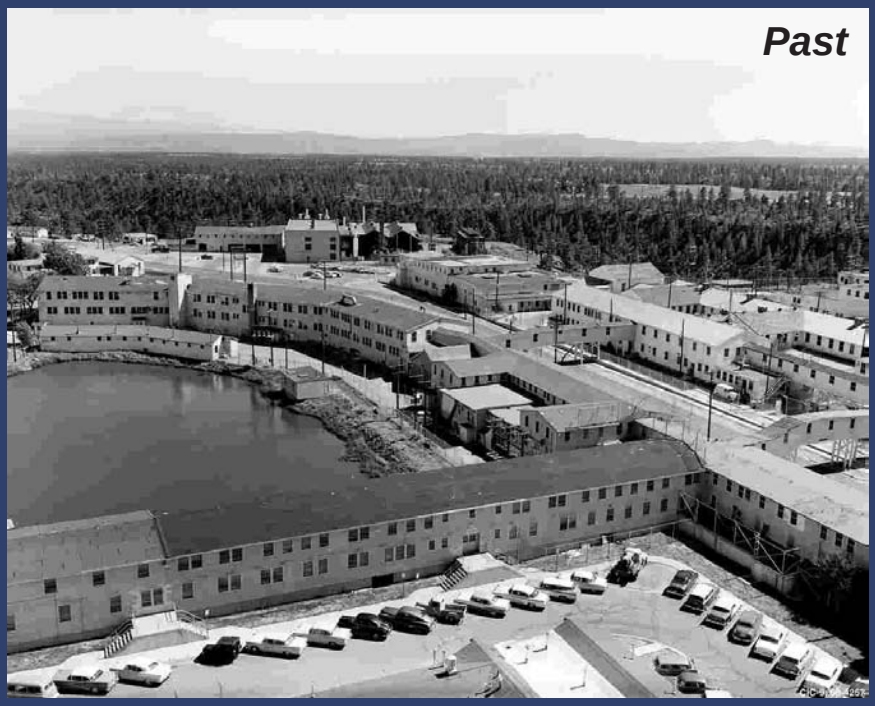
DOE/EIS-0380
May 2008



Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico

Summary

U.S. Department of Energy

National Nuclear Security Administration

Los Alamos Site Office

AVAILABILITY OF
THE FINAL SITE-WIDE ENVIRONMENTAL IMPACT
STATEMENT FOR CONTINUED OPERATION OF
LOS ALAMOS NATIONAL LABORATORY,
LOS ALAMOS, NEW MEXICO

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COVER SHEET

Responsible Agency: U.S. Department of Energy (DOE)
National Nuclear Security Administration (NNSA)

Title: *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (SWEIS) (DOE/EIS-0380)

Location: Los Alamos, New Mexico

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This document is available on the DOE NEPA website (www.eh.doe.gov/nepa) and the NNSA Los Alamos Site Office website (www.doeal.gov/laso/NEPASWEIS.aspx) for viewing and downloading.

Abstract**:** NNSA proposes to continue operating Los Alamos National Laboratory (LANL), which is located in Los Alamos County in north-central New Mexico. NNSA has identified and assessed three alternatives for continued operation of LANL: (1) No Action, (2) Reduced Operations, and (3) Expanded Operations. Under the No Action Alternative, NNSA would continue the historical mission support activities conducted at LANL at currently approved operational levels. Under the Reduced Operations Alternative, NNSA would eliminate some activities and limit the operations of other activities. Under the Expanded Operations Alternative, NNSA would operate LANL at the highest levels of activity currently foreseeable, including full implementation of mission assignments. Expanded Operations is NNSA's Preferred Alternative. NNSA intends to implement actions necessary to comply with the March 2005 Compliance Order on Consent (Consent Order) to address the investigation and remediation of environmental contamination at LANL, regardless of decisions it makes on other actions analyzed in the SWEIS. Under all of the alternatives, the affected environment is primarily within 50 miles (80 kilometers) of LANL. Analyses indicate little difference in the environmental impacts of the alternatives on many resource areas. The primary discriminators are public risk due to radiation exposure, collective worker risk due to radiation exposure, socioeconomic effects due to LANL employment changes, electrical power and water demand, waste management, and transportation. A classified appendix assesses the potential impacts of terrorist acts.

Public Comments: In preparing the Final SWEIS, NNSA considered comments received during the scoping period (January 19 to February 17, 2005) and during the public comment period on the Draft SWEIS (July 7 to September 20, 2006). Public hearings on the Draft SWEIS were held in Los Alamos, Española, and Santa Fe, New Mexico. Comments on the Draft SWEIS were requested during a period of 75 days following publication of the U.S. Environmental Protection Agency's (EPA's) Notice of Availability in the *Federal Register*. All comments, including any late comments, were considered during preparation of the Final SWEIS.

The Final SWEIS contains revisions and new information based in part on comments received on the Draft SWEIS. Vertical change bars in the margins indicate the locations of these revisions and new information. Volume 3 contains the comments received during the public comment period on the Draft SWEIS and NNSA's responses to the comments. NNSA will use the analysis presented in this Final SWEIS, as well as other information, in preparing the Record(s) of Decision (RODs) regarding the level of continued operations at LANL. NNSA will issue ROD(s) no sooner than 30 days after the EPA publishes a Notice of Availability of this Final SWEIS in the *Federal Register*.

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ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ALARA	as low as reasonably achievable
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CMR	Chemistry and Metallurgy Research (Building)
CMRR	Chemistry and Metallurgy Research Building Replacement Project
CO	carbon monoxide
Consent Order	Compliance Order on Consent
DD&D	decontamination, decommissioning, and demolition
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
EIS	environmental impact statement
ERPG	Emergency Response Planning Guideline
FR	*Federal Register*
HEPA	high-efficiency particulate air (filter)
LANL	Los Alamos National Laboratory
LANL SWEIS	*Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico*
LANSCE	Los Alamos Neutron Science Center
LCF	latent cancer fatality
MDA	material disposal area
MEI	maximally exposed individual
NEPA	National Environmental Policy Act of 1969
NNSA	National Nuclear Security Administration
NOI	Notice of Intent
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PC	performance category
PCB	polychlorinated biphenyl
petaflops	one quadrillion floating point operations per second
PM_n	particulate matter less than or equal to *n* microns in aerodynamic diameter
RANT	Radioassay and Nondestructive Testing Facility
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
ROI	region of influence
SHEBA	Solution High-Energy Burst Assembly
SO_2	sulfur dioxide
SWEIS	Site-Wide Environmental Impact Statement

TA	technical area
teraflops	one trillion floating point operations per second
TRU	transuranic
USFWS	U.S. Fish and Wildlife Service
WIPP	Waste Isolation Pilot Plant

CONVERSIONS

METRIC TO ENGLISH			ENGLISH TO METRIC		
Multiply	**by**	**To get**	**Multiply**	**by**	**To get**
Area					
Square meters	10.764	Square feet	Square feet	0.092903	Square meters
Square kilometers	247.1	Acres	Acres	0.0040469	Square kilometers
Square kilometers	0.3861	Square miles	Square miles	2.59	Square kilometers
Hectares	2.471	Acres	Acres	0.40469	Hectares
Concentration					
Kilograms/square meter	0.16667	Tons/acre	Tons/acre	0.5999	Kilograms/square meter
Milligrams/liter	1 [a]	Parts/million	Parts/million	1 [a]	Milligrams/liter
Micrograms/liter	1 [a]	Parts/billion	Parts/billion	1 [a]	Micrograms/liter
Micrograms/cubic meter	1 [a]	Parts/trillion	Parts/trillion	1 [a]	Micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	Pounds/cubic feet	Pounds/cubic feet	0.016018	Grams/cubic centimeter
Grams/cubic meter	0.0000624	Pounds/cubic feet	Pounds/cubic feet	16,025.6	Grams/cubic meter
Length					
Centimeters	0.3937	Inches	Inches	2.54	Centimeters
Meters	3.2808	Feet	Feet	0.3048	Meters
Kilometers	0.62137	Miles	Miles	1.6093	Kilometers
Temperature					
Absolute					
Degrees C + 17.78	1.8	Degrees F	Degrees F - 32	0.55556	Degrees C
Relative					
Degrees C	1.8	Degrees F	Degrees F	0.55556	Degrees C
Velocity/Rate					
Cubic meters/second	2118.9	Cubic feet/minute	Cubic feet/minute	0.00047195	Cubic meters/second
Grams/second	7.9366	Pounds/hour	Pounds/hour	0.126	Grams/second
Meters/second	2.237	Miles/hour	Miles/hour	0.44704	Meters/second
Volume					
Liters	0.26418	Gallons	Gallons	3.78533	Liters
Liters	0.035316	Cubic feet	Cubic feet	28.316	Liters
Liters	0.001308	Cubic yards	Cubic yards	764.54	Liters
Cubic meters	264.17	Gallons	Gallons	0.0037854	Cubic meters
Cubic meters	35.314	Cubic feet	Cubic feet	0.028317	Cubic meters
Cubic meters	1.3079	Cubic yards	Cubic yards	0.76456	Cubic meters
Cubic meters	0.0008107	Acre-feet	Acre-feet	1233.49	Cubic meters
Weight/Mass					
Grams	0.035274	Ounces	Ounces	28.35	Grams
Kilograms	2.2046	Pounds	Pounds	0.45359	Kilograms
Kilograms	0.0011023	Tons (short)	Tons (short)	907.18	Kilograms
Metric tons	1.1023	Tons (short)	Tons (short)	0.90718	Metric tons

ENGLISH TO ENGLISH

Acre-feet	325,850.7	Gallons	Gallons	0.000003046	Acre-feet
Acres	43,560	Square feet	Square feet	0.000022957	Acres
Square miles	640	Acres	Acres	0.0015625	Square miles

a. This conversion is only valid for concentrations of contaminants (or other materials) in water.

METRIC PREFIXES

Prefix	Symbol	Multiplication factor
exa-	E	1,000,000,000,000,000,000 = 10^{18}
peta-	P	1,000,000,000,000,000 = 10^{15}
tera-	T	1,000,000,000,000 = 10^{12}
giga-	G	1,000,000,000 = 10^{9}
mega-	M	1,000,000 = 10^{6}
kilo-	k	1,000 = 10^{3}
deca-	D	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}

SUMMARY

SUMMARY

The National Nuclear Security Administration (NNSA) has prepared a *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0380) (SWEIS) that evaluates the potential impacts of current and proposed activities at the Los Alamos National Laboratory (LANL) in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations, and the U.S. Department of Energy (DOE) NEPA Implementing Procedures. This Summary is a concise stand-alone version of the main text of the SWEIS, and includes information about the NEPA process as applied to the SWEIS, background information (including a summary of the changes at LANL since the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico [1999 SWEIS]* [DOE/EIS-0238] was prepared), the purpose and need for the agency action, reasonable alternatives, consideration of public comments on the Draft SWEIS, and a comparison of the environmental consequences of the reasonable alternatives. Vertical change bars in the margins indicate the locations of revisions and new information based in part on comments on the Draft SWEIS.

S.1 Background

The NEPA Implementing Procedures of DOE (Title 10 *Code of Federal Regulations* [CFR], 1021.330(c)) require the preparation of a SWEIS, a broad-scoped document that identifies and assesses the individual and cumulative impacts of ongoing and reasonably foreseeable future actions at a DOE site for large multiple-facility sites such as LANL in Los Alamos, New Mexico (see **Figure S–1**). Since 1992, these procedures also require evaluation of a DOE SWEIS at least every 5 years by means of a Supplement Analysis. Based on the Supplement Analysis, DOE determines whether an existing SWEIS remains adequate, or whether to prepare a new SWEIS or supplement the existing SWEIS, as appropriate.

DOE issued the first SWEIS and Record of Decision (ROD) for the operation of LANL (then known as the Los Alamos Scientific Laboratory) in 1979. That environmental impact statement (EIS) was entitled *Final Environmental Impact Statement, Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico* (DOE/EIS-0018). Twenty years later, DOE issued the *1999 SWEIS* and its associated ROD (64 *Federal Register* [FR] 50797).

In early 2004, NNSA[1] undertook the required 5-year evaluation of the *1999 SWEIS* by initiating the preparation of a Supplement Analysis. In mid-2004, shortly into the process of preparing the Supplement Analysis, NNSA determined that the criteria for preparing at least a Supplemental SWEIS had been met. Criteria identified in DOE NEPA Implementing Procedures (10 CFR 1021.314) state that a Supplemental EIS shall be prepared if there are substantial changes to the proposal or significant new circumstances or information relevant to environmental concerns.

[1] *NNSA is a semiautonomous agency within DOE (see the National Nuclear Security Administration Act [Title 32 of the Defense Authorization Act for Fiscal Year 2000, Public Law 106-65]).*

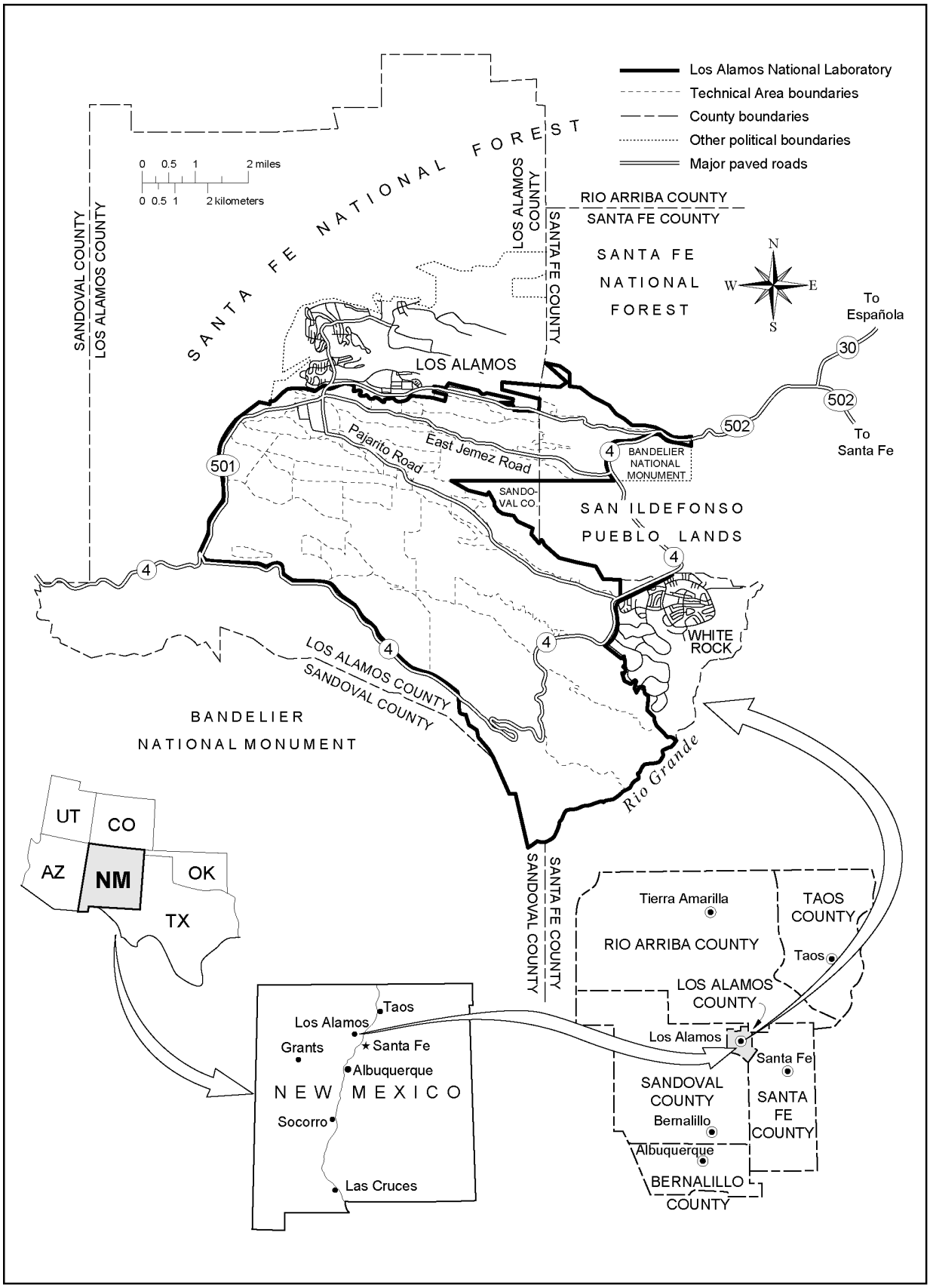

Figure S–1 Location of Los Alamos National Laboratory Site

In January 2005, NNSA published a Notice of Intent (NOI) in the *Federal Register* (70 FR 307) announcing its plan to prepare a Supplemental SWEIS and conduct a public scoping meeting to receive comments. Subsequently, NNSA determined that changes in the LANL environment and proposed new activities warranted preparation of a new SWEIS. Changes to the LANL environment resulted from the 2000 Cerro Grande Fire, which burned a part of LANL, the Los Alamos townsite, and the surrounding forested area; a regional drought; and a massive regional infestation of bark beetles that killed many evergreen trees. Additional information about the LANL environmental setting has become available, as various elements of this setting, particularly the hydrology, have undergone intense investigation by LANL scientists.

Security requirements have evolved in response to changes in recognized threats to facilities and materials at LANL, and DOE and NNSA have finalized several EISs and environmental assessments for LANL operations and activities since issuance of the *1999 SWEIS*. These documents evaluate implementation of new or changed operations and facilities, land conveyances and transfers, and emergency actions taken at LANL in response to the Cerro Grande Fire.

NNSA is considering new actions for initiation at LANL over about the next 5 years that could affect several areas of LANL operations originally analyzed in the *1999 SWEIS*. While consistent with the 1999 ROD, these proposed activities represent potentially substantial changes to some operations. They include the refurbishment or replacement of existing infrastructure so that LANL operations can continue into the future.

Jointly, the activities analyzed in NEPA documents completed since 1999, newly proposed activities for LANL, existing and developing changes to the LANL environmental setting, and changes in site security conditions led NNSA to decide to update the *1999 SWEIS* by preparing a new SWEIS rather than a Supplemental SWEIS. Preparation of a new SWEIS also responds to comments received from the public during the scoping period. The new SWEIS impact analysis tiers from the *1999 SWEIS*, as appropriate, and incorporates information from that document by reference where the information presented in the earlier document remains valid.

Another benefit of preparing a new SWEIS is the reevaluation of cumulative impacts associated with LANL operations. When DOE issued the *1999 SWEIS* and its associated ROD, the analyses considered operational impacts to the northern New Mexico environment of actions that would likely occur over the "foreseeable future" (approximately 10 years for the purposes of that analysis). The new SWEIS considers cumulative impacts associated with ongoing activities at LANL in the context of the new information on the changed environment in the region. For example, a great deal of effort that was not anticipated in 1999 has been expended since the 2000 Cerro Grande Fire to implement forest thinning and watershed protection measures on the Pajarito Plateau.

The following section of this summary describes the purpose and need for continued operation of LANL. Sections S.3 and S.4 explain the scope of the new SWEIS and describe the decisions to be made by NNSA based, in part, on the analyses in the SWEIS, respectively. A description of LANL, as well as terms used in discussing the site and environmental impacts, is presented in Section S.5. The public participation process, including a summary of the major issues raised in the public comments, is provided in Section S.6. Section S.6 also summarizes changes made

between the Draft and Final SWEIS. Changes that have occurred at LANL and a comparison to the projected environmental impacts of the *1999 SWEIS* are summarized in Section S.7. Alternatives considered and analyzed in the SWEIS are discussed in Section S.8. The environmental consequences are presented in Section S.9 for the alternatives analyzed in the SWEIS as well as for the individual projects analyzed in appendices of the SWEIS.

S.2 Purpose and Need for Agency Action

The purpose and need for agency action for the new SWEIS remains unchanged from that stated in the *1999 SWEIS*:

> *The purpose of the continued operation of LANL is to provide support for DOE's core missions as directed by the Congress and the President. DOE's need to continue operating LANL is focused on its obligation to ensure a safe and reliable nuclear stockpile. For the foreseeable future, DOE, on behalf of the U.S. Government, will need to continue its nuclear weapons research and development, surveillance, computational analysis, components manufacturing, and nonnuclear aboveground experimentation. Currently, many of these activities are conducted solely at LANL so stopping these activities would run counter to national security policy as established by the Congress.*

With the creation of NNSA in 2000, the President and the Congress reaffirmed the Nation's need for ongoing operations at LANL by assigning administration of LANL to NNSA and by designating LANL as one of three national security laboratories. Further affirmation of the need for continued operations at LANL occurred in 2002, with the creation of the Department of Homeland Security and the subsequent assignment of many of its mission support activities to LANL and other national security laboratories.

On July 13, 2005, a Task Force of the Secretary of Energy Advisory Board issued its report, *Recommendations for the Nuclear Weapons Complex of the Future* (DOE 2005b). This report contains a comprehensive review of the nuclear weapons complex, which includes LANL, and a vision for a modern nuclear weapons complex of the future that would address the needs of the nuclear weapons stockpile. In 2006, NNSA outlined its comprehensive proposal for a smaller, more efficient nuclear weapons complex by the year 2030 that would be better able and more suited to respond to future national security challenges (NNSA 2006b). The proposal included significant dismantling of retired warheads, consolidating special nuclear materials, eliminating duplicative capabilities, consolidating operations, and implementing more efficient and uniform business practices throughout the complex. In an NOI published in the *Federal Register* on October 19, 2006 (71 FR 61731), NNSA announced its intent to prepare a *Supplement to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement – Complex 2030* (now called the *Complex Transformation Supplemental Programmatic Environmental Impact Statement* [*Complex Transformation SPEIS*]) (DOE/EIS-0236-S4). The NOI outlines alternatives for continued transformation of the nuclear weapons complex to better meet future national security requirements, including a proposal to construct and operate a consolidated plutonium center within the complex. Another proposal, to construct and operate a consolidated nuclear production center, was added as a result of scoping comments. Both of these proposals are analyzed in the Draft *Complex Transformation SPEIS* (DOE 2007b).

On January 31, 2007, NNSA submitted a *Report on the Plan for Transformation of the National Nuclear Security Administration Nuclear Weapons Complex* (NNSA 2007) to the Congressional Defense Committees. The report provides additional discussion of the Complex Transformation vision and the associated transformation plan.

Pending completion of the *Complex Transformation SPEIS*, NNSA is deferring a decision on whether to construct the nuclear facility portion of the Chemistry and Metallurgy Research Replacement Facility. NNSA is continuing with construction of the radiological laboratory, administrative offices and support function building of the new facility and with the design of the nuclear facility portion.

The alternatives in the *Complex Transformation SPEIS* would result in changes to facilities and operations at LANL. In the short term, about the next 5 years, current LANL operations are not expected to change dramatically regardless of the strategy NNSA develops for continuing the transformation of the nuclear weapons complex. However, in recognition of the uncertainties associated with future work assignments to LANL, the "foreseeable future" for the purpose of the Proposed Action in the SWEIS has been changed from the 10 years of LANL operations considered in the *1999 SWEIS* to consideration of proposals regarding LANL operations over about the next 5 years.

S.3 Scope of the New SWEIS

The Proposed Action analyzed in the new SWEIS is the continued operation of LANL to meet DOE's purpose and need. The new SWEIS builds on the descriptions and analyses of operational impacts presented in the *1999 SWEIS*, as well as the information contained in the LANL *SWEIS Yearbooks* prepared since the issuance of the 1999 ROD, and additional documents and data sources. The *SWEIS Yearbooks* are published annually to compare projections in the *1999 SWEIS* with actual operations data. This comparison assists in determining the adequacy of the analysis of environmental consequences in the *1999 SWEIS*. The new SWEIS provides a more focused environmental impact analysis, using the level of operations selected in the ROD of the *1999 SWEIS* as a starting point. In the new SWEIS, the No Action Alternative is the continued implementation of decisions announced in the *1999* ROD together with other activities for which separate NEPA reviews have been completed and decisions made since then. Other alternatives evaluated in the SWEIS include a Reduced Operations Alternative with newly proposed decreases in or elimination of certain activities, and an Expanded Operations Alternative that includes increases in certain ongoing activities and proposed new activities. The proposed new activities are evaluated by means of project-specific analyses contained in appendices of the new SWEIS. **Figure S–2** is a simplified depiction of the alternatives evaluated in the new SWEIS; more detailed descriptions of the alternatives are provided in Section S.8 of this Summary.

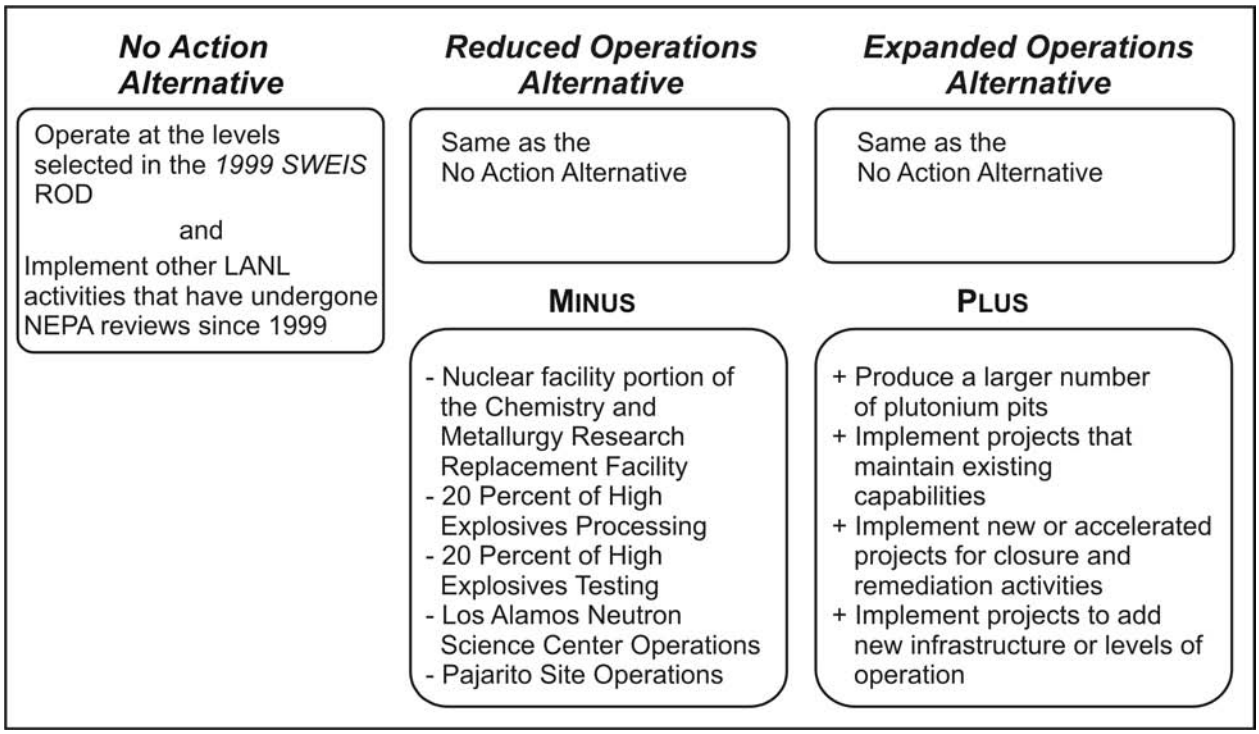

Figure S–2 Summary Comparison of Alternatives Considered in the New Site-Wide Environmental Impact Statement

The new SWEIS also provides an update of current activities at LANL by describing changes that have occurred at the site and presenting a summary of performance compared to *1999 SWEIS* projections. Consistent with the concept of tiering, or building on a previous NEPA document, pertinent information from the *1999 SWEIS* is summarized and incorporated by reference into the new SWEIS. The SWEIS analyzes the potential direct and indirect effects on the human environment under each alternative. Other programmatic decisions currently being considered that might affect LANL and its missions, in combination with activities in the vicinity of LANL, are considered in the cumulative impacts analysis for the new SWEIS.

Appendices of the new SWEIS include specific information and impact analyses for projects that are proposed as part of the Expanded Operations Alternative (project-specific analyses). The project-specific analyses evaluate the potential environmental consequences of projects that are proposed for initiation or implementation prior to 2011. These projects include:

Projects to Maintain Existing LANL Operations and Capabilities – Projects in this group would provide new structures for existing activities at LANL by replacing old and transportable buildings with new modern buildings. This group also includes projects that would provide major refurbishment of selected facilities to maintain capabilities, improve reliability, and prolong operations.

Physical Science Research Complex (formerly the Center for Weapons Physics Research) – provides for the construction and operation of secure and nonsecure facilities in Technical Area (TA) 3.

Replacement Office Buildings Project – provides up to 9 office buildings in TA-3 to replace temporary or obsolete buildings.

Technical Area (TA)

Geographically distinct administrative unit established for the control of LANL operations. There are currently 49 active TAs; 47 in the 40 square miles of the LANL site, one at Fenton Hill, west of the main site, and one comprising leased properties in town.

Radiological Sciences Institute Project (including Phase I – the Institute for Nuclear Nonproliferation Science and Technology) – provides for the consolidation and modernization of radiochemistry capabilities at LANL. Phase I would provide Security Category III and IV laboratories and Security Category I and II training facilities in TA-48 in support of nonproliferation activities.

Radioactive Liquid Waste Treatment Facility (RLWTF) Upgrade Project – provides replacement capabilities in TA-50 for the treatment of radioactive liquids; an auxiliary action provides additional treatment capability that could result in no liquid effluent discharges to the environment.

Los Alamos Neutron Science Center (LANSCE) Refurbishment Project – provides for the replacement of equipment and system refurbishment and improvements at LANSCE in TA-53 to increase the reliability of operations and reduce maintenance costs.

TA-55 Radiography Facility Project – provides radiography capability within the secure area at the TA-55 Plutonium Facility Complex, avoiding the need to transport nuclear components to other locations for examination.

Plutonium Facility Complex Refurbishment Project – provides for a number of subprojects to upgrade electrical, mechanical, safety, and other facility-related systems at the TA-55 Plutonium Facility Complex.

Science Complex Project – provides for the construction of a Science Complex in TA-62 or TA-3. Most bioscience activities currently performed in the Health Research Laboratory would be moved to the new Science Complex.

Remote Warehouse and Truck Inspection Station Project – provides for a warehouse and truck inspection station in TA-72, away from the center portion of LANL.

Projects for Closure and Remediation Actions, including Consent Order Actions – Projects in this group include various actions that would result in the decontamination, decommissioning, and demolition (DD&D) of excess facilities and the remediation of the LANL site. It also includes replacement of waste management capabilities that are displaced as a result of remediation activities.

Decontamination, Decommissioning, and Demolition (DD&D)

DD&D are those actions taken at the end of the useful life of a building or structure to reduce or remove substances that pose a substantial hazard to human health or the environment, retire it from service, and ultimately eliminate all or a portion of the building or structure.

TA-18 Closure, including Remaining Operations Relocation and Structure DD&D Project (TA-18 Closure Project) – provides for the relocation of the Security Category III and IV operations currently at the TA-18 Pajarito Site and the DD&D of the structures.

TA-21 Structure DD&D Project – provides for the DD&D of TA-21 structures. Options evaluated include complete and partial removal of structures to support remediation of potential release sites in TA-21.

Waste Management Facilities Transition Project – provides for the retrieval of transuranic waste stored below ground, the removal of the storage domes, and construction and operation of replacement low-level radioactive waste management facilities in TA-54, and construction and operation of a new TRU (Transuranic) Waste Facility (formerly the Transuranic Waste Consolidation Facility). These actions are necessary to support closure of TA-54, material disposal area (MDA) G.[2]

Major Material Disposal Area Remediation, Canyon Cleanups and Other Compliance Order Actions – provides for the implementation of the Compliance Order on Consent (Consent Order) entered into by DOE, the LANL management and operating contractor, and the State of New Mexico in March 2005 (NMED 2005).[3] The analysis evaluates a Capping Option in which barriers are placed over LANL MDAs and a Removal Option in which the MDAs are exhumed.

Implementing the Consent Order

NNSA intends to implement actions necessary to comply with the Compliance Order on Consent (Consent Order) regardless of decisions it makes on other actions analyzed in the LANL SWEIS. Actions associated with implementing the Consent Order are included in the Expanded Operations Alternative; however, their implementation is not contingent on other actions that are part of that alternative.

Projects Associated with New Infrastructure or Levels of Operation – Projects in this group are of two types. One project would provide for changes in the transportation infrastructure within the LANL site. The other projects would provide for increases in activities or capabilities of existing facilities or projects.

Security-Driven Transportation Modifications Project – provides for the construction of parking lots and changes in access along the Pajarito Road corridor to enhance physical security at facilities in TA-35, TA-48, TA-50, TA-55, and TA-63. Proposed auxiliary actions would provide bridges across Mortandad and Sandia Canyons and roadways connecting to TA-3 and East Jemez Road.

Nicholas C. Metropolis Center for Modeling and Simulation (Metropolis Center) Increase in Level of Operations – provides for the expansion of computing capability at the Metropolis Center.

Increase in the Type and Quantity of Sealed Sources Managed at LANL by the Off-Site Source Recovery Project – expands the types and quantities of sealed sources to be managed at LANL to include non-actinide materials routinely used in sealed sources in addition to sources currently approved for management (primarily actinide-bearing sources).

[2] *MDAs are areas used any time between the beginning of LANL operations in the early 1940s and the present for disposing of chemically, radioactively, or chemically and radioactively contaminated material.*

[3] *NNSA is including impacts associated with Consent Order implementation in order to facilitate Consent Order compliance.*

S.4 Decisions NNSA May Make on the Basis of the New SWEIS

The SWEIS updates the *1999 SWEIS* analysis and evaluates the impacts of newly-proposed projects. RODs based on the new SWEIS may supersede previous decisions made in 1999 regarding the level at which LANL operations will be conducted over at least the next 5 years. Analyses in the SWEIS considered levels of operation and new projects proposed for the period 2007 through about 2011, but would also apply to actions beyond 2011 as long as the actions are bounded by the analyses in the SWEIS. The impacts analyses provided in the SWEIS will allow NNSA to reassess the potential impacts of LANL operations on workers, the public, and the environment in light of changes in the environmental setting, changes in the locations at which certain activities are performed, changes in the boundaries of LANL and therefore the locations to be considered for impacts to a member of the public, and changes in guidance for evaluating risk from radiological exposures.

These changes, together with information regarding impact analyses specific to newly proposed projects at LANL that could have overarching effects, will inform NNSA regarding decisions about the continued operation of LANL over about the next 5 years. Focusing on LANL operations over about the next 5 years allows NNSA to make decisions with a reasonable expectation of being able to implement those decisions and associated mitigation measures.

The decisions NNSA may make regarding the operation of LANL are:

- Whether to implement the No Action Alternative for continued LANL operations, either in whole or in part,
- Whether to implement the Reduced Operations Alternative, either in whole or in part, or
- Whether to implement the Expanded Operations Alternative, either in whole or in part.

NNSA could select the level of operations for a Key Facility or whether to implement individual projects from among the Alternatives. NNSA intends to implement actions necessary to comply with the Consent Order regardless of decisions it makes on other actions analyzed in the SWEIS. NNSA could issue a ROD or RODs to announce its decision regarding the level of operations at LANL or the implementation of a project no sooner than 30 days after the Environmental Protection Agency (EPA) Notice of Availability of the Final SWEIS. In addition to the environmental impact information provided by the SWEIS, other considerations not evaluated through the NEPA process would influence NNSA's decisions. These include cost estimate information, schedule considerations, safeguards and security concerns, and programmatic considerations.

S.5 Site Description

LANL is located in northern New Mexico within Los Alamos County (see Figure S–1). The two primary residential areas within the county are the Los Alamos townsite and the White Rock residential area, home to about 18,400 people. About 13,500 people work at LANL, of which fewer than half reside within the county.

LANL occupies about 40 square miles (25,600 acres [10,360 hectares]) of land on the eastern flank of the Jemez Mountains along the Pajarito Plateau. The terrain consists of relatively flat

mesa tops and canyon bottoms that trend west-to-east toward the Rio Grande. Most of LANL consists of relatively undeveloped forest that serves to provide a buffer for security and safety, as well as space for future expansion.

Activities and potential environmental impacts at LANL are discussed with respect to their location within TAs at the site and whether they are related to those facilities identified as Key Facilities for purposes of the SWEIS. Section S.5.1 describes the TAs at LANL. Section S.5.2 defines the term "Key Facilities" and identifies those facilities at LANL. Section S.5.3 discusses LANL non-Key Facilities.

S.5.1 Technical Areas

LANL operations occupy 49 TAs, including TA-0, the designation given to leased space in the Los Alamos townsite. As shown in **Figure S–3**, there are 47 contiguous TAs; in addition, TA-57 is located approximately 20 miles (32 kilometers) away at Fenton Hill. TAs are geographically discrete areas that are segregated for management, planning, operational, and security purposes. LANL operations occur within the more than 2,000 structures located within these TAs. As of the end of 2005, LANL has approximately 8.6 million square feet (800,000 square meters) under roof on land under the administrative control of NNSA; the total space available for operational use changes frequently as structures are demolished or built. Approximately half of the square footage of buildings at LANL is considered laboratory or production space; the remaining square footage is used for administrative purposes, storage, service, and other space. The number of structures within TAs varies with time, due to frequent addition or removal of temporary structures and miscellaneous buildings. Permanent structures include buildings, meteorological towers, water tanks, manholes, small storage sheds, and electrical transformers, in addition to the specialized facilities that have been built and maintained at LANL over the last 50 years. **Table S–1** provides a brief overview of current activities conducted at each TA.

S.5.2 Key Facilities

Fifteen facilities within LANL were identified in the *1999 SWEIS* as being Key Facilities for the evaluation of potential environmental impacts of operations in the SWEIS. Facilities labeled as "Key" in both the *1999 SWEIS* and the new SWEIS house activities critical to performing mission work assigned to LANL and:

- House operations that have potential to cause significant environmental impacts; or
- Are of most interest or concern to the public based on scoping comments received; or
- Would be most subject to change as a result of programmatic decisions.

The definition of a Key Facility is not limited to a single structure, building, or TA. The number of structures constituting a Key Facility ranges from one (Material Sciences Laboratory) to more than 400 (LANSCE). Key Facilities may exist in more than one TA, as is the case with the High Explosives Processing Key Facilities which consists of structures in six TAs.

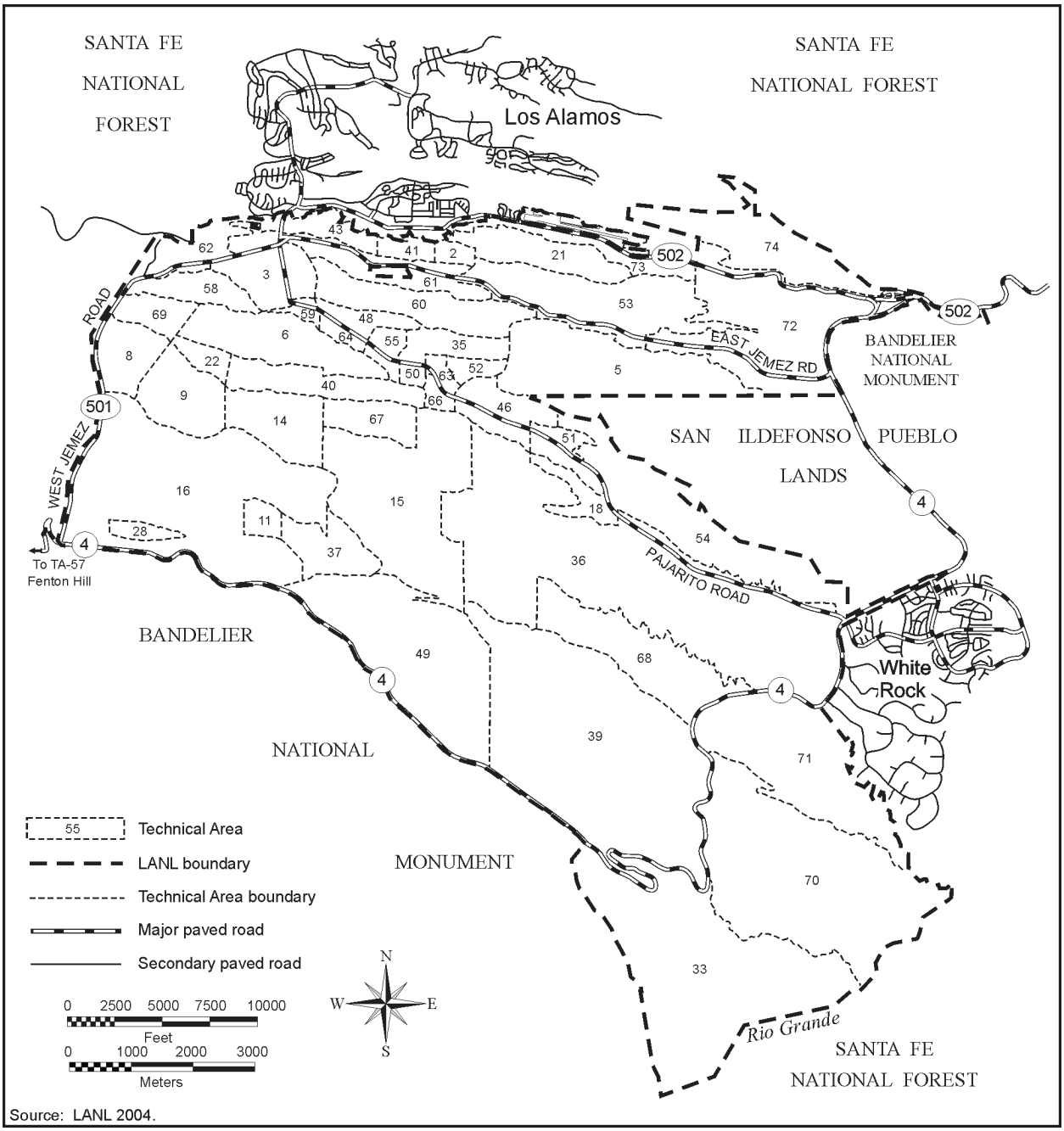

Figure S–3 Technical Areas at Los Alamos National Laboratory

Table S–1 Overview of Los Alamos National Laboratory Technical Areas and Activities

Technical Area [a]	*Activities*
TA-0 (Offsite Facilities)	This TA designation is assigned to structures leased by DOE that are located outside LANL's boundaries in the Los Alamos townsite and White Rock.
TA-2 (Omega Site or Omega West Reactor)	This TA in Los Alamos Canyon was home to the now demolished Omega West Reactor.
TA-3 (Core Area or South Mesa Site)	This TA is LANL's core scientific and administrative area, with approximately half of LANL's employees and total floor space. It is the location of a number of the LANL's Key Facilities, including the Chemistry and Metallurgy Research Building, the Sigma Complex, the Machine Shops, the Material Sciences Laboratory, and the Nicholas C. Metropolis Center for Modeling and Simulation. It is also the location proposed for operating the existing Biosafety Level 3 Facility.
TA-5 (Beta Site)	This TA is largely undeveloped. Located between East Jemez Road and the San Ildefonso Pueblo, it contains physical support facilities, an electrical substation, and test wells.
TA-6 (Two-Mile Mesa Site)	This TA, located in the northwestern part of LANL, is mostly undeveloped. It contains a meteorological tower, gas-cylinder-staging buildings, and aging vacant buildings that are awaiting demolition.
TA-8 (GT-Site [Anchor Site West])	This TA, located along West Jemez Road, is a testing site where nondestructive dynamic testing techniques are used for the purpose of ensuring the quality of materials in items ranging from test weapons components to high-pressure dies and molds. Techniques used include radiography, radioisotope techniques, ultrasonic and penetrant testing, and electromagnetic test methods.
TA-9 (Anchor Site East)	This TA is located on the western edge of LANL. Fabrication feasibility and the physical properties of explosives are explored at this TA, and new organic compounds are investigated for possible use as explosives.
TA-11 (K-Site)	This TA is used for testing explosives components and systems, including vibration analysis and drop-testing materials and components under a variety of extreme physical environments. Facilities are arranged so that testing may be controlled and observed remotely, allowing devices that contain explosives, radioactive materials, and nonhazardous materials to be safely tested and observed.
TA-14 (Q-Site)	This TA, located in the northwestern part of LANL, is one of 14 firing areas. Most operations are remotely controlled and involve detonations, certain types of high explosives machining, and permitted burning.
TA-15 (R-Site)	This TA, located in the central portion of LANL, is used for high explosives research, development, and testing, mainly through hydrodynamic testing and dynamic experimentation. TA-15 is the location of two firing sites, the Dual Axis Radiographic Hydrodynamic Test Facility, which has an intense high-resolution, dual-machine radiographic capability, and Building 306, a multipurpose facility where primary diagnostics are performed.
TA-16 (S-Site)	TA-16, in the western part of LANL, is the location of the Weapons Engineering Tritium Facility, a state-of-the-art tritium processing facility. The TA is also the location of high explosives research, development, and testing, and the High Explosives Wastewater Treatment Facility.
TA-18 (Pajarito Site)	This TA, located in Pajarito Canyon, is the location of the Los Alamos Critical Experiment Facility, a general-purpose nuclear experiments facility. It is the location of the Solution High-Energy Burst Assembly and is also used for teaching and training related to criticality safety and applications of radiation detection and instrumentation. In December 2002, NNSA decided to relocate all TA-18 Security Category I and II materials and activities to the Nevada Test Site; this transfer is in process.
TA-21 (DP-Site)	TA-21 is on the northern border of LANL, next to the Los Alamos townsite. In the western part of the TA is the former radioactive materials (including plutonium) processing facility that has been partially decontaminated and decommissioned. In the eastern part of the TA are the Tritium Systems Test Assembly and the Tritium Science and Fabrication Facility. Operations from both facilities have been transferred elsewhere as of the end of 2006.
TA-22 (TD-Site)	This TA, located in the northwestern portion of LANL, houses the Los Alamos Detonator Facility. Construction of a new Detonator Production Facility began in 2003. Research, development, and fabrication of high-energy detonators and related devices are conducted at this facility.
TA-28 (Magazine Area A)	TA-28, located near the southern edge of LANL, was an explosives storage area. The TA contains five empty storage magazines that are being decontaminated and decommissioned.
TA-33 (HP-Site)	TA-33 is a remotely-located TA at the southeastern boundary of LANL. The TA is used for experiments that require isolation, but do not require daily oversight. The National Radioastronomy Observatory's Very Long Baseline Array telescope is located at this TA.

