LA-13979-ENV

Environmental Surveillance at Los Alamos during 2001

Los Alamos
NATIONAL LABORATORY

Enhancing Our Stewardship of the Environment

The Laboratory places a priority on simultaneously fulfilling our mission responsibilities and our environmental stewardship responsibilities. The overall goal of our stewardship efforts is to minimize negative impacts and ensure a healthy environment. We monitor our performance to demonstrate the fulfillment of these responsibilities. This annual environmental report describes the 2001 successes of our environmental stewardship. The monitoring information focuses on operations, but it also reports on the results of continued environmental monitoring especially designed to address the special conditions created by the Cerro Grande fire of 2000 and its aftermath. The Laboratory established this additional environmental monitoring and sampling to evaluate whether the fire on Laboratory land adversely impacted public and worker health and the environment. Just as importantly, the program addresses changes from pre-fire baseline conditions and will aid in evaluating any future impacts the Laboratory may have, especially those resulting from contaminant transport off-site.

The program involves a number of different organizations within the Laboratory, as well as coordination with outside organizations and agencies. The primary Laboratory organizations involved are the Air Quality Group (ESH-17), the Water Quality and Hydrology Group (ESH-18), the Hazardous and Solid Waste Group, the Ecology Group (ESH-20), and the Environmental Restoration Project (E-ER).

At the close of 2001, the Laboratory formed a new division—Risk Reduction and Environmental Stewardship (RRES)—and the organizations listed above became a part of RRES. This new division was incorporated to strengthen the Laboratory's commitment to managing the entire life-cycle of nuclear materials from generation to permanent disposal as well as to understanding and safeguarding the natural environment on a local to global scale. Over the next two decades, billions of dollars will be invested globally in managing nuclear materials and waste, cleaning up the environment, and protecting and restoring the natural environment. To this end, RRES has highlighted the following strategic environmental science program thrust areas:

- Natural Resources Protection and Restoration,
- Nuclear Waste and Materials Management, and
- Repository Science.

The role of this new division is to reduce the risk of current and historic Laboratory activities to the public, workers, and the environment through natural and cultural resource protection, pollution prevention, waste disposition, and remediation activities. The new division will serve as the steward of the Laboratory reservation by developing and implementing integrated natural and cultural resource management.

This report summarizes the results of the ongoing routine environmental monitoring and surveillance program, for which the Laboratory collects more than 12,000 environmental samples each year from more than 450 sampling stations in and around the Laboratory. In addition, we have summarized results from sampling for effects of the Cerro Grande fire, especially where the fire has resulted in alterations of trends in environmental conditions seen in past years. We will continue to follow the alterations resulting from the wildfire over the next few years to determine if conditions return to pre-fire levels.

In the aftermath of the events of September 11, 2001, enhanced security actions by the Department of Energy resulted in the removal of many environmental World Wide Web pages from public access. At this writing, it is unknown how many pages these actions have affected and when the pages will be accessible again to the general public. If you have difficulty reaching the sites referenced in this document, please contact me, Lars F. Soholt, Ph.D., at soholt@lanl.gov or 505/667-2256. We will make every attempt to get you the information that you desire.

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Environmental Surveillance at Los Alamos during 2001

Environmental Surveillance Program:

Air Quality (Group ESH-17)
505-665-8855

Water Quality and Hydrology (Group ESH-18)
505-665-0453

Hazardous and Solid Waste (Group ESH-19)
505-665-9527

Ecology (Group ESH-20)
505-665-8961

Los Alamos
NATIONAL LABORATORY

Los Alamos NM 87545

APPENDIXES

Environmental Surveillance at Los Alamos reports are prepared annually by the Los Alamos National Laboratory (the Laboratory), Environment, Safety, and Health Division, as required by US Department of Energy Order 5400.1, *General Environmental Protection Program*, and US Department of Energy Order 231.1, *Environment, Safety, and Health Reporting*.

These annual reports summarize environmental data that are used to determine compliance with applicable federal, state, and local environmental laws and regulations, executive orders, and departmental policies. Additional data, beyond the minimum required, are also gathered and reported as part of the Laboratory's efforts to ensure public safety and to monitor environmental quality at and near the Laboratory.

Chapter 1 provides an overview of the Laboratory's major environmental programs. Chapter 2 reports the Laboratory's compliance status for 2001. Chapter 3 provides a summary of the maximum radiological dose a member of the public could have potentially received from Laboratory operations. The environmental data are organized by environmental media (Chapter 4, air; Chapter 5, water; and Chapter 6, soils, foodstuffs, and biota) in a format to meet the needs of a general and scientific audience. A glossary and a list of acronyms and abbreviations are in the back of the report. Appendix A explains the standards for environmental contaminants, Appendix B explains the units of measurements used in this report, and Appendix C describes the Laboratory's technical areas and their associated programs.

We've also enclosed a booklet, *Overview of Environmental Surveillance during 2001,* that briefly explains important concepts, such as radiation, and provides a summary of the environmental programs, monitoring results, and regulatory compliance.

Inquiries or comments regarding these annual reports may be directed to

US Department of Energy
Office of Environment and Projects
528 35th Street
Los Alamos, NM 87544

or

Los Alamos National Laboratory
Environment Safety and Health Division
P.O. Box 1663, MS K491
Los Alamos, NM 87545

To obtain copies of the report, contact

Lars F. Soholt
Ecology Group, Los Alamos National Laboratory
P.O. Box 1663, MS M887
Los Alamos, NM 87545
Telephone: 505-667-2256
e-mail: ***soholt@lanl.gov***

This report is also available on the World Wide Web at
http://lib-www.lanl.gov/cgi-bin/getfile?LA-13979.htm

Los Alamos National Laboratory (LANL or the Laboratory) is managed by the Regents of the University of California (UC) under a contract that is administered by the National Nuclear Security Administration of the Department of Energy (DOE) through the Los Alamos Area Office and the Albuquerque Operations Office. This report presents environmental data and analyses that characterize environmental performance and addresses compliance with environmental laws at the Laboratory during 2001. Using comparisons with standards and regulations, this report concludes that environmental effects from Laboratory operations are small and did not pose a threat to the public, Laboratory employees, or the environment in 2001.

Laboratory operations were in compliance with all environmental regulations and the Environmental Protection Agency's (EPA) Letter of Authorization to dispose of polychlorinated biphenyls (PCBs) at Technical Area (TA) 54, Area G, with the exception of a few exceedances of effluent discharge limits. However, the New Mexico Environment Department issued a Notice of Violation to the DOE and UC, identifing 18 categories of alleged noncompliance with the Hazardous Waste Facility permit to treat, store, or dispose of hazardous chemical waste or the chemical part of radioactive mixed waste.

All newly proposed activities at the Laboratory that could impact the environment were evaluated through the National Environmental Policy Act (NEPA) to determine potential impacts. In 2001, the Laboratory sent 45 NEPA Environmental Review forms to DOE for review. DOE made seven environmental assessment determinations and issued two Findings of No Significant Impact (FONSI) for the Laboratory in 2001. DOE and the Laboratory continued to plan and develop an Integrated Resources Management Plan in 2001 to integrate existing resource management plans and the development of other management plans with LANL's site planning and mission activities.

In this report, we calculate potential radiological doses to members of the public who may be exposed to Laboratory operations. The 2001 Effective Dose Equivalent (EDE) was 1.8 mrem for the air pathway alone. We calculated this dose using EPA-approved methods for air compliance. The EPA's EDE limit for any member of the public from radioactive airborne releases from a DOE facility is 10 mrem/yr. A maximum off-site dose considering all pathways (not just air) was 1.9 mrem. The maximum calculated dose to a member of the public present on-site was 4.2 mrem. Health effects from radiation exposure have been observed in humans only at doses in excess of 10 rem (10,000 mrem). We conclude that the doses calculated here would cause no adverse human health effects. The total dose from natural background radiation is about 360 mrem in this area and can vary by 10 mrem from year to year.

The Laboratory's air quality compliance program includes the development of air quality permits, calculation of nonradioactive air emissions, and radiological dose assessment. During 2001, the Laboratory performed approximately 250 air quality reviews for new and modified projects, activities, and operations to identify all applicable air quality requirements. A number of projects required permits, permit revisions, or administrative notices. Criteria pollutant emissions for 2001 were similar to 2000; sulfur oxide emissions were lower in 2001 because the Laboratory again burned typical amounts of fuel oil in the TA-3 steam plant when compared with quantities burned during the Cerro Grande fire.

The Laboratory reports chemical information to EPA, state, and local authorities under the Emergency Planning and Community Right-to-Know Act (EPCRA). The EPCRA establishes quantity thresholds for reporting. The Laboratory did not have any spills, releases, or leaks to the environment that required reporting. The Laboratory reported the use of 56 chemicals and explosives. The Laboratory also reported the following lead releases: 4.7 pounds released to air, less than 1 pound released to water, 3,799 pounds of on-site land releases from the shooting range, and approximately 7,830 pounds of lead waste shipped off-site for disposal.

Air surveillance at Los Alamos includes monitoring emissions, ambient air quality, direct penetrating radiation, and meteorological parameters to determine the air quality impacts of Laboratory operations. The ambient air quality in and around the Laboratory meets all EPA and DOE standards for protecting the public and workers.

Radioactive materials are an integral part of many activities at the Laboratory, and some of these materials may be vented to the environment through a stack. The Laboratory evaluates these operations to determine impacts on the public and the environment. As of the end of 2001, the Laboratory continuously sampled 30 stacks for the emission of radioactive material to the ambient air. Radioactive air emissions of tritium and gaseous mixed activation products (GMAP) were higher in 2001 than in 2000. Changes in Los Alamos Neutron Science Center (LANSCE) operating systems produced increased GMAP emissions. A container with legacy waste at TA-16 failed causing increased tritium emissions. Radioactive air emissions were well below the amounts that could result in an off-site individual receiving a dose equal to the regulatory limit.

Lower ambient air concentrations of plutonium and americium were recorded at TA-54, Area G, during 2001. Radioactive ambient air quality for Laboratory-derived radionuclides during 2001 was very similar to 2000. In 2001, the Laboratory investigated several instances of elevated air concentrations. None of these elevated air concentrations exceeded DOE or EPA protective standards for workers or the public. The Laboratory began a routine nonradioactive ambient air-monitoring program during 2001.

The Laboratory measures levels of external penetrating radiation (the radiation originating from a source outside the body, including x-rays, gamma rays, neutrons, and charged particle contributions from cosmic, terrestrial, and man-made sources) with thermoluminescent dosimeters. Highest doses were measured at locations on-site at TA-54, Area G; LANSCE; TA-21, Area T; TA-18, Pajarito Site; and the Calibration Facility, TA-3-130.

The Cerro Grande fire caused major physical changes in watersheds crossing the Laboratory boundary and resulted in large impacts on water chemistry. When trees and organic material on the forest floor burned, the fire removed material that previously absorbed rainfall, leading to increased runoff and erosion. Metals (for example, aluminum, iron, barium, manganese, and calcium) and fallout radionuclides (cesium-137; plutonium-239, -240; and strontium-90) previously bound to forest materials were concentrated in resulting ash and readily moved by runoff.

In 2001, record peak storm runoff flows from fire-impacted areas occurred in three canyons. The amount of sediment carried by storm runoff continues to be 100 to 1000 times greater than pre-Cerro Grande fire levels. Largely because of the sediment load and associated background concentrations, we measured record levels of many metals and several radionuclides in the storm runoff. Plutonium-239, -240 activities greater than DOE's derived concentration guidelines (DCG) for radiation protection of the public of 100-mrem were exceeded in runoff in lower Pueblo Canyon and were partly attributable to mobilization of LANL legacy materials. Gross alpha activities were greater than public dose DCGs and New Mexico livestock watering standards in about three-fourths of the storm runoff samples. While high alpha activities were measured at stations both above and below the Laboratory, contributions from LANL are indicated at several locations, most pronounced in Pueblo and Los Alamos Canyons and around TA-54, Area G.

The Laboratory also monitors groundwater to determine its quality. The regional aquifer beneath Los Alamos is the primary source of drinking water for the Laboratory and the residents of Los Alamos County, and it provides a portion of the water for Santa Fe. Continued testing of water supply wells in 2001 showed that high-explosives constituents are not present in Los Alamos County or Santa Fe drinking water. Trace levels of tritium are present in the regional aquifer beneath Los Alamos in a few areas where liquid waste discharges occurred. The tritium levels are less than 1/50th of the drinking water standard. Perchlorate (no drinking water standard) and tritium (at 1/500th of the drinking water standard) continued to be found in water supply well O-1 in Pueblo Canyon during 2001. Radioactivity measurements in perched alluvial groundwater that exceeded DOE's 4-mrem DCGs for drinking water or EPA drinking water standards occurred at locations with current or former radioactive liquid waste discharges: DP/Los Alamos Canyon and Mortandad Canyon. The constituents exceeding drinking water DCGs or maximum contaminant levels were tritium, gross beta, strontium-90, and americium-241. Alluvial groundwater is not used for drinking water.

In 2000 and 2001, perchlorate was apparently discovered in a spring issuing along the Rio Grande below the Laboratory and, in 2001, in numerous surface water samples. Evaluation of analytical laboratory methods and reanalysis of samples show that these apparent detections were the result of matrix interference in the analysis rather than the presence of perchlorate. The Laboratory continues to pursue improvements in analytical measurement of perchlorate.

The long-term trends of water levels in the water supply and test wells in the regional aquifer indicate little depletion of the resource because of pumping for the Los Alamos water supply.

Sediment transport associated with surface water runoff is a significant mechanism for contaminant movement. The Laboratory monitors sediments on and near its property and at regional locations for the presence of metals, radionuclides, and organic compounds including high explosives. In 2000, because of the Cerro Grande fire, cesium-137 was found in many sediment samples at much higher values than previously noted; these high levels continued in 2001. In 2001, the sediment samples on Laboratory property in Mortandad Canyon continued to show cesium-137 exceeding screening action levels (SALs—the level at which the Environmental Restoration Project requires further evaluation).

The Laboratory monitors soils both on- and off-site for radionuclides (e.g., tritium, strontium, cesium, uranium, plutonium, and americium) and trace elements (e.g., arsenic, beryllium, cadmium, mercury, and lead). Most radionuclide concentrations (activity) in soils from Laboratory and perimeter sites were nondetectable or within upper-level regional concentrations; the few detectable values that were above regional concentrations were still very low (pCi/g range) and far below SALs. Uranium and plutonium-239, -240 concentrations in soils collected from Laboratory and perimeter areas were statistically higher than regional concentrations; the differences were very low, however. Similarly, most trace elements, with the exception of beryllium and lead in soils from on-site and perimeter areas, were within regional concentrations. Beryllium and lead, however, were far below SALs. Nearly all mean radionuclide and trace element concentrations in soils collected from Laboratory and perimeter areas after two sampling seasons following the Cerro Grande fire were statistically similar to soils collected before the fire. Trend analyses show that radionuclides in soils, particularly tritium, from both on- and off-site areas have been decreasing over time, so that today most radionuclides are approaching or similar to values close to regional levels.

Foodstuff samples from Laboratory and perimeter locations showed that most radioactivity was attributable to natural sources and/or worldwide fallout, and these samples were statistically indistinguishable from foodstuffs collected in 1999 before the Cerro Grande fire. Produce and fish, in particular, because of the concern for airborne contaminants by smoke and fallout ash and contaminants in runoff, respectively, were not significantly affected. Although soils from on-site and perimeter areas contained significantly higher concentrations of beryllium and lead, beryllium was below detection levels in produce, and lead was not significantly higher in produce collected from on-site and perimeter areas compared with regional areas.

Catfish from Cochiti Reservoir downstream of the Laboratory were analyzed for PCB congeners, organochlorine pesticides, and dioxins/furans. We compared these fish with fish collected from Abiquiu Reservoir, an impoundment upstream of LANL. Mean total dioxin-like, whole-body PCB concentrations in fish from Abiquiu and Cochiti were statistically (alpha = 0.05) similar. A comparison with PCB levels measured in the Rio Grande in 1997 implies that sources may exist for PCBs above LANL influences. Dioxins and furans were detected in 62% (48 of 78) of the possible total results in Cochiti fish, and all detected values were below even the most stringent (lowest) toxicological limit. The mean total DDT and metabolites (DDT+DDD+DDE) concentration in fish from Cochiti was significantly higher than the mean concentration in fish from Abiquiu. The primary source of DDT is thought to be a massive aerial application in 1963. These levels of DDT are within regional and national levels and are within limits suggested for the protection of piscivores and fish. We determined that the portion of catfish not usually consumed by humans contains about 75% of the PCBs and 74% of the total DDT and metabolites. No impacts of the Cerro Grande fire on PCB and other organochlorine levels in fish at Cochiti Reservoir were discernable.

In addition to monitoring Laboratory-wide areas, we also assessed several facilities. We monitored radionuclide and trace elements in soil, vegetation, bees, small mammals, and predators at TA-54, Area G, the Laboratory's primary low-level radioactive waste disposal area. Also, we collected soil, vegetation, and bees within and around DARHT, the Laboratory's Dual Axis Radiographic Hydrodynamic Test facility, and soil from around the Plutonium Processing Facility at TA-55 on three different occasions (1984, 1990, and 2001) for plutonium isotope analysis and report those results.

1. Introduction

contributing authors:

Jarrett Airhart, Linda Anderman, Bob Beers, Eleanor Chapman, Jean Dewart, Barbara Grimes, Todd Haagenstad, Ken Hargis, John Isaacson, Julie Johnston, Karen Lyncoln, Terry Morgan, Ken Rea, David Rogers, Lars Soholt

Abstract

This report presents environmental data that characterize environmental performance and addresses compliance with environmental standards and requirements at Los Alamos National Laboratory (LANL or the Laboratory) during 2001. The Laboratory routinely monitors for radiation and for radioactive and nonradioactive materials at Laboratory sites, as well as at sites in the surrounding region. LANL uses the monitoring results to determine compliance with appropriate standards and to identify potentially undesirable trends. This information is then used for environmental impact analyses, site planning, and annual operational improvements. The Laboratory collected data in 2001 to assess external penetrating radiation and concentrations of chemicals and radionuclides in stack emissions, ambient air, surface waters and groundwaters, the drinking water supply, soils and sediments, foodstuffs, and biota. In addition, the Laboratory continued to conduct extensive sampling following the Cerro Grande fire to determine the effects of smoke and fallout ash on the environment and compared these results with the pre-fire results. Using comparisons with standards and regulations, this report concludes that environmental effects from Laboratory operations are small and do not pose a threat to the public, Laboratory employees, or the environment.

A. Laboratory Overview

1. Introduction to Los Alamos National Laboratory

In March 1943, a small group of scientists came to Los Alamos for Project Y of the Manhattan Project. Their goal was to develop the world's first nuclear weapon. Although planners originally expected that the task would be completed by a hundred scientists, by 1945, when the first nuclear bomb was tested at Trinity Site in southern New Mexico, more than 3,000 civilian and military personnel were working at Los Alamos Laboratory. In 1947, Los Alamos Laboratory became Los Alamos Scientific Laboratory, which in turn became Los Alamos National Laboratory (LANL or the Laboratory) in 1981. The Laboratory is managed by the Regents of the University of California (UC) under a contract that is administered by the National Nuclear Security Administration (NNSA) of the Department of Energy (DOE) through the Los Alamos Area Office (LAAO) and the Albuquerque Operations Office.

The Laboratory's original mission to design, develop, and test nuclear weapons has broadened and evolved as technologies, US priorities, and the world community have changed. Los Alamos National Laboratory enhances global security by

- ensuring the safety and reliability of the US nuclear deterrent,
- reducing the global threat of weapons of mass destruction, and
- solving national problems in energy, infrastructure, and health security. (LANL 2001a).

In its Strategic Plan (2001–2006), Los Alamos National Laboratory expresses its vision and role as follows: "We serve the nation by applying the best science and technology to make the world a better and safer place . . . Inseparable from its commitment to excellence in science and technology is LANL's commitment to completing all endeavors in a safe, secure, and cost-effective manner." (LANL 2001b)

2. Geographic Setting

The Laboratory and the associated residential and commercial areas of Los Alamos and White Rock are located in Los Alamos County, in north-central New Mexico, approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe (Figure 1-1). The 43-square-mile Laboratory is

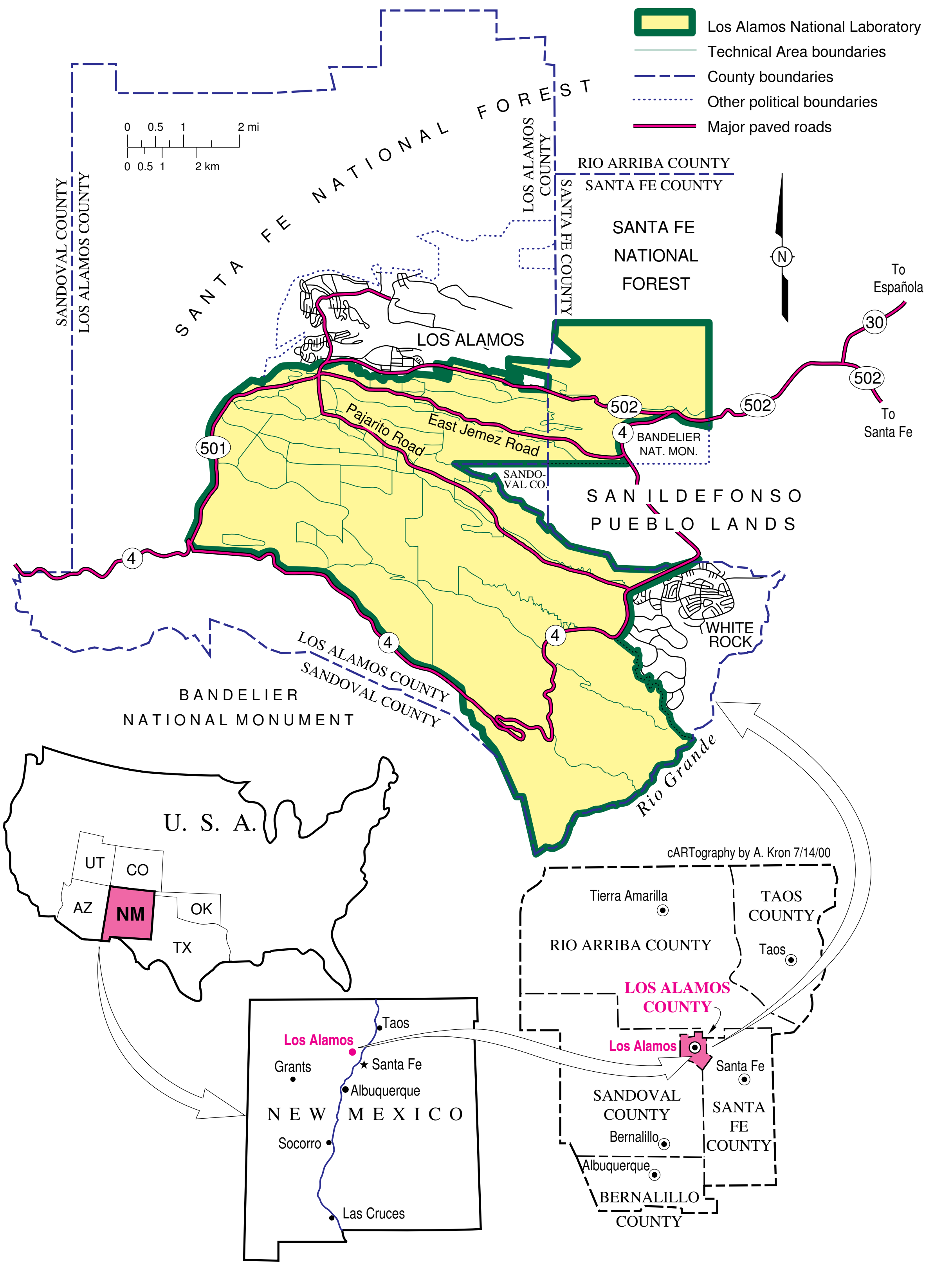

Figure 1-1. Regional location of Los Alamos National Laboratory.

situated on the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep east-to west oriented canyons cut by intermittent streams. Mesa tops range in elevation from approximately 7,800 ft on the flanks of the Jemez Mountains to about 6,200 ft above the Rio Grande Canyon. Most Laboratory and community developments are confined to mesa tops. The surrounding land is largely undeveloped, and large tracts of land north, west, and south of the Laboratory site are held by the Santa Fe National Forest, Bureau of Land Management, Bandelier National Monument, General Services Administration, and Los Alamos County. San Ildefonso Pueblo borders the Laboratory to the east.

The Laboratory is divided into technical areas (TAs) that are used for building sites, experimental areas, support facilities, roads, and utility rights-of-way (see Appendix C and Figure 1-2). However, these uses account for only a small part of the total land area; much land provides buffer areas for security and safety and is held in reserve for future use.

3. Geology and Hydrology

The Laboratory lies at the western boundary of the Rio Grande Rift, a major North American tectonic feature. Three major local faults constitute the modern rift boundary, and each is potentially seismogenic. Recent studies indicate that the seismic surface rupture hazard associated with these faults is localized (Gardner et al., 1999). Most of the finger-like mesas in the Los Alamos area (Figure 1-3) are formed from Bandelier Tuff, which includes ash fall, ash fall pumice, and rhyolite tuff. The tuff is more than 1,000 ft thick in the western part of the plateau and thins to about 260 ft eastward above the Rio Grande. It was deposited by major eruptions in the Jemez Mountains' volcanic center 1.2 to 1.6 million years ago.

On the western part of the Pajarito Plateau, the Bandelier Tuff overlaps onto the Tschicoma Formation, which consists of older volcanics that form the Jemez Mountains. The tuff is underlain by the conglomerate of the Puye Formation in the central plateau and near the Rio Grande. The Cerros del Rio Basalts interfinger with the conglomerate along the river. These formations overlie the sediments of the Santa Fe Group, which extend across the Rio Grande Valley and are more than 3,300 ft thick. Surface water in the Los Alamos area occurs primarily as short-lived or intermittent reaches of streams. Perennial springs on the flanks of the Jemez Mountains supply base flow into upper reaches of some canyons, but the volume is insufficient to maintain surface flows across the Laboratory site before they are depleted by evaporation, transpiration, and infiltration.

Groundwater in the Los Alamos area occurs in three modes: (1) water in shallow alluvium in canyons, (2) perched water (a body of groundwater above a less permeable layer that is separated from the underlying main body of groundwater by an unsaturated zone), and (3) the regional aquifer of the Los Alamos area, which is the only aquifer in the area capable of serving as a municipal water supply. Water in the regional aquifer is under artesian conditions under the eastern part of the Pajarito Plateau near the Rio Grande (Purtymun and Johansen 1974). The source of most recharge to the aquifer appears to be infiltration of precipitation that falls on the Jemez Mountains. The regional aquifer discharges into the Rio Grande through springs in White Rock Canyon. The 11.5-mile reach of the river in White Rock Canyon between Otowi Bridge and the mouth of Rito de los Frijoles receives an estimated 4,300 to 5,500 acre-feet annually from the aquifer.

4. Biology and Cultural Resources

The Pajarito Plateau is a biologically diverse and archaeologically rich area. This diversity is illustrated by the presence of over 900 species of plants; 57 species of mammals; 200 species of birds, including 112 species known to breed in Los Alamos County; 28 species of reptiles; 9 species of amphibians; over 1,200 species of arthropods; and 12 species of fish (primarily found in the Rio Grande, Cochiti Reservoir, and the Rito de los Frijoles). No fish species have been found within LANL boundaries. Roughly 20 plant and animal species are designated as threatened species, endangered species, or species of concern at the federal and/or state level.

Approximately 80% of DOE land in Los Alamos County has been surveyed for prehistoric and historic cultural resources, and over 1800 sites have been recorded. More than 85% of the ruins date from the 14th and 15th centuries. Most of the sites are found in the piñon-juniper vegetation zone, with 80% lying between 5,800 and 7,100 ft. Almost three-quarters of all ruins are found on mesa tops. Buildings and structures from the Manhattan Project and the early Cold War period (1943–1963) are being evaluated for eligibility to the Natural Register of Historic Places.

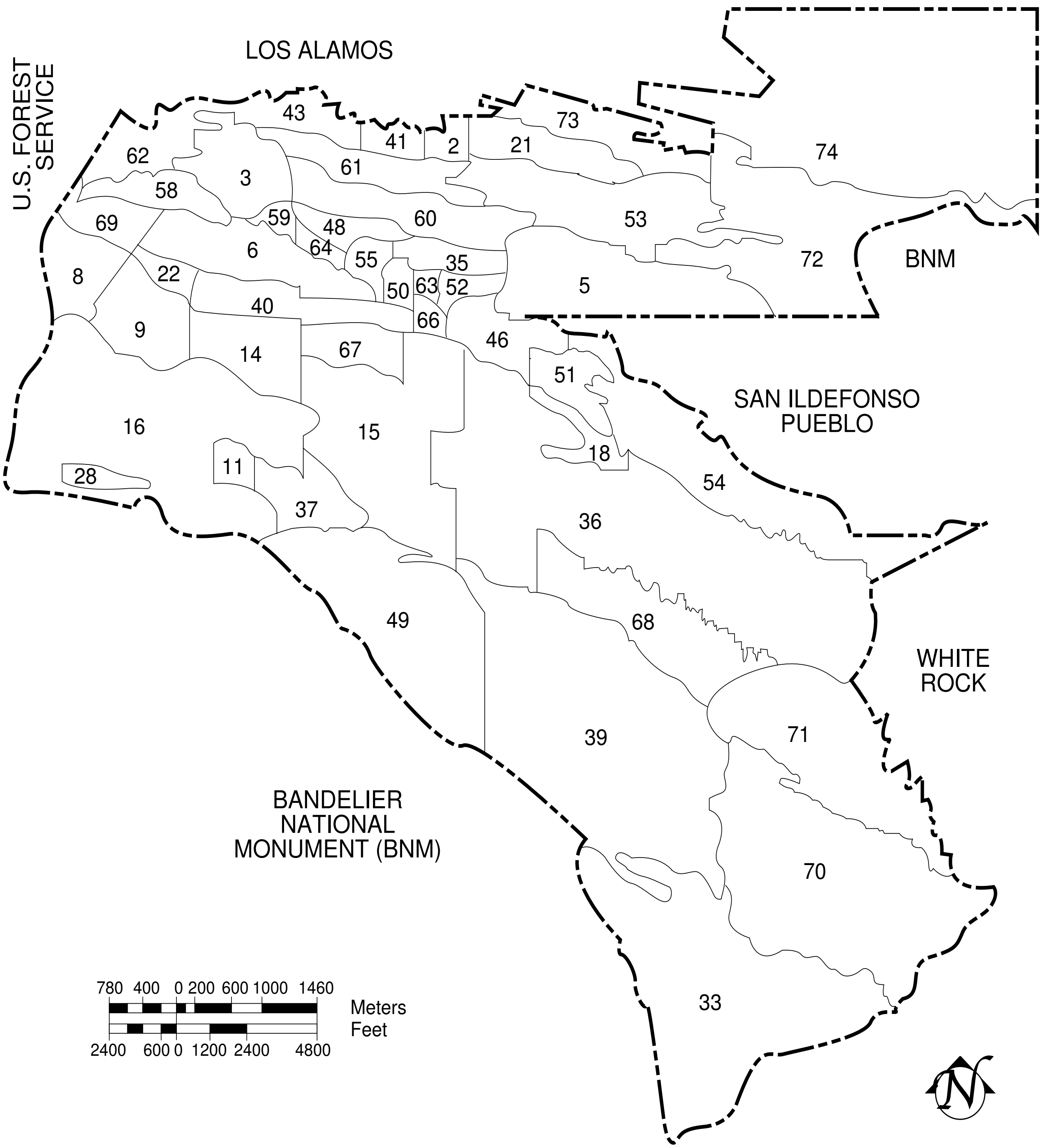

Figure 1-2. Technical Areas of Los Alamos National Laboratory in relation to surrounding landholdings.

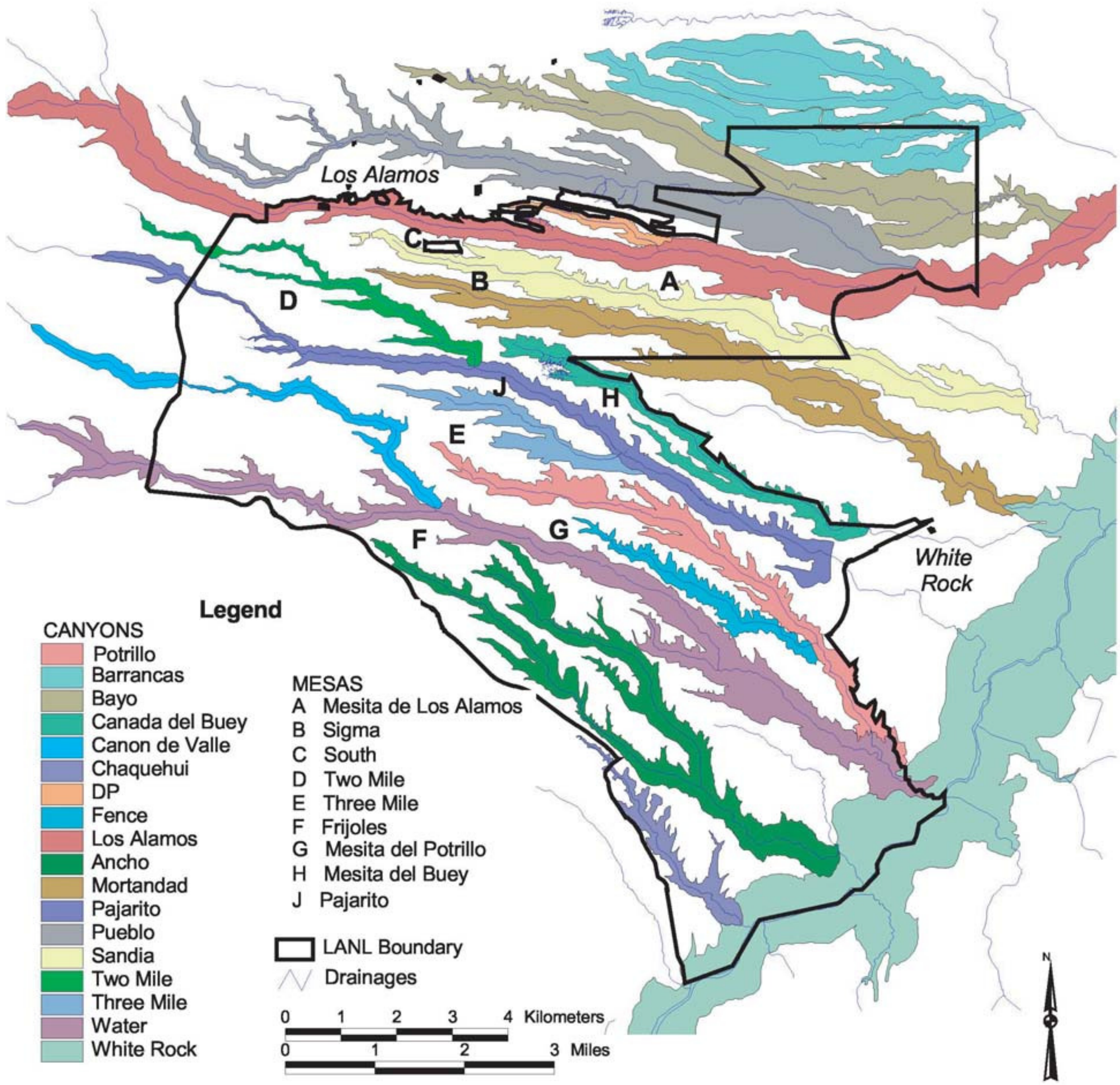

Figure 1-3. Major canyons and mesas.

B. Management of Environment, Safety, and Health

1. Introduction

The Laboratory's environmental, safety, and health (ES&H) goal is to accomplish its mission cost effectively, while striving for an injury-free workplace, protecting worker and public health, minimizing waste streams, and avoiding unnecessary adverse impacts to the environment from its operations.

2. Integrated Safety Management

Throughout the Laboratory, the goal of Integrated Safety Management (ISM) is the systematic integration of ES&H into work practices at all levels. The term "integrated" indicates that the safety management system is a normal and natural element in performing the work. Safety and environmental responsibility involve every worker. Management of ES&H functions and activities is an integral, visible part of the Laboratory's work planning and work execution processes.

The Laboratory is committed to achieving excellence in environmental, safety, health, and security performance. Laboratory Director John C. Browne says, "We will never compromise safety or security for programmatic or operational needs." Zero environmental incidents means complying with all applicable environmental laws and regulations; adopting practicable proactive approaches to achieve environmental excellence (minimizing waste generation, wastewater discharges, air emissions, ecological impacts, cultural impacts, etc.); preventing unnecessary adverse environmental impacts; and enhancing environmental protection (LANL 1999a).

3. Environment, Safety, & Health Division

The Environment, Safety, & Health (ESH) Division is primarily a Laboratory support organization that provides a broad range of technical expertise and assistance in areas such as worker health and safety, environmental protection, facility safety, nuclear safety, hazardous materials response, ES&H training, occurrence investigation and lessons learned, and quality. ESH Division is in charge of performing environmental monitoring, surveillance, and compliance activities to help ensure that Laboratory operations do not adversely affect human health and safety or the environment. The Laboratory conforms to applicable environmental regulatory requirements and reporting requirements of DOE Orders 5400.1 (DOE 1988), 5400.5 (DOE 1990), and 231.1 (DOE 1995). ESH Division has responsibility and authority for serving as the central point of institutional contact, coordination, and support for interfaces with ESH regulators, stakeholders, and the public, including the DOE, the Defense Nuclear Facilities Safety Board, the New Mexico Environment Department (NMED), and the Environmental Protection Agency (EPA).

ESH Division provides line managers with assistance in preparing and completing environmental documentation such as reports required by the National Environmental Policy Act (NEPA) of 1969 and the federal Resource Conservation and Recovery Act (RCRA) and its state counterpart, the New Mexico Hazardous Waste Act (HWA), as documented in Chapter 2 of this report. With assistance from Laboratory Counsel, ESH Division helps to define and recommend Laboratory policies for applicable federal and state environmental regulations and laws and DOE orders and directives. ESH Division is responsible for communicating environmental policies to Laboratory employees and makes appropriate environmental training programs available. The environmental surveillance program resides in four groups in ESH Division—Air Quality (ESH-17), Water Quality and Hydrology (ESH-18), Hazardous and Solid Waste (ESH-19), and Ecology (ESH-20)—that initiate and promote Laboratory programs for environmental assessment and are responsible for environmental surveillance and regulatory compliance.

Approximately 600 sampling locations are used for routine environmental monitoring. The maps in this report present the general location of monitoring stations. For 2001, over 250,000 routine analyses for chemical and radiochemical constituents were performed on more than 12,000 routine environmental samples. Laboratory personnel collected many additional samples as they continued to monitor the effects of the Cerro Grande fire. Samples of air particles and gases, water, soils, sediments, foodstuffs, and associated biota are routinely collected at monitoring stations and then analyzed. The results of these analyses help identify impacts of LANL operations on the environment. ESH personnel collect and analyze additional samples to obtain information about particular events, such as major surface water runoff events, nonroutine releases, or special studies. See Chapters 2, 3, 4, 5, and 6 of this report for methods and procedures for acquiring, analyzing, and recording data. Appendix A presents information about environmental standards.

a. Air Quality. ESH-17 personnel assist Laboratory organizations in their efforts to comply with federal and state air quality regulations. ESH-17 personnel report on the Laboratory's compliance with the air quality standards and regulations discussed in Chapter 2 and conduct various environmental surveillance programs to evaluate the potential impact of Laboratory emissions on the local environment and public health. These programs include measuring direct penetrating radiation, meteorological conditions, and stack emissions and sampling for ambient air contaminants.

Chapter 4 contains a detailed exploration of the methodologies and results of the ESH-17 air monitoring and surveillance program for 2001. Personnel from ESH-17 monitor meteorological conditions to assess the transport of contaminants in airborne emissions to the environment and to aid in forecasting local weather conditions. Chapter 4 also summarizes meteorological conditions during 2001 and provides a climatological overview of the Pajarito Plateau.

Dose Assessment. ESH-17 personnel calculate the radiation dose assessment described in Chapter 3, including the methodology and assessments for specific pathways to the public.

b. Water Quality and Hydrology. ESH-18 personnel provide environmental monitoring activities to demonstrate regulatory compliance and to help ensure that Laboratory operations do not adversely affect public health or the environment. ESH-18 provides technical and regulatory support for the Laboratory to achieve compliance with the following major state and federal statutes and regulations: Clean Water Act, including the National Pollutant Discharge Elimination System (NPDES), Spill Prevention Control and Countermeasures Plans (SPCC), and Section 404/401 Dredge and Fill Permitting; New Mexico Water Quality Control Commission Regulations; Federal Insecticide, Fungicide, and Rodenticide Act; and New Mexico Pesticide Control Act. Surveillance programs and activities include groundwater, drinking water, surface water, and sediments monitoring; water supply reporting for Los Alamos County; and the Groundwater Protection Management Program. Chapter 2 contains documentation on the Laboratory's compliance with state and federal water quality requirements. Chapter 5 summarizes the data ESH-18 personnel collected and analyzed during routine monitoring.

c. Hazardous and Solid Waste. ESH-19 personnel provide services in developing and monitoring permits under hazardous and solid waste rules, RCRA/HWA, Solid Waste Act (SWA), and letters of authorization for landfilling polychlorinated biphenyls (PCB) solids contaminated with radionuclides under the Toxic Substances Control Act (TSCA); providing technical support, regulatory interpretation, and Laboratory policy on hazardous, toxic, and solid waste issues and underground storage tank regulations to Laboratory customers; and documenting conditions at past waste sites. Chapter 2 presents the Laboratory's compliance status with hazardous and solid waste regulations.

d. Ecology. Personnel in ESH-20 investigate and document biological and cultural resources within the Laboratory boundaries; prepare environmental reports, including Environmental Assessments required under NEPA; and monitor the environmental impact of Laboratory operations on soil, foodstuffs, and associated biota. Chapter 2 documents the 2001 work in the areas of NEPA reviews and biological and archaeological reviews of proposed projects at the Laboratory. Chapter 6 contains information on the results and trends of the soil, foodstuff, and biota monitoring programs and related research and development activities.

e. Site-Wide Issues Project Office. The Site-Wide Issues Program Office (SWIPO) functions as the land transfer point-of-contact for LANL to facilitate DOE's compliance with the requirements of Public Law 105-119, prepares the annual Site-Wide Environment Impact Statement (SWEIS) Yearbook, and manages the mitigations contained in the Mitigation Action Plan for the SWEIS.

4. Environmental Management Program

a. Waste Management. Waste management activities focus on minimizing the adverse effects of chemical and radioactive wastes on the environment, maintaining compliance with regulations and permits, and ensuring that wastes are managed safely. Wastes generated at the Laboratory are divided into categories based on the radioactive and chemical content. No high-level radioactive wastes are generated at the Laboratory. Major categories of waste managed at the Laboratory are low-level radioactive waste, transuranic (TRU) waste, hazardous waste, mixed low-level waste (waste that is both hazardous and radioactive), and radioactive liquid waste.

The major portion of the inventory of mixed low-level and TRU wastes at the Laboratory was generated before capabilities existed for treatment and disposal of those wastes, and the wastes were placed into storage at TA-54. Treatment and disposal capabilities now exist for most of these wastes, and DOE provides funding specifically to address these so-called "legacy wastes" at LANL.

Mixed Low-Level Waste Work-Off. In 1994, LANL had the equivalent of about 3,000 55-gallon drums of mixed low-level waste in storage because no capability existed at either LANL or other locations in the United States for proper treatment and disposal of the waste. At that time, NMED approved a plan called the Mixed Waste Site Treatment Plan to develop and operate treatment technologies and facilities at LANL. The original estimate called for completing the treatment and disposal of the mixed low-level waste in storage in 2006. In cooperation with DOE/LAAO, a team worked to evaluate ways to reduce costs and accelerate the schedule. The team identified new treatment capabilities that were being developed commercially and at other DOE sites, and decisions were made to use those capabilities rather than to continue with new facilities at LANL. NMED also approved these efforts. In addition, efforts began to perform extensive characterization of waste that was only suspected of being both hazardous and radioactive. It is expected that this task will be completed in 2004, two years earlier than originally projected.

Transuranic Waste Inspectable Storage Project. The Transuranic Waste Inspectable Storage Project (TWISP) was established to retrieve 187 fiberglass-reinforced plywood crates and 16,641 metal drums containing solid-form, TRU waste from three earth-covered storage pads. This waste was retrieved under a compliance order from NMED because it was not possible to inspect the waste containers as required by the state hazardous waste regulations. After the waste was retrieved, any damaged containers were over-packed in new containers. The containers were vented and had high-efficiency particulate air (HEPA) filters installed in drum lids. The waste containers were then placed in structures where they can be inspected.

After several years of preparation, DOE granted start-up authority for TWISP in March 1997. Retrieval operations were completed in December 2001. The entire project was completed more than two years earlier than the NMED compliance order and $19M under budget.

Decontamination and Volume Reduction System. Large metallic items such as gloveboxes, ventilation ducts, and tanks that are stored within fiberglass-reinforced plywood boxes or other large containers compose about one-third of the legacy TRU waste stored at TA-54. These containers are too large to be shipped for disposal at the Waste Isolation Pilot Plant (WIPP) located east of Carlsbad, New Mexico.

Construction was completed at TA-54 on a new facility called the Decontamination and Volume Reduction System or DVRS. The DVRS includes a 13,200-sq-ft containment area with active ventilation and contamination control, instruments for radioassay of waste items, several processes for decontamination of metal objects, and a large system to shear and crush large metallic objects into drum-sized items. Oversize metallic waste that can be decontaminated to low-level waste will be disposed on-site at TA-54. Waste that remains TRU waste will be placed into drums that can be shipped for disposal at WIPP.

Transuranic (TRU) Waste Characterization, Certification, and Shipment. Transuranic waste must be characterized and certified to meet the Waste Acceptance Criteria at WIPP. LANL was the first DOE site to be granted authorization from DOE to certify TRU waste in September 1997 and made the first of 17 shipments of TRU waste to WIPP in March 1999. During 2000, LANL modified all of its characterization and certification procedures to meet new requirements for shipping mixed TRU waste to WIPP under the hazardous waste facility permit granted to WIPP site by the NMED. LANL made 8 more shipments of TRU waste to WIPP since the hazardous waste permit was issued and expects to make 10 more shipments to WIPP in the coming year.

b. Pollution Prevention. The Laboratory's Prevention Program Office manages the Laboratory's pollution prevention program. Specific waste minimization accomplishments and pollution prevention projects can be seen on the web at *http://emeso.lanl.gov/*. Other waste management activities that reduce waste generation include the following:

- continuing financial incentives for waste reduction and innovative pollution prevention ideas and accomplishments such as the annual Pollution Prevention Awards and Generator Set Aside Fee funding;
- developing databases to track waste generation and pollution prevention/recycling projects;
- providing pollution prevention expertise to Laboratory organizations in source reduction, material substitution, internal recycle/reuse, lifetime extension, segregation, external recycle/reuse, volume reduction, and treatment; and

- providing guidance to divisions within the Laboratory for minimizing waste and pollution through application of the Green Zia tools. Green Zia is a pollution prevention program administered by NMED.

Each year, the Prevention Program Office publishes The Los Alamos National Laboratory Environmental Stewardship Roadmap, in accordance with the Hazardous and Solid Waste Amendments Module VIII of the RCRA Hazardous Waste Permit and 40 CFR 264.73. This document is available at *http://emeso.lanl.gov/useful_info/publications/publications.html* on the World Wide Web.

One of the six Laboratory excellence goals has an environmental focus: zero environmental incidents. The roadmap document describes the Laboratory's current operations and the improvements that will eliminate the sources of environmental incidents. The stewardship solution for zero incidents is to eliminate the incident source. This goal is being accomplished by continuously improving operations to

- reduce waste generation,
- reduce pollutants released,
- reduce natural resources used, and
- reduce natural resources damaged.

c. Environmental Restoration Project. The Environmental Restoration (ER) Project at the Laboratory augments the Laboratory's environmental surveillance program by identifying and characterizing potential threats to human health, the area's ecology, and the environment from past Laboratory operations. The ER Project's mission is to mitigate those threats, where necessary, through cleanup actions that comply with applicable environmental regulations. Corrective actions may include excavating and/or treating the contamination source, capping and containing a source to prevent its migration, and placing controls on future land use. Often these sources are places where wastes were improperly disposed in the past or where the disposal practices of the past would not meet today's standards. As a result, contamination may have spilled or leaked into the environment from such places called potential release sites or PRSs over time, with the possibility of causing hazards to human health and/or the environment. The ER Project then must confirm or deny the existence of these hazards and cleanup sites, when deemed necessary.

The ER Project organizes its activities according to the natural watersheds across the Laboratory in which the various PRSs are located. A single watershed comprises one or more mesas and common canyon drainage. The mesas draining into a common canyon may contain multiple contaminated sites. Each of the one or more pieces (called aggregates) contains several PRSs that will be investigated, assessed, and cleaned up (if necessary) as a group. This approach, termed the Watershed-Aggregate Approach, considers the potential risk created by groups of PRSs within a given watershed rather than attempting to apply risk values of individual PRSs. This approach ensures that drinking water sources and sensitive natural resources will be protected as it accounts for potential cumulative impacts of multiple contaminant sources located on mesa tops and slopes.

An exposure scenario serves as the basis for assessing a site for potential risk to human health and defines the pathways by which receptors are exposed. The ER Project determines human health exposure scenarios based on the current and future land use of the site. Standard land-use scenarios the ER Project uses to determine exposure to human health receptors include

- residential,
- industrial,
- recreational, and
- resource user.

Mirenda and Soholt (1999) fully describe standard land-use scenarios. The Comprehensive Site Plan (LANL 1999b) reflects the status of current facility and land use conditions and future Laboratory needs. Industrial land use affects Laboratory workers and is prescribed by the 30-year planning horizon for the Laboratory's mission and the continued operation of present-day facilities. Buffer zone land use may affect recreational users and is based on present and future access to Laboratory property.

The ER Project is continuing to develop and evaluate a set of pathways that would appropriately describe how members of neighboring pueblos use Laboratory lands and environs. The ER Project revised its risk assessment methodology in 1999 to add ecological risk assessments to the human-health risk assessment if warranted by the risk-screening assessment. The ER Project makes corrective action or cleanup decisions on the basis of ecological risks and risks to the environment, in addition to human-health risks. While human-health risk can be evaluated over a relatively small area, ecological risk assessment requires an understanding of the nature and extent of contamination across much larger areas.

Decisions that are protective of water resources in general also require an understanding of the presence and movement of contamination within an entire watershed.

The ER Project at the Laboratory is structured primarily according to the requirements of the Hazardous and Solid Waste Amendments to RCRA, which refer to these cleanup activities as "corrective actions." Module VIII of the Laboratory's Hazardous Waste Facility Permit contains the corrective action provisions. One of the objectives of the ER Project is to complete corrective actions at every site under its purview as necessary. Corrective actions are considered complete when

- the ER Project has demonstrated and documented that the site either poses no risk to human and ecological receptors or that the risk is acceptable—or a final remedy is evaluated, selected, and implemented to reduce or eliminate risk—and
- the administrative authority has concurred.

NMED regulates the Laboratory's corrective action program under RCRA. The DOE, NMED, and other Laboratory organizations participate on teams that were formed to accelerate environmental restoration through interagency communication and collaborative decision-making at complex and critical path sites. In addition, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) specifies requirements for cleaning up sites that contain certain hazardous substances not regulated by RCRA and for identifying and reporting historical contamination when federal agencies such as DOE transfer surplus property to other agencies or the public. DOE has oversight for those PRSs at the Laboratory that are not subject to RCRA and for the Laboratory's decommissioning program for surplus buildings and facilities.

The ER Project Installation Work Plan (LANL 2000a) fully documents the watershed approach and the corrective action process. The plan is updated annually as part of the requirements of the RCRA Hazardous Waste Facility permit. See *http://erproject.lanl.gov* on the World Wide Web for additional information about the ER Project. See Chapter 2 for summaries of ER Project activities performed in 2001.

5. Land Conveyance and Transfer Under Public Law 105-119

On November 26, 1997, Congress passed Public Law 105-119. Section 632 of the Act directed the Secretary of Energy to identify parcels of land at or near the Laboratory for conveyance and transfer to one of two entities: either Los Alamos County or the Secretary of the Interior (to be held in trust for San Ildefonso Pueblo). Pursuant to this legislation, DOE determined that an Environmental Impact Statement (EIS) would be required under NEPA to satisfy the requirements for review of environmental impacts of the conveyance or transfer of each of the ten tracts of land (totaling about 4,800 acres) slated for transfer. DOE may retain portions of these tracts because of current or future national security mission needs or the inability to complete restoration and remediation for the intended use within the time frame prescribed in the Act. The Final Conveyance and Transfer (CT) EIS is dated October 1999 (DOE 1999), and a Record of Decision was issued in January 2000.

Public Law 105-119 also required DOE to evaluate those environmental restoration activities that would be necessary to support land conveyance and transfer and to identify how this cleanup could be achieved within the ten-year window established by law. The resultant report, the *Environmental Restoration Report to Support Land Conveyance and Transfer under Public Law 105-119*, was dated August 1999. In addition, Congress required DOE to issue a Combined Data Report that summarized the material contained in the CT EIS and Environmental Restoration Report. The Combined Data Report to Congress was released in January 2000, and the official notification that these documents were available from the EPA appeared in February 2000. DOE is taking various actions to accomplish the conveyance and transfer of the 10 subject tracts, including actions taken with the assistance of the Laboratory, such as regulatory compliance and environmental restoration activities. These actions will continue until all 10 tracts have been transferred or until the end of 2007 as provided for in Public Law 105-119.

During 2001, the 10 tracts were divided into 28 subparcels to allow for more rapid transfer of those areas not having potential contamination problems to Los Alamos County or the Bureau of Indian Affairs to be held in trust for San Ildefonso Pueblo. By November 2001, Environmental Baseline Surveys had been completed for six subparcels and had been transmitted to the appropriate agencies for review. Actual transfer of these subparcels is expected in September 2002.

6. Cooperative Resource Management

Interagency Wildfire Management Team. The Interagency Wildfire Management Team continues to be a vehicle for addressing wildfire issues of mutual concern to the regional land management agencies. The team collaborates in public outreach activities, establishes lines of authority to go into place during a wildfire, provides cross-disciplinary training, and shares the expertise that is available from agency to agency. The result of this collaboration has been an increased coordination of management activities between agencies and a heightened response capability in wildfire situations. The Interagency Wildfire Management Team has been instrumental in evaluating and guiding forest thinning activities in the LANL region to minimize the risk and impacts of wildfires. These forest-thinning activities were a critical factor in minimizing some of the spread and impacts of the Cerro Grande fire within Los Alamos County, LANL, and US Forest Service lands bordering LANL. In addition to DOE/NNSA and UC/LANL, regular participants of the Interagency Wildfire Management Team include representatives of the Los Alamos County Fire Department, Santa Fe National Forest, Bandelier National Monument, San Ildefonso Pueblo, NM State Forester's Office, and NMED DOE/NNSA Oversight Bureau.

East Jemez Resource Council. The East Jemez Resource Council remains a highly effective means of improving interagency communication and cooperation in the management of resources on a regional basis. The council includes resource-specific working groups that give resource specialists a forum for a more detailed and technical assessment of resource-specific issues and solutions. The working groups report on progress and issues during the quarterly council meetings. The council is also providing a forum for soliciting regional agency and stakeholder input during the development of the several resource management documents and strategies including the LANL Ecological Risk Assessment Project and the Comprehensive Site Plan. Council participants include Bandelier National Monument, Santa Fe National Forest, NMED, New Mexico State Forestry Division, US Fish and Wildlife Service, NM Department of Game and Fish, San Ildefonso Pueblo, Santa Clara Pueblo, Cochiti Pueblo, Los Alamos County, Rio Arriba County, DOE/NNSA, and UC/LANL.

Cochiti Lake Ecological Resources Team. In 2001, the Cochiti Lake Ecological Resources Team consulted with the US Army Corps of Engineers on the role of Cochiti Lake to address the water and habitat management issues associated with the Rio Grande Silvery Minnow. The team also provided technical expertise in evaluating strategies for assessing the geomorphic condition of the Rio Grande and continued to support the implementation of a rigorous water quality sampling and monitoring study associated with the Cerro Grande fire. Cochiti Lake Ecological Resources Team participants include the US Army Corps of Engineers, Bandelier National Monument, DOE/NNSA Los Alamos Area Office, US Geological Survey, US Fish and Wildlife Service, NM Game and Fish, Cochiti Pueblo, US Forest Service, and UC/LANL.

Pajarito Plateau Watershed Partnership. In 2001, the Pajarito Plateau Watershed Partnership continued to develop a multiagency program and plan to identify and resolve the primary regulatory and stakeholder issues affecting water quality in the watersheds of the Pajarito Plateau region. The partnership's mission is to work together to protect, improve, and/or restore the quality of water in the regional watersheds. The partnership received Clean Water Act Section 319 funding from the EPA to improve regional watersheds impacted by the Cerro Grande fire. Partnership members include Bandelier National Monument, San Ildefonso Pueblo, Santa Clara Pueblo, Los Alamos County, NMED, US Forest Service, DOE/NNSA, and UC/LANL.

7. Community Involvement

The Laboratory continues to encourage public access to information about environmental conditions and the environmental impact of operations at the Laboratory. Although the Community Relations Office has the responsibility to help coordinate activities between the Laboratory and northern New Mexico, many organizations at the Laboratory are actively working with the public. Frequently, these interactions address environmental issues because of the Laboratory's potential impact on local environment, safety, and health.

Outreach

During 2001, Community Relations assigned outreach managers to cover Los Alamos, Santa Fe, Española, and Taos. The Los Alamos center includes a reading room with access to Laboratory documents. Approximately 150 people visited the reading room last year. Access to environmental information is available at outreach centers in Los Alamos and Española. In addition to the activities listed below, the office also helps technical organizations coordinate public meetings, tours, speakers, and other outreach activities as needed including assistance with publications.

The Communications and Outreach (C&O) Team of the ER Project works actively with the public to provide information for review and comment and to provide opportunities to participate in cleanup decisions. The C&O Team coordinates public involvement activities such as public meetings, tours, media briefings, and other outreach activities for ER Project-specific activities. In 1999, the team published a Web site for the ER Project: *http://erproject.lanl.gov* on the World Wide Web. In 2000, the team developed a "Virtual Library" in the ER Project's external web site allowing online public access to ER Project documents. In 2001, the C&O Team hired a local small business to scan documents generated from 1990-2000 into portable document files (pdf). These documents and will be available to the public from the online Virtual Library. The team also initiated a focus group outreach initiative for Material Disposal Area (MDA) H activities. The focus group, composed of a diverse group of public, community, and government representatives, will provide a cleanup recommendation to the ER Project and to NMED.

During 2001, the ER Project coordinated and conducted approximately 15 tours of Laboratory facilities and sites for a variety of audiences including DOE, EPA, and NMED; the Northern New Mexico Citizens Advisory Board (CAB); tribal and local governments and environmental staff; and the media. Many tours conducted in 2001 highlighted the impact of the Cerro Grande fire on ER Project-related sites and other ER cleanup activities. In 2001, the C&O Team participated in and/or coordinated approximately 30 meetings. Additionally, over 20 press releases and articles documenting the successful cleanup activities of 2001 were published. Other miscellaneous C&O Team activities included creating poster displays and panels for a number of ER Project-related conferences.

Bradbury Science Museum

Because many of the Laboratory's facilities are not accessible to the public, the Bradbury Science Museum provides a way for the public to learn about the kinds of work the Laboratory does, whether it is showing how lasers assess air pollution or demonstrating ecological concepts. Attendance at the museum was approximately 85,000 in 2001.

Inquiries

In 2001, the Community Relations Office—with the assistance of a wide variety of Laboratory organizations—responded to questions from members of the public on a variety of topics from the composition of worldwide nuclear fallout to follow-up questions on the impact of the Cerro Grande fire from the year before. In all, more than 120 questions came in to the reading room.

8. Public Meetings

The Laboratory holds public meetings to inform residents of surrounding communities about environmental activities and operations at the Laboratory. The ER Project C&O Team sponsors ER Project-specific public meetings, informational briefings, poster sessions, open houses, and tours. Topics for public meetings held in 2001 included items of interest identified by the public, quarterly status reports on the Project's progress cleaning up sites in the Los Alamos town site and in local canyons, and the cleanup of radioactive sludge at a Laboratory facility wastewater lagoon located at TA-53. Additionally, the C&O staff coordinated two public meetings to discuss a Class III Permit Modification Request to remove 25 solid waste management units (SWMUs) from the Laboratory's Hazardous and Solid Waste Facility Permit. C&O Team staff collaborated extensively with the Interagency Flood Risk Assessment Team and conducted a public meeting on the impacts of the Cerro Grande fire.

9. Tribal Interactions

LANL works with the Accord pueblos and other regional American Indian tribal governments to address issues of concern and implement initiatives to resolve environment, safety, health and other Laboratory-related issues.

Laboratory/tribal interactions in 2001 included the following:

- **UC ESH Panel Meeting.** The environmental program staff managers of each of the Cooperative Agreement Pueblos provided a briefing on their program activities to the University of California President's Council on the National Laboratories Environment, Safety, and Health Panel at the annual meeting of the pueblos and the panel.
- **Sampling/Monitoring.** Sampling and monitoring of air, water, soils, sediments, foodstuffs, game, and fish continue. Laboratory technical staff work closely with each pueblo's environmental program staff on such activities. A major concern includes any post-fire contaminant transport through air, surface water, groundwater, soil, and biotic pathways.

- **Environmental Restoration.** The four pueblos participated in the DOE-DP-sponsored LANL and Accord Pueblo Background/Conceptual Site Model Working Meeting, February 6–8, 2001, to review past and present Laboratory activities and releases, the scope and goals of current environmental monitoring and surveillance programs, and the environmental restoration project. The goal of the workshop was to assist the pueblos in developing environmental programs funded by DOE through the Cooperative Agreements.

  Working interactions between the Cooperative Agreement Pueblos and the Laboratory Environmental Restoration program have included tours of sites, discussions and review of sampling and analysis plans and work plans, status of land transfer, planning for sampling of TA-74, briefing on the risk assessment results of the analyses of post-flood samples, and risk assessment training.
- **Wildfire Impact.** Monthly meetings between the San Ildefonso cultural resources staff and the Laboratory Cultural Resources Management Team and DOE were set up to address the pueblo's concern about the Cerro Grande wildfire impact on cultural sites and any subsequent rehabilitation activities.

  Aerial photographs of the Pajarito Plateau and the Jemez Mountains were taken to document the impacts of the Cerro Grande fire. Santa Clara, San Ildefonso and Cochiti each received a large (approximately 4 ft 5 ft) color print of the study area and 15 CDs that contain a digital copy of the color ortho imagery.
- **Cerro Grande Rehabilitation Project (CGRP).** In October 2001, the Laboratory signed four task order agreements with area pueblos (San Ildefonso, Santa Clara, Cochiti, and Jemez) to support the Laboratory's Cerro Grande Rehabilitation Project (CRGP). The task order agreement will serve as the basis for a long-term contractual relationship between the Laboratory and the pueblos.
- **Work Plans.** Environmental program staff from each pueblo and Laboratory technical staff held several meetings to develop work plans for this year. The work plans focus on identifying key areas of concern and developing joint plans to address the concerns.
- **Emergencies.** The Pueblo of Santa Clara and Los Alamos National Laboratory signed an Emergency Communication Agreement on December 14, 2000. The intent is to encourage and facilitate communication between the pueblo and the Laboratory in emergency situations. San Ildefonso Pueblo signed a similar agreement in December 2001.

As a follow-up to the Cerro Grande fire experience, the Laboratory designated a place for a pueblo representative in the Laboratory's Emergency Operations Center to be instituted during any emergency occurrence.

10. A Report for Our Communities

In December 2001, ESH Division published the annual report, "For the Seventh Generation: Environment, Safety, and Health at Los Alamos National Laboratory: A Report to Our Communities 2000–2001 Volume V" (ESH 2001). This report gives the Laboratory, its neighbors, and other stakeholders a snapshot of some of the Laboratory ESH programs and issues.

Feature articles in this volume fall into two categories—Partnerships and Progress and Environment and Recovery—and include the following:

Johnson Controls: A Great Partner, A Great Neighbor

Students Organize Archaeological Symposium

Disease Detectives

A Biosafety Posse for Biovillains

Environmental Restoration Project: No Easy Solution, No Quick Fix

The Hydrologic Cycle

Forest Recovery, Naturally

Feeding Habits of Rocky Mountain Elk and Mule Deer

Up Close and Personal: Life after Cerro Grande

Project Recovery

This report is available from the Laboratory's Outreach Centers and reading room.

11. Citizens' Advisory Board

The Northern New Mexico Citizens' Advisory Board on Environmental Management was formed in 1995 to provide opportunities for effective communications between the diverse multicultural communities of northern New Mexico, the DOE, the Laboratory, and state and federal regulatory agencies on environmental restoration, environmental surveillance, and waste management activities at the Laboratory. ER Project staff participate in the monthly CAB meetings. More information on the CAB is available at *http://www.nnmcab.org on the World Wide Web*.

C. Assessment Programs

1. Overview of Los Alamos National Laboratory Environmental Quality Assurance Programs

Quality is the extent to which an item or activity meets or exceeds requirements. Quality assurance includes all the planned and systematic actions and activities necessary to provide adequate confidence that a facility, structure, system, component, or process will perform satisfactorily. Each monitoring activity ESH Division sponsors has its own Quality Assurance Plan and implementing procedures. These plans and procedures establish policies, requirements, and guidelines to effectively implement regulatory requirements and to meet the requirements for DOE Orders 5400.1 (DOE 1988), 5400.5 (DOE 1990), and 5700.6C (DOE 1991). Each Quality Assurance Plan must address the criteria for management, performance, and assessments.

The ESH groups performing environmental monitoring activities either provide their own quality assurance support staff or can obtain support for quality assurance functions from the Quality Assurance Support Group (ESH-14). ESH-14 personnel perform quality assurance and quality control audits and surveillance of Laboratory and subcontractor activities in accordance with the Quality Assurance Plan for the Laboratory and for specific activities as requested. The Laboratory's Internal Assessment Group (AA-2) manages an independent environmental appraisal and auditing program that verifies implementation of environmental requirements. The Quality Improvement Office manages and coordinates the effort to become a customer-focused, unified Laboratory.

2. Overview of University of California/ Department of Energy Performance Assessment Program

During 2001, UC and NNSA evaluated the Laboratory based on mutually negotiated ES&H performance measures. The performance measures are linked to the principles and key functions of ISM. The performance assessment program is a process-oriented approach intended to enhance the existing ISM system by identifying performance goals.

Performance measures include the following categories:

- environmental performance;
- radiation protection of workers;
- waste minimization, affirmative procurement, and energy and natural resources conservation;
- management walkarounds;
- hazard analysis and control;
- maintenance of authorization basis; and
- injury/illness prevention.

Specific information on the categories and the assessment scoring can be obtained at *http://arania.lanl.gov:80/PM_Team/html/App%20F/Appendix%20F%20pp1.htm* on the World Wide Web.

3. Environment, Safety, & Health Panel of the University of California President's Council on the National Laboratories (UC-ES&H)

The Environment, Safety, and Health Panel of the University of California President's Council on the National Laboratories held its annual meeting August 15–17, 2001. The agenda included, among others, the following topics:

- the status of Appendix O to the contract between DOE and UC to manage the Laboratory;
- safety at the Laboratory;
- authorization basis facility safety;
- oil spill at the Atlas pulsed-power facility (TA-35) in January 2001;
- Tri-Lab Beryllium Program; and
- the biosafety program.

The panel has not issued a written report summarizing the results of the meeting.

4. Division Review Committee

The ES&H Division Review Committee reviewed ES&H research projects in 2001. The primary purpose of the meeting was to perform the Science & Technology Assessment of ESH Division. The Division Review Committee based its evaluation on the four criteria provided by the UC President's Council on the National Laboratories:

- quality of science and technology;
- relevance to national needs and agency missions;
- support of performance, technical development, and operations of Laboratory facilities; and
- programmatic performance and planning.

The committee assigned an overall grade of outstanding/excellent to the performance of the division for science and technology. The committee found the overall quality improved when compared with 2000 and noticed the shift in focus to fire-related projects. Of the 30 projects evaluated, 13 were truly outstanding or excellent. The projects deemed best in class were

- laser-illuminated track etch scattering (LITES) dosimetry system;
- chronic beryllium disease dosimetry: particle dissolution through lymphocyte activation;
- Bayesian internal dosimetry calculations using Markov chain Monte Carlo;
- assessing potential risks from exposure to natural uranium in well water: Nambé, NM;
- measurements of radioactive air contaminants during the Cerro Grande fire using the LANL air monitoring network (AIRNET); and
- regression modeling to enhance spatial representations of fuel loads and fire hazards.

5. Cooperative and Independent Monitoring by Other State and Federal Agencies

The Agreement-in-Principle between DOE and the State of New Mexico for Environmental Oversight and Monitoring provides technical and financial support for state activities in environmental oversight and monitoring. NMED's DOE Oversight Bureau carries out the requirements of the agreement. The Oversight Bureau holds public meetings and publishes reports on its assessments of Laboratory activities. Highlights of the Oversight Bureau's activities are available at *http://www.nmenv.state.nm.us/DOE_Oversight/doetop.html*.

Environmental monitoring at and near the Laboratory involves other state and federal agencies such as the Defense Nuclear Facilities Safety Board, the Agency for Toxic Substances and Disease Registry, the Bureau of Indian Affairs, the US Geological Survey, the US Fish and Wildlife Service, the US Forest Service, and the National Park Service.

6. Cooperative and Independent Monitoring by the Surrounding Pueblos

DOE and UC have signed agreements with the four surrounding pueblos. The main purposes of these agreements are to build more open and participatory relationships, to improve communications, and to cooperate on issues of mutual concern. The agreements allow access to monitoring locations at and near the Laboratory to encourage cooperative sampling activities, improve data sharing, and enhance communications on technical subjects. The agreements also provide frameworks for grant support that allow development and implementation of independent monitoring programs.

D. Cerro Grande Fire

On May 4, 2000, the National Park Service initiated a prescribed burn on the flanks of Cerro Grande Peak within the boundary of Bandelier National Monument (LANL 2000b, DOE 2000). The intended burn was a meadow of about 300 acres, at 10,120 ft, located 3.5 mi. west of the Laboratory boundary at TA-16 (Figure 1-4). This technical area is located near the southwest corner of the Laboratory. The prescribed burn was begun in the evening, but, by 1:00 p.m. of the following day, the burn was declared a wildfire.

ESH-17's meteorological data showed above average temperatures and low humidity for the first 10 days of the wildfire. Wind speeds averaged 6 to 17 mph and gusted from 27 to 54 mph during these 10 days. Generally, winds tended to be from the southwest to west during this period.

By day five of the wildfire, May 8, spot fires began to occur on Laboratory lands. By May 10, the fire moved into the town site of Los Alamos and was proceeding north and east across the TA-16 mesa top. The fire was moving eastward down Water Canyon, Cañon de Valle, Pajarito Canyon, and Cañada del Buey by May 11. Eventually the fire extended northward on Laboratory lands to Sandia Canyon and eastward down Mortandad Canyon into San Ildefonso Pueblo lands. The wildfire was declared fully contained on June 6, having burned 43,000 acres of land extending to Santa Clara Canyon on Santa Clara Pueblo lands to the north of the town site. In all, approximately 7,500 acres of Laboratory property was covered by wildfire burn.

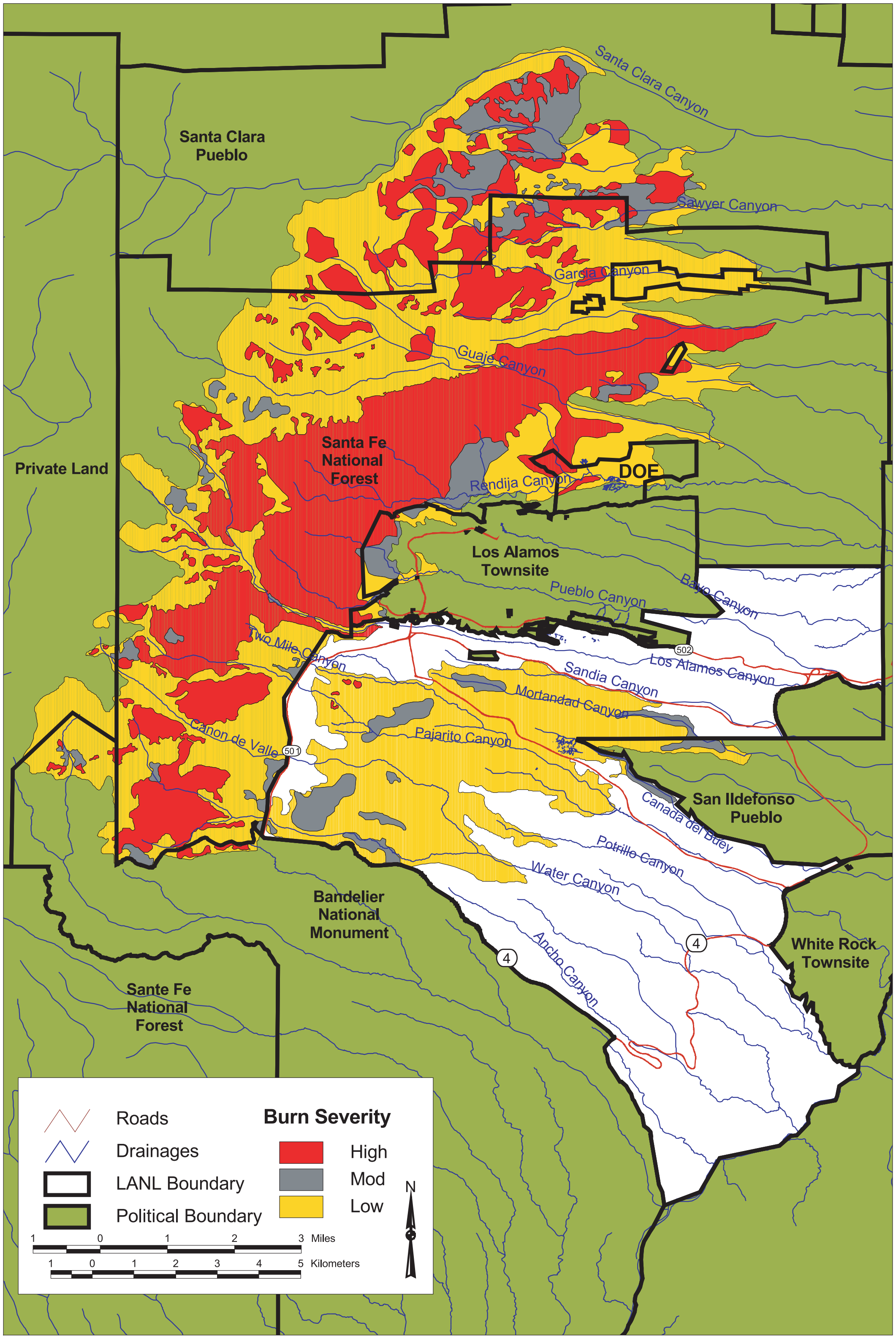

Figure 1-4. Cerro Grande fire burn area.

E. References

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2. Compliance Summary

2. Compliance Summary

contributing authors:

Mike Alexander, Gian Bacigalupa, Marc Bailey, Alice Barr, Robert Beers, Bill Brazile, Eleanor Chapman Jean Dewart, Albert Dye, Todd Haagenstad, Carla Jacquez, Karen Lyncoln, Dave McInroy, Chris McLean Laura Marsh, Charlie Nylander, Dan Pava, Robin Reynolds, Geri Rodriguez, George Vantiem, Steve Veenis

Abstract

Los Alamos National Laboratory (LANL or the Laboratory) staff frequently interacted with regulatory personnel during 2001 on Resource Conservation and Recovery Act (RCRA) and New Mexico Hazardous Waste Act requirements and compliance activities. During 2001, the Laboratory continued to work on the application process to renew its Hazardous Waste Facility permit and to respond to information requests from the New Mexico Environment Department about the history of hazardous waste generation and management at the Laboratory.

In 2001, the Laboratory was in compliance with its National Pollutant Discharge Elimination System (NPDES) permit liquid discharge requirements in 100% of the samples from its sanitary effluent outfalls and in 99.6% of the samples from its industrial effluent outfalls. The Laboratory was in compliance with its NPDES permit liquid discharge requirements in 99.6% of the water quality parameter samples collected in the period from January 1, 2001, through December 31, 2001, at sanitary and industrial outfalls. Concentrations of chemical, microbiological, and radioactive constituents in the drinking water system remained within federal and state drinking water standards.

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A. Introduction

Many activities and operations at Los Alamos National Laboratory (LANL or the Laboratory) use or produce liquids, solids, and gases that may contain nonradioactive hazardous and/or radioactive materials. Laboratory policy implements Department of Energy (DOE) requirements by directing its employees to protect the environment and meet compliance requirements of applicable federal and state environmental protection regulations. Federal and state environmental laws address handling, transport, release, and disposal of contaminants, pollutants, and wastes; protecting ecological, archaeological, historic, atmospheric, soil, and water resources; and conducting environmental impact analyses. Regulations provide specific requirements and standards to ensure maintenance of environmental qualities. The Environmental Protection Agency (EPA) and the New Mexico Environment Department (NMED) are the principal administrative authorities for these laws. DOE and its contractors are also subject to DOE-administered requirements for control of radionuclides. Table 2-1 presents the environmental permits or approvals these organizations issued and the specific operations and/or sites affected.

Table 2-1. Environmental Permits or Approvals under Which the Laboratory Operated during 2001

Category	Approved Activity	Issue Date	Expiration Date	Administering Agency
RCRA Hazardous Waste Facility	Hazardous and mixed waste storage and treatment permit	November 1989	November 1999 Administratively continued	NMED
	RCRA General Part B renewal application	submitted January 15, 1999		
	Request for Supplemental Information	submitted October 2000		MMED
	RCRA mixed waste Revised Part A application	submitted April 1998	– – –	NMED
	TA-50/TA-54 permit renewal application	submitted January 15, 1999		
	TA-54 Characterization, High-Activity Processing, and Storage Facility	submitted September 19, 2000		NMED
	TA-16 permit renewal application	submitted September 2000		NMED
HSWA	RCRA Corrective Activities	March 1990	December 1999 Administratively continued	NMED
TSCA[a]	Disposal of PCBs at TA-54, Area G	June 25, 1996	June 25, 2001 Administratively continued	EPA
CWA/NPDES[b], Los Alamos	Discharge of industrial and sanitary liquid effluents	February 1, 2001	January 31, 2005	EPA
	Storm water permit for industrial activity	December 23, 2000	October 30, 2005	EPA
Storm Water Permit for Construction Activity	DARHT Facility Project	October 2, 1998	July 7, 2003	EPA
	Guaje Well Field Improvements Project	October 2, 1998	July 7, 2003	EPA
	Fire Protection Improvements Project	October 2, 1998	July 7, 2003	EPA
	Strategic Computing Complex Project	May 21, 1999	July 7, 2003	EPA
	Norton Power Line Project	June 1, 1999	July 7, 2003	EPA
	TA-9 to TA-15 Gas Pipeline Replacement Project	August 22, 1999	July 7, 2003	EPA
	Flood Mitigation Project	July 25, 2000	July 7, 2003	EPA
	Nuclear Materials Safeguards and Security Upgrade Project	February 25, 2000	July 7, 2003	EPA
	TA-3 Revitalization Project	March 22, 2001	July 7, 2003	EPA
	TA-55 Fireloop Constructional Project	August 18, 2001	July 7, 2003	EPA
CWA Sections 404/401 Permits	Norton Transmission Line Replacement	March 4, 1999	March 4, 2001	COE/NMED
	Wetland Characterization	May 25, 1999	May 25, 2001	COE/NMED
	Sewer Line Crossing-Upper Sandia Canyon	May 27, 1999	May 27, 2001	COE/NMED
	Lab-wide Gaging Stations/Sci. Meas. Devices Part 2	June 15, 1999	June 15, 2001	COE/NMED

Table 2-1. Environmental Permits or Approvals under Which the Laboratory Operated during 2001 (Cont.)

Category	Approved Activity	Issue Date	Expiration Date	Administering Agency
CWA Sections 404/401 Permits (Cont.)	TA-9 to TA-15 Natural Gas Line Replacement	June 17, 1999	June 17, 2001	COE/NMED
	TA-48 Wetlands Improvement	July 9, 1999	July 9, 2001	COE/NMED
	TA-72 Firing Range Maintenance	July 13, 1999	July 13, 2001	COE/NMED
	Gas Line Leak Repair-LA Canyon	July 16, 1999	When repair completed	COE/NMED
	Cañon de Valle Filtration Weir	June 25, 1999	June 25, 2001	COE/NMED
	Gaging Station Clean-Outs	February 22, 2000	February 22, 2002	COE/NMED
	PRV Installation near TA-2	February 23, 2000	February 23, 2002	COE/NMED
	R-7 Well Access Road	March 24, 2000	March 24, 2002	COE/NMED
	TA-11 Erosion Control/Fire Road Project	April 11, 2000	April 11, 2002	COE/NMED
	Sandia Canyon Wetland Characterization	April 13, 2000	April 13, 2002	COE/NMED
	Organic Biocontaminants Study	May 26, 2000	May 26, 2002	COE/NMED
	Cerro Grande Emergency Operations	June 23, 2000	June 23, 2002	COE/NMED
	COE Projects	July 20, 2000	July 20, 2002	COE/NMED
	Pajarito Flood Retention Structure	July 18, 2000	July 18, 2002	COE/NMED
	Los Alamos/Pueblo Low Head Weirs	July 23, 2000	July 23, 2002	COE/NMED
	Gas Line Replacement in Los Alamos Canyon	September 18, 2000	September 18, 2002	COE/NMED
	Martin Spring Filtration Weir	October 31, 2000	October 31, 2002	COE/NMED
	PRS 3-056 (c), PCB Cleanup	November 17, 2000	November 17, 2002	COE/NMED
	PRS 16-020 Photo Processing Cleanup	November 22, 2000	November 22, 2002	COE/NMED
Groundwater Discharge Plan, Fenton Hill	Discharge to groundwater	June 5, 2000	June 5, 2005	NMOCD[d]
Groundwater Discharge Plan, TA-46 SWS Facility[e]	Discharge to groundwater	January 7, 1998	January 7, 2003	NMED
Groundwater Discharge Plan, Sanitary Sewage Sludge Land Application	Land application of dry sanitary sewage sludge	June 30, 1995	June 30, 2000**	NMED
Groundwater Discharge Plan, TA-50, Radioactive Liquid Waste Treatment Facility	Discharge to groundwater	submitted August 20, 1996 approval pending		NMED

Table 2-1. Environmental Permits or Approvals under Which the Laboratory Operated during 2001 (Cont.)

Category	Approved Activity	Issue Date	Expiration Date	Administering Agency
Air Quality Operating Permit (20 NMAC[f] 2.70)	LANL air emissions	not yet issued		NMED
Air Quality (20 NMAC 2.72)	Portable Rock Crusher	June 16, 1999	None	NMED
	TA-3 Steam Plant-Flue Gas Recirculation	September 27, 2000	None	NMED
Air Quality (NESHAP)[g]	Beryllium machining at TA-3-39	March 19, 1986	None	NMED
	Beryllium machining at TA-3-102	March 19, 1986	None	NMED
	Beryllium machining at TA-3-141	October 30, 1998	None	NMED
	Beryllium machining at TA-35-213	December 26, 1985	None	NMED
	Beryllium machining at TA-55-4	February 11, 2000	None	NMED
Open Burning (20 NMAC 2.60)	Burning of jet fuel and wood for ordnance testing, TA-11	August 18, 1997	December 31, 2002	NMED
	Burning of HE-contaminated[h] materials, TA-14			
	Burning of HE-contaminated materials, TA-16			
	Burning of scrap wood from experiments, TA-36			
	Fuel fire burn of wood or propane, TA-16, Site 1409			
Open Burning (20 NMAC 2.60)	Burning of wood and wood slash from fire mitigation activities around LANL	June 20, 2001	December 31, 2002	NMED

[a]Toxic Substances Control Act.
[b]National Pollutant Discharge Elimination System.
[c]Corps of Engineers.
[d]New Mexico Oil Conservation Division.
[e]Sanitary Wastewater Systems (SWS) Facility.
[f]New Mexico Administrative Code.
[g]National Emission Standards for Hazardous Air Pollutants.
[h]High-explosive.
** Administratively extended by NMED.

B. Compliance Status

1. Resource Conservation and Recovery Act

a. Introduction. The Laboratory produces a variety of hazardous wastes, most in small quantities relative to industrial facilities of comparable size. The Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984, creates a comprehensive program to regulate hazardous wastes from generation to ultimate disposal. The HSWA emphasize reducing the volume and toxicity of hazardous waste. The applicable federal regulation, 40 Code of Federal Regulations (CFR) 268, requires treatment of hazardous waste before land disposal.

EPA or an authorized state issues RCRA permits to regulate storing, treating, or disposing of hazardous waste and the hazardous component of radioactive mixed waste. A RCRA Part A permit application identifies (1) facility location, (2) owner and operator, (3) hazardous or mixed wastes to be managed, and (4) hazardous waste management methods and units (RCRA hazardous waste management areas). A facility that has submitted a RCRA Part A permit application for an existing unit manages hazardous or mixed wastes under transitional regulations known as the Interim Status Requirements pending issuance (or denial) of a RCRA Hazardous Waste Facility permit (the RCRA permit). The RCRA Part B permit application consists of a detailed narrative description of all facilities and procedures related to hazardous or mixed waste management, including contingency response, training, and inspection plans.

In 1996, EPA adopted new standards, under the authority of RCRA, as amended, commonly called "Subpart CC" standards. These standards apply to air emissions from certain tanks, containers, storage facilities, and surface impoundments that manage hazardous waste capable of releasing volatile organic compounds (VOCs) at levels that can harm human health and the environment.

b. Resource Conservation and Recovery Act Permitting Activities. NMED issued the original RCRA Hazardous Waste Facility Permit for the waste management operations at Technical Areas (TAs) 50, 54, and 16 on November 8, 1989. After 10 years, the original permit expired in 1999 but was administratively continued beyond the expiration date (as allowed by the permit and by New Mexico Administration Code, Title 20, Chapter 4, Part 1, as revised January 1, 1997 [20 NMAC 4.1], Subpart IX, 270.51), because of the timely submittal of permit renewal applications.

To support the renewal of the permit, the Laboratory has provided (1) a General Part B permit application to serve as a general resource document and as the basis for Laboratory facilitywide portions of the final permit and (2) TA-specific permit applications to provide detail on specific waste management units in individual chapters of the final permit.

The Laboratory received or responded to six requests for additional or supplemental information (RSIs) from NMED during 2001. The DOE/LANL responses to these RSIs provide further information or detail about RCRA waste management practices to support the development of the new permit and are part of the administrative record NMED keeps for the permit. LANL developed two RSI responses for the General Part B permit application and submitted them to NMED in February and November. An RSI response for TA-50 was submitted to NMED in November.

The Laboratory received an extensive "Request for Information" for all types of waste, including hazardous and mixed, with supporting waste generation data for the entire LANL operating history from NMED on February 12, 2001. LANL's response consisted of 12 information submittals between March and July 2001. The information was gathered from all LANL waste management and generating divisions with significant input from the Environmental Restoration (ER) Project. NMED sent RSIs in December 2001 for the TA-16 Part B permit application and to request new closure and post-closure plans for land disposal units at TA-54. In addition, LANL prepared a new Part B permit application revision for the mixed waste management units at TA-55, which was scheduled for submittal to NMED in early January 2002.

c. Resource Conservation and Recovery Act Corrective Action Activities. Solid waste management units (SWMUs) are subject to the HSWA Permit Module VIII corrective action requirements. See previous LANL environmental reports (ESP 2000, ESP 1999, ESP 1998, ESP 1997, ESP 1996) for the history of RCRA closures and other corrective actions.

Corrective Actions. Some 2001 activities included the following.

The removal of contaminated sediments in the South Fork of Acid Canyon, within the Pueblo Canyon watershed, was an ER Project interim action (IA) in 2001. The South Fork of Acid Canyon received untreated wastewater from laboratories at former TA-1 from 1944 until 1951 and treated wastewater from a radioactive liquid waste treatment facility at former TA-45 from 1951 until 1964. This area was transferred to Los Alamos County in 1967. It is open to the public and crossed by well-used trails. A dose assessment completed in 2000 indicated that no unacceptable levels of radionuclide contamination were present in the canyon. DOE directed the ER Project to prepare an "as low as reasonably achievable" (ALARA) analysis, which led to a decision to plan and implement sediment removal activities. Samples collected from the South Fork of Acid Canyon indicated the presence of plutonium-239, -240; cesium-137; and strontium-90 among others. Sample data also indicated the presence of various metals and organic compounds at levels above background. In 2001, ER Project personnel

- prepared an ALARA analysis for the South Fork of Acid Canyon, which evaluated the costs and benefits of different removal options;
- prepared an IA plan for the removal of contaminated sediment to reduce potential radiation doses to recreational users of the canyon;
- collected 48 sediment samples for analysis at off-site laboratories to help guide cleanup operations and improve waste characterization; and
- began removing sediment with vacuum technology.

By the end of the year, ER excavated approximately 200 yd^3 of sediment.

The ER Project characterized and removed six inactive septic tanks at TAs-21, -51, and -54 as part of Voluntary Corrective Actions (VCAs) or IAs in 2001. The contents of each septic tank and the tanks themselves were removed and disposed of in accordance with all applicable EPA, NMED, DOE, and Laboratory requirements. The ER Project prepared VCA completion reports for the septic tanks at TA-51 and TA-54 and submitted them to the appropriate administrative authority (NMED for HSWA potential release sites [PRSs] and DOE for non-HSWA PRSs) with a recommendation for no further action. NMED has concurred verbally with the recommendation for no further action for the two HSWA PRSs, based on a review of the VCA completion report. The ER Project completed confirmation sampling for the area adjacent to and beneath the two septic tanks at TA-21 and will submit VCA/IA completion reports in early 2002.

The ER Project continued a VCA to remove any soil that contained greater than 1 ppm polychlorinated biphenyls (PCB) from a storage area located northeast of the Johnson Controls Utilities Shop (Building 03-223). The Laboratory's electrical power line maintenance contractor has used the area for storage of electric cable, used and unused dielectric oils, and PCB-containing transformers, capacitors, and oil-filled drums. The contractor also stored drums containing waste and product solvents at the site between 1967 and 1992. In 2001, ER Project personnel

- removed and disposed of approximately 2400 yd^3 of PCB-contaminated soil from the site, including the removal of all sediments from the stream banks on the west slope area and from two drainages in the north area (the west slope, mesa top, and north slope have been excavated down to bedrock);
- collected 86 verification samples from a predetermined hexagonal grid and analyzed them for PCBs (a subset [20 samples] was also analyzed for volatile organic compounds and metals);
- completed site restoration activities; and
- prepared and submitted a VCA report to the EPA and the NMED recommending no further action (NFA) for this site. The EPA approved the NFA.

In 2001, the ER Project completed the drilling and installation of the CdV-R-37-2 well site (a nature-and-extent-of-contamination well that was installed to a depth of 1664 ft to help determine if the high-explosives (HE) contamination that has been detected in the perched and regional aquifers of well R-25 in TA-16 extends to the southeast) and completed hydrologic testing in the well.

The ER Project also conducted extensive characterization of sediments in the tributary to Los Alamos Canyon below the TA-53 surface impoundments to assess potential risk from contaminants in sediments below the outfall, collected 25 sediment samples from 3 different reaches in the tributary canyon, and performed geodetic surveys of the canyon and sampling locations.

Table 2-2 shows the waste quantities ER Project operations generated in 2001, including 5,102 m^3 of chemical waste (from RCRA, Toxic Substances Control Act [TSCA], and New Mexico Special Waste categories) in FY 2001. This volume does not include an additional 18,845 m^3 of nonhazardous municipal solid waste (sanitary waste).

Closure Activities. Material Disposal Area (MDA) P continued as a major effort for the ER Project. MDA P is located at TA-16 on the south rim of Cañon de Valle on the western edge of the Laboratory. The MDA P

Table 2-2. Waste Generated in 2001 by ER Project Operations

Waste Type	Units	2001 Operations
Chemical[a]	m^3/yr	5,102
LLW	m^3/yr	364
MLLW	m^3/yr	22
TRU	m^3/yr	0
Mixed TRU	m^3/yr	0

[a] The chemical waste volume includes the categories of RCRA, TSCA, and New Mexico Special Waste and does not include an additional 18,845 m^3 of sanitary waste.

landfill began receiving waste from the S-Site Burning Grounds in 1950. Debris from WW-II-era buildings was also disposed of at MDA P. Operation of the landfill was suspended in 1984. ER Project personnel began the closure process at the landfill in 1997.

The presence of detonable HE in the landfill required the use of a robotic excavator. Remote excavation of the landfill began in February 1999 and was completed on May 3, 2000, just before the Cerro Grande fire. Excavation of contaminated soil beneath the landfill using nonremote excavation methods resumed after fire recovery and was completed in March 2001. Phase II confirmatory sampling and geophysics measurements began in June 2001. Phase II sampling found additional contamination. This material was excavated and is staged for off-site disposal pending completion of waste characterization analysis. Additional confirmation sampling will be completed when the waste is shipped.

More than 52,500 yd^3 of soil and debris were excavated from MDA P (10,800 yd^3 during fiscal year [FY] 2001). During FY 2001, more than 26,700 yd^3 of material was shipped for disposal. This amount includes hazardous and industrial waste and recycled material. Waste types and amounts generated include

408 lb of detonable HE,

820 yd^3 of hazardous waste with residual levels of radioactive contamination,

6,280 lb of barium nitrate,

2,605 lb of asbestos,

200 lb of mixed waste,

235 ft^3 of low-level radioactive waste, and

888 containers that underwent hazardous categorization characterization.

High-Performance Teams. The ER Project maintains High-Performance Teams (HPTs) that include members from the DOE, other Laboratory organizations, and the NMED. The teams were formed to accelerate critical path activities of the ER Project through interagency communication and collaborative decision-making at complex sites. The teams currently include Building 260 Outfall Corrective Measures Study/Corrective Measures Implementation, Airport Landfill, TA-54 RCRA Material Disposal Area Implementation Plan, Ecological Risk, TA-35 Integrated Sampling and Analysis Plan, and Permit Modifications. More detailed information on ER Project activities and accomplishments is available at *http://erproject.lanl.gov*, in the FY 2001 ER Accomplishments Book, and in the quarterly technical reports.

Responses to the Cerro Grande Fire. One year has passed since the Cerro Grande fire's impact on the Los Alamos town site and the Laboratory. Massive fire rehabilitation and flood mitigation efforts have been ongoing and will continue for several years until areas prone to erosion are stabilized. The Cerro Grande fire put nearly 100 of the ER Project's PRSs at increased risk of contaminant release and/or transport, either by virtue of being directly burned or by increasing their vulnerability to surface water runoff or erosion. Since the fire, the ER Project in cooperation with the Water Quality and Hydrology Group (ESH-18) installed controls at these sites and continues to inspect and maintain them as part of the Laboratory's overall storm water program. For an update on the current status of the PRSs impacted by the Cerro Grande fire, go to *http://lib-www.lanl.gov/pubs/laur01-4122.htm*.

d. Other Resource Conservation and Recovery Act Activities. The Hazardous and Solid Waste Group (ESH-19) began the self-assessment program in 1995 in cooperation with waste management coordinators to assess the Laboratory's performance in managing hazardous and mixed waste to meet the requirements of federal and state regulations, DOE orders, and Laboratory policy. ESH-19 communicates findings from individual self-assessments to waste generators, waste management coordinators, and management to help line managers implement appropriate corrective actions to ensure continual improvement in LANL's hazardous waste program. In 2001, ESH-19 completed 1,134 quarterly self-assessments.

e. Resource Conservation and Recovery Act Compliance Inspection. NMED conducted an annual hazardous waste compliance inspection at the Laboratory from April 23 to the end of August 2001. Section C.1.b presents a summary of the issues identified during the inspection that were included in the NMED Notice of Violation (NOV) issued on October 9, 2001.

f. Mixed Waste Federal Facility Compliance Order. The Laboratory met all 2001 Site Treatment Plan (STP) deadlines and milestones. In October 1995, the State of New Mexico issued a Federal Facility Compliance Order (CO) to both DOE and the University of California (UC) requiring compliance with the STP. That plan documents the use of off-site facilities for treating mixed waste generated at LANL stored more than one year (Section 3004[j] of RCRA and 40 CFR Section 268.50). The Laboratory treated and disposed of over 650 m^3 of STP mixed waste through 2001.

g. Underground Storage Tanks. The Laboratory had two underground storage tanks (USTs) (as defined by 40 CFR Part 280) in operation during 2001, designated as TA-16-197 and TA-15-R312-DARHT.

TA-16-197 is a 10,000-gal. UST for unleaded gasoline at a single-pump station for fueling Laboratory service vehicles located at and around TA-16. TA-15-R312-DARHT is a 10,000-gal. UST that captures and stores any accidental releases from an equipment room located at the Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility. If a pipe breaks or a leak occurs in the equipment room, all fluids enter floor drains that discharge to the UST. This tank is normally empty and is only used as a secondary containment system during an accidental spill. Substances that could potentially enter the tank are mineral oil and glycol. Both USTs are double-walled with double-wall piping. Both tanks have leak-detection systems. TA-16-197 has a cathodic corrosion protection system. TA-15-R312-DARHT is a fiberglass tank that does not require a corrosion protection system. NMED inspected the TA-16-197 UST during 2001 (see Table 2-3). The inspector noted a record keeping deficiency that LANL corrected.

The decontamination and decommissioning (D&D) of the Sherwood Building (TA-3-105) revealed three old USTs. These tanks, TA-3-107, -108, and -109, stored dielectric oil until the 1960s. The NMED was notified, and a UST Bureau representative observed the removal of the tanks. All of the tanks were intact and empty at the time of removal. Sampling of the soil immediately below the tanks indicated the presence of elevated total petroleum hydrocarbon (TPH), which required a corrective action notice to NMED. An extent of contamination investigation will be conducted at the site in 2002.

h. Solid Waste Disposal. The Laboratory has a commercial/special-waste landfill located at TA-54, Area J, that is subject to NM Solid Waste Management Regulations (NMSWMR). The Laboratory submitted a closure plan for Area J to NMED in May 1999. LANL proceeded to close Area J in 2001 by backfilling the pits with clean fill. Cover material and reseeding of the site will proceed in 2002.

In 2001, LANL completed the required Solid Waste Facility annual report for 2000. Personnel from the NMED Solid Waste Bureau did not inspect Area J during 2001.

LANL sends sanitary solid waste (trash), concrete/rubble, and construction and demolition debris to the Los Alamos County Landfill on East Jemez Road for disposal. DOE owns the property and leases it to Los Alamos County under a special-use permit. Los Alamos County owns and operates this landfill and is responsible for obtaining all related permits for this activity from the state. The landfill is registered with the NMED Solid Waste Bureau. The Laboratory contributed 9% (5,110 tons) of the total volume of trash landfilled at this site during 2001, a significant decrease from last year's total volume of 14,237 tons that can be attributed to the Laboratory's waste reduction program. Residents and businesses in Los

Table 2-3. Environmental Inspections and Audits Conducted at the Laboratory during 2001

Date	Purpose	Performing Agency
4/5/01	UST Inspection	NMED[b]
4/23–8/01	RCRA Compliance Inspection	NMED[b]
4/26/01	NPDES Storm Water Program	NMED[b]/SWQB[c]
10/24/01	Asbestos inspection at TA-40 Bldgs. 73 and 74	NMED[b]
10/25/01	Asbestos inspection at TA-46 Bldgs. 86 and 87	NMED[b]

[No NPDES Outfall, Storm Water, FIFRA, SDWA, 404/401, Ground Water Discharge Plan, PCB, or Area J inspections were conducted in 2001. Also no beryllium inspections were conducted (one request for information, no site visit).]

[a]Risk Assessments Corporation.
[b]New Mexico Environment Department.
[c]Surface Water Quality Bureau.

Alamos County and the City of Española contributed the remaining 91% of the total waste volume. Laboratory trash landfilled included 1,977 tons of trash, 2,504 tons of concrete/rubble, and 452 tons of construction and demolition debris. During 2001, the Laboratory also sent 140 tons of brush for composting and 36 tons of metal for recycling to the county landfill.

i. Waste Minimization and Pollution Prevention. To comply with the HSWA Module of the RCRA Hazardous Waste Facility permit, RCRA Subtitle A, DOE Order 5400.1, Executive Order (EO) 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements, and other regulations, the Laboratory must have a waste minimization and pollution prevention program. A copy of that Laboratory program, the *2001 Environmental Stewardship Roadmap*, is located at *http://emeso.lanl.gov/useful_info/publications/publications.html* on the World Wide Web. Section 1003 of the Waste Disposal Act cites minimizing the generation and land disposal of hazardous wastes as a national objective and policy. It also requires handling all hazardous waste in ways that minimize the present and future threat to human health and the environment. The Waste Disposal Act promotes process substitution; materials recovery, recycling, and reuse; and treatment as alternatives to land disposal of hazardous waste.

The 2001 Annual Report on Waste Generation and Waste Minimization Progress as required by DOE Order 5400.1 provides the amounts of routine, nonroutine, and total RCRA-hazardous, low-level, and mixed low-level wastes Laboratory operations generated during FY 2001. See *http://www.doep2.org/wastemin/* on the World Wide Web for a copy of this report and additional information about waste minimization. DOE defines routine/normal waste generation at LANL as waste generated from any type of production, operation, analytical, and/or research and development (R&D) laboratory operations; treatment, storage, and disposal (TSD) operations; work for others; or any other periodic and recurring work that is considered ongoing in nature. Nonroutine/off-normal waste generation is defined as one-time operation waste such as wastes produced from ER Project activities, including primary and secondary wastes associated with removal and remediation operations, and wastes associated with the legacy waste program cleanup and D&D operations.

The Laboratory is working to achieve the Pollution Prevention and Energy Efficiency Leadership Goals set by DOE. The goals and DOE's plan to meet them can be viewed at *http://www.doep2.org/p2plan.asp*. The Laboratory analyzes waste generation data to identify pollution prevention opportunities in its efforts to continually improve its performance toward meeting these goals.

j. Greening of the Government Executive Order. The Laboratory purchases EPA-designated products made with recovered materials in support of EO 13101, "Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition," signed by President Clinton on September 14, 1998, and to comply with RCRA section 6002. EPA designates the categories of these items, referred to as Affirmative Procurement. Based on past reports, the Laboratory purchases the largest number of items in three categories: paper, toner cartridges, and plastic desktop accessories whenever available. The Laboratory submits a summary report to DOE after each fiscal year end and is required to report quarterly to UC on the Affirmative Procurement Rate. Procurement personnel and the Environmental Stewardship Office are working with Laboratory vendors to provide purchasers with a wide variety of recycled content items in the Just-In-Time purchasing system.

k. Resource Conservation and Recovery Act Training. The RCRA training program is a required component of, and is described in, the RCRA Hazardous Waste Facility Permit. The Laboratory training program is in compliance and, with the exception of annual refresher course revisions and a one-course addition, experienced only minor modifications and revisions in 2001 to reflect regulatory, organizational, and/or programmatic changes.

During 2001, 119 workers completed RCRA Personnel Training, and 529 workers completed Waste Generation Overview. Of the 538 workers who received credit for RCRA Refresher Training during 2001, 439 met this requirement through completing Hazardous Waste Operations (HAZWOPER) Refresher for Treatment, Storage, and Disposal Facility Workers, a course that includes the RCRA Refresher as part of its 8-hour requirement.

In response to a new Laboratory requirement, the Environment, Safety, and Health Training Group (ESH-13) developed Waste Generation Overview Refresher, a Web-based course, in 2001. Laboratory waste generators are required to take this course every three years. In 2001, 1,015 Laboratory waste generators received credit for this course.

ESH-13 updated the following RCRA courses during 2001:

- RCRA Refresher Training
- HAZWOPER: Refresher for Environmental Restoration Workers
- HAZWOPER: Refresher for Treatment, Storage, and Disposal Facility Workers
- Waste Management Coordinator Requirements

l. Hazardous Waste Report. The Hazardous Waste Report (HWR) covers hazardous and mixed waste generation, treatment, and storage activities performed at LANL during calendar year 2001 as required by RCRA, under 40 CFR 264.41 - Biennial Report. In 2001, the Laboratory generated about 3.5 million kg of RCRA hazardous waste, 3.4 million kg of which were generated by the ER Project. The waste is recorded for over 20,000 waste movements, or treatment or storage actions, resulting in over 900 Waste Generation and Management forms in the HWR. The entire report is available on the ESH-19 home page at *www.esh.lanl.gov/~esh19*.

m. Hazardous and Solid Waste Amendments Compliance Activities. In 2001, the ER Project remained in compliance with Module VIII of the RCRA permit. The ER Project originally identified 2,124 PRSs, consisting of 1,099 PRSs administered by NMED and 1,025 PRSs administered by DOE. By the end of 2001, only 839 discrete PRSs remain. Approximately 604 units have been approved for NFA, 139 units have been removed from the Laboratory's Hazardous Waste Facility Permit, and 17 units proposed for NFA in previous permit modification requests are pending NMED approval.

Of the 139 total PRSs removed from the permit, 37 were removed in 2001. Additionally, in 2001, we identified two new PRS, proposed 40 additional PRSs to the NMED for NFA, and provided NMED with supplemental information for 2 of the 17 PRSs pending approval.

In 2001, the LANL ER Project HSWA compliance activities included remedial site assessments and site cleanups. The assessment portion of the ER Project included submitting 2 RCRA Facility Investigation (RFI) reports to NMED and RFI fieldwork on 15 sites. The ER Project anticipates that the corrective action process for all PRSs will be complete by 2013. Based on the watershed approach, future work will focus on PRSs in the Los Alamos town site at the head of Los Alamos, Pueblo, Guaje, Rendija, Barranca, Bayo, and DP Canyons and work down each canyon to the Rio Grande. Work will then continue southward, watershed by watershed, until we finish work on PRSs in all eight watersheds.

2. Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, mandates actions for certain releases of hazardous substances into the environment. The Laboratory is not listed on the EPA's National Priority List, but the ER Project follows some CERCLA guidelines for remediating Laboratory sites that contain certain hazardous substances not covered by RCRA and/or that may not be included in Module VIII of the Laboratory's Hazardous Waste Facility Permit. DOE fulfills its responsibilities as both a natural resource trustee and lead response agency for ER Project activities at the Laboratory.

DOE's policy is to consider CERCLA Natural Resource Damage Assessment (NRDA) issues and, when appropriate, resolve them with other natural resource trustees as part of the ER Project remedy selection process. ER Project cleanup considers integrated resource management activities (e.g., biological resource management, watershed management, and groundwater protection) at the Laboratory. As ER Project cleanup activities progress, natural resource trustees (i.e., Department of Interior, Department of Agriculture Forest Service, Cochiti Pueblo, Jemez Pueblo, San Ildefonso Pueblo, Santa Clara Pueblo, and the State of New Mexico) are invited to participate in the process. DOE initiated its dialogue with the natural resource trustees on ER Project activities in 1997.

3. Emergency Planning and Community Right-to-Know Act

a. Introduction. The Laboratory is required to comply with the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and Executive Order (EO) 12856.

b. Compliance Activities. In 2001, the Laboratory submitted two annual reports to fulfill its requirements under EPCRA, as shown on Table 2-4 and described below.

Emergency Planning Notification. Title III, Sections 302–303, of EPCRA requires the preparation of emergency plans for more than 360 extremely hazardous substances if stored in amounts above threshold limits. The Laboratory is required to notify state and local emergency planning committees of any changes at the Laboratory that might affect the local emergency plan or if the Laboratory's emergency planning coordinator changes. No updates to this notification were made in 2001.

Emergency Release Notification. Title III, Section 304, of EPCRA requires facilities to provide emergency release notification of leaks, spills, and other releases of listed chemicals over specified reporting quantities into the environment. Releases must be reported immediately to the state and local emergency planning committees and to the National Response Center. No leaks, spills, or other releases of specific chemicals into the environment that required EPCRA reporting occurred during 2001.

Material Safety Data Sheet/Chemical Inventory Reporting. Title III, Sections 311–312, of EPCRA requires facilities to provide an annual inventory of the quantity and location of hazardous chemicals present at the facility above specified thresholds; the inventory includes the material safety data sheet for each chemical. The Laboratory submitted a report to the state emergency response commission and the Los Alamos County Fire and Police Departments listing 56 chemicals and explosives at the Laboratory that exceeded threshold limits during 2001.

Toxic Release Inventory Reporting. EO 12856 requires all federal facilities to comply with Title III, Section 313, of EPCRA. This section requires reporting of total annual releases of listed toxic chemicals that exceed activity thresholds. Starting with reporting year 2000, new and lower chemical activity thresholds are in place for certain persistent, bioaccumulative, and toxic (PBT) chemicals and chemical categories. The thresholds for PBTs range from 0.1 gram to 100 pounds. Until this change went into effect, the highest threshold was 10,000 pounds. LANL exceeded one threshold in 2001 and therefore was required to report the use and releases. The reported material was lead, with a threshold quantity of 100 pounds established for 2001. The following releases of lead were reported: 5.2 pounds of air emissions, less than 1 pound of water releases, 3,799 pounds of on-site land releases from the shooting range, and approximately 7,800 pounds of lead waste shipped off-site for disposal.

Table 2-4. Compliance with Emergency Planning and Community Right-to-Know Act during 2001

Statute	Brief Description	Compliance
EPCRA Sections 302-303 Planning Notification	Requires emergency planning notification to state and local emergency planning committees.	LANL sent notification to appropriate agencies (July 30, 1999) informing officials of the presence of hazardous materials in excess of specific threshold planning quantities and of the current facility emergency coordinator. An additional update adding sodium cyanide to the list was provided in 2000.
EPCRA Section 304 Release Notification	Requires reporting of releases of certain hazardous substances over specified thresholds to state and local emergency planning committees and to the National Response Center.	There were no leaks, spills, or other releases of chemicals into the environment that required EPCRA Section 304 reporting during 2001.
EPCRA Sections 311-312 MSDSs and Chemical Inventories	Requires facilities to provide appropriate emergency response personnel with an annual inventory and other specific information for any hazardous materials present at the facility over specified thresholds.	The presence of 56 hazardous materials over specified quantities in 2001 required submittal of a hazardous chemical inventory to the state emergency response commission and the Los Alamos County Fire and Police Department.
EPCRA Section 313 Annual Releases	Requires all federal facilities to report total annual releases of listed toxic chemicals used in quantities above reportable thresholds.	Threshold quantities for lead were exceeded in 2001 requiring submittal of a Toxic Chemical Release Inventory Reporting Form to the EPA and the state emergency response commission.

4. Emergency Planning under DOE Order 151.1

The Laboratory's Emergency Management Plan is a document that describes the entire process of planning, responding to, and mitigating the potential consequences of an emergency. The most recent revision of the plan, incorporating DOE Order 151.1A, will be published in March 2002. As a result of the Cerro Grande fire, the need for a new Emergency Operations Center was identified. Ground was broken for a new Joint LANL/Los Alamos County Emergency Operations Center (EOC) with enhanced communications, space for multiple agencies, and significantly improved support capabilities. The facility will also house a County Police/Fire/911 Dispatch Center. The new EOC has a scheduled completion date of fall 2003. In accordance with DOE Order 151.1A, it remains Laboratory policy to develop and maintain an emergency management system that includes emergency planning, emergency preparedness, and effective response capabilities for responding to and mitigating the consequences of any emergency. In CY 2001, 879 employees received training as a result of Emergency Management Plan requirements and the Emergency Management and Response organization's internal training program.

5. Toxic Substances Control Act

Because the Laboratory's activities are research and development and do not involve making chemicals to sell, the PCB regulations (40 CFR 761) have been the Laboratory's main concern under the TSCA. The PCB regulations govern substances including but not limited to dielectric fluids, contaminated solvents, oils, waste oils, heat-transfer fluids, hydraulic fluids, slurries, soils, and materials contaminated by spills.

During 2001, the Laboratory had 46 off-site shipments of PCB waste. The quantities of waste disposed include 276 kg capacitors, 25 kg laboratory waste, 1360 kg PCB-contaminated liquids, and 4037 kg fluorescent light ballasts. Approximately 15,240 kg PCB-contaminated soil was shipped off-site. The Laboratory manages all wastes in accordance with 40 CFR 761 manifesting, record keeping, and disposal requirements. PCB wastes go to EPA-permitted disposal and treatment facilities. Light ballasts are shipped off-site for recycling. The primary compliance document related to 40 CFR 761.180 is the annual PCB report that the Laboratory submits to EPA, Region 6.

The Laboratory disposes of nonliquid wastes containing PCB and contaminated with radioactive constituents at its TSCA-authorized landfill located at TA-54, Area G. Radioactively contaminated PCB liquid wastes are stored at the TA-54, Area L, TSCA-authorized storage facility. Some of these items with no path forward have exceeded TSCA's one-year storage limitation and are covered under the Final Rule for the Disposal of PCB, dated August 28, 1998.

The five-year letter of authorization to use Area G for PCB disposal expired in July 2001, and EPA granted an extension to LANL for continued use of Area G during the submittal and review process. LANL submitted a renewal request to EPA Region 6 January 5, 2001. An EPA Region 6 representative conducted a site visit of Areas G and L in February 2001. The Laboratory expects EPA's decision on reauthorization in the first half of 2002.

6. Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) regulates the manufacturing of pesticides, with requirements for registration, labeling, packaging, record keeping, distribution, worker protection, certification, experimental use, and tolerances in foods and feeds. Sections of this act that are applicable to the Laboratory include requirements for certification of workers who apply pesticides. The New Mexico Department of Agriculture (NMDA) has been granted the primary responsibility for pesticide enforcement under the FIFRA. The New Mexico Pesticide Control Act regulates private and public applicators, commercial and noncommercial applicators, pest management consultants, pesticide dealers, pesticide manufacturers, and all activities relating to the distribution and use of pesticides.

For the Laboratory, these regulations apply to the licensing and certification of pesticide applicators, record keeping, pesticide application, equipment inspection, pesticide storage, and disposal of pesticides.

NMDA did not conduct an inspection of the Laboratory's pesticide application program in 2001. However, DOE's Los Alamos Area Office (LAAO) did conduct an assessment of the program in 2001, and Johnson Controls Northern New Mexico (JCNNM) received high marks on their program implementation.

Amount of Pesticides Used during 2001:

VELPAR L (herbicide)	66 gal.
CONFRONT (herbicide)	336 oz
ROUNDUP (herbicide)	1 gal.
2-4-D Amine (herbicide)	4 gal.
PT110 PYRETHRIN (insecticide)	26 oz
TEMPO (insecticide)	2,098 g
DURSBAN (insecticide)	1 oz
STINGER (wasp freeze)	79 oz

7. Clean Air Act (CAA)

NMED or the EPA regulates Laboratory operations and its air emissions. The Air Quality Group's QA Project Plan for the Operating Permit Project, *http://www.lanl.gov/orgs/rres/maq/QA.htm*, presents a complete description of air quality requirements applicable to the Laboratory. A summary of the major aspects of the Laboratory's air quality compliance program is presented below.

a. New Mexico Air Quality Control Act. In December 1995, LANL submitted to NMED an operating permit application as required under Title V of the Clean Air Act (CAA) and Title 20 of the New Mexico Administrative Code, Chapter 2, Part 70–Operating Permits (20 NMAC 2.70). NMED has not yet issued an operating permit. When issued, the permit will specify the operational terms and limitations imposed on LANL to continue to ensure that all federal and state air quality standards are being met. In the interim, LANL continues to operate under the provisions of source-specific permits and to comply with applicable sections of the state and federal air quality regulations.

LANL is a major source under the Operating Permit Program based on the potential to emit regulated air pollutants. Specifically, LANL is a major source of nitrogen oxides (NO_x) emitted primarily from the TA-3 steam plant boilers. In 2001, LANL continued to implement a project to install flue gas recirculation (FGR) equipment on the boilers at TA-3 to reduce the NO_x emissions by approximately 70%. The FGR equipment is expected to be operational in 2002. Once fully operational, LANL will perform source tests to determine the beneficial effects of the equipment in reducing NO_x.

LANL reviews plans for new and modified projects, activities, and operations to identify all applicable air quality requirements including the need to revise the operating permit application, to apply for construction permits, or to submit notifications to NMED (20 NMAC 2.72). During 2001, the Laboratory performed approximately 250 air quality reviews. Two of the reviewed projects required permitting actions. Four other sources/activities, including natural-gas-fired boilers, hot water heaters, and burners along with gasoline and diesel-powered generators, were exempt from construction permitting but required written notification to NMED. As part of the Operating Permit Program, NMED collects annual fees (20 NMAC 2.71) from sources that are required to obtain an operating permit. For LANL, the fees are based on the allowable emissions from activities and operations as reported in the operating permit application. LANL's fees for 2001 were $12,761.25.

LANL reports emissions for the following industrial-type sources: multiple boilers, a water pump, and an asphalt production facility. Table 2-5 shows LANL's calculated air pollutant emissions as reported to NMED for the 2001 emissions inventory (20 NMAC 2.73). LANL's combustion units were the primary point sources of criteria pollutants (NO_x, sulfur oxides [SO_x], particulate matter [PM], and carbon monoxide [CO] emissions). Of all combustion units, the TA-3 steam plant was the largest source of criteria pollutants. In addition to industrial-type sources, LANL reports emissions from a paper shredder, three degreasers, a rock crusher, three air curtain destructors, and from permitted beryllium activities. Smaller sources of air pollutant emissions, such as nonregulated boilers, emergency generators, space heaters, etc., are located throughout LANL. NMED considers these smaller sources insignificant. Therefore, these sources are not required to be and were not included in the annual emissions inventory.

LANL calculates air emissions using emission factors from source tests, manufacturer data, and EPA documentation. Calculated emissions for industrial sources are based on actual production rates or fuel consumption rates. These industrial-type sources operated primarily on natural gas. The steam plant boilers at TA-3 and TA-21 are capable of burning diesel as a backup.

Figure 2-1 provides a comparison among recent emissions inventories reported to NMED. SO_x emissions returned to normal values after a significant increase in 2000. This change is attributable to the steam plant burning only two-thirds the fuel oil in 2001 that it burned in 2000 (120,000 gallons versus 180,000). The rock crusher was not operated in 2001; therefore, there were no PM emissions from the crushing activities and no combustion products from the rock crusher diesel-fired engine. An assessment of the ambient impacts of air pollutant emissions, presented in the Site-Wide Environmental Impact Statement (SWEIS) Yearbook for 2001, indicates that all emissions are less than the amounts evaluated in the SWEIS. Therefore, no adverse air quality impacts are expected from these emissions.

R&D activities were the primary source of VOC and hazardous air pollutant (HAP) emissions. Detailed analysis of chemical tracking and procurement records indicates that LANL procured approximately 19 tons of VOCs. For a conservative estimate of air emissions, the total quantity of procured VOCs were assumed to be emitted along with VOC emissions calculated for industrial-type sources. The HAP emissions reported from R&D activities generally reflect the quantities procured during the calendar year. In a few cases, procurement values and operational processes were evaluated in more detail so we could report actual emissions in place of the procured value. The total quantity of HAP emissions reported for the year 2001 was 7.4 tons, similar to the 6.5 tons reported in 2000.

Construction Permits. LANL currently operates under the air permits listed in Table 2-1. Table 2-6 summarizes allowable emissions from 20 NMAC 2.72 Construction Permits. In 2001, the Laboratory submitted two Notice of Intent (NOI) applications under 20 NMAC 2.73. The first addressed the installation of three air curtain destructors to burn slash from fire mitigation activities on LANL property. The NMED determined that these sources were applicable under 20 NMAC 2.60 Open Burning and issued an open burn permit on June 20, 2001. The second NOI addressed the installation of two boilers

Table 2-5. Calculated Actual Emissions for Regulated Pollutants (Tons) Reported to NMED

	Pollutants					
Emission Units	**PM**	**CO**	**NO_x**	**SO_x**	**VOC**	**HAP**
Asphalt Plant	0.09	0.52	0.03	0.006	0.01	NA
TA-3 Steam Plant	3.5	18	74	0.72	2.5	NA
TA-16 Boilers	0.05	0.26	0.26	0.004	0.04	NA
TA-21 Steam Plant	0.14	1.55	1.85	0.01	0.1	NA
Water Pump	0.06	3.01	9.41	0.004	0.19	NA
TA-48 Boilers	0.11	1.26	1.5	0.01	0.07	NA
TA-53 Boilers	0.1	1.0	1.2	0.008	0.06	NA
TA-55 Boilers	0.24	1.65	2.88	0.014	0.1	NA
TA-59 Boilers	0.06	0.76	0.9	0.006	0.04	NA
Air Curtain Destructors	1.15	0.99	1.88	0.055	2.36	NA
Degreasers	NA	NA	NA	NA	0.01	NA
Paper Shredder	0.0007	NA	NA	NA	NA	NA
Rock Crusher	0	0	0	0	0	NA
R & D	NA	NA	NA	NA	18.6	7.4
Total	5.5	29	94	0.8	24	7.4

NA = not applicable.

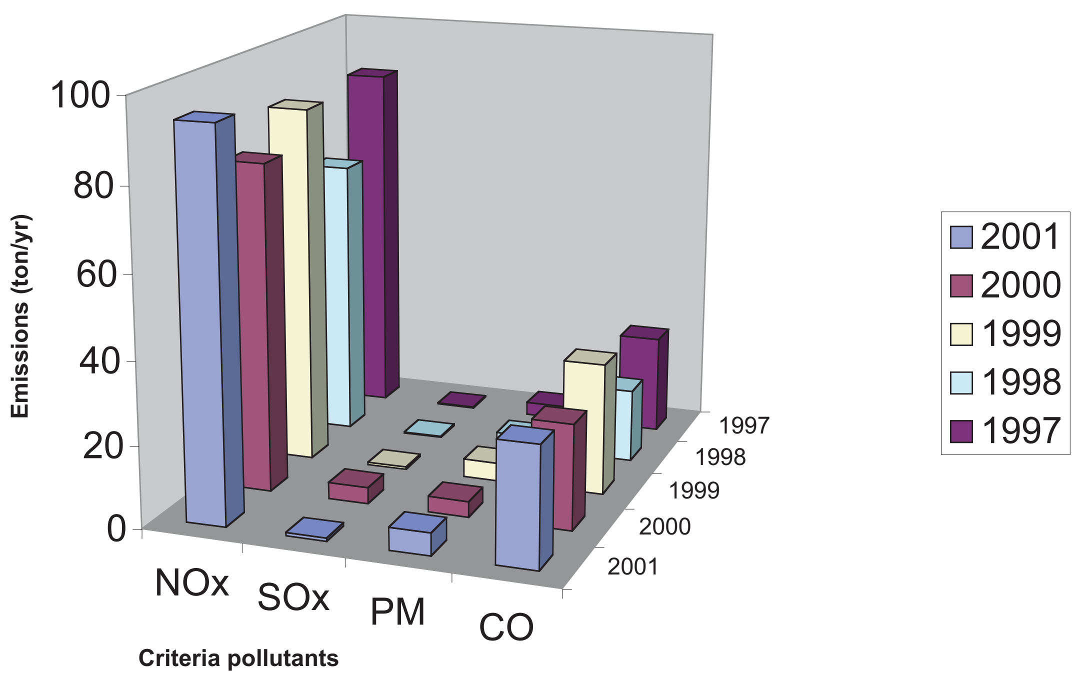

Figure 2-1. Criteria pollutant emissions from LANL.

Table 2-6. Allowable Air Emissions (20 NMAC 2.72)

Source	Condition	Regulated Pollutant	Allowable Emissions
Beryllium Machining at TA-3-39	NA	Beryllium	0.008 lb/yr
		Beryllium	4.0E-06 lb/hr
Beryllium Machining at TA-3-102	NA	Beryllium	0.00014 lb/yr
		Beryllium	4.0E-07 lb/hr
Beryllium Machining at TA-3-141	NA	Beryllium	0.0004 lb/yr
		Beryllium	3.0E-06 lb/hr
Beryllium Machining at TA-35-213	NA	Beryllium	0.0008 lb/yr
		Beryllium	4.0E-07 lb/hr
Beryllium Activities at TA-55-4	Machining	Beryllium	0.0066 lb/yr
		Beryllium	2.6E-04 lb/24-hr
		Aluminum	0.0066 lb/yr
		Aluminum	2.6E-04 lb/24-hr
Beryllium Activities at TA-55-4	Foundry	Beryllium	1.9E-06 lb/yr
		Beryllium	7.7E-08 lb/24-hr
		Aluminum	1.9E-06 lb/yr
		Aluminum	7.7E-08 lb/24-hr
Beryllium Activities at TA-55-4	Combined	Beryllium	0.0066 lb/yr
		Beryllium	2.6E-04 lb/24-hr
		Aluminum	0.0066 lb/yr
		Aluminum	2.6E-04 lb/24-hr
Rock Crusher	NA	Particulate Matter	Limited[a]
		Nitrogen Dioxide	6.4 tons/yr
		Nitrogen Dioxide	6.2 lb/hr
		Carbon Monoxide	1.4 tons/yr
		Carbon Monoxide	1.3 lb/hr
		Volatile Organic Compounds	0.5 tons/yr
		Volatile Organic Compounds	0.5 lb/hr
		Sulfur Dioxide	0.4 tons/yr
		Sulfur Dioxide	0.4 lb/hr
TA-3 Steam Plant	Per Boiler Burning Natural Gas[b]	Particulate Matter	1.4 lb/hr
		Nitrogen Oxides	9.0 lb/hr
		Carbon Monoxide	7.4 lb/hr
		Volatile Organic Compounds	1.0 lb/hr
		Sulfur Oxides	2.6 lb/hr
TA-3 Steam Plant	Per Boiler Burning Fuel Oil[b]	Particulate Matter	2.7 lb/hr
		Nitrogen Oxides	9.9 lb/hr
		Carbon Monoxide	6.8 lb/hr
		Volatile Organic Compounds	0.3 lb/hr
		Sulfur Oxides	68.7 lb/hr
TA-3 Steam Plant	Combined Fuel Use for all Three Boilers	Particulate Matter	15.7 tons/yr
		Nitrogen Oxides	99.6 tons/yr
		Carbon Monoxide	81.3 tons/yr
		Volatile Organic Compounds	11.1 tons/yr
		Sulfur Oxides	36.9 tons/yr

[a] Fugitive particulate matter emissions from transfer points, belt conveyors, screens, feed bins, and from stockpiles shall not exhibit greater than 10% opacity. Fugitive particulate matter emissions from the rock crusher shall not exhibit greater than 15% opacity. Opacity is the degree to which emissions reduce the transmission of light and obscure the view of a background object.

[b] There are three boilers at the TA-3 Steam Plant.

at TA-55. The NMED determined that these sources did not require a construction permit.

