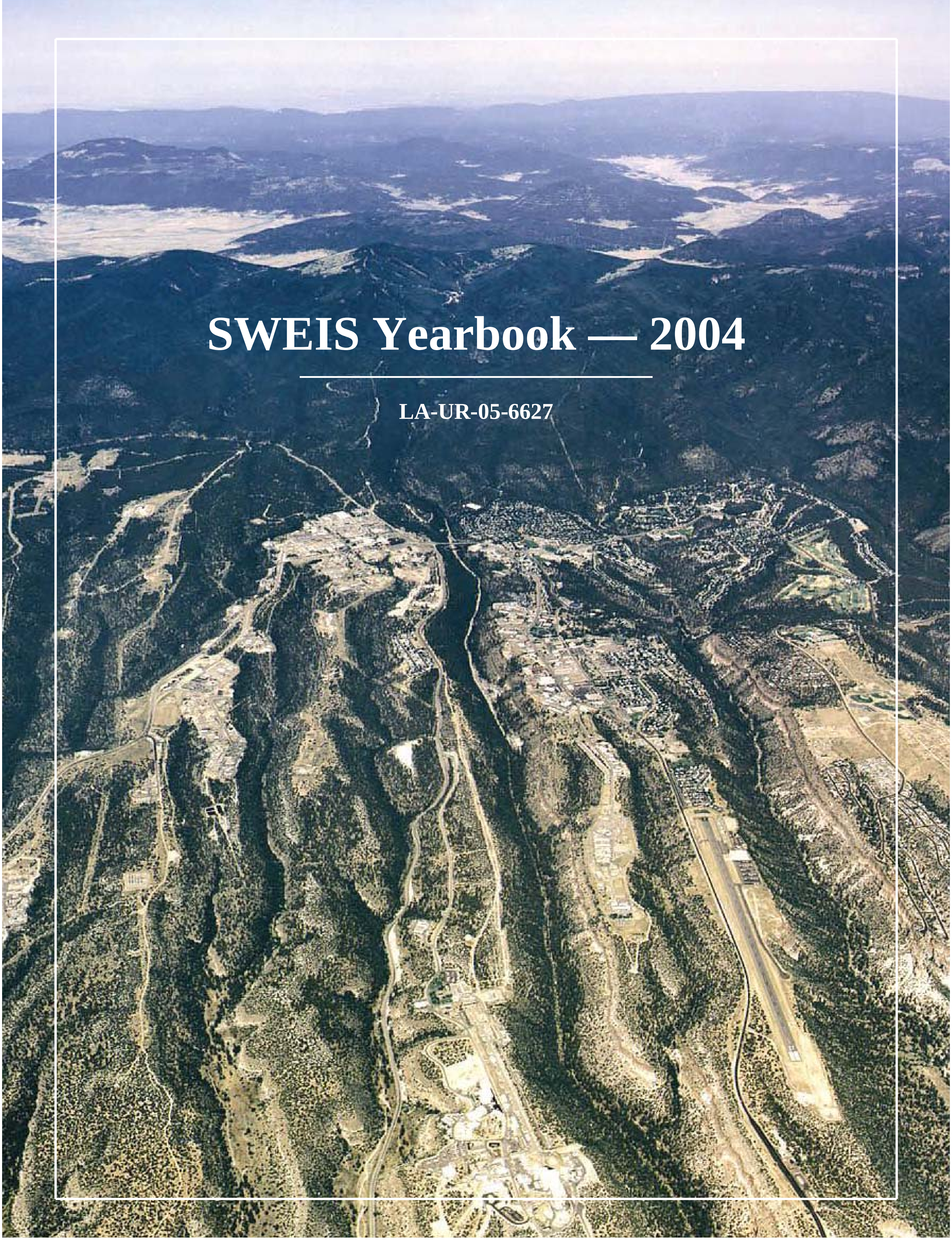

SWEIS Yearbook — 2004

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Title

SWEIS Yearbook — 2004

Comparison of 2004 Data Projections of the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory

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Preface

In the Record of Decision for Stockpile Stewardship and Management, the US Department of Energy (DOE)[1] charged LANL with several new tasks, including war reserve pit production. DOE evaluated potential environmental impacts of these assignments in the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (DOE 1999a). This Site-Wide Environmental Impact Statement (SWEIS) provided the basis for DOE decisions to implement these new assignments at LANL through the SWEIS Record of Decision (ROD) issued in September 1999 (DOE 1999b).

Every five years, DOE performs a formal analysis of the adequacy of the SWEIS to characterize the environmental envelope for continuing operations at LANL. The Annual SWEIS Yearbook was designed to assist DOE in this analysis by comparing operational data with projections of the SWEIS for the level of operations selected by the ROD. As originally planned, the Yearbook was to be published one year following the activities; however, publication was moved approximately six months earlier to achieve timely presentation of the information. Yearbook publications to date include the following:

- "SWEIS 1998 Yearbook," LA-UR-99-6391, December 1999 (LANL 1999, http://lib-www.lanl.gov/cgi-bin/getfile?00460172.pdf).
- "SWEIS Yearbook – 1999," LA-UR-00-5520, December 2000 (LANL 2000a, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-00-5520.htm).
- "A Special Edition of the SWEIS Yearbook, Wildfire 2000," LA-UR-00-3471, August 2000 (LANL 2000b, http://lib-www.lanl.gov/cgi-bin/getfile?00393627.pdf).
- "SWEIS Yearbook – 2000," LA-UR-01-2965, July 2001 (LANL 2001, http://lib-www.lanl.gov/la-pubs/00818189.pdf)
- "SWEIS Yearbook – 2001," LA-UR-02-3143, September 2002 (LANL 2002, http://lib-www.lanl.gov/cgi-bin/getfile?00818857.pdf).
- "SWEIS Yearbook – 2002," LA-UR-03-5862, September 2003 (LANL 2003, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-03-5862.htm)

[1] Congress established the National Nuclear Security Administration (NNSA) within the DOE to manage the nuclear weapons program for the United States. Los Alamos National Laboratory (LANL or Laboratory) is one of the facilities now managed by the NNSA. The NNSA officially began operations on March 1, 2000. Its mission is to carry out the national security responsibilities of the DOE, including maintenance of a safe, secure, and reliable stockpile of nuclear weapons and associated materials capabilities and technologies; promotion of international nuclear safety and nonproliferation; and administration and management of the naval nuclear propulsion program.

- "SWEIS Yearbook – 2003," LA-UR-04-6024, September 2004 (LANL 2004, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-04-6024.htm)
- "SWEIS Yearbook – 2004," LA-UR-05-6627, September 2005 (LANL 2005, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-05-6627.htm)

The Yearbook 2004 will present the sixth year of data compiled since the ROD for the LANL SWEIS was issued in September 1999. The Yearbook 2004 is an essential component in DOE's five-year evaluation of how accurately the SWEIS represents LANL current and projected operations. DOE regulations require this review, called a supplement analysis, of the SWEIS every five years, to determine if the SWEIS is adequate or needs to be supplemented or a new SWEIS should be written.

The collective set of Yearbooks contains data needed for trend analyses, identifies potential problem areas, and enables decision-makers to determine when and if an updated SWEIS or other National Environmental Policy Act analysis is necessary. This edition of the Yearbook summarizes the data from 2004, and, together with the previous editions of the Yearbook, provides trend analysis of these data to assist DOE in its decision-making process.

Previous editions of the Yearbook have incorporated photographs depicting important events that occurred during the calendar year under review. However, due to budgetary constraints this year, the 2004 Yearbook contains no photographs and a minimum of figures. In addition, this edition of the Yearbook will not be published as a stand-alone document but will be available on-line.

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Executive Summary

In 1999, the US Department of Energy (DOE) published a Site-Wide Environmental Impact Statement (SWEIS) for Continued Operation of Los Alamos National Laboratory (LANL or Laboratory) (DOE 1999a). DOE issued a Record of Decision (ROD) for this document in September 1999 (DOE 1999b).

DOE and LANL implemented a program, the Annual Yearbook, making comparisons between SWEIS ROD projections and actual operations data for two reasons: first, to preserve and enhance the usefulness of the SWEIS as a "living" document, and second, to provide DOE with a tool to assist in determining the continued adequacy of the SWEIS in characterizing existing operations. The Yearbooks from calendar year (CY) 1998 through CY 2001 and CYs 2003 and 2004 focus on operations during one CY and specifically address the following:

- facility and/or process modifications or additions,
- types and levels of operations during the CY,
- operations data for the Key Facilities, and
- site-wide effects of operations for the CY.

The 2002 Yearbook was a special edition to assist DOE/National Nuclear Security Administration in evaluating the need for preparing a new SWEIS for LANL. This edition of the Yearbook summarized the data routinely collected from individual CYs as described above. It also contained additional text and tabular summaries as well as a trend analysis. The 2002 Yearbook also indicated LANL's programmatic progress in moving towards the SWEIS projections.

The SWEIS analyzed the potential environmental impacts of scenarios for future operations at LANL. DOE announced in its ROD that it would operate LANL at an expanded level and that the environmental consequences of that level of operations were acceptable. The ROD is not a predictor of specific operations, but establishes boundary conditions for operations. The ROD provides an environmental operating envelope for specific facilities and LANL as a whole. If operations at LANL were to routinely exceed the operating envelope, DOE would evaluate the need for a new SWEIS. As long as LANL operations remain below the level analyzed in the ROD, the environmental operating envelope is valid. Thus, the levels of operation projected by the SWEIS ROD should not be viewed as goals to be achieved, but rather as acceptable operational levels.

The Yearbooks address capabilities and operations using the concept of "Key Facility" as presented in the SWEIS. The definition of each Key Facility hinges upon operations (research, production, or services) and capabilities and is not necessarily confined to a single structure, building, or technical area. Chapter 2 discusses each of the 15 Key Facilities from three aspects—significant facility construction and modifications that have occurred during 2004, the types and levels of operations that occurred during 2004, and the 2004 operations data. Chapter 2 also discusses the "Non-Key Facilities," which include all buildings and structures not part of a Key Facility, or the balance of LANL.

During 2004, planned construction and/or modifications continued at nine of the 15 Key Facilities. These activities were both modifications within existing structures and new or replacement facilities. New structures completed and occupied during 2004 included the Fire Safe Storage Building at Technical Area (TA) 55 and the Materials Science and Technology Office Building at TA-03. Additionally, seven major construction projects were either completed or continued for the Non-Key Facilities. These projects are as follows:

- Atlas was reassembled at the Nevada Test Site during 2003 and 2004 when LANL again assumed ownership and management of the Atlas facility; machine characterization testing began in May 2004 to evaluate performance (compared to experience at LANL), reliability, and reproducibility.
- Construction of the new Medical Facility was completed January 2004.
- Construction of the National Security Sciences Building continued in 2004.
- Construction of the new Facility and Waste Operations Office Building was completed in October 2004.
- Construction of the TA-03 Parking Structure was completed April 2004.
- Construction of the Pajarito Road Access Control Stations was completed April 2004.
- Construction of the Center for Integrated Nanotechnologies was started in November 2004.

The ROD projected a total of 38 facility construction and modification projects for LANL. Twenty projects have now been completed: six in 1998, eight in 1999, two in 2000, and four in 2002. The number of projects started or continued each year were 13 in 1998, 10 in 1999, seven in 2000, and six in both 2001 and 2002. One of these projects was completed in 2003 and one in 2004.

A major modification project, elimination and/or rerouting of National Pollutant Discharge Elimination System (NPDES) outfalls, was completed in 1999, bringing the total number of permitted outfalls down from the 55 identified by the SWEIS ROD to 20. During 2000, Outfall 03A-199, which will serve the TA-3-1837 cooling towers, was included in the new NPDES permit issued by the US Environmental Protection Agency (EPA) on December 29, 2000. This brings the total number of permitted outfalls up to 21. During 2004, only 16 of the 21 outfalls flowed.

As in the Yearbooks since 1999, this issue reports chemical usage and calculated emissions (expressed as kilograms per year) for the Key Facilities, based on an improved chemical reporting system. The 2004 chemical usage amounts were extracted from the Laboratory's EX3 chemical inventory system rather than the Automated Chemical Inventory System used in the past. The quantities used for this report represent chemicals procured or brought on site by CY from 1999 through 2004. Information is presented in Appendix A for actual chemical use and estimated emissions for each Key Facility. Additional information for chemical use and emissions reporting can be found in the annual Emissions Inventory Report as required by New Mexico Administrative Code, Title 20, Chapter 2, Part 73 (20 NMAC 2.73). The most recent report is “Emissions Inventory Report Summary, Reporting Requirements for the New Mexico Administrative

Code, Title 20, Chapter 2, Part 73 (20 NMAC 2.73) for Calendar Year 2003" (LANL 2005).

With a few exceptions, the capabilities identified in the SWEIS ROD for LANL have remained constant since 1998. The exceptions are the

- movement of the Nonproliferation Training/Nuclear Measurement School between Pajarito Site and the Chemistry and Metallurgy Research Building during 2000 and 2002,
- relocation of the Decontamination Operations Capability from the Radioactive Liquid Waste Treatment Facility to the Solid Radioactive and Chemical Waste Facilities in 2001,
- transfer of part of the Characterization of Materials Capability from Sigma to the Target Fabrication Facility (TFF) in 2001, and
- loss of Cryogenic Separation Capability at the Tritium Key Facilities in 2001.

Also, following the events of September 11, 2001, LANL was requested to provide support for homeland security.

During CY 2004, 88 capabilities were active. The eight inactive capabilities were the Cryogenic Separation at the Tritium Facilities; both the Destructive and Nondestructive Assay and the Fabrication and Metallography capabilities at CMR; Characterization of Materials at the TFF; both the Accelerator Transmutation of Wastes and the Medical Isotope Production capabilities at the Los Alamos Neutron Science Center (LANSCE); and Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

While there was activity under nearly all capabilities, the levels of these activities were mostly below levels projected by the ROD. For example, the LANSCE linac generated an H^- beam to the Lujan Center for 1,435 hours in 2004, at an average current of 115.5 microamps, compared to 6,400 hours at 200 microamps projected by the ROD. Similarly, a total of 164 criticality experiments were conducted at Pajarito Site, compared to the 1,050 projected experiments.

As in 1998 through 2000, only three of LANL's facilities operated during 2004 at levels approximating those projected by the ROD—the Materials Science Laboratory (MSL), the Bioscience Facilities (formerly Health Research Laboratory), and the Non-Key Facilities. The two Key Facilities (MSL and Bioscience) are more akin to the Non-Key Facilities and represent the dynamic nature of research and development at LANL. More importantly, none of these facilities are major contributors to the parameters that lead to significant potential environmental impacts. The remaining 13 Key Facilities all conducted operations at or below projected activity levels.

Radioactive airborne emissions from point sources (i.e., stacks) during 2004 totaled approximately 5,230 curies, just under 25 percent of the 10-year average of 21,700 curies projected by the SWEIS ROD. Maximum offsite dose continued to be relatively small for 2004. The final dose is 1.68 millirem, well under the EPA air emissions limit for DOE facilities of 10 millirem per year. Calculated NPDES discharges totaled 162.52 million gallons per year compared to a projected volume of 278 million gallons per year. Due to the LANL stand-down that began in July of 2004, this number is approximately 47 million gallons less than CY 2003. In addition, the apparent decrease in flows compared to the SWEIS ROD is primarily due to the methodology by which flow was measured and reported in the past. Historically, instantaneous flow was measured during field visits as required in the NPDES permit. These measurements were then extrapolated over a 24-hour day/seven-day week. With implementation of the new NPDES permit on February 1, 2001, data are collected and reported using actual flows recorded by flow meters at most outfalls. At those outfalls that do not have meters, the flow is calculated as before, based on instantaneous flow. Quantities of solid radioactive and chemical wastes generated in 2004 ranged from approximately 5.7 percent of the mixed low-level radioactive waste projection to 137 percent of the mixed transuranic (TRU) waste projection. The larger-than-projected quantity of mixed TRU waste was the result of the Decontamination and Volume Reduction System (DVRS) repackaging of legacy TRU waste for shipment to the Waste Isolation Pilot Plant. Both the mixed TRU waste and TRU waste quantities exceeded the SWEIS ROD projections during 2004 due to the DVRS repackaging activity.

The workforce has been above ROD projections since 1997. The 13,261 employees at the end of CY 2004 represent 1,910 more employees than projected but reflect a *decrease* of 355 employees from CY 2003. Since 1998, the peak electricity consumption was 394 gigawatt-hours during 2002 and the peak demand was 85 megawatts during 2001 compared to projections of 782 gigawatt-hours with a peak demand of 113 megawatts. The peak water usage was 461 million gallons during 1998 (compared to 759 million gallons projected), and the peak natural gas consumption was 1.49 million decatherms during 2001 (compared to 1.84 million decatherms projected). Between 1998 and 2004, the highest collective Total Effective Dose Equivalent for the LANL workforce was 124.6 person-rem during 2004, which is considerably lower than the workforce dose of 704 person-rem projected by the ROD.

Measured parameters for ecological resources and groundwater were similar to ROD projections, and measured parameters for cultural resources and land resources were below ROD projections. For land use, the ROD projected the disturbance of 41 acres of new land at TA-54 because of the need for additional disposal cells for low-level radioactive waste. As of 2004, this expansion had not become necessary.

Cultural resources remained protected, and no excavation of sites at TA-54 has occurred. (The ROD projected that 15 prehistoric sites would be affected by the expansion of Area G into Zones 4 and 6 at TA-54.) However, a total of 11 cultural sites were excavated in Rendija Canyon from June to November 2004.

As projected by the ROD, water levels in wells penetrating into the regional aquifer continue to decline in response to pumping, typically by several feet each year. In areas where pumping has been reduced, water levels show some recovery. No unexplained changes in patterns have occurred in the 1995–2004 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977. Five additional characterization wells were complete by the end of 2004.

In addition, ecological resources are being sustained as a result of protection afforded by DOE administration of LANL. These resources include biological resources such as protected sensitive species, ecological processes, and biodiversity. The recovery and response to the Cerro Grande Fire of May 2000 has included a wildfire fuels reduction program, burned area rehabilitation and monitoring efforts, and enhanced vegetation and wildlife monitoring.

In conclusion, LANL operations data mostly fell within projections. Operations data that exceeded projections, such as number of employees or chemical waste from cleanup, either produced a positive impact on the economy of northern New Mexico or resulted in no local impact because these wastes were shipped offsite for disposal. Overall, the 2003 operations data indicate that LANL was operating within the SWEIS envelope and still ramping up operations towards the preferred Expanded Alternative in the ROD.

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Acknowledgments

The Site-Wide Issues Program Office was closed on April 4, 2002. This office prepared the first three editions of the Yearbook and initiated preparation of Yearbook 2001. The Ecology Group of the Environmental Stewardship Division (ENV-ECO) completed Yearbooks 2001, 2002, and 2003. Ken Rea served as document manager for Yearbooks 2001 and 2002. Susan Radzinski, ENV-ECO, served as document manager for Yearbooks 2003 and 2004; chief contributor was Marjorie Wright, ENV-ECO.

Hector Hinojosa provided editorial support; Teresa Hiteman served as the designer and electronic publication specialist. We would also like to thank Kathy Bennett for creating maps and figures.

Many individuals assisted in the collection of information and review of drafts. Data and information came from many parts of the Laboratory, including facility and operating personnel and those who monitor and track environmental parameters. The Yearbook could not have been completed and verified without their help. Though all individuals cannot be mentioned here, the table below identifies major players from each of the Key Facilities and other operations.

Area of Contribution	Contributor
Air Emissions	Margie Stockton
Air Emissions	David Fuehne
Air Emissions	Walter Whetham
Bioscience (Formerly Health Research Laboratory)	Andrea Pistone
Chemistry and Metallurgy Research Building	Robert Romero
Cultural Resources	Kari Garcia
Ecological Resources	Leslie Hansen
Ecological Resources	Randy Balice
Environmental Restoration Project	Virginia Smith
Groundwater	Charles Nylander
Groundwater	Kelly Bitner
High Explosives Processing	Bart Olinger
High Explosives Processing	Kathy Smith
High Explosives Testing	Randy Johnson
High Explosives Testing	Franco Sisneros
Land Resources	Brook Davis
Liquid Effluents	Paul Schumann
Los Alamos Neutron Science Center	Joyce Roberts
Machine Shops	Anthony Martinez
Materials Science Laboratory	Jennifer Rezmer
Materials Science Laboratory – Center for Integrated Nanotechnologies	Betsy Grindstaff
National Pollutant Discharge Elimination System Data	Paul Schumann
National Pollutant Discharge Elimination System Data	Marc Bailey
National Pollutant Discharge Elimination System Data	Carla Jacquez
Non-Key Facilities–Atlas	Robert Reinovsky
Non-Key Facilities–LANL Medical Facility	Aleene Jenkins
Non-Key Facilities–National Security Sciences Building	Keith Orr
Non-Key Facilities–TA-03 Parking Structure	Lee Lucero

Area of Contribution	Contributor
Non-Key Facilities–Pajarito Road Access Control Stations	Michael Grimler
Non-Key Facilities–IM Division Office Building	Jeff Tucker
Pajarito Site	Debbie Baca
Plutonium Complex	Harvey Decker
Radioactive Liquid Waste Treatment Facility	Pete Worland
Radioactive Liquid Waste Treatment Facility	Chris Del Signore
Radiochemistry Facility	Sandy Wagner
Sigma	Jennifer Rezmer
Socioeconomics	John Pantano
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Solid Radioactive and Chemical Wastes	Mary Jane Winch
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Trend Analysis	Brook Davis
Tritium Facilities	Richard Carlson
Utilities	Jerome Gonzales
Utilities	Gilbert Mackey
Utilities	Jim Haugen
Worker Safety/Doses	Brian Colby
Worker Safety/Doses	Tom Buhl
Worker Safety/Doses	Bob Bates
Worker Safety/Doses	Paul Hoover

Acronyms

AFCI	Advanced Fuel Cycle Initiative
ALARA	as low as reasonably achievable
ARTIC	Actinide Research and Technology Instruction Complex
BA	biological assessment
BIO	Basis for Interim Operation
BN	Bechtel Nevada
BSL	Biosafety Level
CASA	Critical Assembly and Storage Area
CDC	Centers for Disease Control
Ci	curie
CINT	Center for Integrated Nanotechnology
CMR	Chemical and Metallurgy Research
COPC	contaminant of potential concern
CRMP	Cultural Resources Management Plan
CY	calendar year
CRT	Cultural Resources Team
D&D	decontamination and demolition
DARHT	Dual-Axis Radiographic Hydrodynamic Test (facility)
DOE	US Department of Energy
DVRS	Decontamination and Volume Reduction System
DX	Dynamic Experimentation (Division)
EA	environmental assessment
EIS	environmental impact statement
EISU	Electrical Infrastructure Safety Upgrades
EMS	Environmental Management System
ENV-ECO	Ecology group
EPA	US Environmental Protection Agency
ER	Environmental Restoration (Project)
ESA	Engineering Sciences and Application (Division)
ESM	Engineering Standards Manual
FITS	Facility Improvement Technical Support (building)
FTE	full-time equivalent (employee)
FWO	Facility and Waste Operations (Division)
FY	Fiscal Year
HAP	hazardous air pollutant
HEPA	high-efficiency particulate air (filter)
HRL	Health Research Laboratory
HSR-1	Health Physics Operations group
IAEA	International Atomic Energy Agency
IM	Information Management (Division)
ISO	International Organization of Standardization
JCATS	Joint Conflict and Tactical Simulation
KSL	KBR/Shaw/LATA
kV	kilovolts
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LASO	Los Alamos Site Office
LEDA	Low-Energy Demonstration Accelerator
linac	linear accelerator
LLW	low-level radioactive waste
LPSS	Long-Pulse Spallation Source
m	meter
MDA	Material Disposal Area
MeV	electron volts
MGY	million gallons per year
MLLW	mixed low-level radioactive waste
MSL	Materials Science Laboratory

MST	Material Science and Technology (Division)
NEPA	National Environmental Policy Act
NFA	no further action
NMED	New Mexico Environment Department
NMSHPD	New Mexico State Historic Preservation Department
NMT	Nuclear Materials Technology (Division)
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
NRC	US Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NSSB	National Security Sciences Building
NTS	Nevada Test Site
OSR	Offsite Source Recovery (Program)
PCB	polychlorinated biphenyl
PHERMEX	Pulsed High-Energy Radiographic Machine Emitting X-rays (facility)
PNM	Public Service Company of New Mexico
PP	Pollution Prevention
PRS	potential release site
PTLA	Protection Technology Los Alamos
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
RS	Remediation Services (Project)
SA	Supplement Analysis
SHPO	State Historic Preservation Officer
SNM	special nuclear material
STA	Southern Technical Area
SWEIS	Site-Wide Environmental Impact Statement
S-SWEIS	Supplemental Site-Wide Environmental Impact Statement
SWMU	solid waste management unit
SWPPP	stormwater pollution prevention plan
TA	Technical Area
TEDE	total effective dose equivalent
TFF	Target Fabrication Facility
TRU	transuranic
TSFF	Tritium Science and Fabrication Facility
TSR	Technical Safety Review
TSTA	Tritium Systems Test Assembly (facility)
TWISP	Transuranic Waste Inspectable Storage Project
TYCSP	Ten-Year Comprehensive Site Plan
UC	University of California
UF/RO	ultrafiltration/reverse osmosis
VOC	volatile organic compound
VTR	vault-type room
WCRR	Waste Characterization, Reduction, and Repackaging (facility)
WETF	Weapons Engineering Tritium Facility
WIPP	Waste Isolation Pilot Plant
WMin	Waste Minimization
WNR	Weapons Neutron Research (facility)
WTA	Western Technical Area

1.0 Introduction

1.1 The SWEIS

In 1999, the US Department of Energy (DOE)[1] published the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (DOE 1999a). DOE issued its Record of Decision (ROD) on this Site-Wide Environmental Impact Statement (SWEIS) in September 1999 (DOE 1999b). The ROD identified the decisions DOE made on levels of operation for LANL for the foreseeable future.

1.2 Annual Yearbook

To enhance the usefulness of this SWEIS, a National Environmental Policy Act (NEPA) document, DOE and LANL implemented a program making annual comparisons between SWEIS ROD projections and actual operations via an Annual Yearbook. The Yearbook's purpose is not to present environmental impacts or environmental consequences, but rather to provide data that could be used to develop an impact analysis. The Yearbook focuses on the following:

- Facility and process modifications or additions (Chapter 2). These include projected activities, for which NEPA coverage was provided by the SWEIS, and some post-SWEIS activities for which environmental coverage was not provided. In the latter case, the Yearbook identifies the additional NEPA analyses (i.e., categorical exclusions, environmental assessments [EAs], or environmental impact statements [EISs]) that were performed.

- The types and levels of operations during the calendar year (Chapter 2). Types of operations are described using capabilities defined in the SWEIS. Levels of operations are expressed in units of production, numbers of researchers, numbers of experiments, hours of operation, and other descriptive units.

- Operations data for the Key Facilities, comparable to data projected by the SWEIS ROD (Chapter 2). Data for each facility include waste generated, air emissions, liquid effluents, and number of workers.

- Site-wide effects of operations for the calendar year (Chapter 3). These include measures such as number of workers, radiation doses, workplace incidents, utility requirements, air emissions, liquid effluents, and solid wastes. These effects also include changes in the regional aquifer, ecological resources, and other resources for

[1] Congress established the National Nuclear Security Administration (NNSA) within the DOE to manage the nuclear weapons program for the United States. Los Alamos National Laboratory (LANL or Laboratory) is one of the facilities now managed by the NNSA. The NNSA officially began operations on March 1, 2000. Its mission is to carry out the national security responsibilities of the DOE, including maintenance of a safe, secure, and reliable stockpile of nuclear weapons and associated materials capabilities and technologies; promotion of international nuclear safety and nonproliferation; and administration and management of the naval nuclear propulsion program.

which the DOE has long-term stewardship responsibilities as an administrator of federal lands.

- Trend analysis (Chapter 4). This includes analysis on land use, quantities of waste generated, utility consumption, and other long-term effects from LANL operations.

- Ten-Year Comprehensive Site Plan (TYSCP; Chapter 5). This summary of LANL projections for the future is not included in this edition of the Yearbook.

- Summary and conclusion (Chapter 6). This chapter summarizes calendar year (CY) 2004 for LANL in terms of overall facility constructions and modifications, facility operations, and operations data and environmental parameters. These data form the basis of the conclusion for whether or not LANL is operating within the envelope of the SWEIS ROD.

- Chemical usage and emissions data (Appendix A). These data summarize the chemical usage and air emissions by Key Facility.

- Nuclear facilities list (Appendix B). This appendix provides a summary of the facilities identified as nuclear at the time the SWEIS was developed through CY 2004.

- Radiological facilities list (Appendix C). These data identify the facilities considered as radiological in CY 2004 and indicate their categorization at the time the SWEIS was developed.

Data for comparison come from a variety of sources, including facility records, operations reports, facility personnel, and the annual Environmental Surveillance Report. The focus on operations rather than on programs, missions, or funding sources is consistent with the approach of the SWEIS.

The Annual Yearbooks provide DOE with information needed to evaluate adequacy of the SWEIS and enable DOE to make decisions on when and if a new SWEIS is needed. The Yearbooks also provide facilities and managers at LANL with a guide in determining whether activities are within the SWEIS operating envelope. The report does not reiterate the detailed information found in other LANL documents, but rather points the interested reader to those documents for the additional detail. The Yearbooks serve as a guide to environmental information collected and reported by the various groups at LANL.

The SWEIS analyzed the potential environmental impacts of scenarios for future operations at LANL. DOE announced in its ROD that it would operate LANL at an expanded level and that the environmental consequences of that level of operations were acceptable. The ROD is not a predictor of specific operations, but establishes boundary conditions for operations. The ROD provides an environmental operating envelope for specific facilities and for LANL as a whole. If operations at LANL were to routinely exceed the operating envelope, DOE would evaluate the need for a new SWEIS. As long as LANL operations remain below the level analyzed in the ROD, the environmental operating envelope is valid. Thus, the levels of operation projected by the SWEIS ROD should not be viewed as goals to be achieved, but rather as acceptable operational limits.

DOE regulations require a formal evaluation, called a supplement analysis (SA), of the SWEIS every five years following the issuance of the ROD, to determine if the SWEIS is adequate or needs to be supplemented or a new SWEIS should be written. Therefore, every fifth year after the issuance of the ROD, the Yearbook will not only report the previous years data on operations, but will also include summaries and trends of the data presented in the previous four editions.

1.3 This Yearbook

The ROD selected levels of operations, and the SWEIS provided projections for these operations. This Yearbook compares data from CY 2004 to the appropriate SWEIS projections. Hence, this report uses the phrases "SWEIS ROD projections," "SWEIS ROD," or "ROD" to convey this concept, as appropriate.

The collection of data on facility operations is a unique effort. The type of information developed for the SWEIS is not routinely collected at LANL. Nevertheless, this information is the heart of the SWEIS and the Yearbook. Although this requires a special effort, the description of current operations and indications of future changes in operations are believed to be sufficiently important to warrant an incremental effort.

The SWEIS Yearbook 2002 represented the fifth year of data collection and comparison since the issuance of the SWEIS. It included summaries of data from 1998 through 2002, trends in the data across these years, and additional information as deemed necessary to enable DOE to use that document together with the SWEIS Yearbooks 2003 and 2004, as the primary source of information to determine the adequacy of the existing SWEIS. The Yearbook 2004 will present the seventh year of data compiled since the SWEIS ROD was issued in September 1999. The annual Yearbooks together are an essential component in DOE's five-year evaluation of how accurately the SWEIS represents LANL current and projected operations.

According to Federal regulations, the NNSA initiated preparation of a SA for the SWEIS in mid-2004. The purpose of the SA was to determine if the existing SWEIS remains adequate. In addition to preparing the 2003 Yearbook, LANL's Ecology group prepared a SA information document to provide the data to be analyzed in the SA. The Yearbook 2003 was an appendix to this SA information document.

During the development of the SA, NNSA identified the need to prepare a Supplemental SWEIS (S-SWEIS). Since the issuance of the Final SWEIS in 1999, DOE and NNSA have completed several EISs, EAs, and a Special Environmental Analysis addressing LANL operations and actions taken immediately after the 2000 Cerro Grande Fire, which burned a part of LANL. These analyses document substantial developing changes to both LANL's environmental setting and LANL's programs since 1999.

In October 2004, NNSA decided to update and supplement the original LANL SWEIS by preparing an S-SWEIS to consider

- impacts of proposed new activities,
- impacts resulting from changes in the environmental setting, and
- cumulative impacts associated with on-going activities on site.

The 2004 Yearbook will be an appendix to the S-SWEIS in preparation during the latter months of 2005.

References

Department of Energy, 1999a. "Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory," US Department of Energy document DOE/EIS-0238, Albuquerque, NM.

Department of Energy, 1999b. "Record of Decision: SWEIS in the State of New Mexico," 64 FR 50797, Washington, D.C.

2.0 Facilities and Operations

LANL has about 2,000 structures with approximately eight million square feet under roof, spread over an area of approximately 40 square miles. In order to present a logical and comprehensive evaluation of LANL's potential environmental impacts, the SWEIS developed the Key Facility concept. Fifteen facilities were identified that were both critical to meeting mission assignments and

- housed operations that have potential to cause significant environmental impacts, or
- were of most interest or concern to the public (based on comments in the SWEIS public hearings), or
- would be more subject to change because of DOE programmatic decisions.

The remainder of LANL was called "Non-Key," not to imply that these facilities were any less important to accomplishment of critical research and development, but because they did not fit the above criteria (DOE 1999a).

Taken together, the 15 Key Facilities represent the great majority of environmental risks associated with LANL operations. Specifically, during 2004, the Key Facilities contributed

- more than 99 percent of all radiation doses to the public,
- more than 90 percent of all radioactive liquid waste generated at LANL,
- more than 90 percent of all radioactive solid waste generated at LANL,
- more than 99 percent of all radiation doses to the LANL workforce, and
- approximately 16 percent of all chemical waste generated by LANL.

In addition, the Key Facilities (as presented in the SWEIS) comprised 42 of the 48 Category 2 and Category 3 Nuclear Structures at LANL[1]. Subsequently, DOE and LANL have published seven lists identifying nuclear facilities at LANL [one in 1998 (DOE 1998a), another in 2000 (DOE 2000a), two in 2001 (LANL 2001a and 2001b), one in 2002 (LANL 2002a), and two in 2004 (LANL 2004a and 2004b)] that significantly changed the classification of some buildings. Appendix B provides a summary of the nuclear facilities and a table has been added to each section of this chapter to explain the differences and identify the 31 structures currently listed by DOE as nuclear facilities. Of these 31 structures, all but one reside within a Key Facility. The former tritium research facility (TA-033-86) was still listed as a Category 2 nuclear facility in 2001, but

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[1] DOE Order 5480.23 (DOE 1992a) categorizes nuclear hazards as Category 1, Category 2, or Category 3. Because LANL has no Category 1 nuclear facilities (usually applied to nuclear reactors), definitions are presented for only Categories 2 and 3:

- Category 2 Nuclear Hazard – has the potential for significant onsite consequences. DOE-STD-1027-92 (DOE 1992b) provides the resulting threshold quantities for radioactive materials that define Category 2 facilities.
- Category 3 Nuclear Hazard – has the potential for only significant localized consequences. Category 3 is designed to capture those facilities such as laboratory operations, low-level radioactive waste (LLW) handling operations, and research operations that possess less than Category 2 quantities of material. DOE-STD-1027-92 (DOE 1992b) provides the Category 3 thresholds for radionuclides. The identification of nuclear facilities is based upon the official list maintained by DOE Los Alamos Site Office (LASO) as of December 2002 (LANL 2002a).

underwent decontamination and decommissioning in 2002, was demolished, and was removed from the nuclear facility list. Appendix C provides a comparison of the facilities identified as radiological when the SWEIS was prepared and those identified as radiological in 2003 (LANL 2002b). The 2003 lists are shorter due to better guidance on the radiological designation[2].

The definition of each Key Facility hinges upon operations[3], capabilities, and location and is not necessarily confined to a single structure, building, or technical area (TA). In fact, the number of structures comprising a Key Facility ranges from one, the Material Sciences Laboratory (MSL), to more than 400 for the LANSCE. Key Facilities can also exist in more than a single TA, as is the case with the High Explosives Testing and High Explosives Processing Key Facilities, which exist in all or parts of five and seven TAs, respectively.

This chapter discusses each of the 15 Key Facilities from three aspects—significant facility construction and modifications, types and levels of operations, and operations data that have occurred during 2004. Each of these three aspects is given perspective by comparing them to projections made by the SWEIS ROD. This comparison provides an evaluation of whether or not data resulting from LANL operations continue to fall within the environmental envelope established by the SWEIS ROD. It should be noted that construction activities projected by the SWEIS ROD were for the 10-year period 1996–2005. All construction activities will not be complete and projected operations may not reach maximum levels until the end of the 10-year period.

This chapter also discusses Non-Key Facilities, which include all buildings and structures not part of a Key Facility, or the balance of LANL. Although operations at Non-Key Facilities do not contribute significantly to radiation doses or generation of radioactive wastes, the Non-Key Facilities represent a significant fraction of LANL. The Non-Key Facilities comprise all or the majority of 30 of LANL's 49 TAs, and approximately 14,224 of LANL's 26,480 acres. The Non-Key Facilities also currently employ about two-thirds the LANL workforce. The Non-Key Facilities include such important buildings and operations as the Central Computing Facility, the TA-46 sewage treatment facility, and the Main Administration Building. Table 2.0-1 identifies and compares the acreage of the 15 Key Facilities and the Non-Key Facilities. Figure 2-1 shows the location of LANL within northern New Mexico, while Figure 2-2 illustrates the TAs. Figure 2-3 shows the locations of the Key Facilities.

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[2] Since the publication of the SWEIS, only two radiological facility lists have been published. The first (LANL 2001c) was published in 2001 and the second (LANL 2002b) in 2002.

[3] As used in the SWEIS and this Yearbook, facility operations include three categories of activities—research, production, and services to other LANL organizations. Research is both theoretical and applied. Examples include modeling (e.g., atmospheric weather patterns) to subatomic investigations (e.g., using the Los Alamos Neutron Science Center [LANSCE] linear accelerator [linac]) to collaborative efforts with industry (e.g., fuel cells for automobiles). Production involves delivery of a product to a customer, such as radioisotopes to hospitals and the medical industry. Examples of services provided to other LANL facilities include utilities and infrastructure support, analysis of samples, environmental surveys, and waste management.

Table 2.0-1. Key and Non-Key Facilities

Facility	Technical Areas	~Size (acres)
Plutonium Complex	TA-55	93
Tritium Facilities	TA-16 & TA-21	312
Chemical and Metallurgy Research (CMR) Building	TA-03	14
Pajarito Site	TA-18	131
Sigma Complex	TA-03	11
MSL	TA-03	2
Target Fabrication Facility (TFF)	TA-035	3
Machine Shops	TA-03	8
High Explosives Processing	TAs 08, 09, 11, 16, 22, 28, 37	1,115
High Explosives Testing	TAs 15, 36, 39, 40	8,691
LANSCE	TA-53	751
Biosciences Facilities (Formerly Health Research Laboratory [HRL])	TA-43, 03, 16, 35, 46	4
Radiochemistry Facility	TA-48	116
Radioactive Liquid Waste Treatment Facility (RLWTF)	TA-50	62
Solid Radioactive and Chemical Waste Facilities	TA-50 & TA-54	943
Subtotal, Key Facilities		12,256
Non-Key Facilities	30 of 49 TAs	14,224 [a]
LANL		26,480

a 14,224 acres is a correction from the 2002 Yearbook that reported 14,244 acres for the Non-Key Facilities.

With the issuance of 10 CFR 830 on January 10, 2001, on-site transportation also needs to be addressed relative to nuclear hazard categorization (FR 2001). This is a change from the SWEIS. At the time the SWEIS was published, on-site transportation was considered part of the affected environment in Section 4.10.3.1. The on-site transportation of nuclear materials greater than or equal to Hazard Category 3 quantities is addressed in a DOE-approved safety analysis (LANL 2002c, DOE 2002a, Steele 2002). The implementation of the analysis and associated controls is under development.

2.1 Plutonium Complex (TA-55)

The Plutonium Complex Key Facility consists of six primary buildings and a number of lesser buildings and structures. As presented in the SWEIS, this Key Facility contained one operational Category 2 nuclear hazard facility (TA-55-4), two Low Hazard chemical facilities (TA-55-3 and TA-55-5), and one Low Hazard energy source facility (TA-55-7). Additionally, Nuclear Materials Technology (NMT) Division acquired and took ownership of the TA-50-37 building, designated as the Actinide Research Training and Instruction Center in CY 2003. A new structure for TA-55, the TA-55-314 Fire Safe Storage Building, was completed in October of 2004.

The DOE listing of LANL nuclear facilities for both 1998 and 2004 (DOE 1998a, LANL 2004b) retained Building TA-55-4 as a Category 2 nuclear hazard facility as shown in Table 2.1-1.

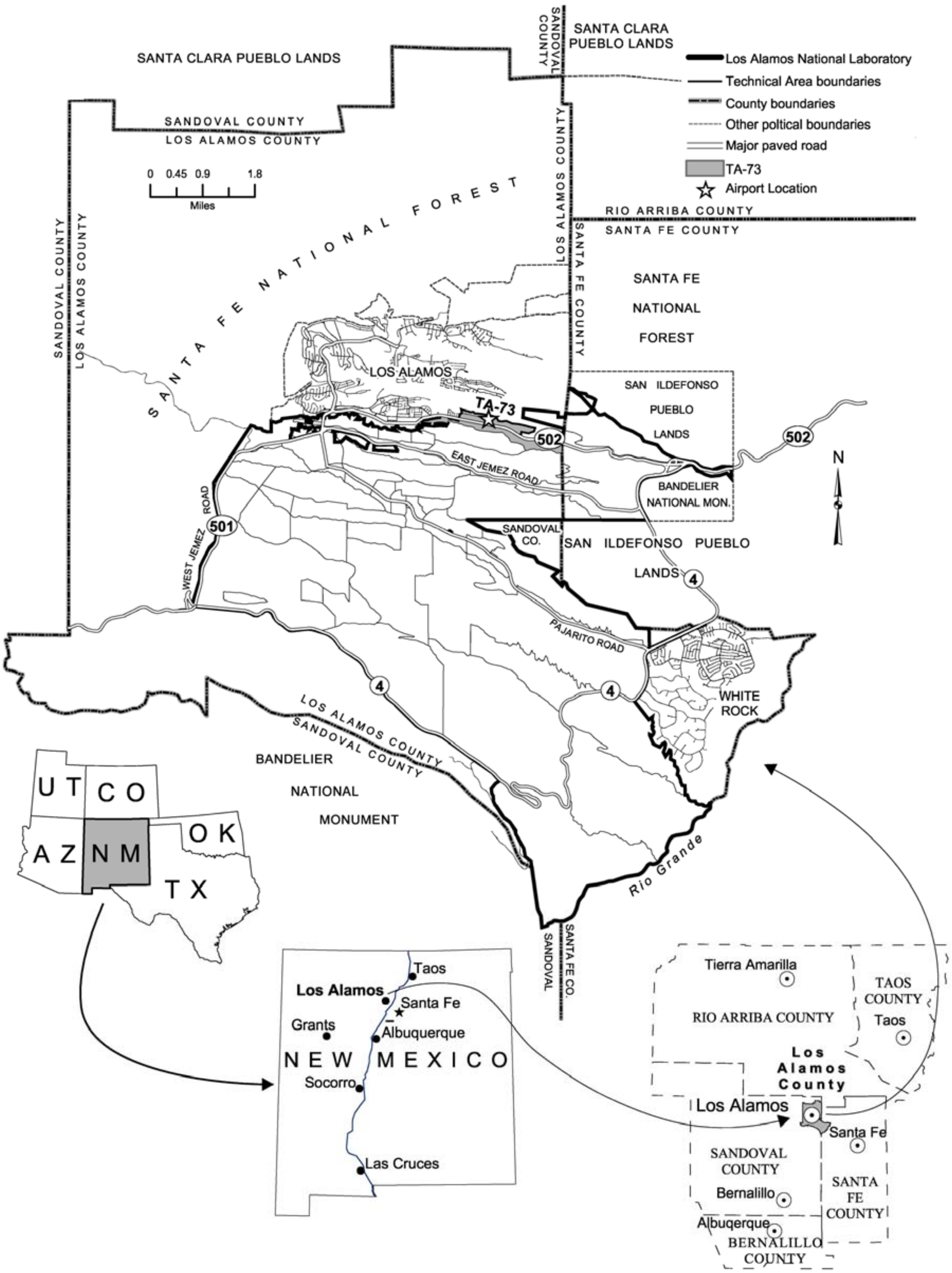

Figure 2-1. Location of LANL

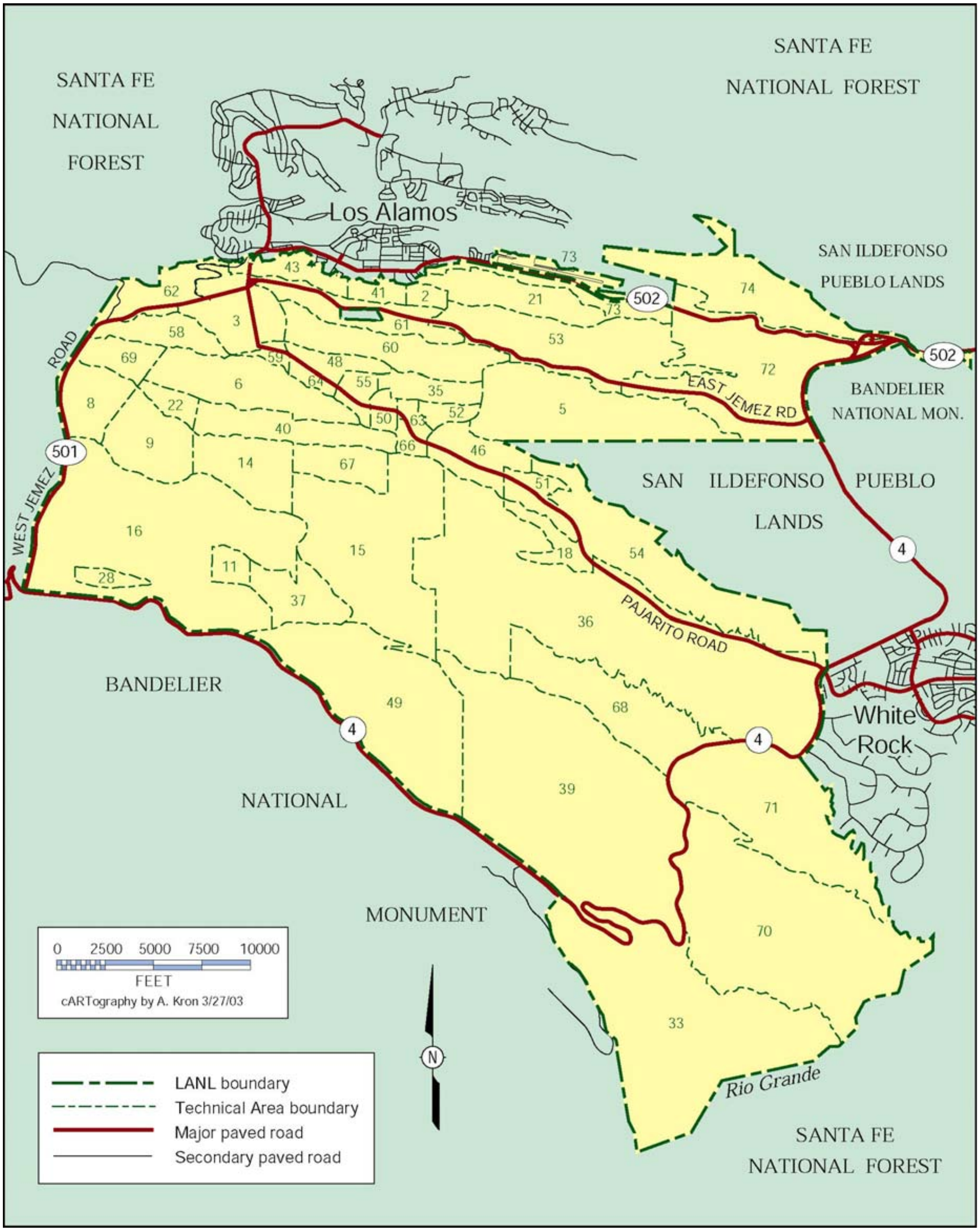

Figure 2-2. Location of TAs

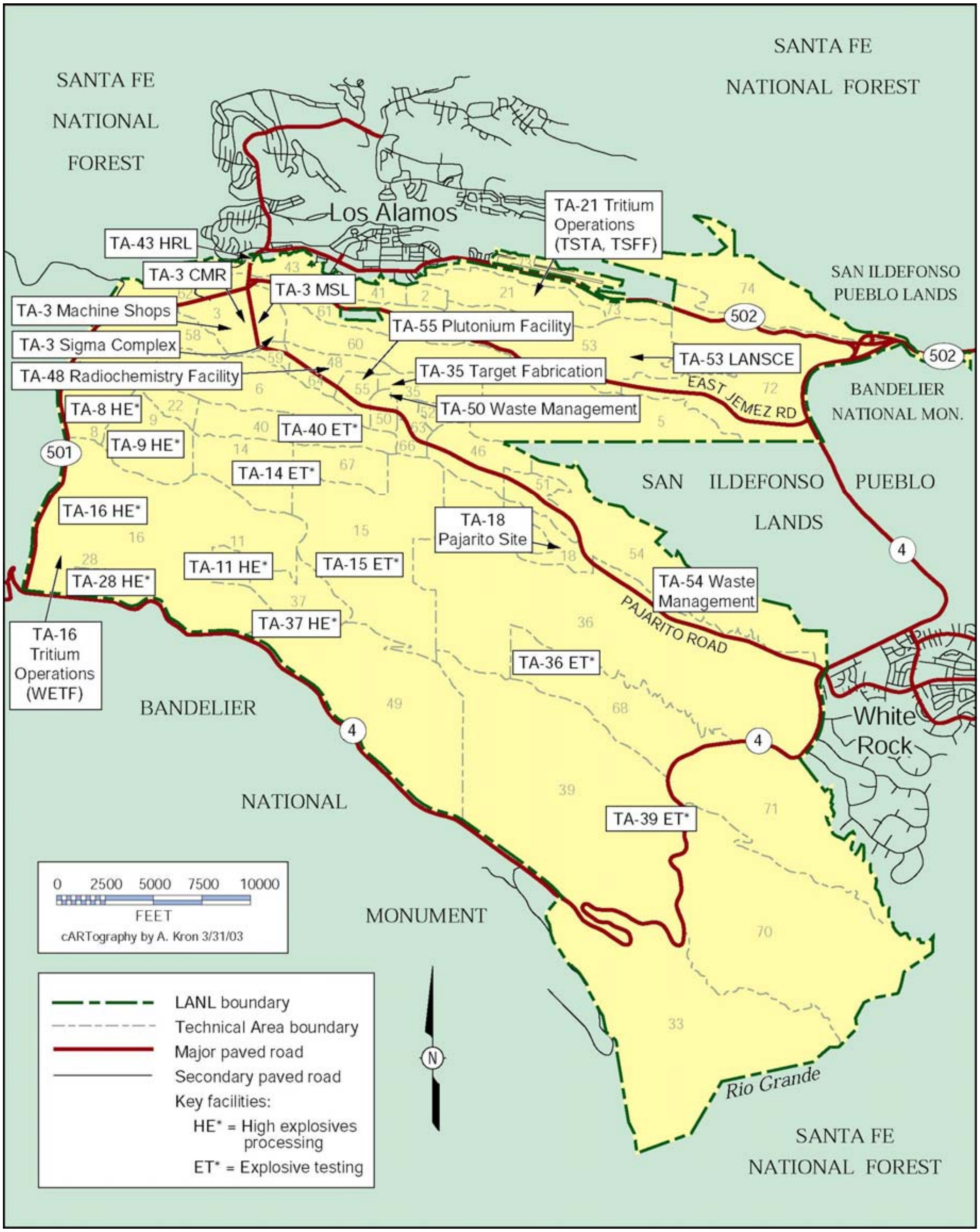

Figure 2-2. Location of Key Facilities

Table 2.1-1. Plutonium Complex Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998[a]	NHC LANL 2004[b]
TA-55-0004	PU Processing	2	2	2
TA-55-0041	Nuclear Material Storage	2		

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).

Note: This table and the Nuclear Hazard Classification tables in the other sections of this Yearbook reflect the data in the published DOE listings of LANL nuclear facilities and LANL radiological facilities that applied during the calendar year under review, in this case CY 2003. Changes in the listings that have occurred during the year will not be reflected in this table if they are not yet published in these documents. However, changes in nuclear hazard classification will be noted in the text of this section.

The SWEIS also identified one potential Category 2 nuclear hazard facility (TA-55-41, the Nuclear Material Storage Facility), which was slated for potential modification to bring it into operational status. This was not done, and the DOE removed this facility from its list of nuclear facilities in its April 2000 listing (DOE 2000a). There are currently no plans to use this building for storage of nuclear materials.