Technical Area [a]	*Activities*
TA-35 (Ten Site)	This TA, located in the north central portion of LANL, is used for nuclear safeguards research and development, primarily in the areas of lasers, physics, fusion, materials development, and biochemistry and physical chemistry research and development. The Target Fabrication Facility, located at this TA, conducts precision machining and target fabrication, polymer synthesis, and chemical and physical vapor deposition. Additional activities at TA-35 include research in reactor safety, optical science, and pulsed-power systems, as well as metallurgy, ceramic technology, and chemical plating. Additionally, there are some Biosafety Level 1 and 2 laboratories at TA-35.
TA-36 (Kappa-Site)	TA-36, a remotely-located area in the eastern portion of LANL, has four active firing sites that support explosives testing. The sites are used for a wide variety of nonnuclear ordnance tests.
TA-37 (Magazine Area C)	This TA is used as an explosives storage area. It is located at the eastern perimeter of TA-16.
TA-39 (Ancho Canyon Site)	TA-39 is located at the bottom of Ancho Canyon. This TA is used to study the behavior of nonnuclear weapons (primarily by photographic techniques) and various phenomenological aspects of explosives.
TA-40 (DF-Site)	TA-40, centrally located within LANL, is used for general testing of explosives or other materials and development of special detonators for initiating high explosives systems.
TA-41 (W-Site)	TA-41, located in Los Alamos Canyon, is no longer actively used. Many buildings have been decontaminated and decommissioned; the remaining structures include historic properties.
TA-43 (the Bioscience Facilities, formerly called the Health Research Laboratory)	TA-43 is adjacent to the Los Alamos Medical Center at the northern border of LANL. Two facilities are located within this TA: the Bioscience Facilities (formerly called the Health Research Laboratory) and NNSA's local Site Office. The Bioscience Facilities have Biosafety Level 1 and 2 laboratories and are the focal point of bioscience and biotechnology at LANL. Research performed at the Bioscience Facilities includes structural, molecular, and cellular radiobiology; biophysics; radiobiology; biochemistry; and genetics.
TA-46 (WA-Site)	TA-46, located between Pajarito Road and the San Ildefonso Pueblo, is one of LANL's basic research sites. Activities have focused on applied photochemistry operations and have included development of technologies for laser isotope separation and laser enhancement of chemical processes. The Sanitary Wastewater Systems Plant is also located within this TA.
TA-48 (Radiochemistry Site)	TA-48, located in the north central portion of LANL, supports research and development in nuclear and radiochemistry, geochemistry, production of medical radioisotopes, and chemical synthesis.
TA-49 (Frijoles Mesa Site)	TA-49, located near Bandelier National Monument, is used as a training area and for outdoor tests on materials and equipment components that involve generating and receiving short bursts of high-energy, broad-spectrum microwaves. A fire support building and helipad located near the entrance to the TA are operated by the U.S. Forest Service.
TA-50 (Waste Management Site)	TA-50, located near the center of LANL, is the location of waste management facilities including the Radioactive Liquid Waste Treatment Facility and the Waste Characterization, Reduction, and Repackaging Facility. The Actinide Research and Technology Instruction Center is also located in this TA.
TA-51 (Environmental Research Site)	TA-51, located on Pajarito Road in the eastern portion of LANL, is used for research and experimental studies on the long-term impacts of radioactive materials on the environment. Various types of waste storage and coverings are studied at this TA.
TA-52 (Reactor Development Site)	TA-52 is located in the north central portion of LANL. A wide variety of theoretical and computational research and development activities related to nuclear reactor performance and safety, as well as to several environmental, safety, and health activities, are carried out at this TA.
TA-53 (Los Alamos Neutron Science Center)	TA-53, located in the northern portion of LANL, includes the LANSCE. LANSCE houses one of the largest research linear accelerators in the world and supports both basic and applied research programs. Basic research includes studies of subatomic and particle physics, atomic physics, neutrinos, and the chemistry of subatomic interactions. Applied research includes materials science studies that use neutron spallation and contributes to defense programs. LANSCE has also produced medical isotopes for the past 20 years.
TA-54 (Waste Disposal Site)	TA-54, located on the eastern border of LANL, is one of the largest TAs at LANL. Its primary function is management of solid radioactive and hazardous chemical wastes, including storage, treatment, decontamination, and disposal operations.

Technical Area [a]	***Activities***
TA-55 (Plutonium Facility Complex Site)	TA-55, located in the center of LANL, is the location of the Plutonium Facility Complex and is the chosen location for the Chemistry and Metallurgy Research Building Replacement. The Plutonium Facility provides chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides into many compounds and forms. The Chemistry and Metallurgy Research Building Replacement, currently under construction, will provide chemistry and metallurgy research, actinide chemistry, and materials characterization capabilities.
TA-57 (Fenton Hill Site)	TA-57 is located about 20 miles (32 kilometers) west of LANL on land administered by the U.S. Forest Service. The primary purpose of the TA is observation of astronomical events. TA-57 houses the Milagro Gamma Ray Observatory and a suite of optical telescopes. Drilling technology research is also performed in this TA.
TA-58 (Twomile North Site)	TA-58, located near LANL's northwest border on Twomile Mesa North, is a forested area reserved for future use because of its proximity to TA-3. The TA houses a few LANL-owned storage trailers and a temporary storage area.
TA-59 (Occupational Health Site)	This TA is located on the south side of Pajarito Road adjacent to TA-3. This is the location of staff who provide support services in health physics, risk management, industrial hygiene and safety, policy and program analysis, air quality, water quality and hydrology, hazardous and solid waste analysis, and radiation protection. The Medical Facility at TA-59 includes a clinical laboratory and provides bioassay sample analytical support.
TA-60 (Sigma Mesa)	TA-60 is located southeast of TA-3. The TA is primarily used for physical support and infrastructure activities. The Nevada Test Site Test Fabrication Facility and a test tower are also located here. Due to the moratorium on testing, these buildings have been placed in indefinite safe shutdown mode.
TA-61 (East Jemez Site)	TA-61, located in the northern portion of LANL, contains physical support and infrastructure facilities, including a sanitary landfill operated by Los Alamos County and sewer pump stations.
TA-62 (Northwest Site)	TA-62, located next to TA-3 and West Jemez Road in the northwest corner of LANL, serves as a forested buffer zone. This TA is reserved for future use.
TA-63 (Pajarito Service Area)	TA-63, located in the north central portion of LANL, contains physical support and infrastructure facilities. The facilities at this TA serve as localized storage and office space.
TA-64 (Central Guard Site)	This TA is located in the north central portion of LANL and provides offices and storage space.
TA-66 (Central Technical Support Site)	TA-66 is located on the southeast side of Pajarito Road in the center of LANL. The Advanced Technology Assessment Center, the only facility at this TA, provides office and technical space for technology transfer and other industrial partnership activities.
TA-67 (Pajarito Mesa Site)	TA-67 is a forested buffer zone located in the north central portion of LANL. No operations or facilities are currently located at the TA.
TA-68 (Water Canyon Site)	TA-68, located in the southern portion of LANL, is a testing area for dynamic experiments that also contains environmental study areas.
TA-69 (Anchor North Site)	TA-69, located in the northwestern corner of LANL, serves as a forested buffer area. The new Emergency Operations Center, completed in 2003, is located here.
TA-70 (Rio Grande Site)	TA-70 is located on the southeastern boundary of LANL and borders the Santa Fe National Forest. It is a forested TA that serves as a buffer zone.
TA-71 (Southeast Site)	TA-71 is located on the southeastern boundary of LANL and is adjacent to White Rock to the northeast. It is an undeveloped TA that serves as a buffer zone for the High Explosives Test Area.
TA-72 (East Entry Site)	TA-72, located along East Jemez Road on the northeastern boundary of LANL, is used by protective force personnel for required firearms training and practice purposes.
TA-73 (Airport Site)	TA-73 is located along the northern boundary of LANL, adjacent to Highway 502. The County of Los Alamos manages, operates, and maintains the community airport under a leasing arrangement with DOE. Use of the airport by private individuals is permitted with special restrictions.
TA-74 (Otowi Tract)	TA-74 is a forested area in the northeastern corner of LANL. A large portion of this TA has been conveyed to Los Alamos County or transferred to the Department of the Interior in trust for the Pueblo of San Ildefonso and is no longer part of LANL.

TA = technical area, LANSCE = Los Alamos Neutron Science Center.

[a] Names in parentheses are common or historical names that are sometimes used to refer to the Technical Areas.

Taken together, the Key Facilities represent the greatest potential for risks of exposure to hazardous materials associated with LANL operations. The *1999 SWEIS* projections and operational experience show that the Key Facilities presented in **Figure S–4** produce:

- More than 99 percent of all radiation doses to the public;
- More than 99 percent of all radiation doses to the LANL workforce;
- More than 90 percent of all radioactive liquid waste generated at LANL; and
- More than 90 percent of all radioactive solid waste generated at LANL.

Nuclear and radiological facilities at LANL are identified by hazard category in accordance with the potential consequences in the event of an accident. At LANL, there are no Hazard Category 1 nuclear facilities; the nuclear facilities are either Hazard Category 2 or Hazard Category 3. Facilities that handle less than Hazard Category 3 threshold quantities of radioactive materials, but require identification as "radiological areas" are designated radiological facilities. All of the nuclear Hazard Category 2 and 3 facilities and most of the radiological facilities at LANL either are Key Facilities in the SWEIS or are MDAs that are being addressed by environmental restoration activities.

Nuclear Facility Hazard Categories

Hazard Category 1: Hazard analysis shows the potential for significant offsite consequences.

Hazard Category 2: Hazard analysis shows the potential for significant onsite consequences.

Hazard Category 3: Hazard analysis shows the potential for only significant localized consequences.

For the impact analysis in the new SWEIS, the identity of the LANL Key Facilities was modified to incorporate decisions DOE made after 1999 that resulted in changes to LANL facilities and operations. As shown in **Table S–2**, most of the Key Facilities in the *1999 SWEIS* are also Key Facilities in the new SWEIS. The only changes to the list are the addition of the Metropolis Center as a new Key Facility, and the removal of the Pajarito Site as a Key Facility for alternatives other than the No Action Alternative.

S.5.3 Non-Key Facilities

The majority of LANL buildings are not Key Facilities, and house operations that are unlikely to cause significant environmental impacts, although some have been designated as radiological or moderate hazard facilities. These buildings and structures, collectively called non-Key Facilities, are located in 30 of the 48 TAs over approximately 14,200 acres (5,750 hectares) of LANL's 25,600 acres (10,360 hectares). Some of these non-Key Facilities are operating, but several are now surplus and awaiting DD&D. Currently, there are no Hazard Category 2 or 3 nuclear facilities among the non-Key Facilities at LANL. The following list provides information about physical changes to non-Key Facilities occurring since the issuance of the *1999 SWEIS* and includes hazard category designation changes where appropriate:

- Various Chlorination Stations (TA-0, Buildings 1109, 1110, 1113, 1114; 16-560; 54-1008; 72-3; 73-9) were designated moderate chemical hazard facilities in the *1999 SWEIS*. Since then, the quantity of chlorine stored at these facilities has been reduced or eliminated, so they are no longer categorized as hazardous facilities. Ownership of several chlorination stations was conveyed to Los Alamos County.

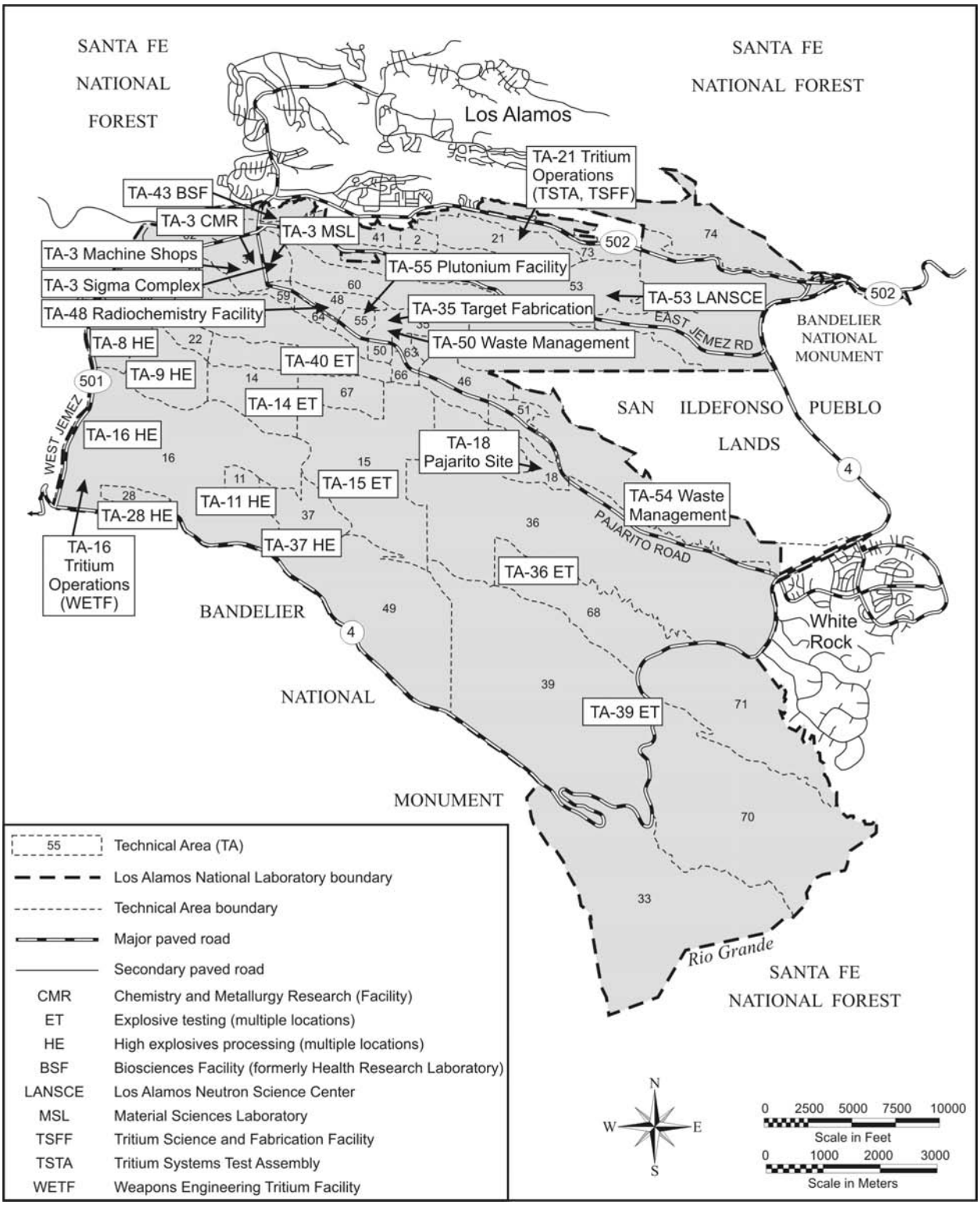

Figure S–4 Locations of Key Facilities

Table S–2 Comparison of Key Facilities Between the *1999 SWEIS* and the New SWEIS

Key Facilities	*1999 SWEIS*	*New SWEIS*
Chemistry and Metallurgy Research Building	✓	✓
Sigma Complex	✓	✓
Machine Shops	✓	✓
Material Sciences Laboratory	✓	✓
Nicholas C. Metropolis Center for Modeling and Simulation		✓
High Explosives Processing Facilities	✓	✓
High Explosives Testing Facilities	✓	✓
Tritium Facilities	✓	✓
Pajarito Site (Los Alamos Critical Experiments Facility)	✓	(a)
Target Fabrication Facility	✓	✓
Bioscience Facilities (previously called Health Research Laboratory)	✓	✓
Radiochemistry Facility	✓	✓
Waste Management Operations: Radioactive Liquid Waste Treatment Facility	✓	✓
Los Alamos Neutron Science Center	✓	✓
Waste Management Operations: Solid Radioactive and Chemical Waste Facilities	✓	✓
Plutonium Facility Complex	✓	✓

[a] The Pajarito Site remains a Key Facility in the No Action Alternative only.

- The Omega West Building (2-1) and reactor were completely decontaminated and demolished in September 2003.
- The Ion Beam Building (3-16) houses an accelerator that is currently in safe-shutdown mode. All radioactive sources have been removed from that building.
- All cryogenics equipment has been removed from the Condensed Matter and Thermal Physics Laboratory (Building 3-34) since 1999 and the Ion Beam M Laboratory now occupies the basement.
- The Health Physics Instrument Calibration facilities, located within the Physics Building (3-40), are no longer designated a Hazard Category 3 nuclear facility. The facilities were relocated to Buildings 36-1 and 36-214, both of which are on the radiological facilities list.
- The Source Storage Building (3-65) has been downgraded from Hazard Category 2 since the *1999 SWEIS*, and removed from the radiological facilities list. It is currently used for storage of materials and test kits.
- The Calibration Building (3-130), designated in the *1999 SWEIS* as a Hazard Category 3 nuclear facility, is being converted into office space with some light-laboratory areas and is no longer on the radiological facilities list.
- The Liquid and Compressed Gas Facility (Building 3-170) was reclassified to a low chemical hazard status. All toxic materials have been removed from this facility since 1999.
- Building 21-5, a laboratory, has been reclassified as a radiological facility since 1999.

- Building 21-150, Molecular Chemistry, has been removed from the radiological facilities list and is now identified as a surplus structure.

- The High Pressure Tritium Facility (Building 33-86) was decommissioned in 2002 prior to its subsequent demolition.

- Nuclear Safeguards Research Facilities (Buildings 35-2 and 35-27) were downgraded to radiological facilities in 2000 from Hazard Category 3 nuclear facilities in the *1999 SWEIS*.

- Central High Pressure Calibration Facility construction (Building 36-214) was completed in October 2001 and categorized as a radiological facility. In addition, Building 36-1, a laboratory and office building, has been categorized as a radiological facility since 1999.

- The Laboratory Building (41-4) was categorized as a radiological facility in the *1999 SWEIS*. Building 41-30 was demolished with a major portion of Building 41-4. The Ice House, Building 41-1, an underground storage vault, is categorized as a radiological facility, although no special nuclear material is now stored in the vault.

- The Sewage Treatment Plants (Building 46-340) no longer use chlorine gas for effluent disinfection, so the designation as moderate chemical hazard facilities prior to 1999 has recently been changed.

S.6 Public Involvement and Issues Identified

The process of preparing an EIS provides opportunities for public involvement (see **Figure S–5**). These opportunities include the scoping process and the public comment period for the EIS. The scoping process is required by 40 CFR 1501.7 while the public comment period is required by 40 CFR 1503.1. Section S.6.1 summarizes the scoping process, major comments received from the public, and changes made by NNSA in response to the public comments. Section S.6.2 summarizes the public comment period process, major comments raised by the public, and NNSA's responses to those comments.

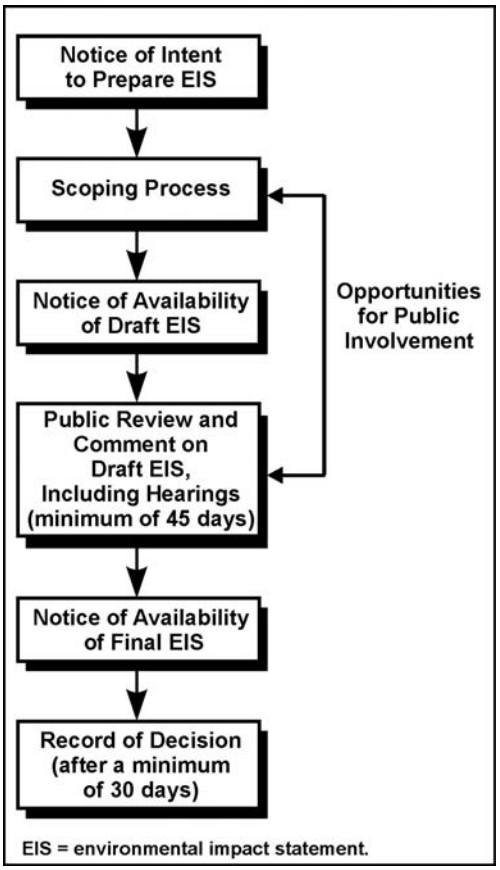

Figure S–5 National Environmental Policy Act Process

S.6.1 Scoping Process

As a preliminary step in the development of an EIS, regulations established by the CEQ (40 CFR 1501.7) and DOE require "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a Proposed Action." The purpose of this scoping process is: (1) to inform the public about a

Proposed Action and the Alternatives being considered, and (2) to identify and clarify issues relevant to the EIS by soliciting public comments.

On January 5, 2005, NNSA published an NOI to prepare a Supplemental SWEIS in the *Federal Register* (70 FR 807). NNSA provided the public an opportunity to participate in the scoping process through a public scoping meeting held on January 19, 2005, in Pojoaque, New Mexico, and through receipt of comments via the U.S. Postal Service, a special DOE Internet address, a toll-free phone line, and a facsimile phone line. The public scoping period ended February 17, 2005. Approximately 225 comments were received from citizens, interested groups, local officials, and representatives of Native American Pueblos in the vicinity of LANL during the scoping process. All comments received were reviewed for consideration by NNSA in proceeding with this NEPA analysis.

Summary of Major Scoping Comments

Multiple comments were made regarding the type of NEPA document that NNSA should prepare. There were comments calling for development of a new SWEIS rather than a supplement to the *1999 SWEIS*. Justifications for a new SWEIS included changes in operations and the environment, issuance of the Consent Order (NMED 2005), concerns about inadequacies of the *1999 SWEIS*, contaminants in the environment, and other reasons. Regarding the scope of the document, comments included the desire to see a Reduced Operations Alternative, a Greener Alternative, and a "true No Action Alternative." In response, NNSA prepared a new SWEIS instead of a Supplemental SWEIS, as originally proposed. The SWEIS includes analysis of a Reduced Operations Alternative to assess the impacts of continued operation of LANL, with certain facilities operating at lower levels. Two alternatives that were suggested for inclusion in the new SWEIS are not analyzed. A "true No Action Alternative," understood to mean a cessation of LANL operations, is not included, nor is a distinct "Greener Alternative." The reasons these alternatives were considered and dismissed from further evaluation are discussed in Section S.8.

Other public comments focused on ensuring that certain facilities, processes, and activities at LANL were included in the SWEIS. In general, all facilities, processes, and other activities at LANL have been included. Operation of the Biosafety Level 3 Facility is being addressed in a separate EIS; however, a summary of the potential impacts is included in the cumulative impacts section of the SWEIS.

A range of comments on environmental changes since the release of the *1999 SWEIS* was also received, including general questions on New Mexico's drought and the impacts of the Cerro Grande Fire. Other comments stressed that the most recent environmental monitoring and hydrological data be incorporated and addressed. The SWEIS summarizes the results of a number of studies performed following the Cerro Grande Fire to determine the impacts the fire had on the movement of contaminants. It also presents a comparison of levels of environmental contamination based on composite samples of groundwater, storm water runoff, sediments, and soil as measured over the years since the Cerro Grande Fire to similar sample results presented in the *1999 SWEIS*. In addition, the most recent publicly available environmental reports have been incorporated into the analyses of the SWEIS.

NNSA received comments from local Native American Tribes that reflected concerns related to LANL operations and human and environmental health problems in their communities. They believe health issues were not properly addressed in the *1999 SWEIS* or ROD and would like to see a more detailed analysis. NNSA believes the SWEIS conforms to the established NEPA requirements and practices for analyzing and presenting these impacts. The text has been revised to provide more information on the analysis of special pathways.

Other concerns identified by commentors in the scoping process were related to analyzing the impacts of reduced air monitoring, improving the air quality and soil analysis, increasing the discussion of cleanup activities, addressing land conveyance and transfer, and questioning the scope of the accident analyses. NNSA addressed all of these topics in the Draft SWEIS and in this Final SWEIS.

Certain groups of comments from the scoping process were not included in the analysis of the SWEIS. These included comments regarding accountability of LANL management, the transfer of LANL management, worker turnover, and worker morale.

S.6.2 Public Comments on the Draft LANL SWEIS

Once the Draft EIS is completed, regulations require that it be issued publicly to obtain the comments of any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved or which is authorized to develop and enforce environmental standards; appropriate State and local agencies; Native American Tribal Governments, when the effects may be on a reservation; and the public, which consists of those persons or organizations who may be interested or affected (40 CFR 1503.1).

NNSA issued a notice of availability for the Draft SWEIS in July 2006 (71 FR 38638). The formal public comment period, originally scheduled for 60 days, lasted 75 days, beginning on July 7, 2006 and ending on September 20, 2006. During this comment period, public hearings were held in Los Alamos, Española, and Santa Fe, New Mexico. In addition, Federal agencies, state and local governmental entities, Native American Tribal Governments, and the general public were encouraged to submit comments via the U.S. mail, e-mail, a toll-free telephone number, and a toll-free fax line. Approximately 1,600 comments were received. NNSA considered all comments, including those received after the comment period ended, in evaluating the accuracy and adequacy of the Draft SWEIS and to determine whether its text needed to be corrected, clarified, or otherwise revised.

Upon receipt, all comment documents (e-mail, letter, telefax, transcribed phone messages) were entered into a tracking system for management during the comment response process. The transcript from each public hearing was entered into the system as a comment document. All comment documents are included in the Administrative Record. The text of each comment document is delineated into individual, sequentially numbered comments and responses are developed for each comment, as appropriate. A copy of each comment document, including transcripts, along with NNSA's response to each comment, is included in Volume 3, *Comment Response Document,* of the SWEIS.

Summary of Major Issues

Several topics raised by public comments on the Draft SWEIS are of broad interest or concern, or require a detailed response. The following discussion presents a summary of these major issues and NNSA's responses.

Opposition to Nuclear Weapons and Pit Production *– Commentors expressed general opposition to nuclear weapons and pit production. Nuclear weapons are seen as unnecessary, immoral, unethical, and violating international nonproliferation treaties, and should be eliminated. Some commentors also called into question the need for pit production because of the apparent long life of plutonium pits.*

NNSA acknowledges that there is wide-spread opposition to the production of nuclear weapons and their components; however, nuclear deterrence will continue to be an important element of national security policy for the foreseeable future. LANL's national security responsibilities are to support NNSA's core mission, which includes ensuring a safe and reliable nuclear stockpile; a cessation of these activities would be counter to national security policy as established by the Congress and the President. Therefore, ending these activities at LANL is not considered in the SWEIS. Maintaining an existing nuclear weapon stockpile for safety and security reasons is not in violation of any current nonproliferation treaty to which the United States is a signatory. Stockpile stewardship capabilities at LANL are currently viewed by the United States as a means to further the Nation's nonproliferation objectives. Continued confidence in the Nation's nuclear stockpile capabilities is likely to remain important in arms control negotiations as the size of the stockpile continues to be reduced in accordance with international treaties. Regarding pit lifetime, NNSA reviewed pit lifetime studies and has concluded that the degradation of plutonium in the majority of nuclear weapons will not affect warhead reliability for a minimum of 85 years; however, the production rate of 80 pits per year analyzed in the SWEIS provides a bounding scenario and would, if implemented, give NNSA flexibility to meet current security needs.

NEPA Process *– Commentors expressed a variety of concerns related to the implementation of the NEPA process for the LANL SWEIS, including an inadequate scoping process, inadequate time to review the Draft SWEIS, inadequate timing and number of public hearings, lack of availability of references for public review, and the need to include not-yet completed technical studies.*

In implementing the NEPA process, NNSA provides reasonable opportunities for the public to provide input, including a scoping period following issuance of an NOI and a comment period after issuance of the Draft SWEIS. NNSA announced a scoping period and scoping meeting based on the plans to prepare a supplement to the *1999 SWEIS*. Subsequently, NNSA determined that it would prepare a new SWEIS rather than a supplemental SWEIS, consistent with the request expressed in some scoping comments. NNSA believes that the scoping comments apply equally to a supplement to the previous SWEIS or to a new SWEIS. For review of the Draft SWEIS, NNSA originally provided for a 60-day comment period; in response to requests for additional time, the comment period was extended by 15 days for a total of 75 days. The number and location of public hearings was consistent with prior public outreach for LANL NEPA documents; in addition, all public announcements regarding the Draft SWEIS identified a

number of other means by which the public could provide comments (U.S. mail, e-mail, fax, or phone message). References used in the Draft SWEIS were available to the public in reading rooms in Los Alamos, Santa Fe, and Albuquerque, New Mexico, also consistent with past practices. Commentors noted that the Draft SWEIS had referenced a draft public health assessment prepared by the Agency for Toxic Substances and Disease Registry; this study has since been finalized and is reflected in the Final SWEIS. Other concerns were that updates to seismic hazards analysis and the TA-54 Area G performance assessment should be included in the SWEIS. To the extent possible, the most recent technical documents, including an update to the seismic hazard analysis, completed in 2007, are considered in the Final SWEIS analyses. Information under development that is not available for use in the Final SWEIS, such as the updated Area G performance assessment, will be considered as it becomes available. In accordance with the NEPA process, the SWEIS impact analyses will be reviewed and supplemented as necessary in response to new information.

Alternative Missions *– Commentors suggested changing LANL's mission of supporting stockpile stewardship activities to another, non-weapons related mission. Examples of alternative missions suggested by commentors include development of renewable resources including solar, wind, and biomass; development of environmental cleanup technologies; addressing global climate change; development of the use of hydrogen fuel cells; and development of anti-terrorism and nonproliferation tools.*

As indicated above, the purpose of the continued operation of LANL is to provide support for NNSA's core mission as directed by the Congress and the President, which includes maintaining a safe and reliable nuclear weapon stockpile. A cessation of these activities would be counter to national security policy and therefore, is not being considered in the SWEIS. Certain of the research areas identified by commentors are currently performed at LANL and therefore are part of the No Action Alternative. These research activities, including research related to national health issues, waste minimization and environmental issues, and international nuclear safety, would continue to be conducted regardless of the alternative selected.

Modernization of the Nuclear Weapons Complex *– Commentors requested to delay completion of the LANL SWEIS until the Complex Transformation SPEIS is completed because it has a broader view of the need for, and level of, pit manufacturing. Comments also included requests to address environmental impacts from implementation of the Reliable Replacement Warhead Program in the SWEIS since reliable replacement warheads would be produced at TA-55 within the next 5 years. Commentors also requested the removal of references to a modern pit facility from the SWEIS.*

The LANL SWEIS focuses on continuing site-specific activities and new projects that may be initiated within about 5 years at LANL, whereas the *Complex Transformation SPEIS* addresses programmatic issues of modernization and consolidation of the nuclear weapons complex over a much longer timeframe and across the nuclear weapons complex. As such, the timing of and analyses in the LANL SWEIS are largely independent of the *Complex Transformation SPEIS*. An exception is the nuclear facility portion of the Chemistry and Metallurgy Research Replacement Facility. In conjunction with its Complex Transformation planning, NNSA is reconsidering its previous decision to construct this facility. Regarding the analysis of environmental impacts from producing reliable replacement warheads, the alternatives analyzed

in the SWEIS are independent of any decision to produce a reliable replacement warhead. Capabilities such as production of plutonium components are required regardless of such a decision. If a reliable replacement warhead is approved by the President and funded by the Congress as part of a national strategy for providing a nuclear deterrent, it would enable a shift to production that requires fewer hazardous operations. The environmental impacts analyzed in the LANL SWEIS are based on the existing stockpile stewardship program and corresponding life extension programs. Since the reliable replacement warhead design is expected to reduce the use of radioactive and hazardous materials, analysis of the current stockpile should reasonably bound the potential impacts of the reliable replacement warhead if it goes into production.

When NNSA announced its intent to prepare the *Complex Transformation SPEIS*, it also announced cancellation of proposals to construct a modern pit facility. Consequently, analyses in the SWEIS no longer include a modern pit facility in the cumulative impacts analysis.

Water Resources *– Commentors expressed concern about the impacts of LANL operations on groundwater in the regional aquifer and surface water in the Rio Grande, and consequently, the safety of the drinking water to local and downstream users.*

Monitoring of groundwater has been performed at LANL for many decades and at numerous locations within and around LANL. The locations include springs, drinking water supply wells, shallow monitoring wells, intermediate-depth monitoring wells, and a variety of different monitoring well types for the regional aquifer. LANL, in consultation with the New Mexico Environment Department, will continue a phased approach to determining which wells are needed and in what locations to satisfy long-term monitoring needs. The information presented in the SWEIS relies on the best information available, and primarily on data from the types of wells and screens that have high quality results. Some contaminants are present onsite at levels above applicable standards and guidelines. Elevated levels are investigated to confirm the validity of the results, determine the source and extent of the contamination, and evaluate needed control and cleanup technologies. Confusion regarding the presence of contaminants in samples caused by the presentation of data in the SWEIS has been addressed by better explaining the purpose, development, and use of the data and contrasting them with the data on detected contaminants reported in the annual LANL environmental surveillance reports. There have been concerns regarding neptunium-237 in the regional aquifer. The values of neptunium-237 shown in the SWEIS reflect the conservative statistical interpretation of the analyses. The minimum detectable activity for this radioisotope was found to be greater than the reported values using laboratory gamma spectrometry analytical methods. This indicates that neptunium was not present, and that the results were an artifact of the analytical method. An alternate analytical method, alpha spectrometry, has been shown to have a significantly lower minimum detection level for neptunium-237 and was used to measure groundwater samples in and around LANL in 2006. The results of these environmental sample measurements to date have shown no neptunium-237 present in regional aquifer groundwater. Plutonium-239, plutonium-240, and strontium-90 have been detected in samples from Los Alamos water supply wells taken on only one or two dates, indicating an error by the analytical laboratory. This conclusion was confirmed by reanalysis of numerous samples and contradictory results from field and laboratory duplicate samples.

Remediation of water resources containing or potentially containing contaminants is carried out consistent with DOE and external regulatory requirements. For example, the 2005 Consent Order requires investigations to fully characterize the nature, extent, fate, and transport of contaminants subject to the Consent Order that have been released to surface water, groundwater, and other environmental media. Following the investigations, corrective measures are evaluated, proposed, authorized, and implemented, as needed, to meet quantitative surface water and groundwater cleanup levels prescribed in Section VIII of the Consent Order.

Sampling in 2005 and 2006 indicates that chromium contamination is present in the regional aquifer in a limited area beneath Sandia and Mortandad Canyons and in perched groundwater beneath Mortandad Canyon. Chromium contamination was not detected in water-supply wells. The LANL contractor has prepared an *Interim Measures Work Plan for Chromium Contamination in Groundwater* (LANL 2006b). An interim measures investigation report prepared in 2006 provides a basis for follow-on work. The report found that the main source of hexavalent chromium was chromium-treated cooling water from a TA-3 power plant at the head of Sandia Canyon during its operations between 1956 and 1972. Additional data collection from other regional groundwater monitoring wells is needed to further assess the extent of LANL-derived chromium contamination. Recommendations included additional data collection on chromium and other chemicals for use in risk assessments and the selection of corrective action remedies.

Despite the detection of polychlorinated biphenyls (PCBs) in stormwater runoff within the LANL site boundaries, available data show no discernible impacts on PCB concentrations in the Rio Grande.

Offsite Contamination *– Commentors expressed concern about offsite contamination from past and proposed LANL operations. Some commentors were concerned that increased activities would lead to new contamination. They questioned increasing pit production when LANL had not controlled releases in the past. Other commentors stated concerns that contaminants could appear outside the site boundaries and affect residents of nearby communities or those living down wind or down river from LANL, and others questioned the use of 50 miles as the range for evaluating offsite impacts.*

The SWEIS describes the environmental laws and regulations that apply to LANL operations. LANL operations do result in emissions to the air and discharges of surface water, but all of these emissions and discharges are in accordance with regulations established to protect public health and safety. The LANL contractor demonstrates compliance through environmental monitoring and reporting, which includes statistical analysis and other methods to determine which results are indicative of the actual presence of a contaminant. The SWEIS describes the current environment and presents, for resource areas with annually measurable parameters, recent data that show compliance status with regulations and permits. Compliance status is based on data contained in the annual environmental surveillance reports that are required for DOE sites and are publicly available.

Contamination in Foodstuffs

Because ingestion of foodstuffs constitutes an important pathway by which radionuclides and other contaminants can be transferred to humans, a wide variety of domestically produced edible vegetables, fruits, grains, and animal products is sampled from the area surrounding LANL and analyzed for a variety of radionuclides. These samples are used to compare the levels of radioactive and nonradioactive contaminants in foodstuffs at onsite and perimeter locations to regional levels, to determine trends over time, and to estimate the radiation doses and chemical exposures to individuals who consume them. Foodstuff monitoring in the region regularly shows no contamination resulting from LANL operations.

LANL Impact on the Rio Grande

Waters and sediments along the Rio Grande historically have shown relatively small impacts from LANL operations. All base flow samples from the Rio Grande had pollutant concentrations below drinking water standards and standards for the protection of aquatic life, wildlife habitat, and irrigation. None of the radionuclides commonly associated with LANL operations was detected, except for uranium; uranium concentrations (0.5 to 2 milligrams per liter) were consistent with naturally occurring levels in regional waters and well below the Federal drinking water standard of 30 milligrams per liter. In 2005, radionuclide concentrations in bottom sediments from the Cochiti Reservoir, the first reservoir on the Rio Grande downstream from LANL, were lower than in other post-Cerro Grande Fire years. Plutonium-239, plutonium-240, and cesium-137 concentrations showed increases for 1 to 2 years following the Cerro Grande Fire, but concentrations in 2005 were comparable with pre-fire levels. Plutonium-239 and plutonium-240 concentrations in 2005 were near or below analytical detection limits. Metals concentrations in the bottom sediments were not sufficiently different from background concentrations to warrant discussion. The residual high-explosives organic compound 2, 4-dinitrotoluene was detected in Cochiti Reservoir bottom sediments at an estimated concentration of 2.8 milligrams per kilogram, considerably below the EPA Region VI soil screening level of 120 milligrams per kilogram. This compound was not detected in earlier analyses.

Use of 50-Mile (80-kilometer) Radius Region of Influence

A 50-mile (80-kilometer) radius is commonly used in EISs because this distance has been shown to encompass the significant impacts to the public. Samples measured at varying distances from emissions sources show that the concentration of radionuclides decreases with the distance from the source.