Open Burning. LANL has an open burning permit (20 NMAC 2.60) for operational burns conducted for research projects. All operational burns for 2001 were conducted within the terms specified in the permit.

In addition to operational burns, the Laboratory also conducted prescribed burning to assist with fire mitigation activities resulting from the Cerro Grande fire. On June 20, 2001, LANL was granted an open burn permit to operate three air curtain destructors (ACDs) within the Laboratory boundaries. These special units were chosen instead of traditional open air burning because of the ACD's ability to operate with very little visible smoke emissions. These ACDs were installed and operated for several months on Engineering Sciences and Applications (ESA) property in TA-16. During the course of these operations, the Laboratory burned over 1,200 tons of slash from fire mitigation activities in 2001. Operations are expected to continue throughout 2002. In December 2001, the Laboratory conducted its initial compliance test for opacity for each of these units. All three met the opacity limitations outlined in 40 CFR 60, Subpart CCCC.

Asbestos. The National Emission Standard for Hazardous Air Pollutants for Asbestos (Asbestos NESHAP, 40 CFR 61 Subpart M) requires that LANL provide advance notice to NMED for large renovation jobs involving asbestos and for all demolition projects. The Asbestos NESHAP further requires that all activities involving asbestos be conducted in a manner that mitigates visible airborne emissions and that all asbestos-containing wastes be packaged and disposed properly.

LANL continued to perform renovation and demolition projects in accordance with the requirements of the Asbestos NESHAP. As in 2000, several projects in 2001 resulted from fire recovery efforts such as renovating or demolishing buildings damaged during the Cerro Grande fire. In addition to fire recovery efforts, other activities included four large renovation jobs and demolition projects for which NMED received advance notice. These projects, combined with fire recovery activities, generated a total 2070 m^3 of asbestos waste, which was not radioactively contaminated. This significant increase in asbestos waste (only 302 m^3 in 2000) was the result of cleanup activities in support of the Cerro Grande fire recovery. Specifically, over 1800 m^3 of asbestos waste came from recovery efforts at TA-40. All asbestos wastes were properly packaged and disposed at approved landfills.

To ensure compliance, the Laboratory conducted internal inspections of job sites and asbestos packaging approximately monthly. In addition, NMED's two inspections during the year identified no violations. The Air Quality Group's QA Project Plan for the Asbestos Report Project is available at *http://www.esh.lanl.gov/~AirQuality/QA.htm* on the World Wide Web.

Degreasers. The solvent cleaning NESHAP (40CFR 63, Subpart T) requires that all solvent cleaning machines containing any of the six listed halogenated solvents be registered with NMED. In late 2000, the Laboratory removed the solvent from a Cold Ultrasonic Bath Degreaser at TA-46. As such, the Laboratory currently operates two regulated solvent cleaning machines registered with NMED.

b. Federal Clean Air Act. The State of New Mexico has adopted all of the federal air quality requirements, with three exceptions: the Stratospheric Ozone Protection (40 CFR 82, Subpart F), the NESHAP for Radionuclides (40 CFR 61, Subpart H), and the Risk Management Program (40 CFR 68).

Ozone-Depleting Substances. Title VI of the CAA contains specific sections establishing regulations and requirements for ozone-depleting substances (ODS) such as halons and refrigerants. The sections applicable to the Laboratory include Section 608, National Recycling and Emission Reduction Program, and Section 609, Servicing of Motor Vehicle Air Conditioners. Section 608 prohibits individuals from knowingly venting ODS into the atmosphere during maintenance, repair, service, or disposal of halon fire suppression systems and air conditioning or refrigeration equipment. All technicians who work on refrigerant systems have to be EPA certified and use certified recovery equipment. The Laboratory is required to maintain records on all work involving refrigerants as well as the purchase, usage, and disposal of refrigerants. All work must be performed in accordance with EPA requirements and Laboratory standards. The Laboratory's standards for refrigeration work are covered under Criterion 408, "EPA Compliance for Refrigeration Equipment," of the Operations and Maintenance manual. Section 609 includes standards and requirements for recycling equipment used to service motor vehicle air conditioners and for training and certification of maintenance and repair technicians. LANL contracts with JCNNM and other vendors to maintain, service, repair, and dispose of halon fire suppression systems and air conditioning and refrigeration equipment. LANL contracts automotive repair work, including motor vehicle air-conditioning work, to JCNNM and to qualified local automotive repair shops.

Radionuclides. Under the National Emission Standard for Hazardous Air Pollutants for Radionuclides (Rad NESHAP), EPA limits the effective dose equivalent (EDE) to any member of the public from radioactive airborne releases from a DOE facility, such as LANL, to 10 mrem/yr. The 2001 EDE (as calculated using EPA-approved methods) was 1.8 mrem. The location of the highest dose was at East Gate. The principal contributor to the dose was operations from the Los Alamos Neutron Science Center (LANSCE). The Air Quality Group's QA Project Plan for the Rad NESHAP Compliance Project is available at *http://www.lanl.gov/orgs/rres/maq/QA.htm* on the World Wide Web.

LANL reviews plans for new and modified projects, activities, and operations to identify the need for emissions monitoring or prior approval from EPA. During 2001, approximately 80 reviews involved the evaluation of air quality requirements associated with the use of radioactive materials. None of these projects required EPA prior approval.

During 2002, independent auditors will conduct the third independent audit of the Laboratory's Rad-NESHAP program. This audit will begin in mid-2002 and will evaluate the Laboratory's compliance for calendar year 2001.

Risk Management Program. The 1990 Clean Air Act Amendments (1990 CAA) included Section 112(r), Prevention of Accidental Releases. Section 112(r) required the EPA to establish a risk management program (RMP) to prevent accidental releases of flammable and toxic substances to the environment and to minimize the consequences of a release. The 112(r) program provides lists of toxic and flammable substances with their associated threshold quantities (TQ). Any process or storage facility that uses any listed substance in quantities exceeding its TQ is subject to EPA's RMP. Under the 112(r) program, threshold determinations are based on the quantity of substance present at a particular location or in a particular process at any point in time (i.e., what is the potential for release during an accident). Threshold determinations are not based on cumulative usage. EPA established the requirements for the RMP in 40 CFR 68. Facilities that are subject to the RMP were required to register with EPA and submit a facility specific risk management plan by June 21, 1999. LANL has not exceeded any TQ between the effective date (June 21, 1999) and the present date. Therefore, LANL is not subject to the RMP and is not required to register with EPA. LANL will continue to evaluate chemical procurements, new sources, and processes containing regulated substances to determine any change in the applicability status of the RMP.

8. Clean Water Act

a. National Pollutant Discharge Elimination System Outfall Program. The primary goal of the Clean Water Act (CWA) (33 U.S.C. 1251 et seq.) is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The act established the requirements for National Pollutant Discharge Elimination System (NPDES) permits for point-source effluent discharges to the nation's waters. The NPDES outfall permit establishes specific chemical, physical, and biological criteria that an effluent must meet before it is discharged. Although most of the Laboratory's effluent is discharged to normally dry arroyos, the Laboratory is required to meet effluent limitations under the NPDES permit program.

UC and DOE are co-permittees of the NPDES permit covering Laboratory operations. EPA Region 6 in Dallas, Texas, issues and enforces the permit. However, NMED certifies the EPA-issued permit and performs some compliance evaluation inspections and monitoring for EPA through a Section 106 water quality grant.

The Laboratory's NPDES Permit, No. NM0028355, expired October 31, 1998, but was administratively continued by EPA until a new permit was issued. As required by the NPDES regulations, on May 4, 1998, 180 days before permit expiration, the Laboratory submitted an application to EPA for renewal of the NPDES permit. On December 29, 2000, the EPA issued the Public Notice of Final Permit Decision for NPDES Permit No. NM0028355. The new NPDES Permit became effective on February 1, 2001, and contains 21 permitted outfalls.

No NPDES outfalls were deleted in 2001. Long-term objectives of the NPDES Outfall Reduction Program will require that outfall owners evaluate outfalls for continued operation and that new construction designs and modifications to existing facilities provide for reduced or no-flow effluent discharge systems.

Under the Laboratory's NPDES outfall permit, samples for effluent quality limits are collected for analysis weekly, monthly, and quarterly depending on the outfall category. The Laboratory also collects water quality samples for analysis annually at all outfalls. The Laboratory reports results to EPA and NMED at the end of the monitoring period for each respective outfall category. During CY 2001, four of the 1,085 samples collected from the industrial outfalls exceeded effluent limits (Table 2-7). No effluent limit exceedances occurred in the 134 samples collected from the Sanitary Wastewater System (SWS) Facility Outfall 13S. See Table A-4 for a summary of these outfalls and a listing of the permit's monitoring requirements.

Table 2-7 presents the exceedances of the water quality parameters for sanitary and industrial outfalls during 2001. The following is a summary of the corrective actions the Laboratory took during 2001 to address permit noncompliances.

TA-3 Power Plant (NPDES Outfall 001). On February 27, 2001, the total suspended solids (TSS) concentration exceeded the NPDES average and maximum permit limits at NPDES Outfall 001. On the day of the exceedence, operators were flushing out the cooling towers so that they could inspect the underground cooling lines. A new cooling tower was built in the summer of 2000 with fiberglass members that could explain fibers and aggregates in the effluent. In a repeat analytical sample collected on March 7, 2001, a TSS value of 3.5 mg/l documented that the effluent was back into compliance with the NPDES permit limits. The primary and secondary environmental tanks were inspected during the May 2001 shutdown; however, the TSS source was not identified. Additionally, further analysis of the compliance sample determined the primary constituent in the sample to be silica. The operating group completed additional corrective actions including construction of an additional tank to separate out the waste streams, boiler blow-down, and the demineralizer.

TA-16, High-Explosive Waste Treatment Facility (NPDES Outfall 05A055). On March 9, 2001, the pH result exceeded the NPDES maximum permit limit at NPDES Outfall 05A055. Potential sources of elevated pH at this outfall include soaps from dishwashers used in the high-explosives analytical laboratories or the change out of carbon filters at the High-Explosive Wastewater Treatment Facility (HEWTF). Site representatives were monitoring the pH of the effluent tank using pH strips that might not have been accurate in the presence of detergents. Site

Table 2-7. National Pollutant Discharge Elimination System Permit Monitoring of Effluent Quality and Water Quality Parameters at Industrial Outfalls: Exceedances during 2001

EPA ID	Outfall Type	Technical Area	Date	Parameter	Results/Limits	Units
February						
001	Industrial	TA-3-22	2/27/01	TSS (daily max)	232/100	mg/L
001	Industrial	TA-3-22	2/1/01–2/28/01	TSS (daily avg)	232/30	mg/L
March						
05A055	Industrial	TA-16-1508	3/9/01	pH (daily max)	9.8/9.0	s.u.
September						
03A185	Industrial	TA-15-312	9-17-01	Se (daily max)*WQP	0.008/0.005	mg/L

TSS = total suspended solids.
WQP = water quality parameters.

representatives will analyze operational samples before discharge for pH using an electrode pH meter instead pH strips. The operating group will not discharge if the effluent is outside of the pH range 6.0–9.0 standard units. Additionally, the operating group added CO^2 for pH adjustment in May of 2001.

TA-15, DARHT Cooling Tower (NPDES Outfall 03A185). On September 17, 2001, the total selenium (Se) concentration exceeded the NPDES maximum permit limit at Outfall 03A185. A new treatment chemical containing low levels of total selenium was in use at this cooling tower several months before this compliance sample was collected. A sample of concentrated (full strength) treatment chemical submitted for total selenium analysis showed some selenium was present. When used at the recommended concentration of 40 ppm, the total selenium result should be well below the permit limit of 0.005 mg/L. The use of the new treatment chemical was suspended. In an additional compliance sample collected on October 30, 2001, the nondetect for total selenium documented that the discharge was back in compliance with the NPDES permit on this date.

b. National Pollutant Discharge Elimination System Sanitary Sewage Sludge Management Program. In July 1997, the Laboratory requested approval from the EPA Region 6 to make a formal change in its sewage sludge disposal practices from land application under 40 CFR Part 503 regulations to landfill disposal as a 50–499 ppm PCB-contaminated TSCA waste, as authorized under 40 CFR 761. This change was necessary because of the repeated detection of low-level PCBs (less than 5 ppm) in the SWS Facility's sewage sludge. The EPA approved the Laboratory's request in September 1997.

Following this change, the Laboratory began an investigation to determine the source of the PCBs found in the SWS Facility's sludge. The investigation's findings led the Laboratory to believe that the PCBs appearing at the SWS Facility might have originated from the remnants of old PCB spills in sewer lines. Subsequently, the Laboratory undertook a program of testing and cleaning sewer lines. Based upon the analytical data obtained from testing sludge, grit, and screenings, the Laboratory believed that it could begin to safely dispose of the sanitary treatment solids as a non-TSCA waste. In September 2000, the Laboratory notified the EPA Region 6 that it intended to change its disposal practice for sewage sludge, grit, and screenings to disposal as a non-TSCA waste (total PCB concentration less than 50 ppm), as authorized under 40 CFR 761.20(a)(4). After September 2000, the Laboratory began disposing of all SWS Facility sludge with less than 50 ppm PCBs as a New Mexico Special Waste.

During 2001, the SWS Facility generated approximately 25 dry tons (49,923 dry lb) of sewage sludge. All of this sludge was disposed of as a New Mexico Special Waste at a landfill authorized to accept this material.

c. National Pollutant Discharge Elimination System Permit Compliance Evaluation Inspection. The EPA and the NMED did not conduct a NPDES Outfall Compliance Evaluation Inspection during 2001 (see Table 2-3).

d. National Pollutant Discharge Elimination System Storm Water Program. The NPDES permit program regulates storm water discharges from identified industrial and construction activities. During 2001, the Laboratory had 11 active NPDES permits for its storm water discharges (see Table 2-1). Under the EPA's NPDES Storm Water Multi-Sector General Permit for Industrial Discharges, the Laboratory is covered by one overall active permit. Under the EPA Region 6 NPDES Storm Water Construction permit, 10 Laboratory projects were permitted and active: DARHT Facility Construction Project, Guaje Well Improvements Project, the Fire Protection Improvements Project, the Norton Power Line Project, the Strategic Computing Complex (SCC) Project, the TA-9 to TA-15 Gas Pipeline Replacement Project, the Flood Mitigation and Fire Recovery Project, the Nuclear Materials Safeguards and Security Upgrades (NMSSUP) Project, TA-3 Revitalization, and TA-55 Fireloop Construction.

UC and DOE are co-permittees under the NPDES Multi-Sector General Permit (MSGP-2000) for the Laboratory. The MSGP-2000 regulates storm water discharges from the following Laboratory industrial activities:

- Sector K—hazardous waste treatment, storage, and disposal facilities including those that are operating under interim status or a permit under Subtitle C of RCRA (this category includes SWMUs);
- Sector L—landfills, land application sites, and open dumps including those that are subject to regulation under Subtitle D of RCRA;

- Sector O—steam electric power generating facilities;
- Sector D—asphalt paving operations;
- Sector N—scrap recycling and waste recycling facilities;
- Sector P—land transportation and warehousing;
- Sector F—primary metals;
- Sector AA—fabricated metal products; and
- Sector C—chemical and allied products manufacturing activities.

Since 1992, the MSGP-2000 is the third general permit the EPA has published to regulate storm water discharges from industrial activities at the Laboratory. This permit expires October 30, 2005. As with the 1992 Baseline General Permit and 1995 Multi-Sector General Permit, the MSGP-2000 requires the development and implementation of a Storm Water Pollution Prevention Plan, which includes installing, inspecting, and maintaining Best Management Practices (BMPs) to reduce the potential for pollutants to migrate into watercourses. During 2001, the Laboratory maintained and implemented 20 Storm Water Pollution Prevention Plans for its industrial activities.

The Multi-Sector General Permit also requires monitoring of the storm water discharges from all identified industrial activities. To meet the monitoring requirements of the MSGP-2000 and other monitoring programs, the Laboratory is operating 69 storm-water monitoring stations within the canyons entering and leaving the Laboratory. These stations collect storm event samples at the confluence of the major canyons and within certain reaches of these canyons. In addition, monitoring is conducted at sector-specific industrial facilities.

The Laboratory collected 96 storm event samples (as compared with 70 samples in 2000) during the summer of 2001 and has submitted this data to EPA and NMED in accordance with the permit's Discharge Monitoring Report (DMR) requirements. The increase, when compared with previous years, in the number of samples submitted was largely due to the Laboratory's efforts to sample and characterize storm-water runoff from Laboratory property impacted by the Cerro Grande fire. "Surface Water Data at Los Alamos National Laboratory: 2001 Water Year" (Shaull et al., 2002) reports the discharge information for 2001.

During 2001, the Laboratory's 10 active construction projects were permitted under the July 6, 1998, EPA Region 6 NPDES General Permit for Storm Water Discharges from Construction Activities Permit. Under the Construction Regulations, all construction sites disturbing five or more acres, including those that are part of a larger plan of development collectively disturbing five or more acres, are required to have a permit. The NPDES Construction Permit regulates storm-water discharges from the construction sites. LANL, with operational control of the construction project plans and specifications, is usually co-permittee with the contractor, who has day-to-day operational control of site activities.

Like the MSGP Permit, the Construction Permit requires each construction site to develop and implement a Storm Water Pollution Prevention (SWPP) Plan. The SWPP Plans describe and ensure the implementation of practices to reduce the pollutants in storm-water discharges associated with construction activity and assure compliance with the terms and conditions of the permit. These practices include installing, inspecting, and maintaining structural and vegetative erosion and sediment controls, postconstruction storm-water management controls, and other controls to limit off-site sediment tracking and contamination of runoff with other potential pollutants. Furthermore, each Plan must describe and implement measures necessary to protect listed endangered or threatened species and critical habitat. In 2001, the Laboratory implemented and maintained 23 construction-related SWPP Plans.

To assist those involved with LANL construction projects, the Laboratory provides design comments with respect to NPDES concerns, aids in the development of SWPP Plans, and inspects the sites in accordance with NPDES Regulations. Inspections occur every 14 days for active sites, every month for inactive sites (when not under a winter waiver), and after any 0.5-in. precipitation event. The appropriate project supervisors receive inspection reports, which document the condition of the site and the site's controls and give recommendations to ensure NPDES Permit compliance.

To track the many industrial and construction sites, the associated BMPs, and the site inspections, the Laboratory has developed a GIS-based tracking system. The system maintains records of the contacts for each site and tracks

- each inspection,
- the condition of each BMP at the time of the inspection,

- deficiencies found,
- the date the deficiencies were corrected,
- work that is required at the site, and
- the overall status of the site.

In addition, the Laboratory maintains a spreadsheet that lists each of the permits, their holders, related permits, and the dates of their termination. General permit information for the Laboratory is accessible to the public through postings in the Laboratory's Community Involvement Office Reading Room and at the ESH-18 Web site.

e. National Pollutant Discharge Elimination System Storm Water Program Inspection. The Laboratory corrected deficiencies noted during a July 12, 1999, EPA Region 6 compliance inspection of the Laboratory's Storm Water Program. At this date, all deficiencies have been addressed.

f. Spill Prevention Control and Countermeasures Program. The Laboratory's Spill Prevention Control and Countermeasures (SPCC) Plans, as required by the CWA in accordance with 40 CFR 112, are comprehensive plans developed to meet EPA requirements that regulate water pollution from oil spills. Table 2-8 shows the SPCC Plans and tanks covered at the Laboratory for 2001. Three tanks were installed at TA-3-316 during 2001.

A spill that did not impact the navigable waters of the US or adjoining shorelines occurred within the ATLAS facility on January 8, 2001. The DOE proactively developed a Corrective Action Plan that includes making improvements in safety performance throughout the Laboratory. The Laboratory's SPCC Plans will be amended to reflect these changes in the Laboratory's potential for the discharge of oil.

g. Dredge and Fill Permit Program. Section 404 of the CWA requires the Laboratory to obtain permits from the US Corps of Engineers (COE) to perform work within perennial, intermittent, or ephemeral watercourses. Projects involving excavation or fill below the normal high-water mark must be conducted with attention to the water quality and riparian habitat preservation requirements of the Act. COE has issued a number of nationwide permits that cover specific activities. Each nationwide permit contains conditions to protect water quality. Section 401 of the CWA requires states to certify that Section 404 permits issued by COE will not prevent attainment of state-mandated stream standards. NMED reviews Section 404/401 joint permit applications and issues separate Section 401 certification letters, which include additional permit requirements to meet state stream standards for individual projects at the Laboratory.

Because of the increased runoff from the Cerro Grande fire, a larger number of Section 404 projects were undertaken during 2001 than in pre-fire years. Many of the projects listed relate to strengthening road crossings or removing sediment that has built up behind culverted road crossings. The removal of sediment at these road crossings is required to keep water from backing up at the culverts and eroding the surface of the road.

Table 2-1 lists all of the Laboratory's Section 404/401 permits during 2001. Projects permitted include utility lines, road crossings, headwaters and isolated waters, and wetland/riparian areas.

9. Safe Drinking Water Act

a. Introduction. On September 5, 2001, DOE completed the transfer of ownership of the Los Alamos Water Supply System to Los Alamos County. Since September 1998, Los Alamos County has operated the water system under a lease agreement. Under this agreement, the Laboratory retained responsibility for operating the distribution system within the Laboratory's boundaries, whereas the county assumed full responsibility for operating the water system, including ensuring compliance with the requirements of the federal Safe Drinking Water Act (SDWA) (40 CFR 141) and the New Mexico Drinking Water Regulations (NMEIB 1995). The SDWA requires Los Alamos County to collect samples from various points in the Laboratory's, Los Alamos County's, and Bandelier National Monument's water distribution systems and from the water supply wellheads to demonstrate compliance with SDWA maximum contaminant levels (MCLs). The EPA has established MCLs for microbiological organisms, organic and inorganic constituents, and radioactivity in drinking water. The state has adopted these standards and has included them in the New Mexico Drinking Water Regulations. The EPA has authorized NMED to administer and enforce federal drinking water regulations and standards in New Mexico.

During 2001, the Laboratory sampled all of the water supply wells in operation at the time of sampling for quality assurance purposes. The Laboratory's quality assurance drinking water program provides

Table 2.8. 2001 SPCC Plans and Tanks

SPCC Plan Name	Tanks Covered
DX	15-261, 15-324, 15-325, 15-435, 15-436, 15-473, 15-474, 36-141, 36-142 (Note: Fire destroyed 15-261 in May 2000, but the plan was not updated.)
TA-3-316	three tanks inside Building 3-316
DARHT	15-461, 15-462
TA-35-29 THOR	three tanks in basement
TA-3 Power Plant	3-26, 3-779
TA-3 Asphalt Batch Plant	3-1969 and 3-1968
TA-21 Steam Power Plant	21-57 and 600 gal tank
included in WCRRF and RAMROD SWPP	50-183
included in TA-50 FMU 64 SWPP	50-188
TA-53	53-640-AST, 53-1058-AST, 53-1071A-AST, 53-1071B-AST, 53-645-AST
ATLAS	Tank outside Building 35-125

additional assurance during the transition period following transfer of the water system to Los Alamos County. The Laboratory's monitoring results are not for SDWA compliance purposes; Los Alamos County's SDWA sampling program determines SDWA compliance. This report presents the results from both the quality assurance monitoring the Laboratory conducted and the SDWA compliance monitoring Los Alamos County conducted.

In 2001, the monitoring network for Los Alamos County's SDWA compliance sampling program consisted of the following three location groups:

(1) wellhead sampling from the water supply wells in operation at the time of sampling (Guaje wells G1A, G2A, G3A, G4A, G5A; Pajarito Mesa wells PM1, PM2, PM3, PM4, PM5; and Otowi wells O1, O4);

(2) the 6 total trihalomethane (TTHM) sampling locations within the distribution system; and

(3) the 41 microbiological sampling sites located throughout the Laboratory, Los Alamos County, and Bandelier National Monument.

Staff from the NMED Drinking Water Bureau performed all chemical and radiological sampling for Los Alamos County with the exception of TTHM sample collection, which JCNNM and Los Alamos County staff conducted. The New Mexico Health Department's Scientific Laboratory Division in Albuquerque and the New Mexico State University's Soil and Water Testing Laboratory in Las Cruces received samples for analysis. The JCNNM Health and Environmental (HENV) laboratory performs microbiological sampling and analysis. NMED has certified the HENV laboratory for microbiological compliance analysis. Certification requirements include proficiency samples, maintaining an approved quality assurance/quality control program, and periodic NMED audits.

In 2001, the Laboratory's monitoring network for quality assurance sampling consisted of the following: wellhead sampling from the 12 water supply wells in operation at the time of sampling (Guaje wells G1A, G2A, G3A, G4A, G5A; Pajarito Mesa wells PM1, PM2, PM3, PM4, PM5; and Otowi wells O1, O4). Sample collection and preservation procedures and analytical methods follow the requirements specified in federal and state regulations. Laboratory staff performed chemical and radiological sampling and submitted the samples for analysis to the New Mexico Health Department's Scientific Laboratory Division in Albuquerque. ESH-18 has certified staff to perform drinking water sampling. ESH-18 maintains both electronic and hard copy files of all data collected from quality assurance testing.

b. Radiochemical Analytical Results. In 2001, Los Alamos County collected drinking water samples from seven water supply wells to determine the radiological quality of the drinking water. As shown in Table 2-9, the concentrations of gross alpha and gross beta activity were less than the EPA screening levels. When gross alpha and beta activity measurements are below the screening levels, Los Alamos County does not need to perform further isotopic analyses or perform dose calculations under the SDWA program. However, it should be noted that ESH-18 also conducts comprehensive monitoring of the water supply wells for radiochemical constituents (see Table 5-20).

Neither NMED nor Los Alamos County collected radon samples for compliance purposes during 2001.

In 2001, the Laboratory collected quality assurance drinking water samples at 12 water supply wells to determine the radiological quality of the drinking water. As shown in Table 2-10, the concentrations of gross alpha and gross beta activity were less than the EPA screening levels.

c. Nonradiological Analytical Results. In 2001, Los Alamos County collected TTHM samples during each quarter from six locations in the Laboratory and Los Alamos County water distribution systems. As shown in Table 2-11, the annual average for samples in 2001 was 3.9 g of TTHM per liter of water, less than the SDWA MCL of 80 /L. In 2001, Los Alamos County collected samples for nitrate/nitrite (as nitrogen) in drinking water at the 11 water supply wells in operation at the time of sampling. As shown in Table 2-12, nitrate/nitrite concentrations at all locations were less than the SDWA MCL. In 2001, Los Alamos County collected samples for VOCs at 12 water supply wells. No VOCs were detected at any of the sampling locations. In 2001, LANL also collected quality assurance samples for inorganic constituents in drinking water at the 12 water supply wells. As shown in Table 2-13, all inorganic constituents at all locations were less than the SDWA MCLs. In 2001, LANL also collected quality assurance VOC samples from the 12 water supply wells. No VOCs were detected at any of the sampling locations at concentrations greater than the analytical laboratory's sample detection limit.

d. Microbiological Analyses of Drinking Water. Each month during 2001, Los Alamos County collected an average of 46 samples from the Laboratory's, Los Alamos County's, and Bandelier National Monument's water distribution systems to determine the free chlorine residual available for disinfection and the microbiological quality of the drinking water. Of the 553 samples analyzed during 2001, none indicated the presence of total or fecal coliforms. Noncoliform bacteria were present in 41 of the microbiological samples. Noncoliform bacteria are not regulated, but their repeated presence in samples may serve as an indicator of stagnation and biofilm growth in water pipes. The maximum count of noncoliform bacteria in a 2001 sample was 122 colonies per milliliter. This level is well below the EPA-recommended limit for drinking water of 500 colonies per milliliter. Table 2-14 presents a summary of the monthly analytical data.

e. Long-Term Trends. During 2001, the Los Alamos water system continued to produce high-quality drinking water that is fully compliant with state and federal drinking water standards. The water system has never incurred a violation for an SDWA-regulated chemical or radiological contaminant. During 2001, no increasing trends were evident for contaminants that the SDWA currently regulates.

f. Drinking Water Inspection. The NMED did not conduct an inspection of the drinking water system during 2001.

10. Groundwater

a. Groundwater Protection Compliance Issues. Groundwater monitoring and protection efforts at the Laboratory have evolved from programs initiated by the US Geological Survey in the 1940s to present efforts. The major regulations, orders, and policies pertaining to groundwater are described in the following paragraphs.

DOE Order 5400.1 requires the Laboratory to prepare a Groundwater Protection Management Program Plan that focuses on protection of groundwater resources in and around the Los Alamos area and ensures that all groundwater-related activities comply with the applicable federal and state regulations.

Task III of Module VIII of the RCRA Hazardous Waste Facility Permit, the HSWA Module, requires the Laboratory to collect information about the environmental setting at the facility and to collect data on groundwater contamination. Task III, Section A.1, requires the Laboratory to conduct a program to evaluate hydrogeologic conditions. Task III, Section C.1, requires the Laboratory to conduct a groundwater

Table 2-9. Radioactivity (pCi/L) in Drinking Water Sampled during 2001 by LA County for Compliance Purposes

	Gross Alpha			Gross Beta		
Sample Location	**Calibration Std.**	**Value**	**(Uncertainty)[a]**	**Calibration Std.**	**Value**	**(Uncertainty)[a]**
Wellheads:						
Pajarito Well Field-PM1	^{241}Am	1.80	(0.40)	^{137}Cs	3.80	(0.60)
	Natural U	2.30	(0.50)	^{90}Sr, ^{90}Y	3.70	(0.60)
Pajarito Well Field-PM3	^{241}Am	0.30	(0.20)	^{137}Cs	2.20	(0.50)
	Natural U	0.40	(0.30)	^{90}Sr, ^{90}Y	2.10	(0.50)
Pajarito Well Field-PM4	^{241}Am	0.80	(0.40)	^{137}Cs	4.30	(0.60)
	Natural U	1.10	(0.50)	^{90}Sr, ^{90}Y	4.10	(0.60)
Guaje Well Field-G2A	^{241}Am	0.50	(0.30)	^{137}Cs	2.10	(0.50)
	Natural U	0.60	(0.30)	^{90}Sr, ^{90}Y	2.00	(0.50)
Guaje Well Field-G3A	^{241}Am	0.10	(0.20)	^{137}Cs	1.80	(0.50)
	Natural U	0.10	(0.30)	^{90}Sr, ^{90}Y	1.80	(0.50)
Guaje Well Field-G4A	^{241}Am	0.60	(0.30)	^{137}Cs	2.00	(0.50)
	Natural U	0.80	(0.30)	^{90}Sr, ^{90}Y	1.90	(0.50)
Otowi Well Field-O1	^{241}Am	1.20	(0.30)	^{137}Cs	4.70	(0.60)
	Natural U	1.50	(0.40)	^{90}Sr, ^{90}Y	4.60	(0.60)
EPA Maximum Contaminant Level		15			NA	
EPA Screening Level		5			50	

[a]Uncertainties are expressed as one standard deviation.

investigation to characterize any contamination at the facility.

In March 1998, NMED approved a comprehensive hydrogeologic characterization work plan for the Laboratory. The Laboratory developed the Hydrogeologic Workplan (LANL 1998a) to address the DOE Order 5400.1 and Task III of Module VIII of the RCRA Hazardous Waste Facility Permit requirements as described above and in response to NMED's denial of the Laboratory's RCRA operating permit application groundwater monitoring waiver demonstrations. The plan proposes a multiyear drilling and hydrogeologic analysis program to characterize the hydrogeologic setting of the Pajarito Plateau and to assess the potential for groundwater contamination from Laboratory operations. The goal of the project is to develop greater understanding of the geology, groundwater flow, and geochemistry beneath the 43-square-mile Laboratory area and to assess any impacts that Laboratory activities may have had on groundwater quality. The Hydrogeologic Workplan will result in an enhanced understanding of the Laboratory's groundwater setting and an improved ability to ensure adequate groundwater monitoring. We anticipate completion of the Hydrogeologic Workplan in 2005.

New Mexico Water Quality Control Commission (NMWQCC) regulations control liquid discharges onto or below the ground surface to protect all groundwater in the State of New Mexico. Under the regulations, when required by NMED, a facility must submit a groundwater discharge plan and obtain NMED approval (or approval from the Oil Conservation Division for energy/mineral extraction activities). Subsequent discharges must be consistent with the terms and conditions of the discharge plan.

The Laboratory has three approved groundwater discharge plans to meet NMWQCC regulations (Table 2-1): one for TA-57 (Fenton Hill); one for the SWS Facility; and one for the land application of dried sanitary sewage sludge from the SWS Facility. The groundwater discharge plan for the land application of sludge has not been renewed by the NMED because the Laboratory has not had land-applied sewage sludge since 1995. The discharge plan has been administra-

Table 2-10. Radioactivity (pCi/L) in Drinking Water during 2001 by LANL

	Gross Alpha			Gross Beta		
Sample Location	**Calibration Std.**	**Value**	**(Uncertainty)[a]**	**Calibration Std.**	**Value**	**(Uncertainty)[a]**
Wellheads:						
Pajarito Well-PM1	^{241}Am	0.9	(0.3)	^{137}Cs	3.3	(0.5)
	Natural U	1.2	(0.4)	^{90}Sr, ^{90}Y	3.2	(0.4)
Pajarito Well-PM2	^{241}Am	0.0	(0.2)	^{137}Cs	1.6	(0.4)
	Natural U	0.0	(0.3)	^{90}Sr, ^{90}Y	1.6	(0.4)
Pajarito Well-PM3	^{241}Am	0.5	(0.3)	^{137}Cs	3.5	(0.5)
	Natural U	0.6	(0.3)	^{90}Sr, ^{90}Y	3.4	(0.5)
Pajarito Well-PM4	^{241}Am	0.1	(0.2)	^{137}Cs	2.0	(0.4)
	Natural U	0.1	(0.2)	^{90}Sr, ^{90}Y	2.0	(0.4)
Pajarito Well-PM5	^{241}Am	0.0	(0.2)	^{137}Cs	2.3	(0.4)
	Natural U	0.0	(0.3)	^{90}Sr, ^{90}Y	2.2	(0.4)
Guaje Well-G1A	^{241}Am	1.0	(0.3)	^{137}Cs	3.1	(0.5)
	Natural U	1.3	(0.4)	^{90}Sr, ^{90}Y	3.0	(0.5)
Guaje Well-G2A	^{241}Am	0.8	(0.3)	^{137}Cs	2.3	(0.4)
	Natural U	1.0	(0.4)	^{90}Sr, ^{90}Y	2.3	(0.4)
Guaje Well-G3A	^{241}Am	0.9	(0.3)	^{137}Cs	2.7	(0.5)
	Natural U	1.1	(0.4)	^{90}Sr, ^{90}Y	2.7	(0.5)
Guaje Well-G4A	^{241}Am	0.2	(0.3)	^{137}Cs	3.1	(0.5)
	Natural U	0.3	(0.3)	^{90}Sr, ^{90}Y	3.0	(0.5)
Guaje Well-G5A	^{241}Am	0.1	(0.2)	^{137}Cs	1.5	(0.4)
	Natural U	0.1	(0.3)	^{90}Sr, ^{90}Y	1.4	(0.4)
Otowi Well-O4	^{241}Am	0.5	(0.3)	^{137}Cs	3.8	(0.5)
	Natural U	0.7	(0.4)	^{90}Sr, ^{90}Y	3.7	(0.5)
Otowi Well-O1	^{241}Am	1.2	(0.3)	^{137}Cs	3.3	(0.5)
	Natural U	1.6	(0.4)	^{90}Sr, ^{90}Y	3.2	(0.4)
EPA Maximum Contaminant Level		15			NA	
EPA Screening Level		5			50	

[a]Uncertainties, sigmas, are expressed as ± one standard deviation (i.e., one standard error).

tively extended. The groundwater discharge plan for the land application of sludge was not renewed in 2001 because the Laboratory is no longer applying sludge; the NMED considers the discharge plan to be administratively extended. On August 20, 1996, the Laboratory submitted a groundwater discharge plan application for the Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50. As of December 31, 2001, NMED approval of the plan was still pending.

b. Compliance Activities. The Groundwater Protection Management Program Plan that ESH-18 administers integrates studies by several Laboratory programs. One of these programs, Hydrogeologic Workplan (LANL 1998a), is an ongoing study of the hydrogeology and stratigraphy of the region to fulfill requirements in the HSWA Module of the RCRA Hazardous Waste Facility Permit, the groundwater monitoring requirements under the RCRA operating permit, and DOE Order 5400.1. The Laboratory's Groundwater Annual Status Summary Report (Nylander et al., 2002) provides more detailed information on newly collected groundwater data. Drilling progress for the Hydrogeologic Workplan (LANL 1998a) during 2001 included work on the following wells.

- completed three Hydrogeologic Workplan wells (R-22, R-7, R-5) and three investigation wells (MCOBT-8.5, MCOBT -4.4, CdV-R-37-2);

Table 2-11. Total Trihalomethanes (g/L) in Drinking Water Sampled during 2001 by LA County for Compliance Purposes

	2001 Quarters			
Sample Location	**First**	**Second**	**Third**	**Fourth**
Distribution Sites:				
Los Alamos Airport	0.6	4.5	11.2	10.7
White Rock Fire Station	<0.5	<0.5	0.6	0.5
North Community Fire Station	<0.5	2.1	2.0	2.0
S-Site Fire Station	1.4	3.9	10.2	6.5
Barranca Mesa School	<0.5	2.6	5.4	1.7
TA-39, Bldg. 02	5.6	4.2	8.9	7.6
2001 Average of 3.9 g/L				
EPA Maximum Contaminant Level			80.0	
Sample Detection Limit			0.5	

Table 2-12. Nitrate/Nitrite (as Nitrogen) (mg/L) in Drinking Water Sampled during 2001 by LA County for Compliance Purposes

Sample Location	**NO^3 /NO^2 (as N)**
Wellheads:	
Pajarito Well Field-PM1	0.45
Pajarito Well Field-PM2	0.40
Pajarito Well Field-PM3	0.42
Pajarito Well Field-PM4	0.29
Pajarito Well Field-PM5	0.27
Otowi Well Field-O1	1.17
Otowi Well Field-O4	0.55
Guaje Well Field-G1A	0.45
Guaje Well Field-G2A	0.43
Guaje Well Field-G3A	0.58
Guaje Well Field-G4A	0.60
EPA Maximum Contaminant Levels (MCLs)	10.0

Table 2-13. Inorganic Constituents (mg/L) in Drinking Water during 2001 by LANL

Sample Location	As	Ba	Be	Cd	Cr	F	CN	Hg	Ni	NO_3 (as N)	Se	Sb	Tl
Wellheads:													
Pajarito Well-PM1	0.002	<0.1	<0.001	<0.001	0.003	0.25	<0.005	<0.0002	<0.01	0.46	<0.005	<0.001	<0.001
Pajarito Well-PM2	0.001	<0.1	<0.001	<0.001	0.004	0.28	<0.005	<0.0002	<0.01	0.31	<0.005	<0.001	<0.001
Pajarito Well-PM3	0.002	<0.1	<0.001	<0.001	0.003	0.30	<0.005	<0.0002	<0.01	0.45	<0.005	<0.001	<0.001
Pajarito Well-PM4	0.001	<0.1	<0.001	<0.001	0.004	0.27	<0.005	<0.0002	<0.01	0.32	<0.005	<0.001	<0.001
Pajarito Well-PM5	<0.001	<0.1	<0.001	<0.001	0.004	0.26	<0.005	<0.0002	<0.01	0.31	<0.005	<0.001	<0.001
Guaje Well-G1A	0.010	<0.1	<0.001	<0.001	0.005	0.51	<0.005	<0.0002	<0.01	0.43	<0.005	<0.001	<0.001
Guaje Well-G2A	0.008	<0.1	<0.001	<0.001	0.004	0.36	<0.005	<0.0002	<0.01	0.41	<0.005	<0.001	<0.001
Guaje Well-G3A	0.003	<0.1	<0.001	<0.001	0.003	0.30	<0.005	<0.0002	<0.01	0.56	<0.005	<0.001	<0.001
Guaje Well-G4A	0.010	<0.1	<0.001	<0.001	0.004	0.41	<0.005	<0.0002	<0.01	0.40	<0.005	<0.001	<0.001
Guaje Well-G5A	0.003	<0.1	<0.001	<0.001	0.002	0.29	<0.005	<0.0002	<0.01	0.48	<0.005	<0.001	<0.001
Otowi Well-O4	0.002	<0.1	<0.001	<0.001	0.003	0.29	<0.005	<0.0002	<0.01	0.39	<0.005	<0.001	<0.001
Otowi Well-O1	0.003	<0.1	<0.001	<0.001	0.004	0.37	<0.005	<0.0002	<0.01	1.10	<0.005	<0.001	<0.001
EPA Maximum Contaminant Levels	0.01a	2.0	0.004	0.005	0.1	4.0	0.2	0.002	0.1	10.0	0.05	0.006	0.002

[a] On February 22, 2002, the new arsenic in drinking water rule became effective. Drinking water systems must comply with the new 10 ppb standard by January 23, 2006.

Table 2-14. Bacteria in Drinking Water Sampled at Distribution System Taps during 2001 by LA County for Compliance Purposes

		No. of Positive Tests		
Month	No. of Samples Collected	Coliform	Fecal Coliform	Noncoliform
January	46	0	0	5
February	47	0	0	2
March	46	0	0	7
April	47	0	0	10
May	45	0	0	0
June	47	0	0	1
July	46	0	0	3
August	47	0	0	4
September	46	0	0	3
October	45	0	0	1
November	45	0	0	4
December	46	0	0	1
Total 2001	553	0	0	41
Maximum Contaminant Level (MCL)	[a]	[b]	[c]	

[a] The MCL for coliforms is positive samples not to exceed 5% of the monthly total.
[b] The MCL for fecal coliforms is no coliform positive repeat samples following a fecal coliform positive sample.
[c] There is no MCL for noncoliforms.

started drilling two Hydrogeologic Workplan wells (R-13, R-8). Well Completion Reports for were published for R-9, R-9i, R-12, R-15, and R-19.

- conducted four rounds of characterization sampling at R-15, R-9, R-12, R-9i, and R-19. The notable results of the characterization sampling are as follows:

  Tritium measurements from characterization samples collected from alluvial and perched groundwater zones have activities indicative of recharge by water less than 60 years old with tritium readings in the alluvium (80–29,300 pCi/L) and in perched groundwater (Cerros del Rio basalt, 3,770 pCi/L) in Mortandad and Los Alamos Canyons. Because of its short half-life (12.43 years) and volatilization, dilution, and dispersion within the vadose zone, tritium activities are much lower in the regional aquifer at R-15 (<3 pCi/L). Sample results from the regional aquifer at R-7, R-13, R-7, R-19, R-31, CdV-15, and CdV-37 show tritium below the analytical laboratory's minimum level of detection (<1 pCi/L); this groundwater is much older than 60 years. However, tritium has been measured in the regional aquifer at R-12 (64 pCi/L) and R-25 (11–17 pCi/L) in previous years.

  Perchlorate is a mobile anion observed within the alluvium, Cerros del Rio basalt (MCOBT-4.4), and the Puye Formation (R-15) in Mortandad Canyon. Perchlorate was recently detected in intermediate perched groundwater at MCOBT-4.4 at 145 g/L at sample depths ranging from 494 ft to 532 ft. Concentrations of perchlorate at well R-15 ranged from <2.8 g/L to 4.19 g/L during characterization sampling (four quarterly samples) conducted from February 2000 through May 2001. The analytical laboratory method detection limit for perchlorate is 1 g/L with a reporting limit of 4 g/L, using ion chromatography. Concentrations of perchlorate measured at well R-15 were very close to both limits, and the analytical laboratory flagged them as estimated detections, or J values. The only detection of perchlorate at well R-15 was at a concentration of 4.19 g/L measured during the fourth sampling round conducted on May 22,

2001. Perchlorate has not been detected at R-5, R-7, R-9, R-9I, R-12, R-19, R-31, or CdV-15. Otowi-1, a water supply well in Pueblo Canyon, has shown the presence of perchlorate at concentrations less than 6 g/L.

11. National Environmental Policy Act

a. Introduction. The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4331 et seq.) requires federal agencies to consider the environmental impacts of proposed actions before making decisions. NEPA also requires a decision-making process open to public participation. All activities that the National Nuclear Security Administration (NNSA) or the Laboratory proposes are subject to NEPA review. NNSA is the sponsoring agency for most LANL activities.

NNSA must comply with the regulations for implementing NEPA published by the Council on Environmental Quality (CEQ) at 40 CFR Parts 1500-1508 and the DOE NEPA Implementing Procedures as published at 10 CFR Part 1021. Under these regulations and DOE Order 451.B, NNSA reviews proposed LANL activities and determines whether the activity is categorically excluded from the need to prepare further NEPA documentation based on previous agency experience and analysis or whether to prepare one of the following:

- An Environmental Assessment (EA), which should provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) for the proposed action, or
- An EIS, which is a detailed written statement of impacts with a subsequent Record of Decision (ROD).

If an EA or an EIS is required, NNSA is responsible for its preparation. In some situations, a LANL project may require an EA or EIS; but, because the project is connected to another larger action that requires an EIS (such as the LANL Site-Wide EIS [SWEIS] or a programmatic EIS done at the nationwide level), the LANL project may be included in the larger EIS. The LANL project is then analyzed in the larger action or analysis or may later tier off the final programmatic EIS after a ROD is issued. LANL project personnel initiate NEPA reviews by completing environment, safety, and health identification documents. These documents create the basis for an NNSA NEPA Environmental Review Form, formerly known as a DOE Environmental Checklist. The LANL Ecology Group (ESH-20) prepares these documents using the streamlined format as specified by LAAO.

In January 2000, LANL instituted a new NEPA, cultural, and biological (NCB) review process known as the NCB Laboratory Implementation Requirement (LIR 404-30-02). In 2001, 28 people were trained as NCB line organization reviewers to conduct preliminary screenings that ensure compliance with applicable NCB requirements. In 2001, ESH-20 held two training courses and two refresher/update classes for LANL NCB reviewers. ESH-20 also published the Facility NCB Reviewer Determination Documents (LA-UR-01-1273) in March 2001. This compendium provides NCB reviewers with succinct and easily referenced guidance about the operational envelopes and capabilities for each of the 15 key facilities analyzed in the SWEIS.

b. Compliance Activities. In 2001, LANL sent 45 NEPA Environmental Review Forms to NNSA compared with 61 in 2000. NNSA categorically excluded 22 new actions and amended the categorical exclusion for another 21 approved actions. LANL applied NNSA "umbrella" categorical exclusion determinations for 122 actions in 2001, compared with 209 in 2000. NNSA made seven EA determinations and issued two FONSIs in 2001. Implementing the NCB review process and the use of the SWEIS internally at ESH-20 likely accounts for the observed reductions in NEPA reviews.

c. Environmental Impact Statements, Supplement Analyses, and Special Environmental Analyses. The Laboratory did not complete any supplement or special environmental analyses in 2001. One draft EIS completed in 2001 considers a LANL capability:

Draft Environmental Impact Statement for the Proposed Relocation of TA-18 Capabilities and Materials at the Los Alamos National Laboratory (DOE/EIS-0319). This draft EIS was released for public review and comment in August 2001. It evaluates the potential direct, indirect, and cumulative environmental impacts associated with relocating LANL's TA-18. The alternatives include

- using a different site at LANL (the Preferred Alternative) and
- relocating to Sandia National Laboratories/New Mexico at Albuquerque, the Nevada Test Site

near Las Vegas, Nevada, or the Argonne National Laboratory-West near Idaho Falls, Idaho.

The EIS also analyzes upgrading the TA-18 facilities at LANL. As required by regulations, the *TA-18 Relocation EIS* also evaluates the No Action Alternative of maintaining the operations at the current TA-18 location.

d. Environmental Assessments Completed during 2001. Three EA-level NEPA documents were prepared at the Laboratory in 2001. A brief description of each EA follows.

Environmental Assessment for Coiled-Tubing Drilling Experiment at San Ysidro, New Mexico, BLM Rio Puerco Resource Management Area, Los Alamos National Laboratory document LA-UR-01-2926 (2001). LANL ESH-20 staff assisted the Bureau of Land Management (BLM) in writing this assessment of a test method proposed to improve microdrilling technology, develop and test miniaturized down-hole instrumentation, and demonstrate "proof-of-principle" of the new technology in an appropriate geologic setting. University of California employees, LANL, or their contractors performed the on-site work once the BLM issued a FONSI on June 25, 2001.

Environmental Assessment for Construction and Operation of a New Office Building and Related Structures within TA-3 at Los Alamos National Laboratory, Los Alamos, New Mexico, NNSA-EA-1375 (July 2001). This assessment considered how to replace the LANL Administration Building (Building 3-43) at TA-3. This building has many identified structural, systemic, and security problems that NNSA needs to correct so that programmatic, management, and support functions housed within can continue to function at LANL with a high level of efficiency. The Proposed Action is to construct and operate a multistoried office building to house about 700 personnel, a lecture hall, and a separate multilevel parking structure. NNSA would demolish Building 3-43 as well. A plan would be developed to document and preserve the building's historic attributes. Cumulative effects of the Proposed Action, along with past, present, and reasonably foreseeable actions, on LANL and surrounding lands are anticipated to be negligible. The NNSA signed a FONSI for this EA on July 26, 2001.

Environmental Assessment for the Proposed Construction and Operation of a New Interagency Emergency Operations Center at Los Alamos National Laboratory, Los Alamos, New Mexico, DOE/EA-1376 (2001). This assessment considered how to replace the existing emergency operations center located in TA-59 to remedy the insufficiencies and inadequacies NNSA identified after the Cerro Grande fire. The Proposed Action is the construction and operation of a new Interagency Emergency Operations Center on a five-acre site at TA-69. The 30,000-sq-ft facility would also have a garage, a 130-car parking lot, and a 150-ft-tall fire-suppression water storage tank with antenna attachments. The new center and associated structures are anticipated to have minimal traffic, visual, and environmental effects. The site is currently vacant but disturbed because of prior tree-thinning operations in this area and fire access roads. Cumulative effects of the Proposed Action, along with past, present, and reasonably foreseeable actions on LANL and surrounding lands, are anticipated to be negligible. The NNSA signed a FONSI for this EA on July 26, 2001.

e. Environmental Assessments in Progress during 2001. Five environmental assessments were in various stages of development during 2001:

- Environmental Assessment for the Proposed TA-16 Engineering Complex Refurbishment and Consolidation at Los Alamos National Laboratory, Los Alamos, New Mexico.
- Environmental Assessment for the Proposed Construction and Operation of a Biosafety Level 3 Facility at Los Alamos National Laboratory, Los Alamos, New Mexico.
- Environmental Assessment for the Proposed Easement for the Construction and Operation of a 12-in. Natural Gas Pipeline by PNM in Los Alamos Canyon, Los Alamos National Laboratory, Los Alamos, New Mexico.
- Proposed Future Disposition of Certain Cerro Grande Fire Flood and Sediment Retention Structures at Los Alamos National Laboratory.
- Environmental Assessment of the Proposed Disposition of the Omega West Facility at Los Alamos National Laboratory, Los Alamos, New Mexico.

f. Mitigation Action Plans. As part of the implementation requirements under NEPA, NNSA prepares and is responsible for implementing Mitigation Action Plans (MAPs) (10 CFR 1021, Section 331 [a] July 9, 1996). MAPs may apply to individual or site-wide projects and are generally project specific and are designed to (1) document potentially adverse environmental impacts of a proposed action, (2) identify impact mitigation commitments made in the final NEPA documents (FONSIs or RODs), and (3) establish action plans to carry out each commitment. The MAP Annual Report (MAPAR) reports the implementation status of each MAP to the public. ESH-20 coordinates the implementation of the following NNSA MAPs at the Laboratory.

Site-Wide Environmental Impact Statement. DOE issued this MAP in September 1999. The MAP provides details about the mitigation actions found in the ROD and tasks LANL with preparation of a project plan to implement them. Mitigations include specific measures to further minimize the impacts identified in the SWEIS as a result of operations (e.g., electrical power and water supply, waste management, and wildfire) and measures to enhance existing programs to improve operational efficiency and minimize future potential impacts from LANL operations (e.g., cultural resources, traditional cultural properties, and natural resources management). The Laboratory expects to complete specific measures by FY 2006, and the enhancement of existing programs should be implemented by FY 2003. A MAPAR is prepared annually.

Dual-Axis Radiographic Hydrodynamic Test Facility Mitigation Action Plan. DOE issued this MAP in 1995. On January 14, 1999, the DARHT MAPAR for 1998 was released to the public for review and comment. During 2000, the Laboratory implemented all operations-related mitigation measures. The construction-related mitigation measures were completed in 1999. The scope of operations-related mitigation measures included ongoing environmental chemistry baseline monitoring, ongoing monitoring of the Nake'muu cultural resources site, and human health and safety mitigations for operations. The DARHT MAPAR for 2000 was distributed to NNSA public reading rooms on January 29, 2001.

Low-Energy Demonstration Accelerator (LEDA) Mitigation Action Plan. DOE issued this MAP in 1996. On January 29, 2001, the LEDA MAPAR for 2000 was distributed to NNSA public reading rooms. All MAP commitments for preventing soil erosion and monitoring industrial NPDES outfalls and potential wetlands formation in and around the LEDA facility are being implemented and are on schedule.

Special Environmental Analysis (SEA) of Actions Taken in Response to the Cerro Grande Fire at Los Alamos National Laboratory, Los Alamos, New Mexico. The NNSA prepared and issued the SEA in September 2000. The SEA was prepared pursuant to the Council on Environmental Quality regulations implementing NEPA under emergency circumstances and NNSA NEPA regulatory requirements by providing an analysis of the Cerro Grande fire emergency fire suppression, soil erosion, and flood control actions that NNSA and LANL took from May through November 2000. As part of the SEA, NNSA identified various mitigation measures that must be implemented as an extension of the fire suppression, erosion, and flood control actions. NNSA assigned the implementation of specific mitigation measures to the LANL management and operations contractor, UC, on December 18, 2000 (DOE 2000). Monitoring results of the mitigation effectiveness and the environmental effects of the emergency actions recognized later are to be made available to the public through an annual mitigation tracking report. The first annual report covering the fiscal year beginning October 1, 2000, and ending on September 30, 2001 will be issued in early 2002.

Other Studies Completed in 2001. LANL ESH-20 prepared four other NEPA-related studies in 2001. Three of these support the proposed Advanced Hydrotest Facility project, and the other was prepared to support an NNSA-wide siting study for the Advanced Accelerator Applications project.

"Accelerator-Driven Test Facility Site Selection," Los Alamos National Laboratory document LA-UR-01-3372 (2001).

"Preliminary Hydro-Geologic Assessment of the Proposed AHF Site in TA-53," Los Alamos National Laboratory document LA-UR-01-3479 (2001).

"Technical Source Document for the Proposed Advanced Hydrotest Facility in Technical Areas 5, 53, and 72: Geology, Soils, Hydrology, and Preexisting Potential Contaminant Release Sites with a Preliminary Assessment of Potential Environmental Impacts," Los Alamos National Laboratory document LA-UR-01-4280 (2001).

"Cultural Resources Status of the Proposed Advanced Hydrotest Facility Site Location in TAs-53, -72, -73, and -5 (LANSCE Site) at Los Alamos National Laboratory, Los Alamos, New Mexico," Los Alamos National Laboratory document LA-UR-01-5721 (2001).

12. Integrated Resources Management

The development and implementation of the Integrated Resources Management Plan (IRMP) is mandated under the ROD and MAP for the LANL SWEIS. DOE/NNSA and LANL completed the Preliminary Draft Integrated Resources Management Plan (IRMP) in May 2001. The Preliminary Draft was distributed to stakeholders and other interested parties for review and comment in June 2001. The final IRMP will be completed, and Laboratory-wide implementation initiated, in late 2002. The IRMP involves DOE/NNSA and multiple LANL organizations and is being developed as a mission-oriented tool for integrating facility and land use planning activities with the management of natural and cultural resources. As part of the IRMP, LANL continued to develop several resource-specific management plans during 2002.

13. Cultural Resources

a. Introduction. The ESH-20 Cultural Resources Team is responsible for developing the Cultural Resources Management Plan (CRMP), building and maintaining a database of all cultural resources found on DOE land, supporting DOE's compliance with the requirements applicable to cultural resource legislation as listed below, and providing appropriate information to the public on cultural resource management issues. Cultural resources are defined as archaeological materials and sites dating to the prehistoric, historic, or European contact period that are currently located on or beneath the ground; standing structures that are over 50 years old or are important because they represent a major historical theme or era; cultural and natural places, select natural resources, sacred objects and sites that have importance to American Indians; and American folklife traditions and arts.

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

During 2001, ESH-20 Laboratory Cultural Resources Team evaluated 1026 Laboratory proposed actions and conducted 20 new field surveys to identify cultural resources. DOE sent eight survey results to the SHPO for concurrence in findings of effects and determinations of eligibility for National Register inclusion of cultural resources located during the survey. The Governors of San Ildefonso, Santa Clara, Cochiti, and Jemez Pueblos and the President of the Mescalero Apache Tribe received for comment copies of two reports to identify any traditional cultural properties that a proposed action could affect. ESH-20 identified adverse effects to two historic buildings that were decommissioned and decontaminated in 2001. Personnel documented and interpreted the historic buildings to resolve the adverse effects.

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 Native American Grave Protection and Repatriation Act of 1990 (Public Law 101-601) states that if federal activities inadvertently disturb burials or cultural objects, 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 2001. The Archaeological Resources Protection Act (ARPA) 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 ARPA violations were recorded on DOE land in 2001.

c. Compliance Activities.

Nake'muu. Nake'muu is one of only a few standing-walled ancestral pueblos remaining in the Jemez Mountains. It dates from circa 1200–1325 A.D. and contains 55 rooms with walls standing up to 6 ft high. It is one of the best-preserved ruins on the Pajarito Plateau. The site is ancestral to the people from San Ildefonso Pueblo who refer to it in their oral histories and songs. They are invited for annual visits to Nake'muu to personally view the ruins and consult on the long-term status of the site and possible stabilization options.

In maintaining institutional compliance with NEPA, the ESH-20 Cultural Resources Team, as part of the DARHT MAP, is monitoring the effects of DARHT operations on the standing-walled masonry at Nake'muu. In a 1997 baseline assessment, the Mesa Verde Architectural Team suggested that the ambient environment posed the greatest threat to the pueblo. This suggestion is primarily based on condition assessment and the observation that rainfall and snowmelt have eroded adobe mortar, rendering many of the walls unstable. The four-year monitoring program (1998–2001) indicates that on the average about 1.3% of the chinking stones and 0.6% of the masonry blocks are falling out of the walls on an annual basis. Two test shots were fired at the DARHT facility to evaluate electronic monitoring equipment at Nake'muu. Accelerometers were placed on two walls at Nake'muu to record the events. After integrating the records, we found a peak displacement of 0.04 mm. Therefore, the walls only moved a maximum distance of 40 m during the test. Future studies will evaluate whether the daily heating and cooling of the standing walls can produce a similar amount of wall movement. In summary, the preliminary results of this four-year study indicate some minor changes in the standing-walled masonry at Nake'muu; however, a long-term database must be established to provide the basis for a more meaningful interpretation of monitoring program results. See Vierra et al. (2002) for more information on this project.

Traditional Cultural Properties Consultation Comprehensive Plan. In 2001, the Cultural Resources Team assisted DOE/LAAO in implementing the Traditional Cultural Properties Consultation Comprehensive Plan. This plan provides the framework to open government-to-government consultations between DOE/LAAO and interested Native American tribal organizations on identifying, protecting, and gaining access to traditional cultural properties and maintaining confidentiality of sensitive information. Representatives from Cochiti, Jemez, Santa Clara and San Ildefonso Pueblos attended initial consultation meetings. Twenty-one additional tribes in the Southwestern United States received invitations to participate in the Traditional Cultural Properties consultation process.

Land Conveyance and Transfer. Public Law 105-119, November 1997, directs DOE to convey and transfer parcels of DOE land in the vicinity of the Laboratory to the County of Los Alamos, New Mexico, and to the Secretary of the Interior, in trust for the San Ildefonso Pueblo. In support of this effort, the Cultural Resources Team conducted historic property inventories and evaluations, as required under Section 106 of the National Historic Preservation Act, in preparation for the eventual transfer of lands out of federal ownership. This effort has included the archaeological survey of 4,700 acres of Laboratory lands and the inventory and evaluation of 47 buildings and structures located on the transfer parcels. In 2001, the Cultural Resources Team developed a draft Programmatic Agreement in consultation with the Advisory Council on Historic Preservation and the New Mexico State Historic Preservation Officer. The draft Programmatic Agreement will be distributed in the spring of 2002 to Los Alamos County, the Pueblo of San Ildefonso, and the interested public for comment. Implementation of the Programmatic Agreement will begin in the summer of 2002.

Cerro Grande Fire Recovery. The Cultural Resources Team is conducting fire damage assessments of approximately 7,500 acres of LANL property burned during the May 2000 Cerro Grande fire. It is estimated that team personnel will visit 519 historic properties during the ongoing assessment activities. The assessments include photography, evaluation of fire impacts, global positioning system (GPS) recording of site locations, site rehabilitation, and long-term monitoring. Preliminary results of the first phase of assessments indicate that the fire damaged the Homestead Period wooden structures most severely, completely destroying a number of homestead cabins. Reassessments of National Register of Historic Places eligibility will be required at these sites.

14. Biological Resources including Floodplain and Wetland Protection

a. Introduction. The DOE and the Laboratory comply with the Endangered Species Act; the Migratory Bird Treaty Act; the Bald Eagle Protection Act; Presidential Executive Order 11988, Floodplain Management; Presidential Executive Order 11990, Protection of Wetlands; and Section 404 of the Clean Water Act. The Laboratory also protects plant and animal species listed by the New Mexico Conservation Act and the New Mexico Endangered Species Act.

b. Compliance Activities. During 2001, the ESH-20 Biology Team reviewed 378 proposed Laboratory activities and projects for potential impact on biological resources, including federally listed threatened and endangered (T&E) species. These reviews evaluate the amount of previous development or disturbance at the site, determine the presence of wetlands or floodplains in the project area, and determine whether habitat evaluations or species-specific surveys are needed. Of the 378 reviews, the Biology Team identified 75 projects that required habitat evaluation surveys to assess whether the appropriate habitat types and parameters were present to support any threatened or endangered species; of those, 35 were identified as having floodplains or wetlands issues. As part of the standard surveys associated with the Threatened and Endangered Species Habitat Management Plan (HMP), the Biology Team conducted approximately 30 species-specific surveys to determine the presence or absence of a threatened or endangered species at LANL. The Laboratory adhered to protocols set by the US Fish and Wildlife Service and to permit requirements of the New Mexico State Game and Fish Department.

c. Biological Resource Compliance Documents. In 2001, the Biology Team prepared 20 biological resource documents, such as biological assessments, biological evaluations, floodplains and wetlands assessments, and other compliance documents. These documents included, among others, a biological assessment of the conveyance and transfer of land tracts (Haarmann and Loftin 2001) and a floodplains and wetlands assessment for the potential effects of the Wildfire Hazard Reduction Plan (Marsh 2001). DOE determined that these projects may affect, but are not likely to adversely affect, individuals of threatened and endangered species or their critical habitat; the US Fish and Wildlife Service concurred with these determinations. The Biology Team contributed to the continued implementation of the Threatened And Endangered Species Habitat Management Plan (LANL 1998b). Site plans were successfully used to further evaluate and manage the threatened and endangered species occupying DOE/Laboratory property.

d. Effects of the Cerro Grande Fire. During 2001, the continuing effects of the Cerro Grande fire of 2000 had the greatest impact to ecological resources. During 2001, we began modifying the HMP to reflect post-fire habitat changes. The Laboratory completed several contaminant studies and continued risk assessment studies on the food chain for threatened and endangered species habituating Laboratory lands, including potential impacts from the fire. Studies continued also on soils, vegetation, and erosion. Fire mitigation measures were undertaken as well in projects such as the Wildfire Hazard Reduction Project that ESH-20 oversaw.

C. Current Issues and Actions

1. Compliance Agreements

a. New Mexico Hazardous Waste Management Regulations Compliance Orders. On June 25, 1998, the Laboratory received CO-98-02 that alleged two violations of the NM Hazardous Waste Management Regulations for the storage of gas cylinders at TA-21. NMED proposed civil penalties of over $950,000. The Laboratory filed its answer to the CO on August 10, 1998, meeting the compliance schedule by demonstrating that all gas cylinders had been disposed of properly. Efforts to resolve this CO continued during 2001.

On December 21, 1999, the Laboratory received CO-99-03. It covered the alleged deficiencies the NMED Hazardous and Radioactive Materials Bureau discovered during a five-month inspection that took place in 1997. The inspection was called “wall-to-wall” because NMED personnel walked every space at the Laboratory—storage areas, laboratories, hallways, stairwells, and the areas around buildings—looking for improperly stored hazardous chemicals. In past inspections, only designated storage areas were included. Twenty-nine deficiencies were alleged with over $1 million in proposed penalties. The Laboratory prepared and submitted its response to the CO and requested a hearing during 2000. Negotiations continued during 2001.

The Laboratory received CO-99-01 on December 28, 1999, in response to the NMED inspection conducted between August 10 and September 18, 1998. The inspection team visited approximately 544 sites at the Laboratory. Thirty violations were alleged in the CO. Total penalties proposed were almost $850,000. The Laboratory prepared and submitted its response to the CO and requested a hearing during 2000. Negotiations to resolve this CO are expected to begin in 2002.

b. Notice of Violation. The NMED issued an NOV to UC and DOE on October 9, 2001, as a result of the 2001 RCRA hazardous waste compliance inspection (April 23 to the end of August 2001). The NOV identified 18 categories of violations, each with one or more instances of alleged noncompliance. The types of issues described ranged from waste determinations, generator’s control of waste, exceeding waste storage time, incompatible chemical storage, training, emergency response, waste manifesting, mixed waste management under the site treatment plan, waste piles, and prevention of releases. UC/DOE's response to the NOV is due to NMED on February 4, 2002.

D. Consent Decree

1. Clean Air Act Consent Decree/Settlement Agreement

During 1997, DOE and the Laboratory Director entered into a Consent Decree and a Settlement Agreement to resolve a lawsuit that the Concerned Citizens for Nuclear Safety filed. The lawsuit, filed in 1994, alleged that the Laboratory was not in full compliance with the CAA Radionuclide NESHAP, 40 CFR 61, Subpart H. The decree and agreement require actions that will continue through 2002 and, depending upon the results of the independent audits, may continue through 2004. All of the provisions of the decree and agreement were met during 2001 and are described in detail at *http://www.air-quality.lanl.gov/ConsentDecree.htm* on the World Wide Web.

E. Significant Accomplishments

1. Follow-Up to the Cerro Grande Fire

Following the Cerro Grande fire, the Laboratory's Emergency Rehabilitation Team (ERT) completed initial assessments and land rehabilitation treatments. The rehabilitation effort on LANL property lasted for approximately 10 weeks. Crews treated approximately 1600 acres using methods much like those used by the Cerro Grande fire Burned Area Emergency Rehabilitation (BAER) team.

To determine the success of the treatments applied, LANL has developed the Burned Area Rehabilitation Treatment (BART) system. BART is a Geographic Information System (GIS)-based tracking and monitoring system designed to identify and generate reports of additional work needed in the treatment units based on field assessments. Field crews collect information on the fire recovery process by documenting recovery on BART field forms and photo points. Comparison of pictures of the same site, over time, will provide visual evidence of vegetation changes and site recovery.

Two rounds of field assessments, implementing the BART field forms, were conducted in 2001. The first inspections began in May 2001 and were completed by June 10, 2001. The crews filled out field forms and established photo points at each treatment areas. The information collected was entered into the BART database. The second assessment occurred in December, although conditions were not ideal for observations because of snow in some units.

In general, the rehabilitation units are in good to excellent condition. In most of the units, the seeded vegetation is established and providing ground cover. Very few wattles were damaged. Most damage was due to poor installation, animals tearing apart the wattles to get to the straw, and blowouts in some of the channel placements. A high percentage of the wattles contained sediment; however, because the ground cover and vegetative growth were excellent, the sediment-filled wattles did not cause great concern. The crews observed very little evidence of down-cutting below wattles or rill erosion on the slopes. Most of the mulch has been incorporated with the vegetation; however, in some areas the mulch has been blown away by high winds. In general, the rehabilitation treatments have stabilized the exposed soil in the rehabilitation units.

Restoration activities conducted last year were successful in establishing ground cover on areas burned by the Cerro Grande fire. Table 2-15 details the results of the BART survey in 2001. Vegetative cover conditions improved from June to December. The 2001 monsoon season was relatively short-lived and did not produce significant storms over the burn units on the LANL site. Effective ground cover decreased from June to December (although snow and late season conditions may have influenced the surveyor's estimations). We will continue to use the BART system to track the recovery of and monitor the rehabilitation units over the next few years. We will maintain existing treatments and apply additional treatments, as needed.

F. Significant Events

1. Effect of the Events of September 11

Because of heightened security awareness after the terrorist attack on the United States, DOE and the Laboratory examined the material available on the Laboratory's World Wide Web sites and moved some information behind the Laboratory's firewall. At this time, the EIS, the ESR, and certain other documents may not be available online to the general public.

Table 2.15. BART Survey Results for 2001

BART Survey	Vegetative Cover (%)[a]	Effective Ground Cover (%)[b]
June 2001[c]	36.7	62.1
December 2001[d]	45.2	56.7

[a]Vegetative cover is new and existing plant growth.
[b]Effective groundcover includes vegetative cover plus nonliving litter, mulch, needlecast, and deadfall.
[c]39 units inspected.
[d]37 units inspected.

G. Awards

1. Achievement Awards

a. DOE. Members of the ESH-18 NPDES team won a 2001 DOE Albuquerque Operations Performance Excellence Award for the Laboratory's NPDES permit application.

b. Los Alamos Achievement. A member of ESH-19 received a Los Alamos Achievement Award for her outstanding accomplishments facilitating the treatment and disposal of 300 containers of potentially explosive reactive materials, which enabled the Laboratory to meet its commitment to DOE to evaluate both the policy on the shelf-life of such chemicals and the hazard level of the chemical inventory.

2. Pollution Prevention Awards

a. DOE Pollution Prevention Awards. The Laboratory won two out of five nominations submitted for the Department of Energy Pollution Prevention (P2) Awards. The DOE P2 Awards Program rewards pollution prevention, recycling, and affirmative procurement activities completed or performed in fiscal year 2001. These awards are typically given out by the Secretary of Energy at a ceremony in Washington. The winners are as follows:

- Creating Jobs and Awareness through a Native American Recycling Center (*http://emeso.lanl.gov/eso_projects/p2_awards/DOE_P2/DOE_p2/NambeAward3Fweb1.pdf*)

  This innovative project addresses two problems facing northern New Mexico: high unemployment and poverty and increasing strains on waste management infrastructure. Nambé Pueblo, in partnership with the Laboratory and JCNNM, has stepped forward to help reduce waste and pollution, build community awareness, and create viable economic opportunities in the region. These partners have launched a recycling facility that provides jobs, services recycling needs of surrounding communities, redirects landfill waste and construction debris to alternative uses, and promotes education and outreach.

- Closing the Circle on One Problematic Nitrate Waste Stream at Los Alamos National Laboratory's Nuclear Materials Technology Division (*http://emeso.lanl.gov/eso_projects/p2_awards/DOE_P2/DOE_p2.nmt2_nomination1Web.pdf*).

  The Actinide Process Chemistry Group has closed the circle on one of the most problematic waste streams in the DOE complex: plutonium-contaminated nitric acid. The Nitric Acid Recovery System (NARS) at the Plutonium Processing and Handling Facility at TA-55 is a distillation process that recycles acid used for plutonium dissolution and recovery. NARS virtually eliminates this waste stream. NARS allows LANL to avoid discharges of TA-55-generated nitrates to the environment. NARS also recycles 100% of radioactivity back into the system, generating activity-free product water. The return on investment was 128% on a $2,000,000 capital cost.

Members of the NPDES team and Facility and Waste Operations (FWO) Waste Facility Management Unit teamed up for a 2001 DOE Pollution Prevention National Runner Up Award and a Certificate of Achievement, "Greening the Government" Award, White House Task Force on Recycling, for improvements in wastewater quality and pollution prevention at the TA-50 RLWTF.

b. Green Zia Awards. In 2001, seven Laboratory organizations and projects received recognition from the New Mexico Green Zia Environmental Excellence program for their noteworthy environmental performance in pollution prevention. The Environmental Science and Waste Technology (E), Human Resources, and Engineering Science and Applications divisions won Achievement Awards. Los Alamos' Business Operations and FWO divisions, Nuclear Materials Technology's PIT Disassembly and Surveillance Tech Group, and Aramark, the Laboratory's food service provider, won Commitment Awards. It is the second year in a row that E Division earned achievement-level recognition. Governor Gary Johnson and State Environment Department Secretary Peter Maggiore recognized the seven Laboratory organizations at a ceremony in La Cienega.

Recognition at the Commitment Level indicates that independent program examiners and judges believe the organization's management has made a strong commitment to pollution prevention and the organization is establishing a basic, systematic pollution prevention program. Recognition at the Achievement Level shows that examiners and judges believe the organization has developed its pollution prevention program into a prevention-based environmental management system and can demonstrate measurable results. The Environmental Stewardship Office (E-ESO) coordinates Green Zia activities at the Laboratory. The NMED sponsors the Green Zia program, and the New Mexico Environmental Alliance, a partnership of state, local, and federal agencies, academia, private industry, and environmental advocacy groups, administers it.

Descriptions of the award-winning efforts are available at *http://emeso.lanl.gov/eso_projects/green_zia/Successes/sucesses.html* on the World Wide Web.

c. Laboratory Pollution Prevention Awards. E-ESO presents these awards to organizations at the Laboratory to recognize the pollution prevention successes of individuals or teams that have minimized waste, conserved water or electricity, reduced air or water pollution, or procured products with recycled content. Award summaries are available at *http://emeso.lanl.gov/eso_projects/p2_awards/01P2.html* on the World Wide Web. Summaries of projects specific to environmental compliance and monitoring are presented below.

An ESH-19 employee received a Pollution Prevention Award for devising an analytical tool to accurately determine whether tritium is present in a waste sample to avoid mischaracterization of the waste.

Members of the ER Project took a proactive approach to categorizing clean waste and were able to prevent 2,400 y^3 of waste from going to a TSCA facility.

Members of ESH-18, working with a team from the TA-50 RLWTF, fine tuned a new treatment process that reduced the amount of both radioactive material and nitrates discharged by 94% from CY 1999. As a result, the facility had no violations of the New Mexico discharge standards, no violations of NPDES permit limits, and no exceedances of the DOE water quality standards. In addition, FWO personnel won an award for implementing water conservation measures for dissolution of the clarifier chemicals, lime, and ferric sulfate, saving 650,000 gal. of potable water each year.

Members of ESH-18, ESH-19 and JCNNM investigated the source of PBCs found in sewage sludge at the TA-46 SWS and discovered remnants of old PCB spills in sewer lines. The lines were cleaned, allowing safe disposal of 23.5 dry tons of sanitary treatment solids as non-TSCA regulated waste.

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3. Environmental Radiological Dose Assessment

contributing authors:

Michael McNaughton, Keith Jacobson, and Lars Soholt

Abstract

We calculated potential radiological doses to members of the public who may be exposed to Los Alamos National Laboratory (LANL or the Laboratory) operations. The population within 80 km of LANL received a collective dose of 1.6 person-rem, which is consistent with previous years. The calculated maximum off-site radiation dose to a member of the public from Laboratory sources was at East Gate and was 1.9 mrem. The calculated maximum on-site individual exposure to a member of the public is 4.2 mrem, which compares with 13 mrem in 2000. No health effects would be expected from these doses. We also concluded that there was no significant dose related to LANL activities from ingesting locally gathered food and water in Los Alamos or White Rock. Similarly, dose assessments of the aftermath of the Cerro Grande fire demonstrated that no significant doses could be attributed to the fire. Doses to nonhuman biota in the LANL area are well below the Department of Energy's interim standards for the protection of biota.

To Read About . . . **Turn to Page . . .**

A. Overview of Radiological Dose Equivalents

Radiological dose equivalents presented here are calculated doses received by individuals exposed to radiation or radioactive material. The "effective dose equivalent" (EDE), referred to here as "dose," has been calculated using "radiation weighting factors" and "tissue weighting factors" to adjust for the effects of the various types of radiation on the various tissues in the body. The final result, measured in mrem, is a measure of the overall risk to an individual, whether from external radiation or contact with radioactive material. For example, 1 mrem of gamma radiation is effectively equivalent to 1 mrem from inhalation of plutonium.

Federal government standards limit the dose that the public may receive from Los Alamos National Laboratory (LANL or the Laboratory) operations. The Department of Energy (DOE 1993) public dose limit to any individual is 100 mrem per year received from all pathways (i.e., all ways in which people can be exposed to radiation, such as inhalation, ingestion, and direct radiation). The dose standard of the Environmental Protection Agency (EPA), which is codified in the Code of Regulations (40 CFR 61: EPA 1986), further restricts the dose received from airborne emissions of radionuclides to 10 mrem per year. These doses are in addition to exposures from natural background, consumer products, and medical sources. Doses from public water supplies are also limited according to the Safe Drinking Water Act, either by established maximum contaminant levels for some radionuclides or by dose (4 mrem/year for man-made radionuclides, beta/photon emitters) (EPA 2000); see Appendix A.

B. Public Dose Calculations

1. Scope

The objective of our dose calculations is to report incremental (above-background) doses caused by LANL operations. Therefore, we do not include dose contributions from radionuclides present in our natural environment or from radioactive fallout unless we identify LANL as the source for these radionuclides. Annual radiation doses to the public are evaluated for three principal exposure pathways: inhalation, ingestion, and direct (or external) radiation. We calculate doses for the following cases:

(1) *the entire population within 80 km of the Laboratory;*

(2) *the maximally exposed individual (MEI) who is not on LANL/DOE property (referred to as the off-site MEI);*

(3) *the on-site MEI, defined as a member of the public who is on LANL/DOE property, such as Pajarito Road;*

(4) *residences in Los Alamos and White Rock; and*

(5) *residences adjacent to Acid Canyon.*

2. General Considerations

We use the standard methods recommended by federal agencies to determine radiation doses (DOE 1988a, 1988b, 1991; EPA 1988, 1993, 1997; and NRC 1977). We begin with measurements and extend these with calculations using standard models and methods that are used worldwide.

a. Direct Radiation Exposure. Direct radiation from gammas or neutrons is measured at more than 100 locations near LANL (Chapter 4, Sections C and H). Doses above natural background are observed near Technical Area (TA) -3, TA-18, TA-53, and TA-54.

To receive a measurable dose, a member of the public must be within a few hundred meters of the source, e.g., on Pajarito Road. At distances more than 1 km, the inverse-square law combined with scattering and attenuation in the air reduces the dose to much less than 0.1 mrem per year, which cannot be distinguished from natural background radiation. In practice, the only significant doses from direct radiation are on Pajarito Road, either from TA-3-130 or from TA-18. Operations at TA-3-130 ceased when this facility closed in July 2001, so the largest dose to a member of the public this year was from TA-18 to a person on Pajarito Road (Section C.3. of this chapter).

To estimate the dose to the public, we combine the measurements of gamma and neutron dose with an occupancy factor. We follow standard guidance and assume continuous occupancy (i.e., 24 hours per day and 365 days per year) for residences and places of business. For locations such as Pajarito Road, where exposure is periodic, we multiply the measured dose by an occupancy factor of 1/16 (NCRP 1976.)

b. Airborne Radioactivity (Inhalation Pathway). At distances more than a few hundred meters from LANL sources, the dose to the public is almost entirely from airborne radioactive material. Whenever possible, we use the direct measurements of airborne radioactivity concentrations measured by AIRNET and reported in Chapter 4, Section A. All of these measurements result in an annual dose to a member of the public that is less than 0.1 mrem. Where local concentrations are too small to measure, we calculate the doses using the standard model, CAP88, that combines source-term information with meteorological data to estimate where the released radioactive material went.

AIRNET does not measure some of the nuclide emissions from the Los Alamos Neutron Science Center (LANSCE). These emissions are measured at the stacks (Chapter 4, Section B), and we use CAP88 to calculate the resulting doses (Chapter 3, Section C). Because the radioactive half-lives are short, these doses decrease steeply with distance; e.g., the annual dose is 1.4 mrem at East Gate 1 km to the north of LANSCE and is less than 0.01 mrem at a location in Los Alamos 5 km to the west-northwest.

c. Food (Ingestion Pathway). A food type is considered a potentially significant exposure pathway if it contains radioactive material that is detected above background concentrations. Chapter 6 reports the measurements of the radioactive content of foods, and Table 3-1 summarizes the resulting ingestion doses. These measurements of radioactive content in food include background radioactivity (including man-made radioisotopes in fallout).

The general process for calculating ingestion doses is to multiply the amount of each radionuclide in a food product by a dose conversion factor for that radionuclide (DOE 1988b). We collected and analyzed many different types of food products for their radionuclide content. Table 3-1 lists the doses from ingesting unit quantities of these foods, but we did not correct them for background or regional concentrations.

The dose from consuming a pound of elk or deer bone is similar to the amounts reported in previous years, less than 0.06 mrem. This dose is almost entirely from strontium-90, which is like calcium and so concentrates in bone. The amount of strontium-90 in animals collected near LANL is not statistically different from those collected far from LANL, which indicates that the strontium-90 is mostly attributable to global fallout and not to LANL.

The dose from consuming a pound of fish is less than 0.001 mrem and is also mostly from strontium-90. Because the fish downstream of LANL do not have significantly higher concentrations than fish upstream,

Table 3-1. Ingestion Doses from Foods Gathered or Grown in the Area during 2001

	Dose per Pound (mrem/lb)	2s[a] (mrem/lb)
Deer		
Regional	4.1E-4 muscle	3.8E-4
	4.0E-2 bone	1.4E-2
San Ildefonso Pueblo	1.09E-04 muscle	1.42E-04
	3.41E-02 bone	6.59E-03
Tesuque Pueblo	1.32E-04 muscle	1.92E-04
	2.46E-02 bone	4.70E-03
Elk		
Regional Background	5.12E-04 muscle	6.34E-04
	5.92E-02 bone	3.86E-02
Regional Background near LANL	6.13E-05 muscle	6.71E-04
	5.23E-02 bone	4.00E-02
Fish		
Game Fish Upstream	**6.00E-04**	2.90E-04
Game Fish Downstream	7.20E-04	4.60E-04
Nongame Fish Upstream	**9.10E-04**	3.30E-04
Nongame Fish Downstream	8.70E-04	4.40E-04
Prickly Pear		
Regional Background	2.69E-03	4.32E-03
Los Alamos	7.00E-03	4.07E-03
San Ildefonso	7.10E-03	4.74E-03
Produce		
Regional Background	2.40E-04	2.12E-04
On LANL	1.70E-04	2.89E-04
Los Alamos	5.02E-04	4.15E-04
White Rock	3.92E-04	6.63E-04
Cochiti	4.28E-04	5.15E-04
San Ildefonso	2.75E-04	2.78E-04

[a] This column is the two-standard-deviation (2s) uncertainty. Where the dose is greater than 2s, the dose is considered statistically significant with 95% confidence and is indicated by bold text.

the strontium-90 is mostly attributable to global fallout and not to LANL.

This year, local samples of prickly pear contained more strontium-90 than regional samples; however, last year's regional samples contained more than either regional or local samples collected this year. These fluctuations appear to be within statistical variability and do not point to LANL as the source of the strontium-90. The prickly pear samples also contain a small but measurable concentration of uranium, but the isotopic ratios are consistent with natural uranium. We conclude that the prickly pear data do not indicate a significant dose attributable to LANL.

The dose from consuming a pound of vegetable or fruit produce from Los Alamos is estimated as about 0.0005 mrem per pound (the statistical significance is marginal). Most of this dose is again from strontium-90, which is most likely from global fallout. Fallout is scavenged by rainfall and therefore tends to be higher in regions of higher rainfall. We conclude it is probably not attributable to LANL. Whatever the origin, the average resident of Los Alamos who consumes 30 pounds of local produce per year would receive an annual dose of 0.015 mrem from this produce.

In summary, we conclude that the LANL contribution to the food dose is too small to measure and is much less than 0.1 mrem per year.

d. Water (Ingestion Pathway). Kraig and Gladney (2001) collected 30 tap water samples: 10 from Los Alamos; 10 from White Rock; 3 from Santa Fe; 2 from Española; and one each from Chimayo, Dixon, El Rito, Jemez, and Pojoaque. Each sample was analyzed for tritium, strontium-90, cesium-137, uranium-234, uranium-235, uranium-238, plutonium-238, plutonium-239, and americium-241. For each radionuclide, the minimum detectable activity was sufficient to measure a potential dose less than 0.1 mrem per year.

At all locations and for all radionuclides except uranium, the doses were much less than 0.1 mrem per year. Natural uranium in the drinking water contributes a dose of about 0.1 mrem per year in Los Alamos County and somewhat more in Santa Fe and the Rio Grande valley.

In summary, we conclude that the LANL contribution to the drinking-water dose is too small to measure and is much less than 0.1 mrem per year.

e. Soil (Direct Exposure Pathway). We report measurements of radionuclide concentrations in surface soil in Chapter 6. These radionuclides in soil contribute to dose through the air pathway, which is evaluated in Section B.2.b; through ingestion of food, which is evaluated in Section B.2.c; and through gamma radiation, which is evaluated in Section B.2.a and is further evaluated here.

Almost all the gamma radiation from soils is from cesium-137, which contributes less than 1 mrem per year. The other radionuclides contribute much less than 0.1 mrem per year.

Cesium-137 is a product of global fallout from nuclear weapons tests and is found worldwide in concentrations similar to those reported in Chapter 6. Two publications, Fresquez et al., 1996, and Fresquez et al., 1998, conclude that the concentrations reported in Chapter 6 are the result of global fallout. Fallout is scavenged by rainfall, so the concentrations are higher in regions where the rainfall is higher; and, for this reason, the concentrations are higher in Los Alamos County than in the Rio Grande valley. In the *Environmental Surveillance Report* for 2000 (ESP 2001), we reported a 2000 dose of 0.14 mrem from radionuclides in soil, with a reported 1 standard deviation of 0.4 mrem. This dose was calculated in the past by subtracting regional soil concentrations from local soil concentrations and modeling the net difference using a modified residential scenario. The resulting dose was very conservative, statistically not significant, and does not contribute measurably to the annual dose to the MEI.

In summary, we conclude that the LANL contribution to dose from soil is too small to measure and is less than 0.1 mrem per year.

f. Release of Property. The Laboratory releases surplus items of property to the general public. Laboratory Implementation Requirement LIR-402-700-01.0, "Occupational Radiation Protection. Chapter 14, Part 3. Releasing Items," describes the requirements for release of such property. In keeping with the principle of maintaining radiation dose levels to "As Low As Reasonably Achievable," it is Laboratory policy to not release any property with residual radioactivity. Therefore, the general public receives no additional dose through the release of personal property for uncontrolled use by the general public.

C. Dose Calculations and Results

1. Population within 80 km

We used the local population distribution (Figure 3-1) to calculate the dose from Laboratory operations

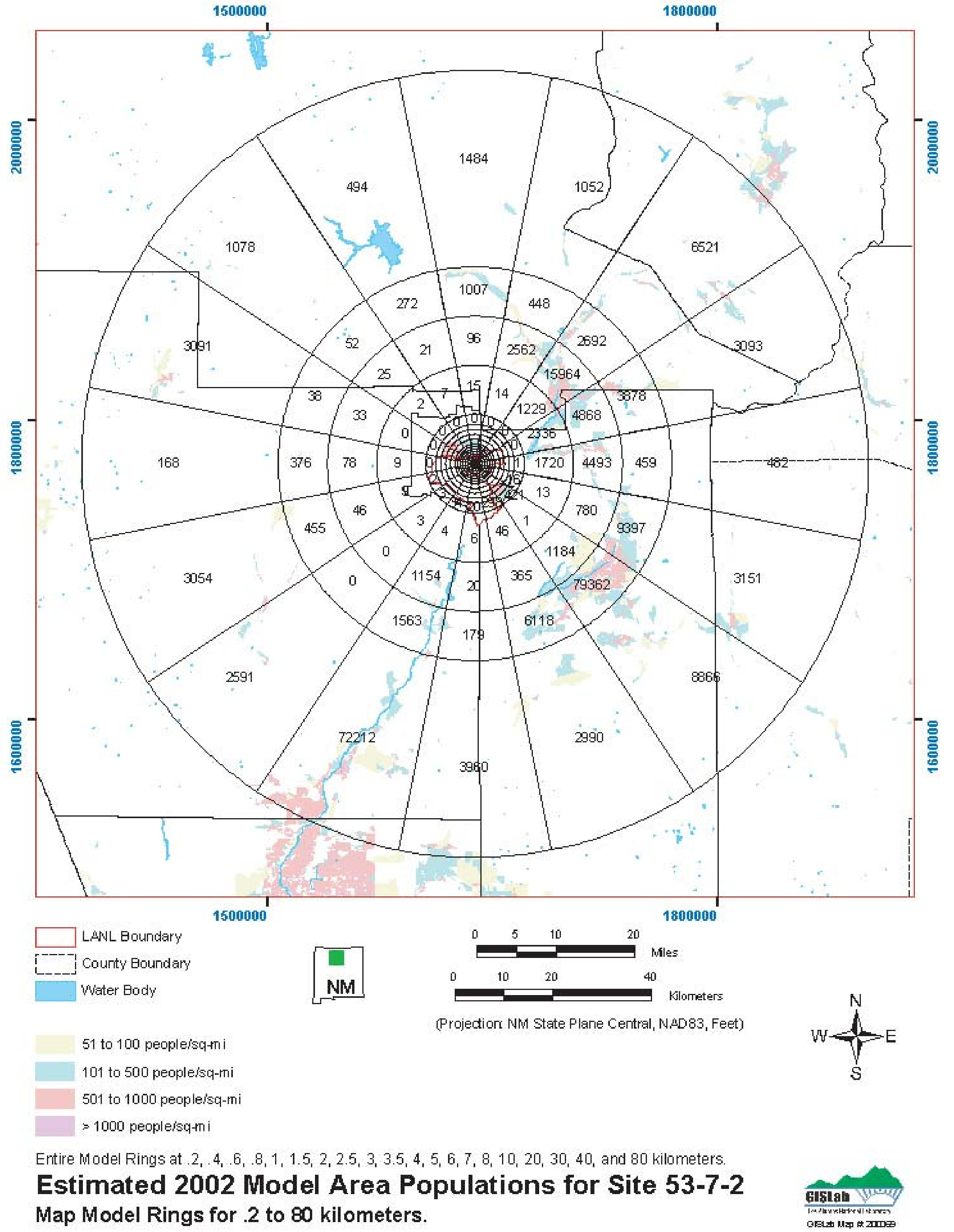

Figure 3-1. Estimated population around Los Alamos National Laboratory.

during 2001 to the population within 80 km (50 miles) of LANL. Approximately 277,000 persons live within an 80-km radius of the Laboratory. We used county population estimates provided by the University of New Mexico Bureau of Business and Economic Research (BBER). These statistics are available at *http://www.unm.edu/~bber/*.

The collective dose from Laboratory operations is the sum of the estimated doses for each member of the public within an 80-km radius of LANL; for example, if two persons each receive 3 mrem, the collective dose is 6 person-mrem. This dose results from airborne radioactive emissions; other potential sources, such as direct radiation, are essentially zero. We calculated the collective dose by modeling the transport of radioactive air emissions using CAP88, an atmospheric dispersion and dose calculation computer code.

The 2001 collective population dose attributable to Laboratory operations to persons living within 80 km of the Laboratory was 1.6 person-rem, which compares with 1 person-rem reported for 2000. This increased dose resulted from increased stack releases as described in Chapter 4, Section B. Tritium increased because of decommissioning TA-33 and TA-41 and also because of an unplanned tritium release from the Weapons Engineering Tritium Facility (WETF) on January 31, 2001. Also, LANSCE emissions increased because of changes to the 1L-target water-cooling system. Tritium contributed about 73% of the dose; short-lived air activation products such as carbon-11, nitrogen-13, and oxygen-15 from LANSCE contributed about 26%; and plutonium, uranium, and americium contributed less than 1%.

No observable health effect is expected from these doses.

2. Off-Site MEI

The off-site MEI is a hypothetical member of the public who, while not on DOE/LANL property, received the greatest dose from LANL operations. The location of the off-site MEI was at East Gate along State Road 502 entering the east side of Los Alamos County. East Gate is normally the location of greatest exposure because of its proximity to LANSCE. During LANSCE operations, short-lived positron emitters such as carbon-11, nitrogen-13, and oxygen-15 are released from the stacks and diffuse from the buildings. These emitters release photon radiation as they decay, producing a potential radiation dose.

As discussed in Chapter 4, Section B, the LANSCE stack emissions were larger this year as a result of changes to the 1L-target water-cooling system. Therefore, the MEI dose was 1.9 mrem this year compared with 0.64 mrem in 2000.

We modeled the dose from LANSCE and from the LANL stacks using CAP88. The CAP88-modeled doses were 1.4 mrem from the LANSCE stack, 0.1 mrem from LANSCE diffuse emissions, 0.1 mrem from the tritium stacks, and 0.2 mrem from other LANL stacks. To this total, we add 0.1 mrem from the radionuclides measured at the AIRNET station, although this is primarily from tritium, which has already been accounted for in the CAP88 model (Jacobson 2002).

The total annual dose, 1.9 mrem, is far below the applicable standards, and we conclude it causes no observable health effects.

3. On-Site MEI

The on-site MEI is a member of the public on Pajarito Road who passes LANL TA-18. Dosimeters that are sensitive to neutron and photon radiation are located on Pajarito Road. We collected data continuously throughout 2001 (Chapter 4, Section C), and these data allow us to calculate doses that might have been received by members of the public. After subtracting the dose from natural background, the total dose (during 24 hours a day and 365 days a year) was 67 mrem. Following the guidance of the National Council on Radiation Protection and Measurements (NCRP 1976), we multiplied this total by 1/16 to account for occupancy (an occupancy factor of 1/16 corresponds to an average of half an hour of exposure every 8-hour workday). This calculation yields a maximum dose of 4.2 mrem to a member of the public during 2001.

We report this dose as a conservative upper bound of the doses that people passing near this facility frequently might have received. All other pathways, including CAP88 calculations for the air pathway, add less than 0.1 mrem to the calculated dose. This dose is about 4% of the DOE public all-pathway dose limit of 100 mrem.

4. Doses in Los Alamos and White Rock

In this section, we discuss the doses to residents in Los Alamos and White Rock. We used the AIRNET data (reported in Chapter 4, Section A) to calculate the average air concentrations for the 21 perimeter stations near Los Alamos and White Rock and subtracted the average of the concentrations at the 4 regional stations.

These concentrations were converted to doses using the factors in DOE 1988b, assuming a breathing rate of 1 m3/hr, and continuous occupancy. To these doses, we added the contributions from LANSCE, calculated using CAP88 for two representative locations: 5 km west-northwest of LANSCE in Los Alamos and 6.8 km southeast of LANSCE in White Rock.

a. Los Alamos. During 2001, the contributions to the dose at an average Los Alamos residence were 0.006 mrem from LANSCE, 0.005 mrem from plutonium, 0.003 mrem from americium, and 0.003 mrem from tritium; these add to 0.017 mrem. All other nuclides contribute less than 0.001 mrem.

b. White Rock. During 2001, the contributions to the dose at an average White Rock residence were 0.009 mrem from LANSCE, 0.001 mrem from plutonium, 0.001 mrem from americium, and 0.002 mrem from tritium; these add to 0.013 mrem. All other nuclides contribute less than 0.001 mrem.

See Section B.2 in this chapter for a discussion of the contributions from direct radiation, food, water, and soil; each was too small to measure and less than 0.1 mrem. Therefore, the total annual dose from all pathways was much less than 0.4 mrem.

5. Acid Canyon

The south fork of Acid Canyon was remediated from September 12 through November 9, 2001. Both the DOE Oversight Bureau of the New Mexico Environment Department (NMED) and the contractor, Washington Group International Inc. (WGII), collected air samples during the remediation activities. From these results, we calculate the dose at the nearest residence, 170 m north of the work site.

NMED measured 3.6E-14 Ci/m^3 of transuranics (primarily plutonium-239) at a location within the roped-off work site and about 10 m north of the main work activities. This measurement was made during two workweeks of 40 hours each. We take this as the concentration for the full 336 work hours and calculated 8.7E-15 Ci/m^3 averaged over the 1392 hours from September 12 to November 9. Also, WGII measured the following transuranic concentrations averaged over 1392 hours: 2.4E-15 Ci/m^3 at 20 m, 3.3E-14 Ci/m^3 at 5 m, and 6.9E-14 Ci/m^3 at 3 m. These concentrations are more than two orders of magnitude below the occupational standard of 6E-12 Ci/m^3 for class-Y transuranics.

These four concentrations are proportional to $x^{-1.8}$, where x is the average distance from the work activities to the air sampler. This model corresponds to the prediction by the CAP88 atmospheric-dispersion program for class-C atmospheric stability. This model predicted that the average concentration at the nearest residence was 5E-17 Ci/m^3. The estimate is conservative because it applies to smooth and flat terrain, whereas the trees and canyon walls reduce the concentration. For comparison, the CALPUFF program calculated an average concentration of 2.5E-17 Ci/m^3 at the residence.

These concentrations are well below the EPA standard of 2E-15 Ci/m^3. The dose to a member of the public who breathes 5E-17 Ci/m^3 of transuranics for 1392 hours is 0.04 mrem, which is well below the 10-mrem dose limit allowed by EPA regulations.

6. Potential Dose Implications in the Aftermath of the Cerro Grande Fire

The burning of many acres of trees and ground cover during the Cerro Grande fire created the possibility of enhanced flooding in the canyons draining the east-facing side of the Jemez Mountains. Several of these watersheds (Los Alamos, Mortandad, and to a lesser extent Pajarito) have residual contamination from LANL operations. However, during the past 50 years or so, radioactive fallout (from worldwide uses of radioactive materials) has accumulated in soils, vegetation, and duff and represents a much larger source term available for mobilization by rainfall and/or flooding.

Our analysis considers two principal exposure scenarios: (1) to a resident who may have lived near contaminated sediments transported by and deposited from post-Cerro Grande runoff and (2) to individuals who may have been exposed to or used Rio Grande water contaminated by runoff events.

a. Exposure Assessment for Lower Los Alamos Canyon. During late 2001, rainstorms caused runoff throughout the Los Alamos Canyon watershed, in particular in Pueblo Canyon on July 2. After that event, we collected samples from locations in the reach near Totavi from layers representing a variety of sediment sizes within the deposits to determine if radionuclide distributions had changed from the previous year. We compared post-fire and flooding 2000 and 2001 data from Totavi with those from a pre-fire reference site immediately upstream from Totavi and with background soils and sediment data from many areas believed to be independent of LANL impacts.

Our analysis of the 2001 data indicated that cesium-137 and americium-241 were the only radionuclides seen in the Totavi area that were above background and pre-fire concentrations. Therefore, we considered only these radionuclides in the radiological dose assessment of potential Cerro Grande impacts at Totavi. The average cesium-137 concentration near Totavi of was about 0.56 pCi/g above the pre-fire concentrations. Americium-241 occurred at 0.014 pCi/g above pre-fire concentrations.

Our scenario involves children playing in the stream area among potentially contaminated sediments (ESP 2001; Kraig et al., 2002). The children are assumed to spend 4.4 hours each day (EPA 1997, Table 5-4) in an area extending 300 meters along the stream with the floodplains and banks 5 meters on each side (10 m wide). Based on our observations of deposited ash, only about 600 m^2 of this 3,000-m^2 exposure unit contained contaminated sediments from the post-fire deposition. The scenario is presented according to the various exposure pathways that could have been significant.

Inhalation Pathway

While playing, the hypothetical children breathe at a rate of 1.9 m^3 per hour. This rate is an average respiration level for children doing heavy activities (EPA 1997, Table 5-23). The dust in the air they breathe is assumed to come from the local (10-m 300-m) area and does not mix with air outside the 3,000-m^2 area. For our calculations, we assumed 100 g/m^3, a value that we consider represents an upper limit. By multiplying the concentration of a contaminant in soil by the fraction of the area that was contaminated and the dust-loading value, we calculated the concentration in air of that contaminant.

After we calculate the air concentration for each radionuclide, we can calculate the inhalation dose associated with that radionuclide. We multiply the air concentration by the amount of air breathed, the exposure frequency (4.4 h/day), exposure duration (365 days), and then by an inhalation dose conversion factor (DOE 1988b) that tells how much dose is received for each intake of radioactive material.

Soil Ingestion Pathway

An ingestion rate of 200 mg/day (EPA 1997) is assumed. This rate is an upper estimate of the daily soil ingestion rate in that it assumes that all of the soil the children ingested daily came from the stream area. Dose is then calculated as the product of the soil concentration, fraction of the area that is contaminated, fraction of time spent in the exposure area (4.4 h/d 24h/d), and ingestion dose conversion factors (DOE 1988b).

Direct Exposure Pathway

To calculate the exposure potential for this pathway, a RESRAD (Yu et al., 2001) run was performed. For the run, only the direct exposure pathway was used. The contamination was assumed to be 9 cm deep spread over a fraction (0.2) of the surface of a 3,000-m^2 circular area. We assumed the area to be circular, even though it is actually rectangular, because this maximizes the calculated direct exposure. A person is assumed to be in the area for 4.4 hours per day (EPA 1997, Table 5-4), unshielded from the radiation.

Dose Assessment for Lower Los Alamos Canyon

Table 3-2 presents the calculated radiological doses from the three exposure pathways. Because the concentration that would cause these dose increments persisted from 2000 into 2001, this year we calculated doses received on an annual basis. In both years, the calculated dose of 0.05 was negligible compared with dose limits established in DOE Order 5400.5.

These figures represent total effects from the Cerro Grande fire and include an increment from LANL-related contamination that cannot be measured.

b. Exposure Assessment for Rio Grande Water Users. This assessment parallels the evaluation of the 2000 post-fire data as described in ESP (2001) and Kraig et al. (2002).

To determine concentrations in the Rio Grande, we identified the data with the smallest differences between flow in the Rio Grande and canyons crossing

Table 3-2. Lower Los Alamos Canyon Annual Dose (mrem)

Exposure Pathway	2000	2001
Inhalation	0.000001	0.0004
Ingestion	0.0005	0.0012
Direct Penetrating Radiation	0.06	0.05
Total	0.06	0.05

LANL, used the ratio of the flows to calculate a minimum dilution factor, and multiplied the dilution factor times the maximum measured concentrations in storm water. The smallest difference in flows occurred on July 2, resulting in calculated dilution factors of 3.5.

Table 3-3 lists the maximum detected concentrations for these LANL canyon stations. Predicted maximums are reported for Guaje and LANL Canyons. Guaje Canyon is included here as a possible reference canyon to help interpret whether risks were strictly fire-related or had a possible LANL contribution. Guaje Canyon is far enough from LANL that sediment concentrations there do not show effects of LANL operations with the possible exception of plutonium-239 (Kraig et al., 2002).

Average and peak concentrations in unfiltered runoff leaving LANL in 2000 and 2001 were significantly greater than pre-fire levels for nearly every analyte during the months of June and July. The peak concentrations of these radionuclides increased by factors of about 2 (see Chapter 5).

c. Irrigation Scenario. Downstream from Cochiti Reservoir, people make considerable use of irrigation water that could have been contaminated by runoff since the Cerro Grande fire. Irrigation water drawn from the river during runoff events and spread on crop fields, fruit trees, or pasture may represent an exposure pathway to animals and eventually to humans.

ESP (2001) and Kraig et al. (2002) describe the input values for this scenario.

Assuming that the source of the flood runoff was LANL-affected canyons, we calculated the dose per irrigation event to be 0.1 mrem, approximately the same amount as last year. The dose from non-LANL-affected canyons was 0.09 mrem, about half of last year's estimate.

d. Drinking Water from, Swimming in, or Fishing in the Rio Grande. Assuming someone drank unfiltered water from the Rio Grande during the runoff with the highest radionuclide concentrations (Table 3-3), the calculated dose was 0.1 mrem per liter consumed from potential LANL-affected canyons and <0.01 mrem from canyons not affected by LANL operations. The largest dose contributor in either case would be plutonium-239, which had a higher concentration in 2001 runoff samples than in the 2000 samples.

If someone swam in the Rio Grande during the time of highest radionuclide concentration, his or her dose (based on input from canyons potentially affected by LANL) was calculated to be much less than 0.001 mrem/h as were calculations based on floodwater concentrations from non-Laboratory-affected canyons. Essentially all of this dose resulted from direct exposure to cesium-137.

We collected fish from Cochiti reservoir in 2000 and 2001 (after the fire) and compared their radionu-

Table 3-3. Rio Grande Runoff Comparison of 2001 Predicted Peak Concentrations in Unfiltered Water in Rio Grande Runoff

	LANL Pre-Fire Measurements[a,b]		2001 Post-Fire Predicted Maximums[b]		USGS 2001 Measurements
Analyte	Mean	Max	Guaje Canyon	LANL Canyons	Maximum
^{241}Am	0.014	0.05	0.3	1.6	0.3
^{137}Cs	1	1.1	2.9	5.1	NA[c]
^{238}Pu	–0.0002	0.02	0.2	0.2	0.02
$^{239,240}Pu$	0.02	0.15	1.1	25	0.04
^{90}Sr	1	9	6.9	5.7	7.4

[a] These are summaries of measurements of the Rio Grande at the Frijoles inlet for the years 1993–1999.
[b] All units are pCi/L.
[c] NA = not applicable.

clide contents with fish collected before the fire (1999). This comparison of radionuclide concentrations in fish collected before and after the fire shows that mean radionuclide concentrations in fish collected after the fire were statistically indistinguishable ($p < 0.05$) or lower than radionuclide concentrations in fish collected before the fire in 1999. Therefore, fish collected and eaten from the Rio Grande or Cochiti Reservoir during year 2001 would not have caused a fire-related dose increment.

e. Cattle Watering Scenario. Livestock watered in the Rio Grande after it was affected by storm water runoff. If these cattle drank contaminated water from the Rio Grande, their consumption by humans could result in a radiation dose. We can calculate this dose by evaluating the amount of radionuclides that the cattle consumed, how much of the radionuclides that were consumed ended up in the cattle tissues, and how much of these radionuclides would be passed to humans if they consumed the cattle (ESP 2001; Kraig et al., 2002). The dose calculations, for which some of the parameters are shown in Table 3-4, indicate that the potential LANL dose contribution from eating meat from cattle that have watered in the Rio Grande is less than 0.01 mrem.

f. Dose Summary and Perspective. The doses reported above for lower Los Alamos Canyon and for Rio Grande exposures were small for years 2000 and 2001. It is possible that the hypothetical individuals exposed at Totavi may also have been exposed to some of the additional pathways described for the Rio Grande. If individuals were exposed to these various pathways, they can calculate their total dose from all pathways by adding the doses from the applicable exposure scenarios presented above. Future conditions and potential exposures will continue to be under evaluation and will be described as they are calculated.

To put some perspective on these doses, a person travelling on a two-hour flight in a jet airliner would receive approximately 1 mrem, and people living in the Los Alamos area receive about 360 mrem from natural sources each year. No health effects are expected from the short-term increase in radioactivity associated with the Cerro Grande fire.

D. Estimation of Radiation Dose Equivalents for Naturally Occurring Radiation

This section discusses the LANL contribution relative to natural radiation and radioactive materials in the environment (NCRP 1975, 1987a, 1987b).

External radiation comes from two sources that are approximately equal: cosmic radiation from space and terrestrial gamma radiation from radionuclides naturally in the environment. Doses from cosmic radiation range from 50 mrem per year at lower elevations near the Rio Grande to about 90 mrem per year in the mountains. Doses from terrestrial radiation range from about 50 to 150 mrem per year depending on the amounts of natural uranium, thorium, and potassium in the soil.

Table 3-4. Monthly Dose from Ingestion of Meat from Cattle that have Watered only in the Rio Grande and only while Runoff from LANL Canyons was Occurring

Radionuclide	Concentration in Rio Grande Water (pCi/L)	Transfer Factor (pCi/kg per pCi/day)[a]	Dose Conversion Factor (mrem/pCi)[b]	Effective Dose Equivalent (mrem)
^{90}Sr	5.7	3.0 E-04	0.00013	0.00005
^{137}Cs	5.1	2.0 E-02	0.00005	0.0012
^{238}Pu	0.2	5.0 E-07	0.0038	0.000000094
$^{239,240}Pu$	25	5.0 E-07	0.0043	0.000013
^{241}Am	1.6	3.5 E-06	0.0045	0.0000062
Total				0.0013

[a]Kennedy and Strenge 1992, p. 6.29.
[b]DOE 1988b.

The largest dose from radioactive material is from the inhalation of naturally occurring radon and its decay products, which contribute about 200 mrem per year. An additional 40 mrem per year results from naturally occurring radioactive materials in the body, primarily potassium-40, which is present in all food and in all living cells.

In addition, members of the US population receive an average dose of 50 mrem per year from medical and dental uses of radiation, 10 mrem per year from man-made products such as stone or adobe walls, and less than 1 mrem per year from global fallout from nuclear-weapons tests (NCRP 1987a). Therefore, the total annual dose from sources other than LANL is in the range of about 300–500 mrem. The estimated LANL-attributable 2001 dose to the on-site MEI, 4.2 mrem, is about 1% this dose.

E. Effect to an Individual from Laboratory Operations

Health effects from radiation exposure have been observed in humans at doses in excess of 10 rem (10,000 mrem). However, doses to the public from LANL operations are much smaller. According to the 1996 Position Statement of the Health Physics Society (HPS 1996): "Below 10 rem, risks of health effects are either too small to be observed or are non-existent." Therefore, the doses reported here are not expected to cause observable health effects.

F. Estimating Radiological Dose to Nonhuman Biota

1. DOE Standard for Evaluating Dose to Aquatic and Terrestrial Biota

In June 2000, the DOE Air, Water, and Radiation Division (EH-412) issued interim DOE Technical Standard ENR-0011, entitled "A Graded Approach for Evaluating Radiation Dose to Aquatic and Terrestrial Biota" (DOE 2000) (available at *http://homer.ornl.gov/oepal/public/bdac/*). The interim standard provides guidance for the evaluation of ionizing radiation doses to aquatic animals and terrestrial animals and plants. DOE sites can use this guidance to establish that site conditions are in compliance with established radiation dose limits for protection of nonhuman biota. DOE Order 5400.5 (DOE 1993) establishes a dose limit of 1 rad day-1 (10 mGy day-1) for protection of aquatic organisms. Based on this limit and a review of the radiation protection literature, the DOE technical standard adopts biota dose limits as follows:

- aquatic animals: absorbed dose that does not exceed 1 rad day-1
- terrestrial plants: absorbed dose that does not exceed 1 rad day-1
- terrestrial animals: absorbed dose that does not exceed 0.1 rad day-1

These limits are based on concerns for limiting reproductive impairment in free-living populations of organisms. Although the goal of the standard is to provide protection for population viability, population dose limits are inferred from observations of individual impairment among the most radiosensitive organisms. These dose limits for protection of populations ensure that there would be no observable adverse effects to members of populations for which protection of individual viability and productivity is of concern. Such considerations are of interest when evaluating impacts to threatened, endangered, or otherwise protected species of biota.

2. Comparison of Media Concentrations to Biota Concentration Guides (BCGs)

The DOE Biota Dose Assessment Team calculated Biota Concentration Guides (BCGs) for screening environmental media to determine the potential for doses to aquatic and terrestrial biota that exceed the prescribed limits. The BCGs are based on the dose limits given above and assume that the daily dose is averaged over a year. See DOE (2000) Module 3 for the input parameters and equations used in derivation of the BCGs.

For aquatic and riparian (streamside) organisms, we used maximum media concentrations for persistent surface water and sediments (Tables 5-2 and 5-14) to compare with applicable BCGs (found in DOE 2000). The values for persistent surface waters were used because runoff (snowmelt and storm water) is generally not persistent enough to support aquatic or wetland/riparian communities. Thus, exposure to aquatic organisms would be dominated by contaminant levels found in persistent surface water bodies. We compared maximum media concentrations in 2001 with applicable BCGs and calculated the ratios (partial fractions) of measured concentrations to the guides (Table 3-5). The sum of these ratios is 0.38, indicating that the total dose to aquatic organisms or riparian

Table 3-5. Comparison of Media Concentrations to Biota Concentration Guides (BCG) for Protection of Aquatic/Riparian Systems

	Water, Aquatic/Riparian Systems			Sediment, Aquatic/Riparian Systems			Water & Sediment Sum of Fractions	Organism Responsible for the Limiting Dose	
Nuclide	Water BCG pCi/L	Site Data[a]	Partial Fraction	Sediment BCG pCi/g	Site Data[b]	Partial Fraction		Water	Sediment
^{241}Am	4.E+02	6.5E+00	1.5E-02	5.E+03	1.3.E+01	2.6E-03	1.7E-02	Aquatic Animal	Riparian Animal
^{137}Cs	4.E+01	1.1E+01	2.6E-01	3.E+03	2.8.E+01	9.3E-03	2.7E-01	Riparian Animal	Riparian Animal
^{3}H	3.E+08	3.1E+03	1.2E-05	4.E+05	3.8.E-03	9.5E-09	1.2E-05	Riparian Animal	Riparian Animal
^{239}Pu	2.E+02	1.8E+00	9.6E-03	6.E+03	1.3.E+01	2.2E-03	1.2E-02	Aquatic Animal	Riparian Animal
^{90}Sr	3.E+02	1.2E+01	4.3E-02	6.E+02	1.8.E+01	3.0E-02	7.3E-02	Riparian Animal	Riparian Animal
^{234}U	2.E+02	8.5E-01	4.2E-03	5.E+03	1.8.E+00	3.6E-04	4.6E-03	Aquatic Animal	Riparian Animal
^{235}U	2.E+02	4.9E-02	2.3E-04	4.E+03	1.3.E-01	3.3E-05	2.6E-04	Aquatic Animal	Riparian Animal
^{238}U	2.E+02	5.0E-01	2.2E-03	2.E+03	2.0.E+00	1.0E-03	3.2E-03	Aquatic Animal	Riparian Animal
	Sum of fractions for radionuclides in water	→	3.3E-01	Sum of fractions for radionuclides in sediment	→	4.5E-02	3.8E-01		

[a]Maxima from Table 5-2.
[b]Maxima from Table 5-14.

organisms is below the dose limit of 1 rad day-1. The primary contributor to the dose here is cesium-137 in waters just downstream from the outfall at TA-50 that discharges effluent from the Laboratory's Radioactive Liquid Waste Treatment Facility. Concentrations of radionuclides in surface waters elsewhere are considerably lower by several orders of magnitude. Overall, releases of radionuclides to surface waters and sediments have not led to doses that exceed limits for the protection of aquatic and riparian animals.

Table 3-6 presents the results of comparing measured maximum soil concentrations and wildlife drinking water concentrations with BCGs for protection of terrestrial biota. The limiting receptor in this case is the generic terrestrial animal for all radionuclides. The sum of the partial fractions in the terrestrial case is 0.05, well below the value of 1, indicating that terrestrial systems are very unlikely to receive exposures leading to exceedance of the dose limit.

Table 3-6. Comparison of Media Concentrations to Biota Concentration Guides (BCG) for Protection of Terrestrial Systems

	Water, Terrestrial Systems			Sediment, Terrestrial Systems			Water &	Organism Responsible for the Limiting Dose	
	Water BCG	Site	Partial	Soil BCG	Site	Partial	Soil Sum		
Nuclide	pCi/L	Data[a]	Fraction	pCi/g	Data[b]	Fraction	of Fractions	Water	Sediment
^{241}Am	2.E+05	6.5E+00	3.3E-05	4.E+03	1.8E-02	4.5E-06	3.7E-05	Terrestrial Animal	Terrestrial Animal
^{137}Cs	6.E+05	1.1E+01	1.8E-05	2.E+01	6.1E-01	3.1E-02	3.1E-02	Terrestrial Animal	Terrestrial Animal
^{3}H	2.E+07	3.1E+03	1.6E-04	6.E+04	2.2E-01	3.7E-06	1.6E-04	Terrestrial Animal	Terrestrial Animal
^{239}Pu	2.E+05	1.8E+00	9.0E-06	6.E+03	3.9E-02	6.5E-06	1.6E-05	Terrestrial Animal	Terrestrial Animal
^{90}Sr	5.E+04	1.2E+01	2.4E-04	2.E+01	2.7E-01	1.4E-02	1.4E-02	Terrestrial Animal	Terrestrial Animal
^{234}U	4.E+05	8.5E-01	2.1E-06	5.E+03	1.6E+00	3.2E-04	3.2E-04	Terrestrial Animal	Terrestrial Animal
^{235}U	4.E+05	4.9E-02	1.2E-07	3.E+03	1.5E-01	5.0E-05	5.0E-05	Terrestrial Animal	Terrestrial Animal
^{238}U	4.E+05	5.0E-01	1.3E-06	2.E+03	1.9E+00	9.5E-04	9.5E-04	Terrestrial Animal	Terrestrial Animal
	Sum of fractions for radionuclides in water	→	4.58E-04	Sum of fractions for radionuclides in soil	→	4.5E-02	4.6E-02		

[a]Maximum values from Table 5-2.
[b]Maximum values from Table 6-1.

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4. Air Surveillance

contributing authors:

*Jean Dewart, Craig Eberhart, Dave Fuehne, Ernie Gladney, Scott Johnson
Angelique Luedeke, Mike McNaughton, Scott Miller, Terry Morgan*

Abstract

Los Alamos National Laboratory (LANL or the Laboratory) operations emit radioactive and nonradioactive air pollutants and direct penetrating radiation into the atmosphere. Air surveillance at Los Alamos includes monitoring emissions, ambient air quality, direct penetrating radiation, and meteorological parameters to determine the air quality impacts of Laboratory operations.

The ambient air quality in and around the Laboratory meets all Environmental Protection Agency (EPA) and Department of Energy (DOE) standards for protecting the public and workers.

Radioactive air emissions, totaling 15,500 Ci, were higher in 2001 than in 2000. This change was primarily due to increased emissions from the Los Alamos Neutron Science Center (LANSCE) and from an unplanned release of tritium gas from the Weapons Engineering Tritium Facility (WETF). Although LANSCE operated for a similar number of hours in 2001 and 2000, a change in the beam target operations produced higher emissions (5940 Ci in 2001 compared with 690 Ci in 2000). The unplanned release of about 7600 Ci of tritium from WETF occurred when a container of legacy waste failed during processing. There were no unplanned releases of radionuclides to the air that required reporting to the EPA or the New Mexico Environment Department (NMED).

Radioactive ambient air quality as monitored by AIRNET was similar to 2000. Highest air concentrations caused by Laboratory operations were measured at Technical Area (TA) 54.

The Air Quality Group (ESH-17) changed methods for recovering tritium from spiked quality control samples to reflect actual AIRNET sampling practices. This change identified the need to correct for the dilution by bound water in the silica gel and thus increased calculated tritium concentrations.

ESH-17 investigated several instances of elevated air concentrations in 2001. Elevated tritium concentrations were measured at several stations from operations at TAs-16, -21, -33, -41, and -54. These elevated air concentrations were the result of routine Laboratory operations. Elevated plutonium concentrations were measured at TA-54. In 2001, measurements at a number of on-site and off-site locations found excess depleted uranium. The loss of ground cover and vegetation resulting from the Cerro Grande fire in 2000, combined with below average precipitation, may have increased resuspension of depleted uranium. None of these elevated air concentrations exceeded applicable DOE or EPA protection standards for workers or the public.

ESH-17 established three nonradioactive air-monitoring stations during 2001 to evaluate air concentrations of metals, volatile organic compounds, and particulate matter. The monitoring stations were designed and located to establish background levels of constituents/pollutants in the surrounding communities and, if possible, to determine any Laboratory impacts. The metals data were consistent with expected values that would occur because of the resuspension of local soils. Particulate matter measurements were consistent with historical measurements.

Quarterly concentrations of beryllium were similar to 2000. Concentrations were consistent with values expected because of resuspension of naturally occurring beryllium in soils. The dustiest locations—the Los Alamos County Landfill, Jemez Pueblo, and TA-54—had the highest measured concentrations. Special short-term beryllium samples were taken to monitor 3 high-explosives test shots. Three on-site air samples contained elevated beryllium and uranium based on comparisons with average air concentrations measured on non-test-shot days.

During 2001, measurements of direct penetrating radiation at most locations were similar to 2000 values. Highest gamma doses were measured at locations on-site at TA-54, Area G; TA-3-

130; and the LANSCE lagoons. Measurements at several TA-54, Area G, locations were similar to 2000 representing the increase in radioactive waste currently stored aboveground. We report one full year of albedo dosimeter (neutron) measurements, taken on-site in the vicinity of TA-18 and TA-3-130. The calibration facility moved to a location distant from public exposure (TA-36) in August 2001 from its former location at TA-3-130.

Los Alamos weather for 2001 continued a four-year trend of warm temperatures and a dryer-than-normal climate. The total precipitation in 2001 was 79% of normal at 14.4 inches. These warm and dry conditions do not appear to be unusual with respect to the 70-year climate history. An inch of rain on July 2 washed out a road and flooded several homes in Los Alamos.

ESH-17 maintains a vigorous quality assurance program. Analytical laboratories met EPA and LANL requirements for quality control samples during 2001.

To Read About . . . Turn to Page . . .

A. Ambient Air Sampling *(Craig Eberhart)*

1. Introduction

The radiological air-sampling network, referred to as AIRNET, at Los Alamos National Laboratory (LANL or the Laboratory) measures environmental levels of airborne radionuclides that may be released from Laboratory operations. Laboratory emissions include plutonium, americium, uranium, tritium, and activation products. Each AIRNET station collects two types of samples for analysis: a total particulate matter sample and a water vapor sample.

Natural atmospheric and fallout radioactivity levels fluctuate and affect measurements made by the Laboratory's air sampling program. Fallout from past atmospheric nuclear weapons tests by several countries, natural radioactive constituents in particulate matter such as uranium and thorium, terrestrial radon diffusing out of the earth and its subsequent decay products, and materials resulting from interactions with cosmic radiation (for example, natural tritiated water vapor produced by interactions of cosmic radiation and common atmospheric gases) make up most of the regional airborne radioactivity. Table 4-1 summarizes regional levels of radioactivity in the atmosphere for the past five years, which can be useful in interpreting current air sampling data.

Particulate matter in the atmosphere is primarily caused by aerosolized soil, which is dependent on meteorological conditions. Windy, dry days can increase soil entrainment, but precipitation (rain or snow) can wash particulate matter out of the air. Consequently, changing meteorological conditions often cause large daily and seasonal fluctuations in airborne radioactivity concentrations. Natural events can also have major impacts: during 2000, a major forest fire (the Cerro Grande fire) dramatically increased short-term ambient concentrations of particulate matter. The 2000 Environmental Surveillance Report (ESP 2001) contained a discussion of the ambient measurements associated with this fire.

The Air Quality Group (ESH-17) compares ambient air concentrations, as calculated from the AIRNET sample measurements, with environmental compliance standards or workplace exposure standards depending on the location of the sampler. We usually compare annual concentrations in areas accessible to the public with the 10-mrem equivalent concentration established by the Environmental Protection Agency (EPA 1989) and published in 40 CFR Part 61 Appendix E Table 2—"Concentration Levels for Environmental Compliance." Concentrations in controlled access areas are usually compared with Department of Energy (DOE) Derived Air Concentrations (DAC) for workplace exposure (DOE 1988a) because access to these areas is generally limited to workers with a need to be in the controlled area.

2. Air Monitoring Network

During 2001, the Laboratory operated more than 50 environmental air samplers to sample radionuclides by collecting water vapor and particulate matter. AIRNET sampling locations (Figures 4-1 through 4-3) are categorized as regional; pueblo; perimeter; quality assurance (QA); Technical Area (TA) 21; TA-15 and TA-36; TA-54 (Area G); or other on-site locations. Four regional sampling stations determine regional background and fallout levels of atmospheric radioactivity. These regional stations are located in Española and El Rancho and at two locations in Santa Fe. The pueblo monitoring stations are located at San Ildefonso and Jemez Pueblos. In 2001, more than 20 perimeter stations were within 4 km of the Laboratory boundary.

Because maximum concentrations of airborne releases of radionuclides would most likely occur on-site, more than 20 stations are within the Laboratory boundary. For QA purposes, two samplers are collocated as duplicate samplers, one at TA-54 and one at TA-49. In addition, a backup station is located at East Gate. Stations can also be classified as being inside or outside a controlled area. A controlled area is a posted area that potentially has radioactive materials or elevated radiation fields (DOE 1988a). The active waste disposal site at TA-54, Area G, is an example of a controlled area.

We added three samplers to the network in 2001: station 68 Airport Road replaced station 71 at TA-21 to provide better measurements downwind from TA-21; station 53 was installed at TA-54, MDA H, to provide tritium data for the Environmental Restoration (ER) program; and station 80 was added at the request of New Mexico Oversight Bureau to provide additional measurements near the burned areas above the Los Alamos town site.

3. Sampling Procedures, Data Management, and Quality Assurance

a. Sampling Procedures. Generally, each AIRNET sampler continuously collects particulate matter and water vapor samples for approximately two weeks per sample. Particulate matter is collected on 47-mm polypropylene filters at airflow rates of about 0.11 m^3 per minute. The vertically mounted canisters each contain about 135 grams of silica gel with an airflow rate of about 0.0002 m^3 per minute; the gel collects the water vapor samples. This silica gel is dried in a drying oven before use in the field to remove most residual water. The gel is a desiccant that removes moisture from the sampled air; the moisture is then distilled, condensed, collected as a liquid, and shipped to the analytical laboratory. The AIRNET project plan (ESH-17 2000) and the numerous procedures through which the plan is implemented provide details about the sample collection, sample management, chemical analysis, and data management activities.

b. Data Management. Using a palm-held microcomputer, we recorded the 2001 sampling data, including timer readings, volumetric airflow rates at the start and stop of the sampling period, and comments pertaining to these data, electronically in the field. We later transferred these data to an electronic table format within the AIRNET Microsoft Access database. We also received the analytical data described in the next section in electronic form and loaded them into the database.

c. Analytical Chemistry. A commercial laboratory analyzed each 2001 particulate matter filter for gross alpha and gross beta activities. These filters were also grouped across sites, designated as "clumps," and analyzed for gamma-emitting radionuclides. For 2001, clumps ranged from six to nine filters. Gamma-emitting radionuclides were also measured at each Federal Facilities Compliance Agreement station by grouping the filters collected each quarter. We combined half-filters from the six or seven sampling periods at each site during the quarter to prepare a quarterly composite for isotopic analyses for each AIRNET station. These composites were dissolved, separated chemically, and then analyzed for isotopes of americium, plutonium, and uranium using alpha spectroscopy. Every two weeks, water was distilled from the silica gel that had been deployed to the field. A commercial laboratory analyzed this distillate for tritium using liquid scintillation spectrometry. All analytical procedures meet the requirements of 40 Code of Federal Regulations (CFR) 61, Appendix B, Method 114. The AIRNET project plan provides a summary of the target minimum detectable activity (MDA) for the biweekly and quarterly samples.

d. Laboratory Quality Control Samples. For 2001, ESH-17 and the contractor analytical laboratories maintained a program of blank, spike, duplicate, and replicate analyses. This program provided information on the quality of the data received from analytical chemistry laboratories. The chemistry met the QA requirements for the AIRNET program. Section F. later in this chapter provides additional detail.

