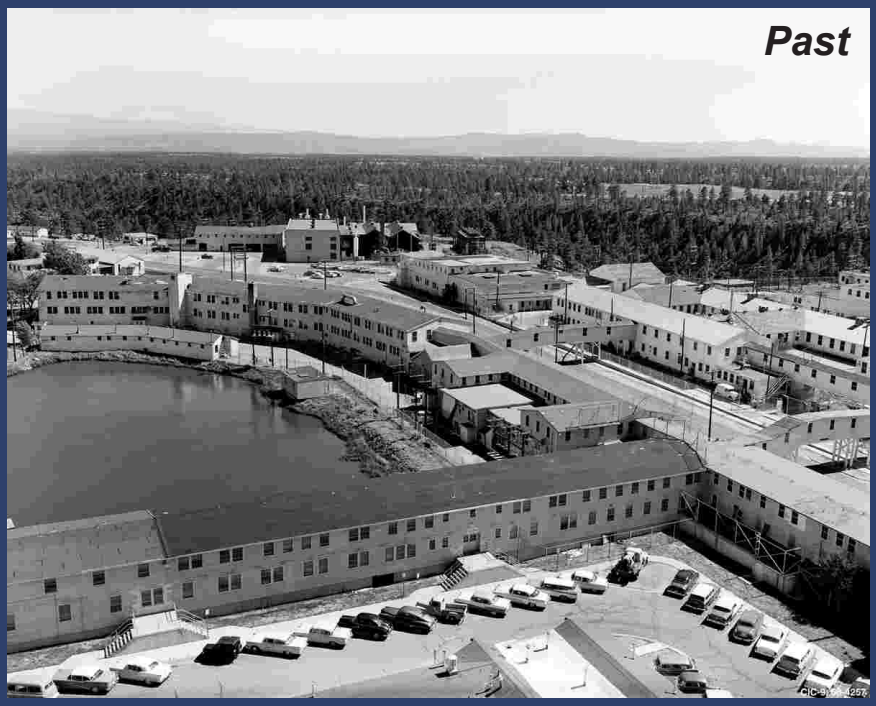
DOE/EIS-0380
May 2008



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

Volume 1
Chapters 1 through 11

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

To submit general questions regarding this EIS, or to request a copy, please contact:

Elizabeth Withers, EIS Document Manager
NNSA Service Center - Albuquerque
National Nuclear Security Administration
U.S. Department of Energy
P. O. Box 5400
KAFB East, SC-1
Albuquerque, NM 87185-5400
Telephone: 505-845-4984

Printed with soy ink on recycled paper

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

For additional information or for copies of the SWEIS, contact:

Elizabeth Withers, EIS Document Manager
NNSA Service Center - Albuquerque
National Nuclear Security Administration
U.S. Department of Energy
P. O. Box 5400
KAFB East, SC-1
Albuquerque, NM 87185-5400
Telephone: 505-845-4984

For general information on the DOE National Environmental Policy Act (NEPA) process, contact:

Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
Telephone: 202-586-4600, or leave a message at 1-800-472-2756

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*.

TABLE OF CONTENTS
VOLUME 1

TABLE OF CONTENTS
VOLUME 1

VOLUME 1 – CHAPTERS 1 THROUGH 11
VOLUME 2 BOOK 1 – APPENDICES A THROUGH H
VOLUME 2 BOOK 2 – APPENDICES I THROUGH M
VOLUME 3 BOOK 1 – COMMENT RESPONSE DOCUMENT
SECTIONS 1, 2, AND 3 (PAGES 3-1 THROUGH 3-561)
VOLUME 3 BOOK 2 – COMMENT RESPONSE DOCUMENT
SECTION 3 (PAGES 3-562 THROUGH 3-1089) AND SECTION 4

Cover Sheet iii

Table of Contents vii

List of Figures xv

List of Tables xvii

Acronyms, Abbreviations, and Conversion Charts xxv

Chapter 1
Introduction and Purpose and Need for Agency Action

1.1 Background 1-7

1.2 Purpose and Need for Agency Action 1-11

1.3 Scope and Alternatives in this New Site-Wide Environmental Impact Statement for Los Alamos National Laboratory Operations 1-11
1.3.1 No Action Alternative 1-13
1.3.2 Reduced Operations Alternative 1-15
1.3.3 Expanded Operations Alternative 1-16
1.3.4 Preferred Alternative 1-23

1.4 Decisions the National Nuclear Security Administration May Make on the Basis of the Site-Wide Environmental Impact Statement 1-25

1.5 Relationships to Other Department of Energy National Environmental Policy Act Documents and Information Sources 1-28

1.6 Public Involvement 1-36
1.6.1 Scoping Process 1-36
1.6.2 Public Comments on the Draft LANL SWEIS 1-38

1.7 Changes from the Draft Environmental Impact Statement 1-48

1.8 Content of this New Site-Wide Environmental Impact Statement 1-51

Chapter 2
Los Alamos National Laboratory Activities and Facilities Update

2.1 Overview of Los Alamos National Laboratory Activities Since Publication of the *1999 SWEIS*.....2-2

2.2 Site-Wide Changes at Los Alamos National Laboratory Since Publication of the *1999 SWEIS*.....2-3
2.2.1 Cerro Grande Fire.....2-7
2.2.2 Land Conveyance and Transfer.....2-7
2.2.3 LANL Security Enhancements.....2-8
2.2.4 Operational Stand Down.....2-8
2.2.5 Off-Site Source Recovery Project.....2-9
2.2.6 Environmental Restoration Project.....2-9

2.3 Technical Areas Changes Since the *1999 SWEIS*.....2-12

2.4 Key Facilities and Non-Key Facilities Changes Since the *1999 SWEIS*.....2-20
2.4.1 Chemistry and Metallurgy Research Building (Technical Area 3).....2-28
2.4.2 Sigma Complex (Technical Area 3).....2-30
2.4.3 Machine Shops (Technical Area 3).....2-32
2.4.4 Materials Science Laboratory (Technical Area 3).....2-34
2.4.5 High Explosives Processing (Technical Areas 8, 9, 11, 16, 22, and 37).....2-35
2.4.6 High Explosives Testing (Technical Areas 14, 15, 36, 39, and 40).....2-38
2.4.7 Tritium Facilities (Technical Area 16 and Technical Area 21).....2-40
2.4.8 Pajarito Site (Technical Area 18).....2-43
2.4.9 Target Fabrication Facility (Technical Area 35).....2-45
2.4.10 Bioscience Facilities (Technical Areas 43, 3, 16, 35, 46) (formerly called the Health Research Laboratory [Technical Area 43]).....2-46
2.4.11 Radiochemistry Facility (Technical Area 48).....2-49
2.4.12 Radioactive Liquid Waste Treatment Facility (Technical Area 50).....2-52
2.4.13 Los Alamos Neutron Science Center (Technical Area 53).....2-54
2.4.14 Solid Radioactive and Chemical Waste Facilities (Technical Area 54 and Technical Area 50).....2-58
2.4.15 Plutonium Facility Complex (Technical Area 55).....2-60
2.4.16 Non-Key Facilities.....2-62