Waste Management *– Commentors were concerned about the large quantities of wastes projected in the SWEIS, particularly for the Expanded Operations Alternative. Commentors questioned the continued generation of waste, particularly when significant legacy waste remains onsite and remediation work is incomplete; where the ultimate disposition of the waste would occur; and the impacts associated with waste storage and disposal, including the impacts from potential accidents. Commentors also questioned the continued practice of onsite disposal of low-level radioactive waste in unlined trenches, citing its impacts on water resources and a general opposition to onsite disposal.*

Although LANL has instituted a pollution prevention and waste minimization program, operation of LANL in support of DOE's core missions will generate radioactive and other wastes. NNSA will continue to manage waste in a manner that minimizes environmental and human health impacts and complies with regulatory requirements and DOE policies and procedures. Mixed low-level radioactive waste and solid and chemical wastes will be shipped to offsite treatment or disposal facilities. Disposal capacity is adequate for these wastes. Low-level radioactive waste may be disposed of onsite or at offsite commercial or DOE disposal facilities, while transuranic waste will be disposed of at the Waste Isolation Pilot Plant (WIPP). Increased pit production, as analyzed in the Expanded Operations Alternative, would not result in a significant increase in the volume of waste. The primary contribution to the large increase in waste volume under this alternative would be from environmental remediation involving complete removal of buried wastes located in MDAs and other contaminated media. In this case, the transuranic waste volume projected from the postulated removal of all MDAs could increase the volume beyond that assumed to come from LANL in the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE/EIS-0026-S-2). Decisions about disposal of this transuranic waste, if generated, would be made within the context of the needs of the entire DOE complex. Regarding the use of unlined pits, future use of lined pits rather than unlined pits for low-level radioactive waste disposal at LANL is being evaluated as part of the required review and update of the Area G performance assessment.

Some wastes would be managed at LANL that cannot be accepted at WIPP or other currently operating and authorized disposal facilities, including commercial sealed sources containing radionuclides in concentrations exceeding the Class C limits in 10 CFR Part 61 and DOE sealed sources containing non-defense transuranic isotopes with similar characteristics. These wastes would be safely stored until they can be disposed of pursuant to the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240). DOE has issued an NOI to prepare an *Environmental Impact Statement for the Disposal of Greater-Than-Class-C Low-Level Radioactive Waste* (72 FR 40135). Several options for disposal of this waste and other DOE waste having similar characteristics are being considered, including disposal at LANL.

Water Use *– Commentors expressed concerns that implementation of the Expanded Operations Alternative would require the use of too much water and could exceed available water rights.*

Total and consumptive water use at LANL have actually decreased since 1999, in part due to water conservation efforts. DOE transferred 70 percent of its water rights for LANL, and leases the remaining 30 percent, to Los Alamos County. DOE is now a county water customer, and is billed and pays for the water it uses in accordance with a water service contract. LANL operational water demands would remain within DOE's water use target ceiling quantity. Water demands at LANL combined with the larger and growing demands of other Los Alamos County users could require up to 98 percent of the currently available water rights.

Consent Order and Environmental Restoration *– Noting that activities to implement the March 2005 Compliance Order on Consent (Consent Order) were included only in the Expanded Operations Alternative, commentors were concerned that NNSA considered compliance with the Consent Order optional. Commentors doubted that cleanup was being addressed and thought that cleanup should be completed before NNSA contemplated increased pit production or generated additional waste at LANL.*

NNSA does not consider compliance with the Consent Order to be optional and is not linking Consent Order compliance with decisions about pit production, proposed new projects or activities, other increased operational levels, or waste generated from other LANL activities. NNSA could choose to implement the alternatives analyzed in the SWEIS either in whole, in part, or in combinations. NNSA intends to implement actions necessary to comply with the Consent Order regardless of decisions it makes on other actions analyzed in the SWEIS. The SWEIS summarizes the progress made in environmental restoration since 1999 and analyzes options related to future cleanup actions that could be undertaken.

Depleted Uranium and the Dual Axis Radiographic Hydrodynamic Test Facility *– Commentors expressed concern about open burning of uranium and the effects this would have on air, water, soil, and human health. Some commentors mentioned that large amounts of depleted uranium have been used in the past and might remain in the environment, and that a more comprehensive monitoring program to monitor open burning and detonation sites is needed. Others questioned the use of foam and its effect on emissions.*

There are no experiments or activities at LANL that would involve the burning of depleted uranium. High explosives and explosives-contaminated materials (not including depleted uranium) are burned or detonated in accordance with a Resource Conservation and Recovery Act (RCRA) permit as a hazardous waste treatment to render the materials safe for disposal. The State of New Mexico open burning permits that would allow a variety of experiments and testing have been withdrawn. Experiments at the Dual Axis Radiographic Hydrodynamic Test Facility are subject to specific monitoring requirements. Sampling is performed to better understand the levels of contamination at the firing sites, the success of decontamination efforts, and the success of mitigation techniques that are applied to specific experiments. LANL monitoring programs are regularly reviewed and adjusted to take into account the latest trends in results. Past emission levels analyzed through the existing LANL monitoring programs and those projected in the SWEIS would not be expected to cause adverse impacts on human health or the environment. The use of aqueous foam was implemented at the Dual Axis Radiographic Hydrodynamic Test Facility to reduce the amount of particulates released. The use of foam is estimated to reduce fine particulates by 50 to 95 percent depending on the individual shot. The foam breaks down and is rinsed to a sump from which it is pumped and sent to the Radioactive Liquid Waste Treatment Facility for treatment. This additional, nonhazardous waste was included in the waste analysis in the SWEIS.

Environmental Justice *– Commentors expressed concerns about the adequacy of the Environmental Justice analysis in the SWEIS, indicating that it does not meet the requirements of Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. They also were concerned that environmental justice was not properly addressed in cumulative impacts and that the special pathways were not adequately analyzed. Some commentors took exception to statements in the SWEIS that there are no disproportionately high and adverse impacts to low-income and minority populations.*

NNSA acknowledges that different approaches can be used to assess the environmental justice impacts from continuing to operate LANL. NNSA has met the objectives of Executive Order 12898 to investigate environmental justice impacts that would be potentially high and adverse and would disproportionately affect one group over another. In response to comments on

the Draft LANL SWEIS, NNSA added additional discussion to address the potential for environmental justice cumulative impacts. An analysis of the radiological doses from emissions associated with normal operations at LANL to minority and low-income populations and individuals was added to the Environmental Justice impacts section of the SWEIS. Under all of the alternatives the doses to members of minority populations or low-income populations were slightly less than for the members of the population that do not belong to these groups. NNSA looked at potential exposure through special pathways as part of the human health impacts analysis in the SWEIS. The special pathways analysis considers ingestion of native vegetation (pinyon nuts and Indian Tea [Cota]), locally grown produce and farm products, groundwater, surface water, fish (game and nongame), game animals, other foodstuffs and incidental consumption of soils and sediments (on produce, in surface water, and ingestion of inhaled dust); adsorption of contaminants in sediments through the skin; and inhalation of plant materials. Even considering these special pathways, NNSA did not find disproportionately high and adverse health impacts to minority or low-income populations. While NNSA recognizes commentors' objections to the conclusions that the analysis in the SWEIS has not identified any disproportionately high and adverse human health or environmental impacts on minority or low-income populations under any of the actions or alternatives analyzed in the SWEIS, NNSA believes this is the correct conclusion. The SWEIS has been revised to include more detailed discussion of the environmental justice analysis.

Comparison to Rocky Flats Plant *– Commentors oppose continued or expanded levels of pit production and associated activities at LANL, concerned that these activities would result in health and safety problems. Commentors cited past performance at the Rocky Flats Plant as being indicative of NNSA's continued and future operations, inferring that similar activities at LANL would result in similar environmental contamination and human health effects.*

A number of factors including much lower pit production levels, a heightened awareness of safety and environmental issues, newer facilities and technologies, more stringent environmental and nuclear safety regulations, a higher level of scrutiny by regulators and independent oversight organizations, and more controlled operational and management practices support the conclusion that LANL operations are not comparable to operations at the Rocky Flats Plant. The Rocky Flats Plant produced thousands of pits per year until it ceased operation in 1989. Under the SWEIS Expanded Operations Alternative, LANL would produce a maximum of 80 pits per year.

The Plutonium Facility in TA-55 is a newer facility than those at the Rocky Flats Plant. The Plutonium Facility has increased safety margins, stronger structural components, firebreaks and automatic fire suppression systems, and more automatic alarms and process controls. Specifically with respect to filtration of process emissions and the problems with the Rocky Flats design, the Plutonium Facility has implemented structural designs for fire containments, multiple stages of high-efficiency particulate air (HEPA) filtration, and firebreaks to prevent, isolate, and confine potential fires from spreading through air filtration systems, thus minimizing potential releases to the environment. Additional upgrades, repairs, and replacements of equipment and components are proposed under the TA-55 Refurbishment Project as part of the SWEIS Expanded Operations Alternative to ensure the facility safety envelope is maintained as the facility and its systems and components age.

Recommendations of the Defense Nuclear Facilities Safety Board (DNFSB) *– Commentors expressed their opinion that LANL is not in compliance with DOE and DNFSB safety regulations and recommendations; some commentors claimed that some LANL facilities are up to 6 years behind on preparing and submitting their safety documentation to DOE; and certain commentors stated that such lack of compliance poses an unacceptable risk to workers, the public and the environment. Commentors stated that the Draft SWEIS should fully incorporate, analyze, consider, and resolve the serious safety issues raised by the DNFSB.*

The DNFSB was created by the Congress in 1988 as an independent oversight organization within the Executive Branch to provide advice and recommendations to the Secretary of Energy regarding protection of public health and safety at defense nuclear facilities. As such, the DNFSB independently oversees activities affecting nuclear safety within the nuclear weapons complex. DNFSB reviews safety issues and formally reports its findings and recommendations to the highest levels of NNSA regarding the safety of nuclear weapons complex facilities. Procedures are in place for NNSA to review and respond to DNFSB recommendations, and to implement recommendations at the sites as appropriate. NNSA and the LANL contractor have reviewed DNFSB reports and responded with commitments to update and improve safety basis documentation. The Los Alamos Site Office Safety Authorization Basis Team assures the development and approval of adequate controls to support operations at LANL in a safe manner. LANL nuclear facility operations are authorized and approved by NNSA based on its evaluation of the acceptability of existing relevant safety documentation.

The environmental impacts of potential accident scenarios, including accidents caused by human error during the performance of high hazard operations, as well as from other types of initiating events, are analyzed in the SWEIS. Safe operation is an intrinsic part of the activities proposed and analyzed in the SWEIS. Nonetheless, NNSA identifies possible operational accidents, natural events, or intentional destructive acts and analyzes their impacts as part of the NEPA process so that this information is available to NNSA in deciding whether to proceed with a proposed action. NNSA has recently revised its oversight practices relative to LANL to increase the focus of its resources on nuclear safety and security.

Plutonium Inventory Discrepancies *– During the scoping process and again during the review of the Draft LANL SWEIS, commentors contended that there were historical differences in plutonium inventories, leading to the conclusion that there was a loss of control of the plutonium materials and that inventory systems were inaccurate.*

The issue of historical differences in the plutonium inventories has been raised previously. DOE addressed this issue in a 1996 report that notes there are differences in the quantity of plutonium according to the accounting books and the quantity measured by a physical inventory.[4] The report explains that inventory differences are primarily due to various measurement uncertainties

[4] In 1996 DOE issued the report Plutonium: The First 50 Years. This report notes that there are differences in the quantity of plutonium according to the accounting books and the quantity measured by a physical inventory. It explains that "inventory differences are not explained as losses but are explained as follows: (1) high measurement uncertainty of plant holdup (plutonium materials remaining in process tanks, piping, drains, ventilation ducts, and other locations); (2) measurement uncertainties because of the wide variations of material matrix; (3) measurement uncertainties due to statistical variations in the measurement; (4) lack of measurement technology to accurately measure material; (5) measurement uncertainties associated with waste due to material concentration and matrix factors; (6) unmeasured material associated with accidental spills; and (7) recording, reporting, and rounding errors."

(DOE 1996). More recently, NNSA addressed allegations of plutonium discrepancies at LANL. The letter responding to this issue states that "the apparent discrepancy is related to the different tracking and reporting procedures for site security and waste management organizations." The letter concludes that "because of the differences between the tracking and reporting of the site security and waste management organizations, comparisons of the information contained in these two systems cannot be used to draw conclusions concerning the control and accountability of special nuclear material" (NNSA 2006a).

S.6.3 Changes from the Draft Environmental Impact Statement

In preparing the Final LANL SWEIS, NNSA made revisions in response to comments received from other federal agencies, state and local government entities, Native American Pueblos, and the public. In addition, the SWEIS was changed to provide additional environmental baseline information, include additional analyses, correct inaccuracies and make editorial corrections, and clarify text. NNSA also updated information due to events or notifications made in other documents since the Draft SWEIS was provided for public comment in July 2006. The following summarizes the more important changes made to the SWEIS.

Incorporation of the Updated Environmental and Other Information

Information was updated in the Final SWEIS to reflect the most recent environmental data from *Environmental Surveillance at Los Alamos during 2005* (LANL 2006d) and information from the 2005 *SWEIS Yearbook* (LANL 2006c). Resource areas most affected include air emissions and water discharges, human health, infrastructure (including electrical and water usage), and waste management. Other new information incorporated into the SWEIS analyses include a biological assessment; an updated seismic hazard analysis, and new New Mexico Environment Department stream water quality standards.

The SWEIS was revised to more clearly indicate the purpose and use of the environmental contamination data included and how they relate to the information reported in annual environmental surveillance reports. The data provide perspective relative to similar data presented in the *1999 SWEIS* and in SWEIS impacts analyses. Affirmed detection of contaminants in the environment is presented in the LANL environmental surveillance reports. In addition, the SWEIS was updated to discuss the monitoring results for nonradiological chemicals that are part of the LANL environmental surveillance program. Information on nonradiological contaminants for the period of 2001 through 2005 has been provided for hexavalent chromium, 1,4-dioxane, and PCBs. In addition, the perchlorate environmental surveillance information was updated to include the results from the most recent year of reporting.

The SWEIS was updated to include 2005 water use data in the trend analysis. The projected demand on available water rights administered by Los Alamos County decreased from 101 percent to 98 percent, leading to the conclusion in the Final SWEIS that the water rights would not be exceeded if the Expanded Operations Alternative were implemented.

Presentation of Impacts from Consent Order Activities

The summary of impacts has been revised to more readily show the impacts associated with activities necessary to comply with the Consent Order. Under the Expanded Operations Alternative, in addition to showing the impacts for the entire alternative, where practical, the impacts from implementing the Consent Order have been shown separately and could be added to any alternative; the impacts for the balance of the Expanded Operations Alternative are also shown. This presentation of the impacts makes it possible for a reader to see how alternatives compare without the influence of Consent Order activities and reinforces the idea that NNSA can select all or part of the Expanded Operations Alternative; however, NNSA does not consider compliance with the Consent Order to be optional.

Environmental Justice

The Environmental Justice analyses were expanded to include radiological doses from LANL operations for the following populations within 50 miles (80 kilometers) of LANL: white (non-Hispanic), all (total) minorities, American Indians, Hispanic of any race, and low-income populations. These data show that the total minority, American Indian, Hispanic, and low-income populations would not be subjected to disproportionately high and adverse dose impacts from operations at LANL.

Removal of References to a Modern Pit Facility

References to a modern pit facility in the Draft LANL SWEIS were made in the context of ensuring that reasonably foreseeable future actions were addressed in accordance with the CEQ NEPA regulations regarding cumulative impacts. In October 2006, NNSA issued an NOI to prepare the *Complex Transformation SPEIS*. In addition to announcing its intent to prepare an assessment of the environmental impacts from the continued transformation of the nuclear weapons complex, NNSA announced cancellation of the previously planned *Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility* (DOE/EIS-236-S2). Therefore, the Final LANL SWEIS does not include a modern pit facility in the discussion of cumulative impacts.

Accident Analyses

The accident analysis has been revised to account for 2006 updates to accident scenarios for certain nuclear facilities that resulted in higher consequences and risks than the previous scenarios. Revising the accident analysis also addressed a comment received regarding an accident scenario involving a fire in the Plutonium Facility Complex. The new accident scenarios were for the Radioassay and Nondestructive Testing Facility, the Waste Characterization, Reduction, and Repackaging Facility, and the Plutonium Facility Complex. The new accident scenarios included one scenario for each of the individual facilities, two scenarios involving the Waste Characterization, Reduction, and Repackaging Facility and the Plutonium Facility Complex during a seismic event, and one scenario involving the Waste Characterization, Reduction, and Repackaging Facility in the event of a wildfire.

The discussion of the site-wide seismic accidents was revised to account for new information from the updated seismic hazard analysis (LANL 2007). The new study indicates that the

seismic hazard is higher than previously understood; that is, the likelihood of earthquakes capable of producing strong ground shaking at the LANL site is greater than previously estimated. This would result in changes to the maximum risks of a latent cancer fatality (LCF) for the maximally exposed individual (MEI), the noninvolved worker, and the offsite population under the two seismic accidents.

Terrorism

The SWEIS has been revised to more fully address the issue of terrorism. A description of the safeguards and security that are in place at LANL to protect facilities and special nuclear materials from malevolent acts has been expanded. It also has been revised to include a discussion of the process of assessing vulnerabilities of facilities to hostile acts. These vulnerability assessments guide the enhancement of safeguards and security at the site. A classified appendix to the SWEIS assesses the potential impacts of terrorist acts.

Transportation Analysis

The transportation analysis was revised to address three specific areas. Responding to comments expressing concerns regarding increased pit production, the SWEIS transportation analysis was revised to provide a clearer distinction between the shipment requirements for production rates of 20 and 80 pits per year. In addition, the impact analysis was revised to bound the impacts of transporting uranium-233 between Oak Ridge National Laboratory and LANL and between LANL and the Nevada Test Site in support of the criticality safety program. A unit basis transportation impacts assessment was also included to provide a basis for assessing impacts of the future transport of sealed sources to LANL in support of the Off-Site Source Recovery Project.

Alternatives for Upgrading the Radiography Facility

The project-specific analysis for providing a radiography facility in TA-55 has been revised to remove any options that considered use of all or part of the previous Nuclear Materials Storage Facility (Building 55-41). Based on evaluations of the structure of Building 55-41, a determination was made that extensive and costly structural upgrades to the building to bring it into compliance with requirements for managing special nuclear material would be needed – roof panel members would need to be replaced and other structural components would need to be repaired, replaced, or reconfigured. This structure was never used for storage of nuclear materials and a determination was made in 2006 to demolish the structure. As an uncontaminated structure, the resulting demolition debris could be reused as fill or sent to a solid waste landfill.

Location of the Proposed TRU Waste Facility

The impacts analysis included for Waste Management Facilities Transition has been revised with respect to the TRU Waste Facility. The function of the facility would primarily be to support operations at the Plutonium Facility Complex, including managing transuranic waste from the Radioactive Liquid Waste Treatment Facility. Therefore, a number of locations along the west end of the Pajarito Road corridor near the waste-producing facilities are being considered. The analysis has been revised to evaluate the impacts of a range of locations in the TAs along Pajarito

Road. For certain resource areas, such as human health impacts, release from normal operations and facility accident impacts, analyses account for the largest impacts that would be expected. For other impacts that would be more site specific such as land use, visual impacts, and effects on cultural resources and ecology, the analyses distinguish among the group of TAs being considered.

Revision of the Reduced Operations Alternative

The Reduced Operations Alternative and impacts analysis were revised to include a possible reduction in scope of the Chemistry and Metallurgy Research Replacement Facility as described in the *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0350) and NNSA's subsequent 2004 ROD (69 FR 6967). The Chemistry and Metallurgy Research Replacement Facility would be limited to the construction and operation of the radiological laboratory, administrative offices, and support facility building. The decision whether to construct the nuclear facility portion will be postponed until completion of the *Complex Transformation SPEIS*. Under this scenario the existing Chemistry and Metallurgy Research Building would continue to operate beyond 2010 to provide analytical chemistry and materials characterization research and development activities.

S.7 Changes at Los Alamos National Laboratory since the *1999 SWEIS*

For the most part, operations at LANL remained within the projections made in the *1999 SWEIS*. Operations that exceeded projections produced a beneficial or neutral impact on northern New Mexico. For example, a larger number of employees than projected increased the tax base and resulted in a higher level of economic activity. Although the amount of chemical waste generation was higher, thereby increasing the amount of offsite transportation, it was managed without adverse impact to the LANL waste management infrastructure, and the waste was treated and disposed of in accordance with applicable regulations. Overall, data on operations during the period 1999 through 2005 indicate that LANL was still approaching the operation levels of the Expanded Operations Alternative in the *1999 SWEIS*, as modified for a lower level of pit production.

Table S–3 presents a summary of the actual impacts and performance changes by resource or impact area from 1999 through 2005 compared to the projected impacts for the modified Expanded Operations Alternative in the *1999 SWEIS*. The first column lists the resource or environmental impact areas. For each resource or impact area, the next column provides a summary description of the projected impact for the Expanded Operations Alternative as presented in the *1999 SWEIS*. The third column summarizes the actual impacts for the years 1999 through 2005 as reported in the LANL *SWEIS Yearbooks*. The final column presents an assessment of performance at the site compared to the projected performance in the *1999 SWEIS*. This comparison shows that, in general, LANL operated within the bounds projected in the *1999 SWEIS*.

Table S–3 Summary Comparison of *1999 SWEIS* [a] Projected Impacts and Actual Changes and Performance (1999 through 2005)

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
Land Resources	LANL covered 43 square miles (111 square kilometers), with about 5 percent of the site developed. It was divided into 6 land use categories and contained 944 permanent buildings, 512 temporary structures, and 806 miscellaneous buildings. Changes to land use included TA-67, where 60 acres (24 hectares) of forested land would be cleared for a road and the land use category changed from "Explosives" to "Explosives and Waste Disposal." Area G expansion was estimated to disturb 41 acres (16.6 hectares) of approximately 72 acres designated for waste disposal. The *1999 SWEIS* predicted limited land disturbance (about 100 acres [40 hectares] of previously undisturbed land) from new construction.	LANL now covers 40 square miles (104 square kilometers). Land use categories have increased from 6 to 10. The number of structures, which change often, now includes 952 permanent buildings, 373 temporary structures, and 897 miscellaneous buildings. Major projects have occupied more land than predicted. Forty-four acres (18 hectares) were leased to Los Alamos County for a research park. Environmental restoration activities have not substantially added to available land. About 4,078 acres (1,650 hectares) have been designated for conveyance to Los Alamos County and the New Mexico Department of Transportation, and transfer to the Department of the Interior (to be held in trust for the Pueblo of San Ildefonso), of which 2,259 acres (914 hectares) have been turned over (as of the end of 2006), including all lands to be transferred to the Department of the Interior (in trust for the Pueblo of San Ildefonso). In 2000, the Cerro Grande Fire burned 43,000 acres (17,400 hectares), including about 7,700 acres (3,110 hectares) at LANL. Direct impacts on land use included damage to or loss of 332 structures. Fire mitigation work, such as flood retention structures, affected about 50 acres (20 hectares) of undeveloped land.	Land use changes were slightly greater than those projected in the *1999 SWEIS*. Actions undertaken at LANL that were either not addressed or predicted in the *1999 SWEIS* include the conveyance of land to Los Alamos County and the New Mexico Department of Transportation, and the transfer of land to the Pueblo of San Ildefonso; and several projects that could disturb up to 245 more acres (99 hectares) of greenfield sites than predicted in the *1999 SWEIS*. These actions, however, were addressed in separate NEPA review documents. Land use changes related to the number of buildings at LANL were within the range of impacts evaluated within the *1999 SWEIS*.
Visual Resources	LANL is primarily distinguishable in the daytime by views of its water storage towers, emission stacks, and occasional glimpses of older buildings. At elevations above LANL, the view is primarily of scattered austere buildings and groupings of several-storied buildings. LANL has relatively few nighttime security light sources compared to the nearby communities; the distinction between LANL and the nearby communities is lost to the casual observer.	In many cases, new construction has reduced visually incompatible building styles and allowed for the removal of some of the more austere buildings. One new building has been built at the Los Alamos Research Park. Radio towers have been erected, but have been painted to blend with the background. The water tower at the new Emergency Operations Center has also been painted to blend with the background. Two domes have been added at TA-54, which contrast with the natural landscape and can be seen from the Pueblo of San Ildefonso sacred area, the Nambe-Española area, and areas in western and southern Santa Fe County.	Visual impacts resulting from continuing operations at LANL slightly exceeded those projected in the *1999 SWEIS*. Actions undertaken at LANL that either were not fully addressed or occurred since the *1999 SWEIS* was published include the construction of domes at TA-54, construction of new facilities (especially those that extend above the tree line), and forest thinning. Activities associated with each of these areas were addressed in separate NEPA actions.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
	Projected temporary and minor impacts included changes resulting from construction and environmental restoration activities.	The Cerro Grande Fire altered views and made site facilities more visible. Since 2000, wildfire prevention activities, such as forest thinning, have reduced tree density on 7,700 acres (3,110 hectares) resulting in a more open, park-like forest, increasing the visibility of some facilities. Bark beetles have killed thousands of evergreen trees, opening the forest and making LANL facilities more visible.	The Cerro Grande Fire and bark beetle infestation altered the viewscape beyond that analyzed in the *1999 SWEIS* or other subsequent NEPA review documents.
Geology and Soils			
- Geology	The *1999 SWEIS* identified major seismic features at LANL. Some sections of faults at LANL constitute active and capable faults under the Nuclear Regulatory Commission nuclear facility criteria. Surface rupture from faulting in TA-3 was identified and concern regarding seismic risk to the Chemistry and Metallurgy Research Building was identified.	LANL operations have not affected seismicity concerns. Most construction was conducted at a distance from mapped faults and injection wells were not operated. Based on the seismic risk at TA-3 identified in the *1999 SWEIS*, LANL decided to move the Chemistry and Metallurgy Research Building operations to TA-55, an area of no observed seismic faulting.	Impacts at LANL were within those projected in the *1999 SWEIS*.
- Soils	The *1999 SWEIS* identified canyon walls as areas of potential slope instability and indicated that disturbed or unvegetated soils have a greater potential for erosion. Small quantities of contaminants from facility operations would impact LANL soils, and that contaminated soil would be excavated from LANL.	LANL operations have not substantially affected slope instability or soil erosion. Construction activities were set back from canyon walls, and although localized erosion due to disturbed soils occurred at construction sites, it was mitigated by standard construction best management practices such as silt fences and flow barriers. The Cerro Grande Fire increased soil erosion at LANL. Releases from facility operations causing soil contamination have been below *1999 SWEIS* projections due to improvements in facility operating procedures.	Impacts were fewer than those projected in the *1999 SWEIS*, in part due to the removal of contaminated soils through environmental restoration activities and continued use of engineering controls at construction sites. While the Cerro Grande Fire increased soil erosion, the overall effects were mitigated through various actions such that *1999 SWEIS* projections were not exceeded.
Surface Water			
- NPDES Outfall Volumes	Total of 61 NPDES-permitted outfalls. Total projected discharge volumes through permitted outfalls: • 278 million gallons per year (1,052 million liters per year). • 136 million gallons per year (515 million liters) from Key Facilities. • 142 million gallons (538 million liters) per year from non-Key Facilities.	NPDES-permitted outfalls decreased to 21 – including 20 industrial outfalls and 1 sanitary outfall. The total flow from all NPDES outfalls was below *1999 SWEIS* projections for 6 of 7 years; in 1999, the flow exceeded *1999 SWEIS* projections by 14 percent. Key facilities: Combined volumes have been less than *1999 SWEIS* projections; however, discharges from four Key Facilities exceeded their individual 1999 projections. • Tritium Facilities: discharges exceeded annual projections each year, ranging from 0.4 to 33 million gallons per year (1.5 to 125 million liters per year), compared to *1999 SWEIS* projection of 0.3 million gallons (1.1 million liters) per year.	The number of NPDES outfalls was within the *1999 SWEIS* projections. The number of permitted NPDES outfalls and the total flow were consistent with or below *1999 SWEIS* projections. The distribution of flow from individual Key and non-Key Facilities, however, has changed from that projected in the *1999 SWEIS*. Although there appears to be a decrease in total flow from NPDES outfalls, it is largely due to a change in how flow is measured and reported. The current method adopted in 2001 uses actual flow meters in many (but not all)

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
		• Chemistry and Metallurgy Research Building discharges exceeded projections 6 of 7 years, ranging from 0.02 to 4.5 million gallons (0.08 to 17 million liters) per year, compared to *1999 SWEIS* projection of 0.5 million gallons (1.9 million liters) per year. • High Explosives Testing Facilities discharges exceeded projections 3 years, ranging from 9 to 16.1 million gallons (34 to 61 million liters) per year in 1999 through 2001, compared to *1999 SWEIS* projection of 3.6 million gallons (14 million liters) per year. • Sigma Complex discharges exceeded projections in 2003 with 7.6 million gallons (29 million liters) compared to the *1999 SWEIS* projection of 7.3 million gallons (28 million liters) per year. Non-Key Facilities: Total flow exceeded *1999 SWEIS* projections 3 out of 7 years, in part due to extrapolation from instantaneous flow measurements.	outfalls and measuring stations, providing more accurate information.
- NPDES Outfall Quality	The implied measure of performance is compliance with NPDES permit levels, the New Mexico Water Quality Control Commission stream standards, and DOE Derived Concentration Guides for radionuclides. As described in the *1999 SWEIS*, RLWTF would be modified and the High Explosives Waste Treatment Facility would be constructed to improve effluent quality.	NPDES effluent quality met permitted levels for 99.75 percent of samples since 2000; number of events where permit levels were exceeded ranged from 0 to 14 (of about 1,100 samples) per year. Exceedances resulted in preparation and implementation of corrective action plans. RLWTF has improved the quality of effluent, reducing annual levels of nitrates and radionuclides. Since 1999, radionuclides activities have been well below the Derived Concentration Guides levels, and nitrates and fluorides concentrations were well below the standards. Volumes of effluent discharged from the High Explosives Wastewater Treatment Facility outfall have been below *1999 SWEIS* projections since 1999.	Surface water quality impacts are consistent with or less than those projected in the *1999 SWEIS*. Overall quality and volume of effluents were within the levels projected in the *1999 SWEIS*.
- Water Quality Impacts from Stormwater and Construction Sources	Water quality was projected to be similar or better than recent experience. The following LANL operations were identified in the *1999 SWEIS* as impacting surface water quality: • Stormwater discharges from industrial activities, with 76 industrial facilities identified on LANL site. • Construction activities disturbing greater than 5 acres (2 hectares). • Excavation or dredge and fill activities, which are permitted by the Corps of Engineers and the New Mexico Environment Department (Section 404 and 401 permits).	LANL still requires Stormwater Pollution Prevention Plans and best management practices to protect surface waters from pollutants from industrial stormwater sources and construction projects. The number of industrial activities requiring individual Stormwater Pollution Prevention Plans has ranged from 15 to 22. Stormwater Pollution Prevention Plans and best management practices are now required for all projects disturbing greater than 1 acre (0.4 hectares) of land. An increase in construction projects and dredge and fill projects was seen following the Cerro Grande Fire; however, each project was required to implement Stormwater Pollution Prevention Plans and meet 404 and 401 permit conditions to protect surface waters.	Impacts from storm flows and construction or excavation projects were within *1999 SWEIS* projections.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
- Contaminant Transport	Small increases in outfall flows to watersheds were not expected to result in substantial contaminant transport offsite. Outfall discharge volumes per watershed were projected. Storm flow and sediment transport were identified as primary mechanisms for potential contaminant transport beyond LANL boundaries. The *1999 SWEIS* discussed watershed monitoring activities to track the extent of offsite contaminant movement in sediments and surface waters, including monitoring for radionuclides, metals, organics, PCBs, and high explosives residue.	Several actions and best management practices were implemented to manage, control, and minimize stormwater and sediment transport. On average, outflows to individual watersheds have been within projections, and trends show that outfall flows per watershed have been declining, thereby reducing the potential for contaminant transport. The number of watersheds receiving outfall flow has been reduced from 8 to 5. The annual flow discharged to the individual watersheds exceeded *1999 SWEIS* projections 5 times from 1999 to 2000 and 1 time since 2000. While radionuclides at or above background levels have been detected in sediments on- and offsite, the overall pattern of radioactivity in sediments has not greatly changed since the *1999 SWEIS*. Concentrations of metals, radionuclides, PCBs, and high explosives residue above water quality standards have been detected during storm flows; however, these events are infrequent and short-lived. As a direct result of the Cerro Grande Fire, stormwater runoff increased (2 to 4 times for average flow, and 10 to 1,000 times for peak flows), increasing the potential for contaminant transport. Storm events in 2001 and 2002 were found to accelerate the transport of legacy contamination (radionuclides) from Pueblo Canyon into lower watersheds and canyons.	Contaminant transport impacts were consistent with the *1999 SWEIS*, due to LANL programs and best management practices that manage and control storm flow and sediment transport. Increased or accelerated transport of contaminants that occurred from postfire storm flows are considered to be short-lived events that are being controlled and will diminish within the next few years.
Groundwater			
- Water Use	The projected effect of water use over the next 10 years (extracted from the main aquifer) is an average drop in DOE well fields of up to 15 feet (4.6 meters).	The drop in the Los Alamos County (previously DOE) well fields has continued to be 1 to 2 feet (0.3 to 0.6 meters) per year, per the *Water Supply at Los Alamos 1998 – 2001* report (LANL 2003).	Impacts of LANL water use on the regional aquifer continue to be bounded by the impacts analyzed in the *1999 SWEIS*.
- Quantity	No substantial changes to groundwater quantities were expected based on recent experience with LANL discharges that had little effect on groundwater quantities.	LANL discharges have had little effect on groundwater quantities in the last 6 years.	Impacts of LANL discharges on groundwater quantities continue to be bounded by the impacts analyzed in the *1999 SWEIS*.
- Quality	Because mechanisms for recharge to groundwater are highly uncertain, it is possible that discharges under any of the alternatives in the *1999 SWEIS* could result in contaminant transport in groundwater and off the site.	Regional groundwater samples taken in 2005 and 2006 show the presence of hexavalent chromium. Other contaminants detected included perchlorate in all groundwater zones in Mortandad Canyon, in the regional aquifer in Pueblo Canyon, and in alluvial groundwater in Cañon de Valle; and 1,4-dioxane in perched groundwater in Mortandad Canyon.	Hexavalent chromium has not been detected in offsite regional groundwater or in water supply wells. Production well Otowi-1 in Pueblo Canyon was taken permanently off-line because it had one tenth of the risk level of 24.5 micrograms per liter of perchlorate. There is no Federal or State standard for 1,4-dioxane.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
Air Quality			
- Nonradiological Criteria Pollutants	Ambient standards would be met. Annual emissions of criteria pollutants (tons per year): CO = 58 NO_x = 201 PM = 11 SO_2 = 0.98	Ambient standards have been met. Annual emissions for highest year, excluding years of the Cerro Grande Fire and fire mitigation activities (tons per year): CO = 35 NO_x = 93.8 PM = 5.5 SO_2 = 1.9	Annual emissions of criteria pollutants from LANL operations reported in the *Annual Emissions Inventories Through 2005* were within *1999 SWEIS* projections. As of 2004, revised reporting methods for the Title V Operating Permit Emissions Report include small exempt boilers and stand-by emergency generators in the emissions calculations; their inclusion results in SO_2 emissions higher than projected in the *1999 SWEIS*. Cerro Grande Fire and fire mitigation activities caused a temporary increase in CO, PM_{10} and SO_2 emissions above the levels analyzed in the *1999 SWEIS*.
- Other Nonradiological Pollutants	A screening analysis of toxic and hazardous pollutants indicated that levels of potential consequence to the public would not be exceeded for most air pollutants. Further detailed analysis demonstrated that concentrations of other pollutants would be below guideline values. For carcinogens, the combined lifetime incremental cancer risk due to all carcinogenic pollutants from all TAs was estimated. Major contributors to the combined cancer risk values included chloroform, formaldehyde, and trichloroethylene from TA-43 (Bioscience Facilities). The cancer risk to the public of less than 7.4×10^{-7} was dominated by the contribution from chloroform. Although annual emissions of chemical pollutants were not reported in detail for all facilities, the details presented for TA-3, for example, indicate emissions of 153 toxic pollutants. The *1999 SWEIS* did not address toxic and hazardous emissions from combustion sources.	Reported toxic and hazardous pollutant emissions generally have been less than guideline values. Carcinogenic emissions generally have been less than the *1999 SWEIS* projections. Chloroform emissions were less than 30 percent of the *1999 SWEIS* projections. TA-3 peak emissions data show that 21 additional pollutants were emitted and emissions of 39 pollutants exceeded *1999 SWEIS* projections. Seventy-five pollutants were not emitted that were projected.	The amounts of chemicals used and the amounts emitted to the air continue to show considerable variation. Although the actual quantities and chemicals vary from those analyzed in the *1999 SWEIS*, the concentrations to which the public is exposed continue to be below levels of potential consequence.

Resource or Impact Area	*1999 SWEIS Projected Impacts*		*Actual Impacts and Performance Changes (1999 to 2005)*		*Assessment*
- Nonradiological Construction Activities	Air quality impacts of construction activities were not quantified in the *1999 SWEIS*. The *1999 SWEIS*, however, indicated that construction activities were planned in various areas and would include land disturbance. These activities would result in emissions from disturbed areas and from equipment.		Construction of new facilities, demolition, and remediation activities have resulted in short-term increases in air pollutant concentrations. These activities were mitigated as appropriate to prevent exceedance of the ambient standards.		Construction at LANL is an ongoing activity with temporary and localized air quality impacts.
- Radiological		*Annual Average (curies per year)*	*Annual Average (curies per year)*	*Peak Year (curies)*	Annual average air emissions continue to be below levels projected in the *1999 SWEIS*. The exceptions for peak years were due to deactivation activities at TA-21 and a single event at the Weapons Engineering Tritium Facility (TA-16) for tritium and the hours of operation and a failed valve at LANSCE for activation products.
	Actinides	0.000798	0.0000113	0.0000302	
	Fission Products	0.00014	Not reported	Not reported	
	Activation Products	16,000	5,070	18,900	
	Tritium (water vapor)	1,260	815	1,200	
	Tritium (gas)	1,920	1,770	8,740	
	Argon-41	870	22.7	49.8	
	Other Noble Gases	1,640	Not detected	Not detected	
	Uranium	0.152	0.00836	0.02	
Noise	There would be little change in noise impacts to the public from traffic or site activities, although sudden loud noises associated with explosives testing may occasionally startle members of the public and workers. There would be some increase in the frequency of impulsive noise, but these noises would be occasional and not prolonged or unusual to the community.		Construction activities at LANL are common and generally have not altered noise conditions to levels that annoy the public. The increase in workforce has not resulted in any noticeable increase in traffic noise.		Noise impacts from construction and operation were similar to those discussed in the *1999 SWEIS*.
Ecological Resources	Only 5 percent of LANL was determined to be unavailable to wildlife. There were 900 species of vascular plants and 294 species of animals in the area. There were 50 acres (20 hectares) of wetlands, 13 acres (5 hectares) of which were created or enhanced by wastewater from 38 outfalls. The site is home to 3 federally listed endangered species, 2 federally listed threatened species, 18 species of concern, and numerous state-listed species. Areas of Environmental Interest were established at LANL to protect threatened and endangered species.		In total, major projects used slightly less acreage of undeveloped land than predicted in the *1999 SWEIS*. About 5 acres (2 hectares) of the Los Alamos Research Park have been cleared, resulting in the loss of habitat. The reduction in permitted outfalls to 21 by 2003 has reduced the amount of wetlands supported by such flows. Approximately 34 acres (14 hectares) of wetlands occur at LANL. Impacts to ecological resources from land conveyance and transfer have resulted in a reduction in potential onsite habitat and the loss of DOE protection for threatened and endangered species, including areas of core and buffer zones within the Areas of Environmental Interests.		Impacts to biological resources were somewhat greater than those predicted in the *1999 SWEIS*. The *1999 SWEIS* did not account for certain events that occurred after 1999, including the land conveyance and transfer. Activities associated with each of these areas were addressed in separate NEPA documents. The Cerro Grande Fire and bark beetle infestation have altered the ecology of the site. The bark beetle infestation could impact runoff, herbaceous growth, and wildlife populations, as well as increase the potential fire hazard.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
	As discussed in the *1999 SWEIS*, about 100 acres (40 hectares) of undeveloped land at LANL were predicted to be disturbed by construction projects, resulting in some habitat loss. The closure of 27 outfalls was predicted to reduce wetland acreage by 8.6 acres (3.5 hectares). About 25 acres (10 hectares) of the core zone of the Areas of Environmental Interest and 38 acres (15 hectares) of buffer zone could be affected by new projects (some of which would be completed in the future).	The Cerro Grande Fire burned 43,000 acres (17,400 hectares), including about 7,700 acres (3,110 hectares) of LANL. Direct impacts to ecological resources included a reduction in habitat and the loss of wildlife. Fire mitigation work, such as flood retention structures, affected about 50 acres (20 hectares) of undeveloped land. Additionally, between 1997 and 2004, 8,233 acres (3,332 hectares) of forest were thinned to reduce potential wildfire. Thinning has both positive and negative effects on wildlife. An infestation of bark beetles resulted in a 12 to 100 percent mortality of pine and fir trees across LANL.	Forest thinning creates a forest that appears more park-like and increases the diversity of shrubs, herbs, and grasses in the understory.
Offsite Radiological Impacts			
- Offsite Population	Affected population within 50 miles (80 kilometers) of LANL.	Population within 50 miles (80 kilometers) of LANL grew by 14 percent between 1995 and 2000.	Lower emissions than those projected in the *1999 SWEIS* resulted in lower population dose and risk.
Dose (per year)	33.09 person-rem	2.5 person-rem in peak year (2005)	
Risk (per year)	0.0165 latent cancer fatalities	0.0015 latent cancer fatalities in peak year (2005)	
- MEI	LANL site MEI located north-northeast of LANSCE.	No change in location for the LANL site MEI.	Average dose to MEI continues to be bounded by projections in the *1999 SWEIS*. Higher emissions in 2005, resulting in a higher MEI dose, were due to a failed valve at LANSCE. The peak year dose is below the 10 millirem annual public exposure limit.
Dose (per year)	5.44 millirem	6.5 millirem in peak year (2005)	
Risk (per year)	2.72×10^{-6} latent cancer fatalities	3.9×10^{-6} latent cancer fatalities in peak year (2005)	
Worker Health			
- Average Measurable Dose			Average dose to workers continues to be bounded by projections in the *1999 SWEIS*.
Dose (per year)	198 millirem	149 millirem in peak year (2000)	
Risk (per year)	7.92×10^{-5} latent cancer fatalities	8.9×10^{-5} latent cancer fatalities in peak year (2000)	
- Collective Dose			Collective dose to the worker population continues to be bounded by projections in the *1999 SWEIS*.
Dose (per year)	704 person-rem	241 person-rem in peak year (2003)	
Risk (per year)	0.281 latent cancer fatalities	0.145 latent cancer fatalities in peak year (2003)	
	Factor used to estimate risk of latent cancer fatalities per rem was 0.0004 in 1999.	Dose-to-risk factor for workers increased from 0.0004 to 0.0006 latent cancer fatalities per rem.	