2.1.1 Construction and Modifications at the Plutonium Complex

The SWEIS projected four facility modifications:

- renovation of the Nuclear Material Storage Facility (not currently planned to be used to store nuclear materials). The current idea is to upgrade this facility in order to utilize it as a radiography facility only when special nuclear material (SNM) is present.
- construction of a new administrative office building. Construction of the Facility Infrastructure Technical Support (FITS) building [PF-66] was completed in 1999;
- upgrades within Building 55-4 to support continued manufacturing at the existing capacity of 14 pits per year (includes the 1996 installation of a new TA-55 Facility Control System); and
- further upgrades for long-term viability of the facility and to boost production to a nominal capacity of 20 pits per year.

In CY 2004, construction of the TA-55-314 Fire Safe Storage building was completed (LANL 2001d, DOE 1996a); NMT Division took beneficial occupancy of the structure in October of 2004.

During CY 2003, upgrades to maintain existing capacity were continued, including design on replacement of the current main fire protection water line and pump houses. In addition, the following equipment upgrades were performed or started during CY 2003:

- installation of the part sanitization furnace (system to sanitize classified non-SNM materials); on-going in 2004;

- procurement and installation of a new packaging line (DOE-STD-3013) complete with automation (project identifier 000100685) was initiated;
- procurement and installation of a new disassembly lathe (with automation to reduce worker exposure) (project identifier 000100661) was initiated; on-going in 2004.

During CY 2001, there were several projects that were started for maintenance or replacement purposes. If these projects have not yet been completed, their 2004 status is listed below:

- CMR Replacement Project[4] DOE Pre-conceptual Design (LANL 2001e), on-going in CY 2004;
- FRIT Transfer System (LANL 2001f; DOE 1996b), on-going in CY 2004;
- TA-18 Relocation Project CATIII/IV at TA-55 (LANL 2001g and 2001h, DOE 2002b). At the end of CY 2004, this was still under consideration; and
- TA-18 Relocation Project CAT-I Piece (LANL 2001i, DOE 2002b). Still under consideration in CY 2004.

During CY 2002, there were several projects that were started for maintenance or replacement purposes. The projects are listed below with their CY 2004 status:

- TA-55 Radiography/Interim (LANL 2001j), on-going in CY 2004;
- TA-55 Radiography (LANL 2001k), complements TA-55 Radiography/Interim, on-going in CY 2004;
- New Radioactive Liquid Waste collection system line tie-ins design phase is on-going on CY 2004 (DOE 2003b);
- Installation of new liquid nitrogen lines and tank on west side of facility was on-going in CY 2004 (DOE 2003c);
- TA-55 New Parking Lot (LANL 2002d), still not started in CY 2004;
- FITS Parking Lot (LANL 2002e), still not started during CY 2004; and
- CMR Replacement Geotechnical Investigation (LANL 2002f), the first phase in determining the feasibility of constructing the CMR Replacement. Geotechnical surveys were performed in CY 2003; additional surveys continued in CY 2004.

In 2004, decontamination and demolition (D&D) and upgrades of equipment were initiated in order to upgrade small sample fabrication with a new machining line for plutonium samples. This upgrades work is expected to be completed in Fiscal Year (FY) 2007.

The procurement and installation of a new uranium decontamination system was initiated in 2004.

[4] The CMR Replacement Project was covered by an EIS (DOE 2003a).

2.1.2 Operations at the Plutonium Complex

The SWEIS identified seven capabilities[5] for this Key Facility. No new capabilities have been added. One capability, SNM Storage, Shipping, and Receiving, had planned to use the Nuclear Material Storage Facility. Because of changes in plans, the Nuclear Material Storage Facility will not be used for this activity, and SNM storage, shipping, and receiving will continue to be performed at the Plutonium Facility (Building 55-4). For all seven capabilities, activity levels were below those projected by the SWEIS ROD. Table 2.1.2-1 presents details.

Table 2.1.2-1. Plutonium Complex/Comparison of Operations

Capability	SWEIS ROD[a]	2004 Operations
Plutonium Stabilization	Recover, process, and store the existing plutonium inventory in eight years.	Highest priority items have been stabilized. The implementation plan has been modified between DOE and the Defense Nuclear Facilities Safety Board to be complete by 2010. The project is funded to 2010 but may potentially extend beyond this time by a year or so.
Manufacturing Plutonium Components	Produce nominally 20 war reserve pits/yr. (Requires minor facility modifications.)	Fewer than 20 qualified pits were produced in CY 2004.
Surveillance and Disassembly of Weapons Components	Pit disassembly: Up to 65 pits/yr disassembled. Pit surveillance: Up to 40 pits/yr destructively examined and 20 pits/yr nondestructively examined.	Fewer than 65 pits were disassembled during CY 2004. Fewer than 40 pits were destructively examined as part of the stockpile evaluation program (pit surveillance) in CY 2004.
Actinide Materials and Science Processing, Research, and Development	Develop production disassembly capacity. Process up to 200 pits/yr, including a total of 250 pits (over four years) as part of disposition demonstration activities.	Fewer than 200 pits were disassembled/converted in CY 2004. Fewer than 12 pits/yr were processed through tritium separation in CY 2004.
	Process neutron sources up to 5,000 curies/yr. Process neutron sources other than sealed sources.	No new sources were processed in 2004.
	Process up to 400 kilograms/yr of actinides.[b] Provide support for dynamic experiments.	Fewer than 400 kilograms/yr of actinides were processed in CY 2004. Support was provided for dynamic experiments.
	Perform decontamination of 28 to 48 uranium components per month.	In CY 2004, fewer than 48 uranium components were decontaminated per month.

5 As defined in the SWEIS, a capability refers to the combination of buildings, equipment, infrastructure, and expertise necessary to undertake types or groups of activities and to implement mission assignments. Capabilities at LANL have been established over time, principally through mission assignments and activities directed by DOE Program Offices.

Table 2.1.2-1. continued

Capability	SWEIS ROD[a]	2004 Operations
	Research in support of DOE actinide cleanup activities. Stabilize minor quantities of specialty items. Research and development on actinide processing and waste activities at DOE sites, including processing up to 140 kilograms of plutonium as chloride salts from the Rocky Flats Environmental Technology Site.	Research supporting DOE actinide cleanup activities continued at low levels. No plutonium residues from Rocky Flats were processed during CY 2004.
	Conduct plutonium research and development and support. Prepare, measure, and characterize samples for fundamental research and development in areas such as aging, welding and bonding, coatings, and fire resistance.	Sample preparation and characterization continued during CY 2004.
	Fabricate and study nuclear fuels used in terrestrial and space reactors. Fabricate and study prototype fuel for lead test assemblies.	The DOE/NE Advanced Fuel Cycle and Mixed Oxide Fuel Initiative (AFCI) is fabricating actinide nitride fuels for irradiation in a reactor environment. NMT is working with Naval Reactor staff for development of fuel(s) for Space Nuclear Power Applications
	Develop safeguards instrumentation for plutonium assay.	Continued support of safeguards instrumentation development during CY 2004.
	Analyze samples in support of actinide reprocessing and research and development activities.	Analysis of actinide samples at TA-55 continued in support of actinide reprocessing and research and development activities.
Fabrication of Ceramic-Based Reactor Fuels	Build mixed oxide test reactor fuel assemblies and continue research and development on fuels.	AFCI fuels are being fabricated for irradiation testing.
Plutonium-238 Research, Development, and Applications	Process, evaluate, and test up to 25 kilograms/yr plutonium-238. Recycle residues and blend up to 18 kilograms/yr plutonium-238.	Recovered approximately 0.7 kilograms of plutonium-238 and processed approximately 0.3 kilograms of plutonium-238 for heat source fuel during CY 2004.
Nuclear Materials Storage, Shipping, and Receiving	Store up to 6,600 kilograms SNM in the Nuclear Material Storage Facility; continue to store working inventory in the vault in Building 55-4; ship and receive SNM as needed to support LANL activities.	Because of changes in plans, the Nuclear Material Storage Facility will not be used for this activity, and SNM storage, shipping, and receiving will continue to be performed at the Plutonium Facility (Building 55-4). Building 55-4 vault levels remained approximately constant at levels identified during preparation of the SWEIS.
	Conduct nondestructive assay on SNM at the Nuclear Material Storage Facility to identify and verify the content of stored containers.	The Nuclear Material Storage Facility is not operational as a storage vault and was not used for nondestructive assay during CY 2004.

a Includes renovation of the Nuclear Material Storage Facility (which is no longer planned for use), construction of new technical support office building, and upgrades to enable the production of nominally 20 war reserve pits per year.

b The actinide activities at the CMR Building and at TA-55 are expected to total 400 kilograms/yr. The future split between these two facilities was not known, so the facility-specific impacts at each facility were conservatively analyzed at this maximum amount. Waste projections that are not specific to the facility (but are related directly to the activities themselves) are only projected for the total of 400 kilograms/yr.

2.1.3 Operations Data for the Plutonium Complex

Details of operational data are presented in Table 2.1.3-1. Radioactive air emissions were less than one percent of projections (fewer than 10 curies in 2004 compared to 1,000 curies projected). No wastes generated during 2004 exceeded SWEIS ROD projections.

Table 2.1.3-1. Plutonium Complex/Operations Data

Parameter	Units[a]	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
Plutonium-239 [b]	Ci/yr	2.70E-5	None detected
Plutonium-238	Ci/yr	Not projected [c]	None detected
Americium-241	Ci/yr	Not projected [c]	None detected
Other actinides [d]	Ci/yr	Not projected [c]	2.24E-7
Strontium-90/Yttrium-90	Ci/yr	Not projected [c]	None detected
Tritium in Water Vapor	Ci/yr	7.50E+2	5.61E+0
Tritium as a Gas	Ci/yr	2.50E+2	3.80E+0
NPDES[e] Discharge			
03A–181	MGY	14	2.7224
Wastes:			
Chemical	kg/yr	8,400	7,807
LLW [f]	m^3/yr	754 [h]	189
MLLW [f]	m^3/yr	13 [h]	1.5
TRU [f]	m^3/yr	237 [i]	13.7
Mixed TRU	m^3/yr	102 [i]	23.3
Number of Workers	FTEs	589 [j]	727 [j]

a Ci/yr = curies per year; MGY = million gallons per year; FTEs = full-time equivalent workers.
b Projections for the SWEIS were reported as plutonium or plutonium-239, the primary material at TA-55.
c The radionuclide was not projected in the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.
d These radionuclides include isotopes of thorium and uranium.
e NPDES is National Pollutant Discharge Elimination System.
f LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; TRU = transuranic.
h Includes estimates of waste generated by the facility upgrades associated with pit fabrication.
i The SWEIS provided data for TRU and mixed TRU wastes in Chapter 3 and Chapter 5. However, projections made had to be modified to reflect the decision to produce nominally 20 pits per year.
j The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include Protection Technology Los Alamos (PTLA), KBR/SHAW/LATA (KSL), and other subcontractor personnel. The number of employees for 2004 operations is routinely collected information and represents only University of California (UC) employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.2 Tritium Facilities (TA-16 and TA-21)

This Key Facility consists of tritium operations at TA-16 and TA-21. Tritium operations in 2004 were conducted in two buildings: The Weapons Engineering Tritium Facility (WETF, Building TA-16-205) and the Tritium Science and Fabrication Facility (TSFF, Building TA-21-209). The Tritium Systems Test Assembly (TSTA) is in a Surveillance and Maintenance mode with only limited equipment removal.

Limited operations involving the removal of tritium from actinide material are conducted at LANL's TA-55 Plutonium Facility; however, these operations are small in scale and this operation was not included as part of the Tritium Facilities in the SWEIS. The tritium emissions from TA-55, however, are included in the Plutonium Complex Key Facility.

One facility, WETF, had a tritium inventory greater than 30 grams during the entire 2003 year and, thus, was a Category 2 nuclear facility. During 2004, the tritium inventory at TSFF was reduced to less than 30 grams. This facility was then reclassified to a Category 3 nuclear facility in June 2004.

Programmatic activities at the TSFF have been reduced and will be moved to the WETF in 2005. The transition of TSFF to a radiological facility is estimated to occur in 2005. Neutron Tube Target Loading activities at the TSFF will continue into 2006 (DOE 1995a). After these activities are completed the TSFF will be placed in a Surveillance and Maintenance mode. When funding becomes available, the TSFF will be deactivated. As shown in Table 2.2-1, the nuclear hazard classification of these three facilities has remained constant. However, WETF was separated into its three component buildings in the SWEIS, but is now considered a single building.

Table 2.2-1. Tritium Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [b]
TA-16-0205 [c]	WETF	2	2	2
TA-16-0205A [c]	WETF	2		2
TA-16-0450 [c]	WETF	2		
TA-21-0155 [d]	TSTA	2	2	
TA-21-0209	TSFF [e]	2	2	3

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).
c In 2003, TA-16-205 and TA-16-205A were nuclear facilities while TA-16-450 was not operational with tritium. The three buildings were physically connected, but radiologically separated. When the WETF Documented Safety Analysis is approved and an operational readiness review is completed, TA-16-205, -205A, and -450 will be considered one facility.
d TSTA was removed from the nuclear facilities list in June of 2003 by DOE and LANL.
e TSFF was downgraded to a category 3 nuclear facility in June 2004.

2.2.1 Construction and Modifications at the Tritium Facilities

During 2004, there were no new major construction activities or building modifications at WETF at TA-16. The inclusion of Building 450 to the WETF nuclear boundary was postponed because of the LANL operations stand-down. In addition, DOE halted the implementation of Neutron Tube Target Loading tritium activities at WETF and may transfer these activities to another laboratory in 2006.

2.2.2 Operations at the Tritium Facilities

The SWEIS identified nine capabilities for this Key Facility. No new capabilities have been added, and one, Cryogenic Separation at TSTA, has been deleted. Table 2.2.2-1 lists the nine capabilities identified in the SWEIS and presents CY 2004 operational data for each of these capabilities. Operations in 2004 were below projections by the SWEIS

ROD because of the LANL operations stand-down and remained within the established environmental envelope. For example, eight high-pressure gas fill operations were conducted in 2004 (compared to 65 fills projected by the SWEIS ROD), and approximately nine gas boost system tests and gas processing operations were performed (compared to 35 projected).

Table 2.2.2-1. Tritium Facilities/Comparison of Operations

Capability	SWEIS ROD[a]	2004 OPERATIONS
High-Pressure Gas Fills and Processing: WETF	Handling and processing of tritium gas in quantities of up to 100 grams with no limit on number of operations per year. Capability used approximately 65 times/yr.	Approximately eight high-pressure gas fills/processing operations.
Gas Boost System Testing and Development: WETF	System testing and gas processing operations involving quantities of up to 100 grams. Capability used approximately 35 times/yr.	Approximately nine gas boost tests and operations.
Cryogenic Separation: TSTA	Tritium gas purification and processing in quantities up to 200 grams. Capability used five to six times/yr.	No capability exist at LANL in 2004.
Diffusion and Membrane Purification: TSFF, WETF	Research on tritium movement and penetration through materials. Expect six to eight experiments/month. Capability also used continuously for effluent treatment.	Capability used in 2004.
Metallurgical and Material Research: TSFF, WETF	Capability involves materials research including metal getter research and application studies. Small quantities of tritium support tritium effects and properties research and development. Contributes <2% of LANL's tritium emissions to the environment.	Activities resulted in <1% tritium emissions from each facility.
Thin Film Loading: TSFF (WETF by 2006)	Chemical bonding of tritium to metal surfaces. Current application is for tritium loading of neutron tube targets; perform loading operations up to 3,000 units/yr.	Approximately 1,500 units were loaded. Operations occurred at TSFF.
Gas Analysis:, TSFF, WETF	Analytical support to current capabilities. Operations estimated to contribute <5% of LANL's tritium emissions to the environment.	Gas analysis operations were continued at TSFF and WETF during 2004. No changes in facility emissions occurred from this activity.
Calorimetry: TSFF, WETF	This capability provides a measurement method for tritium material accountability. Contained tritium is placed in the calorimeter for quantity measurements. This capability is used frequently, but contributes <2% of LANL's tritium emissions to the environment.	Calorimetry activities were conducted at only WETF. No changes occurred in facility emissions from this activity.

Table 2.2.2-1. continued

Capability	SWEIS ROD[a]	2004 OPERATIONS
Solid Material and Container Storage: TSTA, TSFF, WETF	Storage of tritium occurs in process systems, process samples, inventory for use, and as waste. Onsite storage could increase by a factor of 10 over levels identified during preparation of the SWEIS, with most of the increase occurring at WETF.	The storage of tritium at TSTA and TSFF decreased. In June 2004, the TSFF storage was less than 30 grams. The storage at WETF has increased by approximately 5% over levels identified during preparation of the SWEIS.

a Includes the remodel of Building 16-450 to connect it to WETF in support of Neutron Tube Target Loading (DOE 1995a).

2.2.3 Operations Data for the Tritium Facilities

Data for operations at the Tritium Facilities were below levels projected by the SWEIS ROD. Operational data are summarized in Table 2.2.3-1.

Table 2.2.3-1. Tritium Facilities (TA-16 and TA-21)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
TA-16/WETF, Elemental tritium	Ci/yr	3.00E+2	8.95E+1
TA-16/WETF, Tritium in water vapor	Ci/yr	5.00E+2	5.04E+1
TA-21/TSTA, Elemental tritium	Ci/yr	1.00E+2	2.71E+0
TA-21/TSTA, Tritium in water vapor	Ci/yr	1.00E+2	3.34E+2
TA-21/TSFF, Elemental tritium	Ci/yr	6.40E+2	1.29E+1
TA-21/TSFF, Tritium in water vapor	Ci/yr	8.6E+2	2.86E+2
NPDES Discharge: [a]			
Total Discharges	MGY	0.3	22.0949
02A-129 (TA-21)	MGY	0.1	22.0095
03A-158 (TA-21)	MGY	0.2	0.0854
Wastes:			
Chemical	kg/yr	1,700	9.7
LLW	m^3/yr	480	25.5
MLLW	m^3/yr	3	0.3
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	28 [b]	19 [b]

a Outfalls eliminated before 1999: 05S (TA-21), 03A-036 (TA-21), 04A-091 (TA-16). Consolidation and removal of outfalls has resulted in projected NPDES volumes underestimating actual discharges from the exiting outfalls.

b The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.3 Chemistry and Metallurgy Research Building (TA-03)

The CMR Building was designed and constructed in 1952 to house analytical chemistry, plutonium metallurgy, uranium chemistry, engineering design, and drafting. However, at the time the SWEIS ROD was issued in 1999, the CMR Building was described as a "production, research, and support center for actinide chemistry and metallurgy research and analysis, uranium processing, and fabrication of weapon components." It consists of a main building (TA-3-29) and a Low Level Waste Storage and Transfer Facility, TA-3-154. The CMR Building consists of three floors: basement, first floor, and attic. It has seven independent wings connected by a common corridor. The CMR Building remains a Hazard Category 2 per DOE Standard 1027-92 (DOE 1997a).

As shown in Table 2.3-1, DOE has identified the CMR facility, in various levels of detail, as a Category 2 nuclear facility since the publication of the SWEIS ROD (LANL 2002a). CMR is also currently designated a security category 3 nuclear facility.

Table 2.3-1 CMR Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [a]
TA-03-0029	CMR	2		2
TA-03-0029	Radiochemistry Hot Cell		2	
TA-03-0029	SNM Vault		2	
TA-03-0029	Nondestructive analysis/nondestructive examination Waste Assay		2	
TA-03-0029	IAEA Classroom [c]			
TA-03-0029	Wing 9 (Enriched Uranium)		2	

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).
c The IAEA (International Atomic Energy Agency) Classroom was used to conduct Nonproliferation Training. In CY 2001, this capability was moved to Pajarito Site (TA-18) and renamed the "Nuclear Measurement School." However, the capability was returned to and operated in CMR in CY 2002 and continued to operate at CMR in CY 2004.

2.3.1 Construction and Modifications at the CMR Building

The ROD projected five facility modifications by December 2005:

- Phase I Upgrades to maintain safe operating conditions for 5–10 years;
- Phase II Upgrades (except seismic) to enable operations for an additional 20–30 years;
- modifications for production of targets for the molybdenum-99 medical isotope;
- modifications for the recovery of sealed neutron sources; and
- modifications for safety testing of pits in the Wing 9 hot cells.

During the 1996–1998 time period, only the Phase I Upgrades were in progress. By the end of 1998, all 11 of these upgrades had been started, but only five of the 11 Phase I Upgrades were completed. Concurrently, in August 1998, DOE approved the CMR Basis for Interim Operations (BIO), and in the fall of 1998, DOE determined that extensive upgrades to CMR would not be cost effective.

In 1999, DOE directed the CMR Upgrades Project to re-baseline and include only those upgrades needed to ensure compliance with the BIO. These upgrades were required for the facility to be reliable through 2010. The re-baseline was approved in October 1999. It included 16 upgrades necessary to ensure worker safety, public safety, environmental compliance, and reliability of services to safety systems. These 16 upgrades are listed below:

- Duct Wash-down System Upgrade,
- Heating, Ventilation, and Air Conditioning delta Pressure System Upgrade,
- Hood Wash-down System Upgrade,
- Hot Cell Delta Pressure System Upgrade,
- Hot Cell Controls Upgrade,
- Stack Monitors Phase A Upgrade,
- Emergency Personnel Accountability System Upgrade,
- Stack Monitors Phase B Upgrade,
- Compressor System Upgrade,
- Sprinkler Head Replacement Upgrade,
- Emergency Lighting System Upgrade,
- Emergency Notification Upgrade,
- Internal Power Distribution Upgrade,
- Operations Center Upgrade,
- Ventilation System Filter Replacement Upgrade, and
- Fire Protection System Upgrade.

All 16 upgrades were completed by March 2002; the Project submitted all Turnover/Closeout documentation to DOE in July 2002; and DOE approved Turnover/ Closeout in November 2002.

During CY 2003, modifications to Wing 9 were started in support of the Bolas Grande Project. This project would provide for the disposition of large vessels previously used to contain experimental explosive shots involving plutonium. NEPA coverage for this project was provided by a SA to the 1999 Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory for the Proposed Disposition of Certain Large Containment Vessels, DOE/EIS-0238-SA-03 (DOE 2003d). In 2004, implementation of this project was pending approval.

CMR BIO/TSRs Update

Revisions to the CMR BIO and Technical Safety Requirements (TSRs) were started in CY 2003. The CMR BIO/TSRs update was completed and submitted to DOE in April 2004 and is in the review process.

2.3.2 Operations at the CMR Building

The eight capabilities identified in the SWEIS for the CMR Facility are presented in Table 2.3.2-1. No new capabilities have been added, but one capability (Nonproliferation Training) was removed from CMR and relocated back to TA-18.

Table 2.3.2-1. CMR Building (TA-03)/Comparison of Operations

Capability	SWEIS ROD[a]	2004 Operations
Analytical Chemistry	Sample analysis in support of a wide range of actinide research and processing activities. Approximately 7,000 samples/yr.	Approximately 800 samples were analyzed in CY 2004.
Uranium Processing	Activities to recover, process, and store LANL highly enriched uranium inventory by 2005. Includes possible recovery of materials resulting from manufacturing operations.	During CY 2004, highly enriched uranium was processed. One-half batch of uranium nitrate hexahydrate liquids from TA-18 was converted to uranium oxide in CY 2004.
Destructive and Nondestructive Analysis (Design Evaluation Project)	Evaluate 6 to 10 secondaries/yr through destructive/nondestructive analyses and disassembly.	No activity. Project is no longer active; capability has not been used since 1999.
Nonproliferation Training (moved to Pajarito Site [TA-18] and renamed the Nuclear Measurement School).	Nonproliferation training involving SNM. No additional quantities of SNM, but may work with more types of SNM than present during preparation of the SWEIS.	This activity returned to CMR from TA-18 during 2002 and was active in CYs 2002, 2003, and 2004. During CY 2004, four nuclear measurement schools were conducted.
Actinide Research and Processing [b]	Process up to 5,000 Curies/yr plutonium-238/beryllium and americium-241/beryllium neutron sources. Process neutron sources other than sealed sources. Stage up to 1,000 Curies/yr plutonium-238/beryllium and americium-241/beryllium sources in Wing 9 floor holes.	No activity. Mechanical or chemical processing of sources is not allowed in the CMR per the facility Authorization Basis. During CY 2003, sealed sources were brought into Wing 9 for verification of unique identification numbers and were repackaged for eventual shipment to the Waste Isolation Pilot Plant (WIPP).
	Introduce research and development effort on spent nuclear fuel related to long-term storage and analyze components in spent and partially spent fuels.	This project was completed in February 1997 when the final shipment of spent fuel from the Omega West Reactor that was in dry storage in Wing 9 was packaged and shipped to Savannah River Site for reprocessing.
	Metallurgical microstructural/chemical analysis and compatibility testing of actinides and other metals. Primary mission to study long-term aging and other material effects. Characterize about 100 samples/yr. Conduct research and development in hot cells on pits exposed to high temperatures.	In 2004, microstructural characterization tests were performed on 66 samples. [c]

Table 2.3.2-1. continued

Capability	SWEIS ROD[a]	2004 Operations
	Analysis of TRU waste disposal related to validation of the WIPP performance assessment models. TRU waste characterization. Analysis of gas generation such as could occur in TRU waste during transportation to WIPP. Performance Demonstration Program to test nondestructive analysis/nondestructive examination equipment. Demonstrate actinide decontamination technology for soils and materials. Develop actinide precipitation method to reduce mixed wastes in LANL effluents.	Project was completed in CY 2001.
Fabrication and Metallography	Produce 1,080 targets/yr, each containing approximately 20 grams uranium-235, for the production of molybdenum-99, plus an additional 20 targets/wk for 12 weeks. Separate fission products from irradiated targets to provide molybdenum-99. Ability to produce 3,000 six-day curies of molybdenum-99/wk.[d]	Project was terminated in CY 1999.
	Support complete highly enriched uranium processing, research and development, pilot operations, and casting. Fabricate metal shapes, including up to 50 sets of highly enriched uranium components, using 1 to 10 kilograms highly enriched uranium per operation. Material recovered and retained in inventory. Up to 1,000 kilograms annual throughput.	Process activity was never initiated on this project.

a Includes completion of Phase I and Phase II Upgrades, except for seismic upgrades, modifications for the fabrication of molybdenum-99 targets, modifications for the Radioactive Source Recovery Program, and modification for safety testing of pits.

b The actinide activities at the CMR Building and at TA-55 are expected to total 400 kilograms/yr. The future split between these two facilities is not known, so the facility-specific impacts at each facility are conservatively analyzed at this maximum amount. Waste projections, which are not specific to the facility (but are related directly to the activities themselves), are only projected for the total of 400 kilograms/yr.

c The 2003 Yearbook erroneously reported that no samples were characterized in 2003; however, 22 samples were actually characterized.

d Molybdenum-99 is a radioactive isotope that decays to form metastable technicium-99, a radioactive isotope that has broad applications in medical diagnostic procedures. Both isotopes are short-lived, with half-lives (the time in which the quantity of the isotope is reduced by 50 percent) of 66 hours and 6 hours, respectively. These short half-lives make these isotopes both attractive for medical use (minimizes the radiation dose received by the patient) and highly perishable. Production of these isotopes is therefore measured in “six-day curies,” the amount of radioactivity remaining after six days of decay, which is the time required to produce and deliver the isotope to hospitals and other medical institutions.

2.3.3 Operations Data for the CMR Building

Operations data from research, services, and production activities at the CMR Building were well below those projected by the SWEIS ROD. Radioactive air emissions were less than those projected by the SWEIS ROD. No wastes generated exceeded SWEIS ROD projections; the others remained low, ranging from less than 0.1 percent to about 16 percent of these projections. Table 2.3.3-1 provides details of these and other operational data.

Table 2.3.3-1. CMR Building (TA-03)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
Total Actinides[a]	Ci/yr	7.60E-4	6.46E-6
Strontium-90/Yttrium-90	Ci/yr	Not projected [b]	
Krypton-85	Ci/yr	1.00E+2	Not measured [c]
Xenon-131m	Ci/yr	4.50E+1	Not measured [c]
Xenon-133	Ci/yr	1.50E+3	Not measured [c]
Tritium Water	Ci/yr	Negligible	Not measured [c]
Tritium Gas	Ci/yr	Negligible	Not measured [c]
NPDES Discharge:			
03A–021	MGY	0.53	1.18625
Wastes:			
Chemical	kg/yr	10,800	1,766
LLW	m^3/yr	1,820	134
MLLW	m^3/yr	19	0.13
TRU	m^3/yr	28 [d]	4.58
Mixed TRU	m^3/yr	13 [d]	0.42
Number of Workers	FTEs	204 [e]	196 [e]

a Includes uranium, plutonium, americium, and thorium.
b The radionuclide was not projected in the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.
c Potential emissions during the period were sufficiently small that measurement of these radionuclides was not necessary to meet facility or regulatory requirements.
d The SWEIS provided the data for TRU and mixed TRU wastes in Chapter 3 and Chapter 5. However, the projections made had to be modified to reflect the decision to produce nominally 20 pits per year.
e The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.4 Pajarito Site (TA-18)

The Pajarito Site Key Facility is located entirely at TA-18. Principal activities are design and performance of nuclear criticality experiments and detector development in support of emergency response, nonproliferation, and arms control.

The SWEIS defined the facility as having a main building (18-30), three outlying, remote-controlled critical assembly buildings then known as "kivas" (18-23, -32, -116), and a number of additional support buildings, including the hillside vault (18-26). During 2000, in response to concerns expressed by two Native American Indian Pueblos (Santa Ana and Picuris), the term "kiva" (which has religious significance to these Native Americans) was replaced with the acronym CASA (Critical Assembly and Storage Area).

As shown in Table 2.4-1, DOE lists this whole Key Facility as a Category 2 facility and identifies seven buildings with Nuclear Hazard Classification. The four buildings identified in the SWEIS (TA-18-23, 26-32, and -116) have remained Category 2 nuclear facilities. The additions represent buildings with inventories meeting the current nuclear facility classification guidelines. It is interesting to note that the IAEA classroom (Building TA-18-258) represents a capability that was originally at TA-18, transferred to the CMR Building, and then brought back to TA-18 in 2000. The IAEA schools were returned to CMR in 2002. All other schools remain at TA-18.

Table 2.4-1. Pajarito Site Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [b]
TA-18	Site Itself		2	2
TA-18-0023	SNM Vault (CASA 1)	2	2	
TA-18-0026	Hillside Vault	2	2	
TA-18-0032	SNM Vault (CASA 2)	2	2	
TA-18-0116	Assembly Building (CASA 3)	2	2	
TA-18-0127	Accelerator used for weapons x-ray		2	
TA-18-0129	Calibration Laboratory		2	
TA-18-0247	Sealed Sources		3	

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).

The new Authorization Basis, comprised of a BIO document and TSRs, was submitted to NNSA on March 14, 2002, and approved by NNSA on July 31, 2002. Implementation of the new Authorization Basis, including the TSRs, is in progress and scheduled to be completed by October 2005. The new Authorization Basis adds safety measures to TA-18 operations in the form of both engineered and administrative controls.

2.4.1 Construction and Modifications at the Pajarito Site

The SWEIS ROD projected replacement of the portable linac machine. This has not been performed. Construction projects for 2004 consisted of security and safety enhancements The EIS for the proposed relocation of TA-18 (DOE 2002b) was issued for public comment on August 30, 2002. The EIS ROD (DOE 2002c), approved on December 5, 2002, identified the Device Assembly Facility at the Nevada Test Site (NTS) as the preferred alternative for the relocation of TA-18 Security Category I/II materials and activities.

2.4.2. Operations at the Pajarito Site

The SWEIS identified nine capabilities for this Key Facility. No research capabilities have been deleted. However, the Nuclear Measurement School that was originally moved from TA-18 to CMR (before the SWEIS) was moved back to TA-18 in 2000. The TA-18 facility conducted approximately 80 criticality experiments in 2004. This total of 80 experiments represents only about 8 percent of the SWEIS ROD projection of a maximum of 1,050 experiments in any given year. In addition, the nuclear material inventory level has remained below the SWEIS ROD projection. For 2004, the material inventory was reduced by an additional 2 percent over the 10 percent reduction in 2003 and there was not a significant increase in nuclear weapons components and materials at the facility. Table 2.4.2-1 provides details.

Table 2.4.2-1. Pajarito Site (TA-18)/Comparison of Operations

Capabilities	SWEIS ROD[a]	2004 Operations
Dosimeter Assessment and Calibration	Perform up to 1,050 criticality experiments per year.	Performed 164 criticality experiments.
Detector Development	Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing. Increase nuclear materials inventory by 20%, and replace portable linac.	The nuclear materials inventory for 2004 was approximately the same as the 2003 inventory. The portable linac was not replaced.
Materials Testing	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing.	Performed 80 criticality experiments.
Subcritical Measurements	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing. Increase nuclear materials inventory by 20%.	Performed 100 experiments. The nuclear materials inventory for 2004 was approximately the same as the 2003 inventory. .
Fast-Neutron Spectrum	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing. Increase nuclear materials inventory by 20%, and increase nuclear weapons components and materials.	Performed 80 experiments. The nuclear materials inventory for 2004 was approximately the same as the 2003 inventory

Table 2.4.2-1. continued

Capabilities	SWEIS ROD[a]	2004 Operations
Dynamic Measurements	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing. Increase nuclear materials inventory by 20%.	Performed 80 experiments. The nuclear materials inventory for 2004 was decreased by 2 percent.
Skyshine Measurements	Perform up to 1,050 criticality experiments per year.	Performed 80 experiments.
Vaporization	Perform up to 1,050 criticality experiments per year.	Performed 80 experiments.
Irradiation	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, interrogation techniques, and field systems. Increase nuclear materials inventory by 20%.	Performed 80 experiments. The nuclear materials inventory for 2004 was approximately the same as the 2003 inventory.
Nuclear Measurement School (relocated from CMR and renamed. At CMR it was called "Nonproliferation Training") [b].	Not in SWEIS ROD (was located in CMR). IAEA schools are at CMR	The IAEA schools were returned to CMR in 2002. All other schools remain at TA-18.

a Includes replacement of the portable linac.

b This capability was located at TA-18 in years past, but had been moved to CMR. In the effort to reduce the CMR Building to a Category 3 nuclear facility, these operations were moved back to TA-18, necessitating the transfer of additional nuclear material to the facility for use in the classes.

2.4.3 Operations Data for the Pajarito Site

Research activities were well below those projected by the SWEIS ROD. Consequently, operations data were also well below SWEIS ROD projections. The chief environmental measure of activities at the Pajarito Site is the estimated radiation dose to a hypothetical member of the public, referred to as the maximally exposed individual. The dose estimated to result from activities was 1.0 millirem, compared to 28.5 millirem per year projected by the SWEIS ROD. Chemical waste generation at Pajarito Site was below SWEIS ROD projections from 1998 through 2004. Operations data are detailed in Table 2.4.3-1.

2.5 Sigma Complex (TA-03)

The Sigma Complex Key Facility consists of four principal buildings: the Sigma Building (03-66), the Beryllium Technology Facility (03-141), the Press Building (03-35), and the Thorium Storage Building (03-159). Primary activities are the fabrication of metallic and ceramic items, characterization of materials, and process research and development. As shown in Table 2.5-1, this Key Facility had two Category 3 nuclear facilities, 03-66 and

Table 2.4.3-1. Pajarito Site (TA-18)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions: Argon-41 [a]	Ci/yr	1.02E+2	9.1E-1
External Penetrating Radiation	mrem/yr	28.5 [b]	1.25
NPDES Discharge	MGY	No outfalls	
Wastes:			
Chemical	kg/yr	4,000	27
LLW	m^3/yr	145	0
MLLW	m^3/yr	1.5	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	70 [c]	38 [c]

a These values are not stack emissions. The SWEIS ROD projections are from Monte Carlo modeling. Values are from the first 394-foot (120-meter) radius. Other isotopes (nitrogen-13 and oxygen-15) are not shown because of very short half-lives.

b Page 5-116, Section 5.3.6.1, “Public Health,” of the SWEIS.

c The number shown in the “SWEIS ROD” column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

Table 2.5-1. Sigma Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [b]
TA-03-0066	depleted uranium storage	3	3	
TA-03-0159	thorium storage	3	3	

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998)

b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b)

03-159, identified in the SWEIS; however, in April 2000, Building 03-159 was downgraded from a hazard category 3 nuclear facility to a radiological facility and removed from the nuclear facilities list. In March 2001, Building 03-66 was downgraded from a hazard category 3 nuclear facility and removed from the nuclear facilities list (LANL 2002a). In September 2001, Buildings 03-35, 03-66, 03-159, and 03-169 were placed on the radiological facility list (LANL 2002b). Building 03-141 is a Non-Nuclear Moderate Hazard Facility.

2.5.1 Construction and Modifications at the Sigma Complex

The SWEIS projected significant facility changes for the Sigma Building itself. Three of five planned upgrades are done, one is essentially done, and one remains undone. They are

- replacement of graphite collection systems–completed in 1998,
- modification of the industrial drain system–completed in 1999,

- replacement of electrical components–essentially completed in 2000; however, add-on assignments will continue,
- roof replacement–most of the roof was replaced in 1998 and 1999; however, additional work needs to be done, and
- seismic upgrades–not started.

In addition to the five planned upgrades, three additional upgrades were completed in 2003. These are

- replacement of liquid nitrogen Dewar,
- painting of the exterior of Sigma Building, and
- re-installation of the utilities to activate the Press Building.

Construction of the Beryllium Technology Facility (DOE 1993), formerly known as the Rolling Mill Building, was completed during CY 1999. The Beryllium Technology Facility, a state-of-the-art beryllium processing facility, has 16,000 square feet of floor space, of which 13,000 are used for beryllium operations. The remaining 3,000 square feet will be used for general metallurgical activities. The mission of the new facility is to maintain and enhance the beryllium technology base that exists at LANL and to establish the capability for fabrication of beryllium powder components. Research will also be conducted at the Beryllium Technology Facility and will include energy- and weapons-related use of beryllium metal and beryllium oxide. As discussed in Section 2.8, Machine Shops, beryllium equipment was moved from the shops into the Beryllium Technology Facility in stages during CY 2000. The authorization to begin operations in the Beryllium Technology Facility was granted by DOE in January 2001.

Beryllium Technology Facility upgrades include the following:

- Heating, ventilation, and air conditioning system damper replacements – complete.
- Cartridge Filter house enclosure – On hold due to hazard category change.
- PC-3 Vault – On hold due to hazard category change.
- Locker room expansion – complete.
- Facility Management System upgrade – On hold due to hazard category change.

2.5.2 Operations at the Sigma Complex

The SWEIS identified three capabilities for the Sigma Complex. No new capabilities have been added, and none has been deleted. As indicated in Table 2.5.2-1, activity levels for all capabilities during the 2004 timeframe were less than levels projected by the SWEIS ROD.

2.5.3 Operations Data for the Sigma Complex

Levels of research and operations were less than those projected by the SWEIS ROD; consequently, operations data were also below projections. Waste volumes and NPDES discharge volumes were all lower than projected by the SWEIS ROD. Table 2.5.3-1 provides details.

Table 2.5.2-1. Sigma Complex (TA-03)/Comparison of Operations

Capability	SWEIS ROD [a]	2004 Operations
Research and Development on Materials Fabrication, Coating, Joining, and Processing	Maintain and enhance capability to fabricate items from metals, ceramics, salts, beryllium, enriched uranium, depleted uranium, and other uranium isotope mixtures including casting, forming, machining, polishing, coating, and joining.	Capability maintained and enhanced, as projected.
Characterization of Materials	Maintain and enhance research and development activities on properties of ceramics, oxides, silicides, composites, and high-temperature materials. Characterize components for accelerator production of tritium.	Totals of 153 assignments and 759 specimens were characterized.
	Analyze up to 36 tritium reservoirs/yr.	Activity transferred to TFF (See Table 2.7.2-1.) [b]
	Develop library of aged non-SNM materials from stockpiled weapons and develop techniques to test and predict changes. Store and characterize up to 2,500 non-SNM component samples, including uranium.	Approximately 1,250 non-SNM materials samples and 1,250 non-SNM component samples stored in library.
Fabrication of Metallic and Ceramic Items	Fabricate stainless steel and beryllium components for about 80 pits/yr.	Fabricated approximately 66 stainless steel and beryllium pit components.
	Fabricate up to 200 tritium reservoirs per year.	Fewer than 25 reservoirs fabricated.
	Fabricate components for up to 50 secondaries per year.	Fabricated components for fewer than 50 secondaries.
	Fabricate nonnuclear components for research and development: about 100 major hydrotests and 50 joint test assemblies/yr.	Fabricated components for fewer than 100 major hydrotests and for less than 50 joint test assemblies.
	Fabricate beryllium targets.	Provided material for the production of inertial confinement fusion targets and fabricated fewer than 10 targets.
	Fabricate targets and other components for accelerator production of tritium research.	On hold.
	Fabricate test storage containers for nuclear materials stabilization.	Produced approximately 50 containers.
	Fabricate nonnuclear (stainless steel and beryllium) components for up to 20 pit rebuilds/yr.	Fabricated 30 stainless steel and beryllium components.

a Includes Sigma Building renovation and modifications for Beryllium Technology Facility.
b The SWEIS indicated that this activity would also be accomplished at TFF.

Table 2.5.3-1. Sigma Complex (TA-03)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions: [a]			
Uranium-234	Ci/yr	6.60E-5	Not Measured
Uranium-238	Ci/yr	1.80E-3	Not Measured
NPDES Discharge:			
Total Discharges	MGY	7.3	1.971
03A–022	MGY	4.4	1.971
03A–024	MGY	2.9	0
Wastes:			
Chemical	kg/yr	10,000	39,289 [b]
LLW	m^3/yr	960	0.2
MLLW	m^3/yr	4	5.6
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	101[c]	100 [c]

a Stack monitoring at Sigma was discontinued early in CY 2000. This decision was made because the potential emissions from the monitored stack were sufficiently low that stack monitoring was no longer warranted for compliance with Environmental Protection Agency (EPA) or DOE regulations. Therefore, no emissions from monitoring data are available.

b The graphite machine shop at Sigma generates a lot of graphite waste that is mostly powder and cannot be disposed of in the LA County Landfill. Over the past four years, the LANL Pollution Prevention office has searched unsuccessfully for a company that would take the graphite powder for recycle. During this time, the Materials Technology:Metallurgy group had accumulated 115 55-gallon drums (about 24,400 kg) of nonhazardous graphite waste. As a last resort, all the drums were disposed of in June 2004. At the current time, drums are being disposed of as they are filled, about five at a time. Also included in the chemical waste volume are two 20-foot transportainers of beryllium waste (about 14,500 kg) disposed of by the Beryllium Technology Facility in November 2004.

c The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.6 Materials Science Laboratory (TA-03)

The MSL Key Facility is a single laboratory building (3-1698) containing 27 labs, 60 offices, 21 materials research areas, and support rooms. The building, a two-story structure with approximately 55,000 square feet of floor space, was first opened in November 1993. Activities are all related to research and development of materials science. In 1998, 1999, and 2000, this Key Facility was categorized as a Low Hazard nonnuclear facility. In September 2001, MSL was placed on the Radiological Facility List (LANL 2002b) and remained on the list in CY 2004.

2.6.1 Construction and Modifications at the Materials Science Laboratory

Projected: The SWEIS identified that completion of the top floor of the MSL was planned and was included in an EA (DOE 1991), but was not funded.

Actual: To date, the completion of the top floor of the MSL remains unscheduled and unfunded. Construction of the Material Science and Technology (MST) Office Building was initiated in 2003 and completed in 2004.

MST Office Building

This project is consistent with LANL's long-range vision to group materials science activities together in the southeast quadrant of TA-03. The new MST Office Building project location is west of the Sigma Complex security fence. The MSL and the other permanent buildings comprising the materials science complex are all located adjacent to the site proposed for this new office building and a common circulation pattern for that area will be implemented.

This General Plant Project will replace 17 trailers located to the east of 03-1819 and 03-2002 with a multistory office building. This modern, sustainable facility will dramatically reduce operational costs compared to those associated with the "temporary" structures. The project will provide MST Division with a new office building to house approximately 80 staff currently working in a cluster of "temporary" trailers and transportable structures in the materials science complex in TA-03. The project received its own NEPA coverage by Categorical Exclusion # 8618 issued December 07, 2001 (DOE 2001a). Construction of the new office building began in December 2002, continued throughout CY 2003, and was completed in April 2004. Occupancy occurred in May 2004.

2.6.2 Operations at the Materials Science Laboratory

The SWEIS identified four major types of experimentation at MSL: materials processing, mechanical behavior in extreme environments, advanced materials development, and materials characterization. No new capabilities have been added, and none has been deleted.

In CY 2004, there were approximately 102 total researchers and support staff at MSL, about 20 percent more than the 82 projected by the SWEIS ROD[6]. (The primary measurement of activity for this facility is the number of scientists doing research.) Table 2.6.2-1 compares CY 2004 operations to projections made by the SWEIS ROD.

2.6.3 Operations Data for the Materials Science Laboratory

The overall size of the MSL workforce has increased from about 57 workers in CY 1998 to about 59 in CY 2004 (regular part-time and full-time LANL employees listed in Table 2.6.3-1). Operational effects have been normal relative to SWEIS ROD projections. Generally, waste quantities have been lower than projected by the SWEIS ROD. Industrial solid waste is nonhazardous, may be disposed in county landfills, and does not represent a threat to local environs. Radioactive air emissions continue to be negligible and therefore were not measured. Table 2.6.3-1 provides details.

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[6] This number should not be confused with the FTE index shown in Table 2.6.3-1 (52 FTEs) as the two numbers represent different populations of individuals. The 102 total researchers represent students, temporary employees, and visiting staff from other institutions. The 52 FTEs represents only regular full-time and part-time LANL staff.

Table 2.6.2-1. Materials Science Laboratory (TA-03)/Comparison of Operations

Capability	SWEIS ROD [a]	2004 Operations
Materials Processing	Maintain seven research capabilities at levels identified during preparation of the SWEIS: • Wet chemistry • Thermomechanical processing • Microwave processing • Heavy equipment materials • Single crystal growth • Amorphous alloys • Powder processing Expand materials synthesis/processing to develop cold mock up of weapons assembly and processing. Expand materials synthesis/processing to develop environmental and waste technologies.	These capabilities were maintained as projected by the SWEIS ROD. Single crystal growth, amorphous alloy research, and powder processing were expanded in CY 2004. Materials characterization capacity was expanded upon. Cold mock up of weapons assembly and processing as well as other technologies continued to be expanded in CY 2004.
Mechanical Behavior in Extreme Environment	Maintain two research capabilities at levels identified during preparation of the SWEIS: • Mechanical testing • Fabrication and assembly Expand dynamic testing to include research and development for the aging of weapons materials. Develop a new research capability (machining technology).	These two capabilities were maintained as projected by the SWEIS ROD and additional capabilities continued to be expanded as projected by the SWEIS ROD. Fabrication, assembly, and prototype experiments were expanded in CY 2004. Improvements were accomplished in the conduct of dynamic load and crack testing and measurement.
Advanced Materials Development	Maintain four research capabilities at levels identified during preparation of the SWEIS: • New materials • Synthesis and characterization • Ceramics • Superconductors	Capability was maintained as projected and improved. Capability for ion beam modification of materials was increased. Superconductivity capability has been expanded to include • Electron Beam Deposition and • Performance measurement capabilities including atomic force microscopy.
Materials Characterization	Maintain four research capabilities at levels identified during preparation of the SWEIS: • Surface science chemistry • X-ray • Optical metallography • Spectroscopy Expand corrosion characterization to develop surface modification technology. Expand electron microscopy to develop plasma source ion implantation.	Improvements occur on a continual basis including: Electron microscopy expanding to include atomic scale microscopy. X-ray capabilities were improved upon.

a Includes completion of the second floor of MSL.

Table 2.6.3-1. Materials Science Laboratory (TA-03)/Operations Data

Parameter	Units	SWEIS ROD projection	2004 Operations
Radioactive Air Emissions	Ci/yr	Negligible	Not Measured
NPDES Discharge Volume	MGY	No outfalls	No outfalls
Wastes:			
Chemical	kg/yr	600	206
LLW	m^3/yr	0	0
MLLW	m^3/yr	0	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	57 [a]	59 [a]

a The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.7 Target Fabrication Facility (TA-35)

The TFF is a two-story building (35-213) housing activities related to weapons production and laser fusion research. This Key Facility is categorized as a Low Hazard non-nuclear facility. Exhaust air from process equipment is filtered prior to exhaust to the atmosphere. Sanitary wastes are piped to the LANL sewage facility at TA-46, and radioactive liquid wastes are piped to the RLWTF at TA-50.

2.7.1 Construction and Modifications at the Target Fabrication Facility

In 1998, process discharges from Outfall 04A-127 were rerouted to the sewage facility at TA-46, and the outfall was eliminated from the NPDES permit (DOE 1996c). There were no other significant facility additions or modifications during the 1996–1998, 1999, 2000, 2001, 2002, 2003, or 2004 periods. The ROD did not project any facility changes through 2005.

2.7.2 Operations at the Target Fabrication Facility

The SWEIS identified three capabilities for the TFF Key Facility. The primary measurement of activity for this facility is production of targets for research and testing (laser and physics testing). In the 1998–2004 timeframe, the number of targets and specialized components fabricated for testing purposes was consistently less than the 6,100 targets per year projected by the SWEIS ROD. As seen in Table 2.7.2-1, other operations at the TFF were also below levels projected by the SWEIS ROD. The Characterization of Materials capability has been added to Table 2.7.2-1. This was a capability identified in the SWEIS for the TFF and Sigma Key Facilities but, before the 2001 Yearbook, was only listed for the Sigma Key Facility.

Table 2.7.2-1. Target Fabrication Facility (TA-35)/Comparison of Operations

Capability	SWEIS ROD	2004 Operations
Precision Machining and Target Fabrication	Provide targets and specialized components for about 6,100 laser and physics tests/yr, including a 20% increase over levels identified during preparation of the SWEIS for high-explosive pulsed-power target operations, and including about 100 high-energy-density physics tests.	Provided targets and specialized components for about 800 tests. Did not support high-explosive pulsed-power tests at levels identified during preparation of the SWEIS. In addition, provided components to Dynamic Experimentation (DX) and Physics Divisions for high-energy-density physics tests.
Polymer Synthesis	Produce polymers for targets and specialized components for about 6,100 laser and physics tests/yr, including a 20% increase over levels identified during preparation of the SWEIS for high-explosive pulsed-power target operations, and including about 100 high-energy-density physics tests.	Produced polymers for targets and specialized components for about 400 tests. Did not support high-explosive pulsed-power tests at levels identified during preparation of the SWEIS. Supported no high-energy-density physics tests.
Chemical and Physical Vapor Deposition	Coat targets and specialized components for about 6,100 laser and physics tests/yr, including a 20% increase over levels identified during preparation of the SWEIS for high-explosive pulsed-power target operations, including about 100 high-energy-density physics tests, and including support for pit rebuild operations at twice the levels identified during preparation of the SWEIS.	Coated targets and specialized components for about 400 tests. Did not support high-explosive pulsed-power tests at levels identified during preparation of the SWEIS. Supported no high-energy-density physics tests.
Characterization of Materials [a]	Analyze up to 36 tritium reservoirs/yr. [a]	No tritium reservoirs analyzed.

a The SWEIS indicated that this activity would be accomplished at TFF as well as the Sigma Complex. See Table 2.5.2-1.

2.7.3 Operations Data for the Target Fabrication Facility

TFF activity levels are primarily determined by funding from fusion, energy, and other research-oriented programs, as well as funding from some defense-related programs. These programs, and hence operations at TFF, were at levels similar to those levels identified during preparation of the SWEIS and below levels projected by the SWEIS ROD. This summary is supported by the current workforce and by the 1998–2004 waste volumes, which were less than projected. Table 2.7.3-1 details operations data for CY 2004.

2.8 Machine Shops (TA-03)

The Machine Shops Key Facility consists of two buildings, the Nonhazardous Materials Machine Shop (Building 03-39) and the Radiological Hazardous Materials Machine Shop (Building 03-102). Both buildings are located within the same exclusion area. Activities consist of machining, welding, and assembly of various materials in support of major LANL programs and projects, principally those related to weapons manufacturing. In September 2001, Building 03-102 was placed on the Radiological Facility List (LANL 2001c).

Table 2.7.3-1. Target Fabrication Facility (TA-35)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radiological Air Emissions	Ci/yr	Negligible	Not Measured [a]
NPDES Discharge:	MGY		
4A-127	MGY	0	Eliminated
Wastes:			
Chemical	kg/yr	3,800	836
LLW	m^3/yr	10	0
MLLW	m^3/yr	0.4	0.01
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	54 [b]	50 [b]

a The emissions continue to be sufficiently low that monitoring is not required.

b The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.8.1 Construction and Modifications at the Machine Shops

Projected: The SWEIS ROD projected no new construction or major modifications to the shops.

Actual: In CY 2004, electrical upgrades and one facility modification were completed at TA-03-39:

- Security and Safeguards Division`s Joint Conflict and Tactical Simulation (JCATS) System required space to house a Vault-Type Room (VTR) for classified work to the Secret Restricted Data level. The JCATS System laboratory consists of a VTR for internal communications, an office area, and a stand-alone classified computing system all installed in room 27 of TA-3-39. The project involved adding walls inside the existing structure, as described in ESH-ID 02-0040 (LANL 2002g). The proposed work is within the scope of an existing DOE-approved NEPA categorical exclusion LAN-96-022 (DOE 2003e), accession number 8752.

- Electrical upgrades in 23-P of SM-39 occurred in 2004.