4. Ambient Air Concentrations

a. Explanation of Reported Concentrations. Tables 4-1 through 4-12 summarize the ambient air concentrations calculated from the field and analytical data. Table 4-1 summarizes the average background concentrations of airborne radioactivity for the last five years. Tables 4-2 through 4-12 summarize ambient air concentrations by the type of radioactivity or by specific radionuclides. The summaries include the number of measurements; the number of these measurements less than the 2s uncertainty; the maximum, minimum, and average concentrations; the sample standard deviation; and, for the group summaries, the 95% confidence intervals. The number of measurements is normally equal to the number of samples analyzed. The number of measurements less than the uncertainty is the number of calculated net air concentrations that are less than their individual propagated net 2s analytical uncertainties. These concentrations are defined as not having measurable amounts of the material of interest. The MDAs in Tables 4-11 and 4-12 are the levels that the instrumentation could detect under ideal conditions.

All AIRNET concentrations and doses are total measurements without any type of regional background subtractions. However, beginning in 2000, the concentrations and uncertainties reported in Tables 4-2 through 4-10 are net concentrations and net uncertainties. The net air concentrations, or blank-corrected data, include corrections for the radioactivity from the filter material and the analytical process. The net concentrations are usually somewhat lower than the gross concentrations because small amounts of radioactivity are present in the filter material, the acids used to dissolve the filter, and the tracers added to determine recovery efficiencies. The net uncertainties include the variation added by correcting for the blank measurements.

All data in this AIRNET section, whether in the tables or the text, that are expressed as a value plus or minus (±) another value represent a 95% confidence interval. Because these confidence intervals are calculated with data from multiple sites and throughout the year, they include not only random measurement and analytical errors but also seasonal and spatial variations as well. As such, the calculated 95% confidence intervals are overestimated (wider) for the average concentrations and probably represent confidence intervals that approach 100%. In addition, the air concentration standard deviations in the tables represent one standard deviation as calculated from the sample data. All ambient concentrations are activity concentrations per actual cubic meter of sampled air.

Some values in the tables indicate that we measured negative concentrations of radionuclides in the ambient air, which is physically impossible. However, it is possible for the measured concentration to be negative because the measured concentration is a sum of the true value and all random errors. As the true value approaches zero, the measured value approaches the total random errors, which can be negative or positive and overwhelm the true value. Arbitrarily discarding negative values when the true value is near zero will result in overestimated ambient concentrations.

b. Gross Alpha and Beta Radioactivity. We use gross alpha and gross beta analyses primarily to evaluate general radiological air quality, to identify potential trends, and to detect sampling problems. If gross activity in a sample is consistent with past observations and background, immediate special analyses for specific radionuclides are not necessary. If the gross analytical results appear to be elevated, then immediate analyses for specific radionuclides may be performed to investigate a potential problem, such as an unplanned release. Gross alpha and beta activity in air exhibits considerable environmental variability and, for alpha measurements, analytical variability. These naturally occurring sources of variability generally overwhelm any Laboratory contributions.

The National Council on Radiation Protection and Measurements (NCRP) estimated the national average concentration of long-lived gross alpha activity in air to be 2 fCi per cubic meter. The primary alpha activity is due to polonium-210 (a decay product of radon) and other naturally occurring radionuclides (NCRP 1975, NCRP 1987). The NCRP also estimated national average concentration levels of long-lived gross beta activity in air to be 20 fCi per cubic meter. The presence of lead-210 and bismuth-210 (also decay products of radon) and other naturally occurring radionuclides is the primary cause of this activity.

In 2001, we collected and analyzed more than 1,000 air samples for gross alpha and gross beta activity. As shown in Table 4-2, the annual means for all of the stations are less than half of the NCRP's estimated average (2 fCi per cubic meter) for gross alpha concentrations. At least two factors contribute to these seemingly lower concentrations: the use of actual sampled air volumes instead of standard temperature and pressure (STP) volumes and the burial of alpha emitters in the filter that are not measured by front-face counting. Gross alpha activity is almost entirely from the decay of natural radionuclides, primarily polonium-210 in the radon-222 decay chain, and is dependent on variations in natural conditions such as atmospheric pressure, atmospheric mixing, temperature, soil moisture, and the "age" of the radon. Differences among the sampler groups may be attributable to these factors (NCRP 1975, NCRP 1987).

Table 4-3 shows gross beta concentrations within and around the Laboratory. These data show variability similar to the gross alpha concentrations. All of the annual averages are below 20 fCi per cubic meter, the NCRP-estimated national average for beta concentrations, but the gross beta measurements include little if any lead-210 because of its low-energy beta emission. In addition, we also calculate the gross beta measurements on the actual sampled air volumes instead of STP volumes. The primary source of measured gross beta activity in the particulate matter samples is the bismuth-210 in the radon-222 decay chain.

c. Tritium. Tritium is present in the environment primarily as the result of nuclear weapons tests and natural production by cosmogenic processes (Eisenbud and Gesell 1997). We measure the tritium as an oxide (HTO or T_2O) (water) because the dose impact is about 14,000 times higher than if it were hydrogen (DOE 1988b).

Estimating ambient levels of tritium as an oxide (water) requires two factors: water vapor concentrations in the air and tritium concentrations in the water vapor. Both of these need to be representative of the true concentrations to obtain an accurate estimate of the ambient tritium concentrations. We found that the silica gel collection media were not capable of removing all of the moisture from the atmosphere (Eberhart 1999). Because 100% of the water was not collected on the silica gel and we used this water to measure water vapor concentrations, the atmospheric water vapor, and therefore tritiated water, has been underestimated. However, data from the meteorological monitoring network provide accurate measurements of atmospheric water vapor concentrations and have been combined with the analytical results to calculate all ambient tritium concentrations in this report. The EPA approved use of this method for compliance calculations of atmospheric tritium concentrations in March 1999 (EPA 1999).

When these experiments on silica gel collection efficiencies were being conducted, we also evaluated the dilution effect of the bound water in the silica gel. The effect of the bound water did not appear to cause any significant dilution of the tritium samples. However, more recent results, as described below, have indicated otherwise.

To better evaluate the performance of our analytical laboratory, we changed our tritium spike program at the beginning of 2001. Before 2001, we submitted 10-g water samples with known concentrations of tritium to the laboratory for analysis. Starting with the first sampling period in 2001, these spikes were evaporated and absorbed onto silica gel and then sent to the analytical lab for distillation and analysis. The average tritium concentration in the spikes, which are diluted National Institute of Standards and Technology (NIST) standards, for 1999 through 2000 was 96% of the NIST-traceable concentrations. For 2001, the average tritium concentrations in the spikes recovered from the silica gel dropped to 61%. We explored a variety of possible causes, but the apparent causes were loss of tritium to the bound water in the silica gel and the vapor pressure isotopic effect (Rossen et al., 2000). A method to correct for the bound water and the isotopic effect has been published (Rossen et al., 2000). Silica gel samples are weighed after drying, denatured at temperatures from 800 to 1000°C, and then weighed again to determine the bound water in the dried silica gel. The percent bound water, which was determined to be 3.6% of the dried silica gel mass, and the isotopic effect correction (a factor of 1.03) have been applied to all tritium data in Tables 4-1 and 4-4.

Table 4-4 presents the sampling results for tritiated water concentrations. The annual concentrations for 2001 at all of the regional and pueblo stations were lower than all of the on-site and perimeter stations except for the San Ildefonso Pueblo station (41), which had slightly higher concentrations than the Western Arizona Street station (80). In addition, most of the on-site stations in technical areas with tritium sources (TA-16, TA-21, and TA- 54) had higher annual concentrations than the perimeter stations. These data indicate that the Laboratory is a measurable source of tritium based on ambient concentrations. All annual mean concentrations at all sampling sites were well below the applicable EPA and DOE guidelines.

Another way to view the data is by comparing the number of biweekly concentrations greater than their 2s uncertainty (that is, quantitatively measurable) with the total number of measurements. Less than 2% of the measurements at regional and pueblo locations are above their 2s uncertainties, whereas about 38% of the measurements at the perimeter locations are higher. Finally, more than 98% of the measurements in technical areas with tritium sources are higher than their uncertainties.

The highest off-site annual concentration, 13.8 pCi/m^3, was at station 08 (near the McDonald's restaurant), which is close to TA-41. This concentration is equivalent to about 1% of the EPA public dose limit. We measured elevated concentrations at a number of on-site stations, with the highest annual concentration at station 35 within TA-54, Area G. This sampler is located in a radiological control area, near shafts containing tritium-contaminated waste. This annual mean concentration, 1826 pCi/m^3, is only 0.01% of the DOE DAC for worker exposure.

d. Plutonium. While plutonium occurs naturally at extremely low concentrations from cosmic radiation and spontaneous fission (Eisenbud and Gesell 1997), it is not naturally present in measurable quantities in the ambient air. All measurable sources are from plutonium research and development activities, nuclear weapons production and testing, the nuclear fuel cycle, and other related activities. With few exceptions, worldwide fallout from atmospheric testing of nuclear explosives is the primary source of plutonium in ambient air. Four isotopes of concern can be present in the atmosphere: plutonium-238, plutonium-239, plutonium-240, and plutonium-241. Plutonium-241 is not measured because it is a low-energy beta emitter that decays to americium-241, which we do measure. This beta decay is not only hard to measure, but the dose is small when compared with americium-241. Plutonium-239 and plutonium-240 are indistinguishable by alpha spectroscopy and are grouped together for analytical purposes. Therefore, any ambient air concentrations or analyses listed as plutonium-239 actually represent both plutonium-239 and plutonium-240.

Table 4-5 presents sampling results for plutonium-238. No off-site quarterly concentrations were above their uncertainty levels. Three on-site quarterly concentrations were above their uncertainties, with all three at TA-54, Area G. Two of the measurements were at station 34, which indicates that the concentrations at this location are quantitative and above background levels. The annual mean activity at this location was 3.2 aCi/m^3, which corresponds to 0.0001% of the DOE DAC for worker exposure. This same location also had the highest 1999 and 2000 annual concentrations.

Sampling results for plutonium-239, -240 appear in Table 4-6. As with the plutonium-238 analyses, most of the analytical results were below their estimated uncertainties. Five off-site locations (08, 09, 13, 32, and 66), all in Los Alamos County, had one or more quarters with measurable concentrations of plutonium-239, -240. The highest off-site annual mean was at station 66 (Los Alamos Inn-South), with a concentration of 20 aCi/m^3 or about 1% of the EPA public dose limit. These higher ambient concentrations are apparently from historical TA-1 activities that deposited small amount of plutonium on the hillside below station 66. We recorded the highest annual on-site concentration for plutonium-239, -240 at station 34 in Area G. The concentration was 25 aCi/m^3, which is about 0.001% of the DOE DAC for workplace exposure.

e. Americium-241. Americium-241, a decay product of plutonium-241, is the primary source of radiation from this plutonium isotope. Nuclear explosions, the nuclear fuel cycle, and other processing of plutonium release plutonium-241 to the environment.

Table 4-7 presents the americium results. As with the plutonium isotopes, americium is present in very low concentrations in the environment. No quarterly off-site measurements were above their uncertainty levels.

The only location with measurements above the uncertainties was Area G where 10 of 32 quarterly samples were above their 2s uncertainties; these results were similar to 2000 when 12 were above their uncertainties. The overall concentration at Area G was more than 10 times higher than for any group of samplers, with an average of 10 aCi/m^3. The highest annual on-site concentration was 67 aCi/m^3 at station 34 in Area G. This concentration is about 0.003% of the DOE DAC for worker exposure.

f. Uranium. Three isotopes of uranium are normally found in nature: uranium-234, uranium-235, and uranium-238. The natural sources of uranium are crustal rocks and soils. Therefore, the ambient concentrations depend upon the mass of suspended particulate matter, the uranium concentrations in the parent material, and any local sources. Typical uranium crustal concentrations range from 0.5 ppm to 5 ppm, but local concentrations can be well above this range (Eisenbud and Gesell 1997). Relative isotopic abundances are constant and well characterized. Uranium-238 and uranium-234 are essentially in radioactive equilibrium, with a measured uranium-238 to uranium-234 isotopic activity ratio of 0.993 (as calculated from Walker et al., 1989). Thus, activity concentrations of these two isotopes are effectively the same in particulate matter derived from natural sources. Because known LANL uranium emissions are enriched (excess uranium-234 and -235) or depleted (excess uranium-238), we can use comparisons of isotopic concentrations to estimate LANL contributions. Using excess uranium-234 to detect the presence of enriched uranium may not seem suitable because the enrichment process is usually designed to increase uranium-235 concentrations. However, the enrichment process normally increases uranium-234 at a faster rate than uranium-235, and the dose from natural uranium is about an order of magnitude higher for uranium-234 than for uranium-235. Tables 4-8 through 4-10 give uranium results by isotope. Figure 4-4 shows the plotted annual uranium-234 and -238 concentrations along with a line representing the natural abundance of the two isotopes. In addition, the figure identifies several samplers by their site number and/or by the presence or absence of a sample with depleted uranium.

All annual mean concentrations of the three uranium isotopes were well below the applicable EPA and DOE guidelines. The maximum annual uranium concentrations were at locations with high dust levels from local soil disturbances such as dirt roads at the Los Alamos County Landfill and Area G. The maximum annual off-site uranium-234 concentration was 51 aCi/m^3 at the landfill (station 32), which is less than 0.1% of the EPA public exposure limit. One on-site location, station 77 in a controlled access area known to have depleted uranium, had the highest annual uranium-238 concentration of 125 aCi/m^3. This concentration is about 0.0006% of the DOE DAC for worker exposure. See Section A.7 of this chapter for additional information on station 77. The maximum annual off-site uranium-238 concentration was 54 aCi/m^3, which was also at the landfill. As with the uranium-234 concentration, the uranium-238 concentration was less than 0.1% of the EPA limit. Most of the uranium-235 measurements (91%), both on- and off-site, were below the uncertainties, whereas about 5% of the uranium-234 and uranium-238 concentrations were below their 2s uncertainties. Consequently, most uranium-235 data should not be considered quantitative measurements and will not be evaluated as such because the other uranium isotopes, as described earlier in this section, are better indicators of Laboratory impact.

Both the regional and pueblo groupings had higher average concentrations of uranium-234 and uranium-238 than the perimeter group. The higher concentrations for the regional and pueblo groups result from increased particulate matter concentrations associated with unpaved roads, unpaved parking lots, and other soil disturbances such as construction activities and even grazing but not any known “man-made” sources of uranium. Dry weather or a drier climate can also increase ambient concentrations of particulate matter and therefore uranium.

Fifteen sites (09, 14, 17, 20, 23, 30, 35, 47, 49, 51, 62, 71, 76, 77, and 78) had at least one quarter with excess uranium-238 as shown in Figure 4-4. We measured no excess uranium-234 during 2001. We identified these excess uranium concentrations by statistically comparing the uranium-234 and uranium-238 concentrations. If the concentrations in a sample were more than three standard deviations apart, the sample was considered to have excess isotopic uranium. It should be noted that the highest uranium concentrations, with the exception of station 77 which is in a controlled access area, were all attributable to natural uranium because these sites did not show any excess uranium-234 or uranium-238. See Section A.6 for additional detail on excess uranium isotopic measurements.

g. Gamma Spectroscopy Measurements. In 2001, gamma spectroscopy measurements were made on groups of filters including analyses of "clumps" (biweekly filters grouped across sites for a single sampling period) and quarterly composites (biweekly filters grouped across time for a single site). Even though these gamma emitters have no action levels per se, we would investigate any measurement, other than beryllium-7, potassium-40, and lead-210, above the MDA because the existing data indicate that such a measurement is highly unlikely except after an accidental release. Instead of action levels, the AIRNET Sampling and Analysis Plan (ESH-17 2000) lists the minimum detection levels for 16 gamma emitters that could either be released from Laboratory operations or that occur naturally in measurable amounts (beryllium-7 and lead-210). The minimum levels are equivalent to a dose of 0.5 mrem. The beryllium-7 and lead-210 measurements were the only isotopes above their MDAs.

Table 4-11 summarizes the "less than" concentrations. The average annual MDA for every radionuclide in this table meets the required minimum detection levels. Because every value used to calculate the average annual MDA was a "less than" value for the 14 radionuclides listed in the table, it is likely that the actual concentrations are 3 or more standard deviations away from the average MDA. As such, the ambient concentrations, which were calculated from the MDA values, are expressed as "much less" (<<) values.

Table 4-12 summarizes the beryllium-7 and lead-210 data. Both beryllium-7 and lead-210 occur naturally in the atmosphere. Beryllium-7 is cosmogenically produced, whereas lead-210 is a decay product of radon-222. Some lead-210 is related to suspension of terrestrial particulate matter, but the primary source is atmospheric decay of radon-222 as shown in Figure 4-5. Even though the beryllium-7 and lead-210 are derived from gases, both become elements that are present as solids or particulate matter. These radionuclides will quickly coalesce into fine particles and also deposit on the surfaces of other suspended particles. The effective source is cosmic for beryllium-7 and terrestrial for lead-210, so the ratio of the two concentrations will vary, but they should be relatively constant for a given sampling period. Because all of the other radionuclides measured by gamma spectroscopy are "less than" values, measurements of these two radionuclides provide verification that the sample analysis process is working properly.

5. Investigation of Elevated Air Concentrations

Upon receiving the analytical chemistry data for biweekly and quarterly data, ESH-17 personnel calculated air concentrations and reviewed them to determine if any values indicated an unplanned release. Two action levels have been established: investigation and alert. Investigation levels are based on historical measurements and are designed to indicate that an air concentration is higher than expected. Alert levels are based on dose and require a more thorough, immediate follow-up.

In 2001, a number of air sampling values exceeded investigation levels. When a measured air concentration exceeds an investigation level, ESH-17 verifies that the calculations were done correctly and that the sampled air concentrations are likely to be representative, i.e., that no cross contamination has taken place. Next, we work with personnel from the appropriate operations to assess potential sources and possible mitigation for the elevated concentrations.

A number of uranium measurements exceeded action levels during 2001. In most cases, the follow-up investigation demonstrated that natural uranium associated with higher levels of suspended particulate matter produced the elevated uranium concentrations; the exceptions were for the depleted uranium concentrations discussed in SectionsA.4.f of this chapter. Even though a number of sites had excess uranium-238, all concentrations, with the exception of station 77, were less than the maximum natural uranium concentration (the landfill station 32) and much less than the highest natural concentration during the past five years. Therefore, these concentrations *per se* do not raise any public health concerns beyond that posed by natural uranium.

In the AIRNET tritium discussion (A.4.c), the corrections for bound water in the silica gel and for isotopic effects were described. We have applied these corrections to the tritium data in this section. The following sections identify ten investigations that are not covered elsewhere in this document and that warrant further discussion.

Elevated Tritium near TA-41 (May, 2001)

During the first week of May 2001, a planned release of about 12 curies of tritiated water from D&D activities at TA-41 took place. Typically, TA-41 tritiated water (HTO) emissions are less than 10% this amount. Several nearby AIRNET stations (08, 60, and 66) recorded ambient air concentrations of tritium above investigation levels with a maximum concentration of 22 pCi/m^3. If these concentrations were an annual average, they would be less than 2% of the EPA dose limit, which is 1500 pCi/m^3. As two-week averages, they represent about 1/26 of 2% of the EPA public dose limit.

2001 Americium and Plutonium Data at Area G

Americium-241 and plutonium-239 exceeded action levels at station 34 for all four quarters of 2001. In addition, one quarterly sample at this site exceeded its plutonium-238 investigate concentration. The concentrations of all three radionuclides at this site have been higher since early 1999. High concentrations for more than two years and the absence of similar increases at other locations in the eastern part of Area G indicate that these “investigate” concentrations remain localized and are caused by nearby waste-handling activities. These concentrations are less than 0.01% of the DOE workplace exposure standards.

During the fourth quarter of 2001, the plutonium-239 concentration at station 50 was 23 aCi/m^3. This sampler is located in Area G, but the analytical results over the last several years have been on the order of 0–5 aCi/m^3. It is not yet known what caused this increase. This concentration is about 0.001% of the DOE workplace exposure standards.

Sites near TA-41 with Tritium Investigations for July 2, 2001 (010702 sampling period)

The tritium concentrations for four stations (8, 60, 66, and possibly 62) exceeded their Investigation Action Levels (IAL) and correlate very closely in time and location to planned tritiated water emissions at TA-41 of about 25 curies from June 19 through July 3, 2001. Typically, TA-41 HTO emissions are less than 10% this amount. If the maximum concentration (44 pCi/m^3) were an annual average, it would be equivalent to about 3% of the EPA dose limit which is 1500 pCi/m^3. As a two-week average, it represents about 1/26 of 3% of the EPA public dose limit.

Sites near TA-21 with Tritium Investigations for July 2, 2001 (010702 sampling period)

The tritium concentrations for stations 9, 20, 62, and 71 exceeded their IAL and correlate very closely in time and location to planned HTO emissions at TA-21-209 of about 21 curies from June 19 through July 3, 2001. Typically, TA-21 HTO emissions are smaller than this amount. If the maximum concentration (19 pCi/m3) were an annual average, it would be equivalent to about 1% of the EPA dose limit which is 1500 pCi/m3. As a two-week average, it represents about 1/26 of 1% of the EPA public dose limit.

Sites near TA-16 with Tritium Investigations for July 16, 2001

Two adjacent sample sites near TA-16 exceeded their IAL. The higher measured emissions at these locations may be due to increased emissions from the Weapons Engineering Tritium Facility (WETF) at TA-16. The concentrations correlate closely in time and location with routine calibration exercises at TA-16. If the highest concentration (8 pCi/m^3) were an annual average, it would be equivalent to less than 1% of the EPA dose limit, which corresponds to 1500 pCi/m^3.

Sites near TA-21 with Tritium Investigations for July 16 and July 30, 2001

One sample site at TA-21, station 20, exceeded its IAL over two consecutive sampling periods. The concentrations correlate closely in time and location to HTO emissions at TA-21-209 of about 46 curies during July 2001. If the highest concentration (19 pCi/m^3) were an annual average, it would be equivalent to approximately 1% of the EPA dose limit, which corresponds to 1500 pCi/m^3.

Sites near TA-33 with Tritium Investigations for August 2001

Two sample sites near TA-33 exceeded their IAL for the August 27 sampling period. The concentrations correlate closely in time and location to planned HTO emissions at TA-33 of about 33 curies from August 14 through 28, 2001. If the highest concentration (12 pCi/m^3) were an annual average, it would be equivalent to less than 1% of the EPA dose limit, which corresponds to 1500 pCi/m^3.

Sites near TA-41 with Tritium Investigations for July 16, 2001; July 30, 2001; August 13, 2001; and August 27, 2001

Five sample sites near TA-41 (8, 12, 60, 61, and 66) exceeded their IAL over four consecutive sampling periods. The concentrations for stations 8, 12, 60, 61, and 66 correlate closely in time and location to planned HTO emissions at TA-41 of about 24 curies from July 3 through 31, 2001. Additional HTO emissions of about 12 curies were released from July 31 through August 28, 2001. If the highest concentration of these 20 measurements (60 pCi/m^3) were an annual average, it would be equivalent to 4% of the EPA public dose limit, which corresponds to 1500 pCi/m^3.

Tritium Investigations at Area G during 2001

Each year, as the ambient temperature increases, the tritium concentrations at TA-54 increase because of the diffusion of the tritium from the stored waste. Because this effect is a known, repeated phenomenon, we use a moving average to determine if unexpected results are being measured. At station 35, which is located next to tritium waste disposal shafts, this temperature effect is accentuated. During sample periods ending July 30, August 27, and September 24, airborne tritium levels at this site exceeded the moving-average action levels. The maximum two-week concentration at station 35 was 7316 pCi/m^3. These investigate concentrations peaked at approximately twice the highest values previously recorded in other years. An investigation identified no specific explanation for these new peaks. Weather conditions, a "wave" of tritium diffusion through the soil, or physical changes in the buried waste containers may have caused this increase. As noted previously, the annual mean concentration at this site, 1826 pCi/m^3, is only 0.01% of the DOE DAC for worker exposure, which is 20,000,000 pCi/m^3.

TA-21 Plutonium-239 Fourth Quarter Investigation

Station 71 at TA-21 had plutonium-239 results significantly above its IAL with a concentration of 26 aCi/m^3. The increased result may be due to resuspension of historical soil contamination or disconnecting and cleaning up some of the systems within building 344 in preparation for D&D activity. The concentration is about 0.001% of the DOE DAC for worker exposure standard of 2,000,000 aCi/m^3.

6. Long-Term Trends

Previous Environmental Surveillance Reports covered long-term trends for tritium (ESP 1998 and ESP 1999); gross alpha, gross beta, and gamma measurements (ESP 2000); and plutonium and americium (ESP 2001). This year, we evaluated trends for uranium. The Laboratory has measured isotopic uranium concentrations in quarterly particulate matter composites since the first quarter of 1995. As previously described, this analytical change has allowed us to identify and quantify LANL's impact on ambient concentrations of uranium, which are either enriched uranium (excess uranium-234 and -235) or depleted uranium (excess uranium-238). These data are shown in Figures 4-6, 4-7, and 4-8. Two of these figures include uranium-235 concentrations, but it should be noted that most of the measurements are less than their analytical uncertainty because the analytical process measures activity, which is low for uranium-235.

Figure 4-6 compares the network-wide uranium isotopic concentrations by quarter. Even though the annual and quarterly concentrations vary, peak concentrations for all three isotopes occur during the second quarter of each year. Furthermore, the uranium-238 concentrations have been slightly, but consistently, higher than the uranium-234 concentrations since the first quarter of 1998 indicating the presence of depleted uranium in some samples. Station 77 was not included in these averages because of the persistent and known presence of depleted uranium in the samples as discussed below.

Station 77 at TA-36 is located in a posted radiation control area where depleted uranium is still present as surface contamination from explosive tests. It has been previously identified as a location with measured excess ambient concentrations of uranium-238 (Eberhart et al., 1999; ESP 1999; ESP 2000; and ESP 2001). Of the 24 quarterly composites analyzed for isotopic uranium at this site, 20 have had excess uranium-238. The 2001 uranium-238 and uranium-234 concentrations at this site were 125 and 24 aCi/m^3 respectively. These concentrations were higher than the last several years but comparable to the 1995 concentrations of 131 and 20 aCi/m^3. If we assume that about 15% of the activity in depleted uranium is uranium-234, the calculated LANL contributions at this location were about 22 aCi/m^3 of uranium-234 and 123 aCi/m^3 of uranium-238. Therefore, the combined estimated LANL contribution at this on-site controlled access location is about 0.0007% of the DOE DAC for workplace exposure.

Figure 4-7 shows the number of individual sites with quarterly concentrations of measured excess isotopic uranium. As shown in this figure, depleted uranium, as indicated by excess uranium-238, has usually been detected in at least one sample per quarter—most notably the first quarters of 1997 and 2001 when significant differences (3s) were detected in about 25% of the samples. All of the samples with depleted uranium were collected on LANL property or within Los Alamos County. In the six years before 2001, we collected only 15 quarterly composite samples with excess uranium-238 off-site. During 2001, seven off-site samples with excess uranium-238 were collected. In addition, the number of quarterly composites with depleted uranium was higher in 2001 than any of the years since isotopic measurements started in 1995. We are investigating these increases in depleted uranium, but it is believed that the loss in ground cover and vegetation from the Cerro Grande fire combined with the below-average precipitation for the last several years may have increased resuspension of depleted uranium.

Only a few samples show excess enriched uranium, and most of these occurred in 1996. There is some evidence to indicate that these samples were contaminated in a laboratory, but this contamination has not been proven, and the concentrations are still considered valid environmental measurements.

B. Stack Sampling for Radionuclides

1. Introduction

Radioactive materials are an integral part of many activities at the Laboratory. Some operations involving these materials may be vented to the environment through a stack or other forced air release point. Air Quality personnel at the Laboratory evaluate these operations to determine impacts on the public and the environment. If this evaluation shows that emissions from a stack may potentially result in a member of the public receiving as much as 0.1 mrem in a year, the Laboratory must sample the stack in accordance with Title 40 Code of Federal Regulations (CFR) 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities" (EPA 1989). As of the end of 2001, we identified 28 stacks as meeting this criterion. Two additional sampling systems were in place to meet DOE requirements for nuclear facilities prescribed in their respective technical or operational safety requirements. Where sampling is not required, emissions are estimated using engineering calculations and radionuclide materials usage information.

2. Sampling Methodology

As of the end of 2001, LANL continuously sampled 30 stacks for the emission of radioactive material to the ambient air. LANL categorizes its radioactive stack emissions into one of four types: (1) particulate matter, (2) vaporous activation products (VAP), (3) tritium, and (4) gaseous/mixed air activation products (G/MAP). For each of these emission types, the Laboratory employs an appropriate sampling method, as described below.

Emissions of radioactive particulate matter generated by operations at facilities such as the Chemistry and Metallurgy Research Building (CMR) and TA-55 are sampled using a glass-fiber filter. A continuous sample of stack air is pulled through the filter that captures small particles of radioactive material. These samples are analyzed weekly using gross alpha/beta counting and gamma spectroscopy to identify any increase in emissions and to identify short-lived radioactive materials. Every six months, ESH-17 composites these samples to be shipped to an off-site commercial laboratory. The commercial laboratory analyzes these composited samples to determine the total activity of materials such as uranium-234, -235, and-238; plutonium-238 and -239, -240; and americium-241. These data are then used to calculate emissions.

A charcoal cartridge samples VAP emissions such as selenium-75 and bromine-77 generated by LANSCE operations and by hot cell activities at CMR and TA-48. A continuous sample of stack air is pulled through a charcoal filter that adsorbs vaporous emissions of radionuclides. We determine the amount and identity of the radionuclide(s) present on the filter with gamma spectroscopy.

We use a collection device known as a bubbler to measure tritium emissions from the Laboratory's tritium facilities. This device enables the Laboratory to determine not only the total amount of tritium released but also whether it is in the elemental (HT) or oxide (HTO) form. The bubbler operates by pulling a continuous sample of air from the stack, which is then "bubbled" through three sequential vials containing ethylene glycol. The ethylene glycol collects the water vapor from the sample of air, including any tritium that may be part of a water molecule (HTO). After "bubbling" through these three vials, essentially all HTO is removed from the air, leaving only elemental tritium. The sample containing the elemental tritium is then passed through a palladium catalyst that converts the elemental tritium to HTO. The sample is then pulled through three additional vials containing ethylene glycol, which collect the newly formed HTO. The amount of HTO and HT is determined by analyzing the ethylene glycol for the presence of tritium using liquid scintillation counting (LSC).

Although the tritium bubbler described above is the Laboratory's preferred method for measuring tritium emissions, we employ a silica gel sampler at the LANSCE facility. A sample of stack air is pulled through a cartridge containing silica gel. The silica gel collects the water vapor from the air, including any HTO. The water is distilled from the sample, and the amount of HTO is determined by analyzing the water using LSC. Using silica gel is necessary because the ethylene glycol will also collect some of the gaseous emissions from LANSCE other than tritium. These additional radionuclides will interfere with the determination of tritium, resulting in less than desirable results. Also, because the primary source for tritium is activated water, sampling for only HTO is appropriate. After an historical evaluation of HTO emissions from LANSCE in 2001, we discontinued sampling tritium following the July 2001 report period based on the low historical emissions of HTO from TA-53 and the low relative contribution of tritium to the off-site dose from TA-53 emissions.

We measure G/MAP emissions resulting from activities at LANSCE using real-time monitoring data. A sample of stack air is pulled through an ionization chamber that measures the total amount of radioactivity in the sample. We use gamma spectroscopy and decay curves to identify specific radioisotopes.

3. Sampling Procedures and Data Analysis

Sampling and Analysis. We chose analytical methods to comply with EPA requirements (40 CFR 61, Appendix B, Method 114). See Section F in this chapter for the results of analytical quality assurance measurements. General discussions on the sampling and analysis methods for each of LANL's emissions follow.

Particulate Matter Emissions. We generally removed and replaced the glass-fiber filters that sample facilities with significant potential for radioactive particulate emissions weekly and transported them to the Health Physics Analysis Laboratory (HPAL). Before screening the samples for the presence of alpha and beta activity, the HPAL allowed approximately 72 hours for the short-lived progeny of radon to decay. These initial screening analyses ensure that potential emissions were within normal values. The HPAL performed final analyses after the sample had been allowed to decay for approximately one week. In addition to alpha and beta analyses, the HPAL used gamma spectroscopy to identify the energies of gamma ray emissions from the samples. Because the energy of decay is specific to a given radioactive isotope, the HPAL could determine the identity of any isotopes detected by the gamma spectroscopy. The amount, or activity, of an isotope could then be found by noting the number of photons detected during analysis. LANSCE glass-fiber filters were analyzed using only gamma spectroscopy.

Because gross alpha/beta counting cannot identify specific radionuclides, the glass-fiber filters were composited every six months for radiochemical analysis at an off-site commercial laboratory. We used the data from these composite analyses to quantify emissions of radionuclides such as the isotopes of uranium and plutonium. To ensure that the analyses requested (e.g., uranium-234, -235, and -238 and plutonium-238 and -239, -240, etc.) identified all significant activity in the composites, ESH-17 compared the results of the isotopic analysis to gross activity measurements.

VAP Emissions. We generally removed and replaced the charcoal canisters that sample facilities with the potential for significant VAP emissions weekly. These samples were transported to the HPAL where gamma spectroscopy, as described above, identified and quantified the presence of vaporous radioactive isotopes.

Tritium Emissions. Tritium bubbler samples used to sample facilities with the potential for significant elemental and oxide tritium emissions were generally collected and transported to the HPAL on a weekly basis. The HPAL added an aliquot of each sample to a liquid scintillation cocktail and determined the amount of tritium in each vial by LSC.

Silica gel samples were used to sample facilities with the potential for significant tritium emissions in the oxide form only, where the bubbler system would not be appropriate. These samples were transported to the Analytical Chemistry Sciences Group (C-ACS), where C-ACS staff distilled the water from the silica gel and determined the amount of tritium in the sample using LSC.

G/MAP Emissions. We used continuous monitoring, rather than off-line sampling, to record and report G/MAP emissions for two reasons. First, the nature of the emissions is such that standard filter paper and charcoal filters will not collect the radionuclides of interest. Second, the half-lives of these radionuclides are so short that the activity would decay away before any sample could be analyzed offline. The G/MAP monitoring system includes a flow-through ionization chamber in series with a gamma spectroscopy system. Total G/MAP emissions were measured with the ionization chamber. The real-time current measured by this ionization chamber was recorded on a strip chart, and the total amount of charge collected in the chamber over the entire beam operating cycle was integrated on a daily basis. The composition of these G/MAP emissions was analyzed with the gamma spectroscopy system. Using decay curves and energy spectra to identify the various radionuclides, Air Quality personnel determined the relative composition of the emissions. Decay curves were typically taken one to three times per week based on accelerator operational parameters. When major ventilation configuration changes were made at LANSCE, new decay curves and energy spectra were recorded.

4. Analytical Results

Measurements of Laboratory stack emissions during 2001 totaled approximately 15,400 Ci. Of this total, tritium emissions composed approximately 9400 Ci, and air activation products from LANSCE stacks contributed nearly 6000 Ci. Combined airborne emissions of materials such as plutonium, uranium, americium, and particulate/vapor activation products were less than 1 Ci.

Table 4-13 provides detailed emissions data for Laboratory buildings with sampled stacks. Table 4-14 provides a detailed listing of the constituent radionuclides in the groupings of G/MAP and particulate/vapor activation products (P/VAP). Table 4-15 presents the half-lives of the radionuclides emitted by the Laboratory. During 2001, nonpoint source emissions of activated air from the LANSCE facility (TA-53) comprised approximately 150 Ci carbon-11 and 6 Ci argon-41, whereas TA-18 contributed 0.29 Ci argon-41.

5. Long-Term Trends

Figures 4-9 through 4-12 present radioactive emissions from sampled Laboratory stacks. These figures illustrate trends in measured emissions for plutonium, uranium, tritium, and G/MAP emissions, respectively. As the figures demonstrate, tritium emissions and G/MAP emissions each showed a significant increase for 2001. Emissions from plutonium and uranium isotopes stayed relatively steady since 2000.

Emissions from tritium handling facilities increased in 2001 over previous years. A January 31, 2001, release of 7600 curies of tritium gas (HT) from WETF, TA-16-205, dominated these tritium emissions. This single release constitutes over 80% of the total Laboratory tritium emissions for 2001. The release occurred when a container of legacy waste failed during processing. The container was originally thought to contain less than 50 curies of tritium. Failure of the container released the high-purity tritium gas into the stack ventilation system. The off-site dose from this release was well below any regulatory thresholds. See *http://drambuie.lanl.gov/~esh7/Finals/tritfacils/0201.html* for a complete description of the event.

Emissions from other facilities, notably TA-33-86, TA-21-209, and TA-41-4, increased because of cleanup operations in preparation for the D&D of these areas. TA-33-86, which originally housed the High Pressure Tritium Laboratory (HPTL), has been shut down for several years. TA-41-4 likewise has ceased operations, and personnel are preparing the facility for D&D. In these facilities, we expect increased emissions from activities such as equipment disassembly and opening pipes and containers to demonstrate that all significant tritium has been removed. TA-21-209 is transferring its tritium operations to WETF, and the building is being prepared for D&D. As tritium-contaminated systems are dismantled and prepared for removal and disposal, increased releases of tritium are expected. However, overall long-term emissions from all these facilities will decrease following such D&D preparation. As mentioned, all releases in 2001 were well below regulatory limits.

In 2001, LANSCE operated in the same configuration as 2000, with continuous beam operations to the 1L Target and the Lujan Neutron Scattering Center causing the majority of radioactive air emissions. However, changes to the 1L Target cooling water system operation resulted in more off-gassing of very short-lived radionuclides (primarily oxygen-15) from the water systems into the stack air stream. As a result, total emissions from the TA-53-7 stack increased in 2001, while still remaining well below any regulatory limits.

Figure 4-13 shows the individual contribution of each of these emission types to the total Laboratory emissions. It clearly shows that G/MAP emissions and tritium emissions make up the vast majority of radioactive stack emissions.

C. Gamma and Neutron Radiation Monitoring Program *(Mike McNaughton)*

1. Introduction

ESH-17 monitors gamma and neutron radiation in the environment—that is, outside of the workplace—according to the criteria specified in McNaughton et al. (2000).

This radiation consists of both naturally occurring and man-made radiation. Naturally occurring radiation originates from terrestrial and cosmic sources. Because the natural radiation doses are generally much larger than those from man-made sources, it is extremely difficult to distinguish man-made sources from the natural background.

Naturally occurring terrestrial radiation varies seasonally and geographically. Seasonally, radiation levels can vary up to 25% at a given location because of changes in soil moisture and snow cover that reduce or block the radiation from terrestrial sources (NCRP 1975). Spatial variation results from both the soil type and the geometry; for example, dosimeters that are placed in a canyon will receive radiation from the side walls of the canyon as well as from the canyon bottom and will record higher radiation exposures than those dosimeters on a mesa top that do not receive exposure from the walls. The aerial surveys of Los Alamos (EG&G 1989, EG&G 1990, DOE/NV 1998, and DOE/NV 1999) show variations of a factor of three in terrestrial radiation. Measurements of soil concentrations support these surveys: according to Longmire et al., 1996, thorium and uranium concentrations on the Pajarito Plateau range from 0.7 to 3 pCi/g, and potassium-40 ranges from 12 to 30 pCi/g; these concentrations result in terrestrial radiation from 50 to 150 mrem/yr, with the higher values generally being in the canyons.

Naturally occurring ionizing radiation from cosmic sources increases with elevation because of reduced atmospheric shielding (NCRP 1975). At sea level, the dose rate from cosmic sources is 27 mrem/yr. Los Alamos, with a mean elevation of about 2.2 km, receives 70 mrem/yr from cosmic sources, whereas White Rock, at an elevation of 1.9 km, receives 60 mrem/yr, and Española, at 1.7 km, receives 50 mrem/yr.

In summary, the dose rate from natural terrestrial and cosmic sources varies from about 100 to 200 mrem/yr. In publicly accessible locations, the dose rate from man-made radiation is much smaller than, and difficult to distinguish from, natural radiation.

2. Monitoring Network

a. Dosimeter Locations. In an attempt to distinguish any impact from Laboratory operations, ESH-17 has located 140 thermoluminescent dosimeter (TLD) stations around the Laboratory and in the surrounding communities. Beginning in January 2000, the monitoring locations were selected according to the criteria in McNaughton et al., 2000. See Figure 4-14 for the present locations of TLDs.

b. Albedo Dosimeters. We monitor potential neutron doses with twelve albedo TLD stations. We maintain these stations around TA-18 and Building 130 of TA-3. Albedo dosimeters are sensitive to neutrons and use a hydrogenous material to simulate the human body, which causes neutron backscatter.

Background stations are located at Santa Fe and TA-49, and a control dosimeter is kept in a shielded vault.

3. Quality Assurance

ESH-17's operating procedures (ESH-17 2002) contain procedures that outline the QA/QC (quality assurance/quality control) protocols; placement and retrieval of the dosimeters; reading of the dosimeters; and data handling, validation, and tabulation. The Health Physics Measurements Group (ESH-4) calibration lab calibrates the dosimeters.

We estimated the uncertainty in the TLD data by combining the uncertainties from three sources. The standard deviation of the individual TLD chips was calculated from the spread in sets of 5 chips exposed to the same dose and was 3%. We calculated the uncertainty in the light-output-to-dose calibration from the variation of the individual calibrations; it was 5%. The uncertainty in the fade correction was calculated from 20 sets of fade dosimeters with each set each exposed to the same conditions and was 4%. Combining these in the standard way, the overall one-standard-deviation uncertainty is 7%.

As an independent check of the accuracy of our dosimeters, we submitted 14 dosimeters to the 12th International Intercomparison of Environmental Dosimeters organized by the DOE's Environmental Measurements Lab (EML) (*http://www.eml.doe.gov/iied/*). According to the preliminary results, the average dose our field dosimeters measured was 168 mrem, which is 4% higher than the EML measurement of 161 mrem. This result is within the expected margin of uncertainty and is therefore satisfactory.

The DOE Laboratory Accreditation Program has accredited the albedo dosimeters that ESH-4 provides. ESH-4 provides quality assurance for the albedo dosimeters.

4. Analytical Results

a. Gamma TLD Dosimeters. Table 4-16 presents the results for the gamma TLD dosimeters. For some stations, one or more quarters of data are not available as a result of dosimeter loss. We have replaced the missing data by the average of the other quarters.

The annual dose equivalents at almost all stations ranged from 100 to 200 mrem. These dose rates are consistent with natural background radiation and with previous measurements. The largest natural-background dose rates are in low-lying areas and canyons (e.g., at stations 20, 37, 59, 69, and 70) where terrestrial background is high (DOE/NV/11718-107) and canyon walls contribute additional dose. None of these measurements indicates a contribution from Laboratory operations.

The stations with a measurable contribution from Laboratory operations are at TA-18 (station 28), TA-53 (stations 64, 104, and 114–116), TA-3-130 (stations 117–119), and TA-21 (station 323).

At TA-18, most of the external radiation dose is from neutrons, which are measured by the albedo dosimeters discussed in Section 4.c, below. The gamma dose at station 28 is smaller than the uncertainty in the measurement. Though the gamma dose at station 18 is larger than average, this reading is mostly a result of terrestrial radiation in the canyon.

Stations 104 and 114–116 are close to the TA-53 lagoons where activated material such as cobalt-60 has accumulated. Station 64 is close to the TA-53 "boneyard" where radioactive materials are stored. Access to TA-53 is restricted.

Stations 117–119 are close to the TA-3-130 calibration laboratory; they are 27 m north, 10 m east, and 8 m south, respectively. After subtracting approximately 120 mrem of natural background radiation, the dose measurements are consistent with the distances. Stations 118 and 119 are within a fenced area and not accessible to the public. Station 117 is on the fence along the south side of Pajarito Road.

The potential dose to an individual on Pajarito Road is the sum of the gamma dose discussed in this section and the neutron dose discussed in Section 4.c, below. The doses that appear in the tables include natural background and would only apply if an individual remained close to the dosimeter 24 hours a day and 365 days per year.

Station 323 at TA-21, MDA T, is contaminated with 50 pCi/g of cesium-137 (LANL 1991, pp. 16–124). The calculated dose rate from this contamination is 200 mrem/yr. Considering that the dosimeter is on the boundary fence of Area T, the calculation is in reasonable agreement with the measurement, which is about 100 mrem/yr above background. Area T is not accessible to the public.

b. TA-54, Area G. Table 4-17 presents the results from monitoring the TA-54, Area G, waste site. Figure 4-2 shows the locations of the dosimeters at TA-54. As in previous years, the highest dose rates are near building 375 (stations 605–6 to the north), buildings 229-232 (stations 611–4 to the southeast), and building 49 (stations 623–4 to the southwest). The dose rates are the result of radioactive waste stored in these buildings. The increased dose rate from building 375 led us to locate new dosimeter stations 642 and 643 on the fence at the boundary between DOE and San Ildefonso Pueblo land. Although the gamma dose rates at these stations are at the upper end of the range of natural background radiation, we believe this rate is a result of high levels of terrestrial radiation in the canyon and from the canyon walls. Two items of evidence support this conclusion: calculations show the dose from building 375 at the DOE boundary is too small to measure, and the NEWNET station "LANL Buey East," which is close to stations 642 and 643, does not show an increased dose rate. NEWNET is discussed in Section H.

c. Albedo Dosimeters. Table 4-18 presents the monitoring results from the TA-18 albedo dosimeters. The values in Table 4-18 would apply to a hypothetical individual who remains continuously at the specified location.

The neutron dose that a dosimeter measures depends on the neutron-energy spectrum. We calculate the actual neutron dose by multiplying the dosimeter reading by the neutron correction factor, NCF. We calculated the dose from TA-18 using the NCF = 0.145, which corresponds to the neutron energy spectrum from the DOE-standard D_2O-moderated neutron spectrum from californium-252. The reference McNaughton (2000) discusses the reasons for this choice.

Albedo-dosimeter location 10 is collocated with gamma-dosimeter station 117, on the fence south of Pajarito Road and 27 m north of the TA-3-130 calibration sources. The total dose at this location is the sum of the gamma and the neutron dose equivalents.

D. Nonradioactive Ambient Air Monitoring *(Ernie Gladney and Jean Dewart)*

1. Introduction

During the spring of 2000, the Cerro Grande fire reached LANL and ignited both aboveground vegetation and disposed materials in several landfills. The fire raised concerns about the potential human health impacts from chemicals emitted by the combustion of these Laboratory materials, and short-term, intensive air monitoring studies were performed at that time. Unlike the radiological data from many years of AIRNET sampling, LANL did not have an adequate database of nonradiological species under baseline conditions with which to compare data collected during the fire. During 2001, ESH-17 designed and implemented a new air-monitoring program, entitled NonRadNet, to provide these types of data under normal conditions. The objectives of NonRadNet are to

- develop the capability for collecting nonradiological air monitoring data,
- conduct monitoring to develop a database of typical background levels of selected nonradiological species in the communities nearest the Laboratory, and
- measure LANL's potential contribution to nonradiological air pollution in the surrounding communities.

2. Air Monitoring Network

NonRadNet samples environmental levels of nonradiological air constituents in Los Alamos County. Species to be monitored include the following: total suspended particulate matter (TSP), particles with diameters of 10 micrometers or less (PM-10), particles with diameters of 2.5 micrometers or less (PM-2.5), volatile organic compounds (VOC), and inorganic elements on particulate matter. In 2001, the VOCs included up to 160 compounds, and the inorganics included up to 15 elements (arsenic, antimony, barium, beryllium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium, vanadium, and zinc).

We based the sampling locations on EPA (40 CFR Part 58) and LANL (procedure ESH-17-207) siting criteria. Monitoring stations were designed to collect samples in the breathing zone (2 meters above ground surface). Uniform application of these criteria assures consistency, comparability, and representativeness among all air sampling locations. Good scientific judgment is always employed as the final criterion in selecting the optimal locations, in addition to the site-specific ones cited above.

Simultaneous monitoring took place in three different locations—two in Los Alamos and one in White Rock, NM. The White Rock sampling is collocated with the existing AIRNET station at the White Rock Fire Station. One Los Alamos station is collocated with the existing AIRNET station at the Los Alamos Hospital. We established one new station near the intersection of Diamond Drive and East Jemez Road, between the main technical area of the Laboratory and the population center of the Los Alamos town site.

We use existing meteorological data collected through LANL's current monitoring network to help us interpret the data and evaluate their impact. PM-10 and PM-2.5 concentrations are measured continuously and averaged over 1-hour, 3-hour, and 24-hour time periods. VOC and TSP/inorganics sampling takes place on every twelfth day to coincide with EPA's national ambient air monitoring schedule, with each sampling period lasting 24 hours. All sites commenced operation on September 22, 2001.

3. Sampling Procedures, Data Management, and Quality Assurance

Anderson GV-2360 volumetric-flow-controlled high-volume samplers collected samples for 24-hour time-integrated TSP on either Dynaweb polypropylene or Whatman cellulose 8 in. 10 in. filters. All filters are placed in the sampler less than 48 hours before the start of a sampling run and are recovered from the samplers within 24 hours of the end of a sampling period. We weigh all filters before deployment and again after collection. All weighing activities take place in a humidity-conditioning chamber, and filters are equilibrated for at least 24 hours before each weighing to attempt to achieve consistent absorbed water levels. We then send these TSP filters to a commercial environmental analytical chemistry laboratory in glassine envelopes under chain-of-custody for chemical analysis of up to 15 inorganic elements with both inductively coupled plasma emission spectrometry (ICPES) and inductively coupled plasma mass spectrometry (ICPMS) using EPA Methods SW 6010 and SW 6020, respectively.

A Rupprecht & Patashnick TEOM (tapered-element oscillating microbalance) Series 1400a ambient particulate monitor fitted with either PM-10 or PM-2.5 sample inlets collects continuous PM-10 and PM-2.5 concentrations (micrograms per cubic meter). The collecting instruments record the data automatically and save them electronically for subsequent downloading and transfer to an ESH-17-maintained database. We will use these data as an indicator of natural dust loading in the atmosphere and to aid in interpreting the inorganic elemental concentration data determined on the large TSP filters.

A ThermoAnderson AVOCS (Ambient Volatile Organic Collection System) collects samples of ambient air in 15-liter SUMMA Canisters owned by LANL. Before each sampling event, all canisters are precleaned and monitored for residual levels of all VOCs. After collecting an integrated 24-hour sample, taken simultaneously at all sites every 12th day per EPA procedure, we return all canisters to Severn-Trent Laboratories (STL), located in Austin, TX, under chain-of-custody for VOC determination with EPA Compendium Method TO-15. STL reports up to 160 organic compounds to ESH-17, and these data are stored within the existing AIRNET database for subsequent evaluation and interpretation.

ESH-17 personnel enter field sampling data manually on paper forms and key them into an existing database. Using calibration procedures provided by each sampling system's manufacturer, we calculate the net air volumes sampled. We then use these volumes to calculate net ambient air concentrations of TSP, VOCs, and inorganic elements.

4. Ambient Air Concentrations

a. Explanation of Reported Concentrations. Tables 4-19 through 4-24 summarize the ambient air concentrations calculated from field and analytical data, inorganic elements, and VOCs. For many of these elements and compounds, these measurements are the first reported in an annual Environmental Surveillance Report since this series began in 1971. The summaries include

- the number of measurements (samples);
- the number of measurements that were determined to be less than their analytical detection limits;
- the minimum and maximum values (range) where two or more measurements had positive results;
- the mean value of the positive results; and
- the 1s (standard deviation) of the mean where three or more positive values were available.

b. Particulate Matter. Several previous Environmental Surveillance Reports (ESP 1971a, ESP 1971b, ESP 1986, ESP 1987, ESP 1988, and ESP 1989) include limited local TSP data. These data show annual geometric means for both Los Alamos and White Rock to be in the 20–30 ug/m^3 range, with the maximum value observed to be 242 ug/m^3 during those time periods.

In our 2001 TSP data, we observed both negative values and concentrations up to three times the previously reported maximum for individual samples. The overall station means were also a factor of ten above historical measurements. These considerations lead us to believe that the 2001 data are largely invalid, and they were rejected as not being representative of actual atmospheric conditions because they failed to meet our established quality goals. We have selected a different filter material, Whatman cellulose paper, for use during 2002, partially in an effort to improve our overall TSP measurement procedure.

We have reviewed the 24-hour average data for PM-2.5 and PM-10 collected since the start of operation of the first TEOM that we received in late May 2001. The PM-10 measurements had concentrations up to 32 ug/m^3, whereas PM-2.5 exhibited a maximum of 14 ug/m^3. These data are consistent with the historical TSP levels of 20–30 ug/m^3, further supporting our decision to reject all of the 2001 TSP data.

c. Inorganic Elements. Table 4-19 shows the summary of these NonRadNet measurements for 15 elements at three stations. Previous Surveillance Reports contain relatively little air concentration data for inorganic species, and most of what is available was determined using analytical procedures that have much higher detection limits than those used this year.

A common interpretive technique calls for calculating elemental ratios to the element measured that has the minimum uncertainty and is not likely to have any source besides resuspended local soil materials. Elements commonly selected for this comparison purpose include silicon, aluminum, iron, manganese, and rare earth elements. These elemental ratios are then compared with corresponding ones taken from chemical analysis of local soils or to average terrestrial crustal abundance data compiled by Vinogradov 1959, Taylor 1964, Mason 1966, and Wedepohl 1968.

With the data for the elemental content of on-site soils (ESP 2000), we developed a mean elemental concentration for on-site comparison. Unfortunately we did not foresee using this elemental ratio technique when we selected the original list of elements for chemical analysis of our new program's samples, and therefore we must employ another of the major "rock-forming" elements, such as barium. Figure 4-15 displays all our individual measurements of barium with both of the analytical methods used, further illustrating that this element is a good choice because of its consistency over the last quarter of 2001.

We have calculated a set of mean elemental ratios to barium (Ba) from our summary of the on-site soil data from the 2000 ESR in Table 4-20.

The air sample data are internally very consistent and in good agreement with our estimates from our local soils. This agreement suggests no evidence for any non-soil-derived enhancement to the soil background levels of these trace elements except for copper, antimony, and zinc. Copper is strongly enhanced, and this enhancement probably results from contributions from the high-volume pump in the sampling equipment. This effect was documented in 1970 during sampling for metals in clean marine and continental environments (Hoffman 1971). The antimony and zinc results are not so readily understood and require further study and source evaluation before we can draw firm conclusions. It is possible that the average concentrations used for local soils are in error, particularly for antimony, a difficult element to determine at natural abundance levels in soils.

As our program matures, we may add additional soil-derived elements and other elements that LANL operations might influence.

d. Volatile Organic Compounds. Tables 4-21 to 4-24 present summary data for 160 compounds at three stations. The first three of these tables contain summaries for 124 compounds where at least one positive detection was achieved at one site. The final table presents a summary for 36 compounds that have only detection limit data at all sites for all measurements.

Determining background levels for these compounds is not as easy as it is for inorganics. Organic compounds have a variety of natural and anthropogenic sources, and many of these compounds are well mixed in the troposphere. As our program matures, we hope to be able to group this large number of compounds into major source groups (e.g. fuel hydrocarbons, refrigerants, paint solvents, natural vegetation emissions, etc.) to help provide a simpler basis for evaluating seasonal variations and potential impacts from Laboratory operations.

5. Detonation and Burning of Explosives

a. Total Quantities. The Laboratory tests explosives by detonating them at firing sites operated by the Dynamic Testing Division. The Laboratory maintains monthly shot records that include the type of explosives used as well as other material expended at each site. Table 4-25 summarizes the amounts of expended materials for CY 2000 and CY 2001. The Laboratory also burns scrap and waste explosives because of treatment requirements and safety concerns. In 2001, the Laboratory burned 1.1 tons of high explosives.

An assessment of the ambient impacts of high-explosives testing, presented in the Site-Wide Environmental Impact Statement for Los Alamos (DOE 1999), indicates that high-explosives testing produces no adverse air quality impacts. The actual quantities of materials detonated during 2001 were less than the amounts for which impacts are analyzed in the Site-Wide Environmental Impact Statement.

6. Beryllium Sampling

a. Routine Sampling. In the early 1990s, we analyzed a limited number of AIRNET samples for beryllium in an attempt to detect potential impacts from regulated sources and releases from explosive testing. All values were well below the New Mexico 30-day ambient air quality standard of 10 ng/m^3. With the recent heightened interest in the health effects of beryllium, we are again analyzing AIRNET samples for this contaminant.

However, New Mexico no longer has an ambient air quality standard for beryllium for comparison with AIRNET measurements. Therefore, we selected another air quality standard to use for comparison purposes: the National Emission Standards for Hazardous Air Pollutants (NESHAP) standard of 10 ng/m^3 (40 CFR Part 61 Subpart C National Emission Standard for Beryllium) can be, with EPA approval, an alternative to meeting the emission standard for beryllium. LANL is not required to use this alternative standard because the permitted sources meet the emission standards, but we have used it in this case for comparative purposes.

We reinstituted beryllium determination at selected AIRNET sites in 1999. We continued to analyze quarterly composited samples from 29 sites for beryllium during 2001. These sites are located near potential beryllium sources or in nearby communities. Our previous results indicate that the source of beryllium in our AIRNET samples was naturally occurring beryllium in resuspended dust. Dust may be resuspended mechanically, by vehicle traffic on dirt roads or construction activities, or by the wind in dry periods.

For 2001, we calculated air concentrations including a blank subtraction as we did for the 2000 data. Air concentrations for 2001, shown in Table 4-26, are, on average, very similar to the 2000 values. Concentrations at two Area G stations again declined significantly in 2001 just as we observed during 2000. All values are 2% or less than the NESHAP standard.

The highest measured beryllium concentrations occurred at TA-54, Area G; the Los Alamos County Landfill; the Jemez Pueblo Visitor's Center; and in Santa Fe. Because none of these sites have any beryllium handling operations, the source of the beryllium is most likely from naturally occurring beryllium in the soils, resuspended by the wind or by vehicles on dirt roads and earthmoving/construction operations. TA-54, Area G, is located in the drier portion of the Laboratory, making wind resuspension a more important contributor than at other Laboratory locations. Resuspension of fine dust particles is also a common occurrence during trucking operations at the county landfill. Similarly, Jemez Pueblo has reported significant levels of blowing dust, especially during the springtime.

Earlier in this chapter, we used the ratio of uranium-238 to uranium-234 to detect impacts from LANL because these isotopes are naturally present at a constant ratio. No comparable situation exists for beryllium because it is mono-isotopic, but the ratio of beryllium to other elements present in the soil will be relatively constant if the local sources of particulate matter are similar. We chose cerium last year as having good potential to be representative of natural soil particulate matter and unlikely to have a Laboratory source. We have now encountered difficulty with this approach during low dust loading quarters when cerium concentrations in individual samples approach or reach analytical detection limits. Beginning with the second quarter of 2001, we added manganese and strontium to our ratio effort, and, in the third quarter, we dropped cerium entirely. Even though the individual sample concentrations of manganese and strontium never approached their respective analytical detection limits, we observed significant variability in their relative abundance in soils taken from the wide area covered by our AIRNET network. Although we see no evidence of unusual levels of beryllium in any of our samples based on any of these three elemental ratios, it remains difficult to easily assess potential Laboratory impacts using this elemental ratio approach. We continue to search for other approaches.

b. Special Sampling. We performed short-term ambient air sampling for three beryllium-containing high-explosives test shots at TA-15 (Dual Axis Radiographic Hydrodynamics Test [DARHT] and Phermex) during 2001, taking TSP matter samples at 10–13 locations before and during the test. In general, the samplers ran for 24 hours. We analyzed samples for beryllium and uranium isotopes. Samples were also analyzed for inorganic soil elements: cerium, manganese, and strontium. These elements are not found in LANL emissions and so are useful in distinguishing the impacts of high-explosives tests from soils resuspended by winds.

Based on 7 or 8 days of 24-hour sampling on non-high-explosives test shot days, the average beryllium concentration at the short-term sampling locations was 0.036 (±0.0005) ng/m^3. The standard deviation of these 56 samples was 0.041 ng/m^3. The average value was somewhat higher, but consistent with quarterly average beryllium concentrations measured at AIRNET stations. The higher concentration may reflect sampling locations near areas where beryllium has been used historically or near areas where soil disturbing activities (other than high-explosive testing) occur.

We reviewed the ten highest 24-hour beryllium concentrations. Three occurred on days with no beryllium-containing high-explosives tests. One additional beryllium measurement in the highest ten group occurred in a wind direction more than 90 degrees from the direction at the time of the test. Thus, the short-term beryllium air concentration data show significant variability that we need to quantify; they do not appear to be related to high-explosive testing.

We used the TA-49 and TA-6 meteorological tower wind direction data to identify air sample locations downwind of the tests at the time of the test shots. Two air samples for one high-explosives test shot and one sample from another high-explosive test shot showed elevated beryllium and uranium based on comparisons with average air concentrations measured on non-test-shot days. Other samples taken during these tests did not demonstrate both elevated beryllium and uranium air concentrations. The beryllium concentrations measured were 0.700, 0.167, and 0.143 ng/m^3 (without subtraction for background). Each of these air concentrations was measured on-site at TA-15, to the north of the test location.

E. Meteorological Monitoring *(Scot Johnson)*

1. Introduction

Data obtained from the meteorological monitoring network support many Laboratory activities, including emergency management and response, regulatory compliance, safety analysis, engineering studies, and environmental surveillance programs. To accommodate the broad demands for weather data at the Laboratory, we measure a wide variety of meteorological variables across the network, including wind, temperature, pressure, relative humidity and dewpoint, precipitation, and solar and terrestrial radiation. The Meteorological Monitoring Plan (Baars et al., 1998) provides details of the meteorological monitoring program [an electronic copy of the Meteorological Monitoring Plan is available on the Internet at *www.weather.lanl.gov/monplan/mmp1998.pdf*].

2. Climatology

Los Alamos has a temperate, semiarid mountain climate. However, large differences in locally observed temperature and precipitation exist because of the 1,000-ft elevation change across the Laboratory site. Four distinct seasons occur in Los Alamos. Winters are generally mild, with occasional winter storms. Spring is the windiest season. Summer is the rainy season, with frequent afternoon thunderstorms. Fall is typically dry, cool, and calm. The climate statistics summarized below are from analyses provided in Bowen (1990 and 1992) as well as from historical meteorological databases maintained by the Meteorology Project of ESH-17.

Temperatures at Los Alamos are characterized by wide daily variations (a 23°F range on average) because of the semiarid climate. Atmospheric moisture levels are low, and clear skies are present about 75% of the time. These conditions lead to high solar heating during the day and long-wave radiative cooling of the earth at night that is not ameliorated by downward long-wave radiation that would occur in the presence of clouds and water vapor. The daily fluctuation in temperature is therefore high in Los Alamos. Surrounding communities such as White Rock and Española see even greater fluctuations because they receive a cool nighttime flow that drains from the Pajarito Plateau as it slopes downward to the east towards the Rio Grande river and a nighttime flow southward down the Rio Grande valley itself.

Winter temperatures range from 30°F to 50°F during the daytime and from 15°F to 25°F during the nighttime, with a record low temperature of –18°F recorded in 1963. The Sangre de Cristo Mountains to the east of the Rio Grande Valley act as a barrier to wintertime arctic air masses that descend into the central United States, making the occurrence of local subzero temperatures rare. Winds during the winter are relatively light, so extreme wind chills are uncommon. Summer temperatures range from 70°F to 88°F during the daytime and from 50°F to 59°F during the nighttime, with a record high temperature of 95°F recorded in 1998.

The average annual precipitation (which includes both rain and the water equivalent for frozen precipitation) from 1931 to 2000 is 18.3 in. The average annual snowfall is 52.3 in. Winter precipitation in Los Alamos is often due to storms approaching from the Pacific Ocean or to cyclones forming and/or intensifying leeward of the Rocky Mountains. The snow is usually a dry fluffy powder, with an equivalent water-to-snowfall ratio of about 1:20. Large snowfalls may occur locally as a result of orographic lifting of the storms by the Jemez Mountains. The record single-day snowfall is 22 in., which occurred in 1978 and 1987. The record single-season snowfall is 153 in. set in 1986–1987. Any resident and skier knows too well that annual snowfall varies greatly from year to year, but decadal variability in snowfall is surprisingly low—only a few inches variation per year on the decadal average. The exception is the 1980s, during which the annual average snowfall was 77 inches compared with the annual average snowfall since 1931 (including the 80s) of 52.3 in.

The two months of July and August account for 36% of the annual precipitation and encompass the bulk of the rainy season. Afternoon thunderstorms form as moist air advected from the Pacific Ocean and the Gulf of Mexico is convected and/or orographically lifted by the Jemez Mountains. The thunderstorms yield short, heavy downpours and an abundance of lightning. Local lightning density, among the highest in the USA, is estimated at 7 to 22 strikes per square mile per year (from an internal communication by Stone in 1998). ESH-17 began measuring lightning activity in 1998, and, according to this small sample set, 54% of the detected local lightning activity occurred during July and August. Lightning is most commonly observed during warmer months; 93% of the lightning activity counted since 1998 occurred between the months of June and September.

The complex topography of Los Alamos influences local wind patterns, notable in the absence of large-scale disturbances. Often a distinct diurnal cycle of winds is observed. As air close to the ground is heated during the day, it tends to be displaced by cooler air from aloft and tends to rise and flow upslope along the ground—“anabatic” flow. During the night, cool air that forms close to the ground tends to flow downslope—“katabatic” flow. Daytime upslope (anabatic) flow of heated air on the Pajarito Plateau adds a southerly component to the winds on the plateau as it flows up the Rio Grande valley. Nighttime downslope (katabatic) flow of cooled air from the mountains and plateau adds a light westerly to northerly component to local winds. Flow in the east-west oriented canyons that interrupt the Pajarito Plateau is often aligned with the canyons, and so winds are usually from the west at night as katabatic flow and from the east during the day.

3. Monitoring Network

A network of six towers gathers meteorological data (winds, atmospheric state, precipitation, and fluxes) at the Laboratory (see Meteorological Network [Figure 4-16] and the Meteorological Monitoring Plan [Baars et al., 1998]). Four of the towers are located on mesa tops (TA-6, TA-49, TA-53, and TA-54), one is in a canyon (TA-41), and one is on top of Pajarito Mountain (PJMT). The TA-6 tower is the official meteorological measurement site for the Laboratory. A sonic detection and ranging (SODAR) instrument is also located adjacent to the TA-6 meteorological tower. Precipitation is also measured at TA-16, TA-74, and in the North Community of the Los Alamos town site.

4. Sampling Procedures, Data Management, and Quality Assurance

We site instruments in the meteorological network in areas with good exposure to the elements being measured, usually in open fields, to avoid wake effects (from trees and structures) on wind and precipitation measurements. Open fields also prevent the obstruction of radiometers measuring solar and terrestrial radiation (ultraviolet to infrared spectra).

Temperature and wind are measured at multiple levels on open lattice towers. Instruments are positioned on west-pointing booms (toward the prevailing wind), at a distance of at least two times the tower width (to reduce tower wake effects). The multiple levels provide a vertical profile of conditions important in assessing boundary layer flow and stability conditions. The multiple levels also provide redundant measurements, which support data quality checks. The boom-mounted temperature sensors are shielded and aspirated to minimize solar heating effects.

Data loggers at the tower sites sample most of the meteorological variables at 0.33 Hz, store the data, then average the samples over a 15-minute period, and transmit the data to a Hewlett Packard workstation by telephone or cell phone. The workstation automatically edits measurements that fall outside of allowable ranges. Time-series plots of the data are also generated for a meteorologist’s data quality review. Daily statistics of certain meteorological variables (i.e., daily minimum and maximum temperatures, daily total precipitation, maximum wind gust, etc.) are also generated and checked for quality. Once daily over the past 45 years, a similar set of statistics has been telephoned to the National Weather Service. Observers log cloud type and percentage cloud cover three times daily.

All meteorological instruments are annually refurbished and calibrated during an internal audit/ inspection. Field instruments are replaced with backup instruments, and the replaced instruments are checked to verify that they remained in calibration while in service. All instrument calibrations are traceable to the National Institute of Standards and Technology. An external audit is typically performed once every 2 to 3 years, with the most recent performed during the summer of 1999. Results indicated no significant anomalies with the instruments in the network.

5. Analytical Results

The 2001 Weather Summary (Figure 4-17) presents a graphical summary of Los Alamos weather for 2001. The figure depicts the year's monthly average temperature ranges, monthly precipitation, and monthly snowfall totals, compared with monthly normals (averaged from 1931–2000).

Climatologically, Los Alamos weather for 2001 continued a four-year trend of warm temperatures and a dryer-than-normal climate. The average annual temperature of 49.4°F exceeded the normal annual average of 48.2°F by 1.2 degrees. The total precipitation in 2001 was 79% of normal at 14.4 inches. These warm and dry conditions do not appear, however, to be unusual with respect to the 70-year climate history. The area has experienced many warmer years and many drier years. Monthly precipitation totals were above normal early in the year, somewhat below average during the July–August rainy season, and well below normal from September throughout the remainder of the year. The annual snowfall total was 5% above normal at 55 inches with monthly snowfall totals below normal for every month except for January, which was over three times the normal January snowfall.

Wind statistics, based upon 15-minute averaged wind observations at the four Pajarito Plateau towers and the Pajarito Mountain tower for 2001, appear as wind roses in Figure 4-18. The wind roses depict the percentage of time that the wind blows from each of 16 compass rose points, as well as the distribution of wind speed for each of the 16 directions, represented by shaded wind rose barbs.

Daytime winds (sunrise to sunset) measured by the four Pajarito Plateau towers were predominately from the south, consistent with the typical upslope flow of heated daytime air (see Figure 4-19) moving up the Rio Grande Valley. Nighttime winds (sunset to sunrise) on the Pajarito Plateau were lighter and more variable than daytime winds and typically from the west, resulting from a combination of prevailing winds from the west and downslope katabatic flow of cooled mountain air (see Figure 4-20). Winds atop Pajarito Mountain are more representative of upper-level flows and primarily ranged from the northwest to the southwest, mainly because of the prevailing westerly winds.

6. Heavy Rainfall Events Before and After the Cerro Grande Fire

The Cerro Grande fire burned nearly all of the watersheds above LANL and Los Alamos. As a result, the ability of the soil and vegetation in the watersheds to absorb water has been drastically reduced. These watersheds feed streams that follow the canyons eastward through the Laboratory and town toward the Rio Grande. So, in the aftermath of the fire, the danger of flash flooding affecting LANL and Los Alamos during the summer rainy season increased substantially. A number of measures have been taken to alleviate the danger of flooding, including building dams, clearing culverts, and breaking up and reseeding the hydrophobic layer of soil upstream of Los Alamos.

To provide early warning of flash flood danger, the Bureau of Land Management (BLM) placed nine Remote Automated Weather System (RAWS) stations in threatened watersheds that feed the following canyons: Santa Clara (Upper Santa Clara Canyon and Santa Clara Canyon stations), Garcia, Rendija (Guaje Canyon station), Pueblo, Los Alamos (Quemazon and Upper Los Alamos stations), Pajarito, and Water Canyon (see Figure 4-21). The stations are equipped to send a radio warning to local authorities if they measure a rain total of 0.16 inches in a given ten-minute period. The LANL RAWS station data are available online at *http://www.wrcc.dri.edu/losalamos/* and through a LANL meteorologist.

The community did not sustain serious flood damage during the first rainy season following the fire in May of 2000. Although significant rainfall events did occur during the summer of 2000, the heaviest of these amounted to 0.58 inches per hour. Approximately 90% of rainy seasons can be expected to yield higher one-hour rainfalls. Heavy rainfall events returned during the summer of 2001, however, and on July 2, the volunteer fire station at 4017 Arkansas Street in the North Community area of Los Alamos measured 1.06 inches of rain in one hour. The rain event lasted about one hour, which is typical of events during the summer rainy season. But the unusually large drainage in a small canyon nearby washed away North Road. It is estimated that to replace North Road and to employ measures to prevent further flooding damage in that area will cost $26M.

Was the amount of rain that fell from about 4:30 to 5:30 p.m. on July 2 more than usual? Or can we expect another such event in the near future? July 2 saw one of the heaviest rainfall events measured by the North Community rain gauge since it began operating in 1996. But, during the six years that the rain gauge has been in operation, even heavier rains have fallen in the North Community on two occasions. On July 3, 1998, between 3:30 and 4:30 p.m., 1.12 inches fell, and on July 9, 1999, between 2:15 and 3:15 p.m., 1.24 inches fell. Based on the short history of the North Community rain gauge, one can assume that a rainstorm as heavy or heavier than the rainfall event of July 2 can be expected once every other summer. This assumption is consistent with Bowen (1990) who concluded, based on an extreme event analysis using nine years of data from TA-59, that a 1-inch per hour rainfall event will recur in Los Alamos once every two years.

A rain gauge at TA-6 about one mile south of Omega Bridge and the town site corroborates this finding and adds some insight. In 12 years of operation, this gauge has measured rain events of at least one inch per hour on five occasions, suggesting the occurrence of a rain event similar to the July 2, 2001, rain event once every two to three years. These events are not spaced evenly in time, however, with one rain event occurring during each summer of 1990, 1992, and 1993 and two events in 1991, but none during the eight summers from 1994 to 2001. In addition, heavy rain events at one station are usually not coincident with heavy rain events at other stations only a few miles away. For example, during the disastrous rain event of July 2, 2001, the gauge at TA-6 measured only 0.64 inches. Furthermore, in comparison with the maximum hourly rain event of 1.24 inches at the North Community rain gauge, the heaviest hourly rainfall measured at TA-6 is 1.34 inches, which fell on July 22, 1991, between 5:45 and 6:45 p.m. Because the 12-year TA-6 sample set is twice as large as the North Community data set, it can be expected to contain a slightly larger maximum event.

The RAWS stations did not measure as much rainfall on July 2, 2001. The Pueblo station measured 0.7 inches of rainfall between 4 and 5 p.m. (and none after 5 p.m.). The rainfall at the Pueblo station was the heaviest hourly rainfall that any of the nine RAWS stations measured on July 2, which is not unexpected because the washout of North Road was due to rainfall onto the Pueblo Canyon watershed. In comparison with the July 2 TA-6 measurement of 0.64 inches, the Pajarito station, which lies about 2.7 miles west northwest of TA-6, measured only 0.37 inches between 5:00 and 6:00 p.m. The average daily total of the nine RAWS stations for July 2 was a relatively mild 0.58 inches. The monthly total for the RAWS stations averaged 3.9 inches, however, far exceeding the July total at TA-6 of 2.5 inches and 2.1 inches at North Community. This result may be expected because the average RAWS station is about 1300 ft higher than TA-6 and the North Community rain gauge. The relatively light rainfall measured by the RAWS stations on July 2 attests to the high spatial variability of heavy rainfall in this area.

Finally, it should be noted that rain events amounting to about 0.85 inches in one hour, if not quite as sizeable as the July 2 event as measured by the North Community rain gauge, typically occur one or two times per summer (although not even a single time in some summers, as was the case in 2000). This event rate means that significantly heavy and dangerous rainfall events can be expected to occur at least once during almost every summer rainy season, with events exceeding that of July 2, 2001, once every two to three years and surpassing it by 25% one time every decade.

F. Quality Assurance Program in the Air Quality Group *(Ernie Gladney, Angelique Luedeker, and Terry Morgan)*

1. Quality Assurance Program Development

During 2001, ESH-17 revised three quality plans that affect collection and use of air quality compliance data. We also revised approximately 23 implementing procedures to reflect the constant improvements in the processes. Together, these plans and procedures describe or prescribe all the planned and systematic activities believed necessary to provide adequate confidence that ESH-17 processes perform satisfactorily. All current quality related documents are available on the ESH-17 public Web site (*www.lanl.gov/orgs/rres/maq/index.htm*).

2. Field Sampling Quality Assurance

We maintained the overall QA of this portion of the program through the rigorous use of carefully documented procedures governing all aspects of the sample collection program. Particulate and water vapor samples are

- taken on commercially available media of known performance,
- collected under common EPA chain-of-custody procedures using field-portable electronic data systems to minimize the chances of data transcription errors, and
- prepared in a secure and radiologically clean laboratory for shipment.

They are then delivered to internal and external analytical laboratories under full chain-of-custody utilizing secure FedEx shipment to all external vendors, and we track them at all stages of their collection and analysis through the AIRNET and RADAIR relational databases. All NonRadNet program samples are tracked within the AIRNET database. A complete suite of blanks also goes with each set of samples, to include matrix blanks, trip blanks, and process blanks (where applicable). All blanks are submitted to analytical suppliers for chemical measurements.

We assess field sampling completeness every time the analytical laboratory returns the AIRNET bi-weekly gross alpha/beta data. We check RADAIR field sampling completeness each week upon receipt of the gross alpha/beta and tritium bubbler data and NonRadNet field sampling completeness each 12-day sampling period upon receipt of the inorganic or VOC data sets. All these calculations are performed for each ambient air and stack sampling site and are included in the quality assessment memo that the Chemistry Coordination and Information Management staff prepares to evaluate every data group received from a supplier.

3. Analytical Laboratory Quality Assessment

Specific Statements of Work (SOWs) govern the acquisition and delivery of analytical chemistry services after the Data Quality Objective (DQO) process has identified and quantified our program objectives. These SOWs are sent to potentially qualified suppliers who then undergo a pre-award on-site assessment by experienced and trained ESH-17 quality systems and chemistry laboratory assessors. The assessors primarily use SOW specifications, professional judgment, and quality system performance at each lab (including recent past performance on nationally conducted performance evaluation programs) to award contracts for specific types of radiochemical organic and inorganic analyses. Each laboratory conducts its chain-of-custody and analytical processes under its own quality plans and procedures. ESH-17 submits independently prepared blind spiked tritium samples with each tritium sample set. The analytical laboratory returns preliminary data to ESH-17 by e-mail in an Electronic Data Deliverable (EDD) of specified format and content. Each set of samples contains all the internal QA/QC data generated by the analytical laboratory during each phase of chemical analysis (including laboratory control standards, VOC surrogate compounds, process blanks, matrix spikes, duplicates, and replicates, where applicable). ESH-17 uploads all data electronically into either the AIRNET or RADAIR databases (NonRadNet data are stored within AIRNET) and immediately subjects the data to a variety of quality and consistency checks: we calculate analytical completeness, track and trend all blank and control sample data, and include all parameters in the quality assessment memo mentioned in the field sampling section. All parts of the data management process are tracked electronically in each database, and we prepare periodic reports to management.

We changed the tritium blind matrix spike samples used in the AIRNET program in 2001 from simple spiked waters to a more representative matrix of spiked water evaporated onto silica gel. See Section A.4.c. of this chapter for a detailed discussion of the results of this change.

4. Field Data Quality Assessment Results

Field data completeness for AIRNET, NonRadNet, and Stacks was 100%. Sampler run time was greater than 98% for each network during 2001.

5. Analytical Data Quality Assessment Results

The Clean Air Act requires an EPA-compliant program of QC samples as an integral part of the sampling and analysis process. Table 4-27, Table 4-28, and Table 4-29 document the types and numbers of QC samples run for the overall sampling program.

Our sample and data management procedures document the specific evaluations of each type of QC sample for each analytical measurement. Tables 4-30 through 4-35 show the evaluation criteria and overall outcome of these QC tests.

All QC data are tracked and trended and reported in specific QC Evaluation memos that go to project staff along with each set of analytical data received from our chemistry laboratories.

6. Analytical Laboratory Assessments

During 2001, one internal and three external laboratories performed all chemical analyses reported for AIRNET, NonRadNet, and RADAIR samples. The Wastren-Grand Junction analytical laboratory (associated with the DOE's Grand Junction Project Office) provided biweekly gross alpha, gross beta, and isotopic gamma analytical services for AIRNET. Biweekly AIRNET tritium analytical services came from Paragon Analytics, Inc., Fort Collins, CO. Wastren-Grand Junction also provided analytical chemistry services for alpha-emitting isotopes (americium, plutonium, polonium, thorium, and uranium), beta-emitting isotopes (lead-210), and stable beryllium on AIRNET quarterly composite samples. In addition, they performed all inorganic elemental analyses for the AIRNET and NonRadNet programs. Severn-Trent Laboratories, Austin, TX, analyzed the gas collected in SUMMA Canisters for the NonRadNet program for VOCs. Our on-site Health Physics Analytical Laboratory (ESH-4) performed all instrumental analyses (gross alpha, gross beta, isotopic gamma, and tritium) reported for stack emissions and in-stack samples. Semester composites of in-stack filters were analyzed for alpha- and beta-emitting isotopes at the Wastren-Grand Junction site.

ESH-17 also performed formal on-site assessments at all four laboratories during 2001. Three of these analytical laboratories participated in national performance evaluation studies during 2001 (no such national studies are known for VOCs). The DOE Environmental Measurements Laboratory in New York, NY, sponsors a DOE-wide environmental intercomparison study, sending spiked air filters (among other matrices) twice a year to the participating laboratories. Other commercial and state agencies also produce materials and sponsor a wide variety of intercomparison programs. Each assessment report includes the detailed results of these performance evaluations (Lochamy et al., 2001; Gladney and Luedeker 2001; Gladney and Morgan 2002; and Morgan et al., 2002). Overall, the study sponsors judged our analytical labs that participated in these national studies to have acceptable performance for all analytes attempted in all matrices.

G. Unplanned Releases

During 2001, the Laboratory had no instances of increased airborne emissions of radioactive or nonradioactive materials that required reporting to either the New Mexico Environment Department or the EPA.

Although no reporting thresholds were exceeded, one radionuclide release to the air was noteworthy. On January 31, 2001, WETF released approximately 7600 Ci of tritium gas (HT). This single release contributed over 80% of the total Laboratory tritium emissions for 2001. The release occurred when a container of legacy waste, originally thought to contain less than 50 curies of tritium, failed during processing. Failure of the container released the high-purity tritium gas into the stack ventilation system. The off-site dose from this release was calculated using an emergency response model (MIDAS) to be 0.02 mrem at the site boundary. This dose was well below any regulatory thresholds. The Occurrence Report *http://drambuie.lanl.gov/~esh7/Finals/tritfacils/0201.html* contains a complete description of the event.

H. Special Studies—Neighborhood Environmental Watch Network Community Monitoring Stations

Neighborhood Environmental Watch Network (NEWNET) is a LANL program for radiological monitoring in local communities. It establishes gamma-radiation monitoring stations in local communities and near radiological sources. The data from all the stations are available to the public with, at most, a 24-hour delay. The NEWNET Web page also includes a Spanish language version.

During 2001, we upgraded two NEWNET stations with new Campbell CR10X data loggers and telephone modems to replace the 15-year-old Synergetics 3400-series data loggers and satellite transmitters. The result has been a significant decrease in the noise, especially the spikes that limited the accuracy. As a test of the accuracy of the new system, we used one of the new stations, at East Gate, north of TA-53, to estimate the gamma dose for three cases, as follows.

The first two cases are estimates of the external gamma radiation at East Gate from short-lived nuclides from TA-53, primarily oxygen-15 (2-minute half-life) and carbon-11 (20-minute half-life.)

From November 3 to November 12, 2001, the gamma background at East Gate was 16.6 ± 0.1 R/h. Emissions of activated air caused the dose rate to increase to 19 ± 3 R/h when the wind carried this air from the LANSCE stack to the NEWNET station. By integrating the dose rate as a function of time, we estimated that the total dose was 0.04 ± 0.02 mrem above background. For comparison, the CAP88 program calculated the dose for this period as 0.28 mrem.

Similarly, from November 13 to November 26, the background at East Gate was 16.7 ± 0.1 R/h, the total dose estimated from the NEWNET data was 0.11 ± 0.03 mrem above background, and the CAP88 dose was 0.22 mrem.

The third case involves work on a 1500-Ci cesium-137 source at TA-53 on September 17, 2001, which caused the dose rate at East Gate to increase from 16.44 ± 0.01 R/h to 20.5 ± 0.1 R/h for 2.5 h. The total dose, estimated from the NEWNET data, was 10.1 ± 0.3 rem above background. Because this did not involve airborne radionuclides, this dose is not calculated by CAP88, and NEWNET provides the only estimate.

These three examples demonstrate the accuracy of the upgraded NEWNET system. It is now possible to use NEWNET to measure gamma dose rates with an accuracy of 1 mrem/year. More information about NEWNET and the data are available at *http://newnet.LANL.gov/* on the World Wide Web.

I. Tables

Table 4-1. Average Background Concentrations of Radioactivity in the Regional[a] Atmosphere

	Units	EPA Concentration Limit[b]	Annual Averages[d]				
			1997	1998	1999	2000	2001
Gross Alpha	fCi/m^3	NA[c]	0.7	0.8	1.0	1.0	0.8
Gross Beta	fCi/m^3	NA	14.1	12.4	13.4	13.0	13.9
Tritium[e]	pCi/m^3	1,500	0.7	0.5	0.5	0.8	–0.1
^{238}Pu	aCi/m^3	2,100	0.0	0.1	–0.2	0.0	0.0
^{239,240}Pu	aCi/m^3	2,000	–0.2	0.4	0.1	0.0	0.1
^{241}Am	aCi/m^3	1,900	0.2	0.3	–0.2	0.3	–0.2
^{234}U	aCi/m^3	7,700	14.1	12.9	16.1	17.1	17.9
^{235}U	aCi/m^3	7,100	0.6	0.9	1.2	0.9	1.3
^{238}U	aCi/m^3	8,300	12.2	12.8	15.2	15.9	17.7

[a] Data from regional air sampling stations operated by LANL during the last five years. Locations can vary by year.
[b] Each EPA limit equals 10 mrem/yr.
[c] NA = not available.
[d] Gross Alpha and Beta Annual Averages are calculated from gross air concentrations. All other Annual Averages are calculated from net air concentrations.
[e] Tritium Annual Averages have been corrected for the tritium lost to bound water in the silica gel media.

Table 4-2. Airborne Long-Lived Gross Alpha Concentrations for 2001

Station Location		Number of Measurements	Number of Measurements <Uncertainty	Maximum (fCi/m^3)	Minimum (fCi/m^3)	Mean (fCi/m^3)	Sample Standard Deviation
Regional Stations							
01	Española	26	0	2.07	0.40	0.86	0.39
03	Santa Fe	26	0	1.68	0.35	0.76	0.35
55	Santa Fe West (Buckman Booster #4)	26	0	2.15	0.29	0.73	0.39
56	El Rancho	26	0	2.02	0.36	0.84	0.43
Pueblo Stations							
41	San Ildefonso Pueblo	25	0	1.97	0.41	0.86	0.36
59	Jemez Pueblo-Visitor's Center	26	0	1.95	0.45	0.89	0.45
Perimeter Stations							
04	Barranca School	26	0	1.74	0.22	0.67	0.30
05	Urban Park	26	0	1.78	0.34	0.74	0.32
06	48th Street	26	0	2.08	0.38	0.67	0.35
08	McDonald's Restaurant	26	0	2.13	0.31	0.71	0.38
09	Los Alamos Airport	26	0	2.11	0.35	0.72	0.34
10	East Gate	26	0	2.15	0.38	0.77	0.36
11	Well PM-1 (E. Jemez Road)	26	0	1.79	0.31	0.67	0.31
12	Royal Crest Trailer Court	26	0	1.92	0.31	0.66	0.33
13	Rocket Park	26	0	1.79	0.34	0.72	0.33
14	Pajarito Acres	26	0	2.14	0.24	0.75	0.38
15	White Rock Fire Station	26	0	2.00	0.29	0.78	0.35
16	White Rock Nazarene Church	26	0	2.07	0.25	0.74	0.36
17	Bandelier Fire Lookout	26	0	1.82	0.39	0.69	0.29
26	TA-49	26	0	1.92	0.23	0.65	0.32
32	County Landfill	26	0	1.13	0.37	0.65	0.22
54	TA-33 East	26	0	2.01	0.38	0.78	0.41
60	LA Canyon	26	0	2.29	0.35	0.67	0.38
61	LA Hospital	26	0	2.43	0.42	0.86	0.41
62	Crossroads Bible Church	26	1	2.48	0.09	0.77	0.45
63	Monte Rey South	26	0	2.12	0.25	0.72	0.37
66	Los Alamos Inn-South	26	0	2.08	0.40	0.72	0.33
67	TA-3 Research Park	26	0	2.27	0.34	0.91	0.38
68	Airport Road	2	0	0.70	0.61	0.66	0.07
80	Western Arizona Street	12	0	2.28	0.41	0.82	0.51
90	East Gate-Backup	9	0	1.75	0.42	0.78	0.43
TA-15 and TA-36 Stations							
76	TA-15-41	26	0	2.21	0.30	0.71	0.36
77	TA-36 IJ Site	25	0	2.53	0.26	0.68	0.43
78	TA-15-N	26	0	1.91	0.32	0.72	0.32
TA-21 Stations							
20	TA-21 Area B	26	0	1.79	0.24	0.59	0.29
71	TA-21.01 (NW Bldg 344)	26	0	2.72	0.28	0.76	0.46

Table 4-2. Airborne Long-Lived Gross Alpha Concentrations for 2001 (Cont.)

Station Location		Number of Measurements	Number of Measurements <Uncertainty	Maximum (fCi/m^3)	Minimum (fCi/m^3)	Mean (fCi/m^3)	Sample Standard Deviation
TA-54 Area G Stations							
27	Area G (by QA)	26	0	1.77	0.48	0.79	0.29
34	Area G-1 (behind trailer)	26	0	1.79	0.57	0.90	0.29
35	Area G-2 (back fence)	26	0	1.44	0.31	0.70	0.26
36	Area G-3 (by office)	26	0	2.49	0.42	0.75	0.40
45	Area G/South East Perimeter	26	0	1.75	0.45	0.90	0.27
47	Area G/North Perimeter	26	0	2.17	0.53	0.84	0.34
50	Area G-expansion	26	0	1.83	0.50	0.88	0.29
51	Area G-expansion pit	26	0	2.37	0.42	0.83	0.37
Other On-Site Stations							
23	TA-5	26	0	2.03	0.35	0.76	0.35
25	TA-16-450	26	0	2.55	0.28	0.75	0.42
30	Pajarito Booster 2 (P-2)	26	0	2.06	0.31	0.82	0.39
31	TA-3	26	0	2.14	0.29	0.81	0.39
49	Pajarito Road (TA-36)	26	0	1.97	0.31	0.76	0.33
QA Stations							
38	TA-54 Area G-QA (next to #27)	26	0	2.00	0.33	0.77	0.35
39	TA-49-QA (next to #26)	26	0	1.37	0.22	0.61	0.24

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (fCi/m^3)	Minimum (fCi/m^3)	Mean (fCi/m^3)	95% Confidence Interval[a]	Sample Standard Deviation
Regional	104	0	2.15	0.29	0.80	±0.08	0.39
Pueblo	51	0	1.97	0.41	0.88	±0.11	0.40
Perimeter	595	1	2.48	0.09	0.73	±0.03	0.35
TA-15 and TA-36	77	0	2.53	0.26	0.70	±0.08	0.37
TA-21	52	0	2.72	0.24	0.67	±0.11	0.39
TA-54 Area G	208	0	2.49	0.31	0.83	±0.04	0.32
Other On-Site	130	0	2.55	0.28	0.78	±0.06	0.37

Concentration Guidelines
Concentration Guidelines are not available for gross alpha concentrations.

[a] 95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-3. Airborne Long-Lived Gross Beta Concentrations for 2001

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (fCi/m^3)	Minimum (fCi/m^3)	Mean (fCi/m^3)	Sample Standard Deviation
Regional Stations						
01 Española	26	0	25.6	10.2	14.8	4.2
03 Santa Fe	26	0	22.5	8.2	12.8	3.7
55 Santa Fe West (Buckman Booster #4)	26	0	23.3	8.4	13.5	3.8
56 El Rancho	26	0	26.5	8.7	14.5	4.7
Pueblo Stations						
41 San Ildefonso Pueblo	25	0	21.7	9.2	13.7	3.5
59 Jemez Pueblo-Visitor's Center	26	0	21.9	6.5	13.9	3.6
Perimeter Stations						
04 Barranca School	26	0	21.4	7.8	12.2	3.0
05 Urban Park	26	0	20.6	7.7	11.6	2.5
06 48th Street	26	0	22.0	6.7	11.1	3.1
08 McDonald's Restaurant	26	0	24.4	5.8	12.4	4.0
09 Los Alamos Airport	26	0	26.0	8.0	12.4	3.6
10 East Gate	25	0	26.7	8.4	13.0	3.9
11 Well PM-1 (E. Jemez Road)	26	0	21.6	6.5	12.0	3.1
12 Royal Crest Trailer Court	26	0	23.4	8.1	12.5	3.4
13 Rocket Park	26	0	23.5	8.2	13.1	3.7
14 Pajarito Acres	26	0	23.1	7.7	12.4	3.7
15 White Rock Fire Station	26	0	25.2	8.0	13.2	3.8
16 White Rock Nazarene Church	26	0	23.5	7.9	12.8	3.6
17 Bandelier Fire Lookout	26	0	22.8	8.0	13.1	3.6
26 TA-49	26	0	23.1	6.9	11.6	3.2
32 County Landfill	26	0	20.2	5.0	11.0	3.4
54 TA-33 East	26	0	22.9	8.6	13.3	3.7
60 LA Canyon	26	0	24.2	7.6	12.1	3.3
61 LA Hospital	26	0	26.2	8.1	13.2	3.5
62 Crossroads Bible Church	26	0	25.3	2.6	12.9	4.1
63 Monte Rey South	26	0	24.0	7.9	12.7	3.6
66 Los Alamos Inn-South	26	0	24.2	7.7	12.3	3.4
67 TA-3 Research Park	26	0	23.6	8.6	13.1	3.1
68 Airport Road	2	0	13.8	13.0	13.4	0.6
80 Western Arizona Street	12	0	26.3	9.3	14.1	4.3
90 East Gate-Backup	9	0	21.3	12.0	14.6	2.7
TA-15 and TA-36 Stations						
76 TA-15-41	26	0	25.0	7.3	12.5	3.6
77 TA-36 IJ Site	25	0	23.6	7.3	12.5	3.3
78 TA-15-N	26	0	23.3	7.9	12.4	3.2
TA-21 Stations						
20 TA-21 Area B	26	0	21.4	7.5	12.1	2.9
71 TA-21.01 (NW Bldg 344)	26	0	23.3	8.2	12.7	3.4

Table 4-3. Airborne Long-Lived Gross Beta Concentrations for 2001 (Cont.)

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (fCi/m^3)	Minimum (fCi/m^3)	Mean (fCi/m^3)	Sample Standard Deviation
TA-54 Area G Stations						
27 Area G (by QA)	26	0	24.1	7.8	12.3	3.5
34 Area G-1 (behind trailer)	26	0	23.9	2.7	12.2	4.3
35 Area G-2 (back fence)	26	0	22.8	7.2	12.1	3.4
36 Area G-3 (by office)	26	0	25.4	7.7	12.3	3.8
45 Area G/South East Perimeter	26	0	22.3	5.8	12.6	3.7
47 Area G/North Perimeter	26	0	22.6	8.1	12.6	3.7
50 Area G-expansion	26	0	23.3	2.3	13.1	4.4
51 Area G-expansion pit	26	0	26.4	7.9	12.6	3.8
Other On-Site Stations						
23 TA-5	26	0	23.5	7.9	12.8	3.5
25 TA-16-450	26	0	27.1	7.8	12.4	3.7
30 Pajarito Booster 2 (P-2)	26	0	24.3	7.4	12.7	3.7
31 TA-3	26	0	21.4	8.0	12.0	2.9
49 Pajarito Road (TA-36)	26	0	23.5	7.4	12.6	3.3
QA Stations						
38 TA-54 Area G-QA (next to #27)	26	0	23.9	7.7	12.2	3.6
39 TA-49-QA (next to #26)	26	0	20.8	7.0	11.7	3.0

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (fCi/m^3)	Minimum (fCi/m^3)	Mean (fCi/m^3)	95% Confidence Interval[a]	Sample Standard Deviation
Regional	104	0	26.5	8.2	13.9	±0.8	4.2
Pueblo	51	0	21.9	6.5	13.8	±1.0	3.5
Perimeter	595	0	26.7	2.6	12.5	±0.3	3.5
TA-15 and TA-36	77	0	25.0	7.3	12.4	±0.7	3.3
TA-21	52	0	23.3	7.5	12.4	±0.9	3.1
TA-54 Area G	208	0	26.4	2.3	12.5	±0.5	3.8
Other On-Site	130	0	27.1	7.4	12.5	±0.6	3.4

Concentration Guidelines

Concentration guidelines are not available for gross beta concentrations.

[a]95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-4. Airborne Tritium as Tritiated Water Concentrations for 2001

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (pCi/m³)	Minimum (pCi/m³)	Mean (pCi/m³)	Sample Standard Deviation
Regional Stations						
01 Española	26	26	2.3	–1.9[a]	0.0	0.9
03 Santa Fe	26	26	1.6	–1.9	–0.1	0.9
55 Santa Fe West (Buckman Booster #4)	26	25	5.0	–2.7	0.0	1.4
56 El Rancho	26	26	2.7	–2.8	–0.1	1.0
Pueblo Stations						
41 San Ildefonso Pueblo	25	24	13.3	–1.9	1.0	2.8
59 Jemez Pueblo-Visitor's Center	26	26	1.7	–1.7	0.0	0.9
Perimeter Stations						
04 Barranca School	26	15	4.8	0.2	2.0	1.3
05 Urban Park	25	20	3.7	–0.8	1.3	0.9
06 48th Street	25	21	4.3	–0.5	1.4	1.1
08 McDonald's Restaurant	26	1	60.1	1.3	13.8	14.5
09 Los Alamos Airport	26	0	15.4	3.3	5.7	2.5
10 East Gate	26	4	12.3	1.7	5.3	3.4
11 Well PM-1 (E. Jemez Road)	26	14	5.0	0.3	2.4	1.2
12 Royal Crest Trailer Court	26	9	10.2	0.0	3.1	2.2
13 Rocket Park	26	7	13.4	1.0	4.7	3.6
14 Pajarito Acres	26	15	10.3	0.2	2.7	2.2
15 White Rock Fire Station	26	11	6.3	0.4	2.7	1.5
16 White Rock Nazarene Church	26	5	19.5	1.1	6.6	6.0
17 Bandelier Fire Lookout	26	8	11.8	0.4	3.8	2.4
26 TA-49	26	8	25.2	–0.3	5.3	4.8
32 County Landfill	26	11	10.8	1.2	3.1	2.2
54 TA-33 East	26	9	10.9	–0.2	3.3	2.6
60 LA Canyon	26	2	30.9	0.8	7.2	7.3
61 LA Hospital	26	13	7.0	–0.3	2.5	1.5
62 Crossroads Bible Church	26	11	12.2	0.9	3.4	2.4
63 Monte Rey South	26	9	5.7	0.4	2.6	1.4
66 Los Alamos Inn-South	26	2	39.9	1.0	8.3	8.9
67 TA-3 Research Park	26	20	4.1	–0.2	1.8	0.9
68 Airport Road	2	0	6.8	3.6	5.2	2.2
80 Western Arizona Street	11	10	1.7	–0.2	0.7	0.6
90 East Gate-Backup	9	0	12.3	2.9	7.1	3.2
TA-15 and TA-36 Stations						
76 TA-15-41	26	18	6.1	–0.7	2.0	1.6
77 TA-36 IJ Site	26	13	5.2	0.1	2.5	1.3
78 TA-15-N	26	13	6.0	–0.1	2.5	1.6
TA-21 Stations						
20 TA-21 Area B	26	0	18.9	3.2	8.0	5.0
71 TA-21.01 (NW Bldg 344)	26	2	16.2	1.9	6.4	3.7

Table 4-4. Airborne Tritium as Tritiated Water Concentrations for 2001 (Cont.)

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (pCi/m^3)	Minimum (pCi/m^3)	Mean (pCi/m^3)	Sample Standard Deviation
TA-54 Area G Stations						
27 Area G (by QA)	26	0	104.6	1.8	33.2	31.7
34 Area G-1 (behind trailer)	26	0	56.0	2.3	25.8	16.0
35 Area G-2 (back fence)	26	0	7316.1	12.5	1826.5	2273.4
36 Area G-3 (by office)	26	0	82.7	5.2	42.2	29.0
45 Area G/South East Perimeter	26	0	55.0	2.0	23.2	16.5
47 Area G/North Perimeter	26	1	61.1	1.2	23.8	20.5
50 Area G-expansion	26	0	47.8	2.3	19.8	14.9
51 Area G-expansion pit	26	0	49.8	2.7	20.2	14.3
53 TA-54 MDA-H	19	3	70.1	3.1	28.0	21.7
Other On-Site Stations						
23 TA-5	26	5	10.1	0.8	4.2	2.4
25 TA-16-450	26	0	190.3	15.2	68.4	52.7
30 Pajarito Booster 2 (P-2)	26	9	6.8	0.0	2.8	1.8
31 TA-3	26	9	8.1	0.9	3.1	1.6
49 Pajarito Road (TA-36)	26	16	18.5	–1.2	3.0	4.0
QA Stations						
38 TA-54 Area G-QA (next to #27)	26	0	100.8	2.9	33.7	32.3
39 TA-49-QA (next to #26)	26	4	25.2	0.3	5.6	4.7

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (fCi/m^3)	Minimum (fCi/m^3)	Mean (fCi/m^3)	95% Confidence Interval[b]	Sample Standard Deviation
Regional	104	103	5.0	–2.8	–0.1	±0.2	1.0
Pueblo	51	50	13.3	–1.9	0.5	±0.6	2.1
Perimeter	592	225	60.1	–0.8	4.2	±0.4	5.3
TA-15 and TA-36	78	44	6.1	–0.7	2.3	±0.3	1.5
TA-21	52	2	18.9	1.9	7.2	±1.2	4.4
TA-54 Area G	227	4	7316.1	1.2	233.1	±123.6	949.7
Other On-Site	130	39	190.3	–1.2	16.3	±6.1	35.0

Concentration Guidelines

DOE Derived Air Concentration (DAC) Guide for workplace exposure is 20,000,000 pCi/m^3. See Appendix A.
EPA 40 CFR 61 Concentration Guide 1,500 pCi/m^3.

[a] See Section A.4.a of this chapter and Appendix B for an explanation of negative values.
[b] 95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-5. Airborne Plutonium-238 Concentrations for 2001

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
Regional Stations						
01 Española	4	4	0.6	–0.6[a]	0.1	0.5
03 Santa Fe	4	4	0.1	–0.8	–0.3	0.4
55 Santa Fe West (Buckman Booster #4)	4	4	0.4	–0.4	–0.1	0.3
56 El Rancho	4	4	0.5	–0.4	0.1	0.4
Pueblo Stations						
41 San Ildefonso Pueblo	4	4	0.3	–1.0	–0.2	0.6
59 Jemez Pueblo-Visitor's Center	4	4	0.4	–0.3	0.0	0.3
Perimeter Stations						
04 Barranca School	4	4	0.2	–0.6	–0.2	0.3
05 Urban Park	4	4	0.4	–0.6	–0.1	0.4
06 48th Street	4	4	0.0	–0.3	–0.2	0.1
08 McDonald's Restaurant	4	4	0.5	–0.3	0.0	0.4
09 Los Alamos Airport	4	4	0.5	–0.3	0.0	0.4
10 East Gate	4	4	0.3	–0.4	–0.1	0.4
11 Well PM-1 (E. Jemez Road)	4	4	–0.1	–0.5	–0.3	0.2
12 Royal Crest Trailer Court	4	4	0.3	–0.3	0.0	0.3
13 Rocket Park	4	4	0.5	–0.2	0.2	0.3
14 Pajarito Acres	4	4	1.1	–0.7	0.4	0.8
15 White Rock Fire Station	4	4	0.5	–0.2	0.1	0.4
16 White Rock Nazarene Church	4	4	0.2	–0.4	0.0	0.3
17 Bandelier Fire Lookout	4	4	0.1	–0.3	0.0	0.2
26 TA-49	4	4	0.0	–0.4	–0.2	0.1
32 County Landfill	4	4	0.1	–0.3	0.0	0.2
54 TA-33 East	4	4	0.1	–0.4	–0.1	0.2
60 LA Canyon	4	4	0.6	–0.3	0.0	0.4
61 LA Hospital	4	4	0.6	0.0	0.2	0.3
62 Crossroads Bible Church	4	4	0.9	–1.0	–0.1	0.8
63 Monte Rey South	4	4	0.4	–0.3	0.1	0.3
66 Los Alamos Inn-South	4	4	0.8	–0.3	0.3	0.5
67 TA-3 Research Park	4	4	0.3	–0.7	0.0	0.5
68 Airport Road	1	1	0.5	0.5	0.5	
80 Western Arizona Street	2	2	0.1	–0.5	–0.2	0.4
90 East Gate-Backup	2	2	0.3	–0.9	–0.3	0.9
TA-15 and TA-36 Stations						
76 TA-15-41	4	4	0.2	–0.5	–0.2	0.3
77 TA-36 IJ Site	4	4	0.2	–0.8	–0.2	0.5
78 TA-15-N	4	4	0.0	–0.7	–0.4	0.3
TA-21 Stations						
20 TA-21 Area B	4	4	0.3	–0.3	0.1	0.3
71 TA-21.01 (NW Bldg 344)	4	4	0.0	–0.2	–0.1	0.1

Table 4-5. Airborne Plutonium-238 Concentrations for 2001 (Cont.)

Station Location		Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
TA-54 Area G Stations							
27	Area G (by QA)	4	4	1.6	–0.5	0.2	1.0
34	Area G-1 (behind trailer)	4	2	9.0	0.1	3.2	4.0
35	Area G-2 (back fence)	4	4	0.0	–0.5	–0.2	0.2
36	Area G-3 (by office)	4	4	0.4	–0.2	0.1	0.3
45	Area G/South East Perimeter	4	4	0.7	0.1	0.4	0.2
47	Area G/North Perimeter	4	4	0.4	–0.6	0.1	0.5
50	Area G-expansion	4	4	0.7	–0.2	0.3	0.4
51	Area G-expansion pit	4	4	1.2	–0.1	0.5	0.6
Other On-Site Stations							
23	TA-5	4	4	0.2	–0.3	–0.1	0.2
25	TA-16-450	4	4	0.0	–0.5	–0.3	0.3
30	Pajarito Booster 2 (P-2)	4	4	1.0	–0.9	0.0	0.8
31	TA-3	4	4	0.9	–0.2	0.2	0.5
49	Pajarito Road (TA-36)	4	4	0.4	–0.5	–0.2	0.4
QA Stations							
38	TA-54 Area G-QA (next to #27)	4	3	2.0	–0.3	0.5	1.1
39	TA-49-QA (next to #26)	4	4	0.1	–0.4	–0.1	0.2

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	95% Confidence Interval[b]	Sample Standard Deviation
Regional	16	16	0.6	–0.8	0.0	±0.2	0.4
Pueblo	8	8	0.4	–1.0	–0.1	±0.4	0.4
Perimeter	93	93	1.1	–1.0	0.0	±0.1	0.4
TA-15 and TA-36	12	12	0.2	–0.8	–0.2	±0.2	0.3
TA-21	8	8	0.3	–0.3	0.0	±0.2	0.2
TA-54 Area G	32	30	9.0	–0.6	0.6	±0.6	1.7
Other On-Site	20	20	1.0	–0.9	–0.1	±0.2	0.5

Concentration Guidelines

DOE Derived Air Concentration (DAC) Guide for workplace exposure is 3,000,000 aCi/m^3. See Appendix A.
EPA 40 CFR 61 Concentration Guide 2,100 aCi/m^3.

[a]See Section A.4.a of this chapter and Appendix B for an explanation of negative values.
[b]95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-6. Airborne Plutonium-239 Concentrations for 2001

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
Regional Stations						
01 Española	4	4	1.3	–0.1[a]	0.5	0.6
03 Santa Fe	4	4	1.0	–0.9	0.3	0.9
55 Santa Fe West (Buckman Booster #4)	4	4	0.2	–0.9	–0.4	0.5
56 El Rancho	4	4	0.8	–0.6	0.1	0.6
Pueblo Stations						
41 San Ildefonso Pueblo	4	4	1.2	0.3	0.6	0.4
59 Jemez Pueblo-Visitor's Center	4	4	0.5	–0.9	–0.2	0.6
Perimeter Stations						
04 Barranca School	4	4	0.9	–0.6	0.2	0.6
05 Urban Park	4	4	1.5	–0.5	0.5	1.0
06 48th Street	4	4	1.2	–0.1	0.5	0.5
08 McDonald's Restaurant	4	3	3.7	–0.3	1.2	1.7
09 Los Alamos Airport	4	3	2.9	–0.3	1.4	1.5
10 East Gate	4	4	0.8	–0.9	–0.1	0.9
11 Well PM-1 (E. Jemez Road)	4	4	1.1	0.0	0.5	0.5
12 Royal Crest Trailer Court	4	4	0.9	–0.7	0.3	0.7
13 Rocket Park	4	3	2.0	0.0	1.3	0.9
14 Pajarito Acres	4	4	1.1	–0.8	0.0	0.9
15 White Rock Fire Station	4	4	0.5	–0.3	0.1	0.3
16 White Rock Nazarene Church	4	4	0.1	–1.0	–0.3	0.5
17 Bandelier Fire Lookout	4	4	0.1	–0.2	–0.1	0.1
26 TA-49	4	4	0.6	–0.5	0.0	0.5
32 County Landfill	4	2	5.5	0.8	2.4	2.1
54 TA-33 East	4	4	0.6	–0.5	0.0	0.4
60 LA Canyon	4	4	1.4	–0.5	0.6	0.8
61 LA Hospital	4	4	1.9	0.4	0.9	0.7
62 Crossroads Bible Church	4	4	2.5	–0.2	0.9	1.1
63 Monte Rey South	4	4	0.3	–0.6	–0.1	0.5
66 Los Alamos Inn-South	4	0	38.6	4.9	19.9	14.0
67 TA-3 Research Park	4	4	1.3	0.6	0.9	0.3
68 Airport Road	1	1	–1.5	–1.5	–1.5	
80 Western Arizona Street	2	2	0.2	0.0	0.1	0.2
90 East Gate-Backup	2	2	2.3	–0.2	1.1	1.7
TA-15 and TA-36 Stations						
76 TA-15-41	4	4	0.8	–0.7	0.1	0.7
77 TA-36 IJ Site	4	4	0.1	–1.2	–0.6	0.6
78 TA-15-N	4	4	1.0	–0.5	–0.1	0.7
TA-21 Stations						
20 TA-21 Area B	4	4	1.3	–0.2	0.2	0.7
71 TA-21.01 (NW Bldg 344)	4	3	25.5	0.7	7.3	12.2

Table 4-6. Airborne Plutonium-239 Concentrations for 2001 (Cont.)

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
TA-54 Area G Stations						
27 Area G (by QA)	4	1	14.4	–0.1	5.9	6.2
34 Area G-1 (behind trailer)	4	0	35.6	20.4	25.1	7.0
35 Area G-2 (back fence)	4	4	1.3	–0.5	0.5	0.8
36 Area G-3 (by office)	4	4	1.0	–1.0	0.1	0.9
45 Area G/South East Perimeter	4	1	7.7	1.4	4.0	2.7
47 Area G/North Perimeter	4	2	5.8	0.7	3.3	2.7
50 Area G-expansion	4	3	22.8	0.1	6.5	10.9
51 Area G-expansion pit	4	3	4.1	0.6	1.8	1.6
Other On-Site Stations						
23 TA-5	4	4	0.9	–0.8	0.0	0.9
25 TA-16-450	4	4	1.0	–1.1	0.0	0.9
30 Pajarito Booster 2 (P-2)	4	4	2.0	–0.5	0.4	1.1
31 TA-3	4	4	1.6	–0.3	0.4	0.9
49 Pajarito Road (TA-36)	4	4	0.6	–0.2	0.3	0.4
QA Stations						
38 TA-54 Area G-QA (next to #27)	4	1	9.2	3.0	6.2	2.5
39 TA-49-QA (next to #26)	4	4	1.3	–1.7	0.0	1.3

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	95% Confidence Interval[b]	Sample Standard Deviation
Regional	16	16	1.3	–0.9	0.1	±0.4	0.7
Pueblo	8	8	1.2	–0.9	0.2	±0.5	0.6
Perimeter	93	84	38.6	–1.5	1.3	±1.0	4.8
TA-15 and TA-36	12	12	1.0	–1.2	–0.2	±0.4	0.7
TA-21	8	7	25.5	–0.2	3.7	±7.4	8.8
TA-54 Area G	32	18	35.6	–1.0	5.9	±3.3	9.0
Other On-Site	20	20	2.0	–1.1	0.2	±0.4	0.8

Concentration Guidelines
DOE Derived Air Concentration (DAC) Guide for workplace exposure is 2,000,000 aCi/m^3. See Appendix A.
EPA 40 CFR 61 Concentration Guide 2,000 aCi/m^3.

[a]See Section A.4.a of this chapter and Appendix B for an explanation of negative values.
[b]95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-7. Airborne Americium-241 Concentrations for 2001

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
Regional Stations						
01 Española	4	4	0.8	–0.7[a]	–0.1	0.7
03 Santa Fe	4	4	0.5	–1.5	–0.4	1.0
55 Santa Fe West (Buckman Booster #4)	4	4	0.8	–0.7	0.1	0.8
56 El Rancho	4	4	0.8	–1.3	–0.2	1.0
Pueblo Stations						
41 San Ildefonso Pueblo	4	4	1.9	–2.0	0.1	1.6
59 Jemez Pueblo-Visitor's Center	4	4	0.2	–1.4	–0.3	0.7
Perimeter Stations						
04 Barranca School	4	4	1.0	–0.5	0.2	0.8
05 Urban Park	4	4	0.0	–1.0	–0.5	0.4
06 48th Street	4	4	3.9	–1.4	1.0	2.3
08 McDonald's Restaurant	4	4	1.2	–1.3	–0.2	1.1
09 Los Alamos Airport	4	4	1.1	–0.9	0.4	0.9
10 East Gate	4	4	2.7	–1.2	0.5	1.8
11 Well PM-1 (E. Jemez Road)	4	4	1.3	–0.4	0.4	0.9
12 Royal Crest Trailer Court	4	4	2.3	0.6	1.4	0.9
13 Rocket Park	4	4	0.2	–0.6	–0.2	0.4
14 Pajarito Acres	4	4	0.6	–1.2	–0.4	0.8
15 White Rock Fire Station	4	4	–0.2	–1.3	–0.6	0.5
16 White Rock Nazarene Church	4	4	1.0	–0.4	0.2	0.6
17 Bandelier Fire Lookout	4	4	0.5	–0.8	–0.4	0.6
26 TA-49	4	4	3.2	–1.6	0.3	2.0
32 County Landfill	4	4	1.8	–1.0	–0.1	1.3
54 TA-33 East	4	4	2.6	–0.7	0.8	1.4
60 LA Canyon	4	4	2.3	–0.7	0.8	1.2
61 LA Hospital	4	4	0.1	–1.6	–0.7	0.7
62 Crossroads Bible Church	4	4	0.6	–2.0	–0.4	1.1
63 Monte Rey South	4	4	1.4	–1.0	0.0	1.1
66 Los Alamos Inn-South	4	4	0.9	–0.4	0.2	0.5
67 TA-3 Research Park	4	4	0.4	–2.4	–0.6	1.2
68 Airport Road	1	1	5.3	5.3	5.3	
80 Western Arizona Street	2	2	0.2	0.1	0.1	0.1
90 East Gate-Backup	2	2	–1.1	–2.1	–1.6	0.7
TA-15 and TA-36 Stations						
76 TA-15-41	4	4	1.4	–0.9	0.5	1.0
77 TA-36 IJ Site	4	4	0.9	–0.7	0.0	0.7
78 TA-15-N	4	4	0.4	–0.7	0.0	0.5
TA-21 Stations						
20 TA-21 Area B	4	4	0.8	–0.7	0.0	0.6
71 TA-21.01 (NW Bldg 344)	4	4	1.1	–1.7	–0.2	1.2

Table 4-7. Airborne Americium-241 Concentrations for 2001 (Cont.)

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m³)	Minimum (aCi/m³)	Mean (aCi/m³)	Sample Standard Deviation
TA-54 Area G Stations						
27 Area G (by QA)	4	2	11.2	0.1	4.1	5.1
34 Area G-1 (behind trailer)	4	0	105.3	33.7	66.6	29.4
35 Area G-2 (back fence)	4	4	0.5	–1.3	–0.7	0.8
36 Area G-3 (by office)	4	4	1.1	–1.7	–0.2	1.4
45 Area G/South East Perimeter	4	3	2.9	–0.3	1.7	1.5
47 Area G/North Perimeter	4	1	12.3	2.8	7.8	4.1
50 Area G-expansion	4	4	2.8	–0.4	1.3	1.4
51 Area G-expansion pit	4	4	1.5	–0.5	0.3	0.9
Other On-Site Stations						
23 TA-5	4	4	1.5	–1.8	–0.7	1.5
25 TA-16-450	4	4	1.2	–1.0	0.2	0.9
30 Pajarito Booster 2 (P-2)	4	4	1.0	–1.2	–0.2	1.0
31 TA-3	4	4	1.1	–1.5	–0.1	1.1
49 Pajarito Road (TA-36)	4	4	0.6	–1.5	–0.7	1.0
QA Stations						
38 TA-54 Area G-QA (next to #27)	4	2	7.3	0.3	3.8	3.2
39 TA-49-QA (next to #26)	4	4	–0.1	–1.2	–0.8	0.5

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m³)	Minimum (aCi/m³)	Mean (aCi/m³)	95% Confidence Interval[b]	Sample Standard Deviation
Regional	16	16	0.8	–1.5	–0.2	±0.4	0.8
Pueblo	8	8	1.9	–2.0	–0.1	±1.0	1.2
Perimeter	93	93	5.3	–2.4	0.1	±0.3	1.3
TA-15 and TA-36	12	12	1.4	–0.9	0.2	±0.5	0.7
TA-21	8	8	1.1	–1.7	–0.1	±0.8	0.9
TA-54 Area G	32	22	105.3	–1.7	10.1	±8.6	23.8
Other On-Site	20	20	1.5	–1.8	–0.3	±0.5	1.0

Concentration Guidelines

DOE Derived Air Concentration (DAC) Guide for workplace exposure is 2,000,000 aCi/m³. See Appendix A.
EPA 40 CFR 61 Concentration Guide 1,900 aCi/m³.

[a]See Section A.4.a of this chapter and Appendix B for an explanation of negative values.
[b]95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-8. Airborne Uranium-234 Concentrations for 2001

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
Regional Stations						
01 Española	4	0	29.5	10.0	18.6	8.2
03 Santa Fe	4	0	61.3	10.4	27.6	23.2
55 Santa Fe West (Buckman Booster #4)	4	0	14.0	5.9	10.0	3.3
56 El Rancho	4	0	22.6	4.6	15.3	8.2
Pueblo Stations						
41 San Ildefonso Pueblo	4	0	36.3	10.2	23.8	12.3
59 Jemez Pueblo-Visitor's Center	4	0	40.7	20.9	31.8	9.4
Perimeter Stations						
04 Barranca School	4	0	20.7	6.5	14.0	6.9
05 Urban Park	4	0	22.3	7.7	12.8	6.5
06 48th Street	4	2	9.6	2.1	5.8	4.0
08 McDonald's Restaurant	4	0	17.5	5.1	9.9	5.4
09 Los Alamos Airport	4	0	9.6	5.8	8.2	1.7
10 East Gate	4	0	12.7	3.8	7.9	3.7
11 Well PM-1 (E. Jemez Road)	4	3	10.2	2.1	4.4	3.9
12 Royal Crest Trailer Court	4	0	23.5	5.5	10.6	8.7
13 Rocket Park	4	0	9.7	5.6	7.5	1.9
14 Pajarito Acres	4	0	11.3	5.3	7.0	2.9
15 White Rock Fire Station	4	0	17.0	9.4	11.9	3.4
16 White Rock Nazarene Church	4	0	9.4	4.5	5.8	2.4
17 Bandelier Fire Lookout	4	1	9.3	1.7	5.2	3.1
26 TA-49	4	1	9.4	1.6	6.0	3.3
32 County Landfill	4	0	73.1	36.7	51.4	16.3
54 TA-33 East	4	0	11.8	3.1	6.8	3.7
60 LA Canyon	4	0	17.4	3.8	10.3	6.0
61 LA Hospital	4	0	14.9	6.8	11.4	3.5
62 Crossroads Bible Church	4	0	11.9	6.1	8.7	3.0
63 Monte Rey South	4	0	8.7	4.8	7.1	1.7
66 Los Alamos Inn-South	4	0	23.9	4.9	10.3	9.1
67 TA-3 Research Park	4	0	29.9	10.7	19.9	10.1
68 Airport Road	1	1	5.1	5.1	5.1	
80 Western Arizona Street	2	0	14.1	8.5	11.3	3.9
90 East Gate-Backup	2	1	6.8	5.9	6.4	0.6
TA-15 and TA-36 Stations						
76 TA-15-41	4	0	14.6	2.9	7.3	5.1
77 TA-36 IJ Site	4	0	61.9	11.1	24.2	25.2
78 TA-15-N	4	0	12.0	4.1	6.9	3.7
TA-21 Stations						
20 TA-21 Area B	4	0	14.0	6.0	10.1	3.7
71 TA-21.01 (NW Bldg 344)	4	0	13.2	4.9	8.2	3.7

Table 4-8. Airborne Uranium-234 Concentrations for 2001 (Cont.)

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
TA-54 Area G Stations						
27 Area G (by QA)	4	0	58.6	9.5	21.9	24.5
34 Area G-1 (behind trailer)	4	0	72.8	21.5	46.6	22.3
35 Area G-2 (back fence)	4	0	29.0	6.1	14.2	10.1
36 Area G-3 (by office)	4	1	25.8	2.9	10.6	10.3
45 Area G/South East Perimeter	4	0	88.3	18.5	48.0	33.2
47 Area G/North Perimeter	4	0	25.7	9.5	15.0	7.5
50 Area G-expansion	4	0	68.2	20.3	33.5	23.2
51 Area G-expansion pit	4	0	63.9	9.2	26.2	25.3
Other On-Site Stations						
23 TA-5	4	0	15.8	5.6	10.5	4.2
25 TA-16-450	4	0	15.0	5.4	8.9	4.4
30 Pajarito Booster 2 (P-2)	4	0	18.4	8.9	12.7	4.2
31 TA-3	4	0	20.8	8.5	12.6	5.6
49 Pajarito Road (TA-36)	4	0	16.8	6.7	9.8	4.7
QA Stations						
38 TA-54 Area G-QA (next to #27)	4	0	47.9	11.4	21.3	17.8
39 TA-49-QA (next to #26)	4	1	18.3	3.7	8.5	6.7

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	95% Confidence Interval[a]	Sample Standard Deviation
Regional	16	0	61.3	4.6	17.9	±7.2	13.4
Pueblo	8	0	40.7	10.2	27.8	±9.2	11.0
Perimeter	93	9	73.1	1.6	10.9	±2.2	10.6
TA-15 and TA-36	12	0	61.9	2.9	12.8	±10.1	15.9
TA-21	8	0	14.0	4.9	9.2	±3.0	3.6
TA-54 Area G	32	1	88.3	2.9	27.0	±8.4	23.3
Other On-Site	20	0	20.8	5.4	10.9	±2.1	4.4

Concentration Guidelines

DOE Derived Air Concentration (DAC) Guide for workplace exposure is 2,000,000 aCi/m^3. See Appendix A.
EPA 40 CFR 61 Concentration Guide 7,700 aCi/m^3.

[a] 95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-9. Airborne Uranium-235 Concentrations for 2001

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
Regional Stations						
01 Española	4	3	4.1	–0.1[a]	1.6	1.8
03 Santa Fe	4	2	6.7	0.3	2.9	3.1
55 Santa Fe West Buckman Booster #4)	4	4	1.4	–0.5	0.6	1.0
56 El Rancho	4	4	2.1	–0.7	0.1	1.3
Pueblo Stations						
41 San Ildefonso Pueblo	4	4	2.3	0.3	1.5	0.9
59 Jemez Pueblo-Visitor's Center	4	3	3.4	–0.1	1.8	1.4
Perimeter Stations						
04 Barranca School	4	4	0.9	0.0	0.5	0.4
05 Urban Park	4	4	1.7	–1.1	0.2	1.2
06 48th Street	4	4	2.5	–0.5	0.5	1.3
08 McDonald's Restaurant	4	4	2.6	–0.7	0.5	1.5
09 Los Alamos Airport	4	4	1.3	–0.6	0.3	0.8
10 East Gate	4	4	1.2	0.3	0.8	0.5
11 Well PM-1 (E. Jemez Road)	4	4	2.8	–0.9	1.2	1.6
12 Royal Crest Trailer Court	4	4	0.1	–0.3	–0.1	0.2
13 Rocket Park	4	4	1.6	–1.0	0.5	1.1
14 Pajarito Acres	4	4	1.3	0.3	0.7	0.5
15 White Rock Fire Station	4	4	1.4	0.7	1.0	0.3
16 White Rock Nazarene Church	4	4	1.2	–1.6	0.1	1.2
17 Bandelier Fire Lookout	4	4	–0.2	–1.8	–0.9	0.7
26 TA-49	4	4	0.6	–1.1	–0.1	0.7
32 County Landfill	4	3	4.4	0.9	2.2	1.5
54 TA-33 East	4	4	2.4	–0.2	1.0	1.1
60 LA Canyon	4	4	1.0	–2.1	–0.1	1.4
61 LA Hospital	4	4	1.4	–0.2	0.5	0.7
62 Crossroads Bible Church	4	4	1.4	–0.1	0.6	0.7
63 Monte Rey South	4	3	3.2	0.0	0.9	1.5
66 Los Alamos Inn-South	4	4	1.6	–0.7	0.2	1.0
67 TA-3 Research Park	4	4	1.3	–0.6	0.6	0.9
68 Airport Road	1	1	4.9	4.9	4.9	
80 Western Arizona Street	2	2	1.8	–0.1	0.8	1.3
90 East Gate-Backup	2	2	1.4	–3.5	–1.0	3.5
TA-15 and TA-36 Stations						
76 TA-15-41	4	4	0.8	–0.9	0.1	0.8
77 TA-36 IJ Site	4	3	6.2	1.5	3.0	2.2
78 TA-15-N	4	4	0.0	–0.7	–0.3	0.3
TA-21 Stations						
20 TA-21 Area B	4	4	1.3	–1.1	0.0	1.2
71 TA-21.01 (NW Bldg 344)	4	4	1.1	0.0	0.6	0.5

Table 4-9. Airborne Uranium-235 Concentrations for 2001 (Cont.)