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
Environmental Justice	There would be no disproportionately high and adverse impacts to minority or low-income populations from LANL activities. Consultations would continue to provide opportunities for avoiding or minimizing adverse impacts to traditional cultural properties at LANL. Human health impacts associated with special pathways would not present disproportionately high and adverse impacts to minority and low-income populations.	There were no disproportionately high and adverse impacts to minority or low-income populations from LANL activities during this period. Potential impacts to sacred lands adjacent to LANL from activities at TA-54 have been of concern to the San Ildefonso Pueblo. The amount of radiological material released to the environment (curies per year) has been well within the amount projected in the *1999 SWEIS*.	Impacts have not exceeded any health, safety, and environmental regulation, standard, or guideline; nor have they been high or adverse to minority and low-income populations. Ongoing consultations with representatives of the San Ildefonso Pueblo address concerns that activities at LANL and at TA-54 could affect sacred lands. Human health impacts associated with special pathways remained below the levels projected in the *1999 SWEIS*.
Cultural Resources	Cultural resources at LANL were categorized as prehistoric, historic, and traditional cultural properties. As discussed in the *1999 SWEIS*, about 75 percent of LANL was surveyed for cultural resources. Surveys identified 1,295 prehistoric sites, 2,319 historic sites, and 54 traditional cultural properties on or near LANL. As predicted in the *1999 SWEIS*, 15 prehistoric sites associated with the expansion of Area G could be impacted. No impacts to historic sites were expected. Impacts to traditional cultural properties were not fully predictable due to the lack of information on their specific locations and nature; however, impacts could result from changes in hydrology, explosives, hazardous materials, and security measures. It was noted that consultation with affected Pueblos would accompany any potential expansion in Area G or enhancement of pit manufacturing.	The percentage of LANL surveyed for cultural resources increased to 90 percent in 2005, and the number of known cultural resource sites increased as well. Conveyance and transfer of land resulted in the removal of cultural resources from the responsibility and protection of DOE, including resources eligible for listing on the National Register of Historic Places and American Indian sacred sites, remains, and traditional religious sites. A data recovery plan has been written to resolve adverse effects on tracts conveyed to the County of Los Alamos; transferred land would be held in trust by the Department of the Interior (to be held in trust for the Pueblo of San Ildefonso) and so would remain under Federal protection. Following the Cerro Grande Fire, an assessment determined that about 400 archaeological sites and historic buildings and structures were impacted by the fire. Impacts included direct loss, soot staining, spalling and cracking of stone masonry walls, and the exposure of artifacts from erosion. Additionally, the fire and the tree thinning measures taken to reduce wildfire hazard resulted in the discovery of 447 new archaeological sites.	Impacts to cultural resources at LANL exceeded the level predicted in the *1999 SWEIS*, which did not account for events such as land conveyance and transfer. Certain activities associated with the development of new sites and land conveyance and transfer were addressed in separate NEPA documents. The Cerro Grande Fire caused extensive damage to cultural resources at LANL.
Socioeconomics	The *1999 SWEIS* projected the need for 11,351 full-time equivalent LANL-affiliated employees. Changes in employment at LANL would change regional population, employment, personal income, and other socioeconomic measures.	By 2005, there were 13,504 LANL-affiliated employees.	Socioeconomic impacts from continued operations at LANL between 1998 and 2005 have exceeded the socioeconomic impacts projected in the *1999 SWEIS* due to the larger number of employees.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
Infrastructure			
- Electricity	LANL was projected to require 782,000 megawatt-hours of electricity per year, with a peak load demand of 113 megawatts.	Average annual usage: 391,096 megawatt-hours per year, with peak usage of 421,413 megawatt-hours in 2005. Average peak load demand: 68.8 megawatts, with a peak of 70.9 megawatts in 2001 and 2003.	Annual electricity usage at LANL remained below the levels projected in the *1999 SWEIS*. Electrical usage has not exceeded the annual 963,600 megawatt-hour system capacity, or the physical transmission capability (thermal rating) of 110 megawatts.
- Fuel	LANL was projected to require 1.84 million decatherms (52.1 million cubic meters) of natural gas per year. Note: A decatherm is equivalent to 1,000 cubic feet.	Average annual usage: 1.32 million decatherms (37.4 million cubic meters) per year. Peak year usage: 1.49 billion cubic feet (42.2 million cubic meters) (2001).	Annual natural gas usage at LANL remained below the level projected in the *1999 SWEIS*. Demand for natural gas has not exceeded the contractually limited capacity of 8.07 million decatherms (229 million cubic meters) per year.
- Water	LANL was projected to require 759 million gallons (2.87 million liters) of water per year.	Average annual usage: 385 million gallons (1.46 billion liters) per year. Peak year usage: 453 million gallons (1.71 billion liters) (1999).	Annual water usage at LANL remained below the level projected in the *1999 SWEIS*. Demand for water has not exceeded the ceiling quantity of approximately 542 million gallons (2 billion liters) per year.
Environmental Restoration	The *1999 SWEIS* evaluated Environmental Restoration Program impacts in the ecological and human health risk assessments and in analyses related to the transport, treatment, storage, and disposal of waste. Other environmental restoration–related impacts addressed qualitatively in the *1999 SWEIS* included fugitive dust, surface runoff, soil and sediment erosion, and worker health and safety risks.	The environmental restoration project originally identified 2,124 potential release sites, including 1,099 regulated by the New Mexico Environment Department under RCRA and 1,025 regulated by DOE. At the end of 2005, 829 potential release sites remained to be investigated or remediated. Cleanup activities have been completed at many sites. No further action determinations have been made for 774 units, and 146 units have been removed from LANL's RCRA Permit. Major unplanned environmental restoration activities were undertaken in response to the Cerro Grande Fire that reduced long-term exposures to legacy contaminants. The large quantities of waste generated by cleanup were sent to offsite facilities.	The overall impacts of environmental restoration activities and waste generated by activities at LANL remained within the qualitative projections presented in the *1999 SWEIS*.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
Waste Management and Pollution Prevention	Waste management impacts were projected in the *1999 SWEIS* for five categories of waste (low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, mixed transuranic waste, and chemical waste). Liquid radioactive wastes were evaluated separately and subcategory (sludge) quantities were projected. For low-level radioactive waste disposal at TA-54, the *1999 SWEIS* and ROD selected the preferred option of expansion into Zones 4 and 6, providing an additional 72 acres (29 hectares) of low-level radioactive waste disposal area, of which 41 acres (16.6 hectares) would actually be disturbed by waste disposal.	In general, quantities of radioactive waste were below *1999 SWEIS* projections for all categories. Overall low-level radioactive waste generation was well below the projected level up until 2004, when the projection was exceeded due to heightened activities and new construction at non-Key Facilities. Mixed low-level radioactive waste remained within the *1999 SWEIS* projection. For transuranic waste, the quantities were within the *1999 SWEIS* projection for 6 of the 7 years; in 2003, the transuranic waste projection was exceeded due to repackaging of legacy waste for shipment to WIPP and the receipt and storage of sealed sources by the Off-Site Source Recovery Program. Generation of mixed transuranic waste by the waste repackaging effort in 2003 exceeded the *1999 SWEIS* projection, the only exceedance for this category. The chemical waste projection was exceeded for the years 1999 through 2001 due to environmental restoration cleanups. Numerous facility-specific variances to the *1999 SWEIS* chemical waste projections occurred over the timeframe, mostly due to one-time events such as chemical cleanouts or maintenance activities. For liquid radioactive wastes, quantities treated were within *1999 SWEIS* projections; some sludge exceeded *1999 SWEIS* projections, but was within the low-level radioactive waste management capacity. Low-level radioactive waste operations at TA-54 were conducted within the existing footprint.	The amount of waste managed at LANL was within *1999 SWEIS* projections for all waste categories with a few exceptions. Although sporadic exceedances took place, the quantities generated were within the capacity of the existing LANL waste management infrastructure. Liquid radioactive waste treatment quantities remained within *1999 SWEIS* projections.
Emergency Preparedness and Security	LANL's Comprehensive Emergency Management and Response Program, which includes specialized response teams, specialized training, and response agreements in cooperation with local government response agencies was described in the *1999 SWEIS*. In addition, DOE was studying a variety of options for the renovation of the emergency preparedness and security infrastructure at LANL that included replacing a number of aging structures individually or as part of a multi-building effort.	Until 2003, the LANL Emergency Operations Center was located within TA-59. A new Emergency Operations Center located at TA-69 was completed and began operations in 2003.	Impacts were consistent with those described in the *1999 SWEIS*, except for measures taken in response to enhanced national security concerns after the attacks of September 11, 2001.

TA = technical area, NEPA = National Environmental Policy Act, NPDES = National Pollutant Discharge Elimination System, CO = carbon monoxide, NO_x = nitrogen oxide, PM = particulate matter, SO_2 = sulfur dioxide, rem = roentgen equivalent man, PCBs = polychlorinated biphenyls, MEI = maximally exposed individual, RLWTF = Radioactive Liquid Waste Treatment Facility, LANSCE = Los Alamos Neutron Science Center, RCRA = Resource Conservation and Recovery Act, ROD = Record of Decision, WIPP = Waste Isolation Pilot Plant.

[a] Based on the Expanded Operations Alternative as defined in the *1999 SWEIS* and ROD (64 FR 50797).

S.8 Description of the Alternatives

The alternatives considered in the new SWEIS are the No Action Alternative, a Reduced Operations Alternative, and an Expanded Operations Alternative. Under the **No Action Alternative**, LANL would continue to implement decisions made in the *1999 SWEIS* ROD, as well as decisions based on NEPA analyses completed since 1999. For purposes of the SWEIS, the construction and operation of the nuclear facility portion of the Chemistry and Metallurgy Research Replacement Facility is included in the No Action Alternative in keeping with the bounding approach for impact analysis. However, NNSA is engaged in a programmatic review process that includes a reconsideration of its 2004 decision regarding that portion of the Chemistry and Metallurgy Research Replacement Facility through preparation of the *Complex Transformation SPEIS*.

Under the **Reduced Operations Alternative**, many activities would remain unchanged, but others would be eliminated or reduced. Projects that have been approved based on completed NEPA analyses would go forward under this alternative; however, the scope of the Chemistry and Metallurgy Research Replacement Facility would be reduced. Only the radiological laboratory, administrative office, and support functions building would be constructed and operated; the nuclear facility portion would not be constructed, and the existing Chemistry and Metallurgy Research Building would operate beyond its previously identified closure date of 2010.

Alternatives for Continued Operation of Los Alamos National Laboratory

No Action Alternative—Operations would continue at current levels consistent with previous decisions such as those announced in the *1999 SWEIS* ROD.

Reduced Operations Alternative—The nuclear facility portion of the Chemistry and Metallurgy Research Replacement Facility would not be constructed. Operations would be reduced at High Explosive Processing and Testing Facilities and eliminated at LANSCE and Pajarito Site.

Expanded Operations Alternative (Preferred Alternative)—Actions would be implemented to upgrade or replace aging facilities and systems, improve security, and remediate obsolete buildings and contaminated lands. Selected operations would increase, including plutonium pit production.

The **Expanded Operations Alternative** analyzed in the SWEIS, which NNSA has selected as its Preferred Alternative, reflects proposals to expand overall operational levels at LANL above those analyzed in the No Action Alternative. This alternative includes the expansion of operations at certain Key Facilities and the construction of new facilities. This alternative also includes the actions required to support implementation of the Consent Order. Three types of new projects are addressed in the SWEIS under the Expanded Operations Alternative: projects that maintain existing capabilities at LANL, projects that support the cleanup of LANL including the DD&D of excess buildings and implementation of the Consent Order[5] (NMED 2005); and projects that add new or expand existing capabilities at LANL.

[5] *NNSA is including impacts associated with Consent Order implementation in the SWEIS in order to more fully analyze the impacts resulting from Consent Order compliance. NNSA intends to implement actions necessary to comply with the Consent Order regardless of decisions it makes on other actions analyzed in the SWEIS.*

The greatest change at a Key Facility would occur at the Plutonium Facility Complex. The *1999 SWEIS* analyzed a production level of "80 plutonium pits per year in multiple shift operations (up to 50 pits per year in single-shift operations)" as part of its Expanded Operations Alternative (DOE 1999). However, DOE decided in 1999 to manufacture a nominal 20 pits per year, and announced that decision in the *1999 SWEIS* ROD. The annual production of 20 pits was identified in the Final *1999 SWEIS* as part of the Preferred Alternative, and the analysis of impacts for this alternative was developed by scaling the impacts identified for the *1999 SWEIS* Expanded Operations Alternative (which was based on an annual production rate of 80 pits) to a production rate of 20 pits per year.[6]

While recent studies suggest that the lifetime of the plutonium pit in the majority of nuclear weapons may be longer than originally thought, NNSA needs the flexibility provided by increased pit production for two reasons: First, even with longer pit lifetimes, NNSA will need to replace pits in stockpiled warheads as the stockpile ages. Second, at significantly smaller stockpile levels than today, NNSA must anticipate an adverse change in the geopolitical threat environment, or a technical problem with warheads in the operationally deployed force, either of which could require the United States to manufacture and deploy additional warheads on a relatively rapid schedule (NNSA 2006b, 2007).

NNSA proposes to increase the annual manufacturing rate from 20 pits per year (the rate assumed for the No Action Alternative in the SWEIS) to an annual rate of up to 80 pits under the Expanded Operations Alternative. The production of pits includes the activities needed to fabricate new pits, to modify the internal features of existing pits, and to certify new pits or requalify existing pits. Some of the pits produced by these processes may not be certified or requalified. NNSA needs to produce about 50 certified pits annually to meet the immediate requirements of the Stockpile Stewardship Program (although the number of certified pits needed may change in the future), and may need to produce more than 50 pits in order to obtain 50 certified pits. The Expanded Operations Alternative for the SWEIS is based on an annual production rate of 80 pits per year in order to provide NNSA with some flexibility in obtaining the appropriate number of certified pits. The annual production rate of 80 pits analyzed in the Expanded Operations Alternative is the upper limit of the annual production rate at LANL. Although NNSA has proposed further transformations of the nuclear weapons complex to meet future national security needs, NNSA has not completed the *Complex Transformation SPEIS* and therefore has not made a decision on the configuration of the future complex, including decisions regarding whether to increase the pit production capabilities above 80 pits per year at LANL or another NNSA site. Any decision to increase pit production beyond 20 pits per year would be made after NNSA issues the Final *Complex Transformation SPEIS*; such a decision would be based on the analyses in the *Complex Transformation SPEIS*, the SWEIS, and other information, including cost studies, budget projections, and national security requirements.

A decision to increase pit production significantly above 20 pits annually would require NNSA to issue a new or revised ROD. Work continues toward implementing the decision to produce 20 pits per year announced in the *1999 SWEIS* ROD. The current proposal to produce up to

[6] *As part of this scaling process, the 1999 SWEIS provided quantitative adjustments of important impacts where possible to reflect the differences between an annual production rate of 80 pits (the rate used for that SWEIS's Expanded Operations Alternative) and an annual rate of 20 pits (the rate used for the Preferred Alternative and selected by the 1999 ROD). Where quantitative adjustments were not possible, a qualitative discussion of the important differences in impacts was provided.*

80 pits per year involves reorganizing operations within the Plutonium Facility such that no new building or other addition to the "footprint" of the facility would be required. Available production space within the facility would be used more efficiently, and process efficiencies identified since 1999 would be employed. Some modifications to equipment arrangements in the Plutonium Facility might also be necessary. This approach – using only existing floor space – is not the same as the approaches analyzed in the *1999 SWEIS*, each of which would have required addition of floor space to the Plutonium Facility. In the new SWEIS, NNSA is reanalyzing the potential environmental impacts of using this new approach to produce up to 80 pits per year as outlined in the Expanded Operations Alternative. As was the case for the impact analysis used in the Expanded Operations Alternative in the *1999 SWEIS*, the new SWEIS bases the analysis of impacts for its Expanded Operations Alternative on a maximum annual production rate of 80 pits. The No Action Alternative for the SWEIS uses the same scaling process used to develop the Preferred Alternative for the *1999 SWEIS*.

NNSA has selected the Expanded Operations Alternative as its **Preferred Alternative** for the continued operation of LANL. This alternative includes fabrication of up to 80 pits per year at the Plutonium Facility Complex in TA-55, as well as increased activity levels at certain other Key Facilities (such as the Chemistry and Metallurgy Research Replacement Facility) to support this level of pit production. Proposed increases in activity levels would be implemented and new capabilities would be added to existing Key Facilities. Capabilities, activity levels, and projects identified under the No Action Alternative that remain unchanged under the Expanded Operations Alternative would continue as described. NNSA would undertake activities to facilitate compliance with the Consent Order and remediation of the MDAs, as well as other closure and DD&D projects. The proposed projects discussed in Section S.3 of this Summary would proceed, commensurate with funding.

However, full implementation of the Preferred Alternative may be affected by future programmatic decisions. NNSA is reconsidering its decision to construct and operate the nuclear facility portion of the Chemistry and Metallurgy Research Replacement Facility at LANL pending decisions related to its Complex Transformation proposal for the nuclear weapons complex. NNSA is deferring a decision on how to provide the necessary long-term analytical chemistry, materials characterization, and research and development capabilities that would be provided by the nuclear facility portion of the Chemistry and Metallurgy Research Replacement Facility. NNSA may ultimately choose to implement only part of the Expanded Operations Alternative contingent on the Complex Transformation strategy.

Given the uncertainty regarding the nuclear weapons work that will be assigned to LANL in the future, NNSA expects to issue two or more RODs to implement its decisions. Decisions relating to site remediation and to DD&D of facilities are expected to be in the first ROD based on the SWEIS. Specifically, this includes activities that would facilitate remediation of MDAs and other contaminated sites as required by the Consent Order.

Table S–4 provides a comparison of the principal activities associated with each alternative. The table is divided into three sections to reflect whether the proposed activities involve implementation at a site-wide (not associated with a single TA or Key Facility) or TA level, or are specific to a Key Facility. The projects that are the subject of project-specific analyses in the SWEIS could occur at any of these levels, and appear in *italics* in the table to aid in identification.

Table S–4 Summary of Actions Under Proposed Alternatives [a]

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
Site-Wide Activities and Projects				
Security Needs	Site-wide	Complete project related to access control stations and realign roadways around TA-3. Upgrade and replace existing physical security system. Implement Nuclear Materials Safeguards and Security Upgrades Project, Phase II.	Same as No Action Alternative	Same as No Action Alternative, plus: Implement *Security-Driven Traffic Modifications Project* – limit access along Pajarito Corridor West; provide commuter bus parking lots, shuttle bus service, and pedestrian and vehicle bridges between TA-63 and TA-35. Auxiliary actions include constructing 2 more vehicle bridges from TA-35 to TA-60 and TA-60 to TA-61.
Remediation and Closure Activities	Site-wide	Continue remediation of potential release sites. Remediate MDA H.	Same as No Action Alternative	*Major Material Disposal Area Remediation, Canyon Cleanups and Other Consent Order Activities*: Investigate and remediate potential release sites, including MDAs as required by the Consent Order. Perform environmental monitoring as needed to support Los Alamos County Landfill closure.
Land Conveyance and Transfer	Site-wide	Transfer previously identified parcels of LANL land to the Department of the Interior in trust for San Ildefonso Pueblo, or convey to Los Alamos County and New Mexico Department of Transportation.	Same as No Action Alternative	Same as No Action Alternative
Electrical Power System Upgrade	Site-wide	Construct or modify 2 substations. Construct or modify 2 power lines.	Same as No Action Alternative	Same as No Action Alternative
Wildfire Hazard Reduction	Site-wide	Implement ecosystem-based management program for approximately 10,000 acres (4,000 hectares) through forest thinning, construction of access roads and fuel breaks, and use of prescribed fire.	Same as No Action Alternative	Same as No Action Alternative
Flood and Sediment Retention Structures	Site-wide	Remove aboveground portions of the Pajarito Canyon flood retention structure and TA-18 steel diversion wall. Grade streambed and reseed banks.	Same as No Action Alternative	Same as No Action Alternative
Trails Management Program	Site-wide	Repair, maintain, improve or close, as necessary, publicly used trails on LANL property.	Same as No Action Alternative	Same as No Action Alternative
Off-Site Source Recovery Project	TA-3, TA-18, TA-54, TA-55	Continue to receive and store excess sealed radiological sources.	Same as No Action Alternative	Same as No Action Alternative, plus: *Increase Type and Quantities of Sealed Sources Accepted for Management.*
Management of Construction Soils	TA-16, TA-61	Transport and store up to 150,000 cubic yards of soil excavated from Chemistry and Metallurgy Research Replacement Facility Project, and other construction projects at TA-16 or TA-61 borrow areas.	Same as No Action Alternative	Same as No Action Alternative

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
Technical Area Activities and Projects				
Combustion Turbine Generators	TA-3	Install two 20-megawatt combustion turbine generators.	Same as No Action Alternative	Same as No Action Alternative
Physical Science Research Complex	TA-3	No activity	No activity	Construct a new *Physical Science Research Complex*.
Replacement Office Buildings	TA-3	Construct 3 office buildings.	Same as No Action Alternative	Construct up to 9 additional *Replacement Office Buildings*.
Administration Building	TA-3	Demolish building.	Same as No Action Alternative	Same as No Action Alternative
TA-21 DD&D	TA-21	Deactivate tritium facilities followed by surveillance and maintenance.	Same as No Action Alternative	Implement *TA-21 Structure Decontamination, Decommissioning, and Demolition Project.*
Science Complex	TA-62 or TA-3 or Research Park	No activity	No activity	Construct and operate a new *Science Complex.*
Remote Warehouse and Truck Inspection Station	TA-72	No activity	No activity	Construct and operate a new *Remote Warehouse and Truck Inspection Station.*
Key Facility Activities and Projects				
Chemistry and Metallurgy Research Building	TA-3	Continue actinide research and processing activities, characterization, analysis, testing, and fabrication. Conduct nonproliferation training. Recover, process, and store LANL's highly enriched uranium inventory. Complete construction of CMR Replacement Facility at TA-55.	Same as No Action Alternative except: Nuclear facility portion of CMR Replacement Facility would not be constructed.	Same as No Action Alternative, plus: Expand and develop new actinide processing and analysis capabilities. Increase support to the Off-Site Source Recovery Program.
Sigma Complex	TA-3	Conduct research, development, and characterization on materials fabrication from metals, ceramics, salts, beryllium, enriched uranium, depleted uranium, and other uranium isotope mixtures. Analyze and fabricate tritium reservoirs. Fabricate nonnuclear components in support of research and development: 100 hydrotests and 50 joint test assemblies. Fabricate components for up to 80 pits and 50 secondary assemblies per year.	Same as No Action Alternative	Same as No Action Alternative
Machine Shops	TA-3	Machine, weld, and assemble various materials in support of major LANL programs and projects, principally related to weapons manufacturing.	Same as No Action Alternative	Same as No Action Alternative
Material Sciences Laboratory	TA-3	Develop and improve materials formulation and chemical processing technologies, mechanical testing, research, synthesis, and characterization.	Same as No Action Alternative	Same as No Action Alternative
Nicholas C. Metropolis Center for Modeling and Simulation	TA-3	Conduct high-performance, complex computing operations at up to 50 teraflops, using no more than 7.2 megawatts of electricity.	Same as No Action Alternative	Same as No Action Alternative, plus: Implement *Nicholas C. Metropolis Center for Modeling and Simulation Increase in Level of Operations*, using up to 15 megawatts of electricity and 51 million gallons (193 million liters) of water per year.

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
High Explosives Processing Facilities	TA-8, TA-9, TA-11, TA-16, TA-22, TA-37	High explosives processing activities using approximately 82,700 pounds (37,500 kilograms) of explosives and 2,910 pounds (1,320 kilograms) of mock explosives annually. Evaluate stockpile returns, develop and characterize new materials, and research waste treatment methods. Fabricate materials and parts. Conduct up to 15 safety and mechanical tests and support about 100 major hydrodynamic tests annually. Complete construction of TA-16 Engineering Complex and remove or demolish vacated structures.	Twenty percent reduction in activities and materials from the No Action Alternative	Same as No Action Alternative, plus: Increase use to 5,000 pounds (2,270 kilograms) of mock explosives, and conduct up to 500 safety and mechanical tests annually.
High Explosives Testing Facilities	TA-15 with firing sites in TA-14, TA-15, TA-36, TA-39, TA-40	Conduct approximately 1,800 experiments per year using up to 6,900 pounds (3,130 kilograms) of depleted uranium. Conduct explosives experiments and studies, dynamic experiments, and 100 major hydrodynamic tests annually. Install dynamic experimentation structure at TA-15. Complete construction of 15 to 25 new structures to replace about 59 structures currently used; remove or demolish vacated structures.	Twenty percent reduction in activities and materials from the No Action Alternative	Same as No Action Alternative
Tritium Facility	TA-16, TA-21	Perform high-pressure gas fills and processing operations for research and development and nuclear weapons systems. Perform ongoing maintenance, testing, research and development to maintain safety and reliability of gas boost systems for nuclear weapons. Tritium storage of about 35 ounces (1,000 grams). Phase out and move tritium activities from TA-21; decontaminate buildings.	Same as No Action Alternative	Same as No Action Alternative, plus: Implement *TA-21 Structure Decontamination, Decommissioning & Demolition Project.*
Pajarito Site	TA-18	Perform criticality experiments and provide training courses. Continue Security Category III and IV nuclear activities. Operate SHEBA in its security Category III configuration. Develop safeguard instrumentation and perform research and development for nuclear materials. Conduct experiments and activities to support NNSA's Second Line of Defense Program, Nuclear Nonproliferation Research and Development Testing, and Emergency Response Program activities. Receive and store radiation sources retrieved from other locations under the Off-Site Source Recovery Project.	Cease all Security Category III and IV nuclear activities, including SHEBA. Institute surveillance and maintenance of facilities. Eliminate Pajarito Site as Key Facility.	Implement *TA-18 Closure, Including Remaining Operations Relocation and Structure Decontamination, Decommissioning & Demolition*. Move Security Category III and IV material to other LANL facilities. Cease SHEBA activities. Eliminate Pajarito Site as Key Facility.

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
Target Fabrication Facility	TA-35	Conduct material sciences, effects testing, characterization, and technology development for weapons production and laser fusion research. Provide products for about 12,400 laser and physics tests per year.	Same as No Action Alternative	Same as No Action Alternative
Bioscience Facilities	TA-43, TA-3, TA-35, TA-46	Study intact cells, cellular components, and cellular systems. Characterize and synthesize biomaterials and molecules. Analyze samples and identify pathogens in support of biodefense and national security.	Same as No Action Alternative	Same as No Action Alternative, plus: Move selected activities to the new Science Complex in TA-62 (or Research Park or TA-3).
Radiochemistry Facility	TA-48	Conduct research, produce medical radioisotopes, and support other LANL organizations, primarily through radiological and chemical analyses of samples.	Same as No Action Alternative	Same as No Action Alternative, plus: Perform beryllium dispersion and mitigation assessments. Implement radioactive atom trapping for fundamental and applied research. Construct a new *Radiological Sciences Institute (including Phase I - the Institute for Nuclear Nonproliferation Science and Technology).*
Waste Management Operations: Radioactive Liquid Waste Treatment Facility	TA-50	Treat transuranic and low-level radioactive liquid wastes generated at LANL facilities; manage the final disposition of the treated wastes. Construct and operate 300,000-gallon (1.1-million-liter) influent storage facility.	Same as No Action Alternative	Same as No Action Alternative, plus: Treat and manage disposition of about 66 percent more liquid transuranic waste and 25 percent more liquid low-level radioactive waste. Implement the *Radioactive Liquid Waste Treatment Facility Upgrade Project.*
Los Alamos Neutron Science Center	TA-53	Operate the 800-million electron volt linear accelerator and deliver accelerator beam to Areas A, B, and C; Weapons Neutron Research Facility; Manuel Lujan Center; Dynamic Test Facility; and Isotope Production Facility for 10 months each year. Reconfigure beam delivery and support equipment to support new facilities, upgrades, and experiments. Support contained weapons-related experiments using small to moderate quantities of explosives. Install material test station equipment in Experimental Area A and construct neutron spectroscopy facility within existing buildings.	Shut down LANSCE; all capabilities would cease except treatment of radioactive liquid waste brought from the Radioactive Liquid Waste Treatment Facility. Systems would be maintained in a condition to support future restart.	Same as No Action Alternative, plus: Implement *LANSCE Refurbishment Project* for extending reliable operation of facility for next 20 to 30 years.

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
Waste Management Operations: Solid Radioactive and Chemical Waste Facility	TA-54, TA-50	Characterize, process, store, transport, and dispose of radioactive and chemical waste generated at LANL, including: – Prepare and ship transuranic waste to WIPP. – Prepare and ship hazardous and mixed low-level radioactive waste for offsite treatment and disposal. – Dispose of low-level radioactive waste in TA-54, expanding into Zones 4 and 6 as necessary. – Receive 5 to 10 shipments annually of low-level radioactive waste from offsite locations.	Same as No Action Alternative	Same as No Action Alternative plus: Manage additional volumes of transuranic and low-level radioactive waste. Implement *Waste Management Facilities Transition* to include*:* – Construct new TRU Waste Facility in TA-50 or TA-63. – Construct new access control station, low-level radioactive waste compactor building, and low-level radioactive waste certification building in TA-54. – Retrieve transuranic waste from belowground storage and characterize, store, and ship. Expand support of Off-Site Source Recovery Project.
Plutonium Facility Complex	TA-55	Produce 20 plutonium pits per year and disassemble and examine up to 65 plutonium pits per year. Recover, process, and store existing plutonium residue inventory. Perform plutonium (and other actinide) materials research and processing. Process up to 900 pounds (400 kilograms) of actinides per year between TA-55 and CMR Building. Provide storage of the LANL special nuclear material inventory, mainly plutonium. Continue research and development on other fuels. Fabricate and study nuclear fuels for use in terrestrial and space power systems, and power production reactors. Support Off-Site Source Recovery Project	Same as No Action Alternative except: Produce less than 20 plutonium pits per year.	Same as No Action Alternative except: Produce up to 80 pits per year with minor facility modifications. Develop expanded pit disassembly capacity. Conduct plutonium research, development, and support. Process 1,800 pounds, (800 kilograms) of actinides per year, including polishing 460 pounds (210 kilograms) of plutonium oxide. Implement *Plutonium Facility Complex Refurbishment Project*, including major systems repairs and replacements to extend reliable operation of Plutonium Facility for 20 to 30 years. Construct a *TA-55 Radiography Facility.*

TA = technical area; MDA = material disposal area; DD&D = decontamination, decommissioning, and demolition; CMR = Chemistry and Metallurgy Research; teraflops = a trillion operations per second; SHEBA = Solution High-Energy Burst Assembly; NNSA = National Nuclear Security Administration; LANSCE = Los Alamos Neutron Science Center; WIPP = Waste Isolation Pilot Plant.
[a] *Italicized* entries indicate projects for which project-specific impact analyses are included in the SWEIS.

Alternatives Considered but Not Analyzed in Detail

Among the comments received during the scoping process and review of the Draft SWEIS were suggestions for additional alternatives that should be considered in the SWEIS. Two alternatives, a "Greener Alternative" and a "true No Action Alternative" (or shutdown alternative), were suggested.

A Greener Alternative was evaluated in the *1999 SWEIS;* the name and general description of the alternative were provided by interested citizens as a result of the scoping process for that SWEIS. This alternative evaluated LANL capabilities existing at that time with an emphasis on work performed in support of basic science, waste minimization and treatment, dismantlement of nuclear weapons, nonproliferation, and other areas of national and international importance. While the Greener Alternative contained components of both the No Action and the Expanded

Operations Alternatives evaluated in the *1999 SWEIS*, the operational focus was on science, waste management, and nuclear weapons dismantlement. NNSA is not evaluating a similar alternative in the SWEIS because, as stated in the *1999 SWEIS* ROD (64 FR 50797), a Greener Alternative would not support the nuclear weapons mission assigned to LANL. It should be noted, however, that important aspects of the Greener Alternative evaluated in the *1999 SWEIS*, specifically optimization of work in the field of nonproliferation of weapons of mass destruction, as well as enhanced weapons dismantlement work, were incorporated into the No Action Alternative analyzed in the new SWEIS. Other aspects of the Greener Alternative in the *1999 SWEIS* also incorporated into the No Action Alternative of the new SWEIS include enhanced research related to national health issues, waste minimization and environmental restoration technologies, and international nuclear safety.

The alternative characterized as a "true No Action Alternative," in which all operations at LANL, including production and testing in support of stockpile stewardship, would cease is not a reasonable alternative. Thus, NNSA is not analyzing it in the SWEIS. Ceasing operations would result in a loss of support to nonproliferation efforts and research aiding the fight against terrorism. Because these activities are vital to national security and are among the major components of the mission assigned to LANL by NNSA, this alternative is not a reasonable alternative. The SWEIS updates previous EISs that have provided information supporting a number of decisions about operations at LANL. In such situations, an alternative that assumes LANL would cease all mission-related work is not reasonable.

S.9 Summary of Environmental Consequences

This section summarizes the impacts analyses performed for the SWEIS to provide an understanding of the overall consequences of each of the proposed alternatives and how the alternatives compare to each other. Section S.9.1 presents an overview for each of the resource areas, highlighting issues, concerns, or positive impacts. **Table S–5** (located at the end of Section S.9.1) summarizes the potential consequences of each alternative by resource area. Section S.9.2 is a summary of the cumulative impacts analyses that considers operating LANL in the context of other past, present, and reasonably foreseeable actions.

The Expanded Operations Alternative includes implementation of specific projects evaluated in the appendices to the SWEIS. As discussed in Section S.4, however, NNSA may make decisions on individual projects or proposed activities rather than making a single decision to implement an entire alternative. While Section S.9.1 summarizes the impacts from these projects as part of the Expanded Operations Alternative, Section S.9.3 summarizes the environmental consequences of each of the individual proposed projects. This individual treatment is intended to facilitate the decision process by providing an understanding of how each of the proposed projects could affect the overall impacts of continued operations at LANL. Implementing the proposed projects may result in impacts to potential release sites covered under the Consent Order. As needed, these impacts would be addressed through the accelerated cleanup process described in Section VII.F of the Consent Order. NNSA intends to implement the actions necessary to comply with the Consent Order regardless of decisions it makes on other actions analyzed in the SWEIS.

[7] *Possible impacts from a project addressed in the SWEIS to a potential release site covered under the Consent Order would be addressed through the accelerated cleanup process described in Section VII.F of the Consent Order.*

S.9.1 Comparison of Potential Consequences of Alternatives for Continued Operation at Los Alamos National Laboratory

This section focuses on the overall LANL site, providing an overview of impacts for each SWEIS alternative and resource area to provide an understanding of the total potential impacts of each alternative. Table S–5, located at the end of this section, compares the environmental consequences of the three SWEIS alternatives.

Land Use

Under the No Action Alternative, the conveyance of land from LANL to Los Alamos County, and the New Mexico Department of Transportation, and transfer of land to the Department of the Interior (to be held in trust for the Pueblo of San Ildefonso) would continue. Of the 4,078 acres (1,650 hectares) identified under Public Law 105-119 (Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act, 1998), about 1,820 acres (737 hectares) remain to be transferred. This land conveyance and transfer, and the Power Grid Upgrades Project, could impact site and regional land use. Effects of these actions include reduction in the size of LANL, possible changes in offsite land use from development following transfer, loss of recreational opportunities, and changes in site land use. Impacts would be similar under the Reduced Operations Alternative. Under the Expanded Operations Alternative, in addition to the impacts of the No Action Alternative, changes to land use could occur as the result of projects such as the Replacement Office Buildings Project, Radiological Sciences Institute Project, TA-18 Closure Project, MDA Remediation Project,[8] Radioactive Liquid Waste Treatment Facility Upgrade Project, Waste Management Transition Project, Science Complex Project, Remote Warehouse and Truck Inspection Station Project, and Security-Driven Transportation Modifications Project. While actions associated with these projects would in many cases be compatible with existing land use plans, there is no provision in the current plans for the new bridge that could be constructed over Sandia Canyon under Auxiliary Action B of the Security-Driven Transportation Modifications Project. Although no major changes in land use would occur in most cases, environmental remediation occurring for all alternatives could lead to fewer restrictions on land use. The fewest restrictions on land use would occur under the Removal Option for the MDA Remediation Project upon completion of remedial actions.

Visual Environment

Under the No Action Alternative, possible development following conveyance and transfer of land could degrade the views of presently undeveloped areas. For many projects, impacts to the visual environment would be limited to the construction phase. Once complete, most projects would be minimally visible from offsite locations, but more noticeable from closer vantage points; however, near views are often restricted to LANL employees. Under all alternatives, environmental remediation activities at some potential release sites could be publicly visible while remediation occurs. Power grid upgrades could adversely impact the views in previously undisturbed areas. Impacts under the Reduced Operations Alternative would be similar to those identified for the No Action Alternative.

[8] *The phrase MDA Remediation Project is used in the SWEIS as a general term for environmental remediation activities under the Consent Order, addressing MDAs and other potential release sites.*

Although in many cases impacts to the visual environment from implementation of the Expanded Operations Alternative would be similar those associated with the No Action Alternative, a number of proposed projects would cause noticeable changes to the visual environment. Capping or removing MDAs under the MDA Remediation Project would temporarily disturb areas or involve the use of temporary enclosures that could be visible in some cases. MDA Remediation Project activities would increase the visibility of the borrow pit in TA-61; and the Security-Driven Transportation Modifications Project would cause the construction of roads, parking lots, and new bridges over a site canyon. Additional visible bridges could be constructed over site canyons if the auxiliary actions were selected. In addition, new buildings associated with the Replacement Office Buildings and Science Complex Projects would be readily visible from West Jemez or Pajarito Roads. The new building associated with the Remote Warehouse and Truck Inspection Station would be visible from East Jemez Road. Establishment of evaporation tanks for final treatment of effluent from the Radioactive Liquid Waste Treatment Facility would cause a permanent change to the visual environment in the area near the border of TA-52 and TA-5. There would be a break in forest cover that could be seen from areas west of LANL. The removal of old buildings would enhance the visual environment at both TA-18 and TA-21, and the visual environment at TA-21 could further change in the longer term if development takes place. Also, removal of the domes in TA-54 as part of the Waste Management Facilities Transition Project would have a beneficial impact on views of the site from both near (including the Pueblo of San Ildefonso) and far. Construction of the TRU Waste Facility, however, has the potential to impact the visual environment, including views from San Ildefonso Pueblo lands, depending on its location.

Geology and Soils

There is little difference in the impacts on geologic resources for the No Action and Reduced Operations Alternatives; however, the impacts from the Expanded Operations Alternative would be distinctly different. Under the Expanded Operations Alternative, facility construction and DD&D for the following projects would impact geologic materials: Physical Science Research Complex, Replacement Office Buildings, Radiological Sciences Institute, Radioactive Liquid Waste Treatment Facility Upgrade, TA-55 Radiography Facility, Science Complex, Remote Warehouse and Truck Inspection Station, TA-21 DD&D, Waste Management Facilities Transition, and the Security-Driven Transportation Modifications. A total of approximately 3.2 million cubic yards (2.5 million cubic meters) of soil and rock would be disturbed if all of these projects were implemented.

In addition, MDA remediation in compliance with the Consent Order would have a major impact on geologic resources. MDA remediation would require 1.2 million to 2.5 million cubic yards (0.9 million to 1.9 million cubic meters) of crushed tuff and other materials for evapotranspiration covers under the Capping Option, or up to 2.2 million cubic yards (1.7 million cubic meters) of backfill and surface materials under the Removal Option. These geologic resources would be available either at LANL or from nearby offsite sources.

Under all three alternatives, remediation of potential release sites would continue to remove existing contaminants from soils and shallow bedrock at LANL. This impact would be greatest under the Expanded Operations Alternative because the largest area and volume of contaminated soil would be remediated. The use of standard construction methods and best management

practices would minimize the potential for erosion and release of soils during construction and decrease the potential for erosion, slope failure, and contaminant releases after remediation is complete.

Water Resources

There would be only minor adverse impacts on surface water quality and quantity from the No Action Alternative. There could be significant beneficial impacts on Sandia Canyon if the effluent from the Sanitary Wastewater Systems Plant is used as cooling water at the Metropolis Center for Modeling and Simulation. Under the Reduced Operations Alternative, the elimination of cooling tower effluent from LANSCE would result in a significant reduction of effluent discharge to Los Alamos Canyon. The Expanded Operations Alternative could have beneficial impacts on surface water quality due to the installation of new treatment technologies associated with the Radioactive Liquid Waste Treatment Facility Upgrade Project, and the possible elimination of the Radioactive Liquid Waste Treatment Facility discharge to Mortandad Canyon if the auxiliary action to evaporate treated effluents were implemented. Complete DD&D of TA-21 under the Expanded Operations Alternative would eliminate two industrial effluent outfalls, which would have a minor beneficial impact on Los Alamos Canyon. Environmental remediation under all alternatives would have positive impacts on surface water quality; implementation of the MDA Remediation Project under the Expanded Operations Alternative would have additional beneficial impacts on surface water quality due to the potential removal or stabilization of contaminants at the MDAs. Removal of the flood retention structure in Pajarito Canyon under all the alternatives could impact floodplains downstream immediately following removal. None of the alternatives would likely have any other impacts on floodplains.