2.8.2 Operations at the Machine Shops

As shown in Table 2.8.2-1, the SWEIS identified three capabilities at the shops. These same three capabilities continue to be maintained. No new capabilities have been added to this Key Facility. All activities occurred at levels well below those projected by the SWEIS ROD. The workload at the Shops is directly linked to Research and Development and Production requirements.

Table 2.8.2-1. Machine Shops (TA-03)/Comparison of Operations

Capability	SWEIS ROD	2004 Operations
Fabrication of Specialty Components	Provide fabrication support for the dynamic experiments program and explosives research studies. Support up to 100 hydrodynamic tests/yr. Manufacture up to 50 joint test assembly sets/yr. Provide general laboratory fabrication support as requested.	Specialty components were fabricated at levels below those projected by the SWEIS ROD.
Fabrication Utilizing Unique Materials	Continue fabrication utilizing unique and unusual materials.	Fabrication with unique materials was conducted at levels below those projected by the SWEIS ROD.
Dimensional Inspection of Fabricated Components	Provide appropriate dimensional inspection of above fabrication activities. Undertake additional types of measurements/inspections.	Dimensional inspection was provided for the above fabrication activities. Additional types of measurements and inspections were not undertaken.

2.8.3 Operations Data for the Machine Shops

Since activities were well below projections by the SWEIS ROD, so too were operations data. Chemical waste generation was less than one-tenth of a percent of projected generation (414 kilograms generated in 2004, compared to a ROD projection of 474,000 kilograms per year). Table 2.8.3-1 provides details.

Table 2.8.3-1. Machine Shops (TA-03)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
Americium-241	Ci/yr	Not projected [a]	None detected
Thorium-228	Ci/yr	Not projected [a]	6.37E-10
Thorium-230	Ci/yr	Not projected [a]	3.76E-10
Uranium-234	Ci/yr	Not projected [a]	1.77E-08
Uranium-235	Ci/yr	Not projected [a]	6.37E-10
Uranium-238	Ci/yr	1.50E-4	1.61E-09
NPDES Discharge	MGY	No outfalls	No outfalls
Wastes:			
Chemical	kg/yr	474,000	414
LLW	m^3/yr	606	15
MLLW	m^3/yr	0	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	81 [b]	108 [b]

a The radionuclide was not projected by the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.

b The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.9 High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, TA-28, TA-37)

The High Explosives Processing Key Facility is located in all or parts of seven TAs. Building types consist of production and assembly facilities, analytical laboratories, explosives storage magazines, and a facility for treatment of explosive-contaminated wastewaters. Activities consist primarily of manufacture and assembly of high explosives components for nuclear weapons and for Science-Based Stockpile Stewardship Program tests and experiments. Environmental and safety tests are performed at TA-11 and TA-09 while TA-08 houses radiography activities.

As identified in the SWEIS, this Key Facility has one Category 2 nuclear building in TA-08 (TA-08-0023) (see Table 2.9-1). In November 2002, the updated LANL Radiological Facility List (LANL 2002b) was published and identified Buildings TA-08-0022, TA-08-0070, TA-08-0120, TA-11-0030, TA-16-0088, TA-16-0202, TA-16-0207, TA-16-0300, TA-16-0301, TA-16-3020, TA-16-0332, TA-16-0410, TA-16-0411, TA-16-0413, TA-16-0415, TA-037-0010, TA-037-0014, TA-037-0016, TA-037-0022, TA-037-0024, and TA-037-0025 as radiological facilities.

Table 2.9-1. High Explosives Processing Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [b]
TA-08-0022	Radiography facility	2	2	
TA-08-0023	Radiography facility	2	2	2
TA-08-0024	Isotope Building	2		
TA-08-0070	Experimental Science	2		
TA-16-0411	Intermediate Device Assembly		2	

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).

Table 2.9-2. High Explosives Processing Buildings Identified as Radiological Facilities

Building	Description	LANL 2002 [a]
TA-08-0022	Radiography	RAD
TA-08-0070	Nondestructive Testing and Evaluation	RAD
TA-08-0120	Radiography	RAD
TA-11-0030	Vibration Testing	RAD
TA-16-0088	Component Storage	RAD
TA-16-0202	Laboratory	RAD
TA-16-0207	Component Testing	RAD
TA-16-0300	Component Storage	RAD
TA-16-0301	Component Storage	RAD
TA-16-0302	Component Storage/Training	RAD
TA-16-0332	Component Storage	RAD
TA-16-0410	Assembly Building	RAD
TA-16-0411	Assembly Building	RAD
TA-16-0413	Component Storage	---
TA-16-0415	Component Storage	---
TA-037-0010	Storage Magazine	RAD
TA-037-0014	Storage Magazine	RAD

Table 2.9-2. continued

Building	Description	LANL 2002 [a]
TA-037-0016	Storage Magazine	RAD
TA-037-0022	Magazine	---
TA-037-0024	Storage Magazine	RAD
TA-037-0025	Storage Magazine	RAD

a LANL Radiological Facility List (LANL 2002b).

Operations at this Key Facility are performed by two separate Divisions: the DX Division and the Engineering Sciences and Applications (ESA) Division. ESA performs the majority of the high explosives manufacturing and assembly work while DX assesses the parts produced by ESA.

The ESA Weapon Materials and Manufacturing group brings 99 percent of the explosives into LANL and stores it as raw material. ESA presses the raw explosives into solid shapes and machines these shapes to specifications. The completed shapes are shipped to DX for testing (detonation). The DX High Explosives Science and Technology group also produces a small quantity of high explosives during the year from basic chemistry. The DX Detonation Science and Technology group uses a small amount of the raw explosives for making detonators.

There are two major pathways for expending the explosives brought into LANL: wastes from the pressing and machining operations, which are burned; and completed shapes that are detonated as part of the testing program.

As a result, information from both Divisions must be combined to completely capture operational parameters for production of high explosives. To assist the reader, this information is presented both in separate and combined forms.

2.9.1 Construction and Modifications at High Explosives Processing

The ROD projected four facility modifications for this Key Facility. All four projects were completed before 1999. These four modifications were

- construction of the High Explosive Wastewater Treatment Facility–completed and in operation by 1997;
- modification of 17 outfalls and their elimination from the NPDES permit–completed with 19 outfalls actually eliminated during 1997-1998;
- relocation of the Weapons Components Testing Facility–completed before 1999; and
- the TA-16 steam plant conversion–completed.

In 2004, construction continued on the new High Power Detonator Production Facility, Building 22-115, and magazine TA-22-118. The proposed work is within the scope of a DOE-approved NEPA categorical exclusion (DOE 2000b). Construction was delayed because of the shut down. LANL is expected to take beneficial occupancy in summer of 2005.

In 2004, construction began on a new office building for the Hydrotest Design Facility, TA-22-120 (DOE 2002d, LANL 2002h).

2.9.2 Operations at High Explosives Processing

The SWEIS ROD identified six capabilities for this Key Facility. No new capabilities have been added, and none has been deleted. Activity levels during 2004 continued below those projected by the SWEIS ROD. These projections were based on the possibility that LANL would take over high explosives production work being performed at Pantex Plant. DOE decided, however, to keep high explosives production at Pantex Plant. However, the projections for high explosive processing were retained because DOE intends to keep LANL available as a back-up capability for Pantex Plant. As a result of the shut down of LANL operations, production of high explosives components was well below the projected quantities.

As seen in Table 2.9.2-1, high explosives and plastics development and characterization operations remained below levels projected in the SWEIS. Efforts continued in CY 2003 to develop protocols for obtaining stockpile returned materials, develop new test methods, and procure new equipment to support requirements for science-based studies on stockpile materials.

In CY 2004, 2,570 pounds of high explosives and 2,497 pounds of high explosives simulant material were used in the fabrication of test components for DX and ESA Divisions. The level of high explosives usage was significantly below the SWEIS ROD projection of 82,700 pounds of high explosives, while the usage of high explosives simulant was about 86 percent of the SWEIS ROD projection of 2,910 pounds. However, use of the high explosive simulant results in chemical waste that is shipped offsite for disposal and does not result in environmental impacts at LANL.

During CY 2004 ESA Division produced 841 pieces of explosives weighing 2,570 lbs. In machining experimental components, 1,542 lbs of water-saturated explosive scrap were generated and burned. The machined components were sent to DX Division and Lawrence Livermore National Laboratory for test detonations along with an additional 3,095 lbs of raw explosives. During the high explosive processing, 29,261 gallons of explosive-contaminated water were generated, treated, and released. Also, 270 lbs of explosive-contaminated combustible waste and 12 gallons of explosive-contaminated solvent were burned. Finally, 12,580 lbs of explosive-contaminated metal were treated and salvaged.

Three outfalls from High Explosives Processing remain on the NPDES permit: 03A-130, 05A-055 (the High Explosives Wastewater Treatment Facility), and 05A-097.

Table 2.9.2-1. High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, TA-28, and TA-37)/Comparison of Operations

Capability	SWEIS ROD[a, b]	2004 Operations
High Explosives Synthesis and Production	Continue synthesis research and development, produce new materials, and formulate explosives as needed. Increase production of materials for evaluation and process development. Produce material and components for directed stockpile production.	The high explosives synthesis and production operations were less than those projected by the SWEIS ROD.
High Explosives and Plastics Development and Characterization	Evaluate stockpile returns. Increase (40%) efforts in development and characterization of new plastics and high explosives for stockpile improvement. Improve predictive capabilities. Research high explosives waste treatment methods.	High explosives formulation, synthesis, production, and characterization operations were performed at levels that were less than those projected by the SWEIS ROD.
High Explosives and Plastics Fabrication	Continue traditional stockpile surveillance and process development. Supply parts to Pantex for surveillance, stockpile rebuilds, and joint test assemblies. Increase fabrication for hydrodynamic and environmental testing.	DX Division fabricated less than 5,000 high explosive parts, and ESA Division fabricated approximately 1,061 high explosives parts in CY 2004. Therefore, less than 7,000 parts were fabricated in support of the weapons program, including high explosives characterization studies, subcritical experiments, hydrotests, surveillance activities, environmental weapons tests, and safety tests.
Test Device Assembly	Increase test device assembly to support stockpile related hydrodynamic tests, joint test assemblies, environmental and safety tests, and increased research and development. Approximately 100 major assemblies per year.	ESA Division provided fewer than 100 major assemblies for Nevada Test Site subcritical and joint environmental test programs.
Safety and Mechanical Testing	Increase (50%) safety and environmental tests related to stockpile assurance. Improve predictive models. Approximately 15 safety and mechanical tests per year.	DX Division performed fewer than 15 stockpile related safety and mechanical tests during CY 2004.
Research, Development, and Fabrication of High-Power Detonators	Increase operations to support assigned stockpile stewardship management activities; manufacture up to 40 major product lines per year. Support DOE complex for packaging and transportation of electro-explosive devices.	High-power detonator activities by DX Division resulted in the manufacture of fewer than 40 product lines in CY 2004.

a The total amount of explosives and mock explosives used across all activities is an indicator of overall activity levels for this Key Facility. Amounts projected by the SWEIS ROD are 82,700 pounds of explosives and 2,910 pounds of mock explosives. Actual amounts used in CY 2004 were 2,570 pounds of high explosive and 2,487 pounds of mock high explosives.

b Includes construction of the High Explosives Wastewater Treatment Facility, the steam plant conversion, relocation of the Weapons Testing Facility, and outfall modifications.

2.9.3 Operations Data for High Explosives Processing

The details of operations data for CY 2004 are provided in Table 2.9.3-1. The NPDES discharge volume was about 37,500 gallons, compared to a projection of 12 million gallons. Waste quantities were well below projections made by the SWEIS ROD.

Table 2.9.3-1. High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, TA-28, and TA-37)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
Uranium-238	Ci/yr	9.96E-7	Not Measured [a]
Uranium-235	Ci/yr	1.89E-8	Not Measured [a]
Uranium-234	Ci/yr	3.71E-7	Not Measured [a]
NPDES Discharge: [b]			
Number of outfalls		22	3
Total Discharges	MGY	12.4	0.0375
03A–130 (TA-11)	MGY	0.04	0.0030
05A–055 (TA-16)	MGY	0.13	0.0345
05A–097 (TA-11)	MGY	0.01	0
Wastes:			
Chemical	kg/yr	13,000	7,291
LLW	m^3/yr	16	0
MLLW	m^3/yr	0.2	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	96 [c]	105 [c]

a No stacks require monitoring; all non-point sources are measured using ambient monitoring.

b Outfalls eliminated before 1999: 02A-007 (TA-16), 04A-070 (TA-16), 04A-083 (TA-16), 04A-092 (TA-16), 04A-115 (TA-8), 04A-157 (TA-16), 05A-053 (TA-16), 05A-056 (TA-16), 05A-066 (TA-9), 05A-067 (TA-9), 05A-068 (TA-9), 05A-069 (TA-11), 05A-071 (TA-16), 05A-072 (TA-16), 05A-096 (TA-11), 06A-073 (TA-16), 06A-074 (TA-8), and 06A-075 (TA-8).

c The number shown in the “SWEIS ROD” column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.10 High Explosives Testing (TA-14, TA-15, TA-36, TA-39, TA-40)

The High Explosives Testing Key Facility is located in all or parts of five TAs, comprises more than one-half (22 of 40 square miles) of the land area occupied by LANL, and has 16 associated firing sites. All firing sites are in remote locations and/or within canyons. Major buildings are located at TA-15, and include the Dual Axis Radiographic Hydrodynamic Test (DARHT) facility (Building TA-15-312), the Pulsed High Energy Radiation Machine Emitting X-Rays (PHERMEX) (TA-15-184), and the TA-15-306 firing site. Building types consist of preparation and assembly facilities, bunkers, analytical laboratories, high explosives storage magazines, and offices. Activities consist primarily of testing high explosives components for nuclear weapons and for Science-Based Stockpile Stewardship Program tests and experiments.

In September 2001, Building TA-15-R183 was placed on the LANL Radiological Facility List (LANL 2001e).

2.10.1 Construction and Modifications at High Explosives Testing

As required by the ROD for the DARHT EIS (DOE 1995b), the PHERMEX facility (TA-15-184) was deactivated in March 2004.

Construction activities were not conducted within the High Explosives Testing Key Facility during 2004.

During 2004, LANL evaluated the use of foam for reducing particulate emissions during dynamic experiments. Some dynamic experiments post-shot debris contain particulates such as beryllium and/or depleted uranium. The 2004 tests used an aqueous foam to mitigate these particulates. The foam tests were add-ons to existing explosives tests.

DX Division Strategic Plan for the Future

In 2002, NNSA determined that an EA would be required for the DX Division strategic plan including the new structures to be built at TA-22, and the subsequent D&D and replacement of old buildings located in TA-15. NEPA coverage for the strategic plan was provided by the "Environmental Assessment for the Proposed Consolidation of Certain Dynamic Experimentation Activities at the Two-Mile Mesa Complex, Los Alamos National Laboratory, Los Alamos, New Mexico," and subsequent Finding of No Significant Impact issued in November 2003 (DOE 2003f).

2.10.2 Operations at High Explosives Testing

The ROD identified seven capabilities for this Key Facility. None of these has been deleted, and no new capabilities have been introduced. Levels of research were below those predicted by the SWEIS ROD. Table 2.10.2-1 identifies the operational capabilities discussed in the SWEIS and presents 2004 operational data for comparative purposes. The total amount of depleted uranium expended during testing (all capabilities) is an indicator of overall activity levels at this Key Facility. A total of 30.54 kilograms were expended in 2004, compared to approximately 3,900 kilograms projected by the SWEIS ROD.

2.10.3 Operations Data for High Explosives Testing

The operational data presented in Table 2.10.3-1 indicate that the materials used and effects of research during 2004 were considerably less than projections made by the SWEIS ROD.

Table 2.10.2-1. High Explosives Testing (TA-14, TA-15, TA-36, TA-39, and TA-40)/Comparison of Operations

Capability	SWEIS ROD[a]	2004 Operations
Hydrodynamic Tests	Conduct up to 100 hydrodynamic tests/yr. Develop containment technology. Conduct baseline and code development tests of weapons configuration. Depleted uranium use of 6,900 lb/yr (over all activities).	Hydrodynamic tests were conducted in 2004 at a level below those projected by the SWEIS ROD.
Dynamic Experiments	Conduct dynamic experiments to study properties and enhance understanding of the basic physics of state and motion for materials used in nuclear weapons including some experiments with SNM.	Dynamic experiments were conducted at a level below those projected by the SWEIS ROD.
Explosives Research and Testing	Conduct high explosives tests to characterize explosive materials.	Explosives research and testing were conducted at a level below those projected by the SWEIS ROD.
Munitions Experiments	Continued support of Department of Defense in conventional munitions. Conduct experiments with projectiles and study other effects on munitions.	Munitions experiments were conducted at a level below those projected by the SWEIS ROD.
High-Explosives Pulsed-Power Experiments	Conduct experiments and development tests.	Experiments were conducted at a level below those projected by the SWEIS ROD.
Calibration, Development, and Maintenance Testing	Conduct tests to provide calibration data, instrumentation development, and maintenance of image processing capability.	Calibration, development, and maintenance testing were conducted at a level below those projected by the SWEIS ROD.
Other Explosives Testing	Develop advanced high explosives or weapons evaluation techniques.	Other explosives testing was conducted at a level below explosives testing projected by the SWEIS ROD.

a Includes completion of construction for the DARHT facility and its operation.

Table 2.10.3-1. High Explosives Testing (TA-14, TA-15, TA-36, TA-39, and TA-40)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
Depleted Uranium	Ci/yr	1.5E-1 [a]	Not Measured [b]
Chemical Usage:[c]			
Aluminum [d]	kg/yr	45,450	217.16
Beryllium	kg/yr	90	1.63
Copper [d]	kg/yr	45,630	8.6
Depleted Uranium	kg/yr	3,130 [e]	30.54
Lead	kg/yr	240	0
Tantalum	kg/yr	300	0.0012
Tungsten	kg/yr	300	0
NPDES Discharge:			
Number of outfalls [f]	----	14	2
Total Discharges	MGY	3.6	0.5843
03A–028 (TA-15) [g]	MGY	2.2	0.0503
03A–185 (TA-15) [g]	MGY	0.73	0.5340

Table 2.10.3-1. continued

Parameter	Units	SWEIS ROD	2004 Operations
Wastes:			
Chemical	kg/yr	35,300	12.7
LLW	m^3/yr	940	87
MLLW	m^3/yr	0.9	19.3[h]
TRU [i]	m^3/yr	0.2	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	227 [j]	248[j]

a The isotopic composition of depleted uranium is approximately 99.7 percent uranium-238, approximately 0.3 percent uranium-235, and approximately 0.002 percent uranium-234. Because there are no historic measurements of emissions from these sites, projections are based on estimated release fractions of the materials used in tests.

b No stacks require monitoring; all non-point sources are measured using ambient monitoring.

c Usage listed for the SWEIS ROD includes projections for expanded operations at DARHT as well as the other TA-15 firing sites (the highest foreseeable level of such activities that could be supported by the LANL infrastructure). No proposals are currently before DOE to exceed the material expenditures at DARHT evaluated in the DARHT EIS (DOE 1995b).

d The quantities of copper and aluminum involved in these tests are used primarily in the construction of support structures. These structures are not expended in the explosive tests, and thus, do not contribute to air emissions.

e The SWEIS ROD projection for depleted uranium emission has been erroneously reported in previous Yearbooks (1998–2003) due to a discrepancy between the ROD and Table 3.6.1-20 in the SWEIS. The additive volume for depleted uranium in the table is 8,666 lbs/yr (3,930 kg/yr), however the ROD states the annual amount of depleted uranium will increase to 6,900 lbs/yr (3,130 kg/yr).

f Outfalls eliminated before 1999: 04A-101 (TA-40), 04A-139 (TA-15), 04A-141 (TA-039), 04A-143 (TA-15), 04A-156 (TA-039), 06A-080 (TA-40), 06A-081 (TA-40), 06A-082 (TA-40), 06A-099 (TA-40), and 06A-123 (TA-15). Consolidation and removal of outfalls has resulted in projected NPDES volumes underestimating actual discharges from the existing outfalls.

g The annual quantity of discharge was calculated by using the average daily flow and multiplying by 365 days in the year; this results in an overestimate of volume. Totalizing water meters have now been installed on both 03A-185 (TA-15) and 03A-28 (TA-15), which will allow for much more accurate water usage calculations for 2004 reporting.

h The 19.3 cubic meters of MLLW consisted mostly of lead bricks and plates used for shielding; the lead was contaminated with beryllium and depleted uranium. A Division-wide effort was implemented to remove unwanted lead from the site.

i TRU waste (steel) will be generated as a result of DARHT's Phased Containment Option (see DARHT EIS [DOE 1995b]).

j The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.10.4 Cerro Grande Fire Effects at High Explosives Testing

Immediate Effects

About 3,040 acres of land within the High Explosives Testing Key Facility burned during the Cerro Grande Fire. Areas most affected were TA-14, TA-15, and TA-40 and, to a lesser extent, TA-36. Fire damage was in excess of $16 million. Approximately 14 facilities were destroyed and approximately 28 additional facilities were damaged within the DX-controlled area of LANL as a result of the fire. All of the destroyed facilities were transferred to decontamination and decommissioning in 2001. Any reusable items were salvaged and recycled.

Continuing Effects

The Water Quality and Hydrology group and Cerro Grande Rehabilitation Project staff continue to monitor the storm water control placements and re-vegetation efforts (best management practices) that were conducted immediately after the fire. To date, these efforts, a direct consequence of the fire, appear to be successful in stabilizing soils on the DX-controlled area of LANL by preventing run-off and reducing storm flows onto DX property. These inspection and monitoring efforts will continue through 2005.

Other fire-related activities involved fuelwood mitigation efforts that included tree thinning throughout DX Division. The overall goals of the Wildfire Hazard Reduction Plan (LANL 2001l) are to 1) protect the public, LANL workers, facilities, and the environment from catastrophic wildfire; 2) prevent interruptions of LANL operations from wildfire; 3) minimize impacts to cultural and natural resources while conducting fire management activities; and 4) improve forest health and wildlife habitat at LANL and, indirectly, across the Pajarito Plateau. These goals are accomplished through reducing fuel loads within LANL forests to decrease wildfire hazards, and decrease the risk of wildfire escapes at LANL-designated firing sites by treating fuel, and improving wildland fire suppression capability through fire road improvements.

2.11 Los Alamos Neutron Science Center (TA-53)

The LANSCE Key Facility lies entirely within TA-53. The facility has more than 400 buildings, including one of the largest at LANL. Building 53-3, which houses the linac, has 315,000 square feet under roof. Activities consist of neutron science and nuclear physics research, proton radiography, the development of accelerators and diagnostic instruments, and production of medical radioisotopes. Isotope production has not occurred since 1998; however, the new isotope production facility threw its first beam on December 23, 2003, as part of the facility commissioning activities that continued into 2004. Full production has not yet begun. The majority of the LANSCE Key Facility (the User Facility) is composed of the 800-million-electron-volt linac, a Proton Storage Ring, and three major experimental areas: the Manuel Lujan Neutron Scattering Center, the Weapons Neutron Research (WNR) facility, and Experimental Area C.

Experimental Area C is the location of proton radiography experiments for the Stockpile Stewardship Program. A new experimental facility for the production of ultracold neutrons is nearing completion in Area B. Experimental Area A, formerly used for materials irradiation experiments and isotope production, is currently inactive; construction of a new isotope production facility was completed in CY 2002 and commissioning occurred in December 2003. A second accelerator facility located at TA-53, the Low-Energy Demonstration Accelerator (LEDA), is also inactive and is being decommissioned and dismantled.

This Key Facility has three Category 3 nuclear activities (Table 2.11-1): experiments using neutron scattering by actinides in Experimental Area ER-1/ER-2, the 1L neutron production target in Building 53-7, and Area A East in Building 53-3M (LANL 2001b), which is used for passive storage of activated materials. There are no Category 2 nuclear

Table 2.11-1. LANSCE Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [b]
TA-53-1L	1L Target		3	3
TA-53-3M	Experimental Science	3		
TA-53-A-6	Area A East		3	3
TA-53-ER1/ER-2	Actinide scattering experiments		3	3
TA-53-P3E	Pion Scattering Experiment		3	

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).

facilities at TA-53. In September 2001, TA-53-945 and 53-954 were placed on the LANL Radiological Facility List (LANL 2001c). Experimental Area ER-1/ER-2 is categorized as a Moderate Hazard facility. The remainder of the LANSCE User Facility is categorized as Low Hazard. DOE approved an Interim Safety Assessment Document for the LANSCE accelerator and experimental areas in May 2002. LANSCE began work on a two-year project to update and consolidate existing Authorization Basis documents for the User Facility.

2.11.1 Construction and Modifications at Los Alamos Neutron Science Center

Projected: The ROD projected significant facility changes and expansion to occur at LANSCE by December 2005. Table 2.11.1-1 below indicates that one project has been completed and that three have been started.

Not Projected: In addition to these projected construction activities, a new warehouse was constructed in CY 1998 to store equipment and other materials formerly stored outside, a new waste treatment facility for radioactive liquids generated at LANSCE was constructed during CY 1999, and construction of a new cooling tower was completed in CY 2000. These projects received NEPA review through Categorical Exclusions LAN-98-110 (DOE 1998b), LAN-98-109 (DOE 1998c), and LAN-96-022 (DOE 1999b). The new cooling towers (structures #53-963, 53-952) replace cooling towers 53-60, 53-62, and 53-64, which have been taken off line. The new towers discharge through Outfall 03A-048, as had their predecessors. Construction of two new instruments on Flight Paths 12 and 13 at the Lujan Center started in CY 2002. The cold neutron Flight Path 12 was commissioned February 2004, as was most of the NPD-Gamma experiment. (NPD is a nuclear reaction in which a neutron impinges on a proton and emits a deuteron plus a gamma ray.) The liquid hydrogen target is expected to be installed during fall 2005. However, Flight Path 13 remains under construction due to delays in construction of the foundation exterior to Building MPF-30. Work is expected to be complete in CY 2005.

2.11.2 Operations at Los Alamos Neutron Science Center

The SWEIS identified seven capabilities for the LANSCE Key Facility. No new capabilities have been added, and none has been deleted. During CY 2001, LANSCE operated both accelerators and three of the five experimental areas. Area A has been idle for more than two years; Area B has been idle for several years but a new Ultracold Neutron Facility is under construction (DOE 2002e).

Table 2.11.1-1. Status of Projected Facility Changes at LANSCE

Description	SWEIS ROD Ref.	Completed
Closure of two former sanitary lagoons	2-88-R	Started [a]
LEDA to become operational in late 1998	2-89-R	Yes - 1999 [b]
Short-Pulse Spallation Source enhancements	2-90-L	Yes [c]
One-megawatt target/blanket	2-91-L	No
New 100-MeV Isotope Production Facility	2-92-L	Yes [d]
Long-Pulse Spallation Source (LPSS), including decontamination and renovation of Area A	3-25-L	No
Dynamic Experiment Lab	3-25-R	No [e]
Los Alamos International Facility for Transmutation	3-25-R	No
Exotic Isotope Production Facility	3-27-L	No
Decontamination and renovation of Area A-East	3-27-L	No

a Characterization started in CY 1999 and continued into CY 2000. Cleanup at the south lagoon began in CY 2000 with the removal of the sludge and liner. Data analysis and sampling continued through CY 2001 for both lagoons and an Interim Action Plan was written for remediation of the north lagoon. Cleanup of the north lagoon was done in CY 2002. The Lagoons (Solid Waste Management Unit [SWMU] 53-002[a]-99) have been remediated, with the complete removal of all contaminated sludge and liners; the nature and extent of residual contamination have been defined, and it has been shown that the residual contamination does not pose a potential unacceptable risk to humans or the environment. Currently the site is located within an industrial area under LANL (institutional) control. The site is expected to remain so for the reasonably foreseeable future. For these reasons, neither additional corrective action nor further characterization is warranted at the site. The report is in review by the New Mexico Environment Department (NMED) and comments have not been received to date.

b LEDA started high-power conditioning of the radio-frequency quadrupole power supply in November 1998. The first trickle of proton beam was produced in March 1999, and maximum power was achieved in September 1999. It has been designed for a maximum energy of 12 million electron volts, not the 40 million electron volts projected by the SWEIS ROD. LEDA was shut down in December 2001 and will remain inactive until funding is resolved. [Note: The 2003 omnibus bill passed by Congress included funding for LEDA D&D. The plan is to remove all support equipment and leave the building and the accelerator itself in place.]

c The Short-Pulse Spallation Source project was completed in 2004. This project consisted of two components: Accelerator Enhancement and Spectrometer Enhancement. The Accelerator Enhancement portion completed in June 2003 provided a brighter H- ion source and upgrade to the Proton Storage Ring to handle the higher beam current. The Spectrometer E Enhancement completed in January 2004 subproject provided three new neutron scattering spectrometers to the Lujan Center and upgraded the capability of one instrument.

d Preparations began in the spring of CY 1999 for construction of the new 100-million-electron-volt Isotope Production Facility. Construction started in CY 2000 and the facility was completed in CY 2002. The Isotope Production Facility threw its first beam on December 23, 2003. Full production has not begun as of yet.

e The Stockpile Stewardship Program is currently using Experimental Area C, Building 53-3P for proton radiography and the Blue Room in Building 53-07 for neutron resonance spectroscopy. The concept of combining these experiments in a new Dynamic Experiment Laboratory has been replaced by the concept to construct a $1.6 billion Advanced Hydrotest Facility, which is currently in the conceptual phase. Conceptual planning for the Advanced Hydrotest Facility is being done consistent with the Stockpile Stewardship and Management Programmatic EIS (DOE 1996d) and ROD (DOE 1996e). Before DOE decides to build and operate the Advanced Hydrotest Facility at LANL or some other site, an EIS and ROD would be prepared.

The primary indicator of activity for this facility is production of the 800-million-electron-volt LANSCE proton beam as shown in Table 2.11.2-1. These production figures are all less than the 6,400 hours at 1,250 microamps projected by the SWEIS ROD. In addition, there were no experiments conducted for transmutation of wastes. There was also no production of medical isotopes during CY 2004, although construction of a new isotope production facility has been completed. Table 2.11.2-1 provides details.

Table 2.11.2-1. Los Alamos Neutron Science Center (TA-53)/ Comparison of Operations

Capability	SWEIS ROD[a]	2004 Operations
Accelerator Beam Delivery, Maintenance, and Development	Deliver LANSCE linac beam to Areas A, B, C, WNR facility, Manuel Lujan Center, Dynamic Experiment Facility, and new isotope production facility for 10 months/yr (6,400 hrs). Positive ion current 1,250 microampere and negative ion current of 200 microampere.	In 2004, H+ beam was delivered to isotope production facility for commissioning. H- beam was delivered as follows: (a) to the Lujan Center for 1,435 hours at an average current of 115.5 microamperes with 80.0 percent total reliability. (b) to WNR Target 2 for 261.7 hours in a "pulse on demand" mode of operation, with an average current below 1 femtoampere with 90.6% total reliability. (c) to WNR Target 4 for 1,259 hours at an average current of 3.5 microamperes with 85.2% total reliability. (d) through Line X to Lines B and C for 361 hours in a "pulse on demand" mode of operation, with an average current below 1 femtoampere with 86.4% total reliablity.
	Reconfigure beam delivery and support equipment to support new facilities, upgrades, and experiments.[a]	No major upgrades to the beam delivery complex.
	Commission/operate/maintain LEDA for 10 to 15 yrs; operate up to approximately 6,600 hrs/yr.	LEDA was shutdown in December 2001 and is now being decommissioned and dismantled.
Experimental Area Support	Full-time remote handling and radioactive waste disposal capability required during Area A interior modifications and Area A-East renovation.	Full-time capability maintained. (Note: Modifications and renovations were not undertaken, however.)
	Support of experiments, facility upgrades, and modifications.	Support activities were conducted per the projections of the SWEIS ROD.
	Increased power demand for LANSCE linac and LEDA radio-frequency operation.	Average beam current to the Lujan Center was increased to over 110 microamps.
Neutron Research and Technology [b]	Conduct 1,000 to 2,000 experiments/yr using Manuel Lujan Center, WNR facility, and LPSS. Establish LPSS in Area A (requires modification).	99 experiments were conducted at the Lujan Center and 35 experiments at WNR. LPSS was not constructed.
	Construct Dynamic Experiment Laboratory adjacent to WNR Facility. Support contained weapons-related experiments: - With small quantities of actinides, high explosives, and sources (up to approximately 80/yr) - With nonhazardous materials and small quantities of high explosives (up to approximately 200/yr)	`The Dynamic Experiment Laboratory was not constructed, but weapons-related experiments were conducted: - Some with actinides - Some with nonhazardous materials and high explosives - Some with high explosives and depleted uranium - Some shock wave experiments

Table 2.11.2-1. continued

Capability	SWEIS ROD[a]	2004 Operations
Neutron Research and Technology (continued)	- With up to 4.5 kilograms high explosives and/or depleted uranium (up to approximately 60/yr) - Shock wave experiments involving small amounts, up to (nominally) 50 grams plutonium.	
	Provide support for static stockpile surveillance technology research and development.	Support was provided for surveillance research and development.
Accelerator Transmutation of Wastes [c]	Conduct lead target tests for two years at Area A beam stop.	No tests in CY 2004. No lead tests are expected for at least five years unless funding becomes available from DOE-NE.
	Implement the Los Alamos International Facility for Transmutation (Establish one-megawatt, then five-megawatt Accelerator Transmutation of Wastes target/blanket experiment areas adjacent to Area A.)	No Accelerator Transmutation Waste tests are planned for the future.
	Conduct five-megawatt experiments for 10 months/yr for four years using about three kilograms of actinides.	No experiments.
Subatomic Physics Research	Conduct 5 to 10 physics experiments/yr at Manuel Lujan Center, WNR facility, and LPSS.	No ultracold neutron experiments were run during CY 2004 LANSCE beam operations.
	Conduct proton radiography experiments, including contained experiments with high explosives.	14 experiments involving contained high explosives were conducted in CY 2004.
Medical Isotope Production	Irradiate up to approximately 50 targets/yr for medical isotope production.	No production in 2004.
	Added production of exotic, neutron-rich, and neutron-deficient isotopes (requires modification of an existing target area).	No production in 2004.
High-Power Microwaves and Advanced Accelerators	Conduct research and development in these areas, including microwave chemistry research for industrial and environmental applications.	Research and development was conducted.

a Includes the completion of proton and neutron radiography facilities, the LEDA, the isotope production facility relocation, the Short-Pulsed Spallation Source, and the LPSS.

b Numbers of neutron experiments represent plausible levels of activity. Bounding conditions for the consequences of operations are primarily determined by 1) length and power of beam operation and 2) maintenance and construction activities.

c Formerly Accelerator-Driven Transmutation Technology.

The most significant accomplishment in CY 2004 for LANSCE is the successful completion of the run cycle for the three primary experimental facilities: the WNR, the Proton Radiography area, and the Manuel Lujan Jr. Neutron Scattering Center (Lujan Center). LANSCE hosted over 474 user visits this run cycle (June 3–January 26). The facility operated at an average 80 percent availability for the Lujan Center and 85 percent for WNR, allowing the completion of just under 135 experiments for internal and external neutron scattering and neutron nuclear physics users. Construction of two new instruments at the Lujan Center began in CY 2002. One, IN500, will be used for inelastic neutron scattering studies. The other is NPD-Gamma that will look for violations of the weak nuclear interaction.

2.11.3 Operations Data for Los Alamos Neutron Science Center

Since both construction activities, which contribute to waste quantities, and levels of operations were less than those projected by the SWEIS ROD, operations data were also less than projected. Radioactive air emissions are a key parameter since LANSCE emissions have historically accounted for more than 95 percent of the total LANL offsite dose. Emissions of activation products from LANSCE were higher than 2003 levels, but consistent with previous years (2001–2002). The total point source emissions were approximately 4,440 curies. As in recent years, the Area A beam stop did not operate during 2004; however, operations in Line D resulted in the majority of emissions reported for 2004. Waste generation and NPDES discharge volumes were well below projected quantities. Two outfalls at TA-53 were eliminated with completion of the cooling towers. Table 2.11.3-1 provides details.

Table 2.11.3-1. Los Alamos Neutron Science Center (TA-53)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
Argon-41	Ci/yr	7.44E+1	8.48E+0
Arsenic-72	Ci/yr	Not projected [a]	2.21E-5
Arsenic-73	Ci/yr	Not projected [a]	1.34E-4
Beryllium-7	Ci/yr	Not projected [a]	1.26E-6
Bromine-76	Ci/yr	Not projected [a]	1.84E-3
Bromine-77	Ci/yr	Not projected [a]	2.24E-5
Bromine-82	Ci/yr	Not projected [a]	1.51E-3
Carbon-10	Ci/yr	2.65E+0	8.10E-2
Carbon-11	Ci/yr	2.96E+3	3.46E+3
Mercury-193	Ci/yr	Not projected [a]	None detected
Mercury-197m	Ci/yr	Not projected [a]	2.18E-3
Mercury-197	Ci/yr	Not projected [a]	2.18E-3
Mercury-203	Ci/yr	Not projected [a]	None detected
Nitrogen-13	Ci/yr	5.35E+2	6.43E+1
Nitrogen-16	Ci/yr	2.85E-2	2.81E-1
Sodium-24	Ci/yr	Not projected [a]	8.61E-4
Osmium-191	Ci/yr	Not projected [a]	3.01E-5
Oxygen-14	Ci/yr	6.61E+0	4.75E+0
Oxygen-15	Ci/yr	6.06E+2	8.99E+2
Tritium as Water	Ci/yr	Not projected [a]	3.31E+0
LEDA Projections (8-yr average):			
Oxygen-19	Ci/yr	2.16E-3	Not measured [b]
Sulfur-37	Ci/yr	1.81E-3	Not measured [b]
Chlorine-39	Ci/yr	4.70E-4	Not measured [b]
Chlorine-40	Ci/yr	2.19E-3	Not measured [b]
Krypton-83m	Ci/yr	2.21E-3	Not measured [b]
Others	Ci/yr	1.11E-3	Not measured [b]

Table 2.11.3-1. continued

Parameter	Units	SWEIS ROD	2004 Operations
NPDES Discharge:			
Total Discharges	MGY	81.8	8.1217
03A-047	MGY	7.1	0
03A-048	MGY	23.4	7.4707
03A-049	MGY	11.3	0
03A-113	MGY	39.8	0.6510
Wastes:			
Chemical	kg/yr	16,600	97,307 [c]
LLW	m^3/yr	1,085	2.6
MLLW	m^3/yr	1	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	560 [d]	401 [d]

a The radionuclide was not projected by the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.

b Potential emissions from LEDA were sufficiently small that measurement systems were not necessary to meet regulatory or facility requirements.

c This volume of waste was generated by four years accumulation of metal under the DOE moratorium. Current DOE requirements specify that recyclable metals must remain within the DOE system and cannot be sent to commercial metal recyclers. This moratorium metal was shipped to Oak Ridge for evaluation and disposition.

d The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.12 Bioscience Facilities (TA-43, TA-3, TA-16, TA-35, and TA-46)

The Bioscience Key Facility definition includes the main HRL facility (Buildings 43-1, -37, -45, and -20) plus additional offices and labs located at TA-35-85, -254 and -2, TA-03-562 and -1698, and TA-46-158/161, -217, -218, -80, -24, and -31. Additionally, Bioscience has small operations located at TA-16-460. Operations at TA-43, TA-35-85 and -02, and TA-46-158/161 include chemical, laser, and limited radiological activities that maintain hazardous materials inventory and generate hazardous chemical wastes and very small amounts of LLW. Activities at TA-03-562, -03-1698, and TA-16 have relatively minor impacts because of low numbers of personnel and limited quantities of materials. Bioscience activities at TA-03-1698, the MSL, are accounted for with potential impacts of that Key Facility and are not double-counted here. Bioscience research capabilities focus on the study of intact cells (conducted at Biosafety Levels 1 and 2 [BSL-1 and -2]), cellular components (RNA, DNA, and proteins), instrument analysis (laser and mass spectroscopy), and cellular systems (repair, growth, and response to stressors). All Bioscience activities are classed as Low Hazard non-nuclear in all buildings within this Key Facility; there are no Moderate Hazard non-nuclear facilities or nuclear facilities (LANL 2002a). TA-43-1 is on the Radiological Facilities list (LANL 2002b).

The Bioscience Key Facility is a consolidation of bioscience functions and capabilities that represent the dynamic nature of the Yearbook, responding to the growth and decline of research and development across LANL.

2.12.1 Construction and Modifications at the Bioscience Facilities

The continued growth of Computational Biology activities and the growth of the operations staff in Bioscience Division are impacting available office space at TA-43-1. This growth will continue to require additional office space. Buildings within TA-43 continued to undergo interior remodeling and rearranging to accommodate new and existing work. The Computational Biology capability does not generate wastes nor use hazardous materials.

In CY 2004, only minor interior changes to accommodate operational changes occurred (office reconfigurations; heating, ventilation, and air conditioning renovations; laser lab decommissioning; and the institutional Electrical Infrastructure Safety Upgrades [EISU] Project. As in previous years, the volume of radioactive work at HRL has continued to diminish. This decline is attributed to technological advances and new methods of research, such as the use of laser-based instrumentation and chemiluminescense, which do not require the use of radioactive materials. For example, DNA sequencing predominantly uses laser analysis of fluorescent dyes hooked onto DNA bases instead of radioactive techniques.

The HRL facility has BSL-1 and BSL-2 work, which includes very limited work with potentially infectious microbes. All activities involving infectious microorganisms are regulated by the Centers for Disease Control (CDC) National Institutes of Health, LANL's Institutional Biosafety Committee, and the Institutional Biosafety Officer. BSL-2 work is expanding as part of LANL's growing Chemical and Biological Nonproliferation Program.

During CY 2004, Bioscience finalized construction on the BSL-3 facility and made progress on final engineering requirements, the Authorization Basis, and readiness assessments. BSL-3 is a 3,202-square-foot, stand-alone, containment facility located remotely from the Los Alamos town site, in the canyon west of Diamond Drive and south of Sigma Road (south of MSL and Sigma Buildings). The building will include two BSL-3 and one BSL-2 suites plus associated administrative space designed to safely handle and store infectious organisms. The mechanical system will accommodate directional airflow and negative pressure from the areas of lesser to greater risk, plus door interlocks and high-efficiency particulate air (HEPA) filtration.

Because of the building's small size and the small quantities of samples studied, there is no expected increase in quantities of sewage, solid wastes, or chemical wastes, nor should there be increased demand for utilities. NEPA coverage for this project was initially provided by the Environmental Assessment for the Proposed Construction and Operation of a BSL-3 Facility at LANL dated February 26, 2002, and a Finding of No Significant Impact (DOE 2002f). However, the Finding of No Significant Impact for this project was withdrawn by NNSA on January 22, 2004, due to the need to re-evaluate new circumstances concerning BSL-3 operations. Additional NEPA coverage for this project was ongoing in 2004.

2.12.2 Operations at Bioscience Facilities

Bioscience Division has eight core research capabilities:

- Bio-Materials and Chemistry
- Cell Biology
- Computational Biology
- Environmental Microbiology
- Genomic and Proteomic Science
- Measurement Science and Diagnostics
- Molecular Synthesis
- Structural Biology

The In-Vivo Monitoring facility and capability continue to be located in TA-43, HRL-1. At the onset of the July 2004 work suspension, the In-Vivo activities were approved as an essential activity and therefore the work level was not impacted.

Growth in Bioscience has resulted in addition of new personnel and expanded operations. While there have been increases in volumes of chemicals used and generation of chemical wastes, Bioscience continues to decommission unfunded work. Additionally, the amount of unused and unspent chemicals was greatly reduced in 2004. BSL-2 work is expanding to include use of a non-pathogenic strain of Bacillus anthracis–delta Ames, low-toxicity biotoxins (defined by CDC), and DNA from other infectious microbes. The Institutional Biosafety Committee reviews all of this work. Expansion of sequencing efforts was most noticeable but does not generate new wastes or increased volumes of regulated wastes. Upgrades and remodeling have generated minimal construction debris as laboratory areas were cleaned out and equipment was replaced or upgraded. This trend in modernization continued through CY 2004. Bioscience Division continues with the expectation that a new facility will soon become available and that the Division will move into a new building in a few years. Thus, all modernization will be done in a way that can be moved into the new space. TA-43-1 is at capacity for both office and laboratory activities, and future Bioscience expansion is expected to occur at TA-35-85 and TA-46-158.

In addition to the above regulatory activities, Bioscience Division has implemented the Bioscience Division Oversight Review Board that reviews all new or modified activities. This board consists of members from various LANL divisions (Environmental Stewardship; Security and Safeguards; Health, Safety, and Radiation Protection; Performance Surety; Facility and Waste Operations [FWO]; and Bioscience) that provide oversight and guidance.

Table 2.12.2-1 compares CY 2004 operations to those predicted by the SWEIS ROD. The table includes the number of FTEs per capability to measure activity levels compared to the SWEIS ROD. These FTEs are not measured the same as the index shown in Table 2.12.3-1 and these numbers cannot be directly compared.

Table 2.12.2-1. Bioscience Facilities/Comparison of Operations

Capabilities	SWEIS ROD	2004 Operations
Bio-Materials and Chemistry	Not in SWEIS ROD	In CY 2004, 20 FTEs[a] were associated with Biologically Inspired Materials and Chemistry
Cell Biology	Conduct research at current levels utilizing whole cells and cellular systems, both in-vivo and in-vitro, to investigate the effects of natural and catastrophic cellular events like response to aging, harmful chemical and physical agents, and cancer. The work includes using isolated cells to investigate DNA repair mechanisms. (35 FTEs)	In CY 2004, 40 FTEs were associated with Molecular Cell Biology.
Computational Biology	Not in SWEIS ROD	In CY 2004, 20 FTEs were associated with Computational Biology.
Environmental Microbiology	Research to characterize the extent of diversity in environmental microbes and to understand their functions and occurrences in the environment. (25 FTEs)	In CY 2004, 20 FTEs were associated with Environmental Microbiology.
Genomic and Proteomic Science	Conduct research at current levels utilizing molecular and biochemical techniques to determine and analyze the sequences of genomes (human, microbes, and animal). Develop strategies to analyze the nucleotide sequence of individual genes, especially those associated with genetic disorders, infectious disease organisms. (50 FTEs)	In CY 2004, 50 FTEs were associated with Genomic and Proteomic Science
Measurement Science and Diagnostics	Conduct research utilizing imaging and spectroscopy systems to analyze the structures and functions of subcellular systems and components. (40 FTEs)	In CY 2004, 35 FTEs were associated with Measurement Science and Diagnostics.
Molecular Synthesis	Generate biometric organic materials and construct synthetic biomolecules.	In CY 2004, 15 FTEs were associated with Molecular Synthesis.
Structural Biology	Conduct research utilizing chemical and crystallographic techniques to isolate and characterize the properties and three-dimensional shapes of DNA and protein molecules. (15 FTEs)	In CY 2004, 20 FTEs were associated with Structural Biology.
In-Vivo Monitoring. This is not a Bioscience Division capability; however, it is located at TA-43-HRL-1. Therefore, it is a capability within this Key Facility and is included here.	Performs whole-body scans as a service to the LANL personnel monitoring program, which supports operations with radioactive materials conducted elsewhere at LANL. (5 FTEs)	Conducted more than 1,140 lung and whole-body scans and about 750 other counts (detector studies, quality assurance measurements, etc.). In CY 2004, 3 FTEs were associated with this capability.

a FTEs: full-time-equivalent scientists, researchers, and other staff supporting a particular research capability.

Table 2.12.3-1. Bioscience Facilities/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions	Ci/yr	Not estimated	Not measured
NPDES Discharge: [a]			
03A-040	MGY	2.5 [b]	Eliminated in 1999
Wastes:			
Chemical	kg/yr	13,000	699
Biomedical Waste	kg/yr	280 [c]	0
LLW	m^3/yr	34	2.7
MLLW	m^3/yr	3.4	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	98 [d]	113 [d]

a Outfall 03A-040 consisted of one process outfall and nine storm drains.
b Storm water only.
c Animal colony and the associated waste. The animal colony was eliminated in CY 1999.
d The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.12.3 Operations Data for Bioscience Facilities

Table 2.12.3-1 presents the operations data as measured by radioactive air emissions, NPDES discharges, generated waste volumes, and number of workers. The generation of most waste (chemical, administrative, and MLLW) has decreased from historical levels and was smaller than projections.

2.13 Radiochemistry Facility (TA-48)

The Radiochemistry Key Facility includes all of TA-48 (116 acres). It is a research facility that fills three roles—research, production of medical radioisotopes, and support services to other LANL organizations, primarily through radiological and chemical analyses of samples. TA-48 contains six major research buildings: the Radiochemistry Laboratory (Building 48-1), the Assembly Checkout Building (48-17), Diagnostic Instrumentation and Development Building (48-28), the Clean Chemistry/Mass Spectrometry Building (48-45), the Weapons Analytical Chemistry Facility (48-107), and the Machine and Fabrication Shop (48-8). The DOE listing of LANL nuclear facilities for CY 2004 (LANL 2004a) retained Building TA-48-0001 as a Category 3 nuclear facility as shown in Table 2.13-1. However, during CY 2003, the Radiochemistry Laboratory was downgraded to a radiological Category B facility and during the past year, CY 2004, the building was further downgraded to a radiological Category C (low hazard) facility. TA-48, Buildings 8, 17, 28, 45, and 107, are classified as low hazard chemical facilities.

Table 2.13-1. Radiochemistry Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [b]
TA-48-0001	Radiochemistry and Hot Cell	3	3	3 Radiological

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).

2.13.1 Construction and Modifications at the Radiochemistry Facility

The SWEIS ROD projected no facility changes through CY 2005, although a few have occurred over the years (LANL 2003). During CY 2004, only minor maintenance activities occurred. It is expected that during CY 2005 the fire notification system will be upgraded under the institutional program. In addition, Building RC-1 is scheduled for electrical upgrades during 2006 and 2007 under the institutional EISU Project. A major upgrade to the building heating, ventilation, and air conditioning system is also planned for 2006 under the Facilities and Infrastructure Recapitalization Program.

2.13.2 Operations at the Radiochemistry Facility

The SWEIS identified 10 capabilities for the Radiochemistry Key Facility. No new capabilities have been added, and none has been deleted. The primary measure of activity for this Key Facility is the number of personnel conducting research. In CY 2004, approximately 170 chemists and scientists were employed, far below the 250 projected by the SWEIS ROD[7]. As seen in Table 2.13.2-1, only two of the 10 capabilities were active at levels projected by the SWEIS ROD: Radionuclide Transport Studies and Sample Counting.

During 2004, work was initiated to validate a LANL procedure to measure beryllium on contaminated surfaces. This activity received NEPA coverage in the SWEIS. Most of the beryllium work involves solutions of wetted solids or one-piece solids such as coupons or articles and does not require participation in the LANL Chronic Beryllium Disease Prevention Program per LIR 402-560-01.0 (LANL 2004c), because there is no potential for airborne solids. The work includes analysis, ligand binding, materials characterization, field sampling, fundamental beryllium chemistry, and beryllium mitigation. There is a small amount of work done with beryllium solids that has the potential for airborne material including weighing of beryllium solids such as beryllium metal, beryllium carbonate, and beryllium oxide, and ashing of adhesive films used in sampling. Weighing and manipulation of dry powders are carried out in HEPA-filtered boxes and involve less than 10 grams of beryllium. Ashing of films is done in a HEPA-filtered hood and involves micrograms of beryllium per sample. Five-percent-acid baths up to 20 liters in volume are used in the cleaning process. This activity involved six FTEs in 2004.

[7] The 170 chemists and scientists listed cannot be directly compared to the FTEs shown in Table 2.13.3-1, because the two numbers represent two different populations of individuals. The 170 chemists and scientists listed include temporary staff, students, and visiting scientists, whereas, the FTEs in Table 2.13.3-1include only full-time and part-time regular LANL staff.