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
TA-54 Area G Stations						
27 Area G (by QA)	4	3	5.1	0.2	1.5	2.4
34 Area G-1 (behind trailer)	4	2	4.9	–0.1	2.6	2.4
35 Area G-2 (back fence)	4	4	1.1	–0.1	0.7	0.5
36 Area G-3 (by office)	4	4	1.4	–0.8	0.2	1.1
45 Area G/South East Perimeter	4	2	6.4	0.2	3.1	2.6
47 Area G/North Perimeter	4	4	1.1	–0.6	0.3	0.9
50 Area G-expansion	4	4	2.1	–0.1	0.9	1.0
51 Area G-expansion pit	4	2	3.7	2.0	2.8	0.7
Other On-Site Stations						
23 TA-5	4	4	1.6	0.1	0.5	0.7
25 TA-16-450	4	4	0.5	–1.3	–0.5	0.8
30 Pajarito Booster 2 (P-2)	4	3	4.5	1.0	2.4	1.5
31 TA-3	4	4	2.0	0.7	1.5	0.6
49 Pajarito Road (TA-36)	4	3	2.9	0.4	1.6	1.3
QA Stations						
38 TA-54 Area G-QA (next to #27)	4	4	1.6	0.2	0.8	0.6
39 TA-49-QA (next to #26)	4	4	2.0	–0.3	0.9	1.0

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	95% Confidence Interval[b]	Sample Standard Deviation
Regional	16	13	6.7	–0.7	1.3	±1.1	2.1
Pueblo	8	7	3.4	–0.1	1.6	±0.9	1.1
Perimeter	93	91	4.9	–3.5	0.5	±0.3	1.2
TA-15 and TA-36	12	11	6.2	–0.9	0.9	±1.2	2.0
TA-21	8	8	1.3	–1.1	0.3	±0.7	0.9
TA-54 Area G	32	25	6.4	–0.8	1.5	±0.7	1.8
Other On-Site	20	18	4.5	–1.3	1.1	±0.6	1.4

Concentration Guidelines

DOE Derived Air Concentration (DAC) Guide for workplace exposure is 20,000,000 aCi/m^3. See Appendix A.

EPA 40 CFR 61 Concentration Guide 7,100 aCi/m^3.

[a] See Section A.4.a of this chapter and Appendix B for an explanation of negative values.

[b] 95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-10. Airborne Uranium-238 Concentrations for 2001

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
Regional Stations						
01 Española	4	0	39.7	11.2	21.9	13.5
03 Santa Fe	4	0	55.7	9.4	25.7	20.6
55 Santa Fe West (Buckman Booster #4)	4	1	13.8	1.7	7.4	5.4
56 El Rancho	4	0	26.1	6.6	15.7	8.9
Pueblo Stations						
41 San Ildefonso Pueblo	4	0	37.9	10.6	23.6	11.6
59 Jemez Pueblo-Visitor's Center	4	0	46.7	22.7	31.2	11.0
Perimeter Stations						
04 Barranca School	4	0	22.4	3.9	16.4	8.5
05 Urban Park	4	0	24.2	6.5	12.4	8.1
06 48th Street	4	1	5.6	2.2	3.6	1.4
08 McDonald's Restaurant	4	0	17.6	4.5	9.7	5.9
09 Los Alamos Airport	4	0	19.6	7.0	13.3	5.6
10 East Gate	4	0	23.6	5.6	11.1	8.4
11 Well PM-1 (E. Jemez Road)	4	1	9.1	3.2	5.9	2.9
12 Royal Crest Trailer Court	4	1	28.6	3.4	12.4	11.2
13 Rocket Park	4	0	11.9	3.8	8.4	3.5
14 Pajarito Acres	4	0	20.8	4.4	11.1	6.9
15 White Rock Fire Station	4	0	26.8	11.0	15.7	7.4
16 White Rock Nazarene Church	4	0	8.1	3.8	6.7	2.0
17 Bandelier Fire Lookout	4	2	13.9	2.5	7.5	5.7
26 TA-49	4	0	16.0	3.0	9.4	5.6
32 County Landfill	4	0	75.7	37.2	54.0	16.6
54 TA-33 East	4	1	8.5	3.5	6.3	2.1
60 LA Canyon	4	0	15.7	4.2	10.3	6.2
61 LA Hospital	4	0	11.5	6.4	8.2	2.3
62 Crossroads Bible Church	4	0	20.5	11.5	16.9	4.0
63 Monte Rey South	4	0	22.1	7.5	12.8	6.5
66 Los Alamos Inn-South	4	0	25.1	7.5	12.1	8.6
67 TA-3 Research Park	4	0	30.7	8.7	19.8	10.9
68 Airport Road	1	1	1.8	1.8	1.8	
80 Western Arizona Street	2	0	13.0	6.5	9.7	4.6
90 East Gate-Backup	2	0	13.5	4.7	9.1	6.2
TA-15 and TA-36 Stations						
76 TA-15-41	4	0	22.9	4.7	14.8	7.5
77 TA-36 IJ Site	4	0	377.5	31.5	125.4	168.4
78 TA-15-N	4	0	21.7	5.5	16.0	7.2
TA-21 Stations						
20 TA-21 Area B	4	0	34.8	6.8	18.1	12.0
71 TA-21.01 (NW Bldg 344)	4	0	24.5	4.5	14.5	8.1

Table 4-10. Airborne Uranium-238 Concentrations for 2001 (Cont.)

Station Location		Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	Sample Standard Deviation
TA-54 Area G Stations							
27	Area G (by QA)	4	0	63.4	11.0	25.1	25.6
34	Area G-1 (behind trailer)	4	0	71.9	28.4	48.5	20.5
35	Area G-2 (back fence)	4	0	42.8	8.6	20.7	15.2
36	Area G-3 (by office)	4	0	39.0	6.4	16.4	15.3
45	Area G/South East Perimeter	4	0	97.2	23.7	50.7	34.8
47	Area G/North Perimeter	4	0	39.0	8.2	18.3	14.1
50	Area G-expansion	4	0	64.5	19.2	34.4	20.5
51	Area G-expansion pit	4	0	82.3	12.5	30.7	34.4
Other On-Site Stations							
23	TA-5	4	0	33.7	16.3	22.7	7.6
25	TA-16-450	4	0	15.7	6.0	10.3	4.3
30	Pajarito Booster 2 (P-2)	4	0	32.9	8.3	17.2	11.4
31	TA-3	4	0	20.7	9.5	12.7	5.3
49	Pajarito Road (TA-36)	4	0	35.3	4.1	18.2	14.6
QA Stations							
38	TA-54 Area G-QA (next to #27)	4	0	53.1	12.8	25.8	18.4
39	TA-49-QA (next to #26)	4	0	17.1	4.7	10.1	6.2

Group Summaries

Station Location	Number of Measurements	Number of Measurements <Uncertainty	Maximum (aCi/m^3)	Minimum (aCi/m^3)	Mean (aCi/m^3)	95% Confidence Interval[a]	Sample Standard Deviation
Regional	16	1	55.7	1.7	17.7	±7.4	13.9
Pueblo	8	0	46.7	10.6	27.4	±9.4	11.2
Perimeter	93	7	75.7	1.8	12.6	±2.4	11.5
TA-15 and TA-36	12	0	377.5	4.7	52.1	±65.7	103.4
TA-21	8	0	34.8	4.5	16.3	±8.1	9.7
TA-54 Area G	32	0	97.2	6.4	30.6	±8.8	24.5
Other On-Site	20	0	35.3	4.1	16.2	±4.5	9.5

Concentration Guidelines

DOE Derived Air Concentration (DAC) Guide for workplace exposure is 20,000,000 aCi/m^3. See Appendix A.
EPA 40 CFR 61 Concentration Guide 8,300 aCi/m^3.

[a]95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-11. Airborne Gamma-Emitting Radionuclides that are Potentially Released by LANL Operations

Gamma Emitting Radionuclide	Number of Measurements	Number of Measurements ≤MDA	Mean (fCi/m^3)	Measured Average MDA as a Percent of the Required MDA
^{73}As	300	300	<<1.31	0.2
^{74}As	300	300	<<0.64	0.6
^{109}Cd	300	300	<<0.22	0.7
^{57}Co	300	300	<<0.19	0.3
^{60}Co	300	300	<<0.33	39.0
^{134}Cs	300	300	<<0.30	22.4
^{137}Cs	300	300	<<0.29	30.0
^{54}Mn	300	300	<<0.33	2.4
^{22}Na	300	300	<<0.34	26.1
^{83}Rb	300	300	<<0.65	3.8
^{86}Rb	300	300	<<4.76	17.0
^{103}Ru	300	300	<<0.32	0.2
^{75}Se	300	300	<<0.30	3.5
^{65}Zn	300	300	<<0.68	14.9

Table 4-12. Airborne Concentrations of Gamma-Emitting Radionuclides that Naturally Occur in Measurable Quantities

Gamma Emitting Radionuclide	Number of Measurements	Number of Measurements <MDA	Mean[a] (fCi/m^3)
^{7}Be	300	0	59
^{210}Pb	286	14	10

[a] Measurements that are less than the MDA are not included in the Mean because they are "less than" values.

Table 4-13. Airborne Radioactive Emissions from Laboratory Buildings with Sampled Stacks in 2001 (Ci)

TA-Building	^{3}H[a]	^{241}Am	Pu[b]	U[c]	Th	P/VAP[d]	G/MAP[e]
TA-03-029		2.6×10^{-7}	9.2×10^{-6}	7.1×10^{-6}	1.4×10^{-7}		
TA-03-102				2.2×10^{-8}			
TA-16-205	7.9×10^{3}						
TA-21-155	6.6×10^{1}						
TA-21-209	4.2×10^{2}						
TA-33-086	4.6×10^{2}						
TA-41-004	5.3×10^{2}						
TA-48-001						2.3×10^{-3}	
TA-50-001			4.3×10^{-8}				
TA-50-037[f]							
TA-50-069		5.8×10^{-11}	3.1×10^{-10}				
TA-53-003	6.7×10^{-1}						2.0×10^{0}
TA-53-007	5.7×10^{0}					1.1×10^{0}	5.9×10^{3}
TA-55-004	3.3×10^{0}	6.2×10^{-9}	4.3×10^{-8}	1.7×10^{-7}	1.5×10^{-7}		
Total[g]	9.4×10^{3}	2.7×10^{-7}	9.3×10^{-6}	7.3×10^{-6}	2.9×10^{-7}	1.1×10^{0}	6.1×10^{3}[h]

[a] Includes both gaseous and oxide forms of tritium.
[b] Includes ^{238}Pu, ^{239}Pu, and ^{240}Pu.
[c] Includes ^{234}U, ^{235}U, and ^{238}U.
[d] P/VAP—Particulate/vapor activation products.
[e] G/MAP—Gaseous/mixed activation products.
[f] No emissions detected.
[g] Some differences may occur because of rounding.
[h] Total for G/MAP includes 156 curies released from diffuse sources at TA-53.

Table 4-14. Detailed Listing of Activation Products Released from Sampled Laboratory Stacks in 2001 (Ci)

TA-Building	Radionuclide	Emission
TA-48-001	^{73}As	4.2×10^{-5}
TA-48-001	^{74}As	1.1×10^{-5}
TA-48-001	^{68}Ga	1.2×10^{-3}
TA-48-001	^{68}Ge	1.2×10^{-3}
TA-53-003	^{11}C	2.0×10^{0}
TA-53-007	^{41}Ar	1.6×10^{1}
TA-53-007	^{73}As	2.2×10^{-5}
TA-53-007	^{76}Br	2.6×10^{-4}
TA-53-007	^{82}Br	4.2×10^{-3}
TA-53-007	^{10}C	2.5×10^{0}
TA-53-007	^{11}C	3.4×10^{3}
TA-53-007	^{193}Hg	8.0×10^{-1}
TA-53-007	^{195m}Hg	2.0×10^{-2}
TA-53-007	^{197}Hg	1.0×10^{-1}
TA-53-007	^{13}N	1.3×10^{2}
TA-53-007	^{16}N	2.8×10^{-2}
TA-53-007	^{14}O	3.4×10^{1}
TA-53-007	^{15}O	2.4×10^{3}

Table 4-15. Radionuclide: Half-Life Information

Nuclide	Half-Life
^{3}H	12.3 yr
^{7}Be	53.4 d
^{10}C	19.3 s
^{11}C	20.5 min
^{13}N	10.0 min
^{16}N	7.13 s
^{14}O	70.6 s
^{15}O	122.2 s
^{22}Na	2.6 yr
^{24}Na	14.96 h
^{32}P	14.3 d
^{40}K	1,277,000,000 yr
^{41}Ar	1.83 h
^{54}Mn	312.7 d
^{56}Co	78.8 d
^{57}Co	270.9 d
^{58}Co	70.8 d
^{60}Co	5.3 yr
^{72}As	26 h
^{73}As	80.3 d
^{74}As	17.78 d
^{76}Br	16 h
^{77}Br	2.4 d
^{82}Br	1.47 d
^{75}Se	119.8 d
^{85}Sr	64.8 d
^{89}Sr	50.6 d
^{90}Sr	28.6 yr
^{131}I	8 d
^{134}Cs	2.06 yr
^{137}Cs	30.2 yr
^{183}Os	13 h
^{185}Os	93.6 d
^{191}Os	15.4 d
^{193}Hg	3.8 hr
^{195}Hg	9.5 hr
^{195m}Hg	1.67 d
^{197}Hg	2.67 d
^{197m}Hg	23.8 hr
^{234}U	244,500 yr
^{235}U	703,800,000 yr
^{238}U	4,468,000,000 yr
^{238}Pu	87.7 yr
^{239}Pu	24,131 yr
^{240}Pu	6,569 yr
^{241}Pu	14.4 yr
^{241}Am	432 yr

Table 4-16. Thermoluminescent Dosimeter (TLD) Measurements of External Radiation 2000–2001

TLD Station ID #	Location	2000 Annual Dose (mrem)	2001 Quarters Monitored	2001 Annual Dose (mrem)
01	NNMCC, Española	108 ± 8	1,2	107 ± 8
05	Barranca School, Los Alamos	141 ± 10	1,2	127 ± 9
08	48th Street, Los Alamos	152 ± 11	1–4	142 ± 10
09	Los Alamos Airport	124 ± 9	1–4	122 ± 9
12	Royal Crest Trailer Court, Los Alamos	138 ± 10	1–4	133 ± 9
13	White Rock Fire Station	135 ± 9	1–4	129 ± 9
15	Bandelier National Monument	144 ± 10	1–4	143 ± 10
17	TA-21 (DP West)	150 ± 11	1–4	149 ± 10
18	TA-6 Entrance Station	134 ± 9	1–4	132 ± 9
19	TA-53 (LANSCE)West	155 ± 11	1–4	145 ± 10
20	TA-72 Well PM-1, SR 4 and Truck Rt.	165 ± 12	1–4	153 ± 11
21	TA-16 (S-Site) Rt. 501	143 ± 10	1–4	134 ± 9
22	TA-54 West, Booster P-2	145 ± 10	1–4	136 ± 10
23	TA-3 East Gate of SM 43	123 ± 9	1–4	110 ± 8
25	TA-49 (Frijoles Mesa)	131 ± 9	1–4	126 ± 9
28	TA-18 (Pajarito Site)	180 ± 13	1–4	179 ± 13
29	TA-35 (Ten Site A)	126 ± 9	1–4	122 ± 9
30	TA-35 (Ten Site B)	114 ± 8	1–4	110 ± 8
37	TA-72 (Pistol Range)	160 ± 11	1–4	156 ± 11
38	TA-55 (Plutonium Facility South)	150 ± 11	1–4	142 ± 10
39	TA-55 (Plutonium Facility West)	155 ± 11	1–4	150 ± 11
41	McDonald’s Restaurant, Los Alamos	138 ± 10	1–4	140 ± 10
47	Urban Park, Los Alamos	141 ± 10	1–4	134 ± 9
48	TA-61 Los Alamos County Landfill	132 ± 9	1–4	122 ± 9
49	Piñon School (Rocket Park) White Rock	127 ± 9	1–4	123 ± 9
50	White Rock Church of the Nazarene	124 ± 9	1–4	117 ± 8
53	San Ildefonso Pueblo	125 ± 9	1–4	109 ± 8
55	Monte Rey South, White Rock	122 ± 9	1–4	117 ± 8
58	TA-36 Pajarito Road (South of TA-54)	154 ± 11	1–4	148 ± 10
59	TA-43 Los Alamos Canyon	162 ± 11	1–4	155 ± 11
60	Piedra Drive, White Rock	122 ± 9	1–4	114 ± 8
64	TA-53 NE LANSCE Area A Stack	201 ± 8	1–4	181 ± 13
65	TA-53 NW LANSCE Area A Stack	160 ± 11	1–4	155 ± 11
66	TA-73 East Gate	150 ± 11	1–4	147 ± 10
67	Los Alamos Medical Center	134 ± 9	1–4	132 ± 9
68	Trinity (Crossroads) Bible Church	140 ± 10	1–4	126 ± 9
69	TA-50 Old Outfall	166 ± 12	1–4	159 ± 11
70	TA-50 Dirt Road to Outfall	170 ± 12	1–4	163 ± 11
71	TA-50 Dirt Road Turnoff	150 ± 11	1–4	149 ± 10
72	TA-50 East Fence, S. Corner	148 ± 10	1–4	142 ± 10
73	TA-50 East Fence, N. Corner	125 ± 9	1–4	119 ± 8
74	TA-50 Pecos Drive	126 ± 9	1–4	120 ± 8
75	TA-50-37 West	140 ± 10	1–4	131 ± 9
76	TA-16-450 WETF	136 ± 10	1–4	127 ± 9
77	TA-16-210 Guard Station	144 ± 10	1,3,4	133 ± 9
78	TA-8-24 Fitness Trail SW	140 ± 10	1–4	133 ± 9
79	TA-8-24 Fitness Trail SE	144 ± 10	1–4	140 ± 10
80	TA-16 SR 4 Back Gate	133 ± 9	1–4	133 ± 9
81	TA-16 SR 4 Ponderosa Camp	134 ± 9	1,2	121 ± 8
82	TA-15 Phermex N TA-15-185	163 ± 11	1–4	158 ± 11
83	TA-15 Phermex Entrance	130 ± 9	2–4	124 ± 9

Table 4-16. Thermoluminescent Dosimeter (TLD) Measurements of External Radiation 2000–2001 (Cont.)

TLD Station ID #	Location	2000 Annual Dose (mrem)	2001 Quarters Monitored	2001 Annual Dose (mrem)
84	TA-15 Phermex NNE Entrance	134 ± 9	1–4	131 ± 9
85	TA-15 Phermex N DAHRT	135 ± 9	1–4	132 ± 9
86	TA-15-312 DAHRT Entrance	144 ± 10	1–4	136 ± 10
87	TA-15-183 Access Control	143 ± 10	1–4	144 ± 10
88	TA-15 R-Site Road	143 ± 10	1–4	136 ± 10
89	TA-15-45 SW	157 ± 11	1–4	145 ± 10
90	TA-15-306 North	151 ± 11	1–4	133 ± 9
91	TA-15, IJ Firing Point	142 ± 10	1–4	132 ± 9
92	TA-36 Kappa Site	153 ± 11	1–4	128 ± 9
93	TA-15 Ridge Road Gate	134 ± 9	1–4	129 ± 9
94	TA-33 East (VLBA Dish)	120 ± 8	1–4	114 ± 8
95	El Rancho	126 ± 9	1–4	115 ± 8
100	TA-5 Mortandad Canyon, MCO-13	143 ± 10	1–4	146 ± 10
101	Santa Fe West	117 ± 8	1–4	112 ± 8
103	Santa Clara Pueblo	162 ± 11	1–4	137 ± 10
104	TA-53 NE LANSCE Lagoons	198 ± 14	1–4	156 ± 11
105	TA-3 Wellness Center	122 ± 9	1–3	116 ± 8
106	TA-3 University House	127 ± 9	1–4	120 ± 8
107	TA-5 AIRNET	120 ± 8	1–4	118 ± 8
108	TA-43 HRL	130 ± 9	1–4	125 ± 9
109	TA-48 South	130 ± 9	1–4	131 ± 9
110	TA-21 AIRNET	131 ± 9	1–4	129 ± 9
114	TA-53 E of LANSCE Lagoons	163 ± 11	1–4	145 ± 10
115	TA-53 N of LANSCE Lagoons	181 ± 13	1–4	160 ± 11
116	TA-53 Old LANSCE Lagoons	355 ± 25	1–4	207 ± 14
117	TA-3-130 Calibration Lab	224 ± 16	1–4	172 ± 12
118	TA-3-130 inside east fence	NA[a]	1–4	474 ± 33
119	TA-3-130 inside south fence	NA[a]	1–4	679 ± 48
120	TA-2 Omega West	NA[a]	1–4	146 ± 10
121	Los Alamos Inn	NA[a]	1–4	144 ± 10
122	TA-3 Research Park	NA[a]	1–4	123 ± 9
228	TA-49 AB-8	136 ± 10	1–4	127 ± 9
229	TA-49 AB-9	137 ± 10	1–4	123 ± 9
230	TA-49 AB-10	140 ± 10	1–4	135 ± 9
254	TA-21 Area B-14	142 ± 10	1–4	143 ± 10
261	TA-50 NW Area C	125 ± 9	1–4	122 ± 9
262	TA-50 N Area C	144 ± 10	1–4	140 ± 10
265	TA-50 SE Area C	141 ± 10	1–4	139 ± 10
267	TA-50 S Area C	144 ± 10	1–4	136 ± 10
268	TA-50 SW Area C	137 ± 10	1–4	127 ± 9
269	TA-50 SW Area C	142 ± 10	1–4	132 ± 9
270	TA-50 W Area C	140 ± 10	1–4	140 ± 10
323	TA-21 Area T	278 ± 19	1–4	265 ± 19
361	TA-21 Area V	140 ± 10	1–4	127 ± 9
401	TA-73 NE of LANSCE	148 ± 10	1–4	145 ± 10
403	TA-73 NNE of LANSCE	152 ± 11	1–4	150 ± 10
405	TA-73 N of LANSCE	151 ± 11	1–4	150 ± 10
408	TA-73 NNW of LANSCE	160 ± 11	1–4	156 ± 11
412	TA-73 NW of LANSCE	148 ± 10	1–4	153 ± 11

[a]NA = Not applicable; there were no 2001 data at this location.

Table 4-17. Thermoluminescent Dosimeter (TLD) Measurements of External Radiation at the Waste Disposal Area G during 2000–2001

TLD Station ID #	Location	2000 Annual Dose (mrem)	2001 Quarters Monitored	2001 Annual Dose (mrem)
601	TA-54 Area G, 1	170 ± 12	1–4	165 ± 12
602	TA-54 Area G, 2	269 ± 19	1–4	263 ± 18
603	TA-54 Area G, 3	165 ± 12	1–4	167 ± 12
604	TA-54 Area G, 4	169 ± 12	1–4	176 ± 12
605	TA-54 Area G, 5	253 ± 18	1–4	295 ± 21
606	TA-54 Area G, 6	835 ± 60	1–4	952 ± 67
607	TA-54 Area G, 7	212 ± 15	1–4	241 ± 17
608	TA-54 Area G, 8	180 ± 13	1–4	186 ± 13
610	TA-54 Area G, 10	202 ± 14	1–4	205 ± 14
611	TA-54 Area G, 11	489 ± 34	1–4	466 ± 33
613	TA-54 Area G, 13	352 ± 25	1–4	346 ± 24
614	TA-54 Area G, 14	273 ± 19	1–4	272 ± 19
615	TA-54 Area G, 15	174 ± 12	1–4	177 ± 12
616	TA-54 Area G, 16	193 ± 14	1–4	203 ± 14
617	TA-54 Area G, 17	170 ± 12	1–4	167 ± 12
618	TA-54 Area G, 18	170 ± 12	1–4	175 ± 12
619	TA-54 Area G, 19	225 ± 16	1–4	220 ± 15
620	TA-54 Area G, 20	167 ± 12	1–4	160 ± 11
622	TA-54 Area G, 22	227 ± 16	1–4	226 ± 16
623	TA-54 Area G, 23	254 ± 18	1–4	295 ± 21
624	TA-54 Area G, 24	457 ± 32	1–4	372 ± 26
625	TA-54 Area G, 25	196 ± 14	1–4	188 ± 13
626	TA-54 Area G, 26	164 ± 11	1–4	157 ± 11
627	TA-54 Area G, 27	237 ± 17	1–4	246 ± 17
628	TA-54 Area G, 28	232 ± 16	1–4	251 ± 18
629	TA-54 Area G, 29	195 ± 14	1–4	199 ± 14
630	TA-54 Area G, 30	248 ± 17	1–4	230 ± 16
631	TA-54 Area G, 31	180 ± 13	1–4	182 ± 13
634	TA-54 Area G, 34	212 ± 15	1–4	220 ± 15
635	TA-54 Area G, 35	238 ± 17	1–4	229 ± 16
636	TA-54 Area G, 36	162 ± 11	1–4	160 ± 11
637	TA-54 Area G, 37	164 ± 11	1–4	169 ± 12
638	TA-54 Area G, 38	154 ± 11	1–4	153 ± 11
639	TA-54 Area G, 39	225 ± 16	1–4	231 ± 16
640	TA-54 Area G, 40	268 ± 19	1–4	247 ± 17
641	TA-54 Area G, 41	276 ± 19	1–4	263 ± 18
642	TA-54 Area G, 42	190 ± 13	1–4	195 ± 14
643	TA-54 Area G, 43	205 ± 14	1–4	205 ± 14

Table 4-18. Albedo Dosimeter Network

Location ID#	Location	Neutron Dose (mrem)
1	NEWNET Kappa Site	16.4
2	TA-36 Entrance	10.3
3	TA-18 Personnel Gate at Parking Lot	65.8
4	P2 Booster Station at TA-54 Entrance	2.3
5	TA-51 Entrance	1.7
6	Pajarito Hill West of TA-18 Entrance	13.4
7	TA-18 Entrance at Pajarito Road	26.6
8	TA-49 Background	1.4
9	Santa Fe Background	2.1
10	TA-3-130 Calibration Lab North	57.7
11	TA-3-130 Calibration Lab East	380.0
12	TA-3-130 Calibration Lab South	439.4

Table 4-19. Airborne Inorganic Element Concentrations for 2001

Station Location	Analysis	Number of Measurements	Number of Measurements <Detection Limit	Range (ng/m^3)	Mean (ng/m^3)	Standard Deviation of Mean (ng/m^3)
Los Alamos						
81 Intersection of Diamond and E. Jemez	Ag	18		–0.09–0.29	0.10	0.09
	As	9		0.013–0.57	0.24	0.15
	Ba	18		7.1–39	20	11
	Be	9		0.02–0.10	0.05	0.03
	Cd	18	2	–0.03–0.24	0.09	0.06
	Co	18		0.09–0.55	0.28	0.16
	Cr	18		0.51–3.9	1.9	1.1
	Cu	18		18–65	39	14
	Ni	18		0.67–3.5	1.5	0.9
	Pb	18		1.5–7.3	3.1	1.6
	Sb	18		0.29–1.24	0.58	0.27
	Se	9	3	0.12–0.38	0.21	0.10
	Tl	18	10	0.004–0.08	0.02	0.02
	V	9		0.59–2.85	1.7	0.8
	Zn	18		11–41	24	11
61 LA Hospital	Ag	16		0.02–0.91	0.15	0.21
	As	8		–0.009–0.32	0.19	0.10
	Ba	16		4.3–24.7	11.7	6.2
	Be	8	1	0.015–0.10	0.042	0.028
	Cd	16		–0.012–0.17	0.090	0.055
	Co	16		0.05–0.32	0.16	0.07
	Cr	16		0.5–3.4	1.6	1.1
	Cu	16		16–47	31	9
	Ni	16		0.2–1.9	1.0	0.6
	Pb	16		1.0–4.6	2.8	1.2
	Sb	16		0.15–0.79	0.49	0.21
	Se	8	3	0.12–0.25	0.18	0.06
	Tl	16	6	0.01–0.17	0.06	0.06
	V	8		0.5–2.9	1.2	0.8
	Zn	16		12–30	19	5
White Rock						
15 WR Fire Station	Ag	18		0.04–0.27	0.14	0.08
	As	9		0.06–0.39	0.22	0.10
	Ba	18		5–26	14	6
	Be	9		0.02–0.08	0.04	0.02
	Cd	18	1	0.01–0.19	0.09	0.05
	Co	18		0.03–0.43	0.21	0.10
	Cr	18		0.5–2.2	1.4	0.6
	Cu	18		38–82	62	13
	Ni	18		0.7–1.5	1.1	0.3
	Pb	18		1.2–5.3	2.5	1.2
	Sb	18		0.21–0.82	0.50	0.17
	Se	9	4	0.13–0.40	0.20	0.12
	Tl	18	5	0.04–0.16	0.07	0.03
	V	9		0.5–2.5	1.5	0.7
	Zn	18		10–26	18	6

Table 4-20. Total Suspended Particulate Matter Elemental Ratios

Element Ratio	On-Site Soil Average from 2000 ESR	Station 81 for 2001	Station 61 for 2001	Station 15 for 2001
Ag/Ba	< 0.02	0.01	0.01	0.01
As/Ba	0.02	0.01	0.02	0.02
Be/Ba	0.008	0.0025	0.004	0.003
Cd/Ba	< 0.004	0.0045	0.01	0.01
Co/Ba	0.06	0.01	0.01	0.02
Cr/Ba	0.08	0.1	0.1	0.1
Cu/Ba	0.05	2.0	2.6	4.4
Ni/Ba	0.07	0.08	0.09	0.08
Pb/Ba	0.16	0.16	0.24	0.18
Sb/Ba	< 0.002	0.03	0.04	0.04
Se/Ba	0.005	0.01	0.02	0.01
Tl/Ba	0.002	0.001	0.01	0.01
V/Ba	0.15	0.09	0.1	0.11
Zn/Ba	0.4	1.2	1.6	1.3

Table 4-21. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the White Rock Fire Station (ppbv)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
1,1,1-Trichloroethane	71-55-6	8	0	0.031–0.086	0.054	0.021
1,1,2,2-Tetrachloroethane	79-34-5	8	8	<0.047		
1,1-Dichloroethene	75-35-4	8	8	<0.01		
1,2,3-Trimethylbenzene	526-73-8	8	4	0.015–0.028	0.020	0.006
1,2,4-Trichlorobenzene	120-82-1	8	7	0.05	0.050	
1,2,4-Trimethylbenzene	95-63-6	8	0	0.025–0.15	0.078	0.040
1,2-Dichlorobenzene	95-50-1	8	7	0.018	0.018	
1,3,5-Trimethylbenzene	108-67-8	8	2	0.0095–0.048	0.028	0.012
1,3-Butadiene	106-99-0	8	1	0.028–0.12	0.068	0.030
1,3-Dichlorobenzene	541-73-1	8	7	0.01	0.010	
1,4-Dichlorobenzene	106-46-7	8	6	0.015–0.021	0.018	
1-Butanol	71-36-3	8	5	0.025–0.37	0.170	0.180
1-Butene/Isobutene	106-98-9	8	0	0.092–2.3	0.470	0.700
1-Heptene	592-76-7	8	0	0.028–0.41	0.110	0.130
1-Hexene	592-41-6	8	2	0.014–0.23	0.061	0.080
1-Methylcyclopentene	693-89-0	8	6	0.042–0.21	0.130	
1-Nonene	124-11-8	8	7	0.015	0.015	
1-Octene	111-66-0	8	7	0.0071	0.007	
1-Pentene	109-67-1	8	0	0.066–1.6	0.320	0.500
1-Propanol	71-23-8	8	6	0.24–0.41	0.330	
1-Undecene	821-95-4	8	4	0.011–0.15	0.065	0.060
2,2,3-Trimethylpentane	564-02-3	8	2	0.012–0.065	0.024	0.020
2,2,4-Trimethylpentane	540-84-1	8	0	0.037–0.91	0.220	0.290
2,2,5-Trimethylhexane	3522-94-9	8	4	0.014–0.028	0.019	0.007
2,2-Dimethylbutane	75-83-2	8	0	0.024–1.2	0.200	0.400
2,3,4-Trimethylpentane	565-75-3	8	1	0.076–0.21	0.120	0.040
2,3-Dimethylbutane	79-29-8	8	0	0.048–1.9	0.350	0.600
2,3-Dimethylpentane	565-59-3	8	0	0.048–0.92	0.230	0.290
2,4,4-Trimethyl-1-pentene	107-39-1	8	7	0.012	0.012	
2,4-Dimethylpentane	108-08-7	8	0	0.027–0.61	0.140	0.200
2,5-Dimethylhexane	592-13-2	8	2	0.011–0.071	0.020	0.020
2-Butanone (Methyl Ethyl Ketone)	78-93-3	8	0	0.18–1.8	0.530	0.500
2-Ethyl-1-butene	760-21-4	8	7	0.014	0.014	
2-Ethyltoluene	611-14-3	8	2	0.012–0.034	0.022	0.008
2-Methyl-1-pentene	763-29-1	8	2	0.0088–0.23	0.056	0.090
2-Methyl-2-butene	513-35-9	8	0	0.07–4.9	0.780	1.700
2-Methyl-2-pentene	625-27-4	8	0	0.011–0.34	0.066	0.100
2-Methylbutane	78-78-4	8	0	1.2–70	12.900	23.000
2-Methylheptane	592-27-8	8	0	0.023–0.13	0.054	0.040
2-Propanol	67-63-0	8	1	0.078–0.5	0.160	0.160
3-Ethyltoluene	620-14-4	8	0	0.018–0.1	0.050	0.030
3-Methyl-1-butene	563-45-1	8	1	0.035–0.91	0.170	0.330
3-Methylheptane	589-81-1	8	3	0.0093–0.086	0.034	0.030
3-Methylhexane	589-34-4	8	0	0.1–1.0	0.280	0.300
3-Methylpentane	96-14-0	8	0	0.1–3.9	0.700	1.300
4-Ethyltoluene	622-96-8	8	2	0.012–0.05	0.029	0.013
4-Methyl-1-pentene	691-37-2	8	6	0.014–0.15	0.081	
4-Methyl-2-pentanone	108-10-1	8	6	0.021–0.32	0.170	

Table 4-21. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the White Rock Fire Station (ppbv) (Cont.)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
Acetaldehyde	75-07-0	8	0	2.2–12.89	4.200	3.000
Acetone	67-64-1	8	0	2.6–16	5.800	4.000
Acetonitrile	75-05-8	8	6	0.11–0.13	0.120	
Acetylene	74-86-2	8	0	0.21–2.3	1.100	0.600
alpha-Pinene	80-56-8	8	1	0.02–0.082	0.050	0.030
Benzaldehyde	100-52-7	8	1	0.21–0.61	0.360	0.160
Benzene	71-43-2	8	0	0.18–3.2	0.800	1.000
beta-Pinene	127-91-3	8	7	0.0047	0.005	
Bromomethane	74-83-9	8	7	0.02	0.020	
Butane	106-97-8	8	0	1.2–104	19.000	34.000
Butyraldehyde	123-72-8	8	0	0.14–2.8	0.530	0.900
Carbon Tetrachloride	56-23-5	8	0	0.12–0.14	0.120	0.010
Chlorobenzene	108-90-7	8	8	<0.014		
Chlorodifluoromethane	75-45-6	8	0	0.18–0.37	0.240	0.070
Chloroethane	75-00-3	8	8	<0.015		
Chloroform	67-66-3	8	4	0.0055–0.011	0.008	0.003
Chloromethane	74-87-3	8	0	0.42–0.49	0.440	0.021
cis-2-Butene	590-18-1	8	0	0.036–2.9	0.470	1.000
cis-2-Hexene	7688-21-3	8	5	0.011–0.14	0.057	0.070
cis-2-Octene	7642-04-8	8	7	0.05	0.050	
cis-2-Pentene	627-20-3	8	0	0.037–1.8	0.320	0.600
cis-3-Heptene	7642-10-6	8	7	0.15	0.150	
cis-3-Hexene	7642-09-3	8	3	0.0082–0.15	0.043	0.060
cis-3-Methyl-2-pentene	922-62-3	8	5	0.0055–0.16	0.063	0.080
cis/trans-4-Methyl-2-pentene	691-38-3	8	2	0.0034–0.23	0.049	0.090
Cyclohexane	110-82-7	8	0	0.032–1.0	0.210	0.330
Cyclopentane	287-92-3	8	0	0.034–1.5	0.250	0.500
Cyclopentene	142-29-0	8	2	0.014–0.3	0.069	0.100
Dichlorofluoromethane	75-43-4	8	8	<0.014		
Ethane	74-84-0	8	0	2.6–21	7.100	6.000
Ethanol	64-17-5	8	0	3.4–11.7	7.600	2.800
Ethyl Benzene	100-41-4	8	0	0.036–0.28	0.120	0.070
Ethylene	74-85-1	8	0	0.41–2.5	1.500	0.700
Freon 11	75-69-4	8	0	0.28–0.31	0.290	0.011
Freon 113	76-13-1	8	0	0.066–0.086	0.074	0.006
Freon 114	76-14-2	8	0	0.011–0.014	0.012	0.001
Freon 12	75-71-8	8	0	0.56–0.61	0.590	0.020
Halocarbon 134A	811-97-2	8	0	0.029–0.097	0.049	0.021
Heptanal	111-71-7	8	6	0.048–0.19	0.120	
Heptane	142-82-5	8	0	0.024–0.58	0.140	0.180
Hexachlorobutadiene	87-68-3	8	7	0.022	0.022	
Hexanal	66-25-1	8	1	0.036–0.72	0.210	0.230
Hexane	110-54-3	8	0	0.098–3.8	0.700	1.200
Indan	496-11-7	8	8	<0.23		
Isobutane	75-28-5	8	0	0.45–32	5.300	11.000
Isoheptane	31394-5	8	0	0.048–1.7	0.330	0.600
Isohexane	107-83-5	8	0	0.2–6.7	1.200	2.200
Isoprene	78-79-5	8	3	0.019–0.11	0.050	0.040
Limonene	138-86-3	8	7	0.02	0.020	

Table 4-21. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the White Rock Fire Station (ppbv) (Cont.)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
Methanol	67-56-1	8	0	5.6–19	10.400	4.000
Methyl tert-Butyl Ether	1634-04-4	8	7	0.017	0.017	
Methylcyclohexane	108-87-2	8	0	0.0088–0.38	0.086	0.100
Methylcyclopentane	96-37-7	8	0	0.054–2.3	0.410	0.800
Methylene Chloride	75-09-2	8	0	0.023–0.083	0.056	0.021
n-Decane	124-18-5	8	1	0.009–0.027	0.017	0.007
n-Nonane	111-84-2	8	1	0.013–0.08	0.040	0.030
n-Octane	111-65-9	8	0	0.021–0.12	0.050	0.040
n-Propylbenzene	103-65-1	8	4	0.018–0.038	0.025	0.009
n-Undecane	1120-21-4	8	1	0.0056–0.027	0.017	0.009
Naphthalene	91-20-3	8	8	<0.08		
Neopentane	463-82-1	8	1	0.014–0.48	0.092	0.170
o-Xylene	95-47-6	8	0	0.052–0.34	0.150	0.090
p-Xylene/m-Xylene	106-42-3	8	0	0.1–0.943	0.370	0.260
Pentane	109-66-0	8	0	0.52–23	4.000	8.000
Propane	74-98-6	8	0	1–14.9	4.200	5.000
Propylene	115-07-1	8	0	0.094–0.98	0.390	0.270
Styrene	100-42-5	8	4	0.015–0.02	0.018	0.002
Tetrachloroethene	127-18-4	8	8	<0.04		
Toluene	108-88-3	8	0	0.3–3.4	1.100	1.000
trans-2-Butene	624-64-6	8	0	0.045–2.9	0.480	1.000
trans-2-Heptene	14686-1	8	7	0.035	0.035	
trans-2-Hexene	4050-45-7	8	1	0.014–0.28	0.065	0.100
trans-2-Pentene	646-04-8	8	0	0.095–3.6	0.620	1.200
trans-3-Heptene	14686-1	8	7	0.091	0.091	
Trichloroethene	79-01-6	8	8	<0.04		
Vinyl Acetate	108-05-4	8	7	0.54	0.540	

Table 4-22. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the Los Alamos Hospital (ppbv)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
1,1,1-Trichloroethane	71-55-6	7	0	0.032–0.039	0.035	0.002
1,1,2,2-Tetrachloroethane	79-34-5	7	6	0.013	0.013	
1,1-Dichloroethene	75-35-4	7	6	0.018	0.018	
1,2,3-Trimethylbenzene	526-73-8	7	5	0.015–0.029	0.022	
1,2,4-Trichlorobenzene	120-82-1	7	6	0.034	0.034	
1,2,4-Trimethylbenzene	95-63-6	7	0	0.032–0.14	0.068	0.040
1,2-Dichlorobenzene	95-50-1	7	6	0.021	0.021	
1,3,5-Trimethylbenzene	108-67-8	7	3	0.016–0.046	0.026	0.014
1,3-Butadiene	106-99-0	7	1	0.016–0.096	0.060	0.030
1,3-Dichlorobenzene	541-73-1	7	6	0.019	0.019	
1,4-Dichlorobenzene	106-46-7	7	6	0.03	0.030	
1-Butanol	71-36-3	7	5	0.22–0.59	0.460	
1-Butene/Isobutene	106-98-9	7	0	0.082–0.8	0.311	0.300
1-Heptene	592-76-7	7	5	0.037–0.038	0.038	
1-Hexene	592-41-6	7	5	0.04–0.04	0.040	
1-Methylcyclopentene	693-89-0	7	7	<0.015		
1-Nonene	124-11-8	7	6	0.022	0.022	
1-Octene	111-66-0	7	6	0.02	0.020	
1-Pentene	109-67-1	7	1	0.028–0.11	0.052	0.040
1-Propanol	71-23-8	7	5	0.7–1.1	0.900	
1-Undecene	821-95-4	7	6	0.028	0.028	
2,2,3-Trimethylpentane	564-02-3	7	3	0.0086–0.04	0.020	0.014
2,2,4-Trimethylpentane	540-84-1	7	0	0.023–0.84	0.210	0.300
2,2,5-Trimethylhexane	3522-94-9	7	5	0.0098–0.025	0.017	
2,2-Dimethylbutane	75-83-2	7	1	0.011–0.1	0.034	0.030
2,3,4-Trimethylpentane	565-75-3	7	1	0.076–0.15	0.100	0.030
2,3-Dimethylbutane	79-29-8	7	0	0.014–0.081	0.040	0.020
2,3-Dimethylpentane	565-59-3	7	0	0.023–0.13	0.068	0.040
2,4,4-Trimethyl-1-pentene	107-39-1	7	4	0.0083–0.013	0.011	0.002
2,4-Dimethylpentane	108-08-7	7	0	0.015–0.12	0.043	0.040
2,5-Dimethylhexane	592-13-2	7	3	0.012–0.042	0.023	0.014
2-Butanone (Methyl Ethyl Ketone)	78-93-3	7	0	0.13–2.7	0.900	1.100
2-Ethyl-1-butene	760-21-4	7	6	0.024	0.024	
2-Ethyltoluene	611-14-3	7	3	0.012–0.032	0.023	0.008
2-Methyl-1-pentene	763-29-1	7	5	0.0095–0.032	0.020	
2-Methyl-2-butene	513-35-9	7	2	0.011–0.13	0.047	0.050
2-Methyl-2-pentene	625-27-4	7	4	0.0088–0.031	0.018	0.012
2-Methylbutane	78-78-4	7	0	0.54–2.6	1.200	0.700
2-Methylheptane	592-27-8	7	2	0.017–0.43	0.140	0.170
2-Propanol	67-63-0	7	0	0.053–0.91	0.320	0.300
3-Ethyltoluene	620-14-4	7	0	0.019–0.092	0.050	0.030
3-Methyl-1-butene	563-45-1	7	6	0.019	0.019	
3-Methylheptane	589-81-1	7	4	0.0091–0.024	0.018	0.008
3-Methylhexane	589-34-4	7	1	0.054–0.16	0.100	0.040
3-Methylpentane	96-14-0	7	0	0.036–0.18	0.090	0.050
4-Ethyltoluene	622-96-8	7	3	0.019–0.041	0.030	0.009
4-Methyl-1-pentene	691-37-2	7	6	0.039	0.039	
4-Methyl-2-pentanone	108-10-1	7	5	0.32–0.59	0.450	

Table 4-22. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the Los Alamos Hospital (ppbv) (Cont.)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
Acetaldehyde	75-07-0	7	0	2.6–22	8.600	8.000
Acetone	67-64-1	7	0	2.3–27	9.800	1
Acetonitrile	75-05-8	7	2	0.085–0.24	0.150	0.060
Acetylene	74-86-2	7	0	0.91–2.5	1.600	0.600
alpha-Pinene	80-56-8	7	1	0.015–0.08	0.050	0.020
Benzaldehyde	100-52-7	7	0	0.035–0.44	0.220	0.140
Benzene	71-43-2	7	0	0.18–0.62	0.370	0.180
beta-Pinene	127-91-3	7	6	0.0091	0.009	
Bromomethane	74-83-9	7	6	0.033	0.033	
Butane	106-97-8	7	0	0.55–2.3	1.100	0.700
Butyraldehyde	123-72-8	7	0	0.092–4.2	1.000	1.600
Carbon Tetrachloride	56-23-5	7	0	0.11–0.13	0.120	0.010
Chlorobenzene	108-90-7	7	2	0.0069–0.018	0.011	0.004
Chlorodifluoromethane	75-45-6	7	0	0.18–0.22	0.200	0.015
Chloroethane	75-00-3	7	4	0.038–0.072	0.058	0.018
Chloroform	67-66-3	7	2	0.0049–0.01	0.008	0.002
Chloromethane	74-87-3	7	0	0.42–0.5	0.460	0.020
cis-2-Butene	590-18-1	7	3	0.023–0.065	0.040	0.018
cis-2-Hexene	7688-21-3	7	7	<0.01		
cis-2-Octene	7642-04-8	7	6	0.056	0.056	
cis-2-Pentene	627-20-3	7	5	0.02–0.036	0.028	
cis-3-Heptene	7642-10-6	7	7	<0.08		
cis-3-Hexene	7642-09-3	7	7	<0.02		
cis-3-Methyl-2-pentene	922-62-3	7	7	<0.01		
cis/trans-4-Methyl-2-pentene	691-38-3	7	5	0.0033–0.0095	0.006	
Cyclohexane	110-82-7	7	1	0.018–0.1	0.053	0.030
Cyclopentane	287-92-3	7	3	0.016–0.045	0.031	0.012
Cyclopentene	142-29-0	7	7	<0.03		
Dichlorofluoromethane	75-43-4	7	7	<0.015		
Ethane	74-84-0	7	0	3.4–17	6.400	5.000
Ethanol	64-17-5	7	0	8.4–19	14.000	4.000
Ethyl Benzene	100-41-4	7	0	0.031–0.16	0.088	0.050
Ethylene	74-85-1	7	0	0.91–2.8	1.900	0.800
Freon 11	75-69-4	7	0	0.28–0.33	0.320	0.020
Freon 113	76-13-1	7	0	0.063–0.11	0.074	0.015
Freon 114	76-14-2	7	0	0.0091–0.016	0.011	0.002
Freon 12	75-71-8	7	0	0.56–0.62	0.580	0.020
Halocarbon 134A	811-97-2	7	0	0.032–0.16	0.068	0.040
Heptanal	111-71-7	7	5	0.12–1.2	0.660	
Heptane	142-82-5	7	1	0.025–0.11	0.057	0.040
Hexachlorobutadiene	87-68-3	7	6	0.024	0.024	
Hexanal	66-25-1	7	1	0.059–2.9	0.650	1.100
Hexane	110-54-3	7	0	0.044-0.22	0.120	0.060
Indan	496-11-7	7	6	0.012	0.012	
Isobutane	75-28-5	7	0	0.19–0.77	0.320	0.210
Isoheptane	31394-5	7	1	0.027–1.0	0.220	0.390
Isohexane	107-83-5	7	0	0.1–0.43	0.220	0.120
Isoprene	78-79-5	7	3	0.018–0.073	0.040	0.020
Limonene	138-86-3	7	6	0.029	0.029	

Table 4-22. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the Los Alamos Hospital (ppbv) (Cont.)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
Methanol	67-56-1	7	0	4.5–14.3	9.000	3.000
Methyl tert-Butyl Ether	1634-04-4	7	6	0.0086	0.009	
Methylcyclohexane	108-87-2	7	2	0.012–0.096	0.052	0.030
Methylcyclopentane	96-37-7	7	0	0.019–0.13	0.063	0.040
Methylene Chloride	75-09-2	7	0	0.037–0.44	0.120	0.150
n-Decane	124-18-5	7	1	0.003–0.024	0.010	0.010
n-Nonane	111-84-2	7	0	0.012–0.46	0.082	0.160
n-Octane	111-65-9	7	0	0.02–0.064	0.034	0.016
n-Propylbenzene	103-65-1	7	6	0.03	0.030	
n-Undecane	1120-21-4	7	4	0.0052-0.0085	0.007	0.002
Naphthalene	91-20-3	7	6	0.032	0.032	
Neopentane	463-82-1	7	6	0.0056	0.006	
o-Xylene	95-47-6	7	0	0.044–0.21	0.120	0.070
p-Xylene/m-Xylene	106-42-3	7	0	0.093–0.5	0.270	0.170
Pentane	109-66-0	7	0	0.14–0.57	0.330	0.160
Propane	74-98-6	7	0	0.99–4.6	1.800	1.200
Propylene	115-07-1	7	0	0.12–0.69	0.360	0.220
Styrene	100-42-5	7	3	0.012–0.038	0.024	0.012
Tetrachloroethene	127-18-4	7	7	<0.04		
Toluene	108-88-3	7	0	0.26–1.2	0.620	0.350
trans-2-Butene	624-64-6	7	2	0.019–0.068	0.040	0.018
trans-2-Heptene	14686-1	7	7	<0.02		
trans-2-Hexene	4050-45-7	7	5	0.0067–0.018	0.012	
trans-2-Pentene	646-04-8	7	0	0.012–0.074	0.031	0.021
trans-3-Heptene	14686-1	7	6	0.045	0.045	
Trichloroethene	79-01-6	7	7	<0.045		
Vinyl Acetate	108-05-4	7	2	0.3–1.2	0.700	0.400

Table 4-23. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the Intersection of Diamond Drive & East Jemez Roads in Los Alamos (ppbv)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
1,1,1-Trichloroethane	71-55-6	8	1	0.032–0.042	0.036	0.003
1,1,2,2-Tetrachloroethane	79-34-5	8	7	0.023	0.023	
1,1-Dichloroethene	75-35-4	8	8	<0.01		
1,2,3-Trimethylbenzene	526-73-8	8	7	0.027	0.027	
1,2,4-Trichlorobenzene	120-82-1	8	6	0.006–0.0089	0.007	
1,2,4-Trimethylbenzene	95-63-6	8	1	0.015–0.11	0.070	0.040
1,2-Dichlorobenzene	95-50-1	8	7	0.056	0.056	
1,3,5-Trimethylbenzene	108-67-8	8	3	0.015–0.051	0.029	0.014
1,3-Butadiene	106-99-0	8	2	0.022–0.091	0.060	0.030
1,3-Dichlorobenzene	541-73-1	8	7	0.044	0.044	
1,4-Dichlorobenzene	106-46-7	8	7	0.044	0.044	
1-Butanol	71-36-3	8	5	0.071–0.25	0.160	0.090
1-Butene/Isobutene	106-98-9	8	1	0.056–0.31	0.170	0.080
1-Heptene	592-76-7	8	3	0.024–0.089	0.050	0.020
1-Hexene	592-41-6	8	4	0.02–0.034	0.026	0.006
1-Methylcyclopentene	693-89-0	8	8	<0.014		
1-Nonene	124-11-8	8	7	0.019	0.019	
1-Octene	111-66-0	8	7	0.0072	0.007	
1-Pentene	109-67-1	8	2	0.034–0.079	0.054	0.017
1-Propanol	71-23-8	8	7	0.92	0.920	
1-Undecene	821-95-4	8	7	0.0094	0.009	
2,2,3-Trimethylpentane	564-02-3	8	4	0.0061–0.02	0.012	0.006
2,2,4-Trimethylpentane	540-84-1	8	1	0.0097–0.17	0.070	0.050
2,2,5-Trimethylhexane	3522-94-9	8	5	0.0052–0.022	0.014	0.008
2,2-Dimethylbutane	75-83-2	8	3	0.016–0.03	0.022	0.006
2,3,4-Trimethylpentane	565-75-3	8	3	0.084–0.14	0.100	
2,3-Dimethylbutane	79-29-8	8	2	0.024–0.083	0.046	0.021
2,3-Dimethylpentane	565-59-3	8	2	0.038–0.16	0.082	0.040
2,4,4-Trimethyl-1-pentene	107-39-1	8	5	0.0078–0.014	0.012	0.003
2,4-Dimethylpentane	108-08-7	8	2	0.022–0.076	0.042	0.020
2,5-Dimethylhexane	592-13-2	8	5	0.0092–0.025	0.016	0.008
2-Butanone (Methyl Ethyl Ketone)	78-93-3	8	0	0.083–0.4	0.230	0.100
2-Ethyl-1-butene	760-21-4	8	8	<0.019		
2-Ethyltoluene	611-14-3	8	5	0.018–0.031	0.023	0.007
2-Methyl-1-pentene	763-29-1	8	8	<0.015		
2-Methyl-2-butene	513-35-9	8	2	0.012–0.068	0.040	0.020
2-Methyl-2-pentene	625-27-4	8	6	0.015–0.018	0.017	
2-Methylbutane	78-78-4	8	0	0.074–2.1	0.890	0.600
2-Methylheptane	592-27-8	8	3	0.03–0.069	0.047	0.015
2-Propanol	67-63-0	8	3	0.085–0.19	0.120	0.040
3-Ethyltoluene	620-14-4	8	2	0.021–0.076	0.048	0.020
3-Methyl-1-butene	563-45-1	8	8	<0.01		
3-Methylheptane	589-81-1	8	5	0.015–0.021	0.018	0.003
3-Methylhexane	589-34-4	8	3	0.089–0.16	0.110	0.030
3-Methylpentane	96-14-0	8	1	0.015–0.2	0.100	0.070
4-Ethyltoluene	622-96-8	8	4	0.023–0.051	0.035	0.013
4-Methyl-1-pentene	691-37-2	8	7	0.0089	0.009	
4-Methyl-2-pentanone	108-10-1	8	4	0.05–0.086	0.064	0.016

Table 4-23. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the Intersection of Diamond Drive & East Jemez Roads in Los Alamos (ppbv) (Cont.)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
Acetaldehyde	75-07-0	8	0	1.1–8.7	4.000	2.800
Acetone	67-64-1	8	0	1.2–5.4	3.600	1.500
Acetonitrile	75-05-8	8	5	0.1–0.16	0.130	0.030
Acetylene	74-86-2	8	0	0.19–1.8	0.980	0.600
alpha-Pinene	80-56-8	8	4	0.019–0.087	0.042	0.030
Benzaldehyde	100-52-7	8	3	0.1–1.0	0.460	0.350
Benzene	71-43-2	8	0	0.04–0.53	0.311	0.180
beta-Pinene	127-91-3	8	7	0.0072	0.007	
Bromomethane	74-83-9	8	8	<0.03		
Butane	106-97-8	8	0	0.15–2	0.960	0.700
Butyraldehyde	123-72-8	8	1	0.053–0.35	0.190	0.100
Carbon Tetrachloride	56-23-5	8	0	0.027–0.14	0.120	0.040
Chlorobenzene	108-90-7	8	8	<0.014		
Chlorodifluoromethane	75-45-6	8	0	0.11–0.82	0.290	0.220
Chloroethane	75-00-3	8	8	<0.015		
Chloroform	67-66-3	8	4	0.0055–0.018	0.010	0.005
Chloromethane	74-87-3	8	0	0.15–0.49	0.460	0.100
cis-2-Butene	590-18-1	8	5	0.038–0.05	0.042	0.006
cis-2-Hexene	7688-21-3	8	8	<0.01		
cis-2-Octene	7642-04-8	8	8	<0.03		
cis-2-Pentene	627-20-3	8	5	0.024–0.037	0.028	0.007
cis-3-Heptene	7642-10-6	8	8	<0.08		
cis-3-Hexene	7642-09-3	8	8	<0.02		
cis-3-Methyl-2-pentene	922-62-3	8	8	<0.01		
cis/trans-4-Methyl-2-pentene	691-38-3	8	8	<0.009		
Cyclohexane	110-82-7	8	2	0.03–0.12	0.070	0.040
Cyclopentane	287-92-3	8	3	0.018–0.045	0.033	0.011
Cyclopentene	142-29-0	8	6	0.011–0.025	0.018	
Dichlorofluoromethane	75-43-4	8	7	0.0096	0.010	
Ethane	74-84-0	8	0	1.1–14.3	5.600	4.000
Ethanol	64-17-5	8	0	5–19	10.900	5.000
Ethyl Benzene	100-41-4	8	1	0.024–0.15	0.088	0.040
Ethylene	74-85-1	8	0	0.31–2.5	1.480	0.800
Freon 11	75-69-4	8	0	0.078–0.31	0.270	0.080
Freon 113	76-13-1	8	0	0.015–0.081	0.065	0.021
Freon 114	76-14-2	8	1	0.009–0.016	0.011	0.002
Freon 12	75-71-8	8	0	0.16–0.59	0.530	0.150
Halocarbon 134A	811-97-2	8	1	0.023–0.16	0.056	0.050
Heptanal	111-71-7	8	7	0.04	0.040	
Heptane	142-82-5	8	2	0.021–0.093	0.060	0.020
Hexachlorobutadiene	87-68-3	8	7	0.14	0.140	
Hexanal	66-25-1	8	4	0.059–0.25	0.120	0.090
Hexane	110-54-3	8	1	0.022–0.73	0.210	0.240
Indan	496-11-7	8	8	<0.23		
Isobutane	75-28-5	8	0	0.044–0.77	0.320	0.280
Isoheptane	31394-5	8	2	0.04–0.12	0.090	0.030
Isohexane	107-83-5	8	1	0.035–0.33	0.180	0.100
Isoprene	78-79-5	8	3	0.012–0.054	0.034	0.016
Limonene	138-86-3	8	8	<0.029		

Table 4-23. Air Concentration Summary of Volatile Organic Compounds Measured in 2001 at the Intersection of Diamond Drive & East Jemez Roads in Los Alamos (ppbv) (Cont.)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Range	Mean	Standard Deviation
Methanol	67-56-1	8	0	1.2–7.4	4.600	2.000
Methyl tert-Butyl Ether	1634-04-4	8	8	<0.013		
Methylcyclohexane	108-87-2	8	2	0.008–0.12	0.047	0.040
Methylcyclopentane	96-37-7	8	1	0.0063–0.22	0.083	0.070
Methylene Chloride	75-09-2	8	1	0.026–0.26	0.077	0.080
n-Decane	124-18-5	8	2	0.0061–0.024	0.015	0.006
n-Nonane	111-84-2	8	1	0.011–0.044	0.026	0.011
n-Octane	111-65-9	8	3	0.033–0.055	0.043	0.008
n-Propylbenzene	103-65-1	8	6	0.023–0.027	0.025	
n-Undecane	1120-21-4	8	5	0.0094–0.02	0.016	0.006
Naphthalene	91-20-3	8	8	<0.08		
Neopentane	463-82-1	8	6	0.0082–0.009	0.009	
o-Xylene	95-47-6	8	1	0.03–0.22	0.120	0.060
p-Xylene/m-Xylene	106-42-3	8	0	0.019–0.51	0.250	0.170
Pentane	109-66-0	8	0	0.046–0.62	0.330	0.220
Propane	74-98-6	8	0	0.35–5	1.800	1.700
Propylene	115-07-1	8	0	0.028–0.96	0.340	0.310
Styrene	100-42-5	8	5	0.017–0.032	0.022	0.008
Tetrachloroethene	127-18-4	8	6	0.011–0.013	0.012	
Toluene	108-88-3	8	0	0.052–0.98	0.540	0.360
trans-2-Butene	624-64-6	8	4	0.034–0.057	0.043	0.011
trans-2-Heptene	14686-1	8	8	<0.017		
trans-2-Hexene	4050-45-7	8	7	0.016	0.016	
trans-2-Pentene	646-04-8	8	2	0.016–0.075	0.040	0.020
trans-3-Heptene	14686-1	8	7	0.1	0.100	
Trichloroethene	79-01-6	8	5	0.016–0.042	0.031	0.013
Vinyl Acetate	108-05-4	8	7	0.45	0.450	

Table 4-24. Air Concentrations of Volatile Organic Compounds Not Detected at any Site in 2001 (ppbv)

Compound Name	Chemical Abstract Service Compound Number	Number of Measurements	Number of Measurements <Detection Limit	Maximum Air Concentration
1,1,2-Trichloroethane	79-00-5	23	23	<0.022
1,1-Dichloroethane	75-34-3	23	23	<0.016
1,2-Dichloroethane	107-06-2	23	23	<0.02
1,2-Dichloropropane	78-87-5	23	23	<0.02
1,3-Diethylbenzene	141-93-5	23	23	<0.02
1,4-Diethylbenzene	105-05-5	23	23	<0.02
1,4-Dioxane	123-91-1	23	23	<0.09
1-Decene	872-05-9	23	23	<0.33
1-Methylcyclohexene	591-49-1	23	23	<0.03
2,4,4-Trimethyl-2-pentene	107-40-4	23	23	<0.02
2-Chloro-1,3-butadiene	126-99-8	23	23	<0.02
2/3-Chlorotoluene	2/3-CT	23	23	<0.6
4-Chlorotoluene	106-43-4	23	23	<0.33
4-Isopropyltoluene	99-87-6	23	23	<0.27
4-Nonene	2198-23-4	23	23	<0.04
Acrylonitrile	107-13-1	23	23	<0.04
Bromochloromethane	74-97-5	23	23	<0.007
Bromodichloromethane	75-27-4	23	23	<0.02
Bromoform	75-25-2	23	23	<0.01
Butyl acrylate	141-32-2	23	23	<0.2
Chlorotoluene	100-44-7	23	23	<0.06
cis-1,2 Dichloroethene	156-59-2	23	23	<0.04
cis-1,3-Dichloropropene	10061-01-5	23	23	<0.02
Cyclohexene	110-83-8	23	23	<0.03
Dibromochloromethane	124-48-1	23	23	<0.02
Diethyl ether	60-29-7	23	23	<0.03
Ethylene Dibromide	106-93-4	23	23	<0.008
Indene	95-13-6	23	23	<0.01
Isobutylbenzene	538-93-2	23	23	<0.35
Isopropylbenzene	98-82-8	23	23	<0.01
n-Butylbenzene	104-51-8	23	23	<0.24
tert-Butylbenzene	98-06-6	23	23	<0.4
trans-1,2-Dichloroethene	156-60-5	23	23	<0.02
trans-1,3-Dichloropropene	10061-02-6	23	23	<0.03
Vinyl bromide	593-60-2	23	23	<0.016
Vinyl Chloride	75-01-4	23	23	<0.016

Table 4-25. DX Division Firing Sites Expenditures for Calendar Year 2000–2001
(All units are in kilograms unless otherwise noted.)

Materials Expended	Material Totals 2000	Material Totals 2001
HE	2,403	2,558
Aluminum	394	78
Beryllium	2.0	52
Beryllium Oxide	NR	54
Boron	NR	0.13
Brass	148	0
Carbon Phenolic	NR	1.4
Copper	88	24
Depleted Uranium	419	536
DPB plus Teflon	NR	0.011
Foam	5.0	8.6
Lead	5.0	0
Lexan	1.0	0
Lithium	NR	21.6
Molybdenum	3.0	0
Plastic	2.0	7.1
RHA Steel	NR	55
Rubber	NR	20.4
Silver	0.8	0
Stainless Steel	677	270
Tin	0.27	1.0
Tantalum	1.2	12
TMBA	NR	1.1
Tungsten	18.6	0
Teflon	NR	0
Uranium Niobium	NR	232
Uranium	NR	14
Wood	NR	10

Notes: NR = not reported

Table 4-26. Airborne Beryllium Concentrations

Station Location	Number of Measurements	Maximum (ng/m^3)	Minimum (ng/m^3)	Mean (ng/m^3)	Sample Standard Deviation
Regional/Pueblo Stations					
01 Española	4	0.034	0.019	0.025	0.007
03 Santa Fe	4	0.077	0.018	0.039	0.027
41 San Ildefonso Pueblo	4	0.047	0.015	0.028	0.014
55 Santa Fe West (Buckman Booster #4)	4	0.017	0.007	0.012	0.004
56 El Rancho	4	0.023	0.007	0.016	0.008
59 Jemez Pueblo-Visitor's Center	4	0.077	0.038	0.061	0.017
Perimeter Stations					
04 Barranca School	4	0.030	0.011	0.020	0.010
09 Los Alamos Airport	4	0.011	0.005	0.008	0.003
10 East Gate	4	0.019	0.009	0.012	0.005
12 Royal Crest Trailer Court	4	0.024	0.006	0.014	0.007
16 White Rock Nazarene Church	4	0.011	0.006	0.008	0.002
26 TA-49	4	0.016	0.005	0.009	0.005
32 County Landfill	4	0.104	0.063	0.087	0.018
39 TA-49-QA (next to #26)	4	0.022	0.006	0.011	0.007
61 LA Hospital	4	0.017	0.014	0.015	0.002
68 Airport Road	1	0.011	0.011	0.011	
80 Western Arizona Street	2	0.024	0.013	0.019	0.008
90 East Gate-Backup	2	0.012	0.011	0.012	0.001
On-Site Stations					
20 TA-21 Area B	4	0.016	0.007	0.010	0.004
23 TA-5	4	0.022	0.009	0.015	0.007
31 TA-3	4	0.028	0.011	0.017	0.007
71 TA-21.01 (NW Bldg 344)	4	0.018	0.006	0.010	0.005
76 TA-15-41	4	0.020	0.003	0.010	0.007
77 TA-36 IJ Site	4	0.014	0.004	0.008	0.004
78 TA-15-N	4	0.011	0.003	0.006	0.003
TA-54 Area G Stations					
27 Area G (by QA)	4	0.093	0.018	0.038	0.037
35 Area G-2 (back fence)	4	0.039	0.013	0.023	0.011
36 Area G-3 (by office)	4	0.036	0.010	0.017	0.012
38 Area G-QA (next to #27)	4	0.088	0.026	0.042	0.030

Group Summaries

Station Location	Number of Measurements	Maximum (ng/m^3)	Minimum (ng/m^3)	Mean (ng/m^3)	95% Confidence Interval[a]	Sample Standard Deviation
Regional/Pueblo Stations	24	0.077	0.007	0.030	±0.009	0.021
Perimeter Stations	41	0.104	0.005	0.020	±0.007	0.024
On-Site Stations	28	0.028	0.003	0.011	±0.002	0.006
TA-54 Area G Stations	16	0.093	0.010	0.030	±0.013	0.025

[a] 95% confidence intervals are calculated using all calculated sample concentrations from every site within the group.

Table 4-27. AIRNET QC Sample Types

Analyte	Number of Samples	Number of Lab Control Standards	Number of Matrix Spikes	Number of Matrix Blanks	Number of Matrix Replicates	Number of Process Blanks	Number of Trip Blanks
Alpha/Beta	1,371	87		186	83		127
Americium–241	226	15	15	33		15	20
Beryllium	288	25	25	70		24	20
Gamma Nuclides	344	39		44	37	39	46
Lead–210	736	55	55	139		55	89
Plutonium Isotopes	226	15	15	33		15	20
Polonium–210	736	54	54	138		54	89
Stable Elements (except Beryllium)	288	25	25	70		24	20
Tritium	1,316	168	123	78	45	168	127
Uranium Isotopes	381	26	27	78		27	20

Table 4-28. Stack QC Sample Types

Analyte	Number of Samples	Number of Lab Control Standards	Number of Matrix Spikes	Number of Matrix Blanks	Number of Matrix Replicates	Number of Process Blanks	Number of Trip Blanks
Alpha/Beta	1,866	5	107	111	104	5	106
Americium–241	79	5	5	9	2	5	4
Beryllium	56	102	51	51	1	51	51
Gamma Nuclides	2,223	5		416	261	211	108
Lead–210	79	5	5	9	2	5	4
Plutonium Isotopes	79	5	5	9	2	5	4
Polonium–210	79	5	5	9	2	5	4
Strontium–90	79	5	5	9	2	5	4
Thorium Isotopes	79	5	5	9	2	5	4
Tritium	1,902	317	104	634	317	634	
Uranium Isotopes	79	5	5	9	2	5	4

Table 4-29. NonRadNet QC Sample Types

Analyte	Number of Samples	Number of Lab Control Standards	Number of Lab Control Replicates	Number of Matrix Spikes	Number of Matrix Blanks	Number of Process Blanks	Number of Surrogate Compound Measurements
Stable Elements	26	9		9	17	9	NA[a]
Total Suspended Particulates	27						NA
Volatile Organic Compounds	24	10	10		10		305

[a] NA = not applicable.

Table 4-30. QC Performance Evaluation for AIRNET for CY 2001

Evaluation Performed	AIRNET Acceptance Criteria	Gross Alpha/Beta	Tritium	Gamma	Beryllium
Laboratory Control Standard (LCS) Recovery Check	100 ± 10% UC 80 – 90 or 110 – 120% W < 80 or >120% OC	94% UC 6% W	91.7% UC 7.7% W 0.6% OC	64% UC 27% W 9% OC	60% UC 28% W 12% OC
Process Blank (PB)	See control criteria below.	NA[a]	94.6% UC 4.8% W 0.6%OC	100% UC	100% UC
Matrix Blank (MB)	See control criteria below.	95.2% UC 4.6%W 0.3% OC	95% UC 5% W	100% UC	100% UC
Trip Blank (TB)	See control criteria below.	94% UC 6% W	99.2% UC 0.8% W	100% UC	100% UC
Matrix Replicate Evaluation	For analytically significant, positive results, similar to control criteria below.	96.4% UC 3.6% W	100% UC	70% UC 29% W 1% OC	NA
Matrix Replicate Evaluation	Qualitative agreement (within a factor of 3) for analytically insignificant results (i.e. "less-than" values).	NA	NA	99.9% UC 0.1% OC	NA
Matrix Spike	100 ± 10% of added spike.	NA	1% UC 7% W 92% UC	NA	64% UC 32% W 4% OC
MDA[b] Target Achieved	All samples below SOW[c] specification.	99.7%	96.7%	75%	95%
Collection Efficiency	Between 70 and 130% of theoretical.	NA	90% UC 9% low 1% high	NA	NA
Distillation Efficiency	Between 70 and 130% of water collected.	NA	96% UC 4% high	NA	NA
Naturally Occurring Radionuclides	All should have positive results.	NA	NA	99% Yes 1% No	NA
Analytical Completeness	80% successful analysis of valid samples.	100%	99.8%	100%	100%

General Control Criteria
Under Control (UC) is ≤2s of annual mean for that QC type.
Warning (W) is between 2s and 3s of annual mean for that QC type.
Out of Control (OC) is ≥3s of annual mean for that QC type.

[a]NA = not applicable.
[b]Minimum detectable activity.
[c]Statement of work.

Table 4-31. QC Performance Evaluation for AIRNET for CY 2001

Evaluation Performed	AIRNET Evaluation Criteria	^{241}Am	^{210}Pb	^{210}Po	Plutonium Isotopes	Uranium Isotopes
Laboratory Control Standard (LCS) Recovery Check	100 ± 10% UC 80 – 90 or 110 – 120% W < 80 or >120% OC	80% UC 20% W	70% UC 30% W	18% UC 67% W 15% OC	93% UC 7% W	100% UC
Process Blank (PB)	See control criteria below.	100% UC	98% UC 2% W	96% UC 2% W 2% OC	96 % UC 4% W	95% UC 5% W
Matrix Blank (MB)	See control criteria below.	100% UC	96% UC 4% OC	96% UC 1% W 3% OC	96% UC 4% W	96% UC 4% W
Trip Blank (TB)	See control criteria below.	95% UC 5% W	93% UC 7% W	94% UC 6% OC	95% UC 3% W 2% OC	93% UC 5% W 2% OC
Matrix Spike	100 ± 10% UC 80 – 90 or 110 – 120% W < 80 or >120% OC	73% UC 27% W	67% UC 29% W 4% OC	22% UC 61% W 17% OC	87% UC 13% W	48% UC 33% W 19% OC
MDA[a] Target Achieved	All samples below SOW[b] specification.	100%	99.8%	91%	100%	98%
Analytical Completeness	80% successful analysis of valid samples.	100%	90%	90%	100%	100%
Tracer Recovery	Mean ± Standard Dev. % Recovery	74 ± 11%	89 ± 4%	60 ± 14%	74 ± 10%	67 ± 8%
Tracer Recovery Control	50 – 105% is UC	98.5%	99.9%	80.3%	99.4%	98.8%

General Control Criteria
Under Control (UC) is ≤2s of annual mean for that QC type.
Warning (W) is between 2s and 3s of annual mean for that QC type.
Out of Control (OC) is ≥3s of annual mean for that QC type.

[a]Minimum detectable activity.
[b]Statement of work.

Table 4-32. QC Performance Evaluation for Stack Sampling for CY 2001

Evaluation Performed	Stacks Acceptance Criteria	Alpha/Beta	Gamma	Tritium	Beryllium
Laboratory Control Standard (LCS) Recovery Check	100 ± 10% UC 80–90 or 110–120% W <80 or >120% OC	60% UC 40% W	90% UC 7% W 3% OC	100% UC	87% UC 13% W
Matrix Blank (MB)	See control criteria below.	97% UC 3% OC	100% UC	98.4% UC 1.4%W 0.2% OC	100% UC
Process Blank (PB)	See control criteria below.	98% UC 2% OC	99.8% UC 0.1% W	98.5% UC 1.0% W 0.5% OC	100% UC
Trip Blank (TB)	See control criteria below.	97% UC 3% OC	100% UC	NA[a]	100% UC
Matrix Duplicate Evaluation	1–10 uCi/L under control at RPD <10%.	NA	NA	100% UC	100% UC
Matrix Replicate Evaluation	For analytically significant, positive results, similar to control criteria below.	83% UC 16% W 1% OC	NA	NA	NA
Matrix Replicate Evaluation	Qualitative Agreement (within a factor of 5) for analytically insignificant results (i.e. "less-than" values).	NA	99.97%	NA	NA
Matrix Spike	Recovery of added spike: 100± 10% UC 80–90 or 110–120% W <80 or >120% OC	**Alpha:** 35% UC 42% W 23% OC **Beta:** 84% UC 15% W 1% OC	93% UC 6% W 1% OC	100% UC	NA
MDA[b] Achieved	All samples below SOW[c] specification.	98%	99.8%	100%	100%
Analytical Completeness	80% successful analysis of valid samples.	100%	100%	100%	100%

General Control Criteria
Under Control (UC) is ≤2s of annual mean for that QC type.
Warning (W) is between 2s and 3s of annual mean for that QC type.
Out of Control (OC) is ≥3s of annual mean for that QC type.

[a]NA = not applicable.
[b]Minimum detectable activity.
[c]Statement of work.

Table 4-33. QC Performance Evaluation for Stack Sampling for CY 2001

Evaluation Performed	Stacks Acceptance Criteria	^{241}Am	Thorium Isotopes	Plutonium Isotopes	Uranium Isotopes
Laboratory Control Standard (LCS) Recovery Check	100 ± 10% UC 80–90 or 110–120% W <80 or >120% OC	100% UC	80% UC 20% W	100% UC	93% UC 7% W
Matrix Blank (MB)	See control criteria below.	100% UC	100% UC	100% UC	100% UC
Process Blank (PB)	See control criteria below.	100% UC	100% UC	100% UC	100% UC
Trip Blank (TB)	See control criteria below.	100% UC	100% UC	100%UC	100% UC
Matrix Spike	Recovery of added spike: 100 ± 10% UC 80–90 or 110–120% W <80 or >120% OC	80% UC 20%W	40% UC 40% W 20% OC	90% UC 10% W	80% UC 20% W
MDA[a] Achieved	All samples below SOW[b] specification.	100% UC	100% UC	100% UC	100% UC
Analytical Completeness	80% successful analysis of valid samples.	100%	100%	100%	100%
Tracer Recovery	Mean ± Std Dev	79 ± 10%	76 ± 7%	83 ± 8%	59 ± 12%
Tracer Recovery Control	50 – 110% is UC	100%	100%	99%	82%

General Control Criteria
Under Control (UC) is ≤2s of annual mean for that QC type.
Warning (W) is between 2s and 3s of annual mean for that QC type.
Out of Control (OC) is ≥2s of annual mean for that QC type.

[a]Minimum detectable activity.
[b]Statement of work.

Table 4-34. QC Performance Evaluation for Stack Sampling for CY 2001

Evaluation Performed	Stacks Acceptance Criteria	^{210}Po	^{210}Pb	^{90}Sr
Laboratory Control Standard (LCS) Recovery Check	100 ± 10% UC 80 – 90 or 110 – 120% W < 80 or >120% OC	80% UC 20% W	40% UC 60% W	100% UC
Matrix Blank (MB)	See control criteria below.	100% UC	100% UC	100% UC
Process Blank (PB)	See control criteria below.	100% UC	100% UC	100% UC
Trip Blank (TB)	See control criteria below.	100% UC	100% UC	100%UC
Matrix Spike	Recovery of added spike: 100 ± 10% UC 80 – 90 or 110 – 120% W < 80 or >120% OC	80% UC 20% W	100% UC	100% UC
MDA[a] Achieved	Samples achieving SOW[b] specification.	0%	0%	0%
Analytical Completeness	80% successful analysis of valid samples.	100%	100%	100%
Tracer Recovery	Mean ± Standard Dev.	64 ± 8%	83 ± 3%	79 ± 5%
Tracer Recovery Control	50 – 110% is UC	96%	100%	100%

General Control Criteria
Under Control (UC) is ≤2s of annual mean for that QC type.
Warning (W) is between 2s and 3s of annual mean for that QC type.
Out of Control (OC) is ≥3s of annual mean for that QC type.

[a]Minimum detectable activity.
[b]Statement of work.

Table 4-35. QC Performance Evaluation for NonRadNet Sampling for CY 2001

Evaluation Performed	Acceptance Criteria	Beryllium	Inorganic Elements	Total Suspended Particulates	Volatile Organic Compounds
Laboratory Control Standard (LCS) Recovery	ESH-17 criteria shown below.	33% UC 56% W 11% OC	71% UC 15% W 14% OC	NA[a]	75% UC 19% W 6% OC
Laboratory Control Standard Duplicate (LCSD) Recovery	ESH-17 criteria shown below.	NA	NA	NA	74% UC 20% W 6% OC
Laboratory Control Standard (LCS) Recovery	S-T criteria shown below.	NA	NA	NA	98% UC 2% OC
Laboratory Control Standard Duplicate (LCSD) Recovery	S-T criteria shown below.	NA	NA	NA	98% UC 2% OC
Laboratory Control Standard Relative PerCent Difference	Established by Chem. Lab, Varies with Analyte	NA	NA	NA	100% UC
Surrogate Recovery Summary	See Note Below.	NA	NA	NA	99.3% UC 0.7% W
Surrogate Recovery by Compound	See Note Below.	NA	NA	NA	(1) 97± 7% (2) 93 ± 4% (3)105 ± 5% (4) 84 ± 8% (5)102 ± 4%
Analytical Completeness	80% Successful Analysis of Valid Samples	100%	100%	100%	100%

General Control Criteria
Under Control (UC) is ≤2s of annual mean for that QC type.
Warning (W) is between 2s and 3s of annual mean for that QC type.
Out of Control (OC) is ≥3s of annual mean for that QC type.
ESH-17 Laboratory Standard Control criteria for Be, Inorganics, and VOC:
Be and Inorganics: UC is 100±10%; W is 80–90 or 110–120%; and OC is <80 or >120%
VOC: UC is 100±20%; W is 70–80 or 120–130%; and OC is <70 or >130%
Severn-Trent Laboratories LCS criteria for VOC:
These vary with compound and are based upon their historical experience; none are specified in EPA TO-14.
Performance is evaluated against each compound's specific limits and then summarized.
VOC Surrogate Compounds: (1) = 1,4-Dichlorobutane
(2)= 2-Bromo-1,1,1-trifluoroethane
(3)= 4-Bromofluorobenzene
(4)= Fluorobenzene
(5)= Toluene-d8
Acceptance criteria: UC is 100±30% (±2s); W is 55–70 or 130–145% (between 2s and 3s); OC is <55 or >145% (>3s)

[a]NA = not applicable.

J. Figures

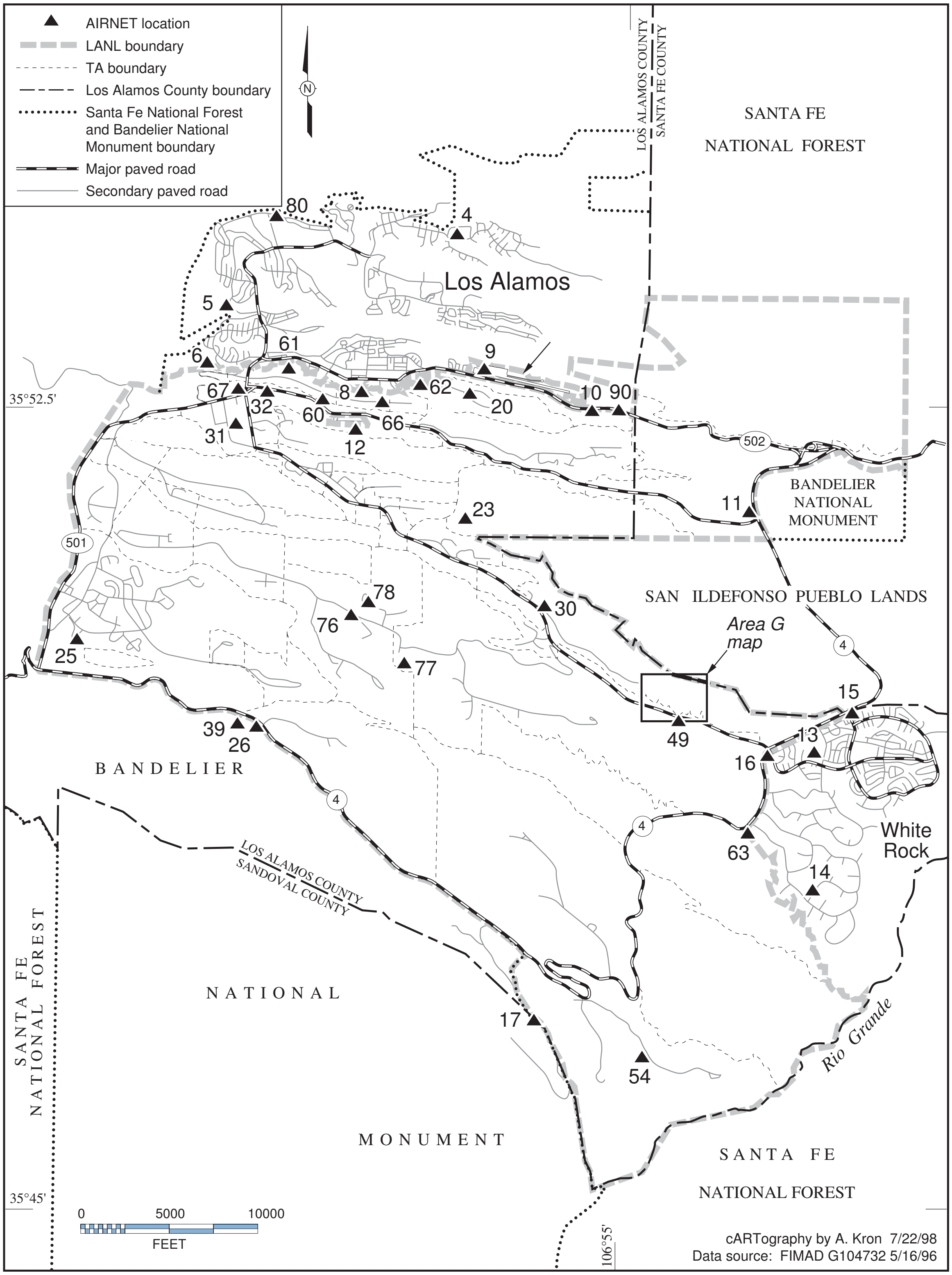

Figure 4-1. Off-site perimeter and on-site Laboratory AIRNET locations.

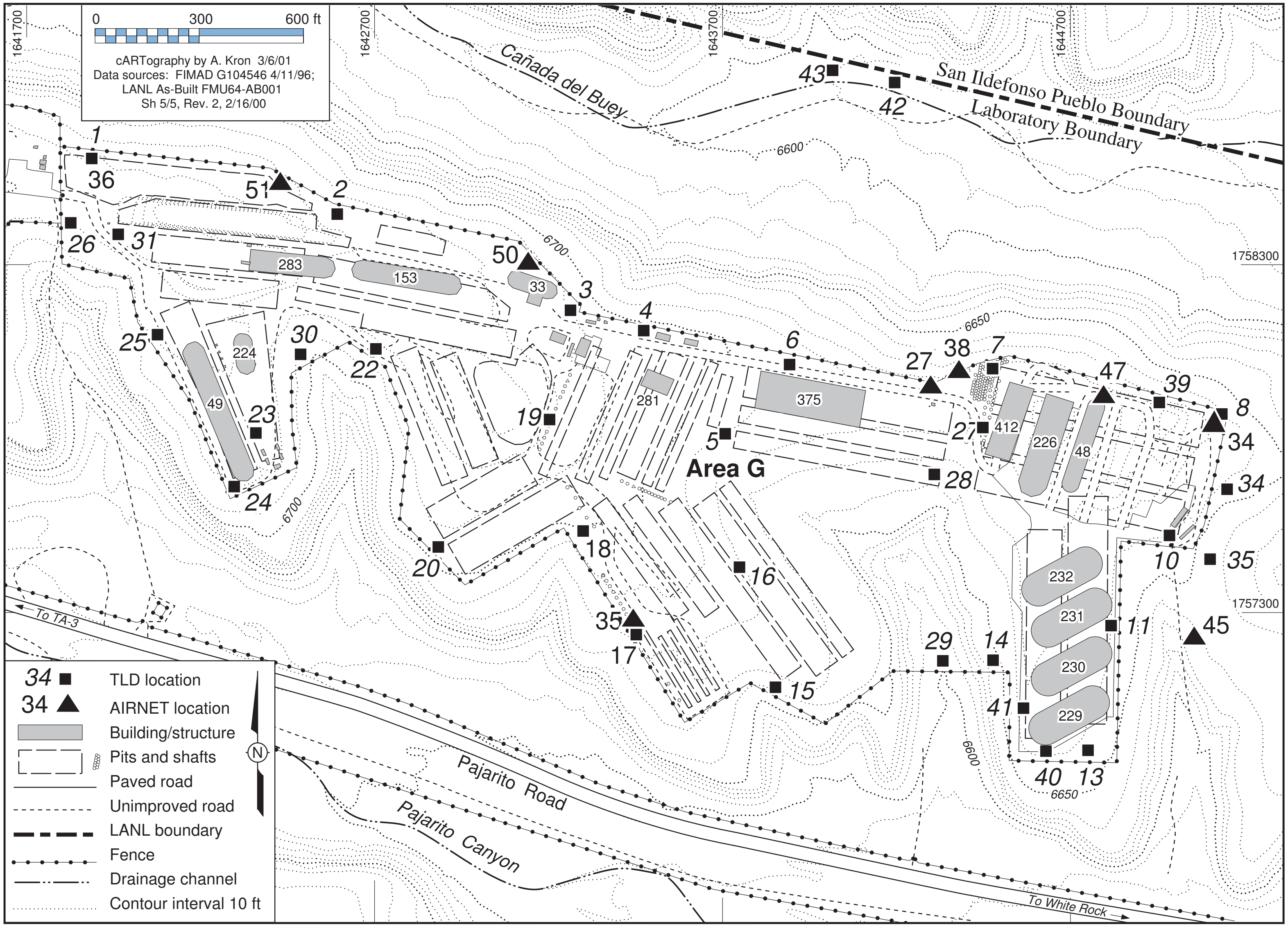

Figure 4-2. Technical Area 54, Area G, map of AIRNET and TLD locations.

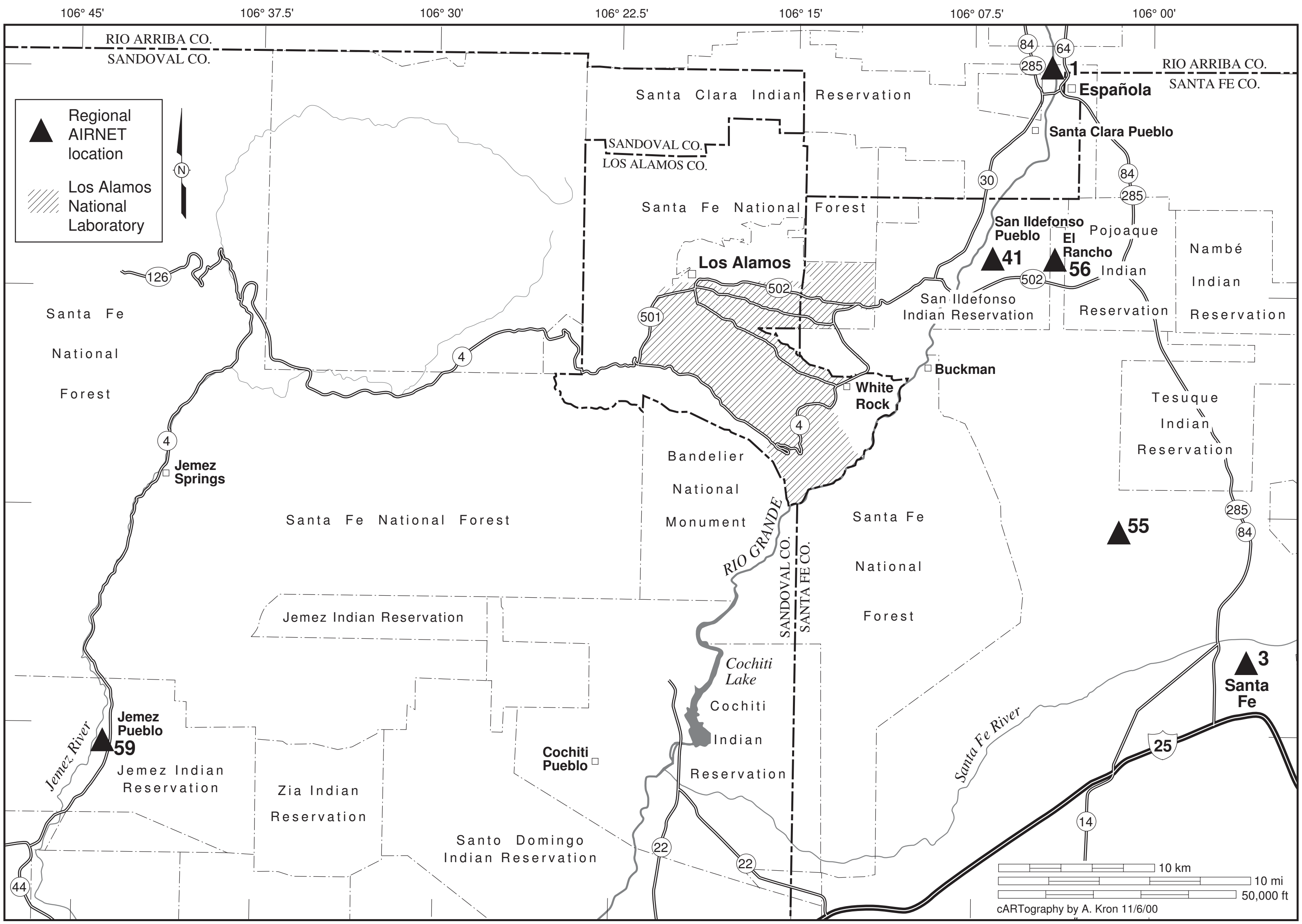

Figure 4-3. Regional and pueblo AIRNET locations.

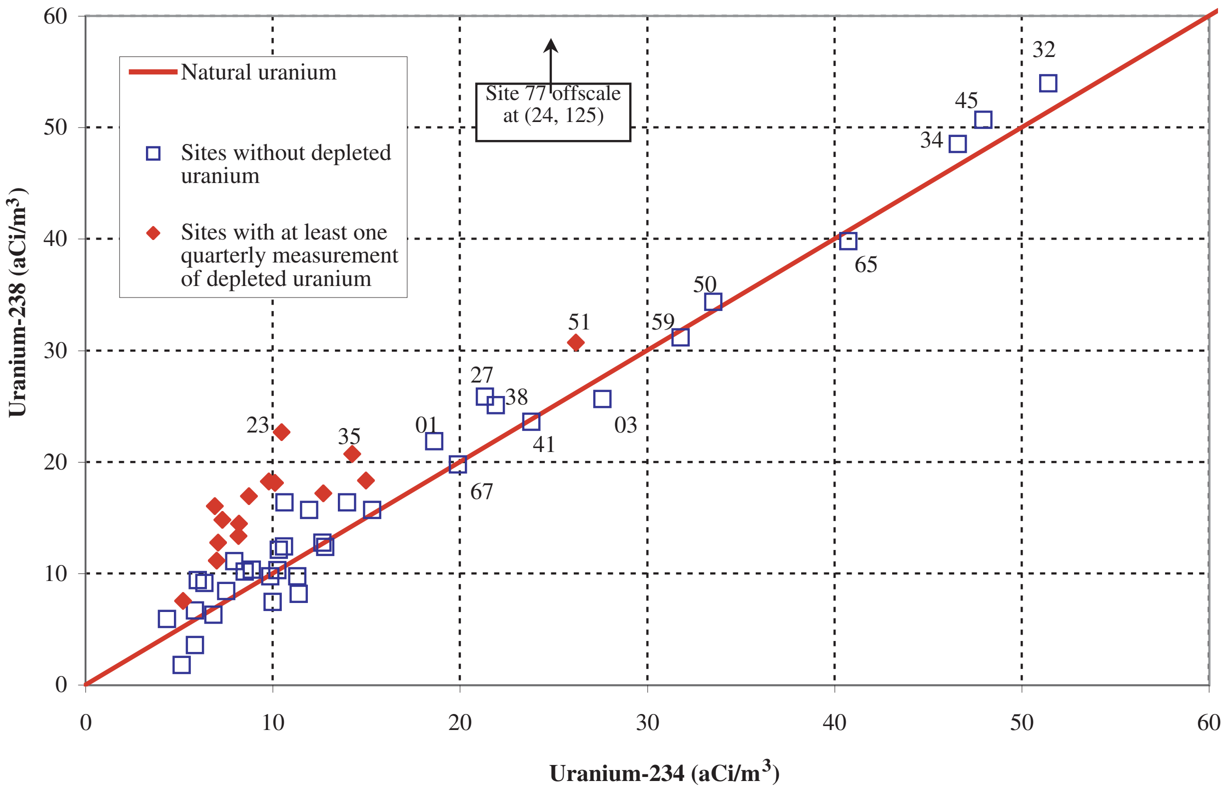

Figure 4-4. AIRNET uranium concentrations for 2001.

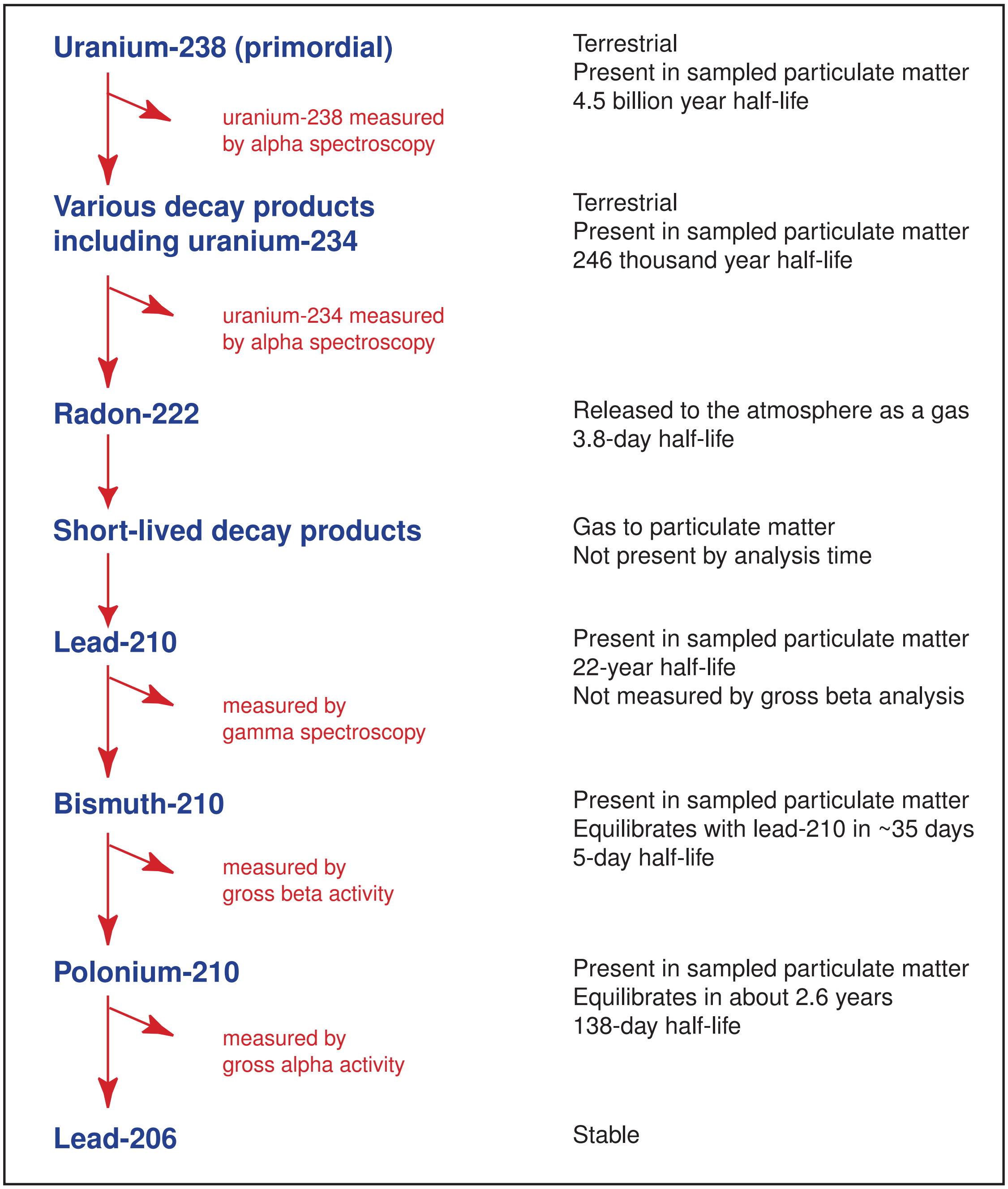

Figure 4-5. Uranium-238 decay series.

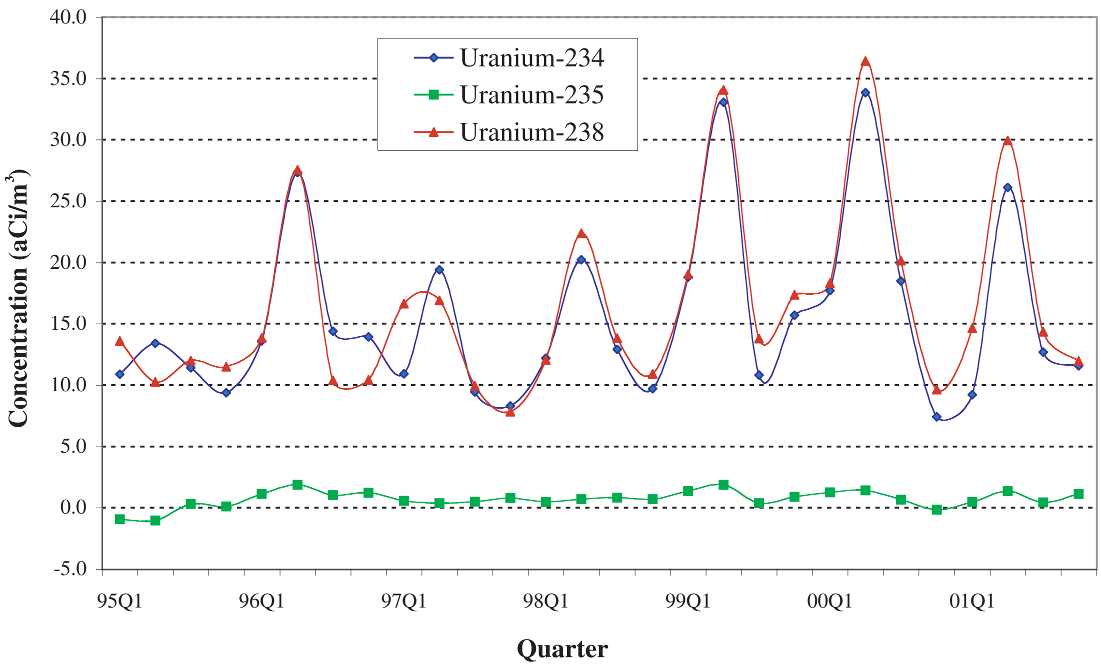

Figure 4-6. AIRNET quarterly uranium concentrations (network-wide concentrations excluding site 77).

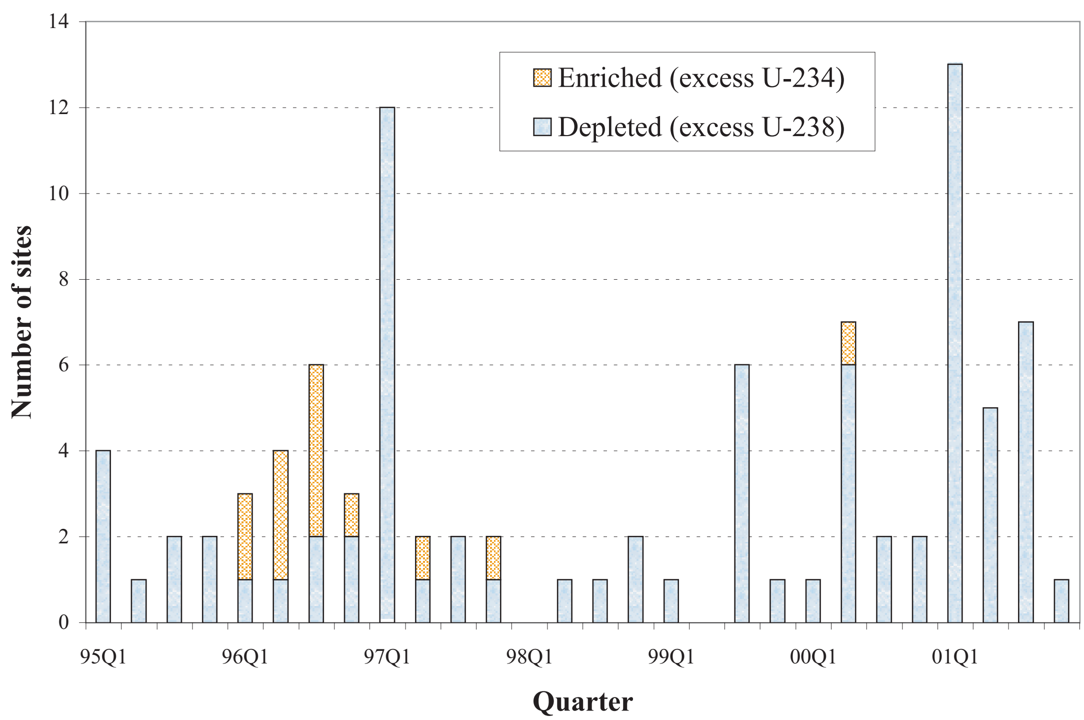

Figure 4-7. AIRNET sites with excess isotopic uranium.

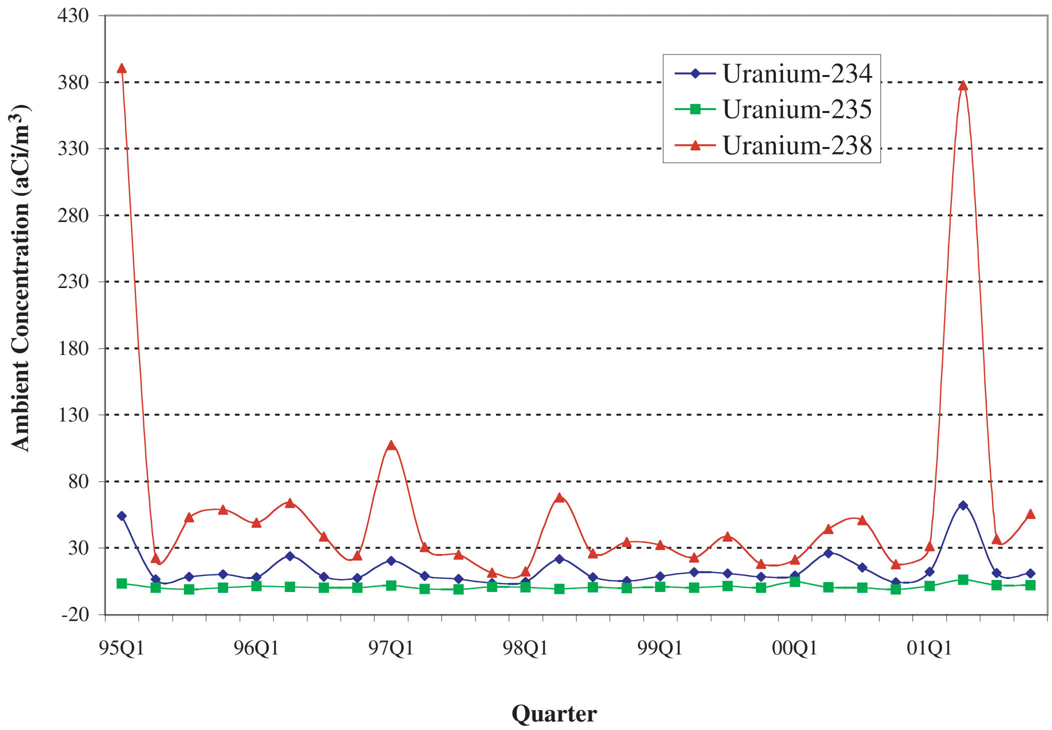

Figure 4-8. Uranium concentrations at site 77.

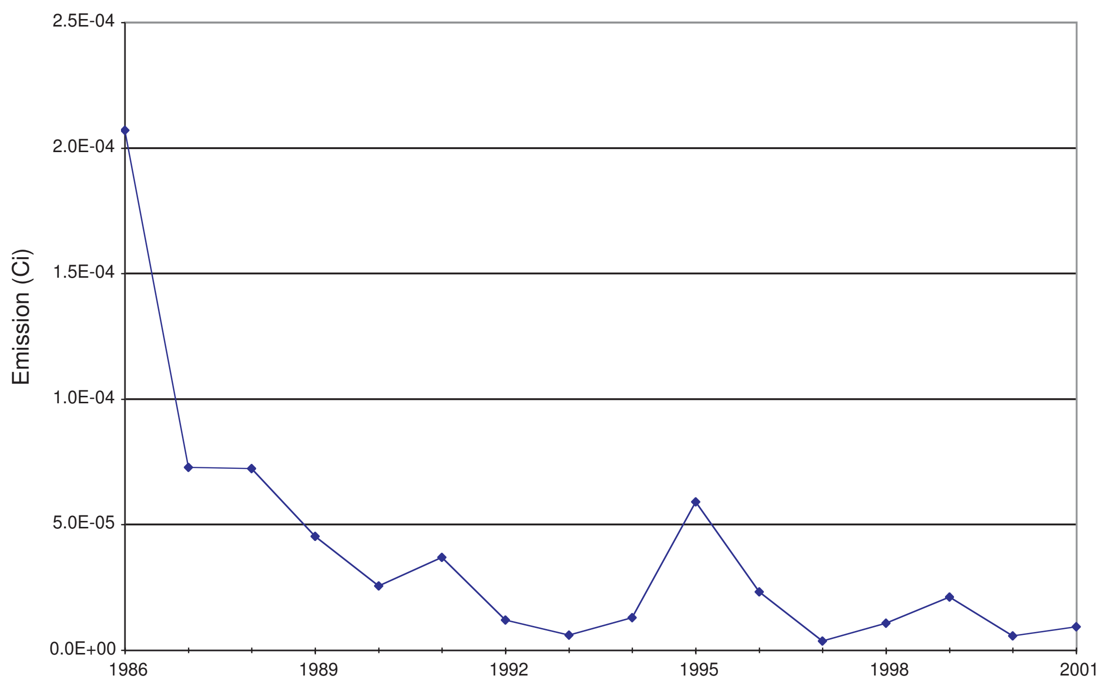

Figure 4-9. Plutonium emissions from sampled Laboratory stacks since 1986.

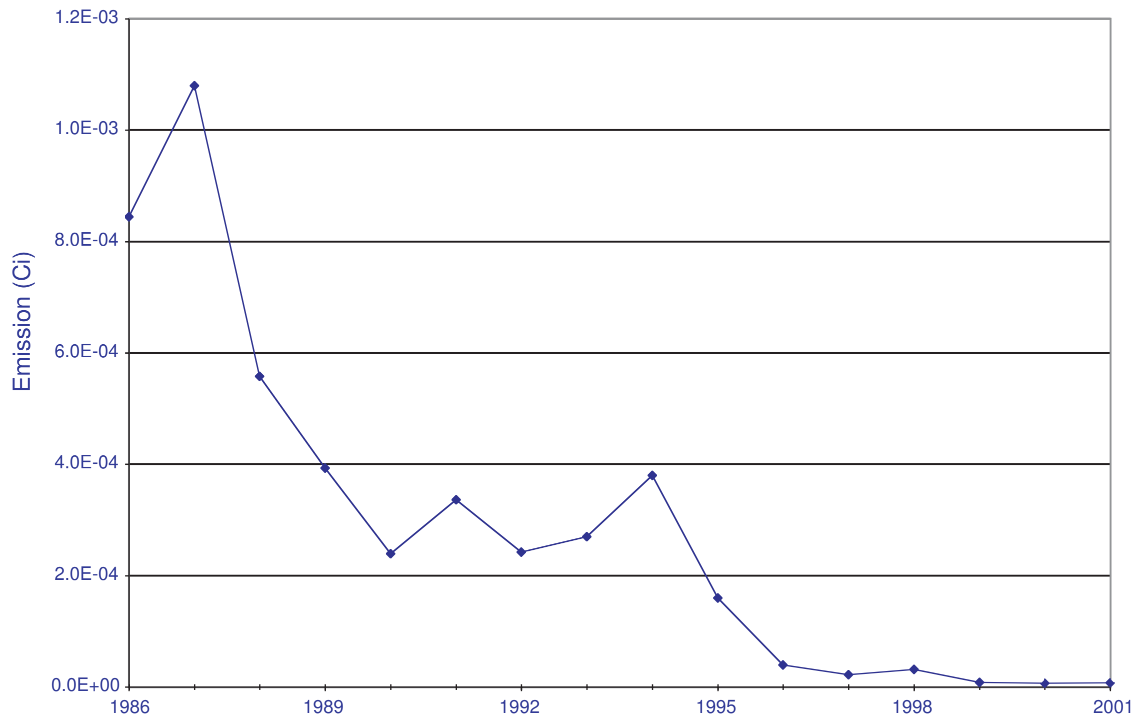

Figure 4-10. Uranium emissions from sampled Laborabory stacks since 1986.

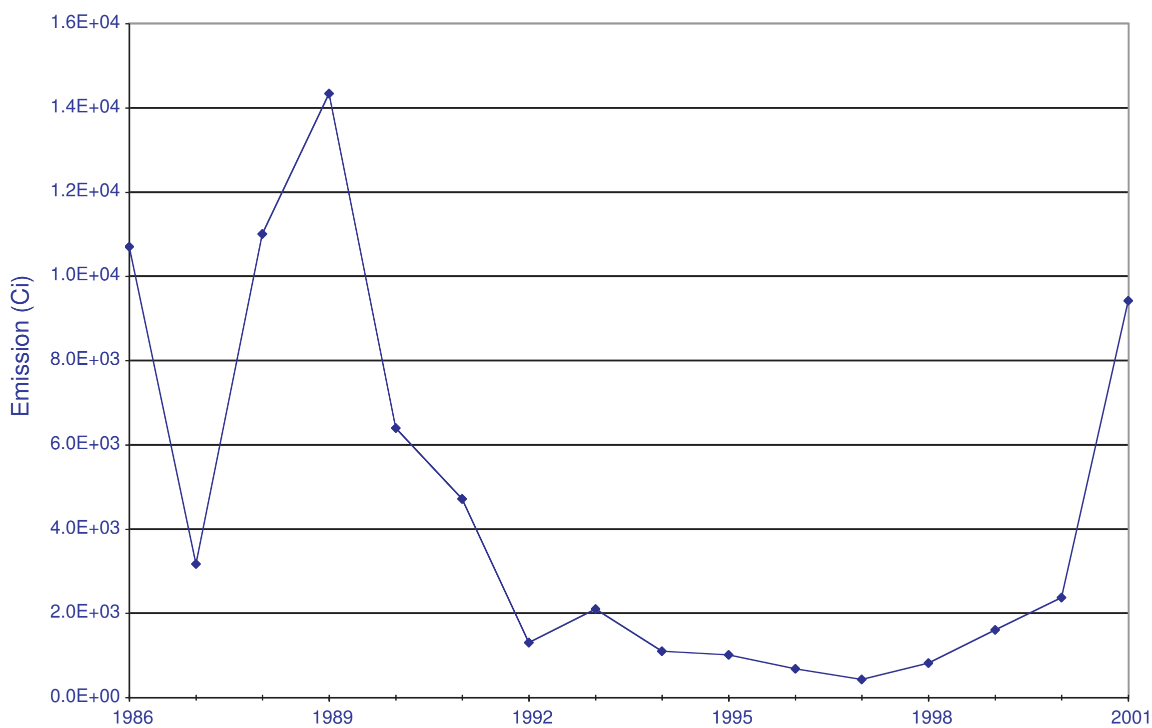

Figure 4-11. Tritium emissions from sampled Laborabory stacks since 1986.

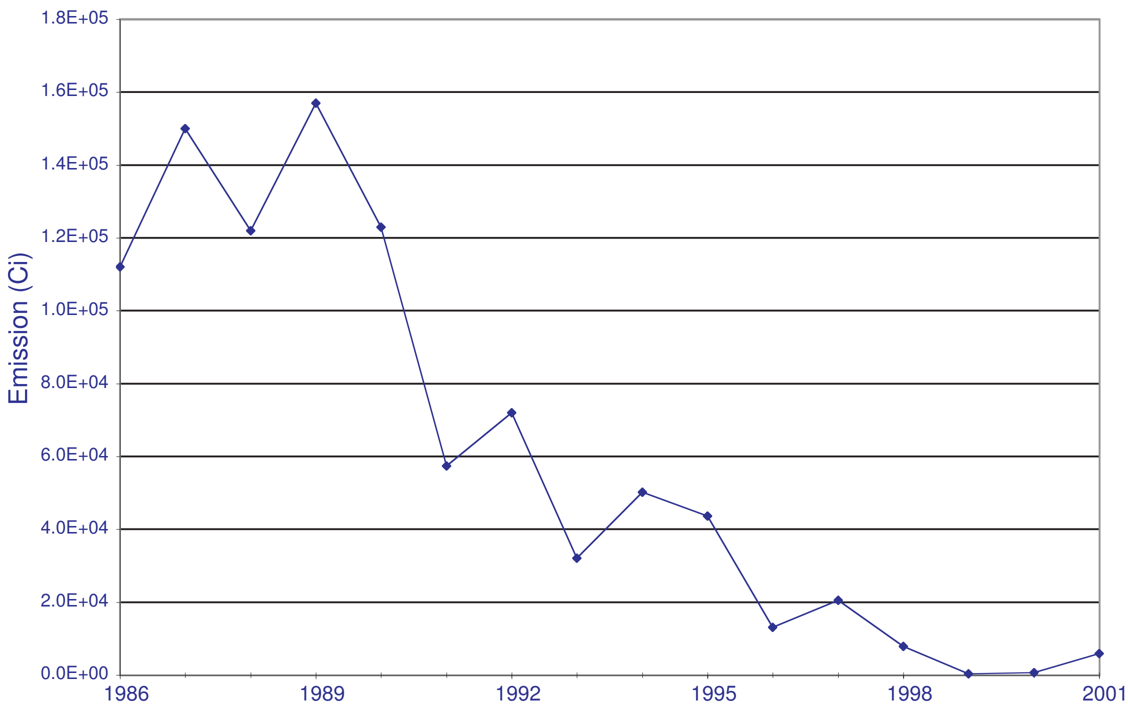

Figure 4-12. G/MAP emissions from sampled Laboratory stacks since 1986.

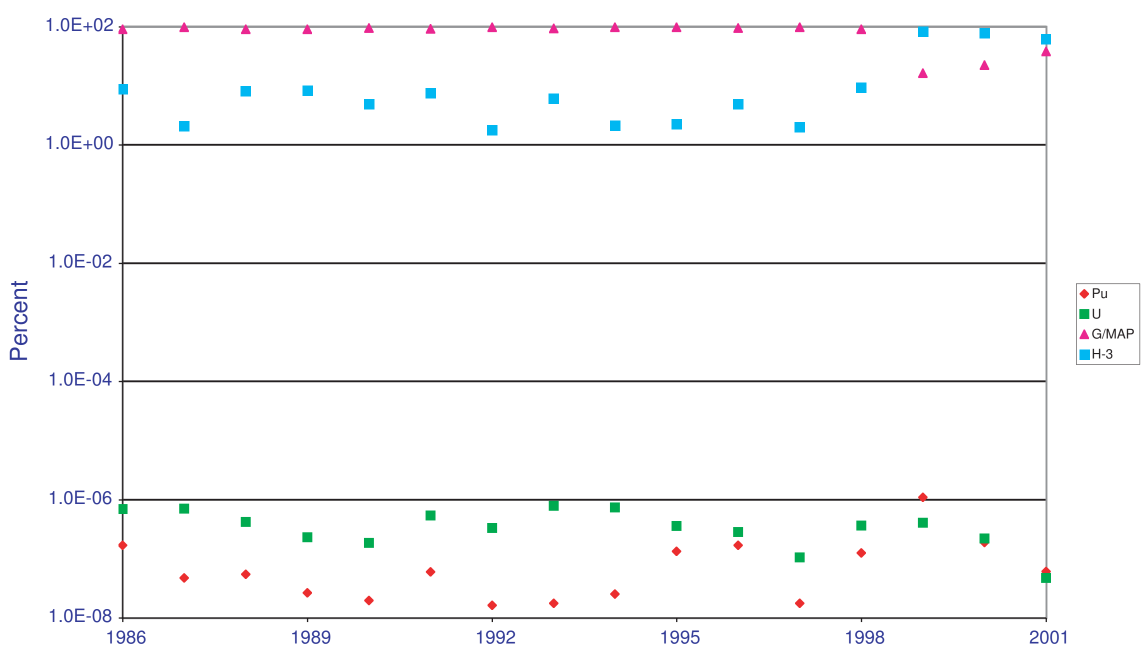

Figure 4-13. Percent of total stack emissions resulting from plutonium, uranium, tritium, and G/MAP.

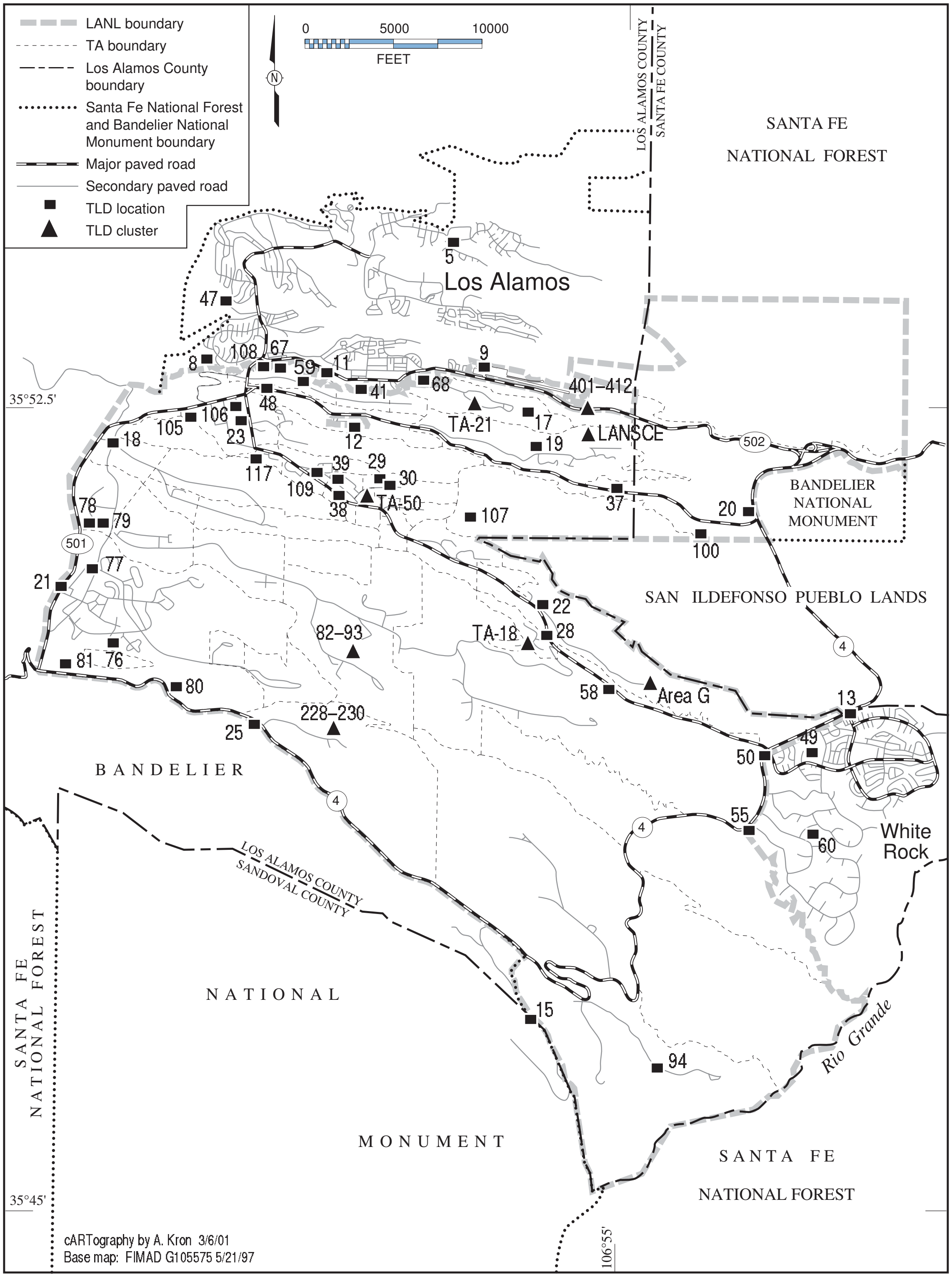

Figure 4-14. Off-site perimeter and on-site Laboratory TLD locations.

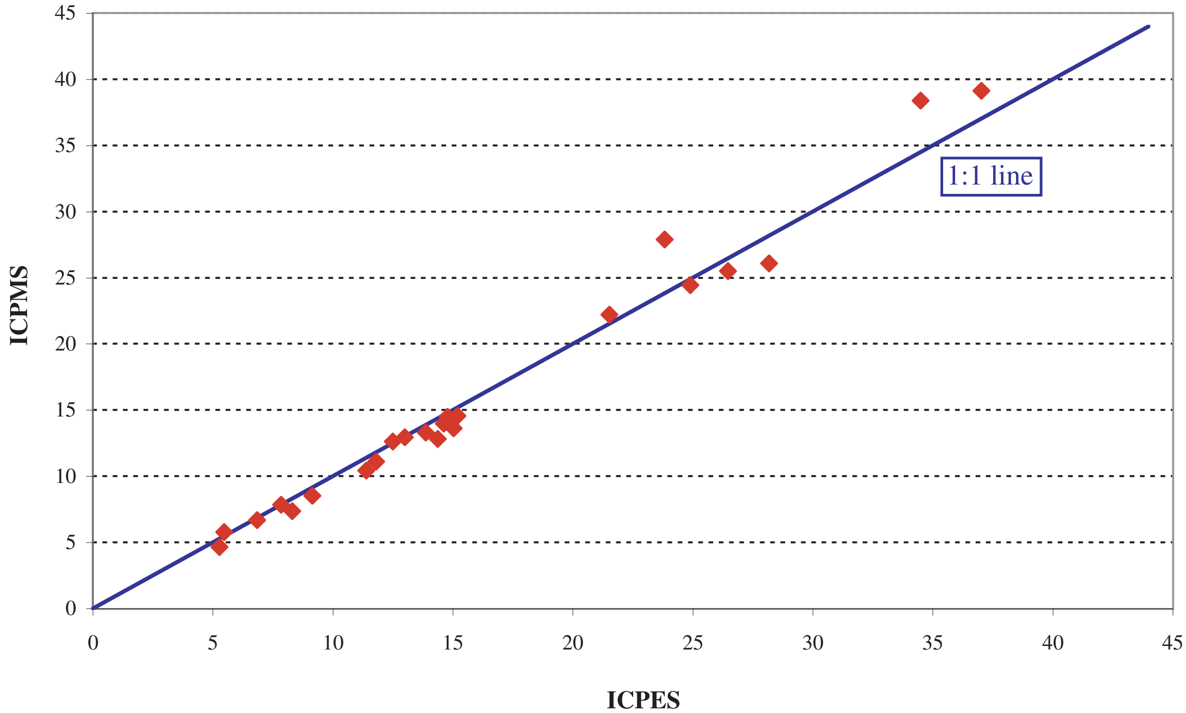

Figure 4-15. ESH-17 barium measurements by ICPES and ICPMS.