There would be no changes in the flow of contaminants to the alluvial or regional groundwater as a result of the No Action Alternative, except for that achieved from continuing the environmental remediation program that existed before the Consent Order. Most impacts to groundwater resources identified as occurring under the No Action Alternative would also occur under the Reduced Operations Alternative. Long-term impacts might be reduced by elimination of some of the canyon outfalls and reduction of water use. Direct and indirect impacts to groundwater as a result of proposed construction and operations under the Expanded Operations Alternative would also be similar to those described for the No Action Alternative. Under the Expanded Operations Alternative, water usage would be greater than the range of LANL's water use over the last 7 years, but within the range of use over the last 14 years. Therefore, impacts to the water levels in the regional aquifer from withdrawals to supply LANL would be within historical levels. The effects of either an MDA Capping or Removal Option under the Expanded Operations Alternative would not appreciably affect the rate of transport of contaminants presently in the vadose zone in the near term, but would likely reduce very long-term migration of contaminants and corresponding impacts on the environment from wastes present in the MDAs.

Air Quality

Nonradiological air pollutant emissions from operations at LANL would continue within the limits of the operating air permit under all the alternatives. Reductions in emissions would occur under the Reduced Operations Alternative from reduced high explosives processing and testing, from shutdown of LANSCE and the Pajarito Site (TA-18), and a smaller construction scope. A

minor increase in operations emissions could occur under the Expanded Operations Alternative, but emissions would remain within the limits of the operating permit. Increased employment under the Expanded Operations Alternative could result in an increase in air pollutant emissions from additional vehicles of employees commuting from Santa Fe and Rio Arriba County and other locations and waste and materials shipments. Temporary localized increases in air pollutant emissions from construction, DD&D, and remediation activities would occur under all alternatives, but under the Expanded Operations Alternative the emissions would be larger. These activities could result in exceedances of short-term ambient standards for nitrogen oxides and carbon monoxide for some projects where activities are near the site boundary or public roads unless these activities are properly controlled. Appropriate management controls and scheduling would be used to minimize impacts on the public and to meet regulatory requirements. Development by others of lands conveyed and transferred could result in air quality impacts.

Radiological air emissions from normal operations under the No Action Alternative would be dominated by short-lived gaseous mixed activation products emitted from LANSCE (TA-53). Under the Reduced Operations Alternative, a reduction in the activity levels of some Key Facilities (including the continued use of the Chemistry and Metallurgy Research Building) and the shutdown of LANSCE and the Pajarito Site (TA-18) would greatly reduce the amount of radiological air emissions. Under the Expanded Operations Alternative, some small increases in radiological air emissions compared to the No Action Alternative would result from increased LANL activities and the operation of new facilities. These emissions would be dominated by operations at LANSCE. There could be temporary additions to radiological air emissions if the New Mexico Environment Department selects exhumation as the corrective measure for any of the MDAs.

Noise

Under the No Action Alternative, noise impacts from operations at LANL would be similar to the impacts from recent operations, including noise from explosives testing and traffic. Construction, DD&D, and remediation activities would result in a minor increase in offsite noise impacts to the public from equipment use and traffic under the No Action and Reduced Operations Alternatives. Under the Reduced Operations Alternative, however, a minor reduction in explosives testing noise would occur, as well as a minor decrease in construction and DD&D noise impacts compared to the No Action Alternative. Under the Expanded Operations Alternative, minor to moderate increases in traffic noise could occur from changes in traffic patterns due to increased construction, MDA remediation, DD&D activities, and increased employment at LANL. In addition, increased equipment-related noise impacts would occur from additional construction, DD&D, and MDA remediation activities. Activities near the site boundary or increases in truck traffic noise under various MDA remediation options could result in some public annoyance. Development by others of lands conveyed and transferred could also result in noise impacts.

Ecological Resources

Under the No Action Alternative, a number of actions would result in impacts on ecological resources. For example, conveyance of land to the county could result in the loss of 770 acres

(312 hectares) of habitat through possible future development. Therefore, impacts such as loss and displacement of wildlife would take place. The Wildfire Hazard Reduction Program would have short-term adverse impacts on wildlife due to activities such as tree trimming, but would produce long-term benefits from returning the forest to a condition similar to that which existed in the past. Increased forest health could also benefit the Mexican spotted owl at LANL and across the region. Impacts from the Reduced Operations Alternative generally would be similar to the No Action Alternative.

Under the Expanded Operations Alternative, however, impacts on ecological resources would be larger than those of the No Action Alternative. A number of projects could impact habitat and wildlife. Those impacts mostly would be temporary disturbances during construction and demolition; however, if all of the proposed projects were implemented, up to about 170 acres (69 hectares) of habitat would be lost; borrow pit expansion, if required, would disturb additional acreage. Most habitat loss would be associated with the Security-Driven Transportation Modifications Project (30 acres [12 hectares] and its two auxiliary actions (91 acres [37 hectares]). Temporary disturbances to habitat and displacement of wildlife could occur from environmental remediation under all alternatives; however, because material disposal areas are mostly grassy, open areas, temporary habitat disturbances associated with the MDA Remediation Project under the Expanded Operations Alternative would be mostly associated with remediation support activities such as operation of temporary storage areas for capping materials. Withdrawal of crushed tuff from the TA-61 borrow pit to support MDA remediation may cause loss of habitat at the borrow pit for the Mexican spotted owl; Section 7 consultation with the U.S. Fish and Wildlife Service would be required.

Impacts to the Mexican spotted owl, bald eagle, and southwestern willow flycatcher were evaluated in a biological assessment prepared by DOE (LANL 2006e). This biological assessment determined that activities associated with many projects may affect, but were not likely to adversely affect, these species. Regarding the Security-Driven Transportation Modifications Project, the U.S. Fish and Wildlife Service determined that provided that reasonable and prudent measures are taken, construction of a span bridge over Ten Site Canyon would not result in adverse affects to the Mexican spotted owl. Further consultation would be needed, however, if a land bridge was to be used. A determination of potential impacts from construction of the auxiliary action bridges associated with the Security-Driven Transportation Modifications Project could not be made because bridge locations and final designs were not known. Thus, further consultation with the U.S. Fish and Wildlife Service would be required prior to bridge construction. Depending on where the TRU Waste Facility would be located, consultation could be required prior to building this facility since construction could affect both core and buffer habitat of the Mexican spotted owl.

Human Health

None of the alternatives would result in an increase in LCFs in the population; and all doses estimated for the MEI, a hypothetical individual located at the site boundary, would meet the regulatory limit of 10 millirem per year (40 CFR 61.92). Under the No Action Alternative, radiological air emissions from LANSCE (TA-53) would be responsible for over 70 percent of the estimated population dose of 30 person-rem per year; emissions from the firing sites (TA-15 and TA-36) would contribute approximately 20 percent. Under the No Action Alternative, the

dose to the MEI would be about 7.8 millirem per year, with 7.5 millirem attributable to emissions from LANSCE.[9] Under the Reduced Operations Alternative, estimated annual doses to the population and the MEI would be reduced by approximately 80 percent and 90 percent, respectively, compared to the No Action Alternative. This reduction would largely be due to the shutdown of LANSCE, along with minor reductions from termination of operations at the Pajarito Site, lower levels of high explosives processing and testing, and continued use of the Chemistry and Metallurgy Research Building. Under the Expanded Operations Alternative, there would be small increases in emissions from the Plutonium Facility Complex from increased pit manufacturing activity and reduced emissions from the Pajarito Site and TA-21, which would result in slight increases in the estimated doses to the public and the MEI from routine operations compared to the No Action Alternative. In addition, there could be temporary increases in offsite doses if the Removal Option were implemented for MDA cleanup. The annual population dose could increase by about 20 percent to approximately 36 person-rem per year, and the MEI dose could increase by about 5 percent to approximately 8.2 millirem per year.

On an individual worker basis, impacts to worker health would be the same across all alternatives. Application of procedures designed to ensure safe worker environments would control exposure to radiation, chemicals, and biohazardous materials. Individual radiation doses would be maintained below the DOE limit of 5 rem per year, with a goal of limiting the dose to 2 rem per year from external exposure. Under normal operating conditions, no adverse effects from chemical or biological exposures would be expected.

The collective dose for workers would be about 280 person-rem per year under the No Action Alternative. Under the Reduced Operations Alternative, the dose would drop to 257 person-rem annually due to the cessation of TA-18 activities and the shutdown of LANSCE. Under the Expanded Operations Alternative, collective doses would differ depending on the actions taken to remediate the MDAs. If the MDA Capping Option were implemented, the collective dose would be about 407 person-rem per year. This increase in dose over the No Action Alternative is primarily associated with manufacturing up to 80 pits per year at the Plutonium Facility Complex. If the MDA Removal Option were implemented, waste in the MDAs would be removed rather than capped in place. In this case, the collective dose would be about 543 person-rem annually. The average annual dose to the worker population contributed by the MDA Remediation Project alone would range from about 1 (MDA capping) to 137 (MDA removal) person-rem.

Cultural Resources

Under the No Action Alternative, potential impacts to cultural resources include conveyance or transfer of lands containing cultural resources from DOE. Further, there is potential for damage to these resources from development and for adverse effects on historic buildings from demolition and remodeling. From a positive standpoint, the Trails Management Program could enhance cultural resource protection by limiting public access to certain trails or trail segments. Documentation could be required to resolve possible adverse effects from demolishing and remodeling historic buildings involved in high explosives processing and testing. Impacts from

[9] *Administrative controls established at LANSCE to regulate beam operations as emissions levels increase require operational changes to prevent the generation of excessive radioactive air emissions, so that the maximum dose to the LANL site-wide MEI from air emissions at LANSCE is 7.5 millirem per year or less.*

the Reduced Operations Alternative generally would be similar to those described for the No Action Alternative.

Under the Expanded Operations Alternative, many impacts would also be similar to those that would occur under the No Action Alternative. In general, individual projects would have a minimal potential for impacting archaeological resources because most projects would not be located in the immediate area of archaeological sites; however, the proposed TRU Waste Facility has the potential to directly impact archaeological resources depending on its location, which has yet to be determined. Potentially affected resources would be protected by LANL requirements for protecting sensitive areas. Additionally, the implementation of LANL requirements would ensure that any proposed demolition or modification of existing historic buildings and structures would be in keeping with *A Plan for the Management of Cultural Heritage at Los Alamos National Laboratory, New Mexico* (LANL 2006a). If the auxiliary actions to build bridges across canyons as part of the Security-Driven Transportation Modifications Project were implemented, certain traditional cultural properties could be adversely affected. Also, the proposed TRU Waste Facility has the potential to impact the view from traditional cultural properties if constructed within certain locations of the Pajarito Road corridor. Removal of the domes from Area G of TA-54 as part of the Waste Management Facilities Transition Project, however, would have a positive effect on views from Pueblo of San Ildefonso lands.

Possible impacts to cultural resources from environmental restoration would be reviewed for all potential release sites and protective measures taken as needed. There would be no direct impacts to cultural resources from either capping or removing material disposal areas under the Expanded Operations Alternative. Any temporary support areas needed for MDA remediation would be located and operated to be protective of cultural resources.

Socioeconomics

Under the No Action Alternative, no change in the socioeconomic impacts on the region from those currently being observed would be expected. As a major employer, LANL provides large socioeconomic contributions to the region. Impacts from the Reduced Operations Alternative would be similar to those associated with the No Action Alternative. Under the Reduced Operations Alternative, however, direct employment at LANL would be expected to decrease by about 3.7 percent (500 jobs) due to the closure of LANSCE, the reduction in high explosives processing and testing, and the cessation of TA-18 activities. This decrease in LANL employment would also be expected to indirectly result in additional job losses in the region. The combined loss of employment due to both direct and indirect job losses would be approximately 1,030 positions, but these losses are not expected to have a major adverse impact on the regional economy because the losses would be small in comparison to the total employment base for the region (less than 1 percent).

Under the Expanded Operations Alternative, jobs would be added at LANL to support the increased workload. It is projected that, compared to the 2005 level, up to 600 jobs by 2007 and 1,890 jobs by 2011 would be added at LANL, in addition to 640 indirect jobs by 2007 and 2,000 indirect jobs by 2011. Although the addition of these positions would be beneficial from an economic standpoint, the influx of workers would place demands on the regional infrastructure in terms of additional housing needs, schools, and community services. There is currently a

housing shortage in Los Alamos County, although the county is planning for additional housing that could allow more employees to live within its borders. Rio Arriba and Santa Fe counties also would be expected to grow as a result of LANL employment increases. Considering that LANL positions are some of the highest paying positions in the region, the benefits associated with these positions in terms of increased revenues and taxes should more than offset any drawbacks. This is especially true in light of regional growth projections that show the region growing at a rate in line with LANL's projected growth rate under the Expanded Operations Alternative.

Infrastructure

Utility infrastructure demands for electricity, natural gas, and water are projected to increase in the LANL region of influence through 2011 regardless of the alternative selected in the SWEIS, mainly due to increasing demands among other Los Alamos County users who rely upon the same utility systems as LANL. Total projected utility infrastructure requirements are summarized for LANL operations and for other Los Alamos County users in Table S–5. Under the No Action Alternative, the total energy and peak load requirements would be about 49 percent and 74 percent, respectively, of the capacity of the power pool serving the Los Alamos area. Natural gas requirements and water requirements respectively would be about 27 percent and 90 percent of system capacity. For the Reduced and Expanded Operations Alternatives, respectively, projected electricity requirements would be about 39 and 63 percent of capacity, peak load demand would be about 54 percent and 96 percent of capacity, natural gas requirements would be about 27 percent and 29 percent of capacity, and water requirements would be about 85 percent and 98 percent of capacity. Projections for natural gas demand show less variation across the alternatives because the demand is controlled mainly by space heating requirements, which are affected less than other utilities by operational levels. LANSCE operations have a major effect on LANL's demand for water and electricity. LANSCE has historically accounted for as much as 25 percent of total water demand and 50 percent of electrical demand at LANL.

Under the Expanded Operations Alternative, peak load demand would approach the capacity of the Los Alamos Power Pool. Similarly, the water demand under the Expanded Operations Alternative could approach the Los Alamos Water Supply System's available water rights. This potential exists because of the projected infrastructure requirements for increased operations at LANL and the forecasted demands of other non-LANL users in Los Alamos County. Completion of a new transmission line and other upgrades, however, would reduce any concerns about peak load capacity. Also there are plans to install a second new combustion turbine generator at the TA-3 Co-Generation Complex, if needed. The second generator would add an additional 20 megawatts (175,200 megawatt-hours) of generating capacity. As for future water needs, Los Alamos County, as owner and operator of the Los Alamos Water Supply System, is currently pursuing use of the San Juan-Chama Transmountain Diversion Project to secure additional water for its customers, including LANL. This would supply the Los Alamos area with up to an additional 391 million gallons (1,500 million liters) of water per year, an increase in capacity of approximately 20 percent.

Waste Management

Under the No Action Alternative, waste management impacts from LANL operations would remain within the capacity of LANL's infrastructure. Most wastes, with the exception of low-level radioactive waste, would be disposed of offsite at facilities designed for specific categories of wastes. The expansion into TA-54, Area G, Zones 4 and 6 as necessary, would provide onsite disposal capacity for low-level radioactive waste from operations through 2016 and beyond. Due to the uncertainties of predicting environmental remediation wastes, variances from projections are likely in future years. The waste management infrastructure at LANL would be adequate, in terms of staffing and facilities, to manage the quantities of waste expected to be generated under the No Action Alternative.

Under the Reduced Operations Alternative, waste management impacts from LANL operations would be similar to those under the No Action Alternative, with some reductions in waste quantities from operations due to the closure of LANSCE and the Pajarito Site, and reduced operational levels at the high explosives facilities, and a smaller construction scope. Although some reductions in operational waste volumes are expected, continued generation of low-level radioactive waste would be expected to result in the expansion of future disposal operations into Zone 4. Wastes generated by environmental restoration and DD&D activities would be expected to be the same as those generated under the No Action Alternative. The LANL waste management infrastructure would be capable of managing the projected quantities.

The Expanded Operations Alternative includes implementing a large number of projects involving major construction and DD&D, as well as increases in operation levels at a number of Key Facilities, so larger volumes of all waste types would be generated than under the other alternatives. Retrieval and processing of transuranic waste stored below grade in Area G of TA-54 would also generate additional volumes of transuranic and low-level radioactive waste. To accommodate the processing and storage of legacy and newly generated transuranic waste from LANL operations, NNSA is proposing to install and operate additional waste management equipment and facilities, and upgrade existing processes.

Full implementation of the MDA Removal Option is conservatively estimated to generate about 1.1 million cubic yards (840,000 cubic meters) of low-level radioactive waste and 22,000 cubic yards (17,000 cubic meters) of transuranic waste, most of which DOE buried before 1970. Final waste volumes may be smaller than the maximum volumes analyzed in the SWEIS because waste generation is dependent on future regulatory decisions by the New Mexico Environment Department. In addition, the estimates are based on the volume of waste as excavated (including soil) and the removal of all major MDAs; no credit has been taken for waste volume reduction techniques such as sorting.

Onsite disposal capacity for low-level radioactive wastes may be sufficient, depending upon the actual volumes generated by remediation; disposal capacity would be supplemented by offsite facilities if needed. The transportation analysis includes the impacts of shipping all low-level radioactive wastes offsite. In the SWEIS, it is assumed that the transuranic waste would be disposed of at WIPP. WIPP disposal capacity is expected to be sufficient for disposal of all retrievably stored waste and all newly generated transuranic waste from the DOE complex over the next few decades, but not sufficient for this waste plus all transuranic waste buried before

1970 across the DOE complex (63 FR 3624). Decisions about disposal of transuranic waste from full removal of LANL MDAs, if generated, would be based on the needs of the entire DOE complex. Any transuranic waste that may be generated at LANL without a disposal pathway would be safely stored until disposal capacity becomes available.

Transportation

Under all alternatives, radioactive, hazardous, and commercial materials would be transported onsite and to and from various offsite locations. The evaluation of impacts in the SWEIS focuses on repeated shipments of materials to and from offsite locations. The specific locations analyzed were the Pantex Plant in Texas, the Y-12 Complex and Oak Ridge National Laboratory in Tennessee, the Lawrence Livermore National Laboratory in California, the Nevada Test Site in Nevada, and the Savannah River Site in South Carolina for transport of special nuclear material (such as plutonium, highly enriched uranium [mainly uranium-235], and uranium-233); WIPP in New Mexico for the transport of transuranic wastes; the Nevada Test Site and a commercial disposal site for low-level radioactive wastes; and multiple locations for disposal of hazardous and nonhazardous waste materials.

It is unlikely that transportation of radioactive materials under any of the alternatives would cause a fatality as a result of radiation either from incident-free operations or postulated accidents. The highest risks to the public would result from the Expanded Operations Alternative if all of the large MDAs were exhumed under the MDA Remediation Project and the Nevada Test Site was the main option for disposal of low-level radioactive waste. This alternative could result in about 122,440 shipments of radioactive materials (both special nuclear material and radioactive waste). It is estimated that there could be about three fatalities from nonradiological traffic accidents associated with the transportation activities required to implement this alternative.

All trucks carrying radioactive materials to or from LANL would travel the section of road from LANL to Pojoaque; many of these trucks would also travel the section of road from Pojoaque to Santa Fe. The radiological risks to the population along these two sections of road are very small under all alternatives. The nonradiological accident risks (the potential for fatalities as a direct result of traffic accidents) are greater than the radiological risks; however, even under the scenario involving the largest amount of transportation, the Expanded Operations Alternative with the MDA Removal Option, no fatalities would be expected along these routes.

Local traffic flows would be expected to remain at current levels under the No Action Alternative because employment would stay at current levels. Under the Reduced Operations Alternative, traffic through LANL would decline by about 4 percent, mainly as a result of the projected decrease in employment. Under the Expanded Operations Alternative, traffic would be expected to increase by up to 18 percent (averaged across all LANL entrances) due to the projected increases in employment and construction, DD&D, and remediation activities. Transportation of waste and fill material by truck for DD&D and MDA remediation could accelerate wear on local roads and exacerbate traffic problems.

Environmental Justice

Executive Order 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*) requires every Federal agency to analyze whether its Proposed Actions and alternatives would have disproportionately high and adverse impacts on minority or low-income populations. Based on the impacts analysis, NNSA expects no high and adverse impacts from the continued operation of LANL under any of the alternatives. For all alternatives the radiological dose from emissions associated with normal operations are slightly lower for members of Hispanic, Native American, total minority, and low-income populations than for the members of the population that are not in these groups. The maximum annual dose for the average member of any of the minority or low-income populations was 0.092 millirem compared to a dose of 0.10 millirem for a member of the general population and a dose of 0.11 millirem for a member of the population that does not belong to a minority or low-income group.

NNSA also analyzed human health impacts from exposure through special pathways, including subsistence consumption of native vegetation (pinyon nuts and Indian Tea [Cota]), locally grown produce and farm products, groundwater, surface waters, fish (game and nongame), game animals, other foodstuffs and incidental consumption of soils and sediments (on produce, in surface water, and from ingestion of inhaled dust). The special pathways could be important to the environmental justice analysis because some of these pathways may be more important or viable for the traditional or cultural practices of members of minority populations in the area. Analyses, however, show that the human health impacts associated with these special pathways would not present disproportionately high and adverse impacts to minority or low-income populations.

Facility Accidents

There is little difference among the alternatives for the maximum potential wildfire, seismic, or facility accident at LANL because actions under each alternative do not, for the most part, affect the location, frequency, scenario, or material at risk of the postulated accidents. Facility accident impacts are presented in terms of consequences and risks. Reported consequences assume that the accident occurs and do not account for how probable the accident is. The risk associated with an accident reflects the probability of the accident occurring; it is calculated by multiplying the consequences times the probability of occurrence.

In 2000, the Cerro Grande Fire burned a heavily forested canyon area to within about 0.75 miles (1.2 kilometers) of the waste storage domes in TA-54, but none were burned and there were no radiological releases from domes. Additional fuel reduction has been conducted since the Cerro Grande Fire, both to the vegetation surrounding the TA-54 area and within the domes themselves (for example, wooden pallets have been replaced with metal pallets), to further decrease the potential for a waste storage dome fire occurring as a result of a site wildfire. In the event of a wildfire that impacted LANL, burned the waste storage domes at TA-54, and caused their contents to be released to the environment, the radiological releases from those waste storage domes would dominate the potential impacts to LANL workers and to the public from the fire. Should such an accident scenario occur in which the contents of the waste storage domes actually caught on fire and burned, the MEI would likely develop a fatal cancer during his or her lifetime

and an additional 55 LCFs could be expected in the general area population. Any onsite worker located within 110 yards (100 meters) of the facility during such an accident would likely develop a fatal cancer during his or her lifetime. Taking into account the probability of occurrence, the annual risks are estimated to be about 1 chance in 20 of an LCF for the MEI or for an onsite worker and an additional 3 (calculated value of 2.7) LCFs in the offsite population. These risks assume that workers and members of the public do not take evasive action in the event of a wildfire. It is likely that workers and the public would be evacuated, as happened during the Cerro Grande Fire. These risks would decrease as transuranic waste is removed from the domes and transported to WIPP for disposal. In terms of chemical risks from a wildfire, the accidental release of formaldehyde from the Bioscience Facilities in TA-43 would expose the public and noninvolved workers to the greatest risks, similar to those associated with a seismic event, as discussed below.

The seismic event that presents the largest risk to the public would be a postulated Performance Category 3 earthquake (Seismic 2 scenario). If this accident were to occur, there would be widespread damage at LANL and across the region resulting in a large number of fatalities and injuries unrelated to LANL operations. Facilities at LANL would be affected and the public and workers at the site would be exposed to increased risks from both radiological and chemical releases. The consequences of such a seismic accident would be an increased lifetime risk of an LCF of 0.55 (1 chance in 1.8) for the MEI and an additional 22 LCFs could be expected in the population; a noninvolved worker 110 feet (100 meters) from certain failed buildings would likely develop an LCF.

The seismic accident scenarios (Seismic 1 and 2) analyzed in the SWEIS are based on the *Seismic Hazards Evaluation of the Los Alamos National Laboratory (February 24, 1995)*. The 1995 study concluded that a seismic event characterized by a peak horizontal ground acceleration of 0.22g (0.22 times the acceleration due to gravity) had an estimated annual probability of exceedance (probability of occurrence when calculating risk) of 0.001 (1 in 1,000). The study also showed that the more severe seismic event characterized by a peak ground acceleration of 0.31g had an estimated annual probability of exceedance of 0.0005 (1 in 2,000). An updated probabilistic seismic hazard analysis that provides an improved understanding of the seismic characteristics of LANL was completed in 2007 (LANL 2007). The new study indicates that the seismic hazard is higher than previously understood; that is, the likelihood of earthquakes capable of producing strong ground shaking at the LANL site is greater than previously estimated. For example, the annual probabilities of exceedance for the previously analyzed peak ground accelerations are now estimated to be about 1 in 700 rather than 1 in 1000 and 1 in 1,250 rather than 1 in 2,000. Using the assumptions inherent in the accident source terms developed for the SWEIS Seismic 1 (Performance Category 2 earthquake) and Seismic 2 (Performance Category 3 earthquake) accident scenarios, the most conservative effect on accident risks would be an increase of 50 percent and 60 percent, respectively. Although the greater probability of exceedance results in a higher risk from seismic events, these risks remain lower than those associated with other postulated accidents.

Taking into account the probability of occurrence, the annual risks from a Seismic 2 accident are estimated to be an increase of 1 chance in 2,200 of the MEI developing an LCF and no additional LCFs (a calculated risk much less than 1) in the offsite population. The largest chemical risk from such an event would result from a formaldehyde release from the Biosciences Facilities in TA-43, leading to life-threatening concentrations at the locations of the noninvolved worker and the MEI. The seismic event that presents the largest risk to a noninvolved worker is the Seismic 1 accident (a Performance Category 2 earthquake) with a frequency of once every 700 years. The annual increased risk of a LCF to the noninvolved worker would be about 0.0015 or 1 in 700.

Just as the updated probabilistic seismic hazards analysis used new data and advanced methods to calculate LANL seismic hazards, revised structural analysis tied to damage states credited in the safety assessments will be used to update the seismic structural integrity evaluation of LANL facilities. The effect of the higher values of peak horizontal ground acceleration on calculated seismic accident consequences and risks will be analyzed in future LANL facility safety analyses and incorporated as appropriate into future LANL NEPA documents. NNSA and the LANL contractor will undertake an evaluation of LANL facility performance in terms of the updated seismic hazard information. Until a revised analysis is completed, facility operations are authorized based on NNSA approval of a contractor-prepared justification for continued operation.

Under all alternatives, the facility accident with the highest radiological risk to the offsite population would be a lightning strike fire at the Radioassay and Nondestructive Testing Facility. If this accident were to occur, there could be six additional LCFs in the offsite population. Under the Expanded Operations Alternative, if the Chemistry and Metallurgy Research Building fire involving sealed sources were to occur, the consequence to the offsite population would be greater (seven LCFs) than that of the Radioassay and Nondestructive Testing Facility lightning strike fire; however, the estimated frequency is much less. Also, the consequences of that accident are based on a conservative assumption that the entire inventory of radiological material allowed in the Chemistry and Metallurgy Research Building is dedicated to a single isotope contained in sealed sources.

Under all alternatives, the individual facility accident with the highest estimated consequences to the MEI and noninvolved workers would be a fire at a waste storage dome in TA-54. If this accident were to occur as modeled, the noninvolved worker and the MEI would receive large radiation doses. Depending on the specific radionuclides released and the route of human exposure, radiation doses of this magnitude would result in near-term health effects or even death from causes other than cancer. In some cases, medical intervention may be effective in reducing the dose to the exposed individual, mitigating health impacts, or both. In addition to the conservative assumptions used to develop the source term (amount of radioactive material released) for this accident, the calculated doses are based on the assumptions that no protective action is taken during the entire time of exposure and that no subsequent medical intervention occurs.

Taking into account the frequency of the postulated accidents, the estimated highest risk accident would be a lightning strike fire at the Radioassay and Nondestructive Testing Facility. The relatively large risk of the accident is due to the conservative assumption that any lightning strike at the Radioassay and Nondestructive Testing Facility has sufficient energy and occurs at a location that results in a building fire and concomitant source term. The increased risk of an LCF for this accident would be 0.06 (about 1 chance in 16) for the MEI, 0.12 (about 1 chance in 8) for the noninvolved worker,[10] and 0.8 for the offsite population (a risk of 1 LCF occurring in the population over approximately 1.3 years of operation).

For chemical accident risks, the individual facility accident with the largest risk to the public is a selenium hexafluoride release from TA-54. There is an annual risk of about 1 chance in 240 that members of the public could receive life-threatening exposures from this accident. For a chlorine gas release outside of TA-55, there is an annual risk of about 1 chance in 15 that noninvolved workers could receive a life-threatening exposure to this chemical from an accident. There is a great deal of uncertainty regarding how much and which chemicals were disposed of in the MDAs. The MDA closest to the public (and thus with the potentially greatest impacts on the public), MDA B, was chosen to bound the chemical accident impacts for MDA cleanup. Two chemicals, sulfur dioxide (a gas) and beryllium (assumed to be in powder form), were chosen based on their respective hazards to bound the impacts of chemicals possibly disposed of in the MDAs. Both of these chemicals, if present in the quantities assumed, would dissipate to below life-threatening concentrations very close to the release point, but would continue to present a risk to the public due to the short distance to the nearest public access point for MDA B.

Substantive details of terrorist attack scenarios and security countermeasures are not released to the public because disclosure of this information could be exploited by terrorists to plan attacks. Depending on the malevolent, terrorist, or intentionally destructive acts, impacts may be similar to or would exceed bounding accident impact analyses prepared for the SWEIS. A separate classified appendix to the Final SWEIS has been prepared that evaluates the underlying facility threat assumptions with regard to malevolent, terrorist, or intentionally destructive acts. These data provide the NNSA decisionmaker with information upon which to base, in part, his or her decisions supported by the SWEIS.

[10] *The lightning strike fire at the Waste Characterization, Reduction, and Repackaging Facility has a slightly higher risk for the noninvolved worker; an increased risk of an LCF of 0.14 (1 chance in 7) per year.*

Table S–5 Summary of Environmental Consequences by Resource Area

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Land Use			
	Land Conveyance and Transfer - The remaining 1,820 acres (737 hectares) of the 4,078 acres (1,650 hectares) of land identified per Public Law 105-119 would be conveyed or transferred. - Development may occur on up to 826 acres (334 hectares). - Potential introduction of incompatible land uses. - Loss of recreational opportunities. *Electrical Power System Upgrades* - 473 acres (191 hectares) affected by upgrades. - Project generally compatible with existing land use.	Same as No Action Alternative.	Same as No Action Alternative, plus: *MDA Remediation Project* - Fewer restrictions on land use for Removal Option than for the Capping Option. - No major changes in land use designations in most cases because surrounding land uses would retain their current classification. *Security-Driven Transportation Modifications Project* - Most development would not conflict with current land use designations. - Auxiliary Action A - Within scope of current land use plans. - Auxiliary Action B - Partially within scope of current land use plans. Current plans, however, contain no provision for a bridge over Sandia Canyon. *Replacement Office Buildings Project* - 13 acres (5.3 hectares) of undeveloped land in TA-3 would be developed consistent with a change in future land use from Reserve to Physical/Technical Support. *TA-18 Closure Project* - Possible change in land use designation of TA-18 to Reserve after DD&D of the Pajarito Site. *TA-21 Structure DD&D Project* - Future LANL development could negate the proposed change in land use from the current designation to Reserve. *Radiological Sciences Institute Project* - 12.6 acres (5.1 hectares) of undeveloped land at or near TA-48 would be developed consistent with land use plans. *RLWTF Upgrade Project* - Up to 4 acres (1.6 hectares) of undeveloped land near the border of TA-5 and TA-52 could be developed for evaporation tanks. *Science Complex Project* - 5 acres (2 hectares) of undeveloped land at or near TA-62 would be developed; 15.6 acres (6.3 hectares) could undergo a change in land use plans to Experimental Science.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
			Remote Warehouse and Truck Inspection Station Project - 4 acres (1.6 hectares) of undeveloped land in TA-72 would be developed with a change in land use plans to Physical/Technical Support. *Waste Management Facilities Transition Project* - Up to 7 acres (2.8 hectares) of undeveloped land could be disturbed that could result in a change in land use designation.
Visual Environment			
	Land Conveyance and Transfer - Development could degrade views of presently undeveloped tracts. *Electrical Power System Upgrades* - Short-term visual impacts during construction. - Adverse visual impact in undisturbed areas. - No overall change in view from Bandelier National Monument. *Wildfire Hazard Reduction Program* - Forest would appear more park-like. - Some LANL facilities would be more visible. *Disposition of Flood Retention Structures* - Temporary impacts during removal if staging areas are located near Pajarito Road. Temporary impacts during construction of the CMRR Facility at TA-55. Temporary impacts during construction of replacement or new buildings and long-term enhancement of visual environment from removal of old buildings for the following projects: - High Explosives Processing Facilities, and - High Explosives Testing Facilities.	Same as No Action Alternative.	Same as No Action Alternative, plus: *MDA Remediation Project* - Temporary visual impacts during MDA capping or removal. - Borrow pit in TA-61 would become more visible due to the large quantities of material needed under both options. *Security-Driven Transportation Modifications Project* - Temporary impacts during construction. - Pronounced impacts due to parking lots, as well as vehicle and pedestrian bridges, especially for auxiliary actions involving bridges across canyons. *Physical Science Research Complex* - Temporary impacts during construction. - New structures would blend with other TA-3 construction. - Appearance of TA-3, TA-35, and TA-53 would improve with demolition of vacated structures. *Replacement Office Buildings Project* - Temporary impacts during construction. - New buildings and parking lot would be visible from West Jemez Road and Pajarito Road. *TA-18 Closure Project* - Temporary impact from demolition of Pajarito Site facilities at TA-18. - Long-term enhancement of visual environment as area is restored to more natural appearance. *TA-21 Structure DD&D Project* - Enhancement of visual environment from the removal of old structures from TA. Both conveyed and nonconveyed lands could undergo development which could change visual environment.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
			Radiological Sciences Institute Project - Temporary impacts during demolition and construction. *RLWTF Upgrade Project* - Short-term impact from construction of new treatment building in TA-50. - Permanent change to the visual environment if evaporation tanks are built near the border of TA-5 and TA-52. *Waste Management Facilities Transition Project* - Beneficial impact on near and distant views from removal of domes in TA-54. - Minimal visual impact of the TRU Waste Facility to the public; possible impact on views from San Ildefonso Pueblo lands, depending on its location. - Temporary impacts during construction of structures at TA-54 and another location in the Pajarito Road corridor. *Science Complex Project* - Under Options 1 and 2, the new facility would be readily visible from West Jemez Road and forested buffer between LANL and Los Alamos Canyon would be lost; potential impacts to Los Alamos Canyon from night lighting. - Negligible impacts for Option 3. *Remote Warehouse and Truck Inspection Station Project* - 4 acres (1.6 hectares) would be cleared making the site readily visible from East Jemez Road; lighting could be visible from Tsankawi Unit of Bandelier National Monument.
Geology and Soils			
	Overall level of legacy contamination in soil should continue to decrease as a result of ongoing remediation projects including cleanup of suspected contamination at TA-21.	Same as No Action Alternative, except that the potential impact of LANL operations on soil could decrease because of the 20 percent reduction in high explosives testing activities.	Same as No Action Alternative, except: *MDA Remediation Project* - Use of large amounts of soil and rock for backfill or closure caps (up to 2.5 million cubic yards) (1.9 million cubic meters). - Positive impact from removal or containment of legacy waste. - TA-61 borrow pit would be expanded to provide additional soil and rock; other sources may be required. Temporary adverse impacts from excavation of large amounts of rock and soil during construction and DD&D, and positive impacts from removal of legacy contamination for the following projects: - *Physical Science Research Complex,* - *Replacement Office Buildings,*

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
			- TA-18 Closure, *- TA-21 Structure DD&D,* *- Radiological Sciences Institute* *- RLWTF Upgrade,* *- Waste Management Facilities Transition,* *- TA-55 Radiography Facility,* *- Science Complex,* *- Remote Warehouse and Truck Inspection Station, and* *- Security-Driven Transportation Modifications.*
Water Resources – Surface Water			
	Only minor impact on surface water quality or quantity, or floodplains from activities other than the project to remove flood retention structures. Removal of flood retention structures could result in potential impacts on Pajarito floodplains. Restoration of normal flow would cause sediments to alter channel and readjust floodplains.	Same as No Action Alternative, except shutdown of LANSCE operations would result in significant reductions of NPDES-permitted cooling tower discharges, particularly to Los Alamos Canyon.	Same as No Action Alternative, and: Potentially long-term positive impact from MDA remediation because water quality would be protected by removal or stabilization of waste or contaminants in soil. DD&D of TA-18 structures would eliminate potential sources of contaminants, thereby enhancing protection of surface water quality. Complete Removal Option for DD&D of TA-21 would eliminate two NPDES-permitted outfalls reducing discharges to Los Alamos Canyon. Although increased pit production would increase RLWTF outfall volumes by 25 percent, this would have a negligible effect on surface water volumes in Mortandad Canyon because other facilities contribute 90 percent of the outfall flow in that canyon. Implementing the zero discharge option at the RLWTF (evaporation tanks) would have a minor effect on surface water volume, but would improve surface water quality by reducing the uptake of historical contaminations in the sediments downstream of that outfall.
Water Resources – Groundwater			
	Construction and DD&D activities are unlikely to affect groundwater resources. Operations-related impacts to groundwater are not likely to be significant in nature.	Same as No Action Alternative, except long-term impacts as a result of operations might be reduced by elimination of additional outfalls and reduction of water use.	Same as No Action Alternative, except impacts from water supply well withdrawals could increase and positive long-term impacts could occur from MDA remediation and the reduced potential for contaminant migration.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Nonradiological Air Quality			
	Minor temporary localized increases in air emissions from construction and demolition activities. Minor increases in air emissions from operations and remediation activities, including operation of new combustion turbine generators.	Same as No Action Alternative, except for reductions in emissions from reduced high explosives processing and testing activities and shutdown of LANSCE and the Pajarito Site (TA-18).	- Higher level of emissions from increased operations and proposed construction, demolition, and remediation including increases in emissions from commuter vehicles, and waste and materials shipments. - Hazardous air pollutants could increase by up to 2.5 percent from the High Explosives Processing Facilities resulting from the increased use of mock explosives. - Temporary construction-type releases of criteria pollutants would occur from MDA remediation, DD&D, and construction of new facilities. - Minor to moderate air quality impacts would result from remediating MDAs, and other PRSs, particularly for MDA removal.
Radiological Air Quality			
Curies per year:			
Tritium [a]	2,400	2,400	2,400 [b]
Americium-241	4.2×10^{-6}	4.2×10^{-6}	4.2×10^{-6} [c]
Plutonium [d]	0.00082	0.000092	0.00084 [c]
Uranium [e]	0.15	0.12	0.15
Particulate and vapor activation products	30	0.014	30
Gaseous mixed activation products	30,600	100 [f]	30,600 [f]
Mixed Fission Products [g]	1,650	1,650	1,650
Emissions from remediation	Not applicable	Not applicable	Variable [h]

[a] Includes both gaseous and oxide forms of tritium.

[b] Tritium emissions would decrease to 1,850 curies per year after about 2009 following decontamination, decommissioning, and demolition of TA-21.

[c] Americium-241 emissions could increase to 1.1×10^{-5} curies per year and plutonium emissions to 0.00089 curies per year if the Decontamination and Volume Reduction System, the new TRU Waste Facility, and remote-handled transuranic waste retrieval activities operated simultaneously (estimated to occur from 2012 through 2015).

[d] Includes plutonium-238, plutonium-239, and plutonium-240.

[e] Includes uranium-234, uranium-235, and uranium-238.

[f] Gaseous mixed activation products emissions would decrease by 100 curies per year after about 2009 due to the permanent shutdown of TA-18, resulting in zero emissions of gaseous mixed activation products in the Reduced Operations Alternative and 30,500 curies per year in the Expanded Operations Alternative.

[g] Mixed fission products include krypton-85, xenon-131m, xenon-133, and strontium-90.