Table 2.13.2-1. Radiochemistry Facility (TA-48)/Comparison of Operations

Capability	SWEIS ROD	2004 Operations
Radionuclide Transport Studies	Actinide transport, sorption, and bacterial interaction studies. Development of models for evolution of groundwater. Assessment of performance or risk of release for radionuclide sources at proposed waste disposal sites. (28 to 34 FTEs [a])	During CY 2004, operations continued at approximately twice the levels identified during preparation of the SWEIS. (36 FTEs)
Environmental Remediation Support	Background contamination characterization pilot studies. Performance assessments, soil remediation research and development, and field support. (34 FTEs)	During CY 2004, operations continued at approximately half the levels identified during preparation of the SWEIS. (10 FTEs)
Ultra-Low-Level Measurements	Isotope separation and mass spectrometry. (30 FTEs)	Level of operations increased during 2004 to 1.5 times the levels identified during preparation of the SWEIS. (20 FTEs)
Nuclear/ Radiochemistry	Radiochemical operations involving quantities of alpha-, beta-, and gamma-emitting radionuclides for non-weapons and weapons work. (44 FTEs)	Significant decrease in quantities of alpha-emitting radionuclides used in operations. (35 FTEs)
Isotope Production	Target preparation. High-level beta/gamma chemistry and target processing to recover isotopes for medical and industrial application. (15 FTEs)	Slightly increased level of operations, but approximately the same as levels identified during preparation of the SWEIS. (11 FTEs)
Actinide/TRU Chemistry	Radiochemical operations involving significant quantities of alpha-emitting radionuclides. (12 FTEs)	Significant decrease in quantities of alpha-emitting radionuclides used in operations. (14 FTEs)
Data Analysis	Re-examination of archive data and measurement of nuclear process parameters of interest to weapons radiochemists. (10 FTEs)	Slight increase from levels identified during preparation of the SWEIS to six FTEs, but less than projected by the SWEIS ROD.
Inorganic Chemistry	Synthesis, catalysis, actinide chemistry: • Chemical synthesis of new organo-metallic complexes • Structural and reactivity analysis, organic product analysis, and reactivity and mechanistic studies • Synthesis of new ligands for radiopharmaceuticals Environmental technology development: • Ligand design and synthesis for selective extraction of metals • Soil washing • Membrane separator development • Ultrafiltration (49 FTEs—total for both activities)	Same level of activity (35 FTEs) as levels identified during preparation of the SWEIS, but below projections of the SWEIS ROD.
Structural Analysis	Synthesis and structural analysis of actinide complexes at current levels. X-ray diffraction analysis of powders and single crystals at current levels. (22 FTEs)	Decreased level of operations from levels identified during preparation of the SWEIS, and about one-third of those projected by the SWEIS ROD. (7 FTEs)
Sample Counting	Measurement of the quantity of radioactivity in samples using alpha-, beta-, and gamma-ray counting systems. (5 FTEs)	During 2004, maintained slightly higher sample processing than the number of samples projected by the SWEIS ROD. (6 FTEs)

a FTEs: full-time-equivalent. It is imperative that these FTE numbers are not confused with the FTEs identified in Table 2.13.3-1. Two different populations of individuals are represented. The FTEs in this table include students, visitors, and temporary staff. The FTEs in Table 2.13.3-1 only include full-time and part-time regular LANL staff.

2.13.3 Operations Data for the Radiochemistry Facility

The overall level of activity at the Radiochemistry Facility was below that projected by the SWEIS ROD. Two of the 10 capabilities at this Key Facility were conducted at levels projected by the SWEIS ROD; the others were at or below activity levels identified during preparation of the SWEIS. As a result, most of the operations data were also below those projected by the SWEIS ROD, as shown in Table 2.13.3-1. An exception is

Table 2.13.3-1. Radiochemistry Facility (TA-48)/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
Mixed Fission Products[a]	Ci/yr	1.4E-4	Not measured[b]
Plutonium-239	Ci/yr	1.1E-5	None detected
Uranium-235	Ci/yr	4.4E-7	None detected
Mixed Activation Products[a]	Ci/yr	3.1E-6	None detected
Arsenic-72	Ci/yr	1.1E-4	None detected
Arsenic-73	Ci/yr	1.9E-4	None detected
Arsenic-74	Ci/yr	4.0E-5	None detected
Beryllium-7	Ci/yr	1.5E-5	None detected
Bromine-77	Ci/yr	8.5E-4	None detected
Germanium-68	Ci/yr	1.7E-5	1.09E-4
Gallium-68	Ci/yr	1.7E-5	1.09E-4
Rubidium-86	Ci/yr	2.8E-7	4.55E-6
Selenium-75	Ci/yr	3.4E-4	7.41E-6
NPDES Discharge:[c]			
Total Discharges	MGY	4.1	0
03A-045	MGY	0.87	Eliminated
04A-016	MGY	None	Eliminated
04A-131	MGY	None	Eliminated
04A-152	MGY	None	Eliminated
04A-153	MGY	3.2	Eliminated
Wastes:			
Chemical	kg/yr	3,300	30,888 [d]
LLW	m^3/yr	270	17.8
MLLW	m^3/yr	3.8	1.4
TRU	m^3/yr	0	0.4 [e]
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	128 [f]	116 [f]

a Emission categories of 'mixed fission products' and 'mixed activation products' are no longer used. Instead, where fission or activation products are measured, they are reported as specific radionuclides, e.g., Cs-137 or Co-60.

b Although stack sampling systems were in place to measure these emissions, any emissions were sufficiently small to be below the detection capabilities of the sampling systems.

c Outfalls eliminated before 1999: 04A-016 (TA-48), 04A-131 (TA-48), 04A-152 (TA-48), and 04A-153 (TA-48); outfall 03A-045 was eliminated in 1999.

d In 2004, TA-48 conducted chemical cleanout activities to dispose of unwanted chemicals. Completion of the radiological inventory reduction and disposal of mercury shielding resulted in the downgrade of TA-48, RC-1 to radiological status.

e In 2004, TRU waste was returned to the generating facility.

f The number shown in the “SWEIS ROD” column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

a large quantity of chemical wastes categorized as industrial solid wastes generated from the chemical cleanouts. These industrial solid wastes are non-hazardous, may be disposed in county landfills, and do not present a threat to the local environs. The quantities of TRU and MLLW generated during CY 2004 result from proposed plans to transition TA-48-1 from a nuclear facility to a radiological facility. The wastes generated were shipped to TA-54.

2.14 Radioactive Liquid Waste Treatment Facility (TA-50)

The RLWTF is located at TA-50 and consists of the treatment facility (Building 50-1), support buildings, and liquid and chemical storage tanks. The primary activity is treatment of radioactive liquid wastes generated at other LANL facilities. The facility also houses analytical laboratories to support waste treatment operations.

This Key Facility is a Nuclear Hazard Category 2 facility, and consists of the following structures (Table 2.14-1): the RLWTF itself (Building 50-01), the tank farm and pumping station (50-2), the acid and caustic solution tank farm (50-66), and a 100,000-gallon influent holding tank (50-90).

There are no other nuclear facilities and no Moderate Hazard non-nuclear buildings within this Key Facility (LANL 2004b).

Table 2.14-1. Radioactive Liquid Waste Treatment Facility Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [b]
TA-50-0001	Main Treatment Plant	2	3	3
TA-50-0002	LLW Tank Farm		3	3
TA-50-0066	Acid and Caustic Tank Farm		3	3
TA-50-0090	Holding Tank		3	3

a DOE /LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE /LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).

2.14.1 Construction and Modifications at the Radioactive Liquid Waste Treatment Facility

Projected: The SWEIS ROD projected three modifications to the RLWTF Key Facility, and all three have been completed. The tank farm was upgraded in 1998. The new UF/RO (ultrafiltration and reverse osmosis) process was installed in 1998 and became operational in March 1999. Nitrate reduction equipment was installed in 1998, became operational in March 1999, and was subsequently removed from service during 2001. Engineering evaluation had shown that more than 70 percent of the nitrates in the LANL radioactive liquid waste were found in less than 1 percent of the waste volume. These low-volume, high-nitrate liquid wastes are now segregated by waste generators and shipped to commercial hazardous waste treatment facilities.

Not Projected: Facility personnel also installed an electrodialysis reversal unit in 1999 and an evaporator in 2000. Both units process the waste stream from the reverse osmosis unit. They received NEPA coverage through Categorical Exclusions #7428, approved 02/23/99 (DOE 1999c), and #7737, approved 10/29/99 (DOE 1999d). The SWEIS ROD projected neither of these modifications.

In addition, decontamination operations were relocated during 2000 from Building 50-01 to TA-54 and moved to the west end of TA-54. Radioactive liquid wastes generated during decontamination operations are collected in two holding tanks at TA-54 and are trucked to the RLWTF at TA-50. The lead decontamination trailer, formerly located between Buildings 50-83 and 50-02, has been decommissioned. The quantity of lead that needed decontamination had become so small that maintaining this operation was no longer cost effective.

During 2002, the RLWTF shop building, 50-83, was relocated to TA-54 to make room for the construction of a new 300,000-gallon influent storage facility funded by the Cerro Grande Rehabilitation Project. Construction of the new facility started during 2004.

2.14.2 Operations at the Radioactive Liquid Waste Treatment Facility

The SWEIS identified five capabilities for the RLWTF Key Facility. The primary measurement of activity for this facility is the volume of radioactive liquid processed through the main treatment equipment. From 1998 through 2004, all discharge volumes have been less than the projected discharge volume of 35 million liters per year in the SWEIS ROD:

- 1998; 23 million liters
- 1999; 20 million liters
- 2000; 19 million liters
- 2001; 14 million liters
- 2002; 11 million liters
- 2003; 11 million liters
- 2004; 8 million liters

Two factors have contributed to reduced waste volumes—source reduction and process improvements. Source reduction efforts, for example, included the re-routing of two significant waste streams, non-radioactive discharge waters from a cooling tower at TA-21 and a boiler at TA-48, to the LANL sewage plant during the summer of 2001. Process improvements included recycling of radioactive liquid waste within the RLWTF. For example, process waters are now used instead of tap water for the dissolution of chemicals needed in the treatment process, and for filter backwash operations. This recycle has eliminated approximately 2.5 million liters per year of fresh water use.

In March 2002, a perchlorate removal system was added to the main treatment plant at TA-50. Ion exchange resin columns were installed and placed in service. To date, the resins have effectively removed perchlorates to less than the 4 parts per billion (ppb) detection limit in all waters discharged since installation. These actions were taken despite the fact that there are no EPA or New Mexico discharge standards for perchlorate. This project received NEPA review through Categorical Exclusion #8632 (DOE 2002g).

As seen in Table 2.14.2-1, operations at the RLWTF during the 1998–2004 timeframe were below levels projected by the SWEIS ROD.

Table 2.14.2-1. Radioactive Liquid Waste Treatment Facility (TA-50)/ Comparison of Operations

Capability	SWEIS ROD [a]	2004 Operations
Waste Characterization	Support, certify, and audit generator characterization programs.	As projected.
Packaging, Labeling	Maintain waste acceptance criteria for radioactive liquid waste treatment facilities.	As projected.
Waste Transport, Receipt, and Acceptance	Collect radioactive liquid waste from generators and transport to TA-50.	As projected.
Radioactive Liquid Waste Pretreatment	Pretreat 900,000 liters/yr of radioactive liquid waste at TA-21.	No pretreatment took place at TA-21.
	Pretreat 80,000 liters/yr of radioactive liquid waste from TA-55 in Room 60.	Pretreated 52,000 liters in Room 60.
	Solidify, characterize, and package 3 cubic meters/yr of TRU waste sludge in Room 60.	No TRU waste sludge was solidified in Room 60.
Radioactive Liquid Waste Treatment Main Plant	Install UF/RO equipment in 1997. Install equipment for nitrate reduction in 1999.	UF/RO equipment installed in 1998. Nitrate reduction equipment installed in 1998 and subsequently removed in 2001. Ion exchange columns for perchlorate treatment installed in 2002 (not projected).
	Treat 35 million liters/yr of radioactive liquid waste.	Discharged 8.2 million liters of radioactive liquid waste.
	De-water, characterize, and package 10 cubic meters/yr of LLW sludge.	De-watering resulted in 13.7 cubic meters of LLW sludge.
	Solidify, characterize, and package 32 cubic meters/yr of TRU waste sludge.	No TRU waste sludge was solidified as a result of main plant operations.
Decontamination Operations	Decontaminate LANL personnel respirators for reuse (approximately 700/month).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]
	Decontaminate air-proportional probes for reuse (approximately 300/month).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]
	Decontaminate vehicles and portable instruments for reuse (as required).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]

Table 2.14.2-1. continued

Capability	SWEIS ROD [a]	2004 Operations
Decontamination Operations (continued)	Decontaminate precious metals for resale (acid bath).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]
	Decontaminate scrap metals for resale (sandblast).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]
	Decontaminate 200 cubic meters of lead for reuse (grit blast).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]

a Includes installation of UF/RO and nitrate reduction processes in Building 50-01 and installation of aboveground tanks for the collection of influent radioactive liquid waste.

b Decontamination operations are reported as part of the Solid Radioactive and Chemical Waste Key Facility.

2.14.3 Operations Data for the Radioactive Liquid Waste Treatment Facility

In 1998, liquid effluent from the RLWTF did not meet DOE's discharge criteria for water quality. In order to improve effluent quality, the treatment process was upgraded in 1999 to include UF/RO equipment. As a result, CY 2004 marked the fifth consecutive year that there were zero violations of the State of New Mexico discharge limit for nitrates and total dissolved solids, zero violations of NPDES permit limits, and zero exceedances of the DOE discharge standards for radioactive liquid wastes. Annual average nitrate discharges were reduced from 360 milligrams per liter in 1993 to less than 10 milligrams per liter in 2000 and have remained at the less-than-10-milligram-level through 2004. Similarly, annual average radioactive discharges were reduced from greater than 250 picocuries alpha activity per liter during the period 1993–1999 to less than 20 picocuries per liter since. In 2004, discharges averaged 5.2 picocuries per liter.

The SWEIS ROD did not project the quality of effluent, only quantity. Radioactive air emissions continued to be negligible (less than one microcurie), and NPDES discharge volume (8.2 million liters) continued to be less than the projected 35 million liters. The quantities of solid wastes varied from projections, but were overall less than projected quantities. Table 2.14.3-1 provides further details.

2.15 Solid Radioactive and Chemical Waste Facilities (TA-50 and TA-54)

The Solid Radioactive and Chemical Waste Key Facility is located at TA-50 and TA-54. Activities are all related to the management (packaging, characterization, receipt, transport, storage, and disposal) of radioactive and chemical wastes generated at LANL facilities.

It is important to note that LANL's waste management operation captures and tracks data for waste streams (whether or not they go through the Solid Radioactive and Chemical Waste Facilities), regardless of their points of generation or disposal. This includes information on the waste generating process; quantity; chemical and physical characteristics of the waste; regulatory status of the waste; applicable treatment and disposal standards; and the final disposition of the waste. The data are ultimately used to

Table 2.14.3-1. Radioactive Liquid Waste Treatment Facility (TA-50)/ Comparison of Operations

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions:			
Americium-241	Ci/yr	Negligible	None detected
Plutonium-238	Ci/yr	Negligible	None detected
Plutonium-239	Ci/yr	Negligible	None detected
Thorium-228	Ci/yr	Negligible	4.84E-8
Thorium-230	Ci/yr	Negligible	2.15E-8
Uranium-234	Ci/yr	Negligible	None detected
NPDES Discharge:			
051	MGY	9.3	2.140
Wastes:			
Chemical	kg/yr	2,200	95
LLW	m^3/yr	160	355 [a]
MLLW	m^3/yr	0	0.03
TRU	m^3/yr	30	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	62 [b]	59 [b]

a LLW in 2004 exceeded the SWEIS ROD projection due to the generation of about 35 cubic meters of water pumped out of manholes and transported to influent tanks at RLWTF for processing. An additional 148 cubic meters of aqueous evaporator bottoms were shipped to Tennessee for processing and another 104 cubic meters of soil were generated by the 2004 construction of new effluent tanks.

b The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

assess operational efficiency, help ensure environmental protection, and demonstrate regulatory compliance.

There are two Category 3 nuclear buildings within this Key Facility: the Waste Characterization, Reduction, and Repackaging (WCRR) Facility (Building 50-69) and the Radioactive Assay and Nondestructive Test Facility (Building 54-38). In addition, there are also several Category 2 nuclear facilities/operations; the LLW disposal cells, shafts, and trenches and fabric domes and buildings within Area G; the Transuranic Waste Inspection Project (TWISP) for the retrieval of TRU wastes, including storage domes 226 and 229–232; and outdoor operations at the WCRR Facility. In addition to the nuclear facilities, the Decontamination and Volume Reduction System (DVRS), TA-54-412, was added to the radiological facility list in CY 2002 (LANL 2002b). ARTIC (Actinide Research and Technology Instruction Complex), formerly Radioactive Materials Research Operations and Demonstration facility, was downgraded from a category 3 nuclear facility to a radiological facility.

As shown in Table 2.15-1, the SWEIS recognized 19 structures as having Category 2 nuclear classification (Area G was recognized as a whole and then individual buildings and structures were also recognized). The WCRR Facility was identified as a Category 2 in the SWEIS, but because of inventories and the newer guidelines, it was downgraded to a Category 3. Area G has remained a Category 2 facility when taken as a whole.

Table 2.15-1. Solid Waste Buildings with Nuclear Hazard Classification

Building	Description	SWEIS ROD	DOE 1998 [a]	LANL 2004 [b]
TA-50-0069	WCRR Facility Building	2	3	3
TA-50-0069 Outside	Nondestructive Analysis Mobile Activities			2
TA-50-0069 Outside [c]	Drum Storage			
TA-54-Area G [d]	LLW Storage/Disposal	2	2	2
TA-54	TWISP		2	2
TA-54-0002	TRU Storage Building		3	2
TA-54-0008	Storage Building			
TA-54-0033	TRU Drum Preparation	2		2
TA-54-0038	Radioassay and Nondestructive Testing Facility	2	3	3
TA-54-0048	TRU Storage Dome	2	3	2
TA-54-0049	TRU Storage Dome	2	3	2
TA-54-0144	Shed	2		2
TA-54-0145	Shed	2		2
TA-54-0146	Shed	2		2
TA-54-0153	TRU Storage Dome	2	3	2
TA-54-0177	Shed	2		2
TA-54-0224	Mixed Waste Storage Dome			2
TA-54-0226	TRU Storage Dome	2		2
TA-54-0229	Tension Support Dome	2		2
TA-54-0230	Tension Support Dome	2		2
TA-54-0231	Tension Support Dome	2		2
TA-54-0232	Tension Support Dome	2		2
TA-54-0283	Tension Support Dome	2		2
TA-54-0375	TRU Storage Dome	2		2
TA-54-Pad10[e]	Storage Pad	2		2
TA-54-Pad3	Storage Pad	2		2

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).
c In the most recent nuclear facility list (LANL 2004b), “Drum Storage” includes drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69.
d This includes LLW (including mixed waste) storage and disposal in domes, pits, shafts, and trenches. TRU waste storage in domes and shafts (does not include TWISP). TRU legacy waste in pits and shafts. Low-level disposal of asbestos in pits and shafts. Operations building: TRU waste storage.
e Pad 10 was originally designated as Pads 2 and 4 in the SWEIS ROD.

2.15.1 Construction and Modifications at the Solid Radioactive and Chemical Waste Facility

Projected: The SWEIS ROD projected two construction activities for this Key Facility: the construction of four additional fabric domes for the storage of TRU wastes retrieved from earth-covered pads and the expansion of Area G.

Actual: Only one of the two construction activities projected by the SWEIS ROD has been completed. The construction of four additional fabric domes for the storage of TRU wastes retrieved from earth-covered pads was completed in 1998. Although expansion of Area G has not yet begun, the possibility exists for initiation of radioactive and mixed waste storage and disposal operations in Zone 4 within the next year.

The Off-Site Source Recovery (OSR) Project recovers and manages unwanted radioactive sealed sources and other radioactive material that

- present a risk to public health and safety,
- present a potential loss of control by a US Nuclear Regulatory Commission (NRC) or agreement state licensee,
- are excess and unwanted and are a DOE responsibility under Public Law 99-240[8], or
- are DOE-owned.

The project is sponsored by DOE's Office of Technical Program Integration and the Albuquerque Operations Office Waste Management Division that operates from LANL. It focuses on the problem of sources and devices held under NRC or agreement state licenses for which there is no disposal option. The project was reorganized in 1999 to more aggressively recover and manage the estimated 18,000 sealed source devices that will become excess and unwanted over the next decade. This reorganization combined three activities, the Radioactive Source Recovery Program, the Off-Site Waste Program, and the Pu-239/Be Neutron Source Project. Approximately 1,350 sources were collected for storage at TA-54 during CY 2004. Eventually, these sources will be shipped to the WIPP for final disposition. The OSR Project received NEPA coverage under an EA and subsequent Finding of No Significant Impact (DOE 1995c), Accession Numbers 6279 (DOE 1996f), 7405 (DOE 1999e), and 7570 (DOE 1999f), the 1999 SWEIS (DOE 1999a), and a SA to the 1999 SWEIS (DOE 2000c).

In CY 2002, LANL submitted a closure plan for three Resource Conservation and Recovery Act (RCRA) regulated storage units at TA-50. These units were TA-50, Building 1, room 59, TA-50-114, and TA-50-37. The first two units are located at the RLWTF and the third is at ARTIC. NMED approved LANL's closure of these three units in CY 2004.

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[8] Public Law 99-240: an act to amend the Low-Level Radioactive Waste Policy Amendments Act of 1985. Introduced in the Senate and House of Representatives of the United States of America in Congress assembled, Ninety-Ninth Congress, January 15, 1986. The Policy Act was designed to stimulate development of new facilities by encouraging states to form interstate compacts for disposal on a regional basis.

2.15.2 Operations at the Solid Radioactive and Chemical Waste Facility

The SWEIS identified eight capabilities for this Key Facility. No new capabilities have been added, and none has been deleted. The primary measurements of activity for this facility are volumes of newly generated chemical, low-level, and TRU wastes to be managed and volumes of legacy TRU waste and MLLW in storage. A comparison of CY 2004 to projections made by the SWEIS ROD can be summarized as follows:

Chemical wastes: Approximately 1,210 metric tons of chemical waste were generated at LANL during CY 2004. This compares to an average quantity of 3,250 metric tons per year projected by the SWEIS ROD.

LLW: Approximately 14,800 cubic meters were placed into disposal cells and shafts at Area G, compared to an average volume of 12,230 cubic meters per year projected by the SWEIS ROD. No new disposal cells were constructed, and disposal operations did not expand into either Zone 4 or Zone 6 at TA-54. Operations could expand into Zone 4 within the next year.

MLLW: 33 cubic meters were generated and delivered to TA-54 during CY 2004, compared to an average volume of 632 cubic meters per year projected by the SWEIS ROD. This volume is well under the projection in the SWEIS ROD.

TRU wastes: No wastes were shipped to WIPP during CY 2004, and 40 cubic meters of newly generated TRU wastes (non-hazardous) were added to storage.

Mixed TRU Wastes: During CY 2004 approximately 24 cubic meters of mixed TRU wastes were received for storage.

In summary, chemical and radioactive waste management activities were at levels below those projected by the SWEIS ROD and also below levels of 1998 and 1999 operations at this Key Facility. These and other operational details appear in Table 2.15.2-1.

Table 2.15.2-1. Solid Radioactive and Chemical Waste Facilities (TA-50 and TA-54)/Comparison of Operations

Capability	SWEIS ROD[a]	2004 Operations
Waste Characterization, Packaging, and Labeling	Support, certify, and audit generator characterization programs.	As projected.
	Maintain waste acceptance criteria for LANL waste management facilities.	As projected.
	Characterize 760 cubic meters of legacy MLLW.	Characterized 15 cubic meters of legacy MLLW.
	Characterize 9,010 cubic meters of legacy TRU waste.	Characterized approximately 50 cubic meters of TRU waste in 2004.

Table 2.15.2-1. continued

Capability	SWEIS ROD[a]	2004 Operations
Waste Characterization, Packaging, and Labeling (continued)	Verify characterization data at the Radioactive Assay and Nondestructive Test Facility for unopened containers of LLW and TRU waste.	Did not verify characterization data at Radioactive Assay and Nondestructive Test Facility.
	Maintain waste acceptance criteria for offsite treatment, storage, and disposal facilities.	As projected.
	Over-pack and bulk waste as required.	As projected.
	Perform coring and visual inspection of a percentage of TRU waste packages.	Performed visual examinations on six TRU waste packages; no drums were cored in 2004.
	Vent 16,700 drums of TRU waste retrieved during TWISP.	Vented approximately 750 drums during 2004.
	Maintain current version of WIPP waste acceptance criteria and liaison with WIPP operations.	As projected.
Compaction	Compact up to 25,400 cubic meters of LLW.	Approximately 62 cubic meters of LLW was compacted into approximately 14 cubic meters.
Size Reduction	Size reduce 2,900 cubic meters of TRU waste at WCRR Facility and the Drum Preparation Facility.	No waste was processed through the DVRS.
Waste Transport, Receipt, and Acceptance	Collect chemical and mixed wastes from LANL generators and transport to TA-54.	Collected and transported chemical and mixed wastes.
	Begin shipments to WIPP in 1999.	Shipments to WIPP began 3/26/1999.
	Over the next 10 years, ship 32,000 metric tons of chemical wastes and 3,640 cubic meters of MLLW for offsite land disposal restrictions, treatment, and disposal.	Approximately 1,100 metric tons of chemical waste and approximately 42 cubic meters of MLLW were shipped for offsite treatment and disposal from the Solid Radioactive and Chemical Waste Facility.
	Over the next 10 years, ship no LLW for offsite disposal.	Approximately 4.5 cubic meters of LLW was shipped for offsite disposal.
	Over the next 10 years, ship 9,010 cubic meters of legacy TRU waste to WIPP.	No wastes were shipped to WIPP in 2004.
	Over the next 10 years, ship 5,460 cubic meters of operational and environmental restoration TRU waste to WIPP.	No operational or environmental restoration TRU wastes were shipped to WIPP.
	Over the next 10 years, ship no environmental restoration soils for offsite solidification and disposal.	No environmental restoration soils were shipped for offsite solidification and disposal in 2004. [b]
	Annually receive, on average, 5 cubic meters of LLW and TRU waste from offsite locations in 5 to 10 shipments.	No LLW or TRU waste was received from offsite locations.
Waste Storage	Stage chemical and mixed wastes before shipment for offsite treatment, storage, and disposal.	Chemical and mixed wastes were staged before shipment.
	Store legacy TRU waste and MLLW.	Legacy TRU waste and MLLW were stored.

Table 2.15.2-1. continued

Capability	SWEIS ROD[a]	2004 Operations
Waste Storage (continued)	Store LLW uranium chips until sufficient quantities have accumulated for stabilization.	There were 4 cubic meters of uranium chips in storage awaiting stabilization.
Waste Retrieval	Begin retrieval operations in 1997.	Retrieval begun in 1997.
	Retrieve 4,700 cubic meters of TRU waste from Pads 1, 2, 4 by 2004.	Retrieval activities completed in 2001. No retrieval occurred in 2004.
Other Waste Processing	Demonstrate treatment (e.g., electrochemical) of MLLW liquids.	No activity.
	Land farm oil-contaminated soils at Area J.	Closure of Area J is now complete.
	Stabilize 870 cubic meters of uranium chips.	No uranium chips were stabilized in CY 2004.
	Provide special-case treatment for 1,030 cubic meters of TRU waste.	None.
	Solidify 2,850 cubic meters of MLLW (environmental restoration soils) for disposal at Area G.	No environmental restoration soils were solidified.
Disposal	Over next 10 years, dispose of 420 cubic meters of LLW in shafts at Area G.	Approximately 7 cubic meters of LLW were disposed of in shafts at Area G.
	Over next 10 years, dispose of 115,000 cubic meters of LLW in disposal cells at Area G. (Requires expansion of onsite LLW disposal operations beyond existing Area G footprint.)	Approximately 14,300 cubic meters of LLW was disposed of in cells. Area G was not expanded.
	Over next 10 years, dispose of 100 cubic meters per year administratively controlled industrial solid wastes[c] in pits at Area J.	Closure of Area J is now complete.
	Over next 10 years, dispose of non-radioactive classified wastes in shafts at Area J.	Closure of Area J is now complete.
Decontamination Operations[d]	Decontaminate LANL personnel respirators for reuse (approximately 700/month).	In 2004, decontaminated approximately 250 personnel respirators per month at TA-54-1009.
	Decontaminate air-proportional probes for reuse (approximately 300/month).	In 2004, decontaminated 40 faces and 40 bodies per month at TA-54-1009.
	Decontaminate vehicles and portable instruments for reuse (as required).	No activity in 2004.
	Decontaminate precious metals for resale (acid bath).	No activity.[e]
	Decontaminate scrap metals for resale (sandblast).	No activity.[e]
	Decontaminate 200 cubic meters of lead for reuse (grit blast).	No activity.[e]

a Includes the construction of four new storage domes for the TWISP.
b The Environmental Restoration Project (now called the Remediation Services [RS] Project) usually ships soils removed in remediation of a potential release site (PRS) directly to an offsite disposal facility. These wastes do not typically require processing at TA-54 and do not go through the TA-54 operations for shipment.
c In the SWEIS, the term "industrial solid waste" was used for construction debris, chemical waste, and sensitive paper records.

d The Decontamination Operations capability was identified with the Radioactive Liquid Waste Treatment Key Facility in the SWEIS. Activities prior to 2000 are reported in Section 2.14.2 of the Yearbook. In 2000, this capability was relocated to TA-54 and the Solid Radioactive and Chemical Waste Facility.
e Although there has been no activity in CYs 2001, 2002, 2003 and 2004, this decontamination operation is now part of the Solid Radioactive and Chemical Waste Facility capabilities.

2.15.3 Operations Data for the Solid Radioactive and Chemical Waste Facility

Levels of activity in CY 2004 were less than projected by the SWEIS ROD and so were air emissions. Table 2.15.3-1 provides details.

Table 2.15.3-1. Solid Radioactive and Chemical Waste Facilities (TA-54 and TA-50) /Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions: [a]			
Tritium	Ci/yr	6.09E+1	Not monitored [a]
Americium-241	Ci/yr	6.60E-7	None detected [a]
Plutonium-238	Ci/yr	4.80E-6	None detected [a]
Plutonium-239	Ci/yr	6.80E-7	None detected [a]
Uranium-234	Ci/yr	8.00E-6	None detected [a]
Uranium-235	Ci/yr	4.10E-7	5.01E-11
Uranium-238	Ci/yr	4.00E-6	None detected [a]
Strontium-90/Yttrium-90	Ci/yr	Not projected [b]	None detected [a]
Thorium isotopes	Ci/yr	Not projected [b]	None detected [a]
NPDES Discharge	MGY	No outfalls	0
Wastes: [c]			
Chemical	kg/yr	920	1,199 [d]
LLW	m^3/yr	174	41
MLLW	m^3/yr	4	0
TRU	m^3/yr	27	0
Mixed TRU	m^3/yr	0	0.2
Number of Workers	FTEs	65 [e]	61 [e]

a Data shown are measured emissions from WCRR Facility and the ARTIC Facility at TA-50. No stacks require monitoring at TA-54. All non-point sources at TA-50 and TA-54 are measured using ambient monitoring.
b These radionuclides were not projected in the SWEIS ROD because they were either dosimetrically insignificant or not isotopically identified.
c Secondary wastes are generated during the treatment, storage, and disposal of chemical and radioactive wastes. Examples include repackaging wastes from the visual inspection of TRU waste, high-efficiency particulate air filters, personnel protective clothing and equipment, and process wastes from size reduction and compaction.
d SWEIS ROD projections for chemical waste generated at the Solid Chemical and Radioactive Waste Facility were exceeded during CY 2004 due to DVRS repackaging of legacy TRU waste for shipment to the WIPP.
e The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

The exception is chemical waste generation at the Solid Chemical and Radioactive Waste Key Facility. SWEIS ROD projections for chemical waste generated at the Solid

Chemical and Radioactive Waste Facility were exceeded during CY 2004 due to DVRS repackaging of legacy TRU waste for shipment to WIPP.

2.16 Non-Key Facilities

The balance, and majority, of LANL buildings are referred to in the SWEIS as Non-Key Facilities. Non-Key Facilities house operations that do not have potential to cause significant environmental impacts. These buildings and structures are located in 30 of LANL's 49 TAs and comprise approximately 14,224 of LANL's 26,480 acres.

As shown in Table 2.16-1, the SWEIS identified six buildings within the Non-Key Facilities with Nuclear Hazard Categories. The High-Pressure Tritium Facility (Building TA-33-86), classified in 2001 as a Category 2 nuclear facility, was removed from the Nuclear Facility List in March 2002 and downgraded to a radiological facility. The D&D of the formerly used tritium facility, TA-33-86, the High-Pressure Tritium Laboratory, was completed in 2002. At the present time, there are no Category 2 or 3 nuclear facilities among the Non-Key Facilities.

Table 2.16-1. Non-Key Facilities with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2004 [b]
TA-03-0040	Physics Building	3		
TA-03-0065	Source Storage	2		
TA-03-0130	Calibration Building	3		
TA-33-0086	Former Tritium Research	3	2	
TA-35-0002	Non-American National Standards Institute Uranium Sources	3	3	
TA-35-0027	Safeguard Assay and Research	3	3	

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2004b).

Additionally, several Non-Key Facilities were identified as radiological facilities in September 2002 (LANL 2002b). These include the Omega West Reactor, Building 2-1; the Cryogenics Building B, 3-34: the Physics Building (HP), 3-40; the Lab Building, 21-5; Nuclear Safeguards Research, 35-2; Nuclear Safeguards Lab, 35-27; and the Underground Vault, 41-1. Table 2.16-2 lists all the Non-Key Facilities identified as radiological in CY 2004.

2.16.1 Construction and Modifications at the Non-Key Facilities

The SWEIS ROD had projected just one major construction project (Atlas) for the Non-Key Facilities. In contrast, however, LANL plans for the next 10 years call for the construction or modification of many buildings due to programmatic requirements and replacement of damaged or destroyed facilities following the Cerro Grande Fire (LANL 2001l). Major projects that have been completed are listed in Table 2.16-3. Complete descriptions of these projects can be found in previous Yearbooks (LANL 2003, 2004d).

Table 2.16-2. Non-Key Facilities with Radiological Hazard Classification

Building	Description	LANL 2001 [a]	LANL 2002 [b]
TA-2-1	Omega Reactor	RAD	RAD
TA-3-16	Ion Exchange	---	RAD
TA-3-34	Cryogenics Bldg. B	RAD	RAD
TA-3-40	Physics Bldg. (HP)	RAD	RAD
TA-3-169	Warehouse	---	RAD
TA-3-1819	Experiment Mat'l Lab	---	RAD
TA-21-5	Lab Bldg	RAD	RAD
TA-21-150	Molecular Chemical	RAD	---
TA-33-86	High Pressure Tritium	---	RAD
TA-35-2	Nuclear Safeguards Research	RAD	RAD
TA-35-27	Nuclear Safeguards Lab	RAD	RAD
TA-36-1	Laboratory and offices	---	RAD
TA-36-214	Central HP Calibration Facility	---	RAD
TA-41-1	Underground Vault	RAD	RAD
TA-41-4	Laboratory	RAD	---

a LANL Radiological Facility List (LANL 2001c).
b LANL Radiological Facility List (LANL 2002b).

Table 2.16-3. Non-Key Facilities Completed Construction Projects

Description	Year Completed	NEPA Review
Los Alamos Research Park	2001	DOE 1997b
Strategic Computing Complex	2001	DOE 1998d
Nonproliferation and International Security Center	2003	DOE 1999g
Emergency Operations Center	2003	DOE 2001b
Multi-Channel Communications Project	2003	DOE 2001b
Security Systems group Security Systems Support Facility	2003	DOE 2001c
Decision Applications Division Office Building	2003	DOE 2002h
Chemistry Division Office Building (Chemistry Technical Support Building)	2002	DOE 2001d
TA-72 Live Fire Shoot House	2003	DOE 2000d
Security Truck Inspection Station	2002	DOE 2002i

New projects that are still under construction are discussed in the following paragraphs.

a) Atlas

Description: Atlas was constructed in parts of five buildings at TA-35 (35-124, -125, -126, -294, and -301). Atlas was designed for research and development in the fields of physics, chemistry, fusion, and materials science that will contribute to predictive capability for the aging and performance of primary and secondary components of nuclear weapons. The heart of the Atlas facility is a pulsed-power capacitor bank that will deliver a large amount of electrical and magnetic energy to a centimeter-scale target in less than 10 microseconds. Each experiment will require extensive preparation of the experimental assembly and diagnostic instrumentation.

The facility will require up to five megawatt-hours of electrical energy annually (less than one percent of total LANL consumption); will have a peak electrical demand of four megawatts for about one minute per week; and will employ about 15 people. This facility has its own NEPA coverage provided by Appendix K of the Final Programmatic

Environmental Impact Statement for Stockpile Stewardship and Management (DOE 1996d).

Status: Construction was completed in September 2000. Major testing of the capacitor banks (about 30 mega-amps) was successfully completed in December 2000. Critical Decision 4 (authorization to commence operation) was received from DOE in March 2001. An Independent Verification Panel process was completed to assure readiness for operations in July 2001, and the first experiments were performed in September 2001 and continued through September 2002.

During 2002, a new building was constructed at the NTS to accommodate the relocation of Atlas. The relocation of Atlas to the NTS had its own NEPA coverage in the form of an EA and Finding of No Significant Impact issued 06/05/2001 (DOE 2001e). The physical transfer of the Atlas machine to Bechtel Nevada (BN) at the NTS began in October 2002. The formal property transfer took place at about the same time. Reassembly of the machine began in November 2002 and continued through April 2004. NNSA/Nevada Site Office issued CD-4 to BN for the relocated Atlas machine on April 26, 2004. In May 2004 LANL again assumed ownership and management of the Atlas facility at the NTS from BN; LANL personnel will continue to be involved in experimentation activities at the NTS. Machine Characterization Testing began in May 2004 to evaluate performance (compared to experience at LANL), reliability, and reproducibility. Characterization Testing was interrupted due to the 2004 LANL operational stand down.

b) LANL Medical Facility

Description: Employee health is monitored to assure the effectiveness of site health and safety programs and hazard control plans in protecting employees. The Occupational Medicine Program provides the DOE with operational assurance that regulatory requirements are being met, that employees are fit (both physically and psychologically) to perform work at LANL, and that mission activities are not harming our workers. The new facility supports Occupational Medicine functions to include human reliability, medical survey and certification evaluations, and illness/injury management.

This project will construct an approximately 20,000-square-foot structure employing a pre-engineered building with interior design to specifically support DOE/NNSA and LANL requirements for occupational medicine certification, monitoring, intervention, and quality control. The building will house 60 medical staff personnel and support approximately 2,500 patients per month. The project replaces existing non-permanent facilities that have exceeded their life expectancy and are rapidly deteriorating to the point that their condition is currently impacting delivery of medical programs.

Status: The project received NEPA coverage through Categorical Exclusion #8398, approved May 30, 2001 (DOE 2001f). The design/build subcontract was awarded in September 2002. Construction start was in October 2002. In 2003, design and construction of the facility was completed with "Substantial Completion" as defined in the subcontract acknowledged September 2003. The project then focused on punch list issues from various Laboratory subject matter experts. As planned, the readiness assessment was completed in December 2003. The facility was brought into service in January 2004 and is fully operational.

c) NPDES Outfall Project

The NPDES Outfall Project (DOE 1996f) is an on-going project and is described in detail in the 2002 SWEIS Yearbook (LANL 2003), section 2.16.

d) National Security Sciences Building

The National Security Sciences Building (NSSB) within TA-03 will provide approximately 275,000 square feet of space for theoretical and applied physics, computation science and program, and senior-management functions. The NSSB will be an eight-story-high building to house about 700 personnel and their functions, which would move from building TA-03-0043. It also includes a one-story, 600-seat lecture hall and a separate multilevel parking structure that will provide 400 spaces. The facility will cost approximately $97 million dollars to build. When personnel are completely removed from building TA-03-0043 to the new NSSB building, TA-03-0043 is scheduled to be demolished. This project has its own NEPA coverage provided by the Environmental Assessment for Proposed Construction and Operation of the New Office Building and Related Structures within TA-03 at Los Alamos National Laboratory (NNSA 2001) along with a Finding of No Significant Impact.

Because the use of energy-efficient lighting and equipment and the use of water-conservation measures were incorporated in the construction design, operation of the new office building is expected to use less water and electricity than building TA-03-0043.

Status: Senator Pete Domenici and LANL senior managers attended a groundbreaking ceremony on August 20, 2003, to turn the first yards of earth for the building. Construction on the NSSB began in February 2004 and is scheduled for completion in CY 2006. Beneficial occupancy is scheduled for March 2006. The subcontractor broke ground on the parking structure in April 2004 and it is scheduled to open in spring 2005.

e) FWO Division Office Building

Description: The FWO Division Office Building was proposed to help consolidate some of the FWO personnel that were scattered throughout LANL in numerous trailers and transportables located at TA-03 and TA-63. This building is a two-story, approximately 20,000-square-foot building with a capacity of between 75 to 80 people.

Status: The project received NEPA coverage through an existing DOE-approved categorical exclusion (DOE 2001g) issued May 4, 2001. The method of execution was Design Build. The contractor selected was issued the Notice to Proceed on April 23, 2003. The contractor began the design shortly thereafter with the initial emphasis on the site preparation design. Construction was completed in October 2004 and Beneficial Occupancy occurred that same month.

f) TA-03 Parking Structure

Description: A parking structure was constructed in the TA-03 area in order to ease the critical shortage of parking spaces in that area. This structure is located west of Building SM-31 and south of Building SM-30. The pre-cast concrete structure is four stories tall and is capable of holding 337 vehicles.

Status: NEPA categorical exclusion # 9443 was issued by NNSA/DOE on March 17, 2003 (DOE 2003g). Construction of the new TA-03 Parking Structure began July 2003 and was opened for parking in April 2004.

g) Pajarito Road Access Control Stations

Description: Two staffed access-control stations were constructed on Pajarito Road. One station was constructed on the east end of Pajarito Road (west of intersection with New Mexico State Route 4 in White Rock), and the other station was constructed on Pajarito Road east of the LANL core and west of TA-55. The staffed access-control stations are about 200 square feet in floor space with an adjacent support building up to about 2,000 square feet. Each station is equipped with appropriate utilities with electricity and lighted parking. The adjacent support building is equipped with various video systems, electric control devices, and fencing to preclude drive arounds as well as appropriate utilities including electricity, potable water, and sewage services.

Status: This project had its own NEPA coverage provided by the Environmental Assessment for Proposed Access Control and Traffic Improvements at Los Alamos National Laboratory, Los Alamos, New Mexico (DOE 2002j). Construction Notice to Proceed was issued on October 3, 2003. Construction substantial completion occurred March 3, 2004. The East Station became operational on the first weekend of April 2004. The West Station became operational on the third weekend of April 2004.

h) Information Management Division Office Building

Description: Information Management (IM) Division Office Building is proposed to consolidate IM Division Office and Communication Arts and Services group personnel into a centralized and more efficient office building. This building will be located at the northeast corner of the intersection of Diamond Drive and Pajarito Road within TA-03. The facility will be two-story, and approximately 15,000 to 18,000 square feet. Electric, steam, water, sanitary sewer, and communication utilities will be required.

Status: This project received NEPA coverage through an existing DOE-approved categorical exclusion (DOE 2004) and was also reviewed in the Environmental Assessment for the Nonproliferation and International Security Center (DOE 1999g). The design subcontract was awarded in March 2005; design should be complete in FY 2005. Construction is expected to be complete by the end of FY 2006.

i) Center for Integrated Nanotechnologies

Description: The Center for Integrated Nanotechnologies (CINT) will contain laboratories and office space to accommodate state-of-the-art equipment and research. It will be located near the Materials Science Complex. The two-story, 36,500-square-foot building will house approximately 50 people. Occupants will be LANL staff plus collaborators from universities, other laboratories, and private industry. CINT will focus on five areas: 1) theory, modeling, and simulation; 2) nanoscale bio-microinterfaces research; 3) nanophotonics and nanoelectronics research; 4) complex functional nanomaterials research; and 5) nanomechanics research.

Status: The project received NEPA coverage through a DOE-approved categorical exclusion (DOE 2002k) issued March 28, 2002. The design-build subcontract was awarded in March 2004. Construction start was November 2004. This building is expected to be complete in December 2005. Initial operations are expected to start in April 2006, with full operations expected by May 2007.

2.16.2 Operations at the Non-Key Facilities

Non-Key Facilities are host to seven of the eight categories of activities at LANL (DOE 1999a) as shown in Table 2.16.2-1 below. The eighth category, environmental restoration, is discussed in Section 2.17. During CY 2004, no new capabilities were added to the Non-Key Facilities and none of the eight was deleted.

Table 2.16.2-1. Operations at the Non-Key Facilities

Capability	Examples
1. Theory, modeling, and high-performance computing.	Modeling of atmospheric and oceanic currents. Theoretical research in areas such as plasma and beam physics, fluid dynamics, and superconducting materials.
2. Experimental science and engineering.	Experiments in nuclear and particle physics, astrophysics, chemistry, and accelerator technology. Also includes laser and pulsed-power experiments (e.g., Atlas).
3. Advanced and nuclear materials research and development and applications	Research and development into physical and chemical behavior in a variety of environments; development of measurement and evaluation technologies.
4. Waste management	Management of municipal solid wastes. Sewage treatment. Recycle programs.
5. Infrastructure and central services	Human resources activities. Management of utilities (natural gas, water, electricity). Public interface.
6. Maintenance and refurbishment	Painting and repair of buildings. Maintenance of roads and parking lots. Erecting and demolishing support structures.
7. Management of environmental, ecological, and cultural resources	Research into, assessment of, and management of plants, animals, cultural artifacts, and environmental media (groundwater, air, surface waters).

The 5,755 employees in the Non-Key Facilities at the end of CY 2004 reflect an increase of 179 employees over the employees reported in the 2003 SWEIS Yearbook (LANL 2004d).

2.16.3 Operations Data for the Non-Key Facilities

The Non-Key Facilities occupy more than half of LANL and now employ about 70 percent of the workforce. In previous years, activities in these facilities have typically contributed less than 20 percent of most operational effects. However, in CY 2004, operational effects in the Non-Key Facilities have increased. For example, the 928,556 kilograms of chemical waste generated at the Non-Key Facilities constituted about 84 percent of the total LANL chemical waste volume in CY 2004 and exceeded the SWEIS ROD projection by about 50 percent. Also in CY 2004, the Non-Key Facilities generated about 87 percent of the total LANL LLW waste volume; about 30 percent of the MLLW volume; and about 54 percent of the TRU waste volume. Table 2.16.3-1 presents details of the operations data from CY 2004.

The combined flows of the sanitary waste treatment plant and the TA-03 Steam Plant account for about 88 percent of the total discharge from Non-Key Facilities and about 67 percent of all water discharged by LANL. Section 3.2 has more detail. Operations data are summarized in Table 2.16.3-1.

Table 2.16.3-1. Non-Key Facilities/Operations Data

Parameter	Units	SWEIS ROD	2004 Operations
Radioactive Air Emissions: [a]			
Tritium	Ci/y	9.1E+2	None measured
Plutonium	Ci/y	3.3E-6	None measured
Uranium	Ci/y	1.8E-4	None measured
NPDES Discharge:			
Total Discharges	MGY	142	123.6636
001	MGY	114	108.8506
013	MGY	[b]	[b]
03A-027	MGY	5.8	6.9290
03A-160	MGY	5.1	7.884
03A-199	MGY	---	0 [c]
22 others	MGY	17	[d]
Wastes:			
Chemical	kg/yr	651,000	928,556 [e]
LLW	m^3/yr	520	13,963 [f]
MLLW	m^3/yr	30	10
TRU	m^3/yr	0	21.4 [g]
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	4,601 [h]	5,755 [h]

a Stack emissions from previously active facilities (TA-33 and TA-41); these were not projected as continuing emissions in the future. Does not include non-point sources.

b Outfall 013 is from the TA-46 sewage plant. Instead of discharging to Mortandad Canyon, however, treated waters are pumped to TA-3 for re-use and ultimate discharge through Outfall 001 into Sandia Canyon. This transfer of water has resulted in projected NPDES volumes underestimating actual discharges from the exiting outfall.

c New Outfall 03A-199 was permitted by the EPA on 12/29/00. It had no discharge during CY 2004.

d The Non-Key Facilities formerly had 28 total outfalls (DOE 1999a, p. A-5). Twenty-two of these, with projected total flow of 17 million gallons per year, were eliminated from LANL's NPDES permit during 1998 and 1999.

e Chemical waste generation at the Non-Key Facilities exceeded the SWEIS ROD projection due to heightened activities and new construction.

f LLW generation at the Non-Key Facilities exceeded the SWEIS ROD projection due to heightened activities and new construction.

g TRU waste generated at the Non-Key Facilities during CY 2004 was the result of the OSR Project. Because this waste comes from Shipping and Receiving, it is attributed to that location as the point of generation.

h The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2004 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2004 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.17 Remediation Services Project (previously the Environmental Restoration Project)

The RS Project, formerly called the Environmental Restoration Project, may generate a significant amount of waste during cleanup activities; therefore, the project is included as a section in Chapter 2. The SWEIS ROD forecasted that the RS Project would contribute 60 percent of the chemical waste, 35 percent of the LLW, and 75 percent of the MLLW generated at LANL over the 10 years from 1996–2005.

The DOE established the RS Project in 1989 to characterize and in most cases remediate over 2,100 PRSs known, or suspected, to be contaminated from historical Laboratory operations. Many of the sites remain under DOE control; however, some have been transferred to Los Alamos County or to private ownership (at various locations within the Los Alamos town site). Remediation and cleanup efforts are regulated by and coordinated with the NMED and/or DOE.

In CY 2004, RS Project activities included drafting and finalizing several characterization and remediation reports for NMED and conducting characterization fieldwork on sites that could potentially be affected by upcoming infrastructure and construction projects. All work performed was formally tracked.

Some completed characterization and remediation reports include the following:

- TA-53 Surface Impoundments Investigation Report
- Los Alamos and Pueblo Canyons Investigation Report
- Mortandad Canyon Groundwater Work Plan
- Addendum to Sampling and Analysis Plan for Middle Mortandad/Ten Site Canyon Aggregate
- SWMU 16-003(o) Investigation Work Plan
- Accelerated Corrective Action Plan for Former TA-19
- Material Disposal Area (MDA) B Investigation Work Plan
- MDA V Investigation Work Plan
- Update to Investigation Work Plan for MDA C, Revision 1
- Investigation Work Plan for MDA G
- MDA T Investigation Work Plan

Ongoing field activities included the following:

- Bimonthly moisture monitoring at MDA AB, a site of underground nuclear safety tests in the early 1960s
- Subsurface investigations at MDA l, a 2.5-acre fenced area that is a RCRA-permitted hazardous waste unit

- Sampling at PRS 03-012(b)-00
- Installation of best management practices at PRS 46-008(g) to mitigate the effects of erosion after a release of potable water
- Sediment sampling in Cañada del Buey and Pajarito Canyon, in support of the investigation of MDA G
- Soil removal and sediment sampling as part of DP Road voluntary corrective action [PRSs 0-004, 0-030(a), 0-027, 0-033(a), 0-010(A, B), 0-029(A, B, C), 21-021, and consolidated unit 0-030(b)-00]
- Accelerated corrective action fieldwork at the former East Gate laboratory (TA-19), which is slated to be transferred to Los Alamos County as part of DOE's land transfer initiative
- Sediment and soil sampling at 85 PRSs located in the Middle Mortandad/Ten Site Aggregate
- Well and borehole drilling as part of the implementation of the Mortandad Canyon Investigation Work Plan

2.17.1 Operations of the Remediation Services Project

The RS Project originally identified 2,124 PRSs; 1,099 PRSs administered by NMED and 1,025 PRSs administered by DOE. By the end of CY 2004, only 829 PRSs remain. Approximately 711 units have been approved for no further action (NFA)[9], and 146 units have been removed from the Laboratory's Hazardous Waste Facility Permit. During 2004, the RS Project received 14 NFA approvals from DOE, three from NMED, and a joint NFA approval for a consolidated unit made up of one NMED and four DOE sites. A total of 18 approvals were granted.

New Solid Waste Management Unit

The RS Project notified NMED about a newly identified SWMU at TA-3 on June 8, 2004. The SWMU, designated 03-013(i), is located at Buildings TA-03-246 and TA-03-247 and consists of historical (i.e., pre-1985) operational releases of hydraulic oil. Based on soil sampling performed after discovery of the site, the RS Project's letter to NMED stated that although the site is a SWMU, there did not appear to be any releases of hazardous waste or hazardous constituents requiring corrective action pursuant to the Hazardous and Solid Waste Amendments Module. Samples were analyzed for polychlorinated biphenyls (PCBs), metals, organics, and total petroleum hydrocarbons. No PCBs or organics were detected. Metals were detected below residential risk levels. This site was cleaned up and the soil was disposed of as New Mexico Special Waste. Confirmatory sampling will be conducted by the RS Project in early 2005.

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[9] NFA means that the site is considered "clean" for its intended purpose. An industrial site would not be cleaned up to the same level as a residential site.

Knights of Columbus Remediation

A subsurface legacy waste site on the Knights of Columbus property on DP Road was remediated. The soil vapor extraction system operated at the site in a full-time extraction mode (operating 24 hours a day/seven days a week) with three extraction wells. Beginning in November of 2002, the system removed approximately 17,000 lbs of petroleum contamination from the underlying rock formation. The primary risk driver at the site was benzene, with the benzene, toluene, ethylbenzene, and xylene compounds being the target contaminants of the system. Following extraction the system was demobilized and removed from the site. Confirmatory sampling has been completed and the site has been restored. A final report is underway.

Combustion Turbine Generator Project Support

RS Project Facility Integration personnel provided support to the Combustion Turbine Generator Project at the TA-3 Power Plant. Utility lines and several support structures required for the new turbine will be located within the boundary of PRS 03-012(b)-00. Because of the LANL shutdown in July of 2004, initiation of this project was delayed by more than six months. Data collected in 2003 showed elevated levels of heavy metals within the SWMU boundary. Excavation of the new utility trenches began in late 2004. The project should be complete by the end of 2005.

Beryllium Facility Storage Vault Project Support

RS Project personnel worked with facility personnel regarding the planned construction of a new storage vault and cartridge filter house adjacent to the Beryllium Facility (03-141) at TA-03. The proposed location of the new storage vault overlapped the location of SWMU 03-056(l). Eberline Services, a KSL subcontractor, collected confirmation samples within the boundary of SWMU 03-056(l) in support of a pending NFA determination. RS Project personnel also worked with the Sampling Management Office and Eberline Services to ensure the samples were collected and analyzed in accordance with RS Project Quality Assurance requirements. Results showed no detected beryllium and supported the NFA determination. Preparation of a report recommending NFA began in late 2004.