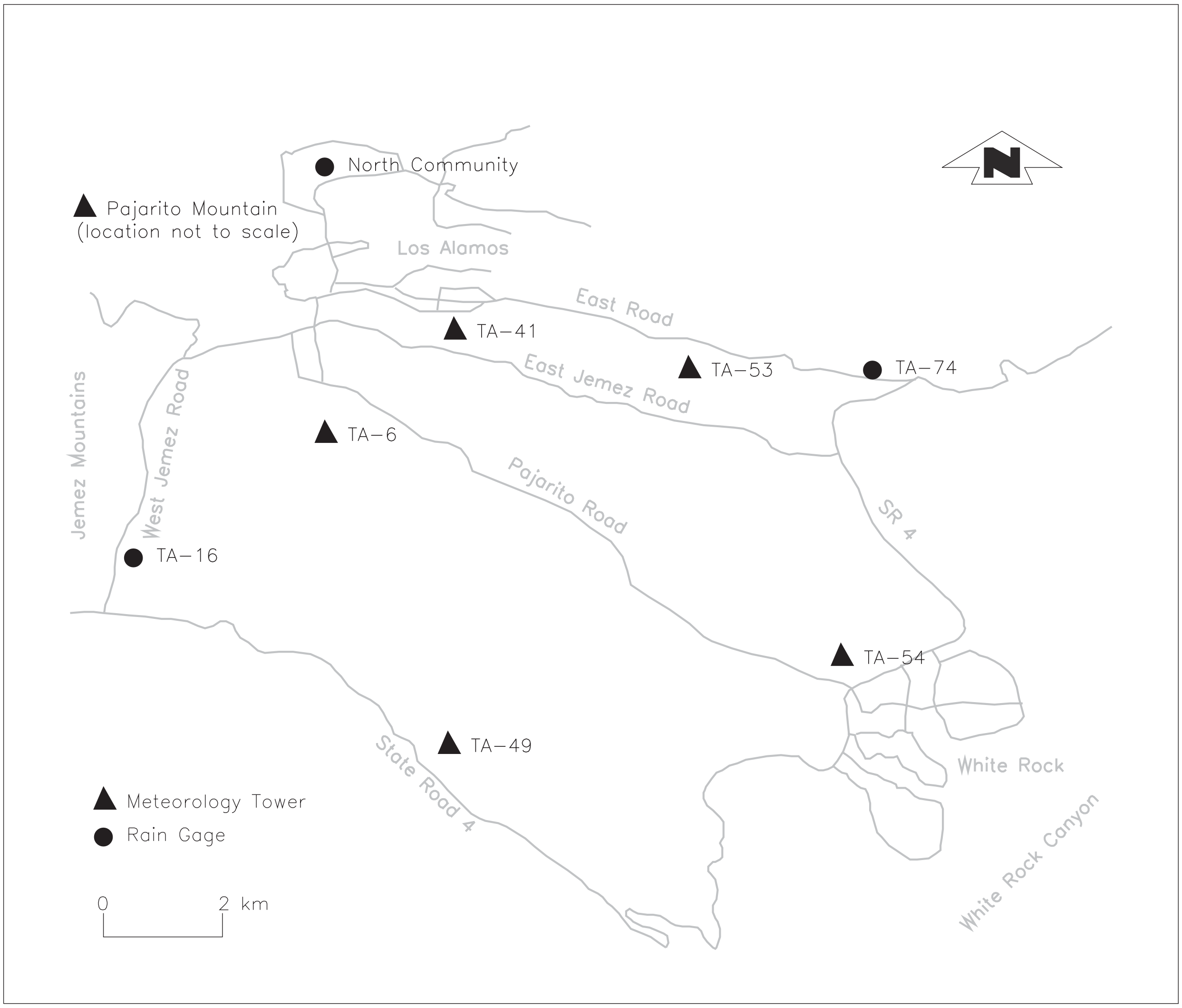

Figure 4-16. Meteorological network.

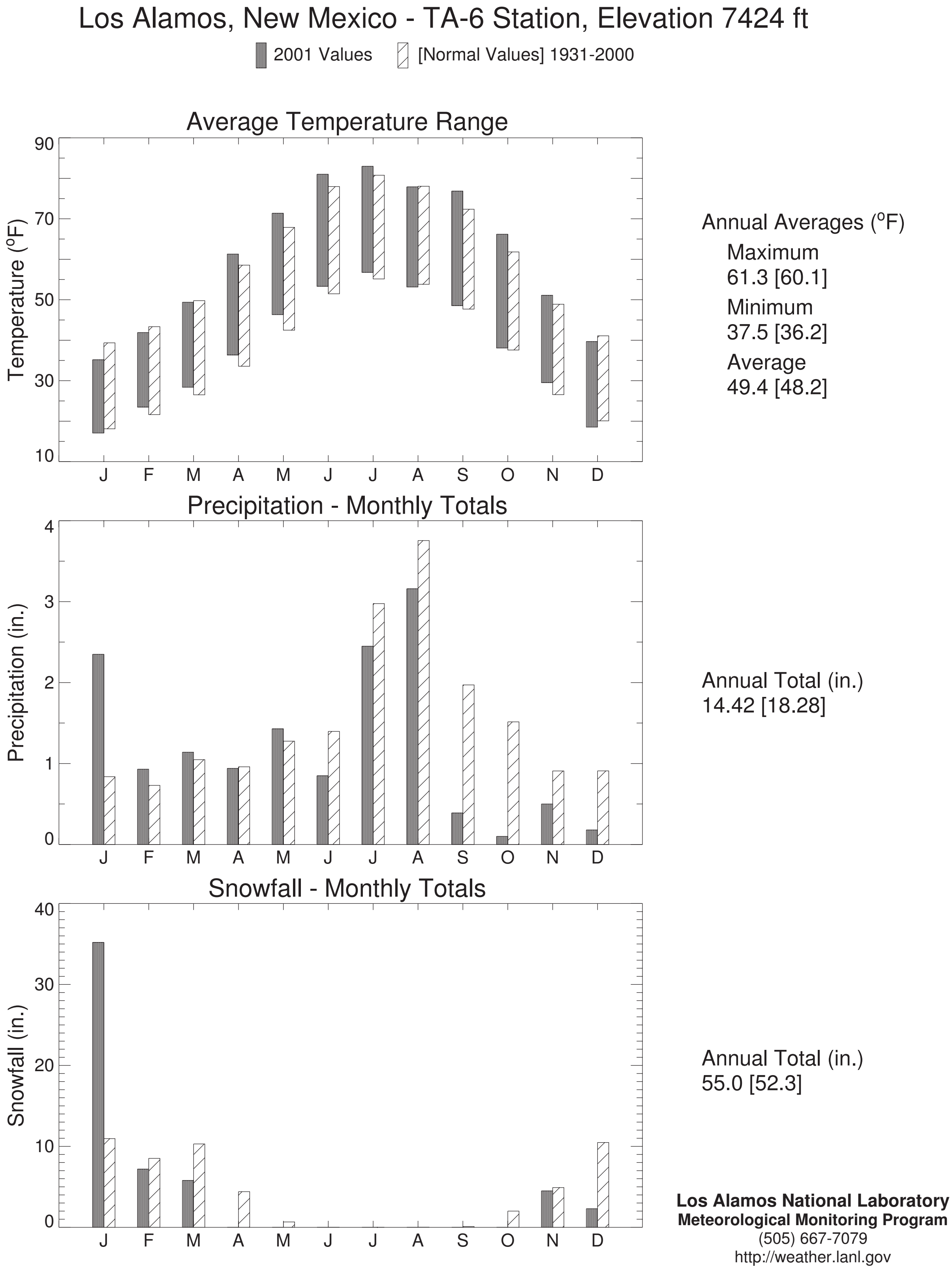

Figure 4-17. 2001 weather summary for Los Alamos.

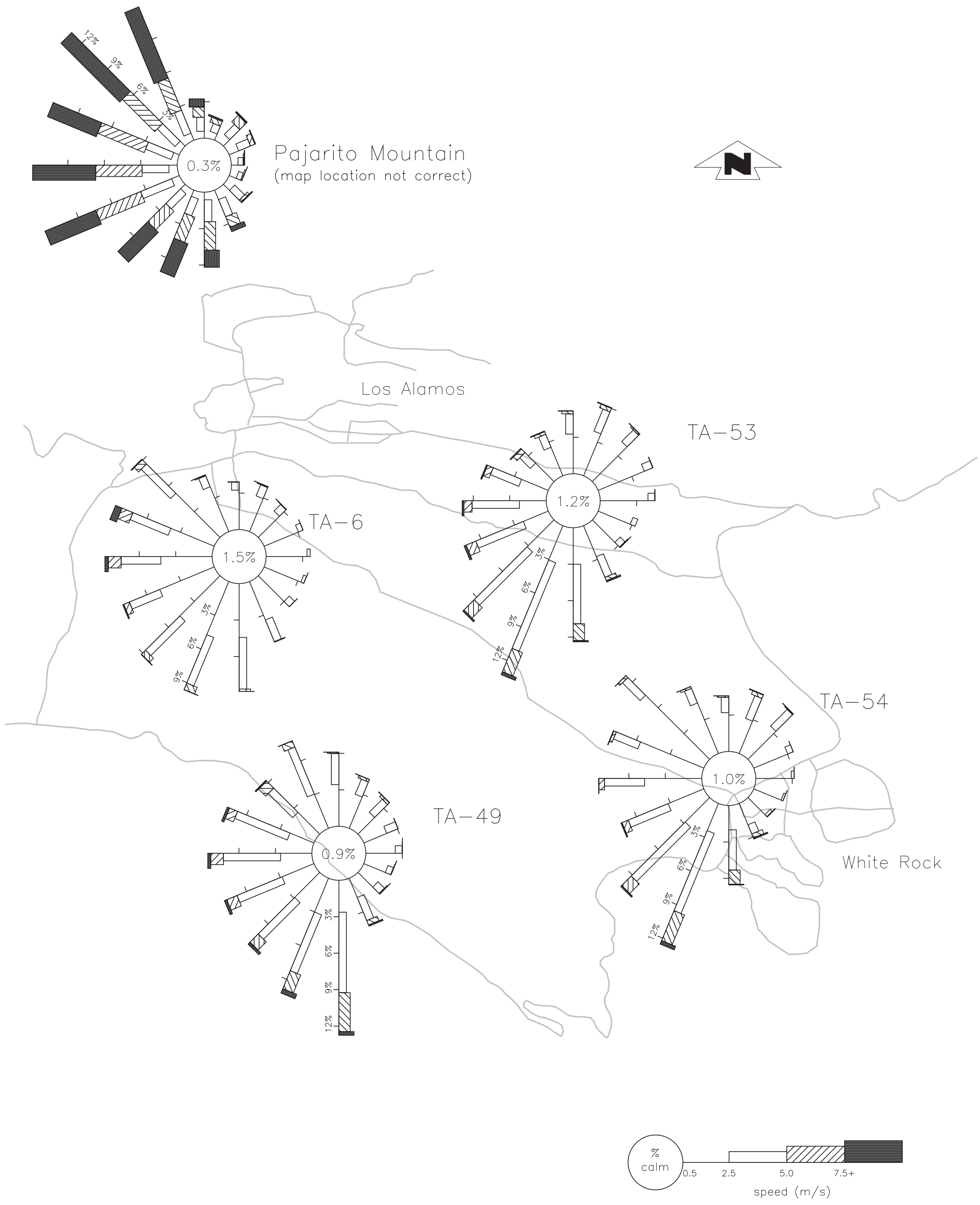

Figure 4-18. 2001 total wind roses.

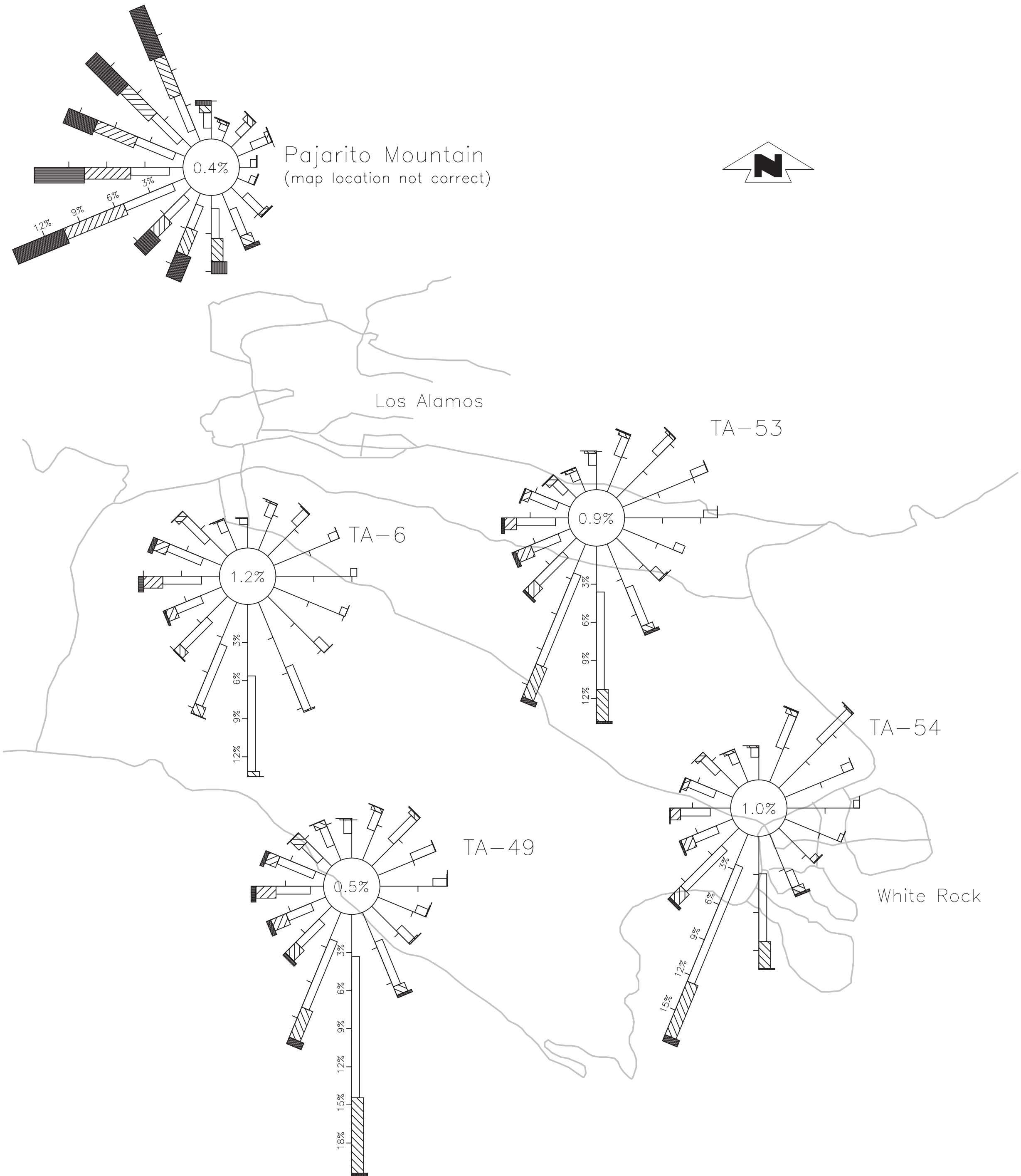

Figure 4-19. Daytime wind roses.

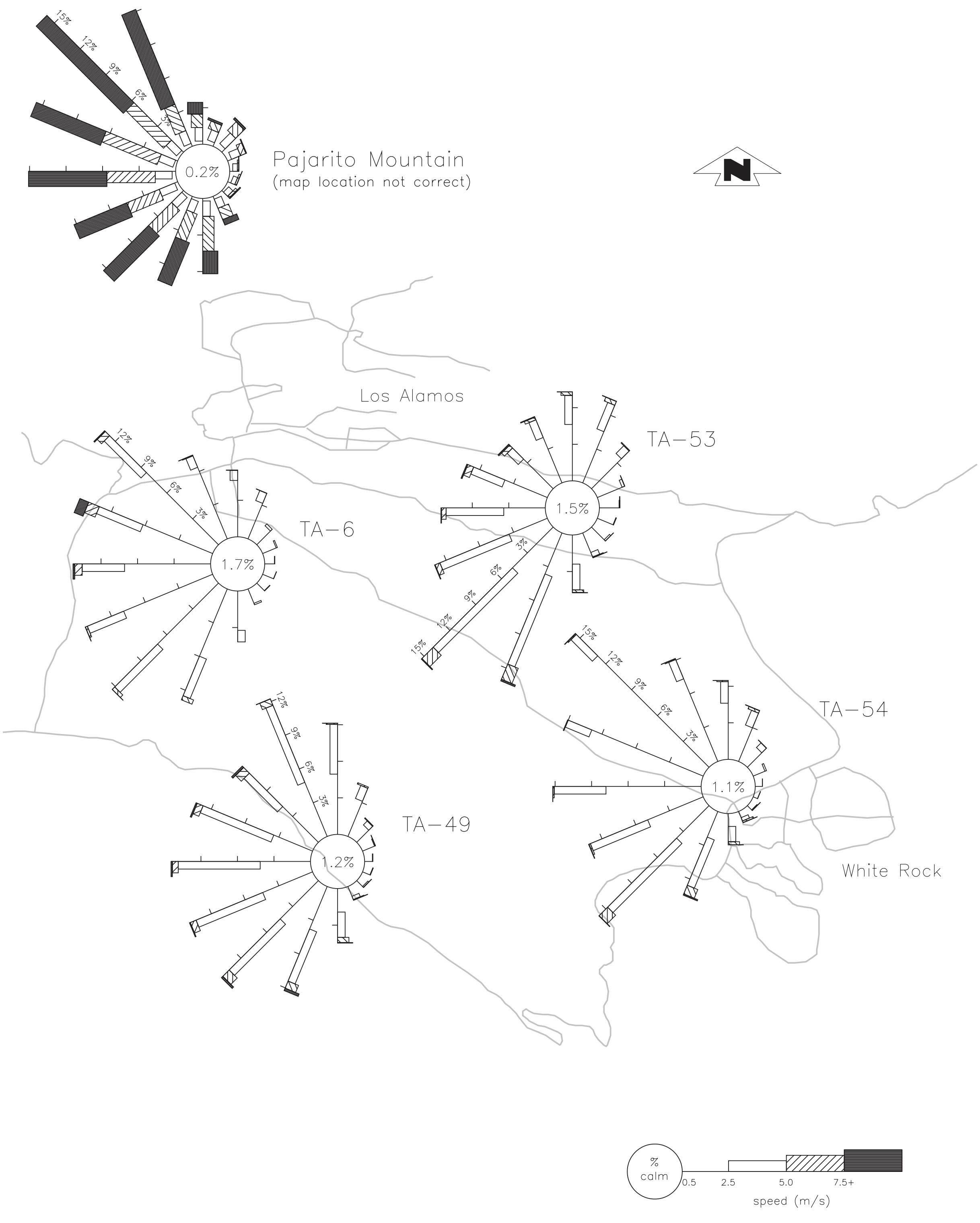

Figure 4-20. Nighttime wind roses.

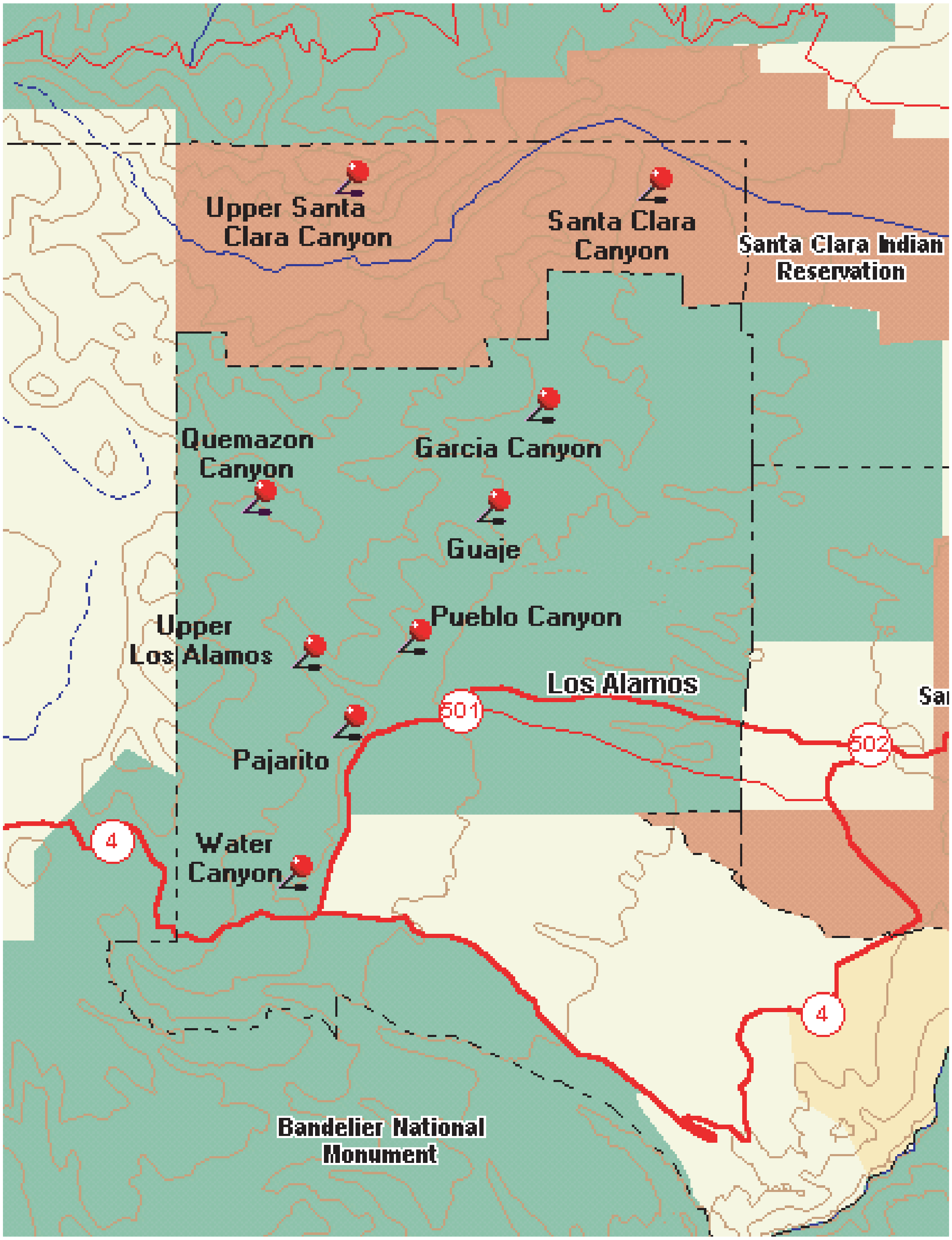

Figure 4-21. LANL Remote Automated Weather Station (RAWS) locations.

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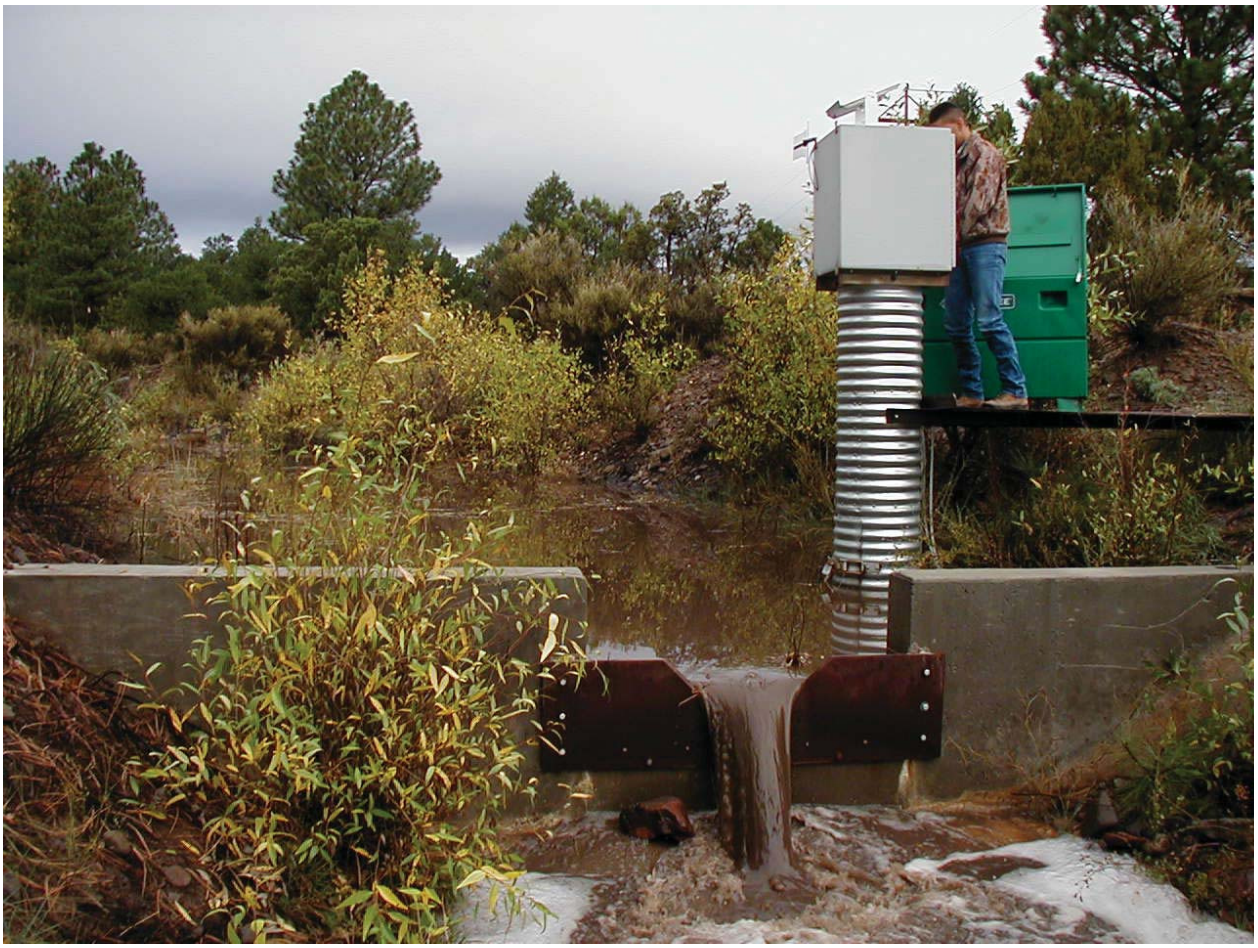
5. Surface Water, Groundwater, and Sediments



5. Surface Water, Groundwater, and Sediments

contributing authors:
David B. Rogers, Bruce M. Gallaher, Richard J. Koch, Billy R. J. R. Turney, Robert S. Beers

Abstract

Record volumes of snowmelt and storm runoff crossed the Laboratory in 2001, reflecting the increased yield of surface water from the Jemez Mountains following the Cerro Grande fire. Snowmelt was present in the larger canyon systems for two months and provided a potential sustained source of water for wildlife. None of the snowmelt or base flow samples contained radioactivity greater than Department of Energy (DOE) Derived Concentration Guides (DCGs) values for public exposure. Measurements of alpha radiation in excess of 15 pCi/L occurred at locations with current or former radioactive liquid waste discharges: Acid/Pueblo, DP/Los Alamos, and Mortandad Canyons. For the second consecutive year, americium-241, plutonium-238, and plutonium-239, -240 in effluent from the Technical Area (TA)-50 Radioactive Liquid Waste Treatment Facility (RLWTF) outfall did not exceed DCGs. The average TA-50 RLWTF effluent nitrate and fluoride concentrations were below the New Mexico groundwater standards. Four snowmelt or base flow samples in Los Alamos Canyon contained lead concentrations greater than drinking water standards. Low levels of high-explosives compounds were detected in snowmelt in the Water Canyon drainage, consistent with earlier results.

Storm runoff in otherwise dry drainages results from summer thunderstorms. Record peak flows from fire-impacted areas occurred in three canyons. The amount of sediment carried by storm runoff continues to be 100 to 1000 times greater than pre-fire levels. Largely because of the sediment load and associated background concentrations, we measured record levels of many metals and several radionuclides in the storm runoff. Plutonium-239, -240 activities exceeded DOE DCGs in runoff in lower Pueblo Canyon and were partly attributable to mobilization of Laboratory legacy materials. We estimate that storm runoff transported approximately 20 to 40 mCi of plutonium-239, -240 downstream in lower Pueblo Canyon in 2001. This amount represents an estimated increase of more than 40 times the levels measured since automated runoff measurements started in 1997. Gross alpha activities were greater than public exposure DCGs in about three-fourths of the storm runoff samples. While high alpha activities were measured at stations both above and below the Laboratory, Laboratory contributions are indicated at several locations, most pronounced in Pueblo and Los Alamos Canyons and around Material Disposal Area (MDA) G. Selenium exceeded the New Mexico wildlife habitat standard in nearly half of the samples and appears to be of natural origin.

In 2000, because of the Cerro Grande fire, many sediment samples contained cesium-137 at much higher values than previously noted. Values in 2001 continued to show high cesium-137 at some stations. The sediment sampling again shows that plutonium occurs above fallout levels in Pueblo and Los Alamos Canyons and extends off-site from the Laboratory. Cesium-137 and plutonium-239, -240 activities in lower Pueblo Canyon have risen over the past few years, a result that may be due in part to mobilization of sediments by increased flows and of fallout cesium-137 in ash from vegetation burned in the Cerro Grande fire. Within Mortandad Canyon, the greatest radionuclide levels in sediments are found between the point where the TA-50 RLWTF effluent enters the drainage and the sediment traps, approximately a 3-km distance. Sampling after relocation of stations below the sediment traps in 2001 indicates that relatively high values of sediment radioactivity extend closer to the Laboratory boundary than previously described. Sediment samples below the TA-50 RLWTF outfall again showed cesium-137 concentrations that were up to five times greater than the screening action level (SAL) value. In 2001, sediment samples near the Laboratory boundary had cesium-137 activity of 1.3 to 5.6 times background. The latter sample, a few feet on the San Ildefonso Pueblo side of the boundary, had a value 60% of the SAL. A number of sediment samples near and downstream of the TA-54 Solid Waste Operations at MDA

G contained plutonium-238 and plutonium-239, -240 above background. We also found above-background levels of plutonium and americium in sediments downstream of MDA AB, TA-49.

Continued testing of water supply wells in 2001 showed that high-explosives constituents are not present in Los Alamos County and Santa Fe drinking water. Perchlorate (no drinking water standard) and tritium (at 1/500 of the drinking water standard) continued to be found in water supply well O-1 in Pueblo Canyon during 2001. Nitrate is higher than background in O-1. Other groundwater samples from the regional aquifer were consistent with previous results. Trace levels of tritium are present in the regional aquifer in a few areas where past liquid waste discharges occurred, notably beneath Los Alamos, Pueblo, and Mortandad Canyons. The highest tritium level found in a regional aquifer test well (near water supply well O-1) is about 1/50 of the drinking water standard. The nitrate concentration in a test well beneath Pueblo Canyon remains elevated but, in 2001, was only about half the drinking water standard. Except for above-background tritium in O-1, we detected no radionuclides other than naturally occurring uranium in Los Alamos County, San Ildefonso Pueblo, or Santa Fe water supply wells.

In 2000 and 2001, it appeared that perchlorate had been discovered in a spring issuing along the Rio Grande below the Laboratory and, in 2001, in numerous surface water samples. Evaluation of analytical laboratory methods and reanalysis of samples show that these apparent detections were the result of matrix interference in the analysis rather than the presence of perchlorate.

Analytical results for perched alluvial and intermediate-depth groundwater are similar to those of past years. Waters near former or present effluent discharge points show the effects of these discharges. A gross alpha sample from a test well in Cañada del Buey had a value about 65% of the DOE DCGs for public exposure. No values exceeded the DOE DCGs. Radioactivity measurements in perched alluvial groundwater that exceeded DOE DCGs for a DOE-operated drinking water system or EPA drinking water standards occurred at locations with current or former radioactive liquid waste discharges: gross beta, americium-241, and strontium-90 values from Mortandad and Los Alamos Canyons (these waters are not used as drinking water). Monitoring of fluoride and nitrate in Mortandad Canyon perched alluvial groundwater shows that levels of these substances have for the most part dropped below NM groundwater standards during 2001 as a result of their reduction in the TA-50 RLWTF effluent.

To Read About . . . Turn to Page . . .

A. Description of Monitoring Program

Studies related to development of groundwater supplies began at Los Alamos in 1945 under the direction of the US Geological Survey (USGS). In about 1949, the Atomic Energy Commission, the Los Alamos Scientific Laboratory, and the USGS jointly initiated studies aimed specifically at environmental monitoring and protecting groundwater quality. These initial efforts focused on Pueblo and DP/Los Alamos Canyons, which received radioactive industrial waste discharges in the early days of the Laboratory.

The current network of annual sampling stations for surface water and sediment surveillance includes a set of regional (or background) stations and a group of stations near or within the Los Alamos National Laboratory (LANL or the Laboratory) boundary. The regional stations establish the background quantities of radionuclides and radioactivity derived from natural minerals and from fallout affecting northern New Mexico and southern Colorado.

The Water Quality and Hydrology Group (ESH-18) collects groundwater samples from wells and springs within or adjacent to the Laboratory and from the nearby San Ildefonso Pueblo. The on-site stations, for the most part, focus on areas of present or former radioactive waste disposal operations, such as canyons (Figure 1-3). To provide a context for discussion of monitoring results, the setting and operational history of currently monitored canyons that have received radioactive or other liquid discharges are briefly summarized below.

For a discussion of sampling procedures, analytical procedures, data management, and quality assurance, see Section F. below.

1. Acid Canyon, Pueblo Canyon, and Lower Los Alamos Canyon

Acid Canyon, a small tributary of Pueblo Canyon, was the original disposal site for liquid wastes generated by research on nuclear materials for the World War II Manhattan Engineer District atomic bomb project. Acid Canyon received untreated radioactive industrial effluent from 1943 to 1951. The Technical Area (TA) 45 treatment plant was completed in 1951, and from 1951 to 1964 the plant discharged treated effluents that contained residual radionuclides into nearby Acid Canyon. Several decontamination projects have removed contamination from the area, but remaining residual radioactivity from these releases is now associated with the sediments in Pueblo Canyon (ESP 1981).

The inventory of radioactivity remaining in the Pueblo Canyon system is only approximately known. Several studies (ESP 1981; Ferenbaugh et al., 1994) have concluded that the plutonium in this canyon system does not present a health risk to the public. Based on analysis of radiological sediment survey data, the estimated total plutonium inventory in Acid Canyon, Pueblo Canyon, and Lower Los Alamos Canyon ranges from 246 mCi to 630 ± 300 mCi (ESP 1981). The estimated plutonium releases were about 177 mCi, in satisfactory agreement with the measured inventory considering uncertainties in sampling and release estimates. About two-thirds of this total is in the Department of Energy (DOE)-owned portion of lower Pueblo Canyon, which is planned to be transferred to Los Alamos County in 2007.

Pueblo Canyon currently receives treated sanitary effluent from the Los Alamos County Bayo Sewage Treatment Plant in the middle reach of Pueblo Canyon. Perched groundwater occurs seasonally in the alluvium, depending on the volume of surface flow from snowmelt, thunderstorm runoff, and sanitary effluents. Tritium, nitrate, and chloride, apparently derived from these Laboratory and municipal disposal operations, have infiltrated to the intermediate perched groundwater (at depths of 37 to 58 m [120 to 190 ft]) and to the regional aquifer (at a depth of 180 m [590 ft]) beneath the lower reach of Pueblo Canyon. Except for occasional nitrate values, levels of these constituents are a small fraction of the Environmental Protection Agency (EPA) drinking water standards.

Starting in 1990, increased discharge of sanitary effluent from the county treatment plant resulted in nearly continual flow during most except summer months in the lower reach of Pueblo Canyon, across DOE land into the lower reach of Los Alamos Canyon on San Ildefonso Pueblo land. From mid-June through early August, higher evapotranspiration and the diversion of sanitary effluent for golf course irrigation eliminate flow from Pueblo Canyon into Los Alamos Canyon. Hamilton Bend Spring, which in the past discharged from alluvium in the lower reach of Pueblo Canyon, has been dry since 1990, probably because there was no upstream discharge from the older, abandoned Pueblo Sewage Treatment Plant. Farther east, the alluvium is continuously saturated, mainly because of infiltration of effluent from the Bayo Sewage Treatment Plant. Effluent flow from Pueblo

Canyon into Los Alamos Canyon generally extends to somewhere between the DOE/San Ildefonso Pueblo boundary and the confluence of Guaje and Los Alamos Canyons.

2. DP Canyon and Los Alamos Canyon

In the past, Los Alamos Canyon received treated and untreated industrial effluents containing some radionuclides. The upper reach of Los Alamos Canyon experienced releases of treated and untreated radioactive effluents during the earliest Manhattan Project operations at TA-1 (1942–1945) and some release of water and radionuclides from the research reactors at TA-2. An industrial liquid waste treatment plant that served the old plutonium processing facility at TA-21 discharged effluent containing radionuclides into DP Canyon, a tributary to Los Alamos Canyon, from 1952 to 1986. Los Alamos Canyon also received discharges containing radionuclides from the sanitary sewage lagoon system at the Los Alamos Neutron Science Center (LANSCE) at TA-53. The low-level radioactive waste stream was separated from the sanitary system at TA-53 in 1989 and directed into a total retention evaporation lagoon.

The reach of Los Alamos Canyon within the Laboratory boundary presently carries flow from the Los Alamos Reservoir (west of the Laboratory) as well as National Pollutant Discharge Elimination System (NPDES)-permitted effluents from TA-53 and TA-21. Infiltration of effluents and natural runoff from the stream channel maintain a shallow body of perched groundwater in the alluvium of Los Alamos Canyon within the Laboratory boundary west of State Road (SR) 4. Groundwater levels are highest in late spring from snowmelt runoff and in late summer from thundershowers. Water levels decline during the winter and early summer when runoff is at a minimum. Perched groundwater also occurs within alluvium in the lower portion of Los Alamos Canyon on San Ildefonso Pueblo lands. Intermediate-depth perched groundwater occurs in the lower part of the Bandelier tuff and the underlying Puye Formation and Cerros del Rio basalt at depths of a few hundred feet below the canyon bottom. This intermediate groundwater also shows some evidence of contamination from Laboratory sources.

3. Sandia Canyon

Sandia Canyon has a small drainage area that heads at TA-3. The canyon receives water from the cooling tower at the TA-3 power plant. Treated effluents from the TA-46 Sanitary Wastewater Systems (SWS) Facility are rerouted to Sandia Canyon. These effluents support a continuous flow in a short reach of the upper part of the canyon. Only during summer thundershowers does stream flow approach the Laboratory boundary at SR-4, and only during periods of heavy thunderstorms or snowmelt does surface flow extend beyond the Laboratory boundary.

4. Mortandad Canyon

Mortandad Canyon has a small drainage area that heads at TA-3. Its drainage area receives inflow from natural precipitation and a number of NPDES outfalls, including one from the Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50. The TA-50 facility began operations in 1963. The effluents infiltrate into the stream channel and maintain a saturated zone in the alluvium extending about 3.5 km (2.2 mi) downstream from the outfall. The easternmost extent of saturation remains on-site, ending about 1.6 km (1 mi) west of the Laboratory boundary with San Ildefonso Pueblo. Over the period of operation, the radionuclides in the RLWTF effluent have often exceeded the DOE Derived Concentration Guides (DCGs) for public dose from drinking water (although this water is not used as drinking water). The effluent also contains nitrate that has caused perched alluvial groundwater concentrations to exceed the New Mexico groundwater standard of 10 mg/L (nitrate as nitrogen). In April 1999, the new reverse osmosis and ultrafiltration system at the RLWTF began operation. This system removes additional radionuclides and nitrate from the effluent, and discharges from the plant now meet the DOE public dose DCGs and the New Mexico groundwater standard for nitrate. The RLWTF effluent has met DOE DCGs continuously since December 10, 1999.

Perchlorate is a nonradioactive chemical compound containing a chlorine atom bound to four oxygen atoms and is used in a variety of industrial processes. At the Laboratory, perchlorate is a byproduct of the perchloric acid used in nuclear chemistry research. Perchlorate is on the EPA's contaminant candidate list, which under the Safe Drinking Water Act (SDWA) requires background investigations to determine a Maximum Contaminant Level (MCL). Perchlorate is present in the influent to the RLWTF at concentrations up to several thousand parts per billion (ppb). Perchlorate affects hormone production in the human thyroid and is a suspected, but not proven, carcinogen. The California Department of Health Services has issued a health advisory limit of 18 ppb for perchlorate in drinking water. California revised its perchlorate action level down to 4 g/L on January 18, 2002. (California DHS, EPA 2002) The Laboratory is conducting pilot tests to remove perchlorate from the RLWTF effluent.

The RLWTF is working on a system, which should be operational by March 31, 2002, for removing perchlorate from the plant effluent.

Continuous surface flow across the drainage has not reached the San Ildefonso Pueblo boundary since observations began in the early 1960s (Stoker et al., 1991). Three sediment traps located about 3 km (2 mi) downstream from the effluent discharge in Mortandad Canyon dissipate the energy of major thunderstorm runoff events and settle out transported sediments. From the sediment traps, it is approximately 2.3 km (1.4 mi) downstream to the Laboratory boundary with San Ildefonso Pueblo.

The alluvium is less than 1.5 m thick in the upper reach of Mortandad Canyon and thickens to about 23 m at the easternmost extent of saturation. The saturated portion of the alluvium is perched on weathered and unweathered tuff, generally with no more than 3 m of saturation. There is considerable seasonal variation in saturated thickness, depending on the amount of runoff experienced in any given year (Stoker et al., 1991). Velocity of water movement in the alluvium ranges from 18 m/day in the upper reach to about 2 m/day in the lower reach of the canyon (Purtymun 1974; Purtymun et al., 1983). The high turnover rate for water in the alluvial groundwater prevents accumulation of chemicals from the RLWTF effluent (Purtymun et al., 1977). The top of the regional aquifer is about 290 m below the alluvial groundwater.

5. Pajarito Canyon

In Pajarito Canyon, water perched in the alluvium is perched on the underlying tuff and is recharged mainly through snowmelt and thunderstorm runoff. Saturated alluvium does not extend beyond the facility boundary. Three shallow observation wells were constructed in 1985 as part of a compliance agreement with the State of New Mexico to determine whether technical areas in the canyon or solid waste disposal activities on the adjacent mesa were affecting the quality of shallow groundwater. No effects were observed; the alluvial groundwater is contained in the canyon bottom and does not extend under the mesa (Devaurs 1985).

6. Cañada del Buey

Cañada del Buey contains a shallow perched alluvial groundwater system of limited extent. The thickness of the alluvium ranges from 1.2 to 5 m, but the underlying weathered tuff ranges in thickness from 3.7 to 12 m. In 1992, saturation was found within only a 0.8-km-long segment, and only two observation wells have ever contained water (ESP 1994). Because treated effluent from the Laboratory's SWS Facility may at some time be discharged into the Cañada del Buey drainage system, a network of five shallow groundwater monitoring wells and two moisture monitoring holes was installed during the early summer of 1992 within the upper and middle reaches of the drainage (ESP 1994).

7. Water Canyon and Cañon de Valle

Water Canyon and Cañon de Valle (a tributary) pass through the southern portion of LANL where explosives development and testing occurs. The canyons contain thin alluvium near the mountains, but it thickens considerably across the Laboratory. West of the Laboratory, Upper Cañon de Valle contains perennial reaches, and the upper portions of both canyons have several springs (both on the flanks of the Sierra de los Valles and on the Pajarito Plateau) that discharge from perched layers in the Bandelier Tuff. Cañon de Valle has shallow alluvial groundwater of limited extent on Laboratory property. Surface flow in Cañon de Valle and Water Canyon is mainly ephemeral within the Laboratory, though short perennial reaches may exist in each canyon. The flow in Water Canyon below the western Laboratory boundary is due in part to flow from the Water Canyon Gallery. In the past, the Laboratory released wastewater from several high-explosives (HE) processing sites in TA-16 and TA-9 into both canyons. Consolidation of these individual NPDES outfalls to the High Explosives Wastewater Treatment Facility was completed in 1997 (reducing the number of outfalls from 21 to one). In the process, the Laboratory reduced the 12 million gallons of water per year used for high-explosives processing by 99%. The remaining water discharged is treated to comply with environmental regulations. Solid HE is captured in filters, and an activated carbon adsorption system removes dissolved HE.

B. Surface Water Sampling

1. Introduction

The Laboratory monitors surface water from regional and Pajarito Plateau stations to evaluate the potential environmental effects of Laboratory operations. No perennial surface water extends completely across the Laboratory in any canyon. Regional surface water samples are collected from rivers or reservoirs. Within and near the Laboratory, we collect base flow samples where effluent discharges or spring discharges maintain stream flow persistently for several weeks or months during the year. Periodic natural runoff occurs in two modes: (1) spring snowmelt that occurs over days to weeks at a low discharge rate and sediment load and (2) summer storm runoff from thunderstorms that occurs over hours, usually at a high discharge rate and sediment load.

To aid in water quality interpretation, we divide stream flow into three types or matrices. Each of the three flow types might be collected at a single location within a time span of as little as a week, depending on weather conditions. At times, the flow might represent a combination of several of these components. The three types are

- base flow—persistent stream flow, but not necessarily perennial water. This stream flow is present for periods of weeks or longer. The water source may be effluent discharge or shallow groundwater that discharges in canyons.
- snowmelt—flowing water that is present as a result of melting snow. This type of water often may be present for a week or more and in some years may not be present at all.
- storm runoff—flowing water that is present in response to rainfall. These flow events are generally very short-lived, with flows lasting from less than an hour to several days.

Because snowmelt and base flow are present for extended periods of time, they pose similar potentially longer-term exposure concerns, such as for wildlife watering. We thus discuss snowmelt and base flow together, separate from storm runoff. Although storm runoff may provide a short-term source of water for wildlife, it is of primary concern as a principal agent for moving Laboratory-derived constituents off-site and possibly into the Rio Grande.

The surface water within the Laboratory is not a source of municipal, industrial, or irrigation water, though wildlife does use the waters. Activities of radionuclides in surface water samples are compared with either the DOE DCGs or the New Mexico Water Quality Control Commission (NMWQCC 2000) stream standards, which in turn reference the New Mexico Environment Department's (NMED's) New Mexico Radiation Protection Regulations (Part 4, Appendix A). However, New Mexico radiation protection activity levels are in general two orders of magnitude greater than the DOE DCGs for public dose, so we discuss only the DCGs here. The concentrations of nonradioactive constituents may be compared with the NMWQCC General, Livestock Watering, and Wildlife Habitat Standards. The NMWQCC (NMWQCC 2000) groundwater standards can also be applied in cases where groundwater outflow may affect stream water quality. Appendix A presents these standards.

2. Runoff in 2001

Environmental surveillance monitoring focuses on describing the levels of specific chemical constituents in the environment. To understand the post-fire base flow monitoring results, however, it is also important to recognize the general hydrologic conditions that prevailed during the sampling period(s). In this section, we briefly discuss the magnitude of runoff in 2001. Table 5-1 presents a summary of flow data from Water Year 2001. Gaging stations with discharge data published in the report, "Surface Water Data at Los Alamos National Laboratory: 2001 Water Year" (Shaull et al., 2001), show higher peak flows than ever recorded. The annual water data report contains LANL flow data. LANL personnel collected and published surface water discharge data from approximately 36 stream-gaging stations that cover most of the Laboratory. The Laboratory operates and maintains this network of 85 stations, which seeks to characterize runoff from all watersheds at the Laboratory. (The Laboratory publishes station data only for gages that have developed stage and discharge relationships.)

The snowmelt in 2001 was significantly higher than observed during the previous six years of record (Shaull et al., 1996a, 1996b, 1998, 1999, 2000, 2001, and 2002). Figure 5-1 shows the total annual snowmelt at gages that are upstream and downstream of the Laboratory (excluding Pueblo Canyon). The November through May seasonal precipitation at TA-6 for each year is also shown. The snowmelt in 2001 is about 1.5 times higher than previously observed at upstream gages and about 2 times higher than recently observed at downstream gages, although the seasonal precipitation in 2001 (9.1 in.) was about 10% less than that received in 1995 (10.1 in.). The increased snowmelt in 2001 was likely due in part to the effects of the Cerro Grande fire, which increased runoff by removing vegetation and soils from upper watersheds.

One of the notable effects of the Cerro Grande fire was increased storm runoff from precipitation events during the summer of 2000 and again in 2001. When thunderstorms occurred over the higher elevations of the Sierra de los Valles, runoff from burned slopes was significantly higher in canyons downstream of the precipitation than before the fire. Studies by Shaull et al. (2001), Koch et al. (2001), Johansen et al. (2001), and Gallaher et al. (2002) described storm runoff in 2000 after the Cerro Grande fire. Generally, most storm runoff events at LANL in 2001 were less intense than in 2000, partially because of below normal amounts of precipitation during the summer thunderstorm season and possibly because of partial recovery of fire-impacted areas in the watersheds. In 2001, however, record peak flows from fire-impacted areas occurred in Pueblo, Los Alamos, and Rendija Canyons, and the total volume of storm runoff was higher than in 2000.

The major storm runoff event of 2001 occurred in Pueblo Canyon on July 2, 2001, when a flood event totaling about 90 ac-ft rushed through the canyon. This record high runoff event resulted from a 60-minute thunderstorm that occurred west of Los Alamos town site on the afternoon of July 2, 2001.

Figure 5-2 shows the seasonal storm runoff measured at the gages downstream of the Laboratory (including Pueblo Canyon with base flow removed) for the period 1995 through 2001. The yearly seasonal storm runoff is the sum of runoff at each downstream gage from June 1 through October 31 of each year. Figure 5-2 also shows the seasonal precipitation received at the TA-6 meteorological station each year from June 1 through October 31.

The total downstream storm runoff in 2001 was 1.5 times higher than the storm runoff in 2000 after the Cerro Grande fire and about 3.6 times higher than the pre-fire average annual runoff (106 ac-ft), even though the seasonal precipitation in 2001 (6.94 in.) was less than the amount received in 2000 and less than the pre-fire average seasonal precipitation (12.4 in.).

3. Base Flow and Snowmelt Monitoring Networks

We collect snowmelt at upstream and downstream gaging stations at the Laboratory and base flow samples from Pajarito Plateau stations near the Laboratory and from regional stations. We collect base flow grab samples annually from locations where effluent discharges or natural runoff maintains persistent stream flow, and we collect regional base flow samples from monitoring stations on the Rio Grande, Rio Chama, and Jemez River (Figure 5-3.) These samples provide background data from areas beyond the Laboratory boundary.

Figure 5-4 shows the locations of gaging stations where storm runoff and some snowmelt samples were collected in 2001. Figure 5-5 shows base flow and snowmelt monitoring stations located on the Pajarito Plateau. In 2001, we took a total of 44 snowmelt samples from 18 collection sites and a total of 29 base flow samples from 21 monitoring sites at and near the Laboratory. The following sections describe the results of the analyses of these snowmelt and base flow samples.

4. Radiochemical Analytical Results for Base Flow and Snowmelt

Table 5-2 lists the results of radiochemical analyses for snowmelt and base flow samples for 2001. The table also lists the total propagated one-sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods and as total uranium for most samples in 2001. We submitted a total of 53 filtered and 75 unfiltered samples of base flow and snowmelt for radiochemical analysis.

To emphasize values that are detections, Table 5-3 lists radionuclides detected in snowmelt and base flow samples. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. The table shows two categories of qualifier codes: those from the analytical laboratory and from secondary validation. See Table 5-4 for an explanation of the qualifier codes. We show qualifier codes because some analytical results meet the detection criteria but are not really detections because of analytical problems. For example, in some cases, the analyte was found in the lab blank. Because uranium, gross alpha, and gross beta are usually detected, we indicate in Table 5-3 only occurrences of these measurements above specific values. The specific values are 5 g/L for total uranium, 5 pCi/L for gross alpha, and 20 pCi/L for gross beta and are lower than the EPA MCLs or screening levels.

The right-hand columns of Table 5-3 indicate radiochemical detections that are greater than one-half of the DOE DCGs for public dose for ingestion of environmental water or the standards shown. Bear in mind that surface waters on the Laboratory are not used for drinking water.

None of the base flow or snowmelt samples analyzed contained radiochemical activities greater than the DOE DCGs for public exposure. Three gross alpha measurements in Los Alamos Canyon were 60 to 90% of this value; one was from a sample collected upstream of the Laboratory near the ice rink. Three samples contained radionuclide activities greater than the 4-mrem-dose in the DOE drinking water DCGs.

Four samples of snowmelt contained radiochemical activities greater than New Mexico or EPA water quality standards. All of these samples came from areas below historical Laboratory effluent discharges. A sample from Acid Weir station collected on April 11, 2001, contained 14.9 pCi/L dissolved strontium-90; this concentration is 1.9 times the EPA primary drinking water standard. A sample from DPS-1 in DP Canyon collected on March 28 contained 139 pCi/L dissolved gross beta activity, 2.8 times the EPA secondary drinking water level, and 76.6 pCi/L dissolved strontium-90, nearly 10 times the EPA primary drinking water standard. Two unfiltered snowmelt samples collected on March 15 from Los Alamos Canyon above SR-4 and below the Los Alamos Canyon weir contained up to 26.8 pCi/L gross alpha activity, at 1.5 to 1.8 times the NM livestock watering standard. This weir sample also contained an americium-241 activity approaching (75%) the DOE drinking water DCG.

A base flow sample collected from Mortandad Canyon at GS-1 on April 18, 2001, contained total activity of 12.1 pCi/L strontium-90 and 92.9 pCi/L gross beta activity, which were above the EPA primary drinking water standard and the EPA secondary drinking water DCG, respectively. The amercium-241 activity in the sample was 5.5 times the DOE drinking water standard, and the plutonium-238 and plutonium-239, -240 levels were near the DOE drinking water DCG.

An unfiltered base flow sample collected along the Laboratory's western boundary contained gross alpha activity greater than the EPA primary drinking water standard and the New Mexico livestock watering standard of 15 pCi/L in 2001. This sample, collected from the Los Alamos Canyon below Ice Rink station on August 2, 2001, contained 16.7 pCi/L gross alpha activity, 1.1 times the standard. The base flow at this location on August 1 was the result of dredging operations by Los Alamos County that discharged water from the Los Alamos Reservoir. The sample contained an abnormally high concentration (for base flow) of 2890 mg/L total suspended solids (TSS), about 5 times the TSS concentration of other base flow samples in 2001.

Two base flow samples collected from regional locations contained detections greater than half the minimum standard. An unfiltered sample collected from the Rio Chama at Chamita (bank) station contained 7.7 pCi/L gross alpha activity, about 52% of the EPA primary drinking water standard and the New Mexico livestock watering standard of 15 pCi/L. A sample from the Jemez River contained americium-241 activity nearly double the DOE drinking water DCG. However, repeat analysis of the same sample did not confirm the americium-241 detection.

5. Nonradiochemical Analytical Results for Base Flow and Snowmelt

a. Major Chemical Constituents. Table 5-5 lists the results of analyses for major chemical constituents in snowmelt and base flow samples collected in 2001.

The chemical quality of base flow and snowmelt samples in 2001 is generally consistent with the quality of samples observed in pre-fire years. These waters commonly contain relatively low levels of both dissolved and suspended solids. Median total dissolved solids (TDS) concentrations at gages upstream of the Laboratory are comparable to downstream values in Los Alamos and Water Canyons. In Pajarito Canyon, however, median TDS concentrations in snowmelt increase by nearly 3 times at the downstream stations. In past monitoring, we have noted elevated levels of dissolved solutes in the alluvial groundwater in lower Pajarito Canyon. Possible causes of the TDS increase in Pajarito Canyon include evaporation, road salt, or residual effects of the Cerro Grande fire.

The measurements of base flow collected from areas receiving effluents often show the effect of these effluents. The TDS concentrations of base flow samples collected in Sandia Canyon at SCS-2 and SCS-3 on May 17 were 707 and 719 mg/L, respectively, which were above the EPA secondary drinking water standard for TDS. The nitrate (as nitrogen) value for base flow from station lower Pueblo Canyon at SR-502 was 11.8 mg/L, above the EPA drinking water standard of 10 mg/L. The nitrate measurement probably included effluent from the Los Alamos County sewage treatment plant in lower Pueblo Canyon. The nitrate (as nitrogen) concentration reported for base flow from station Guaje Canyon was 130 mg/L; however, Guaje Canyon upstream of this location has no known source of nitrate, and the unusually high value reported by the analytical laboratory is considered an analytical laboratory or sampling error.

Five base flow samples and nine snowmelt samples contained more than 20 mg/L sodium, the EPA drinking water health advisory level. The highest sodium concentration in snowmelt was 160 mg/L in a sample collected from upper DP Canyon March 28, 2001. The same sample contained 632 mg/L TDS, which was also above the EPA secondary drinking water standard (500 mg/L) for TDS. The source is probably road salt runoff from urban road deicing operations.

The TSS concentration in base flow and snowmelt samples collected in 2001 was usually less than 400 mg/L. The TSS concentrations often reflect the landscape stability in the various canyons. Median TSS concentrations increase nearly 10 times between upstream and downstream gages in Los Alamos and Water Canyons. These data indicate a net removal of sediment from these canyons. In contrast, TSS concentrations in Pajarito Canyon decline downstream and indicate net deposition of sediment. The average TSS in snowmelt samples collected at all canyon upstream sites was 47 mg/L, and the average TSS in samples collected at downstream sites was 161 mg/L. The highest TSS in snowmelt was 652 mg/L in a sample from lower Los Alamos Canyon above SR-4. The highest TSS in base flow was recorded on August 1 in Los Alamos Canyon as the reservoir was being drained for maintenance operations. Using these average TSS concentrations and the total upstream and downstream snowmelt volumes (Section B.2., Runoff in 2001, in this chapter), we estimated the transport of suspended sediment in snowmelt at upstream locations as about 33,000 kg and at downstream locations as about 105,000 kg.

The results of the analyses of perchlorate in base flow appear in Table 5-6. Samples that were analyzed with the ion chromatography method before April 25, 2001, yielded many false positives because of matrix interferences (see Section F). Based on analytical laboratory qualifiers and validation of perchlorate data, only three base flow samples in 2001 contained detections of perchlorate. Samples collected in Sandia Canyon at locations SCS-1 and SCS-3 on November 29, 2001, contained estimated concentrations of 1.2 g/L and 0.52 g/L, respectively. We obtained these measurements using the new liquid chromatography/mass spectrometry/mass spectrometry (LC/MS/MS) method (see QA, Section F). A base flow sample collected from Mortandad Canyon at GS-1 on April 18, 2001, contained perchlorate in a concentration of 99.5 g/L; the base flow at this location reflects effluent discharges from the TA-50 RLWTF.

b. Trace Metals. Table 5-7 lists the results of trace metal analyses on snowmelt and base flow samples for 2001. We filtered samples collected for trace metal analysis so that we could compare them with the NMWQCC standards that apply to dissolved constituents. We left samples collected for mercury and selenium analysis unfiltered, because the NMWQCC standards for these analytes apply to total metal content. With some exceptions, the levels of trace metals in samples for 2001 were generally consistent with previous observations.

Only one sample contained a metal concentration greater than NMWQCC standards for livestock watering or wildlife habitat. The analysis detected selenium in an off-site base flow sample from station Frijoles at Monument Headquarters in a concentration of 5.6 g/L, slightly above the wildlife habitat standard.

In 2001, the EPA lowered its primary drinking water standard and the tap water MCL for arsenic from 50 g/L to 10 g/L. No snowmelt samples contained dissolved arsenic in concentrations greater than the new standard. One base flow sample collected from station Los Alamos Canyon below Ice Rink on August 1 contained arsenic in a concentration of 11.4 g/L, slightly above the new standard. This sample also contained barium at levels approaching (90%) the NM groundwater standard and lead above the EPA drinking water guideline. The water contained unusually high TSS from dredging operations conducted by Los Alamos County at the Los Alamos reservoir in the upper part of the Los Alamos Canyon watershed.

We also found lead concentrations approaching or slightly greater than the EPA drinking water guideline in three snowmelt and one base flow sample collected in lower Los Alamos Canyon. The snowmelt sample collected March 15 also contained antimony, cadmium, and thallium at levels greater than the EPA primary drinking water standards. A duplicate analysis of the sample, however, did not support the antimony, cadmium, or thallium detections.

Aluminum, iron, and manganese concentrations in filtered snowmelt and base flow were greater than EPA secondary drinking water standards at many locations in 2001, consistent with historical results. These metals are naturally occurring constituents in silt and clay minerals in base flow and runoff.

c. Organic Constituents in Snowmelt and Base Flow. Table 5-8 summarizes the locations where we collected organic samples in 2001. (See Section 5.F.2.c. later in this chapter for analytical methods and analytes.) We analyzed samples for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs). Some samples were also analyzed for high-explosive (HE) constituents. Table 5-9 shows organic compounds detected above the analytical laboratory's quantification level in 2001, as well as results from blanks.

The analysis detected the HE compounds RDX and HMX in 3 snowmelt samples in 2001. One sample collected from station Water Canyon at Beta contained 1.9 g/L HMX and 0.49 g/L RDX, and two samples collected from Water Canyon below SR-4 contained detections of HMX of 0.99 and 3.8 g/L and RDX of 0.26 and 0.9 g/L, respectively. These RDX values are below EPA's drinking water health advisory limit of 2 g/L. Earlier monitoring had detected both of these compounds in a variety of water sampling locations within the Water Canyon drainage system.

The analysis detected SVOCs in base flow samples from 4 locations in 2001, including two regional locations. The most common compound detected was bis(2-ethylhexyl)phthalate, which was reported in a concentration of 1080 g/L in a sample from the station Rio Chama at Chamita. Other detections of bis(2-ethylhexyl)phthalate included 6.4 g/L from Pueblo 3 and 2 g/L from station Pueblo Canyon at SR-502 in samples collected on April 3, 2001. The compound bis(2-ethylhexyl)phthalate is a plasticizer and a common artifact in analytical laboratory analyses of organic compounds, although this level is unusually high for such artifacts. The sample was collected upstream of the Laboratory at a location with little industrial activity.

The base flow sample collected from the station Rio Chama at Chamita also contained 20.4 g/L pyrene and 21.5 g/L of fluoranthene. The EPA has no standards for these compounds.

A snowmelt sample from upper Pueblo Canyon, at station Pueblo 1R located above Laboratory operations, contained 5.2 g/L chloroform and 1.4 g/L of bromodichloromethane. Both are common byproducts from chlorination. The specific source is unknown at present.

Polychlorinated biphenyls (PCBs) or dioxins/furans were not detected in snowmelt or base flow samples in 2001.

6. Long-Term Trends

Long-term trends for base flow are discussed in Section 5.D with groundwater trends.

7. Storm Runoff Monitoring Network

Storm runoff samples were historically collected as grab samples from usually dry portions of drainages during or shortly after runoff events. As of 1996, we have collected storm runoff samples using stream gaging stations, most with automated samplers (Shaull et al., 2000). The stream gaging stations collect samples when a significant rainfall event causes flow in a monitored portion of a drainage. Many gaging stations are located where drainages cross the Laboratory's boundaries. For the larger drainages, we sample where they exit the Laboratory and at upstream locations. In contrast, we sample storm runoff at several mesa-top sites (for example, MDA G [Figure 5-4], MDA L, TA-55) from locations that target specific industrial activities, with negligible run-on from other sources. We collected one sample (Los Alamos Canyon Weir) manually (grab sample) to supplement the automated samplers. Figure 5-4 shows gaging stations on the Pajarito Plateau. We use samples from the stations to monitor water quality effects of potential contaminant sources such as industrial outfalls or soil contamination sites.

In 2000, a large storm runoff event after the Cerro Grande fire destroyed most samplers located along the Laboratory's western boundary (background stations). Those stations were all rebuilt and operable through the 2001 season. Storm runoff samples were collected on 30 days during the 2001 season. We collected over

100 storm runoff samples from April through October, the majority (59%) from watercourses. Thirty-nine samples came from mesa-top stations.

8. Transport of Sediment by Storm Runoff

The levels of many chemical constituents in Los Alamos storm runoff are related to the TSS concentrations (Gallaher et al., 2002). We use TSS as a proxy measurement for the quantity of sediment carried in storm runoff. Generally, the most sediment-laden samples contain the highest total radioactivity and metals content. Thus, it is important to recognize the general trends in TSS concentrations. Higher levels of total radioactivity may be due to increased sediment erosion and transport in canyons, rather than to a new contaminant source.

We estimate changes in TSS concentrations with an averaging technique (flow weighting) that accounts for the variations in sediment associated with a changing streamflow regime (Belillas and Roda 1993; Brown and Krygier 1971). To calculate the mass of sediment (load) carried in each storm runoff event, we multiplied the appropriate TSS concentrations by the runoff volumes entering or leaving the Laboratory during a specific storm event. Then we estimated the average sediment load in runoff by dividing the total mass of sediment by the total volume of water in all the sampled storm events. This technique normalizes the effect of abnormal flow events, such as were observed at LANL after the Cerro Grande fire, allowing for comparison with pre-fire conditions.

After the Cerro Grande fire in 2000, the load of TSS per liter of water at most of the upstream monitoring stations increased by 100 to 1000 times (Figure 5-6). This trend continued in 2001 with higher average TSS concentrations at all upstream locations in 2001 except for the upstream location in Los Alamos Canyon. The reservoir in upper Los Alamos Canyon likely helps to reduce TSS concentrations in storm runoff. At the downstream stations in Pueblo, Los Alamos, Pajarito, and Water Canyons, the average TSS concentrations increased further in 2001, likely an effect of the Cerro Grande fire.

The largest downstream changes in 2001 occurred in Pueblo Canyon, with TSS concentrations increasing more than 100 times in 2000 after the fire and 10 times further in 2001, primarily as the result of the large flood event on July 2, 2001. The hydrologic and sediment transport regimes were not appreciably altered in the lesser-burned canyons of Cañada del Buey, Potrillo, and Ancho, where TSS concentrations in storm runoff do not show significant changes.

The 2001 TSS data indicate that about 1.3 million kg suspended sediment entered LANL at upstream locations (excluding Pueblo Canyon where upstream data are not available) and about 1.6 million kg suspended sediment was carried in storm runoff downstream of LANL. About 10 million kg suspended sediment was carried downstream in lower Pueblo Canyon in 2001; over half of this amount was during the large July 2 runoff event. Although the Laboratory's automated sampler did not collect sufficient water to analyze the July 2 flood for radioisotopes, a sample collected by NMED provides some basis for evaluating the load of plutonium-239, -240 carried by the event. The NMED grab sample contained 250 pCi/L plutonium-239, -240. Combining this measurement with other Laboratory results and flow measurements allows us to calculate the transported inventory. We estimate that storm runoff transported approximately 20 to 40 mCi of plutonium-239, -240 downstream in lower Pueblo Canyon in 2001. This amount represents an estimated increase of more than 40 times the levels measured since 1997 (Gallaher et al., 2002). About two-thirds of the plutonium transport in Pueblo Canyon occurred on July 2. The largest contributions to the Rio Grande occurred in the 1950s and 1960s, with relatively small contributions in the 70s, 80s, or 90s. The recent floods seen since the Cerro Grande fire contribute pulses of plutonium into the Rio Grande, likely not seen since the 1960s.

9. Radiochemical Analytical Results for Storm Runoff

Table 5-10 presents radiochemical analytical results for storm runoff in 2001. We commonly detected radionuclides in the unfiltered storm runoff samples, as expected with samples containing abundant sediment and associated natural or fallout radioactivity. Except for cesium-137 and uranium-235, the analysis detected each of the radionuclides in more than 50% of the samples. The levels of radionuclides we measured in our samples were quite variable by location and through time.

a. Comparison to Historical Levels. We evaluate the data by comparing results with historical levels and relevant standards and by looking for spatial and temporal trends. The benchmarks for comparing with historical levels are the analytical results obtained since 1995 from storm runoff samples collected across and near the Laboratory. We use the post-1995 data set for comparison because, although storm runoff data were collected before 1995, the post-1995 data sampling methods were similar to those used for the current data. The pre-fire data set mainly includes 1995–1999 results from Los Alamos Canyon and Cañada del Buey. For other drainages, pre-fire storm runoff was limited.

The year 2001 activities were the highest ever recorded for plutonium-239, -240; uranium-234, -235, -238; gross alpha; and gross beta. In most cases, the enhanced radioactivity is attributable to increased storm runoff after the Cerro Grande fire. The plutonium-239, -240 maximums were seen in lower Pueblo Canyon and reflect a significantly increased mobilization of legacy LANL contamination in the canyon sediments. In contrast, the high total uranium activities were seen mainly in Guaje and Rendija Canyons, north of the Laboratory, and are related to increased natural sediment load in the large post-fire runoff events.

The largest overall changes from historical levels were recorded for gross alpha and gross beta activities. For both activities, 17 of the largest 20 historical values occurred during 2001. The elevated gross alpha and gross beta activities were seen roughly equally at on-site locations and at locations upstream or north of the Laboratory. A major factor of the elevated readings can simply be the larger sediment loads carried in the larger-magnitude post-Cerro Grande fire storm runoff events. To evaluate whether the increased gross alpha and beta activities were due mainly to the enhanced sediment load or whether LANL-derived constituents were mobilized, we performed the following screening analysis to remove the effect of the sediment load.

We compared calculated alpha activities in the suspended sediment for on-site locations against background sites located upstream and north of the Laboratory and with historical results. We calculated suspended sediment activities by dividing the unfiltered water alpha activities with the associated TSS concentrations. Results of the calculations appear in Figure 5-7, which compares alpha activities for background sites with on-site locations by time. As a group, activities for on-site locations are larger than those at background stations. For 2001, the median alpha activity calculated in suspended sediment was 26 pCi/g for on-site samples versus 10 pCi/g for the background samples. Residual sediment from the Cerro Grande fire, deposited in 2000 floods, could be the source of a fraction of the larger on-site alpha activities. Background values drop from 2000 to 2001, possibly because the flows flushed ash out of the burned areas, depositing some it on LANL.

This analysis indicates that most of the larger alpha activity values were LANL-related. Los Alamos and Pueblo Canyons and the area around MDA G (Figure 5-8) produced the largest alpha activities in suspended sediment in 2001. The gross beta activities follow the same general pattern described for gross alpha. It is likely that the post-fire stream flows are mobilizing higher-activity sediments that were previously stored in historic flood plain deposits along the active channels. The larger flows are probably encroaching upon the flood plains and scouring a broader segment of the canyon floor sediments.

b. Fire Impacts on Storm Runoff Quality. The largest residual effect from the Cerro Grande fire on radioactivity in storm runoff probably is increased scour and transport of sediment because of the heightened storm water flows. Los Alamos and Pueblo Canyons in particular show evidence of increased mobilization of Laboratory-impacted stream sediments. In addition to increased bulk movement of sediment, results also indicate an increase in the gross radioactivity of the suspended sediment carried by the on-site runoff since the fire, as discussed above. We have insufficient pre-fire storm runoff results, however, to do a direct site-by-site comparison.

Residual impacts from the dispersal of ash appear to be minimal. In 2000, we observed heightened levels of fallout-derived cesium-137 in ash-laden storm runoff after the fire. In 2001, peak concentrations of cesium-137 in runoff were markedly lower throughout the Pajarito Plateau, indicating a general flushing of the ash. The flows in Guaje Canyon display the most striking difference. Peak cesium-137 activity observed in several large Guaje Canyon 2001 storm runoff events was about 1/10th those observed in 2000 runoff events. These findings are consistent with data collected in the latter part of the 2000 season.

c. Comparison of Radioactivity in Storm Runoff with Standards and Screening Levels. Water quality standards have not been established specific to most radionuclides in runoff. We compare the results for unfiltered water samples with DOE DCGs for public exposure and NMWQCC general, livestock watering, and wildlife habitat standards (Table 5-3).

We further compare the results for filtered waters with appropriate EPA drinking water standards or DOE DCGs for drinking water (Table 5-3). Keep in mind that the storm runoff water is not used for drinking purposes because of its short-lived nature. Also keep in mind that the NMWQCC standards for gross alpha require the subtraction of activity from radon and uranium, as well as activity from source, special nuclear, and byproduct material. Our reported values do not reflect these subtractions. We make the comparison with drinking water standards to provide context to measured values. Lastly, we screen for significant concentrations in the suspended sediment by comparing them with radioactive Screening Action Levels (SALs) for sediments (ER 2001).

In unfiltered samples, gross alpha activities were greater than public exposure DCG levels (30 pCi/L) and State of New Mexico livestock watering standards (15 pCi/L) in about three-fourths of all samples collected. The gross alpha DCG is based on the most restrictive anthropogenic alpha emitters (plutonium-239, -240 and americium-241) and is commonly exceeded by storm runoff laden with naturally derived alpha emitters (such as from the uranium decay series). To illustrate, all of the background samples collected upstream or north of the Laboratory contain gross alpha activity greater than these reference standards. The gross beta activity DCG for public exposure was exceeded in five samples, three of which were collected on-site.

The plutonium-239, -240 DCG for public exposure was exceeded in 3 samples, all collected in lower Pueblo Canyon (station Pueblo above SR-502). The median plutonium-239, -240 activity for station Pueblo above SR-502 also was greater than the public exposure DCG, as shown in Figure 5-9. The calculated plutonium-239, -240 activities for the suspended sediment carried by these storm runoff events are 4.4, 1.6, and 1.2 pCi/g. A background storm runoff station for upper Pueblo Canyon was not yet operable during these events, and thus we cannot directly distinguish Laboratory-derived plutonium from fallout plutonium. However, the calculated activities in the Pueblo Canyon samples are one order of magnitude larger than calculated values (0.1 pCi/g or less) for storm runoff samples collected at other background stations north and upstream of the Laboratory. This comparison suggests that the exceedances of the DCGs are partly due to mobilization of Laboratory-derived plutonium and not solely due to the high sediment loads. The calculated suspended sediment plutonium-239, -240 activities in the Pueblo Canyon storm runoff samples are 10% or less the SAL of 44 pCi/g (ER 2001).

The analysis detected elevated levels of tritium in several storm runoff samples collected in DP/Los Alamos Canyons, upper Pajarito Canyon, and around MDA G. The maximum activity recorded (890 pCi/L at MDA G-3) was less than 5% of the reference standards.

All filtered samples contained radionuclide levels below the EPA and DOE drinking water standards, with one exception. A single sample from lower DP Canyon contained dissolved strontium-90 at 1.1 times greater than the EPA standard. The source of the strontium-90 in that sample is likely from past Laboratory operations at TA-21, and the result is consistent with previous monitoring data.

Suspended sediment in storm runoff samples collected at MDA G-4 is calculated to contain cesium-137 activities greater than the SAL, by 5 times. Because of further downstream mixing, the activities in sediment found in deposits after the runoff events will likely be substantially lower than those found in the runoff samples. The results indicate, nonetheless, elevated levels in storm runoff at MDA G. Levels of cesium-137 in sediments deposited around the perimeter of MDA G remain within background ranges, possibly because of the limited runoff volumes from the facility. We will continue to monitor to confirm this initial indication.

10. Nonradiochemical Analytical Results for Storm Runoff

a. Major Chemical Constituents. Table 5-11 lists the results of analyses for major chemical constituents in storm runoff samples for 2001. The concentrations of most constituents were comparable to pre-Cerro Grande fire levels. In 2000, we noted increases resulting from the fire for total alkalinity, calcium, magnesium, potassium, total phosphorous, and cyanide concentrations. In 2001, concentrations of these constituents were substantially lower than the previous year, indicating a general recovery after the fire.

TSS concentrations in storm runoff samples collected in 2001 were highly variable, depending on location and runoff magnitude. The average TSS concentration for sites upstream of the Laboratory was 23,000 mg/L, compared with 17,000 mg/L at LANL sites. The largest TSS concentrations were consistently recorded in Guaje and Rendija Canyons, to the north of the Laboratory. TSS concentrations in those canyons averaged 78,000 mg/L, with a maximum of 144,000 mg/L. Storm runoff from mesa-top sites carried much less sediment, averaging 1,000 mg/L.

Samples from middle Los Alamos Canyon (above DP Canyon) and from around MDA G (G-3) both contained TDS concentrations greater than the EPA secondary drinking water standard. The MDA G-3 sample also contained chloride at a concentration greater than the NMWQCC groundwater standard, along with elevated levels of several other solutes.

We detected trace levels of total cyanide and amenable cyanide in several drainages crossing the Laboratory and in Guaje Canyon. All values were below the NMWQCC general, livestock watering, and wildlife habitat standards. In 2000, storm runoff derived from the Cerro Grande fire contained much higher total cyanide concentrations.

b. Trace Metals. Table 5-12 presents trace metals (for 23 metals) analytical results for year 2001 storm runoff in both filtered and unfiltered samples. With filtered samples, we can compare results with the NMWQCC standards for protection of livestock watering and wildlife habitat that apply to dissolved constituents. Samples analyzed for mercury and selenium were typically unfiltered, as the NMWQCC standards for these analytes apply to total metal content. In general, metals concentrations in filtered samples were lower than concentrations in unfiltered samples. This relationship indicates that the metals are generally associated with the particulate and sediment carried by the storm runoff rather than dissolved in the water.

For nearly every metal, the levels in both filtered and unfiltered storm runoff samples for 2001 were significantly higher than in prior years. As with the radionuclides, the increase in total metals concentrations is largely due to the increased sediment load in runoff after the Cerro Grande fire. It is uncertain what the source(s) of the larger dissolved metals concentrations might be. One possible cause is simply the mechanical limitations in the filtration process. Many of the samples contained large quantities (more than 50,000 mg/L) of suspended sediment, and even a small percentage of leakage passing the filter could affect the measured constituent concentrations in the filtered sample. The analytical laboratory reported that some filtered sample aliquots contained visible sediments.

With one exception, background metals concentrations in 2001 storm runoff samples were substantial and probably represent a major portion of the metals load. Silver appears to be the only metal readily attributable to Laboratory sources. At background sites, we rarely detect silver in storm runoff. In years 2000 and 2001, the 20 largest silver concentrations were all from on-site samples, and 18 of those came from Water and Pajarito Canyons. The Laboratory discharged silver with spent photographic solutions into a tributary of Cañon de Valle for more than 40 years, resulting in silver concentrations of up to 25,000 ppm in sediment in the tributary (Kasunic et al., 1985). The large runoff events following the Cerro Grande fire have accelerated the downstream movement of silver.

Comparison with Standards and Screening Levels. Selenium exceeded the New Mexico wildlife habitat standard of 5 g/L in nearly half (50/109) of the unfiltered storm runoff samples collected from locations both on and above the Laboratory. The high percentage of values greater than the standard largely reflects the sediment load in the unfiltered samples. Three of the four largest values were from samples collected from background sites, in Guaje and in Pajarito Canyons.

Mercury was detected at levels greater the New Mexico wildlife habitat standard of 0.77 g/L at one location, at station Los Alamos above SR-4. The mercury level at this site was twice the standard, and two additional samples from this and another station in Los Alamos Canyon had detectable levels of mercury at about 25% of the standard. These results are consistent with pre-fire results obtained in lower Los Alamos Canyon, and the persistence of the results suggests a LANL source. The analysis also detected mercury at low levels in a runoff sample from MDA G and in a background sample from Guaje Canyon north of the Laboratory.

Aluminum and vanadium concentrations were greater than NMWQCC livestock watering standards in 4 and 2 samples, respectively. Half of the samples containing values above the standard came from background sites, where these metals are probably derived from natural sources.

In 2001, the EPA primary drinking water standard for arsenic was lowered from 50 g/L to 10 g/L. Two filtered storm runoff samples from stations Guaje

Canyon above Rendija Canyon (46 g/L) and Water Canyon at SR-4 (55 g/L) contained arsenic greater than the new standard. Several other samples from these drainages contained arsenic values lower than the standard.

Because the suspended solids compose such a large portion of the total metals load in the runoff samples, we examined the suspended sediment for significant levels of the individual metals. Only concentrations for iron, a natural component of soils, were greater than residential EPA soil screening levels for metals (EPA 2000).

c. Organic Constituents in Storm Runoff. Table 5-8 summarizes the locations where we collected organic samples in 2001. (See Section F. in this chapter for analytical methods and analytes.) We analyzed storm runoff samples from TA-54 for SVOCs, HE compounds, PCBs, and dioxins/furans. Table 5-9 shows organic compounds detected above the analytical laboratory's quantification level in 2001.

We detected SVOCs in storm runoff samples collected from TA-54 at MDA L and MDA G. A runoff sample collected from TA-54 below MDA L contained the SVOC di-n-octylphthalate at a concentration of 23.6 g/L. Storm runoff samples collected July 2, 2001, from MDA G-3 contained up to 27.4 g/L phenol, 351 g/L 4-methylphenol, and 5.9 g/L bis(2-ethylhexyl)phthalate. Levels of the latter two compounds are slightly greater than the EPA tap water guidelines by 1.9 and 1.2 times, respectively. Runoff samples collected from MDA G-4 contained 2.9 g/L bis(2-ethylhexyl)phthalate. We know of no definitive environmental source for the SVOC bis(2-ethylhexyl)phthalate, but this compound is recognized as commonly introduced in analytical laboratory analyses.

The analysis detected dioxin compound OCDD in a storm runoff sample collected from TA-54 below MDA L on July 17, 2001, at a concentration of 0.0346 g/L. Two other dioxin-like compounds, OCDF and 1,2,3,4,6,7,8-HpCDD, were also detected in the sample at levels below the quantification limit (J-flagged laboratory qualifier).

We analyzed eight storm runoff samples from TA-54 for PCB compounds in 2001. The analysis did not find PCB compounds in storm runoff samples above analytical detection limits. Five storm runoff samples from TA-54 below MDA L, MDA G-3, and MDA G-4 were analyzed for HE compounds; the analysis did not find HE compounds above analytical detection limits in storm runoff in 2001.

11. Technical Area 50 Discharges

The cumulative discharge of radionuclides from the RLWTF into Mortandad Canyon between 1963 and 1977 and yearly discharge data for 1998 through 2001 appear in Table 5-13. In addition to total annual activity released for 1998 through 2000, Table 5-13 also shows mean annual activities in effluent for each radionuclide and the ratio of this activity to the DOE DCG for public dose. Figure 5-10 shows the relationship of RLWTF average annual radionuclide activities and mineral concentrations in discharges to DOE DCGs or New Mexico groundwater standards since 1996. Americium-241, plutonium-238, and plutonium-239, -240 in the discharge did not exceed the DCG in 2000 or 2001. As mentioned above, the new reverse osmosis and ultrafiltration system began operating at the RLWTF in 2000. This system is designed to remove additional radionuclides from the effluent and to ensure that the discharges meet the DOE public dose DCGs.

In response to a letter of noncompliance from the NMED, in March 2000 the RLWTF instituted a program to restrict the discharge of nitrogenous wastes into facility's collection system. Therefore, the nitrate (nitrate as nitrogen) concentration of all effluent discharge from the RLWTF during 2001 was less than 10 mg/L. The average 2001 effluent nitrate concentration (value of 3.9 mg/L, nitrate as nitrogen) was below the New Mexico groundwater standard of 10 mg/L and was much lower than the values for previous years. The nitrate concentration in Mortandad Canyon base flow at station GS-1 in 2001 was 2.14 mg/L.

The fluoride concentration in the discharge also has declined over the last few years. The 2001 effluent fluoride concentration (average value of 0.73 mg/L) was below the New Mexico groundwater standard of 1.6 mg/L. The fluoride concentration in Mortandad Canyon at station GS-1 in 2001 was 0.3 mg/L.

In 2000, the RLWTF discharged 4.74 kg of perchlorate, for an average concentration of 254 g/L in the effluent. This amount compares with values in 2001 of 2.29 kg of perchlorate, for an average concentration of 169 g/L. The RLWTF is working on a system for removing perchlorate from the plant effluent. In 2001, they conducted pilot scale tests using ion exchange resins selective for perchlorate, which confirmed that treatment to below 4 ppb is achievable. The ion exchange treatment system is expected to be operational by March 31, 2002.

C. Sediment Sampling

1. Introduction

Sediment transport associated with surface water runoff is a significant mechanism for contaminant movement. Contaminants originating from airborne deposition, effluent discharges, or unplanned releases can become attached to soils or sediments by adsorption or ion exchange.

There are no federal or state regulatory standards for soil or sediment contaminants that we can use for comparison with the Laboratory's environmental surveillance data. Instead, contaminant levels in sediments may be interpreted in terms of toxicity because of ingestion, inhalation, or direct exposure. The Laboratory's Environmental Restoration (ER) Project uses SALs to identify contaminants at concentrations or activities of concern. SALs are screening levels selected to be less than levels that would constitute a human health risk. SAL values are derived from toxicity values and exposure parameters using data from the EPA. The ER Project reevaluated radionuclides SALs in 2001 (ER 2001). Contaminant levels in sediments may also be compared with residential soil screening levels developed by EPA Region 6 (EPA 2000). These screening levels are derived from toxicity data and are currently used as SALs by the ER Project.

We can also compare the sediment data with background levels of metals or background activities of radionuclides resulting from atmospheric fallout or naturally occurring radionuclides. The ER Project determined background levels of metals and radionuclides in soils, rock, and sediments around the Pajarito Plateau (Ryti et al., 1998). Purtymun et al. (1987) used radionuclide analyses of sediment samples collected from regional stations for the period 1974 to 1986 to establish background activities from atmospheric fallout of radionuclides and to determine the background concentrations of naturally occurring uranium. McLin and Lyons (2002) developed background levels for data from the period 1974 to 1996. In this latter study, the authors determined separate values for reservoir sediments and river sediments. Differences in grain size and depositional setting lead to different levels of accumulation for fallout-derived radionuclides in these two environments. McLin and Lyons (2002) use the 0.95-quantile activity of each of the radionuclides in the regional station samples as an estimate of the upper limit of background values. If the activity of an individual sediment sample is greater than the estimated background value, we consider the Laboratory as a possible source of contamination. Tables summarizing analytical results list the background and SAL values for sediments.

2. Monitoring Network

Sediments are sampled in all major canyons that cross the Laboratory, including those with either perennial or ephemeral flows. We also sample sediments from regional reservoirs and stream channels annually.

Regional sediment sampling stations (Figure 5-3) are located within northern New Mexico and southern Colorado at distances up to 200 km from the Laboratory. Samples from regional stations provide a basis for estimating background activities of radionuclides resulting from atmospheric fallout or from naturally occurring radionuclides. We obtained regional sediment samples from reservoirs on the Rio Grande and the Rio Chama and at stations on the Rio Grande and Jemez River.

Stations on the Pajarito Plateau (Figure 5-11) are located within about 4 km of the Laboratory boundary, with the majority located within the Laboratory boundary. The information gathered from these stations documents conditions in areas potentially affected by Laboratory operations. Many of the sediment sampling stations on the Pajarito Plateau are located within canyons to monitor sediment contamination related to past and/or present effluent release sites. We sampled three major canyons (Pueblo, Los Alamos, and Mortandad Canyons) that have experienced past or present liquid radioactive releases, from upstream of the Laboratory to their confluence with the Rio Grande.

We also collected sediments from drainages downstream of two material disposal areas. MDA G at TA-54 is an active waste storage and disposal area. Nine sampling stations were established outside its perimeter fence in 1982 (Figure 5-12) to monitor possible transport of radionuclides from the area.

MDA AB at TA-49 was the site of underground nuclear weapons testing from 1959 to 1961 (Purtymun and Stoker 1987; ESP 1988). The tests involved high explosives and fissionable material insufficient to produce a nuclear reaction. We established 11 stations in 1972 to monitor surface sediments in drainages adjacent to MDA AB (Figure 5-13).

3. Radiochemical Analytical Results for Sediments

Table 5-14 shows the results of radiochemical analysis of sediment samples collected in 2001. The table also lists the total propagated one-sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods rather than as total uranium for most samples in 2001; we calculated total uranium from these values using specific activities for each isotope. The sample size for most sediment samples is 100 g.

To emphasize values that are detections, Tables 5-15 and 5-16 list radiochemical detections for values that are higher than river or reservoir background levels and identify values that are near or above SALs. Table 5-15 shows all tritium detections regardless of screening levels. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. The table shows two categories of qualifier codes: those from the analytical laboratory and from secondary validation. See Table 5-4 for the qualifier codes. Qualifier codes are shown because some analytical results that meet the detection criteria are not really detections because of problems in the analytical laboratory. For example, in some cases the analyte was found in the lab blank.

In 1999, strontium-90 was found above fallout levels in all 105 sediment samples where it was detected in samples from the Pajarito Plateau and at regional stations. These high values resulted from problems with a new strontium-90 laboratory technique. Strontium-90 was previously detected infrequently at most stations. In 2000, strontium-90 was found above background only at Acid Weir below the former TA-45 outfall (a duplicate laboratory analysis detected strontium-90 below background in the sample). In 2001, strontium-90 was detected in sediment samples at DPS-1 and Mortandad Canyon stations GS-1, MCO-7, and MCO-9.

In 2000, the analysis found cesium-137 in many samples at much higher values than previously noted because of the Cerro Grande fire. Several studies (Bitner et al., 2001) have shown that fires concentrate fallout-derived cesium-137 from vegetation into the soil where it is available for redistribution by runoff. Storm runoff samples taken in 2000 from upstream of the Laboratory after the fire found cesium-137 levels much above normal (Johansen et al., 2001; ESP 2001). Cesium-137 in the suspended sediment portion of the storm runoff samples discussed in Johansen et al. (2001) was above the sediment SAL. Post-fire sediment samples from several canyons or at stations without previous evidence of radioactive contamination showed high cesium-137 values, some above SALs. In 2001, cesium-137 at some stations, including Pueblo 3, Pueblo at SR-502, Los Alamos at SR-4, and Water at SR-4, continued to be higher than previous values.

For 2000, samples from several reservoirs, including Cochiti Reservoir and reservoirs upstream from Laboratory influence, showed radionuclides above background. These values may reflect a change in analytical laboratory from previous years because of changes in analytical methods. For 2001, samples from Cochiti and Abiquiu Reservoirs had americium-241 two to three times above background levels. Rio Grande and Cochiti Reservoirs had plutonium-239, -240 values 60% to 170% above background. Several regional stations had gross beta measurements slightly above background. Station Guaje Canyon at SR-502 showed plutonium-239, -240 values at about twice background.

Many 2001 sediment samples from the known radioactive effluent release areas in Acid/Pueblo, DP/Los Alamos, and Mortandad Canyons exceeded background levels for tritium, cesium-137, plutonium-238, plutonium-239, -240, americium-241, gross alpha, gross beta, and gross gamma activities. These levels are consistent with historical data.

In sediments of both Los Alamos and Pueblo Canyons, above-background levels of plutonium and cesium-137 are evident for distances greater than 16 km downstream from the sources in Acid and DP Canyons (Figure 5-14). The contamination extends off-site across San Ildefonso Pueblo lands and reaches the Rio Grande near the Otowi Bridge. Plutonium-238 and plutonium-239, -240 activities downstream of historical release sites in those canyons have remained relatively constant during the past. These patterns have been documented for several decades in Laboratory reports (ESP 1981).

In 2001, the analysis found americium-241 at five times background in Pueblo Canyon, above Acid

Canyon at Pueblo 1R; this value is the highest observed at this station. At Acid Weir (at the confluence of Acid and Pueblo Canyons), plutonium-239, -240 activity was about 400 times background, consistent with historical data. At Pueblo 2, plutonium-239, -240 activity was 300 to 500 times background. Levels above background decrease to 105 times background at Hamilton Bend Spring, 150 times background at Pueblo 3, and 175 times background at Pueblo at SR-502. Plutonium-239, -240 activities at stations downstream of Acid Canyon have risen over the last three years (Figure 5-14). Cesium-137 in Pueblo Canyon sediments was generally below background during the late 80s and early 90s. Higher cesium-137 values were observed at Pueblo 3 in 1998, at Pueblo 1 and Acid Weir in 2000, and at Acid Weir, Pueblo 3, and Pueblo at SR-502 in 2001. Values found after the Cerro Grande fire may reflect mobilization of fallout cesium-137 in ash from burned vegetation.

Plutonium-239, -240 activities in Los Alamos Canyon are higher above DP Canyon, at stations Los Alamos at LAO-1 and Los Alamos at Upper Gaging Station, in the range of 40 times background. In DP Canyon, plutonium-239, -240 activities are 1.5 to 7 times background, having fallen by two orders of magnitude since the mid-80s. In Los Alamos Canyon, below the confluence with DP Canyon, plutonium-239, -240 activities are about 15 to 20 times background at stations Los Alamos at LAO-3, LAO-4.5, and SR-4. Below the confluence of Los Alamos and Pueblo Canyons, plutonium-239, -240 activities are about 40 times background at Los Alamos at Totavi. These findings indicate a larger contribution of plutonium-239, -240 by Pueblo Canyon in Los Alamos Canyon east of the Pueblo Canyon confluence.

Cesium-137 in Los Alamos Canyon both in DP Canyon (DPS-1) and above the confluence with DP Canyon (Los Alamos at Upper Gaging station) show similar histories. Values at these stations have decreased nearly two orders of magnitude to near background since the late 70s (Figure 5-14). Cesium-137 activity at station Los Alamos at SR-4 has decreased to near background and at station Los Alamos at Otowi has fluctuated around background.

Within Mortandad Canyon, the greatest radionuclide levels in sediments are found between the point where the TA-50 RLWTF effluent enters the drainage (above station Mortandad at GS-1) and the sediment traps (MCO-7), approximately a 3-km distance. Radionuclide levels decrease in the downstream direction from TA-50 to the sediment traps. Before 2001, radionuclide levels near, or slightly exceeding, background levels were found downstream of the sediment traps, extending to the Laboratory/San Ildefonso Pueblo boundary station A-6. Based on mass spectrometry analysis, Gallaher concluded that off-site plutonium contamination at levels near fallout values might extend two miles beyond the Laboratory boundary (Gallaher et al., 1997).

Below the sediment traps, the channel in Mortandad Canyon seldom has flow and is ill defined. In 2001, we evaluated the location of sediment station Mortandad at MCO-9 and moved it south to a more recently active channel. A station Mortandad at MCO-8.5 was added a short distance upstream. Results from these two stations are higher than prior values (Figure 5-15) from these stations in Environmental Surveillance Reports. In sediment radioactivity surveys during 1978 and 1981, Purtymun (1994) found cesium-137 values near station MCO-9 ranging from 0.7 to 6.9 pCi/g, which encompass the 2001 values of 3.1 to 5.7 pCi/g. For plutonium-239, -240, he found values of 0.1 and 1.3 pCi/g, compared with 2001 values of 0.9 to 2.7 pCi/g. Comparison of the Purtymun (1994) data with the 2001 data indicates no recent movement of cesium into the vicinity.

In 2001, sediment samples from GS-1, MCO-5, MCO-7, MCO-8.5, and MCO-9 stations in Mortandad Canyon showed cesium-137 concentrations that ranged from 0.5 up to 5 times the SAL value. Median values since 1980 for cesium-137 at the first three of these stations range up to six times greater than the SAL value. Overall, cesium-137 levels at these three stations have declined by factors of 5 to 35 since the early 1980s because of lower cesium-137 discharges from the RLWTF. In 2001, sediment samples near the Laboratory boundary had cesium-137 activity of 1.3 to 5.6 times background. The latter sample, a few feet on the San Ildefonso Pueblo side of the boundary, had 3.2 pCi/g and was 60% of the SAL. A sample collected in 1997 at this location had 2.2 pCi/g.

The americium-241 values range from 170 times background at GS-1 to below background at the Laboratory boundary. Plutonium-238 activity was 800 times background at GS-1 and not detected at the Laboratory boundary. Plutonium-239, -240 activity ranges from about 1000 times background at GS-1 and MCO-5 to about 10 times background (0.12 pCi/g) at and across the Laboratory boundary. A 1997 sample just across the Laboratory boundary had 0.09 pCi/g. Trends in sediment radioactivity are discussed in detail in section C.5 of this chapter.

A number of sediment samples in the vicinity and downstream of MDA G contained americium-241, plutonium-238, and plutonium-239, -240 at activities greater than background. Both plutonium isotopes were about 20 times background at G-7. A second sample collected west of G-7 had plutonium-238 at 150 times background and plutonium-239, -240 at 30 times background. G-6R had a plutonium-239, -240 activity more than 13 times background. Americium-241 was 6 times background at G-6 R. Tritium was again found at G-4 R-1 and G-4 R-2 at significant activities and was also seen at G-5.

We found plutonium-238 and plutonium-239, -240 at activities greater than background in a number of sediment samples collected at MDA AB. Station AB-3 is located immediately downstream of a known surface-contamination area dating to 1960 (Purtymun and Stoker 1987). At AB-3, plutonium-239, -240 was about 30 times background. Because erosion control activities have altered this station, we collected an additional sample about 150 ft down slope. The plutonium-239, -240 activity at this location was 55 times background. These values are consistent with past results.

At station Ancho at SR-4, tritium was again detected. The station Above Ancho Spring had tritium above the SAL in 2000 but a very low value of 189 pCi/L in 2001.

Station Chaquehui at Rio Grande again had a detection of cesium-137 (just above background) and showed tritium. Sandia at SR-4 had 1270 pCi/L of tritium. Sandia at Rio Grande had 650 pCi/L of tritium and plutonium-238 at five times background.

Radioactivity in the remainder of sediment samples collected at locations at the Laboratory in 2001 was near background levels.

4. Nonradiochemical Analytical Results

a. Trace Metals. Beginning in 1990, we have analyzed sediments for trace metals. Table 5-17 presents trace metal results for the sediment samples collected in 2001.

Since 1990, trace metals analysis has indicated the presence of mercury at near detection limit concentrations (0.025 mg/kg) in nearly 200 sediment samples. The largest numbers of those historic samples containing mercury (from 1990–1998) were from Los Alamos Canyon (22 samples), followed by Mortandad Canyon (21 samples since 1992), MDA AB (19 samples), and MDA G (15 samples since 1994). In 2001, a sample from one station in Pueblo Canyon contained mercury above the background value of 0.1 mg/kg.

Barium and manganese are two metals that may be mobilized by forest fires. For 2000, we reported that many stations had manganese above SALs, including around MDA G and MDA AB and in samples from Bayo, Guaje, Water, and Los Alamos Canyons. The EPA residential soil screening level for manganese (3239 mg/kg) is an order of magnitude larger than the SAL (390 mg/kg), and no 2001 measurements are near the EPA level. For 2001, manganese was somewhat above background at stations Mortandad at MCO-5 and A-6, Pueblo at SR-502, Cañon de Valle at SR-501, and Los Alamos at Bridge. The latter two stations are upstream of Laboratory influence. Barium was more than twice background in samples from below the Laboratory at Rio Grande at Chaquehui and Pajarito.

Lead was above background at stations Acid Weir and Mortandad at A-6. Selenium was above background in samples from stations Mortandad at MCO-5 and Mortandad at A-6, Pueblo 3, and Pueblo at SR-502, and Frijoles at Monument Headquarters.

A sample from Pueblo 3 had above-background silver, copper, mercury, and selenium. Mercury and selenium were above background in a sample at station Pueblo at SR-502. Station Mortandad at MCO-5 had above-background iron, selenium, and zinc. This iron value exceeded the EPA residential screening level and is higher than most prior measurements by a factor of 10. Station Mortandad at A-6 had above-background cadmium, copper, lead, barium, and selenium.

b. Organic Analysis. Beginning in 1993, we have analyzed sediments for PCBs and SVOCs. Some sediment samples have been analyzed for HE constituents since 1995. Generally, we analyze samples from only a portion of the sediment stations each year, but in 2001 a larger number of samples was analyzed to evaluate Cerro Grande fire effects. This sampling was particularly concentrated along the Rio Grande and in Pueblo, Los Alamos, Pajarito, and Water Canyons. Table 5-18 lists these samples. With exceptions shown in Table 5-19, the analytical results showed no PCBs, SVOCs, or HE constituents detected above the analytical laboratory's reporting limit in any of the sediment samples collected during 2001.

Of the compounds listed in Table 5-19, most were at levels far below EPA residential soil screening levels (which are not available for all compounds). Three SVOCs, (benzo(a)pyrene, benzo(b)fluoranthene, and benzo(a)anthracene), were found at several stations at levels above the EPA Region 6 residential soil screening levels. These compounds are polycyclic aromatic hydrocarbon (PAH) compounds that are formed by burning of gasoline, garbage, or animal or plant material and are usually found in smoke and soot.

PAHs are also commonly found in urban or highway runoff (Lopes and Dionne 1998). These authors report that sediment organic content increases PAH retention and that in some studies EPA sediment PAH health-screening levels were exceeded in up to 70% of roadside and urban stream sediments. Another study by Walker (1999) notes that much of the PAHs may come from atmospheric fallout originating from fossil fuel burning and forest fires. It seems likely that the unusual detection of PAHs in sediments during 2001 may be the result of the Cerro Grande fire.

Locations where we found these PAHs in 2001 include Pueblo, Los Alamos, and Sandia Canyons. The highest values were in Los Alamos Canyon, which had relatively little runoff after the Cerro Grande fire. The lower runoff might have retained more ash from the Cerro Grande fire in that canyon.

Samples from at least four locations in Los Alamos Canyon showed PCBs at a few percent of EPA screening levels. Some PCB analyses were rejected in validation because of analytical deficiencies. In prior years, we have not analyzed PCBs in samples from these locations, but we will analyze for them in the future.

In addition to Indio Canyon at SR-4, we found high explosives in sediment samples from three stations upstream of the Laboratory boundary: Cañon de Valle at SR-501, Water at SR-501, and Twomile at SR-501. We previously sampled the Indio Canyon at SR-4 station for high explosives in 1996 and 1998 with no detections. The other stations have not been sampled for high explosives before but will have follow-up sampling in 2002. False identification of high-explosives compounds could occur if samples contained large amounts of ash or other organic matter, perhaps resulting from the Cerro Grande fire. The RDX and HMX values for station Water at SR-501 were 131 and 94 g/kg, just above the method detection limits of 80 g/kg, and they were not detected in a duplicate sample. RDX was found at station Cañon de Valle at SR-501 at a similar value. Values for HMX and RDX at stations Twomile at SR-501 and Indio Canyon at SR-4 were in the 600 to 900 g/kg range. These RDX values are 15 to 20 percent of the EPA residential soil screening levels. Samples from these two stations also showed 2,4,6-Trinitrotoluene above 100 g/kg.

5. Long-Term Trends

For the plots discussed in this section, we show only detections of a particular radionuclide in sediments; samples without such detections are not included.

Figure 5-14 shows activities of plutonium-239, -240 and cesium-137 at selected stations in Los Alamos and Pueblo Canyons. Pueblo Canyon stations are below a former outfall that discharged radioactive effluent into Acid Canyon. The activity of plutonium-239, -240 has remained approximately constant at these stations over the past two decades, perhaps increasing slightly at Pueblo at SR-502. Cesium-137 has generally decreased, although an increase appears over the last few years. This increase may be due in part to cesium-137 mobilized by combustion of forest materials in the Cerro Grande fire.

Stations in Los Alamos Canyon above and including Los Alamos at SR-4 are downstream of former sites of reactors, the Manhattan Project, and radioactive effluent discharge in DP Canyon. Stations in lower Los Alamos Canyon (Los Alamos at Otowi) are below sources in both Pueblo and Los Alamos Canyons. Plutonium-239, -240 and cesium-137 activities in DP Canyon sediments have decreased by orders of magnitude over the past 25 years, to near background values. Cesium-137 activity in stations above Los Alamos at SR-4 has also fallen, whereas at Los Alamos at Otowi, it has remained approximately constant and near background. Plutonium-239, -240 activity at other stations in Los Alamos Canyon is above background and has changed little for two decades.

Figure 5-15a depicts plutonium-238 activities at five stations in Mortandad Canyon from 1976 to 2001. GS-1, MCO-5, and MCO-7 are located downstream of the RLWTF discharge point and upstream of the sediment traps. Plutonium-238 activity at GS-1 has decreased by a factor of about 10 during that time period and, except for a 1999 sample at MCO-5 (which was questionable as a duplicate analysis was in the usual range), has not exceeded the SAL since 1985. MCO-9 and MCO-13 are located downstream of the sediment traps. Before

2001, plutonium-238 was infrequently above background at those stations and not regularly detected. Values in 2001 at stations below the sediment traps are higher, in part because we relocated some stations as discussed earlier.

Figure 5-15b shows plutonium-239, -240 levels on Laboratory lands in Mortandad Canyon. Plutonium-239, -240 levels upstream of the sediment traps have declined by approximately a factor of 10 since the 1980s, presumably because of decreased radioactivity in the RLWTF discharges and the dispersal of previously contaminated sediments. Downstream of the sediment traps, plutonium activities remained relatively constant until stations were moved in 2001; the activities were two orders of magnitude less than upstream of the sediment traps and near background activities. Values in 2001 are less than one order of magnitude lower than near the sediment traps.

Figure 5-15c shows that cesium-137 has been present in Mortandad Canyon since the first data collected in the 1970s. Between TA-50 and the sediment traps, cesium-137 levels have often exceeded the SAL but have decreased over the last 25 years. Before 2001, data indicated that cesium-137 levels below the sediment traps had gradually declined to near background levels. Relocation of two stations in 2001 showed cesium-137 below the sediment traps at values near the SAL. A station just across the Laboratory boundary with San Ildefonso Pueblo (Mortandad at A-6) also showed cesium-137 near the SAL. A few prior samples at this station have shown similar values.

D. Groundwater Sampling

1. Introduction

Groundwater resource management and protection efforts at the Laboratory focus on the regional aquifer underlying the region (see Section 1.A.3) but also consider perched groundwater found within canyon alluvium and at intermediate depths above the regional aquifer. The Los Alamos public water supply comes from supply wells drawing water from the regional aquifer.

The early groundwater management efforts by the USGS evolved through the growth of the Laboratory's current Groundwater Protection Management Program, required by DOE Order 5400.1 (DOE 1988). This program addresses environmental monitoring, resource management, aquifer protection, and hydrogeologic investigations. The Laboratory issued formal documentation for the program, the "Groundwater Protection Management Program Plan," in April 1990 and revised it in 1995 (LANL 1996). During 1996, the Laboratory developed and submitted an extended groundwater characterization plan, known as the Hydrogeologic Workplan (LANL 1998), to the NMED. NMED approved the Hydrogeologic Workplan on March 25, 1998. See Chapter 2 for a description of investigations under the Hydrogeologic Workplan.

Concentrations of radionuclides in environmental water samples from the regional aquifer, the perched alluvial groundwater in the canyons, and the intermediate-depth perched systems may be evaluated by comparison with DCGs for ingested water calculated from DOE's public dose limit (see Appendix A for a discussion of standards). The NMWQCC has also established standards for groundwater quality (NMWQCC 1996). Concentrations of radioactivity in drinking water samples from the water supply wells, which draw water from the regional aquifer, are compared with New Mexico drinking water regulations and EPA MCLs or to the DOE DCGs applicable to drinking water, which are more restrictive in a few cases.

The concentrations of nonradioactive chemical quality parameters may be evaluated by comparing them with NMWQCC groundwater standards (NMWQCC 1996) and with the New Mexico drinking water regulations and EPA drinking water standards, although these latter standards are only directly applicable to the public water supply. Although it is not a source of municipal or industrial water, shallow alluvial groundwater is a source of return flow to surface water and springs used by livestock and wildlife and may be compared with the standards for groundwater or the NMWQCC's (NMWQCC 2000) livestock watering and wildlife habitat stream standards. However, it should be noted that these standards are for the most part based on dissolved concentrations. Many of the results reported here are total concentrations (that is, they include both dissolved and suspended solids concentrations), which may be higher than dissolved concentrations alone.

2. Monitoring Network

Groundwater sampling locations are divided into three principal groups, related to the three modes of groundwater occurrence: the regional aquifer, perched alluvial groundwater in the bottom of some canyons, and localized intermediate-depth perched groundwater systems. Figure 5-16 shows the sampling locations for the regional aquifer and the intermediate-depth perched groundwater systems. Figure 5-17 presents the sampling locations for the canyon alluvial groundwater systems. Purtymun (1995) described the springs and wells.

Sampling locations for the regional aquifer include test wells, supply wells, and springs. New wells, constructed pursuant to implementation of the Hydrogeologic Workplan activities, are designed to evaluate the adequacy of LANL's current monitoring system. These wells are not yet part of LANL's Groundwater Monitoring Plan and the monitoring well network. In 2002, the first set of the regional aquifer (R) wells, installed pursuant to implementation of the Hydrogeologic Workplan, will be turned over to ESH-18 for custodianship and possible inclusion in the monitoring network. ESH-18 is working with the NMED and other Laboratory organizations to formulate a protocol for adding these wells to LANL's Groundwater Monitoring Plan to meet site-wide groundwater monitoring needs.

We routinely sample eight deep test wells, completed within the regional aquifer. The USGS drilled these test wells between 1949 and 1960 using the cable tool method. The Laboratory located these test wells where they might detect infiltration of contaminants from areas of effluent disposal or underground weapons testing operations. These wells penetrate only a few tens or hundreds of feet into the upper part of the regional aquifer. The casings are not cemented, which would seal off surface infiltration along the boreholes.

We collect samples from 12 deep water supply wells in three well fields that produce water for the Laboratory and community. The wells are part of the Los Alamos water supply system and are owned (as of September 2001) and operated by the County of Los Alamos. The well fields include the off-site Guaje well field and the on-site Pajarito and Otowi well fields. The Guaje well field, located northeast of the Laboratory, contains five producing wells. The five wells of the Pajarito well field are located in Sandia and Pajarito Canyons and on mesa tops between those canyons. Two wells make up the Otowi well field, located in Los Alamos and Pueblo Canyons. Additional regional aquifer samples come from wells located on San Ildefonso Pueblo and from the Buckman well field operated by the city of Santa Fe. The frequency of monitoring varies from annual to monthly depending on the analytes and sampling location.

We sample numerous springs near the Rio Grande because they represent natural discharge from the regional aquifer (Purtymun and Adams 1980). As such, the springs serve to detect possible discharge of contaminated groundwater from beneath the Laboratory into the Rio Grande. Based on their chemistry, the springs in White Rock Canyon are divided into four groups, three of which have similar, regional-aquifer-related chemical quality. The chemical quality of springs in a fourth group reflects local conditions in the aquifer, probably related to discharge through faults or from volcanics. Sacred Spring is west of the river in lower Los Alamos Canyon.

We sample approximately half of the White Rock Canyon springs each year. Larger springs and springs on San Ildefonso Pueblo lands are sampled annually, with the remainder scheduled for alternate years.

We sample the perched alluvial groundwater in five canyons (Pueblo, Los Alamos, Mortandad, and Pajarito Canyons and Cañada del Buey) with shallow observation wells to determine the impact of NPDES discharges and past industrial discharges on water quality. In any given year, some of these alluvial observation wells may be dry, and thus we cannot obtain water samples. Observation wells in Water, Fence, and Sandia Canyons have been dry since their installation in 1989. All but two of the wells in Cañada del Buey are generally dry.

Intermediate-depth perched groundwater of limited extent occurs in conglomerates and basalt at depths of several hundred feet beneath the alluvium in portions of Pueblo, Los Alamos, and Sandia Canyons. We obtain samples from two test wells and one spring. The well and spring locations allow us to monitor possible infiltration of effluents beneath Pueblo and Los Alamos Canyons.

Some perched water occurs in volcanics on the flanks of the Jemez Mountains to the west of the Laboratory. This water discharges at several springs (Armstead and American) and yields a significant flow from a gallery in Water Canyon, where this perched water is sampled. Additional perched water extends eastward from the Jemez Mountains beneath TA-16 in the southwestern portion of the Laboratory. The drilling of Hydrogeologic Workplan well R-25 confirmed the existence of this perched water, at a depth of about 750 ft below the mesa top, in 1998. The water was found to contain high-explosives compounds resulting from past Laboratory discharges. The Laboratory is conducting further work to characterize this perched zone.

3. Radiochemical Analytical Results for Groundwater

Table 5-20 lists the results of radiochemical analyses of groundwater samples for 2001. The table also lists the total propagated one-sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods; total uranium was calculated from these values using specific activities for each isotope.

To emphasize values that are detections, Table 5-21 lists radionuclides detected in groundwater samples. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. Qualifier codes are shown because some analytical results that meet the detection criteria are not detections: in some cases, the analyte was found in the laboratory blank or was below the method detection limit, but the analytical result was reported as the minimum detectable activity. Because gross alpha and gross beta are usually detected, we indicate in Table 5-21 only occurrences of these measurements above threshold values. The specific levels are 5 pCi/L for gross alpha and 20 pCi/L for gross beta and are lower than the EPA MCLs or screening levels.

The right-hand columns of Table 5-21 indicate radiochemical detections that are greater than one-half of the DOE DCGs for public dose for ingestion of environmental water or the standards shown. Several groundwater values exceeded half the DOE public dose DCG values in 2001. These were gross alpha values in two San Ildefonso Pueblo water wells and in Cañada del Buey well CDBO-6. The gross alpha in San Ildefonso Pueblo wells is due to naturally occurring uranium in the water. The EPA MCL for gross alpha does not include the contribution to gross alpha by uranium. CDBO-6 had a gross alpha of 19.3 pCi/L on November 7 and has shown higher values in 1993, 1994, 1997, and 1998. A sample collected on May 1 had a gross alpha of 3.7 pCi/L. Other radioactivity has not generally been detected in CDBO-6 or 7. These wells often are dry and produce turbid samples.

Discussion of results will address the regional aquifer, the perched canyon alluvial groundwater, and the intermediate-depth perched groundwater system.

a. Radiochemical Constituents in the Regional Aquifer. For samples from wells or springs in the regional aquifer, most of the results for radiochemical measurements were below the DOE drinking water DCGs or the EPA or New Mexico standards applicable to a drinking water system. In addition, most of the results were near or below the detection limits of the analytical methods used. The exceptions are discussed below.

The main radioactive element the analysis detected in the regional aquifer was uranium, found in springs and wells on San Ildefonso Pueblo land. See Section E in this chapter for a discussion of these values.

A number of regional aquifer springs and wells had apparent detections of americium-241, plutonium-238, or other isotopes. In many cases, the analysis of laboratory or field duplicate samples did not support the apparent detections. At values near the detection limit, it is technically difficult to determine whether an analyte has been detected in an individual sample. However, because these measurements are not repeatable, these apparent detections are more likely to be due to analytical outliers (that is, false positives) than to the presence of the particular isotope in groundwater. Important factors in monitoring for radioactivity in groundwater are using detection limits substantially below the drinking water MCL and drawing conclusions based on a large body of data rather than from an individual sample. By observing data trends over time and location, we identify likely false positives potentially associated with any errors arising from chemical analysis or sampling.

In 2000, numerous apparent detections of plutonium isotopes (most near the detection limit) occurred in regional aquifer well and spring waters. Analysis of laboratory or field duplicates, done for many of the samples, did not support any of the apparent detections (and contradicted many of them). As plutonium isotopes are not regularly found in these waters, it is likely that the results were analytical artifacts. We collected additional samples in 2001 to check for the possibility of plutonium occurrence at these stations; none of the stations had plutonium detected. Four analyses in Test Well 3 showed no detections of either plutonium-238 or plutonium-239, -240. Sandia Spring had one analysis, and Spring 2 had two. We sampled San Ildefonso wells on two different dates, and none of the stations had plutonium detected. LA-5 had five separate analyses for plutonium, Pajarito Well Pump 1 had six, Don Juan Playhouse Well had four, Otowi House Well had five, and New Community Well had four.

Americium-241 was apparently found near the detection limit in Sandia Spring (but not in a field duplicate), Spring 4 (but not in a duplicate analysis), and Spring 9. Americium-241 was also detected at about these levels in two deionized water (DI) blanks during the year. It has not been regularly found at any of these locations, so it is likely that these results are false positives. Plutonium-238 was found in Spring 4A at a low level. Detection of tritium in Test Well (186 pCi/L) was at a level below that seen earlier in several samples (350 pCi/L). Ancho Spring had a detection of strontium-90, but this strontium-90 was not seen in a duplicate sample.

We sampled regional aquifer test wells either quarterly or semiannually for strontium-90 in 2001. See Table 5-22. No strontium-90 was detected in these wells. One sample collected from PM-4 showed a strontium-90 detection, which reanalysis did not confirm. A letter from the analytical laboratory (GEL) states that the strontium-90 detection at PM-4 was unequivocally a false positive result. Four analyses of three other samples collected in 2001 from PM-4 did not show strontium-90.

Table 5-23 compiles the water supply well tritium results for 2001. The University of Miami analyzed these samples at a low detection limit of about 1 pCi/L. Samples taken from the O-1 supply well contained tritium within an average concentration of 31.6 pCi/L during 2001. These concentrations are 500 times lower than the federal drinking water standard but are above background concentrations that can be found in regional aquifer groundwater around the Laboratory. Tritium was either not detected or was found at background levels in other water supply wells, including the Santa Fe Buckman field.

Concentrations of tritium in the regional aquifer in other parts of the Laboratory can be found ranging between 1 and 3 pCi/L; tritium concentrations in northern New Mexico surface water and rainwater range from 30 to 40 pCi/L. Tritium also has been seen in the deep aquifer in a test well several hundred yards downstream from the O-1 supply well. The concentration of tritium in Test Well 1 was 360 pCi/L in 1993. The test well just penetrates the top of the regional aquifer about 600 ft beneath the canyon floor. In contrast, the zone within the aquifer from which O-1 draws its water begins at just about 1,000 ft below the canyon floor (and about 400 ft lower than the top of the aquifer and Test Well 1) and continues down an additional 1,460 ft.

In 2001, we sampled seven wells in the city of Santa Fe's Buckman field for strontium-90, uranium isotopes, general inorganic chemistry constituents, perchlorate, and high explosives. One sample from Buckman No. 2 contained about 223 g/L of uranium, a value in line with earlier values obtained by the Santa Fe water company for that well.

b. Radiochemical Constituents in Alluvial Groundwater. None of the radionuclide activities in perched alluvial groundwater are above the DOE DCGs for public dose for ingestion of environmental water. Except for americium-241 and strontium-90 values from Mortandad and Los Alamos Canyons, none of the radiochemical measurements exceed DOE DCGs applicable to drinking water (that is, exceed 4 mrem or 1/25th of the DOE DCGs for public dose for ingestion of environmental water). Levels of tritium; cesium-137; uranium; plutonium-238; plutonium-239, -240; and gross alpha, beta, and gamma are all within the range of values observed in recent years.

In Pueblo Canyon, samples from APCO-1 showed detections of strontium-90 and plutonium-239, -240. This well has had plutonium-239, -240 above the detection limit in most years since 1994. We have seen similar values in previous years in surface water and alluvial groundwater in Pueblo Canyon because of past Laboratory discharges. The samples of perched alluvial groundwater in Los Alamos and DP Canyons show residual contamination, as we have seen since the original installation of monitoring wells in the 1960s. Strontium-90 was found in LAO-1, DP Spring, LAO-2, and other wells downstream to LAO-6. In LAO-1, LAO-2, and LAO-3A, the activity of strontium-90 usually approaches or exceeds the EPA primary drinking water MCL of 8 pCi/L. DP Spring, LAO-2, and LAO-3A showed gross beta activities approaching or exceeding the drinking water screening level of 50 pCi/L.

Radioactivity results for several of the perched alluvial groundwater samples from Mortandad Canyon were not available for this report because of the analytical laboratory's record processing error; they will appear in the next report. The available data showed activities of radionuclides within the ranges observed previously. Tritium; strontium-90; cesium-137; plutonium-238; plutonium-239, -240; americium-241; and gross alpha, beta, and gamma are usually detected in many of the wells. The radionuclide levels are in general highest nearest to the TA-50 RLWTF outfall at well MCO-3 and decrease down the canyon. The levels of tritium, strontium-90, and gross beta usually exceed EPA drinking water criteria in many of the wells. In some years, the levels (except for tritium) exceed the 4-mrem DOE drinking water DCGs, but the levels do not exceed the DOE DCGs for public dose for ingestion of environmental water.

In 2001, strontium-90 in MCO-3 and MCO-5 exceeded the EPA MCL. EPA has no drinking water criteria for plutonium-238, plutonium-239, -240, or americium-241. Except for americium-241 in MCO-3, the 4-mrem DOE drinking water DCGs for these latter radionuclides were not exceeded in Mortandad Canyon alluvial groundwater in samples taken in 2001.

CDBO-6 had a high gross alpha value as discussed earlier. PCO-3 had a detection of strontium-90 of 0.4 pCi/L, the first in that well.

c. Radiochemical Constituents in Intermediate-Depth Perched Groundwater. In the 1950s, based on measurements of water levels and major inorganic ions, the USGS established that contaminated surface water and perched alluvial groundwater in Pueblo Canyon recharge the intermediate-depth perched zone water that underlies the canyon floor (Weir et al., 1963; Abrahams 1966). Taken over time, the radionuclide activity measurements in samples from Test Well 1A, Test Well 2A, and Basalt Spring in Pueblo and Los Alamos Canyons confirm this connection. Test Well 2A, farthest upstream and closest to the historical discharge area in Acid Canyon, has shown the highest levels. In 2001, we sampled Test Well 2A, Basalt Spring, and POI-4 (an intermediate-depth well located near Test Well 1A). Strontium-90 was again detected in the Basalt Spring sample. Tritium was found at 1110 pCi/L in Test Well 2A, in line with previous values. The sample from the Water Canyon Gallery, which lies southwest of the Laboratory, was consistent with previous results, showing no evidence of radionuclides from Los Alamos operations.

4. Nonradiochemical Analytical Results

Table 5-24 lists the results of general chemical analyses of groundwater samples for 2001. Table 5-25 lists groundwater perchlorate results, and the results of trace metal analyses appear in Table 5-26.

a. Nonradiochemical Constituents in the Regional Aquifer. With the exceptions discussed here, values for all parameters measured for environmental surveillance sampling in the water supply wells are within drinking water limits. Separate samples collected from the public water supply system to determine regulatory compliance with the Safe Drinking Water Act were all in compliance for 2001 (see Section 2.B.9).

The test wells in the regional aquifer showed levels of several constituents that approach or exceed standards for drinking water distribution systems. However, it should be noted that the test wells are for monitoring purposes only and are not part of the water supply system. TW-1 had a nitrate value of 5.8 mg/L (nitrate as nitrogen), again below the EPA primary drinking water standard of 10 mg/L. This test well has shown nitrate levels in the range of about 5 to 20 mg/L (nitrate as nitrogen) since the early 1980s. The source of the nitrate might be infiltration from sewage treatment effluent released into Pueblo Canyon or residual nitrate from the now decommissioned TA-45 radioactive liquid waste treatment plant that discharged effluents into upper Pueblo Canyon until 1964. Nitrogen isotope analyses the ER Project made during 1998 indicate that the nitrate is from a sewage source (Nylander et al., 1999).

In the last few years, iron, manganese, cadmium, nickel, antimony, and zinc have been high in several of the regional aquifer test wells. These wells are due to be replaced by new wells drilled as part of the Hydrogeologic Work Plan. Levels of trace metals that approach water quality standards in some of the test wells are believed to be associated with turbidity of samples and with the more than 40-year-old steel casings and pump columns. The lead levels appear to result from flaking of piping installed in the test wells and do not represent lead in solution in the water (ESP 1996). In 2001, iron approached or exceeded the EPA secondary drinking water standard in Test Wells 1, 3, 4, and DT-10 and exceeded the New Mexico groundwater limit in Test Well 3. Manganese approached or exceeded the EPA secondary drinking water standard in Test Wells 3 and 4. Test Wells 1 and 4 had lead concentrations above the EPA action level, and Test Well 8 had an aluminum concentration above the EPA MCL.

Samples collected for metals analysis from most of the White Rock Canyon springs were filtered in 2001. Many of the springs have very low flow rates, and we collected samples in small pools in contact with the surrounding soils. None of the springs showed trace metals at levels of concern in 2001.

In 2001, surface water and groundwater samples the Environmental Surveillance Program collected were analyzed for perchlorate. Our investigations of analytical method performance indicated that samples analyzed by the ion chromatography method probably have a detection limit in the neighborhood of 4 g/L. Samples analyzed by one of our analytical laboratories before April 25, 2001, showed many false positives because the analytical laboratory did not perform all the anion removal steps possible in the EPA analytical method. Thus, many of the apparent detections indicated in Table 5-25 are not detections. A new method combining liquid chromatography and mass spectrometry shows promise. During 2001, the new method was in development, and performance using this method was poor. This new method used liquid chromatography and two mass spectrometry steps (LC/MS/MS) and claims a detection limit of 0.25 g/L. See Section F later in this chapter for more information on this topic.

Perchlorate was detected in samples collected during 2001 from the O-1 water supply well at concentrations of 2 and 5 g/L, depending on analytical method (Table 5-25). Two methods were used with detection limits of 4 g/L or 0.25 g/L as listed in the table. The analytical laboratory J-flagged many of the analytical results, meaning that the results are below the reporting limit and the quantities are estimated. For the ion chromatography method, the reporting limit is probably about 12 g/L. Following the initial discovery, we have sampled O-1 monthly for perchlorate. The source of perchlorate may be effluent from the Manhattan Project and early cold-war-era radioactive liquid waste treatment facilities that discharged into Acid Canyon until 1964. Other water supply wells (including wells in Santa Fe's Buckman Field) are sampled on a semiannual basis, and none have shown perchlorate in samples.

Follow-up sampling for perchlorate at several springs near Spring 4 (which we reported as having perchlorate in 2000 at 8.5 ppb) does not confirm the presence of perchlorate in springs of this area. The original measurement is in doubt as the analytical laboratory did not include all anion removal steps in the analysis, and presence of sulfate (for example) can cause interference in perchlorate analysis.

b. Nonradiochemical Constituents in Alluvial Groundwater. The canyon bottom perched alluvial groundwater in Pueblo, Los Alamos, and Mortandad Canyons receives or has received Laboratory effluents. The groundwater shows the effects of those effluents in that values of some constituents are elevated above natural levels.

Many of the Mortandad Canyon alluvial groundwater samples in Table 5-24 had fluoride and nitrate concentrations greater than half the New Mexico groundwater standards. The nitrate source is nitric acid from plutonium processing at TA-55 that enters the TA-50 waste stream. In response to a letter of noncompliance from NMED, in March 1999 the RLWTF instituted a program to restrict the discharge of nitrogenous wastes into the facility's collection system. As shown in Figure 5-18, the nitrate (nitrate as nitrogen) concentration of effluent discharge from the RLWTF after March 1999 has been less than 10 mg/L. The concentration of fluoride in the RLWTF effluent after August 1999 has been less than the 1.6 mg/L standard. The value in October 2001 was 1.56 mg/L, just below the standard.

Under the Laboratory's groundwater discharge plan application for the RLWTF, we collected separate samples for nitrate, fluoride, and TDS approximately bimonthly from three alluvial monitoring wells in Mortandad Canyon during 2001: MCO-3, MCO-6, and MCO-7. We reported the analytical results quarterly to the NMED. During 2001, nitrate concentrations in alluvial groundwater except at well MCO-7 were below the New Mexico groundwater standard for nitrate of 10 mg/L (nitrate as nitrogen), as Figure 5-18 shows. Fluoride concentrations at MCO-7 and MCO-7.5 exceeded the NMWQCC groundwater standard for fluoride of 1.6 mg/L during 2001, as shown in Figure 5-18.

Perchlorate was detected in groundwater at every alluvial groundwater well sampled in Mortandad Canyon. Perchlorate concentrations ranged from 53 g/L to 220 g/L (see Table 5-25). The perchlorate source is discharges from the TA-50 RLWTF, which processes wastewater from analytical chemistry facilities that perform actinide chemistry. The RLWTF has a treatment system to remove perchlorate from the effluent that will be operational in March 2002.

LAO-2 and LAO-4 continued to show elevated levels of molybdenum, and LAO-3A had molybdenum at about 70% of the New Mexico groundwater limit of 1000 g/L (Figure 5-19). The potential source of this molybdenum is sodium molybdate, a commonly used water treatment chemical in cooling towers. Historically, sodium molybdate was used as a tracer in managing water chemistry in the cooling towers at TA-53. Three cooling towers (NPDES Outfalls 03A047, 03A048, 03A049) discharged upstream of LAO-3A. These cooling towers have recently been replaced with two new cooling towers. Facility managers will replace sodium molybdate with a phosphate-based tracer in 2002.