[h] There would be additional emissions from the remediation of the larger MDAs. These emissions would depend on radionuclides present, whether an MDA is being capped or removed, the number of MDAs being remediated at one time, and whether exhumation occurs under an enclosure.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
		Noise	
	Operations noise levels would have little impact on the public with the exception of sporadic noise from explosives detonations and traffic noise. Temporary localized increases in noise levels would occur from construction, demolition, and remediation activities that would be expected to have little impact on the public.	Same as No Action Alternative, except minor reductions in noise levels from reduced high explosives testing activities and shutdown of LANSCE and Pajarito Site (TA-18).	Higher noise levels than the No Action Alternative from increased operations, construction, DD&D, and remediation activities. Increase in truck and personal vehicle traffic noise, some of which could occur during nighttime, could result in public annoyance: - Up to a 32 percent increase in traffic along DP Road affecting nearby businesses and residents. - Up to a 13 percent increase in traffic along East Jemez Road affecting residents.
		Ecological Resources	
	Land Conveyance and Transfer - 770 acres (312 hectares) of habitat could be lost through development. - Transfer of resource protection responsibility could result in a less rigorous environmental protection review process. *Electrical Power System Upgrades* - Temporary displacement of wildlife due to construction-related activities. - Potentially positive impact by providing perching sites for larger birds. *Wildfire Hazard Reduction Program* - Short-term disturbance of wildlife due to forest thinning activities. - Increased forest health could benefit the Mexican spotted owl and other species. *Disposition of Flood Retention Structures* - Temporary displacement of wildlife due to construction-related activities. - Potentially minor impacts on downstream wetlands *Trails Management Program* - Temporary disturbance of wildlife during implementation activities. Clearing of some ponderosa pine forest in TA-48 and TA-55 for construction of CMRR Facility would cause loss or displacement of associated wildlife.	Same as No Action Alternative, plus: - Reduction in high explosives testing activities would reduce the number of times animals would be subjected to stress resulting from high explosives testing.	Same as No Action Alternative, plus: *MDA Remediation Project* - Short-term disturbance and displacement of wildlife during capping or waste removal. - Loss of habitat at borrow pit in TA-61, including buffer and core habitat for the Mexican spotted owl. Section 7 consultation with the U.S. Fish and Wildlife Service would be required. - Remediation activities may affect, but are not likely to adversely affect the Mexican Spotted Owl, bald eagle, and southwestern willow flycatcher. *Security-Driven Transportation Modifications Project* - Parking lot construction and placement of pedestrian and vehicle bridges would destroy up to 30 acres (12 hectares) of natural habitat. Construction of a span bridge over Ten Site Canyon would be unlikely to adversely affect the Mexican spotted owl. - Auxiliary Action A would disturb up to 25.4 acres (10.6 hectares) of undeveloped core and buffer Mexican spotted owl habitat. Auxiliary Action B would disturb up to 67.1 acres (27.2 hectares) of undeveloped core and buffer habitat. - Under both auxiliary actions, bridge traffic over the core zone of the Sandia-Mortandad Canyon Mexican spotted owl Area of Environmental Interest could cause long-term impacts. Section 7 consultation with the U.S. Fish and Wildlife Service would be needed. *Replacement Office Buildings Project* - Temporary displacement of wildlife due to construction-related activities.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
	Short-term impacts in TA-6, TA-22, and TA-40 from construction of new High Explosives Test Facility buildings and demolition of old structures would cause loss or displacement of wildlife.		- Clearing 13 acres (5.3 hectares) of mixed conifer forest in TA-3 would result in loss or permanent displacement of wildlife. - Construction may affect, but is not likely to adversely affect, the Mexican spotted owl and bald eagle. *TA-18 Closure Project* - Minor impact on wildlife during demolition of Pajarito Site structures in TA-18. DD&D activities may affect, but is not likely to adversely affect, the Mexican spotted owl and southwestern willow flycatcher. - Restoration of TA-18 (Pajarito Site) would create a more natural habitat and benefit wildlife, potentially including the Mexican spotted owl. *TA-21 Structure DD&D Project* - Minor disturbance of wildlife on adjacent land during demolition of structures. DD&D activities may affect, but is not likely to adversely affect, the Mexican spotted owl. *Radiological Sciences Institute Project* - Temporary disturbance of wildlife during demolition of structures and construction in TA-48. - Clearing of 12.6 acres (5 hectares) of ponderosa pine forest would cause loss or displacement of associated wildlife. - Construction may affect, but is not likely to adversely affect, the Mexican spotted owl and bald eagle. - DD&D activities may affect, but are not likely to adversely affect, the Mexican spotted owl. *RLWTF Upgrade Project* - Loss of up to 5.4 acres (2.2 hectares) of habitat if the evaporation tanks and pipeline are constructed. - Implementation of the evaporation tank option would reduce wetlands and riparian habitat in Mortandad Canyon and the abundance and diversity of Mexican spotted owl prey species, requiring Section 7 consultation with the U.S. Fish and Wildlife Service. - Construction may affect, but is not likely to adversely affect, the Mexican spotted owl and bald eagle. *Waste Management Facilities Transition Project* - Short-term impacts on wildlife in the vicinity of TA-54 and the TRU Waste Facility site from new construction and demolition activities. - TRU Waste Facility construction could result in the loss of 2.5 to 7 acres (1.0 to 2.8 hectares) of ponderosa pine forest or open field.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
			- Construction at TA-54 may affect, but is not likely to adversely affect, the southwestern willow flycatcher. - A TRU Waste Facility could be built in portions of the Mexican spotted owl Area of Environmental Interest which would require Section 7 consultation with the U.S. Fish and Wildlife Service.
			Science Complex Project - Temporary displacement of wildlife due to construction-related activities. - Options 1 and 2 would remove 5 acres (2 hectares) of ponderosa pine forest. - Under Option 3, less than 5 acres (2 hectares) of grassland and forest would be cleared. - Construction may affect, but is not likely to adversely affect, the Mexican spotted owl and bald eagle. *Remote Warehouse and Truck Inspection Station Project* - Temporary displacement of wildlife due to construction-related activities. - 4 acres (1.6 hectares) of ponderosa pine forest and pinyon-juniper woodland would be cleared. - Construction may affect, but is not likely to adversely affect, the bald eagle.
Human Health			
Offsite Population			
Dose (person-rem per year)	30	6.1 [i]	Less than 36 [j, k]
Risk (LCFs per year)	0.018	0.0037	0.022
MEI [l]			
Dose (millirem per year)	7.8	0.78 [i]	Less than 8.2 [j, k]
Risk (LCFs per year)	4.7×10^{-6}	4.7×10^{-7}	4.9×10^{-6}
Workers			
Dose (person-rem per year)	280	257	407 to 543 [m]
Risk (LCFs per year)	0.17	0.15	0.24 to 0.33 [m]

[i] After about 2009, TA-18 (Pajarito Site) would no longer be able to contribute to radiological air emissions, thereby reducing the MEI and population doses.

[j] Population dose and MEI dose include 6.2 person-rem and 0.42 millirem respectively, attributable to the assumed removal of all MDAs (LCF risk of 3.7×10^{-3} and 2.5×10^{-7}, respectively). This dose could be smaller depending on the MDAs being remediated, whether an MDA is capped rather than removed, the number of MDAs being remediated at one time, and other factors.

[k] After about 2009, TA-18 (Pajarito Site) and TA-21 would not contribute to radiological air emissions, thereby reducing the MEI and population doses.

[l] Under the No Action Alternative and the Expanded Operations Alternative, the LANL site-wide MEI would be located near LANSCE. Under the Reduced Operations Alternative, the LANL site-wide MEI would be located near the firing sites at TA-36.

[m] The range for the Expanded Operations Alternative reflects the contribution from the two MDA Remediation Project options. The lower value is for the Capping Option, the higher value is for the Removal Option. The annual average worker doses contributed by the MDA Remediation Project alone would range from about 1 (MDA capping) to 137 (MDA removal) person-rem per year (0.0006 to 0.082 LCF per year).

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Cultural Resources			
	Land Conveyance and Transfer - Potential damage to cultural resources and impacts on protection of and accessibility to Native American sacred sites from conveyance or transfer of cultural resources out of the responsibility and protection of DOE. Potential damage on conveyed or transferred parcels due to future development. *Trails Management Program* - Enhanced protection of cultural resources. Potentially adverse effects from demolition and remodeling of historic buildings in High Explosive Processing and Testing Facilities. Documentation would be required to resolve adverse effect.	Same as No Action Alternative.	Same as No Action Alternative plus: *Waste Management Facilities Transition Project* Removal of domes would have a positive impact on views from traditional cultural properties. Potential impact to cultural resources from construction of the TRU Waste Facility. Also, this facility could be visible from lands of the Pueblo of San Ildefonso, depending on its location. *MDA Remediation Project* No direct impacts are expected for either option of the MDA Remediation Project, although the potential for indirect impacts from temporary remediation support activities in the vicinities of the MDAs and PRSs would require review and protective measures taken as needed. To varying degrees, impacts on archaeological sites or historic structures eligible or potentially eligible for listing on the National Register of Historic Places could result from the following projects. These resources would be protected as appropriate and documentation would be developed as required to resolve adverse effects. *- Security-Driven Transportation Modifications,* *- Physical Science Research Complex,* *- Replacement Office Buildings,* *- Radiological Sciences Institute (including the Institute for Nuclear Nonproliferation Science and Technology),* *- RLWTF Upgrade,* *- LANSCE Refurbishment,* *- Waste Management Facilities Transition,* *- TA-55 Radiography Facility,* *- Science Complex* *- Remote Warehouse and Truck Inspection Station.* *- TA-18 Closure Project* *- TA-21 Structure DD&D*

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Socioeconomics			
	LANL Employment		
	2005 levels of employment assumed to remain steady at 13,504 employees.	A decrease of 500 employees from 2005 levels would be expected to result in the loss of 530 indirect jobs in the region (total 1,030 jobs lost).	An employment increase of 2.2 percent per year from 2007 to 2011 would result in an additional 600 to 1,890 employees working at LANL and creation of another 640 to 2,000 indirect jobs. This growth rate is consistent with the projected regional growth rate.
	Housing		
	No new housing units needed specific to changes in LANL employment level.	Additional housing units could become available in the tri-county area as a result of the projected decrease in LANL's employment level. These could be expected to offset the need for additional housing units in the region because the population would still be expected to grow, although at a slower rate (about 1.5 percent versus 2.3 percent).	Additional housing units would be required in the tri-county area due to the projected increase in LANL's employment level along with the projected increase in the region's population. More LANL employees could be expected over time to reside in Rio Arriba, Santa Fe, or other surrounding counties, compared to Los Alamos County, where a shortage of available housing would likely continue. The number of housing units needed would depend on the number of workers relocating from outside the area. Overall, the number of units needed would likely be small compared to overall needs in the tri-county area.
	Construction		
	Completion of previously approved construction projects is expected to draw workers already in the region who historically work from job-to-job.	Same as the No Action Alternative for construction projects.	An increase in the number of construction projects would be expected to draw workers already in the region who historically work from job-to-job.
	Local Government Finance		
	Annual gross receipts tax yields would be expected to remain at current levels in real terms.	Annual gross receipts tax yields directly and indirectly associated with LANL employment could decrease by about 1.1 percent.	Annual gross receipts tax yields directly and indirectly associated with LANL employment are projected to increase by between 1.3 and 3.9 percent from 2007 through 2011 over 2005 levels in real terms.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
	Services		
	The demand for services such as police, fire, and hospital beds would be expected to remain at current levels in proportion to LANL employment. Regional population is projected to increase even if LANL employment remains flat, so there would be an increase in the demand for regional services but the increased demand would not be driven by LANL employment growth.	Demand for services would be expected to decrease in proportion to the number of out-of-work LANL-related employees leaving the region. However, regional population would still be projected to increase even if LANL employment was to decrease by the small levels envisioned in this alternative compared to the No Action Alternative. Demand for services would likely increase as well.	Demand for services would be expected to increase in proportion to the number of additional LANL-related jobs added to the region. The associated number of additional school age children would be between 440 and 1,400 in the tri-county area, resulting in an estimated increase in needed public school funding from the State of $3.2 million in 2007 to $11 million in 2011. Most of the additional services would be required in Rio Arriba, Santa Fe, and other surrounding counties.
Site Infrastructure			
LANL Site and Other Los Alamos County Users Total Per Alternative (annual)	Electricity requirements: 645,000 megawatt-hours total (495,000 megawatt-hours for LANL); 49 percent of system capacity. Electric Peak Load: 111 megawatts total (91.2 megawatts for LANL); 74 percent of system capacity. Natural Gas Demand: 2,215,000 decatherms total (1,197,000 decatherms for LANL); 27 percent of system contract capacity supply. Water Demand: 1,621 million gallons total (380 million gallons for LANL); 90 percent of system available water rights. *Project Effects:* - Ongoing electrical power system upgrades would have a positive incremental impact on site electrical energy and peak load capacity. - Potential for increased natural gas consumption from increased capacity at the TA-3 Co-Generation Complex. Note: Values are rounded.	Electricity Requirements: 516,000 megawatt-hours total (366,000 megawatt-hours for LANL); 39 percent of system capacity. Electric Peak Load: 80.6 megawatts total (60.4 megawatts for LANL); 54 percent of system capacity. Natural Gas Demand: 2,181,000 decatherms total (1,163,000 decatherms for LANL); 27 percent of system contract supply capacity. Water Demand: 1,544 million gallons total (303 million gallons for LANL); 85 percent of system available water rights. *Project Effects:* Same as the No Action Alternative.	Electricity Requirements: 827,000 megawatt-hours total (677,000 megawatt-hours for LANL); 63 percent of system capacity. Electric Peak Load: 144 megawatts total (124 megawatts for LANL); 96 percent of system capacity. Natural Gas Demand: 2,331,000 decatherms total (1,313,000 decatherms for LANL); 29 percent of system contract supply capacity. Water Demand: 1,763 million gallons total (522 million gallons for LANL); 98 percent of system available water rights. *Project Effects:* - Increases in electrical energy, peak load, and water demands over the No Action Alternative due to increased operational levels at the Metropolis Center and LANSCE (see above).
MDA Remediation (total over ten years)	No change in utility demands.	Same as No Action Alternative.	Annual average of up to 70 million gallons of liquid fuels and 58 million gallons of water for remediation activities.

Waste Type	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*		
			Total Including MDA Remediation Project	*Total Excluding MDA Remediation Project*	*MDA Remediation [n] Project Only*
Waste Management (10-Year Total)					
Transuranic Waste					
Contact-handled [o] (cubic yards)	3,500 to 5,900	3,500 to 5,900	5,300 to 33,000	5,200 to 11,000	68 to 22,000
Remote-handled [p] (cubic yards)	–	–	11 to 61	11	0 to 50
Low-Level Radioactive Waste [p, q]					
Bulk low-level radioactive waste (cubic yards)	39,000	39,000	196,000 to 884,000	186,000	11,000 to 698,000
Packaged low-level radioactive waste (cubic yards)	33,000 to 128,000	33,000 to 110,000	80,000 to 183,000	80,000 to 183,000	–
High activity low-level [p] radioactive waste (cubic yards)	–	–	0 to 347,000	–	0 to 347,000
Remote-handled low-level [p] radioactive waste (cubic yards)	–	–	480 to 1,700	480	0 to 1,200
Mixed low-level radioactive waste (cubic yards)	1,800 to 2,800	1,800 to 2,800	3,900 to 183,000	3,200 to 4,400	710 to 178,000
Construction/Demolition Debris [r] (cubic yards)	198,000	197,000	642,000 to 722,000	595,000	47,000 to 126,000
Chemical waste [s] (pounds)	19,000,000 to 37,000,000	19,000,000 to 36,000,000	64,000,000 to 129,000,000	22,000,000 to 39,000,000	42,000,000 to 90,000,000
Liquid Radioactive Wastes					
Liquid transuranic waste (gallons)	300,000	300,000	500,000	500,000	(t)
Liquid low-level radioactive waste (at TA-50) (gallons)	40,000,000	40,000,000	50,000,000	50,000,000	(t)
Liquid low-level radioactive waste (at TA-53) (gallons)	1,400,000	50,000 [u]	1,400,000	1,400,000	(t)

[n] Waste volumes are the incremental increase over remediation waste projections from the No Action Alternative.

[o] Operations waste volumes are assumed to be contact-handled transuranic waste and packaged low-level radioactive waste; small volumes of remote-handled or high-activity waste may be generated.

[p] These waste types are generated during retrieval of waste from MDAs under the Expanded Operations Alternative. Nominal volumes generated under other alternatives are accounted for in other waste categories.

[q] The subcategories of low-level radioactive waste do not necessarily meet precise definitions, but are used to assist in the analysis of transportation and disposal options and impacts.
- Bulk low-level radioactive waste = wastes that can be transported in large volumes in soft-sided containers.
- Packaged low-level radioactive waste = typical low-level radioactive waste packaged in drums or boxes.
- High activity low-level radioactive waste = waste exceeding 10 CFR 61.55 Class A concentrations (greater than 10 nanocuries per gram of transuranic nuclides) and therefore not accepted at certain facilities.
- Remote-handled low-level radioactive waste = waste with a dose rate exceeding 200 millirem per hour at the surface of the container.

[r] Demolition waste includes uncontaminated wastes such as steel, brick, concrete, pipes and vegetative matter from land clearing.

[s] Chemical waste includes wastes regulated under the Resource Conservation and Recovery Act, Toxic Substances Control Act, or state hazardous waste regulations. The large increase under the Expanded Operations Alternative is primarily due to high volumes of waste associated with MDA remediation.

[t] MDA remediation is projected to generate roughly 10,000 to 24,000 gallons (38,000 to 91,000 liters) of industrial, hazardous, low-level, and mixed low-level liquid wastes.

[u] Under the Reduced Operations Alternative, operations at the LANSCE facility would cease. Approximately 5,000 gallons (20,000 liters) of radioactive liquid waste per year from TA-50 would continue to be treated at TA-53.

Note: Because values have been rounded to the nearest hundred, thousand, or million, totals may not equal the sum of individual contributions.
To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359; gallons to liters, multiply by 3.78533.

	No Action Alternative	Reduced Operation Alternative	Expanded Operations Alternative (Preferred Alternative)				
			Total Including MDA Remediation Project		Excluding MDA Remediation Project	MDA Remediation Project Only	
			Capping	Removal		Capping	Removal
Transportation (for 10-Year Period 2007-2016)							
Incident Free							
Public Radiation Exposure *Dose (person-rem) / Risk (LCFs):*							
Total	58.4/0.035	53.1/0.032	89.1/0.053	286.8/0.17	88.6/0.053	0.49/0.0003	198.2/0.12
LANL to Pojoaque	1.8/0.0011	1.7/0.0010	2.8/0.0017	8.1/0.0049	2.8/0.0017	0.01/0.000006	5.3/0.0032
Pojoaque to Santa Fe	3.3/0.0020	3.1/0.0019	4.6/0.0028	13.3/0.0080	4.6/0.0028	0.02/0.00001	8.7/0.0052
Worker Radiation Exposure: (transport drivers) *Dose (person-rem) / Risk (LCFs):*	163.8/0.098	147.2/0.088	255.9/0.15	910.3/0.55	254.0/0.15	1.9/0.0012	656.4/0.40
Transportation Accidents							
Population: *- Radiological Risk (LCFs)*	0.00017	0.00015	0.00025	0.0016	0.00024	0.00001	0.0013
- Nonradiological Traffic Fatalities [v]	0 (0.37)	0 (0.34)	1 (0.95)	3 (3.23)	1 (0.90)	0 (0.02)	2 (2.3)

[v] Nonradiological traffic fatalities include all traffic accidents involving both radioactive and nonradioactive materials and waste shipments. Values presented are the nearest whole number.

	No Action Alternative	Reduced Operation Alternative	Expanded Operations Alternative (Preferred Alternative)
Local Traffic			
Average Daily Traffic at Entry Points	42,300	40,600	up to 49,800
Environmental Justice			
	No disproportionately high and adverse impacts on minority or low-income populations. Radiological doses to minority and low-income populations would be lower than those to sectors of the population that are not members of these groups. Human health impacts from exposure through special pathways (including subsistence consumption of fish and wildlife) would not present disproportionately high and adverse impacts to minority or low-income populations.	Same as No Action Alternative.	While there would be small, but not significant, increases in radiological and chemical risks to the public (0.004 LCFs), increased levels of operations and implementation of proposed projects are not expected to have any disproportionately high and adverse impacts on minority or low-income populations. Radiological doses to minority and low-income populations would be lower than those to sectors of the population that are not members of these groups.

	No Action Alternative	*Reduced Operation Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Facility Accidents (highest risk and MDA removal accidents presented)			
Wildfire – Radiological (Waste Storage Domes at TA-54 – assumed frequency 1 in 20 years)			
Offsite Population			
Dose (person-rem)	91,000	Same as No Action Alternative.	Same as No Action Alternative.
Risk (LCFs per year)	2.7		
MEI			
Dose (rem)	1,900 [w]		
Risk (LCFs per year)	0.05 [x]		
Noninvolved Worker			
Dose (rem)	8,700 [w]		
Risk (LCF per year)	0.05 [x]		
Wildfire – Chemical (Releases formaldehyde at TA-43 – assumed frequency 1 in 20 years)			
- Concentrations above which life-threatening health effects could result (ERPG-3 [y] limit)	25 parts per million	Same as No Action Alternative	Same as No Action Alternative.
- ERPG-3 distance	97 yards		
- Distance to the site boundary	13 yards		
Site-Wide Seismic Event – Radiological (PC-3 seismic event – assumed frequency 1 in 1,250 years) [z]			
Offsite Population			
Total Dose (person-rem)	36,000	Same as No Action Alternative	Same as No Action Alternative
Risk (LCF per year)	0.014		
MEI			
Maximum Dose (rem)	460 [w]		
Risk (LCF per year)	0.00045		
Noninvolved Worker [aa]			
Maximum Dose (rem)	2,000 [w]		
Risk (LCF per year)	0.0008		
Site-Wide Seismic Event – Chemical (PC-3 seismic event releases formaldehyde at TA-43 – assumed frequency 1 in 1,250 years) [z]			
- Concentrations above which life-threatening health effects could result (ERPG-3 [y] limit)	25 parts per million	Same as No Action Alternative	Same as No Action Alternative.
- ERPG-3 distance	120 yards		
- Distance to the site boundary	13 yards		
Facility Accident (RANT lightning strike fire – assumed frequency 1 in 8 years)			
Offsite Population			
Dose (person-rem)	11,000	Same as No Action Alternative	Same as No Action Alternative
Risk (LCF per year)	0.8		
MEI			
Dose (rem)	410 [w]		
Risk (LCF per year)	0.06		
Noninvolved Worker [bb]			
Dose (rem)	1,900 [w]		
Risk (LCF per year)	0.12 [x]		

	No Action Alternative	*Reduced Operation Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Facility Chemical Release (Selenium hexafluoride at TA-54 – assumed frequency 1 in 240 years)			
- Concentrations above which life-threatening health effects could result (ERPG-3 [y] limit)	5 parts per million	Same as No Action Alternative	Same as No Action Alternative.
- ERPG-3 distance	962 yards		
- Distance to the site boundary	537 yards		
MDA G Removal Accident – Radiological (explosion – assumed frequency 1 in 100 years)			
Offsite Population	Not applicable	Not applicable	
Dose (person-rem)			770
Risk (LCF per year)			0.005
MEI			
Dose (rem)			55
Risk (LCF per year)			0.0007
Noninvolved Worker			
Dose (rem)			410
Risk (LCF per year)			0.005
MDA B Removal Accident (sulfur dioxide – frequency not assumed)			
- Concentrations above which life-threatening health effects could result (ERPG-3 [y] limit)	Not applicable	Not applicable	15 parts per million
- ERPG-3 distance			37 yards
- Distance to the site boundary			49 yards

[w] Individual radiation doses in excess of a few hundred rem would result in acute (near-term) health effects or even death from causes other than cancer. In some cases, medical intervention may be effective in reducing the dose, mitigating health impacts, or both. The listed doses are calculated assuming that the exposed individual takes no protective action during the period of exposure and that no subsequent medical intervention occurs.

[x] The risk to any individual would not exceed the risk of the accident scenario.

[y] ERPG-3 is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects (DOE 2005c).

[z] Based on the 2007 update of the probabilistic seismic hazard analysis (LANL 2007).

[aa] The maximum risk (considering consequence and probability) to the noninvolved worker comes from the PC-2 seismic event which has a frequency of 1 in 700 (LANL 2007).

[bb] The maximum risk (considering consequence and probability) to the noninvolved worker comes from the Waste Characterization, Reduction, and Repackaging Facility lightning strike fire which has a frequency of 1 in 7.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; MDA = material disposal area; LANSCE = Los Alamos Neutron Science Center; NPDES = National Pollutant Discharge Elimination System; RLWTF = Radioactive Liquid Waste Treatment Facility; CMRR = Chemistry and Metallurgy Research Replacement Facility; LCF = latent cancer fatality; MEI = maximally exposed individual; ERPG = Emergency Response Planning Guideline; PC = performance category; RANT = Radioassay and Nondestructive Testing; USFWS = U.S. Fish and Wildlife Service; ROI = region of influence.

Note: To convert gallons to liters, multiply by 3.7854; cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359.

S.9.2 Summary of Cumulative Impacts

In accordance with CEQ regulations, a cumulative impact analysis includes "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The cumulative impact analysis for the SWEIS includes (1) an examination of cumulative impacts presented in the *1999 SWEIS*; (2) impacts since the *1999 SWEIS* was issued (presented in the new SWEIS); and (3) a review of the environmental impacts of past, present, and reasonably foreseeable actions for other Federal and non-Federal agencies in the region.

Reasonably foreseeable actions that are likely to occur at LANL are described under the Expanded Operations Alternative. Additional DOE or NNSA actions that could impact LANL include the possible consolidation of nuclear operations related to production of radioisotope power systems (DOE/EIS-0373D), proposed operation of a Biosafety Level 3 facility, a proposed advanced fuel cycle facility for research and development associated with the Global Nuclear Energy Partnership (GNEP) initiative; the potential implementation of Complex Transformation, and a potential disposal facility for Greater-Than-Class C waste.

Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems – As proposed in the *Draft Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems* (DOE/EIS-0373D) (*Consolidation EIS*) (DOE 2005a), consolidation of DOE plutonium-238 activities at the Idaho National Laboratory would reduce plutonium-238 operations at LANL. But regardless of the decision on the *Consolidation EIS*, some plutonium-238 operations would continue at LANL. Therefore, very small changes in the impacts from plutonium-238 activities at LANL would occur.

If current plutonium-238 operations were to continue at the LANL Plutonium Facility Complex, as described under the *Consolidation EIS* No Action Alternative, manufacturing of up to 80 pits per year could still be accomplished within the LANL Plutonium Facility Complex. This would be accommodated by consolidating a number of plutonium processing and support activities (such as analytical chemistry and materials characterization at the Chemistry and Metallurgy Research Replacement Facility). The impacts of the 80-pit-per-year production rate and plutonium-238 processing (at levels far above the level of plutonium-238 processing identified in the *Consolidation EIS*) have been evaluated in both the LANL *1999 SWEIS* and the new SWEIS. Therefore, there would be no additional cumulative effects from these activities.

Biosafety Level 3 Facility – NNSA is preparing an *Environmental Impact Statement for the Operation of a Biosafety Level-3 Facility at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0388D) to analyze the potential environmental impacts of operating a Biosafety Level 3 Facility. Operation of the facility would be consistent with the land use designation of Research & Development for Experimental Science. The facility is visually compatible with surrounding structures; therefore, there would be no impacts to visual resources. There would be no impacts to geology and soils and water resources from operations. Air emissions from the facility's laboratories would be HEPA-filtered, resulting in very minor air quality effects. Noise impacts would be limited to noise from heating, ventilation, and air conditioning system operations, consistent with other buildings in the area. Facility operations

would have no effect upon ecological resources or prehistoric, historic, traditional, or paleontological resources in the area. Facility personnel would come primarily from the existing LANL workforce, leading to no socioeconomic impacts. Operations would be well within LANL infrastructure capability to provide utilities such as electricity, water, and natural gas. There would be no discernable effects on local traffic conditions. There have been no reported cases of illnesses in the United States due to the release of diagnostic specimens during transport (Cummings 2007).

There would be a low potential risk of illness to site workers or visitors and no public human health effect from routine operations involving biohazardous material. Accident conditions would result in minimal or no impact to the public primarily because there would be severely limited opportunity for transport of an infectious dose of a biohazardous material to the public. Biohazardous material in open cultures would be handled only in a biosafety cabinet where a spill would be contained. In addition, biohazardous material would be handled in a liquid or solid culture container that would release very few organisms to the air if dropped or spilled. This means that one of the most critical risk factors, public exposure to an infectious dose from a biohazardous material, is greatly minimized, and therefore, the potential risk of disease would be very low. The EIS will address slope stability at the Biosafety Level 3 Facility based on the recent update to the LANL probabilistic seismic hazard analysis (Cummings 2007, LANL 2007).

Advanced Fuel Cycle Facility – On January 4, 2007, DOE issued an NOI (72 FR 331) to prepare a Programmatic EIS for the GNEP initiative. GNEP would encourage expansion of domestic and international nuclear energy production while reducing nuclear proliferation risks, and reduce the volume, thermal output, and radiotoxicity of spent nuclear fuel before disposal in a geologic repository. LANL is one of the DOE sites being considered for an advanced fuel cycle facility. The advanced fuel cycle facility would be a large shielded facility (approximately 1 million square feet [92,900 square meters]) (DOE 2008). Potential cumulative impacts at LANL associated with the proposed advanced fuel cycle facility are based on preliminary data and could change prior to the public release of the Draft *GNEP PEIS*.

Complex Transformation – On January 11, 2008, NNSA announced the availability of the Draft *Complex Transformation SPEIS* (73 FR 2023), which evaluates NNSA's proposal for a smaller, more efficient nuclear weapons complex that would be better able and more suited to respond to future national security challenges. The Preferred Alternative in the Draft *Complex Transformation SPEIS* is to pursue distributed centers of excellence. LANL would be the center of excellence for plutonium manufacturing and research and development, with a production capacity of up to 80 pits per year. This alternative would be based on the use of the existing and planned infrastructure already described in the SWEIS Expanded Operations Alternative (DOE 2007b). Among other alternatives for LANL that are evaluated in the *Complex Transformation SPEIS*, the one that would have the largest potential cumulative impacts is the consolidated nuclear production center. The SWEIS cumulative impacts analysis addresses the impacts of construction and operation of a consolidated nuclear production center at LANL.

Disposal of Greater-Than-Class-C Low-Level Radioactive Waste (GTCC EIS). In July 2007, DOE issued an NOI to prepare an *Environmental Impact Statement for the Disposal of Greater-Than-Class-C Low-Level Radioactive Waste (GTCC EIS)* (72 FR 40135). The *GTCC EIS* will address the disposal of low-level radioactive waste generated by activities licensed by the

Nuclear Regulatory Commission or an Agreement State that contain radionuclides in concentrations exceeding 10 CFR 61 Class C limits, as well as DOE waste having similar characteristics. LANL is being considered as one of eight candidate DOE disposal sites for Greater-Than-Class C waste, along with a generic commercial disposal facility option in arid and humid environments. In addition, DOE is evaluating several disposal technologies in the *GTCC EIS* including geologic repositories, intermediate depth boreholes, and enhanced near-surface disposal facilities. The alternatives in the *GTCC EIS* could result in changes to facilities or operations at LANL, but because the changes have yet to be developed, quantitative data are not available for the cumulative impacts analysis.

Reasonably foreseeable actions for the region surrounding LANL were also reviewed for the cumulative impacts analysis. Interviews were conducted with personnel in planning departments in the surrounding counties, as well as from the regional Bureau of Land Management and Santa Fe National Forest offices, to collect information on activities that might affect cumulative impacts. Available documentation was reviewed for activities that could contribute to cumulative impacts.

Each resource area in the SWEIS was reviewed for potential cumulative impacts; the analyses are summarized in the following paragraphs. The level of detail provided for each resource area is commensurate with the extent of the potential cumulative impacts. Some resources were not provided with a detailed analysis based on minimal or very localized impacts from LANL operations and a judgment that, cumulatively, there would be no appreciable impacts on these resources.

The following paragraphs summarize cumulative impacts for LANL and the surrounding region of influence. The maximum cumulative impacts for all resource areas would occur if a decision was made to implement the SWEIS Expanded Operations Alternative in its totality.

Land Use, Visual Environment, Ecological Resources, and Cultural Resources

Impacts on land use, visual environment, ecological resources, and cultural resources from LANL operations have been discussed previously. Additional impacts could arise from the conveyance and transfer of land as required under Public Law 105-119. Up to 826 acres (334 hectares) of land could be developed after transfer or conveyance. For example, Los Alamos County has indicated there are proposals to develop approximately 1,000 new residences on land adjacent to LANL and to develop land for light industry, retail, and residential units along the Los Alamos Canyon rim across from the airport. This could change the current land use and increase cumulative impacts on visual, ecological, and cultural resources. In addition, the *Complex Transformation SPEIS* consolidated nuclear production center facilities, if constructed at LANL, could result in disturbance of up to 545 acres (221 hectares) of land. The total land area required for the GNEP advanced fuel cycle facility would be approximately 373 acres (151 hectares) with 144 acres (58 hectares) inside a property protection fence, including approximately 62 acres (25 hectares) within a perimeter intrusion, detection, and assessment system (DOE 2008).

Impacts from the construction of the consolidated nuclear production center or the GNEP advanced fuel cycle facility at LANL would include the loss of habitat and of less mobile wildlife, such as reptiles and small mammals. Best management practices and implementation

measures set forth in the LANL *Threatened and Endangered Species Habitat Management Plan* would be used to minimize the potential for any adverse effects to plant and animal communities and on threatened and endanger or special interest species. After construction, temporary structures would be removed and the sites reclaimed.

Proposed sites for the *Complex Transformation SPEIS* consolidated nuclear production center in TA-16 or TA-55 and the GNEP advanced fuel cycle facility in TA-36 that involve undisturbed lands are likely to contain archaeological resources due to the high density of these resources in the region. Identification, evaluation, determination of impact, and implementation of mitigative measures would be conducted in consultation with the New Mexico State Historical Preservation Office (SHPO), interested Native American tribes, and in accordance with *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico*.

Geology and Soils

For geology and soils, the primary impacts are due to proposed closure of the MDAs under the Expanded Operations Alternative in compliance with the Consent Order. If the waste at the MDAs is contained in place (MDA Capping Option), the final covers would require up to 2.5 million cubic yards (1.9 million cubic meters) of bulk materials including crushed tuff, rock, gravel, topsoil, and other materials for surface grading and erosion control. Construction of the consolidated nuclear production center or the GNEP advanced fuel cycle facility would also require the use of bulk geologic materials. These materials would be obtained from LANL resources and from quarries and mines in the surrounding counties. While the quantity of materials would be large, there would be sufficient resources in the region to meet the demand.

Water Resources

Reasonably foreseeable activities in the region could affect surface water and groundwater in combination with past and present activities, as well as those proposed at LANL in the SWEIS. Mitigation measures implemented by Federal agencies during fire and vegetation management projects and modification of water control structures installed after the Cerro Grande Fire would minimize impacts on surface water quality and quantity. Use of facilities to evaporate treated effluent from the Radioactive Liquid Waste Treatment Facility would improve surface water resources in Mortandad Canyon. Additional groundwater depletion projected as a result of potential new residential development within Los Alamos County could be somewhat offset by reduced depletion of the regional aquifer following implementation of the city of Santa Fe's water diversion project and reduced pumping of the Buckman Well Field. Monitoring of the quality and quantity of the regional aquifer would be needed to evaluate the rate and direction of contaminant movements and to track the amount of water available for use. The North Railroad Avenue groundwater contamination plume located over 12 miles (19 kilometers) from the LANL boundary is undergoing remediation, and is not expected to migrate into groundwater and surface water impacted by past or present LANL operations.

Air Quality

Under the Expanded Operations Alternative, construction, excavation, and remediation activities could result in temporary increases in air pollutant concentrations at the site boundary and along publicly accessible roads. These impacts would be similar to those that would occur during

construction of a housing project or a commercial complex. Emissions of fugitive dust from these activities would be controlled with water sprays and other engineering and management practices as appropriate. The maximum ground level concentrations offsite and along publicly accessible roads would be below ambient air quality standards, except for possible short-term concentrations of nitrogen oxides and carbon monoxide for certain projects that could occur near the site boundary. Appropriate management controls and scheduling would be used to minimize impacts on the public and to meet regulatory requirements. The impacts on the public would be expected to be minor.

The projected increase in LANL employees and vicinity populations would cause an increase in vehicles and an associated increase in vehicle emissions along the routes used to access the site. However, cumulative concentrations of all criteria pollutants are expected to remain compliant with Federal and State ambient air quality standards.

The 24-hour standard for nitrogen dioxide and total suspended particulates could be exceeded if the Complex Transformation consolidated nuclear production center operated at LANL along with implementation of the Expanded Operations Alternative. Based on these potential exceedances, more detailed site-specific analyses would need to be performed if LANL were selected as the site for the consolidated nuclear production center. Preliminary data available for the GNEP advanced fuel cycle facility do not include emissions.

The contribution to cumulative air quality impacts from offsite construction and operation activities was also evaluated. The maximum impacts from construction activities (including fugitive dust) for oil and gas development in the region are evaluated in the *Farmington Proposed Resource Management Plan and Final EIS* and were shown to occur very close to the source, with concentrations decreasing rapidly with distance. Therefore, it is expected that offsite air emissions from disturbance and construction would not contribute substantially to cumulative impacts at LANL.

Impacts of inert pollutants (pollutants other than ozone and its precursors) generally were found to be limited to a few miles downwind from the source. For emissions from the oil and natural gas well fields, the distance where the nitrogen dioxide concentrations dropped below their significance levels was 15.6 to 24.9 miles (25 to 40 kilometers). Therefore, it is expected that emissions from the operation of offsite facilities would not contribute substantially to cumulative impacts at LANL.

In contrast, the maximum effects of volatile organic compounds and nitrogen oxide emissions on ozone levels usually occurs several hours after these compounds are emitted and many miles from their sources. A number of mitigation measures for activities occurring in the region are designed to reduce the cumulative air quality impacts from gas and oil wells and pipelines. One of the more successful mitigation measures requires that new and replacement wellhead compressors limit their nitrogen oxide emissions to less than 10 grams per horsepower-hour, and each pipeline compressor station limit its total nitrogen oxide emissions to less than 1.5 grams per horsepower-hour. This measure is intended to substantially reduce the level and extent of emissions that form ozone throughout the region and to reduce visibility impacts on Class I Areas such as Bandelier National Monument.

Human Health

For human health, the dose to the general public from all anticipated airborne emissions at LANL (Expanded Operations Alternative) could be as much as 36 person-rem per year. The dose to the offsite MEI from all anticipated airborne emissions at LANL could be as much as 8.2 millirem per year. The Clean Air Act regulations limit airborne radiation doses to 10 millirem per year for any individual member of the public. No additional LCFs would be expected at these dose levels. If the consolidated nuclear production center facilities were sited at LANL, the offsite radiological impacts would be essentially unchanged due to closure of facilities whose functions would be included in the new center. Preliminary data available for the GNEP advanced fuel cycle facility do not include estimates of offsite dose impacts.

Collective worker doses would increase if the MDA Removal Option was implemented. Collective worker dose would increase from about 280 person-rem per year under the No Action Alternative to an average of up to about 540 person-rem per year due to the number of workers involved. At the maximum dose, the annual risk of a LCF in the worker population would be about 0.3 (or for each 3 years of operation, 1 chance of an LCF in the worker population). Worker dose would decrease by about 140 person-rem annually after the MDA remediation work was complete. Worker doses would be expected to increase from operation of the consolidated nuclear production center facilities at LANL. The net increase in collective worker doses would be approximately 105 person-rem per year. The increased annual risk of an LCF in the worker population would be 0.06 (or for each 17 years of operation, an additional LCF might be expected in the worker population). Preliminary data for the GNEP advanced fuel cycle facility do not include a worker population dose estimate. Individual worker doses would be maintained as low as reasonably achievable (ALARA) and within applicable regulatory limits.

Environmental surveillance results for radioisotopes and chemicals, monitoring of LANL radiological emissions and radiation dose data, and cancer mortality and incidence rates in New Mexico and all counties surrounding LANL are presented in the SWEIS. These data, along with the final LANL Public Health Assessment, issued on August 31, 2006, by the U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, show that "there is no evidence of contamination from LANL that might be expected to result in ill health to the community" and "[o]verall, cancer rates in the Los Alamos area are similar to cancer rates found in other communities." Additionally, there is currently a Center for Disease Control and Prevention dose reconstruction project at LANL in the initial information gathering phase; therefore, this information is not available to include in the cumulative impacts analysis.

Socioeconomics

By 2011, LANL operations under the No Action Alternative could account for approximately 20 percent of employment in the tri-county area (Los Alamos, Rio Arriba, and Santa Fe Counties) and an even higher percentage of wages due to the large difference in average wages for LANL employees versus the county averages. Under the Expanded Operations Alternative, direct employment at LANL could increase by another 14 percent by 2011. Of the 1,890 direct and 2,000 indirect jobs thus created, about 1,600 and 1,700 jobs respectively, would be held by those in the tri-county area. This would increase the estimated percentage of the population employed in the tri-county area as a result of LANL operations activities to 22 percent.

If the maximum number of jobs estimated for operation of the Los Alamos Research Park and the conveyance and transfer of land were also created by 2011, there could be additional socioeconomic impacts in the region of influence. Cumulatively, the Expanded Operations Alternative and these activities could result in nearly 21,000 direct and 22,000 indirect jobs in the region. This scenario would increase the estimated percentage of the population employed by LANL-related activities or actions to 31 percent of the region of influence.

Increases in employment related to the proposed *Complex Transformation SPEIS* consolidated nuclear production center facilities would add approximately 1,500 direct and 1,600 indirect jobs for a total of 3,100 additional employees living in the tri-county region of influence. The addition of the GNEP advanced fuel cycle facility could add about 1,100 direct jobs in the tri-county region of influence, generating approximately 1,200 indirect jobs for a total 2,300 additional employees living in the tri-county region of influence. Combined with the other initiatives discussed above and LANL's continuing operations under the Expanded Operations Alternative, this scenario could increase the estimated percentage of the population employed by LANL-related activities to 33 percent of the region of influence.

The rate of population growth in the region would likely exceed current rates, placing additional strain on regional infrastructure and social services. For example, additional demand would be placed on regional water and electrical systems, roads would be more heavily traveled, additional housing would need to be constructed, and there may be demands for additional schools and hospitals. There would also be beneficial gains in terms of average wages and benefits flowing into the local economy because many of these jobs should be relatively higher paying jobs (for example, research jobs), and the unemployment rate would likely fall.

Infrastructure

Under the SWEIS Expanded Operations Alternative, the cumulative peak electrical load would approach, but not exceed, the system capacity; and the water use would approach, but not exceed, the system available water rights. Planned upgrades to the electrical system should enhance peak load capacity and ensure that electric energy is available for future operations. For water use, Los Alamos County is currently pursuing additional water rights to supply its water customers, including LANL. LANL water requirements have been decreasing compared to the demand in 1999, and are far below projections included in the *1999 SWEIS*. In the near term, no infrastructure capacity constraints are expected, and LANL demands on infrastructure resources are below projected levels and within site capacities. Potential shortfalls in available capacity would need to be addressed if increased site requirements are larger than those analyzed in the SWEIS.

If the proposed Complex Transformation consolidated nuclear production center, the GNEP advanced fuel cycle facility, or both were located at LANL, the system capacities for electricity and water could be exceeded and additional resources might need to be identified to satisfy the projected demand. It is likely that significant modifications would be required and LANL would need to obtain greater water resources, or significantly reduce its potable water use through mitigative measures. Overall LANL work assignments might have to be revamped, reduced, or eliminated so that existing potable water supplies would be adequate to support the assigned LANL work load.

Waste Management

Cumulative generation of all waste types is expected to be substantial, largely due to future remediation of MDAs and DD&D of facilities. Although this would be the case under all alternatives, the quantities of wastes projected under the Expanded Operations Alternative would be significantly larger than those projected under the other alternatives. Sufficient disposal capacity, both on- and offsite, for all waste types would be available except possibly under the Expanded Operations Alternative. Up to 1.4 million cubic yards (1.1 million cubic meters) of low-level radioactive waste and 33,000 cubic yards (25,000 cubic meters) of transuranic waste are projected. About two-thirds of the transuranic waste volume is associated with postulated complete removal of all waste from the MDAs – including transuranic waste buried before 1970. Final waste volumes from MDA remediation may be smaller because waste generation is dependent on future regulatory decisions by the New Mexico Environment Department and on waste volume reduction techniques such as sorting. Additional resources, including new storage and handling facilities, could be required to augment existing and proposed waste management capabilities.