Security Perimeter Road Project

The RS Project submitted an Accelerated Corrective Action Work Plan to NMED for the investigation and remediation of SWMUs 61-002 and 03-029 and Area of Concern 03-001(i) in support of the Security Perimeter Road Project. The work plan describes the activities to be accomplished in support of the characterization and remediation of the PRSs located in the direct path of the perimeter road. The work plan is scheduled to be implemented in early 2005.

National Security Sciences Building Construction Project

The RS Project supported the construction of the NSSB location at TA-3, which impacted several PRSs. As part of construction activities for the new NSSB, two sections of buried storm drain lines from the following locations were removed: one section of storm drain located directly south of Building 03-261, which was part of SWMU 03-013(a)-00, and another directly northeast and east of the former locations of Buildings 03-287 and 03-105 and north and east of Building 03-43, which was part of SWMU 03-054(c). RS Project staff inspected each portion of the corrugated metal pipe storm drain and the soil directly underneath for any evidence of release. All sections of the removed storm drain lines were found to be intact and in good condition. There was no staining of the soil or evidence of a release from the drain lines. To control storm water flow at the site, RS Project staff coordinated the removal of soil and structure foundations from the former location of a cooling tower and pump house (former structures 03-156 and 03-163) in SWMU 03-054(c) in the western portion of the NSSB construction footprint. The preparation of a report recommending NFA at these PRSs began in late 2004.

Technical Area 21 Investigation and Cleanup Activities

SWMU 21-013(d)-99 is a consolidated site made up of former SWMUs 21-013(d) and 21-013(e). The site, referred to as the "cold dump," received construction and building debris. The former Zia Company supervisor confirmed that no toxic, explosive, or radioactive substances were dumped at the site. In response to a notice of deficiency from NMED, RS Project staff completed resampling activities in September 2004. These activities included sampling at eight previously sampled locations (two depths each) to determine if anomalously high chromium, nickel, and copper concentrations were the result of site contamination or an artifact of the sampling method. Results will be submitted to NMED in 2005.

Best management practices were maintained at SWMU 21-011(k), and winter kill vegetation was replaced.

Watershed-Scale Erosion Control for Pueblo Canyon

RS Project staff led an effort to identify a variety of actions in Pueblo Canyon that, in combination, will represent a true watershed-scale approach to reducing post-fire runoff erosion and associated plutonium transport. Other team members included the Water Quality and Hydrology group and the legal office at LANL, the US Forest Service, Los Alamos County, NMED, and San Ildefonso Pueblo. The team met twice in 2004 to discuss mitigation ideas. The first idea was a proposal to move the outfall associated with the planned Los Alamos County wastewater treatment plant. Moving the outfall farther up canyon, as compared to the first design, could potentially create more continuous riparian vegetation that would stabilize banks. The second topic discussed was the county’s plan to periodically remove sediment impounded behind the new gabion structures in the north and south forks of Pueblo Canyon above North Road. The team recommended leaving the sediment in place—erosive flood peaks would be significantly attenuated because floodwater could infiltrate into the alluvium before entering the portion of the canyon where plutonium contamination exists. The team meetings are ongoing.

2.17.2 Operations Data for the Remediation Services Project

Waste quantities generated during FY 2004 are shown in Table 2.17.2-1. The RS Project generated approximately 73 cubic meters of chemical waste (including the categories RCRA, Toxic Substances Control Act, and New Mexico Special Waste) in CY 2004—all below the projections made by the SWEIS ROD.

Table 2.17.2-1. Remediation Services Project/Operations Data

Waste Type	Units	SWEIS ROD	2004 Operations
Chemical [a]	m^3/yr	2,000,000	73
LLW	m^3/yr	4,260	0.76
MLLW	m^3/yr	548	0.015
TRU	m^3/yr	11	0
Mixed TRU	m^3/yr	0	0

a The chemical waste volume includes the categories of RCRA, Toxic Substances Control Act, and New Mexico Special Waste.

2.17.3 Cerro Grande Fire Effects on the Remediation Services Project

The Los Alamos and Pueblo Canyons Investigation Report was submitted to the NMED in 2004 (LANL 2004e). It addressed, among other things, the impact of the Cerro Grande Fire on chemical of potential concern (COPC) concentrations in canyon media. The results of this investigation indicate that for contaminants released from LANL PRSs, the human health risks are below NMED's and DOE's target levels for present-day and foreseeable future land uses, and that adverse ecological effects have not been observed in terrestrial and aquatic systems in the watershed.

No new Environmental Sites were added to the LANL Nuclear Facility List (LANL 2004b) during CY 2004. The existing Environmental Sites that are categorized as Hazard Category 2 and Hazard Category 3 Nuclear Facilities are shown in Table 2.17.3-1.

Table 2.17.3-1. Environmental Sites with Nuclear Hazard Classification

Zone	PRS	Description	HAZ CAT
TA-10	10-0029(a)-99	PRS 10-002(a)-99 is associated with the former liquid disposal complex serving the radiochemistry laboratory at TA-10. The complex discharged to leach fields and pits. The entire complex underwent D&D in 1963. The remaining materials were placed in a pit that remains in place.	3

Table 2.17.3-1. continued

Zone	PRS	Description	HAZ CAT
TA-21	21-014	MDA A is a 1.25-acre site that was used intermittently from 1945 to 1949 and from 1969 to 1977 to dispose of radioactively contaminated solid wastes, debris from D&D activities, and radioactive liquids generated at TA-21. The area contains two buried 50,000-gal. storage tanks (the "General's Tanks") on the west side of MDA A, two rectangular disposal pits (each 18 ft long by 12.5 ft wide by 12.5 ft deep) on the east side of MDA A, and a large central pit (172 ft long by 134 ft wide by 22 ft deep).	2
TA-21	21-015	MDA B is an inactive 6.03-acre disposal site. It was the first common disposal area for radioactive waste generated at LANL and operated from 1945 to 1952. The site runs along the fence line on DP Road and is located about 1,600 ft east of the intersection of DB (*sic*) Road and Trinity Drive. The site comprises four major pits (each 300 ft by 15 ft by 12 ft deep), a small trench (40 ft by 2 ft by 3 ft deep), and miscellaneous small disposal sites.	3
TA-21	21-016(a)-99	MDA T, an area of about 2.2 acres, consists of four inactive absorption beds, a distribution box, a subsurface retrievable waste storage area disposal shafts (*sic*), a former waste treatment plant, and cement paste spills on the surface and within the retrievable waste storage area.	2
TA-35	35-001	MDA W consists of two vertical shafts or "tanks" that were used for the disposal of sodium coolant used in LAMPRE-1 sodium cooled research reactor. The two tanks are 125-ft-long stainless steel tubes that were half filled and inserted into carbon steel casings separated by approximately 3 ft. Until 1980, a metal control shed was located above the tanks, but this feature was removed and replaced with a concrete cover. The predominant radionuclide of concern in the sodium is Pu-239 that may have been introduced from a breach of one or two fuel elements during the operational life of LAMPRE-1.	3
TA-35	35-003(a)-99	The Wastewater Treatment Plant was located at the east end of Ten Site Mesa and operated from 1951 until 1963. It consisted of an array of underground waste lines, storage tanks, and chemical treatment precipitation tanks. The plant treated liquid waste that originated from the radiochemistry laboratories and operation of the radioactive lanthanum-140 hot cells in Bldg 35-2. The liquid wastes from the laboratories were acidic, and the radioactivity in the waste came from barium-140, lanthanum-140, strontium-89, strontium-90, and yttrium-90.	3
TA-35	35-003(d)-00	The former structures associated with the Pratt Canyon component of the Wastewater Treatment Plant. All buildings, foundations, and structures were removed during D&D activities in 1981 and 1985, then backfilled with 20 ft of clean fill material.	3
TA-49	49-001(a)-00	This underground, former explosive test site comprises four distinct areas, each with a series of deep shafts used for subcritical testing. Radioactively contaminated surface soil exists at one of the test areas [SWMU 49-001(g)].	2

Table 2.17.3-1. continued

Zone	PRS	Description	HAZ CAT
TA-50	50-009	MDA C was established in 1948 to replace MDA B. MDA C covers 11.8 acres and consists of seven pits (four are 610 ft by 40 ft by 25 ft, one is 110 ft by 705 ft by 18 ft, one is 100 ft by 505 ft by 25 ft, and one is 25 ft by 180 ft by 12 ft), 107 shafts (each typically 2 ft dia. by 10 to 25 feet deep), and one unnumbered shaft used for a single strontium-90 source disposal. Pits and shafts were used for burial of hazardous chemicals, uncontaminated classified materials, and radioactive materials. TRU waste also was buried in unknown quantities in the pits. The landfill was used until 1974. COPCs included inorganic chemicals, volatile organic compounds (VOCs), semi-volatile organic compounds, and radionuclides.	2
TA-53	21-014	Three inactive underground tanks exist and are associated with the former radioactive liquid waste system at TA-53. One tank (structure 53-59) is 28 in diameter and 65 ft long and contains spent ion exchange resin. Two empty tanks are 6 ft in diameter and 12 ft long and are not included here.	2
TA-54	Area G	LLW (including mixed waste) storage and disposal in domes, pits, shafts, and trenches occur here. TRU waste storage in domes and shafts (does not include TWISP) is present as is TRU legacy waste in pits and shafts. Low-level disposal of asbestos in pits and shafts occurs. There is an operations building.	2

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3.0 Site-Wide 2004 Operations Data

The Yearbook's role is to provide data that could be used to develop an impact analysis. However, in two cases, worker dose and dose from radioactive air emissions, the Yearbook specifically addresses impacts as well. In this chapter, the Yearbook summarizes operational data at the site-wide level. These impact assessments are routinely undertaken by LANL, using standard methodologies that duplicate those used in the SWEIS; hence, they have been included to provide the base for future trend analysis.

Chapter 3 compares actual operating data to projected effects for about half of the parameters discussed in the SWEIS, including effluent, workforce, regional, and long-term environmental effects. Some of the parameters used for comparison were derived from information contained in both the main text and appendices of the SWEIS. Many parameters cannot be compared because data are not routinely collected. In these cases, projections made by the SWEIS ROD (DOE 1999) resulted only from expenditure of considerable special effort, and such extra costs were avoided when preparing the Yearbook.

3.1 Air Emissions

3.1.1 Radioactive Air Emissions

Radioactive airborne emissions from point sources (i.e., stacks) during 2004 totaled approximately 5,230 curies, just under 25 percent of the 10-year average of 21,700 curies projected by the ROD. These low emissions result from operations at the Key Facilities not being performed at projected levels and from the conservative nature of the emissions calculations performed for the SWEIS.

As in recent years, the two largest contributors to radioactive air emissions were tritium from the Tritium Facilities (both Key and Non-Key) and activation products from LANSCE. Stack emissions from the Tritium Key Facilities were about 790 curies. Clean-up activities at TA-33 and TA-41 (both Non-Key Facilities) were completed, and neither of these facilities was monitored in 2004.

Emissions of activation products from LANSCE were higher than 2003 levels, but consistent with previous years (2001–2002). The total point source emissions were approximately 4,440 curies. As in recent years, the Area A beam stop did not operate during 2004; however, operations in Line D resulted in the majority of emissions reported for 2004.

Non-point sources of radioactive air emissions are present at LANSCE, Area G, TA-18, and other locations around LANL. Non-point emissions, however, are generally small compared to stack emissions. For example, non-point air emissions from LANSCE were approximately 84 curies. Additional detail about radioactive air emissions is provided in LANL's 2004 annual compliance report to the EPA submitted on June 30, 2004 (LANL

2005a) and in the 2004 Environmental Surveillance Report, to be issued after October 1, 2005.

Maximum offsite dose continued to be relatively small for 2004. The final dose is 1.68 millirem, well under the EPA air emissions limit for DOE facilities of 10 millirem per year. This dose is calculated to the theoretical "maximum exposed individual" who lives at the nearest off-site receptor location 24 hours per day, eating food grown at that same site, etc. No actual person received a dose of this magnitude.

3.1.2 Non-Radioactive Air Emissions

3.1.2.1 Emissions of Criteria Pollutants

Criteria pollutants include nitrogen oxides, sulfur oxides, carbon monoxide, and particulate matter. LANL, in comparison to industrial sources and power plants, is a relatively small source of these non-radioactive air pollutants. As such, LANL is required to estimate emissions, rather than perform actual stack sampling. As Table 3.1.2.1-1 illustrates, CY 2004 emissions of criteria pollutants are within the estimated emissions presented in the SWEIS ROD.

Table 3.1.2.1-1. Emissions of Criteria Pollutants as Reported on LANL's Annual Emissions Inventory[a]

Pollutants	Units	SWEIS ROD	2000 Operations	2001 Operations	2002 Operations	2003 Operations	2004 Operations
Carbon monoxide	Tons/year	58	26	29.1	28.1	31.9	17.1
Nitrogen oxides	Tons/year	201	80	93.8	64.7	49.6	24.5
Particulate matter	Tons/year	11	3.8	5.5	15.5 [b]	22.1[b]	3.0
Sulfur oxides	Tons/year	0.98	4.0 [c]	0.82	1.3 [b]	1.3[b]	0.3

a Emissions included on the annual emission inventory report do not include insignificant sources.
b The increased emissions are attributed to operation of three air curtain destructors used to burn wood and slash from fire mitigation activities around LANL. Operation of the air curtain destructors ceased in 2003.
c The higher emissions of sulfur oxides in CY 2000 were due to the main steam plant's burning fuel oil during the Cerro Grande Fire.

Criteria pollutant emissions from LANL's fuel burning equipment are reported in the annual Emissions Inventory Report as required by the New Mexico Administrative Code, Title 20, Chapter 2, Part 73 (20.2.73 NMAC). The report provides emission estimates for the steam plants, nonexempt boilers, and the asphalt plant. In addition, emissions from the paper shredder, data disintegrator, rock crusher, carpenter shops, degreasers, oil storage tanks, and permitted beryllium machining operations are reported. For more information, refer to LANL's 2002 and 2003 Emissions Inventory Reports (LANL 2003a, 2005b).

In CY 2004, approximately two-thirds of the most significant criteria pollutant, nitrogen oxides, resulted from the TA-03 steam plant. In late CY 2002, LANL installed flue gas recirculation equipment on the steam plant boilers to reduce emissions of nitrogen oxides. This equipment was operational for all of CY 2004. Emission stack testing conducted in

September 2002 demonstrated that the flue gas recirculation equipment resulted in a reduction in nitrogen oxide emissions of approximately 64 percent.

Emissions are lower in 2004 primarily because the air curtain destructors were shutdown. From late 2001 to late 2003 LANL operated three air curtain destructors to cleanly and safely burn wood and slash from forest thinning activities for forest fire mitigation. These burning activities contributed to the higher reported emissions in 2001 through 2003. The air curtain destructors were taken out of service in October 2003 and were not operated in 2004.

In 2004 LANL received a Title V Operating permit from the NMED. This permit included facility-wide emission limits and additional recordkeeping and reporting requirements. Table 3.1.2.1-2 summarizes the facility-wide emission limits in the Title V Operating permit and the SWEIS ROD emissions and presents the 2004 emissions from all sources included in the permit. Note that emissions from insignificant sources of boilers, heaters, and emergency generators are included in these totals. All emissions are below the levels evaluated in the SWEIS ROD except sulfur oxides. The slightly higher sulfur oxide emissions in the Title V operating permit emissions report are due to over 200 small boilers and heaters located throughout the LANL facility.

Table 3.1.2.1-2. 2004 Emissions for Criteria Pollutants as Reported on LANL's Title V Operating Permit Emissions Report[a]

Pollutants	Units	SWEIS ROD	Title V Operating Permit Facility-Wide Emission Limits	2004 Emissions
Carbon monoxide	Tons/year	58	225	35.4
Nitrogen oxides	Tons/year	201	245	50.5
Particulate Matter	Tons/year	11	120	4.8
Sulfur oxides	Tons/year	0.98	150	1.5

a The Title V Operating Permit Emissions report includes two categories of sources not required in the annual emission inventory: small, exempt boilers and heaters, and exempt stand-by emergency generators.

3.1.2.2 Chemical Usage and Emissions

The 1999 edition of the Yearbook (LANL 2000a) proposed to report chemical usage and calculated emissions for Key Facilities obtained from the LANL's Automated Chemical Inventory System. (Note: In CY 2002, LANL transitioned to a new chemical inventory system called ChemLog and no longer uses the Automated Chemical Inventory System.) The quantities presented in this approach represent all chemicals procured or brought on site in the respective calendar year. This methodology is identical to that used by LANL for reporting under Section 313 of the Emergency Planning Community Right-to-Know Act (42 USC) and for reporting regulated air pollutants estimated from research and development operations in the annual Emissions Inventory Report (LANL 2003a, 2005b).

Air emissions shown in Tables A-1 through A-14 of Appendix A are divided into emissions by Key Facility. Emission estimates (expressed as kilograms per year) were performed in the same manner as that reported in the 1999 through 2003 Yearbooks (LANL 2000a, 2001a, 2002a, 2003b, 2004a, respectively). First, usage of listed chemicals was summed by facility. It was then estimated that 35 percent of the chemical used was released to the atmosphere. Emission estimates for some metals, however, were based on an emission factor of less than one percent. This is appropriate because these metal emissions are assumed to result from cutting or melting activities. Fuels such as propane and acetylene were assumed to be completely combusted; therefore, no emissions are reported.

Information on total VOCs and hazardous air pollutants (HAPs) estimated from research and development operations is shown in Table 3.1.2.2-1. Projections by the SWEIS ROD for VOCs and HAPs were expressed as concentrations rather than emissions; therefore, direct comparisons cannot be made, and projections from the SWEIS ROD are not presented. The VOC emissions reported from research and development activities reflect quantities procured in each calendar year. The HAP emissions reported from research and development activities generally reflect quantities procured in each calendar year. In a few cases, however, procurement values and operational processes were further evaluated so that actual air emissions could be reported instead of procurement quantities.

Table 3.1.2.2-1. Emissions of Volatile Organic Compounds and Hazardous Air Pollutants from Chemical Use in Research and Development Activities

Pollutant	Emissions (Tons/year)					
	1999	2000	2001	2002	2003	2004
Hazardous Air Pollutants	13.6	6.5	7.4	7.74	7.32	5.71
Volatile Organic Compounds	20	10.7	18.6	14.9	11.2	7.95

Emissions of VOCs and HAPs from chemical use in research and development activities in 2004 are lower than in previous years. This is due to the LANL shutdown of activities in July 2004. During the shutdown new chemicals were not purchased and research activities were halted while employees focused their efforts on safety and security issues.

3.2 Liquid Effluents

LANL may discharge wastewater from its activities via 21 outfalls that are regulated under NPDES Permit No. NM0028355. The current NPDES permit expires on January 31, 2005. LANL applied for a renewed permit by August 2004. The EPA is allowing LANL to continue discharging industrial wastewater under the current permit until a new permit is issued in CY 2005. Based on discharge monitoring reports prepared by LANL's Water Quality and Hydrology group, only 16 of the 21 permitted outfalls had recorded flows in CY 2004. Effluent flow through the 16 NPDES outfalls totaled an estimated 162.52 million gallons in CY 2004. This is approximately 47.3 million gallons less than the CY 2003 total of 209.82 million gallons, due largely to the LANL stand-down that began in July 2004. The 2004 total volume of discharge is well below the maximum flow of 278.0 million gallons that was projected in the SWEIS ROD. Treated wastewater released from LANL's NPDES outfalls rarely leaves the site.

Historically, instantaneous flows were measured in the field and then extrapolated over a 24-hour day/seven-day week. Pursuant to the current NPDES permit requirements, actual flows are now being recorded by flow meters at most outfalls. At those outfalls that do not have meters, flows continue to be calculated from instantaneous flow measurements as before. Details on NPDES noncompliance during 2004 will be provided in the 2004 Annual Environmental Surveillance Report to be issued after October 1, 2005.

CY 2004 discharges are summarized by watershed and compared with watershed totals projected in the SWEIS ROD in Table 3.2-1. The bulk of the CY 2004 discharges came from Non-Key Facilities (see Table 3.2-2).

Table 3.2-1. NPDES Discharges by Watershed (Millions of Gallons)

Watershed	# Outfalls (SWEIS ROD)	# Outfalls (2004) [a]	Discharge (SWEIS ROD)	Discharge 2004
Cañada del Buey	3	1 [b]	6.4	0
Guaje	7	0	0.7	0
Los Alamos	8	5	44.8	29.57
Mortandad	7	5	37.4	15.90
Pajarito	11	0	2.6	0
Pueblo	1	0	1.0	0
Sandia	8	5	170.7	116.43 [b]
Water	10	5[c]	14.2	0.62
Totals	**55**	**21**	**278.0**	**162.52**

a Twenty-one outfalls were permitted to discharge during 2004.
b Includes Outfall 13S from the Sanitary Wastewater System, which is registered as a discharge to Cañada del Buey or Sandia. The effluent is actually piped to TA-03 and ultimately discharged to Sandia Canyon via Outfall 001.
c Includes 05A-055 discharge to Cañon de Valle, a tributary to Water Canyon.

Several Key Facilities accounted for approximately 39 million gallons of the 2004 total. LANSCE discharged approximately 8.1 million gallons in 2004, about 8.3 million gallons less than in 2003, accounting for about 20.9 percent of the total discharge from all Key Facilities (see Table 3.2-2). This percentage has decreased from almost 31 percent of the contribution in 2003 due to less activity at LANSCE overall, and fewer hours of "beam time" than anticipated. Table 3.2-2 compares NPDES discharges by Key and Non-Key Facilities. See Section 2.11 for more information.

LANL has three principal wastewater treatment facilities—the sewage plant (Sanitary Wastewater System) at TA-46, the RLWTF at TA-50, and the High Explosives Wastewater Treatment Facility at TA-16. The sewage treatment plant at TA-46, one of the Non-Key Facilities, is discussed below.

The RLWTF (one of the Key Facilities), Building 50-01, Outfall 051discharges into Mortandad Canyon. During CY 2004, about 2.14 million gallons of treated radioactive liquid effluent, about 0.83 million gallons less than CY 2003, were released to Mortandad Canyon from the RLWTF, compared to 9.3 million gallons projected in the SWEIS ROD.

Table 3.2-2. NPDES Discharges by Facility (Millions of Gallons)

Facility	# Outfalls (SWEIS ROD)	# Outfalls (2004)	Discharge (SWEIS ROD)	Discharge (2004)
Key Facilities				
Plutonium Complex	1	1	14.0	2.72
Tritium Facility	2	2	0.3	22.10
CMR Building	1	1	0.5	1.19
Sigma Complex	2	2	7.3	1.97
High Explosives Processing	11	3	12.4	0.04
High Explosives Testing	7	2	3.6	0.58
LANSCE	5	4	81.8	8.12
Biosciences	1	0	2.5	0
Radiochemistry Facility	2	0	4.1	0
RLWTF	1	1	9.3	2.14
Pajarito Site	None	0	0	0
MSL	None	0	0	0
TFF	None	0	0	0
Machine Shops	None	0	0	0
Waste Management Operations	None	0	0	0
Non-Key Facilities	22	5	142.1	123.66
Totals	**55**	**21**	**278.0**	**162.52**

The TA-16 High Explosives Wastewater Treatment Facility (one of the Key Facilities) discharged about 0.04 million gallons in CY 2004. This is significantly less than the 12.4 million gallons projected in the SWEIS ROD.

Discharges from the Non-Key Facilities made up the majority of the total CY 2004 discharge from LANL. This total, 123.66 million gallons, was about 18.4 million gallons less than the 142.1 million-gallon total discharge from the Non-Key Facilities that was projected in the SWEIS ROD. Two Non-Key Facilities, the TA-46 sanitary waste treatment plant and the TA-03 Steam Plant, account for about 88 percent of the total discharge from Non-Key Facilities and about 67 percent of all water discharged by LANL. The Sanitary Wastewater System at TA-46 processed about 104.07 million gallons of treated wastewater during CY 2004, all of which was pumped to TA-03, to be either recycled at the TA-03 Power Plant (as make-up water for the cooling towers), or discharged into Sandia Canyon via Outfall 001. The discharge of 4.78 million gallons from the TA-03 Power Plant to Outfall 001 was significantly less than the 2003 discharge of 38.9 million gallons. While the 2004 contribution from TA-46 (Outfall 13S) to the total Outfall 001 discharge increased by about 11.6 million gallons over the 2003 value, the total discharge from Outfall 001 decreased by about 22.6 million gallons.

The NPDES Industrial Storm Water Permit Program regulates storm water discharges from identified industrial activities (including runoff from inactive SWMUs). The UC and the DOE are co-permittees under LANL's NPDES Multi-Sector General Permit 2000. This permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) to ensure that LANL surface waters that receive storm water runoff meet state water-quality standards. Currently, LANL maintains and implements 15 SWPPPs for its industrial activities. During CY 2004, LANL also completed negotiations with the EPA and NMED on a Federal Facility Compliance Agreement that will require LANL and DOE to apply for an Individual Permit for storm water discharges from SWMUs.

During CY 2004, LANL operated about 75 stream monitoring and partial-record storm water-monitoring stations located in nine watersheds. Data gathered from these stations show that surface water, including storm water, occasionally flows off DOE property. LANL is currently conducting stream monitoring and storm water monitoring at the confluence of major canyons, in certain segments of these canyons, and at a number of specific facilities as well. In addition, LANL conducts voluntary monitoring in the major canyons that enter and leave LANL property. Flow-discharge information is reported in discharge monitoring reports, and flow measurements and water quality data for surface water are published annually in two reports, Environmental Surveillance at Los Alamos (an example is LANL 2004b) and Surface Water Data at Los Alamos National Laboratory (an example is LANL 2005c).

LANL also has a NPDES Storm Water Construction Activities Permit Program, which is responsible for compliance with the NPDES Construction General Permit regulations for storm water discharges from large and small construction activities. This permit requires the development and implementation of a project-specific SWPPP to ensure that storm water runoff from LANL construction sites meets Federal and state water-quality standards. In CY 2004, LANL maintained and implemented SWPPPs covering 76 active and inactive construction sites. Also during CY 2004, 657 compliance inspections were conducted at LANL construction sites. Approximately 193 required storm water inspections were conducted following rain events of 0.5 inch or greater. Approximately 259 storm water compliance inspections were conducted for active construction sites. For inactive construction sites, approximately 205 inspections were completed in CY 2004.

During CY 2004 LANL also completed a revision of the civil section of the LANL Engineering Standards Manual (ESM) and Construction Specification 01560, Compliance Requirements. The ESM revision included NPDES storm water compliance, and appropriate Best Management Practice selection and design criteria for storm water management and sediment and erosion control. Specification 01560 identifies environmental requirements associated with construction activities. These documents will provide guidance to engineers, designers, and contractors. It is anticipated that the result of these revisions will be increased environmental compliance, improved storm water management and sediment and erosion control, and a reduction in construction contractor Change Order requests.

3.3 Solid Radioactive and Chemical Wastes

Because of the complex array of facilities and operations, LANL generates a wide variety of waste types including solids, liquids, semi-solids, and contained gases. These waste streams are variously regulated as solid, hazardous, LLW, TRU, or wastewater by a host of State and Federal regulations. The institutional requirements relating to waste management at LANL are located in a series of documents that are part of the Laboratory Implementation Requirements. These requirements specify how all process wastes and contaminated environmental media generated at LANL are managed. Wastes are managed from planning for waste generation for each new project through final disposal or permanent storage of those wastes. This ensures that LANL meets all requirements including DOE Orders, Federal and State regulations, and LANL permits.

LANL's waste management operation captures and tracks data for waste streams, regardless of their points of generation or disposal. This includes information on the waste generating process; quantity; chemical and physical characteristics of the waste; regulatory status of the waste; applicable treatment and disposal standards; and final disposition of the waste. The data are ultimately used to assess operational efficiency, help ensure environmental protection, and demonstrate regulatory compliance.

LANL generates radioactive and chemical wastes as a result of research, production, maintenance, construction, and RS Project activities as shown in Table 3.3-1. Waste generators are assigned to one of three categories—Key Facilities, Non-Key Facilities, and the Environmental Restoration Project (now called Remediation Services). Waste types are defined by differing regulatory requirements. No distinction has been made between routine wastes, those generated from ongoing operations, and non-routine wastes such as those generated from the decontamination and decommissioning of buildings.

Table 3.3-1. LANL Waste Types and Generation

Waste Type	Units	SWEIS ROD Projection	2003	2004
Chemical	10^3 kg/yr	3,250	670	1,210
LLW	m^3/yr	12,200	5,625	14,838
MLLW	m^3/yr	632	36.10	32.9
TRU	m^3/yr	333	403.37	40.1
Mixed TRU	m^3/yr	115	156.95	23.9

In general, waste quantities from operations at the Key Facilities were below SWEIS ROD projections for nearly all waste types, reflecting the levels of operations at the Key Facilities. This is due primarily to the LANL stand-down and work suspension from July 16 through most of the year that stopped all but essential medium- and high-risk work activities performed during this time period.

3.3.1 Pollution Prevention Program

The Pollution Prevention (PP) Program improves LANL operations by minimizing environmental damage and adverse regulatory findings (LANL 2004c). LANL's commitment to PP and broader environmental stewardship arises from two goals: (1) maintaining a good environmental and ecological condition for present and future employees, residents, and neighbors and (2) remaining in compliance with the many regulatory requirements required to operate LANL. To attain these goals, LANL's Waste Minimization (WMin)/PP approach focuses on the following:

- ensuring that LANL policies and procedures highlight prevention as the preferred methodology to address waste issues;
- integrating waste minimization principles into the planning process;
- supporting the development of new technologies to minimize waste;
- working with waste generators to identify waste minimization opportunities;
- using appropriate material substitution and process improvements;
- recycling and reusing materials; and
- tracking, projecting, and analyzing waste data to improve waste management.

The WMin/PP approach is consistent with LANL's site-wide waste minimization plan that recognizes the severe limitations of onsite disposal capacity for LLW and onsite storage capacity for MLLW. In addition, this approach was adopted to address the variable and nonrecurring nature of wastes coming from the RS Project activities.

In 2004, LANL began development and implementation of an Environmental Management System (EMS) to comply with DOE Order 450.1 (Environmental Protection). EMS is a systematic method for assessing mission activities, determining the environmental impacts of those activities, prioritizing improvements, and measuring results. DOE Order 450.1 defines an EMS as "a continuous cycle of planning, implementing, evaluation and improving processes and actions undertaken to achieved environmental missions and goals."

While several EMS frameworks are available, LANL has chosen to implement the one described by the International Organization for Standardization (ISO) 14001. This choice was made on the basis of the widespread use of the ISO 14001 standard in government and private sector and the availability of resources and training materials.

The EMS is extremely important to PP at Los Alamos because both DOE Order 450.1 and the ISO 14001 standard stress PP as a primary mechanism to achieve continual improvement. Implementation of this system will extend PP principles to a much broader set of LANL activities.

3.3.2 Chemical Wastes

As projected by the SWEIS ROD, chemical waste includes not only construction and demolition debris, but also all other non-radioactive wastes passing through the Solid Radioactive and Chemical Waste Facility. In addition, construction and demolition debris is a component of those chemical wastes that in most cases are sent directly to offsite disposal facilities. Construction and demolition debris consists primarily of asbestos and construction debris from decontamination and decommissioning projects.

Construction and demolition debris is disposed of in solid waste landfills under regulations promulgated pursuant to Subtitle D of RCRA. (Note: Hazardous wastes are regulated pursuant to Subtitle C of RCRA.)

Chemical waste generation in CY 2004 was only about 37 percent of the chemical waste volumes projected by the SWEIS ROD. Table 3.3.2-1 summarizes chemical waste generation during CY 2004.

Table 3.3.2-1. Chemical Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2003	2004
Key Facilities	10^3 kg/yr	600	45	188
Non-Key Facilities	10^3 kg/yr	650	594	929 [a]
Remediation Services (formerly called the ER Project)	10^3 kg/yr	2,000	31	94
LANL	10^3 kg/yr	3,250	670	1,210

a Chemical waste generation at the Non-Key Facilities exceeded the SWEIS ROD projection due to heightened activities and new construction.

RS Project wastes accounted for only about 8 percent of the total chemical wastes generated. One RS Project that contributed to the waste generated was soil removal and sediment sampling as part of DP Road voluntary corrective action [PRSs 0-004, 0-030(a), 0-027, 0-033(a), 0-010(A, B), 0-029(A, B, C), 21-021, and consolidated unit 0-030(b)-00].

3.3.3 Low-Level Radioactive Wastes

LLW generation in 2004 exceeded LLW volumes projected by the SWEIS ROD (Table 3.3.3-1). This is due to the large volume of waste generated as a result of heightened activities and new construction at the Non-Key Facilities.

Table 3.3.3-1. LLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2003	2004
Key Facilities	m^3/yr	7,450	1,843	875
Non-Key Facilities	m^3/yr	520	1,964 [a]	13,963 [a]
Remediation Services (formerly called the ER Project)	m^3/yr	4,260	1,819	0.76
LANL	m^3/yr	12,230	5,625	14,838

a LLW generation at the Non-Key Facilities slightly exceeded the SWEIS ROD projection due to heightened activities and new construction.

Significant differences form SWEIS ROD projections occurred at the Sigma Complex (960 cubic meters projected versus 39 actual) and High Explosives Testing (940 cubic meters projected versus 87 actual). In addition, LANSCE generated lower volumes than projected (1,085 cubic meters projected versus 2.6 actual) because decommissioning and renovation of Experimental Area A did not occur. Normal to low workloads and the LANL work suspension accounted for lower waste volumes at the other Key Facilities.

LLW generation at Non-Key Facilities was more than seven times greater than the volume projected in the SWEIS ROD due to heightened activities and new construction at Non-Key Facilities.

3.3.4 Mixed Low-Level Radioactive Wastes

Generation in 2004 approximated 5.2 percent of the MLLW volumes projected by the SWEIS ROD. RS (formerly called the Environmental Restoration Project) produced only 0.02 cubic meters of MLLW in 2004. Table 3.3.4-1 examines these wastes by generator categories.

Table 3.3.4-1. MLLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2003	2004
Key Facilities	m^3/yr	54	16.55	22.9
Non-Key Facilities	m^3/yr	30	19.55	32.9
Remediation Services	m^3/yr	548	0	0.02
LANL	m^3/yr	632	36.10	32.95

3.3.5 Transuranic Wastes

During CY 2004, the LANL TRU waste volumes exceeded the SWEIS ROD projections. As projected in the SWEIS, TRU wastes are expected to be generated almost exclusively in four Key Facilities (the Plutonium Facility Complex, the CMR Building, the RLWTF, and the Solid Radioactive and Chemical Waste Facility) and by RS. RS did not produce any TRU wastes in 2004. TRU waste generated at the Non-Key Facilities during CY 2004 was the result of the OSR Project. Because this waste comes through Shipping and Receiving, it is attributed to that location as the point of generation. Table 3.3.5-1 examines TRU wastes by generator categories.

Table 3.3.5-1. Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2003	2004
Key Facilities	m^3/yr	322	312.91	18.7
Non-Key Facilities	m^3/yr	0	90.46 [a]	40.1 [a]
Remediation Services	m^3/yr	11	0	0
LANL	m^3/yr	333	403.37	40.14

a TRU waste generated at the Non-Key Facilities during CYs 2003 and 2004 was the result of the OSR Project. Because this waste comes through Shipping and Receiving, it is attributed to that location as the point of generation.

3.3.6 Mixed Transuranic Wastes

LANL mixed TRU waste generation in 2004 was below the mixed TRU waste volume projected by the SWEIS ROD. In 2004 mixed TRU waste was generated at only three facilities–the Plutonium Facility Complex, the CMR Building, and the Solid Radioactive and Chemical Waste Facility. Table 3.3.6-1 examines mixed TRU wastes by generator categories.

Table 3.3.6-1. Mixed Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2003	2004
Key Facilities	m^3/yr	115	151.04 [a]	23.9
Non-Key Facilities	m^3/yr	0	5.91 [b]	0
Remediation Services (formerly called the ER Project)	m^3/yr	0	0	0
LANL	m^3/yr	115	156.95	23.9

a SWEIS ROD projection for mixed TRU waste generated by the Key Facilities was exceeded at the Solid Chemical and Radioactive Waste Facility due to DVRS repackaging of legacy TRU waste for shipment to the WIPP.
b Generation of 5.91 cubic meters of mixed TRU waste at the Non-Key Facilities in 2003 was the result of the OSR Project. Because this waste comes through Shipping and Receiving, it is attributed to that location as the point of generation.

Both the Plutonium Facility Complex (23 cubic meters actual versus 102 cubic meters per year projected by the SWEIS ROD) and the CMR Building (0.4 cubic meters actual versus 13 cubic meters per year projected by the SWEIS ROD) produced less mixed TRU waste than projected due to the work suspension and because full-scale production of war reserve pits had not begun.

3.4 Utilities

Ownership and distribution of utility services continue to be split between NNSA and Los Alamos County. NNSA owns and distributes most utility services to LANL facilities, and the County provides these services to the communities of White Rock and Los Alamos. Routine data collection for both gas and electricity are done on a fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.

3.4.1 Gas

There was a change in ownership to the DOE Natural Gas Transmission Line in August 1999. DOE sold 130 miles of gas pipeline and metering stations to the Public Service Company of New Mexico (PNM). This gas pipeline transverses the area from Kutz Canyon Processing Plant south of Bloomfield, New Mexico, to Los Alamos. Approximately 4 miles of the gas pipeline are within LANL. Table 3.4.1-1 presents gas usage by LANL for FY 2004. Approximately 98 percent of the gas used by LANL was used for heating (both steam and hot air). The remainder was used for electrical production. LANL electrical generation is used to fill the difference between peak loads and the electric import capability.

As shown in Table 3.4.1-1, total gas consumption for FY 2004 was less than projected by the SWEIS ROD. During FY 2004, less natural gas was used for heating than in

FY 2003, and there was less electric generation at the TA-03 Power Plant than in FY 2003. Table 3.4.1-2 illustrates steam production for FY 2004.

Table 3.4.1-1. Gas Consumption (decatherms [a]) at LANL/FY[b] 2004

SWEIS ROD	Total LANL Consumption	Total Used for Electric Production	Total Used for Heat Production	Total Steam Production
1,840,000	1,149,936	25,680	1,124,256	Table 3.4.1-2

a A decatherm is equivalent to 1,000 to 1,100 cubic feet of natural gas.
b Routine data collection for both gas and electricity are done on a fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.

Table 3.4.1-2. Steam Production at LANL/FY[a] 2004

TA-03 Steam Production (klb [b])	TA-21 Steam Production (klb)	Total Steam Production (klb)
347,110 [c]	23,910	371,020

a Routine data collection for both gas and electricity are done on a fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.
b klb: Thousands of pounds
c TA-03 steam production has two components: that used for electric production (25,528 klb for FY 2004) and that used for heat (321,582klb in FY 2004).

3.4.2 Electrical

LANL is supplied with electrical power through a partnership arrangement with Los Alamos County, known as the Los Alamos Power Pool, which was established in 1985. The NNSA and Los Alamos County have entered into a 10-year contract known as the Electric Coordination Agreement whereby each entity's electric resources are consolidated or pooled. Recent changes (as of August 1, 2002) in transmission agreements with PNM have resulted in the removal of contractual restraints on Power Pool resources import capability. Import capacity is now limited only by the physical capability (thermal rating) of the transmission lines that is approximately 110 to 120 megawatts from a number of hydroelectric, coal, and natural gas power generators throughout the western United States.

Onsite electric generating capability for the Power Pool is limited by the existing TA-03 Co-generation Complex (the Power Plant generates both steam and power), which is capable of producing up to 20 megawatts of electric power that is shared by the Pool under contractual arrangement. The #3 steam turbine at the Co-generation Complex is currently a 10-MW unit. Rewinding of this unit began in CY 2003; it is expected that after this is completed, the turbine's new output will be greater than 15 MW. Rewinding should be finished and the unit re-installed about May 2005. To get the maximum benefit from this refurbishment, the steam path and cooling tower for the unit need to be improved; this upgrade is scheduled to be completed in FY 2005. Implementation of these improvements should increase the output of the TA-03 Co-generation Complex to greater than 25 MW.

The ability to accept additional power into the Los Alamos Power Pool grid is limited by the regional electric import capability of the existing northern New Mexico power transmission system. In recent years, the population growth in northern New Mexico, together with expanded industrial and commercial usage, has greatly increased power demands on the northern New Mexico regional power system. In CY 2002, LANL completed construction of the new Western Technical Area (WTA) 115/13.8-kV substation at TA-06. The main power transformer for WTA, rated at up to 50 megavolt amperes, was delivered in CY 2001. WTA will provide LANL and the Los Alamos town site with redundancy in bulk power transformation facilities to guard against losses of either the Eastern Technical Area Substation or the TA-03 Substation.

Several proposals for bringing additional power into the region have been considered. One of these proposals is construction of a new transmission line and substation (DOE 2000). The line would be constructed in two segments: from PNM's Norton substation to a newly constructed substation, Southern Technical Area (STA), to be constructed near White Rock, and from the STA substation to the WTA substation. The segment from Norton to WTA would be constructed at 345 kV but operated at 115 kV. Large pulse power loads at LANL will need this higher voltage in the future. The segment from STA to WTA would be constructed and operated at 115 kV. If completed, this would be a third transmission line to LANL; it will add much needed reliability and security to the electric transmission system that serves LANL. Construction of the transmission line and uncrossing of the two existing 115-kV lines within LANL is projected to start in the spring of 2005 and take approximately a year to complete. The contract for the construction of the portion of the line from STA to WTA and the STA switchyard plus the uncrossing of the two existing 115-kV lines has been determined. The line and switchyard should become operational about August 2006. The construction of the portion of the line from the Norton substation to STA is still being negotiated.

The reliability of the Norton Line and the Reeves Line that serve the Power Pool is compromised because they cross at one location within LANL. In doing so, they do not provide physically separate avenues for the delivery of power from independent power supply sources. The crossing of power lines results in a situation where a single outage event, such as a conductor or structural failure, could potentially cause a major power loss to the Power Pool. If such an event occurred when the TA-03 Co-generation Complex was not operating or was being serviced or repaired, there would be no power available to the Power Pool. A single outage event could have serious and disruptive consequences to LANL and to the citizens of Los Alamos County. This vulnerability was noted by the Defense Nuclear Facilities Safety Board (DOE 2002).

In CY 2002, an EA (DOE 2002), "Environmental Assessment for Installation and Operation of Combustion Turbine Generators at Los Alamos National Laboratory, Los Alamos, New Mexico" (DOE/EA-1430) was written to analyze the effects of increasing the TA-03 Co-generation Complex's generating capability by an additional 40 megawatts of power in the near future. Based on this EA, DOE issued a Finding of No Significant Impact in December 2002. Installation of the first combustion turbine generator at the TA-03 power plant is scheduled to occur during the FY 2004 to FY 2005 timeframe.

Table 3.4.2-1 shows peak demand and Table 3.4.2-2 shows annual use of electricity for FY 2003. LANL's electrical energy use remains below projections in the SWEIS ROD. The ROD projected peak demand to be 113,000 kilowatts (with 63,000 kilowatts being used by LANSCE and about 50,000 kilowatts being used by the rest of LANL). In addition, the ROD projected annual use to be 782,000 megawatt hours with 437,000 megawatt hours being used by LANSCE and about 345,000 megawatt hours being used by the rest of LANL. Actual use has fallen below these values, and the projected periods of brownouts have not occurred. However, on a regional basis, failures in the PNM system have caused blackouts in northern New Mexico and elsewhere.

Table 3.4.2-1. Electric Peak Coincident Demand/FY[a] 2004

Category	LANL Base	LANSCE	LANL Total	County Total	Pool Total
SWEIS ROD	50,000[b]	63,000	113,000	Not projected	Not projected
FY 2004	47,608	21,811	69,419	16,231	85,650

a Routine data collection for both gas and electricity are done on a fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.
b All figures in kilowatts.

Table 3.4.2-2. Electric Consumption/FY[a] 2004

Category	LANL Base	LANSCE	LANL Total	County	Pool Total
SWEIS ROD	345,000[b]	437,000	782,000	Not projected	Not projected
FY 2004	327,117	86,275	413,392	127,429	540,821

a Routine data collection for both gas and electricity are done on a fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.
b All figures in kilowatt-hours.

Operations at several of the large LANL loads changed during 2004. In FY 2004 LANSCE changed their operating schedule. For the past several years their electric demand peaked with the rest of LANL, usually in July or August. But, now LANSCE's peak demand has been shifted to the winter (around January). This will change the overall electric demand for LANL, since LANSCE's load is such a large part of the LANL's load (about 46 percent). The peak demand for LANL will change summer to winter. Also, due to budgetary constraints LANSCE may have to reduce their electric demand of annual energy consumption in FY 2006.

The LEDA funding was curtailed in FY 2001 and FY 2002 resulting in the loss of 2 to 4 MW of load. LEDA was decommissioned in FY 2003; no future activity is expected.

The National High Magnetic Field Laboratory sat out operations during FY 2001 and FY 2002. This represents a temporary reduction of approximately 2 megawatts load in FY 2001 and FY 2002. The 60-Tesla superconducting magnet that failed in 2000 has been redesigned and reconstructed and is now back in operation in 2004 at about 2 megawatts of load.

The DARHT facility began commissioning operations of its first axis in FY 2001. The load level is about 1 megawatt for the first axis. The second axis became operational in late FY 2004 and is currently in use at about 1 to 2 megawatts of load.

Mitigation of the damage to LANL utilities from the Cerro Grande Fire was for the most part completed in FY 2002. Tree trimming clearance for the power line corridors will take many more years to bring areas up to the desired LANL standard.

Electrical Infrastructure Safety Upgrades Project

Project Overview
The EISU Project seeks to upgrade the electrical infrastructure in buildings throughout LANL to improve electrical safety. Typically, the project seeks to correct National Electrical Code violations, replace aging, unsafe equipment, and improve equipment and facility grounding.

The Conceptual Design Report for the EISU Project was completed in 1998. Thirty-one buildings were identified for upgrades and were prioritized based on the safety hazards they presented. Since then, the EISU Project has been coordinated with the LANL TYCSP and subprojects have been removed from the list as the buildings have been identified for decommissioning and demolition. To date, five subprojects have been removed from the list for a new total of 26 General Plant Projects. An evaluation of the LANL electrical safety maintenance backlog may increase the number of subprojects under the EISU Project. As of February 2004, four EISU projects have been completed (TA-03-43, TA-16-200, TA-40-1, TA-03-40), five projects are in construction (TA-03-40 S&W, TA-03-261, TA-43-1, TA-46-31, TA-8-21), and three projects were scheduled for design (TA-46-1, TA-53-2, TA-48-1) in FY 2004.

3.4.3 Water

Before September 8, 1998, DOE supplied all potable water for LANL, Bandelier National Monument, and Los Alamos County, including the towns of Los Alamos and White Rock. This water was obtained from DOE's groundwater right to withdraw 5,541.3 acre-feet per year or about 1,806 million gallons of water per year from the main aquifer. On September 8, 1998, DOE leased these water rights to Los Alamos County. This lease also included DOE's contractual annual right obtained in 1976 to 1,200 acre-feet per year of San Juan-Chama Transmountain Diversion Project water. The lease agreement was effective for three years until September 8, 2001. In September 2001, DOE officially turned over the water production system and transferred 70 percent of the water rights to Los Alamos County. Los Alamos County has continued to lease the remaining 30 percent of the water rights from DOE. LANL is now considered a customer of Los Alamos County. Los Alamos County is continuing to pursue the use of San Juan-Chama water as a means of maintaining those water rights. Los Alamos County has completed a preliminary engineering study and is currently negotiating a convert contract, which will provide more stability, prior to further investment.

LANL is in the process of installing additional water meters and a Supervisory Control and Data Acquisition/Equipment Surveillance System on the distribution system to keep track of water usage and to determine the specific water use for various applications. Data is being accumulated to establish a basis for conserving water. LANL continues to maintain the distribution system by replacing portions of the over-50-year old-system as problems arise. In remote areas, LANL is trying to automate the monitoring of the system to be more responsive during emergencies such as the Cerro Grande Fire.

Table 3.4.3-1 shows water consumption in thousands of gallons for CY 2004. Under the expanded alternative, water use for LANL was projected to be 759 million gallons per year. LANL consumed about 347 million gallons during CY 2004. Actual use by LANL in 2004 was about 412 million gallons less than the SWEIS ROD projected consumption. A 10-year agreement with Los Alamos County, which started in 1998, has an escalating estimated LANL water consumption. Actual use by LANL in CY 2004 was about 191 million gallons less than the estimated CY 2004 consumption of 538 million gallons. The calculated NPDES discharge of 209.8 million gallons (see Table 3.2-2) in CY 2003 was about 56 percent of the total LANL usage of 378 million gallons.

Table 3.4.3-1. Water Consumption (thousands of gallons) for Calendar Year 2004

Category	LANL	Los Alamos County	Total
SWEIS ROD	759,000	Not Projected	Not Applicable
CY 2004	346,624	Not Available [a]	Not Available [a]

a In September 2001, Los Alamos County acquired the water supply system and LANL no longer collects this information.

The County now bills LANL for water, and all future water use records maintained by LANL will be based on those billings. The distribution system used to supply water to LANL facilities now consists of a series of reservoir storage tanks, pipelines, and fire pumps. The LANL distribution system is gravity fed with pumps for high-demand fire situations at limited locations.

3.5 Worker Safety

Working conditions at LANL have remained essentially the same as those identified in the SWEIS. The work suspension from July 16 through most of the year stopped all but essential medium- and high-risk work activities performed during this time period. More than half the workforce remains routinely engaged in activities that are typical of office and computing industries. Much of the remainder of the workforce is engaged in light industrial and bench-scale research activities. Approximately one-tenth of the general workforce at LANL continues to be engaged in production, services, maintenance, and research and development within Nuclear and Moderate Hazard facilities.

3.5.1 Accidents and Injuries

Table 3.5.1-1 summarizes occupational injury and illness rates during CY 1999–CY 2004. Occupational injury and illness rates for workers in CY 2004, although higher than previous years, continue to be small as shown in Table 3.5.1-1. These rates correlate to reportable injuries and illnesses during the year for 200,000 hours worked or roughly 100 workers.

Table 3.5.1-1. Total Recordable and Lost Workday Case Rates at LANL

Calendar Year	UC Workers Only		LANL (all workers)	
	TRC[a]	DART[b]	TRC	DART
1999	2.37	1.24	2.52	1.37
2000	1.53	0.62	1.97	0.94
2001	1.62	0.55	1.96	0.91
2002	2.16	1.24	2.39	1.46
2003	2.11	1.08	2.30	1.26
2004	2.93	1.3	2.86	1.35

a Total recordable cases, number per 200,000 hours worked. Formerly called TRI: Total Recordable Incident rate
b Days Away, Restricted, or Transferred, number of cases per 200,000 hours worked. Formerly called LWC: Lost workday cases

3.5.2 Ionizing Radiation and Worker Exposures

Occupational radiation exposures for workers at LANL during CY 2004 are summarized in Table 3.5.2-1. The collective Total Effective Dose Equivalent, or collective TEDE, for the LANL workforce during CY 2004 was 124.6 person-rem, considerably lower than the workforce dose of 704 person-rem projected by the ROD. These reported doses in Table 3.5.2-1 for 2004 could change with time because estimates of committed effective dose equivalent in many cases are based on several years of bioassay results, and as new results are obtained the dose estimates may be modified accordingly. The reduction of collective dose from 2003 to 2004 resulted from the suspension of work at nuclear facilities. Of the 124.6 person-rem collective TEDE reported for CY 2004, 8.7 person-rem was from internal exposures to radioactive materials, primarily from small plutonium uptakes.

Table 3.5.2-1. Radiological Exposure to LANL Workers

Parameter	Units	SWEIS ROD	Value for 2003	Value for 2004
Collective TEDE (external + internal)	person-rem	704	241	124.6
Number of workers with non-zero dose	number	3,548	1,989	1,710
Average non-zero dose:				
• external + internal radiation exposure	millirem	Not projected	121	73
• external radiation exposure only	millirem	Not projected	111	68

The highest individual doses in CY 2004 were 1.539, 1.510, 1.500, 1.148, and 1.061 rem. There were no worker doses that exceeded the DOE's 5-rem-per-year Radiation Protection Standard and all workers' doses in 2004 were below the 2-rem-per-year performance goal set by the ALARA (as low as reasonably achievable) Steering

Committee in accordance with LANL procedures. Table 3.5.2-2 summarizes the highest individual dose data for CYs 1999–2004.

Table 3.5.2-2. Highest Individual Doses from External Radiation to LANL Workers (rem) [a]

CY 1999	CY 2000	CY 2001 [b]	CY 2002	CY 2003	CY2004
1.910	1.048	1.284	2.214	10.197	1.539
1.866	1.013	1.225	1.897	8.097	1.510
1.783	0.905	1.123	1.813	1.710	1.500
1.755	0.828	1.002	1.644	1.569	1.148
1.749	0.815	0.934	1.619	1.214	1.061

a Data on highest doses have only been presented in the Yearbooks since CY 2000.
b During CY 2001, five individual doses were greater than 1 rem but less than 2 rem. Only the highest dose was identified.