2.5 Overview of Actual Impacts Compared to Site-Wide Environmental Impact Statement Projections.....2-67

Chapter 3
Alternatives for Continued Operation of Los Alamos National Laboratory

3.1 No Action Alternative.....3-3
3.1.1 Site-Wide Projects.....3-4
3.1.1.1 Security Needs.....3-6
3.1.1.2 Remediation and Closure Activities.....3-6
3.1.1.3 Land Conveyance and Transfer.....3-7
3.1.1.4 Electrical Power System Upgrades.....3-7
3.1.1.5 Wildfire Hazard Reduction Project Plan.....3-8
3.1.1.6 Disposition of Flood and Sediment Retention Structures.....3-8
3.1.1.7 Trails Management Program.....3-9
3.1.1.8 Off-Site Source Recovery Project.....3-9
3.1.1.9 Management of Construction Fill.....3-9
3.1.2 Technical Area Projects.....3-10
3.1.2.1 Technical Area 3.....3-10
3.1.2.2 Technical Area 18.....3-12
3.1.2.3 Deactivation and Decontamination of Technical Area 21 Buildings.....3-12
3.1.2.4 Technical Area 54 Material Disposal Area H Closure.....3-12

3.1.3 Key Facilities 3-13
3.1.3.1 Chemistry and Metallurgy Research Building 3-13
3.1.3.2 Sigma Complex 3-17
3.1.3.3 Machine Shops 3-19
3.1.3.4 Material Sciences Laboratory 3-20
3.1.3.5 Nicholas C. Metropolis Center for Modeling and Simulation 3-22
3.1.3.6 High Explosives Processing Facilities 3-23
3.1.3.7 High Explosives Testing Facilities 3-26
3.1.3.8 Tritium Facilities 3-29
3.1.3.9 Pajarito Site 3-32
3.1.3.10 Target Fabrication Facility 3-34
3.1.3.11 Bioscience Facilities (formerly Health Research Laboratory) 3-36
3.1.3.12 Radiochemistry Facility 3-40
3.1.3.13 Waste Management Operations: Radioactive Liquid Waste Treatment Facility 3-44
3.1.3.14 Los Alamos Neutron Science Center 3-46
3.1.3.15 Waste Management Operations: Solid Radioactive and Chemical Waste Facilities 3-51
3.1.3.16 Plutonium Facility Complex 3-56

3.2 Reduced Operations Alternative 3-59
3.2.1 Chemistry and Metallurgy Research Replacement Facility 3-60
3.2.2 High Explosives Processing Facilities 3-60
3.2.3 High Explosives Testing Facilities 3-60
3.2.4 Pajarito Site 3-61
3.2.5 Los Alamos Neutron Science Center 3-61
3.2.6 Plutonium Facility Complex 3-61

3.3 Expanded Operations Alternative 3-61
3.3.1 Los Alamos National Laboratory Site-Wide Projects 3-61
3.3.1.1 Security Needs 3-61
3.3.1.2 Remediation and Closure Activities 3-62
3.3.1.3 Increase in the Type and Quantity of Sealed Sources Managed at Los Alamos National Laboratory by the Off-Site Source Recovery Project 3-63
3.3.2 Technical Area Projects 3-64
3.3.2.1 Technical Area 3 3-64
3.3.2.2 Technical Area 21 Structure Decontamination, Decommissioning, and Demolition Project 3-65
3.3.2.3 Science Complex Project in Technical Area 62 3-66
3.3.2.4 Remote Warehouse and Truck Inspection Station Project in Technical Area 72 3-66
3.3.3 Key Facilities 3-67
3.3.3.1 Chemistry and Metallurgy Research Building 3-67
3.3.3.2 Nicholas C. Metropolis Center for Modeling and Simulation 3-68
3.3.3.3 High Explosives Processing Facilities 3-68
3.3.3.4 Tritium Facilities 3-68
3.3.3.5 Pajarito Site 3-68
3.3.3.6 Bioscience Facilities 3-68
3.3.3.7 Radiochemistry Facility 3-69
3.3.3.8 Waste Management Operations: Radioactive Liquid Waste Treatment Facility 3-69
3.3.3.9 Los Alamos Neutron Science Center 3-70
3.3.3.10 Waste Management Operations: Solid Radioactive and Chemical Waste Facilities 3-70
3.3.3.11 Plutonium Facility Complex 3-70

3.4 Preferred Alternative 3-71

3.5 Alternatives Considered but Not Analyzed in Detail in the Site-Wide Environmental Impact Statement 3-72

3.6 Summary of Environmental Consequences 3-73
3.6.1 Comparison of Potential Consequences of Alternatives for Continued Operation at Los Alamos National Laboratory 3-73
3.6.2 Summary of Cumulative Impacts 3-103
3.6.3 Summaries of Potential Consequences from Project-Specific Analyses 3-112

Chapter 4
Affected Environment

4.1 Land Resources 4-3
4.1.1 Land Use 4-3
4.1.2 Visual Environment 4-14

4.2 Geology and Soils 4-15
4.2.1 Geology 4-15
4.2.2 Geologic Conditions 4-17
4.2.2.1 Stratigraphy 4-17
4.2.2.2 Volcanism 4-21
4.2.2.3 Seismic Activity 4-21
4.2.2.4 Slope Stability, Subsidence, and Soil Liquefaction 4-27
4.2.3 Soils 4-28
4.2.3.1 Soil Monitoring 4-28
4.2.3.2 Soil Erosion 4-32
4.2.4 Mineral Resources 4-33
4.2.5 Paleontological Resources 4-33