The Cerro Grande fire caused high manganese, aluminum, and iron concentrations in many surface water and shallow alluvial perched groundwater samples. CDBO-6 had high aluminum and iron values, probably related to a high TSS of about 25 mg/L. This well also had high amounts of cobalt. Higher than usual manganese concentrations were found in APCO-1 (Pueblo Canyon) and PCO-3 (Pajarito Canyon). Both canyons were extensively burned in the Cerro Grande fire.

c. Nonradiochemical Constituents in Intermediate-Depth Perched Groundwater. In 2001, the nitrate value for Basalt Spring was only 12% of the NMWQCC groundwater and EPA drinking water standards. In the past, it has exceeded the standards. The source of the nitrate is infiltration of contaminated surface water and shallow groundwater from Pueblo Canyon. Test Well 2A had high values of iron, magnesium, and zinc related to well casing materials. Basalt Spring had a mercury value that was about 60% of the New Mexico wildlife habitat standard for surface water. The Water Canyon gallery had high aluminum and iron, probably related to high sample turbidity.

d. Organic Constituents in Groundwater. We performed analyses for organic constituents on selected springs and test wells in 2001. The stations sampled appear in Table 5-27. Some samples were analyzed for VOCs, SVOCs, and PCBs. We analyzed water supply wells, test wells, and most springs for HE constituents. No HE constituents were found above the analytical laboratory's reporting limit in the groundwater samples listed in Table 5-27. LANL rejected many of the possible organic detections the analytical laboratory reported because the compounds were either detected in method blanks (that is, they were introduced during laboratory analysis) or detected in trip blanks. Trip blanks go along during sampling to determine if organic constituents come from sample transportation and shipment. Table 5-28 shows organic compounds detected above the analytical laboratory's reporting level in 2001, as well as results from blanks. Organics detected in groundwater in 2001 include the finding of butanone [2-] in two field blanks, bis(2-ethylhexyl)phthalate in LAO-3A and PCO-3 samples, and trichloroethane[1,1,1-] at the Otowi House well. Bis(2-ethylhexyl)phthalate is a plastics component that is often found as a result of contamination during analytical laboratory organic analysis.

In 1998, drilling of characterization well R-25 at TA-16 in the southwest portion of the Laboratory revealed the presence of HE constituents at concentrations above the EPA Health Advisory guidance values for drinking water. Consequently, the Laboratory tested all nearby water supply wells for these compounds. None of the analytical laboratories detected any HE or their degradation products in any of the water samples from any of the supply wells sampled. We sample all water supply wells at least annually for HE compounds. The wells nearest to TA-16 are sampled quarterly. We also did not find HE in any of the water supply well samples (including wells in Santa Fe's Buckman Field) in 2001.

5. Long-Term Trends

a. Regional Aquifer. The long-term trends of water quality in the regional aquifer have shown limited impact resulting from Laboratory operations. As noted above, in 1998, drilling characterization well R-25 at TA-16 in the southwest portion of the Laboratory revealed the presence of HE constituents. No HE constituents have been found in water supply wells. The extent of high explosives in the regional aquifer is presently unknown. The Laboratory is working in cooperation with regulatory agencies to define the extent of the contamination and ensure that drinking water supplies are adequately protected.

Aside from naturally occurring uranium, the only radionuclide we consistently detected in water samples from production wells or test wells within the regional aquifer is tritium, which is found at trace levels. We have found tritium contamination at four locations in Los Alamos and Pueblo Canyons and one location in Mortandad Canyon. The tritium levels measured range from less than 2% to less than 0.01% of current drinking water standards, and all are below levels detectable by the EPA-specified analytical methods normally used to determine compliance with drinking water regulations. Tritium at about 40 pCi/L was found in water supply well O-1. Other measurements of radionuclides above detection limits in the regional aquifer reflect occasional analytical outliers not confirmed by analysis of subsequent samples.

Nitrate concentrations in TW-1 have been near the EPA MCL since 1980. The source of the nitrate might be infiltration of sewage-effluent-contaminated shallow groundwater and surface water in Pueblo Canyon or residual nitrate from the now decommissioned radioactive liquid waste treatment plants that discharged effluents into upper Pueblo Canyon until 1964. Perchlorate is present in water supply well O-1 at concentrations up to 5 ppb, compared with provisional drinking water limits of 18 ppb. The source of the perchlorate might be residual perchlorate from the now decommissioned radioactive liquid waste treatment plants that discharged effluents into upper Pueblo Canyon until 1964.

Sampling of wells of Santa Fe's Buckman field, across the Rio Grande from Los Alamos, shows no evidence of compounds that might be from Los Alamos (tritium, strontium-90, perchlorate, or high explosives). In addition, none of these compounds are found in springs that discharge from the regional aquifer along the Rio Grande below Los Alamos.

b. Surface Water and Alluvial Groundwater in Mortandad Canyon. Figure 5-20 depicts long-term trends of radionuclide concentrations in surface water and shallow perched alluvial groundwater in Mortandad Canyon downstream from the outfall for the RLWTF at TA-50. The figure only shows radionuclide detections. Because of strong adsorption to sediments, cesium-137 is not detected in groundwater samples. If more than one sample was collected in a year, the average value for the year is plotted. The surface water samples are from the station Mortandad at GS-1, a short distance downstream of the TA-50 effluent discharge. Radioactivity levels at this station vary daily depending on whether individual samples are collected shortly after a release from the RLWTF. These samples also vary in response to changes in amount of runoff from other sources in the drainage. The groundwater samples are from observation well MCO-5 in the middle reach of the canyon. Groundwater radioactivity at MCO-5 is more stable than at Mortandad at GS-1 because groundwater responds more slowly to variations in runoff water quality.

Chemical reactions such as adsorption do not delay tritium transport, and high tritium activities are found throughout the groundwater within the Mortandad Canyon alluvium. The tritium levels in MCO-5 and at Mortandad at GS-1 in 2001 were below the EPA MCL of 20,000 pCi/L. The surface water tritium activity at Mortandad at GS-1 reflects diluted values of effluent from TA-50 as the effluent mixes with other stream water. The tritium activity at MCO-5 has fluctuated almost in direct response (with a time lag of about one year) to the average annual activity of tritium in the TA-50 outfall effluent. Tritium values at both stations have decreased since the mid-1980s because of decreased tritium content of the TA-50 effluent.

For all but four years between 1973 and 1999, the americium-241 activity of RLWTF discharges exceeded the DOE DCG for public dose of 30 pCi/L. Americium-241 activity has not been measured regularly at monitoring stations in Mortandad Canyon. Under many environmental conditions, americium is less strongly adsorbed than cesium or strontium and moves more readily in groundwater. Americium-241 activity in the shallow alluvial groundwater in 2001 was well below the DOE drinking water DCG of 1.2 pCi/L, except at MCO-3, where it was 77% of this value. Americium-241 at Mortandad at GS-1 showed an increase in activity approaching the DOE DCG for public dose from 1995 to 1998, decreased in 1999 and 2000, and increased again in 2001. At MCO-5, the americium-241 activity showed only a slight increase from 1995 to 1998 and a general decline over the past few years.

In 2001, we detected strontium-90 in surface water at Mortandad at GS-1 and in shallow perched alluvial groundwater observation wells MCO-3 and MCO-5. The activities remain at values in the range of the EPA drinking water standard (8 pCi/L) and the DOE DCG for a DOE-maintained drinking water system (40 pCi/L). It appears that strontium-90 has been retained by adsorption or mineral precipitation within the upstream portion of the alluvium. The level of strontium-90 has risen gradually at downstream wells MCO-5 and MCO-6 over the last 20 years suggesting that the mass of the radionuclide is moving slowly downstream.

We detected plutonium isotopes at Mortandad at GS-1, MCO-3, and MCO-5 in 2001. Both isotopes have been detected at Mortandad at GS-1 and MCO-3 at levels near the DOE public dose DCGs (30 pCi/L for plutonium-239, -240 and 40 pCi/L for plutonium-238) over the past few years, but the levels have decreased recently. Values at other alluvial observation wells except for MCO-4 and MCO-7.5 have been near the detection limit in the 1990s. Plutonium has in general been detected in all alluvial observation wells in Mortandad Canyon but appears to be decreasing in activity at downstream locations.

E. Groundwater and Sediment Sampling at San Ildefonso Pueblo

To document the potential impact of Laboratory operations on lands belonging to San Ildefonso Pueblo, DOE entered into a Memorandum of Understanding (MOU) with the Pueblo and the Bureau of Indian Affairs in 1987 to conduct environmental sampling on pueblo land. This section deals with hydrologic and sediment sampling. Figures 5-21 and 5-22 show the groundwater, surface water, and sediment stations sampled on San Ildefonso Pueblo. Aside from stations shown on those figures, the MOU also specifies collection and analysis of additional water and sediment samples from sites that have long been included in the Laboratory's Environmental Surveillance Program, as well as sampling of storm runoff in Los Alamos Canyon. These locations appear in Figures 5-3, 5-4, 5-5, and 5-11. We discuss the results of these analyses in previous sections.

1. Groundwater

Table 5-20 lists the results of radiochemical analyses of groundwater samples for 2001. The table also lists the total propagated one-sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods; total uranium was calculated from these values using specific activities for each isotope.

To emphasize values that are detections, Table 5-21 lists radionuclides detected in groundwater samples. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. Qualifier codes are shown because some analytical results that meet the detection criteria are not detections: in some cases, the analyte was found in the lab blank or was below the method detection limit, but the analytical result was reported as the minimum detectable activity. Because gross alpha and gross beta are usually detected, we indicate in Table 5-21 only occurrences of these measurements above threshold values. The specific levels are 5 pCi/L for gross alpha and 20 pCi/L for gross beta and are lower than the EPA MCLs or screening levels.

The right-hand columns of Table 5-21 indicate radiochemical detections that are greater than one-half of the DOE DCGs for public dose for ingestion of environmental water or the standards shown. Several groundwater values (gross alpha values in two San Ildefonso Pueblo water wells) exceeded half the DOE public dose DCG values in 2001. This gross alpha is due to naturally occurring uranium in the water. The EPA MCL for gross alpha does not include the contribution to gross alpha by uranium.

See Section D in this chapter for a discussion of most of the groundwater stations (wells and springs) listed in the MOU. The present section focuses on the San Ildefonso Pueblo water supply wells.

In 2000, numerous apparent detections of plutonium isotopes (most near the detection limit) occurred in regional aquifer well and spring waters. Analysis of laboratory or field duplicates, done for many of the samples, did not support any of the apparent detections (and contradicted many of them). As plutonium isotopes are not regularly found in these waters, it is likely that the results were analytical artifacts. We collected additional samples in 2001 to check for the possibility of plutonium occurrence at these stations; none of the stations had plutonium detected. Four analyses in Test Well 3 showed no detections of either plutonium-238 or plutonium-239, -240. Sandia Spring had one analysis, and Spring 2 had two. We sampled San Ildefonso wells on two different dates, and none of the stations had plutonium detected. LA-5 had five separate analyses for plutonium, Pajarito Well Pump 1 had six, Don Juan Playhouse Well had four, Otowi House Well had five, and New Community Well had four.

As in previous years, the groundwater data for San Ildefonso Pueblo indicate the widespread presence of naturally occurring uranium at levels approaching the EPA drinking water limit. Naturally occurring uranium concentrations near the EPA MCL of 30 g/L are prevalent in well water throughout the Pojoaque area and San Ildefonso Pueblo. The high gross alpha readings for these wells are related to uranium occurrence.

In 2001, New Community well had the highest total uranium, 21 g/L. The uranium concentrations at Pajarito Well Pump 1 were about 33% of the standard. These measurements are consistent with the levels in previous samples and with the relatively high levels of naturally occurring uranium in other wells and springs in the area.

The usual gross alpha levels in these wells are attributable to the presence of uranium. The gross alpha values in some wells were above the EPA primary drinking water standard of 15 pCi/L but were not detections because of high analytical uncertainties. This standard applies to gross alpha from radionuclides other than radon and uranium.

During the 1999 sampling, analytical laboratory problems caused many apparent detections of strontium-90 where it had not been seen previously. The 2000 and 2001 data support the conclusion that much of the 1999 strontium-90 data were subject to analytical error; no strontium-90 was detected in any of these wells.

The chemical quality of the groundwater, shown in Table 5-24, is consistent with previous observations. The sample from the Pajarito Well Pump 1 exceeded the drinking water standard for total dissolved solids; this level is similar to those previously measured. This well also has a chloride concentration at 60% of the New Mexico groundwater limit.

In 2001, surface water and groundwater samples that the Environmental Surveillance Program collected were analyzed for perchlorate. No samples collected at San Ildefonso contained perchlorate. Our investigations of analytical method performance indicated that samples analyzed by the ion chromatography method probably have a detection limit in the neighborhood of 4   g/L. Samples one of our analytical laboratories analyzed before April 25, 2001, showed many false positives because the analytical laboratory did not perform all the anion removal steps possible in the EPA analytical method. Thus, many of the apparent detections indicated in Table 5-25 are not detections. A new method combining ion chromatography and mass spectrometry shows promise, but, during 2001, it was in development, and performance using this method was poor. See Section F later in this chapter for more information on this topic.

The fluoride values for some wells (Eastside Artesian and Pajarito Pump 1) are about half the NMWQCC groundwater standard of 1.6 mg/L, similar to previous values. Several of the wells (Eastside Artesian and Don Juan Playhouse) have alkaline pH values above the EPA secondary standard range of 6.8 to 8.5; these values do not represent a change from those previously observed in the area.

Many of the wells have sodium values significantly above the EPA health advisory limit of 20 mg/L. The value from Pajarito Well Pump 1 is especially high.

Table 5-26 shows trace metal analyses. The boron value in Pajarito Well Pump 1 was 170% of the NMWQCC groundwater limit of 750   g/L. This value was similar to those of past years. Otowi House Well had detectable selenium.

We performed analyses for organic constituents on selected springs and test wells in 2001. The stations sampled appear in Table 5-27. Some samples were analyzed for VOCs, SVOCs, and PCBs. LANL rejected many of the possible organic detections the analytical laboratory reported because the compounds were either detected in method blanks (that is, they were introduced during laboratory analysis) or detected in trip blanks. Trip blanks go along during sampling to determine if organic constituents come from sample transportation and shipment. Table 5-28 shows organic compounds detected above the analytical laboratory's reporting level in 2001, as well as results from blanks. Organics detected in groundwater in 2001 include trichloroethane[1,1,1-] at the Otowi House well.

2. Sediments

We collected sediments from San Ildefonso Pueblo lands in Mortandad Canyon in 2001 from several stations. The results of radiochemical analysis of sediment samples collected in 2001 appear in Table 5-14. The table also lists the total propagated one-sigma analytical uncertainty and the analysis-specific minimum detectable activity where available. Uranium was analyzed by isotopic methods rather than as total uranium for most samples in 2001; total uranium was calculated from these values using specific activities for each isotope.

To emphasize values that are detections, Tables 5-15 (river sediments) and 5-16 (reservoir sediments) list radiochemical detections for values that are higher than river or reservoir background levels and identify values that are near or above SALs. Table 5-15 shows all tritium detections regardless of screening levels. Detections are defined as values exceeding both the analytical method detection limit (where available) and three times the individual measurement uncertainty. Lab qualifier codes are shown because some analytical results that meet the detection criteria are not detections: in some cases, the analyte was found in the lab blank or was below the method detection limit, but the analytical result was reported as the minimum detectable activity. Results from the 2001 sediment sample analysis are generally consistent with historical data.

In Mortandad Canyon, the channel below the sediment traps seldom has flow and is ill defined. In 2001, we evaluated the location of sediment station Mortandad at MCO-9 and moved it south to a more recently active channel. A station Mortandad at MCO-8.5 was added a short distance upstream. These stations are on LANL property. Results from these two stations are much higher than prior values from these stations (Figure 5-15) in Environmental Surveillance Reports. In sediment radioactivity surveys during 1978 and 1981, Purtymun (1994) found cesium-137 values near MCO-9 ranging from 0.7 to 6.9 pCi/g, bounding 2001 values of 3.1 to 5.7 pCi/g. For plutonium-239, -240, Purtymun found values of 0.1 and 1.3 pCi/g, compared with 2001 values of 0.9 to 2.7 pCi/g. Comparison of the Purtymun (1994) data with the 2001 data indicates no recent movement of cesium into this vicinity.

In 2001, sediment samples from GS-1, MCO-5, MCO-7, MCO-8.5, and MCO-9 in Mortandad Canyon showed cesium-137 concentrations that ranged from 0.5 up to 5 times the SAL value. Median values since 1980 for cesium-137 at the first three of these stations range up to six times greater than the SAL value. Overall, cesium-137 levels at these three stations have declined by factors of 5 to 35 since the early 1980s because of lower cesium-137 discharges from the RLWTF. In 2001, sediment samples near the Laboratory boundary had cesium-137 activity of 1.3 to 5.6 times background. The latter sample, a few feet on the San Ildefonso Pueblo side of the boundary, had 3.2 pCi/g and was 60% of the SAL. A sample collected in 1997 at this location had 2.2 pCi/g.

Sediments from the sampling station located on San Ildefonso Pueblo lands at Los Alamos at Otowi showed the activity of plutonium-239, -240 at 7 times background. Below the confluence of Los Alamos and Pueblo Canyons, plutonium-239, -240 activities are about 40 times background at Los Alamos at Totavi. These values are within the range of previous measurements at these stations. See Section C.3 in this chapter for a more detailed discussion.

F. Sampling Procedures, Analytical Procedures, Data Management, and Quality Assurance

1. Sampling

The Draft Quality Assurance Project Plan (ESH-18, as per the DOE-AL Model SOP for Data Validation 1996) is the basic document covering sampling procedures and quality assurance (QA). All sampling is conducted using strict chain-of-custody procedures, as described in Gallaher (1993). The completed chain-of-custody form serves as an analytical request form and includes the requester or owner, sample barcode number, program code, date and time of sample collection, total number of bottles, the list of analytes to be measured, and the bottle sizes and preservatives for each analysis required.

The “F/UF” column on the tables of analytical results shows a “UF” for nonfiltered samples and an “F” for samples that were filtered through a 0.45-micron filter. We field-filtered radionuclide and metals samples collected at the White Rock Canyon springs to minimize the effects of surface soils and to represent groundwater surfacing at the springs. We also field-filtered surface water samples that were collected for metals analysis. This procedure allows for comparison of analytical results with NMWQCC standards. These standards are mainly for dissolved concentrations, except the mercury and selenium standards that are based on total concentrations. Samples we submitted for analysis of mercury and selenium were not filtered in the field and were analyzed to determine total concentration.

Automated samplers located at gaging stations (Shaull et al., 2001) collected storm runoff. In 2001 homogenization, and filtering if requested, of runoff samples took place at the analytical laboratory. If the automated sampler collected an adequate volume of water, both unfiltered (for total analyte concentration analysis) and filtered (for dissolved analyte analysis) analysis of the samples were requested. If the volume was insufficient, we requested analysis of only the unfiltered samples.

In 2001, we sent samples to four commercial analytical laboratories and one university research laboratory: General Engineering Laboratories, Inc. (GEL), Acculabs, Inc. (Acculabs), Edward S. Babcock & Sons, Inc. (ESB), the New Mexico Scientific Laboratory Division (SLD), and the University of Miami Tritium Laboratory (UoM).

New contracts with GEL and Acculabs were let in 2001. The new contracts required those laboratories to follow the Model Statement of Work for Analytical Laboratories (DOE-AL SOW) that was prepared for the DOE Albuquerque Operations Office (AQA 2000). An addendum describing specific requirements and guidelines for analysis of storm runoff, industrial wastewater, base flow, snowmelt, groundwater, and sediment samples accompanied the DOE-AL SOW. GEL and Acculabs were audited against the DOE-AL SOW in 2001, using procedures that the DOE-AL Analytical Management Program developed (see AGRA [1998] for a description of the procedures). GEL and Acculabs were awarded contracts only after they demonstrated that they met the requirements described in the DOE-AL SOW.

2. Analytical Procedures

a. Metals and Major Chemical Constituents. Storm runoff samples, base flow, snowmelt, and fire-related storm runoff samples are analyzed by methods consistent with 40 CFR 136.3. Groundwater samples and sediments are analyzed using EPA SW-846 methods.

b. Radionuclides. Radiochemical analysis is performed using methods as updated in Gautier (1995) or described in the DOE-AL SOW. Radiological detection limits are calculated according to the equations in the DOE-AL SOW. Sources of uncertainty that are included in the total propagated uncertainty associated with radiological results include both counting uncertainties and sample preparation (measurement) contributors.

We preserve water samples in the field for radiochemical analyses with nitric acid to a pH of 2 or less. Before 1996, the analytical laboratories filtered the preserved water samples. Samples collected in 1996 and after were preserved in the field as before but were not filtered by the laboratories. We collect a separate, unpreserved sample for tritium analysis.

Sediment samples are screened through a number-12 US-standard testing sieve before digestion. The sieve meets ASTM E-11 specifications and screens out materials larger than 1.7 mm.

When trace-level tritium analyses are required, we ship samples to the University of Miami Tritium Laboratory. These samples are collected and analyzed according to procedures described in Tritium Laboratory (1996).

Negative values are sometimes reported in radiological measurements. Negative numbers occur because radiochemistry counting instrument backgrounds must be subtracted to obtain net counts. Because of slight background fluctuations, individual values for samples containing little or no activity can be positive or negative numbers. Although negative values do not represent a physical reality, we report them as they are received from the analytical laboratory. Valid long-term averages can be obtained only if negative values are included in the analytical results.

Infrequent situations exist where net counts are zero, or about zero, resulting in values with an associated uncertainty of zero. In both cases, the problem is not considered significant as the result will be considered a nondetect in either case.

The first case involves net counts of zero. In order to propagate uncertainties, the relative uncertainties, in quadrature, are summed (total propagated uncertainty [TPU]). The resulting relative uncertainty is then multiplied by the result to arrive at the actual uncertainty. If the result is zero, multiplying any number by zero will result in zero, and the uncertainty will thus also be zero. GEL's reporting policy in 2001 was to not report TPUs of zero when activities of samples were zero but instead to report a TPU of 1, as a default value, when activities of samples were zero.

The second case, where activities are close to zero, is a reporting issue involving significant digits. For these low activities, a large number of leading zeros may be reported to provide a result with the requisite number of significant digits. However, the situation is the same; these values should be considered to be zero, or nondetects.

c. Organic Compounds. See Table A-9 for organic methods and analytes of surface water, groundwater, and sediment analysis. Tables A-10–13 list the specific compounds that are analyzed in each suite. All samples we submit for organic chemistry analyses are collected in brown glass bottles, and the aqueous VOC samples are preserved with hydrochloric acid. A trip blank or field blank always accompanies the VOC samples. In addition, most analytical methods require the analysis of laboratory-prepared method blanks or instrument blanks with each batch of samples. Organic target analytes that are detected in these blanks indicate contamination from the sampling or analytical environments. Certain organic compounds used in analytical laboratories are frequently detected in blanks. That is, contamination introduced by the laboratories is common for these compounds. These compounds include acetone, methylene chloride, toluene, 2-butanone, di-n-butyl phthalate, di-n-octyl phthalate, and bis(2-ethylhexyl)phthalate (Fetter 1993).

3. Data Management and Quality Assurance

a. Data Management. GEL and Acculabs submitted Level 4 data packages (comprehensive data packages that include information about all quality control, chromatograms, etc.) to ESH-18 both electronically and in paper report form. We use an internal database to track the status of analyses submitted electronically, and final analytical results are also stored in that database. ESB, SLD, and UoM submitted Level 2 data packages (analytical results and associated quality control summaries only) in paper report form. Analytical data are validated according to the specifications of the DOE-AL Model Data Validation Procedure (AQA 2001). Table 5-4 lists qualifier and validation flag codes that accompany 2001 sediments and water data. The ESH-18 sample management representative performs technical oversight of analytical laboratories, with the assistance of the DOE-AL Analytical Management Program.

b. Quality Assurance. The DOE-AL SOW for analytical chemistry gives detailed requirements for the content of subcontract laboratory QA plans. The DOE-AL SOW also describes the exact requirements for handling ESH-18 samples, from initial sample receipt to the final data report. All of the applicable requirements for batch quality control (QC), which may include method blanks, matrix spikes, laboratory control samples, calibration verifications, detection limit verifications, etc., are discussed in that document.

In addition to batch QC performed by laboratories, ESH-18 may submit blind field QC samples to test analytical laboratory proficiency and spot check for analytical problems. These performance evaluation (PE) samples include blanks, field duplicates, and occasionally samples spiked with known amounts of analyte.

Performance evaluation blanks (PEB) are blank water samples with deionized water from a known source. Field blanks (FB) aid in the detection of contamination encountered during sampling events. Field blanks are collected during sampling events. Sample containers are filled with DI water brought to the sampling site in a clean container. The field blanks are preserved and analyzed in the same manner as the samples collected for environmental surveillance. Analysis of field blanks can indicate the introduction of contaminants to samples by cross-contamination, materials suspended in air and water, and by physical contamination (e.g., any sediment introduced to the sample during sampling).

Tables 5-29, 5-30, and 5-31 present the analytical results for the blanks. Tables 5-32, 5-33, and 5-34 present detections of analytes in performance evaluation blanks and field blanks. The detections in the field blanks indicate contamination that may have been introduced to the samples at the time of sample collection. In many cases, however, the quality of the source of the DI water used in the blanks appears to be in question. Several PEBs and FBs contained small, but measurable, amounts of various analytes, including a number of metals (e.g., aluminum, copper, iron, and zinc) and general inorganic analytes (e.g., silica and sodium). The source of the DI water was upgraded at the end of the 2001 sampling season with a deionization filter that is designed to deliver high-purity DI water.

The analytical result tables present the analytical results for the field duplicates. We did not submit PE samples for sediment analyses because soil PE samples are easily recognized by analytical laboratories. Similarly, PE samples are easily distinguishable from storm runoff. Because of this, we do not send PE samples with storm runoff samples.

The analytical laboratories following the DOE-AL SOW are also required to participate in several independent national performance evaluation programs: the Environmental Measurement Laboratory Quality Assessment Program (QAP) and the Department of Energy Mixed Analyte Performance Evaluation Program (MAPEP) for radiochemistry analysis and the EPA Water Supply (WS), the EPA Water Pollution (WP), the EPA NPDES (DMRQA), and the MAPEP programs for organic and inorganic constituents.

The QAP is designed to test the quality of the environmental measurements that its contractor laboratories report to DOE. The Environmental Measurements Laboratory (EML) administers the QAP for the DOE Office of Environmental Management (EM). The QAP meets the requirements of DOE Order 414.1A, which requires DOE facilities to substantiate, by an external assessment, the quality of radiochemical analyses by their subcontract analytical laboratories. The QAP Web site describes the history and objectives of the program in detail, along with access to the QAP reports (*http://www.eml.doe.gov/qap*).

The Mixed Analyte Performance Evaluation Program (MAPEP) is another external, independent program that includes radionuclides and hazardous waste contaminants that are covered by the Resource Conservation and Recovery Act (RCRA). The Radiological and Environmental Sciences Laboratory (RESL), a government-owned and government-operated (GOGO) laboratory, administers MAPEP. RESL is located at the Central Facilities Area of the Idaho National Engineering and Environmental Laboratory (INEEL). The MAPEP Web site describes the history and objectives of the program in detail and provides access to MAPEP reports (*http://www.inel.gov/resl/mapep/*).

The WS, WP, and DMRQA programs are EPA-required programs supporting ground water and wastewater compliance programs. Commercial National Environmental Laboratory Accreditation Conference (NELAC)-certified performance-testing organizations administer these programs. See the EPA and DMRQA Web sites (*http://www.epa.gov/waterscience/methods/wswpinfo.html* and *http://www.dmrqa.com*) for the history and objectives of these programs, along with performance data.

Categories of results from all of these PE programs are (1) acceptable (result within the two-sigma acceptance range), (2) acceptable with warning (result within the three-sigma acceptance range), and (3) not acceptable (result outside the three-sigma acceptance range). The laboratories initiate internal corrective actions when PE results are categorized as not acceptable, and those corrective actions are spot-checked during various laboratory oversight activities.

PE Sample Results Summaries for Analytical Laboratories

General Engineering Laboratories, Inc.

ESH-18 submitted field blank water samples to GEL. Results for all analytes except toluene and methylene chloride were generally below the detection limit, and when results were above the detection limit, they were generally attributable to laboratory contamination; that is, the analyte was also detected in the batch preparation blank. Blank results not attributable to laboratory contamination were random and did not repeat between sampling events. Toluene and methylene chloride (both common laboratory contaminants) were detected in a significant number of field blanks. An investigation by the laboratory found chronic random low-level laboratory contamination for these analytes and led to a corrective action for reduction of low-level false positives.

Analysis of the QAP samples in soil and water had "acceptable" or "acceptable with warning" scores for all radionuclides. The MAPEP-00-S7 strontium-90 in soil result and the MAPEP-00-W8 strontium-90 in water were scored as not acceptable, and the MAPEP-01-S8 americium-241 in soil was scored as not acceptable. The laboratory subsequently instituted corrective actions for these failures. A detection of americium-241 in a DI water blank submitted to the laboratory had a value less than three times the minimum detectable activity, and the value, as per the DOE-AL Model Data Validation Procedure, is deemed estimated. Uranium-234, plutonium-238, and amercium-241 were detected in various field blanks. The QC associated with all of these samples does not indicate problems with the analysis. Both of the samples indicating the presence of amercium-241 were submitted to GEL before the corrective action for americium-241 in soil. "Acceptable" or "acceptable with warning" scores were achieved for all other radionuclides, including americium-241 in water, analyzed in the MAPEP program.

Several organic and inorganic analytes in the MAPEP samples had scores of "not acceptable." All of the organic and inorganic analytes included in the MAPEP program are also included in the WS, WP, and DMRQA programs. All analytes in the MAPEP samples with "not acceptable" results were analyzed with "acceptable" results in these programs.

The QC associated with a high TDS value in one DI water blank did not indicate laboratory analysis problems. The sample also contained a small, but measurable, amount of nitrate. Another blank sample had a high specific conductance value. Other samples also had small, but measurable, concentrations of various ions. These detections indicate the known source of DI water used for blanks may have not been of sufficiently high quality, and, as mentioned above, we upgraded the source of the DI water at the end of the 2001 sampling season with a deionization filter that is designed to deliver high-purity DI water.

"Acceptable" or "acceptable with warning" scores were achieved for all organic and inorganic constituents in the DMRQA program. Several organic and inorganic analytes in the WS and WP programs were scored as "unacceptable." The laboratory re-ordered blind PE samples for all failed analytes and analyzed these samples as part of their corrective action. All reanalyses achieved "acceptable" scores. In all cases, no analyte had "unacceptable" results reported in two consecutive PE data sets.

We added perchlorate ($ClO4-$) as an analyte of concern following its placement on EPA's Contaminant Candidate List (EPA 1998). Results from initial sampling and analysis of "real" waters (i.e. groundwaters from Los Alamos) showed random low-level perchlorate detects in water samples that were not expected to have perchlorate. Investigations, including several blind field spike sets, identified the following problems:

The EPA-recommended analytical method for perchlorate is *Method 314; Determination of Perchlorate in Drinking Water Using Ion Chromatography* (EPA 1999). This procedure recommends a three ionic-cartridge cleanup step that the analytical laboratory was not initially using. Because this cleanup was not being used, interferences from other anions, primarily sulfate, were producing random and highly variable noise in the baseline at the perchlorate retention time. In April, a corrective action was requested, and GEL implemented it. Although the implementation of the cleanup did improve the variation in the baseline, a significant background signal above zero was still seen in most of the “real” samples.

The method detection limit (MDL) given in Method 314 is 0.53 g/L. The GEL-derived MDL, using the procedure described in 40CFR136 with clean spiked water, generally agrees with this value; however, MDL verification studies, as required by the DOE-AL SOW, show that, in “real” samples, spikes at the MDL cannot reliably be detected. In addition, using an MDL of about 1 g/L has been shown to produce an unacceptable number of “false positives” in the range of 1 to 4 g/L. From these studies and similar studies conducted at the DOE Pantex site in Texas, GEL has recommended to the DOE a 4- g/L detection limit for Method 314 in “real” waters.

EPA and several state regulatory groups, including NMED, are considering lowering the MCL for perchlorate to below 4 g/L. Given the problems we have encountered with using Method 314 to measure perchlorate at low concentrations, we are working with the DOE and the NMED to investigate alternative methods for determining perchlorate.

Acculabs, Inc.

Acculabs developed a method for determining perchlorate in water and soil matrices using liquid chromatography/mass spectrometry/mass spectrometry (LC/MS/MS) in 2001. The aqueous method detection limit was purported to be 0.25 g/L. For this reason, Acculabs was contracted to conduct perchlorate analysis of groundwater samples.

The LC/MS/MS method was in the development stages in mid-2001, and samples ESH-18 submitted were the first attempt to analyze actual groundwater samples for perchlorate by the LC/MS/MS technique. An MDL study performed at the analytical laboratory indicated the average recovery at very low concentrations of perchlorate (~0.1 g/L) was approximately 1.5 times greater than the known spiked values of the samples. The laboratory control samples (LCS) and matrix spikes and matrix spike duplicates (MS/MSD) samples all had recoveries that ranged from 2.5 to 5 times greater than the known spiked values of the LCSs and MS/MSDs.

Performance samples ESH-18 submitted in 2001 contained concentrations of perchlorate, in groundwater, that ranged from 1 g/L to 5 g/L. The values acquired by the LC/MS/MS methodology ranged from 2 to 5 times the known spiked values, with the highest errors occurring at the lowest spiked concentrations. The laboratory ran the performance samples again after subsequent development of the method, with results ranging from within 10% to 60% greater than the known spiked values.

Although the laboratory noted the high recoveries, it was decided to proceed with the analyses of the ESH-18 samples while they investigated the cause of the high recoveries. Acculabs considered the method still under development until February 2002.

Edward S. Babcock & Sons, Inc.

ESB analyzed perchlorate in groundwaters by Method 314 with a purported detection limit of 2.2 g/L. The laboratory did not employ the three ionic-cartridge cleanup step as required by the procedure.

Performance samples ESH-18 submitted in 2001 contained concentrations of perchlorate in groundwater that ranged from 1 g/L to 5 g/L. The laboratory was not able to reliably detect perchlorate at less than 4 g/L, with reported values 25% to 65% higher than the known concentrations in the samples spiked at 5 g/L.

Only QC summaries were required to be included in the data packages ESB submitted to ESH-18 in 2001. Service with ESB was terminated in 2002 after the laboratory declined to enter into a new contract that required the three ionic-cartridge cleanup and following the DOE-AL SOW.

Analytical Detections

For low-level radiochemical results, data are qualified based upon total propagated uncertainties and the proximity to the detection limits.

Radiological detection limits are sample specific, are based on Currie’s formula (Currie 1968), and are reported in the tables. The laboratories have determined detection limits for each of the other analytical methods. In deriving the detection limits, the laboratories included the average uncertainties associated with the entire analytical method. Sources of error considered include average counting uncertainties, sample preparation effects, digestion, dilutions, gravimetric and pipetting uncertainties, and spike recoveries.

Although these MDLs determined by the analytical laboratories give an idea of the average limit of detection for a particular measurement technique, the detection limits do not apply to each individual sample measurement (except for radiological analysis). Instead, the question of whether or not an individual measurement is a detection is evaluated in light of its individual measurement uncertainty. For radiochemical analytical results, the analytical uncertainties are reported in the tables. These uncertainties represent a one standard deviation (one-sigma) propagated uncertainty. "It is virtually unanimously accepted that an analyte should be reported as present when it is measured at a concentration three-sigma or more above the corresponding method blank," (Keith 1991). We report radiochemical detections as values greater than three times the reported uncertainty. For sediments, the values reported as detections in the table are also above background levels determined for fallout (or natural background levels in the case of uranium).

The limit of quantification, or LOQ, is the level where the concentration of an analyte can be quantified with confidence. Again according to Keith (1991), "When the analyte signal is 10 or more times larger than the standard deviation of the measurements, there is a 99% probability that the true concentration of the analyte is ±30% of the calculated concentration." Thus, measured values near the detection limit or less than 10 times the analytical uncertainty do not provide a reliable indication of the amount present. The importance of this number is demonstrated when analytical results are compared against standards; the analytical result should be greater than 10 times the analytical uncertainty for the comparison to be meaningful.

G. Unplanned Releases

1. Radioactive Liquid Materials

One unplanned radioactive liquid release occurred in 2001 when less than 50 gallons of partially treated radioactive liquid wastewater were inadvertently released from Holding Tank 21-113 at TA-21.

2. Nonradioactive Liquid Materials

Three unplanned releases of nonradioactive liquid took place in 2001. The following is a summary of these discharges.

- Two unplanned releases of sanitary sewage:

  A plugged leach field line caused an unplanned release from a permitted septic tank (LA-45).

  A plugged sanitary collection system line caused a sanitary wastewater release from a manhole (MH 03-696).

- A broken air compressor line allowed approximately four gallons of oil to enter a floor drain that was connected to NPDES Outfall 03A028.

ESH-18 personnel investigated all unplanned releases of liquids. Facility operators have completed corrective actions, and ESH-18 has recommended closure of these releases. It is anticipated that these unplanned release investigations will be closed when personnel from the NMED's Surface Water Quality Bureau become available for inspections.

H. Tables

Table 5-1. Summary of Discharges from Stream-Monitoring Stations at Los Alamos National Laboratory for Water Year 2001 (October 1, 2000–September 30, 2001)

Canyon Sites	Days with Flow	Volume of Water (Acre Feet)	Instantaneous Max (ft^3/s)
E025 Los Alamos above Ice Rink	241	505	185
E026 Los Alamos below Ice Rink[a]	201	463	185
E030 Los Alamos above DP Canyon	162	510	60
E038 DP above TA-21	122	107	208
E039 DP below Meadow at TA-21	136	133	77
E040 DP above Los Alamos Canyon	52	18	33
E042 Los Alamos above SR-4[b]	137	537	146
E060 Pueblo above SR-502[b]	365	850	1,440
E089 Guaje above Rendija[a]	32	73	644
E090 Rendija above Guaje[a]	7	93	2,120
E123 Sandia below Wetlands	365	342	50
E125 Sandia above SR-4[b]	0	0	0
E200 Mortandad below Effluent Canyon	255	55	49
E202 Mortandad above Sediment Traps	4	0.6	0.23
E203 Mortandad below Sediment Traps	0	0	0
E204 Mortandad at LANL Boundary[b]	0	0	0
E218 Cañada del Buey near TA-46	67	11	20
E225 Cañada del Buey near MDA G	0	0	0
E230 Cañada del Buey above SR-4[b]	6	2.2	8.1
E240 Pajarito below SR-501[a]	60	88	154
E241 Pajarito above Starmers[a]	81	7.6	108
E242 Starmers above Pajarito	365	117	103
E245 Pajarito above TA-18	140	290	137
E246 Threemile above Pajarito	40	15.2	25
E250 Pajarito above SR-4[b]	81	104	22
E252 Water above SR-501[a]	193	157	255
E253 Cañon de Valle above SR-501[a]	50	34	19
E262 Cañon de Valle above Water	67	7.9	26
E262.5 Water below MDA AB[a]	22	14	50
E263 Water at SR-4	53	180	87
E265 Water below SR-4[b]	55	122	96
E267 Potrillo above SR-4[b]	4	1.4	6.8
E275 Ancho below SR-4[b]	5	0.9	34
E350 Rio de los Frijoles at Bandelier	365	950	14

[a] Based on partial year of record.
[b] Station at downstream Laboratory boundary.

Table 5-2. Radiochemical Analysis of Snowmelt and Base Flow for 2001 (pCi/L[a])

Station Name	Date	Codes[b]			^{3}H Result	^{3}H Uncert	^{3}H MDA	^{90}Sr Result	^{90}Sr Uncert	^{90}Sr MDA
Regional Stations										
Rio Chama at Chamita (bank)	08/01	WS	UF	CS	-76	47	161	0.21	0.09	0.28
Rio Grande at Embudo (bank)	08/01	WS	UF	CS	-99	45	158	0.18	0.12	0.39
Rio Grande at Otowi Upper (bank)	07/17	WS	UF	CS	-52	48	166	0.33	0.13	0.30
Rio Grande at Otowi (bank)	07/17	WS	F	CS						
Rio Grande at Otowi (bank)	07/17	WS	UF	CS	-105	47	168	0.01	0.07	0.20
Rio Grande at Frijoles (bank)	09/26	WS	UF	CS	-55	55	186	0.12	0.07	0.23
Rio Grande at Cochiti	09/26	WS	UF	CS	-82	54	184	0.13	0.09	0.28
Jemez River	04/18	WS	UF	CS	-169	50	185	0.17	0.11	0.35
Jemez River	04/18	WS	UF	DUP				0.45	0.10	0.27
Jemez River	04/18	WS	UF	RE						
Pajarito Plateau Stations										
Guaje Canyon:										
Guaje above Rendija	04/18	WM	F	CS				0.21	0.07	0.22
Guaje above Rendija	04/18	WM	UF	CS	-169	51	186	0.18	0.08	0.27
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):										
Los Alamos Reservoir	05/01	WS	F	CS				0.10	0.11	0.38
Los Alamos Reservoir	05/01	WS	F	DUP				0.23	0.16	0.52
Los Alamos Reservoir	05/01	WS	UF	CS	-57	55	189	0.21	0.11	0.36
Los Alamos Reservoir	05/01	WS	UF	DUP						
Los Alamos above Ice Rink	03/07	WM	UF	CS	-143	60	212	0.35	0.15	0.50
Los Alamos above Ice Rink	03/07	WM	UF	DUP	-170	58	210			
Los Alamos above Ice Rink	03/07	WM	F	CS				0.56	0.12	0.35
Los Alamos above Ice Rink	03/07	WM	F	DUP				0.17	0.14	0.47
Los Alamos above Ice Rink	03/15	WM	F	CS				0.19	0.08	0.25
Los Alamos above Ice Rink	03/15	WM	F	DUP						
Los Alamos above Ice Rink	03/15	WM	UF	CS	-29	53	179	0.40	0.09	0.27
Los Alamos above Ice Rink	03/20	WM	F	CS				0.41	0.09	0.24
Los Alamos above Ice Rink	03/20	WM	UF	CS	0	53	178	0.36	0.08	0.23
Los Alamos above Ice Rink	03/20	WM	UF	DUP						
Los Alamos above Ice Rink	03/20	WM	F	CS				0.52	0.08	0.24
Los Alamos above Ice Rink	03/20	WM	F	DUP						
Los Alamos above Ice Rink	03/20	WM	UF	CS	0	53	179	0.41	0.09	0.24
Los Alamos above Ice Rink	04/04	WM	F	CS				0.37	0.11	0.36
Los Alamos above Ice Rink	04/04	WM	UF	CS	28	53	176	0.47	0.07	0.22
Los Alamos above Ice Rink	04/04	WM	UF	DUP						
Los Alamos above Ice Rink	05/02	WM	F	CS				0.07	0.10	0.34
Los Alamos above Ice Rink	05/02	WM	UF	CS	-58	55	191	0.38	0.16	0.49
Los Alamos below Ice Rink	04/18	WM	F	CS				0.20	0.11	0.37
Los Alamos below Ice Rink	04/18	WM	F	DUP						
Los Alamos below Ice Rink	04/18	WM	UF	CS	-86	54	188	0.28	0.09	0.30
Los Alamos below Ice Rink	04/18	WM	UF	DUP						
Los Alamos below Ice Rink	08/01	WS	F	CS				1.13	0.19	0.26
Los Alamos below Ice Rink	08/01	WS	F	DUP				1.07	0.18	0.19
Los Alamos below Ice Rink	08/01	WS	UF	CS	0	50	163	1.91	0.29	0.25
Los Alamos below Ice Rink	08/01	WS	UF	DUP	25	49	158			
Los Alamos below Ice Rink	08/02	WS	F	CS				1.34	0.22	0.28
Los Alamos below Ice Rink	08/02	WS	F	DUP						
Los Alamos below Ice Rink	08/02	WS	UF	CS	235	53	152	1.28	0.21	0.20
Los Alamos below Ice Rink	08/02	WS	UF	DUP	184	52	153			
Los Alamos at Upper GS	03/26	WM	F	CS				0.83	0.11	0.29
Los Alamos at Upper GS	03/26	WM	F	DUP						
Los Alamos at Upper GS	03/26	WM	UF	CS	85	55	175	0.83	0.08	0.23
Los Alamos at Upper GS	03/26	WM	UF	DUP						

Station Name	Date	^{137}Cs Result	^{137}Cs Uncert	^{137}Cs MDA	^{234}U Result	^{234}U Uncert	^{234}U MDA
Regional Stations							
Rio Chama at Chamita (bank)	08/01	1.27	1.14	2.52	0.961	0.086	0.008
Rio Grande at Embudo (bank)	08/01	1.41	0.82	3.04	1.160	0.098	0.020
Rio Grande at Otowi Upper (bank)	07/17	-1.88	1.89	6.36	0.843	0.072	0.025
Rio Grande at Otowi (bank)	07/17						
Rio Grande at Otowi (bank)	07/17	-3.20	1.83	6.10	0.909	0.077	0.028
Rio Grande at Frijoles (bank)	09/26	-0.64	0.82	2.74	0.834	0.084	0.050
Rio Grande at Cochiti	09/26	-0.81	0.80	2.71	0.728	0.069	0.028
Jemez River	04/18	1.19	1.23	3.27	0.668	0.076	0.072
Jemez River	04/18						
Jemez River	04/18						
Pajarito Plateau Stations							
Guaje Canyon:							
Guaje above Rendija	04/18	0.44	0.63	2.30	0.087	0.022	0.041
Guaje above Rendija	04/18	-1.82	1.07	3.43	0.185	0.037	0.073
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):							
Los Alamos Reservoir	05/01	0.39	1.04	1.75	0.047	0.011	0.007
Los Alamos Reservoir	05/01						
Los Alamos Reservoir	05/01	1.66	1.37	3.67	0.077	0.015	0.018
Los Alamos Reservoir	05/01						
Los Alamos above Ice Rink	03/07	-0.95	0.78	2.65	0.061	0.026	0.087
Los Alamos above Ice Rink	03/07	0.62	0.82	2.93	0.105	0.035	0.074
Los Alamos above Ice Rink	03/07	0.09	0.75	2.61	0.025	0.022	0.107
Los Alamos above Ice Rink	03/07						
Los Alamos above Ice Rink	03/15	-0.66	0.65	2.21	0.051	0.024	0.069
Los Alamos above Ice Rink	03/15						
Los Alamos above Ice Rink	03/15	0.71	0.87	3.10	0.090	0.038	0.128
Los Alamos above Ice Rink	03/20	0.83	0.61	2.32	0.042	0.022	0.069
Los Alamos above Ice Rink	03/20	1.21	0.87	3.09	0.045	0.025	0.093
Los Alamos above Ice Rink	03/20	0.34	0.80	2.84			
Los Alamos above Ice Rink	03/20	0.00	0.67	2.36	0.077	0.026	0.023
Los Alamos above Ice Rink	03/20						
Los Alamos above Ice Rink	03/20	1.89	0.89	3.18	0.044	0.028	0.125
Los Alamos above Ice Rink	04/04	0.42	0.99	1.74	0.039	0.023	0.086
Los Alamos above Ice Rink	04/04	0.83	0.91	3.26	0.148	0.031	0.064
Los Alamos above Ice Rink	04/04	0.45	0.96	3.40			
Los Alamos above Ice Rink	05/02	0.62	0.55	2.05	0.065	0.017	0.037
Los Alamos above Ice Rink	05/02	-1.38	1.04	3.46	0.064	0.016	0.037
Los Alamos below Ice Rink	04/18	0.70	0.71	2.61	0.062	0.018	0.013
Los Alamos below Ice Rink	04/18				0.017	0.012	0.045
Los Alamos below Ice Rink	04/18	-0.39	1.03	3.52	0.092	0.022	0.041
Los Alamos below Ice Rink	04/18	1.04	0.93	3.41			
Los Alamos below Ice Rink	08/01	0.44	0.95	3.55	0.444	0.046	0.019
Los Alamos below Ice Rink	08/01	-0.13	1.32	4.72	0.441	0.044	0.022
Los Alamos below Ice Rink	08/01	0.01	1.92	6.95	3.820	0.346	0.145
Los Alamos below Ice Rink	08/01	3.21	3.43	8.39			
Los Alamos below Ice Rink	08/02	-0.12	0.98	3.42	0.388	0.045	0.037
Los Alamos below Ice Rink	08/02	1.64	0.87	3.42			
Los Alamos below Ice Rink	08/02	3.46	1.92	7.62	0.957	0.087	0.024
Los Alamos below Ice Rink	08/02	1.61	1.94	7.26	0.987	0.092	0.010
Los Alamos at Upper GS	03/26	0.37	0.58	2.15	0.056	0.017	0.029
Los Alamos at Upper GS	03/26				0.071	0.019	0.031
Los Alamos at Upper GS	03/26	0.24	0.89	3.02	0.206	0.032	0.011
Los Alamos at Upper GS	03/26	0.39	1.27	4.53			

Station Name	Date	$^{235,236}U$ Result	$^{235,236}U$ Uncert	$^{235,236}U$ MDA	^{238}U Result	^{238}U Uncert	^{238}U MDA
Regional Stations							
Rio Chama at Chamita (bank)	08/01	0.0463	0.0131	0.0227	0.614	0.061	0.023
Rio Grande at Embudo (bank)	08/01	0.0381	0.0105	0.0074	0.608	0.059	0.025
Rio Grande at Otowi Upper (bank)	07/17	0.0491	0.0106	0.0056	0.541	0.050	0.015
Rio Grande at Otowi (bank)	07/17						
Rio Grande at Otowi (bank)	07/17	0.0235	0.0073	0.0058	0.538	0.051	0.020
Rio Grande at Frijoles (bank)	09/26	0.0662	0.0200	0.0446	0.590	0.065	0.030
Rio Grande at Cochiti	09/26	0.0838	0.0169	0.0081	0.433	0.047	0.028
Jemez River	04/18	0.0303	0.0134	0.0355	0.299	0.044	0.035
Jemez River	04/18						
Jemez River	04/18						
Pajarito Plateau Stations							
Guaje Canyon:							
Guaje above Rendija	04/18	0.0005	0.0100	0.0533	0.037	0.014	0.033
Guaje above Rendija	04/18	0.0327	0.0145	0.0383	0.148	0.031	0.048
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):							
Los Alamos Reservoir	05/01	0.0246	0.0094	0.0229	0.030	0.010	0.023
Los Alamos Reservoir	05/01						
Los Alamos Reservoir	05/01	0.0149	0.0062	0.0067	0.035	0.011	0.023
Los Alamos Reservoir	05/01						
Los Alamos above Ice Rink	03/07	-0.0075	0.0113	0.0977	0.041	0.018	0.022
Los Alamos above Ice Rink	03/07	0.0205	0.0188	0.0934	0.085	0.031	0.074
Los Alamos above Ice Rink	03/07	0.0000	1.0000	0.0270	0.006	0.016	0.107
Los Alamos above Ice Rink	03/07						
Los Alamos above Ice Rink	03/15	0.0000	1.0000	0.0253	0.037	0.019	0.025
Los Alamos above Ice Rink	03/15						
Los Alamos above Ice Rink	03/15	-0.0033	0.0033	0.1020	0.083	0.035	0.037
Los Alamos above Ice Rink	03/20	-0.0041	0.0122	0.1010	0.029	0.020	0.087
Los Alamos above Ice Rink	03/20	0.0110	0.0142	0.0657	0.044	0.020	0.052
Los Alamos above Ice Rink	03/20						
Los Alamos above Ice Rink	03/20	0.0258	0.0150	0.0233	0.043	0.020	0.023
Los Alamos above Ice Rink	03/20						
Los Alamos above Ice Rink	03/20	0.0192	0.0136	0.0260	0.082	0.032	0.103
Los Alamos above Ice Rink	04/04	-0.0624	0.0231	0.1350	-0.033	0.025	0.132
Los Alamos above Ice Rink	04/04	0.0209	0.0116	0.0359	0.147	0.029	0.036
Los Alamos above Ice Rink	04/04						
Los Alamos above Ice Rink	05/02	0.0103	0.0086	0.0368	0.015	0.010	0.041
Los Alamos above Ice Rink	05/02	-0.0025	0.0065	0.0296	0.044	0.012	0.026
Los Alamos below Ice Rink	04/18	-0.0035	0.0035	0.0354	0.034	0.013	0.013
Los Alamos below Ice Rink	04/18	0.0063	0.0078	0.0361	0.010	0.007	0.013
Los Alamos below Ice Rink	04/18	0.0127	0.0115	0.0481	0.047	0.016	0.041
Los Alamos below Ice Rink	04/18						
Los Alamos below Ice Rink	08/01	0.0393	0.0117	0.0244	0.395	0.042	0.019
Los Alamos below Ice Rink	08/01	0.0442	0.0111	0.0171	0.348	0.038	0.025
Los Alamos below Ice Rink	08/01	0.2610	0.0559	0.0937	3.910	0.351	0.024
Los Alamos below Ice Rink	08/01						
Los Alamos below Ice Rink	08/02	0.0422	0.0128	0.0289	0.255	0.034	0.037
Los Alamos below Ice Rink	08/02						
Los Alamos below Ice Rink	08/02	0.0315	0.0116	0.0306	0.829	0.078	0.024
Los Alamos below Ice Rink	08/02	0.0798	0.0187	0.0276	0.882	0.085	0.040
Los Alamos at Upper GS	03/26	-0.0080	0.0057	0.0373	0.048	0.014	0.011
Los Alamos at Upper GS	03/26	0.0209	0.0095	0.0113	0.033	0.015	0.039
Los Alamos at Upper GS	03/26	0.0119	0.0120	0.0428	0.123	0.024	0.029
Los Alamos at Upper GS	03/26						

Table 5-2. Radiochemical Analysis of Snowmelt and Base Flow for 2001 (pCi/L[a]) (Cont.)

					^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station Name	**Date**	**Codes[b]**			**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Pajarito Plateau Stations (Cont.)																						
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																						
DPS-1	03/28	WM	F	CS				76.60	9.86	0.23	0.00	0.70	2.65	1.210	0.111	0.045	0.0504	0.0172	0.0390	0.218	0.036	0.050
DPS-1	03/28	WM	UF	CS	197	57	174	95.20	6.70	0.25	1.89	0.86	3.16	1.130	0.112	0.085	0.0683	0.0297	0.0884	0.204	0.040	0.077
Los Alamos above SR-4	03/15	WM	F	CS				1.40	0.10	0.17	0.30	0.72	2.50	0.069	0.027	0.092	-0.0031	0.0136	0.1000	0.054	0.023	0.071
Los Alamos above SR-4	03/15	WM	F	DUP				1.59	0.10	0.20												
Los Alamos above SR-4	03/15	WM	UF	CS	116	57	180	1.48	0.23	0.39	1.79	0.91	3.21	0.209	0.059	0.134	-0.0035	0.0035	0.1060	0.086	0.036	0.039
Los Alamos above SR-4	03/15	WM	UF	DUP	58	55	179				2.06	1.27	4.66									
Los Alamos above SR-4	03/21	WM	F	CS				1.58	0.13	0.30	-0.73	0.66	2.21	0.071	0.019	0.044	0.0068	0.0083	0.0314	0.027	0.010	0.009
Los Alamos above SR-4	03/21	WM	F	DUP																		
Los Alamos above SR-4	03/21	WM	UF	CS	-28	51	174	1.48	0.12	0.21	-0.43	1.02	3.45	0.103	0.021	0.031	0.0234	0.0112	0.0310	0.040	0.018	0.053
Los Alamos above SR-4	04/04	WM	F	CS				0.85	0.09	0.23	0.00	0.63	2.36	0.124	0.026	0.034	0.0196	0.0108	0.0337	0.100	0.023	0.012
Los Alamos above SR-4	04/04	WM	F	DUP										0.096	0.025	0.048	0.0208	0.0105	0.0141	0.085	0.023	0.038
Los Alamos above SR-4	04/04	WM	UF	CS	28	53	177	0.92	0.09	0.21	1.31	0.85	3.08	0.281	0.044	0.047	0.0217	0.0120	0.0374	0.157	0.030	0.014
Los Alamos above SR-4	04/18	WM	F	CS				0.90	0.14	0.23	1.11	0.71	2.65	0.044	0.016	0.032	0.0220	0.0118	0.0324	0.026	0.013	0.032
Los Alamos above SR-4	04/18	WM	F	DUP				0.85	0.09	0.22												
Los Alamos above SR-4	04/18	WM	UF	CS	-29	55	188	1.21	0.12	0.31	0.55	0.81	2.91	0.134	0.028	0.045	0.0417	0.0165	0.0452	0.110	0.026	0.045
Los Alamos above SR-4	05/02	WM	F	CS				0.93	0.12	0.33	1.13	0.54	1.94	0.039	0.011	0.025	-0.0009	0.0037	0.0248	0.054	0.013	0.020
Los Alamos above SR-4	05/02	WM	UF	CS	-58	55	190	0.49	0.15	0.45	1.29	1.04	3.72	0.081	0.018	0.031	0.0176	0.0085	0.0243	0.053	0.014	0.009
Los Alamos above SR-4	06/15	WS	F	CS				1.05	0.22	0.38	2.29	0.95	3.83	0.068	0.014	0.022	0.0024	0.0062	0.0253	0.052	0.012	0.017
Los Alamos above SR-4	06/15	WS	UF	CS	54	51	166	1.00	0.17	0.36	1.41	1.95	7.16	0.207	0.031	0.053	0.0346	0.0106	0.0196	0.260	0.033	0.025
Los Alamos below LA Weir	03/15	WM	F	CS				1.28	0.14	0.31	0.62	0.71	2.60	0.202	0.031	0.010	0.0112	0.0065	0.0102	0.138	0.025	0.010
Los Alamos below LA Weir	03/15	WM	F	DUP										0.222	0.059	0.104	0.0215	0.0206	0.1310	0.127	0.044	0.038
Los Alamos below LA Weir	03/15	WM	UF	CS	87	56	181	1.12	0.11	0.27	1.64	0.96	3.48	0.263	0.067	0.109	0.0148	0.0149	0.0402	0.233	0.062	0.109
Los Alamos below LA Weir	03/21	WM	F	CS				1.35	0.11	0.21	-0.23	0.49	1.69	0.076	0.027	0.078	-0.0040	0.0184	0.0727	0.056	0.021	0.056
Los Alamos below LA Weir	03/21	WM	UF	CS	29	54	180	1.39	0.09	0.20	-0.23	1.02	3.54	0.070	0.019	0.030	0.0123	0.0123	0.0441	0.049	0.015	0.011
Los Alamos below LA Weir	04/04	WM	F	CS				1.00	0.08	0.21	0.93	0.67	2.37	0.030	0.019	0.073	0.0044	0.0111	0.0561	0.008	0.011	0.048
Los Alamos below LA Weir	04/04	WM	F	DUP																		
Los Alamos below LA Weir	04/04	WM	UF	CS	58	55	179	1.01	0.15	0.19	0.58	0.84	2.91	0.105	0.027	0.053	-0.0025	0.0081	0.0528	0.108	0.026	0.015
Los Alamos below LA Weir	04/18	WM	F	CS				0.92	0.15	0.24	0.18	0.88	3.00	0.057	0.016	0.034	0.0131	0.0091	0.0341	0.016	0.009	0.027
Los Alamos below LA Weir	04/18	WM	UF	CS	29	57	187	1.13	0.13	0.32	0.85	0.97	3.41	0.072	0.021	0.037	0.0130	0.0114	0.0470	0.022	0.012	0.037
Los Alamos below LA Weir	05/02	WM	F	CS				0.74	0.07	0.20	0.87	1.58	3.24	0.062	0.024	0.072	-0.0120	0.0070	0.0650	0.086	0.025	0.044
Los Alamos below LA Weir	05/02	WM	F	DUP																		
Los Alamos below LA Weir	05/02	WM	UF	CS	-85	53	187	0.83	0.18	0.54	1.00	1.11	3.86	0.096	0.019	0.009	0.0001	0.0062	0.0368	0.043	0.014	0.032
Los Alamos at SR-4	03/26	WM	F	CS				0.93	0.14	0.23	-0.70	0.78	2.64	0.091	0.027	0.063	0.0096	0.0068	0.0130	0.067	0.021	0.045
Los Alamos at SR-4	03/26	WM	UF	CS	0	52	175	1.02	0.19	0.29	15.60	2.08	2.83	0.495	0.056	0.035	0.0414	0.0139	0.0277	0.443	0.052	0.035
Los Alamos at Rio Grande	03/26	WM	F	CS				0.76	0.13	0.40	0.46	0.67	2.41	0.255	0.038	0.038	-0.0041	0.0041	0.0303	0.201	0.032	0.011
Los Alamos at Rio Grande	03/26	WM	UF	CS	28	53	176	0.79	0.13	0.23	0.00	0.84	2.91	0.126	0.024	0.011	0.0122	0.0108	0.0377	0.097	0.023	0.038
Pueblo 1 R	04/11	WM	F	CS				1.52	0.21	0.22	0.95	0.73	2.32	0.115	0.023	0.011	0.0131	0.0085	0.0293	0.136	0.026	0.029
Pueblo 1 R	04/11	WM	UF	CS	0	56	187	1.23	0.10	0.24	0.87	0.90	3.16	0.128	0.028	0.066	0.0237	0.0098	0.0107	0.130	0.025	0.011
Pueblo 1 R	04/11	WM	UF	DUP				1.10	0.09	0.22												
Acid Weir	04/11	WM	F	CS				14.90	0.91	0.21	-0.84	0.62	2.05	0.205	0.034	0.040	0.0240	0.0124	0.0401	0.097	0.023	0.040
Acid Weir	04/11	WM	UF	CS	-28	55	186	14.80	1.88	0.23	0.36	0.88	3.09	0.352	0.047	0.012	0.0272	0.0113	0.0123	0.108	0.024	0.012
Acid Weir	04/11	WM	UF	DUP	56	56	184							0.206	0.033	0.031	0.0252	0.0104	0.0114	0.109	0.023	0.011
Pueblo 2	04/03	WM	F	CS				2.40	0.12	0.19	-0.14	0.63	2.20	0.119	0.024	0.035	0.0112	0.0084	0.0275	0.082	0.020	0.035
Pueblo 2	04/03	WM	F	DUP										0.214	0.029	0.008	0.0058	0.0058	0.0214	0.084	0.017	0.008
Pueblo 2	04/03	WM	UF	CS	57	55	178	2.74	0.20	0.42	1.24	1.20	4.23	0.113	0.021	0.029	0.0157	0.0095	0.0292	0.063	0.016	0.029
Pueblo 3	04/03	WS	F	CS				0.36	0.09	0.28	0.81	0.66	2.41	0.328	0.041	0.024	0.0066	0.0047	0.0090	0.132	0.024	0.031
Pueblo 3	04/03	WS	UF	CS	-117	51	181	0.29	0.10	0.31	0.81	2.07	2.79	0.380	0.048	0.048	0.0185	0.0134	0.0444	0.284	0.040	0.048
Pueblo 3	04/03	WS	UF	DUP																		
Pueblo at SR-502	04/03	WS	F	CS				0.36	0.09	0.30	-0.97	0.67	2.16	0.206	0.030	0.034	0.0032	0.0071	0.0295	0.104	0.021	0.034
Pueblo at SR-502	04/03	WS	F	DUP				0.41	0.12	0.33												
Pueblo at SR-502	04/03	WS	F	CS				0.48	0.10	0.30	0.88	0.65	2.39	0.189	0.029	0.034	0.0063	0.0077	0.0293	0.113	0.021	0.009
Pueblo at SR-502	04/03	WS	UF	CS	-57	51	178	0.44	0.11	0.33	0.54	0.82	2.86	0.232	0.031	0.027	0.0177	0.0073	0.0080	0.179	0.027	0.027
Pueblo at SR-502	04/03	WS	UF	DUP							0.46	0.81	2.90									
Pueblo at SR-502	04/03	WS	UF	CS	-113	49	176	0.73	0.10	0.27	0.17	0.89	3.10	0.213	0.033	0.047	-0.0067	0.0067	0.0359	0.166	0.026	0.009

Table 5-2. Radiochemical Analysis of Snowmelt and Base Flow for 2001 (pCi/L[a]) (Cont.)

Station Name	Date	Codes[b]			^{3}H Result	^{3}H Uncert	^{3}H MDA	^{90}Sr Result	^{90}Sr Uncert	^{90}Sr MDA	^{137}Cs Result	^{137}Cs Uncert	^{137}Cs MDA	^{234}U Result	^{234}U Uncert	^{234}U MDA	$^{235,236}U$ Result	$^{235,236}U$ Uncert	$^{235,236}U$ MDA	^{238}U Result	^{238}U Uncert	^{238}U MDA
Pajarito Plateau Stations (Cont.)																						
Sandia Canyon:																						
SCS-1	05/17	WS	UF	CS	98	49	160	0.08	0.08	0.27	3.66	1.41	2.89	0.153	0.023	0.030	0.0000	1.0000	0.0392	0.091	0.017	0.027
SCS-1	05/17	WS	UF	DUP										0.135	0.021	0.028	0.0070	0.0070	0.0251	0.046	0.014	0.033
SCS-2	05/17	WS	UF	CS	72	47	155	0.28	0.08	0.24	0.16	1.10	3.89	0.218	0.031	0.041	0.0081	0.0112	0.0406	0.140	0.024	0.041
SCS-2	05/17	WS	UF	DUP	0	0	0.161	0.33	0.09	0.23												
SCS-2	05/17	WS	UF	CS	95	47	154	0.11	0.07	0.26	-0.21	1.27	4.37	0.236	0.029	0.028	0.0275	0.0094	0.0227	0.143	0.022	0.035
SCS-3	05/17	WS	UF	CS	71	47	157	0.07	0.08	0.27	2.53	1.44	2.31	0.196	0.028	0.025	0.0082	0.0048	0.0074	0.136	0.022	0.007
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																						
Mortandad at GS-1	04/18	WS	UF	CS	3140	115	184	12.10	0.64	0.28	10.80	1.59	3.61	0.846	0.094	0.084	0.0497	0.0202	0.0605	0.502	0.066	0.079
Pajarito Canyon (includes Twomile, Threemile Canyons):																						
Pajarito below SR-501	03/20	WM	F	CS				0.36	0.08	0.26	-0.46	0.77	2.28	0.043	0.023	0.071	0.0432	0.0173	0.0397	0.043	0.017	0.040
Pajarito below SR-501	03/20	WM	F	DUP										0.087	0.032	0.089	0.0008	0.0165	0.1160	0.048	0.025	0.089
Pajarito below SR-501	03/20	WM	UF	CS	-29	52	179	0.56	0.14	0.45	1.11	0.91	3.06	0.152	0.036	0.076	0.0144	0.0119	0.0466	0.046	0.019	0.047
Pajarito below SR-501	04/04	WM	F	CS				0.45	0.11	0.33	0.18	0.75	2.31	0.051	0.018	0.045	0.0110	0.0091	0.0354	0.016	0.010	0.035
Pajarito below SR-501	04/04	WM	F	DUP				0.39	0.09	0.25												
Pajarito below SR-501	04/04	WM	UF	CS	0	53	177	0.29	0.07	0.18	1.58	1.40	3.18	0.061	0.019	0.036	0.0049	0.0050	0.0134	0.041	0.016	0.036
Pajarito below SR-501	04/18	WM	F	CS				0.24	0.11	0.36	0.15	1.33	1.96	0.045	0.017	0.043	-0.0054	0.0075	0.0505	0.009	0.007	0.013
Pajarito below SR-501	04/18	WM	UF	CS	-28	54	185	0.26	0.13	0.41	-0.32	0.97	3.31	0.069	0.022	0.057	0.0244	0.0143	0.0497	0.026	0.016	0.057
Pajarito below SR-501	05/02	WM	F	CS				0.25	0.07	0.22	-0.21	0.68	2.31	0.031	0.010	0.008	-0.0018	0.0019	0.0205	0.014	0.006	0.008
Pajarito below SR-501	05/02	WM	F	DUP				0.18	0.08	0.27												
Pajarito below SR-501	05/02	WM	UF	CS	-115	53	189	0.34	0.10	0.34	8.43	1.81	3.59	0.032	0.012	0.035	0.0081	0.0071	0.0243	0.012	0.005	0.006
Pajarito below SR-501	05/02	WM	UF	DUP																		
Pajarito Canyon	04/04	WM	F	CS				0.17	0.09	0.29	-0.58	0.63	2.08	0.043	0.012	0.008	-0.0031	0.0031	0.0227	0.043	0.013	0.029
Pajarito Canyon	04/04	WM	UF	CS	29	54	177	0.40	0.10	0.30	-0.19	0.87	2.95	0.064	0.021	0.056	0.0101	0.0076	0.0247	0.087	0.019	0.025
Pajarito above SR-4	03/21	WM	F	CS				2.46	0.21	0.19	-0.31	0.71	2.47	1.310	0.116	0.053	0.0677	0.0185	0.0384	1.620	0.137	0.038
Pajarito above SR-4	03/21	WM	F	DUP										1.260	0.114	0.011	0.0776	0.0182	0.0105	1.660	0.143	0.011
Pajarito above SR-4	03/21	WM	UF	CS	86	55	178	2.47	0.11	0.18	-0.69	1.25	4.27	1.230	0.113	0.056	0.0838	0.0200	0.0294	1.470	0.130	0.029
Pajarito above SR-4	03/21	WM	UF	DUP																		
Pajarito above SR-4	04/04	WM	F	CS				1.47	0.11	0.24	0.59	0.64	2.53	0.140	0.029	0.057	0.0229	0.0112	0.0319	0.193	0.033	0.040
Pajarito above SR-4	04/04	WM	UF	CS	88	56	181	1.31	0.18	0.20	-1.59	0.89	2.82	0.139	0.029	0.052	0.0062	0.0077	0.0356	0.227	0.038	0.058
Pajarito above SR-4	04/18	WM	F	CS				1.43	0.12	0.26	0.55	0.84	2.97	0.235	0.041	0.063	-0.0196	0.0130	0.0828	0.276	0.045	0.063
Pajarito above SR-4	04/18	WM	UF	CS	-56	53	185	1.40	0.10	0.24	1.07	1.04	3.64	0.262	0.041	0.055	0.0223	0.0136	0.0496	0.342	0.048	0.060
Pajarito above SR-4	05/02	WM	F	CS				1.84	0.16	0.22	0.00	0.68	2.59	0.422	0.051	0.011	0.0426	0.0141	0.0360	0.605	0.066	0.051
Pajarito above SR-4	05/02	WM	UF	CS	-29	56	191	2.17	0.19	0.38	0.53	1.11	3.94	0.548	0.058	0.023	0.0539	0.0136	0.0086	0.611	0.063	0.038
Pajarito at Rio Grande	09/25	WS	UF	CS	-82	54	186	-0.03	0.08	0.28	0.17	0.73	2.61	0.679	0.071	0.036	0.0236	0.0137	0.0424	0.298	0.041	0.029
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):																						
Water above SR-501	03/15	WM	F	CS				0.08	0.09	0.31	0.12	0.71	2.50	0.120	0.035	0.101	0.0161	0.0172	0.0929	0.000	0.009	0.072
Water above SR-501	03/15	WM	UF	CS	-29	52	177	-0.03	0.12	0.42	0.66	1.04	3.24	0.021	0.025	0.140	0.0038	0.0127	0.0819	0.004	0.010	0.067
Water above SR-501	03/20	WM	F	CS				0.18	0.07	0.23	0.42	0.65	2.31	0.023	0.019	0.096	0.0000	1.0000	0.0241	0.027	0.016	0.024
Water above SR-501	03/20	WM	F	DUP				0.12	0.06	0.19												
Water above SR-501	03/20	WM	UF	CS	0	52	175	0.08	0.09	0.30	-0.65	0.87	2.98	0.131	0.029	0.050	0.0482	0.0164	0.0145	0.039	0.016	0.039
Water above SR-501	04/04	WM	F	CS				0.12	0.06	0.20	-0.47	0.75	2.55	0.052	0.017	0.042	0.0149	0.0097	0.0334	0.018	0.009	0.012
Water above SR-501	04/04	WM	UF	CS	-29	52	178	0.04	0.06	0.19	1.25	1.88	2.83	0.010	0.026	0.119	0.0099	0.0206	0.0954	0.026	0.019	0.077
Water above SR-501	04/18	WM	F	CS				0.18	0.09	0.30	-0.52	0.62	2.07	0.029	0.011	0.031	0.0017	0.0060	0.0314	0.024	0.010	0.025
Water above SR-501	04/18	WM	F	DUP										0.046	0.015	0.030	0.0133	0.0087	0.0298	0.025	0.011	0.030
Water above SR-501	04/18	WM	UF	CS	-56	53	183	0.02	0.07	0.24	-0.11	1.14	3.97	0.060	0.020	0.059	0.0095	0.0120	0.0540	0.015	0.010	0.033
Water above SR-501	05/02	WM	F	CS				0.11	0.07	0.22	0.29	0.79	2.76	0.022	0.009	0.025	0.0156	0.0080	0.0255	0.009	0.008	0.037
Water above SR-501	05/02	WM	F	DUP																		
Water above SR-501	05/02	WM	UF	CS	-87	55	191	0.16	0.14	0.47	1.36	1.04	3.78	0.034	0.011	0.009	0.0202	0.0084	0.0091	0.040	0.012	0.009
Cañon de Valle above SR-501	04/04	WM	F	CS				0.35	0.07	0.23	-0.70	0.63	2.13	0.079	0.021	0.034	0.0196	0.0109	0.0337	0.041	0.014	0.012
Cañon de Valle above SR-501	04/04	WM	UF	CS	57	54	176	0.34	0.08	0.19	1.27	0.98	2.64	0.133	0.030	0.050	0.0178	0.0116	0.0398	0.077	0.022	0.040
Cañon de Valle above SR-501	04/18	WM	F	CS				0.23	0.10	0.31	0.64	1.37	1.73	0.053	0.018	0.038	-0.0037	0.0037	0.0381	0.013	0.012	0.048

Table 5-2. Radiochemical Analysis of Snowmelt and Base Flow for 2001 (pCi/L[a]) (Cont.)

						^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station Name	**Date**	**Codes[b]**				**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Pajarito Plateau Stations (Cont.)																							
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons): (Cont.)																							
Cañon de Valle above SR-501	04/18	WM	UF	CS		-141	51	185	0.14	0.09	0.29	8.79	1.72	3.09	0.109	0.034	0.110	0.0241	0.0179	0.0718	0.027	0.020	0.082
Cañon de Valle above SR-501	05/02	WM	F	CS					0.12	0.07	0.22	-0.27	0.83	2.80	0.043	0.013	0.011	0.0000	1.0000	0.0106	0.033	0.012	0.029
Cañon de Valle above SR-501	05/02	WM	F	DUP											0.025	0.013	0.046	0.0027	0.0066	0.0317	0.016	0.007	0.007
Cañon de Valle above SR-501	05/02	WM	UF	CS		-116	54	192	0.26	0.16	0.52	-0.02	1.03	3.53	0.057	0.015	0.028	0.0061	0.0044	0.0083	0.031	0.010	0.008
Water at Beta	04/17	WM	UF	CS		-28	54	184	0.57	0.11	0.34	2.83	1.11	3.19	0.019	0.012	0.042	-0.0041	0.0041	0.0422	0.025	0.014	0.042
Water below SR-4	03/21	WM	F	CS					0.36	0.09	0.28	-0.92	0.63	2.08	0.071	0.021	0.049	-0.0074	0.0139	0.0590	0.059	0.015	0.010
Water below SR-4	03/21	WM	UF	CS		0	53	177	0.50	0.07	0.21	1.40	0.86	3.65	0.209	0.032	0.034	0.0037	0.0082	0.0341	0.209	0.032	0.034
Water below SR-4	04/04	WM	F	CS					0.21	0.06	0.20	-0.69	0.59	1.71	0.028	0.016	0.057	-0.0113	0.0083	0.0568	0.026	0.015	0.052
Water below SR-4	04/04	WM	UF	CS		57	54	177	0.32	0.08	0.25	0.00	1.19	4.37	0.099	0.024	0.036	0.0196	0.0099	0.0133	0.125	0.027	0.045
Ancho Canyon:																							
Ancho at Rio Grande	09/25	WS	UF	CS		0	57	187	0.01	0.08	0.26	0.86	1.33	2.74	0.151	0.025	0.009	0.0197	0.0105	0.0305	0.085	0.018	0.024
Frijoles Canyon:																							
Frijoles at Monument Headquarters	07/18	WS	UF	CS		-79	48	168	0.21	0.10	0.24	-1.72	1.95	6.82	0.090	0.018	0.032	0.0053	0.0076	0.0287	0.061	0.014	0.020
Frijoles at Monument Headquarters	07/18	WS	UF	DUP		-54	50	171				0.98	1.68	6.33	0.071	0.020	0.046	0.0098	0.0086	0.0302	0.088	0.019	0.024
Frijoles at Rio Grande	09/26	WS	UF	CS		-108	52	182	0.11	0.10	0.33	1.25	0.68	2.62	0.063	0.020	0.050	-0.0141	0.0123	0.0559	-0.007	0.013	0.056
Frijoles at Rio Grande	09/26	WS	UF	DUP					0.06	0.07	0.22				0.030	0.016	0.053	-0.0036	0.0036	0.0328	0.017	0.014	0.053
Frijoles at Rio Grande	09/26	WS	UF	CS		-137	53	186	0.26	0.09	0.26	1.22	1.15	4.17	0.072	0.018	0.028	0.0227	0.0108	0.0279	0.023	0.012	0.035
Water Quality Standards[d]																							
DOE DCG for Public Dose						2,000,000			1,000			3,000			500			600			600		
DOE Drinking Water System DCG						80,000			40			120			20			24			24		
EPA Primary Drinking Water Standard						20,000			8														
EPA Screening Level																							
NMWQCC Groundwater Limit																							
NMWQCC Livestock Watering						20,000																	

Table 5-2. Radiochemical Analysis of Snowmelt and Base Flow for 2001 (pCi/L[a]) (Cont.)

						U (µg/L)	^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station Name	Date		Codes[b]			Result	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Regional Stations																					
Rio Chama at Chamita (bank)	08/01	WS	UF	CS			-0.003	0.005	0.028	0.000	1.000	0.022	0.032	0.015	0.039	7.7	1.1	1.7	6.6	0.6	1.6
Rio Grande at Embudo (bank)	08/01	WS	UF	CS			0.000	1.000	0.028	0.009	0.007	0.022	0.021	0.010	0.025	0.8	0.7	2.4	3.5	0.6	2.1
Rio Grande at Otowi Upper (bank)	07/17	WS	UF	CS			0.002	0.004	0.018	0.008	0.006	0.021	0.014	0.007	0.017	3.7	1.0	1.6	6.1	0.9	2.6
Rio Grande at Otowi (bank)	07/17	WS	F	CS		1.63															
Rio Grande at Otowi (bank)	07/17	WS	UF	CS			0.000	0.003	0.018	0.000	0.003	0.018	0.014	0.008	0.022	3.1	0.8	1.4	7.1	0.9	2.8
Rio Grande at Frijoles (bank)	09/26	WS	UF	CS			0.000	1.000	0.024	0.006	0.006	0.024	-0.009	0.010	0.042	3.2	0.5	0.9	6.0	0.3	0.6
Rio Grande at Cochiti	09/26	WS	UF	CS			0.000	1.000	0.007	0.016	0.007	0.019	0.012	0.010	0.033	2.8	0.6	1.2	6.4	0.4	0.9
Jemez River	04/18	WS	UF	CS			0.015	0.011	0.020	0.011	0.011	0.040	2.100	0.185	0.022	1.9	0.6	1.5	1.5	0.8	2.7
Jemez River	04/18	WS	UF	DUP																	
Jemez River	04/18	WS	UF	RE									0.047	0.021	0.025						
Pajarito Plateau Stations																					
Guaje Canyon:																					
Guaje above Rendija	04/18	WM	F	CS	<[c]	0.10	0.008	0.008	0.021	0.000	1.000	0.051	0.025	0.014	0.037	0.6	0.6	2.1	3.8	0.9	2.6
Guaje above Rendija	04/18	WM	UF	CS		0.64	0.000	1.000	0.015	-0.008	0.008	0.044	0.014	0.010	0.019	1.0	0.5	1.3	4.6	1.1	3.2
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):																					
Los Alamos Reservoir	05/01	WS	F	CS			0.020	0.009	0.011	0.005	0.006	0.029	-0.003	0.005	0.027	2.1	0.8	2.0	6.7	1.2	3.2
Los Alamos Reservoir	05/01	WS	F	DUP																	
Los Alamos Reservoir	05/01	WS	UF	CS			0.009	0.005	0.008	0.006	0.004	0.008	0.016	0.007	0.007	1.3	0.6	1.9	4.5	1.0	3.1
Los Alamos Reservoir	05/01	WS	UF	DUP									0.005	0.005	0.014	0.8	0.5	1.7	2.6	0.9	2.8
Los Alamos above Ice Rink	03/07	WM	UF	CS	<	0.10	0.013	0.009	0.017	0.000	1.000	0.012	0.038	0.011	0.009	0.8	0.3	0.7	4.8	0.8	2.1
Los Alamos above Ice Rink	03/07	WM	UF	DUP	<	0.08	0.012	0.012	0.046	0.000	1.000	0.041				0.1	0.5	1.7	4.2	0.9	2.6
Los Alamos above Ice Rink	03/07	WM	F	CS	<	0.09	0.059	0.024	0.026	0.049	0.019	0.019	0.032	0.011	0.010	0.3	0.3	1.2	3.4	0.7	2.2
Los Alamos above Ice Rink	03/07	WM	F	DUP									0.040	0.012	0.009						
Los Alamos above Ice Rink	03/15	WM	F	CS	<	0.07	0.000	1.000	0.027	0.033	0.011	0.010	0.065	0.020	0.016	0.4	0.4	1.5	2.3	0.8	2.5
Los Alamos above Ice Rink	03/15	WM	F	DUP												-0.5	0.4	1.4	4.1	0.8	2.2
Los Alamos above Ice Rink	03/15	WM	UF	CS		0.28	0.000	1.000	0.012	0.004	0.004	0.012	0.118	0.028	0.017	0.6	0.3	1.0	3.9	0.7	2.1
Los Alamos above Ice Rink	03/20	WM	F	CS	<	0.06	0.011	0.006	0.008	0.006	0.006	0.021	0.022	0.013	0.020	0.0	0.4	1.3	4.3	0.7	2.1
Los Alamos above Ice Rink	03/20	WM	UF	CS	<	0.14	0.000	1.000	0.008	0.000	1.000	0.028	0.042	0.013	0.011	7.1	1.4	1.1	4.4	1.0	3.1
Los Alamos above Ice Rink	03/20	WM	UF	DUP	<	0.13															
Los Alamos above Ice Rink	03/20	WM	F	CS	<	0.08	0.000	1.000	0.008	-0.006	0.007	0.036	0.037	0.013	0.013	0.2	0.2	0.8	4.1	0.7	2.0
Los Alamos above Ice Rink	03/20	WM	F	DUP									0.055	0.023	0.025						
Los Alamos above Ice Rink	03/20	WM	UF	CS		0.30	0.000	1.000	0.023	0.013	0.008	0.023	0.021	0.015	0.028	-1.1	0.5	2.0	4.9	0.9	2.5
Los Alamos above Ice Rink	04/04	WM	F	CS	<	0.06	0.015	0.011	0.021	0.006	0.012	0.052	0.018	0.013	0.043	0.6	0.3	0.9	3.2	0.7	2.2
Los Alamos above Ice Rink	04/04	WM	UF	CS		0.35	0.000	1.000	0.031	0.016	0.012	0.022	0.020	0.013	0.038	1.6	0.7	1.8	4.8	1.1	3.2
Los Alamos above Ice Rink	04/04	WM	UF	DUP		0.32															
Los Alamos above Ice Rink	05/02	WM	F	CS	<	0.07	0.003	0.003	0.007	0.003	0.003	0.007	0.001	0.005	0.031	0.1	0.7	2.7	4.8	1.0	2.8
Los Alamos above Ice Rink	05/02	WM	UF	CS	<	0.14	0.008	0.007	0.029	0.007	0.006	0.023	-0.005	0.008	0.035	2.2	1.0	2.6	4.2	0.9	2.8
Los Alamos below Ice Rink	04/18	WM	F	CS	<	0.05	-0.006	0.006	0.045	0.018	0.009	0.012	0.009	0.009	0.024	0.8	0.4	1.2	2.8	0.8	2.6
Los Alamos below Ice Rink	04/18	WM	F	DUP			0.000	1.000	0.012	0.003	0.006	0.024	0.014	0.010	0.019						
Los Alamos below Ice Rink	04/18	WM	UF	CS		0.23	0.000	1.000	0.014	0.008	0.005	0.010	0.014	0.010	0.020	0.5	0.6	2.2	5.1	1.3	3.9
Los Alamos below Ice Rink	04/18	WM	UF	DUP	<	0.16										3.1	1.0	2.5	4.0	1.2	3.7
Los Alamos below Ice Rink	08/01	WS	F	CS		1.16	-0.002	0.004	0.020	0.009	0.004	0.006	0.059	0.016	0.034	-0.1	0.6	2.2	6.2	0.6	1.7
Los Alamos below Ice Rink	08/01	WS	F	DUP		1.23															
Los Alamos below Ice Rink	08/01	WS	UF	CS		6.51	0.028	0.011	0.029	0.142	0.023	0.023	0.070	0.016	0.009	2.9	0.4	0.7	2.4	0.4	0.9
Los Alamos below Ice Rink	08/01	WS	UF	DUP		6.36															
Los Alamos below Ice Rink	08/02	WS	F	CS		0.79	-0.003	0.006	0.032	0.010	0.008	0.025	0.027	0.010	0.025	0.8	0.4	1.4	9.2	0.9	2.7
Los Alamos below Ice Rink	08/02	WS	F	DUP		0.86															
Los Alamos below Ice Rink	08/02	WS	UF	CS		1.76	0.025	0.009	0.020	0.019	0.010	0.029	0.016	0.008	0.024	8.1	2.0	4.2	23.1	2.5	6.5
Los Alamos below Ice Rink	08/02	WS	UF	DUP		1.74	0.005	0.003	0.006	0.048	0.013	0.030	0.039	0.011	0.023	16.7	3.0	4.1	28.8	2.8	6.7
Los Alamos at Upper GS	03/26	WM	F	CS			0.019	0.013	0.025	0.019	0.013	0.025	0.034	0.018	0.053	0.0	0.5	1.8	4.7	1.0	2.8
Los Alamos at Upper GS	03/26	WM	F	DUP			0.000	1.000	0.030	0.016	0.012	0.038	0.023	0.012	0.016	1.3	0.6	1.6	6.1	0.9	2.5
Los Alamos at Upper GS	03/26	WM	UF	CS			0.025	0.012	0.017	0.319	0.049	0.045	0.041	0.015	0.014	2.7	0.8	1.3	8.3	1.1	2.4
Los Alamos at Upper GS	03/26	WM	UF	DUP																	

Table 5-2. Radiochemical Analysis of Snowmelt and Base Flow for 2001 (pCi/L[a]) (Cont.)

					U (µg/L)	^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station Name	Date	Codes[b]			Result	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Pajarito Plateau Stations (Cont.)																				
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																				
DPS-1	03/28	WM	F	CS		-0.005	0.005	0.038	0.005	0.005	0.014	0.051	0.019	0.042	2.2	0.9	2.2	139.0	7.3	2.6
DPS-1	03/28	WM	UF	CS		0.005	0.005	0.014	0.015	0.012	0.038	0.056	0.019	0.017	6.7	6.5	1.6	165.0	22.2	2.4
Los Alamos above SR-4	03/15	WM	F	CS	0.20	0.007	0.005	0.010	0.019	0.008	0.010	0.030	0.015	0.020	0.8	0.3	0.6	4.5	0.8	2.2
Los Alamos above SR-4	03/15	WM	F	DUP		0.003	0.006	0.025	0.010	0.006	0.009									
Los Alamos above SR-4	03/15	WM	UF	CS	0.59	0.016	0.008	0.011	0.061	0.017	0.030	0.189	0.030	0.011	22.7	4.1	1.9	39.3	5.2	4.1
Los Alamos above SR-4	03/15	WM	UF	DUP	111.00															
Los Alamos above SR-4	03/21	WM	F	CS	< 0.10	0.007	0.007	0.018	0.007	0.012	0.049	0.013	0.009	0.017	-0.2	0.4	1.5	4.9	0.8	2.2
Los Alamos above SR-4	03/21	WM	F	DUP								0.050	0.019	0.047						
Los Alamos above SR-4	03/21	WM	UF	CS	0.33	0.000	1.000	0.020	0.166	0.039	0.067	0.159	0.031	0.015	-0.1	0.8	2.8	9.2	1.9	4.4
Los Alamos above SR-4	04/04	WM	F	CS	< 0.13	0.098	0.032	0.027	0.035	0.016	0.019	0.008	0.008	0.031	0.2	0.6	2.1	4.9	1.1	3.4
Los Alamos above SR-4	04/04	WM	F	DUP		0.012	0.012	0.032	0.034	0.017	0.023	0.029	0.017	0.026						
Los Alamos above SR-4	04/04	WM	UF	CS	0.58	0.012	0.012	0.033	0.190	0.042	0.023	0.090	0.023	0.044	0.6	0.7	2.4	7.1	1.5	4.0
Los Alamos above SR-4	04/18	WM	F	CS	< 0.06	0.005	0.005	0.014	0.027	0.012	0.028	0.096	0.031	0.026	0.8	0.5	1.6	3.6	1.0	3.0
Los Alamos above SR-4	04/18	WM	F	DUP																
Los Alamos above SR-4	04/18	WM	UF	CS	0.50	0.021	0.011	0.014	0.142	0.027	0.046	0.088	0.026	0.020	1.3	0.7	2.1	8.0	1.1	2.6
Los Alamos above SR-4	05/02	WM	F	CS	< 0.10	0.003	0.003	0.008	0.007	0.006	0.022	0.013	0.007	0.009	2.7	1.8	1.3	5.5	1.2	2.7
Los Alamos above SR-4	05/02	WM	UF	CS	< 0.11	0.009	0.005	0.008	0.015	0.008	0.031	0.014	0.008	0.013	0.8	0.8	2.7	4.9	1.0	2.8
Los Alamos above SR-4	06/15	WS	F	CS	< 0.08	0.000	1.000	0.011	0.006	0.006	0.021	0.016	0.010	0.030	-0.1	0.2	0.8	5.4	0.7	2.0
Los Alamos above SR-4	06/15	WS	UF	CS	0.73	0.003	0.006	0.025	0.262	0.029	0.007	0.103	0.016	0.016	8.3	0.9	1.8	14.9	1.0	2.5
Los Alamos below LA Weir	03/15	WM	F	CS	0.38	0.006	0.005	0.009	0.010	0.006	0.009	0.014	0.008	0.013	1.1	0.3	0.6	6.8	0.9	2.0
Los Alamos below LA Weir	03/15	WM	F	DUP																
Los Alamos below LA Weir	03/15	WM	UF	CS	1.32	0.018	0.008	0.010	0.077	0.018	0.027	0.905	0.084	0.034	26.8	6.1	3.9	26.4	4.0	5.9
Los Alamos below LA Weir	03/21	WM	F	CS	< 0.17	0.006	0.010	0.041	0.000	1.000	0.015	0.043	0.015	0.014	0.5	0.3	1.1	4.4	0.7	2.1
Los Alamos below LA Weir	03/21	WM	UF	CS	< 0.18	0.005	0.005	0.015	0.053	0.017	0.015	0.038	0.016	0.017	1.9	0.7	1.7	12.7	1.6	2.8
Los Alamos below LA Weir	04/04	WM	F	CS	< 0.10	0.018	0.013	0.024	0.006	0.006	0.017	0.019	0.011	0.018	0.6	0.3	1.0	4.3	1.0	2.9
Los Alamos below LA Weir	04/04	WM	F	DUP											0.3	0.4	1.5	6.5	1.3	3.6
Los Alamos below LA Weir	04/04	WM	UF	CS	0.39	0.000	1.000	0.027	0.078	0.024	0.019	0.092	0.020	0.011	0.7	0.4	1.2	6.1	1.5	4.0
Los Alamos below LA Weir	04/18	WM	F	CS	< 0.07	0.000	1.000	0.018	0.024	0.011	0.013	0.019	0.010	0.013	0.2	0.3	1.1	5.4	1.0	2.7
Los Alamos below LA Weir	04/18	WM	UF	CS	< 0.11	0.000	1.000	0.014	0.015	0.010	0.034	0.054	0.019	0.018	-0.2	0.5	1.8	5.9	1.1	3.1
Los Alamos below LA Weir	05/02	WM	F	CS	< 0.08	0.011	0.008	0.015	0.002	0.007	0.041	0.044	0.025	0.040	0.9	0.6	1.5	4.1	1.1	2.9
Los Alamos below LA Weir	05/02	WM	F	DUP								0.015	0.025	0.107						
Los Alamos below LA Weir	05/02	WM	UF	CS	< 0.15	0.010	0.006	0.021	0.035	0.011	0.021	0.014	0.007	0.010	1.6	0.9	2.7	6.2	1.0	2.9
Los Alamos at SR-4	03/26	WM	F	CS		-0.005	0.008	0.042	0.009	0.007	0.012	0.039	0.018	0.047	0.3	0.3	1.2	4.3	0.8	2.2
Los Alamos at SR-4	03/26	WM	UF	CS		0.021	0.015	0.028	0.407	0.070	0.028	0.094	0.027	0.020	3.2	0.9	1.4	11.4	1.2	2.4
Los Alamos at Rio Grande	03/26	WM	F	CS		0.022	0.011	0.015	-0.006	0.009	0.051	0.007	0.012	0.052	1.1	0.5	1.3	7.0	0.9	2.4
Los Alamos at Rio Grande	03/26	WM	UF	CS		0.007	0.007	0.019	0.246	0.044	0.019	0.077	0.020	0.014	1.4	0.6	1.7	53.7	3.9	2.7
Pueblo 1 R	04/11	WM	F	CS		-0.004	0.004	0.031	0.006	0.004	0.008	0.022	0.013	0.019	0.7	0.5	1.3	5.5	1.1	2.9
Pueblo 1 R	04/11	WM	UF	CS		-0.005	0.005	0.035	0.010	0.008	0.025	0.041	0.018	0.022	-0.6	0.6	2.5	6.4	1.2	3.3
Pueblo 1 R	04/11	WM	UF	DUP																
Acid Weir	04/11	WM	F	CS		0.000	1.000	0.013	0.020	0.011	0.031	0.013	0.013	0.046	1.0	0.8	2.4	25.4	2.2	3.3
Acid Weir	04/11	WM	UF	CS	0.39	0.000	1.000	0.015	0.072	0.020	0.043	0.010	0.010	0.027	0.4	0.7	2.8	27.8	2.9	4.4
Acid Weir	04/11	WM	UF	DUP	0.35	-0.006	0.006	0.042	0.029	0.011	0.011	0.039	0.018	0.021	0.7	0.7	2.3	27.1	3.0	3.5
Pueblo 2	04/03	WM	F	CS		0.000	1.000	0.025	0.038	0.014	0.032	0.022	0.013	0.020	0.2	0.5	1.9	11.3	1.3	2.9
Pueblo 2	04/03	WM	F	DUP								0.029	0.012	0.013						
Pueblo 2	04/03	WM	UF	CS		0.171	0.027	0.043	0.131	0.022	0.024	0.052	0.019	0.043	-0.5	0.5	2.1	10.1	1.2	2.8
Pueblo 3	04/03	WS	F	CS		0.000	1.000	0.011	0.008	0.008	0.031	0.051	0.017	0.015	-0.4	0.6	2.7	12.2	1.5	3.4
Pueblo 3	04/03	WS	UF	CS		0.008	0.006	0.011	0.560	0.056	0.029	0.046	0.019	0.021	7.3	2.5	1.4	22.8	4.4	3.9
Pueblo 3	04/03	WS	UF	DUP		0.019	0.010	0.028	0.579	0.057	0.011									
Pueblo at SR-502	04/03	WS	F	CS		0.007	0.007	0.026	0.014	0.009	0.026	0.043	0.019	0.023	0.4	0.6	2.3	12.2	1.8	4.2
Pueblo at SR-502	04/03	WS	F	DUP																
Pueblo at SR-502	04/03	WS	F	CS		0.007	0.005	0.009	0.023	0.009	0.009	0.011	0.011	0.029	1.0	1.0	3.3	13.8	1.8	3.5
Pueblo at SR-502	04/03	WS	UF	CS		0.011	0.006	0.010	0.065	0.017	0.033	0.052	0.019	0.018	0.3	0.6	2.1	13.8	1.6	3.1
Pueblo at SR-502	04/03	WS	UF	DUP																
Pueblo at SR-502	04/03	WS	UF	CS		0.004	0.009	0.037	0.063	0.017	0.029	0.031	0.016	0.021	-0.1	0.9	3.4	15.3	2.2	5.0

Table 5-2. Radiochemical Analysis of Snowmelt and Base Flow for 2001 (pCi/L[a]) (Cont.)

					U (µg/L)	^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station Name	**Date**	**Codes[b]**			**Result**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Pajarito Plateau Stations (Cont.)																				
Sandia Canyon:																				
SCS-1	05/17	WS	UF	CS		0.000	1.000	0.037	0.005	0.005	0.018	0.009	0.005	0.008	-0.1	0.5	2.0	10.3	1.3	3.0
SCS-1	05/17	WS	UF	DUP		0.005	0.005	0.013	0.004	0.006	0.025	0.016	0.008	0.011	0.5	0.7	2.4	12.9	1.5	3.2
SCS-2	05/17	WS	UF	CS		0.000	1.000	0.012	0.003	0.005	0.023	0.015	0.008	0.010	1.5	0.7	1.8	7.9	1.2	3.0
SCS-2	05/17	WS	UF	DUP																
SCS-2	05/17	WS	UF	CS		0.000	1.000	0.014	0.007	0.005	0.010	0.017	0.011	0.032	0.6	0.7	2.3	10.7	1.3	3.0
SCS-3	05/17	WS	UF	CS		-0.004	0.004	0.032	0.009	0.008	0.029	0.019	0.009	0.010	0.7	0.6	2.0	4.8	1.1	3.1
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																				
Mortandad at GS-1	04/18	WS	UF	CS		1.520	0.119	0.035	1.780	0.122	0.025	6.540	0.451	0.046	26.5	9.4	2.8	92.9	4.5	2.7
Pajarito Canyon (includes Twomile, Threemile Canyons):																				
Pajarito below SR-501	03/20	WM	F	CS	< 0.20	0.005	0.004	0.007	0.024	0.008	0.007	0.018	0.013	0.024	0.6	0.3	1.0	3.5	0.7	2.1
Pajarito below SR-501	03/20	WM	F	DUP		0.000	0.004	0.022	0.003	0.005	0.022									
Pajarito below SR-501	03/20	WM	UF	CS	0.39	0.016	0.007	0.009	0.003	0.008	0.034	0.039	0.020	0.027	3.1	1.0	2.5	6.8	1.7	4.7
Pajarito below SR-501	04/04	WM	F	CS	< 0.06	0.043	0.019	0.023	0.012	0.009	0.017	0.015	0.009	0.027	0.7	0.3	1.0	3.2	0.8	2.4
Pajarito below SR-501	04/04	WM	F	DUP																
Pajarito below SR-501	04/04	WM	UF	CS	< 0.10	0.000	1.000	0.032	0.025	0.015	0.023	0.000	1.000	0.019	0.1	0.5	1.8	2.5	1.0	3.2
Pajarito below SR-501	04/18	WM	F	CS	< 0.04	0.031	0.013	0.014	0.008	0.008	0.028	0.010	0.007	0.013	0.6	0.5	1.8	2.6	0.8	2.5
Pajarito below SR-501	04/18	WM	UF	CS	< 0.11	0.011	0.008	0.014	0.012	0.009	0.028	0.034	0.014	0.015	1.5	0.6	1.6	4.3	1.0	3.1
Pajarito below SR-501	05/02	WM	F	CS	< 0.03	-0.002	0.002	0.019	0.005	0.005	0.025	0.006	0.008	0.036	0.9	0.7	2.2	3.4	0.9	2.8
Pajarito below SR-501	05/02	WM	F	DUP											-0.8	0.6	2.6	2.7	0.9	2.8
Pajarito below SR-501	05/02	WM	UF	CS	< 0.03	-0.001	0.005	0.032	0.017	0.008	0.009	0.009	0.008	0.027	0.9	0.7	2.2	4.3	1.0	2.9
Pajarito below SR-501	05/02	WM	UF	DUP	< 0.03															
Pajarito Canyon	04/04	WM	F	CS		0.004	0.004	0.010	0.000	1.000	0.028	0.018	0.013	0.025	-0.3	0.5	2.1	2.3	1.1	3.1
Pajarito Canyon	04/04	WM	UF	CS		0.009	0.007	0.023	0.003	0.003	0.008	0.008	0.008	0.022	0.2	0.6	2.1	5.6	1.2	3.6
Pajarito above SR-4	03/21	WM	F	CS	4.78	0.006	0.013	0.053	0.000	1.000	0.042	0.037	0.015	0.034	1.9	0.5	1.1	13.7	1.2	2.1
Pajarito above SR-4	03/21	WM	F	DUP		0.006	0.013	0.052	0.023	0.011	0.015	0.036	0.014	0.014	2.6	1.3	1.7	15.2	3.1	2.3
Pajarito above SR-4	03/21	WM	UF	CS	4.90	0.000	1.000	0.011	0.008	0.006	0.011	0.034	0.013	0.013	2.7	1.0	2.4	14.8	2.5	4.3
Pajarito above SR-4	03/21	WM	UF	DUP	4.83															
Pajarito above SR-4	04/04	WM	F	CS	0.71	0.000	1.000	0.024	0.025	0.013	0.017	0.000	1.000	0.018	0.6	0.4	1.0	7.2	1.2	3.0
Pajarito above SR-4	04/04	WM	UF	CS	0.76	0.000	1.000	0.028	0.015	0.011	0.020	0.000	1.000	0.053	0.8	0.4	1.0	7.7	1.1	2.7
Pajarito above SR-4	04/18	WM	F	CS	1.13	-0.005	0.005	0.039	0.012	0.009	0.028	0.012	0.007	0.011	1.7	1.1	2.5	7.5	1.1	2.9
Pajarito above SR-4	04/18	WM	UF	CS	1.15	0.000	0.007	0.038	0.007	0.005	0.010	0.039	0.016	0.018	1.1	0.7	1.9	8.5	1.1	2.6
Pajarito above SR-4	05/02	WM	F	CS	2.20	0.007	0.006	0.022	0.003	0.003	0.008	0.011	0.010	0.041	1.6	0.7	1.9	7.4	1.2	3.1
Pajarito above SR-4	05/02	WM	UF	CS	2.23	0.003	0.003	0.007	0.005	0.004	0.007	0.008	0.007	0.027	2.5	2.2	3.5	10.9	1.0	1.9
Pajarito at Rio Grande	09/25	WS	UF	CS		-0.007	0.005	0.032	0.028	0.016	0.049	0.030	0.012	0.028	1.4	0.4	1.1	0.9	0.4	1.2
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):																				
Water above SR-501	03/15	WM	F	CS	< 0.05	0.004	0.004	0.009	0.007	0.007	0.026	0.046	0.021	0.025	0.3	0.3	0.9	2.9	0.7	2.1
Water above SR-501	03/15	WM	UF	CS	< 0.07	0.004	0.004	0.010	0.012	0.007	0.010	0.013	0.009	0.018	0.6	0.3	1.0	2.8	0.7	2.3
Water above SR-501	03/20	WM	F	CS	< 0.15	-0.003	0.003	0.020	0.006	0.004	0.008	0.016	0.012	0.022	-1.3	0.4	1.7	0.2	0.7	2.3
Water above SR-501	03/20	WM	F	DUP																
Water above SR-501	03/20	WM	UF	CS	< 0.07	0.006	0.004	0.008	0.003	0.003	0.008	0.008	0.008	0.021	1.8	0.7	1.8	5.6	1.5	4.2
Water above SR-501	04/04	WM	F	CS	< 0.07	0.000	1.000	0.032	0.000	1.000	0.023	0.023	0.011	0.030	-0.1	0.3	1.0	3.3	0.7	2.0
Water above SR-501	04/04	WM	UF	CS	< 0.10	0.012	0.012	0.031	0.017	0.012	0.022	0.000	0.010	0.054	-0.3	0.4	1.4	3.4	0.8	2.3
Water above SR-501	04/18	WM	F	CS	< 0.02	0.000	1.000	0.031	0.008	0.008	0.022	0.011	0.008	0.014	0.1	0.5	1.9	3.6	0.8	2.5
Water above SR-501	04/18	WM	F	DUP																
Water above SR-501	04/18	WM	UF	CS	< 0.02	0.000	1.000	0.015	0.004	0.007	0.028	0.043	0.019	0.045	0.3	0.3	0.9	4.6	1.0	2.4
Water above SR-501	05/02	WM	F	CS	< 0.03	0.001	0.003	0.018	0.002	0.002	0.007	0.001	0.009	0.047	1.2	0.6	1.8	4.1	1.1	3.2
Water above SR-501	05/02	WM	F	DUP		0.015	0.007	0.008	0.004	0.005	0.022									
Water above SR-501	05/02	WM	UF	CS	0.44	0.001	0.004	0.022	0.006	0.004	0.008	-0.002	0.005	0.035	-0.3	0.5	2.3	4.7	1.0	2.9
Cañon de Valle above SR-501	04/04	WM	F	CS	< 0.05	0.000	1.000	0.025	0.007	0.007	0.018	0.024	0.012	0.016	-0.4	0.4	1.8	-0.2	0.8	3.0
Cañon de Valle above SR-501	04/04	WM	UF	CS	0.22	0.000	1.000	0.042	0.011	0.011	0.030	0.022	0.011	0.015	1.1	0.3	0.6	3.9	0.7	2.0
Cañon de Valle above SR-501	04/18	WM	F	CS	< 0.05	0.000	1.000	0.015	0.004	0.004	0.011	0.006	0.006	0.017	0.2	0.3	1.2	1.2	0.7	2.5

Table 5-2. Radiochemical Analysis of Snowmelt and Base Flow for 2001 (pCi/L[a]) (Cont.)

					U (µg/L)	^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station Name	**Date**	**Codes[b]**			**Result**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Pajarito Plateau Stations (Cont.)																				
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):																				
Cañon de Valle above SR-501	04/18	WM	UF	CS	< 0.08	-0.005	0.005	0.037	0.018	0.011	0.034	0.053	0.024	0.029	-0.1	0.4	1.6	2.2	0.8	2.4
Cañon de Valle above SR-501	05/02	WM	F	CS	< 0.05	0.007	0.005	0.020	0.015	0.007	0.020	0.030	0.011	0.010	0.6	0.3	0.9	2.1	0.5	1.7
Cañon de Valle above SR-501	05/02	WM	F	DUP																
Cañon de Valle above SR-501	05/02	WM	UF	CS	< 0.06	0.010	0.005	0.007	-0.002	0.004	0.028	0.004	0.004	0.010	1.1	0.7	2.2	2.8	0.9	2.8
Water at Beta	04/17	WM	UF	CS		0.019	0.012	0.035	0.014	0.009	0.026	0.018	0.011	0.016	0.0	0.5	2.0	5.8	0.9	2.5
Water below SR-4	03/21	WM	F	CS	< 0.16	0.012	0.008	0.016	0.000	1.000	0.016	0.037	0.017	0.045	0.5	0.4	1.2	3.4	0.9	2.6
Water below SR-4	03/21	WM	UF	CS	0.69	0.014	0.010	0.019	0.056	0.022	0.051	0.065	0.026	0.060	2.3	0.7	1.7	7.5	1.6	4.1
Water below SR-4	04/04	WM	F	CS	< 0.09	0.008	0.008	0.022	0.000	1.000	0.042	0.000	0.008	0.042	-1.8	0.5	1.8	-2.4	0.8	2.9
Water below SR-4	04/04	WM	UF	CS	0.39	0.023	0.017	0.032	0.025	0.015	0.023	0.000	1.000	0.042	-0.9	0.5	1.8	1.9	0.8	2.5
Ancho Canyon:																				
Ancho at Rio Grande	09/25	WS	UF	CS		-0.006	0.004	0.028	0.012	0.011	0.040	0.000	1.000	0.041	0.7	0.4	1.3	2.2	0.4	1.0
Frijoles Canyon:																				
Frijoles at Monument Headquarters	07/18	WS	UF	CS		0.006	0.006	0.020	0.000	1.000	0.020	0.021	0.007	0.006	0.8	0.4	1.5	2.5	0.7	2.7
Frijoles at Monument Headquarters	07/18	WS	UF	DUP		0.000	1.000	0.007	0.003	0.005	0.020	0.005	0.011	0.042	1.3	0.5	1.5	4.2	0.7	2.1
Frijoles at Rio Grande	09/26	WS	UF	CS		0.000	1.000	0.009	0.000	1.000	0.035	0.028	0.012	0.033	0.2	0.4	1.3	1.7	0.4	1.2
Frijoles at Rio Grande	09/26	WS	UF	DUP		-0.004	0.011	0.046	0.007	0.007	0.026	0.033	0.013	0.013						
Frijoles at Rio Grande	09/26	WS	UF	CS		0.018	0.008	0.010	0.011	0.006	0.010	0.030	0.011	0.011	0.0	0.3	1.5	2.6	0.4	1.0
Water Quality Standards[d]																				
DOE DCG for Public Dose					800	40			30			30			30			1,000		
DOE Drinking Water System DCG					30	1.6			1.2			1.2			1.2			40		
EPA Primary Drinking Water Standard					30										15					
EPA Screening Level																		50		
NMWQCC Groundwater Limit					5,000															
NMWQCC Livestock Watering															15					

[a]Except where noted. Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytical laboratory measurement-specific minimum detectable activity.

[b]Codes: WM–snowmelt; WS–base flow; UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate; TRP–laboratory triplicate; RE–laboratory reanalysis; REDP–laboratory reanalysis duplicate.

[c]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.

[d]Standards given here for comparison only; see Appendix A.

Table 5-3. Detections of Radionuclides[a] and Comparison to Standards[b] in Snowmelt and Base Flow for 2001

Station Name	Date	Codes[c]			Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qualifier Code[f]	Validation Flag Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Regional Stations																
Rio Chama at Chamita (bank)	08/01	WS	UF	CS	Gross Alpha	7.73	1.08	1.69	pCi/L			0.52	15	EPA PRIM DW STD		
Jemez River	04/18	WS	UF	CS	^{241}Am	2.1	0.185	0.0215	pCi/L		J+	1.75	1.2	DOE DW DCG		
Jemez River	04/18	WS	UF	CS	^{238}Pu	0.091	0.0227	0.0145	pCi/L							
Jemez River	04/18	WS	UF	DUP	^{90}Sr	0.445	0.0952	0.273	pCi/L							
Pajarito Plateau Stations																
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):																
DPS-1	03/28	WM	UF	CS	Gross Beta	165	22.2	2.44	pCi/L			3.30	50	EPA SEC DW LVL		
DPS-1	03/28	WM	F	CS	Gross Beta	139	7.3	2.59	pCi/L			2.78	50	EPA SEC DW LVL		
DPS-1	03/28	WM	UF	CS	^{3}H	197	57.3	174	pCi/L							
DPS-1	03/28	WM	UF	CS	^{90}Sr	95.2	6.7	0.245	pCi/L			11.90	8	EPA PRIM DW STD		
DPS-1	03/28	WM	F	CS	^{90}Sr	76.6	9.86	0.233	pCi/L			9.58	8	EPA PRIM DW STD		
Los Alamos above SR-4	03/15	WM	UF	CS	^{241}Am	0.189	0.0296	0.0109	pCi/L							
Los Alamos above SR-4	03/15	WM	UF	CS	Gross Alpha	22.7	4.05	1.94	pCi/L			1.51	15	EPA PRIM DW STD	30	0.76
Los Alamos above SR-4	03/15	WM	UF	CS	Gross Beta	39.3	5.22	4.07	pCi/L			0.79	50	EPA SEC DW LVL		
Los Alamos above SR-4	03/15	WM	UF	CS	^{239,240}Pu	0.0612	0.0171	0.03	pCi/L							
Los Alamos above SR-4	03/15	WM	F	DUP	^{90}Sr	1.59	0.0967	0.204	pCi/L							
Los Alamos above SR-4	03/15	WM	UF	CS	^{90}Sr	1.48	0.233	0.389	pCi/L							
Los Alamos above SR-4	03/15	WM	F	CS	^{90}Sr	1.4	0.0978	0.167	pCi/L							
Los Alamos above SR-4	03/21	WM	UF	CS	^{241}Am	0.159	0.031	0.0149	pCi/L							
Los Alamos above SR-4	03/21	WM	UF	CS	^{239,240}Pu	0.166	0.0387	0.067	pCi/L		J					
Los Alamos above SR-4	03/21	WM	F	CS	^{90}Sr	1.58	0.133	0.303	pCi/L							
Los Alamos above SR-4	03/21	WM	UF	CS	^{90}Sr	1.48	0.115	0.211	pCi/L							
Los Alamos above SR-4	04/04	WM	UF	CS	^{241}Am	0.0903	0.0234	0.0441	pCi/L		J					
Los Alamos above SR-4	04/04	WM	F	CS	^{238}Pu	0.0984	0.0317	0.0267	pCi/L		J					
Los Alamos above SR-4	04/04	WM	UF	CS	^{239,240}Pu	0.19	0.0422	0.0234	pCi/L		J+					
Los Alamos above SR-4	04/04	WM	UF	CS	^{90}Sr	0.92	0.0925	0.207	pCi/L							
Los Alamos above SR-4	04/04	WM	F	CS	^{90}Sr	0.852	0.0931	0.233	pCi/L		J					
Los Alamos above SR-4	04/18	WM	F	CS	^{241}Am	0.0956	0.0308	0.0259	pCi/L							
Los Alamos above SR-4	04/18	WM	UF	CS	^{241}Am	0.0882	0.0261	0.0199	pCi/L		J+					
Los Alamos above SR-4	04/18	WM	UF	CS	^{239,240}Pu	0.142	0.0268	0.0461	pCi/L							
Los Alamos above SR-4	04/18	WM	UF	CS	^{90}Sr	1.21	0.124	0.309	pCi/L							
Los Alamos above SR-4	04/18	WM	F	CS	^{90}Sr	0.896	0.143	0.227	pCi/L							
Los Alamos above SR-4	04/18	WM	F	DUP	^{90}Sr	0.847	0.0852	0.224	pCi/L							
Los Alamos above SR-4	05/02	WM	F	CS	^{90}Sr	0.933	0.119	0.33	pCi/L		J					
Los Alamos above SR-4	05/02	WM	UF	CS	^{90}Sr	0.485	0.154	0.454	pCi/L		J					
Los Alamos above SR-4	06/15	WS	UF	CS	^{241}Am	0.103	0.0164	0.0159	pCi/L							
Los Alamos above SR-4	06/15	WS	UF	CS	Gross Alpha	8.31	0.909	1.77	pCi/L			0.55	15	EPA PRIM DW STD		
Los Alamos above SR-4	06/15	WS	UF	CS	^{239,240}Pu	0.262	0.029	0.00664	pCi/L							
Los Alamos above SR-4	06/15	WS	F	CS	^{90}Sr	1.05	0.223	0.375	pCi/L							
Los Alamos above SR-4	06/15	WS	UF	CS	^{90}Sr	0.996	0.173	0.356	pCi/L							
Los Alamos below LA Weir	03/15	WM	UF	CS	^{241}Am	0.905	0.084	0.034	pCi/L			0.75	1.2	DOE DW DCG		
Los Alamos below LA Weir	03/15	WM	UF	CS	Gross Alpha	26.8	6.06	3.87	pCi/L			1.79	15	EPA PRIM DW STD	30	0.89
Los Alamos below LA Weir	03/15	WM	UF	CS	Gross Beta	26.4	4	5.88	pCi/L			0.53	50	EPA SEC DW LVL		

Table 5-3. Detections of Radionuclides[a] and Comparison to Standards[b] in Snowmelt and Base Flow for 2001 (Cont.)

Station Name	Date	Codes[c]			Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qualifier Code[f]	Validation Flag Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Pajarito Plateau Stations (Cont.)																
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																
Los Alamos below LA Weir	03/15	WM	UF	CS	^{239,240}Pu	0.0769	0.018	0.0269	pCi/L							
Los Alamos below LA Weir	03/15	WM	F	CS	^{90}Sr	1.28	0.141	0.312	pCi/L							
Los Alamos below LA Weir	03/15	WM	UF	CS	^{90}Sr	1.12	0.108	0.27	pCi/L							
Los Alamos below LA Weir	03/21	WM	UF	CS	^{239,240}Pu	0.0534	0.0171	0.0145	pCi/L							
Los Alamos below LA Weir	03/21	WM	UF	CS	^{90}Sr	1.39	0.0855	0.195	pCi/L							
Los Alamos below LA Weir	03/21	WM	F	CS	^{90}Sr	1.35	0.109	0.213	pCi/L							
Los Alamos below LA Weir	04/04	WM	UF	CS	^{241}Am	0.0916	0.0198	0.0108	pCi/L							
Los Alamos below LA Weir	04/04	WM	UF	CS	^{239,240}Pu	0.0782	0.024	0.0193	pCi/L		J+					
Los Alamos below LA Weir	04/04	WM	UF	CS	^{90}Sr	1.01	0.147	0.187	pCi/L							
Los Alamos below LA Weir	04/04	WM	F	CS	^{90}Sr	0.996	0.0812	0.206	pCi/L							
Los Alamos below LA Weir	04/18	WM	UF	CS	^{90}Sr	1.13	0.129	0.315	pCi/L							
Los Alamos below LA Weir	04/18	WM	F	CS	^{90}Sr	0.917	0.146	0.235	pCi/L							
Los Alamos below LA Weir	05/02	WM	UF	CS	^{239,240}Pu	0.0352	0.0106	0.0209	pCi/L		J					
Los Alamos below LA Weir	05/02	WM	UF	CS	^{90}Sr	0.829	0.176	0.538	pCi/L		J					
Los Alamos below LA Weir	05/02	WM	F	CS	^{90}Sr	0.74	0.0732	0.197	pCi/L							
Los Alamos at SR-4	03/26	WM	UF	CS	^{241}Am	0.0937	0.0266	0.0195	pCi/L							
Los Alamos at SR-4	03/26	WM	UF	CS	^{137}Cs	15.6	2.08	2.83	pCi/L							
Los Alamos at SR-4	03/26	WM	UF	CS	^{239,240}Pu	0.407	0.0698	0.0283	pCi/L							
Los Alamos at SR-4	03/26	WM	UF	CS	^{90}Sr	1.02	0.192	0.286	pCi/L							
Los Alamos at SR-4	03/26	WM	F	CS	^{90}Sr	0.927	0.143	0.23	pCi/L							
Los Alamos at Rio Grande	03/26	WM	UF	CS	^{241}Am	0.0771	0.0204	0.0139	pCi/L							
Los Alamos at Rio Grande	03/26	WM	UF	CS	Gross Beta	53.7	3.93	2.65	pCi/L			1.07	50	EPA SEC DW LVL		
Los Alamos at Rio Grande	03/26	WM	UF	CS	^{239,240}Pu	0.246	0.0439	0.0191	pCi/L							
Los Alamos at Rio Grande	03/26	WM	UF	CS	^{90}Sr	0.79	0.127	0.228	pCi/L							
Los Alamos at Rio Grande	03/26	WM	F	CS	^{90}Sr	0.755	0.132	0.399	pCi/L							
Pueblo 1 R	04/11	WM	F	CS	^{90}Sr	1.52	0.212	0.22	pCi/L							
Pueblo 1 R	04/11	WM	UF	CS	^{90}Sr	1.23	0.0952	0.242	pCi/L							
Pueblo 1 R	04/11	WM	UF	DUP	^{90}Sr	1.1	0.0882	0.222	pCi/L							
Acid Weir	04/11	WM	UF	CS	Gross Beta	27.8	2.9	4.42	pCi/L		J	0.56	50	EPA SEC DW LVL		
Acid Weir	04/11	WM	UF	DUP	Gross Beta	27.1	2.95	3.5	pCi/L		J	0.54	50	EPA SEC DW LVL		
Acid Weir	04/11	WM	F	CS	Gross Beta	25.4	2.19	3.33	pCi/L		J	0.51	50	EPA SEC DW LVL		
Acid Weir	04/11	WM	UF	CS	^{239,240}Pu	0.0723	0.02	0.0432	pCi/L		J					
Acid Weir	04/11	WM	F	CS	^{90}Sr	14.9	0.908	0.205	pCi/L			1.86	8	EPA PRIM DW STD		
Acid Weir	04/11	WM	UF	CS	^{90}Sr	14.8	1.88	0.231	pCi/L			1.85	8	EPA PRIM DW STD		
Pueblo 2	04/03	WM	UF	CS	^{238}Pu	0.171	0.0274	0.0431	pCi/L							
Pueblo 2	04/03	WM	UF	CS	^{239,240}Pu	0.131	0.0224	0.0242	pCi/L							
Pueblo 2	04/03	WM	UF	CS	^{90}Sr	2.74	0.196	0.416	pCi/L		J+					
Pueblo 2	04/03	WM	F	CS	^{90}Sr	2.4	0.115	0.194	pCi/L							
Pueblo 3	04/03	WS	UF	CS	Gross Beta	22.8	4.42	3.9	pCi/L		J					
Pueblo 3	04/03	WS	UF	DUP	^{239,240}Pu	0.579	0.0565	0.0105	pCi/L		J					
Pueblo 3	04/03	WS	UF	CS	^{239,240}Pu	0.56	0.0559	0.0288	pCi/L		J					
Pueblo 3	04/03	WS	F	CS	^{90}Sr	0.361	0.0901	0.283	pCi/L		J					

Table 5-3. Detections of Radionuclides[a] and Comparison to Standards[b] in Snowmelt and Base Flow for 2001 (Cont.)

Station Name	Date	Codes[c]	Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qualifier Code[f]	Validation Flag Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Pajarito Plateau Stations (Cont.)														
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)														
Pueblo at SR-502	04/03	WS UF CS	^{239,240}Pu	0.0645	0.0171	0.0333	pCi/L		J					
Pueblo at SR-502	04/03	WS UF CS	^{239,240}Pu	0.0632	0.0171	0.0291	pCi/L		J					
Pueblo at SR-502	04/03	WS UF CS	^{90}Sr	0.731	0.0959	0.271	pCi/L		J					
Pueblo at SR-502	04/03	WS F CS	^{90}Sr	0.481	0.0975	0.303	pCi/L		J					
Pueblo at SR-502	04/03	WS UF CS	^{90}Sr	0.442	0.105	0.332	pCi/L		J					
Pueblo at SR-502	04/03	WS F DUP	^{90}Sr	0.408	0.121	0.327	pCi/L		J					
Pueblo at SR-502	04/03	WS F CS	^{90}Sr	0.355	0.0941	0.299	pCi/L		J					
Los Alamos above Ice Rink	03/07	WM F DUP	^{241}Am	0.0398	0.0117	0.00898	pCi/L							
Los Alamos above Ice Rink	03/07	WM UF CS	^{241}Am	0.0379	0.0112	0.00857	pCi/L							
Los Alamos above Ice Rink	03/07	WM F CS	^{90}Sr	0.56	0.116	0.353	pCi/L		J					
Los Alamos above Ice Rink	03/15	WM UF CS	^{241}Am	0.118	0.0281	0.0169	pCi/L							
Los Alamos above Ice Rink	03/15	WM UF CS	^{241}Am	0.0666	0.0189	0.0139	pCi/L							
Los Alamos above Ice Rink	03/15	WM F CS	^{241}Am	0.0648	0.0199	0.016	pCi/L							
Los Alamos above Ice Rink	03/15	WM UF CS	^{90}Sr	0.404	0.0873	0.273	pCi/L							
Los Alamos above Ice Rink	03/20	WM UF CS	^{241}Am	0.0418	0.0134	0.0113	pCi/L							
Los Alamos above Ice Rink	03/20	WM UF CS	Gross Alpha	7.09	1.39	1.08	pCi/L							
Los Alamos above Ice Rink	03/20	WM F CS	^{90}Sr	0.524	0.0815	0.236	pCi/L		J					
Los Alamos above Ice Rink	03/20	WM F CS	^{90}Sr	0.408	0.0926	0.241	pCi/L		J					
Los Alamos above Ice Rink	03/20	WM UF CS	^{90}Sr	0.405	0.0912	0.237	pCi/L		J					
Los Alamos above Ice Rink	03/20	WM UF CS	^{90}Sr	0.356	0.0761	0.232	pCi/L		J					
Los Alamos above Ice Rink	04/04	WM UF CS	^{90}Sr	0.469	0.0728	0.219	pCi/L		J					
Los Alamos above Ice Rink	04/04	WM F CS	^{90}Sr	0.371	0.111	0.359	pCi/L		J					
Los Alamos below Ice Rink	08/01	WS UF CS	^{241}Am	0.0697	0.0157	0.00899	pCi/L		J+					
Los Alamos below Ice Rink	08/01	WS F CS	^{241}Am	0.0591	0.0159	0.0335	pCi/L		J					
Los Alamos below Ice Rink	08/01	WS UF CS	^{239,240}Pu	0.142	0.0227	0.0227	pCi/L							
Los Alamos below Ice Rink	08/01	WS UF CS	^{90}Sr	1.91	0.293	0.247	pCi/L							
Los Alamos below Ice Rink	08/01	WS F CS	^{90}Sr	1.13	0.191	0.257	pCi/L							
Los Alamos below Ice Rink	08/01	WS F DUP	^{90}Sr	1.07	0.184	0.187	pCi/L							
Los Alamos below Ice Rink	08/02	WS UF DUP	^{241}Am	0.0389	0.0111	0.0226	pCi/L							
Los Alamos below Ice Rink	08/02	WS UF DUP	Gross Alpha	16.7	3	4.06	pCi/L			1.11	15	EPA PRIM DW STD	30	0.56
Los Alamos below Ice Rink	08/02	WS UF CS	Gross Alpha	8.07	1.96	4.21	pCi/L			0.54	15	EPA PRIM DW STD		
Los Alamos below Ice Rink	08/02	WS UF DUP	Gross Beta	28.8	2.81	6.68	pCi/L			0.58	50	EPA SEC DW LVL		
Los Alamos below Ice Rink	08/02	WS UF CS	Gross Beta	23.1	2.46	6.5	pCi/L							
Los Alamos below Ice Rink	08/02	WS UF CS	^{3}H	235	53	152	pCi/L							
Los Alamos below Ice Rink	08/02	WS UF DUP	^{3}H	184	52	153	pCi/L							
Los Alamos below Ice Rink	08/02	WS UF DUP	^{239,240}Pu	0.048	0.013	0.03	pCi/L							
Los Alamos below Ice Rink	08/02	WS F CS	^{90}Sr	1.34	0.215	0.275	pCi/L							
Los Alamos below Ice Rink	08/02	WS UF CS	^{90}Sr	1.28	0.209	0.195	pCi/L							
Los Alamos at Upper GS	03/26	WM UF CS	^{239,240}Pu	0.319	0.0485	0.0451	pCi/L							
Los Alamos at Upper GS	03/26	WM UF CS	^{90}Sr	0.833	0.0845	0.231	pCi/L							
Los Alamos at Upper GS	03/26	WM F CS	^{90}Sr	0.828	0.105	0.285	pCi/L							

Table 5-3. Detections of Radionuclides[a] and Comparison to Standards[b] in Snowmelt and Base Flow for 2001 (Cont.)