Comparison with the SWEIS Baseline. The collective TEDE for CY 2004 is 60 percent of the 208 person-rem of 1993–1995 used as the baseline in the ROD.

Work and Workload: Changes in workload and types of work at nuclear facilities tend to increase or decrease the collective TEDE. Of special importance to the baseline ROD is that the radionuclide (Pu-238) power source for the Cassini spacecraft was being constructed at TA-55 during the baseline time period. Workers incurred higher neutron exposure during this project. After the project was completed in the 1995–1996 time frame, the LANL collective TEDE was reduced. Pu-238 programs at TA-55 remain active today, but long-term plans are to shift this mission to Idaho National Engineering and Environmental Laboratory. Pit production at TA-55 is planned to increase to 50 pits per year, which will result in higher collective doses.

ALARA Program: Improvements in the ALARA program, such as the continuing addition of shielding and better radiological safety designs that are being implemented during the replacement of aged production lines in TA-55, should result in lower worker exposures and justify collective TEDE for LANL plutonium workers.

Comparison with the Projected TEDE in the ROD. The CY 2004 collective TEDE is less than the baseline collective TEDE levels in CYs 1993–1995, and significantly less than the 704 person-rem collective TEDE projected in the ROD. The implementation of war reserve pit manufacture, which was approved in the ROD, has not become fully operational causing lower collective doses than projected. The collective dose will increase once the pit manufacturing program is fully implemented.

Collective TEDEs for Key Facilities. In general, collective TEDEs by Key Facility or TA are difficult to determine because these data are collected at the group level, and members of many groups and/or organizations receive doses at several locations. The fraction of a group's collective TEDE coming from a specific Key Facility or TA can only be estimated. For example, personnel from the Health Physics Operations group (HSR-1) and KSL are distributed over all of LANL, and these two organizations account for a significant fraction of the total LANL collective TEDE. Approximately 95 percent of the collective TEDE that these groups incur is estimated to come from operations at

TA-55. The total collective TEDE for NMT Division, HSR-1, and KSL groups in CY 2004 was approximately 90 person-rem, which is 72 percent of the total LANL collective TEDE of 124.6 person-rem.

3.6 Socioeconomics

The LANL-affiliated workforce continues to include UC employees and subcontractors. As shown in Table 3.6-1, the number of employees has exceeded SWEIS ROD projections. The 13,261 employees at the end of CY 2004 are 2,265 more employees than SWEIS ROD projections of 11,351. SWEIS ROD projections were based on 10,593 employees identified for the index year (employment as of March 1996). The 13,261 total employees at the end of CY 2004 reflect a *decrease* of 355 employees over the 13,616 employees reported in the 2003 Yearbook (LANL 2004a).

Table 3.6-1. LANL-Affiliated Work Force

Category	UC Employees	Technical Contractor	Non-Technical Contractor	KSL	PTLA	Total
SWEIS ROD [a]	8,740	795	Not projected [b]	1,362	454	11,351
Calendar Year 2004	10,374	815	157	1,375	542	13,261

a Total number of employees was presented in the SWEIS, the breakdown had to be calculated based on the percentage distribution shown in the SWEIS for the base year.
b Data were not presented for non-technical contractors or consultants.

These employees have had a positive economic impact on northern New Mexico. Through 1998, DOE published a report each fiscal year regarding the economic impact of LANL on north-central New Mexico as well as the State of New Mexico (Lansford et al. 1997, 1998, and 1999). The findings of these reports indicate that LANL activities resulted in a total increase in economic activity in New Mexico of about $3.2 billion in 1996, $3.9 billion in 1997, and $3.8 billion in 1998. The publication of this report was discontinued after FY 1998 due to funding deficiencies. However, based on number of employees and payroll, it is expected that the LANL 2004 economic contribution was similar to the three years analyzed for DOE.

The residential distribution of UC employees reflects the housing market dynamics of three counties. As seen in Table 3.6-2, 88 percent of the UC employees continued to reside in the three counties of Los Alamos, Rio Arriba, and Santa Fe.

Table 3.6-2. County of Residence for UC Employees [a]

Calendar Year	Los Alamos	Rio Arriba	Santa Fe	Other NM	Total NM	Outside NM	Total
SWEIS ROD [b]	4,279	1,762	1,678	671	8,390	350	8,740
Calendar Year 2004	5,010	1,924	2,240	670	9,844	530	10,374

a Includes both Regular and Temporary employees, including students who may not be at LANL for much of the year.
b Total number of employees was presented in the SWEIS, the breakdown had to be calculated based on the percentage distribution shown in the SWEIS for the base year.

LANL records contain the TA and building number of each employee's office. This information does not necessarily indicate where the employee actually performs his or her work; but rather, indicates where this employee gets mail and officially reports to duty. However, for purposes of tracking the dynamics of changes in employment across Key Facilities, this information provides a useful index. Table 3.6-3 identifies UC

Table 3.6-3. UC Employee[a] Index for Key Facilities

Key Facility	Reference Year 1999 [b]	Calendar Year 2004
Plutonium Complex	589	727
Tritium Facilities	28	19
CMR	204	196
Pajarito Site	70	38
Sigma Complex	101	100
MSL	57	59
Target Fabrication	54	50
Machine Shops	81	108
High Explosive Testing	227	248
High Explosive Processing	96	105
LANSCE	560	401
Bioscience	98	113
Radiochemistry Laboratory	128	116
Waste Management – Radioactive Liquid Waste	62	59
Waste Management – Radioactive Solid and Chemical Waste	65	61
Rest of LANL	4,601	5,755
Total Employees	7,021	8,268

a Includes full-time and part-time regular employees; it does not include students who may be at LANL for much of the year nor does it include special programs personnel. A similar index does not exist in the SWEIS, which used a very time-intensive method to calculate this index.

b CY 1999 was selected as the reference year for this index because it represents the year the SWEIS ROD was published.

employees by Key Facility based on the facility definitions contained in the SWEIS. The employee numbers contained in the category "Rest of LANL," were calculated by subtracting the Key Facility numbers from the CY total.

The numbers in Table 3.6-3 cannot be directly compared to numbers in the SWEIS. The employee numbers for Key Facilities in the SWEIS represent total workforce, and include PTLA, KSL, and other subcontractor personnel. The new index (shown in Table 3.6-3) is based on routinely collected information and only represents full-time and part-time regular UC employees. It does not include employees on leave of absence, students (high school, cooperative, undergraduate, or graduate), or employees from special programs (i.e., limited-term or long-term visiting staff, post-doctorate, etc.). Because the two sets of numbers do not represent the same entity, a comparison to numbers in the SWEIS is not appropriate. This new index will be used throughout the lifetime of the Yearbook; hence, future comparisons and trending will be possible. CY 1999 was selected as the reference year for this index because it represents the year the SWEIS ROD was published.

3.7 Land Resources

Land resources were examined in 1996–1998 during the development of the SWEIS. From then until CY 2002, the land resources (i.e., undeveloped and developed lands) available for use at LANL remained constant. In CY 2002, approximately 2,209 acres of land were transferred to private ownership under Public Law 105-119. No lands were transferred during CY 2003 or CY 2004.

During 2000, land resources were impacted by the Cerro Grande Fire, which burned across approximately 7,500 acres or 27 percent of LANL's land. Of the 332 structures affected by the fire, 236 were impacted, 68 damaged, and 28 destroyed (ruined beyond economic repair). Fire mitigation work, such as flood retention structures, modified fewer than 50 acres of undeveloped land.

Also during CY 2000, LANL's new Comprehensive Site Plan (LANL 2000b) was completed. This site plan is LANL's guide for land development and its geographic information system identified approximately 18,500 acres or two-thirds of LANL's land resources as undesirable for development due to physical and operational constraints. Of the remaining 9,300 acres (about one-third of LANL) over 5,500 acres have been developed, leaving about 4,000 acres undeveloped. The majority of this undeveloped land is located in TA-58, TA-70, TA-71, and TA-74. Because of the remote locations and adjacent land uses of TA-70, TA-71, and TA-74, these lands are not considered prime developable lands for LANL activities.

Projects under construction in CY 2004 included the CINT, the Medical Clinic, the MST Office Building, the High-Powered Detonator Facility, and the Hydrotest Design Facility. Most of these projects are on previously developed or disturbed land (LANL 2000a).

CY 2004 was similar to the previous calendar years: the land acreage (Table 3.7-1) remained constant; the ongoing construction projects from CY 2003 continued; and the mitigation efforts and repairs from the Cerro Grande Fire of 2000 continued.

Table 3.7-1. Sitewide Land Use

Land Use Category	Acreage in CY 2004
Service/Support	184
Experimental Science	705
High Explosives Research and Development	1,297
High Explosives Testing	7,209
Nuclear Materials Research and Development	131
Physical/Technical Support	452
Public/Corporate Interface	31
Theoretical/Computational	7
Waste Management	196
Reserve	15,355
Total	25,590

The RS Project is unique from a land use standpoint. Rather than using land for development, the project cleans up legacy wastes and makes land available for future use. Through these efforts, several large tracts of land will be made available for use by LANL, Los Alamos County, or other adjacent landowners. For example, under Public Law 105-119, the DOE was directed to convey to Los Alamos County and transfer to the Department of Interior, in trust for the Pueblo of San Ildefonso, lands not required to meet the national security mission of DOE. Several tracts of land were identified for conveyance or transfer and, pending cleanup by RS, will be made available for future use.

CY 2002 marked the first land transfers under Public Law 105-119 (LANL 2003b). In CY 2004, no land was transferred to private ownership. Table 3.7-2 provides a summary of the potential land parcels remaining to be transferred.

Table 3.7.2 Potential Land Transfer Tracts

Land Tract	Acreage	Location
TA-21	244	On the eastern end of the same mesa on which the central business district or Los Alamos is located.
DP Road	50	Between the western boundary of TA-21 and the major commercial districts of the Los Alamos town site.
DOE LASO	13	Within the Los Alamos town site between Los Alamos Canyon and Trinity Drive.
Airport	198	East of the Los Alamos town site, close to the East Gate Business Park.
Rendija Canyon	909	North of and below Los Alamos town site's Barranca Mesa residential subdivision.
White Rock Y	435	A complex area that incorporates the alignments and intersections of State Routes 4 and 502 and the easternmost part of Jemez Road.

Because of the land transfers, the distance to some site boundaries has decreased and a preliminary assessment of the impact of the boundary changes on the accident analyses in the SWEIS has been performed. The full assessment is in Appendix E of the SWEIS Yearbook 2003 (LANL 2004a).

The basic conclusion of the assessment is that the decrease in distances between assumed accident locations and previously analyzed receptor locations will have little or no impact on estimated doses in the SWEIS. On this basis there appears to be no need to revise accident analyses in the SWEIS because of land transfers from the DOE to public entities. The conclusion is based on a review of several facilities and postulated accidents, especially risk-dominant accidents in the SWEIS. Very few or minimal changes in predicted effects are expected to occur. One exception, a hydrogen cyanide accident at the Sigma Facility, has been noted. The SWEIS still serves the purpose of characterizing LANL operations, differentiating among alternatives, and presenting a baseline that is suitable for tiering and bounding of potential accidents at LANL. A recommendation in the conclusion is that site boundary changes be considered in future NEPA reviews as appropriate.

3.8 Groundwater

Groundwater occurs in three settings beneath the Pajarito Plateau: alluvium, intermediate saturated zones, and the regional aquifer. The major source of recharge to the regional aquifer beneath the Pajarito Plateau is precipitation within the Sierra de los Valles. However, alluvial groundwater on the Pajarito Plateau is also a source of recharge to underlying intermediate saturated zones and to the regional aquifer.

Water levels have been measured in wells tapping the regional aquifer since the late 1940s when the first exploratory wells were drilled by the US Geological Survey (LANL 1998a). The annual production and use of water increased from 231 million gallons in 1947 to a peak of 1,732 million gallons in 1976. Water use has declined since 1976 to 1,506 million gallons in 2000 (LANL 2003c). LANL used between about 50 percent and 27 percent of the total water pumped from 1999 to 2001 (LANL 2003c). Trends in water levels in the wells reflect a plateau-wide decline in regional aquifer water levels in response to municipal water production. The decline is gradual and does not exceed one to two feet per year for most production wells (LANL 2003c; 1998a). When pumping stops in the production wells, the static water level returns in about six to 12 months. Hence, the water level trends suggest no adverse impacts on long-term water supply production from groundwater withdrawals (LANL 2003c, 1998a).

Sampling and analysis of water from water supply wells indicate that water in the regional aquifer beneath the Pajarito Plateau is generally of high quality and meets or exceeds all applicable water supply standards. There have been 29 hydrogeologic characterization wells installed in the regional aquifer and six characterization wells in intermediate saturated zones over the past six years and each of the wells has been sampled (Figure 3-1). The chemistry of regional aquifer water ranges from calcium-sodium bicarbonate composition (Sierra de los Valles) to sodium-calcium bicarbonate composition (White Rock Canyon springs) (LANL 1995a, 2001b, 2002b, 2002c). Silica is the second most abundant solute found in surface water and groundwater because of reactions between soluble silica glass in the rock and water. Trace metals including barium, strontium, and uranium vary within the different saturated zones (alluvial, intermediate, and regional aquifer) depending on how long the water has been in contact with the host rock. Older groundwater within the regional aquifer tends to have higher concentrations of trace elements.

The conceptual model with regard to interconnection between alluvial groundwater, intermediate saturated zones, and the regional aquifer has been refined based on the data collected in the drilling, sampling, and testing of new wells. The conceptual model is that contaminants are transported in surface water or alluvial groundwater from source areas to areas where infiltration occurs. Infiltration is most likely to occur where the Bandelier Tuff thins or is not present (for example, Los Alamos Canyon near the low-head weir on State Route 4) or where a structure pools water (for example, in Mortandad Canyon at the sediment traps). Infiltration carries contaminants to intermediate saturated zones and to the regional aquifer.

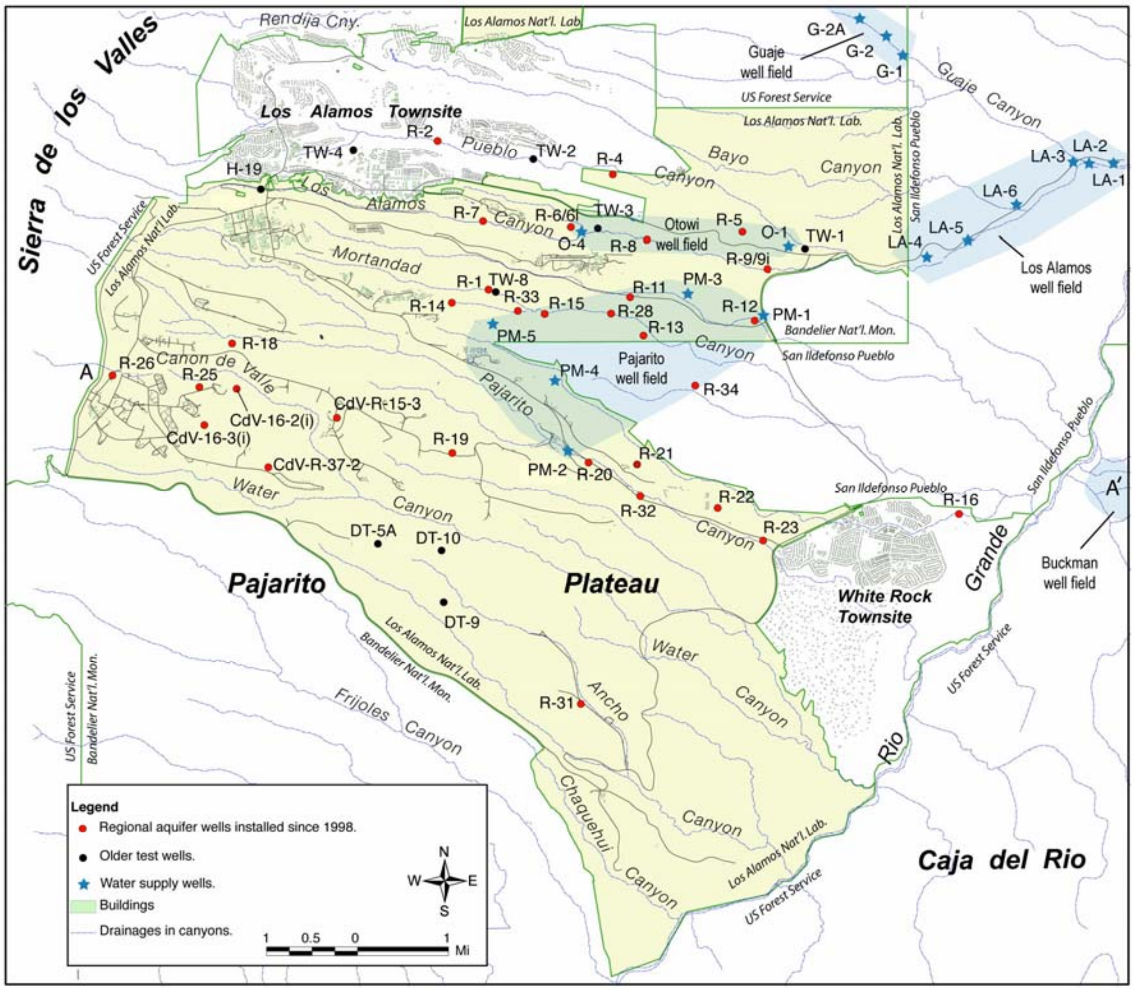

Figure 3-1. Regional aquifer wells at LANL and vicinity.

Based on analysis of water samples, the source terms correlate reasonably well with chemical data for mobile solutes collected at downgradient characterization wells (LANL 2001b, 2002b). Non-adsorbing contaminants (perchlorate, nitrate, and tritium) are among the most mobile and travel the greatest distances along flow paths**.** Groundwater impacted by LANL-derived effluent is characterized by elevated concentrations of major ions (calcium, magnesium, potassium, sodium, chloride, bicarbonate, nitrate, and sulfate); trace solutes (for example, molybdenum, perchlorate, barium, boron, and uranium); high explosive compounds and other VOCs; and radionuclides (tritium, americium-241, cesium-137, plutonium isotopes, strontium-90, and uranium isotopes) (LANL 2001b, 2002b, 2002c, 2002d, 2002e).

Work underway as part of the Hydrogeologic Characterization Program, and described in the Hydrogeologic Workplan (LANL 2001c), provided new information on the regional aquifer and details of the hydrogeologic conditions. By the end of 2004, five additional characterization wells were complete. The characterization wells were drilled using air rotary in the vadose zone and rotary with water, foam, or EZ Mud (a polymer) in the saturated zone. Geologic core was collected in the upper vadose zone in some of the wells and geologic cuttings were collected at defined intervals during the drilling operations and described to record the stratigraphy encountered. Geophysical logging was conducted in each well to enhance the understanding of the stratigraphy and rock characteristics. The five completed characterization wells include

- R-6 and R-6i in DP Canyon,
- R-18 in Pajarito Canyon, and
- R-33 and R-34 in Mortandad Canyon.

R-6 is located in DP Canyon, a tributary in the Los Alamos watershed. The primary purpose of the well is to serve as an upgradient sentinel well for water supply well Otowi-4. Drilling started in October 2004 and was completed at a total depth of 1,303 feet in November 2004. The regional aquifer water table is at a depth of 1,158 feet in the older fanglomerate unit. The well was constructed with a single screen at the water table. R-6i was drilled to characterize an intermediate perched zone encountered while drilling R-6. It has a total depth of 697 feet and was completed with a single screen.

R-18 is located in upper Pajarito Canyon, within TA-14. The primary purpose of the well is to characterize groundwater in the intermediate-depth perched groundwater (if present) and regional groundwater downgradient from several LANL areas. Drilling started in November 2004 and was completed at a total depth of 1,440 feet in December 2004. The regional aquifer water table is at a depth of 1,286 feet in the fanglomerates of the Puye Formations. The well was constructed with a single screen at the water table.

R-34 is located in lower Mortandad Canyon on San Ildefonso Pueblo. The primary purpose of the well is to determine regional aquifer water quality downgradient of the LANL boundary and to establish a regional aquifer monitoring point on San Ildefonso Pueblo. Drilling started in July 2004 and was completed at a total depth of 1,065 feet in August 2004. The regional aquifer water table is at a depth of 796 feet in the Puye Formation. The well was constructed with a single screen at the water table.

R-33 is located in Mortandad Canyon. R-33 will be used to provide sentinel contaminant monitoring for supply well PM-5 along with R-14 and R-15. Drilling started in August 2004 and was completed at a total depth of 1,140 feet in October 2004. The regional aquifer water table is at a depth of 979 feet in the Puye Formation. The well was constructed with two screens, one at the water table and the second in the Totavi Lentil. Water samples taken from both screens in the well during development did not have detectable levels of nitrate or perchlorate (Longmire and Counce 2005).

In addition to the site-wide hydrogeologic characterization, substantial progress was made on the Mortandad Canyon Groundwater Investigation, as described in the Mortandad Canyon Groundwater Work Plan (LANL 2003d). In the fall of 2004 the following were completed:

- six intermediate-depth wells were completed (I-1, I-4, I-5, I-6, I-8, and I-10) with about 2,185 feet of core collected for contaminant and moisture profile analysis,

- thirteen alluvial wells were completed (A-1, A-2, A3a-f, A-4, A-5, A-6, A-7, and A-9) and about 410 feet of core collected,
- fourteen characterization boreholes (no wells constructed) resulting in 1,300 feet of core collected, and
- three boreholes (no wells constructed) to evaluate the relationship between the results from the 2002 resistivity survey and the moisture profiles and potential perched groundwater in the upper vadose zone. About 590 feet of core were collected from these boreholes.

Preliminary results from the Mortandad Canyon Groundwater Investigation (LANL 2005d) are as follows:

- The new regional well R-33 shows no contamination with respect to nitrate, perchlorate, and tritium based on initial analytical results.
- The intermediate wells show concentrations of perchlorate and nitrate that are of similar magnitude or lower than in previously drilled intermediate-depth wells.
- Recharge to perched saturated zones in Mortandad Canyon probably occurs east of well I-8, based on the lack of contaminants in the initial analytical results.

3.9 Cultural Resources

LANL has a large and diverse number of historic properties. Approximately 85 percent of DOE land in Los Alamos County has been surveyed for prehistoric and historic cultural resources. Over 1,700 prehistoric sites have been recorded (Table 3.9-1). More than 85 percent of these archeological sites date from the 14th and 15th centuries. Most of the sites are found in the piñon-juniper vegetation zone, with 80 percent lying between 5,800 and 7,100 feet in elevation. Almost three-quarters of all sites are found on mesa tops.

LANL continues to evaluate buildings and structures from the Manhattan Project and the Early Cold War period (1943–1963) for eligibility to the Natural Register of Historic Places (NRHP). Within LANL's limited access boundaries, there are ancestral villages, shrines, petroglyphs, sacred springs, trails, and traditional use areas that could be identified by Pueblo and Athabascan[1] communities as traditional cultural properties.

The SWEIS ROD lists 2,319 historic (AD 1600 to the present) cultural resource sites, including sites dating from the Historic Pueblo, US Territorial, Statehood, Homestead, Manhattan Project, and Cold War periods (Table 3.9-2).

To date LANL has identified no sites associated with the Spanish Colonial or Mexican Periods. During FY 2004 it was decided to combine the historic periods (Historic Pueblo, US Territorial, Statehood, and Undetermined Athabaskan) into one site affiliation code "Early Historic Pajarito Plateau" (AD 1500 to 1943). Many of the 2,319 potential

[1] Athabascan refers to a linguistic group of North American Indians. Their range extends from Canada to the American Southwest, including the languages of the Navajo and Apache.

Table 3.9-1. Acreage Surveyed, Prehistoric Cultural Resource Sites Recorded, and Cultural Resource Sites Eligible for the National Register of Historic Places at LANL FY 2004[a]

Fiscal Year	Total acreage surveyed	Total acreage systematically surveyed to date	Total prehistoric cultural resource sites recorded to date[b] (cumulative)	Total number of eligible & potentially eligible NRHP sites	Number of notifications to Indian Tribes [c]
SWEIS ROD	Not reported	Not reported	1,295[d]	1,092	23
1998	1,920	17,937	1,369	1,304	10
1999	1,074	19,011	1,392	1,321	13
2000	119	19,428	1,459	1,386	6
2001	4,112	19,790	1,424[d]	1,297[d]	2
2002	2,686	22,476	1,835	1,699	6
2003	200	22,676	1,797 [d]	1,667 [d]	6
2004	50	22,726	1,785 [d]	1,650 [d]	3

a Source: Information on LANL provided by DOE/LASO and LANL Cultural Resources Team (CRT) (formerly the Heritage Resources and Environmental Policy Compliance Team) to the Secretary of Interior for a Report to Congress on Federal Archaeological Activities.

b In the CYs 1999 and 2000 Yearbooks, this column, then titled 'Total Archaeological Sites Recorded to Date,' included Historic Period cultural resources (AD 1600 to present), including buildings. In order to conform to the way cultural properties were discussed in the SWEIS, Historic Period properties were removed beginning with the CY 2001 SWEIS Yearbook. Historic sites are now documented in a separate table (Table 3.9-2).

c As part of the SWEIS preparation, 23 tribes were consulted in a single notification. Subsequent years, however, show the number of separate projects for which tribal notifications were issued; the number of tribes notified is not indicated.

d As part of ongoing work to field verify sites recorded 20 to 25 years ago, LANL's CRT has identified sites that have been recorded more than once and have multiple Laboratory of Anthropology site numbers. Therefore, the total number of recorded archaeological sites is less than indicated in FY 2000. This effort will continue over the next several years and more sites with duplicate records will probably be identified.

Table 3.9-2 Historic Period Cultural Resource Properties at LANL[a]

Fiscal Year	Potential Properties[b]	Properties Recorded[c]	Eligible and Potentially Eligible Properties	Non-Eligible Properties	Evaluated Buildings Demolished
LANL SWEIS ROD	2319	164	98	Not Reported	Not Reported
1998	Not Reported	181	136	45	Not Reported
1999	Not Reported	240	170	70	Not Reported
2000	Not Reported	246	173	73	Not Reported
2001	733	259	186	73	33
2002	753	301	218	83	42
2003	757	404	254	150	71
2004	760	410	255	155	82

a Source: Information on LANL provided by DOE/LASO and LANL CRT to the Secretary of Interior for a Report to Congress on Federal Archaeological Activities. Numbers given represent cumulative total properties identified, evaluated, or demolished by the end of the given fiscal year.

b This number includes historic sites that have not been evaluated, and therefore, may be potentially NRHP-eligible. In addition, beginning with the CY 2002 Yearbook, historic properties that are exempt from review under the terms of the Programmatic Agreement were removed from these totals, substantially reducing the number of potential Historic Period cultural resources.

c This represents both eligible and non-eligible sites.

historic cultural resources are temporary and modular properties, sheds, and utility features associated with the Manhattan Project and Cold War periods. Since the SWEIS ROD was issued, these types of properties have been removed from the count of historic properties because they are exempt from review under the terms of the Programmatic Agreement (MOU DE-GM32-00AL77152) between the DOE LASO, the New Mexico State Historic Preservation Office, and the Advisory Council on Historic Preservation. Additionally, the CRT has evaluated many Manhattan Project and Early Cold War properties (AD 1942–1963) and those properties built after 1963 that potentially have historical significance, reducing the total number of potential historic cultural resource sites to 757. Most buildings built after 1963 are being evaluated on a case-by-case basis as projects arise that have the potential to impact the properties. Therefore, additional buildings may be added to the list of historic properties in the future.

LANL has recorded 137 historic sites. All have been given unique New Mexico Laboratory of Anthropology site numbers. Some of the 137 are experimental areas and artifact scatters dating from the Manhattan Project and Early Cold War periods. The majority, 124 sites, are structures or artifact scatters associated with the Early Historic Pajarito Plateau or Homestead periods. Of these 137 sites, 97 have been declared eligible for the NRHP. LANL's Manhattan Project and Early Cold War period buildings account for the remaining 620 of the 757 Historic Period properties. At this time, the New Mexico State Historic Preservation Division (NMSHPD) does not assign Laboratory of Anthropology numbers to LANL buildings. Of these historic buildings, 273 have been evaluated for eligibility and inclusion on the NRHP. One hundred fifteen of these evaluated buildings have been declared not eligible for the NRHP; the remaining 158 are NRHP-eligible.

The CRT has documented 63 of the NRHP-eligible buildings in accordance with the terms of official Memorandums of Agreement between the DOE and the NMSHPD. They have subsequently been decontaminated, decommissioned, and demolished through the Decontamination and Decommissioning Program. Forty-two of the 115 non-eligible buildings have also been demolished through this program.

3.9.1 Compliance Overview

Section 106 of the National Historic Preservation Act, Public Law 89-665, implemented by 36 Code of Federal Regulations Part 800 (36 CFR 800), requires federal agencies to evaluate the impact of proposed actions on historic properties. Federal agencies must also consult with the State Historic Preservation Officer (SHPO) and/or the Advisory Council on Historic Preservation about possible adverse effects to NRHP-eligible resources.

During FY 2004 (October 2003 through September 2004), the CRT evaluated 807 LANL-proposed actions and conducted one new field survey to identify cultural resources. DOE sent 11 survey reports to the SHPO for concurrence in findings of effects and determinations of eligibility for the NRHP of cultural resources located during the survey.

The American Indian Religious Freedom Act of 1978 (Public Law 95-341) stipulates that it is Federal policy to protect and preserve the right of American Indians to practice their traditional religions. Tribal groups must receive notification of possible alteration of traditional and sacred places. The Governors of San Ildefonso, Santa Clara, Cochiti, and Jemez Pueblos and the President of the Mescalero Apache Tribe received copies of three reports to identify any traditional cultural properties that a proposed action could affect.

CRT completed documentation and interpretation to resolve the adverse effects of decommissioning and decontamination on 31 buildings required by seven Memorandums of Agreement in 2004.

The Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601) states that if burials or cultural objects are inadvertently disturbed by Federal activities, work must stop in that location for 30 days, and the closest lineal descendant must be consulted for disposition of the remains. No discoveries of burials or cultural objects occurred in FY 2004 from Federal undertakings.

The Archaeological Resources Protection Act of 1979 (Public Law 96-95) provides protection of cultural resources and sets penalties for their damage or removal from Federal land without a permit. No violations of this Act were recorded on DOE land in FY 2004.

3.9.2 Compliance Activities

Nake'muu. During FY 2004, as part of the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility Mitigation Action Plan (LANL 1995b), the CRT continued a long-term monitoring program at the ancestral pueblo of Nake'muu to assess the impact of LANL mission activities on cultural resources. Nake'muu is the only pueblo at LANL that still contains its original standing walls. It dates from circa AD 1200 to 1325 and contains 55 rooms with walls standing up to six feet high. Over the seven-year monitoring program, the site has witnessed a 0.7 percent displacement rate of chinking stones and 0.3 percent displacement of masonry blocks. The annual loss rate dropped slightly for chinking stones (0.5 percent) and masonry blocks (0.07 percent). However, it reflects a continuing three-year pattern of low displacement rates. Statistical analyses indicate that these displacement rates are significantly correlated with annual snowfall, but not with annual rainfall or shots from the DARHT Facility.

Traditional Cultural Properties Comprehensive Plan. During FY 2004, the CRT continued to assist DOE in implementing the Traditional Cultural Properties Comprehensive Plan (LANL 2000c). This included a formal meeting with the Pueblo of San Ildefonso and informal discussions with the Pueblo of Santa Clara. Discussions during the year centered around working with San Ildefonso regarding properties in TA-03, along with working with both San Ildefosno and Santa Clara regarding traditional cultural properties in Rendija Canyon.

Land Conveyance and Transfer. The Programmatic Agreement Among the United States Department of Energy, the Advisory Council on Historic Preservation, the New

Mexico State Historic Preservation Officer, and the Incorporated County of Los Alamos, New Mexico, Concerning the Conveyance of Certain Parcels of Land to Los Alamos County, New Mexico was signed in May 2002. Excavations at the Rendija Canyon Tract continued from June to November 2004. A total of 11 cultural sites were excavated during the field season. An additional 11 sites are expected to be excavated during the summer of 2005. Five historic buildings will be documented before D&D or transfer to Los Alamos County.

Cerro Grande Fire Recovery. During 2004, the CRT continued to assist the Cerro Grande Rehabilitation Project in support of a contract with the Pueblo of San Ildefonso to conduct additional hand tree thinning in and around areas containing large concentrations of Ancestral Pueblo and Archaic period archaeological sites. This work will be conducted in 2005.

3.9.3 Cultural Resources Management Plan

The Cultural Resources Management Plan (CRMP) will provide a set of guidelines for managing and protecting cultural resources, in accordance with requirements of the National Historic Preservation Act, the Archaeological Resources Protection Act, and the American Indian Religious Freedom Act and in the context of UC/LANL's mission.

The Comprehensive Plan for Consideration of Traditional Cultural Properties and Sacred Sites at Los Alamos National Laboratory, New Mexico (LANL 2000c), issued August 2000, presents a framework for collaborating with Native American Tribal organizations and other ethnic groups in identifying traditional cultural properties and sacred sites. The CRMP will provide high-level guidance for implementation of this Comprehensive Plan and all other aspects of cultural resources management at LANL.

Status:
The bulk of the CRMP was written in 2004 and will be completed in draft form during 1st quarter 2005. The management plan will be updated every five years after issuance.

Relationship to Other Plans:
The Biological Resources Management Plan (particularly the Threatened and Endangered Species Habitat Management Plan [LANL 1998b]) may limit access to certain cultural resource sites. Erosion control under the water plans will have a potential impact on cultural resource sites.

Demolished Buildings

Table 3.9.3-1 indicates the extent of historic building documentation and demolition to date. For FY 2002 and FY 2003 the number of documented buildings that were demolished was corrected from last years report. Additionally, to date, not all buildings that have been documented have been demolished.

Table 3.9.3-1. Historic Building Documentation and Demolition Numbers

Fiscal Year	Number of Buildings for which Required Documentation was Completed	Number of Buildings Actually Demolished in Fiscal Year[a]
Pre 1995	1	Unknown
1995	21	Unknown
1998	5	Unknown
1999	5	Unknown
2000	0	Unknown
2001	8	Unknown
2002	37	14
2003	5	22
2004	14	14
TOTAL	96	50

a Although buildings were demolished in the years before 2002, the CRT did not monitor the dates when the building demolitions actually occurred.

2004 Land Transferred

No land tracts were transferred in CY 2004 (see Land Resources Section 4.7). Excavations at 11 cultural sites are expected to continue in the Rendija Tract during 2005.

3.10 Ecological Resources

LANL is located in a region of diverse landforms, elevation, and climate—features that contribute to producing diverse plant and animal communities. Plant communities range from urban and suburban areas to grasslands, wetlands, shrublands, woodlands, and mountain forest. These plant communities provide habitat for a variety of animal life.

The SWEIS ROD projected no significant adverse impacts to biological resources, ecological processes, or biodiversity (including threatened and endangered species) resulting from LANL operations. Data collected for CY 2004 support this projection. These data are reported in the 2004 Environmental Surveillance Report to be issued after October 1, 2005.

3.10.1 Conditions of the Forests and Woodlands

Probably the greatest natural resources management issue for LANL in 2004 was the continuing severe drought conditions. Burned area rehabilitation and monitoring efforts are ongoing. Vegetation monitoring efforts continue to evaluate the effects of the Cerro Grande Fire of 2000 and the thinning activities. Drought conditions have encouraged the infestation of bark beetles.

The drought that has gripped the Los Alamos region for several years continued through 2004. Tree mortality first became a prominent result of the drought during 2002. However, the total numbers of dead trees increased in both 2003 and 2004. By the end of 2004, 95 percent of the piñon trees had been killed. In addition, approximately 12 percent of ponderosa pine trees had been killed. In the lower elevations of the mixed conifer zone on north-facing slopes of the canyons, up to 100 percent of the Douglas fir trees were also killed by the drought.

Thinning from below to reduce fire hazards has been a primary management activity in forests and woodlands at LANL. In Rendija Canyon, 113 acres were thinned during 2004. This brought the total amount of thinning conducted since 2000 to 7,283 acres (Smith 2004). Of this, approximately 40 percent or 2,920 acres were in ponderosa pine forests, with the remaining acreage consisting of piñon-juniper woodlands. In addition, 800 acres at LANL had been thinned between 1997 and 1999. Throughout, the thinning targets ranged from 50 to 150 trees per acre, but recent mortality in many of these thinned areas has further reduced the density of the treated forests and woodlands.

The Cerro Grande Fire burned approximately 7,678 acres on LANL property (LANL 2004d). Most of this, 62 percent or 4,760 acres, was in ponderosa pine forests. An additional 17 percent of the Cerro Grande Fire burned in piñon-juniper woodlands on LANL. In either case, a large percentage of this, 88 percent, was burned at low severity and with 10 percent to 40 percent overstory mortality. Only 12 percent of the area at LANL that was burned by the Cerro Grande Fire was at moderate- or high-burn severities. To minimize the potential for erosion and to facilitate recovery from the fire, a total of 1,800 acres was rehabilitated after the fire with seeded grass, straw mulch, and hydromulch (LANL 2002f).

Because LANL is located in a fire-prone region, there will always be a potential for wildfires to occur during the fire season, from April 10 to September 30 (LANL 2005e). Recent modeling of wildfire risks indicates that the greatest potential for lightning to ignite fires occurs along the western and southwestern boundary of LANL and in the adjacent mountainous areas. Studies continue to determine what management practices will further aid in sustainable stewardship given these conditions.

3.10.2 Threatened and Endangered Species Habitat Management Plan

LANL's Threatened and Endangered Species Habitat Management Plan (LANL 1998b) received US Fish and Wildlife Service concurrence on February 12, 1999. The plan is used in project reviews and to provide guidelines to project managers for assessing and reducing potential impacts to federally listed threatened and endangered species, including the Mexican spotted owl, southwestern willow flycatcher, and bald eagle. The Threatened and Endangered Species Habitat Management Plan was incorporated into the NEPA, Cultural, and Biological Laboratory Implementation Requirement document (LANL 2000d) developed during 1999. The Laboratory Implementation Requirement program provides training to LANL personnel on the proper implementation of the Threatened and Endangered Species Habitat Management Plan.

In CY 2004, LANL continued conducting annual surveys for Mexican spotted owls, and found a new area of LANL inhabited by them. LANL continues to operate under the original Threatened and Endangered Species Habitat Management Plan guidelines. Work is continuing on a habitat model of Mexican spotted owls at LANL. The results of this project will refine the model of Mexican spotted owl habitat requirements and will be used to modify the Threatened and Endangered Species Habitat Management Plan to reflect post-fire and post-drought habitat changes, if any. LANL plans to submit an amended Habitat Management Plan to the US Fish and Wildlife Service in CY 2005 for concurrence.

3.10.3 Biological Assessments and Compliance Packages

LANL reviews proposed activities and projects for potential impact on biological resources including Federal- or State-listed threatened or endangered species. These reviews evaluate and record the amount of development or disturbance at proposed construction sites, the amount of disturbance within designated core and buffer habitat, the potential impact to wetlands or floodplains in the project area, and whether habitat evaluations or species-specific surveys are needed.

During 2004 LANL completed four biological compliance packages for projects requiring an Endangered Species Act biological assessment (BA). The compliance package includes the BA, a wetlands and floodplains assessment, a migratory birds assessment, and an assessment of state-listed species of interest. Compliance packages were written in support of the Security Perimeter Project Modifications (LANL 2004e), the TA-33 Bunker 87 Complex Refurbishment (LANL 2004f), the Airport Landfill Capping Project (LANL 2004g), and the Remediation of MDA's V and B (LANL 2004h). The US Fish and Wildlife Service concurred in determinations that all four projects may affect, but are not likely to adversely affect, the Mexican spotted owl and the bald eagle and will have no effect on other threatened or endangered species. In addition to the compliance packages, LANL produced one independent floodplains/wetlands assessments: for the actions taken in preparation of the transfer of the Rendija Canyon tract (LANL 2004i).

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4.0 Trend Analysis

Beginning in 1999 the Yearbook included a new chapter that examined trends by comparing actual LANL operating conditions to SWEIS ROD projections. Where the 1999 Yearbook was restricted to waste data, subsequent Yearbooks, including this edition, also included land use and utilities information. Additional information was added to the 2002 edition of the Yearbook so that SWEIS ROD projections could be applied to a wider range of data to assist in the preparation of the five-year review of the SWEIS. The purpose of these additional comparisons was to allow a more comprehensive review of the SWEIS projections compared to actual LANL operating parameters over the years in which data were available. Many of these comparisons are qualitative due to the nature of the data collected.

In preparing this chapter, it became obvious that not all data collected lend themselves to this type of analysis. First, some data consist mostly of estimates (i.e., historical NPDES outfall flows) where variations between years may be nothing more than an artifact of the methodology used to make estimates. These data did not depict environmental risk, and any evaluation between years would be meaningless. Second, some data were so far below SWEIS ROD projections (i.e., air quality and high explosive production), that even significant increases in measured quantities would not cause LANL to exceed the risks evaluated in the SWEIS, and such a comparison would have served no practical purpose for the development of a SWEIS in the future. Finally, some data did not represent site impacts, were inherently variable, and did not represent utilization of onsite natural resources (for example, RS Project exhumed material shipped offsite). The data conducive to numerical analysis represent real numbers of two distinct types: first, data that demonstrate cumulative effects across years where summed quantities could approach or exceed SWEIS ROD projections or regulatory limits or create negative environmental impacts (e.g., waste disposed at LANL); or, second, data that represent, on an annual basis, measured quantities that approach limits established by agreement and/or regulation (i.e., gas, electric, and water consumption).

4.1 Land Use

Land use at LANL is a high-priority issue. Most of the undeveloped land is either required as buffer zones for operations or is unsuitable for development. Therefore, loss of available lands through development or Congressionally mandated land transfer could have an impact on strategic planning for operations. Conversely, increases in available lands through cleanups performed by RS and demolition of vacated buildings also affect strategic planning. To date, however, RS has not significantly added to available land.

In CY 2002, the first of the Congressionally mandated conveyance of land to the County of Los Alamos and transfer to the Pueblo of San Ildefonso were accomplished. These disbursals effectively removed 2,239 acres from LANL and made them unavailable for LANL operational uses, though these were acres previously identified as reserve properties with no identified land use. No additional land transfers occurred during CY 2003 or 2004.

The SWEIS ROD did not anticipate any significant effects on land use. Land uses within LANL boundaries have not changed substantially since the SWEIS was issued (see Table 3.7-1) and are not expected to change in the next few years. Future development will be consistent with LANL's Comprehensive Site Plan 2000 (LANL 2000), which guides LANL land development.

Though construction and modification often result in substantial loss of greenfields (previously undeveloped areas), this has not been the case for the period 1998–2003. For this Yearbook, the amount of greenfield and brownfield (previously developed areas) development was estimated using geographic information system data relating to LANL's larger ground-disturbing projects. The estimates do not include small facility projects, such as installing short utility lines. Nor do they include emergency activities performed during the Cerro Grande Fire, such as cutting firebreaks. Although the Cerro Grande Rehabilitation Project thinned trees over a large portion of LANL, both greenfield and brownfield areas, the basic character (greenfield or brownfield) was not altered by these actions.

LANL's major projects between 1998 and 2004 have affected or will affect (in some cases, actual construction has not begun) about 292 acres. About 142 acres of greenfield (about 30 acres attributable to the Research Park) have been developed or proposed for development; the remaining 150 acres consist of brownfield areas.

The greenfield development in FY 2004 consisted of several General Plant Projects and includes the STA, the Emergency Operations Center, the TA-49 Joint Fire Equipment Complex, two buildings at TA-16, one at TA-22, and a parking area at TA-64.

The brownfield development also included several General Plant Project buildings as well as the line item CINT at TA-03. A major project that commenced in CY 2003 is the NSSB, which included the removal of the former badge office building. This project includes the removal of a TA-03 parking area and construction of a new parking structure. The NSSB is continuing under construction in 2004, and its associated parking structure has been completed. Other projects include the Medical Clinic, a Safe, Secure Trailer Pad at TA-55, the Isotope Production Facility at LANSCE, the Records Building at TA-63, the Weapons Plant Support Facility at TA-16, and a modular office building at TA-64,

Future construction at LANL is incorporated in various facility strategic plans. A common component of these plans is consolidation of dispersed activities into central areas. As a result, future construction will frequently be concentrated in areas that are already developed or are adjacent to developed areas, thus reducing future greenfield loss.

Projects planned for FY 2005 and FY 2006 include two institutional office buildings to be located in a greenfield area west of the Wellness Center parking lot and the IM Division office building on a greenfield at the northeast corner of the Diamond Drive and Pajarito Road intersection.

4.2 Waste Quantities

Wastes have been generated at levels below quantities projected by the SWEIS ROD with the exception of RS Project chemical wastes. For three of the last six years (1999–2001), RS Project wastes (see Table 4.2-1) have been generated at levels at least seven times the SWEIS projection. RS Project wastes are typically shipped offsite for disposal at EPA-certified waste treatment, storage, and disposal facilities and do not impact local environs. These wastes result from exhumation of materials placed into the environment during the early history of LANL and thus differ from the newly created wastes from routine operations.

As a result of the uncertainty in RS Project waste estimates, the Yearbook presents totals for LANL waste generation both with and without the RS Project. As shown in tables in Section 3.3, except for TRU and mixed TRU wastes, total generated amounts fall within projections made by the SWEIS ROD. This Yearbook also presents total volumes of solid sanitary waste.

Pollution Prevention Metrics

The PP program improves LANL operations with the goal of preventing environmental damage and adverse regulatory findings. To assess progress toward that goal, the PP Office has developed and the DOE has approved a set of performance metrics. Progress is measured against the goals established in the November 12, 1999, Secretary of Energy's Memorandum "Pollution Prevention, Energy Efficiency Leadership Goals," (Richardson 1999). The measures and associated metrics for all the waste types are presented in Table 4.2-1 taken from the 2004 Pollution

Table 4.2-1. DOE FY 2005 Performance Goals

	Goal Title	DOE 2005 Goal % Reduction	Baseline (year)	2004 Performance	2005 Goal	FY04 Index
1a	Hazardous waste reduction	90%	307 tonnes (93)	19.1 MT	31 tonnes	110%
1b	LLW reduction	80%	1987 m^3 (93)	787.1 m^3	397 m^3	75.5%
1c	MLLW reduction	80%	12.3 m^3 (93)	4.46 m^3	2.46 m^3	79.6%
1d	TRI chemical use reduction	90%	88,293 lb (93)	16,122 lb	8829 lb	90.8%
1e	Sanitary waste reduction	55%	2780 tonnes (93)	1476 tonnes	1509 tonnes	103%
1f	Sanitary material recycling	50%	N/A	64%	50%	110%
1g	Cleanup/stabilization waste reduction	10%	N/A	10%	10%	100%
1h	Affirmative procurement	100%	N/A	100%	100%	100%
1i	Replace ODS Class I chillers, >150 T	100%	3050 T (00)	3050 T	0	100%
1j	Transuranic (TRU) WMin	50%	100 m^3	60.7 m^3	50 m^3	78.5%
Overall Index						**94.7%**

Prevention Roadmap (LANL 2004). LANL performance toward the goals is measured through an index that combines performance toward individual goals into a single number expressed as a percentage. A 100 corresponds to achieving the 2005 goal.

Sanitary Waste

LANL sanitary waste generation and transfer of waste to the Los Alamos County Landfill has varied considerably over the last decade, with a peak (more than 14,000 tons) transferred to the landfill in 2000 that is probably due to removal of Cerro Grande Fire debris. The SWEIS estimated that LANL disposed of approximately 4,843 tons of waste at the Los Alamos County Landfill between July 1995 and June 1996 (DOE 1999). This estimate may have not been representative of LANL's sanitary waste disposal over the long term.

The SWEIS projected that the Los Alamos County Landfill would not reach capacity until about 2014. In 2002, NMED issued a 35-year permit for operation of the current landfill—five years of additional disposal of waste and 30 years of post-closure operation. The Los Alamos County solid waste landfill is scheduled to close by December 2006. In compliance with NMED regulations, a post-closure operations and maintenance manual would be prepared with all the information needed to effectively monitor and maintain the facility for the entire post-closure period. NNSA is currently evaluating replacing the County landfill with a waste transfer station.

DOE has implemented goals for waste minimization. LANL performance goals for sanitary waste reduction are based on waste generation in 1993. However, DOE has normalized the goal to a per-capita rate to eliminate waste generation effects associated with increased mission scope since 1993. LANL has instituted an aggressive waste minimization and recycling program that has reduced the amount of waste disposed in sanitary landfills. LANL's per capita generation of routine sanitary waste fell from 265 kilograms per person per year in 1993 to 163 kilograms per person per year in 2001 to 109 kilograms per person per year, equivalent to a 59 percent decrease in routine waste generation (LANL 2004). This reduction is the result of aggressive waste minimization programs that include recycling of white paper, junk mail, colored office paper, catalogs, cardboard, styrofoam, pallets, scrap wood, and metal and source reduction efforts such as the Stop Mail program.

LANL's total waste generation can be classified as routine and non-routine. The waste can also be categorized as recyclable and non-recyclable. Table 4.2-2 shows LANL sanitary waste generation for FY 2004. The recycle of total (routine + nonroutine) sanitary waste currently stands at 67 percent compared to 1993 when LANL recycled only about 10 percent of the sanitary waste. The disposal total for FY 2004 is 400 metric tons less than the disposal total for FY 2003.

Table 4.2-2. LANL Sanitary Waste Generation in 2004 (metric tons)

	Routine	Nonroutine	Total
Recycled	1,771	2,076	3,847
Landfill disposal	1,476	466	1,942
Total	3,247	2,542	5,789

Routine sanitary waste consists mostly of food and food-contaminated waste, paper, plastic, wood, glass, styrofoam packing material, old equipment, and similar items.

Nonroutine sanitary waste is typically derived from construction and demolition projects. Until May 1998, construction debris was used as fill to construct a land bridge between two areas of LANL; however, environmental and regulatory issues resulted in this activity being halted. Construction of new facilities and demolition of old facilities are expected to continue to produce substantial quantities of this type of waste. In 2004, the total amount of construction waste generated decreased by 33 percent from 2003 (LANL 2004). Recycling programs for concrete, asphalt, dirt, and brush were established in FY 2001 and are a major component of LANL's sanitary waste reduction efforts.

Chemical Waste

Waste projections for the RS Project by the SWEIS ROD are uncertain at best. These projections were developed in the 1996–1997 time period. Estimates were based on the then current Installation Work Plan methodology. The ER Project office kept a continuously updated database of waste projections by waste type for each PRS. Estimates were made for the amount of waste expected to be generated by that PRS for the life of the RS Project. In 1996–1997, it was assumed that the life of the ER Project would be 10 years, but the schedule now projects cleanup will extend to 2020. This demonstrates the legitimate uncertainty in waste estimates and schedules developed for the RS Project caused by changing requirements and refined waste calculations as additional data were gathered.

One task of the RS Project is to characterize sites about which little is known and to make adjustments in waste quantity estimates based on new information. In addition, even the most rigorous field investigations cannot truly determine waste quantities with a high degree of certainty until remediation has progressed considerably. Remediation can often create more or less waste, or waste that was not anticipated, based on field sampling. Moreover, the administrative authority may not approve a NFA recommendation or may require additional sampling or an alternative corrective action than the one planned. All of these factors lead to waste projections that are highly uncertain.

An example of the latter is MDA P. The first closure plan for MDA P was submitted to EPA, and later NMED, in the early 1980s. This plan proposed closure in place, but was never approved. During the mid- to late-1980s, all parties (LANL, DOE, EPA, and NMED) decided that clean-closure was a more appropriate standard and the plan was rewritten to reflect risk-based clean-closure. All information in the closure plan, including waste estimates, was based on best available information (a combination of operating group records and data from field investigations). However, when remediation started, it quickly became apparent that early information was not reliable, and that there would be more waste generated than originally anticipated. The RS Project clean closure of MDA P began on November 17, 1997, and Phase I (i.e., waste management, handling, and disposal) and Phase II (i.e., confirmatory sampling) activities were completed by April 2002. A total of 20,812 cubic yards of hazardous waste and 21,354 cubic yards of other waste were excavated and shipped to a disposal facility. A total of 6,600 cubic yards were shipped and used as clean fill at MDA J.

Chemical waste quantities shown in Table 4.2-3 are higher than projections from 1999–2001 for two reasons: RS Project cleanup activities during 1999, 2000, and 2001 and the Legacy Materials Cleanup Project during 1998. The variability in RS Project waste projections is discussed in the previous paragraph. The Legacy Materials Cleanup Project, completed in September 1998, required facilities to locate and inventory all materials for which a use could no longer be identified. All such materials (more than 22,000 items) were characterized, collected, and managed. In 1999, the Non-Key Facilities also exceeded projections, and this was attributed to RS Project cleanups of PRSs within the Non-Key Facilities. When comparing the subtotal of Key and Non-Key Facilities, only the Legacy Program in 1998 pushes the quantities over SWEIS ROD projections. Regardless, these wastes (both RS and Legacy Program) were and are shipped offsite, do not impact the local environs, and do not hasten the need to expand the size of Area G. High amounts of chemical waste at Non-Key Facilities during 2001 are mostly due to new construction and some expanded operations.