4.3 Water Resources 4-33
4.3.1 Surface Water 4-35
4.3.1.1 Surface Water and Sediment Quality 4-36
4.3.1.2 Industrial Effluents 4-43
4.3.1.3 Stormwater Runoff 4-49
4.3.1.4 Watercourse Protection 4-54
4.3.1.5 Watershed and Sediment Monitoring 4-54
4.3.1.6 Floodplains 4-56
4.3.1.7 Overview of Cerro Grande Fire Impacts on Los Alamos Watersheds 4-58
4.3.2 Groundwater 4-63
4.3.2.1 Flow and Transport of Groundwater 4-66
4.3.2.2 Groundwater Quality in the Los Alamos National Laboratory Area 4-66

4.4 Air Quality and Noise 4-75
4.4.1 Climatology and Meteorology 4-75
4.4.1.1 Wind Conditions 4-77
4.4.1.2 Severe Weather 4-82
4.4.2 Nonradiological Air Quality 4-82
4.4.2.1 Applicable Requirements and Guidelines 4-82
4.4.2.2 Sources of Nonradiological Emissions 4-85
4.4.2.3 Existing Ambient Air Conditions 4-89
4.4.3 Radiological Air Quality 4-90
4.4.3.1 Radiological Monitoring 4-90
4.4.4 Visibility 4-91
4.4.5 Noise, Air Blasts, and Vibration Environment 4-91
4.4.5.1 Noise Level Regulatory Limits and Los Alamos National Laboratory Administrative Requirements 4-94
4.4.5.2 Existing Los Alamos National Laboratory Noise, Air Blast, and Vibration Environment 4-94

4.5 Ecological Resources 4-95
4.5.1 Terrestrial Ecology 4-95
4.5.2 Wetlands 4-97
4.5.3 Aquatic Resources 4-99
4.5.4 Protected and Sensitive Species 4-99
4.5.5 Biodiversity 4-105

4.6 Human Health 4-106
4.6.1 Public Health in the Los Alamos National Laboratory Vicinity 4-106
4.6.1.1 Cancer Incidence and Mortality in the Los Alamos Region 4-106
4.6.1.2 Radiation in the Environment around Los Alamos National Laboratory 4-108
4.6.1.3 Radionuclides and Chemicals in the Environment Around Los Alamos National Laboratory 4-113
4.6.2 Los Alamos National Laboratory Worker Health 4-116
4.6.2.1 Worker Exposures to Ionizing Radiation 4-116
4.6.2.2 Non-ionizing Radiation, Chemical and Biological Exposures 4-117
4.6.2.3 Occupational Injuries and Illness 4-119
4.6.3 Accident History 4-119
4.6.4 Los Alamos National Laboratory Emergency Management and Response Program 4-121
4.6.5 Los Alamos National Laboratory Security Program 4-123

4.7 Cultural Resources 4-124
4.7.1 Archaeological Resources 4-126
4.7.2 Historic Buildings and Structures 4-127
4.7.3 Traditional Cultural Properties 4-128

4.8 Socioeconomics and Infrastructure 4-130
4.8.1 Socioeconomics 4-130
4.8.1.1 Regional Economic Characteristics 4-130
4.8.1.2 Demographic Characteristics 4-131
4.8.1.3 Regional Income 4-132
4.8.1.4 Los Alamos National Laboratory-Affiliated Work Force 4-133
4.8.1.5 Housing 4-133
4.8.1.6 Local Government Finances 4-134
4.8.1.7 Services 4-135
4.8.2 Infrastructure 4-135
4.8.2.1 Electricity 4-136
4.8.2.2 Fuel 4-141
4.8.2.3 Water 4-143

4.9 Waste Management and Pollution Prevention 4-146
4.9.1 Wastewater Treatment and Effluent Reduction 4-148
4.9.1.1 Sanitary Liquid Waste 4-148
4.9.1.2 Sanitary Sludge 4-148
4.9.1.3 High Explosives-Contaminated Liquid Wastes 4-148
4.9.1.4 Industrial Effluent 4-149
4.9.2 Solid Waste 4-149
4.9.3 Radioactive and Chemical Waste 4-150
4.9.4 Offsite Shipments of Radioactive and Chemical Wastes 4-160

4.10 Transportation 4-162
4.10.1 Regional and Site Transportation Routes 4-162
4.10.2 Transportation Accidents 4-165
4.10.3 Los Alamos National Laboratory Shipments 4-166
4.10.3.1 Onsite Shipments 4-167
4.10.3.2 Offsite Shipments 4-167

4.11 Environmental Justice 4-168
4.11.1 Region of Analysis 4-169
4.11.2 Changes Since the *1999 SWEIS* 4-171
4.11.3 Minority Population in 2000 4-172
4.11.4 Low-Income Population in 2000 4-174

4.12 Environmental Restoration 4-174

Chapter 5
Environmental Consequences

5.1 Land Resources Impacts 5-2
5.1.1 Land Use 5-2
5.1.1.1 No Action Alternative 5-5
5.1.1.2 Reduced Operations Alternative 5-6
5.1.1.3 Expanded Operations Alternative 5-6
5.1.2 Visual Environment Impacts 5-9
5.1.2.1 No Action Alternative 5-9
5.1.2.2 Reduced Operations Alternative 5-15
5.1.2.3 Expanded Operations Alternative 5-15

5.2 Geology and Soils 5-19
5.2.1 No Action Alternative 5-23
5.2.2 Reduced Operations Alternative 5-24
5.2.3 Expanded Operations Alternative 5-24

5.3 Water Resources 5-29
5.3.1 Surface Water 5-29
5.3.1.1 No Action Alternative 5-33
5.3.1.2 Reduced Operations Alternative 5-36
5.3.1.3 Expanded Operations Alternative 5-37
5.3.2 Groundwater Resources 5-39
5.3.2.1 No Action Alternative 5-40
5.3.2.2 Reduced Operations Alternative 5-42
5.3.2.3 Expanded Operations Alternative 5-42

5.4 Air Quality and Noise 5-43
5.4.1 Nonradiological Impacts 5-43
5.4.1.1 No Action Alternative 5-48
5.4.1.2 Reduced Operations Alternative 5-54
5.4.1.3 Expanded Operations Alternative 5-55
5.4.2 Radiological Air Quality Impacts 5-59
5.4.2.1 No Action Alternative 5-59
5.4.2.2 Reduced Operations Alternative 5-61
5.4.2.3 Expanded Operations Alternative 5-61
5.4.3 Noise Impacts 5-64
5.4.3.1 No Action Alternative 5-65
5.4.3.2 Reduced Operations Alternative 5-70
5.4.3.3 Expanded Operations Alternative 5-71