Station Name	Date	Codes[c]			Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qualifier Code[f]	Validation Flag Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Pajarito Plateau Stations (Cont.)																
Sandia Canyon:																
SCS-2	05/17	WS	UF	DUP	^{90}Sr	0.325	0.087	0.23	pCi/L		J					
SCS-2	05/17	WS	UF	DUP	^{90}Sr	0.325	0.087	0.23	pCi/L							
SCS-2	05/17	WS	UF	CS	^{90}Sr	0.281	0.0822	0.244	pCi/L		J					
SCS-2	05/17	WS	UF	CS	^{90}Sr	0.281	0.0822	0.244	pCi/L							
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																
Mortandad at GS-1	04/18	WS	UF	CS	^{241}Am	6.54	0.451	0.0463	pCi/L		J+	5.45	1.2	DOE DW DCG		
Mortandad at GS-1	04/18	WS	UF	CS	^{137}Cs	10.8	1.59	3.61	pCi/L		U					
Mortandad at GS-1	04/18	WS	UF	CS	Gross Beta	92.9	4.5	2.66	pCi/L		J	1.86	50	EPA SEC DW LVL		
Mortandad at GS-1	04/18	WS	UF	CS	^{3}H	3140	115	184	pCi/L							
Mortandad at GS-1	04/18	WS	UF	CS	^{238}Pu	1.52	0.119	0.0353	pCi/L			0.95	1.6	DOE DW DCG		
Mortandad at GS-1	04/18	WS	UF	CS	^{239,240}Pu	1.78	0.122	0.0254	pCi/L			1.48	1.2	DOE DW DCG		
Mortandad at GS-1	04/18	WS	UF	CS	^{90}Sr	12.1	0.64	0.276	pCi/L		J+	1.51	8	EPA PRIM DW STD		
Pajarito Canyon (includes Twomile, Threemile Canyons):																
Pajarito below SR-501	03/20	WM	UF	CS	^{90}Sr	0.56	0.143	0.452	pCi/L		J					
Pajarito below SR-501	03/20	WM	F	CS	^{90}Sr	0.36	0.0839	0.264	pCi/L		J					
Pajarito below SR-501	04/04	WM	F	CS	^{90}Sr	0.454	0.107	0.334	pCi/L		J					
Pajarito below SR-501	04/04	WM	F	DUP	^{90}Sr	0.392	0.0942	0.254	pCi/L							
Pajarito below SR-501	04/04	WM	UF	CS	^{90}Sr	0.292	0.0676	0.178	pCi/L		J					
Pajarito below SR-501	05/02	WM	UF	CS	^{137}Cs	8.43	1.81	3.59	pCi/L		J					
Pajarito below SR-501	05/02	WM	UF	CS	^{90}Sr	0.335	0.104	0.335	pCi/L							
Pajarito below SR-501	05/02	WM	F	CS	^{90}Sr	0.251	0.068	0.219	pCi/L		J					
Pajarito Canyon	04/04	WM	UF	CS	^{90}Sr	0.399	0.095	0.296	pCi/L		J					
Pajarito above SR-4	03/21	WM	UF	CS	^{90}Sr	2.47	0.109	0.18	pCi/L							
Pajarito above SR-4	03/21	WM	F	CS	^{90}Sr	2.46	0.206	0.188	pCi/L		J					
Pajarito above SR-4	04/04	WM	F	CS	^{90}Sr	1.47	0.114	0.235	pCi/L							
Pajarito above SR-4	04/04	WM	UF	CS	^{90}Sr	1.31	0.184	0.199	pCi/L							
Pajarito above SR-4	04/18	WM	F	CS	^{90}Sr	1.43	0.118	0.256	pCi/L							
Pajarito above SR-4	04/18	WM	UF	CS	^{90}Sr	1.4	0.103	0.235	pCi/L							
Pajarito above SR-4	05/02	WM	UF	CS	^{90}Sr	2.17	0.192	0.381	pCi/L							
Pajarito above SR-4	05/02	WM	F	CS	^{90}Sr	1.84	0.157	0.224	pCi/L		U					

Table 5-3. Detections of Radionuclides[a] and Comparison to Standards[b] in Snowmelt and Base Flow for 2001 (Cont.)

Station Name	Date	Codes[c]			Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qualifier Code[f]	Validation Flag Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Pajarito Plateau Stations (Cont.)																
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):																
Canon de Valle above SR-501	04/04	WM	F	CS	^{90}Sr	0.346	0.0745	0.229	pCi/L		J					
Canon de Valle above SR-501	04/04	WM	UF	CS	^{90}Sr	0.336	0.0804	0.185	pCi/L		J					
Canon de Valle above SR-501	04/18	WM	UF	CS	^{137}Cs	8.79	1.72	3.09	pCi/L		J					
Water at Beta	04/17	WM	UF	CS	^{90}Sr	0.574	0.113	0.335	pCi/L		J					
Water below SR-4	03/21	WM	UF	CS	^{90}Sr	0.501	0.0696	0.207	pCi/L		J					
Water below SR-4	03/21	WM	F	CS	^{90}Sr	0.362	0.087	0.275	pCi/L		J					
Water below SR-4	04/04	WM	UF	CS	^{90}Sr	0.322	0.0781	0.247	pCi/L		J					
Water below SR-4	04/04	WM	F	CS	^{90}Sr	0.211	0.0617	0.199	pCi/L		J					
Frijoles Canyon:																
Frijoles at Monument Headquarters	07/18	WS	UF	CS	^{241}Am	0.0214	0.00686	0.00579	pCi/L							

[a]Detection defined as value ≥ 3× uncertainty and ≥ detection limit, except values shown for uranium isotopes ≥ DOE DW DCG/4, for gross alpha ≥ 5 pCi/L, and for gross beta ≥ 20 pCi/L. Note that some results in this table were qualified as nondetections by the analytical laboratory or during validation.

[b]Values indicated by entries in right-hand columns are greater than half the minimum standard shown. The minimum standard is either a DOE 4-mrem drinking water DCG or an EPA drinking water standard.

[c]Codes: WM–snowmelt; WS–base flow; UF–unfiltered; F–filtered; CS–customer sample; DUP–analytical laboratory duplicate analysis.

[d]One standard deviation radioactivity counting uncertainty.

[e]MDA=minimum detectable activity.

[f]For Laboratory Qualifier Codes and Validation Flag Codes, see Table 5-4.

Table 5-4. Secondary Validation and Laboratory Qualifier Flag Codes

Code	Description
Secondary Validation Flags	
A	The contractually required supporting documentation for this datum is absent.
J	The analyte is classified as detected, but the reported concentration value is expected to be more uncertain than usual.
J+	The analyte is classified as detected, but the reported concentration value is expected to be more uncertain than usual with a potential positive bias.
J-	The analyte is classified as detected, but the reported concentration value is expected to be more uncertain than usual with a potential negative bias.
NJ	(Organic)—Analyte has been tentatively identified, and the associated numerical value is estimated based upon 1:1 response factor to the nearest eluting internal standard.
PM	Manual review of raw data is recommended to determine if the observed noncompliances with quality acceptance criteria adversely impact data use.
R	The sample results are rejected because of serious deficiencies in the ability to analyze the sample and meet quality-control criteria. Presence or absence cannot be verified.
RPM	The reported sample result is classified as rejected because of serious noncompliances in the quality control acceptance criteria. The presence or absence of the analyte cannot be verified based on routine validation alone.
U	The analyte is classified as not detected.
UJ	The analyte is classified as not detected, with an expectation that the reported result is more uncertain than usual.
Laboratory Qualifier Flags	
*	(Inorganic)—Duplicate analysis not within control limits. (Organic)—Spike recovery is equal to or outside the control criteria used.
**	(Inorganic) and (Organic) GEL—Laboratory Control Sample recovery outside of acceptance limit.
*+	(Inorganic)—Duplicate analysis not within control limits. (Organic)—Spike recovery is equal to or outside the control criteria used.
	(Inorganic) GEL—Correlation coefficient the Method of Standard Addition (MSA) is less than 0.095. Paragon—No meaning. (Organic)—Duplicate Analysis (relative percent difference) not within control limits.
+	(Inorganic) GEL—Correlation coefficient the Method of Standard Addition (MSA) is less than 0.095. Paragon—No meaning. (Organic)—Duplicate Analysis (relative percent difference) not within control limits.
B	(Inorganic)—Reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). (Organic)—Analyte present in the blank and the sample.
B*	(Inorganic)—Reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). (Inorganic)—Duplicate analysis not within control limits.
B*N	(Inorganic)—Reported value < CRDL and > IDL. Duplicate Analysis not within control limits. Spiked sample recovery not within control limits.

Table 5-4. Secondary Validation and Laboratory Qualifier Flag Codes (Cont.)

Code	Description
Laboratory Qualifier Flags (Cont.)	
BE	Low surrogate recovery; analyzed twice.
BE*	(Inorganic)—Concatination of B, E, and *.
BEN	(Inorganic)—Concatination of B, E, and N.
BN	Ignites but does not sustain ignition.
D	(Organic)—Analytes analyzed at a secondary dilution.
E	(Inorganic) Paragon—Reported value is estimated because of the presence of interference. GEL—Percent difference between the parent sample and its serial dilution concentration exceeds 10%. (Organic)—Analyte concentration exceeded the upper level of the calibration range of the instrument for that specific analysis.
E*	(Inorganic) Paragon—Reported value is estimated because of interference. GEL—Percent difference between the parent sample and its serial dilution concentration exceeds 10%. Duplicate analysis not within control limits. (Organic)—Analyte concentration exceeded the upper level of the calibration range of the instrument for that specific analysis, and spike recovery is equal to or outside the control criteria used.
EB	(Organic)—Analyte concentration exceeded the upper level of calibration range of the instrument. Analyte present in the blank and the sample.
EN	(Inorganic)—Concatination of E and N.
J	(Inorganic)—The associated numerical value is an estimated quantity. (Organic)—The associated numerical value is an estimated quantity.
J*	(Inorganic)—The associated numerical value is an estimated quantity. Duplicate analysis not within control limits.
J*+	(Inorganic)—The associated numerical value is an estimated quantity. Duplicate analysis not within control limits. (Inorganic) GEL—Correlation coefficient the Method of Standard Addition (MSA) is less than 0.095. Paragon—No meaning (Organic)—Duplicate analysis (relative percent difference) not within control limits.
JB	(Inorganic)—The associated numeric value is an estimated quantity. The reported value was obtained from a reading that was less than the Contract Required Detection Limit.
JD	(Organic)—Estimated value. Analytes analyzed at a secondary dilution.
JP	(Organic)—The associated numerical value is an estimated quantity. > 25% difference for detected concentrations between two columns.
N	(Inorganic)—Spiked sample recovery not within control limits. (Organic)—Presumptive evidence based on a mass spectral library search to make a tentative identification of the analyte.
N*	(Inorganic)—Spiked sample recovery not within control limits. Duplicate analysis not within control limits.
NJ	(Organic)—Analyte has been tentatively identified, and the associated numerical value is estimated based upon 1:1 response factor to the nearest eluting internal standard.
P	(Organic)— > 25% difference for detected concentrations between two columns.
R	(Inorganic)—The data are not usable. (Organic)—The data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.

Table 5-4. Secondary Validation and Laboratory Qualifier Flag Codes (Cont.)

Code	Description
Laboratory Qualifier Flags (Cont.)	
U	(Inorganic)—The material was analyzed for but was not detected above the level of the associated numeric value. The associated numerical value is either the sample quantitation limit or the sample detection limit. (Organic)—The material was analyzed.
U*	(Inorganic)—Compound was analyzed for but was not detected. Duplicate analysis not within control limits.
UE	(Inorganic)—Compound was analyzed for but was not detected. Reported value is estimated because of the presence of interference.
UEN	(Inorganic)—Concatination of U, E, and N.
UJ	(Inorganic)—The material was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise. (Organic)—The material was analyzed for but was not detected. Quantitation limit is an estimated quantity.
UN	(Inorganic)—Compound was analyzed for but was not detected. Spiked sample recovery not within control limits.
UN*	(Inorganic)—Compound was analyzed for but was not detected. Spiked sample recovery not within control limits. Duplicate analysis not within control limits.
X	Reported concentration is a false positive.

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a])

Station Name	Date	Codes[b]			SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N
Regional Stations																
Rio Chama at Chamita (bank)	08/01	WS	F	CS	14.3	42.3	8.4	2.1	17.8	3.2	83.5	1.1	96	0.10	<[f] 0.02	0.07
Rio Chama at Chamita (bank)	08/01	WS	UF	CS												
Rio Grande at Embudo (bank)	08/01	WS	F	CS	25.8	29.6	6.1	3.1	18.2	5.0	37.2	4.8	97	0.37	< 0.02	< 0.01
Rio Grande at Embudo (bank)	08/01	WS	UF	CS												
Rio Grande at Otowi Upper (bank)	07/17	WS	F	CS	17.1	31.4	6.1	2.8	16.2	3.2	42.3	1.5	100	0.22	< 0.02	< 0.01
Rio Grande at Otowi Upper (bank)	07/17	WS	UF	CS												
Rio Grande at Otowi (bank)	07/17	WS	F	CS	17.1	32.5	6.3	2.7	15.8	3.4	42.3	1.2	88	0.22	< 0.02	< 0.01
Rio Grande at Otowi (bank)	07/17	WS	F	DUP										0.23		
Rio Grande at Otowi (bank)	07/17	WS	UF	CS												
Rio Grande at Frijoles (bank)	09/26	WS	F	CS	19.4	36.4	6.9	2.3	15.0	3.2	47.4	0.9	97	0.31	< 0.02	0.05
Rio Grande at Frijoles (bank)	09/26	WS	UF	CS												
Rio Grande at Cochiti	09/26	WS	F	CS	18.1	37.4	7.1	2.3	15.3	3.6	50.8	1.1	84	0.28	< 0.02	0.06
Rio Grande at Cochiti	09/26	WS	UF	CS												
Jemez River	04/18	WS	F	CS	14.2	27.6	2.5	1.4	5.6	2.9	5.0	< 1.5	109	0.15	0.02	< 0.01
Jemez River	04/18	WS	F	DUP												
Jemez River	04/18	WS	UF	CS												
Jemez River	04/18	WS	UF	DUP												
Jemez River	04/18	WS	UF	TRP												
Pajarito Plateau Stations																
Guaje Canyon:																
Guaje Canyon	10/12	WS	F	CS	52.6	17.4	5.2	5.0	7.5	1.5	2.1	< 0.7	66	0.17	0.08	130.00
Guaje Canyon	10/12	WS	F	DUP	52.6	17.4	5.2	5.0	7.5	1.5	2.1	< 0.7	69			
Guaje Canyon	10/12	WS	UF	CS												
Guaje Canyon	10/12	WS	UF	DUP												
Guaje above Rendija	04/18	WM	F	CS		12.1	3.9	3.9	7.1	2.1	13.8	< 1.5	45			
Guaje above Rendija	04/18	WM	F	DUP												
Guaje above Rendija	04/18	WM	UF	CS			4.9								0.25	0.62
Guaje above Rendija	04/18	WM	UF	DUP												
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):																
Los Alamos Reservoir	05/01	WS	F	CS	30.6	10.0	2.9	2.8	6.9	7.4	8.9	< 1.5	30	0.07	0.04	0.71
Los Alamos Reservoir	05/01	WS	F	DUP	30.5	10.0	2.9	2.8	6.9			< 1.5	29		0.02	
Los Alamos Reservoir	05/01	WS	F	TRP												
Los Alamos Reservoir	05/01	WS	UF	CS	32.7											
Los Alamos Reservoir	05/01	WS	UF	DUP												
Los Alamos above Ice Rink	03/07	WM	UF	CS			5.1								0.05	0.53
Los Alamos above Ice Rink	03/07	WM	UF	DUP			5.0									0.54
Los Alamos above Ice Rink	03/07	WM	F	CS			5.0			5.4	14.1					
Los Alamos above Ice Rink	03/07	WM	F	DUP												
Los Alamos above Ice Rink	03/15	WM	F	CS			4.7			7.5	15.1	< 1.5	49			
Los Alamos above Ice Rink	03/15	WM	UF	CS			4.8								0.04	0.70
Los Alamos above Ice Rink	03/20	WM	F	CS			4.6			9.4	15.7	< 0.7	45			

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N
Pajarito Plateau Stations (Cont.)																
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																
Los Alamos above Ice Rink	03/20	WM	F	DUP								< 0.7	44			
Los Alamos above Ice Rink	03/20	WM	UF	CS			4.8								0.05	0.80
Los Alamos above Ice Rink	03/20	WM	UF	DUP			4.7								0.04	0.80
Los Alamos above Ice Rink	03/20	WM	F	CS			4.6			9.3	15.5	< 0.7	46			
Los Alamos above Ice Rink	03/20	WM	UF	CS			4.7								< 0.02	0.79
Los Alamos above Ice Rink	04/04	WM	F	CS		15.2	4.2	3.4	8.0	10.9	14.4	< 1.5	36			
Los Alamos above Ice Rink	04/04	WM	F	DUP												
Los Alamos above Ice Rink	04/04	WM	UF	CS			5.1								0.24	1.39
Los Alamos above Ice Rink	04/04	WM	UF	DUP												
Los Alamos above Ice Rink	04/04	WM	UF	TRP												
Los Alamos above Ice Rink	05/02	WM	F	CS		11.9	3.4	3.2	7.6	7.9	9.4	< 0.7	34			
Los Alamos above Ice Rink	05/02	WM	F	DUP												
Los Alamos above Ice Rink	05/02	WM	UF	CS			3.4								0.06	0.64
Los Alamos above Ice Rink	05/02	WM	UF	DUP											0.05	
Los Alamos below Ice Rink	04/18	WM	F	CS		13.1	3.7	3.4	7.9	10.8	12.6	< 1.5	37			
Los Alamos below Ice Rink	04/18	WM	F	DUP						11.3	13.1	< 1.5	34			
Los Alamos below Ice Rink	04/18	WM	F	TRP												
Los Alamos below Ice Rink	04/18	WM	UF	CS			3.8								0.10	1.06
Los Alamos below Ice Rink	04/18	WM	UF	DUP		13.5	3.9	3.7	8.3						0.10	1.04
Los Alamos below Ice Rink	04/18	WM	UF	TRP												
Los Alamos below Ice Rink	08/01	WS	F	CS			7.2			4.8	5.3	0.9	133			
Los Alamos below Ice Rink	08/01	WS	F	DUP			7.4			4.4	5.4	1.0	135			
Los Alamos below Ice Rink	08/01	WS	F	TRP												
Los Alamos below Ice Rink	08/01	WS	UF	CS			17.9								1.10	0.05
Los Alamos below Ice Rink	08/01	WS	UF	DUP			18.0								1.07	0.05
Los Alamos below Ice Rink	08/01	WS	UF	TRP												
Los Alamos below Ice Rink	08/02	WS	F	CS			7.8			5.7	4.9	1.0	140			
Los Alamos below Ice Rink	08/02	WS	F	DUP			7.8			5.7	4.9	1.1	139			
Los Alamos below Ice Rink	08/02	WS	F	TRP												
Los Alamos below Ice Rink	08/02	WS	UF	CS			9.9								0.38	0.05
Los Alamos below Ice Rink	08/02	WS	UF	DUP			9.8								0.38	0.05
Los Alamos below Ice Rink	08/02	WS	UF	TRP												
Los Alamos at Upper GS	03/26	WM	F	CS	27.5	19.2	4.8	4.2	15.2	27.8	16.8	< 0.7	40	0.09	0.05	1.11
Los Alamos at Upper GS	03/26	WM	F	DUP	27.8	19.6	4.7	4.3	15.4					0.10		1.13
Los Alamos at Upper GS	03/26	WM	UF	CS												
Los Alamos at Upper GS	03/26	WM	UF	DUP												
DPS-1	03/28	WM	F	CS	14.2	65.9	4.5	8.4	160.0	246.0	18.0	< 0.7	113	0.29	< 0.02	0.71
DPS-1	03/28	WM	F	DUP											0.02	
DPS-1	03/28	WM	UF	CS												
Los Alamos above SR-4	03/15	WM	F	CS			5.6			56.4	14.0	< 1.5	56			
Los Alamos above SR-4	03/15	WM	F	DUP								< 1.5	57			
Los Alamos above SR-4	03/15	WM	UF	CS			7.0								0.08	0.43
Los Alamos above SR-4	03/15	WM	UF	DUP			7.1								0.09	0.44

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity		Total Alkalinity	F	PO_4-P	NO_3+NO_2-N
Pajarito Plateau Stations (Cont.)																	
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																	
Los Alamos above SR-4	03/21	WM	F	CS			5.2			40.9	15.7	<	0.7	49			
Los Alamos above SR-4	03/21	WM	F	DUP													
Los Alamos above SR-4	03/21	WM	UF	CS			5.6									0.08	0.60
Los Alamos above SR-4	03/21	WM	UF	DUP													
Los Alamos above SR-4	04/04	WM	F	CS		17.7	4.9	3.8	15.1	22.9	14.6	<	1.5	50			
Los Alamos above SR-4	04/04	WM	F	DUP													
Los Alamos above SR-4	04/04	WM	UF	CS			5.8									0.23	1.19
Los Alamos above SR-4	04/04	WM	UF	DUP													
Los Alamos above SR-4	04/04	WM	UF	TRP													
Los Alamos above SR-4	04/18	WM	F	CS		14.0	3.8	3.4	16.3	22.4	13.1	<	1.5	43			
Los Alamos above SR-4	04/18	WM	F	DUP													
Los Alamos above SR-4	04/18	WM	UF	CS			4.3									0.13	0.83
Los Alamos above SR-4	04/18	WM	UF	DUP												0.13	
Los Alamos above SR-4	05/02	WM	F	CS		14.4	3.9	3.5	16.8	24.2	11.0	<	0.7	42			
Los Alamos above SR-4	05/02	WM	F	DUP													
Los Alamos above SR-4	05/02	WM	UF	CS			3.9									0.03	0.46
Los Alamos above SR-4	06/15	WS	F	CS			4.2			11.3	7.2	<	0.7	56			
Los Alamos above SR-4	06/15	WS	F	DUP													
Los Alamos above SR-4	06/15	WS	F	TRP													
Los Alamos above SR-4	06/15	WS	UF	CS			5.4									0.26	0.05
Los Alamos above SR-4	06/15	WS	UF	DUP			5.4										
Los Alamos above SR-4	06/15	WS	UF	TRP													
Los Alamos below LA Weir	03/15	WM	F	CS			5.6			49.1	13.3	<	1.5	66			
Los Alamos below LA Weir	03/15	WM	F	DUP						48.8	13.3						
Los Alamos below LA Weir	03/15	WM	UF	CS			7.4									0.15	0.43
Los Alamos below LA Weir	03/21	WM	F	CS			5.1			39.9	14.8	<	0.7	52			
Los Alamos below LA Weir	03/21	WM	F	DUP													
Los Alamos below LA Weir	03/21	WM	UF	CS			5.4									0.04	0.57
Los Alamos below LA Weir	03/21	WM	UF	DUP													
Los Alamos below LA Weir	04/04	WM	F	CS		17.0	4.5	3.7	14.2	21.1	16.1	<	1.5	40			
Los Alamos below LA Weir	04/04	WM	F	DUP													
Los Alamos below LA Weir	04/04	WM	UF	CS			5.3									0.17	1.24
Los Alamos below LA Weir	04/04	WM	UF	DUP													
Los Alamos below LA Weir	04/04	WM	UF	TRP													
Los Alamos below LA Weir	04/18	WM	F	CS		14.6	3.9	3.5	16.9	21.1	12.7	<	1.5	42			
Los Alamos below LA Weir	04/18	WM	F	DUP													
Los Alamos below LA Weir	04/18	WM	UF	CS			4.0									0.08	0.83
Los Alamos below LA Weir	04/18	WM	UF	DUP													
Los Alamos below LA Weir	05/02	WM	F	CS		14.0	3.8	3.4	16.4	24.5	11.1	<	0.7	41			
Los Alamos below LA Weir	05/02	WM	F	DUP													
Los Alamos below LA Weir	05/02	WM	UF	CS			4.0									0.03	0.47
Los Alamos below LA Weir	05/02	WM	UF	DUP													
Los Alamos at SR-4	03/26	WM	F	CS	28.4	19.4	4.9	4.3	15.4	27.8	16.7	<	0.7	42	0.11	0.03	1.06

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N
Pajarito Plateau Stations (Cont.)																
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																
Los Alamos at SR-4	03/26	WM	UF	CS												
Los Alamos at Rio Grande	03/26	WM	F	CS	39.5	26.7	5.0	6.4	31.4	33.3	17.3	< 0.7	76	0.23	0.96	2.75
Los Alamos at Rio Grande	03/26	WM	UF	CS												
Pueblo 1 R	04/11	WM	F	CS	23.0	32.0	5.8	5.5	36.7	44.5	22.0	< 1.5	88	0.13	< 0.02	0.74
Pueblo 1 R	04/11	WM	UF	CS			5.7									
Acid Weir	04/11	WM	F	CS	17.1	30.0	3.0	6.1	88.4	174.0	9.8	< 1.5	50	0.20	0.04	0.51
Acid Weir	04/11	WM	F	DUP												
Acid Weir	04/11	WM	UF	CS		30.9	3.1	6.3	92.7							
Acid Weir	04/11	WM	UF	DUP	16.8	30.4	3.1	6.2	85.2							
Pueblo 2	04/03	WM	F	CS	25.8	28.8	4.8	6.8	30.9	42.8	24.7	< 1.5	68	0.22	0.24	0.72
Pueblo 2	04/03	WM	F	DUP												
Pueblo 2	04/03	WM	UF	CS												
Pueblo 2	04/03	WM	UF	DUP												
Pueblo 3	04/03	WS	F	CS	72.7	22.2	6.3	14.2	63.0	37.8	26.9	< 1.5	189	0.38	4.35	1.31
Pueblo 3	04/03	WS	F	DUP											4.30	1.32
Pueblo 3	04/03	WS	UF	CS												
Pueblo 3	04/03	WS	UF	DUP												
Pueblo 3	04/03	WS	UF	TRP												
Pueblo 3	11/27	WS	UF	CS												
Pueblo 3	11/27	WS	UF	CS												
Pueblo 3	11/27	WS	UF	DUP												
Pueblo at SR-502	04/03	WS	F	CS	74.9	25.7	6.9	13.7	66.2	37.1	22.7	< 1.5	117	0.39	4.25	11.80
Pueblo at SR-502	04/03	WS	F	DUP											4.45	11.10
Pueblo at SR-502	04/03	WS	F	CS	71.0	26.0	7.0	12.9	63.1	41.1	21.8	< 1.5	119	0.40	4.30	11.60
Pueblo at SR-502	04/03	WS	F	DUP												
Pueblo at SR-502	04/03	WS	UF	CS												
Pueblo at SR-502	04/03	WS	UF	DUP	68.7	26.8	7.2	13.2	65.5							
Pueblo at SR-502	04/03	WS	UF	CS												
Pueblo at SR-502	04/03	WS	UF	DUP												
Pueblo at SR-502	11/27	WS	UF	CS												
Pueblo at SR-502	11/27	WS	UF	CS												
Sandia Canyon:																
SCS-1	05/17	WS	F	CS	98.0	21.4	6.6	12.8	104.0	88.7	17.0	3.4	123	0.40	3.65	1.63
SCS-1	05/17	WS	F	DUP	96.6	21.0	6.5	12.3	99.4	87.8	16.7	3.1	125		3.70	
SCS-1	05/17	WS	UF	CS												
SCS-1	05/17	WS	UF	DUP												
SCS-1	11/29	WS	UF	CS												
SCS-1	11/29	WS	UF	CS												
SCS-1	11/29	WS	UF	CS												
SCS-2	05/17	WS	F	CS	89.6	23.3	6.1	15.3	173.0	105.0	102.0	4.0	157	0.51	4.20	0.57
SCS-2	05/17	WS	F	CS	89.7	21.9	5.7	15.0	167.0	106.0	102.0	3.4	154	0.52	4.40	0.59
SCS-2	05/17	WS	UF	CS												

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N
Pajarito Plateau Stations (Cont.)																
Sandia Canyon: (Cont.)																
SCS-2	05/17	WS	UF	CS												
SCS-2	11/29	WS	UF	CS												
SCS-2	11/29	WS	UF	CS												
SCS-3	05/17	WS	F	CS	104.0	23.6	6.1	16.7	181.0	117.0	107.0	3.8	153	0.53	4.25	0.64
SCS-3	05/17	WS	UF	CS												
SCS-3	11/27	WS	UF	CS												
SCS-3	11/29	WS	UF	CS												
SCS-3	11/29	WS	UF	CS												
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																
Mortandad at GS-1	04/18	WS	F	CS	40.3	28.9	3.7	4.2	44.8	20.6	40.7	< 1.5	76	0.35	0.08	2.14
Mortandad at GS-1	04/18	WS	F	DUP	41.2	29.4	3.7	4.3	46.5							
Mortandad at GS-1	04/18	WS	UF	CS												
Pajarito Canyon (includes Twomile, Threemile Canyons):																
Pajarito below SR-501	03/20	WM	F	CS			4.0			8.3	18.4	< 0.7	30			
Pajarito below SR-501	03/20	WM	UF	CS			4.7								0.09	0.98
Pajarito below SR-501	03/20	WM	UF	DUP												
Pajarito below SR-501	04/04	WM	F	CS		12.3	3.6	2.7	4.9	3.8	17.9	< 1.5	26			
Pajarito below SR-501	04/04	WM	F	DUP												
Pajarito below SR-501	04/04	WM	UF	CS			3.8								0.11	1.45
Pajarito below SR-501	04/04	WM	UF	DUP												
Pajarito below SR-501	04/18	WM	F	CS		9.1	2.7	2.6	3.9	1.9	11.3	< 1.5	27			
Pajarito below SR-501	04/18	WM	F	DUP												
Pajarito below SR-501	04/18	WM	UF	CS			2.9								0.13	0.76
Pajarito below SR-501	04/18	WM	UF	DUP												
Pajarito below SR-501	05/02	WM	F	CS		10.0	3.0	2.9	4.2	3.2	9.5	< 0.7	32			
Pajarito below SR-501	05/02	WM	F	DUP		10.1	3.1	2.8	4.3	3.3	9.6	< 0.7	32			
Pajarito below SR-501	05/02	WM	UF	CS			3.0		4.3						0.06	0.45
Pajarito below SR-501	05/02	WM	UF	DUP											0.06	
Pajarito Canyon	04/04	WM	F	CS	27.8	15.7	4.3	3.0	12.2	14.3	17.9	< 1.5	40	0.12	< 0.02	1.13
Pajarito Canyon	04/04	WM	F	DUP												
Pajarito Canyon	04/04	WM	F	TRP												
Pajarito Canyon	04/04	WM	UF	CS												
Pajarito Canyon	04/04	WM	UF	DUP												
Pajarito above SR-4	03/21	WM	F	CS			14.8			51.8	34.3	1.6	194			
Pajarito above SR-4	03/21	WM	F	DUP												
Pajarito above SR-4	03/21	WM	F	TRP												
Pajarito above SR-4	03/21	WM	UF	CS			14.7								0.10	0.01
Pajarito above SR-4	03/21	WM	UF	DUP			15.1								0.15	
Pajarito above SR-4	04/04	WM	F	CS		33.6	7.4	5.6	21.5	30.4	21.5	< 1.5	91			
Pajarito above SR-4	04/04	WM	F	DUP												

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N
Pajarito Plateau Stations (Cont.)																
Pajarito Canyon (includes Twomile, Threemile Canyons): (Cont.)																
Pajarito above SR-4	04/04	WM	F	TRP												
Pajarito above SR-4	04/04	WM	UF	CS			7.2								0.12	0.49
Pajarito above SR-4	04/04	WM	UF	DUP												
Pajarito above SR-4	04/18	WM	F	CS		40.3	9.0	6.4	28.7	42.9	18.5	< 1.5	118			
Pajarito above SR-4	04/18	WM	F	DUP												
Pajarito above SR-4	04/18	WM	UF	CS			9.4								0.09	0.05
Pajarito above SR-4	04/18	WM	UF	DUP												
Pajarito above SR-4	05/02	WM	F	CS		59.3	13.2	7.6	34.4	58.3	12.5	1.4	180			
Pajarito above SR-4	05/02	WM	F	DUP												
Pajarito above SR-4	05/02	WM	UF	CS			13.3								0.07	0.02
Pajarito above SR-4	05/02	WM	UF	DUP												
Pajarito at Rio Grande	09/25	WS	F	CS	73.7	21.8	4.8	2.6	13.0	4.5	5.1	0.8	104	0.47	< 0.02	0.69
Pajarito at Rio Grande	09/25	WS	UF	CS												
Pajarito at Rio Grande	09/25	WS	UF	DUP												
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):																
Water above SR-501	03/15	WM	F	CS			4.1			10.3	9.0	< 1.5	39			
Water above SR-501	03/15	WM	F	DUP												
Water above SR-501	03/15	WM	UF	CS			4.2								0.03	0.77
Water above SR-501	03/20	WM	F	CS			4.3			10.2	10.4	< 0.7	37			
Water above SR-501	03/20	WM	UF	CS			4.2								< 0.02	0.75
Water above SR-501	04/04	WM	F	CS		15.9	5.3	3.7	8.3	12.6	17.1	< 1.5	36			
Water above SR-501	04/04	WM	F	DUP		16.1	5.4	3.8	8.4							
Water above SR-501	04/04	WM	UF	CS			5.3								0.04	1.50
Water above SR-501	04/04	WM	UF	DUP												
Water above SR-501	04/18	WM	F	CS		15.7	5.5	4.3	9.8	19.1	17.7	< 1.5	38			
Water above SR-501	04/18	WM	F	DUP												
Water above SR-501	04/18	WM	UF	CS			5.7								0.05	1.39
Water above SR-501	04/18	WM	UF	DUP												
Water above SR-501	05/02	WM	F	CS		15.6	5.5	4.4	10.9	20.0	18.0	< 0.7	37			
Water above SR-501	05/02	WM	F	DUP												
Water above SR-501	05/02	WM	UF	CS			6.2								< 0.02	1.27
Water above SR-501	05/02	WM	UF	DUP												
Cañon de Valle above SR-501	04/04	WM	F	CS		10.9	3.0	2.2	3.2	1.9	9.4	< 1.5	28			
Cañon de Valle above SR-501	04/04	WM	F	DUP												
Cañon de Valle above SR-501	04/04	WM	UF	CS			3.4								0.12	1.06
Cañon de Valle above SR-501	04/04	WM	UF	DUP												
Cañon de Valle above SR-501	04/18	WM	F	CS		8.7	2.5	2.0	3.3	1.3	7.7	< 1.5	28			
Cañon de Valle above SR-501	04/18	WM	F	DUP												
Cañon de Valle above SR-501	04/18	WM	UF	CS			2.5								0.08	0.58
Cañon de Valle above SR-501	04/18	WM	UF	DUP												
Cañon de Valle above SR-501	05/02	WM	F	CS		9.2	2.6	2.1	3.6	1.3	6.8	< 0.7	30			
Cañon de Valle above SR-501	05/02	WM	F	DUP												

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N
Pajarito Plateau Stations (Cont.)																
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons): (Cont.)																
Cañon de Valle above SR-501	05/02	WM	UF	CS			2.5								0.03	0.12
Cañon de Valle above SR-501	05/02	WM	UF	DUP												
Water at Beta	04/17	WM	F	CS	33.5	16.9	5.4	4.2	11.8	23.1	15.5	< 1.5	94	0.13	0.08	0.85
Water at Beta	04/17	WM	F	DUP								< 1.5	92			
Water at Beta	04/17	WM	F	TRP												
Water at Beta	04/17	WM	UF	CS												
Water at Beta	04/17	WM	UF	DUP												
Water below SR-4	03/21	WM	F	CS			4.3			14.2	9.8	< 0.7	43			
Water below SR-4	03/21	WM	UF	CS			5.3								0.10	0.67
Water below SR-4	03/21	WM	UF	DUP												
Water below SR-4	04/04	WM	F	CS		16.5	5.3	4.0	11.1	15.8	16.6	< 1.5	41			
Water below SR-4	04/04	WM	F	DUP												
Water below SR-4	04/04	WM	F	TRP												
Water below SR-4	04/04	WM	UF	CS			5.5								0.07	1.20
Water below SR-4	04/04	WM	UF	DUP												
Ancho Canyon:																
Ancho at Rio Grande	09/25	WS	F	CS	77.0	12.7	3.3	1.9	10.9	2.3	2.1	2.6	87	0.42	< 0.02	0.01
Ancho at Rio Grande	09/25	WS	F	DUP						2.3	2.1					
Ancho at Rio Grande	09/25	WS	UF	CS												
Frijoles Canyon:																
Frijoles at Monument Headquarters	07/18	WS	F	CS	68.5	8.9	2.9	2.0	10.3	4.0	1.8	< 0.7	30	0.12	0.02	0.02
Frijoles at Monument Headquarters	07/18	WS	F	DUP												0.02
Frijoles at Monument Headquarters	07/18	WS	UF	CS												
Frijoles at Monument Headquarters	07/18	WS	UF	DUP	60.8	8.9	3.0	2.2	10.2							
Frijoles at Rio Grande	09/26	WS	F	CS	70.7	10.3	3.5	2.2	11.2	3.3	1.6	< 0.7	51	0.23	< 0.02	< 0.01
Frijoles at Rio Grande	09/26	WS	F	DUP	70.8	10.4	3.5	2.1	11.1					0.22		< 0.01
Frijoles at Rio Grande	09/26	WS	F	CS	70.6	10.3	3.5	2.3	11.4	3.6	1.7	< 0.7	59	0.25	< 0.02	< 0.01
Frijoles at Rio Grande	09/26	WS	F	DUP												
Frijoles at Rio Grande	09/26	WS	UF	CS												
Frijoles at Rio Grande	09/26	WS	UF	CS												
Frijoles at Rio Grande	09/26	WS	UF	DUP												

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N
Water Quality Standards[g]														
EPA Primary Drinking Water Standard									500			4.00		10
EPA Secondary Drinking Water Standard								250	250					
EPA Health Advisory							20							
NMWQCC Groundwater Limit								250	600			1.60		10
NMWQCC Wildlife Habitat Standard														

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a])

Station Name	Date	Codes[b]			ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)[d]	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Regional Stations													
Rio Chama at Chamita (bank)	08/01	WS	F	CS				253			140	7.8	279
Rio Chama at Chamita (bank)	08/01	WS	UF	CS	< 0.958	< 0.0029	< 0.0029		352				
Rio Grande at Embudo (bank)	08/01	WS	F	CS				196			99.1	8.1	464
Rio Grande at Embudo (bank)	08/01	WS	UF	CS	< 0.958	< 0.0029	< 0.0029		29				
Rio Grande at Otowi Upper (bank)	07/17	WS	F	CS				190			103	8.3	181
Rio Grande at Otowi Upper (bank)	07/17	WS	UF	CS	< 0.958		< 0.0029		76				
Rio Grande at Otowi (bank)	07/17	WS	F	CS				187			107	8.3	2
Rio Grande at Otowi (bank)	07/17	WS	F	DUP				183					
Rio Grande at Otowi (bank)	07/17	WS	UF	CS	< 0.958		< 0.0029		111				
Rio Grande at Frijoles (bank)	09/26	WS	F	CS				197			120	8.1	290
Rio Grande at Frijoles (bank)	09/26	WS	UF	CS	< 0.958		< 0.0029		132				
Rio Grande at Cochiti	09/26	WS	F	CS				196			123	8.0	124
Rio Grande at Cochiti	09/26	WS	UF	CS	< 0.958		< 0.0029		116				
Jemez River	04/18	WS	F	CS				107			79.3	7.9	137
Jemez River	04/18	WS	F	DUP				90					
Jemez River	04/18	WS	UF	CS	< 0.801		0.0039		77				
Jemez River	04/18	WS	UF	DUP	< 0.801				84				
Jemez River	04/18	WS	UF	TRP					83				
Pajarito Plateau Stations													
Guaje Canyon:													
Guaje Canyon	10/12	WS	F	CS				142			64.9	7.4	151
Guaje Canyon	10/12	WS	F	DUP								7.4	151
Guaje Canyon	10/12	WS	UF	CS	< 0.958				1				
Guaje Canyon	10/12	WS	UF	DUP	< 0.958								
Guaje above Rendija	04/18	WM	F	CS				134			46.1	7.7	
Guaje above Rendija	04/18	WM	F	DUP				140					
Guaje above Rendija	04/18	WM	UF	CS	< 0.801	< 0.0028	0.0039		335				121
Guaje above Rendija	04/18	WM	UF	DUP					376				
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):													
Los Alamos Reservoir	05/01	WS	F	CS				104			36.7	7.1	100
Los Alamos Reservoir	05/01	WS	F	DUP				99				7.1	
Los Alamos Reservoir	05/01	WS	F	TRP				102					
Los Alamos Reservoir	05/01	WS	UF	CS	1.970		< 0.0028		6				
Los Alamos Reservoir	05/01	WS	UF	DUP									
Los Alamos above Ice Rink	03/07	WM	UF	CS	< 0.958	< 0.0028	< 0.0028		11				121
Los Alamos above Ice Rink	03/07	WM	UF	DUP	< 0.958	< 0.0028	< 0.0028						121
Los Alamos above Ice Rink	03/07	WM	F	CS								7.7	
Los Alamos above Ice Rink	03/07	WM	F	DUP								7.7	
Los Alamos above Ice Rink	03/15	WM	F	CS				119				7.6	
Los Alamos above Ice Rink	03/15	WM	UF	CS	10	< 0.0028	< 0.0028		27				20
Los Alamos above Ice Rink	03/20	WM	F	CS				135				7.7	

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)[d]	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Pajarito Plateau Stations (Cont.)													
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)													
Los Alamos above Ice Rink	03/20	WM	F	DUP				135				7.7	
Los Alamos above Ice Rink	03/20	WM	UF	CS	3.930	< 0.0028	< 0.0028		32				130
Los Alamos above Ice Rink	03/20	WM	UF	DUP	< 0.958		< 0.0028						131
Los Alamos above Ice Rink	03/20	WM	F	CS				132				7.7	
Los Alamos above Ice Rink	03/20	WM	UF	CS	6.760	< 0.0028	< 0.0028		32				124
Los Alamos above Ice Rink	04/04	WM	F	CS				134			55.3	7.4	
Los Alamos above Ice Rink	04/04	WM	F	DUP				137					
Los Alamos above Ice Rink	04/04	WM	UF	CS	1.970	< 0.0028	< 0.0028		215				14
Los Alamos above Ice Rink	04/04	WM	UF	DUP	< 0.801	< 0.0028	< 0.0028		229				14
Los Alamos above Ice Rink	04/04	WM	UF	TRP					229				
Los Alamos above Ice Rink	05/02	WM	F	CS				112			43.7	7.6	
Los Alamos above Ice Rink	05/02	WM	F	DUP				115					
Los Alamos above Ice Rink	05/02	WM	UF	CS	< 0.958	< 0.0028	< 0.0028		20				102
Los Alamos above Ice Rink	05/02	WM	UF	DUP					19				
Los Alamos below Ice Rink	04/18	WM	F	CS				116			47.8	7.6	
Los Alamos below Ice Rink	04/18	WM	F	DUP				114				7.6	
Los Alamos below Ice Rink	04/18	WM	F	TRP				117					
Los Alamos below Ice Rink	04/18	WM	UF	CS	< 0.801	0.0032	0.0069		65				191
Los Alamos below Ice Rink	04/18	WM	UF	DUP	1.380	< 0.0028	0.0043		66				
Los Alamos below Ice Rink	04/18	WM	UF	TRP					70				
Los Alamos below Ice Rink	08/01	WS	F	CS				215					
Los Alamos below Ice Rink	08/01	WS	F	DUP				220					
Los Alamos below Ice Rink	08/01	WS	F	TRP				220					
Los Alamos below Ice Rink	08/01	WS	UF	CS	< 4.790	< 0.0029	< 0.0029		2,870			7.1	298
Los Alamos below Ice Rink	08/01	WS	UF	DUP	< 4.790	< 0.0029	< 0.0029		2,890	5,360		7.1	298
Los Alamos below Ice Rink	08/01	WS	UF	TRP					2,610	6,070			
Los Alamos below Ice Rink	08/02	WS	F	CS				224					
Los Alamos below Ice Rink	08/02	WS	F	DUP				225					
Los Alamos below Ice Rink	08/02	WS	F	TRP				220					
Los Alamos below Ice Rink	08/02	WS	UF	CS	< 0.958	< 0.0029	0.0038		484	509		8.0	186
Los Alamos below Ice Rink	08/02	WS	UF	DUP	< 0.958	< 0.0029	< 0.0029		498	510		8.0	186
Los Alamos below Ice Rink	08/02	WS	UF	TRP					524				
Los Alamos at Upper GS	03/26	WM	F	CS				166			67.5	7.8	192
Los Alamos at Upper GS	03/26	WM	F	DUP				170				7.8	193
Los Alamos at Upper GS	03/26	WM	UF	CS	< 0.801		< 0.0028		311				
Los Alamos at Upper GS	03/26	WM	UF	DUP	< 0.801		< 0.0028		341				
DPS-1	03/28	WM	F	CS				632			183	7.3	899
DPS-1	03/28	WM	F	DUP									
DPS-1	03/28	WM	UF	CS	< 0.801		< 0.0028		3				
Los Alamos above SR-4	03/15	WM	F	CS				218				7.9	
Los Alamos above SR-4	03/15	WM	F	DUP								7.9	
Los Alamos above SR-4	03/15	WM	UF	CS	< 0.958	< 0.0028	< 0.0028		613				22
Los Alamos above SR-4	03/15	WM	UF	DUP		< 0.0028	< 0.0028		652				23

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)[d]	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Pajarito Plateau Stations (Cont.)													
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)													
Los Alamos above SR-4	03/21	WM	F	CS				197				8.0	
Los Alamos above SR-4	03/21	WM	F	DUP				202					
Los Alamos above SR-4	03/21	WM	UF	CS	11.200	< 0.0028	< 0.0028		151				245
Los Alamos above SR-4	03/21	WM	UF	DUP					159				
Los Alamos above SR-4	04/04	WM	F	CS				154			64.5	7.9	
Los Alamos above SR-4	04/04	WM	F	DUP				157					
Los Alamos above SR-4	04/04	WM	UF	CS	< 0.801	< 0.0028	< 0.0028		339				1330
Los Alamos above SR-4	04/04	WM	UF	DUP					371				
Los Alamos above SR-4	04/04	WM	UF	TRP					385				
Los Alamos above SR-4	04/18	WM	F	CS				146			50.7	7.7	
Los Alamos above SR-4	04/18	WM	F	DUP				149					
Los Alamos above SR-4	04/18	WM	UF	CS	< 0.801	< 0.0028	0.0063		295				143
Los Alamos above SR-4	04/18	WM	UF	DUP			0.0042		314				
Los Alamos above SR-4	05/02	WM	F	CS				147			52	7.8	
Los Alamos above SR-4	05/02	WM	F	DUP				148					
Los Alamos above SR-4	05/02	WM	UF	CS	< 0.958	< 0.0028	< 0.0028		11				150
Los Alamos above SR-4	06/15	WS	F	CS				135				7.7	
Los Alamos above SR-4	06/15	WS	F	DUP				142					
Los Alamos above SR-4	06/15	WS	F	TRP				137					
Los Alamos above SR-4	06/15	WS	UF	CS	< 0.958	< 0.0028	< 0.0028		291			7.5	147
Los Alamos above SR-4	06/15	WS	UF	DUP		< 0.0028	< 0.0028		297			7.5	
Los Alamos above SR-4	06/15	WS	UF	TRP					330				
Los Alamos below LA Weir	03/15	WM	F	CS				213				7.9	
Los Alamos below LA Weir	03/15	WM	F	DUP									
Los Alamos below LA Weir	03/15	WM	UF	CS	11.600	< 0.0028	< 0.0028		306				24
Los Alamos below LA Weir	03/21	WM	F	CS				204				8.0	
Los Alamos below LA Weir	03/21	WM	F	DUP				205					
Los Alamos below LA Weir	03/21	WM	UF	CS	6.730	< 0.0028	< 0.0028		22				14
Los Alamos below LA Weir	03/21	WM	UF	DUP					23				
Los Alamos below LA Weir	04/04	WM	F	CS				152			61.3	7.8	
Los Alamos below LA Weir	04/04	WM	F	DUP				158					
Los Alamos below LA Weir	04/04	WM	UF	CS	< 0.801	< 0.0028	< 0.0028		187				149
Los Alamos below LA Weir	04/04	WM	UF	DUP					188				
Los Alamos below LA Weir	04/04	WM	UF	TRP					183				
Los Alamos below LA Weir	04/18	WM	F	CS				148			52.6	7.7	
Los Alamos below LA Weir	04/18	WM	F	DUP				151					
Los Alamos below LA Weir	04/18	WM	UF	CS	< 0.801	< 0.0028	0.0076		19				194
Los Alamos below LA Weir	04/18	WM	UF	DUP					20				
Los Alamos below LA Weir	05/02	WM	F	CS				141			50.5	7.8	
Los Alamos below LA Weir	05/02	WM	F	DUP				143					
Los Alamos below LA Weir	05/02	WM	UF	CS	3.420	< 0.0028	< 0.0028		53				147
Los Alamos below LA Weir	05/02	WM	UF	DUP					59				
Los Alamos at SR-4	03/26	WM	F	CS				173			68.6	7.8	189

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)[d]	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Pajarito Plateau Stations (Cont.)													
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)													
Los Alamos at SR-4	03/26	WM	UF	CS	< 0.801		< 0.0028		476				
Los Alamos at Rio Grande	03/26	WM	F	CS				237			87.1	8.0	265
Los Alamos at Rio Grande	03/26	WM	UF	CS	1.200		< 0.0028		181				
Pueblo 1 R	04/11	WM	F	CS				239			104	7.7	273
Pueblo 1 R	04/11	WM	UF	CS	< 0.801		< 0.0028		4				
Acid Weir	04/11	WM	F	CS				331			87.2	6.6	462
Acid Weir	04/11	WM	F	DUP				342				6.6	463
Acid Weir	04/11	WM	UF	CS	< 0.801		< 0.0028		< 1				
Acid Weir	04/11	WM	UF	DUP									
Pueblo 2	04/03	WM	F	CS				243			91.8	7.8	308
Pueblo 2	04/03	WM	F	DUP				247					
Pueblo 2	04/03	WM	UF	CS	1.030		< 0.0028		6				
Pueblo 2	04/03	WM	UF	DUP					7				
Pueblo 3	04/03	WS	F	CS				394			81.3	7.6	523
Pueblo 3	04/03	WS	F	DUP				395					
Pueblo 3	04/03	WS	UF	CS	3.700		0.0032		182				
Pueblo 3	04/03	WS	UF	DUP					191				
Pueblo 3	04/03	WS	UF	TRP					191				
Pueblo 3	11/27	WS	UF	CS	< 0.250								
Pueblo 3	11/27	WS	UF	CS	2.660								
Pueblo 3	11/27	WS	UF	DUP	3.890								
Pueblo at SR-502	04/03	WS	F	CS				400			92.6	7.5	446
Pueblo at SR-502	04/03	WS	F	DUP				408				7.5	447
Pueblo at SR-502	04/03	WS	F	CS				405			93.8	7.3	451
Pueblo at SR-502	04/03	WS	F	DUP				406					
Pueblo at SR-502	04/03	WS	UF	CS	< 0.801		< 0.0028		13				
Pueblo at SR-502	04/03	WS	UF	DUP	1.900		< 0.0028		13				
Pueblo at SR-502	04/03	WS	UF	CS	< 0.801		< 0.0028		11				
Pueblo at SR-502	04/03	WS	UF	DUP					12				
Pueblo at SR-502	11/27	WS	UF	CS	< 0.250								
Pueblo at SR-502	11/27	WS	UF	CS	2.320								
Sandia Canyon:													
SCS-1	05/17	WS	F	CS				492			80.5	8.7	608
SCS-1	05/17	WS	F	DUP				492				8.7	609
SCS-1	05/17	WS	UF	CS	9.990		< 0.0028		9				
SCS-1	05/17	WS	UF	DUP			< 0.0028						
SCS-1	11/29	WS	UF	CS	1.200								
SCS-1	11/29	WS	UF	CS	2.750								
SCS-1	11/29	WS	UF	CS	2.310								
SCS-2	05/17	WS	F	CS				705			83.2	8.7	904
SCS-2	05/17	WS	F	CS				719			78.1	8.7	930
SCS-2	05/17	WS	UF	CS	3.320		0.0036		6				

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)[d]	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Pajarito Plateau Stations (Cont.)													
Sandia Canyon: (Cont.)													
SCS-2	05/17	WS	UF	CS	2.810		< 0.0028		6				
SCS-2	11/29	WS	UF	CS	< 0.250								
SCS-2	11/29	WS	UF	CS	2.420								
SCS-3	05/17	WS	F	CS				707			83.9	8.8	930
SCS-3	05/17	WS	UF	CS	4.680		< 0.0028		5				
SCS-3	11/27	WS	UF	CS	< 0.250								
SCS-3	11/29	WS	UF	CS	0.520								
SCS-3	11/29	WS	UF	CS	2.380								
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):													
Mortandad at GS-1	04/18	WS	F	CS				282			87.2	7.7	303
Mortandad at GS-1	04/18	WS	F	DUP				287					
Mortandad at GS-1	04/18	WS	UF	CS	99.500		0.0037		< 1				
Pajarito Canyon (includes Twomile, Threemile Canyons):													
Pajarito below SR-501	03/20	WM	F	CS				128				7.6	
Pajarito below SR-501	03/20	WM	UF	CS	< 0.958	< 0.0028	0.0093		56				114
Pajarito below SR-501	03/20	WM	UF	DUP					56				
Pajarito below SR-501	04/04	WM	F	CS				120			45.4	7.7	
Pajarito below SR-501	04/04	WM	F	DUP				123					
Pajarito below SR-501	04/04	WM	UF	CS	< 0.801	< 0.0028	0.0031		24				84
Pajarito below SR-501	04/04	WM	UF	DUP					25				
Pajarito below SR-501	04/18	WM	F	CS				102			33.8	7.6	
Pajarito below SR-501	04/18	WM	F	DUP				99					
Pajarito below SR-501	04/18	WM	UF	CS	< 0.801	< 0.0028	0.0037		62				95
Pajarito below SR-501	04/18	WM	UF	DUP					54				
Pajarito below SR-501	05/02	WM	F	CS				98			37.5	7.3	
Pajarito below SR-501	05/02	WM	F	DUP				100				7.3	
Pajarito below SR-501	05/02	WM	UF	CS	0.958	< 0.0028	< 0.0028		< 1				82
Pajarito below SR-501	05/02	WM	UF	DUP		< 0.0028	< 0.0028		1				
Pajarito Canyon	04/04	WM	F	CS				158			56.8	7.7	161
Pajarito Canyon	04/04	WM	F	DUP				162					
Pajarito Canyon	04/04	WM	F	TRP				161					
Pajarito Canyon	04/04	WM	UF	CS	< 0.801		0.0030		87				
Pajarito Canyon	04/04	WM	UF	DUP					94				
Pajarito above SR-4	03/21	WM	F	CS				416				7.8	
Pajarito above SR-4	03/21	WM	F	DUP				418				7.8	
Pajarito above SR-4	03/21	WM	F	TRP				418					
Pajarito above SR-4	03/21	WM	UF	CS	< 0.958	< 0.0028	< 0.0028		19				416
Pajarito above SR-4	03/21	WM	UF	DUP			< 0.0028		22				415
Pajarito above SR-4	04/04	WM	F	CS				220			114	7.7	
Pajarito above SR-4	04/04	WM	F	DUP				218					

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)[d]	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Pajarito Plateau Stations (Cont.)													
Pajarito Canyon (includes Twomile, Threemile Canyons): (Cont.)													
Pajarito above SR-4	04/04	WM	F	TRP				223					
Pajarito above SR-4	04/04	WM	UF	CS	< 0.801	< 0.0028	< 0.0028		2				221
Pajarito above SR-4	04/04	WM	UF	DUP					3				
Pajarito above SR-4	04/18	WM	F	CS				261			138	7.7	
Pajarito above SR-4	04/18	WM	F	DUP				266					
Pajarito above SR-4	04/18	WM	UF	CS	< 0.801	< 0.0028	0.0046		< 1				392
Pajarito above SR-4	04/18	WM	UF	DUP					1				
Pajarito above SR-4	05/02	WM	F	CS				358			202	7.6	
Pajarito above SR-4	05/02	WM	F	DUP				362					
Pajarito above SR-4	05/02	WM	UF	CS	< 0.958	< 0.0028	< 0.0028		1				429
Pajarito above SR-4	05/02	WM	UF	DUP					2				
Pajarito at Rio Grande	09/25	WS	F	CS				184			74.1	7.9	126
Pajarito at Rio Grande	09/25	WS	UF	CS	< 0.958		< 0.0029		1				
Pajarito at Rio Grande	09/25	WS	UF	DUP			< 0.0029						
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):													
Water above SR-501	03/15	WM	F	CS				118				7.2	
Water above SR-501	03/15	WM	F	DUP				118					
Water above SR-501	03/15	WM	UF	CS	3.530	< 0.0028	< 0.0028		5				19
Water above SR-501	03/20	WM	F	CS				121				7.2	
Water above SR-501	03/20	WM	UF	CS	3.060	< 0.0028	< 0.0028		11				109
Water above SR-501	04/04	WM	F	CS				149			61.4	7.5	
Water above SR-501	04/04	WM	F	DUP				150					
Water above SR-501	04/04	WM	UF	CS	< 0.801	< 0.0028	< 0.0028		15				158
Water above SR-501	04/04	WM	UF	DUP					17				
Water above SR-501	04/18	WM	F	CS				150			61.8	7.1	
Water above SR-501	04/18	WM	F	DUP				152					
Water above SR-501	04/18	WM	UF	CS	< 0.801	0.0035	0.0054		2				175
Water above SR-501	04/18	WM	UF	DUP					2				
Water above SR-501	05/02	WM	F	CS				156			61.8	6.9	
Water above SR-501	05/02	WM	F	DUP				159					
Water above SR-501	05/02	WM	UF	CS	< 0.958	< 0.0028	< 0.0028		34				7560
Water above SR-501	05/02	WM	UF	DUP					37				
Cañon de Valle above SR-501	04/04	WM	F	CS				90			39.6	7.7	
Cañon de Valle above SR-501	04/04	WM	F	DUP				95					
Cañon de Valle above SR-501	04/04	WM	UF	CS	< 0.801	< 0.0028	< 0.0028		110				66
Cañon de Valle above SR-501	04/04	WM	UF	DUP					111				
Cañon de Valle above SR-501	04/18	WM	F	CS				83			32	7.5	
Cañon de Valle above SR-501	04/18	WM	F	DUP				91					
Cañon de Valle above SR-501	04/18	WM	UF	CS	< 0.801	< 0.0028	0.0054		20				69
Cañon de Valle above SR-501	04/18	WM	UF	DUP					22				69
Cañon de Valle above SR-501	05/02	WM	F	CS				81			33.4	7.8	
Cañon de Valle above SR-501	05/02	WM	F	DUP				87					

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]			ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)[d]	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Pajarito Plateau Stations (Cont.)													
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons): (Cont.)													
Cañon de Valle above SR-501	05/02	WM	UF	CS	2.370	< 0.0028	< 0.0028		8				6930
Cañon de Valle above SR-501	05/02	WM	UF	DUP					10				
Water at Beta	04/17	WM	F	CS				151			64.3	7.4	135
Water at Beta	04/17	WM	F	DUP				156				7.4	
Water at Beta	04/17	WM	F	TRP				158					
Water at Beta	04/17	WM	UF	CS	< 0.801		< 0.0028		3				
Water at Beta	04/17	WM	UF	DUP	< 0.801								
Water below SR-4	03/21	WM	F	CS				150				7.9	
Water below SR-4	03/21	WM	UF	CS	11.300	< 0.0028	< 0.0028		181				120
Water below SR-4	03/21	WM	UF	DUP					189				
Water below SR-4	04/04	WM	F	CS				154			63.2	7.8	
Water below SR-4	04/04	WM	F	DUP				156					
Water below SR-4	04/04	WM	F	TRP				157					
Water below SR-4	04/04	WM	UF	CS	< 0.801	< 0.0028	< 0.0028		104				1360
Water below SR-4	04/04	WM	UF	DUP					108				
Ancho Canyon:													
Ancho at Rio Grande	09/25	WS	F	CS				135			45.1	8.6	282
Ancho at Rio Grande	09/25	WS	F	DUP									
Ancho at Rio Grande	09/25	WS	UF	CS	< 0.958		< 0.0029		< 1				
Frijoles Canyon:													
Frijoles at Monument Headquarters	07/18	WS	F	CS				128			34.3	7.9	123
Frijoles at Monument Headquarters	07/18	WS	F	DUP									
Frijoles at Monument Headquarters	07/18	WS	UF	CS	< 0.958		< 0.0029		24				
Frijoles at Monument Headquarters	07/18	WS	UF	DUP	< 0.958		< 0.0029		26				
Frijoles at Rio Grande	09/26	WS	F	CS				131			40	7.4	198
Frijoles at Rio Grande	09/26	WS	F	DUP									197
Frijoles at Rio Grande	09/26	WS	F	CS				136			40	8.0	122
Frijoles at Rio Grande	09/26	WS	F	DUP				134					
Frijoles at Rio Grande	09/26	WS	UF	CS	< 0.958		< 0.0029		1				
Frijoles at Rio Grande	09/26	WS	UF	CS	< 0.958		< 0.0029		< 1				
Frijoles at Rio Grande	09/26	WS	UF	DUP					2				

Table 5-5. Chemical Quality of Snowmelt and Base Flow for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]	ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)[d]	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Water Quality Standards[g]											
EPA Primary Drinking Water Standard					0.20						
EPA Secondary Drinking Water Standard						500				6.8–8.5	
EPA Health Advisory											
NMWQCC Groundwater Limit					0.20	1,000				6–9	
NMWQCC Wildlife Habitat Standard				0.0052							

[a]Except where noted.

[b]Codes: WM–Snowmelt; WS–Base flow; UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate; TRP–laboratory triplicate; QUD–laboratory quadruplicate.

[c]Total dissolved solids.

[d]Total suspended solids.

[e]Standard units.

[f]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.

[g]Standards given here for comparison only; see Appendix A.

Table 5-6. Perchlorate in Surface Water during 2001 (µg/L)[a]

Location Name	Sample Date	Analysis Date	Codes[b]	Field QC Type Code[c]	Result	MDL	Lab Qualifier Code[d]	Valid Flag Code[d]	Lab[e]
Regional Stations									
Rio Chama at Chamita (bank)	08/01	08/07	WS UF CS		<0.958	0.958	U		GELC
Rio Grande at Embudo (bank)	08/01	08/07	WS UF CS		<0.958	0.958	U		GELC
Rio Grande at Otowi Upper (bank)	07/17	08/06	WS UF CS		<0.958	0.958	U		GELC
Rio Grande at Otowi (bank)	07/17	08/06	WS UF CS		<0.958	0.958	U		GELC
Rio Grande at Frijoles (bank)	09/26	10/09	WS UF CS		<0.958	0.958	U		GELC
Rio Grande at Cochiti	09/26	10/09	WS UF CS		<0.958	0.958	U		GELC
Jemez River	04/18	05/04	WS UF DUP		<0.801	0.801	U		GELC
Jemez River	04/18	05/04	WS UF CS		<0.801	0.801	U		GELC
Jemez River	04/18	05/05	WS UF CS	FB	<0.801	0.801	U		GELC
Pajarito Plateau Stations									
Guaje Canyon:									
Guaje Canyon	10/12	10/18	WS UF CS		<0.958	0.958	U		GELC
Guaje Canyon	10/12	10/18	WS UF DUP		<0.958	0.958	U		GELC
Guaje above Rendija	04/18	05/04	WM UF CS		<0.801	0.801	U		GELC
Guaje above Rendija	08/11	09/06	WT UF CS		<4.79	4.79	U		GELC
Guaje above Rendija	08/14	09/06	WT UF CS		<4.79	4.79	U		GELC
Guaje above Rendija	08/14	09/06	WT UF DUP		<4.79	4.79	U		GELC
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):									
Los Alamos Reservoir	05/01	05/08	WS UF CS		1.97	0.958	J		GELC
Los Alamos above Ice Rink	03/07	03/19	WM UF CS		<0.958	0.958	U		GELC
Los Alamos above Ice Rink	03/07	03/19	WM UF DUP		<0.958	0.958	U		GELC
Los Alamos above Ice Rink	03/15	03/28	WM UF CS		10	0.958			GELC
Los Alamos above Ice Rink	03/15	03/28	WM UF CS	FB	7.83	0.958			GELC
Los Alamos above Ice Rink	03/20	03/28	WM UF DUP		<0.958	0.958	U		GELC
Los Alamos above Ice Rink	03/20	03/28	WM UF CS		6.76	0.958			GELC
Los Alamos above Ice Rink	03/20	03/28	WM UF CS		3.93	0.958	J		GELC
Los Alamos above Ice Rink	04/04	04/28	WM UF DUP		<0.801	0.801	U		GELC
Los Alamos above Ice Rink	04/04	04/28	WM UF CS		1.97	0.801	J	U	GELC
Los Alamos above Ice Rink	05/02	05/18	WM UF CS		<0.958	0.958	U		GELC

Table 5-6. Perchlorate in Surface Water during 2001 (µg/L)[a] (Cont.)

Location Name	Sample Date	Analysis Date	Codes[b]	Field QC Type Code[c]	Result	MDL	Lab Qualifier Code[d]	Valid Flag Code[d]	Lab[e]
Pajarito Plateau Stations (Cont.)									
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)									
Los Alamos below Ice Rink	04/18	05/04	WM UF CS		<0.801	0.801	U		GELC
Los Alamos below Ice Rink	04/18	05/04	WM UF DUP		1.38	0.801	J		GELC
Los Alamos below Ice Rink	07/02	07/19	WT UF CS		<9.58	9.58	U		GELC
Los Alamos below Ice Rink	07/02	07/19	WT UF DUP		<9.58	9.58	U		GELC
Los Alamos below Ice Rink	07/13	08/06	WT UF CS		<4.79	4.79	U		GELC
Los Alamos below Ice Rink	07/13	08/06	WT UF DUP		<4.79	4.79	U		GELC
Los Alamos below Ice Rink	08/01	08/07	WS UF CS		<4.79	4.79	U		GELC
Los Alamos below Ice Rink	08/01	08/07	WS UF DUP		<4.79	4.79	U		GELC
Los Alamos below Ice Rink	08/02	08/28	WS UF CS		<0.958	0.958	U		GELC
Los Alamos below Ice Rink	08/02	08/28	WS UF DUP		<0.958	0.958	U		GELC
Los Alamos below Ice Rink	08/09	08/30	WT UF CS		<1.92	1.92	U		GELC
Los Alamos above DP Canyon	07/26	08/07	WT UF DUP		<4.79	4.79	U		GELC
Los Alamos above DP Canyon	07/26	08/07	WT UF CS		<4.79	4.79	U		GELC
Los Alamos above DP Canyon	08/09	08/30	WT UF DUP		<3.83	3.83	U		GELC
Los Alamos above DP Canyon	08/09	08/30	WT UF CS		<3.83	3.83	U		GELC
Los Alamos above DP Canyon	08/16	09/06	WT UF CS		<0.958	0.958	U		GELC
Los Alamos above DP Canyon	08/16	09/06	WT UF DUP		<0.958	0.958	U		GELC
Los Alamos at Upper GS	03/26	04/25	WM UF CS		<0.801	0.801	U		GELC
Los Alamos at Upper GS	03/26	04/25	WM UF DUP		<0.801	0.801	U		GELC
DPS-1	03/28	04/25	WM UF CS		<0.801	0.801	U		GELC
DP above Los Alamos Canyon	06/27	07/19	WT UF CS		<0.958	0.958	U		GELC
DP above Los Alamos Canyon	06/27	07/19	WT UF CS		<0.958	0.958	U		GELC
Los Alamos above SR-4	03/15	03/19	WM UF CS		<0.958	0.958	U		GELC
Los Alamos above SR-4	03/21	03/28	WM UF CS		11.2	0.958			GELC
Los Alamos above SR-4	04/04	04/28	WM UF CS		<0.801	0.801	U		GELC
Los Alamos above SR-4	04/18	05/04	WM UF CS		<0.801	0.801	U		GELC
Los Alamos above SR-4	05/02	05/18	WM UF CS		<0.958	0.958	U		GELC
Los Alamos above SR-4	06/15	07/09	WS UF CS		<0.958	0.958	U		GELC
Los Alamos above SR-4	08/16	09/06	WT UF CS		<0.958	0.958	U		GELC
Pueblo above SR-502	8/11	9/6	WT UF CS		<4.79	4.79	U		GELC

Table 5-6. Perchlorate in Surface Water during 2001 (µg/L)[a] (Cont.)

Location Name	Sample Date	Analysis Date	Codes[b]	Field QC Type Code[c]	Result	MDL	Lab Qualifier Code[d]	Valid Flag Code[d]	Lab[e]
Pajarito Plateau Stations (Cont.)									
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)									
Los Alamos below LA Weir	03/15	03/28	WM UF CS		11.6	0.958			GELC
Los Alamos below LA Weir	03/21	03/28	WM UF CS		6.73	0.958			GELC
Los Alamos below LA Weir	04/04	04/28	WM UF CS		<0.801	0.801	U		GELC
Los Alamos below LA Weir	04/18	05/04	WM UF CS		<0.801	0.801	U		GELC
Los Alamos below LA Weir	05/02	05/25	WM UF CS		3.42	0.958	J	U	GELC
Los Alamos at SR-4	03/26	04/25	WM UF CS		<0.801	0.801	U		GELC
Los Alamos at Rio Grande	03/26	04/25	WM UF CS		1.2	0.801	J		GELC
Pueblo 1 R	04/11	05/02	WM UF CS		<0.801	0.801	U		GELC
Acid Weir	04/11	05/02	WM UF CS		<0.801	0.801	U		GELC
Pueblo 2	04/03	04/27	WM UF CS		1.03	0.801	J	U	GELC
Pueblo 3	04/03	04/27	WS UF CS		3.7	0.801	J	U	GELC
Pueblo 3	11/27	01/21	WS UF CS		<0.25	0.25	U		ACCU
Pueblo 3	11/27	12/17	WS UF DUP		3.89	0.801	J		GELC
Pueblo 3	11/27	12/17	WS UF CS		2.66	0.801	J	U	GELC
Pueblo at SR-502	04/03	04/27	WS UF CS	FD	<0.801	0.801	U		GELC
Pueblo at SR-502	04/03	04/27	WS UF CS		<0.801	0.801	U		GELC
Pueblo at SR-502	04/03	04/27	WS UF DUP		1.9	0.801	J		GELC
Pueblo at SR-502	11/27	01/21	WS UF CS		<0.25	0.25	U		ACCU
Pueblo at SR-502	11/27	12/17	WS UF CS		2.32	0.801	J	U	GELC
Pueblo above SR-502	08/9	08/31	WT UF CS		<3.83	3.83	U		GELC
Sandia Canyon:									
SCS-1	5/17	6/8	WS UF CS		9.99	0.958		U	GELC
SCS-1	11/27	12/17	WS UF CS	FB	<0.801	0.801	U		GELC
SCS-1	11/29	1/21/02	WS UF CS		1.2	0.25			ACCU
SCS-1	11/29	12/17	WS UF CS		2.75	0.801	J	U	GELC
SCS-1	11/29	12/17	WS UF CS	FD	2.31	0.801	J	U	GELC
SCS-2	5/17	6/8	WS UF CS		3.32	0.958	J	U	GELC
SCS-2	5/17	6/7	WS UF CS	FD	2.81	0.958	J	U	GELC
SCS-2	11/29	01/22	WS UF CS		<0.25	0.25	U		ACCU

Table 5-6. Perchlorate in Surface Water during 2001 (µg/L)[a] (Cont.)

Location Name	Sample Date	Analysis Date	Codes[b]	Field QC Type Code[c]	Result	MDL	Lab Qualifier Code[d]	Valid Flag Code[d]	Lab[e]
Pajarito Plateau Stations (Cont.)									
Sandia Canyon: (Cont.)									
SCS-2	11/29	12/17	WS UF CS		2.42	0.801	J	U	GELC
SCS-3	05/17	06/08	WS UF CS		4.68	0.958		U	GELC
SCS-3	11/27	01/22	WS UF CS	FD	<0.25	0.25	U		ACCU
SCS-3	11/29	01/22	WS UF CS		0.52	0.25			ACCU
SCS-3	11/29	12/17	WS UF CS		2.38	0.801	J	U	GELC
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):									
Mortandad Tributary NE Drainage at TA-55	07/19	08/07	WT UF CS		1.17	0.958	J		GELC
Mortandad at GS-1	04/18	05/08	WS UF CS		99.5	1.6			GELC
MDA L	05/28	06/08	WT UF CS		<1.92	1.92	U		GELC
MDA L	06/07	06/19	WT UF CS		<0.958	0.958	U		GELC
Pajarito Canyon (includes Twomile, Threemile Canyons):									
Pajarito below SR-501	03/20	03/28	WM UF CS		<0.958	0.958	U		GELC
Pajarito below SR-501	04/04	04/28	WM UF CS		<0.801	0.801	U		GELC
Pajarito below SR-501	04/18	05/04	WM UF CS		<0.801	0.801	U		GELC
Pajarito below SR-501	05/02	05/18	WM UF CS		0.958	0.958			GELC
Pajarito above Starmers	08/05	08/30	WT UF CS		<4.79	4.79	U		GELC
Pajarito Canyon	04/04	04/27	WM UF CS		<0.801	0.801	U		GELC
MDA G-3	06/07	06/26	WT UF CS		<3.83	3.83	U		GELC
MDA G-3	07/02	07/19	WT UF CS		<9.58	9.58	U		GELC
Pajarito above SR-4	03/21	03/28	WM UF CS		<0.958	0.958	U		GELC
Pajarito above SR-4	04/04	04/28	WM UF CS		<0.801	0.801	U		GELC
Pajarito above SR-4	04/18	05/04	WM UF CS		<0.801	0.801	U		GELC
Pajarito above SR-4	05/02	05/25	WM UF CS		<0.958	0.958	U		GELC
Pajarito above SR-4	05/02	05/25	WM UF CS	FB	1.27	0.958	J	U	GELC
Pajarito above SR-4	06/27	07/20	WT UF CS		<9.58	9.58	U		GELC
Pajarito above SR-4	08/06	08/30	WT UF DUP		<4.79	4.79	U		GELC
Pajarito above SR-4	08/06	08/30	WT UF CS		<4.79	4.79	U		GELC

Table 5-6. Perchlorate in Surface Water during 2001 (µg/L)[a] (Cont.)

Location Name	Sample Date	Analysis Date	Codes[b]	Field QC Type Code[c]	Result	MDL	Lab Qualifier Code[d]	Valid Flag Code[d]	Lab[e]
Pajarito Plateau Stations (Cont.)									
Pajarito Canyon (includes Twomile, Threemile Canyons) (Cont.)									
Pajarito above SR-4	08/09	09/06	WT UF CS		<1.92	1.92	U		GELC
Pajarito above SR-4	08/09	09/06	WT UF DUP		<1.92	1.92	U		GELC
Pajarito above SR-4	08/16	09/06	WT UF CS		<0.958	0.958	U		GELC
Pajarito at Rio Grande	09/25	10/09	WS UF CS		<0.958	0.958	U		GELC
Pajarito at Rio Grande	09/25	10/09	WS UF CS	FB	<0.958	0.958	U		GELC
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):									
Water above SR-501	03/15	03/28	WM UF CS		3.53	0.958	J		GELC
Water above SR-501	03/20	03/28	WM UF CS		3.06	0.958	J		GELC
Water above SR-501	04/04	04/28	WM UF CS		<0.801	0.801	U		GELC
Water above SR-501	04/18	05/04	WM UF CS		<0.801	0.801	U		GELC
Water above SR-501	05/02	05/25	WM UF CS		<0.958	0.958	U		GELC
Cañon de Valle above SR-501	04/04	04/28	WM UF CS		<0.801	0.801	U		GELC
Cañon de Valle above SR-501	04/18	05/04	WM UF CS		<0.801	0.801	U		GELC
Cañon de Valle above SR-501	05/02	05/25	WM UF CS		2.37	0.958	J	U	GELC
Cañon de Valle above Water	08/09	09/06	WT UF CS		<4.79	4.79	U		GELC
Water at Beta	04/17	05/02	WM UF DUP		<0.801	0.801	U		GELC
Water at Beta	04/17	05/02	WM UF CS		<0.801	0.801	U		GELC
Water below MDA AB	08/08	08/30	WT UF CS		<3.83	3.83	U		GELC
Water below SR-4	03/21	3/28	WM UF CS		11.3	0.958			GELC
Water below SR-4	04/04	4/28	WM UF CS		<0.801	0.801	U		GELC
Water below SR-4	08/03	8/30	WT UF CS		<4.79	4.79	U		GELC
Potrillo Tributary Study Area	8/30	9/13	WT UF CS		<0.958	0.958	U		GELC

Table 5-6. Perchlorate in Surface Water during 2001 (µg/L)[a] (Cont.)

Location Name	Sample Date	Analysis Date	Codes[b]	Field QC Type Code[c]	Result	MDL	Lab Qualifier Code[d]	Valid Flag Code[d]	Lab[e]
Pajarito Plateau Stations (Cont.)									
Frijoles Canyon:									
Frijoles at Monument Headquarters	7/18	08/06	WS UF CS		<0.958	0.958	U		GELC
Frijoles at Monument Headquarters	7/18	08/06	WS UF DUP		<0.958	0.958	U		GELC
Frijoles at Rio Grande	09/26	10/09	WS UF CS	FTB	<0.958	0.958	U		GELC
Frijoles at Rio Grande	09/26	10/09	WS UF CS	FD	<0.958	0.958	U		GELC
Quality Assurance:									
DI Blank	04/04	04/28	WM UF CS	PEB	<0.801	0.801	U		GELC
DI Blank	07/17	08/06	WS UF CS	PEB	<0.958	0.958	U		GELC

[a]Detections are shaded.

[b] Codes: WM-snowmelt; WT-storm runoff; WS-base flow; UF-unfiltered; F-filtered; CS-customer sample; DUP-laboratory duplicate; TRP-laboratory triplicate; QUD-laboratory quadruplicate.

[c]FTB-trip blank; FD-field duplicate; FB-field blank; PEB-performance evaluation blank.

[d]For Lab Qualifier Codes and Valid Flag Codes, see Table 5-4.

[e]GEL-General Engineering Labs; ACCU-Acculabs.

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L)

Station Name	Date	Codes[a]			Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Regional Stations																
Rio Chama at Chamita (bank)	08/01	WS	F	CS	<[b] 0.3	62.5	< 2.6	< 33.3	91.5	< 0.25	< 0.1	< 1.0	< 1.5	< 1.9	< 26.0	< 0.07
Rio Chama at Chamita (bank)	08/01	WS	UF	CS												< 0.07
Rio Grande at Embudo (bank)	08/01	WS	F	CS	< 0.3	< 33.9	< 2.6	< 42.0	35.7	< 0.25	< 0.1	< 1.0	< 1.5	< 1.2	< 4.6	< 0.07
Rio Grande at Embudo (bank)	08/01	WS	UF	CS												< 0.07
Rio Grande at Otowi Upper (bank)	07/17	WS	F	CS	< 0.7	< 14.9	< 2.6	< 43.9	56.9	< 0.21	< 0.4	< 0.7	< 0.6	< 1.8	< 10.5	< 0.06
Rio Grande at Otowi Upper (bank)	07/17	WS	UF	CS												< 0.06
Rio Grande at Otowi (bank)	07/17	WS	F	CS	< 0.7	< 16.5	< 2.6	< 45.6	58.2	< 0.21	< 0.4	< 0.7	< 0.6	< 1.7	< 11.9	< 0.06
Rio Grande at Otowi (bank)	07/17	WS	F	DUP												
Rio Grande at Otowi (bank)	07/17	WS	UF	CS												< 0.06
Rio Grande at Frijoles (bank)	09/26	WS	F	CS	< 0.3	< 17.1	< 2.6	< 21.6	66.4	< 0.25	< 0.5	< 1.0	< 1.5	< 1.1	< 6.0	< 0.07
Rio Grande at Frijoles (bank)	09/26	WS	UF	CS												< 0.07
Rio Grande at Cochiti	09/26	WS	F	CS	< 0.3	< 39.1	< 2.6	< 40.1	71.4	< 0.25	< 0.5	< 1.2	< 1.5	< 1.3	< 6.5	< 0.07
Rio Grande at Cochiti	09/26	WS	UF	CS												< 0.07
Jemez River	04/18	WS	F	CS	< 0.9	340.0	< 2.3	< 38.6	61.6	< 0.16	< 0.1	< 3.3	< 0.6	< 1.5	220.0	< 0.06
Jemez River	04/18	WS	UF	CS												< 0.06
Jemez River	04/18	WS	UF	DUP												
Jemez River	04/18	WS	UF	TRP												
Pajarito Plateau Stations																
Guaje Canyon:																
Guaje Canyon	10/12	WS	F	CS	< 0.3	< 23.4	< 2.6	< 29.0	31.3	< 0.25	< 0.5	< 1.0	< 1.5	< 1.9	137.0	< 0.07
Guaje Canyon	10/12	WS	F	DUP	< 0.3	< 18.9	< 3.9	< 28.5	31.4	< 0.25	< 0.5	< 1.0	< 1.5	< 1.9	145.0	
Guaje Canyon	10/12	WS	UF	CS												< 0.07
Guaje above Rendija	04/18	WM	F	CS	< 0.9	486.0	< 2.3	< 17.0	31.7	< 0.16	< 0.1	< 2.7	< 0.6	< 1.0	234.0	< 0.06
Guaje above Rendija	04/18	WM	UF	CS	< 0.9	6570.0	< 2.3	< 12.0	117.0	0.65	< 0.4	< 1.9	< 2.3	< 4.3	3,810.0	< 0.06
Guaje above Rendija	04/18	WM	UF	DUP												
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):																
Los Alamos Reservoir	05/01	WS	F	CS	< 0.9	1140.0	< 4.1	< 25.3	33.6	< 0.19	< 0.1	< 0.8	< 0.7	< 1.2	434.0	< 0.06
Los Alamos Reservoir	05/01	WS	F	DUP	< 0.9	1080.0	< 4.1	< 24.3	32.9	< 0.19		< 0.8	< 0.9	< 1.2	418.0	
Los Alamos Reservoir	05/01	WS	UF	CS	< 0.9	1820.0	< 4.1	< 29.9	38.5	< 0.19	< 0.1	< 0.8	< 1.1	< 1.2	732.0	< 0.06
Los Alamos above Ice Rink	03/07	WM	UF	CS	< 1.0	500.0	< 2.6	< 27.6	41.6	< 0.25	< 0.1	< 1.0	< 1.0	< 0.7	319.0	< 0.07
Los Alamos above Ice Rink	03/07	WM	UF	DUP	< 1.0	492.0	< 2.6	< 26.5	41.5	< 0.25	< 0.1	< 1.0	< 1.2	< 0.9	291.0	< 0.07
Los Alamos above Ice Rink	03/07	WM	F	CS	< 0.3	188.0	< 2.6	< 23.6	38.0	< 0.25	< 0.1	< 1.0	< 0.6	< 1.9	114.0	
Los Alamos above Ice Rink	03/15	WM	F	CS	< 0.3	125.0	< 2.6	< 11.4	34.9	< 0.25	< 0.1	7.9	< 1.5	< 1.1	65.4	
Los Alamos above Ice Rink	03/15	WM	UF	CS	< 0.3	933.0	< 2.6	< 7.4	44.4	< 0.25	< 0.1	< 1.0	< 1.5	< 1.1	536.0	< 0.07
Los Alamos above Ice Rink	03/20	WM	F	CS	< 0.3	74.9	< 2.6	< 14.2	35.5	< 0.25	< 0.1	< 1.0	< 1.5	< 1.9	< 39.1	< 0.07
Los Alamos above Ice Rink	03/20	WM	UF	CS	< 0.3	1080.0	< 2.6	< 10.1	49.0	< 0.25	< 0.1	< 1.0	< 1.5	< 1.4	609.0	< 0.07
Los Alamos above Ice Rink	03/20	WM	UF	DUP	< 0.3	1060.0	< 2.6	< 10.2	48.9	< 0.25	< 0.1	< 1.0	< 0.6	< 1.2	602.0	< 0.07
Los Alamos above Ice Rink	03/20	WM	F	CS	< 0.3	123.0	< 2.6	< 15.9	36.3	< 0.25	< 0.1	< 1.0	< 1.5	< 0.7	67.0	< 0.07
Los Alamos above Ice Rink	03/20	WM	UF	CS	< 0.3	1030.0	< 2.6	< 18.1	47.9	< 0.25	< 0.1	< 1.0	< 1.5	< 1.4	576.0	< 0.07
Los Alamos above Ice Rink	04/04	WM	F	CS	< 0.9	84.9	< 2.3	< 17.9	29.5	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	81.0	< 0.06
Los Alamos above Ice Rink	04/04	WM	UF	CS	< 0.9	7180.0	< 2.3	< 16.8	109.0	< 0.35	< 0.1	< 1.5	< 3.3	< 3.5	3,780.0	< 0.06
Los Alamos above Ice Rink	04/04	WM	UF	DUP							< 0.1					
Los Alamos above Ice Rink	04/04	WM	UF	TRP												
Los Alamos above Ice Rink	05/02	WM	F	CS	< 0.9	1090.0	< 4.1	< 32.5	37.8	< 0.19	< 0.1	< 1.1	< 1.0	< 1.7	454.0	< 0.06
Los Alamos above Ice Rink	05/02	WM	UF	CS	< 0.9	1910.0	< 4.1	< 31.9	43.9	< 0.19	< 0.1	< 0.8	< 0.8	< 1.2	850.0	< 0.06
Los Alamos above Ice Rink	05/02	WM	UF	DUP												
Los Alamos below Ice Rink	04/18	WM	F	CS	< 0.9	266.0	< 2.3	< 15.6	31.3	< 0.16	< 0.2	< 0.4	< 0.6	< 1.0	130.0	< 0.06

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Pajarito Plateau Stations (Cont.)																
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																
Los Alamos below Ice Rink	04/18	WM	UF	CS	< 0.9	2010.0	< 2.3	< 8.8	55.0	< 0.16	< 0.3	< 0.4	< 0.9	< 2.4	1,270.0	< 0.06
Los Alamos below Ice Rink	04/18	WM	UF	DUP	< 0.9	2030.0	< 2.3	< 8.9	53.3	< 0.16	< 0.3	< 0.4	< 0.6	< 1.9	1,040.0	< 0.06
Los Alamos below Ice Rink	04/18	WM	UF	TRP												
Los Alamos below Ice Rink	08/01	WS	F	CS	< 0.3	101.0	< 2.6	< 25.0	83.8	< 0.25	0.1	< 1.0	< 1.5	< 1.7	70.5	< 0.07
Los Alamos below Ice Rink	08/01	WS	F	DUP	< 0.3	95.2	< 2.6	< 24.8	84.9	< 0.25	< 0.1	< 1.0	< 1.5	< 1.5	65.1	< 0.07
Los Alamos below Ice Rink	08/01	WS	UF	CS	< 0.3	57600.0	11.2	< 13.8	851.0	< 4.46	1.6	15.1	30.1	47.8	38,400.0	< 0.07
Los Alamos below Ice Rink	08/01	WS	UF	DUP	< 0.3	58800.0	11.4	< 14.9	844.0	< 4.44	1.6	15.4	30.8	47.4	39,400.0	< 0.07
Los Alamos below Ice Rink	08/01	WS	UF	TRP												
Los Alamos below Ice Rink	08/02	WS	F	CS	< 0.3	103.0	< 2.8	< 26.7	77.8	< 0.25	< 0.3	< 1.0	< 1.5	< 1.4	72.0	< 0.07
Los Alamos below Ice Rink	08/02	WS	F	DUP	< 0.3	88.1	< 2.6	< 26.8	78.3	< 0.25	< 0.3	< 1.0	< 1.5	< 1.5	64.6	< 0.07
Los Alamos below Ice Rink	08/02	WS	UF	CS	< 0.3	11900.0	< 2.6	< 22.7	236.0	< 0.95	< 0.8	< 2.7	5.6	11.0	7,090.0	< 0.07
Los Alamos below Ice Rink	08/02	WS	UF	DUP	< 0.3	12000.0	< 4.6	< 21.6	236.0	< 0.82	< 0.7	< 2.4	5.2	10.3	7,080.0	< 0.07
Los Alamos below Ice Rink	08/02	WS	UF	TRP												
Los Alamos at Upper GS	03/26	WM	F	CS	< 0.3	< 37.2	< 2.6	< 24.9	42.0	< 0.25	< 0.1	< 1.0	< 1.5	< 1.9	< 13.8	< 0.07
Los Alamos at Upper GS	03/26	WM	F	DUP	< 0.3	< 30.2	< 2.6	< 24.6	43.0	< 0.25	< 0.1	< 1.0	< 0.6	< 1.2	< 4.9	
Los Alamos at Upper GS	03/26	WM	UF	CS												< 0.07
Los Alamos at Upper GS	03/26	WM	UF	DUP												< 0.07
DPS-1	03/28	WM	F	CS	< 0.3	< 18.7	< 2.6	< 27.7	215.0	< 0.36	< 0.1	< 0.7	< 0.9	< 2.5	< 37.0	< 0.18
DPS-1	03/28	WM	UF	CS												< 0.07
Los Alamos above SR-4	03/15	WM	F	CS	< 0.3	113.0	< 2.6	< 12.8	48.1	< 0.25	< 0.1	< 3.5	< 1.2	< 1.0	50.7	
Los Alamos above SR-4	03/15	WM	UF	CS	< 1.6	8750.0	5.5	< 13.9	121.0	< 0.80	< 0.2	8.6	6.0	5.2	4,940.0	< 0.07
Los Alamos above SR-4	03/15	WM	UF	DUP	< 0.3	8160.0	< 3.9	< 10.1	123.0	< 0.81	108.0	8.4	< 4.9	6.4	4,640.0	< 0.07
Los Alamos above SR-4	03/21	WM	F	CS	< 0.3	240.0	< 2.6	< 25.6	53.7	< 0.25	< 0.1	< 1.0	< 0.6	< 0.7	122.0	< 0.07
Los Alamos above SR-4	03/21	WM	UF	CS	< 0.3	3610.0	< 2.6	< 22.2	86.8	< 0.26	< 0.1	< 1.3	< 3.3	< 3.3	2,390.0	< 0.07
Los Alamos above SR-4	03/21	WM	UF	DUP												
Los Alamos above SR-4	04/04	WM	F	CS	< 0.9	< 27.1	< 2.3	< 20.0	36.3	< 0.16	< 0.1	< 0.4	< 0.8	< 0.6	< 3.3	< 0.06
Los Alamos above SR-4	04/04	WM	UF	CS	< 0.9	9120.0	< 2.3	< 20.2	142.0	< 0.56	< 0.1	< 2.0	< 4.7	5.7	5,490.0	< 0.06
Los Alamos above SR-4	04/04	WM	UF	DUP												
Los Alamos above SR-4	04/04	WM	UF	TRP												
Los Alamos above SR-4	04/18	WM	F	CS	< 0.9	501.0	< 2.3	< 18.0	37.0	< 0.16	< 0.3	< 0.4	< 0.6	< 4.4	207.0	< 0.06
Los Alamos above SR-4	04/18	WM	UF	CS	< 0.9	4210.0	< 2.3	< 17.7	85.7	< 0.22	< 0.4	< 0.6	< 2.0	< 3.8	2,520.0	< 0.06
Los Alamos above SR-4	04/18	WM	UF	DUP												
Los Alamos above SR-4	05/02	WM	F	CS	< 0.9	1040.0	< 4.1	< 32.3	43.7	< 0.19	< 0.1	< 0.8	< 3.8	< 1.2	501.0	< 0.06
Los Alamos above SR-4	05/02	WM	UF	CS	< 0.9	1450.0	< 4.1	< 39.5	46.1	< 0.19	< 0.1	8.0	< 1.2	< 1.2	642.0	< 0.06
Los Alamos above SR-4	06/15	WS	F	CS	< 0.9	118.0	< 4.1	< 16.8	40.8	< 0.19	< 0.1	< 0.8	< 0.7	< 1.2	70.0	< 0.06
Los Alamos above SR-4	06/15	WS	UF	CS	< 0.9	8500.0	< 4.1	< 21.8	136.0	< 0.73	< 0.2	< 2.0	< 4.8	7.4	5,120.0	< 0.06
Los Alamos above SR-4	06/15	WS	UF	DUP	< 0.9	8390.0	< 4.1	< 20.2	136.0	< 0.62		< 2.0	< 4.5	5.6	5,030.0	< 0.06
Los Alamos above SR-4	06/15	WS	UF	TRP												
Los Alamos below LA Weir	03/15	WM	F	CS	< 0.3	68.5	< 2.6	< 17.5	49.3	< 0.25	< 0.1	< 4.9	< 1.3	< 1.9	< 18.3	
Los Alamos below LA Weir	03/15	WM	UF	CS	< 0.3	11900.0	6.4	< 13.7	130.0	< 1.12	< 0.4	6.3	5.6	6.7	5,930.0	< 0.07
Los Alamos below LA Weir	03/21	WM	F	CS	< 0.3	98.5	< 2.6	< 28.2	50.8	< 0.25	< 0.1	< 1.0	< 1.1	< 1.1	60.7	< 0.07
Los Alamos below LA Weir	03/21	WM	UF	CS	< 0.3	1680.0	< 2.6	< 25.2	63.7	< 0.25	< 0.1	< 1.0	< 1.3	< 1.6	964.0	< 0.07
Los Alamos below LA Weir	03/21	WM	UF	DUP												
Los Alamos below LA Weir	04/04	WM	F	CS	< 0.9	208.0	< 2.3	< 16.2	38.0	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	107.0	< 0.06
Los Alamos below LA Weir	04/04	WM	UF	CS	< 0.9	7230.0	< 2.3	< 19.1	106.0	< 0.36	< 0.1	< 2.1	< 3.9	< 3.4	3,880.0	< 0.06
Los Alamos below LA Weir	04/04	WM	UF	DUP												
Los Alamos below LA Weir	04/04	WM	UF	TRP												
Los Alamos below LA Weir	04/18	WM	F	CS	< 0.9	311.0	< 2.3	< 16.0	37.8	< 0.16	< 0.3	< 2.2	< 0.6	< 1.0	136.0	< 0.06

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Pajarito Plateau Stations (Cont.)																
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																
Los Alamos below LA Weir	04/18	WM	UF	CS	< 0.9	1280.0	< 2.3	< 7.9	45.8	< 0.16	< 0.3	< 0.4	< 0.8	< 1.5	681.0	< 0.06
Los Alamos below LA Weir	04/18	WM	UF	DUP												
Los Alamos below LA Weir	05/02	WM	F	CS	< 0.9	991.0	< 4.1	< 30.6	42.0	< 0.19	< 0.1	7.0	< 0.7	< 1.2	401.0	< 0.06
Los Alamos below LA Weir	05/02	WM	UF	CS	< 1.0	2060.0	< 4.1	< 23.8	54.8	< 0.19	< 0.1	8.6	< 1.8	< 1.2	1,000.0	< 0.06
Los Alamos below LA Weir	05/02	WM	UF	DUP												
Los Alamos at SR-4	03/26	WM	F	CS	< 0.3	188.0	< 2.6	< 22.8	43.2	< 0.25	< 0.1	< 1.0	< 1.1	< 1.0	90.9	< 0.07
Los Alamos at SR-4	03/26	WM	F	DUP												< 0.07
Los Alamos at SR-4	03/26	WM	UF	CS												< 0.07
Los Alamos at Rio Grande	03/26	WM	F	CS	< 0.3	< 25.3	< 2.6	88.4	59.3	< 0.25	< 0.1	< 1.0	< 1.5	< 1.8	< 15.4	< 0.07
Los Alamos at Rio Grande	03/26	WM	UF	CS												< 0.07
Pueblo 1 R	04/11	WM	F	CS	< 1.5	65.6	< 2.6	< 29.9	69.3	< 0.27	< 0.2	< 1.0	< 1.5	< 1.9	89.9	< 0.07
Pueblo 1 R	04/11	WM	UF	CS	< 1.7	432.0	< 4.5	< 24.8	72.7	< 0.52	< 0.2	< 1.0	< 1.5	< 1.9	400.0	< 0.07
Acid Weir	04/11	WM	F	CS	< 1.5	< 27.4	< 2.6	< 21.2	53.8	< 0.25	< 0.2	< 1.0	< 1.5	< 1.9	< 15.9	< 0.07
Acid Weir	04/11	WM	UF	CS	< 1.7	< 28.7	< 2.6	< 21.0	53.2	< 0.31	< 0.3	< 1.0	< 1.5	< 1.6	< 25.9	< 0.07
Acid Weir	04/11	WM	UF	DUP	< 1.6	< 39.1	< 2.6	< 19.8	54.8	< 0.32	< 0.3	< 1.0	< 1.5	< 1.9	< 13.6	< 0.07
Acid Weir	04/11	WM	UF	TRP			< 4.1					< 0.8	< 0.7	< 1.2		< 0.06
Pueblo 2	04/03	WM	F	CS	< 0.9	77.4	< 2.3	< 31.5	53.6	< 0.16	< 0.1	< 1.1	< 0.6	< 0.6	< 34.4	< 0.06
Pueblo 2	04/03	WM	UF	CS	< 0.9	534.0	< 2.3	< 38.1	58.2	< 0.16	< 0.1	< 0.4	< 0.6	< 1.5	305.0	< 0.06
Pueblo 2	04/03	WM	UF	DUP												
Pueblo 3	04/03	WS	F	CS	< 0.9	126.0	< 2.3	347.0	19.7	< 0.16	< 0.1	< 0.4	< 1.0	36.2	280.0	< 0.06
Pueblo 3	04/03	WS	UF	CS	< 2.3	3210.0	< 3.3	347.0	73.2	< 0.16	< 0.2	< 0.9	< 4.8	43.5	2,810.0	< 0.06
Pueblo 3	04/03	WS	UF	DUP												
Pueblo 3	04/03	WS	UF	TRP												
Pueblo at SR-502	04/03	WS	F	CS	< 0.9	< 29.8	< 2.3	334.0	17.0	< 0.16	< 0.1	< 1.0	< 0.6	7.5	139.0	< 0.06
Pueblo at SR-502	04/03	WS	F	CS	< 0.9	< 28.9	< 2.3	331.0	17.1	< 0.16	< 0.1	5.1	< 0.6	9.4	95.5	< 0.06
Pueblo at SR-502	04/03	WS	UF	CS	< 0.9	268.0	< 2.3	341.0	22.4	< 0.16	< 0.1	< 1.0	< 0.6	9.1	330.0	< 0.06
Pueblo at SR-502	04/03	WS	UF	DUP	< 0.9	284.0	< 2.3	345.0	22.6	< 0.16	< 0.1	< 1.0	< 0.7	9.6	339.0	< 0.06
Pueblo at SR-502	04/03	WS	UF	CS	< 0.9	265.0	< 2.3	320.0	21.7	< 0.16	< 0.1	< 4.7	< 0.6	9.0	331.0	< 0.06
Pueblo at SR-502	04/03	WS	UF	DUP												
Sandia Canyon:																
SCS-1	05/17	WS	F	CS	< 0.9	< 15.7	< 3.9	53.7	28.2	< 0.16	< 0.1	< 0.4	< 3.3	< 3.8	< 48.5	< 0.06
SCS-1	05/17	WS	F	DUP	< 0.9	< 7.6	5.3	50.9	27.6	< 0.16		< 0.4	< 3.5	< 4.3	< 3.3	
SCS-1	05/17	WS	UF	CS												< 0.06
SCS-2	05/17	WS	F	CS	< 0.9	170.0	5.2	73.6	32.6	< 0.16	< 0.3	< 0.4	9.4	8.0	298.0	< 0.06
SCS-2	05/17	WS	F	CS	< 0.9	137.0	< 3.7	65.5	30.3	< 0.16	< 0.2	< 0.4	8.6	6.8	254.0	< 0.06
SCS-2	05/17	WS	UF	CS												< 0.06
SCS-2	05/17	WS	UF	DUP												< 0.06
SCS-2	05/17	WS	UF	CS												< 0.06
SCS-3	05/17	WS	F	CS	< 0.9	187.0	6.3	78.4	33.0	< 0.16	< 0.1	< 0.4	9.7	7.6	297.0	< 0.06
SCS-3	05/17	WS	UF	CS												< 0.06
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																
Mortandad at GS-1	04/18	WS	F	CS	< 0.9	933.0	< 2.3	< 43.4	31.4	< 0.16	1.0	< 0.5	< 2.2	30.3	584.0	< 0.06
Mortandad at GS-1	04/18	WS	F	DUP	< 0.9	973.0	< 2.3	< 44.4	31.7	< 0.16		< 0.4	< 2.2	30.5	601.0	
Mortandad at GS-1	04/18	WS	UF	CS												< 0.06

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Pajarito Plateau Stations (Cont.)																
Pajarito Canyon (includes Twomile, Threemile Canyons):																
Pajarito below SR-501	03/20	WM	F	CS	< 0.3	324.0	< 2.6	< 13.0	42.2	< 0.25	< 0.1	< 4.4	< 1.5	< 0.7	167.0	< 0.07
Pajarito below SR-501	03/20	WM	UF	CS	< 0.3	4510.0	< 2.6	< 12.6	131.0	< 0.30	< 0.1	< 4.7	< 2.1	< 3.7	2,620.0	< 0.07
Pajarito below SR-501	03/20	WM	UF	DUP												
Pajarito below SR-501	04/04	WM	F	CS	< 0.9	660.0	< 2.3	< 7.5	39.0	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	267.0	< 0.06
Pajarito below SR-501	04/04	WM	UF	CS	< 0.9	1610.0	< 2.3	< 17.1	52.2	< 0.16	< 0.1	< 1.3	< 0.8	< 0.6	737.0	< 0.06
Pajarito below SR-501	04/04	WM	UF	DUP												
Pajarito below SR-501	04/18	WM	F	CS	< 0.9	1180.0	< 2.3	< 7.6	37.2	< 0.16	< 0.1	< 0.4	< 0.6	< 1.1	421.0	< 0.06
Pajarito below SR-501	04/18	WM	UF	CS	< 0.9	1820.0	< 2.3	< 13.3	51.6	< 0.16	< 0.3	< 2.5	< 0.7	< 1.7	834.0	< 0.06
Pajarito below SR-501	04/18	WM	UF	DUP												
Pajarito below SR-501	05/02	WM	F	CS	< 0.9	683.0	< 4.1	< 10.6	37.7	< 0.19	< 0.1	< 0.8	< 0.7	< 1.2	286.0	< 0.06
Pajarito below SR-501	05/02	WM	F	DUP	< 0.9	683.0	< 4.1	< 10.7	38.5	< 0.19		< 0.8	< 0.7	< 1.2	288.0	
Pajarito below SR-501	05/02	WM	UF	CS	< 0.9	742.0	< 4.1	< 33.9	39.1	< 0.19	< 0.1	< 3.2	< 0.7	< 1.2	310.0	< 0.06
Pajarito below SR-501	05/02	WM	UF	DUP							< 0.1					
Pajarito Canyon	04/04	WM	F	CS	< 0.9	336.0	< 2.3	< 12.5	52.8	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	160.0	< 0.06
Pajarito Canyon	04/04	WM	UF	CS	< 0.9	3250.0	< 2.3	< 9.1	87.8	< 0.16	< 0.1	< 0.6	< 1.8	< 2.7	1,910.0	< 0.06
Pajarito Canyon	04/04	WM	UF	DUP												
Pajarito above SR-4	03/21	WM	F	CS	< 0.3	< 45.1	< 3.2	< 48.2	154.0	< 0.25	< 0.1	< 1.5	< 1.5	< 1.5	< 37.1	< 0.07
Pajarito above SR-4	03/21	WM	UF	CS	< 0.3	577.0	< 2.6	55.7	161.0	< 0.25	< 0.1	< 1.0	< 1.5	< 1.9	401.0	< 0.07
Pajarito above SR-4	03/21	WM	UF	DUP	< 0.3	604.0	< 2.6	56.8	165.0	< 0.25	< 0.1	< 1.0	< 1.5	< 1.6	412.0	< 0.07
Pajarito above SR-4	04/04	WM	F	CS	< 0.9	89.1	< 2.3	< 41.3	88.7	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	63.6	< 0.06
Pajarito above SR-4	04/04	WM	UF	CS	< 0.9	394.0	< 2.3	< 34.6	90.7	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	300.0	< 0.06
Pajarito above SR-4	04/04	WM	UF	DUP												
Pajarito above SR-4	04/18	WM	F	CS	< 0.9	< 16.0	< 2.3	< 45.4	113.0	< 0.16	< 0.1	< 0.4	< 0.6	< 2.2	59.3	< 0.06
Pajarito above SR-4	04/18	WM	UF	CS	< 0.9	< 32.9	< 2.3	< 40.4	118.0	< 0.16	< 0.3	< 0.4	< 0.6	< 1.7	87.3	< 0.06
Pajarito above SR-4	04/18	WM	UF	DUP												
Pajarito above SR-4	05/02	WM	F	CS	< 0.9	72.9	< 4.1	56.2	153.0	< 0.19	< 0.1	< 4.5	< 0.7	< 1.2	77.1	< 0.06
Pajarito above SR-4	05/02	WM	UF	CS	< 0.9	65.7	< 4.1	< 47.6	157.0	< 0.19	< 0.1	< 3.7	< 0.7	< 1.2	107.0	< 0.06
Pajarito above SR-4	05/02	WM	UF	DUP												
Pajarito at Rio Grande	09/25	WS	F	CS	< 0.3	< 34.3	< 2.6	< 29.2	40.9	< 0.25	< 0.5	< 2.5	< 3.8	< 1.9	< 4.6	< 0.07
Pajarito at Rio Grande	09/25	WS	UF	CS												< 0.07
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):																
Water above SR-501	03/15	WM	F	CS	< 0.3	453.0	< 2.6	< 15.2	32.1	< 0.25	< 0.1	< 1.0	< 1.5	< 1.1	192.0	
Water above SR-501	03/15	WM	UF	CS	< 0.3	643.0	< 2.6	< 13.9	35.0	< 0.25	< 0.1	< 1.0	< 1.5	< 1.1	301.0	< 0.07
Water above SR-501	03/20	WM	F	CS	< 0.3	484.0	< 2.6	< 8.0	33.6	< 0.25	< 0.1	< 4.9	< 1.5	< 3.1	231.0	< 0.07
Water above SR-501	03/20	WM	UF	CS	< 0.3	575.0	< 2.6	< 8.5	36.1	< 0.25	< 0.1	9.9	< 1.5	< 0.9	289.0	< 0.07
Water above SR-501	04/04	WM	F	CS	< 0.9	373.0	< 2.3	< 14.4	43.5	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	149.0	< 0.06
Water above SR-501	04/04	WM	F	DUP	< 0.9	399.0	< 2.3	< 13.4	44.2	< 0.16		< 0.4	< 0.6	< 0.6	176.0	< 0.06
Water above SR-501	04/04	WM	UF	CS	< 0.9	813.0	< 2.3	< 12.4	48.8	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	383.0	< 0.06
Water above SR-501	04/04	WM	UF	DUP												
Water above SR-501	04/18	WM	F	CS	< 0.9	52.1	< 2.3	< 3.6	40.7	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	< 33.0	< 0.06
Water above SR-501	04/18	WM	UF	CS	< 0.9	108.0	< 2.3	< 17.0	42.3	< 0.16	< 0.3	< 0.4	< 0.6	< 0.9	91.0	< 0.06
Water above SR-501	04/18	WM	UF	DUP												
Water above SR-501	05/02	WM	F	CS	< 0.9	162.0	< 4.1	< 20.4	42.7	< 0.19	< 0.1	< 0.8	< 0.7	< 1.2	67.5	< 0.06
Water above SR-501	05/02	WM	UF	CS	< 0.9	4000.0	< 4.1	< 19.2	99.0	< 0.19	< 0.1	< 0.8	< 2.3	< 1.5	2,250.0	< 0.06
Water above SR-501	05/02	WM	UF	DUP												
Cañon de Valle above SR-501	04/04	WM	F	CS	< 0.9	243.0	< 2.3	< 7.0	24.5	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	89.8	< 0.06
Cañon de Valle above SR-501	04/04	WM	UF	CS	< 0.9	4750.0	< 2.3	< 3.7	69.8	< 0.16	< 0.1	< 0.9	< 2.1	< 1.1	2,300.0	< 0.06

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Pajarito Plateau Stations (Cont.)																
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons): (Cont.)																
Cañon de Valle above SR-501	04/04	WM	UF	DUP												
Cañon de Valle above SR-501	04/18	WM	F	CS	< 0.9	1550.0	< 2.3	< 14.9	30.7	< 0.16	< 0.1	< 0.5	< 0.6	< 1.2	522.0	< 0.06
Cañon de Valle above SR-501	04/18	WM	UF	CS	< 0.9	1950.0	< 2.3	< 14.0	36.6	< 0.16	< 0.3	< 2.5	< 0.7	< 1.3	741.0	< 0.06
Cañon de Valle above SR-501	04/18	WM	UF	DUP												
Cañon de Valle above SR-501	05/02	WM	F	CS	< 0.9	1030.0	< 4.1	< 9.1	30.3	< 0.19	< 0.1	< 0.8	< 0.7	< 1.2	379.0	< 0.06
Cañon de Valle above SR-501	05/02	WM	UF	CS	< 0.9	1310.0	< 4.1	< 27.9	34.9	< 0.19	< 0.1	< 3.7	< 0.8	< 1.2	504.0	< 0.06
Cañon de Valle above SR-501	05/02	WM	UF	DUP												
Water at Beta	04/17	WM	F	CS	< 0.9	132.0	< 2.3	< 24.2	142.0	< 0.16	< 0.1	< 2.4	< 0.6	< 1.1	68.6	< 0.06
Water at Beta	04/17	WM	F	DUP							< 0.1					
Water at Beta	04/17	WM	UF	CS												< 0.06
Water at Beta	04/17	WM	UF	DUP												< 0.06
Water below SR-4	03/21	WM	F	CS	< 0.3	341.0	< 2.6	< 47.3	136.0	< 0.25	< 0.1	< 1.0	< 1.5	< 1.9	187.0	< 0.07
Water below SR-4	03/21	WM	UF	CS	< 0.3	8410.0	< 2.6	< 42.8	269.0	< 0.48	< 0.1	< 1.1	< 4.0	5.3	5,010.0	< 0.07
Water below SR-4	03/21	WM	UF	DUP												
Water below SR-4	04/04	WM	F	CS	< 0.9	212.0	< 2.3	< 17.3	106.0	< 0.16	< 0.1	< 0.4	< 0.6	< 0.6	95.7	< 0.06
Water below SR-4	04/04	WM	UF	CS	< 0.9	2980.0	< 2.3	< 15.9	149.0	< 0.16	< 0.1	< 0.9	< 1.4	< 0.7	1,690.0	< 0.06
Water below SR-4	04/04	WM	UF	DUP												
Ancho Canyon:																
Ancho at Rio Grande	09/25	WS	F	CS	< 0.3	< 34.3	< 2.6	< 20.6	26.3	< 0.25	< 0.5	< 0.7	< 1.5	< 1.9	< 4.6	< 0.07
Ancho at Rio Grande	09/25	WS	UF	CS												< 0.07
Frijoles Canyon:																
Frijoles at Monument Headquarters	07/18	WS	F	CS	< 0.7	< 29.8	< 2.6	< 12.7	16.3	< 0.21	< 0.4	< 0.7	< 0.6	< 1.0	68.2	< 0.06
Frijoles at Monument Headquarters	07/18	WS	UF	CS												< 0.06
Frijoles at Monument Headquarters	07/18	WS	UF	DUP	< 0.7	708.0	< 2.6	< 7.1	22.6	< 0.21	< 0.4	< 0.7	< 0.6	< 1.5	483.0	< 0.06
Frijoles at Rio Grande	09/26	WS	F	CS	< 0.3	< 48.5	< 2.6	< 14.6	17.1	< 0.25	< 0.4	< 1.0	< 1.5	< 1.9	73.6	< 0.07
Frijoles at Rio Grande	09/26	WS	F	DUP	< 0.3	52.8	< 2.6	< 12.6	17.7	< 0.25	< 0.5	< 1.0	< 1.5	< 1.9	71.6	< 0.07
Frijoles at Rio Grande	09/26	WS	F	CS	< 0.3	52.3	< 2.6	< 10.1	16.6	< 0.25	< 0.5	< 3.8	< 1.5	< 1.9	66.2	< 0.07
Frijoles at Rio Grande	09/26	WS	UF	CS												< 0.07
Frijoles at Rio Grande	09/26	WS	UF	CS												< 0.07
Frijoles at Rio Grande	09/26	WS	UF	DUP												
Water Quality Standards[c]																
EPA Primary Drinking Water Standard							10		2,000	4	5		100			2
EPA Secondary Drinking Water Standard						50-200									300	
EPA Action Level														1,300		
EPA Health Advisory																
NMWQCC Livestock Watering Standard						5,000	200	5,000			50	1,000	1,000	500		10
NMWQCC Groundwater Limit					50	5,000	100	750	1,000		10	50	50	1,000	1,000	2
NMWQCC Wildlife Habitat Standard																0.77

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Regional Stations															
Rio Chama at Chamita (bank)	08/01	WS	F	CS	< 6.4	< 1.7	< 1.3	< 0.03	0.34	< 2.4	< 3.5	395.0	< 0.01	< 2.5	< 3.3
Rio Chama at Chamita (bank)	08/01	WS	UF	CS						< 2.4					
Rio Grande at Embudo (bank)	08/01	WS	F	CS	< 4.3	< 7.7	< 1.2	< 0.10	0.26	< 2.4	< 3.5	234.0	< 0.01	5.3	< 3.3
Rio Grande at Embudo (bank)	08/01	WS	UF	CS						< 2.4					
Rio Grande at Otowi Upper (bank)	07/17	WS	F	CS	< 3.0	< 4.2	< 1.3	< 2.43	< 0.41	< 3.5	< 1.9	262.0	< 0.31	< 4.0	< 1.3
Rio Grande at Otowi Upper (bank)	07/17	WS	UF	CS						< 3.5					
Rio Grande at Otowi (bank)	07/17	WS	F	CS	20.3	< 7.4	< 1.3	< 2.43	< 0.20	< 3.5	< 1.9	261.0	1.03	< 4.3	< 1.4
Rio Grande at Otowi (bank)	07/17	WS	F	DUP					< 0.13				< 0.31		
Rio Grande at Otowi (bank)	07/17	WS	UF	CS						< 3.5					
Rio Grande at Frijoles (bank)	09/26	WS	F	CS	< 4.4	< 3.8	< 1.2	< 2.57	0.15		< 3.5	294.0	< 0.01	< 3.2	< 1.3
Rio Grande at Frijoles (bank)	09/26	WS	UF	CS						< 2.4					
Rio Grande at Cochiti	09/26	WS	F	CS	21.2	< 2.8	< 1.2	< 2.57	0.11		< 3.5	303.0	< 0.01	< 3.5	< 1.1
Rio Grande at Cochiti	09/26	WS	UF	CS						< 2.4					
Jemez River	04/18	WS	F	CS	< 8.8	< 1.3	< 0.9	< 0.16	< 0.15		< 2.3	88.0	0.55	< 1.2	< 0.7
Jemez River	04/18	WS	UF	CS						< 2.9					
Jemez River	04/18	WS	UF	DUP											
Jemez River	04/18	WS	UF	TRP											
Pajarito Plateau Stations															
Guaje Canyon:															
Guaje Canyon	10/12	WS	F	CS	318.0	< 2.4	< 1.3	< 2.57	< 0.20	< 2.4	< 3.5	93.2	< 0.01	< 1.5	< 3.4
Guaje Canyon	10/12	WS	F	DUP	319.0	< 1.7	< 1.2	< 2.57	< 0.17	< 2.4	< 3.5	93.2	< 0.01	< 1.4	6.4
Guaje Canyon	10/12	WS	UF	CS						< 2.4					
Guaje above Rendija	04/18	WM	F	CS	< 9.0	< 1.3	< 1.8	< 0.13	< 0.15	< 2.9	< 2.3	68.9	< 0.08	< 2.3	< 2.8
Guaje above Rendija	04/18	WM	UF	CS	368.0	< 1.3	< 4.4	6.40	< 0.15	< 2.9	< 2.3	95.6	< 0.24	7.9	21.2
Guaje above Rendija	04/18	WM	UF	DUP											
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):															
Los Alamos Reservoir	05/01	WS	F	CS	41.6	< 1.5	< 1.7	0.27	< 0.15		< 3.0	78.8	< 0.13	< 1.5	< 3.3
Los Alamos Reservoir	05/01	WS	F	DUP	41.5	< 1.5	< 1.6			< 2.8	< 3.0	78.7		< 1.7	< 2.0
Los Alamos Reservoir	05/01	WS	UF	CS	58.4	< 1.5	< 1.4	0.71	< 0.15	< 2.8	< 3.0	79.9	< 0.48	< 1.9	< 3.2
Los Alamos above Ice Rink	03/07	WM	UF	CS	41.7	< 2.1	< 1.2	< 0.48	< 0.11	< 4.7	< 3.5	111.0	0.58	< 1.7	22.0
Los Alamos above Ice Rink	03/07	WM	UF	DUP	41.0	< 1.7	< 1.2	< 0.47	< 0.11	< 2.4	< 2.6	111.0	< 0.01	< 1.9	< 2.9
Los Alamos above Ice Rink	03/07	WM	F	CS	11.7	< 1.6	< 1.2	< 0.08	< 0.11		< 2.6	112.0	1.22	< 1.3	13.5
Los Alamos above Ice Rink	03/15	WM	F	CS	19.1	< 1.7	< 1.0	0.22	< 0.11	< 2.4	< 3.5	101.0	< 0.01	< 1.0	3.7
Los Alamos above Ice Rink	03/15	WM	UF	CS	83.0	< 1.5	< 1.2	1.46	< 0.11	< 2.4	< 3.5	102.0	< 0.27	< 1.7	7.4
Los Alamos above Ice Rink	03/20	WM	F	CS	15.7	< 1.7	< 1.2	< 0.08	< 0.11	< 2.4	< 3.5	105.0	< 0.01	< 0.7	< 1.3
Los Alamos above Ice Rink	03/20	WM	UF	CS	93.9	< 3.6	< 1.2	< 1.38	< 0.11	< 2.4	< 3.5	109.0	< 0.43	< 1.5	5.4
Los Alamos above Ice Rink	03/20	WM	UF	DUP	92.9	< 1.7	< 1.2	< 1.33	< 0.11	< 2.4	< 3.5	108.0	< 0.01	< 1.5	5.9
Los Alamos above Ice Rink	03/20	WM	F	CS	16.1	< 1.7	< 1.2	< 0.08	< 0.11	< 2.4	< 3.5	106.0	< 0.01	< 1.0	< 1.7
Los Alamos above Ice Rink	03/20	WM	UF	CS	86.5	< 1.4	< 1.0	< 1.33	< 0.11	< 2.4	< 3.5	109.0	< 0.01	< 1.5	5.5
Los Alamos above Ice Rink	04/04	WM	F	CS	< 9.1	< 1.3	< 0.8	< 0.04	< 0.15	< 2.9	< 2.3	94.6	< 0.08	< 0.6	< 2.1
Los Alamos above Ice Rink	04/04	WM	UF	CS	385.0	< 1.3	< 4.5	5.98	< 0.15	< 2.9	< 2.3	118.0	< 0.24	6.1	20.9
Los Alamos above Ice Rink	04/04	WM	UF	DUP				5.75	< 0.15				< 0.08		
Los Alamos above Ice Rink	04/04	WM	UF	TRP											
Los Alamos above Ice Rink	05/02	WM	F	CS	14.6	< 1.5	< 1.9	< 0.04	< 0.15	< 2.8	< 3.0	88.0	< 0.08	< 1.9	< 3.0
Los Alamos above Ice Rink	05/02	WM	UF	CS	57.4	< 1.5	< 1.4	< 0.67	< 0.15	< 2.8	< 3.0	90.0	< 0.08	< 2.0	5.1
Los Alamos above Ice Rink	05/02	WM	UF	DUP											
Los Alamos below Ice Rink	04/18	WM	F	CS	< 8.8	< 1.3	< 0.9	< 0.29	< 0.15	< 2.9	< 2.3	91.5	< 0.16	< 1.3	< 1.4

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (Cont.)															
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)															
Los Alamos below Ice Rink	04/18	WM	UF	CS	135.0	< 1.3	< 2.5	2.44	< 0.15	< 2.9	< 2.3	94.5	0.68	< 2.4	17.3
Los Alamos below Ice Rink	04/18	WM	UF	DUP	140.0	< 1.3	< 2.2	2.27	< 0.15	< 2.9	< 2.3	95.6	< 0.24	< 2.2	7.4
Los Alamos below Ice Rink	04/18	WM	UF	TRP											
Los Alamos below Ice Rink	08/01	WS	F	CS	21.1	< 3.5	< 1.2	< 0.08	0.13	< 2.4	< 3.5	216.0	< 0.01	< 2.2	< 3.3
Los Alamos below Ice Rink	08/01	WS	F	DUP	21.3	< 3.4	< 1.2	< 0.01	< 0.13	< 2.4	< 3.5	221.0	< 0.01	< 2.1	< 3.3
Los Alamos below Ice Rink	08/01	WS	UF	CS	3,830.0	< 3.4	34.4	93.30	0.64	< 2.4	< 3.5	419.0	0.90	62.5	277.0
Los Alamos below Ice Rink	08/01	WS	UF	DUP	3,810.0	< 4.1	34.6	93.50	< 0.43	< 3.7	< 2.1	415.0	0.89	64.5	278.0
Los Alamos below Ice Rink	08/01	WS	UF	TRP											
Los Alamos below Ice Rink	08/02	WS	F	CS	< 1.9	< 2.8	< 1.2	< 0.12	< 0.19	< 2.4	< 3.5	226.0	< 0.05	< 2.1	< 2.6
Los Alamos below Ice Rink	08/02	WS	F	DUP	< 1.7	< 2.9	< 1.2	< 0.19	< 0.19	< 2.4	< 3.5	227.0	< 0.09	< 2.0	< 1.8
Los Alamos below Ice Rink	08/02	WS	UF	CS	862.0	< 3.6	6.9	19.00	< 0.48	< 2.4	< 3.5	271.0	0.74	12.3	57.3
Los Alamos below Ice Rink	08/02	WS	UF	DUP	859.0	< 2.5	6.6	19.20	< 0.49	< 2.4	< 3.5	271.0	< 0.45	12.4	55.0
Los Alamos below Ice Rink	08/02	WS	UF	TRP											
Los Alamos at Upper GS	03/26	WM	F	CS	< 5.7	< 1.7	< 1.2	< 0.08	< 0.11	< 2.4	< 3.5	117.0	< 0.45	< 1.2	< 1.8
Los Alamos at Upper GS	03/26	WM	F	DUP	< 5.6	< 1.7	< 0.8	< 0.08	< 0.11	< 2.4	< 3.5	118.0	< 0.01	< 1.5	< 1.9
Los Alamos at Upper GS	03/26	WM	UF	CS						< 2.4					
Los Alamos at Upper GS	03/26	WM	UF	DUP											
DPS-1	03/28	WM	F	CS	119.0	< 3.4	< 2.7	< 0.20	< 0.62	< 2.4	< 3.5	283.0	0.51	< 2.2	18.1
DPS-1	03/28	WM	UF	CS						< 2.4					
Los Alamos above SR-4	03/15	WM	F	CS	< 4.6	39.7	< 1.2	0.26	< 0.11	< 2.4	< 3.5	126.0	< 0.01	< 2.0	3.9
Los Alamos above SR-4	03/15	WM	UF	CS	302.0	39.5	< 3.4	10.70	< 0.22	< 4.0	< 3.1	143.0	0.53	10.6	45.6
Los Alamos above SR-4	03/15	WM	UF	DUP	305.0	39.3	< 4.1	112.00	118.00	< 2.4	< 3.5	148.0	104.00	8.8	42.6
Los Alamos above SR-4	03/21	WM	F	CS	< 8.5	27.7	< 1.2	< 0.19	< 0.11	< 2.4	< 3.5	131.0	< 0.01	< 1.1	< 4.4
Los Alamos above SR-4	03/21	WM	UF	CS	159.0	27.2	< 2.0	6.49	< 0.27	< 2.4	< 3.5	136.0	< 0.01	< 4.4	26.1
Los Alamos above SR-4	03/21	WM	UF	DUP											
Los Alamos above SR-4	04/04	WM	F	CS	< 1.7	10.3	< 0.8	< 0.04	< 0.15	< 2.9	< 2.3	108.0	< 0.08	< 2.0	< 1.1
Los Alamos above SR-4	04/04	WM	UF	CS	538.0	10.3	5.8	12.00	< 0.15	< 2.9	< 2.3	130.0	< 0.08	8.8	40.8
Los Alamos above SR-4	04/04	WM	UF	DUP											
Los Alamos above SR-4	04/04	WM	UF	TRP											
Los Alamos above SR-4	04/18	WM	F	CS	< 5.9	14.9	< 1.0	< 0.50	< 0.39	< 2.9	< 2.3	95.4	< 0.18	< 1.2	27.7
Los Alamos above SR-4	04/18	WM	UF	CS	266.0	14.8	< 2.6	8.47	< 0.15	< 2.9	< 2.3	108.0	0.68	< 4.9	27.1
Los Alamos above SR-4	04/18	WM	UF	DUP											
Los Alamos above SR-4	05/02	WM	F	CS	18.0	13.3	< 1.4	< 0.04	< 0.15	< 2.8	< 3.0	104.0	< 0.08	< 2.2	15.3
Los Alamos above SR-4	05/02	WM	UF	CS	32.3	12.5	< 2.3	< 0.41	< 0.15	< 2.8	< 3.0	102.0	< 0.08	< 2.2	19.0
Los Alamos above SR-4	06/15	WS	F	CS	< 2.8	< 4.7	< 1.4	< 0.04	< 0.15	< 2.8	< 3.0	110.0	< 0.08	< 1.0	< 2.1
Los Alamos above SR-4	06/15	WS	UF	CS	646.0	< 4.3	< 3.7	15.80	< 0.18	< 2.8	< 3.0	134.0	< 0.08	8.3	50.3
Los Alamos above SR-4	06/15	WS	UF	DUP	647.0	< 5.1	< 3.5			< 2.8	< 3.0	134.0		8.4	49.9
Los Alamos above SR-4	06/15	WS	UF	TRP											
Los Alamos below LA Weir	03/15	WM	F	CS	< 9.3	36.2	< 1.2	0.16	< 0.11	< 2.4	< 3.5	128.0	< 0.01	< 3.0	6.4
Los Alamos below LA Weir	03/15	WM	UF	CS	304.0	35.3	< 4.4	18.60	< 0.30	< 2.4	< 3.5	148.0	0.84	11.2	67.1
Los Alamos below LA Weir	03/21	WM	F	CS	< 7.3	27.2	< 1.0	< 0.14	< 0.11	< 2.4	< 3.5	128.0	< 0.01	< 1.3	12.0
Los Alamos below LA Weir	03/21	WM	UF	CS	50.3	27.8	< 1.2	2.06	< 0.16	< 2.4	< 3.5	132.0	< 0.01	< 2.3	25.7
Los Alamos below LA Weir	03/21	WM	UF	DUP											
Los Alamos below LA Weir	04/04	WM	F	CS	< 5.6	< 9.7	< 0.8	0.28	< 0.15	< 2.9	< 2.3	103.0	< 0.08	< 1.2	< 4.5
Los Alamos below LA Weir	04/04	WM	UF	CS	309.0	< 9.5	< 4.6	7.68	< 0.15	< 2.9	< 2.3	121.0	< 0.08	6.6	29.6
Los Alamos below LA Weir	04/04	WM	UF	DUP											
Los Alamos below LA Weir	04/04	WM	UF	TRP											
Los Alamos below LA Weir	04/18	WM	F	CS	< 6.8	15.9	< 1.4	< 0.34	< 0.15	< 2.9	< 2.3	98.3	< 0.17	< 1.2	8.7