Table 4.2-3. Chemical Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004
Key Facilities	10^3 kg/yr	600	120	49	1,121	513	267	64	189
Non-Key Facilities	10^3 kg/yr	650	1,506 [a]	765	368	1,255 [b]	334	594	929 [b]
RS Project	10^3 kg/yr	2,000	144	14,630 [c]	26,185 [d]	25,816 [e]	1,133	31	94
LANL	10^3 kg/yr	3,250	1,771	15,441	27,674	27,583	1,734	689	1,210

a At the Non-Key Facilities in 1998, chemical waste quantities exceeded projections because of a LANL-wide campaign to identify and dispose of chemicals no longer used or needed.
b At the Non-Key Facilities in 2001 and 2004, the increased activity from new construction generated a higher quantity of chemical waste in the form of industrial solid waste.
c Cleanup efforts of the ER Project accounted for the large waste volumes, almost 95 percent of the total. Most of the 14.5 million kilograms of chemical waste generated by the ER Project resulted from remediation of PRSs at TA-16, particularly MDA P. MDA P was exhumed as part of a clean-closure under the RCRA.
d Cleanup efforts of the ER Project accounted for the large waste volumes. The continuing cleanup of MDA P, remediation of PRS 3-056(c) at the upper end of Sandia Canyon in TA-03, and the accelerated cleanup of MDA R due to the Cerro Grande Fire, were responsible for most of the chemical waste generation.
e The continuing cleanup efforts at MDA P and PRS 3-056(c) accounted for most of the ER Project generated waste in 2001.

Low Level Waste

LANL generation of LLW is generally below that projected in the SWEIS ROD (Table 4.2-4). Although data from 2004 show that SWEIS projections were exceeded at the Non-Key Facilities, total waste volumes remain within SWEIS projections.

Table 4.2-4. LLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004
Key Facilities	m^3/yr	7,450	1,045	1,017	1,172	2,776	1,202	1,843	875
Non-Key Facilities	m^3/yr	520	36	286	578 [a]	601 [a]	624 [a]	1,964 [a]	13,962 [a]
ER/RS Project	m^3/yr	4,260	726	407	2,467	562	5,484	1,819	0.76
LANL	m^3/yr	12,230	1,807	1,710	4,217	3,939	7,310	5,625	14,839

a LLW generation at the Non-Key Facilities exceeds the SWEIS ROD due to heightened activities and new construction.

Mixed Low Level Waste

Table 4.2-5 shows a significant increase in MLLW in 2000. Total LANL MLLW volume for 2000 was 598 cubic meters; 575 of that came from the MDA P cleanup. Waste generation returned to more typical levels in 2001, 2002, 2003, and 2004. Even with the noticeable increase in 2000, the generation of MLLW remains within SWEIS projections.

Table 4.2-5. MLLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004
Key Facilities	m^3/yr	54	8	17	11	20	11	16.55	22.90
Non-Key Facilities	m^3/yr	30	55 [a]	3	10	9	9	19.55	32.93
ER/RS Project	m^3/yr	548	9	1	577 [b]	29	0	0	0.02
LANL	m^3/yr	632	72	21	598	58	20	36.10	32.95

a MLLW for Non-Key Facilities was contaminated soil and asphalt generated by construction activities.
b Almost all of the MLLW generated in 2000 resulted from the remediation of MDA P.

TRU and Mixed TRU

Despite the expected slow, but increasing, levels of activity on pit production and related programs, generation of TRU (Table 4.2-6) and Mixed TRU waste (Table 4.2-7) remained within the projections of the SWEIS ROD. Increasing levels of effort in the pit production program and related programs are expected to result in increasing quantities of these waste types in the near future but are not expected to exceed SWEIS projections. LANL's OSR Project has generated TRU waste that is considered to be a waste from Non-Key Facilities. The SWEIS did not anticipate TRU waste generation from Non-Key Facilities. A separate NEPA review was conducted for the OSR Program and the effects of implementing the program were determined to be bounded by the SWEIS impact analysis (DOE 2000).

Table 4.2-6. Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004
Key Facilities	m^3/yr	322	108	143	122	83	82	312.91	18.7
Non-Key Facilities	m^3/yr	0	0	0	3	25	37 [a]	90.46 [a]	21.4 [a]
ER/RS Project	m^3/yr	11	0	0	0	0	0	0	0
LANL	m^3/yr	333	108	143	125	108	119	403.37	40.1

a TRU waste generated at the Non-Key Facilities during CYs 2002, 2003, and 2004 was the result of the OSR Project. Because this waste comes through Shipping and Receiving, it is attributable to that location as the point of generation.

Table 4.2-7. Mixed Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004
Key Facilities	m^3/yr	115	34	72	89	35	87	151.04 [a]	23.9 [a]
Non-Key Facilities	m^3/yr	0	0	0	0	0	0	5.91 [b]	0
ER/RS Project	m^3/yr	0	0	0	0	0	0	0	0
LANL	m^3/yr	115	34	72	89	35	87	156.95	23.9

a SWEIS ROD projection for mixed TRU waste generated by the Key Facilities was exceeded at the Solid Chemical and Radioactive Waste Facility due to DVRS repackaging of legacy TRU waste for shipment to WIPP.
b Generation of 5.91 cubic meters of mixed TRU waste at the Non-Key Facilities was the result of the OSR Project. Because this waste comes through Shipping and Receiving, it is attributed to that location as the point of generation.

4.3 Utility Consumption

Consumption of gas, water, and electricity is not additive in the same context as waste generation. Rather, consumption of these commodities is restricted by contract and should be compared to the SWEIS ROD projections for annual use. Section 3.4 presents these three sets of data (gas [see Table 3.4.1-1], electricity [see Tables 3.4.2-1 and 3.4.2-2], and water [see Table 3.4.3-1]) and demonstrates that none of these measured consumptions of utilities exceeded SWEIS ROD projections, except for natural gas in 1993, which is before the 10-year window evaluated by the SWEIS ROD. Based on these data, it appears that utility usage remains within the SWEIS ROD environmental envelope for operations.

Tables 4.3-1 and 4.3-2 show peak demand and consumption for FY 1991–2004.

Table 4.3-1. Electric Peak Coincident Demand/Fiscal Years 1991–2004

Category	LANL Base	LANSCE	LANL Total	County Total	Pool Total
SWEIS ROD	50,000[a]	63,000	113,000	Not projected	Not projected
FY 1991	43,452	32,325	75,777	11,471	84,248
FY 1992	39,637	33,707	73,344	12,426	85,770

Table 4.3-1. continued

Category	LANL Base	LANSCE	LANL Total	County Total	Pool Total
FY1993	40,845	26,689	67,534	12,836	80,370
FY 1994	38,354	27,617	65,971	11,381	77,352
FY 1995	41,736	24,066	65,802	14,122	79,924
FY 1996	41,799	20,799	62,598	13,160	75,758
FY 1997	37,807	28,846	62,653	13,661	76,314
FY 1998	39,064	24,773	63,837	13,268	77,105
FY 1999	43,976	43,976	68,486	14,399	82,885
FY 2000	45,104	45,104	65,447	15,176	80,623
FY 2001	50,146	50,146	70,878	14,583	85,461
FY 2002	45,809	20,938	66,747	16,653	83,400
FY 2003	50,008	20,859	70,687	16,910	87,597
FY 2004	47,608	21,811	69,419	16,231	85,650

a All figures in kilowatts.

Table 4.3-2. Electric Consumption/Fiscal Years 1991–2004

Category	LANL Base	LANSCE	Lanl Total	County	Pool Total
SWEIS ROD	345,000[a]	437,000	782,000	Not projected	Not projected
FY 1991	282,994	89,219	372,213	86,873	459,086
FY 1992	279,208	102,579	381,787	87,709	469,496
FY 1993	277,005	89,889	366,894	89,826	456,720
FY 1994	272,518	79,950	352,468	92,065	444,533
FY 1995	276,292	95,853	372,145	93,546	465,691
FY 1996	277,829	90,956	368,785	93,985	462,770
FY 1997	258,841	138,844	397,715	96,271	493,986
FY 1998	262,570	64,735	327,305	97,600	424,905
FY 1999	255,562	113,759	369,321	106,547	475,868
FY 2000	263,970	117,183	381,153	112,216	493,369
FY 2001	294,169	80,974	375,143	116,043	491,186
FY 2002	299,422	94,966	394,398	121,013	515,401
FY 2003	294,993	87,856	382,849	109,822	492,671
FY 2004	327,117	86,275	413,392	127,429	540,821

a All figures in megawatt-hours

Table 4.3-3 shows water consumption in thousands of gallons for CY 1992 through CY 2004.

Table 4.3-3. Water Consumption (thousands of gallons) for Calendar Years 1992–2004

Category	LANL	Los Alamos County	Total
SWEIS ROD	759,000	Not Projected	Not Applicable
CY 1992	547,535	982,132	1,529,667
CY 1993	467,880	999,863	1,467,743

Table 4.3-3. continued

Category	LANL	Los Alamos County	Total
CY 1994	524,791	913,430	1,438,221
CY 1995	337,188	1,022,126	1,359,314
CY 1996	340,481	1,035,244	1,375,725
CY 1997	488,252	800,019	1,288,271
CY 1998	461,350	Not Available [a]	Not Available [a]
CY 1999	453,094	Not Available [a]	Not Applicable
CY 2000	441,000	Not Available [a]	Not Available [a]
CY 2001	393,123	Not Available [a]	Not Applicable
CY 2002	324,514	Not Available [a]	Not Available [a]
CY 2003	377,768	Not Available [a]	Not Available [a]
CY 2004	346,624	Not Available [a]	Not Available [a]

a In September 2001, Los Alamos County acquired the water supply system and LANL no longer collects this information.

Tables 4.3-4 and 4.3-5 illustrate gas consumption and steam production, respectively, from FY 1991 through FY 2004.

Table 4.3-4. Gas Consumption (decatherms[a]) at LANL/Fiscal Years 1991–2004

Fiscal Year	SWEIS ROD	Total LANL Consumption	Total Used For Electric Production	Total Used For Heat Production
1991	1,840,000	1,480,789	64,891	1,415,898
1992	1,840,000	1,833,318	447,427	1,385,891
1993	1,840,000	1,843,936	411,822	1,432,113
1994	1,840,000	1,682,180	242,792	1,439,388
1995	1,840,000	1,520,358	111,908	1,408,450
1996	1,840,000	1,358,505	11,405	1,347,100
1997	1,840,000	1,444,385	96,091	1,348,294
1998	1,840,000	1,362,070	128,480	1,233,590
1999	1,840,000	1,428,568	241,490	1,187,078
2000	1,840,000	1,427,914	352,126	1,075,788
2001	1,840,000	1,492,635	273,312	1,219,323
2002	1,840,000	1,325,639	212,976	1,112,663
2003	1,840,000	1,220,137	41,632	1,178,505
2004	1,840,000	1,149,936	25,680	1,124,256

a A decatherm is equivalent to 1,000 to 1,100 cubic feet of natural gas.

4.4 Long-Term Effects

To date, LANL has continued to operate within the projections made by the SWEIS ROD. None of the measured parameters exceed SWEIS ROD projections or regulatory limits. Thus, long-term effects should remain within the projections made by the SWEIS ROD.

Table 4.3-5. Steam Production at LANL/Fiscal Years 1996–2004

Fiscal Year	TA-3 Steam Production (klb [a])	TA-21 Steam Production (klb)	Total Steam Production (klb)
1996	451,363	54,033	701,792
1997	413,684	50,382	464,066
1998	377,883	37,359	415,242
1999	576,548 [b]	29,468	606,016
2000	634,758 [b]	27,840	662,598
2001	531,763 [b]	29,195	560,958
2002	478,007 [b]	26,206	504,213
2003	351,905 [b]	26,147	378,052
2004	347,110 [b]	23,910	371,020

a klb: Thousands of pounds

b TA-03 steam production has two components: that used for electric production (25,528 klb for FY 2004) and that used for heat (321,582 klb in FY 2004).

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5.0 Ten-Year Comprehensive Site Plan

The TYCSP is not included in this edition of the Yearbook because it contains Official Use Only information that cannot be released to the public. Since the Yearbooks have always been approved for public release with an unlimited distribution, the TYCSP overview of DOE/NNSA's long-range planning process at LANL will not be included in the 2004 Yearbook.

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6.0 Summary and Conclusion

6.1 Summary

The 2004 SWEIS Yearbook reviews CY 2004 operations for the 15 Key Facilities (as defined by the SWEIS) and Non-Key Facilities at LANL and compares those operations to levels projected by the ROD. The Yearbook also reviews the environmental parameters associated with operations at the same 15 Key Facilities and the Non-Key Facilities and compares these data with ROD projections. In addition, the Yearbook presents a number of site-wide effects of those operations and environmental parameters. The more significant results presented in the Yearbook are as follows:

Facility Construction and Modifications. The ROD projected a total of 38 facility construction and modification projects for LANL facilities. Ten of these projects were listed only in the Expanded Operations Alternative, such as expansion of the LLW disposal area at TA-54, Area G, and the LPSS at TA-53. These 10 projects could not proceed until DOE issued the ROD in September 1999. However, the remaining 28 construction projects were projected in the No Action Alternative. These included facility upgrades (e.g., safety upgrades at the CMR Building and process upgrades at the RLWTF), facility renovation (e.g., conversion of the former Rolling Mill, Building 03-141, to the Beryllium Technology Facility), and the erection of new storage domes at TA-54 for TRU wastes. Since these projects had independent NEPA documentation, they could proceed while the SWEIS was still in process.

During 2004, planned construction and/or modifications continued at nine of the 15 Key Facilities. These activities were both modifications within existing structures and new or replacement facilities. New structures completed and occupied during 2004 included the Fire Safe Storage Building at TA-55 and the MST Division Office Building at TA-03. Additionally, seven major construction projects were either completed or continued for the Non-Key Facilities. These projects are as follows:

- Atlas was reassembled at the NTS during 2003 and 2004 when LANL again assumed ownership and management of the Atlas facility; machine characterization testing began in May 2004 to evaluate performance (compared to experience at LANL), reliability, and reproducibility.
- Construction of the new Medical Facility was completed January 2004.
- Construction of the NSSB continued in 2004.
- Construction of the new FWO Division Office Building was completed in October 2004.
- Construction of the TA-03 Parking Structure was completed April 2004.
- Construction of the Pajarito Road Access Control Stations was completed April 2004.
- Construction of the CINT was started in November 2004.

Facility Operations. The SWEIS grouped LANL into 15 Key Facilities, identified the operations at each, and then projected the level of activity for each operation. These operations were grouped in the SWEIS under 96 different capabilities for the Key

Facilities. Capabilities across LANL changed during 2001. Following the events of September 11, 2001, the Laboratory was requested to provide support for homeland security.

During CY 2004, 88 capabilities were active. The eight inactive capabilities were the Cryogenic Separation at the Tritium Facilities; both the Destructive and Nondestructive Assay and the Fabrication and Metallography capabilities at CMR; Characterization of Materials at the TFF; both the Accelerator Transmutation of Wastes and the Medical Isotope Production capabilities at LANSCE; and Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

While there was activity under nearly all capabilities, the levels of these activities were mostly below levels projected by the ROD. For example, the LANSCE linac generated an H^- beam to the Lujan Center for 1,435 hours in 2004, at an average current of 115.5 microamps, compared to 6,400 hours at 200 microamps projected by the ROD. Similarly, a total of 164 criticality experiments were conducted at Pajarito Site, compared to the 1,050 projected experiments.

As in 1998 through 2003, only three of LANL's facilities operated during 2004 at levels approximating those projected by the ROD—the MSL, the Bioscience Facilities (formerly HRL), and the Non-Key Facilities. The two Key Facilities (MSL and Bioscience) are more akin to the Non-Key Facilities and represent the dynamic nature of research and development at LANL. More importantly, none of these facilities are major contributors to the parameters that lead to significant potential environmental impacts. The remaining 13 Key Facilities all conducted operations at or below projected activity levels.

Operations Data and Environmental Parameters. This 2004 Yearbook evaluates the effects of LANL operations in three general areas—effluents to the environment, workforce and regional consequences, and changes to environmental areas for which the DOE has stewardship responsibility as the administrator of LANL.

Radioactive airborne emissions from point sources (i.e., stacks) during 2004 totaled approximately 5,230 curies, just under 25 percent of the 10-year average of 21,700 curies projected by the SWEIS ROD. Maximum offsite dose continued to be relatively small for 2004. The final dose is 1.68 millirem, well under the EPA air emissions limit for DOE facilities of 10 millirem per year. Calculated NPDES discharges totaled 162.52 million gallons per year compared to a projected volume of 278 million gallons per year. Due to the LANL stand-down that began in July of 2004, this number is approximately 47 million gallons less than CY 2003. In addition, the apparent decrease in flows compared to the SWEIS ROD is primarily due to the methodology by which flow was measured and reported in the past. Historically, instantaneous flow was measured during field visits as required in the NPDES permit. These measurements were then extrapolated over a 24-hour day/seven-day week. With implementation of the new NPDES permit on February 1, 2001, data are collected and reported using actual flows recorded by flow meters at most outfalls. At those outfalls that do not have meters, the flow is calculated as before, based on instantaneous flow. Quantities of solid radioactive and chemical wastes generated in 2004 ranged from approximately 5.7 percent of the MLLW projection to 137 percent of the mixed TRU waste projection. The larger than projected quantity of mixed TRU waste was the result of the DVRS repackaging of legacy TRU waste for shipment to WIPP. Both the mixed TRU waste and TRU waste quantities exceeded the SWEIS ROD projections during 2004 due to the DVRS repackaging activity.

The workforce has been above ROD projections since 1997. The 13,261 employees at the end of CY 2004 represent 1,910 more employees than projected but reflect a *decrease* of 355 employees from CY 2003. Since 1998, the peak electricity consumption was 394 gigawatt-hours during 2002 and the peak demand was 85 megawatts during 2001 compared to projections of 782 gigawatt-hours with a peak demand of 113 megawatts. The peak water usage was 461 million gallons during 1998 (compared to 759 million gallons projected), and the peak natural gas consumption was 1.49 million decatherms during 2001 (compared to 1.84 million decatherms projected). Between 1998 and 2004, the highest collective Total Effective Dose Equivalent for the LANL workforce was 124.6 person-rem during 2004, which is considerably lower than the workforce dose of 704 person-rem projected by the ROD.

Measured parameters for ecological resources and groundwater were similar to ROD projections, and measured parameters for cultural resources and land resources were below ROD projections. For land use, the ROD projected the disturbance of 41 acres of new land at TA-54 because of the need for additional disposal cells for LLW. As of 2004, this expansion had not become necessary.

Cultural resources remained protected, and no excavation of sites at TA-54 has occurred. (The ROD projected that 15 prehistoric sites would be affected by the expansion of Area G into Zones 4 and 6 at TA-54.) However, a total of 11 cultural sites were excavated in Rendija Canyon from June to November 2004.

As projected by the ROD, water levels in wells penetrating into the regional aquifer continue to decline in response to pumping, typically by several feet each year. In areas where pumping has been reduced, water levels show some recovery. No unexplained changes in patterns have occurred in the 1995–2004 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977. Five additional characterization wells were complete by the end of 2004.

In addition, ecological resources are being sustained as a result of protection afforded by DOE administration of LANL. These resources include biological resources such as protected sensitive species, ecological processes, and biodiversity. The recovery and response to the Cerro Grande Fire of May 2000 have included a wildfire fuels reduction program, burned area rehabilitation and monitoring efforts, and enhanced vegetation and wildlife monitoring.

6.2 Conclusion

In conclusion, LANL operations data mostly fell within projections. Operations data that exceeded projections, such as number of employees or chemical waste from cleanup, either produced a positive impact on the economy of northern New Mexico or resulted in no local impact because these wastes were shipped offsite for disposal. Overall, the 2004 operations data indicate that LANL was operating within the SWEIS envelope and still ramping up operations towards the preferred Expanded Alternative in the ROD.

One purpose of the 2004 Yearbook is to compare LANL operations and resultant 2004 data to the SWEIS ROD to determine if LANL was still operating within the environmental envelope established by the SWEIS and the ROD. Data for 2004 indicate that positive impacts (such as socioeconomics) were greater than SWEIS ROD projections, while negative impacts, such as radioactive air emissions and land disturbance, were within the SWEIS operating envelope.

6.3 To the Future

The Yearbook will continue to be prepared on an annual basis, with operations and relevant parameters in a given year compared to SWEIS projections for activity levels chosen by the ROD. The presentation proposed for the 2005 Yearbook will follow that developed for the previous Yearbooks—comparison to the SWEIS ROD.

The 2004 Yearbook is an important step forward in fulfilling a commitment to make the SWEIS for LANL a living document. Future Yearbooks are planned to continue that role.

Appendix A: Chemical Usage and Estimated Emissions Data

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Table A-1. Chemical and Metallurgy Research Building Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
CMR Building	Acetone	67-64-1	kg/yr	2.49	7.11
	Acetonitrile	75-05-8	kg/yr	0.38	1.10
	Ammonium Chloride (Fume)	12125-02-9	kg/yr	0.26	0.75
	Arsenic, el.&inorg.,exc. Arsine, as As	7440-38-2	kg/yr	0.25	0.70
	Carbon Tetrachloride	56-23-5	kg/yr	0.56	1.59
	Chromium, Metal &Cr III Compounds, as Cr	7440-47-3	kg/yr	0.63	1.81
	Copper	7440-50-8	kg/yr	0.00	0.40
	Ethanol	64-17-5	kg/yr	2.21	6.31
	Hydrogen Bromide	10035-10-6	kg/yr	0.26	0.75
	Hydrogen Chloride	7647-01-0	kg/yr	13.79	39.41
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.60	1.73
	Isopropyl Alcohol	67-63-0	kg/yr	0.41	1.18
	Methyl Alcohol	67-56-1	kg/yr	1.11	3.17
	Methylene Chloride	75-09-2	kg/yr	53.58	153.09
	n,n-Dimethylformamide	68-12-2	kg/yr	0.66	1.90
	Nitric Acid	7697-37-2	kg/yr	90.13	257.52
	Propane	74-98-6	kg/yr	0.00	6.69
	Styrene	100-42-5	kg/yr	0.32	0.91
	Sulfuric Acid	7664-93-9	kg/yr	1.93	5.52

Table A-2. Biosciences Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
HRL	2-Butoxyethanol	111-76-2	kg/yr	0.16	0.45
	Acetic Acid	64-19-7	kg/yr	1.53	4.37
	Acetone	67-64-1	kg/yr	2.21	6.32
	Acetonitrile	75-05-8	kg/yr	23.73	67.81
	Acrylamide	79-06-1	kg/yr	1.18	3.37
	Ammonium Chloride (Fume)	12125-02-9	kg/yr	0.09	0.25
	Chloroform	67-66-3	kg/yr	0.31	0.89
	Ethanol	64-17-5	kg/yr	205.81	588.04
	Ethyl Acetate	141-78-6	kg/yr	1.26	3.60
	Hydrogen Chloride	7647-01-0	kg/yr	2.70	7.72
	Hydrogen Peroxide	7722-84-1	kg/yr	2.46	7.03
	Isopropyl Alcohol	67-63-0	kg/yr	10.31	29.46
	Methyl Alcohol	67-56-1	kg/yr	14.74	42.10
	n,n-Dimethylformamide	68-12-2	kg/yr	0.33	0.95
	Phenol	108-95-2	kg/yr	0.22	0.63
	Potassium Hydroxide	1310-58-3	kg/yr	0.35	1.00
	Pyridine	110-86-1	kg/yr	1.17	3.35
	Trichloroacetic Acid	76-03-9	kg/yr	4.54	12.96
	Triethylamine	121-44-8	kg/yr	0.13	0.36

Table A-3. High Explosive Processing Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
High Explosive Processing	Acetone	67-64-1	kg/yr	7.26	20.74
	Acetonitrile	75-05-8	kg/yr	11.27	32.21
	Chloroform	67-66-3	kg/yr	8.31	23.73
	Dicyclopentadienyl Iron	102-54-5	kg/yr	0.09	0.25
	Diethanolamine	111-42-2	kg/yr	0.19	0.55
	Ethanol	64-17-5	kg/yr	19.61	56.04
	Ethyl Ether	60-29-7	kg/yr	0.98	2.80
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	0.46	1.32
	Hydrazine	302-01-2	kg/yr	0.18	0.50
	Hydrogen Chloride	7647-01-0	kg/yr	13.50	38.58
	Iodine	7553-56-2	kg/yr	0.16	0.45
	Isopropyl Alcohol	67-63-0	kg/yr	4.40	12.57
	Methyl Alcohol	67-56-1	kg/yr	12.46	35.61
	Methyl Ethyl Ketone (MEK)	78-93-3	kg/yr	53.00	151.42
	n,n-Dimethyl Acetamide or Dimethyl Acetamide	127-19-5	kg/yr	0.17	0.47
	n,n-Dimethylformamide	68-12-2	kg/yr	4.32	12.33
	n-Butyl Acetate	123-86-4	kg/yr	0.31	0.88
	Nitric Acid	7697-37-2	kg/yr	1.60	4.58
	Nitrobenzene	98-95-3	kg/yr	0.21	0.60
	Potassium Hydroxide	1310-58-3	kg/yr	17.50	50.00
	p-Phenylenediamine	106-50-3	kg/yr	0.18	0.50
	Propane	74-98-6	kg/yr	0.00	107.09
	Propionitrile	107-12-0	kg/yr	0.14	0.39
	Styrene	100-42-5	kg/yr	0.32	0.91
	Sulfuric Acid	7664-93-9	kg/yr	47.54	135.82
	Tetrahydrofuran	109-99-9	kg/yr	32.68	93.37
	Toluene	108-88-3	kg/yr	1.52	4.33
	VM & P Naphtha	8032-32-4	kg/yr	0.99	2.84

Table A-4. High Explosive Testing Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
High Explosive Testing	Acetic Acid	64-19-7	kg/yr	4.59	13.12
	Acetone	67-64-1	kg/yr	7.94	22.70
	Acetylene	74-86-2	kg/yr	0.00	1.31
	Ammonium Chloride (fume)	12125-02-9	kg/yr	1.99	5.68
	Ethanol	64-17-5	kg/yr	2.73	7.81
	Ethyl Acetate	141-78-6	kg/yr	0.32	0.90
	Isopropyl Alcohol	67-63-0	kg/yr	0.23	0.65
	Kerosene	8008-20-6	kg/yr	3.18	9.09
	Methyl Alcohol	67-56-1	kg/yr	0.55	1.58
	Phosphorus	7723-14-0	kg/yr	0.16	0.45
	Propane	74-98-6	kg/yr	0.00	167.87
	Sulfur Hexaflouride	2551-62-4	kg/yr	71.04	202.98

Table A-5. LANSCE Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
LANSCE	Acetic Acid	64-19-7	kg/yr	5.56	15.89
	Acetone	67-64-1	kg/yr	3.87	11.06
	Acetonitrile	75-05-8	kg/yr	0.55	1.57
	Acetylene	74-86-2	kg/yr	0.00	2.30
	Antimony and Compounds, as Sb	7440-36-0	kg/yr	0.18	0.50
	Arsenic, el.&inorg.,exc. Arsine, as As	7440-38-2	kg/yr	0.21	0.61
	Benzene	71-43-2	kg/yr	0.61	1.75
	Chlorodifluoromethane	75-45-6	kg/yr	0.96	2.75
	Chloroform	67-66-3	kg/yr	0.52	1.48
	Copper	7440-50-8	kg/yr	0.01	0.63
	Cyclopentane	287-92-3	kg/yr	0.25	0.70
	Dichlorodifluoromethane	75-71-8	kg/yr	0.42	1.20
	Ethanol	64-17-5	kg/yr	21.06	60.17
	Ethyl Ether	60-29-7	kg/yr	0.91	2.60
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	0.92	2.64
	Hydrogen Bromide	10035-10-6	kg/yr	0.21	0.60
	Hydrogen Chloride	7647-01-0	kg/yr	3.32	9.50
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	1.56	4.46
	Hydrogen Peroxide	7722-84-1	kg/yr	0.25	0.70
	Isobutane	75-28-5	kg/yr	16.96	48.46
	Isopropyl Alcohol	67-63-0	kg/yr	5.05	14.43
	Isopropylamine	75-31-0	kg/yr	0.24	0.69
	Kerosene	8008-20-6	kg/yr	2.12	6.06
	Mercury numerous forms	7439-97-6	kg/yr	0.00	0.45
	Methyl Alcohol	67-56-1	kg/yr	14.57	41.63
	n,n-Dimethylformamide	68-12-2	kg/yr	2.49	7.12
	n-Butyl Alcohol	71-36-3	kg/yr	0.99	2.83
	Nitric Acid	7697-37-2	kg/yr	16.02	45.78
	Phosphorus Pentachloride	10026-13-8	kg/yr	0.35	1.00
	Potassium Hydroxide	1310-58-3	kg/yr	9.15	26.13
	Propane	74-98-6	kg/yr	0.00	928.69
	Selenium Compounds, as Se	7782-49-2	kg/yr	0.26	0.73
	Sulfur Hexafluoride	2551-62-4	kg/yr	9.69	27.68
	Tetrahydrofuran	109-99-9	kg/yr	1.24	3.56
	Toluene	108-88-3	kg/yr	0.14	0.40
	Xylene (o-,m-,p-Isomers)	1330-20-7	kg/yr	0.09	0.25

Table A-6. Machine Shops Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
Machine Shops	Ethanol	64-17-5	kg/yr	6.27	17.93
	Propane	74-98-6	kg/yr	0.00	24.37

Table A-7. Materials Science Laboratory Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
MSL	Acetone	67-64-1	kg/yr	2.90	8.29
	Acetonitrile	75-05-8	kg/yr	0.74	2.12
	Ethanol	64-17-5	kg/yr	2.21	6.31
	Ethyl Ether	60-29-7	kg/yr	0.98	2.80
	Hydrogen Chloride	7647-01-0	kg/yr	0.21	0.59
	Hydrogen Peroxide	7722-84-1	kg/yr	0.49	1.41
	Isopropyl Alcohol	67-63-0	kg/yr	4.95	14.14
	Methyl Alcohol	67-56-1	kg/yr	9.97	28.49
	Nitric Acid	7697-37-2	kg/yr	1.34	3.82
	Xylene (o-,m-,p-Isomers)	1330-20-7	kg/yr	1.21	3.44

Table A-8. Pajarito Site Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
Pajarito Site	Propane	74-98-6	kg/yr	0.00	170.77

Table A-9. Plutonium Facility Complex Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
Plutonium Facility Complex	Acetylene	74-86-2	kg/yr	0.00	14.46
	Ammonium Chloride (Fume)	12125-02-9	kg/yr	0.38	1.07
	Chloroform	67-66-3	kg/yr	1.56	4.45
	Ethanol	64-17-5	kg/yr	14.12	40.34
	Hydrogen Chloride	7647-01-0	kg/yr	362.28	1035.08
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	2.90	8.28
	Hydrogen Peroxide	7722-84-1	kg/yr	12.31	35.17
	Isobutane	75-28-5	kg/yr	0.16	0.45
	Lead, el.&inorg.compounds, as Pb	7439-92-1	kg/yr	0.03	2.83
	Methyl Alcohol	67-56-1	kg/yr	0.28	0.79
	Nitric Acid	7697-37-2	kg/yr	226.27	646.49
	Oxalic Acid	144-62-7	kg/yr	28.18	80.50
	Phosphoric Acid	7664-38-2	kg/yr	0.32	0.92
	Potassium Hydroxide	1310-58-3	kg/yr	122.96	351.33
	Sulfuric Acid	7664-93-9	kg/yr	0.97	2.76

Table A-10. Radiochemistry Site Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
Radiochemistry Site	1,4-Dioxane	123-91-1	kg/yr	0.43	1.24
	Acetic Acid	64-19-7	kg/yr	0.36	1.02
	Acetone	67-64-1	kg/yr	34.97	99.92
	Acetonitrile	75-05-8	kg/yr	2.68	7.65
	Aniline & Homologues	62-53-3	kg/yr	0.18	0.51
	Benzene	71-43-2	kg/yr	0.21	0.61
	Catechol	120-80-9	kg/yr	0.18	0.50
	Chloroform	67-66-3	kg/yr	15.73	44.94
	Cyclohexene	110-83-8	kg/yr	0.14	0.41
	Diisopropylamine	108-18-9	kg/yr	0.25	0.70
	Ethanol	64-17-5	kg/yr	14.87	42.48
	Ethyl Acetate	141-78-6	kg/yr	10.08	28.81
	Ethyl Ether	60-29-7	kg/yr	9.07	25.90
	Ethylene Diamine	107-15-3	kg/yr	0.25	0.72
	Ethylene Dichloride	107-06-2	kg/yr	0.22	0.62
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	2.80	7.99
	Hydrogen Bromide	10035-10-6	kg/yr	9.98	28.50
	Hydrogen Chloride	7647-01-0	kg/yr	64.24	183.55
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	2.25	6.43
	Hydrogen Peroxide	7722-84-1	kg/yr	0.49	1.41
	Iron Oxide Fume, as Fe	1309-37-1	kg/yr	0.18	0.50
	Isopropyl Alcohol	67-63-0	kg/yr	12.92	36.92
	Manganese Dust & Compounds or Fume	7439-96-5	kg/yr	0.50	1.44
	Methyl Alcohol	67-56-1	kg/yr	4.99	14.25
	Methylene Chloride	75-09-2	kg/yr	37.55	107.29
	n,n-Dimethylformamide	68-12-2	kg/yr	0.33	0.95
	Nitric Acid	7697-37-2	kg/yr	297.34	849.53
	Nitrobenzene	98-95-3	kg/yr	0.21	0.60
	o-Phenylenediamine	95-54-5	kg/yr	0.26	0.75
	Oxalic Acid	144-62-7	kg/yr	0.18	0.50
	Pentane (all isomers)	109-66-0	kg/yr	2.63	7.51
	Phenol	108-95-2	kg/yr	0.35	1.00
	Phosphoric Acid	7664-38-2	kg/yr	0.32	0.92
	Potassium Hydroxide	1310-58-3	kg/yr	1.58	4.50
	Propane	74-98-6	kg/yr	0.00	1265.92
	Propionic Acid	79-09-4	kg/yr	0.35	0.99
	Pyridine	110-86-1	kg/yr	1.01	2.90
	Sulfuric Acid	7664-93-9	kg/yr	9.08	25.94
	Tetrahydrofuran	109-99-9	kg/yr	6.57	18.78
	Tetrasodium Pyrophosphate	7722-88-5	kg/yr	1.05	3.00
	Tin numerous forms	7440-31-5	kg/yr	0.01	0.50
	Toluene	108-88-3	kg/yr	5.79	16.55
	VM & P Naphtha	8032-32-4	kg/yr	9.71	27.75

Table A-11. Sigma Complex Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
Sigma Complex	Acetic Acid	64-19-7	kg/yr	0.37	1.05
	Acetone	67-64-1	kg/yr	1.11	3.16
	Arsenic, el.&inorg.,exc. Arsine, as As	7440-38-2	kg/yr	0.20	0.56
	Cobalt, elemental & inorg.comp., as Co	7440-48-4	kg/yr	0.01	1.12
	Furfuryl Alcohol	98-00-0	kg/yr	0.40	1.13
	Hydrogen Chloride	7647-01-0	kg/yr	286.69	819.10
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.50	1.44
	Hydrogen Peroxide	7722-84-1	kg/yr	4.23	12.10
	Isopropyl Alcohol	67-63-0	kg/yr	4.40	12.57
	Magnesium Oxide Fume	1309-48-4	kg/yr	4.20	12.00
	Methyl Alcohol	67-56-1	kg/yr	1.11	3.17
	Nickel, metal (dust) or Soluble & Inorganic Comp.	7440-02-0	kg/yr	0.26	0.75
	Nitric Acid	7697-37-2	kg/yr	812.37	2321.06
	Paraffin Wax Fume	8002-74-2	kg/yr	0.35	1.00
	Phosphoric Acid	7664-38-2	kg/yr	0.64	1.83
	Sulfuric Acid	7664-93-9	kg/yr	381.98	1091.36
	Tantalum Metal	7440-25-7	kg/yr	12.67	36.20
	Tungsten as W insoluble Compounds	7440-33-7	kg/yr	1.55	154.64
	Zirconium Compounds, as Zr	7440-67-7	kg/yr	0.05	5.40

Table A-12. Target Fabrication Facility Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
Target Fabrication Facility	Acetonitrile	75-05-8	kg/yr	0.82	2.36
	Ammonia	7664-41-7	kg/yr	7.94	22.68
	Cyclohexane	110-82-7	kg/yr	0.27	0.78
	Dibutyl Phthalate	84-74-2	kg/yr	1.05	3.00
	Ethanol	64-17-5	kg/yr	7.51	21.47
	Ethyl Ether	60-29-7	kg/yr	2.77	7.91
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	2.31	6.60
	Hydrogen Chloride	7647-01-0	kg/yr	0.42	1.19
	Hydrogen Sulfide	7783-06-4	kg/yr	0.26	0.73
	Isopropyl Alcohol	67-63-0	kg/yr	15.95	45.56
	Mercury numerous forms	7439-97-6	kg/yr	0.05	4.54
	Methyl Alcohol	67-56-1	kg/yr	24.79	70.83
	Methyl Ethyl Ketone (MEK)	78-93-3	kg/yr	0.28	0.81
	Methyl Methacrylate	80-62-6	kg/yr	0.99	2.83
	Methyl Silicate	681-84-5	kg/yr	1.33	3.80
	Methylene Bisphenyl Isocyanate (MDI)	101-68-8	kg/yr	2.63	7.50
	Methylene Chloride	75-09-2	kg/yr	1.53	4.38
	Morpholine	110-91-8	kg/yr	0.18	0.50
	n,n-Dimethylformamide	68-12-2	kg/yr	29.22	83.50
	n-Butyl Alcohol	71-36-3	kg/yr	0.28	0.81
	Nitric Acid	7697-37-2	kg/yr	0.18	0.50
	Potassium Hydroxide	1310-58-3	kg/yr	0.88	2.51
	Styrene	100-42-5	kg/yr	0.08	0.24
	Sulfuric Acid	7664-93-9	kg/yr	0.32	0.92
	tert-Butyl Alcohol	75-65-0	kg/yr	0.28	0.79
	Tetrahydrofuran	109-99-9	kg/yr	4.36	12.45
	Toluene	108-88-3	kg/yr	2.12	6.07

Table A-13. Tritium Operations Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
Tritium Operations	Ethanol	64-17-5	kg/yr	0.10	0.28
	Propane	74-98-6	kg/yr	0.00	24.47
	Yttrium	7440-65-5	kg/yr	0.09	0.25
	Zirconium Compounds, as Zr	7440-67-7	kg/yr	0.01	0.50

Table A-14. Waste Management Operations Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2004 Estimated Air Emissions	2004 Usage
Waste Management Operations	Ethanol	64-17-5	kg/yr	1.11	3.16
	Hydrogen Chloride	7647-01-0	kg/yr	328.14	937.53
	Nitric Acid	7697-37-2	kg/yr	12.28	35.10
	Potassium Hydroxide	1310-58-3	kg/yr	2.75	7.85
	Propane	74-98-6	kg/yr	0.00	0.62
	Sulfuric Acid	7664-93-9	kg/yr	216.26	617.88

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Appendix B: Nuclear Facilities List

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United States Government **Department of Energy**

memorandum

National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

DATE: August 27, 2004

REPLY TO ATTN OF: SABT/JWH-04-012

SUBJECT: Los Alamos Nuclear Facilities List, Revision 5

TO: James W. Angelo, Division Leader, Performance Surety Division, C-347

The Los Alamos Site Office (LASO) has reviewed revision 5 of the Los Alamos National Laboratory's Nuclear Facilities List. The list provides a compilation of Nuclear Hazard Category 2 and 3 facilities at the Los Alamos National Laboratory (LANL).

The LANL Nuclear Facilities List is created and provided solely as a document to identify, in a single location, the Hazard Category 2 and 3 Nuclear Facilities at Los Alamos and provide a reference to the document categorizing the facility. This document is not intended and does not serve to document the complete Authorization Basis of a nuclear facility. The complete Authorization Basis for a nuclear facility is documented in the Authorization Agreement.

The nuclear facilities list is periodically revised to reflect changes that occur in facility status. For example, a final hazard categorization or the movement, relocation or final disposition of inventory. LANL will need to ensure that changes reflected in Revision 4 of the nuclear facility list are properly reflected into the current Authorization Agreements for each nuclear facility.

In May this office identified errors in Revision 4 and brought them to the attention of LANL with a request to correct the errors. It is understood LANL is undergoing many changes but the length of time to correct minor errors needs to be remedied.

Revision 5 comprises the official list of Nuclear Hazard Category 2 and 3 facilities and Revision 5 is approved and supercedes the April 15, 2004 Revision 4 DOE/LANL Nuclear Facilities List.

If you should have any questions please contact Joe Houghton of the Safety Authorization Basis Team staff at (505) 667 – 6778

Christopher M. Steele
Senior Authorization Basis Manger

This document is determined to be UNCLASSIFIED and contains no UCNI Joseph W. Houghton, ADC 8/26/04

Attachment: as stated

cc w/attachment:

X. Ascanio, NA-124, HQ/GTN
E. Wilmont, Manager, LASO
T. Harmenson, Acting Deputy Manager, LASO
G. Schlapper, SSA, LASO
C. Steele, SABM, LASO
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Los Alamos
NATIONAL LABORATORY
EST. 1943

Action
Joe H
8/26/04

Received from Tony V
8/24/04 RC
10:30 AM

Performance Surety Division
James W. Angelo, Division Leader
P.O. Box 1663, MS C347
Los Alamos, New Mexico 87545
505-665-5550/Fax 505-665-0318

Date: August 23, 2004
Refer To: PS-DO:04-071

Mr. Christopher Steele
Senior Authorization Basis Manager
Los Alamos Site Office
528 35th Street, MS A316
Los Alamos, NM 87544

Dear Mr. Steele:

The attached document, DOE/LANL List of Los Alamos National Laboratory Nuclear Facilities, has been updated to reflect the current categorization of the Laboratory's nuclear facilities. As agreed to at the SABT/SBO June 30, 2004 Biweekly meeting, the List will reference only the document that identifies the hazard category of the facility. The Laboratory intends to review and update this document whenever a significant change occurs, such as the addition or deletion of a nuclear facility from the list.

Please review and concur with the document as the SABM and LASO Manager by signing page ii, then return the signed original to PS-4 with a recommended DOE distribution. This office will provide the production and distribution, and will post it on he Laboratory's internal web site.

If you have any questions regarding this transmittal, please call Tony Villegas at 665-2478.

Sincerely,

James W. Angelo
Division Leader

JWA/DGS:ar

Attachment: a/s

Cy: C. Keilers, DNFSB, A316
D. Satterwhite, PS-4, K561
A. Villegas, PS-4, K561
IM-9, A150
PS-DO Files

Performance Surety Division	Documentation and Records	PS-SBO 401 Rev. 5 August 20, 2004

DOE/LANL LIST OF LOS ALAMOS NATIONAL LABORATORY NUCLEAR FACILITIES

U.S. Department of Energy
National Nuclear Security Administration
Los Alamos Site Office

Los Alamos National Laboratory
Performance Surety Division
Safety Basis Office (PS-4)

APPROVED FOR USE	
LANL PS-SBO Office Leader	8/20/04 Date
NNSA-LASO Senior Authorization Basis Manager	8/26/04 Date
LASO Director	8/27/04 Date

Record of Document Revisions

Revision Record		
Revision	**Date**	**Summary**
0	April 2000	Original Issue.
1	June 2001	Updated nuclear facility list and modified format.
2	December 2001	Corrected CSOs, referenced DOE approval memo for 10 CFR 830 compliant facilities, new acronym list, and safety basis documentation update since last revision.
3	July 2002	Semi-annual update.
4	February 2004	Update safety basis documentation for Transportation, TA-18 LACEF, TA-8-23 Radiography, TA-21 TSTA, and TA-50 RLWTF. Added 11 Environmental Sites that were categorized as Hazard Category 2 and Hazard Category 3 Nuclear Facilities. TA-21 TSTA, TA-48-1 Radiochemistry, and TA-50 RAMROD were downgraded to Radiological Facilities and removed from this list. The facility contacts were changed from the Facility Manager and Facility Operations to Responsible Division Leader and Facility Management Unit.
5	August 2004	Updated TA-50 RLWTF as Hazard Category 2 Nuclear Facility, Added DVRS as a temporary Hazard Category 2 Nuclear Facility. Downgraded TSFF to a Hazard Category 3 Nuclear Facility from a Hazard Category 2. The organization of the Nuclear Facility List was modified to identify only the document that categorizes the facility. Other safety basis documents related to a facility would be identified in the Authorization Agreements. The purpose of this was to reduce redundancy and conflicts between the Nuclear Facility List and Authorization Agreements.

Changes in Nuclear Facility Status

Date	Description
3/97	Omega West Reactor (OWR), TA-2-1, downgraded from hazard category 2 reactor facility to a radiological facility. OWR removed from the nuclear facilities list.
9/98	Safety Analysis Report (SAR) approved accepting the Radioactive Materials, Research, Operations, and Demonstration Facility (RAMROD), TA-50-37, as a hazard category 2 nuclear facility. RAMROD added to the nuclear facilities list.
9/98	TA-35 Buildings 2 and 27 downgraded from a hazard category 2 nuclear facility to a hazard category 3 nuclear facility.
9/98	Basis of Interim Operations (BIO) approved accepting the Los Alamos Neutron Science Center (LANSCE) A-6 Isotope Production and Materials Irradiation and 1L Manuel Lujan Neutron Scattering Center (MLNSC) Target Facilities as hazard category 3 nuclear facilities.
10/98	TA-8 Radiography Facility Buildings 24 and 70 downgraded from hazard category 2 nuclear facilities to radiological facilities.
11/98	Health Physics Calibration Facility (TA-3 SM-40, SM-65 and SM-130) downgraded from a hazard category 2 nuclear facility to a radiological facility. SM-40 and SM-65 had been hazard category 2 nuclear facilities while SM-130 had been a hazard category 3 nuclear facility. Health Physics Calibration Facility removed from the nuclear facilities list.
12/98	Radioactive Liquid Waste Treatment Facility (RLWTF) downgraded from a hazard category 2 nuclear facility to a hazard category 3 nuclear facility.
1/99	Pion Scattering Experiment of the TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE) removed from the nuclear facilities list.
2/00	Building TA-50-190, Liquid Waste Tank, of the Waste Characterization Reduction and Repackaging Facility (WCRRF) removed from the nuclear facilities list.
3/00	DOE SER clarifies segmentation of the Waste Characterization Reduction and Repackaging Facility (WCRRF) as: 1) Building TA-50-69 designated as a hazard category 3 nuclear facility, 2) an outside operational area designated as a hazard category 2 nuclear facility, and 3) the Non-Destructive Assay (NDA) Mobile Facilities located outside TA-50-69 and designated as a hazard category 2 nuclear facility.
4/00	Building TA-3-159 of the TA-3 SIGMA Complex downgraded from hazard category 3 nuclear facility to a radiological facility and removed from the nuclear facilities list.
4/00	TA-35 Nonproliferation and International Security Facility Buildings 2 and 27 downgraded from hazard category 3 nuclear facilities to radiological facilities and removed from the nuclear facilities list.
3/01	TA-3-66, Sigma Facility, downgraded and removed from this nuclear list.
5/01	TA-16-411, Assembly Facility, downgraded and removed from this nuclear list.
5/01	TA-8-22, Radiography Facility, downgraded and removed from this nuclear list.
6/01	Site Wide Transportation added as a nuclear activity (included in 10 CFR 830 plan).
9/01	TA-53 LANSCE, WNR Target 4 JCO approved as hazard category 3 nuclear activity.
10/01	TA-53 LANSCE IL JCO in relation to changes in operational parameters of the coolant system with an expiration date of 1/31/02.
10/01	TA-53 LANSCE Actinide BIO approved as hazard category 3 nuclear activity.
3/02	TA-33-86, High Pressure Tritium Facility (HPTF) removed from nuclear facilities list.
4/02	TA-53 LANSCE, DOE NNSA approves BIO for Storing Activated Components (A6, etc.) in Bldg 53-3 Sector M "Area A East" and added as hazard category 3 nuclear activity.
7/02	TA-53 LANSCE, WNR Facility Target 4 downgraded to below hazard category 3 and removed

Changes in Nuclear Facility Status

Date	Description
	from the nuclear facilities list.
1/03	TA-50 Radioactive Materials, Research, Operations, and Demonstration (RAMROD) facility was downgraded to below hazard category 3 and removed from the nuclear facilities list.
6/03	TA-48-1, Radiochemistry and Hot Cell Facility was downgraded to below hazard category 3 and removed from the nuclear facilities list.
7/03	TA-21 Tritium System Test Assembly (TSTA) facility was downgraded to below hazard category 3 and removed from the nuclear facilities list.
11/03	TA-10 PRS 10-002(a)-00 (Former liquid disposal complex) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-21 PRS 21-014 (Material Disposal Area A) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-21 PRS 21-015 (Material Disposal Area B) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-21 PRS 21-016(a)-99 (Material Disposal Area T) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-35 PRS 35-001 (Material Disposal Area W, Sodium Storage Tanks) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-35 PRS 35-003(a)-99 (Wastewater treatment plant (WWTP)) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-35 PRS 35-003(d)-00 (Wastewater treatment plant – Pratt Canyon) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-49 PRS 49-001(a)-00 (Material Disposal Area AB) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-50 PRS 50-009 (Material Disposal Area C) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-53 PRS 53-006(b)-99 (Underground tank with spent resins) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-54 PRS 54-004 (Material Disposal Area H) environmental site was categorized as a hazard category 3 nuclear facility
3/04	TA-54-38, Radioassay and Nondestructive Testing (RANT) Facility, is re-categorized as a Hazard Category 2 nuclear facility from Hazard Category 3.
6/04	TA-54-412 Decontamination and Volume Reduction Glovebox (DVRS) added to Nuclear Facility List. The facility will operate as a Hazard Category 2 not exceeding 5 months from the date LASO formally releases the facility for operations following readiness verification.
6/04	DOE Safety Evaluation Report for the TSFF BIO establishes that TSFF is re-categorized as a Hazard Category 3 from Hazard Category 2.
7/04	TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) was re-categorized as a Hazard Category 2 Nuclear Facility based on a DOE Memo dated March 20, 2002.

FORWORD

1. This joint U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA), Los Alamos Site Office (LASO) and Los Alamos National Laboratory (LANL), Performance Surety (PS) Division document has been prepared by the LASO Safety Authorization Basis Team (SABT) and the Safety Basis Office (SBO) at LANL. This document provides a tabulation and summary information concerning hazard category 2 and 3 nuclear facilities at LANL.

2. This nuclear facility list will be updated to reflect changes in facility status caused by inventory reductions, final hazard classifications, exemptions, facility consolidations, and other factors.

3. DOE-STD-1027-92 methodologies are the bases used for identifying nuclear facilities to be included in this standard. Differences between this document and other documents that identify nuclear facilities may exist as this list only covers nuclear hazard category 2 and 3 facilities that must comply with the requirements stipulated in 10 CFR 830, Subpart B. Other documents might include facilities that have inventories below the nuclear hazard category 3 threshold, such as radiological facilities.

LIST OF ACRONYMS AND ABBREVIATIONS

Term	Meaning
ARIES	Advanced Recovery and Integration Extraction System
BIO	basis for interim operations
BUS	Business Operations (Division)
C	Chemistry (Division)
CFR	Code of Federal Regulations
CMR	Chemistry and Metallurgy Research (Facility)
CSO	cognizant secretarial officer
DD	Division Director
DOE	U.S. Department of Energy
DOE/AL	DOE Albuquerque Operations
DP	Defense Programs (DOE)
DSA	documented safety analysis
DVRS	decontamination and volume reduction glovebox
EM	Environmental Management (DOE)
ESA	Engineering Sciences and Applications (Division)
ESH	Environment, Safety and Health (Division)
F&IB	Feedback and Improvement Board
FSAR	final safety analysis report
FM	facility management
FMU	facility management unit
FWO	Facility and Waste Operations (Division)
HA	hazard analysis
HC	hazard category
HPTF	High Pressure Tritium Facility
HSR	Health, Safety and Radiation
IAW	in accordance with
IFIT	Isotopic Fuel Impact Test
ITSR	interim technical safety requirements
JCO	justification for continued operations
LACEF	Los Alamos Criticality Experiment Facility
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LASO	Los Alamos Site Office
LLW	low-level waste
MER	management evaluation report
MDA	material disposal area
MLNSC	Manuel Lujan Neutron Scattering Center
N	Nuclear Nonproliferation Division
NIS	Nonproliferation and International Security (Division) (name changed to Nuclear Nonproliferation Division)
NDA	non-destructive assay
NMT	Nuclear Materials Technology (Division)

NNSA .... National Nuclear Security Administration
NSM Rule .... Nuclear Safety Management Rule, 10 CFR 830
NTTL .... neutron tube target loading
OAB .... Office of Authorization Basis
OLASO .... Office of Los Alamos Site Operation
OSR .... operational safety requirement
OWR .... Omega West Reactor
PRS .... Potential Release Site
PS .... Performance Surety (Division)
Pu .... plutonium
RAMROD .... Radioactive Material, Research, Operations, and Demonstration (Facility)
RANT .... Radioactive Assay Nondestructive Testing (Facility)
RDL .... Responsible Division Leader
Rev. .... revision
RLWTF .... Radioactive Liquid Waste Treatment Facility
SA .... safety assessment
SAR .... safety analysis report
SB .... safety basis
SBO .... Safety Basis Office
SER .... safety evaluation report
SM .... South Mesa
STD .... standard
SUP .... Supply Chain Management (Division) (formerly known as BUS)
TA .... technical area
TBD .... to be determined
TRU .... transuranic
TSD .... transportation safety document
TSE .... Tritium Science Engineering (Group)
TSFF .... Tritium Science and Fabrication Facility
TSR .... technical safety requirement
TSTA .... Tritium Systems Test Assembly (Facility)
TWISP .... Transuranic Waste Inspectable Storage Project
USQ .... unreviewed safety question
WCRRF .... Waste Characterization, Reduction and Repackaging Facility
WETF .... Weapons Engineering Tritium Facility
WSDF .... Waste Storage and Disposal Facility

1 SCOPE

Standard DOE-STD-1027-92, Change 1, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, provides methodologies for the hazard categorization of DOE facilities based on facility material inventories and material at risk. This document lists hazard category 2 and 3 nuclear facilities because they must comply with requirements in Title10, *Code of Federal Regulations*, Part 830, Nuclear Safety Management, Subpart B, "Safety Basis Requirements." The Los Alamos National Laboratory (LANL) nuclear facilities that are below hazard category 3 (radiological facilities) have not been included on this list because they are exempt from the requirements in 10 CFR 830, Subpart B.