5.5 Ecological Resources 5-73
5.5.1 No Action Alternative 5-74
5.5.2 Reduced Operations Alternative 5-79
5.5.3 Expanded Operations Alternative 5-80

5.6 Human Health 5-87
5.6.1 Radiological Impacts on the Public 5-87
5.6.1.1 No Action Alternative 5-91
5.6.1.2 Reduced Operations Alternative 5-93
5.6.1.3 Expanded Operations Alternative 5-95
5.6.2 Chemical Impacts on the Public 5-98
5.6.2.1 No Action Alternative 5-98
5.6.2.2 Reduced Operations Alternative 5-100
5.6.2.3 Expanded Operations Alternative 5-100
5.6.3 Worker Health 5-100
5.6.3.1 No Action Alternative 5-101
5.6.3.2 Reduced Operations Alternative 5-103
5.6.3.3 Expanded Operations Alternative 5-104

5.7 Cultural Resources 5-106
5.7.1 No Action Alternative 5-109
5.7.2 Reduced Operations Alternative 5-111
5.7.3 Expanded Operations Alternative 5-111

5.8 Socioeconomics and Infrastructure 5-116
5.8.1 Socioeconomics 5-116
5.8.1.1 No Action Alternative 5-117
5.8.1.2 Reduced Operations Alternative 5-119
5.8.1.3 Expanded Operations Alternative 5-121
5.8.2 Infrastructure 5-122
5.8.2.1 No Action Alternative 5-123
5.8.2.2 Reduced Operations Alternative 5-131
5.8.2.3 Expanded Operations Alternative 5-132

5.9 Waste Management 5-134
5.9.1 No Action Alternative 5-135
5.9.2 Reduced Operations Alternative 5-143
5.9.3 Expanded Operations Alternative 5-145

5.10 Transportation 5-153
5.10.1 No Action Alternative 5-159
5.10.2 Reduced Operations Alternative 5-161
5.10.3 Expanded Operations Alternative 5-163

5.11 Environmental Justice 5-166
5.11.1 No Action Alternative 5-168
5.11.2 Reduced Operations Alternative 5-171
5.11.3 Expanded Operations Alternative 5-173

5.12 Facility Accidents 5-176
5.12.1 Facility Radiological Impacts 5-177
5.12.1.1 No Action Alternative 5-177
5.12.1.2 Reduced Operations Alternative 5-180
5.12.1.3 Expanded Operations Alternative 5-180
5.12.2 Facility Hazardous Chemical Impacts 5-183
5.12.2.1 No Action Alternative 5-183
5.12.2.2 Reduced Operations Alternative 5-185
5.12.2.3 Expanded Operations Alternative 5-185
5.12.3 Site-Wide Seismic Impacts 5-185
5.12.3.1 No Action Alternative 5-188
5.12.3.2 Reduced Operations Alternative 5-197
5.12.3.3 Expanded Operations Alternative 5-197

5.12.4 Wildfire Accident Impacts....5-198
5.12.4.1 Wildfire – Radiological....5-198
5.12.4.2 Wildfire – Chemical....5-200
5.12.5 Construction Accidents....5-201
5.12.6 Terrorist Incidents....5-201
5.12.6.1 Assessment of Vulnerability to Terrorist Threats....5-202
5.12.6.2 Terrorist Impacts Analysis....5-204

5.13 Cumulative Impacts....5-204

5.14 Mitigation Measures....5-233
5.14.1 Existing Programs and Controls....5-234
5.14.2 Mitigation Measures Incorporated in the SWEIS Alternatives....5-237
5.14.3 Other Mitigation Measures Considered....5-238

5.15 Resource Commitments....5-240
5.15.1 Unavoidable Adverse Environmental Impacts....5-240
5.15.2 Relationship Between Local Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity....5-240
5.15.3 Irreversible and Irretrievable Commitments of Resources....5-241

Chapter 6
Applicable Laws, Regulations, and Other Requirements

6.1 Applicable Federal Laws, Regulations, and Permits....6-3

6.2 Executive Orders....6-16

6.3 Applicable DOE Orders....6-19

6.4 Applicable State of New Mexico and Local Statutes, Regulations, and Agreements....6-24

6.5 Consultations....6-28
6.5.1 Consultation Requirements....6-28
6.5.1.1 Ecological Resources....6-28
6.5.1.2 Cultural Resources....6-28
6.5.1.3 Tribal Consultations....6-28
6.5.2 Consultation Letters....6-30

Chapter 7
References....7-1

Chapter 8
Glossary....8-1

Chapter 9
Index....9-1

Chapter 10
List of Preparers....10-1

Chapter 11
Distribution List....11-1

LIST OF FIGURES

Chapter 1

Figure 1–1 Location of Los Alamos National Laboratory Site 1-8
Figure 1–2 Identification and Location of Technical Areas Comprising Los Alamos National Laboratory 1-9
Figure 1–3 Summary Comparison of Alternatives Considered in this New Site-Wide Environmental Impact Statement 1-14
Figure 1–4 National Environmental Policy Act Process 1-37

Chapter 2

Figure 2–1 Conceptual Framework for Analysis 2-3
Figure 2–2 Technical Areas at Los Alamos National Laboratory 2-13
Figure 2–3 Los Alamos National Laboratory Key Facilities 2-21