Onsite disposal capacity for low-level radioactive wastes may be sufficient, depending on the actual volumes generated by remediation; disposal capacity can be supplemented by offsite facilities if needed. It is assumed that the transuranic waste would be disposed of at WIPP. WIPP disposal capacity is expected to be sufficient for disposal of all retrievably stored waste and all newly generated transuranic waste from the DOE complex over the next few decades, but not sufficient for this waste and all of the transuranic waste buried before 1970 across the complex (63 FR 3624). Decisions about disposal of transuranic waste from full removal of LANL MDAs would be based on the needs of the entire DOE complex. Any transuranic waste that may be generated at LANL without a disposal pathway would be safely stored until disposal capacity becomes available.

Operation of the proposed Complex Transformation consolidated nuclear production center would result in additional radioactive waste being generated. Up to 1,160 cubic yards (890 cubic meters) of transuranic waste, 12,000 cubic yards (9,000 cubic meters) of low-level radioactive waste, and 72 cubic yards (55 cubic meters) of mixed low-level radioactive waste would be generated annually. Operations would also generate up to 8,900 gallons (33,800 liters) of liquid low-level waste and up to 3,600 gallons (13,700 liters) of mixed low-level liquid waste annually. These wastes would be treated and packaged for disposal in accordance with their characteristics and applicable requirements in existing facilities or new facilities. Low-level waste would be disposed of onsite, mixed low-level waste would be disposed of at a permitted offsite facility, and transuranic waste would be disposed of at WIPP.

The volumes of low-level radioactive waste (up to 3,450 cubic yards [2,640 cubic meters]) and mixed low-level radioactive waste (up to 4.4 cubic yards [3.4 cubic meters]) projected to be generated annually by the GNEP advanced fuel cycle facility (DOE 2008) would be managed within the current waste management program. In addition, the project could generate up to 928 cubic yards (710 cubic meters) of nondefense transuranic waste annually (DOE 2008), which is not eligible for disposal at WIPP. Transuranic waste without a disposal pathway would be safely stored until a disposal facility became available. The project could also generate 34 cubic yards (26 cubic meters) of high-level radioactive waste annually (DOE 2008). Facilities to safely

manage high-level radioactive waste until it could be sent to a geologic repository would have to be provided by the project since no high-level radioactive waste is currently managed at LANL.

Transportation

The total cumulative worker dose from 130 years of radioactive materials shipments (general transportation, historical DOE shipments, and reasonably foreseeable actions as estimated in the *Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada,* DOE/EIS-0250F-S1D) (DOE 2007a), as well as shipments associated with the LANL SWEIS alternatives, would be a maximum of 382,400 person-rem, which could result in 229 LCFs. The total cumulative dose to the general public would be a maximum of 343,900 person-rem, which could result in 206 excess LCFs. The total estimated traffic fatalities associated with accidents involving radioactive material and waste transports would be a maximum of 119.

Implementing the Expanded Operation Alternative would result in no more than three additional traffic fatalities and zero worker or public cancer deaths (LCFs); therefore, they would not contribute substantially to cumulative impacts. For perspective, in 2004, there were 522 traffic fatalities in New Mexico, 58 of which occurred in the three counties neighboring LANL (Los Alamos, Rio Arriba, and Santa Fe Counties).

Daily traffic could increase on county roads by up to 18 percent (averaged across all LANL entrances) due to (1) increased development of both housing and light industry as a result of the conveyance and transfer of lands; (2) increased truck shipments under the Expanded Operations Alternative; (3) projected increases in the LANL workforce under the Expanded Operations Alternative; and (4) increased employment at the Los Alamos Research Park. Development of land transferred under the *Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracks Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico* (DOE/EIS-0293) could increase traffic in the vicinity of the airport and TA-21 based on current Los Alamos County plans to develop light industry, retail, and residential units on these tracts. This action, combined with the increased traffic associated with DD&D activities at TA-21, could cause excessive traffic loads on NM 502.

The major radiological transportation actions involving Category I/II special nuclear material related to the proposal to consolidate activities at LANL would be transportation of pits currently stored at Pantex and highly enriched uranium currently stored at Y-12 to LANL. After these one-time shipments were completed, there would be no annual shipment of pits and highly enriched uranium from these sites. The estimated radiological health impacts of the one-time transportation of pits and highly enriched uranium to LANL would not result in any additional LCFs in the general public. Non-radiological impacts would be expected to result in zero fatalities as a result of accidents. Workers handling the movement of pits and highly enriched uranium would receive a collective dose of approximately 5,500 person-rem, resulting in an estimated 3.3 LCFs. It should be noted that in accordance with DOE regulations, the maximum annual dose to a radiation worker would be administratively controlled to 2 rem per year; therefore, an individual worker would not be expected to develop a lifetime latent fatal cancer from exposures during these activities.

The major transportation actions involving radioactive materials related to the *GNEP PEIS* advanced fuel cycle facility at LANL would involve the receipt of shipments of spent reactor fuel, shipments of transmutation fuel, shipments of spent fast reactor fuel, and radioactive waste shipments associated with operation of the advanced fuel cycle facility (DOE 2008).

The addition of proposed facilities and an increased number of workers for the consolidated nuclear production center in TA-16 would likely result in increased traffic along NM 4 from White Rock to West Jemez Road and on West Jemez Rd to the center of the site. The consolidation of facilities in TA-16 would somewhat alleviate current concerns related to increased traffic along Pajarito Road under the Expanded Operations Alternative, because there could be a corresponding decrease in traffic along Pajarito Road from NM 4 to TA-55 if the activities at the Plutonium Facilities Complex were relocated to TA-16. Conversely, the GNEP advanced fuel cycle facility is proposed to be built in TA-36 which would lead to increased traffic along Pajarito Road from NM 4 to the center of LANL, if approved.

Environmental Justice

No disproportionately high adverse human and environmental effects to minority or low-income populations would be expected as a result of implementing any of the three alternatives considered in the SWEIS, or constructing and operating the *Complex Transformation SPEIS* consolidated nuclear production center or the GNEP advanced fuel cycle center. Employment at LANL and in the surrounding region would be expected to increase, thus creating additional employment opportunities for local individuals. As additional funding flows into the regional economy, increased opportunities for low-income and minority populations should be realized. Also, the conveyance and transfer of land to the Department of the Interior that has occurred benefits people inhabiting the Pueblo of San Ildefonso. A consultation process is in place to address possible impacts to traditional cultural properties from LANL actions.

S.9.3 Summaries of Potential Consequences from Project-Specific Analyses

Appendices of the SWEIS contain evaluations of the environmental impacts of projects proposed for implementation under the Expanded Operations Alternative. They include projects to replace or refurbish existing structures and their related capabilities, DD&D of old structures and remediation of environmental contamination, modifications to site infrastructure, and expansion of site capabilities. This section summarizes the potential consequences of implementing each of the proposed projects.

The sliding-scale approach is used in the SWEIS to evaluate environmental consequences. This approach implements the CEQ instruction to "focus on significant environmental issues" (40 CFR 1502.1) and to discuss impacts "in proportion to their significance" (40 CFR 1502.2[b]). For some of the project-specific analyses it was determined that there would be no or only minor impacts for some resource areas. Consequently, these resource areas are not analyzed in detail. In the following tables, these resource areas are identified as having "no or negligible impacts."

General temporary construction-related impacts would be expected to occur for most of the projects summarized in this section during construction and DD&D activities. After project

completion, these impacts would cease and the area would return to normal. These impacts are not discussed in detail in the project summaries:

- Physical disturbances to areas under or in the vicinity of construction and DD&D projects would disrupt land use, affect the visual environment, and disturb the soils and geology, the latter primarily from excavation activities.
- Water resources, primarily surface water quality, could be temporarily affected by runoff and increased sediment loads from construction and DD&D sites. Stormwater Pollution Prevention Plans describing best management practices would be required and would mitigate most of these impacts. A Construction General Permit, a U.S. Army Corps of Engineers Section 404 Dredge and Fill Permit, and a Section 401 New Mexico Water Quality Certification would be obtained, if needed, for projects that may affect surface water.
- Air quality impacts would be increased by emissions of criteria air pollutants, primarily carbon monoxide and nitrogen oxides from vehicles and heavy equipment, as well as particulate matter from soil disturbance.
- Noise levels could rise from the increased number of personal vehicles, trucks hauling materials and waste to and from construction sites, and heavy equipment involved in the activities. Most noise would be localized, but if a project were near a LANL site boundary, offsite populations could be disturbed.
- Loss of habitat from land disturbance and increased noise and light are potentially adverse ecological impacts from construction and DD&D activities. Impacts could be minimized by avoiding working during nesting seasons for sensitive species, using special lighting, protecting areas of concern, and working only during certain times of the day or year.
- Construction workers would be subject to accidents typical of any construction site. Adverse effects could range from relatively minor (such as lung irritation, cuts, or sprains) to major (such as lung damage, broken bones, or fatalities). To prevent serious exposures and injuries, all site construction contractors would be required to submit and adhere to a Construction Safety and Health Plan and undergo site-specific hazard training. Appropriate personal protection measures would be a routine part of construction activities, including use of personal protection equipment such as coveralls, respirators, gloves, hard hats, steel-toed boots, eye shields, and earplugs or covers. Workers also would be protected by other engineered and administrative controls.
- Increased consumption of fuels, water, and electricity would occur during construction and DD&D.
- Implementing the projects addressed in this section may result in impacts to potential release sites covered under the Consent Order. As needed, these potential impacts would be addressed through the accelerated cleanup process described in Section VII.F of the Consent Order.

Summary of Impacts for the Physical Science Research Complex Project

The Physical Science Research Complex would be a complex of four buildings in TA-3 with approximately 350,000 square feet (32,500 square meters) of floor space, approximately 30 percent of which would be laboratory space (primarily laser). This complex would be available to consolidate staff currently located in TA-3 and other LANL locations in newer, more efficient and modern space. A number of structures would be demolished to make room for the Physical Science Research Complex, and a number of buildings vacated by staff moving to the new facility would also undergo DD&D. A building potentially eligible for listing on the National Register of Historic Places could be impacted, as well as the Administration Building which has been determined to be eligible. Proposed activities would require documentation to resolve adverse effects. Only minor impacts would be expected from construction and operation of this facility. There would be some improvement in the overall appearance of areas in which aging buildings and temporary structures would be demolished. **Table S–6** summarizes the potential impacts of implementing this project.

Table S–6 Summary of Impacts for the Physical Science Research Complex Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impact. *Visual Environment* – Demolition of vacated structures would improve the overall appearance of TA-3, TA-35, and TA-53.
Geology and Soils	Temporary construction- and DD&D-related impacts. Approximately 499,000 cubic yards of rock and soil would be disturbed during construction.
Water Resources	No or negligible impact.
Air Quality and Noise	*Air Quality* – Temporary construction- and DD&D-related impacts. Little or no change in emissions from operations. *Noise* – Temporary construction- and DD&D-related impacts.
Ecological Resources	No or negligible impact.
Human Health	Temporary construction-related impacts and accident potential for workers. Potential worker exposure to radiological contamination and asbestos during DD&D. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. Positive impact on relocated staff from improved working conditions.
Cultural Resources	Possible impact on a building potentially eligible for listing on the National Register of Historic Places and the Administration Building, which has been determined to be eligible. Proposed activities would require documentation to resolve adverse effects.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – No more than negligible impact on LANL utility capacity, requirements would be similar to or less than the facilities being replaced.
Waste Management	*Construction* – 1,600 cubic yards of construction debris. *DD&D* – 17,000 cubic yards of low-level radioactive waste; 177,000 cubic yards of solid waste including demolition debris; and 314,000 pounds of chemical waste.
Transportation	Transportation of construction materials and wastes and demolition wastes (some radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impact.
Facility Accidents	No or negligible impact.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359.

Summary of Impacts for the Replacement Office Buildings Project

The TA-3 Replacement Office Buildings Project would consolidate staff and activities currently located in temporary or aging permanent buildings into more efficient and safer structures. The complex would include the construction of 11 two-story buildings, 1 three-story building, and related parking structures. The Wellness Center and a warehouse would be demolished to accommodate this project.

There would be no major environmental impacts from construction, operation, and DD&D of existing buildings for the Replacement Office Buildings Project. Most construction would be in a developed portion of TA-3; however, a portion of the project area would require use of about 13 acres (5.3 hectares) of currently undeveloped land. Protection of cultural resources and potential accommodation for the Mexican spotted owl during construction could be required. **Table S–7** summarizes the potential impacts of implementing this project.

Table S–7 Summary of Impacts for the Replacement Office Buildings Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – Consistent with future land use plans; about 13 acres of undeveloped land would be disturbed. *Visual Environment* – New buildings and parking lot could be visible from West Jemez Road and Pajarito Road.
Geology and Soils	Temporary construction- and DD&D-related impacts. Approximately 369,000 cubic yards of rock and soil would be disturbed during construction.
Water Resources	Temporary construction- and DD&D-related impacts.
Air Quality and Noise	*Air Quality* – Temporary construction-and DD&D-related impacts. No change in emissions from operations. *Noise* – Temporary construction- and DD&D-related impacts.
Ecological Resources	Temporary construction-related impacts. Loss of 13 acres of habitat. Construction may affect, but is not likely to adversely affect, the Mexican spotted owl and bald eagle.
Human Health	Temporary construction- and DD&D-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment.
Cultural Resources	Possible impact on a historic trail potentially eligible for listing on the National Register of Historic Places. Proposed activities could require documentation to resolve adverse effects.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – No more than negligible impact on LANL utility capacity; requirements would be similar to or less than the facilities being replaced.
Waste Management	*Construction* – 1,700 cubic yards of construction waste. *DD&D* – 31 cubic yards of low-level radioactive waste and 6,900 cubic yards of demolition debris.
Transportation	No or negligible impact.
Environmental Justice	No or negligible impact.
Facility Accidents	No or negligible impact.

TA = technical area; DD&D = decontamination, decommissioning, and demolition.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; acres to hectares, multiply by 0.40469.

Summary of Impacts for the Radiological Sciences Institute Project, Including Phase I – the Institute for Nuclear Nonproliferation Science and Technology

The proposed project would involve the DD&D of 52 obsolete structures scattered over 6 TAs, and the construction of the Radiological Sciences Institute in TA-48, which would include as many as 13 new facilities. Phase I would include construction of five buildings associated with the Institute for Nuclear Nonproliferation Science and Technology. This facility would include

Security Category I and II laboratories and vaults, other laboratory space, a secure radiochemistry laboratory, and associated offices and support facilities.

DD&D activities and transportation would result in the largest potential impacts. DD&D activities are expected to generate large quantities of debris, including some radioactively-contaminated debris. With the exception of low-level radioactive waste, most DD&D waste would be transported to appropriate offsite facilities. Transportation impacts would include temporary disruption of traffic on Pajarito Road during construction; increased local traffic during operations; and movement of large amounts of DD&D waste. **Table S–8** summarizes the potential impacts of implementing this project.

Table S–8 Summary of Impacts for the Radiological Sciences Institute Project, Including Phase I – the Institute for Nuclear Nonproliferation Science and Technology

Resource Area	*Impact Summary*
Land Resources	*Land Use* – Some currently designated Reserve and Experimental Science areas would be redesignated in the future as Nuclear Materials Research and Development; 12.6 acres of undeveloped land would be disturbed. *Visual Environment* – Minor impact from new development in TA-48 west of existing buildings.
Geology and Soils	Temporary construction-related impacts. Approximately 802,000 cubic yards of rock and soil would be disturbed during construction. Excavation of welded tuff could necessitate blasting. Negligible impacts anticipated from DD&D activities.
Water Resources	Temporary construction-related impacts. DD&D of older contaminated structures could reduce the potential for future surface water and groundwater contamination.
Air Quality and Noise	*Air Quality* – Temporary construction- and DD&D-related nonradiological impacts and potential for release of radionuclides in contaminated soils in the vicinity of the proposed building location. Little or no change in emissions from operations. *Noise* – Temporary construction- and DD&D-related impacts could include blasting.
Ecological Resources	Temporary construction-related impacts. Loss of 12.6 acres of habitat. Construction may affect, but is not likely to adversely affect, the Mexican spotted owl and bald eagle. DD&D activities may affect, but are not likely to adversely affect, the Mexican spotted owl.
Human Health	Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. No additional LCFs in general population or to the MEI from radiological doses from facility construction or operation and associated DD&D.
Cultural Resources	Possible impact on two archaeological sites determined to be eligible for the National Register of Historic Places and on potentially eligible historic buildings, including the Radiochemistry Building. Documentation to resolve adverse effects on the archaeological sites would be required before beginning construction of the Radiological Sciences Institute and could be required before demolition of any of the potentially important historic structures.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – No more than negligible impact on LANL utility capacity, requirements would be similar to or less than the facilities being replaced.
Waste Management	*Construction* – 2,800 cubic yards of construction debris and associated solid waste. *DD&D* – 1,100 cubic yards of transuranic waste; 96,000 cubic yards of low-level radioactive waste; 1,000 cubic yards of mixed low-level radioactive waste; 77,000 cubic yards of demolition debris; and 988,000 pounds of chemical waste.
Transportation	Transportation of construction materials and wastes, and demolition wastes (some of which would be radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impact.
Facility Accidents	Postulated facility accident with the highest impacts would result in an LCF risk of 1 in 12,000 for a noninvolved worker and 1 in 77,000 for the MEI; there would be no excess LCFs expected in the exposed population.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality; MEI = maximally exposed individual.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359; acres to hectares, multiply by 0.40469.

Summary of Impacts for Radioactive Liquid Waste Treatment Facility Upgrade Project

This project has been proposed to improve the operation and reliability of the Radioactive Liquid Waste Treatment Facility in TA-50. Three options have been proposed to upgrade the facility, each involving DD&D of part of the existing facility. Under Option 1, a new building for treating liquid low-level radioactive and transuranic wastes would be constructed west of the existing facility in a parking area, along with a central utilities building. The East Annex would be demolished. Under Option 2, the Radioactive Liquid Waste Treatment Facility treatment capabilities would be housed in two or more separate structures to the west and north of the existing facility (for example, one or more structures for low-level radioactive liquid waste and one or more structures for transuranic liquid waste). The East Annex, the North Annex, and a transformer located on the north side of the existing facility would be demolished to accommodate the new construction. Option 3 is identical to Option 2, except that the existing facility would be renovated for reuse; the most DD&D would be required under this option. An auxiliary action of installing a pipeline and constructing evaporation tanks to treat effluent could occur with any of the options, including the No Action Option (not upgrading the facility).

Potential impacts from each of the action options would be similar. Demolition of the East Annex and the transuranic influent storage tanks would likely produce considerable low-level radioactive waste and some transuranic waste. There is also the potential for releasing radioactive or other hazardous constituents from contaminated soils and contaminated structural materials, but proper procedures would be followed to minimize their release. **Table S–9** summarizes the potential impacts of implementing this project.

Implementing the auxiliary action to construct evaporation tanks and a pipeline would result in a change in the land use category and the permanent loss of habitat of up to 5.4 acres (2.2 hectares) of currently undeveloped land. Tank construction would cause a break in the forest cover that would be noticeable from areas west of LANL. Use of the evaporation tanks would improve surface water quality by eliminating a discharge that could contribute to movement of existing environmental contamination.

Summary of Impacts for Los Alamos Neutron Science Center Refurbishment Project

The LANSCE Refurbishment Project would include renovations and improvements to the existing facility in TA-53 to increase its reliability and extend its operating life. Impacts from implementation would be minimal. There could be minimal indirect effects on utility usage and air emissions from increased usage of the facilities after the project was complete. **Table S–10** summarizes the potential impacts of LANSCE Refurbishment Project activities.

Table S–9 Summary of Impacts for the Radioactive Liquid Waste Treatment Facility Upgrade Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – If the option to construct evaporation tanks and pipeline were implemented, the land use designation of up to 5.4 acres of land for the area of the tanks would change from Reserve to Waste Management. *Visual Environment* – The new treatment buildings would not result in a change to the overall visual character of the area within TA-50, but the area proposed for construction of the evaporation tanks is currently undeveloped and wooded, and a break in the forest cover would be noticeable from areas west of LANL.
Geology and Soils	Temporary construction- and DD&D-related impacts. Construction may affect, but is not likely to adversely affect, the Mexican spotted owl and bald eagle. Permanent removal of contaminated soil to accommodate new facilities. Up to 164,000 cubic yards of rock and soil could be disturbed, assuming construction of the evaporation tanks and pipeline.
Water Resources	Potential positive impact on effluent water quality and quantity due to more stringent discharge requirements and improved processing.
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. Potential for increased radioactive emissions during DD&D. Minimal impact expected from operation. *Noise* – Minor construction equipment and traffic noise impact to workers.
Ecological Resources	Temporary construction- and DD&D-related impacts. Loss of up to 4 acres of habitat if the evaporation tanks and pipeline are built. May affect, but is not likely to adversely affect, the Mexican Spotted Owl and bald eagle.
Human Health	Temporary construction-related impacts and accident potential for workers. Potential worker exposure to radiological contamination during DD&D. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. During operations, worker health and safety would be improved because of improved reliability and design and less maintenance on new systems. RLWTF emissions do not have a distinguishable effect on the projected dose to the public.
Cultural Resources	Possible impact on several historic properties, including the RLWTF, potentially eligible for listing on the National Register of Historic Places. Proposed activities could require documentation or excavation to resolve adverse effects.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – Utility requirements are expected to increase but to stay within LANL utility capacity.
Waste Management	*Construction* – Up to 1,150 cubic yards of construction debris. *DD&D* – Up to 230 cubic yards of transuranic waste; 10,300 cubic yards of low-level radioactive waste; 150 cubic yards of mixed low-level radioactive waste; 1,800 cubic yards of demolition debris; and 212,000 pounds of chemical waste.
Transportation	Temporary disruption of local traffic during construction and DD&D. Transportation of construction materials and wastes and demolition wastes (some of which would be radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impact.
Facility Accidents	No or negligible impact.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality; RLWTF = Radioactive Liquid Waste Treatment Facility.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; gallons to liters, multiply by 3.7854; pounds to kilograms, multiply by 0.45359; acres to hectares, multiply by 0.40469.

Table S–10 Summary of Impacts for the Los Alamos Neutron Science Center Refurbishment Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impact. *Visual Environment* – No or negligible impact.
Geology and Soils	No or negligible impact.
Water Resources	Project implementation may result in a small increase in nonradiological cooling water discharge from increased facility usage.
Air Quality and Noise	*Air Quality* – Negligible to minor impacts during refurbishment. Operations may result in increased nonradiological air emissions from increased facility usage. *Noise* – Potential temporary increase in onsite noise levels during refurbishment.
Ecological Resources	No or negligible impact.
Human Health	Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and use of personal protective equipment. Operations impacts may increase as a result of increased accelerator usage. The maximum dose to the MEI as a result of emissions, however, would be limited to 7.5 millirem per year.
Cultural Resources	Possible impact on several historic buildings potentially eligible for listing on the National Register of Historic Places and the LANSCE accelerator building, which has been determined to be eligible. Documentation to resolve adverse effects would be required before making modifications to the accelerator building and could be required before modifications or demolition of any of the other potentially important historic structures.
Socioeconomics and Infrastructure	*Socioeconomics* – No impacts identified. *Infrastructure* – Negligible utility requirements during refurbishment. Project implementation could result in increased utility demands from increased facility usage. Peak load demand could approach current capacity but ongoing improvements to LANL's electric power infrastructure should alleviate this concern.
Waste Management	Small quantities of low-level radioactive waste, mixed low-level radioactive waste, chemical waste, and nonhazardous solid waste would be generated during refurbishment.
Transportation	No or negligible impact.
Environmental Justice	No or negligible impact.
Facility Accidents	No or negligible impact.

MEI = maximally exposed individual; LANSCE = Los Alamos Neutron Science Center.

Summary of Impacts for the Radiography Facility Project

The proposed Radiography Facility would be constructed at TA-55 to eliminate the need for transporting nuclear items to different locations at LANL during the examination process. Minor impacts from construction would be expected. Radiography operations would use engineering and administrative controls to ensure workers would not be exposed to high radiation fields. Implementation of the project would reduce the number of onsite trips for nuclear components, resulting in fewer road closures and improved traffic flow. **Table S–11** summarizes the potential impacts of the proposed TA-55 Radiography Facility Project.

Table S–11 Summary of Impacts for the Technical Area 55 Radiography Facility Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impact. *Visual Environment* – No or negligible impact.
Geology and Soils	Temporary construction-related impacts. Up to 8,000 cubic yards of soil and rock would be disturbed.
Water Resources	No or negligible impact.
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. *Noise* – Temporary construction-related impacts.
Ecological Resources	No or negligible impact.
Human Health	*Construction* – Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. *Operations* – Operations would involve high radiation fields. Worker health would be protected by facility design, radiation control procedures, and personal protective equipment.
Cultural Resources	No or negligible impact.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – No more than negligible impact on LANL utility capacity.
Waste Management	*Construction* – Up to 24 cubic yards of solid waste would be generated during construction of the new building.
Transportation	Implementation of project would reduce onsite nuclear material transport.
Environmental Justice	No or negligible impact.
Facility Accidents	Accident impacts are bounded by those analyzed for the TA-55 Plutonium Facility Complex.

TA = technical area.
Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Summary of Impacts for Plutonium Facility Complex Refurbishment Project

The TA-55 Plutonium Facility Complex Refurbishment Project would upgrade the electrical, mechanical, safety, and other selected facility systems to improve overall reliability to ensure continued operations. The project would be implemented in phases as a series of subprojects. All work would be performed inside the existing TA-55 complex. Several subprojects could have positive impacts on the environment, including replacement of the chiller, which would result in fewer emissions of ozone-depleting substances; implementation of the Steam System Subproject, which would reduce emissions of criteria pollutants; several subprojects that would improve the safety basis of the complex; and improvement in stack mixing and emissions monitoring resulting from implementation of the Stack Upgrade and Replacement Subproject. Implementation of the project would result in small amounts of radioactive and chemical waste that would be accommodated by the LANL waste management infrastructure. **Table S–12** summarizes the potential impacts for the Plutonium Facility Complex Refurbishment Project.

Table S–12 Summary of Impacts for the Plutonium Facility Complex Refurbishment Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – Temporary construction-related impacts of previously disturbed areas. *Visual Environment* – No impacts identified.
Geology and Soils	Temporary construction-related impacts.
Water Resources	No impacts identified.
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. Potential reduction in air emissions from upgrades and installation of new equipment. *Noise* – Temporary construction-related impacts confined to LANL site in and near TA-55, except for a very small potential increase in traffic noise.
Ecological Resources	No or negligible impact.
Human Health	Temporary construction-related impacts and accident potential for workers. Potential worker exposure to radiological contamination during refurbishment activities. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. No radiological risks to members of the public identified from construction or normal operations.
Cultural Resources	No or negligible impact.
Socioeconomics and Infrastructure	*Socioeconomics* – No impacts identified. *Infrastructure* – No more than negligible impact on LANL utility capacity.
Waste Management	*Construction and DD&D* – 340 cubic yards of transuranic waste; 1,300 cubic yards of low-level radioactive waste; 220 cubic yards of mixed low-level radioactive waste; 2,700 cubic yards of demolition debris; and 2,000 pounds of chemical waste.
Transportation	Transportation of construction materials and wastes and demolition wastes (some of which would be radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impact.
Facility Accidents	A number of the higher-priority subprojects involve upgrades that would substantially improve the safety basis of the Plutonium Facility Complex.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.4536.

Summary of Impacts for the Science Complex Project

The proposed Science Complex, a state-of-the-art multidisciplinary facility used for light laboratory and offices, would consist of two buildings and one supporting parking structure. The Science Complex would be constructed at one of three proposed sites: in TA-62, west of the Research Park area; in the Research Park in the northwest portion TA-3; or in the southeast portion of TA-3.

Construction of the Science Complex at the TA-62 site or the Research Park site would disturb about 5 acres (2 hectares) of undeveloped land. Each of the locations would require some modification of site infrastructure such as extending natural gas pipelines. The Research Park option would likely require rerouting of additional utilities currently located in or near the project area. **Table S–13** summarizes the potential impacts of Science Complex Project activities.

Table S–13 Summary of Impacts for the Science Complex Project

Resource Area	Impact Summary		
	Northwest TA-62 Option	***Research Park Option***	***South TA-3 Option***
Land Resources	*Land Use* – 5 acres of undeveloped land would be permanently disturbed; the land use plans for 15.6 acres would be changed. *Visual Environment* – Views from neighboring properties and roadways would be altered by construction of the proposed structures and from night lighting. Forested buffer between LANL and Los Alamos Canyon would be lost.	*Land Use* – Impacts similar to Northwest TA-62 Site. *Visual Environment* – Impacts similar to Northwest TA-62 Site.	*Land Use* – Negligible impacts identified. *Visual Environment* – No impacts identified.
Geology and Soils	Temporary construction-related impacts. Approximately 840,000 cubic yards of soil and rock would be disturbed.		
Water Resources	Temporary construction-related impacts.		
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. *Noise* – Temporary construction-related impacts. Minor increased noise levels from operation.		
Ecological Resources	Temporary construction-related impacts; loss of up to 5 acres of habitat. Under the TA-62 option, construction may affect, but is not likely to adversely affect, the Mexican spotted owl and bald eagle.		
Human Health	Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment.		
Cultural Resources	Possible impact on two archaeological sites determined to be eligible for the National Register of Historic Places. Proposed activities would require documentation to resolve adverse effects.	No impacts identified.	No impacts identified.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – Addition of a natural gas line and tie-in to sanitary sewage system would be required. No more than negligible impact on LANL utility capacity.	*Socioeconomics* – No or negligible impact. *Infrastructure* – Would likely require rerouting of many utilities currently located on the site and extension of a sewer trunk line.	*Socioeconomics* – No or negligible impact. *Infrastructure* – Addition of a natural gas line and tie-in to sanitary sewage system would be required.
Waste Management	*Construction* – Approximately 3,300 cubic yards of construction debris would be generated.		
Transportation	Once complete, impacts would include an estimated 5,790 vehicle trips on the average weekday (2,895 vehicles entering and exiting in a 24-hour period).	Impacts similar to Northwest TA-62 Site.	Impacts would be greater than those for the Northwest TA-62 site due to the site location within the planned Security Perimeter Road and higher traffic flows on Diamond Drive relative to those on West Jemez Road. Construction traffic impacts would also be greater due to travel on Diamond Drive.
Environmental Justice	No or negligible impact.		
Facility Accidents	Risk of an LCF for a Science Complex occupant from a CMR Building accident: 1 chance in 560,000 per year.	Risk of an LCF for a Science Complex occupant from a CMR Building accident: 1 chance in 240,000 per year.	Risk of an LCF for a Science Complex occupant from a CMR Building accident: 1 chance in 60,000 per year.

TA = technical area; LCF = latent cancer fatality; CMR = Chemistry and Metallurgy Research.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; acres to hectares, multiply by 0.40469.

Summary of Impacts for Remote Warehouse and Truck Inspection Station Project

The Remote Warehouse and Truck Inspection Station Project would relocate shipment receiving, warehousing, and distribution functions from TA-3 to a site in TA-72. In addition, the Truck Inspection Station would be relocated from its current location on the northwest corner of NM 4 and East Jemez Road to the new location. Impacts resulting from this project would be minor, although the proposed facilities would be constructed in a relatively undeveloped area with desirable aesthetic qualities. Some screening of the proposed facilities would be possible using selective tree cutting and strategic placement of the facilities, but the view would be permanently altered to one that is typical of a more developed area. Nearby sensitive archaeological sites and National Historic Landmarks would be protected from construction and operation activities and increased visitation by installing fencing around the perimeter of the Remote Warehouse and Truck Inspection Station. **Table S–14** summarizes the potential impacts for this project.

Table S–14 Summary of Impacts for the Remote Warehouse and Truck Inspection Station Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* –Land use designation would change from Reserve to Physical/Technical Support; 4 acres of undeveloped land would be disturbed. *Visual Environmental* – Views would change from primarily natural landscape to include developed area. Lighting could be visible from Tsankawi Unit of Bandelier National Monument.
Geology and Soils	Temporary construction-related impacts. Approximately 90,000 cubic yards of soil and rock would be disturbed during construction.
Water Resources	Temporary construction-related impacts.
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. *Noise* – Temporary construction-related impacts. Possible noticeable noise along East Jemez Road during operations.
Ecological Resources	Temporary construction-related impacts; loss of 4 acres of habitat. Construction may affect, but is not likely to adversely affect, the bald eagle.
Human Health	Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment.
Cultural Resources	Possible impact on three nearby archaeological sites potentially eligible for listing on the National Register of Historic Places and two National Historic Landmarks. Proposed activities could require documentation to resolve adverse effects. Fencing around perimeter of project site would aid in protecting these sensitive sites.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – Addition of a natural gas line and means of sanitary sewage treatment, conveyance, or disposal would be required. No more than negligible impact on LANL utility capacity.
Waste Management	Approximately 610 cubic yards of construction debris would be generated.
Transportation	Changes to geometry of East Jemez Road. Potential reduction of traffic in and around TA-3.
Environmental Justice	No or negligible impact.
Facility Accidents	No or negligible impact.

TA = technical area.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; acres to hectares, multiply by 0.40469.

Summary of Impacts for TA-18 Closure Project, Including Remaining Operations Relocation, and Structure Decontamination, Decommissioning, and Demolition

This proposed project would relocate the Security Category III and IV capabilities and materials remaining in TA-18, and would conduct DD&D of the buildings and structures at TA-18. The removal of buildings and structures at TA-18 (Pajarito Site) would provide positive local visual impacts, as would the eventual return of the area to its natural state, which would blend with other undisturbed portions of LANL. Buildings of historic importance and other cultural sites are located in TA-18. These cultural resources would be protected during DD&D activities as required. **Table S–15** summarizes the potential impacts of these activities.

Table S–15 Summary of Impacts for the Technical Area 18 Closure Project, Including Remaining Operations Relocation and Structure Decontamination, Decommissioning, and Demolition

Resource Area	*Impact Summary*
Land Resources	*Land Use* – DD&D could result in an overall change in the land use designation from Nuclear Materials Research and Development to Reserve. *Visual Environmental* – Potentially positive impact from removal of old buildings.
Geology and Soils	Temporary DD&D-related impacts.
Water Resources	DD&D would remove facilities from a floodplain, thereby enhancing protection of surface water quality.
Air Quality and Noise	*Air Quality* – Temporary DD&D-related impacts. *Noise* – Temporary DD&D-related impacts.
Ecological Resources	Temporary DD&D-related impacts. DD&D activities may affect, but are not likely to adversely affect, the Mexican spotted owl and southwestern willow flycatcher. Restoration of the site could create a more natural habitat and benefit wildlife.
Human Health	The primary source of potential impacts on workers and members of the public would be associated with the release of radiological contaminants during DD&D. Potential impacts would be much less than during past operations and would be mitigated using confinement and filtration methods.
Cultural Resources	Three archaeological resources sites found at TA-18 (a rock shelter, a cavate complex, and the Ashley Pond cabin) have been determined to be eligible for listing on the National Register of Historic Places, and there are other eligible and potentially eligible buildings within the TA. Proposed activities would require documentation to resolve adverse effects, and these buildings would be protected during DD&D activities as required. Several historic properties at TA-18 have been identified for permanent retention, including the Pond Cabin, the Slotin Accident Building (TA-18-1), and other properties that represent the history of the TA and LANL.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – No or negligible impact.
Waste Management	Waste generated from the disposition of the buildings and structures is estimated to be 4,700 cubic yards of low-level radioactive waste; 5 cubic yards of mixed low-level radioactive waste; 17,000 cubic yards of demolition debris; and 75,000 pounds of chemical waste.
Transportation	Transportation of wastes would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impact.
Facility Accidents	No or negligible impact.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359.

Summary of Impacts for the TA-21 Structure Decontamination, Decommissioning, and Demolition Project

All or a portion of the buildings and structures at TA-21 would undergo DD&D under this project. Two options are proposed: the Complete DD&D Option would remove essentially all

structures within TA-21; the Compliance Support Option would remove only those structures necessary to support remediation activities.

Onsite and offsite visual impacts would be improved by removal of some or all of the buildings and structures at TA-21. DD&D activities would affect buildings and structures potentially eligible for listing on the National Register of Historic Places, so documentation to resolve adverse effects could be required. Implementation of this project at the same time that TA-21 MDA remediation is underway would result in local traffic impacts along DP Road and in the Los Alamos townsite. **Table S–16** summarizes the potential impacts of these activities.

Table S–16 Summary of Impacts for Technical Area 21 Structure Decontamination, Decommissioning, and Demolition Project

Resource Area	*Impact Summary*	
	Complete DD&D Option	***Compliance Support Option***
Land Resources	*Land Use* – The remainder of the western portion of the area would be available for conveyance to Los Alamos County. The eastern part of the TA would remain a part of LANL for the foreseeable future. *Visual Resources* – Temporary DD&D-related impacts. Long-term impacts would be positive with the removal of old industrial buildings.	*Land Use* – Currently unconveyed portions of TA-21 would remain under control of DOE. Land use designations would remain unchanged. *Visual Environment* – Temporary construction- and DD&D-related impacts. Over the long-term, the view of the TA from NM 502 and from higher elevations to the west would still include portions of the current mix of 50-year-old structures.
Geology and Soils	Temporary DD&D-related impacts.	Temporary DD&D-related impacts.
Water Resources	Improvement in overall water resources from discontinuing processes and associated water use and eliminating two outfalls.	Little or no impact on water resources.
Air Quality and Noise	*Air Quality* – Temporary DD&D impacts. Operational emissions would be relocated or cease. *Noise* – Temporary DD&D-related impacts.	*Air Quality* – Nonradioactive air pollutant emissions from the three natural gas-fired boilers in Building 21-0357 and the vehicle exhaust and emissions from activities in the maintenance facilities would remain. *Noise* – Temporary DD&D-related impacts.
Ecological Resources	Temporary DD&D-related impacts. Activities may affect, but are not likely to adversely affect, the Mexican spotted owl.	
Human Health	East Gate MEI would receive 2×10^{-4} millirem over the life of the project.	
Cultural Resources	DD&D of buildings and structures at TA-21 would have direct effects on 15 NRHP-eligible historic buildings and structures (and 1 potentially eligible building) associated with the Manhattan Project and Cold War years at LANL.	
Socioeconomics and Infrastructure	*Socioeconomics* – Temporary modest increase in employment due to DD&D activities. *Infrastructure* – No or negligible impact.	
Waste Management	DD&D would generate 1 cubic yard of transuranic waste; 34,000 cubic yards of low-level radioactive waste, 65 cubic yards of mixed low-level radioactive waste; 47,000 cubic yards solid waste; and 420,000 pounds of chemical waste.	The volume of solid waste and debris generated under this Option would be about 29,000 cubic yards less than that under the Complete DD&D Option.
Transportation	Transportation of construction materials and wastes and demolition wastes (some radioactive) would not be expected to result in any fatalities or excess LCFs. Local traffic impacts associated with DD&D activities would be exacerbated by MDA remediation occurring at the same time.	
Environmental Justice	No or negligible impact.	
Facility Accidents	No or negligible impact.	

TA = technical area; DD&D = decontamination, decommissioning, and demolition; MEI = maximally exposed individual; NRHP = National Register for Historic Places; LCF = latent cancer fatality; MDA = material disposal area.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359.

Summary of Impacts for Waste Management Facilities Transition Project

This project involves DD&D of certain aboveground facilities in TA-54, Areas G and L, to facilitate closure of those areas; construction of additional waste management facilities; removal of waste stored underground in pits and shafts in Area G; and preparation and shipment of this waste for disposal. New waste management facilities would include a retrieval facility to assist in removal of high-activity remote-handled transuranic waste from certain shafts, new low-level radioactive waste facilities in TA-54, and a new TRU Waste Facility in the Pajarito Road Corridor to store and process transuranic waste.

The waste storage domes in Area G would be removed as part of this project, which would have a beneficial impact on both near and distant views. Because these domes are visible from the lands of the Pueblo of San Ildefonso, their removal would improve the views from that vantage point. Construction at TA-54 may affect, but is not likely to adversely affect, the southwestern willow flycatcher. Construction of the TRU Waste Facility, which could require up to 7 acres (2.8 hectares), could occur within Mexican spotted owl Areas of Environment Interest which would require consultation with the U.S. Fish and Wildlife Service. (The location of the TRU Waste Facility has not been finalized, so land resource, ecological, and cultural resource impacts could vary.) Eventual removal of stored wastes in Area G would reduce the dose to the facility-specific MEI. Worker doses could also decrease after 2015, once waste management activities in Area G are completed. **Table S–17** summarizes the potential impacts of these activities.

Summary of Impacts for Major Material Disposal Area Remediation, Canyon Cleanups, and Other Consent Order Actions[11]

The environmental impacts that could result from implementation of the Consent Order depend on decisions yet to be made by the New Mexico Environment Department. To bound the range of possible consequences of implementing different corrective measures, two action options have been evaluated: (1) a Capping Option, in which specific MDAs are stabilized in-place, and (2) a Removal Option, in which the waste and contamination within the MDAs are removed. These options are for analytical purposes only and do not necessarily represent the corrective measures that NNSA would propose to the New Mexico Environment Department. Remediation of other potential release sites would also occur at LANL. The impacts of remediating other potential release sites would be small relative to those for MDA remediation.