2 PURPOSE

This standard provides a list of hazard category 2 (HC2) and 3 (HC3) nuclear facilities at LANL. The list will be revised, as appropriate, to reflect changes in facility status resulting from final hazard categorization or movement, relocation, or final disposal of radioactive inventories. The list shall be used as the basis for determining initial applicability of DOE nuclear facility requirements. The list now identifies the categorization of site wide transportation and environmental sites per the requirements of 10 CFR 830, Subpart B.

3 APPLICABILITY

This standard is intended for use by NNSA and contractors with responsibilities for facility operation and/or oversight at LANL.

4 REFERENCES

4.1 49 CFR 173.469, Title 49, *Code of Federal Regulations,* Part 173 "Shippers - General Requirements for Shipments and Packagings."

4.2 DOE O 420.2, Change 1, *Safety of Accelerator Facilities*, USDOE, 5/26/99.

4.3 DOE-STD-1027-92, Change 1, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, USDOE, 9/97.

4.4 10 CFR 830, Title 10, *Code of Federal Regulations*, Part 830, "Nuclear Safety Management."

4.5 ANSI N43.6, American National Standards Institute (ANSI) N43.6, "American National Standard for General Radiation Safety—Sealed Radioactive Sources, Classification".

5 NUCLEAR FACILITIES LIST

Table 5-1 identifies all HC2 and HC3 nuclear facilities at LANL. Facilities have been categorized based on criteria in DOE-STD-1027-92, Change 1. Site, zone or area, building number, name, and dominant hazard category identifies each facility. The dominant hazard category is determined by identifying the highest hazard category for multi-process facilities. Buildings, structures, and processes addressed by a common documented safety analysis have been designated as a single facility. DOE-STD-1027-92, Change 1, permits exclusion of sealed radioactive sources from a radioactive inventory of the facility if the sources were fabricated and tested in accordance with 49 CFR 173.469 or ANSI N43.6. In addition, material contained in U.S. Department of Transportation (DOT) Type B shipping containers may also be excluded from radioactive inventory. Facilities containing only material tested or stored in accordance with these standards do not appear in the list and tables that follow.

TABLE 5-1. Summary of LANL Nuclear Facilities

HAZ CAT	FACILITY NAME
2	TA-3 Chemistry and Metallurgy Research Facility (CMR)
2	TA-8 Radiography Facility
3	TA-10 PRS 10-002(a)-00 (Former liquid disposal complex)
2	TA-16 Weapons Engineering Tritium Facility (WETF)
2	TA-18 Los Alamos Critical Experiment Facility (LACEF) and Hillside Vault
3	TA-21 Tritium Science and Fabrication Facility (TSFF)
2	TA-21 PRS 21-014 (MDA A)
3	TA-21 PRS 21-015 (MDA B)
2	TA-21 PRS-21-016(a)-99 (MDA T)
3	TA-35 PRS 35-001 (MDA W – Sodium Storage Tanks)
3	TA-35 PRS 35-003(a)-99 (Wastewater Treatment Plant (WWTP))
3	TA-35 PRS 35-003(d)-00 (Wastewater Treatment Plant (Pratt Canyon))
2	TA-49 PRS 49-00(a)-00 (MDA AB)
2	TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF)
2	TA-50 Waste Characterization Reduction and Repackaging Facility (WCRRF)
2	TA-50 PRS 50-009 (MDA C)
3	TA-53 Los Alamos Neutron Science Center (LANSCE) 1L Target
3	TA-53 LANSCE Lujan Center ER-1/2 Actinide
3	TA-53 LANSCE Storage of Activated Components/Targets (A-6, etc.) in Building 53-3, Sector M Area A East
2	TA-53 PRS 53-006(b)-99 (Underground tank with spent resin)
2	TA-54 Waste Storage and Disposal Facility (Area G)
2	TA-54 Transuranic Waste Inspectable Storage Project (TWISP)
2	TA-54 Radioactive Assay Nondestructive Testing (RANT) Facility
3	TA-54 PRS 54-004 (MDA H)
2	TA-54 Decontamination and Volume Reduction (DVRS) Glovebox
2	TA-55 Plutonium Facility
2	Site Wide Transportation

Summary of Table 5-1:

17 Hazard Category 2 Nuclear Facilities

10 Hazard Category 3 Nuclear Facilities

27 Total Nuclear Facilities

6 LANL NUCLEAR FACILITIES SUMMARY TABLES

The Table 5-2 lists the categorization basis information and a brief description for each nuclear facility identified in Table 5-1.

TABLE 5-2. Nuclear Facility Categorization Information

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
3	0029		2	Chemistry and Metallurgy Research Facility CMR	Actinide chemistry research and analysis	*CMR Basis for Interim Operations*, dated August 26, 1998	DP	9	NMT
8	0023		2	TA-8 Radiography Facility	Radiography Facility-	Documented Safety Analysis for TA-8, Building 23 – Radiography Facility, LA-CP-02-380, September 9, 2002.	DP	5	ESA
10		10-0029(a)-99	3	PRS 10-002(a)-99 (Former liquid disposal complex)	PRS 10-002(a)-99 is associated with the former liquid disposal complex serving the radiochemistry laboratory at TA-10. The complex discharged to leach fields and pits. The entire complex underwent D&D in 1963. All above ground and below ground structures were removed. The remaining materials were placed in a pit that remains in place.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM		RRES
16	0205		2	Weapons Engineering and Tritium Facility (WETF)	Tritium Research	Safety Evaluation Report (SER) for WETF, SER-Rev.0, March 27, 2002.	DP	5	ESA
18			2	Los Alamos Critical Experiment Facility (LACEF)	Critical experiment site	LANL Technical Area 18 Basis for Interim Operations, TA-18-AB-SAD-0102. March 2002.	DP	6	N

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
21	0209		3	Tritium Science and Fabrication Facility (TSFF)	Stabilization activities and NTLL Support	Safety Evaluation Report (SER), Basis for Interim Operation (BIO) and Technical Safety Requirements (TSRs) for the Tritium Science Fagrication Facility (TSFF), Technical Area 21, Building 209, LANL TSFF-DSA-BIO, R2 and LANL TSFF TSR, Revision 2, June 10, 2004.	DP	5	ESA
21		21-014	2	PRS 21-014 (MDA A)	MDA A is a 1.25 acre site that was used intermittently from 1945 to 1949 and 1969 to 1977 to dispose of radioactively contaminated solid wastes, debris from D&D activities, and radioactive liquids generated at TA-21. The area contains two buried 50,000 gal. storage tanks (the "General's Tanks") on the west side of MDA A, two rectangular disposal pits (each 18 ft long x 12.5 ft wide x 12.5 deep) on the east side of MDA A, and a large central pit (172 ft long x 134 ft wide x 22 ft deep).	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	8	RRES

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
21		21-015	3	PRS 21-015 (MDA B)	MDA B is an inactive 6.03 acre disposal site. It was the first common disposal area for radioactive waste generated at LANL and operated from 1945 to 1952. The site runs along the fence line on DP Road and is located about 1600 ft east of the intersection of DB Road and Trinity Drive. The site comprises four major pits (each 300 ft x 15 ft x 12 ft deep), a small trench (40 ft x 2 ft x 3 ft deep), and miscellaneous small disposal sites.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	8	RRES
21		21-016(a)-99	2	PRS 21-016(a)-99 (MDA T)	MDA T, an area of about 2.2 acres, consists of four inactive absorption beds, a distribution box, a subsurface retrievable waste storage area disposal shafts, a former waste treatment plant, and cement paste spills on the surface and within the retrievable waste storage area.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	8	RRES

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
35		35-001	3	PRS 31-001 (MDA W Sodium Storage Tanks)	MDA W consists of two vertical shafts or "tanks" that were used for the disposal of sodium coolant used in LAMPRE-1 sodium cooled research reactor. The two tanks are 125 ft long stainless steel tubes that were half filled and inserted into carbon steel casings separated by approximately 3 ft. Until 1980, a metal control shed was located above the tanks, but this feature was removed and replaced with a concrete cover. The predominant radionuclide of concern in the Sodium is Pu-239 that may have been introduced from a breach of one or two fuel elements during the operational life of LAMPRE-1.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	8	RRES

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
35		35-003(a)-99	3	PRS 35-003(a)-99 (Wastewater treatment plant (WWTP))	The WWTP was located at the east end of Ten Site Mesa and operated from 1951 until 1963. It consisted of an array of underground waste lines, storage tanks, and chemical treatment precipitation tanks. The plant treated liquid waste that originated from the radiochemistry laboratories and operation of the radioactive lanthanum-140 hot cells in Bldg 35-2. The liquid wastes from the laboratories were acidic, and the radioactivity in the waste came from barium-140, lanthanum-140, strontium-89, strontium-90, and yttrium-90.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	8	RRES
35		35-003(d)-00	3	PRS 35-003(d)-00 (Wastewater treatment plant – Pratt Canyon)	The former structures associated with the Pratt Canyon component of the WWTP. All buildings, foundations, and structures were removed during D&D activities in 1981 and 1985, then backfilled with 20 ft of clean fill material.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	8	RRES

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
49		49-001(a)-00	2	PRS 49-001(a)-00 (MDA AB)	This underground, former explosive test site comprises four distinct areas, each with a series of deep shafts used for subcritical testing. Radioactively contaminated surface soil exists at one of the test areas [SWMU 49-001(g)].	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	8	RRES
50	0001		2	TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF)	Main treatment plant, pretreatment plant, decontamination operation	DOE Memorandum: Hazard Categorization of the Radioactive Liquid Waste Treatment Facility (RLWTF), SABT/RCJ.0202, March 20, 2002.	DP	6	FWO
	0002		2		Low level liquid influence tanks, treatment effluent tanks, low level sludge tanks				
	0066		2		Acid and Caustic waste holding tanks				
	0090		2		Holding tank				
50	0069		3	TA-50 Waste Characterization Reduction and Repackaging Facility (WCRRF)	Waste characterization, reduction, and repackaging facility	*Safety Evaluation Report (SER) for Waste Characterization, Reduction, and Repackaging Facility (WCRRF) Interim Technical Safety Requirements (ITSRs), TA-50-69*, Rev. 0, February 15, 2000, March 13, 2000. (ITSRs/ HA approved as a BIO)	DP	6	FWO
	External		2		NDA mobile activities outside TA-50-69				
	External		2		Drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69				

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
50		50-009	2	PRS 50-009 (MDA C)	MDA C was established in 1948 to replace MDA B. MDA C covers 11.8 acres and consists of 7 pits (four are 610 ft x 40 ft x 25 ft, one is 110 ft x 705 ft x 18 ft, one is 100 ft x 505 ft x 25 ft, and one 25 ft x 180 ft x 12 ft), 107 shafts (each typically 2 ft dia. x 10-25 deep), and one unnumbered shaft used for a single strontium-90 source disposal. Pits and shafts were used for burial of hazardous chemicals, uncontaminated classified materials, and radioactive materials. TRU waste also was buried in unknown quantities in the pits. The landfill was used until 1974. COCPCs included inorganic chemicals, VOCs, SVOCs, and radionuclides.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	6	RRES
53	1L Target		3	TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE)	Lujan Center Neutron Production Target	Safety Evaluation Report for LANSCE (TA-53) 1L Target-BIO, Rev.1, March 22,2000	DP	4	LANSCE
53	Lujan Center ER-1/2		3	TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE)	Actinide scattering experiments	Safety Evaluation Report Basis for Interim Operations for Experiments on Neutron Scattering by Actinides at the Manuel Lujan, Jr. Neutron Scattering Center, Sept 17, 2001	DP	4	LANSCE

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
53	Area A-6		3	TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE)	In-place storage DU and A-6 beam stop	DOE Memo – Approval and Safety Evaluation (SER) for the Basis for Interim Operations (BIO) for the LANSCE in Place Storage Operations in Building 53-3, Sector M "Area East", SABM A6 LANSCE BIO Approval, April 6, 2002.	DP	4	LANSCE
53		53-006(b)-99	2	PRS 53-006(b)-99 (Underground tank with spent resins)	Three inactive underground tanks associated with the former radioactive liquid waste system at TA-53. One tank (Structure 53-59) is 28 in dia x 65 ft long and contains spent ion exchange resin. Two empty tanks are 6 ft dia x 12 ft long and are not included here.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	4	RRES
54	Area G		2	TA-54 Waste Storage and Disposal Facility (Area G)	Low level waste (LLW) (including mixed waste) storage and disposal in domes, pits, shafts, and trenches. TRU waste storage in domes and shafts (does not include TWISP). TRU legacy waste in pits and shafts. Low level disposal of asbestos in pits and shafts. Operations building; TRU waste storage.	U.S. Department of Energy, National Nuclear Security Administration SER for TA-55 Area G DSA 11/25/03; Final Documented Safety Analysis (DSA) Technical Area 54, Area g, ABD-WFM-001, Rev.0 April 9, 2003, ADB-WFM-002, Rev. 0, November 10, 2003.	DP	6	FWO
54	Pad 2		2	TA-54 Transuranic Waste Inspectable	Recovery of buried TRU waste	Safety Evaluation Report (SER) for TWISP-SER-Rev. 0 June 26,	DP	6	FWO

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
	0033		2	Storage Project (TWISP)	TRU waste storage, fabric dome with TRU waste drum	2000. Basis for Interim Operations (BIO) Transuranic Waste Inspectable Storage Project (TWISP), TA-54, Area G; TWISP-BIO-Rev. 0, April 24, 2000; TWISP-TSR-Rev. 0, April 24, 2000.			
54	412		2	TA-54 Decontamination and Volume Reduction Glovebox Note: The facility will operate as a Hazard Category 2 not exceeding 5 months from the date LASO formally releases the facility for operations following readiness verification.	Recovery of buried TRU waste	Safety Evaluation Report: Basis for Interim Operation (BIO) and Technical Safety Requirements (TSRs) for the Decontamination and Volume Reduction Glovebox in support of the Quick-to-WIPP Project. ABD-WFM, Rev. 0 April 8, 2004. SER Effective Date: June 8, 2004.	DP	6	FWO
54	0038		2	TA-54 Radioactive Assay Nondestructive Testing (RANT) Facility	Nondestructive assay and examination of waste drums, WIPP certification of TRU waste drums, TRUPACT loading of drums	Safety Evaluation Report, Basis for Interim Operation (BIO) and Technical Safety Requirements for the Radioassay and Nondestructive Testing (RANT) Facility, Technical Area 54-38, ABD-WFM-007, Rev. 0, May 30, 2003; LASO December 23, 2003	DP	6	FWO
54		54-004	3	PRS 54-004 (MDA H)	MDA H is a 0.3 acre site on Mesita del Buey that contains nine inactive shafts that were used for disposal of LANL waste. Each shaft is 6 ft dia x 60 ft deep.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EM	6	RRES

TA	Bldg	PRS	Hazard Category	Facility Name	Description	Categorization Basis	CSO	FMU	RDL
55	4		2	TA-55 Plutonium Facility	Pu glovebox lines; processing of isotopes of Pu	*Safety Evaluation Report of the Los Alamos National Laboratory Technical Area 55 Plutonium Building-4, Safety Analysis Report and Technical Safety Requirements*, December 1996.	DP	7	NMT
Site Wide			2	Site Wide Transportation	Laboratory nuclear materials transportation	Safety Evaluation Report, Los Alamos National Laboratory Transportation Safty Document (TSD) Technical Safety Requirements (TSRs), September 2002, LANL BUS4-SA-002, R0. US DOE NNSA LASO November 8, 2002.	DP	FWO-DLL	SUP

Appendix C: Radiological Facilities List

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LOS ALAMOS NATIONAL LABORATORY

RADIOLOGICAL FACILITY LIST

PS-OAB-403, Revision 1

Prepared by: George F. Nolan	Signature: [signature] for George Nolan	Date: 1/13/03
Approved by: David G.Satterwhite, Office Leader	Signature: [signature]	Date: 1/13/03

HISTORY OF REVISIONS

Revision Record		
Revision	**Date**	**Summary**
0	09/18/01	Original Issue
1	11/14/02	Annual update based upon input from facility managers

Los Alamos
NATIONAL LABORATORY

James L. Holt
Associate Director for Operations
Los Alamos National Laboratory
Mail Stop A104
Los Alamos, New Mexico 87545
505-667-0079/Fax 505-665-1812

Date: September 26, 2002
Refer to: AD-Ops:02-120

Christopher M. Steele
National Nuclear Security Administration
Office of Los Alamos Support Operations
P.O. Box 1663, Mail Stop A316
Los Alamos, NM 87545

Dear Mr. Steele:

Subject: Radiological Facilities Inventory of Radioactive Material

Attached for your information are the results of LANL's annual radioactive material inventory, conducted in accordance with the requirement of LIR 300-00-05, *Facility Hazard Categorization*. Attachment 1 is the radioactive material inventory report for radiological facilities. The methodology used in developing this report is detailed in Attachment 2. Attachment 3 is the updated listing of radiological facilities. Attachment 4 is a summary of the changes to the radiological facilities list over the past year

If you have questions please contact George Nolan, 7-3477.

Sincerely,

James L. Holt
Associate Director for Operations

JLH:DGS:mv

Attachments:

1. RAM Inventory
2. RAM Inventory Methodology
3. LANL Radiological Facility List
4. Summary of Radiological Facility List Changes.

Action to Jim Loud and Dave Satterwhite Due to Scott COB Nov. 7th.

KMB 11/1

United States Government

Department of Energy

National Nuclear Security Administration
Albuquerque Operations Office
Office of Los Alamos Site Operations
Los Alamos, New Mexico 87544

memorandum

DATE: October 25, 2002

REPLY TO ATTN OF: SABT/RCJ.02.012: SABM Steele

SUBJECT: Radiological Facilities Inventory of Radioactive Material

TO: James L. Holt, Associate Director for Operations, MS-A104

The Los Alamos National Laboratory (LANL) submitted, via a letter from J. Holt to C. Steele, dated September 26, 2002, the "Radiological Facilities Inventory of Radioactive Material" to National Nuclear Security Administration (NNSA) for information (Attachment 1). NNSA has reviewed the subject document and has identified issues in a number of the hazard categorization tables included in the document. These tables provide the calculations of the Hazard Category (HC3) Ratio used to determine that the radioactive material inventory in the facility is less than HC3 in accordance with the standard and Laboratory Implementing Requirements (LIR 300-00-05, Facility Hazard Categorization).

The calculations provided in these tables are used by LANL to finalize the current list of Radiological Facilities (RF) at LANL. NNSA performed independent verification of a small number of the hazard categorization results using the Mass Inventory values provided with the correct threshold values obtained from DOE-STD-1027-92 CN1. The results of the NNSA review indicates that the inventory / HC3 ratios for the NIS facilities could be greater than one (Attachment 2).

NNSA comments on the above referenced submittal are included as Attachment 2. NNSA requires LANL to review all of the Radioactive Material Inventory tables submitted in the referenced document and revise those tables as appropriate.

If you have any questions regarding this matter please contact Randy Janke of my staff at 665-4205 or myself at 667-3418.

Christopher M. Steele
Senior Authorization Basis Manager

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Los Alamos
NATIONAL LABORATORY

James L. Holt
Associate Director for Operations
Los Alamos National Laboratory
Mail Stop A104
Los Alamos, New Mexico 87545
505-667-0079/Fax 505-665-1812

Date: November 14, 2002
Refer to: AD-Ops:02-152

Christopher M. Steele
National Nuclear Security Administration
Office of Los Alamos Support Operations
P.O. Box 1663, Mail Stop A316
Los Alamos, NM 87545

Dear ~~Mr. Steele~~ Chris:

Subject: Radiological Facilities Inventory of Radioactive Material

Reference: SABT/RCJ.02.012:SABM Steele (October 25, 2002)

The subject document has been revised and attached (Attachment 1) according to your comments/ observations transmitted in the Reference stated above. Response/resolution to each comment has been also documented and attached (Attachment 2).

If you have questions, please contact David Satterwhite 5-8034 or Kyo Kim 5-8902 of my staff.

Sincerely,

Jim

James L. Holt
Associate Director for Operations

JLH:DGS:mv

Attachments:

1. List of LANL Radiological Facilities
2. NNSA Comment Resolution

Based upon input from facility managers (FM), the facilities listed in the table below are identified as radiological facilities. The definition for radiological facility per in the DOE-approved LIR 300-00-05, *Facility Hazard Categorization,* is:

> *A radioactive material using area/activity that contains less than category 3 inventories as listed in Table A.1 DOE-STD-1027-92, but where the amount of radioactive material present is sufficient to create a "radiological area" as defined in 10 CFR 835. Radioactive material that is either in a DOT Type B shipping container or is a sealed source may be excluded from consideration per the conditions defined by DOE-STD-1027-92.*

Based on the LIR definition, the following instructions were provided to the facility mangers to identify radiological facilities:

a. Contains less than hazard category 3 (<HC3) amounts of RAM (see DOE-STD-1027-92, Change 1).
b. Contains area posted as a radiological area (per 10 CFR 835)
c. Exclude RAM in sealed radioactive sources meeting requirements of ANSI N43.6.
d. Exclude RAM in U.S. Department of Transportation (DOT) Type B container.
e. Exclude structures included in the safety bases of HC2 and HC3 nuclear facility (see *DOE/LANL List of Los Alamos National Laboratory Nuclear Facilities*, FWO-OAB 401, Rev. 1), and
f. Exclude structures whose only source of radiation is machine produced X rays.
g. RAM used in exempted, commercially available products, should not be considered part of a facility's inventory.

Radiological facilities (<HC3) are nuclear facilities but are not required to comply with 10 CFR 830, Subpart B. The attached table provides a list of these radiological facilities identified in September 2002. Several facilities are listed as potentially radiological facilities. These facilities normally have no RAM, but could receive RAM on an interim basis. Per DOE-STD-1027-92, a facility is involved with an inventory of radioactive materials that varies with time must be categorized on the basis of its maximum inventory of radioactive materials.

LANL RADIOLOGICAL FACILITY SUMMARY TABLE

TA-BLDG	Descriptor	FM/FMU	Disposition Note
TA-2-1	Omega Reactor	D. McLain/64	D&D residual radiation
TA-3-16	Ion Exchange	D. McLain/64	D&D, tritium
TA-3-34	Cryogenics Bldg B	L. Woodrow/73	Multiple isotope samples
TA-3-35	Σ Press Building	L. Woodrow/73	DU plus residual in ducts
TA-3-40	Physics Bldg (HP)	S. Archuleta/77	To relocate TA-36-1/214
TA-3-66	Sigma Building	L. Woodrow/73	DU
TA-3-102	Tech Shop Add	B. Grace/70	DU
TA-3-159	Σ Thorium Storage	L. Woodrow/73	Th-232
TA-3-169	Warehouse	L. Woodrow/73	DU
TA-3-1698	Material Science Lab	L. Woodrow/73	Multiple isotope samples
TA-3-1819	Experiment Mat'l Lab	L. Woodrow/73	Multiple isotope samples
TA-8-22	X ray Facility	B. Grace/70	Potential DU
TA-8-70	Non Destructive Testing	B. Grace/70	DU/Th-232
TA-8-120	Radiography	B. Grace/70	Potential DU
TA-11-30	Vibration Test	B. Grace/70	Potential DU
TA-15-R183	Vault	T. Alexander/67	DU
TA-16-88	RAM Machine Shop	B. Grace/70	DU/Th-232
TA-16-202	Laboratory	B. Grace/70	DU/tritium
TA-16-207	Component Testing	B. Grace/70	Potential DU/Th-232, Rm 113
TA-16-300	Component Storage	B. Grace/70	DU/Th-232
TA-16-301	Component Storage	B. Grace/70	DU
TA-16-302	Component Storage Training	B. Grace/70	DU/Th-232
TA-16-332	Component Storage	B. Grace/70	DU/Th-232
TA-16-410	Assembly Building	B. Grace/70	DU/Th-232
TA-16-411	Assembly Building	B. Grace/70	DU/Th-232
TA-21-5	Lab Bldg	D. McLain/64	D&D
TA-33-86	High pressure tritium	D. McLain/64	D&D
TA-35-2	Nuclear Safeguards Research	P. Bussolini/75	NIS-5 sources
TA-35-27	Nuclear Safeguards Lab	P. Bussolini/75	NIS-5 sources
TA-36-1	Laboratory and offices	S. Helmick/71	Sources
TA-36-214	Central HP Calibration Facility	S. Helmick/71	Sources
TA-37-10	Storage Magazine	B. Grace/70	DU
TA-37-14	Storage Magazine	B. Grace/70	DU
TA-37-16	Storage Magazine	B. Grace/70	DU
TA-37-24	Storage Magazine	B. Grace/70	DU
TA-37-25	Storage Magazine	B. Grace/70	DU
TA-41-1	Underground Vault	B. Grace/70	DU/Th-232
TA-43-1	Bio Lab	R. Crook/72	Sources
TA-53-945	RLW Treatment Facility	D. Seely/61	Waste products
TA-53-954	RLW Basins	D. Seely/61	Waste products
TA-54-412	DVRS	D. McLain/64	Waste products

LIST OF LANL RADIOLOGICAL FACILITIES

Table	TA-BLDG	Descriptor	FM/FMU	Disposition/Note
1.	TA-2-1	Omega Reactor	D. McLain/64	D&D residual radiation
2.	TA-3-16	Ion exchange	D. McLain/64	D&D tritium
3.	TA-3-34	Condensed Matter & Thermal Physics	L. Woodrow/73	Multiple isotope samples
4.	TA-3-35	Sigma Press Building	L. Woodrow/73	DU
5.	TA-3-40	Physics Bldg (Health Physics)	S. Archuleta/77	Multiple isotope samples
6.	TA-3-66	Sigma Building	L. Woodrow/73	DU
7.	TA-3-102	RAM Machine Shop	B. Grace/70	DU
8.	TA-3-159	Sigma Thorium Building	L. Woodrow/73	Th-232
9.	TA-3-169	Sigma Thorium Building	L. Woodrow/73	DU
10.	TA-3-1698	Material Science Lab	L. Woodrow/73	Multiple isotope samples
11.	TA-3-1819	Material Science Lab	L. Woodrow/73	Multiple isotope samples
12.	TA-8-22	Radiography	B. Grace/70	DU
13.	TA-8-70	NDT&E	B. Grace/70	DU/Th-232
14.	TA-8-120	Radiography	B. Grace/70	Potential DU
15.	TA-11-30	Vibration Testing	B. Grace/70	Potential DU
16.	TA-15-R183	Vault	T. Alexander/67	DU
17.	TA-16-88	Component Storage	B. Grace/70	DU/Th-232
18.	TA-16-202	Laboratory	B. Grace/70	DU/tritium
19.	TA-16-207	Component Testing	B. Grace/70	DU/Th-232, Rm 113
20.	TA-16-300	Component Storage	B. Grace/70	DU/Th-232
21.	TA-16-301	Component Storage	B. Grace/70	DU
22.	TA-16-302	Component Storage/Training	B. Grace/70	DU/Th-232
23.	TA-16-332	Component Storage	B. Grace/70	DU/Th-232
24.	TA-16-410	Assembly Building	B. Grace/70	DU/Th-232
25.	TA-16-411	Assembly Building	B. Grace/70	DU/Th-232
26.	TA-21-5	Lab Bldg	D. McLain/64	D&D
27.	TA-33-86	High pressure tritium facility	D. McLain/64	D&D, tritium
28.	TA-35-2	Nuclear Safeguards Research	P. Bussolini/75	Sources
29.	TA-35-27	Nuclear Safeguards Research	P. Bussolini/75	Sources
30.	TA-36-1	Calibration Lab and offices	S. Helmick/71	Sources
31.	TA-36-214	Calibration Lab and offices	S. Helmick/71	Sources
32.	TA-37-10	Storage Magazine	B. Grace/70	DU
33.	TA-37-14	Storage Magazine	B. Grace/70	DU
34.	TA-37-16	Storage Magazine	B. Grace/70	DU
35.	TA-37-24	Storage Magazine	B. Grace/70	DU
36.	TA-37-25	Storage Magazine	B. Grace/70	DU
37.	TA-41-1	Underground Vault	B. Grace/70	DU/Th-232
38.	TA-43-1	Bio/Chem Laboratory	Crook/72	Lab sources
39.	TA-53-945	RLW Treatment	D. Seely/61	RLW products
40.	TA-53-954	RLW Basins	D. Seely/61	RLW products
41.	TA-54-412	Radioactive waste compactor (DVRS)	D. McLain/64	Residual

Table 1 Isotopic Inventory for BLDG TA-2-1

Descriptor: Omega Reactor

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: SO-WFM-001, *Inventory Control for Radiological Facilities*

Disposition D&D

Date of Inventory: Not applicable

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Fixed low level residual radiation. No new RAM allowed.			
		HC3 Ratio Sum	NA

Table 2 Isotopic Inventory for BLDG TA-3-16

Descriptor: Ion exchange

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: FM Standing Order

Disposition D&D

Date of Inventory: Not applicable

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Entrained tritium. No new RAM allowed.			
		HC3 Ratio Sum	NA

Table 3 Isotopic Inventory for TA-3-34

Descriptor: Condensed Matter and Thermal Physics

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FSP-PAC-5304, *Facility Safety Plan for the Material Science Complex*

Date of Inventory: August 8, 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Pu-239	0.15	8.4	0.020
		HC3 Ratio Sum	**0.020**

Table 4 Isotopic Inventory for TA-3-35

Descriptor: Sigma Press Building

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FOM-AP-0310, *MST Field Operations Manual for Radionuclide Inventory Management*

Date of Inventory: August 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Empty			
		HC3 Ratio Sum	**0.000**

Table 5 Isotopic Inventory for TA-3-40

Descriptor: Physics Building (Health Physics)

Division: P

Responsible FM/FMU: D. Riker/77

RAM Accountability Procedure: FSP-FMU77-2002-02

Date of Inventory: September 12, 2002

Isotope	Activity(Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Cl-36	4.7E-7	3.4E+2	0.000
Co-60	2.00E-6	2.8E+2	0.000
Sr-90	1.70E-5	1.6E+1	0.000
I-129	1.03E-6	6.0E-2	0.000
Cs-137	5.50E-3	6.0E+1	0.000
Pu-238	7.41E-8	6.2E-1	0.000
Pu-239	4.00E-8	5.2E-1	0.000
H-3	1.00E+1	1.6E+4	0.001
		HC3 Ratio Sum	**0.001**

Table 6 Isotopic Inventory for TA-3-66

Descriptor: Sigma Building

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FOM-AP-0310, *MST Field Operations Manual for Radionuclide Inventory Management*

Date of Inventory: August 15, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	9.55E+3	1.3E+4	0.735
		HC3 Ratio Sum	**0.735**

Table 7 Isotopic Inventory for TA-3-102

Descriptor: RAM machine shop

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	3E+3	1.3E+4	0.231
		HC3 Ratio Sum	**0.231**

Table 8 Isotopic Inventory for TA-3-159

Descriptor: Sigma Thorium Building

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FOM-AP-0310, *MST Field Operations Manual for Radionuclide Inventory Management*

Date of Inventory: August 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Th-232	2.43E+5	9.1E+5	0.267
		HC3 Ratio Sum	**0.267**

Table 9 Isotopic Inventory for TA-3-169

Descriptor: Sigma Thorium Building

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FOM-AP-0310, *MST Field Operations Manual for Radionuclide Inventory Management*

Date of Inventory: August 15, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	1.18E+3	1.3E+4	0.091
		HC3 Ratio Sum	**0.091**

Table 10 Isotopic Inventory for TA-3-1698

Descriptor: Material Science Lab

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FSP-PAC-5304, *Facility Safety Plan for the Material Science Complex*

Date of Inventory: August 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Empty			0.000
		HC3 Ratio Sum	**0.000**

Table 11. Isotopic Inventory for TA-3-1819

Descriptor: Material Science Lab

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FSP-PAC-5304, *Facility Safety Plan for the Material Science Complex*

Date of Inventory: August 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Empty			0.00
		HC3 Ratio Sum	**0.00**

Table 12. Isotopic Inventory for TA-8-22

Descriptor: Radiography

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	4.8E+1	1.3E+4	0.004
		HC3 Ratio Sum	**0.004**

Table 13. Isotopic Inventory for TA-8-70

Descriptor: NDT&E

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	4.70E+1	1.3E+4	0.004
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.004**

Table 14. Isotopic Inventory for TA-8-120

Descriptor: Radiography

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
Empty			
		HC3 Ratio Sum	**0.000**

Table 15. Isotopic Inventory for TA-11-30

Descriptor: Vibration testing

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Empty			
		HC3 Ratio Sum	**0.000**

Table 16. Isotopic Inventory for TA-15-R183

Descriptor: Vault

Division: DX

Responsible FM/FMU: T. Alexander/67

RAM Accountability Procedure: PRO-DX-001 and PRO-DX-009

Date of Inventory: August 26, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
U-238 (DU)	7.38E+5	1.3E+7	0.057
		HC3 Ratio Sum	**0.057**

Table 17. Isotopic Inventory for TA-16-88

Descriptor: Component storage

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	6.26E+2	1.3E+4	0.048
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.048**

Table 18. Isotopic Inventory for TA-16-202

Descriptor: Laboratory

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
U-238 (DU)	0.0E+0	1.3E+7	0.000
H-3	0.0E+0	1.6E+0	0.000
		HC3 Ratio Sum	**0.000**

Table 19. Isotopic Inventory for TA-16-207

Descriptor: Component testing

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	5.4E+1	1.3E+4	0.004
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.004**

Table 20. Isotopic Inventory for TA-16-300

Descriptor: Component storage

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	0	1.3E+4	0.000
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.000**

Table 21. Isotopic Inventory for TA-16-301

Descriptor: Component storage

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	2.3E+1	1.3E+4	0.002
		HC3 Ratio Sum	**0.002**

Table 22. Isotopic Inventory for TA-16-302

Descriptor: Component storage/training

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	3.91E+2	1.3E+4	0.030
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.030**

Table 23. Isotopic Inventory for TA-16-332

Descriptor: Component storage

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	5.113E+3	1.3E+4	0.393
Th-232	1.50E+2	9.1E+2	0.165
		HC3 Ratio Sum	**0.558**

Table 24. Isotopic Inventory for TA-16-410

Descriptor: Assembly building

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	1.94E+2	1.3E+4	0.015
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.015**

Table 25. Isotopic Inventory for TA-16-411

Descriptor: Assembly building

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	4.0E+0	1.3E+4	0.000
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.000**

Table 26. Isotopic Inventory for TA-21-5

Descriptor: Laboratory building

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: FM Standing Order

Disposition: D&D

Date of Inventory: Not applicable

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Fixed low level residual radiation. No new RAM allowed per FM standing order.			
		HC3 Ratio Sum	**NA**

Table 27. Isotopic Inventory for TA-33-86

Descriptor: High-pressure tritium facility

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: FM Standing Order

Disposition: D&D

Date of Inventory: Not applicable

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Entrained tritium in confinement system piping that is open to the atmosphere. No new RAM allowed per FM standing order.			
		HC3 Ratio Sum	**NA**

Table 28. Isotopic Inventory for TA-35-2

Descriptor: Nuclear safeguards research

Division: NIS

Responsible FM/FMU: P. Bussolini/75

RAM Accountability Procedure: NIS-5-99-01, *Radioactive Sealed Source Control and Accountability*

Date of Inventory: August 8, 2002

Isotope	Inventory (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Am-241	1.32E-1	5.20E-1	0.254
Ba-133	3.42E-3	1.10E+3	0.000
Cd-109	1.65E-4	1.80E+2	0.000
Cm-244	3.80E-5	1.04E+0	0.000
Cs-137	5.24E-4	6.00E+1	0.000
Np-237	4.00E-6	4.20E-1	0.000
Pu-238*	5.55E-3	3.60E-2	0.154
Pu-239*	1.49E+0	8.40E+0	0.177
Pu-240*	2.83E-1	2.28E+0	0.124
Pu-241*	1.97E-2	3.10E-1	0.064
Pu-242*	2.20E-2	1.58E+2	0.000
Sr-90	2.28E-2	1.60E+1	0.001
Tc-99	8.50E-2	1.70E+3	0.000
Th-228	6.31E-6	1.00E+0	0.000
Th-232	5.62E-4	1.00E-1	0.006
U-235*	1.81E+3	1.90E+6	0.001
U-238*	2.42E+4	1.30E+7	0.002
		HC3 Ratio Sum	**0.783**

Note *: U and Pu isotopes are in gram unit

Table 29. Isotopic Inventory for TA-35-27

Descriptor: Nuclear safeguards research

Division: NIS

Responsible FM/FMU: P. Bussolini/75

RAM Accountability Procedure: NIS-5-99-01, *Radioactive Sealed Source Control and Accountability*

Date of Inventory: August 8, 2002

Isotope	Inventory (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
H-3	2.91E+0	1.60E+4	0.000
Cf-252	2.09E-2	3.20E+0	0.007
Am-241	3.88E-2	5.20E-1	0.074
Cs-137	2.84E-3	6.00E+1	0.000
Pu-238*	5.18E-4	3.60E-2	0.014
Pu-239*	4.58E-1	8.40E+0	0.054
Pu-240*	5.27E-2	2.28E+0	0.023
Pu-241*	3.31E-3	3.10E-1	0.010
Pu-242*	1.50E-2	1.58E+2	0.000
Ra-226	4.43E+0	1.20E+1	0.369
U-235*	9.96E+3	1.90E+6	0.005
U-238*	1.39E+6	1.30E+7	0.106
		HC3 Ratio Sum	**0.662**

Note *: Pu and U isotopes are in gram units

Table 30. Isotopic Inventory for TA-36-1

Descriptor: Calibration lab and offices

Division: Responsible FM/FMU: S. Helmick/71

RAM Accountability Procedure: HSR-4-SOP-07, *Safe Operating Procedure for the Central Health Physics Calibration Facility*

Date of Inventory: September 3, 2002

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Am-241	1.13E-5	5.2E-1	0.000
Gd-148	4.2E-8	8.2E-2	0.000
Ba-133	2.08E-6	1.1E+3	0.000
C-14	1.6E-7	4.2E+2	0.000
Cl-36	4.79E-7	3.4E+2	0.000
Cs-137	7.76E-5	6.0E+1	0.000
I-129	1.03E-7	6.0E-2	0.000
Na-22	1.36E-6	2.4E+2	0.000
Pm-147	1.14E-7	1.00E+3	0.000

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Pu-238	7.00E-8	6.2E-1	0.000
Pu-239	3.97E-6	5.2E-1	0.000
Ra-226	9.00E-10	1.20E+1	0.000
Sr-90	4.54E-5	1.6E+1	0.000
Tc-99	2.92E-7	1.7E+3	0.000
Tl-204	4.00E-8	1.20E+3	0.000
H-3	2.00E+1	1.6E+4	0.001
U-235	6.00E-9	4.2E+0	0.000
		HC3 Ratio Sum	**0.001**

Table 31. Isotopic Inventory for TA-36-214

Descriptor: Calibration lab and offices

Division: Responsible FM/FMU: S. Helmick/71

RAM Accountability Procedure: HSR-4-RIC-SOP-06, *Central Health Physics Calibration Facility Safe Operating Procedure, (Sec. 8)*

Date of Inventory: September 3, 2002

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Pm-147	1.58E-3	1.00E+3	0.000
Tl-204	1.20E-4	1.20E+3	0.000
Sr-90	4.65E-3	1.6E+1	0.000
Cs-137	1.28E-4	6.0E+1	0.000
		HC3 Ratio Sum	**0.000**

Table 32. Isotopic Inventory for TA-37-10

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.60E+3	1.3E+4	0.662
		HC3 Ratio Sum	**0.662**

Table 33. Isotopic Inventory for TA-37-14

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.79E+3	1.3E+4	0.676
		HC3 Ratio Sum	**0.676**

Table 34. Isotopic Inventory for TA-37-16

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.28E+3	1.3E+4	0.637
		HC3 Ratio Sum	**0.637**

Table 35. Isotopic Inventory for TA-37-24

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.80E+3	1.3E+4	0.677
		HC3 Ratio Sum	**0.677**

Table 36. Isotopic Inventory for TA-37-25

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.77E+3	1.3E+4	0.675
		HC3 Ratio Sum	**0.675**

Table 37. Isotopic Inventory for TA-41-1

Descriptor: Underground vault

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	0	1.3E+4	0.000
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.000**

Table 38. Isotopic Inventory for TA-43-1

Descriptor: Bio/Chem Lab

Division: B

Responsible FM/FMU: R. Crook/72

RAM Accountability Procedure: B-PRO-001, *Procedure for Receipt of Radioactive Material at HRL*

Date of Inventory: September 16, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
C-14	2.24E-3	9.40E+1	0.000
		HC3 Ratio Sum	**0.000**

Table 39. Isotopic Inventory for TA-53-945

Descriptor: RLW treatment

Division: LANSCE

Responsible FM/FMU: D. Seely/61

RAM Accountability Procedure: SOP-RLW-002, Rev. 3, *Procedures for TA-53 Radioactive Liquid Waste System: Emergency, Operations, Maintenance, and Sampling*

Date of Inventory: September 24, 2002

Isotope	Activity(Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
H-3	5.8E-2	1.6E+4	0.000
P-32	9.9E-4	1.2E+1	0.000
Co-58	4.5E-8	9.0E+2	0.000
Gd-148	1.2E-4	8.2E-2	0.001
Yb-166	1.4E-2	8.4E+2	0.000
Lu-170	3.1E-2	5.0E+2	0.000
Lu-171	2.3E-3	1.4E+3	0.000
Hf-172	2.2E-2	9.4E+1	0.000
Lu-172	4.8E-3	4.8E+2	0.000
Hf-175	1.4E-2	2.0E+3	0.000
W-181	1.5E-1	1.3E+4	0.000
Ta-182	4.9E-2	6.2E+2	0.000
W-185	9.0E-2	1.4E+3	0.000
U-234	8.3E-6	4.2E+0	0.000
U-235	1.9E-7	4.2E+0	0.000
U-238	1.6E-7	4.2E+0	0.000
Pu-238	4.6E-6	6.2E-1	0.000
Pu-239	2.2E-6	5.2E-1	0.000
Am-241	8.0E-6	5.2E-1	0.000
		HC3 Ratio Sum	**0.001**

Table 40. Isotopic Inventory for TA-53-954

Descriptor: Radioactive liquid waste basins

Division: LANSCE

Responsible FM/FMU: D. Seely/61

RAM Accountability Procedure: SOP-RLW-002, Rev. 3, *Procedures for TA-53 Radioactive Liquid Waste System: Emergency, Operations, Maintenance, and Sampling*

Date of Inventory: September 24, 2002

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
H-3	5.8E-2	1.6E+4	0.000
Co-58	4.5E-8	9.0E+2	0.000
Lu-170	3.1E-2	5.0E+2	0.000
Hf-172	2.2E-2	9.4E+1	0.000

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Hf-175	1.4E-2	2.0E+3	0.000
W-181	1.5E-2	1.3E+4	0.000
		HC3 Ratio Sum	**0.000**

Table 41. Isotopic Inventory for TA-54-412

Descriptor: Radioactive waste compactor (DVRS)

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: DOP-WFM-001, *DVRS Process Operation*

Date of Inventory: September 24, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
None			
		HC3 Ratio Sum	**NA**

Attachment 2

Response/Resolution of NNSAComments on LANL's Radiological Facilities Inventory of Radioactive Material

No.	Page	Section/Para/Line	Reviewer Comment	Response/Resolution
1	1	List of LANL RF's	Observation: The table descriptors are inconsistent with the descriptor provided by the Facility Manager (FM). Example; table 3 states 'Cryogenics Bldg. B' and the FM's ' Condensed matter and Thermal Physics'. This inconsistency can be found for table 3,7,9,11,12,17,and 41. Action; use consistent terminology.	Revised descriptors to be consistent with each other.
2	1	List of LANL RF's	Observation: the tables' Disposition/Note are not consistent with that provided by the FM. Example; table 9 states 'Multiple isotope samples' and the FM's is 'Empty' This inconsistency can be found for table 3,4,10,11,14,and 15. Action; correct the difference.	The subject buildings will be used for the purpose Noted when needed. No RAM was stored at the time of inventory.
3	1	List of LANL RF's	Observation: the observation items No.1 and No. 2, listed above, have been incorporated into the LANL List of Radiological Facility (RF) attached to LOS ALAMOS NATIONAL LABORATORY RADIOLOGICAL FACILITY LIST, PS-OAB-403, Rev. 1 Action: correct the RF's list using the information obtained from the completion of observation items No. 1 and 2.	See 1 & 2 above
4	8	Table 20	Observation: the header states 1027 HC3 TQ (g) while the threshold values listed are in (kg). No impact on the HC3 ratio Action; list the required 1027 TQ values in (g)	Corrected, changed "g" to read "kg".
5	9	Table 23	Observation; the header states 1027 HC3 TQ (g) while the threshold values for U-238 and Th-232 listed are in (kg). Using the inventory mass values listed (g) and the correct 1027 values in (g) shown in Bold then;	All numbers are in Kg units. Table heading has been corrected. HC3 ratios as reported is still correct.

Attachment 2

Response/Resolution of NNSAComments on LANL's Radiological Facilities Inventory of Radioactive Material

<table>
<tr><th>No.</th><th>Page</th><th>Section/Para/Line</th><th>Reviewer Comment</th><th>Response/Resolution</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Isotope,</th><th>Inventory Mass(g),</th><th>1027 HC3 TQ (g),</th><th>HC3 Ratio</th></tr>
<tr><td>U-238,</td><td>5.113E+3,</td><td>1.3 E+7,</td><td>0.000393</td></tr>
<tr><td>Th-232,</td><td>1.5E+2 ,</td><td>9.1E+5</td><td>0.000165</td></tr>
<tr><td></td><td>HC# RATIO SUM</td><td></td><td>0.000558</td></tr>
</table>

Because of the obvious errors with the TQ values from 1027 there is no confidence that the Mass values listed under Inventory column are correct, therefore revise the whole table.</td><td></td></tr>
<tr><td>6</td><td>11</td><td>Table 28</td><td>Observation; the header states 1027 HC3 TQ (Ci) while the TQ values listed are not correct for Pu-238, 239,240,241, Pu-242, U-235 and U-238, they appear to be stated in grams. Using the inventory mass values listed (Ci) and the correct 1027 values in (Ci) shown in Bold below then;

<table>
<tr><th>Isotope ,</th><th>Inventory (Ci),</th><th>1027 HC3TQ(Ci),</th><th>HC3 Ratio</th></tr>
<tr><td>Am –241</td><td>1.32E-1</td><td>5.2E-1</td><td>0.254</td></tr>
<tr><td>Ba-133</td><td>3.42E-3</td><td>1.1E+3</td><td>0.000</td></tr>
<tr><td>Cd-109</td><td>1.65E-4</td><td>1.8E+2</td><td>0.000</td></tr>
<tr><td>Cm-244</td><td>3.8E-5</td><td>1.04E+1</td><td>0.000</td></tr>
<tr><td>Cs-137</td><td>5.24E-4</td><td>6.00E+1</td><td>0.000</td></tr>
<tr><td>Np-237</td><td>4.00E-6</td><td>4.2E-1</td><td>0.000</td></tr>
<tr><td>Pu-238</td><td>5.55E-3</td><td>6.2E-1</td><td>0.0089</td></tr>
<tr><td>Pu-239</td><td>1.49E+0</td><td>5.2E-1</td><td>2.865</td></tr>
<tr><td>Pu-240</td><td>2.83E-1</td><td>5.2E-1</td><td>0.5442</td></tr>
<tr><td>Pu-241</td><td>1.97E-2</td><td>3.2E+1</td><td>0.0006</td></tr>
<tr><td>Pu-242</td><td>2.20E-2</td><td>6.2E-2</td><td>0.0354</td></tr>
<tr><td>Sr-90</td><td>2.28E-2</td><td>1.6E+1</td><td>0.000</td></tr>
<tr><td>Tc-99</td><td>8.5E-2</td><td>1.7E+3</td><td>0.000</td></tr>
<tr><td>Th-228</td><td>6.31E-6</td><td>1.0E+00</td><td>0.000</td></tr>
<tr><td>U-235</td><td>1.81E+3</td><td>4.2E+00</td><td>4.30E+2</td></tr>
<tr><td>U-238</td><td>2.42E+4</td><td>4.2E+00</td><td>5.762E+3</td></tr>
<tr><td></td><td>HC3 Ratio Sum</td><td></td><td>6.2E+3</td></tr>
</table></td><td>All Pu and U isotopes are reported in grams and a footnote has been added to note this fact at the bottom of the table. HC3 Ratio as reported is correct and no "unidentified HC3 facility" exists.</td></tr>
</table>

Attachment 2

Response/Resolution of NNSAComments on
LANL's Radiological Facilities Inventory of Radioactive Material

No.	Page	Section/Para/Line	Reviewer Comment	Response/Resolution
			The errors in the Table raise a concern that TA-35-2 may be an **unidentified HC3** facility. Because of the obvious errors with the TQ values from 1027 there is no confidence that the Mass values listed under Inventory column are correct, therefore revise the whole table.	
7	12	Table 29	Observation; the header states the 1027 HC3 TQ (Ci), while the TQ values listed are not correct for Pu-238, 239, 240, 241, Pu-242, U-235 and U-238, they are in (g). Using the inventory mass values listed (Ci) and the correct 1027 values in (Ci) shown in Bold below then; Isotope , Inventory (Ci), 1027 HC3 TQ (Ci), HC3 Ration H-3 2.91E+0 **1.6E+4** **0.000** Cf-252 2.09E-2 3.2E+0 0.007 Am-241 3.88E-2 5.2E-1 0.074 Cs-137 2.84E-3 6.00E+1 0.000 Pu-238 5.18E-4 **6.2E-1** **0.000** Pu-239 4.58E-1 **5.2E-1** **0.881** Pu-240 5.27E-2 **5.2E-1** **0.101** Pu-241 3.31E-3 **3.2E+1** **0.000** Pu-242 1.5E-2 **6.2E-1** **0.024** Ra-226 4.43E+0 1.20E+1 0.369 U-235 9.96E+3 **4.2E+00** **2.37E+3** U-238 1.39E+6 **4.2E+00** **3.31E+5** HC3 Ratio Sum **3.312E+5** The errors in the Table raise a concern that TA-35-27 may be an **unidentified HC3** facility. Because of the obvious errors with the TQ values from 1027	The H-3 TQ has been corrected. All Pu and U isotopes are reported in grams. The HC3 ratio has been changed from 0.665 to 0.662 due to H-3 isotope. A footnote has been added at the bottom of the table.

Response/Resolution of NNSAComments on LANL's Radiological Facilities Inventory of Radioactive Material

No.	Page	Section/Para/Line	Reviewer Comment	Response/Resolution
			there is no confidence that the Mass values listed under Inventory column are correct, therefore revise the whole table.	
8	14-15	Table 35 and 36	The Inventory/Hazard Category 3 (HC3) ratios for separate facilities within close proximity approach unity. The proximity of storage magazines within TA-37, with radioactive material inventories approaching unity, may be as close as a few hundred feet. For example, storage magazines 24 and 25 are within approximately 200 feet of one another and have HC3 ratios of 0.677 and 0.675, respectively. DOE-STD-1027-92 states: "...the standard permits the concept of facility segmentation provided the hazardous material in one segment could not interact with hazardous materials in other segments..." Common cause evaluation basis accidents need to be carefully evaluated to ensure that the hazard categorization was appropriately applied for this facility as well as others. The use of segmentation per DOE-STD-1027-92 should be evaluated carefully to ensure that the hazard categorization can be supported.	In accordance with ESA practices, bulk DU and bulk HE are not stored together in these magazines. Hence, segmentation for these facilities is believed to be defensible under the worst case situation due to facility design and form of DU (solid non-dispersible). However, the segmentation issue will be re-visited as a part of resolving non-nuclear hazard categorization issues raised in the NNSA memorandum, SABT:3DN-008 (April 25, 2002)."

S = Suggested comment.
R = Required comment (comment must be addressed).

To obtain a copy of the SWEIS Yearbook – 2004, contact Susan Radzinski Project Leader, ENV-ECO, P.O. Box 1663, MS M887 Los Alamos, New Mexico 87545. This 2004 Yearbook is available on the web at:

http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-05-6627.htm

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