Chapter 4

Figure 4–1 Location of Los Alamos National Laboratory 4-2
Figure 4–2 Land Management and Ownership 4-4
Figure 4–3 Technical Areas of Los Alamos National Laboratory 4-6
Figure 4–4 Los Alamos National Laboratory Site-Wide Land Use 4-7
Figure 4–5 Cerro Grande Fire, Total Area Burned 4-11
Figure 4–6 Overview of Land Conveyance and Transfer 4-13
Figure 4–7 Generalized Cross-Section of the Los Alamos National Laboratory Area 4-16
Figure 4–8 Stratigraphy of the Bandelier Tuff 4-19
Figure 4–9 Mapped Faults in the Los Alamos National Laboratory Area 4-22
Figure 4–10 Onsite and Perimeter Soil Sampling Locations 4-29
Figure 4–11 Offsite (Regional) Soil Sampling Locations – 2003 4-30
Figure 4–12 Watersheds in the Los Alamos National Laboratory Region 4-34
Figure 4–13 Impaired Reaches in the Vicinity of Los Alamos National Laboratory 4-41
Figure 4–14 National Pollutant Discharge Elimination Systems Permit Exceedance Trend 4-47
Figure 4–15 Post-Cerro Grande Fire Floodplains 4-57
Figure 4–16 Flow-Weighted Average Concentrations of Radionuclides, Pre-Cerro Grande Fire to 2003 4-61
Figure 4–17 Estimated Plutonium-239 and Plutonium-240 Transported by Suspended Sediment in Runoff, Pre-Cerro Grande Fire to 2003 4-61
Figure 4–18 Illustration of the Hydrologic Cycle at Los Alamos National Laboratory 4-64
Figure 4–19 Los Alamos National Laboratory Meteorological Network 4-76
Figure 4–20 Los Alamos Area Mean Precipitation (1971 to 2000) 4-77
Figure 4–21 Los Alamos National Laboratory Meteorological Stations with Daytime Wind Rose Data 4-78
Figure 4–22 Los Alamos National Laboratory Meteorological Stations with Nighttime Wind Rose Data 4-79
Figure 4–23 Los Alamos National Laboratory Meteorological Stations with Total Wind Rose Data 4-80
Figure 4–24 Pajarito Mountain and Technical Area 41 Associated Wind Rose Data 4-81
Figure 4–25 Los Alamos National Laboratory Vegetation Zones 4-96
Figure 4–26 Annual Collective Dose (person-rem) to the Population within 50 Miles (80 kilometers) of Los Alamos National Laboratory 4-110
Figure 4–27 Annual Dose (millirem) to the Maximally Exposed Individual Offsite 4-110
Figure 4–28 Counties in the Los Alamos National Laboratory Region of Influence 4-130
Figure 4–29 Los Alamos Area Electric Power Distribution System 4-137
Figure 4–30 Los Alamos National Laboratory Vicinity Regional Highway System and Major Roads 4-164
Figure 4–31 Location of Technical Area 53 and Indian Reservations Surrounding Los Alamos National Laboratory 4-170

Figure 4–32 Potentially Affected Counties Surrounding Los Alamos National Laboratory.....4-170
Figure 4–33 Minority Population – Block Groups with More Than 50 Percent Minority Population within a 50-Mile (80-kilometer) Radius of Los Alamos National Laboratory.....4-173
Figure 4–34 Low-Income Population – Block Groups with More Than 18 Percent of the Population Living Below the Federal Poverty Threshold within a 50-mile (80-kilometer) Radius of Los Alamos National Laboratory.....4-175

LIST OF TABLES

Chapter 1

Table 1–1 Comparison of Key Facilities between the *1999 Site-Wide Environmental Impact Statement* and this New Site-Wide Environmental Impact Statement 1-10

Chapter 2

Table 2–1 Major Remediation Activities Completed Since the *1999 SWEIS* 2-11
Table 2–2 Overview of Los Alamos National Laboratory Technical Areas and Activities 2-14
Table 2–3 Los Alamos National Laboratory Key and Nuclear Facilities – *1999 SWEIS* and 2005 Listings 2-24
Table 2–4 Los Alamos National Laboratory Emissions, Doses, Discharges, and Radioactive Waste Generation Since 1999 2-68
Table 2–5 Summary Comparison of *1999 SWEIS* Projected Impacts and Actual Changes and Performance (1999 to 2005) 2-70

Chapter 3

Table 3–1 Site-Wide Projects and Activities 3-4
Table 3–2 Technical Area Projects and Activities 3-11
Table 3–3 Chemistry and Metallurgy Research Building Capabilities and Activity Levels 3-14
Table 3–4 Sigma Complex Capabilities and Activity Levels 3-18
Table 3–5 Machine Shops Capabilities and Activity Levels 3-20
Table 3–6 Material Sciences Laboratory Capabilities and Activity Levels 3-21
Table 3–7 Nicholas C. Metropolis Center for Modeling and Simulation Capabilities and Activity Levels 3-23
Table 3–8 High Explosives Processing Facilities Capabilities and Activity Levels 3-24
Table 3–9 High Explosives Testing Facilities Capabilities and Activity Levels 3-27
Table 3–10 Tritium Facilities Capabilities and Activity Levels 3-30
Table 3–11 Pajarito Site Capabilities and Activity Levels 3-33
Table 3–12 Target Fabrication Facility Capabilities and Activity Levels 3-35
Table 3–13 Bioscience Facilities Capabilities and Activity Levels 3-37
Table 3–14 Radiochemistry Facility Capabilities and Activity Levels 3-41
Table 3–15 Waste Management Operations: Radioactive Liquid Waste Treatment Facility Capabilities and Activity Levels 3-45
Table 3–16 Los Alamos Neutron Science Center Capabilities and Activity Levels 3-47
Table 3–17 Waste Management Operations: Solid Radioactive and Chemical Waste Facilities Capabilities and Activity Levels 3-52
Table 3–18 Plutonium Facility Complex Capabilities and Activity Levels 3-57
Table 3–19 Summary of Environmental Consequences by Resource Area 3-88
Table 3–20 Summary of Impacts for the Physical Science Research Complex Project 3-114
Table 3–21 Summary of Impacts for the Replacement Office Buildings Project 3-115
Table 3–22 Summary of Impacts for the Radiological Sciences Institute Project, Including Phase I – the Institute for Nuclear Nonproliferation Science and Technology 3-116
Table 3–23 Summary of Impacts for the Radioactive Liquid Waste Treatment Facility Upgrade Project 3-118
Table 3–24 Summary of Impacts for the Los Alamos Neutron Science Center Refurbishment Project 3-119
Table 3–25 Summary of Impacts for the Technical Area 55 Radiography Facility Project 3-120
Table 3–26 Summary of Impacts for the Plutonium Facility Complex Refurbishment Project 3-121
Table 3–27 Summary of Impacts for the Science Complex Project 3-122
Table 3–28 Summary of Impacts for the Remote Warehouse and Truck Inspection Station Project 3-123
Table 3–29 Summary of Impacts for the Technical Area 18 Closure Project, Including Remaining Operations Relocation and Structure Decontamination, Decommissioning, and Demolition 3-124
Table 3–30 Summary of Impacts for Technical Area 21 Structure Decontamination, Decommissioning, and Demolition Project 3-125
Table 3–31 Summary of Impacts for the Waste Management Facilities Transition Project 3-127

Table 3–32 Summary of Impacts for Major Material Disposal Area Remediation, Canyon Cleanups, and Other Consent Order Actions....3-128
Table 3–33 Summary of Impacts for the Security-Driven Transportation Modifications Project....3-130
Table 3–34 Summary of Impacts for Nicholas C. Metropolis Center for Modeling and Simulation Increase in Level of Operations....3-132
Table 3–35 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....3-133