The Removal Option would result in larger near-term impacts than the Capping Option. Both options would involve major ground-disturbing activities that would require use of heavy equipment and hauling of materials and wastes. Temporary construction impacts such as increases in noise levels and emissions of criteria pollutants and particulate matter would be expected. Because these activities would be widespread and would continue over a number of years, MDA remediation activities would have a larger impact than other proposed projects. Under the Removal Option, large quantities of wastes would be generated including low-level radioactive waste and transuranic waste buried at LANL before 1970. Onsite disposal capacity

[11] *NNSA is including impacts associated with Consent Order implementation in the SWEIS in order to more fully analyze the impacts resulting from Consent Order compliance. NNSA intends to implement actions necessary to comply with the Consent Order regardless of decisions it makes on other actions analyzed in the SWEIS.*

Table S–17 Summary of Impacts for the Waste Management Facilities Transition Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – Temporary construction-related impacts. The TRU Waste Facility could require up to 7 acres of undeveloped land and could result in a change in land use designation, depending on its location. *Visual Environment* – Positive impact due to removal of the domes in TA-54. The TRU Waste Facility could be visible from San Ildefonso Pueblo lands, depending on its location.
Geology and Soils	Temporary construction- and DD&D-related impacts would occur in previously disturbed areas; impacts would be minor. Up to 169,000 cubic yards of soil and rock would be disturbed.
Water Resources	Minor impacts to surface water and groundwater. New facilities would use mitigative techniques to minimize impacts of spills.
Air Quality and Noise	*Air Quality* – Temporary construction impacts. Operational emissions would be mitigated using engineering controls, such as filtration systems, and monitored. Emissions from new facilities would not exceed those currently measured at the Decontamination and Volume Reduction System. Point source and area emissions in Area G would decrease by the end of 2015. *Noise* – Temporary construction-related impacts.
Ecological Resources	Temporary construction-related impacts at TA-54 may affect, but is not likely to adversely affect, the southwestern willow flycatcher. Construction of the TRU Waste Facility could disturb up to 7 acres of ponderosa pine forest and open field. Consultation with the U.S. Fish and Wildlife Service could be required since construction could take place within Mexican spotted owl Areas of Environmental Interest.
Human Health	Minimal radiological impacts to offsite population. Reduced impacts to the MEI. Removal of transuranic waste would reduce area sources of occupational radiological exposure in Area G, potentially decreasing worker exposures after 2015.
Cultural Resources	Removal of the domes at TA-54 would reduce visual impacts on nearby traditional cultural properties. Potential impact to cultural resources could occur from construction of the TRU Waste Facility, depending on its location.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – Infrastructure demands would not exceed current LANL site capabilities.
Waste Management	Construction waste would include 500 cubic yards of construction debris. DD&D waste would include 30,000 cubic yards of low-level radioactive waste; 8 cubic yards of mixed low-level radioactive waste; 54,000 cubic yards of solid waste including demolition debris; and 566,000 pounds of chemical waste.
Transportation	Transportation of construction materials and wastes and demolition wastes (some radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impact.
Facility Accidents	The postulated facility accident having the highest impacts would result in an LCF risk of 1 in 900 for a noninvolved worker, 1 in 12,000 for the MEI, and 1 in 500 to the exposed population.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; MEI = maximally exposed individual; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359; acres to hectares, multiply by 0.40469.

for low-level radioactive wastes may be sufficient, depending on the actual volumes generated by remediation; disposal capacity can be supplemented by offsite facilities if needed. WIPP's disposal capacity is expected to be sufficient for disposal of all retrievably stored waste and all newly generated transuranic waste from the DOE complex over the next few decades, but not sufficient for this waste plus all transuranic waste buried before 1970 across the DOE complex (63 FR 3624). Decisions about disposal of transuranic waste from full removal of LANL MDAs, if generated, would be based on the needs of the entire DOE complex. Any transuranic waste generated at LANL without a disposal pathway would be safely stored until disposal capacity becomes available.

The Removal Option would result in over 100,000 shipments of radioactive and nonradioactive wastes that could require transportation to offsite disposal facilities. These shipments could lead to two to three traffic fatalities over a 10-year period from nonradiological (truck collision) accidents. In addition, both the Capping or Removal Option would require the use of large quantities of soil, rock, and other bulk materials that would be obtained from LANL or local sources including the borrow pit in TA-61. Transporting this material to the MDAs could increase traffic congestion on LANL and local roads. Acquisition of large quantities of material from the TA-61 borrow pit could result in local visual impacts and some elimination of wildlife habitat.

Operational accidents postulated for the Removal Option could result in radiological or chemical exposures and risks to noninvolved workers, the MEI, and the population within a 50-mile (80-kilometer) radius. Although sulfur dioxide is not known to be present in MDA B, an accident was postulated in which a quantity of the gas would be released. This postulated accident could result in concentrations of sulfur dioxide in excess of the Emergency Response Planning Guideline (ERPG)-3 out to 111 feet (34 meters). The MDA B MEI distance is 148 feet (45 meters). The ERPG-2 distance would be approximately 270 feet (80 meters). **Table S–18** summarizes the potential impacts of the options for remediation, cleanup, and Consent Order actions.

Table S–18 Summary of Impacts for Major Material Disposal Area Remediation, Canyon Cleanups, and Other Consent Order Actions

Resource Area	*Capping Option*	*Removal Option*
Land Resources	*Land Use* – Temporary commitment of land may be required to support remediation. Future use of the MDAs would remain restricted because capping would stabilize rather than remove existing contamination. *Visual Environment* – Temporary adverse impacts would result from capping activities. Borrow pit in TA-61 would become more visible.	*Land Use* – Temporary commitment of land may be required to support remediation. Decontamination would provide expanded opportunities for future use of some lands. *Visual Environment* – Temporary adverse impacts would result from removal activities. Borrow pit in TA-61 would become more visible.
Geology and Soils	Up to 2.5 million cubic yards of soil and rock would be required for capping; most material would be available from LANL sources. Covers for the MDAs would be contoured and provided with run-on and run-off control measures. Contamination within the subsurface of the MDAs and in the immediate vicinities would be fixed in-place except for contaminated gases or vapors.	Up to 2.2 million cubic yards of soil and rock would be required for fill and cover material; most would be available from LANL sources. Complete removal of the MDAs would eliminate the susceptibility of buried materials to erosional or other geological processes. Existing soil contamination in the vicinity of the MDAs would be greatly reduced, and contaminated soil or gas would be largely eliminated.
Water Resources	Few, if any impacts to surface water or groundwater from site investigations. Final MDA covers would minimize surface water run-on, runoff, erosion, and could protect surface and groundwater resources.	Few, if any, impacts to surface or groundwater from site investigations. There would be much less contamination in soils and sediments that could present a risk to water quality.
Air Quality and Noise	*Air Quality* – Minor to moderate impacts from releases of airborne pollutants caused by heavy equipment used in remediation and trucks hauling materials. Increased potential for particulate matter release from TA-61 borrow pit. *Noise* – Minor to moderate increase in traffic noise associated with remediation.	*Air Quality* – Larger releases of airborne pollutants than Capping Option from additional vehicles and heavy equipment. Comparable particulate matter release. The potential for long-term release of volatile organic compounds from the MDAs would be greatly reduced, if not eliminated. *Noise* – Temporary increase in noise in vicinity of remediation. Minor to moderate increase in traffic noise associated with remediation.

Resource Area	*Capping Option*	*Removal Option*
Ecological Resources	Temporary localized, construction-type impacts during site investigations and remediation. In a few cases, remediation activities may affect, but are not likely to adversely affect, the Mexican spotted owl, bald eagle, and southwestern willow flycatcher. Possible loss of habitat at the TA-61 borrow pit, including undeveloped buffer and core habitat for the Mexican spotted owl. Expansion of the borrow pit would require consultation with the U.S. Fish and Wildlife Service.	
Human Health	Radiological and nonradiological risks to workers would be minor. There would be no risk to the public during MDA capping, while future risks would be reduced.	Radiological and nonradiological risks to workers would be increased. There would be small risk to the public during MDA removal, while future risks would be greatly reduced.
Cultural Resources	No archaeological resources are located within any of the MDAs. Few or no risks to cultural resources at potential release sites. All work would be coordinated with LANL personnel responsible for preservation of cultural resources.	
Socioeconomics and Infrastructure	*Socioeconomics* – Marginal increases in employment, personal income, and other economic measures. *Infrastructure* – Marginal increases in utility usage.	*Socioeconomics* –Increases anticipated in employment, personal income, and other economic measures. *Infrastructure* – Increases in utility infrastructure demands.
Waste Management	280 cubic yards of transuranic waste; 20,000 cubic yards of low-level radioactive waste; 1,800 cubic yards of mixed low-level radioactive waste; 47,000 cubic yards of solid waste; and 50 million pounds of chemical waste. Sufficient capacity would exist at LANL to dispose of the low-level radioactive waste.	22,000 cubic yards of transuranic waste; 1,000,000 cubic yards of low-level radioactive waste; 180,000 cubic yards of mixed low-level radioactive waste; 130,000 cubic yards of solid waste; and 97 million pounds of chemical waste. This volume of low-level radioactive waste may require use of some offsite disposal capacity.
Transportation	Increase in shipments of waste and bulk materials on onsite and offsite roads would not be expected to result in any LCFs among workers or the public from radiation exposure during waste transport, nor traffic fatalities from accidents.	Large increase in shipments of waste and bulk materials on onsite and offsite roads would not be expected to result in any LCFs among workers or the public from radiation exposure during waste transport, but could result in traffic fatalities.
Environmental Justice	No disproportionately high and adverse impacts on minority or low-income populations.	
Facility Accidents	Low risks of accidents involving radioactive or hazardous materials.	Postulated facility accident with the highest radiological impacts would result in an LCF risk of 1 in 210 for a noninvolved worker; 1 in 1,500 for the MEI; and 1 in 220 for the population within a 50-mile radius. Postulated facility accident with the highest chemical impacts would result in concentrations of sulfur dioxide exceeding ERPG-3 out to 111 feet; ERPG-2 out to 270 feet.

MDA = material disposal area; TA = technical area; LCF = latent cancer fatality; MEI = maximally exposed individual; ERPG = Emergency Response Planning Guideline.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; feet to meters, multiply by 0.3048; miles to kilometers, multiply by 1.6093; pounds to kilograms, multiply by 0.45359.

Summary of Impacts for Security-Driven Transportation Modifications Project

This proposed project would restrict privately owned vehicles (according to their security level) along portions of the Pajarito Corridor West between TA-48 and TA-63. The project would involve constructing new roadways, parking lots, pedestrian and vehicle bridges across Ten Site Canyon, and security check points. Auxiliary actions are also being considered that would construct bridges across Mortandad and Sandia Canyons. **Table S–19** summarizes the potential impacts of these activities.

Table S–19 Summary of Impacts for the Security-Driven Transportation Modifications Project

Resource Area	Impact Summary	
	Proposed Action	**Auxiliary Actions**
Land Resources	*Land Use* – Development of portions of the Pajarito Corridor West would be within current land use plans. *Visual Environment* – Temporary construction impacts. Permanent, pronounced changes to views from parking lots and pedestrian and vehicle bridges across Ten Site Canyon.	*Land Use* – The route for Auxiliary Action A would represent a change in land use but would be within the scope of the LANL Comprehensive Site Plan. The route for Auxiliary Action B would be partially within current land use plans. *Visual Environment* – Permanent, pronounced changes to views from proposed bridges over Mortandad and Sandia Canyons.
Geology and Soils	Temporary construction-related impacts. Approximately 238,000 cubic yards of soil and rock would be disturbed during construction. Up to 26,000 cubic yards of soil and rock would be disturbed if both auxiliary actions are implemented.	
Water Resources	Temporary construction-related impacts.	
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. Minor increase in vehicle emissions during operation. *Noise* – Temporary construction-related impacts. Minor increase in traffic noise in vicinity of new roads and bus routes during operation.	*Air Quality* – Temporary construction-related impacts. Minor increase in vehicle emissions during operation. *Noise* – Temporary construction-related impacts. Minor increase in traffic noise in vicinity of new roads and bus routes during operation.
Ecological Resources	Temporary construction-related impacts. Up to 30 acres of habitat loss from parking lot and bridge construction. Construction of a span bridge across Ten Site Canyon would be unlikely to cause adverse affects to the Mexican spotted owl.	Temporary construction-related impacts. Proposed Auxiliary Action A construction falls within Areas of Environmental Interest core and buffer zones for the Mexican spotted owl and would disturb up to 25.4 acres of habitat. Proposed Auxiliary Action B construction falls within the Area of Environmental Interest buffer zone for the Mexican spotted owl, and would disturb 67.1 acres of habitat. Potentially adverse impacts on owls from traffic noise and light. Implementation of either Auxiliary Action would necessitate consultation with the U.S. Fish and Wildlife Service.
Human Health	No or negligible impact.	
Cultural Resources	Proposed bridges could adversely affect views of Ten Site Canyon from nearby Traditional Cultural Properties.	Further detailed analysis would be required once the exact bridge locations are determined to ensure protection of prehistoric and historic sites located to the east and west of the proposed bridge corridor. Proposed bridges could adversely affect views of Mortandad and Sandia Canyons from nearby Traditional Cultural Properties.
Socioeconomics and Infrastructure	*Socioeconomics* – No impacts identified. *Infrastructure* – Temporary construction-related impacts. Some existing utilities might require relocation or rerouting.	
Waste Management	Approximately 1,260 cubic yards of construction debris.	Approximately 160 cubic yards under Auxiliary Action A, and 110 cubic yards under Auxiliary Action B, of construction debris.
Transportation	Some temporary and intermittent disruption of traffic during construction of new roads and bridges. Traffic patterns would be permanently altered, but impacts would be minor.	
Environmental Justice	No or negligible impact.	

Note: To convert cubic yards to cubic meters, multiply by 0.76456; acres to hectares, multiply by 0.40469.

The most consequential impacts from implementing this project would be on the visual environment and the Mexican spotted owl. The removal of open and forested land under the Proposed Action would add to the overall developed appearance of the Pajarito Corridor West as viewed from nearby and higher elevations to the west. The construction of both vehicle and pedestrian bridges across Ten Site Canyon under the Proposed Action, and Mortandad and Sandia Canyons under the auxiliary actions, would be major changes to the landscape. While careful site selection and bridge design would help mitigate visual impacts, the bridges would nevertheless alter the natural appearance of the canyons as viewed from both nearby and distant locations. The proposed bridges could adversely affect views of the three canyons from nearby traditional cultural properties. Bridges constructed across Mortandad and Sandia Canyons would pass through Areas of Environmental Interest for the Mexican spotted owl. Habitat would be lost as a result of the proposed and auxiliary actions, and the light and noise from traffic could create adverse effects. The U.S. Fish and Wildlife Service has determined that, provided reasonable and prudent measures are taken, construction of a span bridge over Ten Site Canyon would be unlikely to cause adverse affects to the Mexican spotted owl. Additional consultation with the U.S. Fish and Wildlife Service would be needed for the proposed action if a land rather than span bridge was to be used, and for the auxiliary actions once the exact locations and designs of the optional bridges over Mortandad and Sandia Canyons are better known.

Summary of Impacts for Nicholas C. Metropolis Center for Modeling and Simulation Increase in Level of Operations

This project would expand the computing capabilities of the Metropolis Center to support a 100-teraflops capability at a minimum, and could approach 1,000 teraflops (1 petaflops). This action would add mechanical and electrical equipment, including chillers, cooling towers, and air-conditioning units. **Table S–20** summarizes the potential impacts of these activities.

Table S–20 Summary of Impacts for Nicholas C. Metropolis Center for Modeling and Simulation Increase in Level of Operations

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impact. *Visual Environment* – No or negligible impact.
Geology and Soils	No or negligible impact.
Water Resources	Discussed in infrastructure.
Air Quality and Noise	No or negligible impact.
Ecological Resources	No or negligible impact.
Human Health	No or negligible impact.
Cultural Resources	No or negligible impact.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – Water usage would expand to 51 million gallons per year, which would not exceed available water supply capacities. Electrical demand would increase to 15 megawatts, which would not exceed available electrical supply capacities.
Waste Management	No or negligible impact.
Transportation	No or negligible impact
Environmental Justice	No or negligible impact.
Facility Accidents	No or negligible impact.

Note: To convert gallons to liters, multiply by 3.7854.

The level to which operations could increase would be limited by the amount of electricity (15 megawatts) and water (51 million gallons [193 million liters] per year) needed to support the increased capabilities. Because each new generation of computing machinery continues to be designed with increased computational speed and enhanced efficiency in cooling water and electrical requirements, it is anticipated that higher computing capabilities could be achieved within these limitations. Planned improvements to the Sanitary Effluent Recycling Facility should increase its effectiveness in supplying the Metropolis Center with cooling water. Accordingly, the Metropolis Center's reliance on groundwater is expected to diminish substantially.

Summary of Impacts for Increase in Type and Quantity of Sealed Sources Managed at LANL by the Off-Site Source Recovery Project

This proposed project would expand the types and quantities of sealed sources that could be managed at LANL by the Off-Site Source Recovery Project. The proposed project would continue the current approach of providing safe storage of sealed sources at LANL when other reasonable options for disposition, such as reuse or commercial disposal, are not available. The only impacts resulting from these activities would result from exposure to the radioactive sources during normal operations and postulated accidents. Under normal conditions, the sealed sources would be completely contained and would contribute only to external radiation exposure. Proper shielding and radiation control procedures would minimize worker exposure. Noninvolved workers and the public would not be expected to receive any measurable dose during normal operations.

For purposes of analysis, potential bounding accident scenarios were assessed for an aircraft crash with fire at Area G at TA-54, as well as a seismic event with fire at Wing 9 of the Chemistry and Metallurgy Research Building. Consequences of the Wing 9 event also were calculated for a release emanating from TA-48 because the Radiological Sciences Institute that would be built in TA-48 would provide a replacement for the Chemistry and Metallurgy Research Building Wing 9 hot cell. The highest LCF risk to the population would result from an accident at Wing 9 of the Chemistry and Metallurgy Research Building with consequences calculated at TA-3. Taking into consideration the frequency, this postulated accident could result in an increase in LCF risk of approximately 1 chance in 6 million for the noninvolved worker, 1 chance in 70 million for the MEI, and 1 chance in 600 for the population within a 50-mile (80-kilometer) radius.

Potential mitigation measures could include placing sealed sources at locations where they would not be susceptible to damage from an aircraft crash, fire, or seismic event (kept underground); or instituting lower limits for maximum allowable source radioisotope activity in shipping containers, the TA-54 dome, and Wing 9 of the Chemistry and Metallurgy Research Building. **Table S–21** summarizes the potential impacts from increasing the scope of the Off-Site Source Recovery Project at LANL.

Table S–21 Summary of Impacts for Increase in Type and Quantity of Sealed Sources Managed at Los Alamos National Laboratory by the Off-Site Source Recovery Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impact. *Visual Environment* – No or negligible impact.
Geology and Soils	No or negligible impact.
Water Resources	No or negligible impact.
Air Quality and Noise	*Air Quality* – No or negligible impact. *Noise* – Temporary construction-related impacts from construction and burial activities.
Ecological Resources	No or negligible impact.
Human Health	Involved worker doses would be maintained below their regulatory and administrative limits through use of shielding, safe work practices, procedures, and personal protective equipment. Noninvolved workers and the public would not be expected to receive any measurable doses during normal operations.
Cultural Resources	No or negligible impact.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impact. *Infrastructure* – No impacts identified.
Waste Management	No impacts identified.
Transportation	No or negligible impact.
Environmental Justice	No or negligible impact.
Facility Accidents	Postulated accidents could result in an increase in LCF risk to the noninvolved worker, the MEI, and population within a 50-mile radius. Highest LCF risk to population would be from a CMR Building Wing 9 accident.

LCF = latent cancer fatality; MEI = maximally exposed individual; CMR = Chemistry and Metallurgy Research.
Note: To convert miles to kilometers, multiply by 1.6093.

S.10 References

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S.11 Glossary

actinide—Any member of the group of elements with atomic numbers from 89 (actinium) to 103 (lawrencium) including uranium and plutonium. All members of this group are radioactive.

activation products—Nuclei, usually radioactive, formed by the bombardment and absorption in material with neutrons, protons, or other nuclear particles.

alluvium (alluvial)—Unconsolidated, poorly sorted detrital sediments, ranging from clay-to-gravel sizes, deposited by streams.

as low as reasonably achievable (ALARA)—An approach to radiation protection to manage and control worker and public exposures (both individual and collective) and releases of radioactive material to the environment to as far below applicable limits as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit but a process for minimizing doses to as far below limits as is practicable.

Atomic Energy Act—A law originally enacted in 1946 and replaced in 1954 that placed nuclear production and control of nuclear materials within a civilian agency, originally the Atomic Energy Commission. The functions of the Atomic Energy Commission were replaced by the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy.

baseline—The existing environmental conditions against which impacts of the Proposed Action and its alternatives can be compared. The environmental baseline is the site environmental conditions as they exist or are estimated to exist in the absence of the Proposed Action.

bedrock—The solid rock that lies beneath soil and other loose surface materials.

best management practices—Structural, nonstructural, and managerial techniques, other than effluent limitations, to prevent or reduce pollution of surface water. They are the most effective and practical means to control pollutants that are compatible with the productive use of the resource to which they are applied. Best Management Practices are used in both urban and agricultural areas. Best Management Practices can include schedules of activities; prohibitions of practices; maintenance procedures; treatment requirements; operating procedures; and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

borrow—Excavated material that has been taken from one area to be used as raw material or fill at another location.

bound—To use simplifying assumptions and analytical methods in analyzing potential impacts or risks such that the result provides an overestimate or upper limit that encompasses the potential impacts or risks.

capable fault—A fault that has exhibited one or more of the following characteristics: (1) movement at or near the ground surface at least once within the past 35,000 years, or movement of a recurring nature within the past 500,000 years; (2) macro-seismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault; (3) a structural relationship to a capable fault according to characteristic (1) or (2) above, such that movement on one could be reasonably expected to be accompanied by movement on the other.

carcinogen—An agent that may cause cancer. Ionizing radiation is a physical carcinogen; there are also chemical and biological carcinogens, and biological carcinogens may be external (such as viruses) or internal (such as genetic defects).

cavate—Consists of a room carved into a cliff face within the Bandelier Tuff geological formation. The category includes isolated cavates, multi-roomed contiguous cavates, and groups of adjacent cavates that together form a cluster or complex.

chemical wastes—Defined as hazardous waste (designated under the Resource Conservation and Recovery Act regulations); toxic waste (asbestos and polychlorinated biphenyls [PCBs], designated under the Toxic Substances Control Act); and special waste (designated under the New Mexico Solid Waste Regulations and including industrial waste, infectious waste, and petroleum contaminated soils). In the past, LANL tracking efforts for chemical waste included construction and demolition debris and all other non-radioactive waste that managed through the Solid Chemical and Radioactive Waste Facilities. For waste projections in the SWEIS, construction and demolition debris are presented as a separate categories.

classified information—(1) Information that has been determined pursuant to Executive Order 12958, any successor order, or the Atomic Energy Act of 1954 (42 U.S.C. 2011) to require protection against unauthorized disclosure; (2) certain information requiring protection against unauthorized disclosure in the interest of national defense and security or foreign relations of the United States pursuant to Federal statute or Executive Order.

***Code of Federal Regulations* (CFR)**—All Federal regulations in effect are published in codified form in the CFR. References to the CFR usually take the form of XX CFR Part YY, where XX refers to Title (major division) and YY refers to Part (section).

collective dose—The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem or person-sievert.

Compliance Order on Consent (Consent Order)—An enforcement document signed by the New Mexico Environment Department, the U.S. Department of Energy, and the Regents of the University of California on March 1, 2005, which prescribes the requirements for corrective action at Los Alamos National Laboratory. The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, the facility; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, the facility; and (3) to implement such corrective measures. The Consent Order supersedes the corrective action requirements previously specified in Module VIII of the LANL Hazardous Waste Facility Permit.

criteria pollutants—An air pollutant that is regulated by National Ambient Air Quality Standards. The U.S. Environmental Protection Agency must describe the characteristics and potential health and welfare effects that form the basis for setting, or revising, the standard for each regulated pollutant. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter, less than or equal to 10 micrometers (0.0004 inch) in diameter, and less than or equal to 2.5 micrometers (0.0001 inch) in diameter. New pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available. (See National Ambient Air Quality Standards.)

criticality—The condition in which a system is capable of sustaining a nuclear chain reaction.

cultural resources—Archaeological materials (artifacts) and sites that date to the prehistoric, historic, and ethnohistoric periods and that are currently located on the ground surface or buried beneath it; standing structures and/or their component parts that are over 50 years of age and are important because they represent a major historical theme or era, including the Manhattan Project and the Cold War era and structures that have an important technological, architectural, or local significance; cultural and natural places, select natural resources, and sacred objects that have importance for American Indians; American folklife traditions and arts; “historic properties” as defined in the National Historic Preservation Act; “archaeological resource” as defined in the Archaeological Resources Protection Act; and “cultural items” as defined in the Native American Graves Protection and Repatriation Act.

cumulative impacts—The impacts on the environment that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person who undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

curie—A unit of radioactivity equal to 37 billion disintegrations per second (37 billion becquerels); also a quantity of any radionuclide or mixture of radionuclides having 1 curie of radioactivity.

deactivation—The placement of a facility in a radiologically and industrially safe shutdown condition that is suitable for a long-term surveillance and maintenance phase prior to final decontamination and decommissioning.

decommissioning—Retirement of a facility, including any necessary decontamination and dismantlement.

decontamination—The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination, from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

decontamination, decommissioning, and demolition (DD&D)—Actions taken at the end of the useful life of a building or structure to reduce or remove substances that pose a substantial hazard to human health or the environment, retire it from service, and ultimately eliminate all or a portion of the structure.

depleted uranium—Uranium whose content of the fissile isotope uranium-235 is less than the 0.7 percent (by weight) found in natural uranium, so that it contains more uranium-238 than natural uranium. (See enriched uranium, highly enriched uranium, natural uranium, low-enriched uranium, and uranium.)

dose (radiological)—A generic term meaning absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or committed equivalent dose. It is a measure of the energy imparted to matter by ionizing radiation. The unit of dose is the rem or rad. The radiation dose delivered per unit of time (such as rem per year) is the dose rate.

drinking water standards—The level of constituents or characteristics in a drinking water supply specified in regulations under the Safe Drinking Water Act as the maximum permissible.

effluent—A waste stream flowing into the surface water, groundwater, or soil. Most frequently the term applies to wastes discharged to surface waters.

emission—A material discharged into the atmosphere from a source operation or activity.

endangered species—Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). The lists of endangered species can be found in 50 CFR 17.11 for wildlife, 50 CFR 17.12 for plants, and 50 CFR 222.23(a) for marine organisms. (See threatened species.)

enriched uranium—Uranium whose content of the fissile isotope uranium-235 is greater than the 0.7 percent (by weight) found in natural uranium. (See depleted uranium, uranium, natural uranium, low-enriched uranium, and highly enriched uranium.)

environmental impact statement (EIS)—The detailed written statement required by the National Environmental Policy Act (NEPA) section 102(2)(C) for a proposed major Federal action significantly affecting the quality of the human environment. A U.S. Department of Energy (DOE) EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality National Environmental Policy Act regulations in 40 CFR Parts 1500 to 1508 and DOE NEPA regulations in 10 CFR Part 1021. The statement includes, among other information, discussions of the environmental impacts of the Proposed Action and all reasonable alternatives, adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources.

environmental justice—The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies. Executive Order 12898 directs Federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations. (See minority population and low-income population.)

fault—A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred. A normal fault occurs when the hanging wall has been depressed in relation to the footwall. A reverse fault occurs when the hanging wall has been raised in relation to the footwall.

fission—The splitting of the nucleus of a heavy atom into two lighter nuclei. It is accompanied by the release of neutrons, gamma rays, and kinetic energy of fission products.

fission products—Nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragments' radioactive decay.

grading—Any stripping, cutting, filling, stockpiling, or combination thereof that modifies the land surface.

groundwater—Water below the ground surface in a zone of saturation.

habitat—The environment occupied by individuals of a particular species, population, or community.

hazardous air pollutants—Air pollutants not covered by ambient air quality standards but which may present a threat of adverse human health effects or adverse environmental effects. Those specifically listed in 40 CFR 61.01 are asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. More broadly, hazardous air pollutants are any of the 189 pollutants listed in or pursuant to the Clean Air Act, Section 112(b). Very generally, hazardous air pollutants are any air pollutants that may realistically be expected to pose a threat to human health or welfare.

hazardous chemical—Under 29 CFR Part 1910, Subpart Z, hazardous chemicals are defined as "any chemical which is a physical hazard or a health hazard." Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed employees. Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

hazardous material—A material, including a hazardous substance, as defined by 49 CFR 171.8, that poses a risk to health, safety, and property when transported or handled.

hazardous waste—A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20-24 (ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.31-33.

high-efficiency particulate air (HEPA) filter—An air filter capable of removing at least 99.97 percent of particles 0.3 micrometers (about 0.00001 inches) in diameter. High-efficiency particulate air filters include a pleated fibrous medium (typically fiberglass) capable of capturing very small particles.

historic structure—A building or other structure constructed after AD 1593 (but most typically in the Los Alamos area constructed after about AD 1900).

hot cell—A shielded facility that requires the use of remote manipulators for handling radioactive materials.

isotope—Any of two or more variations of an element in which the nuclei have the same number of protons (and thus the same atomic number), but different numbers of neutrons so that their atomic masses differ. Isotopes of a single element possess almost identical chemical properties, but often different physical properties (for example, carbon-12 and -13 are stable; carbon-14 is radioactive).

latent cancer fatalities (LCFs)—Deaths from cancer occurring some time after, and postulated to be due to, exposure to ionizing radiation or other carcinogens.

long-term impact—In general, an impact that endures beyond the timeframe of the action or activity that causes the impact.

low-income population—Low-income populations, defined in terms of Bureau of the Census annual statistical poverty levels (Current Population Reports, Series P-60 on Income and Poverty), may consist of groups or individuals who live in geographic proximity to one another or who are geographically dispersed or transient (such as migrant workers or American Indians), where either group experiences common conditions of environmental exposure or effect. (See environmental justice and minority population.)

low-level radioactive waste—Waste that contains radioactivity but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or byproduct material as defined by Section 11e (2) of the Atomic Energy Act of 1954, as amended. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level radioactive waste, provided the concentration of transuranic waste is less than 100 nanocuries per gram.

material disposal area (MDA)—An area used any time between the beginning of Los Alamos National Laboratory operations in the early 1940s and the present for disposing of chemically, radioactively, or chemically and radioactively contaminated materials.

maximally exposed individual (MEI)—A hypothetical individual whose location and habits result in the highest total radiological or chemical exposure (and thus dose) from a particular source for all exposure routes (inhalation, ingestion, direct exposure).

maximally exposed individual (transportation analysis)—A hypothetical individual receiving radiation doses from transporting radioactive materials on the road. For the incident-free transport operation, the maximally exposed individual would be an individual stuck in traffic next to the shipment for 30 minutes. For accident conditions, the maximally exposed individual is assumed to be an individual located approximately 33 meters (100 feet) directly downwind from the accident.

millirem—One-thousandth of 1 rem. (See rem.)

minority population—Minority populations exist where either: (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than in the general population or other appropriate unit of geographic analysis (such as a governing body's jurisdiction, a neighborhood, census tract, or other similar unit). "Minority" refers to individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. "Minority populations" include either a single minority group or the total of all minority persons in the affected area. They may consist of groups of individuals living in geographic proximity to one another or a geographically dispersed/transient set of individuals (such as migrant workers or American Indians), where either group experiences common conditions of environmental exposure or effect. (See environmental justice and low-income population.)

mitigate—Mitigation includes: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

mixed waste—Waste that contains both nonradioactive hazardous waste and radioactive waste, as defined in this glossary.

National Environmental Policy Act (NEPA) of 1969—This Act is the basic national charter for protection of the environment. It establishes policy, sets goals (Section 101), and provides means (Section 102) for carrying out policy. Section 102(2) contains "action-forcing" provisions to ensure that Federal agencies follow the letter and spirit of the act. For major Federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of the National Environmental Policy Act requires Federal agencies to prepare a detailed statement that includes the environmental impacts of the Proposed Action and other specified information.

National Pollutant Discharge Elimination System—A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the U.S. Environmental Protection Agency, a state, or, where delegated, a tribal government on an Indian reservation. The National Pollutant Discharge Elimination System permit lists either permissible discharges, the level of cleanup technology required for wastewater, or both.

National Register of Historic Places—The official list of the Nation's cultural resources that are worthy of preservation. The National Park Service maintains the list under direction of the Secretary of the Interior. Buildings, structures, objects, sites, and districts are included in the National Register for their importance in American history, architecture, archaeology, culture, or engineering. Properties included on the National Register range from large-scale, monumentally proportioned buildings to smaller-scale, regionally distinctive buildings. The listed properties are not just of nationwide importance; most are significant primarily at the state or local level. Procedures for listing properties on the National Register are found in 36 CFR Part 60.

natural uranium—Uranium with the naturally occurring distribution of uranium isotopes (approximately 0.7-weight percent uranium-235, and the remainder essentially uranium-238). (See uranium, depleted uranium, enriched uranium, highly enriched uranium, and low-enriched uranium.)

neptunium-237—A manmade element with the atomic number 93. Pure neptunium is a silvery metal. The neptunium-237 isotope has a half-life of 2.14 million years. When neptunium-237 is bombarded by neutrons, it is transformed to neptunium-238, which in turn undergoes radioactive decay to become plutonium-238. When neptunium-237 undergoes radioactive decay, it emits alpha particles and gamma rays.

nitrogen oxides—Refers to the oxides of nitrogen, primarily nitrogen oxide and nitrogen dioxide. These are produced in the combustion of fossil fuels and can constitute an air pollution problem. Nitrogen dioxide emissions contribute to acid deposition and formation of atmospheric ozone.

nonnuclear aboveground experimentation—Aboveground experimentation or testing in support of nuclear weapons programs that does not involve detonation of a nuclear explosive.

nonproliferation—Preventing the spread of nuclear weapons, nuclear weapon materials, and nuclear weapon technology.

normal operations—All normal (incident-free) conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.

Notice of Intent (NOI)—Public announcement that an environmental impact statement will be prepared and considered. It describes the Proposed Action, possible alternatives, and scoping process, including whether, when, and where any scoping meetings will be held. The NOI is usually published in the *Federal Register* and local media. The scoping process includes holding at least one public meeting and requesting written comments on issues and environmental concerns that an environmental impact statement should address.

nuclear facility—A facility that is subject to requirements intended to control potential nuclear hazards. Defined in U.S. Department of Energy directives as any nuclear reactor or any other facility whose operations involve radioactive materials in such form and quantity that a significant nuclear hazard potentially exists to the employees or the general public.

nuclear material—Composite term applied to—(1) special nuclear material; (2) source material such as uranium or thorium or ores containing uranium or thorium; and (3) byproduct material, which is any radioactive material that is made radioactive by exposure to the radiation incident to the process of producing or using special nuclear material.

nuclear weapons complex—The sites supporting the research, development, design, manufacture, testing, assessment, certification, and maintenance of the Nation's nuclear weapons and the subsequent dismantlement of retired weapons.

outfall—The discharge point of a drain, sewer, or pipe as it empties into the environment.

ozone—The triatomic form of oxygen; in the stratosphere, ozone protects the Earth from the sun's ultraviolet rays, but in lower levels of the atmosphere, ozone is considered an air pollutant.

particulate matter (PM)—Any finely divided solid or liquid material, other than uncombined (pure) water. A subscript denotes the upper limit of the diameter of particles included. Thus, PM_{10} includes only those particles equal to or less than 10 micrometers (0.0004 inches) in diameter; $PM_{2.5}$ includes only those particles equal to or less than 2.5 micrometers (0.0001 inches) in diameter.

person-rem—A unit of collective radiation dose applied to populations or groups of individuals; that is, a unit for expressing the dose when summed across all persons in a specified population or group. (See collective dose.)

pit—The central core of a primary assembly in a nuclear weapon typically composed of plutonium-239 and/or highly-enriched uranium and other materials.

plutonium—A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially by neutron bombardment of uranium. Plutonium has 15 isotopes with atomic masses ranging from 232 to 246 and half-lives from 20 minutes to 76 million years.

plutonium-238—An isotope with a half-life of 87.74 years used as the heat source for radioisotope power systems. When plutonium-238 undergoes radioactive decay, it emits alpha particles and gamma rays. Plutonium-238 may fission if exposed to neutrons. The likelihood of plutonium-238 undergoing fission is dependent upon many factors including the number and energy of neutrons, temperature, plutonium-238 purity and shape, and the presence and proximity of other elements.

plutonium-239—An isotope with a half-life of 24,110 years that is the primary radionuclide in weapons-grade plutonium. When plutonium-239 decays, it emits alpha particles. Plutonium-239 may fission if exposed to neutrons. The likelihood of plutonium-239 undergoing fission is dependent upon many factors including the number and energy of neutrons, temperature, plutonium-239 purity and shape, and the presence and proximity of other elements.

population dose—See collective dose.

potential release site (PRS)—A site suspected of releasing or having the potential to release contaminants (radioactive, chemical, or both) into the environment. PRS is a generic term that includes solid waste management units and areas of concern that are cited and defined in the Compliance Order on Consent (Consent Order).

radioactive waste—In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or byproduct material is subject to regulation as radioactive waste under the Atomic Energy Act. Also, waste material that contains accelerator-produced radioactive material or a high concentration of naturally occurring radioactive material may be considered radioactive waste.

radioactivity—

Defined as a *process*: The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation.

Defined as a *property*: The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

radioisotope or radionuclide—An unstable isotope that undergoes spontaneous transformation, emitting radiation. (See isotope.)

radioisotope power system—Any one of a number of technologies used in spacecraft and in national security technologies that produces heat or electricity from the radioactive decay of suitable radioactive substances such as plutonium-238. They are typically used in applications such as to enable the operation of instruments and sensors where energy sources such as solar power are undesirable or impractical due to the remoteness or extreme conditions of the operating environment.

Record of Decision (ROD)—A document prepared in accordance with the requirements of 40 CFR 1505.2 and 10 CFR 1021.315 that provides a concise public record of the U.S. Department of Energy's (DOE) decision on a Proposed Action for which an environmental impact statement was prepared. A ROD identifies the alternatives considered in reaching the decision; the environmentally preferable alternative; factors balanced by DOE in making the decision; and whether all practicable means to avoid or minimize environmental harm have been adopted, and, if not, the reason why they were not.

region of influence (ROI)—A site-specific geographic area in which the principal direct and indirect effects of actions are likely to occur.

rem (roentgen equivalent man)—A unit of dose equivalent. The dose equivalent in rem equals the absorbed dose in rad in tissue multiplied by the appropriate quality factor and possibly other modifying factors. Derived from "roentgen equivalent man," referring to the dosage of ionizing radiation that will cause the same biological effect as one roentgen of x-ray or gamma-ray exposure. One rem equals 0.01 sieverts. (See absorbed dose and dose equivalent.)

remediation—The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

Resource Conservation and Recovery Act, as Amended (RCRA)—A law that gives the U.S. Environmental Protection Agency the authority to control hazardous waste from "cradle to grave" (from the point of generation to the point of ultimate disposal), including its minimization, generation, transportation, treatment, storage, and disposal. The Resource Conservation and Recovery Act also sets forth a framework for the management of nonhazardous solid wastes. (See hazardous waste.)

risk—The probability of a detrimental effect of exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of that event (in other words, the product of these two factors).

risk assessment (chemical or radiological)—The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

runoff—The portion of rainfall, melted snow, or irrigation water that flows across the ground surface, and eventually enters streams.

safeguards—An integrated system of physical protection, material accounting, and material control measures designed to deter, prevent, detect, and respond to unauthorized access, possession, use, or sabotage of nuclear materials.

security—An integrated system of activities, systems, programs, facilities, and policies for the protection of Restricted Data and other classified information or matter, nuclear materials, nuclear weapons and nuclear weapons components, and/or U.S. Department of Energy or contractor facilities, property, and equipment.

sediment—Soil, sand, and minerals washed from land into water that deposit on the bottom of a water body.

seismic—Pertaining to any Earth vibration, especially an earthquake.

seismicity—The frequency and distribution of earthquakes.

shielding—With regard to radiation, any material of obstruction (bulkheads, walls, or other construction) that absorbs radiation to protect personnel or equipment.

short-term impact—In general, an impact that occurs during or for a short time after the action or activity that causes the impact.

source material—Depleted uranium, normal uranium, thorium, or any other nuclear material determined, pursuant to Section 61 of the Atomic Energy Act of 1954, as amended, to be source material, or ores containing one or more of the foregoing materials in such concentration as may be determined by regulation.

source term—The amount of a specific pollutant (chemicals, radionuclides) emitted or discharged to a particular environmental medium (air, water, earth) from a source or group of sources. It is usually expressed as a rate (amount per unit time).

special nuclear material(s)—A category of material subject to regulation under the Atomic Energy Act, consisting primarily of fissile materials. It is defined to mean plutonium, uranium-233, uranium enriched in the isotopes of uranium-233 or -235, and any other material that the Nuclear Regulatory Commission determines to be special nuclear material, but it does not include source material.

stockpile—The inventory of active nuclear weapons for the strategic defense of the United States.

stockpile stewardship program—A program that ensures the operational readiness (safety and reliability) of the U.S. nuclear weapons stockpile by the appropriate balance of surveillance, experiments, and simulations.

target—A tube, rod, or other form containing material that, on being irradiated in a nuclear reactor or an accelerator, would produce a desired end product.

technical area (TA)—Geographically distinct administrative units established for the control of LANL operations. There are currently 49 active TAs; 47 in the 41 square miles of the LANL site, one at Fenton Hill, west of the main site, and one comprising leased properties in town.

threatened species—Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the Endangered Species Act and its implementing regulations (50 CFR Part 424). (See endangered species.)

Toxic Substances Control Act of 1976—This Act authorizes the U.S. Environmental Protection Agency (EPA) to secure information on all new and existing chemical substances and to control any substances determined to cause an unreasonable risk to public health or the environment. This law requires that the health and environmental effects of all new chemicals be reviewed by the EPA before they are manufactured for commercial purposes.

transuranic—Refers to any element whose atomic number is higher than that of uranium (atomic number 92), including neptunium, plutonium, americium, and curium. All transuranic elements are produced artificially and are radioactive.

transuranic waste—Radioactive waste containing more than 100 nanocuries (3,700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for: (1) high-level radioactive waste; (2) waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations; of (3) waste that the U.S. Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61 (DOE 435.1).

tuff—A fine-grained rock composed of ash or other material formed by volcanic explosion or aerial expulsion from a volcanic vent.

uranium—A radioactive, metallic element with the atomic number 92; one of the heaviest naturally occurring elements. Uranium has 14 known isotopes, of which uranium-238 is the most abundant in nature. Uranium-235 is commonly used as a fuel for nuclear fission. (See natural uranium, enriched uranium, highly enriched uranium, and depleted uranium.)

vadose zone—The portion of Earth between the land surface and the water table.

volatile organic compounds—A broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures, such as benzene, chloroform, and methyl alcohol. With regard to air pollution, any organic compound that participates in atmospheric photochemical reaction, except for those designated by the U.S. Environmental Protection Agency Administrator as having negligible photochemical reactivity.

Waste Isolation Pilot Plant (WIPP)—A U.S. Department of Energy facility designed and authorized to permanently dispose of defense-related transuranic waste in a mined underground facility in deep geologic salt beds. It is located in southeastern New Mexico, 42 kilometers (26 miles) east of the city of Carlsbad.

wetland—Wetlands are "... those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3).