Chapter 4

Table 4–1 General Regions of Influence for the Affected Environment....4-3
Table 4–2 Lands Conveyed to Los Alamos County and Transferred to the Department of Interior to be Held in Trust for the Pueblo of San Ildefonso....4-12
Table 4–3 Summary of Movement on Faults of the Pajarito Fault System....4-23
Table 4–4 Los Alamos National Laboratory Mean Peak Ground Acceleration Values (g) from the Uniform Hazard Response Spectra....4-27
Table 4–5 Los Alamos National Laboratory Peak Ground Acceleration Values (g) from the Design Response Spectra....4-27
Table 4–6 Comparison of Probabilistic Peak Horizontal Accelerations in g's from 1995 and 2007 Studies....4-27
Table 4–7 Standards and References Used for Evaluating Water Quality....4-37
Table 4–8 Surface Water and Sediment Contamination Affected by Los Alamos National Laboratory Operations....4-38
Table 4–9 New Mexico Environment Department List of Impaired Reaches....4-39
Table 4–10 Estimated Average Annual Concentrations of Radionuclides in Base Flows in Pueblo and Mortandad Canyons Compared with the Biota Concentration Guides....4-43
Table 4–11 National Pollutant Discharge Elimination System Industrial Point Source Outfalls....4-44
Table 4–12 National Pollutant Discharge Elimination Systems Permitted Outfalls and Discharges by Watershed....4-44
Table 4–13 National Pollutant Discharge Elimination Systems Permitted Outfalls and Discharges by Facility....4-46
Table 4–14 Effluent Quality Monitoring and Compliance with Permit Limits for National Pollutant Discharge Elimination Systems-Permitted Outfalls....4-47
Table 4–15 Selected Water Quality Data for Radioactive Liquid Waste Treatment Facility Effluent in 2005....4-49
Table 4–16 Summary of Stormwater Program Activity....4-50
Table 4–17 Summary of Dredge and Fill Permits Issued Each Year....4-54
Table 4–18 Operation Permit Emission Limits....4-84
Table 4–19 Emissions of Criteria Pollutants....4-86
Table 4–20 Emissions of Hazardous Air Pollutants and Volatile Organic Compounds from Chemical Use....4-87
Table 4–21 2005 Ambient Air Monitoring for Particulate Matter....4-89
Table 4–22 Annual Average Background Concentration of Radioactivity in the Regional Atmosphere....4-91
Table 4–23 Range of Annual Airborne Radioactive Emissions from Los Alamos National Laboratory Buildings with Sampled Stacks from 1999 through 2005 (curies)....4-92
Table 4–24 Average Visibility Measurements at Bandelier National Monument (1993 to 2002)....4-92
Table 4–25 Protected and Sensitive Species....4-100
Table 4–26 Five-Year Profile of Cancer Mortality and Incidence in the United States, New Mexico, and Los Alamos Region, 1999 through 2003....4-107
Table 4–27 Changes in Population Distribution Since the *1999 SWEIS*....4-110
Table 4–28 Radiological Exposures of Los Alamos National Laboratory Workers....4-117
Table 4–29 Highest Individual Doses to Los Alamos National Laboratory Workers....4-117
Table 4–30 Occupational Injury and Illness Rates at Los Alamos National Laboratory....4-119
Table 4–31 Culture History Chronology for Northern Rio Grande Specific to Los Alamos National Laboratory and the Pajarito Plateau....4-126
Table 4–32 Distribution of Los Alamos National Laboratory Affiliated Work Force by Place of Residence in the Region of Influence....4-131

Table 4–33 Demographic Profile of the County Population in the Los Alamos National Laboratory Region of Influence....4-132
Table 4–34 Income Information for the Los Alamos National Laboratory Region of Influence....4-132
Table 4–35 Los Alamos National Laboratory-Affiliated Work Force....4-133
Table 4–36 Housing in the Los Alamos National Laboratory Region of Influence....4-134
Table 4–37 Percentage of Los Alamos National Laboratory Employees Residing in the Region of Influence....4-134
Table 4–38 General Funds Revenues in the Tri-County Region (Fiscal Year 2003)....4-135
Table 4–39 Trend in Peak Electric Load Demand for the Los Alamos Power Pool....4-138
Table 4–40 Trend in Total Electrical Energy Consumption for the Los Alamos Power Pool....4-138
Table 4–41 Trend in Natural Gas Consumption for Los Alamos National Laboratory and Los Alamos County....4-142
Table 4–42 Trend in Steam Production for Los Alamos National Laboratory....4-142
Table 4–43 Trend in Water Use for Los Alamos National Laboratory and Los Alamos County....4-145
Table 4–44 Los Alamos National Laboratory Waste Types and Generation....4-151
Table 4–45 Low-Level Radioactive Waste Generation at Los Alamos National Laboratory by Facility (cubic yards per year)....4-152
Table 4–46 Mixed Low-Level Radioactive Waste Generation at Los Alamos National Laboratory by Facility (cubic yards per year)....4-154
Table 4–47 Transuranic Waste Generation at Los Alamos National Laboratory by Facility (cubic yards per year)....4-155
Table 4–48 Mixed Transuranic Waste Generation at Los Alamos National Laboratory by Facility (cubic yards per year)....4-157
Table 4–49 Chemical Waste Generated at Los Alamos National Laboratory by Facility (pounds per year)....4-158
Table 4–50 Radioactive Liquid Waste Treated at Los Alamos National Laboratory....4-161
Table 4–51 Amount of Radioactive and Chemical Wastes Shipped Offsite....4-162
Table 4–52 Park and Ride Pickup and Drop-Off Locations....4-163
Table 4–53 Park and Ride Use....4-163
Table 4–54 Los Alamos National Laboratory Main Access Points....4-163
Table 4–55 Average Weekday Traffic Volume in the Vicinity of NM 502 and NM 4....4-165
Table 4–56 New Mexico Traffic Accidents in Los Alamos and Nearby Counties, 2004....4-166
Table 4–57 Los Alamos County Traffic Accidents, 1999 - 2004....4-166
Table 4–58 Offsite Waste Shipments 2002 - 2005....4-168
Table 4–59 Populations in Potentially Affected Counties Surrounding Los Alamos National Laboratory in 2000....4-171
Table 4–60 Populations in Potentially Affected Counties Surrounding Los Alamos National Laboratory in 1990....4-172

Chapter 5

Table 5–1 Summary of Environmental Consequences of Land Use Changes....5-3
Table 5–2 Summary of Environmental Consequences on the Visual Environment....5-10
Table 5–3 Summary of Environmental Consequences for Geology and Soils....5-20
Table 5–4 Summary of Environmental Consequences on Surface Water....5-31
Table 5–5 Estimated National Pollutant Discharge Elimination System Permitted Discharges by Facility and Canyon (million gallons per year)....5-34
Table 5–6 Summary of Environmental Consequences on Groundwater....5-40
Table 5–7 Summary of Environmental Consequences on Nonradiological Air Quality....5-45
Table 5–8 Facility-Wide Criteria Pollutant Impacts....5-49
Table 5–9 Estimated Emission Rates of the Pollutants that Could Be Released from High Explosives Testing Facilities....5-50
Table 5–10 Beryllium Annual Emission Rates Associated with Technical Area 3 and Technical Area 55 Facilities....5-52
Table 5–11 Air Quality Concentrations from Chemistry and Metallurgy Research Replacement Facility Generator Testing at Technical Area 55....5-53
Table 5–12 Summary of Annual Projected Radiological Air Emissions (curies per year)....5-60

Table 5–13 Summary of Environmental Consequences for Noise at LANL 5-66
Table 5–14 Summary of Environmental Consequences of Ecological Resource Changes at Los Alamos National Laboratory 5-75
Table 5–15 List of Facilities Modeled for Radionuclide Air Emissions from Los Alamos National Laboratory 5-88
Table 5–16 Distance and Direction from Key Facilities to the Facility-Specific Maximally Exposed Individual 5-89
Table 5–17 Summary of Projected Doses to the Maximally Exposed Individual from Normal Operations at Los Alamos National Laboratory (millirem per year) 5-90
Table 5–18 Summary of Projected Doses to the General Public Within 50 Miles (80 kilometers) of Los Alamos National Laboratory from Normal Operations (person-rem per year) 5-91
Table 5–19 Annual Radiological Impacts on the Public from Los Alamos National Laboratory Operations under the No Action Alternative 5-92
Table 5–20 Annual Ingestion Pathway Dose for Average Consumption Rates by Specific Receptors 5-92
Table 5–21 Annual Radiological Impacts on the Public from Los Alamos National Laboratory Operations under the Reduced Operations Alternative 5-94
Table 5–22 Annual Radiological Impacts on the Public from Los Alamos National Laboratory Operations under the Expanded Operations Alternative 5-96
Table 5–23 Estimated Annual Emission Rates of Carcinogenic Pollutants that Could Be Released from the Health Research Laboratory of the Technical Area 43 Facilities 5-99
Table 5–24 Results of the Dispersion Modeling Analysis of Carcinogenic Pollutants from the Health Research Laboratory at Technical Area 43 5-99
Table 5–25 Projected Worker Radiation Exposure under the No Action Alternative 5-101
Table 5–26 Projected Worker Exposure to Radiation under the Reduced Operations Alternative 5-103
Table 5–27 Projected Worker Exposure to Radiation under the Expanded Operations Alternative 5-104
Table 5–28 Annual Projected Occupational Injuries and Illnesses Under the Expanded Operations Alternative 5-106
Table 5–29 Summary of Environmental Consequences on Cultural Resources 5-107
Table 5–30 Summary of Socioeconomic Consequences 5-118
Table 5–31 Projected Los Alamos National Laboratory Employment under the Expanded Operations Alternative 5-121
Table 5–32 Summary of Environmental Consequences on Site Infrastructure 5-124
Table 5–33 Baseline Infrastructure Requirements and System Capacities for the Los Alamos National Laboratory Region of Influence 5-128
Table 5–34 Projected Site Infrastructure Requirements under the No Action Alternative 5-129
Table 5–35 Projected Site Infrastructure Requirements under the Reduced Operations Alternative 5-131
Table 5–36 Projected Site Infrastructure Requirements under the Expanded Operations Alternative 5-133
Table 5–37 Summary of Total (Operations, Decontamination, Decommissioning, and Demolition, and Remediation) Waste Generation Projections by Alternative (Cumulative 2007 through 2016) 5-136
Table 5–38 Wastes from Decontamination, Decommissioning, and Demolition Activities – No Action Alternative (cubic yards) 5-138
Table 5–39 Radioactive and Chemical Waste Projections from Routine Operations – No Action Alternative 5-139
Table 5–40 Radioactive Liquid Waste Treated at Los Alamos National Laboratory – No Action Alternative 5-141
Table 5–41 Summary of Waste Types by Generator Category – No Action Alternative (Cumulative 2007 through 2016) (in cubic yards) 5-142
Table 5–42 Radioactive and Chemical Waste Projections from Routine Operations – Reduced Operations Alternative 5-144
Table 5–43 Radioactive Liquid Waste Treated at Los Alamos National Laboratory – Reduced Operations Alternative 5-145
Table 5–44 Summary of Waste Types by Generator Category – Reduced Operations Alternative (Cumulative 2007 through 2016) (in cubic yards) 5-146
Table 5–45 Wastes from Decontamination, Decommissioning, and Demolition Activities – Expanded Operations Alternative (cubic yards) 5-147
Table 5–46 Construction Wastes – Expanded Operations Alternative 5-147

Table 5–47 Radioactive and Chemical Waste Projections from Routine Operations – Expanded Operations Alternative 5-149
Table 5–48 Radioactive Liquid Waste Treated at Los Alamos National Laboratory – Expanded Operations Alternative 5-150
Table 5–49 Summary of Waste Types by Generator Category – Expanded Operations Alternative (Cumulative 2007 through 2016) (in cubic yards) 5-151
Table 5–50 10-Year Total Number of Offsite Shipments under Each Alternative and Selected Activities 5-156
Table 5–51 Risks of Transporting Radioactive Materials under Each Alternative and Selected Activities 5-157
Table 5–52 Summary of Changes in Annual Traffic Flow at the Entrances to Los Alamos National Laboratory 5-159
Table 5–53 Estimated Changes in Traffic at the Entrances to Los Alamos National Laboratory under the Reduced Operations Alternative 5-163
Table 5–54 Estimated Changes in Traffic at the Entrances to Los Alamos National Laboratory under the Expanded Operations Alternative 5-165
Table 5–55 Potentially Affected Populations 5-167
Table 5–56 Comparison of Total Minority, Hispanic, American Indian and Low-Income Population and Average Individual Doses Under the No Action Alternative 5-169
Table 5–57 Comparison of Total Minority, Hispanic, American Indian and Low-Income Population and Average Individual Doses Under the Reduced Operations Alternative 5-172
Table 5–58 Comparison of Total Minority, Hispanic, American Indian and Low-Income Population and Average Individual Doses Under the Expanded Operations Alternative 5-174
Table 5–59 Summary of Worker and Public Radiological Risks and Chemical Consequences from Potential Accidents 5-176
Table 5–60 Radiological Accident Offsite Population Consequences for the No Action and Reduced Operations Alternatives 5-178
Table 5–61 Radiological Accident Onsite Worker Consequences for the No Action and Reduced Operations Alternatives 5-178
Table 5–62 Radiological Accident Offsite Population and Worker Risks for the No Action and Reduced Operations Alternatives 5-179
Table 5–63 Radiological Accident Offsite Population Consequences for the Expanded Operations Alternative 5-181
Table 5–64 Radiological Accident Onsite Worker Consequences for the Expanded Operations Alternative 5-182
Table 5–65 Radiological Accident Offsite Population and Worker Risks for the Expanded Operations Alternative 5-182
Table 5–66 Chemical Accident Risks under the No Action and Reduced Operations Alternatives 5-184
Table 5–67 Chemical Accident Risks under the Expanded Operations Alternative 5-186
Table 5–68 Site-Wide Seismic 1 Radiological Accident Offsite Population Consequences for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-189
Table 5–69 Site-Wide Seismic 1 Radiological Accident Onsite Worker Consequences for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-190
Table 5–70 Site-Wide Seismic 1 Radiological Accident Offsite Population and Worker Risks for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-190
Table 5–71 Site-Wide Seismic 2 Radiological Accident Offsite Population Consequences for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-192
Table 5–72 Site-Wide Seismic 2 Radiological Accident Onsite Worker Consequences for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-192
Table 5–73 Site-Wide Seismic 2 Radiological Accident Offsite Population and Worker Risks for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-193
Table 5–74 Chemical Accident Risks under Seismic 1 Conditions for the No Action, Reduced Operations, and the Expanded Operations Alternatives 5-195
Table 5–75 Chemical Accident Risks under Seismic 2 Conditions for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-196
Table 5–76 Radiological Accident Offsite Population Consequences for a Wildfire Accident for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-199
Table 5–77 Radiological Accident Onsite Worker Consequences for a Wildfire Accident for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-199

Table 5–78 Radiological Accident Offsite Population and Worker Risks for a Wildfire Accident for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-200
Table 5–79 Chemical Accident Risks under Wildfire Conditions for the No Action, Reduced Operations, and Expanded Operations Alternatives 5-201
Table 5–80 Estimated Maximum Cumulative Air Quality Concentrations at the Site Boundary (micrograms per cubic meter) 5-217
Table 5–81 Estimated Cumulative Radiological Impacts 5-221
Table 5–82 Estimated Cumulative Socioeconomic Impacts 5-223
Table 5–83 Estimated Cumulative Infrastructure Requirements for the Los Alamos National Laboratory Region of Influence 5-225
Table 5–84 Estimated Cumulative Waste Generation at Los Alamos National Laboratory (2007 to 2016) 5-226
Table 5–85 Cumulative Impacts of Radioactive Material and Waste Transport (1943 to 2073) 5-230
Table 5–86 Summary of Changes in Traffic Flow at the Entrances to Los Alamos National Laboratory 5-231

Chapter 6

Table 6–1 Potentially Applicable Environmental, Safety, and Health Laws, Regulations, and Executive Orders 6-4
Table 6–2 Federal Permits 6-9
Table 6–3 Applicable DOE Orders and Directives (as of December 8, 2006) 6-20
Table 6–4 State and Local Requirements 6-25
Table 6–5 State Environmental Permits 6-27
Table 6–6 Government-to-Government Relationships with Tribal Governments 6-29

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ALARA	as low as reasonably achievable
ATSDR	Agency for Toxic Substances and Disease Registry
BCG	Biota Concentration Guide
CAP-88	Clean Air Act Assessment Package, 1988
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CMR	Chemistry and Metallurgy Research (Building)
CMRR	Chemistry and Metallurgy Research Building Replacement Project
CO	carbon monoxide
DARHT	Dual Axis Radiographic Hydrodynamic Test (Facility)
dB	decibel
dBA	decibel A-weighted
dBC	decibel C-weighted
DCG	derived concentration guideline
DD&D	decontamination, decommissioning, and demolition
DDT	dichlorodiphenyl-trichlorethane
DHS	U.S. Department of Homeland Security
DNA	deoxyribonucleic acid
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	environmental assessment
EIS	environmental impact statement
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ERPG	Emergency Response Planning Guideline
FFCA	Federal Facility Compliance Agreement
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FY	fiscal year
HEPA	high-efficiency particulate air (filter)
HSWA	Hazardous and Solid Waste Amendments
ISCST3	Industrial Source Complex Short Term
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
LASL	Los Alamos Scientific Laboratory (now LANL)

LCF	latent cancer fatality
LLW	low-level radioactive waste
MCL	maximum contaminant level
MDA	material disposal area
MEI	maximally exposed individual
MPF	modern pit facility
MSL	Materials Science Laboratory
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMSA	New Mexico Statutes Annotated
NMWQCC	New Mexico Water Quality Control Commission
NNSA	National Nuclear Security Administration
NOI	Notice of Intent
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NTS	Nevada Test Site
PC	performance category
petaflops	one quadrillion floating point operations per second
PM_n	particulate matter less than or equal to *n* microns in aerodynamic diameter
PRS	potential release site
R&D	research and development
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RLWTF	Radioactive Liquid Waste Treatment Facility
RNA	ribonucleic acid
ROD	Record of Decision
ROI	region of influence
SA	supplement analysis
SHEBA	Solution High-Energy Burst Assembly
SNM	special nuclear material
SO_2	sulfur dioxide
SST	safe secure transport
SWEIS	Site-Wide Environmental Impact Statement
SWMU	solid waste management unit
TA	technical area
TEDE	total effective dose equivalent
teraflops	one trillion floating point operations per second

TFF	Target Fabrication Facility
TRU	transuranic
TSCA	Toxic Substances Control Act
TSFF	Tritium Science and Fabrication Facility
TSP	total suspended particulate
TSTA	Tritium Systems Test Assembly
UCL	upper confidence limit
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
WETF	Weapons Engineering Tritium Facility
WIPP	Waste Isolation Pilot Plant
°C	degrees Celsius
°F	degrees Fahrenheit

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}