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (Cont.)															
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)															
Los Alamos below LA Weir	04/18	WM	UF	CS	44.7	14.8	< 1.7	< 1.42	< 0.15	< 2.9	< 2.3	99.7	< 0.33	< 1.9	17.9
Los Alamos below LA Weir	04/18	WM	UF	DUP											
Los Alamos below LA Weir	05/02	WM	F	CS	< 10.0	12.9	< 1.7	< 0.04	< 0.15	< 2.8	< 3.0	101.0	< 0.08	< 1.7	5.4
Los Alamos below LA Weir	05/02	WM	UF	CS	75.7	12.4	< 3.0	< 1.68	< 0.15	< 2.8	< 3.0	105.0	< 0.08	< 2.9	10.7
Los Alamos below LA Weir	05/02	WM	UF	DUP											
Los Alamos at SR-4	03/26	WM	F	CS	10.3	11.2	< 1.2	< 0.17	< 0.11	< 3.4	< 3.5	116.0	< 0.13	< 1.3	< 3.6
Los Alamos at SR-4	03/26	WM	F	DUP											
Los Alamos at SR-4	03/26	WM	UF	CS						< 2.4					
Los Alamos at Rio Grande	03/26	WM	F	CS	11.3	< 7.2	< 2.0	< 0.04	< 0.11	< 2.4	< 3.5	157.0	< 0.01	< 4.9	< 4.2
Los Alamos at Rio Grande	03/26	WM	UF	CS						< 3.7					
Pueblo 1 R	04/11	WM	F	CS	153.0	< 1.7	< 1.2	< 0.37	< 0.17	< 2.4	< 3.5	173.0	< 0.29	< 0.8	< 2.3
Pueblo 1 R	04/11	WM	UF	CS	157.0	< 1.7	< 1.2	< 0.78	< 0.23	< 2.4	< 3.5	173.0	< 0.49	< 1.2	< 4.1
Acid Weir	04/11	WM	F	CS	< 1.6	< 1.7	< 1.2	< 0.28	< 0.24	< 2.4	< 3.5	173.0	< 0.32	< 1.0	5.2
Acid Weir	04/11	WM	UF	CS	< 1.5	< 1.7	< 1.2	< 0.38	< 0.29	< 2.4	< 3.5	177.0	0.80	< 1.3	< 3.3
Acid Weir	04/11	WM	UF	DUP	< 1.5	< 1.7	< 1.2	< 0.36	< 0.27	< 2.4	< 3.5	178.0	0.84	< 1.1	< 3.9
Acid Weir	04/11	WM	UF	TRP		< 7.7	< 1.4			< 2.8	< 3.0				
Pueblo 2	04/03	WM	F	CS	< 6.0	< 1.3	< 0.8	< 0.17	< 0.23	< 2.9	< 2.3	146.0	< 0.10	< 3.1	8.7
Pueblo 2	04/03	WM	UF	CS	15.9	< 1.6	< 0.8	< 0.95	< 0.40	< 2.9	< 2.3	149.0	< 0.20	< 3.6	< 3.6
Pueblo 2	04/03	WM	UF	DUP											
Pueblo 3	04/03	WS	F	CS	345.0	< 5.0	< 1.4	< 0.80	< 0.24	< 2.9	< 2.3	95.1	< 0.08	12.2	42.9
Pueblo 3	04/03	WS	UF	CS	452.0	< 6.7	< 3.1	7.76	< 0.35	< 2.9	< 2.3	114.0	< 0.20	17.4	74.0
Pueblo 3	04/03	WS	UF	DUP											
Pueblo 3	04/03	WS	UF	TRP											
Pueblo at SR-502	04/03	WS	F	CS	135.0	< 4.2	< 2.6	< 0.68	< 0.15	< 2.9	< 2.3	110.0	< 0.11	6.2	18.6
Pueblo at SR-502	04/03	WS	F	CS	137.0	< 4.4	< 3.3	< 0.71	< 0.15	< 2.9	< 2.3	112.0	< 0.10	6.2	20.6
Pueblo at SR-502	04/03	WS	UF	CS	174.0	< 5.4	< 2.9	< 1.41	< 0.15	< 2.9	< 2.3	113.0	0.53	6.8	21.7
Pueblo at SR-502	04/03	WS	UF	DUP	175.0	< 5.1	< 3.3	< 1.34	< 0.15	< 2.9	< 2.3	114.0	< 0.15	7.0	21.5
Pueblo at SR-502	04/03	WS	UF	CS	169.0	< 4.0	< 3.6	< 1.42	< 0.15	< 2.9	< 2.3	111.0	< 0.13	6.9	21.3
Pueblo at SR-502	04/03	WS	UF	DUP											
Sandia Canyon:															
SCS-1	05/17	WS	F	CS	< 9.6	< 8.6	< 0.8	< 0.04	< 0.58	< 2.9	< 2.3	106.0	< 0.08	12.0	420.0
SCS-1	05/17	WS	F	DUP	< 9.1	< 8.6	< 0.8			< 2.9	< 2.3	104.0		11.9	413.0
SCS-1	05/17	WS	UF	CS						< 2.9					
SCS-2	05/17	WS	F	CS	10.2	41.4	< 1.4	< 0.22	< 0.44	< 2.9	< 2.3	112.0	< 0.08	12.3	69.7
SCS-2	05/17	WS	F	CS	< 8.9	38.4	< 0.8	< 0.21	< 0.46	< 2.9	< 2.3	105.0	< 0.08	11.5	72.7
SCS-2	05/17	WS	UF	CS						< 2.9					
SCS-2	05/17	WS	UF	DUP											
SCS-2	05/17	WS	UF	CS						< 2.9					
SCS-3	05/17	WS	F	CS	< 8.1	43.0	< 1.0	< 0.19	< 0.45	< 2.9	< 2.3	113.0	< 0.08	12.9	58.5
SCS-3	05/17	WS	UF	CS						< 2.9					
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):															
Mortandad at GS-1	04/18	WS	F	CS	< 5.5	36.7	5.4	< 1.47	< 0.48		< 2.3	74.3	< 0.27	< 2.3	265.0
Mortandad at GS-1	04/18	WS	F	DUP	< 5.6	36.6	5.3				< 2.3	75.1		< 2.3	268.0
Mortandad at GS-1	04/18	WS	UF	CS						< 2.9					

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (Cont.)															
Pajarito Canyon (includes Twomile, Threemile Canyons):															
Pajarito below SR-501	03/20	WM	F	CS	< 9.8	< 1.7	< 1.2	< 0.07	< 0.11	< 2.4	< 3.5	99.9	< 0.01	< 1.6	< 4.1
Pajarito below SR-501	03/20	WM	UF	CS	247.0	< 1.7	< 2.5	5.94	< 0.16	< 2.4	< 3.5	120.0	< 0.01	6.8	25.8
Pajarito below SR-501	03/20	WM	UF	DUP											
Pajarito below SR-501	04/04	WM	F	CS	< 4.4	< 1.3	< 0.8	0.14	< 0.15	< 2.9	< 2.3	84.6	< 0.08	< 2.1	7.4
Pajarito below SR-501	04/04	WM	UF	CS	31.8	< 1.3	< 0.9	0.76	< 0.15	< 2.9	< 2.3	91.1	< 0.08	< 2.9	< 4.7
Pajarito below SR-501	04/04	WM	UF	DUP											
Pajarito below SR-501	04/18	WM	F	CS	< 5.1	< 1.3	< 1.4	< 0.34	< 0.15	< 2.9	< 2.3	68.7	< 0.08	< 2.9	< 4.1
Pajarito below SR-501	04/18	WM	UF	CS	37.4	< 1.3	< 1.9	< 1.39	< 0.15	< 2.9	< 2.3	74.9	< 0.23	< 3.7	6.5
Pajarito below SR-501	04/18	WM	UF	DUP											
Pajarito below SR-501	05/02	WM	F	CS	< 4.3	< 1.5	< 1.4	< 0.04	< 0.15	< 2.8	< 3.0	80.6	< 0.08	< 2.7	10.7
Pajarito below SR-501	05/02	WM	F	DUP	< 4.2	< 1.5	< 1.4			< 2.8	< 3.0	82.6		< 2.7	11.2
Pajarito below SR-501	05/02	WM	UF	CS	< 4.9	< 1.7	< 1.9	< 0.04	< 0.15	< 2.8	< 3.0	81.8	< 0.08	< 3.0	9.7
Pajarito below SR-501	05/02	WM	UF	DUP				< 0.04	< 0.15				< 0.08		
Pajarito Canyon	04/04	WM	F	CS	< 7.1	< 1.3	< 1.2	< 0.27	< 0.15	< 2.9	< 2.3	98.7	< 0.08	< 1.4	< 2.5
Pajarito Canyon	04/04	WM	UF	CS	116.0	< 1.3	< 2.9	4.11	< 0.15	< 2.9	< 2.3	106.0	< 0.18	< 4.4	12.3
Pajarito Canyon	04/04	WM	UF	DUP											
Pajarito above SR-4	03/21	WM	F	CS	50.8	< 4.6	< 1.8	< 0.08	< 0.20	< 2.4	< 3.5	400.0	< 0.01	< 1.1	< 1.8
Pajarito above SR-4	03/21	WM	UF	CS	86.7	< 6.1	< 1.7	< 0.68	< 0.20	< 2.4	< 3.5	398.0	< 0.18	< 1.6	< 2.7
Pajarito above SR-4	03/21	WM	UF	DUP	88.9	< 4.5	< 1.4	< 0.71	< 0.21	< 2.4	< 3.5	408.0	< 0.01	< 1.9	< 3.5
Pajarito above SR-4	04/04	WM	F	CS	21.8	< 1.9	< 1.4	< 0.04	< 0.15	< 2.9	< 2.3	189.0	< 0.08	< 1.1	< 2.9
Pajarito above SR-4	04/04	WM	UF	CS	27.6	< 1.9	< 2.2	0.34	< 0.15	< 2.9	< 2.3	187.0	< 0.08	< 1.3	< 2.9
Pajarito above SR-4	04/04	WM	UF	DUP											
Pajarito above SR-4	04/18	WM	F	CS	91.1	< 3.2	< 2.2	< 0.04	< 0.15	< 2.9	< 2.3	248.0	< 0.08	< 1.0	6.5
Pajarito above SR-4	04/18	WM	UF	CS	97.9	< 2.9	< 1.9	< 0.28	< 0.15	< 2.9	< 2.3	260.0	< 0.19	< 1.0	< 1.4
Pajarito above SR-4	04/18	WM	UF	DUP											
Pajarito above SR-4	05/02	WM	F	CS	223.0	< 1.5	< 3.7	< 0.04	< 0.15	< 2.8	< 3.0	388.0	< 0.08	< 1.0	< 1.9
Pajarito above SR-4	05/02	WM	UF	CS	231.0	< 1.5	< 3.6	< 0.04	< 0.15	< 2.8	< 3.0	392.0	< 0.08	< 0.8	< 1.9
Pajarito above SR-4	05/02	WM	UF	DUP											
Pajarito at Rio Grande	09/25	WS	F	CS	< 0.9	< 1.6	< 1.2	< 2.57	0.23		< 3.5	124.0	< 0.01	10.3	< 3.5
Pajarito at Rio Grande	09/25	WS	UF	CS						< 2.4					
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):															
Water above SR-501	03/15	WM	F	CS	< 1.8	< 1.7	< 1.2	0.33	< 0.11	< 2.4	< 3.5	80.0	< 0.01	< 2.5	2.8
Water above SR-501	03/15	WM	UF	CS	< 9.2	< 1.4	< 1.2	0.89	< 0.11	< 2.4	< 3.5	80.5	< 0.08	< 3.1	3.9
Water above SR-501	03/20	WM	F	CS	< 2.0	< 1.7	< 1.2	< 0.10	< 0.11	< 2.4	< 3.5	86.8	< 0.01	< 3.0	< 3.9
Water above SR-501	03/20	WM	UF	CS	10.2	< 3.5	< 2.2	< 0.25	< 0.11	< 2.4	< 3.5	86.7	< 0.43	< 2.9	5.1
Water above SR-501	04/04	WM	F	CS	< 2.0	< 2.0	< 0.8	0.08	< 0.15	< 2.9	< 2.3	109.0	< 0.08	< 2.4	< 2.5
Water above SR-501	04/04	WM	F	DUP	< 2.2	< 1.3	< 0.8			< 2.9	< 2.3	111.0		< 2.2	< 3.3
Water above SR-501	04/04	WM	UF	CS	16.4	< 1.3	< 0.8	0.29	< 0.15	< 2.9	< 2.3	111.0	< 0.08	< 2.6	< 4.7
Water above SR-501	04/04	WM	UF	DUP											
Water above SR-501	04/18	WM	F	CS	< 0.3	< 1.3	< 0.8	< 0.04	< 0.15	< 2.9	< 2.3	114.0	< 0.08	< 2.1	< 2.5
Water above SR-501	04/18	WM	UF	CS	< 2.4	< 1.3	< 0.8	< 0.21	< 0.15	< 2.9	< 2.3	117.0	< 0.17	< 2.1	< 2.6
Water above SR-501	04/18	WM	UF	DUP											
Water above SR-501	05/02	WM	F	CS	< 1.4	< 1.5	< 1.4	< 0.04	< 0.15	< 2.8	< 3.0	119.0	< 0.08	< 2.4	< 2.7
Water above SR-501	05/02	WM	UF	CS	206.0	< 1.5	< 2.7	3.27	< 0.15	< 2.8	< 3.0	135.0	< 0.08	6.7	16.6
Water above SR-501	05/02	WM	UF	DUP											
Cañon de Valle above SR-501	04/04	WM	F	CS	< 6.7	< 1.3	< 0.8	< 0.04	< 0.15	< 2.9	< 2.3	74.6	< 0.08	< 0.6	< 2.1
Cañon de Valle above SR-501	04/04	WM	UF	CS	137.0	< 1.3	< 2.0	3.04	< 0.15	< 2.9	< 2.3	85.9	< 0.08	< 4.5	14.3

Table 5-7. Trace Metals in Snowmelt and Base Flow for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]			Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (Cont.)															
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons): (Cont.)															
Cañon de Valle above SR-501	04/04	WM	UF	DUP											
Cañon de Valle above SR-501	04/18	WM	F	CS	< 7.3	< 1.3	< 1.2	< 0.28	< 0.15	< 2.9	< 2.3	69.4	< 0.08	< 1.7	< 4.3
Cañon de Valle above SR-501	04/18	WM	UF	CS	29.0	< 1.3	< 1.5	< 1.05	< 0.15	< 2.9	< 2.3	69.5	< 0.17	< 2.2	6.8
Cañon de Valle above SR-501	04/18	WM	UF	DUP											
Cañon de Valle above SR-501	05/02	WM	F	CS	< 7.3	< 1.5	< 1.4	< 0.04	< 0.15	< 2.8	< 3.0	77.0	< 0.08	< 1.7	< 3.0
Cañon de Valle above SR-501	05/02	WM	UF	CS	21.4	< 1.5	< 1.5	< 0.04	< 0.15	< 2.8	< 3.0	78.2	< 0.08	< 1.8	12.2
Cañon de Valle above SR-501	05/02	WM	UF	DUP											
Water at Beta	04/17	WM	F	CS	< 1.4	< 1.3	< 0.8	< 0.10	< 0.15		< 2.3	109.0	< 0.50	< 1.7	< 0.7
Water at Beta	04/17	WM	F	DUP				< 0.16	< 0.15				< 0.08		
Water at Beta	04/17	WM	UF	CS						< 2.9					
Water at Beta	04/17	WM	UF	DUP											
Water below SR-4	03/21	WM	F	CS	< 7.0	< 2.0	< 1.2	< 0.13	< 0.11	< 2.4	< 3.5	95.9	< 0.01	< 1.7	< 2.5
Water below SR-4	03/21	WM	UF	CS	232.0	< 3.5	< 4.6	6.92	< 0.19	< 2.4	< 3.5	113.0	< 0.29	9.1	30.3
Water below SR-4	03/21	WM	UF	DUP											
Water below SR-4	04/04	WM	F	CS	< 1.7	< 1.3	< 0.8	< 0.04	< 0.15	< 2.9	< 2.3	107.0	< 0.08	< 1.6	< 3.7
Water below SR-4	04/04	WM	UF	CS	110.0	< 1.3	< 1.8	3.28	< 0.15	< 2.9	< 2.3	111.0	< 0.08	< 4.5	10.8
Water below SR-4	04/04	WM	UF	DUP											
Ancho Canyon:															
Ancho at Rio Grande	09/25	WS	F	CS	< 0.5	< 1.3	< 1.2	< 2.57	0.10		< 3.5	59.9	< 0.01	6.7	< 2.8
Ancho at Rio Grande	09/25	WS	UF	CS						< 2.4					
Frijoles Canyon:															
Frijoles at Monument Headquarters	07/18	WS	F	CS	< 9.8	< 1.6	< 1.3	< 2.43	< 0.25	< 3.5	< 1.9	55.1	< 0.28	< 3.8	< 1.7
Frijoles at Monument Headquarters	07/18	WS	UF	CS						5.6					
Frijoles at Monument Headquarters	07/18	WS	UF	DUP	47.2	< 1.2	< 1.3	< 2.43		< 3.5	< 1.9	56.6		< 4.7	< 3.8
Frijoles at Rio Grande	09/26	WS	F	CS	< 1.3	< 2.0	< 1.2	< 2.57	0.06	< 2.4	< 3.5	61.2	< 0.01	< 3.2	< 2.9
Frijoles at Rio Grande	09/26	WS	F	DUP	< 0.8	< 1.6	< 1.2	< 2.57	< 0.11	< 2.4	< 3.5	60.9	< 0.01	< 3.1	< 2.7
Frijoles at Rio Grande	09/26	WS	F	CS	< 0.6	< 1.9	< 1.2	< 2.57	< 0.11		< 3.5	60.2	< 0.01	< 3.0	< 2.8
Frijoles at Rio Grande	09/26	WS	UF	CS						< 2.4					
Frijoles at Rio Grande	09/26	WS	UF	CS						< 2.4					
Frijoles at Rio Grande	09/26	WS	UF	DUP											
Water Quality Standards[c]															
EPA Primary Drinking Water Standard							100		6	50			2		
EPA Secondary Drinking Water Standard					50										5,000
EPA Action Level								15							
EPA Health Advisory												25,000–90,000		80–110	
NMWQCC Livestock Watering Standard								100		50				100	25,000
NMWQCC Groundwater Limit					200	1,000	200	50		50					10,000
NMWQCC Wildlife Habitat Standard										5					

[a]Codes: WM–snowmelt runoff; WS–base flow; UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.

[b]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.

[c]Standards given here for comparison only; see Appendix A. Note that New Mexico Livestock Watering and Groundwater limits are based on dissolved concentrations, whereas many of these analyses are of unfiltered samples; thus, concentration may include suspended sediment quantities.

Table 5-8. Number of Samples Collected for Each Suite of Organic Compounds in Surface Water Samples in 2001

			Organic Suite[b]				
Station Name	**Date**	**Matrix[a]**	**DIOX/FUR**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Regional Stations							
Rio Chama at Chamita (bank)	08/01	WS			1	1	1
Rio Grande at Embudo (bank)	08/01	WS					1
Rio Grande at Embudo (bank)	08/01	WS			1	1	1
Rio Grande at Otowi Upper (bank)	07/17	WS		1	1	1	1
Rio Grande at Otowi (bank)	07/17	WS		1	1	1	1
Rio Grande at Frijoles (bank)	09/26	WS		1	1	1	1
Rio Grande at Cochiti	09/26	WS					1
Rio Grande at Cochiti	09/26	WS		1	1	1	1
Jemez River	04/18	WS			1	1	1
Jemez River	04/18	WS			1	1	1
Pajarito Plateau Stations							
Guaje Canyon:							
Guaje Canyon	10/12	WS					1
Guaje Canyon	10/12	WS			1	1	1
Guaje above Rendija	04/18	WM	1		1	1	1
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):							
Los Alamos Reservoir	05/01	WS					1
Los Alamos Reservoir	05/01	WS			1	1	1
Los Alamos above Ice Rink	03/07	WM	1	1	1	1	1
Los Alamos above Ice Rink	03/15	WM	1	1	1	1	2
Los Alamos above Ice Rink	03/15	WM	1	1	1	1	1
Los Alamos above Ice Rink	03/20	WM	1	1	1	1	1
Los Alamos above Ice Rink	03/20	WM	1	1	1	1	1
Los Alamos above Ice Rink	04/04	WM	1	1	1	1	2
Los Alamos above Ice Rink	05/02	WM	1	1	1	1	1
Los Alamos below Ice Rink	04/18	WM	1	1	1	1	1
Los Alamos at Upper GS	03/26	WM			1	1	1
DPS-1	03/28	WM			1	1	1
Los Alamos above SR-4	03/15	WM	1	1	1	1	1
Los Alamos above SR-4	03/21	WM	1	1	1	1	1
Los Alamos above SR-4	04/04	WM	1	1	1	1	1
Los Alamos above SR-4	04/18	WM	1	1	1	1	1
Los Alamos above SR-4	05/02	WM	1	1	1	1	1
Los Alamos above SR-4	06/15	WS	1	1	1	1	
Los Alamos below LA Weir	03/15	WM	1	1	1	1	1
Los Alamos below LA Weir	03/21	WM	1	1	1	1	1
Los Alamos below LA Weir	04/04	WM	1	1	1	1	1
Los Alamos below LA Weir	04/18	WM	1	1	1	1	1
Los Alamos below LA Weir	05/02	WM	1	1	1	1	1
Los Alamos at SR-4	03/26	WM			1	1	1
Los Alamos at Rio Grande	03/26	WM			1	1	1
Pueblo 1 R	04/11	WM					1
Pueblo 1 R	04/11	WM			1	1	1
Acid Weir	04/11	WM			1	1	1
Pueblo 2	04/03	WM				1	1
Pueblo 3	04/03	WS			1	1	1
Pueblo at SR-502	04/03	WS			2	2	2

Table 5-8. Number of Samples Collected for Each Suite of Organic Compounds in Surface Water Samples in 2001 (Cont.)

			Organic Suite[b]				
Station Name	**Date**	**Matrix[a]**	**DIOX/FUR**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Pajarito Plateau Stations (Cont.)							
Sandia Canyon:							
SCS-2	05/17	WS			2	2	3
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):							
MDA L	04/06	WT			1		
MDA L	05/28	WT				1	
MDA L	06/07	WT			1		
MDA L	07/02	WT			1		
MDA L	07/17	WT	1	1	1	1	
MDA L	07/21	WT		1	1		
Pajarito Canyon (includes Twomile, Threemile Canyons):							
Pajarito below SR-501	03/20	WM	1	1	1	1	1
Pajarito below SR-501	04/04	WM	1	1	1	1	1
Pajarito below SR-501	04/18	WM	1	1	1	1	1
Pajarito below SR-501	05/02	WM	1	1	1	1	1
Pajarito Canyon	04/04	WM					1
Pajarito Canyon	04/04	WM			1	1	1
MDA G-3	06/07	WT			1		
MDA G-3	07/02	WT				1	
MDA G-3	07/13	WT		1			
MDA G-3	08/01	WT	1				
MDA G-3	08/30	WT				1	
MDA G-4	04/06	WT			1		
MDA G-4	07/02	WT			1		
MDA G-4	07/17	WT				1	
MDA G-4	08/01	WT		1			
Pajarito above SR-4	03/21	WM	1	1	1	1	1
Pajarito above SR-4	04/04	WM	1	1	1	1	1
Pajarito above SR-4	04/18	WM	1	1	1	1	1
Pajarito above SR-4	05/02	WM	2	2	2	2	3
Pajarito at Rio Grande	09/25	WS		1	1	1	2
Pajarito at Rio Grande	09/25	WS		1	1	1	1
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):							
Water above SR-501	03/15	WM	1	1	1	1	1
Water above SR-501	03/20	WM	1	1	1	1	1
Water above SR-501	04/04	WM			1	1	1
Water above SR-501	04/18	WM	1	1	1	1	1
Water above SR-501	05/02	WM	1	1	1	1	1
Cañon de Valle above SR-501	04/04	WM	1	1	1	1	1
Cañon de Valle above SR-501	04/18	WM	1	1	1	1	1
Cañon de Valle above SR-501	05/02	WM	1	1	1	1	1
Water at Beta	04/17	WM		1	1	1	2
Water below SR-4	03/21	WM	1	1	1	1	1
Water below SR-4	04/04	WM	1	1	1	1	1
Ancho Canyon:							
Ancho at Rio Grande	09/25	WS					2

Table 5-8. Number of Samples Collected for Each Suite of Organic Compounds in Surface Water Samples in 2001 (Cont.)

			Organic Suite[b]				
Station Name	**Date**	**Matrix[a]**	**DIOX/FUR**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Pajarito Plateau Stations (Cont.)							
Frijoles Canyon:							
Frijoles at Monument Headquarters	07/18	WS		1	1	1	1
Frijoles at Rio Grande	09/26	WS		2	2	2	2
Quality Assurance Samples:							
DI Blank	04/04	WM	1	1	1	1	1
DI Blank	07/17	WS		1	1	1	1
DI Blank	07/18	WS					1

[a]Matrix Codes: WM = snowmelt, WS = base flow, WT = storm runoff.
[b]Dioxins/Furans, high explosives, polychlorinated biphenyls, semivolatiles, and volatiles.

Table 5-9. Organic Compounds Detected in Surface Water in 2001 (μg/L)

Station Name	Date	Codes[a]				Dilution Factor	Suite[b]	Analyte	Result	Lab Qual Code[c]	Valid Flag Code	EPA Tap Screening Level	Result/ Screening Level)
Regional Stations													
Rio Chama at Chamita (bank)	08/01	WS	UF		CS	10	SVOA	Bis(2-ethylhexyl)phthalate	1,080	D		5	225.00
Rio Chama at Chamita (bank)	08/01	WS	UF		CS	1	SVOA	Bis(2-ethylhexyl)phthalate	584	E		5	121.67
Rio Chama at Chamita (bank)	08/01	WS	UF		CS	10	SVOA	Pyrene	20.4	D		183	0.11
Rio Chama at Chamita (bank)	08/01	WS	UF		CS	10	SVOA	Fluoranthene	21.5	D		1,460	0.01
Jemez River	04/18	WS	UF		CS	1	SVOA	Bis(2-ethylhexyl)phthalate	1.6		J	5	0.33
Pajarito Plateau Stations													
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):													
Pueblo 1 R	04/11	WM	UF	FTB	CS	1	VOA	Chloroform	5.2			0	32.50
Pueblo 1 R	04/11	WM	UF	FTB	CS	1	VOA	Bromodichloromethane	1.4			0	7.78
Pueblo 3	04/03	WS	UF		CS	1	SVOA	Bis(2-ethylhexyl)phthalate	6.4			5	1.33
Pueblo at SR-502	04/03	WS	UF	FD	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	2			5	0.42
Pueblo at SR-502	04/03	WS	UF		CS	1	SVOA	Bis(2-ethylhexyl)phthalate	1.5			5	0.31
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):													
MDA L	07/17	WT	UF		CS	1	DIOX/FUR	OCDD	0.0346				
MDA L	07/17	WT	UF		CS	1	SVOA	Di-n-octylphthalate	23.6			730	0.03
Pajarito Canyon (includes Twomile, Threemile Canyons):													
MDA G-3	07/02	WT	UF		CS	10	SVOA	4-Methylphenol	351	D		183	1.92
MDA G-3	07/02	WT	UF		CS	1	SVOA	4-Methylphenol	238	E		183	1.30
MDA G-3	07/02	WT	UF		CS	1	SVOA	Phenol	20			21,900	0.00
MDA G-3	07/02	WT	UF		CS	1	SVOA	Bis(2-ethylhexyl)phthalate	5.9			5	1.23
MDA G-4	07/17	WT	UF		CS	1	SVOA	Bis(2-ethylhexyl)phthalate	2.9			5	0.60
Water Canyon (includes Canon del Valle, Potrillo, Fence, Indio Canyons):													
Water at Beta	04/17	WM	UF		CS	1	HEXP	RDX	0.49			1	0.80
Water at Beta	04/17	WM	UF		CS	1	HEXP	HMX	1.9			1,825	0.00
Water below SR-4	03/21	WM	UF		CS	1	HEXP	RDX	0.9			1	1.48
Water below SR-4	03/21	WM	UF		CS	1	HEXP	HMX	3.8			1,825	0.00
Water below SR-4	04/04	WM	UF		CS	1	HEXP	RDX	0.26			1	0.43
Water below SR-4	04/04	WM	UF		CS	1	HEXP	HMX	0.99			1,825	0.00

Table 5-9. Organic Compounds Detected in Surface Water in 2001 (μg/L) (Cont.)

Station Name	Date	Codes[a]	Dilution Factor	Suite[b]	Analyte	Result	Lab Qual Code[c]	Valid Flag Code	EPA Tap Screening Level	Result/ Screening Level)
Quality Assurance										
DI Blank	07/17	WS UF PEB CS	1	VOA	Chloroform	53.9			0	336.88
DI Blank	07/17	WS UF PEB CS	1	VOA	Bromodichloromethane	2.7			0	15.00

[a]Codes: WM–snowmelt; WS–base flow; WT–storm runoff; UF–unfiltered sample; F–filtered sample; FD–field blank sample; FTB–field trip blank; PEB–performance evaluation blank; CS–customer sample.
[b]HEXP–high-explosive compounds; SVOA–semivolatile organics; VOA–volatile organics; DIOX/FUR–dioxins/furans.
[c]For Lab Qualifier Codes and Valid Flag Codes, see Table 5-4.

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a])

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station Name	**Date**	**Codes[b]**		**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Guaje Canyon:																					
Guaje above Rendija	08/08	F	CS																		
Guaje above Rendija	08/08	UF	CS				22.40	3.37	0.55	2.86	3.08	7.23	55.700	5.230	1.780	2.490	0.669	0.449	55.200	5.190	1.530
Guaje above Rendija	08/09	F	CS				1.09	0.16	0.25	8.55	3.64	8.51	0.373	0.040	0.018	0.014	0.006	0.007	0.301	0.034	0.007
Guaje above Rendija	08/09	UF	CS	-27	45	149	22.00	3.81	2.24	1.92	1.69	4.94	354.000	48.600	5.260	15.200	3.460	3.610	334.000	45.900	4.540
Guaje above Rendija	08/11	F	CS				1.45	0.21	0.18	0.00	1.80	3.10	0.098	0.019	0.032	0.000	1.000	0.007	0.080	0.017	0.032
Guaje above Rendija	08/11	UF	CS	134	48	148	23.60	3.63	1.11	10.10	2.84	9.17	100.000	60.900	1.820	6.490	4.080	0.533	92.000	55.800	2.110
Guaje above Rendija	08/14	F	CS				0.87	0.15	0.20	0.78	1.90	7.16	0.106	0.026	0.055	0.022	0.012	0.039	0.067	0.018	0.031
Guaje above Rendija	08/14	F	DUP																		
Guaje above Rendija	08/14	UF	CS	26	44	143	12.20	1.82	1.29	4.66	1.92	7.59	33.000	20.000	1.300	1.970	1.310	1.030	27.800	16.900	1.030
Guaje above Rendija	08/14	UF	DUP	54	46	148	13.50	1.90	1.14	4.66	3.15	8.81	51.500	31.200	1.690	4.110	2.620	1.160	48.400	29.300	1.460
Guaje above Rendija	08/16	F	CS				0.88	0.14	0.16	1.82	1.70	3.31	0.066	0.014	0.019	0.015	0.008	0.024	0.054	0.013	0.024
Guaje above Rendija	08/16	F	DUP																		
Guaje above Rendija	08/16	UF	CS				23.80	3.85	1.41	9.75	4.59	6.71	84.600	51.200	1.920	4.850	3.050	1.080	72.900	44.200	1.080
Rendija above Guaje	07/02	F	CS																		
Rendija above Guaje	07/02	UF	CS																		
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):																					
Los Alamos below Ice Rink	07/02	F	CS																		
Los Alamos below Ice Rink	07/02	UF	CS																		
Los Alamos below Ice Rink	07/02	UF	DUP	108	51	162							14.200	1.410	0.188	0.534	0.117	0.150	17.000	1.670	0.149
Los Alamos below Ice Rink	07/13	F	CS				1.88	0.33	0.41	0.66	1.36	4.96	0.869	0.080	0.044	0.063	0.015	0.032	0.736	0.070	0.028
Los Alamos below Ice Rink	07/13	F	DUP				1.98	0.37	0.40	0.87	0.80	3.15	0.920	0.084	0.028	0.047	0.013	0.022	0.866	0.080	0.028
Los Alamos below Ice Rink	07/13	UF	CS	-54	50	172	5.22	0.88	0.47	5.94	3.22	6.16	8.810	0.705	0.111	0.481	0.074	0.079	8.560	0.687	0.023
Los Alamos below Ice Rink	07/13	UF	DUP	-80	49	171	4.98	0.77	0.46	6.77	2.79	6.33	8.220	0.699	0.126	0.392	0.075	0.086	8.280	0.703	0.032
Los Alamos below Ice Rink	08/09	F	CS				1.70	0.29	0.26	-0.17	2.68	9.54	0.774	0.069	0.030	0.030	0.009	0.018	0.621	0.058	0.026
Los Alamos below Ice Rink	08/09	UF	CS	-27	45	149	3.62	0.60	0.30	6.18	2.40	5.96	9.180	1.340	1.670	0.512	0.316	0.942	5.990	0.999	0.939
Los Alamos above DP Canyon	07/02	F	CS																		
Los Alamos above DP Canyon	07/02	UF	CS																		
Los Alamos above DP Canyon	07/02	UF	DUP																		
Los Alamos above DP Canyon	07/14	F	CS				1.80	0.30	0.40	4.37	3.40	5.42	1.240	0.105	0.020	0.067	0.015	0.020	1.100	0.095	0.033
Los Alamos above DP Canyon	07/14	UF	CS	-81	49	173	7.57	1.29	0.68	8.32	3.13	5.94	34.400	3.410	0.474	1.420	0.266	0.442	35.600	3.520	0.403
Los Alamos above DP Canyon	07/26	F	CS				2.52	0.36	0.34	-1.18	0.81	2.67	0.498	0.056	0.044	0.030	0.015	0.044	0.468	0.053	0.034
Los Alamos above DP Canyon	07/26	F	DUP				1.98	0.25	0.23	4.49	2.30	3.20									
Los Alamos above DP Canyon	07/26	UF	CS	80	53	170	4.42	0.70	0.22	-0.91	1.34	4.73	6.040	1.390	0.745	0.404	0.264	0.814	5.680	1.310	0.586
Los Alamos above DP Canyon	07/26	UF	DUP	27	52	171				0.00	1.35	5.10									
Los Alamos above DP Canyon	08/05	F	CS				0.53	0.10	0.24	0.32	0.99	3.18	0.075	0.016	0.037	-0.002	0.008	0.039	0.082	0.016	0.031
Los Alamos above DP Canyon	08/05	F	RE																		
Los Alamos above DP Canyon	08/05	UF	CS	26	50	163	2.96	0.46	0.27	0.00	3.60	11.40	10.700	1.260	0.338	0.607	0.153	0.262	12.600	1.470	0.262
Los Alamos above DP Canyon	08/09	F	CS				1.24	0.21	0.23	1.04	0.91	3.45	0.319	0.039	0.036	0.036	0.014	0.036	0.245	0.033	0.032
Los Alamos above DP Canyon	08/09	F	DUP				1.21	0.17	0.27				0.321	0.042	0.011	0.032	0.013	0.030	0.281	0.039	0.030
Los Alamos above DP Canyon	08/09	UF	CS	27	46	150	14.70	2.43	0.53	10.00	2.96	6.00	149.000	12.000	1.360	6.040	1.060	1.080	147.000	11.900	1.080
Los Alamos above DP Canyon	08/09	UF	DUP	54	47	151				2.78	2.54	6.29									
Los Alamos above DP Canyon	08/16	F	CS				0.66	0.12	0.27	1.30	1.64	6.10	0.109	0.020	0.031	-0.008	0.008	0.036	0.074	0.016	0.031
Los Alamos above DP Canyon	08/16	F	DUP																		
Los Alamos above DP Canyon	08/16	UF	CS	373	59	160	3.09	0.49	0.34	3.78	2.02	7.78	12.600	1.840	0.218	0.504	0.164	0.356	12.600	1.850	0.355
Los Alamos above DP Canyon	08/16	UF	DUP	211	54	159	3.19	0.51	0.29	3.12	1.94	7.66	12.100	1.840	0.498	0.908	0.252	0.431	12.800	1.940	0.341
DP above TA-21	05/13	UF	CS				0.33	0.12	0.35	0.36	1.44	5.18	3.880	0.298	0.031	0.228	0.031	0.034	3.900	0.300	0.021
DP above TA-21	05/13	UF	DUP							-0.38	2.25	8.02									
DP above TA-21	05/28	F	CS																		
DP above TA-21	05/28	UF	CS																		
DP above TA-21	05/28	UF	DUP																		
DP above TA-21	06/27	F	CS																		
DP above TA-21	06/27	UF	CS																		
DP above TA-21	07/02	F	CS																		
DP above TA-21	07/02	F	DUP																		
DP above TA-21	07/02	UF	CS																		

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

			^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station Name	**Date**	**Codes[b]**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																				
DP above TA-21	08/01	F CS																		
DP above TA-21	08/01	UF CS																		
DP above TA-21	08/04	F CS																		
DP above TA-21	08/04	UF CS	400	58	155															
DP above TA-21	08/16	F CS																		
DP above TA-21	08/16	UF CS	238	55	159															
DP below Meadow at TA-21	06/27	F CS																		
DP below Meadow at TA-21	06/27	UF CS																		
DP below Meadow at TA-21	07/02	F CS																		
DP below Meadow at TA-21	07/02	UF CS																		
DP above Los Alamos Canyon	05/13	UF CS				28.30	3.67	0.25	10.60	2.68	6.71	26.900	2.340	0.261	1.180	0.190	0.161	25.800	2.250	0.160
DP above Los Alamos Canyon	05/13	UF DUP																		
DP above Los Alamos Canyon	05/28	F CS																		
DP above Los Alamos Canyon	05/28	UF CS																		
DP above Los Alamos Canyon	06/27	F CS				8.77	1.66	0.79	2.48	1.39	5.30	0.062	0.014	0.027	0.004	0.006	0.021	0.041	0.010	0.021
DP above Los Alamos Canyon	06/27	UF CS	218	55	164	21.80	6.01	1.01	19.90	3.54	6.07	11.100	0.978	0.143	0.639	0.100	0.118	9.620	0.856	0.030
DP above Los Alamos Canyon	08/04	F CS																		
DP above Los Alamos Canyon	08/04	UF CS																		
Los Alamos above SR-4	07/02	F CS																		
Los Alamos above SR-4	07/02	UF CS																		
Los Alamos above SR-4	07/14	F CS																		
Los Alamos above SR-4	07/14	UF CS	0	51	172	9.90	1.72	0.52	16.40	3.92	5.76	24.600	2.460	0.408	0.993	0.204	0.290	24.600	2.460	0.084
Los Alamos above SR-4	07/26	UF CS																		
Los Alamos above SR-4	08/01	F CS																		
Los Alamos above SR-4	08/01	UF CS																		
Los Alamos above SR-4	08/04	F CS				4.26	0.63	0.28	0.38	0.88	3.16	0.059	0.013	0.025	0.017	0.007	0.017	0.060	0.014	0.028
Los Alamos above SR-4	08/04	F RE																		
Los Alamos above SR-4	08/04	UF CS	123	51	158	13.50	1.91	0.24	4.92	7.58	9.48	14.400	1.660	0.283	0.946	0.210	0.367	13.700	1.590	0.328
Los Alamos above SR-4	08/08	F CS																		
Los Alamos above SR-4	08/09	UF CS																		
Los Alamos above SR-4	08/16	F CS																		
Los Alamos above SR-4	08/16	UF CS																		
Los Alamos above SR-4	08/16	F CS				1.30	0.23	0.49	1.59	3.33	6.07	0.094	0.020	0.035	0.012	0.013	0.044	0.056	0.018	0.049
Los Alamos above SR-4	08/16	UF CS	288	56	157	6.34	0.89	0.28	2.41	2.85	5.97	23.300	3.380	0.439	1.350	0.311	0.380	25.300	3.650	0.300
Los Alamos below LA Weir	07/26	F CS																		
Los Alamos below LA Weir	07/26	UF CS																		
Los Alamos below LA Weir	08/09	F CS																		
Los Alamos below LA Weir	08/09	UF CS	-27	45	149															
Los Alamos below LA Weir	08/16	F CS																		
Los Alamos below LA Weir	08/16	UF CS																		
Acid above Pueblo	08/03	F CS																		
Acid above Pueblo	08/03	UF CS				4.13	0.59	0.25	1.18	2.06	7.54	4.420	0.498	0.218	0.729	0.145	0.064	4.410	0.500	0.352
Acid above Pueblo	08/13	UF CS				7.87	1.16	0.34	-1.00	1.78	6.09	5.940	0.600	0.177	0.311	0.073	0.040	5.790	0.585	0.040
Pueblo above SR-502	07/02	F CS																		
Pueblo above SR-502	07/26	F CS				2.64	0.45	0.35	2.88	2.39	3.98	0.647	0.062	0.029	0.038	0.011	0.020	0.668	0.063	0.025
Pueblo above SR-502	07/26	UF CS				19.80	3.02	0.79	3.31	1.90	5.38	14.300	5.900	0.248	1.010	0.542	0.851	13.100	5.420	0.673
Pueblo above SR-502	08/04	UF CS	546	61	151	10.00	1.34	0.37	8.09	3.12	5.84	8.760	2.710	0.733	0.396	0.287	0.852	8.840	2.730	0.214
Pueblo above SR-502	08/09	F CS				2.16	0.33	0.26	4.46	3.36	5.75	0.357	0.040	0.040	0.018	0.010	0.031	0.324	0.037	0.019
Pueblo above SR-502	08/09	UF CS	54	47	149	15.70	2.31	0.47	17.70	3.06	5.57	88.900	7.240	1.110	4.700	0.843	0.886	91.900	7.460	0.883
Pueblo above SR-502	08/11	F CS				1.77	0.24	0.20	1.30	1.83	6.68	0.711	0.066	0.035	0.044	0.011	0.007	0.615	0.058	0.026
Pueblo above SR-502	08/11	UF CS	161	49	149	16.00	2.55	0.66	14.80	4.28	7.59	78.900	32.200	0.947	7.280	3.140	1.690	82.700	33.800	1.190
Pueblo above SR-502	08/16	F CS				1.43	0.22	0.37	0.28	1.76	3.74	0.837	0.076	0.021	0.035	0.011	0.021	0.802	0.074	0.008
Pueblo above SR-502	08/16	UF CS	74	47	149	9.67	1.59	0.65	0.00	3.31	6.37	70.600	18.000	1.070	3.200	1.070	1.070	65.300	16.700	1.350

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U		
Station Name	**Date**	**Codes[b]**		**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Sandia Canyon:																					
Sandia tributary at Salvage Yard	06/27	F	CS																		
Sandia tributary at Salvage Yard	06/27	F	DUP																		
Sandia tributary at Salvage Yard	06/27	UF	CS																		
Sandia tributary at Salvage Yard	06/27	UF	DUP																		
Sandia tributary at Salvage Yard	07/26	F	CS																		
Sandia tributary at Salvage Yard	07/26	UF	CS	0	51	173															
Sandia tributary at Salvage Yard	08/01	F	CS																		
Sandia tributary at Salvage Yard	08/01	UF	CS																		
Sandia below Wetlands	08/05	F	CS																		
Sandia below Wetlands	08/05	UF	CS				0.09	0.07	0.22	-1.60	1.82	6.33	2.280	0.183	0.037	0.106	0.021	0.032	2.350	0.188	0.045
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																					
TA-55 NW above Effluent Canyon	04/07	UF	CS				0.42	0.10	0.26	2.46	1.84	7.00	0.059	0.019	0.049	0.020	0.011	0.035	0.049	0.014	0.024
TA-55 NW above Effluent Canyon	04/20	UF	CS				-0.11	0.12	0.44	0.22	1.69	3.11	0.172	0.031	0.033	0.001	0.006	0.033	0.202	0.033	0.012
TA-55 NW above Effluent Canyon	04/20	UF	DUP																		
TA-55 NW above Effluent Canyon	05/13	F	CS				0.44	0.11	0.28	0.66	0.78	2.83	0.040	0.011	0.023	0.004	0.007	0.028	0.036	0.011	0.027
TA-55 NW above Effluent Canyon	05/13	UF	CS	-35	46	155	0.05	0.09	0.31	4.16	2.02	7.89	0.211	0.028	0.023	0.032	0.010	0.018	0.260	0.032	0.018
TA-55 NW above Effluent Canyon	05/28	F	CS				-0.03	0.10	0.33	2.96	1.05	4.17	0.071	0.015	0.027	0.009	0.007	0.021	0.009	0.008	0.027
TA-55 NW above Effluent Canyon	05/28	UF	CS	53	48	154	0.08	0.14	0.50	1.25	1.94	6.84	0.252	0.028	0.005	0.013	0.006	0.014	0.191	0.023	0.005
TA-55 NW above Effluent Canyon	05/28	UF	DUP				0.09	0.12	0.41												
TA-55 NW above Effluent Canyon	06/27	F	CS				-0.16	0.10	0.41	0.00	1.42	3.09	0.003	0.009	0.053	0.011	0.007	0.010	0.015	0.008	0.010
TA-55 NW above Effluent Canyon	06/27	UF	CS				0.13	0.10	0.39	4.76	2.42	7.26	0.845	0.080	0.024	0.061	0.016	0.035	0.785	0.076	0.009
TA-55 NW above Effluent Canyon	07/02	F	CS																		
TA-55 NW above Effluent Canyon	07/02	UF	CS																		
TA-55 NW above Effluent Canyon	07/13	UF	CS	0	50	168	0.00	0.20	0.66	-0.91	2.22	7.87	0.119	0.041	0.123	0.012	0.021	0.111	0.158	0.043	0.075
TA-55 NW above Effluent Canyon	07/19	F	CS				0.00	0.08	0.21	-1.11	0.87	2.92	0.030	0.011	0.028	0.004	0.005	0.020	0.025	0.008	0.018
TA-55 NW above Effluent Canyon	07/19	UF	CS				-0.76	0.51	1.39	-0.83	1.82	6.34	0.237	0.032	0.043	0.018	0.009	0.028	0.252	0.032	0.036
TA-55 NW above Effluent Canyon	07/19	UF	DUP							1.42	1.88	7.19									
TA-55 NW above Effluent Canyon	08/01	F	CS				-0.07	0.08	0.27	2.66	1.20	4.58	0.041	0.013	0.027	0.003	0.008	0.032	0.026	0.012	0.032
TA-55 NW above Effluent Canyon	08/01	UF	CS				-0.09	0.07	0.22	2.61	2.02	6.99	0.079	0.017	0.028	0.000	1.000	0.033	0.054	0.015	0.033
MDA L	04/06	UF	CS	-115	53	189	-0.25	0.13	0.46	-0.06	1.14	3.94	0.076	0.025	0.021	-0.012	0.007	0.082	0.031	0.015	0.021
MDA L	04/27	UF	CS	28	56	187	0.19	0.13	0.41	1.14	1.08	3.89	0.185	0.042	0.023	0.034	0.024	0.078	0.177	0.043	0.062
MDA L	04/27	UF	DUP	-116	53	190				0.14	0.99	3.43									
MDA L	05/28	F	CS																		
MDA L	05/28	UF	CS				0.24	0.08	0.26	-3.31	2.12	6.95	0.108	0.019	0.029	0.012	0.006	0.018	0.060	0.013	0.007
MDA L	05/28	UF	DUP																		
MDA L	06/07	F	CS																		
MDA L	06/07	UF	CS	26	46	150				0.18	1.83	6.57	0.134	0.023	0.039	0.022	0.010	0.030	0.189	0.026	0.030
MDA L	06/07	UF	DUP										0.103	0.020	0.035	0.011	0.011	0.037	0.243	0.031	0.025
MDA L	07/02	UF	CS																		
MDA L	07/26	F	CS																		
MDA L	07/26	UF	CS				-0.11	0.08	0.22	2.73	1.86	7.03	0.069	0.013	0.020	0.004	0.004	0.014	0.061	0.012	0.005
Pajarito Canyon (includes Twomile, Threemile Canyons):																					
Pajarito below SR-501	07/26	UF	CS				17.90	2.70	0.74	1.43	2.76	4.77	9.290	5.770	2.650	0.424	0.570	1.850	9.430	5.820	1.310
Pajarito below SR-501	08/09	F	CS																		
Pajarito below SR-501	08/09	UF	CS																		
Pajarito above Starmers	07/26	F	CS				1.56	0.23	0.25	2.17	1.47	2.13	0.284	0.035	0.029	0.060	0.014	0.025	0.149	0.023	0.025
Pajarito above Starmers	07/26	UF	CS				4.40	0.75	0.35	1.48	1.46	5.45	7.740	1.260	0.302	0.718	0.193	0.240	7.550	1.240	0.350
Pajarito above Starmers	08/05	F	CS																		
Pajarito above Starmers	08/05	UF	CS	449	59	153	6.75	1.15	0.27	6.78	3.55	7.95	3.050	0.515	0.208	0.085	0.110	0.399	4.120	0.669	0.370
Pajarito above Starmers	08/11	F	CS																		
Pajarito above Starmers	08/11	UF	CS				2.04	0.31	0.24	-1.09	1.69	5.97	4.760	2.070	1.000	0.874	0.491	0.796	6.920	2.940	1.000
Pajarito above TA-18	07/02	F	CS																		
Pajarito above TA-18	07/02	UF	CS																		
Pajarito above TA-18	08/05	F	CS																		
Pajarito above TA-18	08/05	UF	CS																		

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station Name	Date	Codes[b]		Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Pajarito Canyon (includes Twomile, Threemile Canyons): (Cont.)																					
MDA G-1	08/05	UF	CS				0.84	0.15	0.19	4.24	2.12	8.44	2.360	0.244	0.082	0.204	0.052	0.082	2.150	0.228	0.103
MDA G-2	08/30	F	CS				0.14	0.09	0.27	1.24	0.98	3.72	0.096	0.019	0.026	0.006	0.008	0.030	0.082	0.016	0.008
MDA G-2	08/30	F	DUP																		
MDA G-2	08/30	UF	CS				1.44	0.28	0.33	1.47	2.30	9.14	17.600	1.360	0.086	0.821	0.104	0.105	17.800	1.370	0.059
MDA G-3	06/07	F	CS							1.55	1.33	4.97	0.046	0.024	0.074	0.000	0.009	0.039	0.025	0.015	0.045
MDA G-3	06/07	UF	CS							2.19	2.15	8.20	1.070	0.098	0.035	0.043	0.025	0.082	1.020	0.095	0.055
MDA G-3	07/02	F	CS																		
MDA G-3	07/02	UF	CS																		
MDA G-3	07/13	F	CS				0.01	0.10	0.34	3.32	2.12	2.96	0.060	0.014	0.025	0.004	0.004	0.020	0.048	0.012	0.007
MDA G-3	07/13	UF	CS	324	60	173	0.41	0.12	0.34	3.84	1.84	7.47	0.369	0.045	0.033	0.029	0.011	0.033	0.319	0.041	0.033
MDA G-3	08/01	F	CS				0.10	0.06	0.19	0.32	0.92	3.44	0.068	0.016	0.022	0.006	0.008	0.032	0.030	0.012	0.032
MDA G-3	08/01	UF	CS	593	63	158	0.01	0.06	0.21	4.85	2.51	9.71	0.320	0.034	0.025	0.010	0.007	0.022	0.239	0.028	0.015
MDA G-3	08/04	F	CS				0.09	0.07	0.23	1.21	1.00	3.12	0.037	0.013	0.037	0.012	0.008	0.032	0.025	0.010	0.025
MDA G-3	08/04	UF	CS	368	57	153	0.02	0.06	0.21	0.00	4.56	16.90	2.280	0.181	0.035	0.155	0.025	0.024	2.400	0.189	0.024
MDA G-3	08/30	F	CS				0.29	0.16	0.48	-0.78	1.29	4.51	0.063	0.014	0.008	0.011	0.006	0.008	0.023	0.009	0.021
MDA G-3	08/30	F	DUP				-0.05	0.12	0.42												
MDA G-3	08/30	UF	CS	890	65	150	0.08	0.10	0.34	-0.97	2.10	7.72	0.589	0.057	0.032	0.029	0.011	0.025	0.576	0.056	0.019
MDA G-3	08/30	UF	DUP							2.67	2.71	9.65									
MDA G-4	04/06	F	CS				-0.05	0.06	0.22	0.29	0.73	2.56	0.057	0.021	0.019	0.011	0.011	0.052	0.036	0.016	0.019
MDA G-4	04/06	UF	CS	0	56	189	0.26	0.07	0.23	0.00	1.41	5.30	0.457	0.053	0.035	0.034	0.014	0.035	0.430	0.051	0.028
MDA G-4	04/06	UF	DUP										0.494	0.052	0.008	0.065	0.016	0.029	0.386	0.044	0.008
MDA G-4	06/07	F	CS				-0.02	0.06	0.21	11.20	2.70	4.18	0.018	0.014	0.045	-0.015	0.011	0.050	0.021	0.011	0.032
MDA G-4	06/07	UF	CS	129	48	149	0.14	0.07	0.22	46.80	4.95	7.07	0.897	0.085	0.047	0.080	0.018	0.025	0.934	0.087	0.025
MDA G-4	06/07	UF	DUP																		
MDA G-4	06/27	F	CS																		
MDA G-4	06/27	UF	CS				0.00	0.10	0.41	29.90	4.93	7.16	1.420	0.126	0.045	0.045	0.014	0.010	1.270	0.115	0.041
MDA G-4	06/27	UF	DUP							34.80	4.89	6.44									
MDA G-4	07/02	F	CS																		
MDA G-4	07/02	UF	CS																		
MDA G-4	07/13	F	CS				0.06	0.13	0.45	1.50	0.88	3.86	0.021	0.014	0.061	0.012	0.009	0.040	0.009	0.011	0.052
MDA G-4	07/13	UF	CS	214	57	171	0.22	0.14	0.43	0.41	1.84	6.72	0.212	0.030	0.038	0.022	0.010	0.035	0.223	0.031	0.044
MDA G-4	07/17	UF	CS	242	58	172	0.34	0.13	0.36	-0.17	1.92	6.72	0.221	0.030	0.032	0.013	0.007	0.022	0.225	0.031	0.028
MDA G-4	07/26	F	CS																		
MDA G-4	08/01	F	CS				0.05	0.10	0.34	8.65	3.25	5.56	0.030	0.014	0.040	-0.003	0.010	0.043	0.036	0.012	0.024
MDA G-4	08/01	UF	CS				0.12	0.09	0.27	0.18	1.85	6.87	0.230	0.027	0.028	0.012	0.009	0.032	0.230	0.028	0.036
MDA G-4	08/04	F	CS				0.09	0.07	0.22	0.77	1.34	4.91	0.058	0.019	0.058	0.010	0.006	0.009	0.072	0.017	0.031
MDA G-4	08/04	F	RE																		
MDA G-4	08/04	UF	CS				0.23	0.08	0.22	-1.94	1.79	5.99	2.870	0.230	0.067	0.182	0.032	0.053	2.640	0.213	0.056
Pajarito above SR-4	06/27	F	CS				1.63	0.29	0.55	2.57	3.46	5.16	0.946	0.079	0.029	0.066	0.013	0.015	1.270	0.102	0.025
Pajarito above SR-4	06/27	UF	CS	136	52	163	2.73	0.43	0.53	7.03	2.24	8.72	5.570	0.428	0.054	0.274	0.038	0.011	7.000	0.531	0.010
Pajarito above SR-4	08/06	F	CS				1.89	0.31	0.27	0.77	1.00	3.45	0.566	0.060	0.054	0.016	0.010	0.037	0.509	0.055	0.044
Pajarito above SR-4	08/06	F	DUP				1.70	0.25	0.25	1.34	1.01	3.40									
Pajarito above SR-4	08/06	F	RE																		
Pajarito above SR-4	08/06	UF	CS	0	48	157	4.45	0.77	0.36	1.37	1.96	7.29	9.790	1.480	0.391	0.363	0.151	0.437	9.910	1.500	0.098
Pajarito above SR-4	08/06	UF	DUP	-25	48	160							8.010	1.260	0.117	0.379	0.164	0.467	10.300	1.580	0.319
Pajarito above SR-4	08/09	F	CS				1.58	0.26	0.25	0.14	1.29	4.65	0.244	0.032	0.031	0.009	0.008	0.027	0.207	0.029	0.021
Pajarito above SR-4	08/09	F	DUP																		
Pajarito above SR-4	08/09	UF	CS	108	48	150	3.90	0.63	0.36	11.10	3.30	7.13	8.390	0.743	0.191	0.234	0.088	0.192	8.440	0.747	0.191
Pajarito above SR-4	08/09	UF	DUP	107	48	148				2.23	2.03	7.83									
Pajarito above SR-4	08/16	F	CS				0.93	0.14	0.25	0.00	2.26	8.68	0.155	0.022	0.007	0.000	0.006	0.027	0.210	0.027	0.007
Pajarito above SR-4	08/16	F	DUP																		
Pajarito above SR-4	08/16	UF	CS	186	54	160	1.65	0.25	0.28	0.76	1.83	6.77	6.260	1.460	0.548	0.296	0.279	0.940	5.490	1.310	0.833

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station Name	Date	Codes[b]		Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):																					
Water above SR-501	07/22	F	CS																		
Water above SR-501	07/22	UF	CS	-53	49	169															
Cañon de Valle above SR-501	07/22	F	CS							0.50	1.19	3.85	0.143	0.020	0.023	0.004	0.005	0.018	0.141	0.020	0.023
Cañon de Valle above SR-501	07/22	UF	CS				12.60	1.67	0.40	15.00	3.71	6.70	20.700	2.230	0.254	1.520	0.247	0.175	19.900	2.140	0.220
Cañon de Valle above SR-501	07/26	F	CS																		
Cañon de Valle above SR-501	07/26	UF	CS																		
S Site Canyon above Water	08/03	F	CS																		
S Site Canyon above Water	08/03	UF	CS																		
Cañon de Valle above Water	08/05	UF	CS				14.10	2.42	0.61	0.80	2.20	8.07	51.500	16.000	1.270	3.310	1.210	0.869	53.900	16.800	0.867
Cañon de Valle above Water	08/05	F	CS																		
Cañon de Valle above Water	08/09	F	CS				1.07	0.17	0.25	1.15	0.97	3.77	0.155	0.023	0.029	0.000	0.007	0.029	0.081	0.016	0.026
Cañon de Valle above Water	08/09	UF	CS	27	46	148	9.56	1.32	0.29	9.57	2.99	5.25	47.900	3.860	1.040	2.650	0.582	1.280	50.600	4.050	1.280
Water below MDA AB	07/26	F	CS				1.18	0.17	0.26	4.36	1.17	4.67	0.800	0.074	0.027	0.066	0.016	0.031	0.757	0.070	0.021
Water below MDA AB	07/26	UF	CS				16.90	2.49	1.58	3.25	1.51	5.86	33.900	29.300	2.650	4.860	4.340	2.380	30.600	26.500	3.110
Water below MDA AB	08/03	F	CS				0.68	0.15	0.32	-0.65	0.92	3.23	0.101	0.017	0.020	0.009	0.005	0.016	0.109	0.018	0.016
Water below MDA AB	08/03	F	RE																		
Water below MDA AB	08/03	UF	CS	-80	50	171	3.54	0.58	0.28	0.00	6.89	6.87	12.000	1.400	0.272	0.763	0.175	0.216	14.000	1.620	0.215
Water below MDA AB	08/08	F	CS				0.95	0.14	0.22	0.00	3.92	6.90	0.152	0.023	0.023	0.012	0.009	0.030	0.103	0.018	0.026
Water below MDA AB	08/08	UF	CS	54	47	150	8.13	1.30	0.30	12.40	3.35	5.70	47.800	3.800	0.727	4.810	0.703	0.956	46.600	3.720	0.628
Water at SR-4	07/26	F	CS																		
Water at SR-4	07/26	UF	CS																		
Water at SR-4	08/03	UF	CS				8.99	1.16	0.37	0.00	8.80	8.19	61.600	25.200	1.590	1.560	0.822	1.430	62.800	25.700	0.973
Water at SR-4	08/03	F	CS																		
Water at SR-4	08/03	UF	CS	-80	50	172															
Water at SR-4	08/09	F	CS				0.85	0.14	0.26	-0.02	0.85	3.11	0.229	0.029	0.034	0.023	0.010	0.028	0.215	0.027	0.017
Water at SR-4	08/09	UF	CS	54	47	149	11.80	1.68	0.87	6.63	4.14	7.00	16.500	2.040	1.780	1.490	0.568	1.380	16.900	2.050	1.090
Water below SR-4	08/03	F	CS				0.65	0.13	0.27	1.24	0.90	3.57	0.063	0.019	0.053	-0.004	0.009	0.050	0.049	0.015	0.036
Water below SR-4	08/03	F	RE																		
Water below SR-4	08/03	UF	CS	-105	48	169															
Water below SR-4	08/03	F	CS																		
Water below SR-4	08/03	UF	CS				2.56	0.38	0.21	0.89	3.50	7.13	10.900	1.010	0.288	0.615	0.145	0.308	11.700	1.070	0.307
Water below SR-4	08/09	F	CS																		
Water below SR-4	08/09	UF	CS				11.00	1.88	0.53	10.60	2.90	6.33	79.000	6.350	1.220	3.660	0.751	1.430	82.100	6.580	1.220
Potrillo tributary Study Area	08/05	F	CS				0.20	0.08	0.25	-0.33	0.78	2.74	0.161	0.030	0.055	0.000	0.022	0.101	0.095	0.025	0.068
Potrillo tributary Study Area	08/05	F	RE																		
Potrillo tributary Study Area	08/05	F	REDP																		
Potrillo tributary Study Area	08/05	UF	CS				1.92	0.28	0.24	0.00	2.25	9.24	18.400	4.700	0.604	0.619	0.255	0.414	18.900	4.830	0.521
Potrillo tributary Study Area	08/05	UF	RE																		
Potrillo tributary Study Area	08/11	F	CS				0.14	0.07	0.18	1.47	0.98	3.96	0.268	0.033	0.032	0.017	0.010	0.032	0.171	0.025	0.028
Potrillo tributary Study Area	08/11	UF	CS				1.88	0.35	0.39	1.53	1.67	6.23	25.700	5.580	0.935	1.860	0.516	0.414	27.300	5.920	0.413
Potrillo tributary Study Area	08/30	F	CS																		
Potrillo tributary Study Area	08/30	UF	CS	27	45	147	8.80	1.66	0.74	5.22	2.41	9.76	18.900	6.230	0.905	0.831	0.425	0.907	20.100	6.610	0.554
Potrillo tributary Study Area	08/30	UF	DUP	137	48	147							26.400	8.630	1.030	2.060	0.790	0.791	27.200	8.910	0.788

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station Name	**Date**	**Codes[b]**		**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Ancho Canyon:																					
Ancho Canyon spring tributary below SR-4	08/12	F	CS																		
Ancho Canyon spring tributary below SR-4	08/12	UF	CS																		
Water Quality Standards[c]																					
DOE DCG for Public Dose				2,000,000			1,000			3,000			500			600			600		
DOE Drinking Water System DCG				80,000			40			120			20			24			24		
EPA Primary Drinking Water Standard				20,000			8														
EPA Screening Level																					
NMWQCC Groundwater Limit																					
NMWQCC Livestock Watering				20,000																	

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				U (μg/L)	^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station Name	Date	Codes[b]		Result	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Guaje Canyon:																			
Guaje above Rendija	08/08	F	CS	0.30															
Guaje above Rendija	08/08	UF	CS	16.10	0.063	0.128	0.460	3.320	0.348	0.155	1.010	0.180	0.072	77.1	7.1	2.5	132.0	2.3	2.2
Guaje above Rendija	08/09	F	CS		0.699	0.062	0.009	0.014	0.009	0.025	0.028	0.010	0.024	3.0	0.8	1.9	11.6	0.9	1.8
Guaje above Rendija	08/09	UF	CS	137.00	0.524	0.184	0.406	3.530	0.574	0.655	1.020	0.230	0.106	1,190.0	146.0	287.0	5,350.0	217.0	432.0
Guaje above Rendija	08/11	F	CS	0.30	-0.009	0.007	0.037	0.006	0.009	0.033	0.018	0.007	0.007	0.9	0.3	0.8	10.5	0.5	0.7
Guaje above Rendija	08/11	UF	CS	77.90	0.065	0.046	0.088	3.930	0.474	0.426	1.220	0.151	0.035	398.0	21.9	18.3	512.0	19.9	38.5
Guaje above Rendija	08/14	F	CS	0.14	0.005	0.007	0.027	-0.008	0.007	0.033	0.033	0.010	0.019	1.6	0.5	1.2	7.7	0.9	2.6
Guaje above Rendija	08/14	F	DUP	0.15															
Guaje above Rendija	08/14	UF	CS	75.50	0.263	0.100	0.257	2.840	0.329	0.065	0.863	0.128	0.104	531.0	29.3	25.8	691.0	22.7	34.5
Guaje above Rendija	08/14	UF	DUP	74.50	0.277	0.079	0.136	3.910	0.381	0.136	0.819	0.077	0.032						
Guaje above Rendija	08/16	F	CS		0.003	0.006	0.038	0.002	0.015	0.093	0.020	0.009	0.011	-0.1	0.4	1.8	6.6	0.6	1.3
Guaje above Rendija	08/16	F	DUP											0.4	0.5	1.9	6.9	0.6	1.5
Guaje above Rendija	08/16	UF	CS		0.291	0.144	0.436	2.930	0.364	0.079	1.410	0.252	0.098	608.0	25.6	37.0	760.0	15.3	22.4
Rendija above Guaje	07/02	F	CS	2.53															
Rendija above Guaje	07/02	UF	CS	7.54															
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons):																			
Los Alamos below Ice Rink	07/02	F	CS	1.46															
Los Alamos below Ice Rink	07/02	UF	CS	23.20															
Los Alamos below Ice Rink	07/02	UF	DUP	21.10	0.165	0.047	0.088	1.340	0.163	0.033	1.290	0.120	0.017	715.0	38.9	37.4	863.0	29.2	48.5
Los Alamos below Ice Rink	07/13	F	CS	2.85	0.001	0.010	0.047	0.002	0.006	0.030	0.025	0.009	0.023	2.3	0.5	1.4	14.1	0.9	2.4
Los Alamos below Ice Rink	07/13	F	DUP	2.79	0.003	0.010	0.043	0.010	0.005	0.007	0.029	0.015	0.042	3.2	0.5	1.2	15.5	1.0	2.5
Los Alamos below Ice Rink	07/13	UF	CS	12.10	0.023	0.011	0.030	0.413	0.041	0.008	0.127	0.021	0.030	767.0	80.9	69.2	995.0	30.1	59.2
Los Alamos below Ice Rink	07/13	UF	DUP	11.60	0.044	0.013	0.010	0.376	0.043	0.010	0.128	0.020	0.024	681.0	64.9	61.4	1,050.0	28.8	48.5
Los Alamos below Ice Rink	08/09	F	CS	2.16	0.790	0.062	0.019	0.036	0.012	0.031	0.030	0.010	0.020	2.4	0.8	2.2	9.4	0.6	1.5
Los Alamos below Ice Rink	08/09	UF	CS	9.31	0.065	0.020	0.016	0.576	0.068	0.055	0.300	0.065	0.088	61.6	3.1	3.1	78.4	1.5	2.1
Los Alamos above DP Canyon	07/02	F	CS	1.43															
Los Alamos above DP Canyon	07/02	UF	CS	6.66															
Los Alamos above DP Canyon	07/02	UF	DUP								0.830	0.134	0.133						
Los Alamos above DP Canyon	07/14	F	CS	3.87	-0.006	0.006	0.033	0.009	0.007	0.023	0.015	0.006	0.007	3.5	0.6	1.7	10.7	0.6	1.5
Los Alamos above DP Canyon	07/14	UF	CS	24.90	0.215	0.051	0.031	6.020	0.463	0.083	0.630	0.073	0.045	756.0	66.5	64.9	953.0	28.1	54.3
Los Alamos above DP Canyon	07/26	F	CS	1.06	0.000	0.007	0.031	0.024	0.009	0.009	0.029	0.012	0.029	2.8	0.6	1.3	11.1	1.0	2.6
Los Alamos above DP Canyon	07/26	F	DUP	0.99															
Los Alamos above DP Canyon	07/26	UF	CS	31.60	0.056	0.016	0.027	2.190	0.152	0.027	0.165	0.026	0.031	404.0	32.9	8.0	568.0	37.0	14.4
Los Alamos above DP Canyon	07/26	UF	DUP	33.50	0.076	0.021	0.043	2.320	0.163	0.011	0.366	0.038	0.020	364.0	13.3	10.2	557.0	10.2	13.4
Los Alamos above DP Canyon	08/05	F	CS	0.15	0.002	0.005	0.028	0.025	0.009	0.022	0.014	0.006	0.006	0.3	0.3	1.0	5.2	0.6	2.1
Los Alamos above DP Canyon	08/05	F	RE								0.000	1.000	0.026						
Los Alamos above DP Canyon	08/05	UF	CS	15.00	0.146	0.033	0.065	5.680	0.391	0.040	0.302	0.032	0.024	228.0	15.8	7.6	238.0	14.6	12.3
Los Alamos above DP Canyon	08/09	F	CS	0.83	0.173	0.030	0.054	-0.007	0.019	0.075	0.029	0.009	0.008	1.2	0.5	1.3	8.8	0.6	1.2
Los Alamos above DP Canyon	08/09	F	DUP	0.83															
Los Alamos above DP Canyon	08/09	UF	CS	11.10	0.545	0.133	0.255	6.480	0.638	0.751	2.610	0.374	0.505	96.3	8.6	3.4	144.0	2.3	2.2
Los Alamos above DP Canyon	08/09	UF	DUP	37.00	0.538	0.118	0.158	7.720	0.678	0.405	2.010	0.208	0.095						
Los Alamos above DP Canyon	08/16	F	CS	0.16	0.014	0.012	0.057	0.064	0.020	0.062	0.022	0.013	0.045	0.9	0.8	2.7	1.7	1.4	5.2
Los Alamos above DP Canyon	08/16	F	DUP	0.15															
Los Alamos above DP Canyon	08/16	UF	CS	16.10	0.069	0.015	0.009	3.630	0.223	0.038	0.165	0.042	0.026	374.0	18.1	22.0	500.0	19.1	39.4
Los Alamos above DP Canyon	08/16	UF	DUP	14.70	0.085	0.024	0.046	5.950	0.407	0.017	0.287	0.055	0.066	349.0	22.1	24.4	484.0	17.8	34.3
DP above TA-21	05/13	UF	CS		0.012	0.007	0.011	0.084	0.016	0.008	0.037	0.013	0.027	14.5	2.8	1.1	26.9	2.3	2.6
DP above TA-21	05/13	UF	DUP																
DP above TA-21	05/28	F	CS	0.08															
DP above TA-21	05/28	UF	CS	2.45															
DP above TA-21	05/28	UF	DUP	2.68															
DP above TA-21	06/27	F	CS	0.07															
DP above TA-21	06/27	UF	CS	4.91															
DP above TA-21	07/02	F	CS	0.04															
DP above TA-21	07/02	F	DUP	0.04															
DP above TA-21	07/02	UF	CS	2.07															

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				U (µg/L)	^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station Name	Date	Codes[b]		Result	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons): (Cont.)																			
DP above TA-21	08/01	F	CS	0.05															
DP above TA-21	08/01	UF	CS	1.24															
DP above TA-21	08/04	F	CS	0.03															
DP above TA-21	08/04	UF	CS	2.24															
DP above TA-21	08/16	F	CS	0.02															
DP above TA-21	08/16	UF	CS	0.95															
DP below Meadow at TA-21	06/27	F	CS	0.08															
DP below Meadow at TA-21	06/27	UF	CS	3.46															
DP below Meadow at TA-21	07/02	F	CS	0.07															
DP below Meadow at TA-21	07/02	UF	CS	2.88															
DP above Los Alamos Canyon	05/13	UF	CS	11.00	1.400	0.273	0.620	8.500	1.110	0.295	14.200	1.260	1.460	21.0	4.0	1.8	89.7	6.7	2.6
DP above Los Alamos Canyon	05/13	UF	DUP		0.945	0.152	0.047	5.700	0.587	0.272	16.100	1.440	1.660						
DP above Los Alamos Canyon	05/28	F	CS	0.11															
DP above Los Alamos Canyon	05/28	UF	CS	7.85															
DP above Los Alamos Canyon	06/27	F	CS	0.09	0.000	0.003	0.014	0.010	0.006	0.018	0.033	0.015	0.018	2.0	0.4	1.0	27.5	1.1	2.2
DP above Los Alamos Canyon	06/27	UF	CS	5.01	0.439	0.041	0.018	2.460	0.153	0.032	10.100	1.230	0.649	521.0	26.6	30.4	773.0	23.5	44.6
DP above Los Alamos Canyon	08/04	F	CS	0.08															
DP above Los Alamos Canyon	08/04	UF	CS	4.09															
Los Alamos above SR-4	07/02	F	CS	0.10															
Los Alamos above SR-4	07/02	UF	CS	6.00															
Los Alamos above SR-4	07/14	F	CS	4.00															
Los Alamos above SR-4	07/14	UF	CS	26.40	0.071	0.021	0.040	3.270	0.228	0.039	0.837	0.080	0.035	405.0	39.6	47.9	451.0	20.7	45.7
Los Alamos above SR-4	07/26	UF	CS	58.10															
Los Alamos above SR-4	08/01	F	CS	1.20															
Los Alamos above SR-4	08/01	UF	CS	4.74															
Los Alamos above SR-4	08/04	F	CS	0.11	0.017	0.010	0.030	0.038	0.013	0.030	0.034	0.009	0.007	0.4	0.4	1.5	11.9	0.8	2.4
Los Alamos above SR-4	08/04	F	RE								0.021	0.009	0.025						
Los Alamos above SR-4	08/04	UF	CS	7.70	0.374	0.041	0.045	6.320	0.364	0.008	5.560	0.336	0.016	76.0	6.9	4.3	121.0	9.3	6.6
Los Alamos above SR-4	08/08	F	CS	0.60															
Los Alamos above SR-4	08/09	UF	CS	8.97															
Los Alamos above SR-4	08/16	F	CS	0.54															
Los Alamos above SR-4	08/16	UF	CS	3.53															
Los Alamos above SR-4	08/16	F	CS	0.11	0.000	1.000	0.013	0.007	0.010	0.053	0.058	0.015	0.011	0.8	0.4	1.1	9.2	1.2	4.1
Los Alamos above SR-4	08/16	UF	CS	17.30	0.319	0.053	0.020	11.700	0.785	0.055	2.440	0.224	0.070	655.0	48.5	59.4	1,140.0	34.4	54.3
Los Alamos below LA Weir	07/26	F	CS	2.03															
Los Alamos below LA Weir	07/26	UF	CS	17.70															
Los Alamos below LA Weir	08/09	F	CS	0.98															
Los Alamos below LA Weir	08/09	UF	CS	52.80															
Los Alamos below LA Weir	08/16	F	CS	0.09															
Los Alamos below LA Weir	08/16	UF	CS	11.30															
Acid above Pueblo	08/03	F	CS	1.28															
Acid above Pueblo	08/03	UF	CS		0.004	0.006	0.027	0.304	0.039	0.045	0.057	0.014	0.021	84.4	5.2	5.0	117.0	4.1	7.4
Acid above Pueblo	08/13	UF	CS		0.012	0.007	0.018	0.800	0.061	0.007	0.106	0.050	0.143	211.0	15.4	15.6	369.0	15.7	35.3
Pueblo above SR-502	07/02	F	CS	2.01															
Pueblo above SR-502	07/26	F	CS		0.000	0.005	0.024	0.112	0.020	0.024	0.040	0.016	0.037	3.3	0.4	0.7	24.3	0.7	1.4
Pueblo above SR-502	07/26	UF	CS		0.097	0.044	0.053	13.800	1.220	0.143	1.180	0.171	0.146	1,240.0	105.0	32.1	1,890.0	132.0	45.2
Pueblo above SR-502	08/04	UF	CS		0.172	0.031	0.014	18.600	1.040	0.037	0.942	0.093	0.053						
Pueblo above SR-502	08/09	F	CS	1.12	0.029	0.014	0.044	0.037	0.013	0.035	0.030	0.010	0.019	1.0	0.5	1.4	16.9	1.1	2.0
Pueblo above SR-502	08/09	UF	CS	81.80	0.415	0.091	0.049	40.600	2.850	0.167	4.930	0.383	0.027	309.0	16.8	19.4	342.0	7.0	9.0
Pueblo above SR-502	08/11	F	CS	2.10	0.000	1.000	0.010	0.079	0.021	0.047	0.047	0.013	0.024	1.2	0.5	1.3	15.4	1.1	2.0
Pueblo above SR-502	08/11	UF	CS	60.50	0.412	0.123	0.093	49.900	4.260	0.449	4.070	0.305	0.020	1,090.0	110.0	191.0	3,010.0	129.0	248.0
Pueblo above SR-502	08/16	F	CS	1.91	0.003	0.007	0.043	0.638	0.072	0.043	0.052	0.013	0.008	5.8	0.8	1.6	13.3	1.4	4.2
Pueblo above SR-502	08/16	UF	CS	46.60	0.590	0.105	0.197	85.300	6.000	0.083	5.560	0.429	0.027	1,800.0	129.0	109.0	2,500.0	107.0	240.0

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				U (μg/L)	^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station Name	Date	Codes[b]		Result	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Sandia Canyon:																			
Sandia tributary at Salvage Yard	06/27	F	CS	0.31															
Sandia tributary at Salvage Yard	06/27	F	DUP	0.26															
Sandia tributary at Salvage Yard	06/27	UF	CS	0.32															
Sandia tributary at Salvage Yard	06/27	UF	DUP	0.37															
Sandia tributary at Salvage Yard	07/26	F	CS	0.24															
Sandia tributary at Salvage Yard	07/26	UF	CS	1.39															
Sandia tributary at Salvage Yard	08/01	F	CS	0.11															
Sandia tributary at Salvage Yard	08/01	UF	CS	0.89															
Sandia below Wetlands	08/05	F	CS	0.16															
Sandia below Wetlands	08/05	UF	CS	3.26	0.042	0.011	0.008	0.064	0.014	0.008	0.064	0.023	0.022	15.0	1.0	1.3	19.5	0.6	0.9
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey):																			
TA-55 NW above Effluent Canyon	04/07	UF	CS		0.000	1.000	0.036	0.017	0.008	0.009	0.017	0.012	0.023						
TA-55 NW above Effluent Canyon	04/20	UF	CS		0.006	0.006	0.016	0.043	0.014	0.012	0.033	0.018	0.049	13.4	2.4	1.3	11.7	1.3	2.8
TA-55 NW above Effluent Canyon	04/20	UF	DUP											7.2	1.3	1.7	14.0	1.6	3.1
TA-55 NW above Effluent Canyon	05/13	F	CS		0.121	0.020	0.008	0.013	0.005	0.006	0.014	0.007	0.009	0.3	0.3	1.2	3.0	0.9	2.8
TA-55 NW above Effluent Canyon	05/13	UF	CS		0.025	0.010	0.010	0.031	0.011	0.028	0.174	0.022	0.006	3.9	0.9	1.4	21.6	1.9	3.3
TA-55 NW above Effluent Canyon	05/28	F	CS		0.026	0.009	0.008	0.002	0.006	0.022	0.028	0.013	0.037	0.1	0.2	1.1	1.3	0.6	2.6
TA-55 NW above Effluent Canyon	05/28	UF	CS		0.010	0.005	0.007	0.009	0.009	0.031	0.169	0.023	0.007						
TA-55 NW above Effluent Canyon	05/28	UF	DUP																
TA-55 NW above Effluent Canyon	06/27	F	CS	0.02	0.002	0.004	0.017	0.012	0.005	0.006	0.033	0.011	0.026	3.7	0.5	1.2	5.2	0.8	2.5
TA-55 NW above Effluent Canyon	06/27	UF	CS		0.020	0.007	0.007	0.027	0.009	0.018	0.087	0.017	0.031	28.9	1.6	1.1	49.8	1.7	2.8
TA-55 NW above Effluent Canyon	07/02	F	CS	0.02															
TA-55 NW above Effluent Canyon	07/02	UF	CS	0.38															
TA-55 NW above Effluent Canyon	07/13	UF	CS		0.034	0.012	0.025	0.017	0.010	0.031	0.088	0.018	0.010	2.4	0.6	1.6	6.7	0.6	1.7
TA-55 NW above Effluent Canyon	07/19	F	CS		0.008	0.004	0.005	0.000	1.000	0.018	0.016	0.006	0.005	0.0	0.2	1.2	1.6	0.6	2.2
TA-55 NW above Effluent Canyon	07/19	UF	CS		0.031	0.010	0.027	0.023	0.007	0.006	0.123	0.019	0.029	31.6	2.1	1.9	54.5	1.6	2.7
TA-55 NW above Effluent Canyon	07/19	UF	DUP																
TA-55 NW above Effluent Canyon	08/01	F	CS		0.012	0.012	0.041	0.007	0.007	0.026	0.014	0.009	0.026	0.1	0.3	1.3	0.7	0.4	1.5
TA-55 NW above Effluent Canyon	08/01	UF	CS	0.14	0.019	0.007	0.007	0.024	0.009	0.018	0.063	0.016	0.026	2.5	0.7	1.9	7.5	0.7	1.8
MDA L	04/06	UF	CS	0.14	0.000	1.000	0.018	0.024	0.011	0.013	0.053	0.022	0.024	1.3	0.8	0.9	12.0	1.8	2.4
MDA L	04/27	UF	CS	0.51	0.035	0.025	0.048	0.018	0.018	0.048	0.808	0.124	0.041	13.3	2.6	1.5	33.8	2.6	3.1
MDA L	04/27	UF	DUP	0.38															
MDA L	05/28	F	CS	0.06															
MDA L	05/28	UF	CS	0.19	0.003	0.003	0.009	0.032	0.015	0.046	0.025	0.013	0.041	1.5	0.5	1.0	5.5	0.9	2.4
MDA L	05/28	UF	DUP	0.17															
MDA L	06/07	F	CS	0.00										0.0	0.3	1.4	1.0	0.7	2.8
MDA L	06/07	UF	CS	0.76	0.000	0.005	0.025	-0.004	0.010	0.038	0.011	0.008	0.027	7.4	1.2	2.1	26.3	1.5	2.9
MDA L	06/07	UF	DUP	0.59	0.000	1.000	0.008	-0.004	0.007	0.030	0.013	0.007	0.019						
MDA L	07/02	UF	CS	0.08															
MDA L	07/26	F	CS	0.02															
MDA L	07/26	UF	CS	0.35	-0.005	0.003	0.019	0.000	0.003	0.013	0.004	0.009	0.035	0.4	0.3	1.1	12.2	1.2	2.2
Pajarito Canyon (includes Twomile, Threemile Canyons):																			
Pajarito below SR-501	07/26	UF	CS		0.061	0.033	0.090	2.680	0.246	0.033	0.864	0.123	0.098	626.0	34.4	25.7	1,490.0	32.9	42.5
Pajarito below SR-501	08/09	F	CS	0.30															
Pajarito below SR-501	08/09	UF	CS	27.20															
Pajarito above Starmers	07/26	F	CS		-0.007	0.007	0.038	0.007	0.007	0.026	0.035	0.013	0.032	1.4	0.5	1.4	8.1	0.9	2.7
Pajarito above Starmers	07/26	UF	CS		0.064	0.019	0.015	0.907	0.087	0.015	0.305	0.050	0.019	142.0	12.7	6.1	329.0	22.6	10.6
Pajarito above Starmers	08/05	F	CS	0.21															
Pajarito above Starmers	08/05	UF	CS	15.80	0.031	0.012	0.029	0.369	0.039	0.023	0.198	0.031	0.036	89.1	6.1	5.3	131.0	5.6	12.7
Pajarito above Starmers	08/11	F	CS	0.09															
Pajarito above Starmers	08/11	UF	CS	6.05	0.008	0.008	0.023	0.432	0.069	0.100	0.142	0.042	0.075	150.0	11.9	17.4	219.0	16.4	38.5
Pajarito above TA-18	07/02	F	CS	0.93															
Pajarito above TA-18	07/02	UF	CS	12.90															
Pajarito above TA-18	08/05	F	CS	0.44															
Pajarito above TA-18	08/05	UF	CS	36.80															

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				U (µg/L)	^{238}Pu			$^{239,240}Pu$			^{241}Am			Gross Alpha			Gross Beta		
Station Name	Date	Codes[b]		Result	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Pajarito Canyon (includes Twomile, Threemile Canyons): (Cont.)																			
MDA G-1	08/05	UF	CS	2.97	0.069	0.015	0.009	0.081	0.018	0.029	0.075	0.016	0.021	61.8	3.3	4.3	70.1	3.1	8.0
MDA G-2	08/30	F	CS	0.13	-0.003	0.006	0.029	0.006	0.008	0.029	0.013	0.008	0.024	1.0	0.3	0.9	3.2	0.3	0.6
MDA G-2	08/30	F	DUP		0.019	0.008	0.008	0.000	0.009	0.037	0.032	0.012	0.027						
MDA G-2	08/30	UF	CS	16.40	0.065	0.017	0.037	0.239	0.031	0.034	0.156	0.029	0.013	350.0	22.1	31.9	365.0	11.5	19.6
MDA G-3	06/07	F	CS	0.08	0.003	0.003	0.008	0.011	0.007	0.020	0.019	0.010	0.013	0.5	0.5	2.1	6.1	0.9	3.2
MDA G-3	06/07	UF	CS	1.61	0.048	0.012	0.008	0.230	0.026	0.033	0.143	0.020	0.006	51.5	3.5	2.7	63.0	3.0	6.0
MDA G-3	07/02	F	CS	0.13															
MDA G-3	07/02	UF	CS	0.58															
MDA G-3	07/13	F	CS	0.22	-0.002	0.007	0.033	0.019	0.007	0.017	0.008	0.006	0.019	0.1	0.5	1.9	4.5	0.6	1.9
MDA G-3	07/13	UF	CS	0.59	0.003	0.004	0.020	0.095	0.015	0.016	0.060	0.012	0.006	10.4	1.3	1.7	14.2	0.7	1.4
MDA G-3	08/01	F	CS	0.09	0.003	0.003	0.008	0.003	0.006	0.027	0.065	0.017	0.032	-0.4	0.6	2.3	2.2	0.6	1.9
MDA G-3	08/01	UF	CS	0.36	0.007	0.005	0.013	0.035	0.009	0.020	0.050	0.011	0.016	7.2	1.0	1.6	10.9	0.8	1.7
MDA G-3	08/04	F	CS	0.04	0.006	0.004	0.008	0.015	0.007	0.008	0.017	0.007	0.008	0.2	0.3	1.4	4.4	0.7	2.6
MDA G-3	08/04	UF	CS	2.42	0.059	0.018	0.047	0.779	0.062	0.030	0.435	0.043	0.008	85.6	3.5	3.0	87.7	2.8	4.4
MDA G-3	08/30	F	CS	0.02	0.019	0.009	0.011	0.004	0.007	0.029	0.023	0.008	0.008	0.5	0.2	0.6	1.7	0.2	0.6
MDA G-3	08/30	F	DUP																
MDA G-3	08/30	UF	CS	0.41	0.053	0.015	0.029	0.389	0.041	0.029	0.152	0.025	0.040	7.8	0.9	1.0	10.7	0.6	0.8
MDA G-3	08/30	UF	DUP	0.44															
MDA G-4	04/06	F	CS	0.17	0.000	1.000	0.015	0.025	0.012	0.030	0.027	0.014	0.018	0.1	0.3	1.3	9.3	1.3	2.8
MDA G-4	04/06	UF	CS	0.69	0.022	0.013	0.040	1.420	0.107	0.042	0.805	0.071	0.025	4.6	0.9	1.5	18.2	1.9	2.6
MDA G-4	04/06	UF	DUP								0.729	0.069	0.011						
MDA G-4	06/07	F	CS	0.04	0.007	0.007	0.020	0.005	0.005	0.014	0.091	0.023	0.015	0.7	0.5	2.2	5.3	0.9	3.0
MDA G-4	06/07	UF	CS	1.73	0.027	0.013	0.033	0.538	0.051	0.009	1.350	0.099	0.008	68.4	11.9	15.3	100.0	12.4	24.9
MDA G-4	06/07	UF	DUP	1.65															
MDA G-4	06/27	F	CS	0.08															
MDA G-4	06/27	UF	CS	1.15	0.037	0.009	0.017	0.385	0.033	0.005	1.020	0.076	0.035	37.1	1.9	2.1	54.9	1.8	2.7
MDA G-4	06/27	UF	DUP																
MDA G-4	07/02	F	CS	0.07															
MDA G-4	07/02	UF	CS	1.04															
MDA G-4	07/13	F	CS	0.05	0.018	0.011	0.040	0.023	0.009	0.021	0.037	0.009	0.014	-0.1	0.5	2.0	2.9	0.5	1.7
MDA G-4	07/13	UF	CS	0.44	0.024	0.007	0.006	0.142	0.021	0.036	0.309	0.031	0.016	4.8	0.9	1.9	14.3	0.7	1.5
MDA G-4	07/17	UF	CS	0.31	0.000	0.007	0.032	0.146	0.021	0.018	0.286	0.030	0.015	4.1	0.7	1.9	29.6	1.0	2.1
MDA G-4	07/26	F	CS	0.02															
MDA G-4	08/01	F	CS		0.004	0.003	0.006	0.027	0.008	0.015	0.054	0.014	0.028	0.1	0.4	1.6	1.5	0.4	1.5
MDA G-4	08/01	UF	CS		0.004	0.004	0.016	0.138	0.017	0.013	0.461	0.044	0.019	7.0	1.3	2.7	13.1	0.9	2.2
MDA G-4	08/04	F	CS		-0.003	0.003	0.033	0.023	0.011	0.033	0.089	0.017	0.008	0.4	0.4	1.0	3.0	0.5	1.3
MDA G-4	08/04	F	RE								0.131	0.021	0.021						
MDA G-4	08/04	UF	CS	2.23	0.084	0.015	0.022	1.020	0.071	0.017	3.220	0.223	0.037	69.9	5.7	2.8	64.6	1.4	2.0
Pajarito above SR-4	06/27	F	CS	4.44	0.000	1.000	0.006	0.006	0.004	0.006	0.048	0.018	0.019	4.7	0.7	1.7	15.5	1.0	2.4
Pajarito above SR-4	06/27	UF	CS	13.10	0.019	0.006	0.006	0.262	0.027	0.006	0.151	0.024	0.009	147.0	12.8	17.6	251.0	15.6	36.0
Pajarito above SR-4	08/06	F	CS	0.82	0.003	0.003	0.008	0.014	0.008	0.028	0.008	0.005	0.007	5.1	0.8	1.5	12.8	0.7	1.4
Pajarito above SR-4	08/06	F	DUP	0.81										3.1	0.7	1.9	10.8	0.6	1.3
Pajarito above SR-4	08/06	F	RE								0.012	0.006	0.008						
Pajarito above SR-4	08/06	UF	CS	11.60	0.016	0.008	0.011	0.379	0.046	0.048	0.202	0.031	0.011	137.0	11.6	5.0	148.0	3.4	4.5
Pajarito above SR-4	08/06	UF	DUP	12.10	0.034	0.012	0.012	0.327	0.043	0.040	0.191	0.028	0.024						
Pajarito above SR-4	08/09	F	CS	0.40	0.000	0.004	0.020	0.048	0.014	0.032	0.035	0.012	0.024	2.7	0.5	0.8	14.0	0.8	1.6
Pajarito above SR-4	08/09	F	DUP	0.41															
Pajarito above SR-4	08/09	UF	CS	12.90	0.310	0.059	0.098	0.879	0.115	0.200	0.897	0.121	0.086	42.9	2.7	3.8	67.9	1.5	2.2
Pajarito above SR-4	08/09	UF	DUP	12.90															
Pajarito above SR-4	08/16	F	CS	0.67	0.009	0.009	0.044	0.014	0.010	0.044	0.023	0.009	0.009	1.3	0.4	0.8	9.8	1.0	2.2
Pajarito above SR-4	08/16	F	DUP											1.3	0.5	1.3	13.4	1.1	2.3
Pajarito above SR-4	08/16	UF	CS	8.16	0.069	0.015	0.008	0.333	0.037	0.028	0.011	0.011	0.029	138.0	8.4	6.2	149.0	6.2	9.3

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

				U (µg/L)	^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station Name	Date	Codes[b]		Result	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons):																			
Water above SR-501	07/22	F	CS	2.53															
Water above SR-501	07/22	UF	CS	20.90															
Cañon de Valle above SR-501	07/22	F	CS		0.000	0.003	0.015	0.012	0.006	0.018	0.005	0.003	0.006	0.0	0.4	1.8	11.4	1.0	2.6
Cañon de Valle above SR-501	07/22	UF	CS		0.100	0.036	0.090	2.090	0.182	0.023	0.550	0.070	0.049	462.0	26.8	26.0	944.0	25.6	41.5
Cañon de Valle above SR-501	07/26	F	CS	0.42															
Cañon de Valle above SR-501	07/26	UF	CS	26.50															
S Site Canyon above Water	08/03	F	CS	0.41															
S Site Canyon above Water	08/03	UF	CS	23.10															
Cañon de Valle above Water	08/05	UF	CS	28.90	0.260	0.060	0.087	3.150	0.275	0.032	1.180	0.119	0.021	337.0	17.2	16.1	539.0	12.9	17.3
Cañon de Valle above Water	08/05	F	CS	0.95															
Cañon de Valle above Water	08/09	F	CS	0.21	0.002	0.005	0.023	0.024	0.010	0.026	0.025	0.008	0.008	1.6	0.5	1.3	14.1	1.0	2.4
Cañon de Valle above Water	08/09	UF	CS	39.70	0.251	0.097	0.269	1.040	0.182	0.348	0.490	0.064	0.018	545.0	32.8	26.9	786.0	25.4	46.2
Water below MDA AB	07/26	F	CS	0.75	-0.002	0.003	0.018	0.023	0.007	0.014	0.039	0.011	0.025	9.6	0.8	1.0	23.5	0.9	2.1
Water below MDA AB	07/26	UF	CS	104.00	0.304	0.095	0.075	2.180	0.306	0.203	0.776	0.137	0.051	1,660.0	73.3	71.5	2,990.0	64.1	117.0
Water below MDA AB	08/03	F	CS	0.28	0.000	1.000	0.007	0.005	0.004	0.007	0.009	0.005	0.016	2.0	0.4	0.8	7.4	0.7	2.1
Water below MDA AB	08/03	F	RE								0.018	0.008	0.008						
Water below MDA AB	08/03	UF	CS	11.30	0.042	0.014	0.011	0.626	0.063	0.031	0.233	0.028	0.007	238.0	11.4	11.9	297.0	10.4	18.4
Water below MDA AB	08/08	F	CS	0.25	0.006	0.006	0.023	0.111	0.020	0.008	0.014	0.009	0.026	0.9	0.4	1.1	8.5	0.9	2.2
Water below MDA AB	08/08	UF	CS	43.90	0.066	0.030	0.036	1.070	0.144	0.159	0.501	0.066	0.049	948.0	83.9	121.0	2,260.0	97.2	202.0
Water at SR-4	07/26	F	CS	2.03															
Water at SR-4	07/26	UF	CS	76.60															
Water at SR-4	08/03	UF	CS	12.10	0.261	0.071	0.120	1.600	0.192	0.044	0.491	0.073	0.087	223.0	12.1	20.2	393.0	10.5	18.6
Water at SR-4	08/03	F	CS	0.19															
Water at SR-4	08/03	UF	CS	17.10															
Water at SR-4	08/09	F	CS	0.27	0.007	0.016	0.059	0.042	0.013	0.024	0.027	0.010	0.022	5.7	0.6	1.0	13.0	0.6	1.0
Water at SR-4	08/09	UF	CS	15.10	0.427	0.128	0.264	2.160	0.405	0.993	0.868	0.186	0.094	88.2	9.2	4.0	139.0	2.3	2.5
Water below SR-4	08/03	F	CS		0.000	0.003	0.013	0.011	0.005	0.013	0.020	0.008	0.019	1.3	0.5	1.7	9.2	0.8	2.5
Water below SR-4	08/03	F	RE								0.015	0.007	0.008						
Water below SR-4	08/03	UF	CS	15.60															
Water below SR-4	08/03	F	CS	0.18															
Water below SR-4	08/03	UF	CS	15.20	0.038	0.010	0.007	0.398	0.038	0.007	0.193	0.027	0.026	45.0	3.3	4.6	64.1	4.0	10.5
Water below SR-4	08/09	F	CS	0.59															
Water below SR-4	08/09	UF	CS	27.20	0.549	0.080	0.121	0.662	0.094	0.167	0.267	0.074	0.052	87.9	9.4	4.1	131.0	2.2	2.2
Potrillo tributary Study Area	08/05	F	CS		0.003	0.003	0.009	-0.002	0.002	0.023	0.023	0.007	0.006	1.0	0.2	0.6	5.8	0.6	2.0
Potrillo tributary Study Area	08/05	F	RE								0.006	0.004	0.008						
Potrillo tributary Study Area	08/05	F	REDP								0.008	0.005	0.008						
Potrillo tributary Study Area	08/05	UF	CS		0.025	0.011	0.013	0.029	0.014	0.036	0.042	0.014	0.013	503.0	29.3	37.7	823.0	25.3	41.3
Potrillo tributary Study Area	08/05	UF	RE								0.136	0.030	0.050						
Potrillo tributary Study Area	08/11	F	CS	0.61	0.000	1.000	0.009	0.000	0.005	0.025	0.013	0.008	0.024	0.7	0.4	1.2	4.1	0.7	2.1
Potrillo tributary Study Area	08/11	UF	CS	13.30	0.280	0.071	0.045	0.247	0.070	0.121	0.127	0.038	0.029	421.0	29.5	33.2	468.0	24.4	56.9
Potrillo tributary Study Area	08/30	F	CS	0.78															
Potrillo tributary Study Area	08/30	UF	CS	27.60	0.065	0.023	0.022	0.195	0.047	0.098	0.094	0.029	0.053	516.0	31.6	49.6	805.0	20.1	36.4
Potrillo tributary Study Area	08/30	UF	DUP																

Table 5-10. Radiochemical Analysis of Storm Runoff for 2001 (pCi/L[a]) (Cont.)

			U (μg/L)	^{238}Pu			$^{239,240}Pu$			^{241}Am			Gross Alpha			Gross Beta		
Station Name	**Date**	**Codes[b]**	**Result**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Ancho Canyon:																		
Ancho Canyon spring tributary below SR-4	08/12	F CS	0.09															
Ancho Canyon spring tributary below SR-4	08/12	UF CS	8.11															
Water Quality Standards[c]																		
DOE DCG for Public Dose			800	40			30			30			30			1,000		
DOE Drinking Water System DCG			30	1.6			1.2			1.2			1.2			40		
EPA Primary Drinking Water Standard			30										15					
EPA Screening Level																50		
NMWQCC Groundwater Limit			5,000															
NMWQCC Livestock Watering													15					

[a]Except where noted. Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytical laboratory measurement-specific minimum detectable activity.

[b]Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate; TRP–laboratory triplicate; RE–laboratory replicate sample; REDP–laboratory duplicate replicate sample.

[c]Standards given here for comparison only; see Appendix A.

Table 5-11. Chemical Quality of Storm Runoff for 2001 (mg/L[a])

Station Name	Date	Codes[b]		Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	PO_4-P	NO_3+ NO_2-N	ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)	Hardness (as $CaCO_3$)	Lab pH[c]	Conductance (µS/cm)
Guaje Canyon																						
Guaje above Rendija	08/08	F	CS		4.0			1.8	6.8	< 1	59						180				7.4	
Guaje above Rendija	08/08	F	DUP														178					
Guaje above Rendija	08/08	UF	CS		43.0							4.89	1.01					41,900	42,300		7.0	184
Guaje above Rendija	08/08	UF	DUP															47,000	51,800			
Guaje above Rendija	08/09	UF	CS		154.0										< 0.0029	0.016		144,000	100,000		7.0	
Guaje above Rendija	08/09	UF	DUP															155,000	81,900			
Guaje above Rendija	08/11	F	CS		3.7			1.2	4.6	< 1	72											
Guaje above Rendija	08/11	UF	CS		55.6							2.85	0.46	< 4.79	< 0.0029	0.0237		57,200	7,780		7.1	201
Guaje above Rendija	08/11	UF	DUP															56,300	8,420			
Guaje above Rendija	08/11	UF	TRP															62,800				
Guaje above Rendija	08/14	F	CS		32.4			2.8	4.4	< 1	35						108				7.2	
Guaje above Rendija	08/14	F	DUP		32.9			2.8	4.4								120				7.2	
Guaje above Rendija	08/14	F	TRP														138					
Guaje above Rendija	08/14	UF	CS		2.4							3.75	1.19	< 4.79	0.0050	0.0181		50,900	51,600		7.1	8950
Guaje above Rendija	08/14	UF	DUP		2.3							3.70	1.20	< 4.79	0.0060	0.0183		59,400	54,600		7.2	8980
Guaje above Rendija	08/14	UF	TRP															66,600	53,400			
Guaje above Rendija	08/16	UF	CS															61,100	42,300		6.9	
Guaje above Rendija	08/16	UF	DUP															68,600	35,500		6.9	
Rendija above Guaje	07/02	F	CS		7.4																	
Rendija above Guaje	07/02	F	DUP		7.4																	
Rendija above Guaje	07/02	UF	CS		124.0													113,000	101,000		7.3	
Rendija above Guaje	07/02	UF	DUP															126,000	81,400		7.3	
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons)																						
Los Alamos below Ice Rink	07/02	F	CS		5.4			7.0	9.3	< 1	89						220					
Los Alamos below Ice Rink	07/02	F	DUP					6.8	9.1	< 1	90						221					
Los Alamos below Ice Rink	07/02	UF	CS		44.1							4.08	1.45	< 9.58	< 0.0028	0.0223		10,200	21,000		7.6	262
Los Alamos below Ice Rink	07/02	UF	DUP		42.9							4.11	1.45	< 9.58	0.0029	0.0066		10,600	22,700			
Los Alamos below Ice Rink	07/02	UF	TRP															10,200				
Los Alamos below Ice Rink	07/13	F	CS		7.6			5.3	7.8	< 1	150						131					
Los Alamos below Ice Rink	07/13	F	DUP		7.5			5.4	8.1	< 1	151						134					
Los Alamos below Ice Rink	07/13	F	TRP														133					
Los Alamos below Ice Rink	07/13	UF	CS		32.0							2.61	< 0.01	< 4.79	< 0.0029	0.0110		4,630	26,400		7.4	328
Los Alamos below Ice Rink	07/13	UF	DUP		33.1							2.61	< 0.01	< 4.79	< 0.0029	0.0109		4,780	30,300		7.4	329
Los Alamos below Ice Rink	07/13	UF	TRP															4,660	32,100			
Los Alamos below Ice Rink	08/09	F	CS		8.7			4.7	4.2	2	148						235				7.8	
Los Alamos below Ice Rink	08/09	F	DUP														236					
Los Alamos below Ice Rink	08/09	UF	CS		26.5							2.38	0.30	< 1.92	< 0.0029	0.0061		4,480	8,560		7.1	282
Los Alamos below Ice Rink	08/09	UF	DUP															4,490	9,220			
Los Alamos above DP Canyon	07/02	F	CS		4.8																	
Los Alamos above DP Canyon	07/02	UF	CS		36.9							5.55	0.83		< 0.0028	0.0091		8,990	17,900		7.7	265
Los Alamos above DP Canyon	07/02	UF	DUP															9,320	26,100			264
Los Alamos above DP Canyon	07/14	F	CS		7.4																	
Los Alamos above DP Canyon	07/14	UF	CS		52.1										< 0.0029	0.0030		18,100	19,000		7.5	
Los Alamos above DP Canyon	07/14	UF	DUP															18,800	19,100			
Los Alamos above DP Canyon	07/26	F	CS		9.8			6.1	6.1	< 1	29						573					
Los Alamos above DP Canyon	07/26	F	DUP		9.8			6.1	6.1	< 1	30						587					
Los Alamos above DP Canyon	07/26	F	TRP														531					
Los Alamos above DP Canyon	07/26	UF	CS		31.5							3.55	0.41	< 4.79	< 0.0029	0.0068		13,200	12,000		7.5	265
Los Alamos above DP Canyon	07/26	UF	DUP		35.3							3.65	0.45	< 4.79	< 0.0029	0.0070		13,700	14,700		7.6	266
Los Alamos above DP Canyon	07/26	UF	TRP															14,000				
Los Alamos above DP Canyon	08/05	F	CS		2.4			9.1	4.1	< 1	53						116				7.4	
Los Alamos above DP Canyon	08/05	F	DUP							< 1	60										7.4	
Los Alamos above DP Canyon	08/05	UF	CS		28.9							1.92	0.29		< 0.0029	0.0125		8,580	17,100		7.5	177
Los Alamos above DP Canyon	08/05	UF	DUP															8,700	21,200			
Los Alamos above DP Canyon	08/05	UF	TRP																18,800			

Table 5-11. Chemical Quality of Storm Runoff for 2001 (mg/L[a])

Station Name	Date	Codes[b]		Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	PO_4-P	NO_3+ NO_2-N	ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons) (Cont.)																						
Los Alamos above DP Canyon	08/09	F	CS		5.3			3.9	6.1	< 1	91						188				7.6	
Los Alamos above DP Canyon	08/09	F	DUP		5.3			3.8	6.0	< 1	92						190				7.6	
Los Alamos above DP Canyon	08/09	UF	CS		42.9							7.80	1.01	< 3.83	< 0.0029	0.0157		37,300	27,600		7.2	263
Los Alamos above DP Canyon	08/09	UF	DUP		69.9							8.00	0.99	< 3.83	< 0.0029	0.0135		41,500	35,800		7.2	263
Los Alamos above DP Canyon	08/09	UF	TRP															40,600	44,000			
Los Alamos above DP Canyon	08/16	F	CS		2.7			7.3	4.3	< 1	40						110				7.1	
Los Alamos above DP Canyon	08/16	F	DUP		2.7			7.3	4.3	< 1	40						116				7.2	
Los Alamos above DP Canyon	08/16	F	TRP														126					
Los Alamos above DP Canyon	08/16	UF	CS		27.0							1.66	0.43	< 0.96	< 0.0029	0.0114		7,970	14,900		7.5	160
Los Alamos above DP Canyon	08/16	UF	DUP		24.7							1.64	0.43	< 0.96	< 0.0029	0.0111		9,010	13,900		7.5	160
Los Alamos above DP Canyon	08/16	UF	TRP															8,650	16,900			
DP above TA-21	05/13	UF	CS															2,660			7.8	
DP above TA-21	05/13	UF	DUP															2,710			7.8	
DP above TA-21	05/28	F	CS		0.7																	
DP above TA-21	05/28	UF	CS		5.9													1,440	3,060		7.0	
DP above TA-21	05/28	UF	DUP		6.4													1,510	3,380			
DP above TA-21	05/28	UF	TRP																3,730			
DP above TA-21	06/27	F	CS		0.8																	
DP above TA-21	06/27	UF	CS		9.7							1.15	0.22		< 0.0029	< 0.0029		3,180	2,230		7.3	
DP above TA-21	06/27	UF	DUP															3,250	2,510			
DP above TA-21	07/02	F	CS		0.5																	
DP above TA-21	07/02	UF	CS		4.1													1,150	2,050		7.1	
DP above TA-21	07/02	UF	DUP															950	2,370			
DP above TA-21	08/01	F	CS		0.6			2.8	2.9	< 1	33						72					
DP above TA-21	08/01	F	DUP														77					
DP above TA-21	08/01	UF	CS		3.2							0.36	0.44					840	1,060		7.3	100
DP above TA-21	08/01	UF	DUP															853	1,500		7.3	
DP above TA-21	08/01	UF	TRP																1,280			
DP above TA-21	08/04	F	CS		0.5																	
DP above TA-21	08/04	UF	CS		5.0							0.44	0.17		< 0.0029	< 0.0029		1,450	1,800		7.5	
DP above TA-21	08/04	UF	DUP															1,540	2,060			
DP above TA-21	08/16	F	CS		0.4																	
DP above TA-21	08/16	UF	CS		2.2										< 0.0029	0.0058		895	1,140		6.9	
DP above TA-21	08/16	UF	DUP															645	889			
DP below Meadow at TA-21	06/27	F	CS		0.9																	
DP below Meadow at TA-21	06/27	UF	CS		7.7							0.66	0.36		< 0.0029	0.0052		2,550	3,430		7.2	
DP below Meadow at TA-21	06/27	UF	DUP															2,690	3,530		7.2	
DP below Meadow at TA-21	07/02	F	CS		0.9																	
DP below Meadow at TA-21	07/02	UF	CS		9.5													2,880	3,320		7.0	
DP below Meadow at TA-21	07/02	UF	DUP															3,000	3,670			
DP below Meadow at TA-21	07/02	UF	TRP																4,030			
DP below Meadow at TA-21	08/04	UF	CS									0.66	0.13					2,730	3,650		6.8	92
DP below Meadow at TA-21	08/04	UF	DUP															2,860	4,280			
DP above Los Alamos Canyon	05/13	UF	CS		24.4													8,250	12,100		7.8	
DP above Los Alamos Canyon	05/13	UF	DUP															8,540	13,500			
DP above Los Alamos Canyon	05/13	UF	TRP																14,400			
DP above Los Alamos Canyon	05/28	F	CS		1.4																	
DP above Los Alamos Canyon	05/28	UF	CS		16.1													5,140			7.2	
DP above Los Alamos Canyon	05/28	UF	DUP															5,960				
DP above Los Alamos Canyon	06/27	F	CS		1.1			6.3	3.2	< 1	44						100					
DP above Los Alamos Canyon	06/27	F	DUP														103					
DP above Los Alamos Canyon	06/27	UF	CS		7.9							1.17	0.35	< 0.96	< 0.0029	0.0033		5,480	11,800		7.4	103
DP above Los Alamos Canyon	06/27	UF	DUP															5,900	12,400			
DP above Los Alamos Canyon	08/04	F	CS		1.0																	
DP above Los Alamos Canyon	08/04	UF	CS		11.3													3,320	5,350		6.9	102
DP above Los Alamos Canyon	08/04	UF	DUP																5,840		6.9	

Table 5-11. Chemical Quality of Storm Runoff for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]		Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	PO_4-P	NO_3+ NO_2-N	ClO_4 (μg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (μS/cm)
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons) (Cont.)																						
Los Alamos above SR-4	07/02	F	CS		1.7																	
Los Alamos above SR-4	07/02	UF	CS		17.2													7,300	12,500		7.2	
Los Alamos above SR-4	07/02	UF	DUP															8,020	14,000			
Los Alamos above SR-4	07/02	UF	TRP																11,700			
Los Alamos above SR-4	07/14	F	CS		7.2																	
Los Alamos above SR-4	07/14	UF	CS		53.6										< 0.0029	0.0075		15,900	16,400		7.3	
Los Alamos above SR-4	07/14	UF	DUP													0.0091		16,500	16,600		7.3	
Los Alamos above SR-4	07/26	UF	CS		117.0													26,000	37,600		7.3	
Los Alamos above SR-4	07/26	UF	DUP															28,900	39,600		7.3	
Los Alamos above SR-4	07/26	UF	TRP															26,800	38,600			
Los Alamos above SR-4	08/01	F	CS		6.6																	
Los Alamos above SR-4	08/01	UF	CS		13.7							0.81	0.01					2,730	1,200		8.2	358
Los Alamos above SR-4	08/01	UF	DUP															2,800	1,310			
Los Alamos above SR-4	08/01	UF	TRP															2,530				
Los Alamos above SR-4	08/04	F	CS		2.5			10.2	3.9	< 1	58						110				7.5	
Los Alamos above SR-4	08/04	F	DUP														112					
Los Alamos above SR-4	08/04	UF	CS		23.0							1.35	0.26		< 0.0029	0.0085		5,900	16,500		7.2	160
Los Alamos above SR-4	08/04	UF	DUP															6,750	20,400			
Los Alamos above SR-4	08/08	F	CS		3.7																	
Los Alamos above SR-4	08/09	UF	CS		23.3							2.29	0.21					8,630	12,300		7.3	225
Los Alamos above SR-4	08/09	UF	DUP															8,750	14,800			
Los Alamos above SR-4	08/16	F	CS		6.0																	
Los Alamos above SR-4	08/16	UF	CS		12.3													2,840	2,340		7.3	
Los Alamos above SR-4	08/16	UF	DUP																2,460		7.3	
Los Alamos above SR-4	08/16	F	CS		2.3			6.0	3.7	< 1	38						95				7.0	
Los Alamos above SR-4	08/16	F	DUP														98					
Los Alamos above SR-4	08/16	UF	CS		26.3							1.95	0.40	< 0.96	0.0096	0.0114		9,000	5,070		7.1	146
Los Alamos above SR-4	08/16	UF	DUP															9,050	5,340			
Los Alamos below LA Weir	07/26	F	CS		6.3																	
Los Alamos below LA Weir	07/26	UF	CS		44.1							3.36	0.43					9,720	10,400		7.6	273
Los Alamos below LA Weir	07/26	UF	DUP															9,900	9,720			
Los Alamos below LA Weir	08/09	F	CS		5.9																	
Los Alamos below LA Weir	08/09	UF	CS		85.3							6.90	1.02		< 0.0029	0.0153		26,600	42,600		6.7	211
Los Alamos below LA Weir	08/09	UF	DUP															31,500	42,800			
Los Alamos below LA Weir	08/09	UF	TRP																43,600			
Los Alamos below LA Weir	08/16	F	CS		2.6																	
Los Alamos below LA Weir	08/16	UF	CS		24.3							1.42	0.30					9,420	7,860		7.2	135
Los Alamos below LA Weir	08/16	UF	DUP															9,750	8,310			
Acid above Pueblo	08/03	F	CS		5.9																	
Acid above Pueblo	08/03	UF	CS															4,090	10,100		7.2	
Acid above Pueblo	08/03	UF	DUP																9,730			
Acid above Pueblo	08/03	UF	TRP																9,640			
Acid above Pueblo	08/13	UF	CS															4,460			7.5	
Pueblo above SR-502	07/02	F	CS		5.9																	
Pueblo above SR-502	07/02	UF	CS															49,500	44,000		7.3	
Pueblo above SR-502	07/02	UF	DUP															53,000	57,100			
Pueblo above SR-502	07/26	UF	CS									4.65	2.31					40,400	40,700		7.3	368
Pueblo above SR-502	07/26	UF	DUP															41,500	45,800			
Pueblo above SR-502	08/04	UF	CS															22,000	10,600		7.5	
Pueblo above SR-502	08/04	UF	DUP															23,300	12,100			
Pueblo above SR-502	08/09	F	CS		5.2			10.9	16.3	< 1	99						228				7.3	
Pueblo above SR-502	08/09	F	DUP														234					
Pueblo above SR-502	08/09	UF	CS		83.8							4.50	1.57	< 3.83	< 0.0029	0.0099		33,300	33,800		7.2	311
Pueblo above SR-502	08/09	UF	DUP															35,600	39,000			
Pueblo above SR-502	08/09	UF	TRP																40,000			
Pueblo above SR-502	08/11	F	CS		5.4			8.2	23.5	< 1	115						246				8.1	

Table 5-11. Chemical Quality of Storm Runoff for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]		Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity		Total Alkalinity	PO_4-P	NO_3+ NO_2-N	ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons) (Cont.)																							
Pueblo above SR-502	08/11	F	DUP															251				8.1	
Pueblo above SR-502	08/11	UF	CS		69.4								4.30	0.92	< 4.79	< 0.0029	0.0132		30,900	50,100		7.3	346
Pueblo above SR-502	08/11	UF	DUP																32,600	50,700			
Pueblo above SR-502	08/16	F	CS		4.3			8.2	24.9	<	1	85						203				8.0	
Pueblo above SR-502	08/16	F	DUP															208					
Pueblo above SR-502	08/16	UF	CS		76.1								4.50	0.88					19,300	36,400		7.5	
Pueblo above SR-502	08/16	UF	DUP										4.70	0.88					21,300	41,500			
Sandia Canyon																							
Sandia tributary at Salvage Yard	06/27	F	CS		1.4																		
Sandia tributary at Salvage Yard	06/27	F	DUP		1.4																		
Sandia tributary at Salvage Yard	06/27	UF	CS		1.7								0.03	1.40		< 0.0029	0.0041		72	2,540		9.0	
Sandia tributary at Salvage Yard	06/27	UF	DUP										0.02	1.36		< 0.0029	0.0039		80	2,630		9.0	
Sandia tributary at Salvage Yard	07/26	F	CS		0.5																		
Sandia tributary at Salvage Yard	07/26	UF	CS		3.8											< 0.0029	0.0038		923	1,320		6.9	
Sandia tributary at Salvage Yard	07/26	UF	DUP																943	1,350		6.9	
Sandia tributary at Salvage Yard	07/26	UF	TRP																	1,330			
Sandia tributary at Salvage Yard	08/01	F	CS		0.7																		
Sandia tributary at Salvage Yard	08/01	UF	CS		2.7								0.09	0.24					378	1,260		7.5	285
Sandia tributary at Salvage Yard	08/01	UF	DUP																380	1,400			
Sandia below Wetlands	08/05	F	CS		2.7																		
Sandia below Wetlands	08/05	UF	CS		10.9														1,760	3,250		7.1	440
Sandia below Wetlands	08/05	UF	DUP																1,770	3,290			
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey)																							
TA-55 NW above Effluent Canyon	04/07	UF	CS																46			7.3	
TA-55 NW above Effluent Canyon	04/07	UF	DUP																47			7.3	
TA-55 NW above Effluent Canyon	05/13	UF	CS																472			7.6	
TA-55 NW above Effluent Canyon	05/13	UF	DUP																480				
TA-55 NW above Effluent Canyon	05/28	UF	CS																512			6.9	
TA-55 NW above Effluent Canyon	05/28	UF	DUP																548			6.9	
TA-55 NW above Effluent Canyon	06/27	F	CS		0.2																		
TA-55 NW above Effluent Canyon	06/27	UF	CS																1,060	1,150		7.1	
TA-55 NW above Effluent Canyon	06/27	UF	DUP																996	1,290			
TA-55 NW above Effluent Canyon	07/02	F	CS		0.3																		
TA-55 NW above Effluent Canyon	07/02	UF	CS		1.3														250	218		6.8	
TA-55 NW above Effluent Canyon	07/02	UF	DUP																292	248			
TA-55 NW above Effluent Canyon	07/13	F	CS					8.7	2.6	<	1	35						33					
TA-55 NW above Effluent Canyon	07/13	F	DUP															38					
TA-55 NW above Effluent Canyon	07/13	UF	CS																102	219		6.8	
TA-55 NW above Effluent Canyon	07/13	UF	DUP																113	224			
TA-55 NW above Effluent Canyon	07/19	F	CS					1.8	1.9	<	1	17						34					
TA-55 NW above Effluent Canyon	07/19	F	DUP							<	1	18						38					
TA-55 NW above Effluent Canyon	07/19	F	TRP															40					
TA-55 NW above Effluent Canyon	07/19	UF	CS										0.05	0.50	1.17	< 0.0029	0.0031		494			7.1	
TA-55 NW above Effluent Canyon	07/19	UF	DUP														0.0033		512			7.1	
TA-55 NW above Effluent Canyon	07/19	UF	TRP																418				
TA-55 NW above Effluent Canyon	08/01	UF	CS		0.5														100	112		6.9	
TA-55 NW above Effluent Canyon	08/01	UF	DUP																88	118			
MDA L	04/06	UF	CS		0.5														42				
MDA L	04/06	UF	CS																42				
MDA L	04/06	UF	DUP																43				
MDA L	04/27	UF	CS		1.1																		
MDA L	04/27	UF	QUD																320				

Table 5-11. Chemical Quality of Storm Runoff for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]		Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	PO_4-P	NO_3+ NO_2-N	ClO_4 (μg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (μS/cm)
Mortandad Canyon (includes Ten Site Canyon, Cañada del Buey) (Cont.)																						
MDA L	04/27	UF	TRP															310				
MDA L	05/28	F	CS		0.3					< 1	33						68				6.7	
MDA L	05/28	F	DUP														64					
MDA L	05/28	F	TRP														60					
MDA L	05/28	UF	CS		0.5							0.18	0.56	< 1.92		0.0037		106	151		6.6	44
MDA L	05/28	UF	DUP		0.5								0.55					139	156		6.6	44
MDA L	06/07	F	CS		0.2			0.9	1.9	< 1	9						37				7.6	
MDA L	06/07	F	DUP														37				7.6	
MDA L	06/07	UF	CS		1.1							0.23	0.45	< 0.96	< 0.0028	< 0.0028		253	588		6.5	32
MDA L	06/07	UF	DUP									0.22			< 0.0028	< 0.0028		273	595			
MDA L	07/02	UF	CS		0.3							0.08	0.49					52	153		6.6	
MDA L	07/02	UF	DUP															54	160		6.6	
MDA L	07/17	UF	CS															15			7.1	
MDA L	07/17	UF	DUP															18			7.1	
MDA L	07/21	UF	CS																24		6.9	
MDA L	07/21	UF	DUP																29		6.9	
MDA L	07/26	F	CS		0.4																	
MDA L	07/26	UF	CS		0.6													28	44		7.0	81
MDA L	07/26	UF	DUP															30	49		7.0	
MDA L	10/05	UF	CS		0.8											0.0048		22				
MDA L	10/05	UF	DUP													0.0048		23				
Pajarito Canyon (includes Twomile, Threemile Canyons)																						
Pajarito below SR-501	07/26	UF	CS															48,500	44,700		7.5	
Pajarito below SR-501	07/26	UF	DUP															49,100	51,800			
Pajarito below SR-501	08/09	F	CS		3.9																	
Pajarito below SR-501	08/09	UF	CS		81.0							7.55	1.00					42,500	17,300		7.1	210
Pajarito below SR-501	08/09	UF	DUP															46,000	20,200			
Pajarito above Starmers	07/26	UF	CS															11,300	27,100		7.3	
Pajarito above Starmers	07/26	UF	DUP															11,400	30,800			
Pajarito above Starmers	08/05	F	CS		3.5			1.7	5.0	< 1	70						153					
Pajarito above Starmers	08/05	F	DUP														165					
Pajarito above Starmers	08/05	UF	CS		35.6							3.95	1.29	< 4.79	< 0.0029	0.0100		11,100	29,100		7.4	553
Pajarito above Starmers	08/05	UF	DUP															11,600	31,800			
Pajarito above Starmers	08/05	UF	TRP																33,500			
Pajarito above Starmers	08/11	F	CS		3.3																	
Pajarito above Starmers	08/11	UF	CS		15.2							1.65	0.86		< 0.0029	0.0134		3,990	15,900		12.2	142
Pajarito above Starmers	08/11	UF	DUP															4,110	16,300			
Pajarito above Starmers	08/11	UF	TRP																16,100			
Pajarito above TA-18	07/02	F	CS		2.6																	
Pajarito above TA-18	07/02	UF	CS		10.4													3,000	7,170		7.1	
Pajarito above TA-18	07/02	UF	DUP															3,060	8,130			
Pajarito above TA-18	08/05	F	CS		2.3																	
Pajarito above TA-18	08/05	UF	CS		29.2													15,100	19,700		7.5	196
Pajarito above TA-18	08/05	UF	DUP															16,000	8,500			
MDA G-1	08/05	UF	CS		19.2													2,880	5,370		7.1	
MDA G-1	08/05	UF	DUP															2,920	5,840			
MDA G-2	08/30	F	CS		9.4			39.4	1.8	< 1	31						130				7.8	
MDA G-2	08/30	F	DUP														130					
MDA G-2	08/30	F	TRP														136					
MDA G-2	08/30	UF	CS		53.1							0.36	0.33					2,270	12,600		8.1	231
MDA G-2	08/30	UF	DUP															2,510	14,600			
MDA G-2	08/30	UF	TRP															2,320				
MDA G-3	06/07	F	CS		5.8			44.7	8.9	0	34						220				7.5	
MDA G-3	06/07	F	DUP							< 1	34						228					
MDA G-3	06/07	UF	CS		11.0							0.25	1.00	< 3.83	0.0045	0.0093		830	918		6.9	210

Table 5-11. Chemical Quality of Storm Runoff for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]		Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	PO_4-P	NO_3+NO_2-N	ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Pajarito Canyon (includes Twomile, Threemile Canyons) (Cont.)																						
MDA G-3	06/07	UF	DUP															885	930			
MDA G-3	07/02	F	CS		347.0			957.0	6.3	< 1	27						2,060					
MDA G-3	07/02	F	DUP														2,140					
MDA G-3	07/02	F	TRP														2,000					
MDA G-3	07/02	UF	CS		340.0							0.12	0.22	< 9.58	< 0.0028	< 0.0028		399	763		7.2	3520
MDA G-3	07/02	UF	DUP												< 0.0028	< 0.0028		418	845			
MDA G-3	07/02	UF	TRP															428	866			
MDA G-3	07/13	F	CS		51.4			183.0	6.1	< 1	163						484					
MDA G-3	07/13	F	DUP														508					
MDA G-3	07/13	UF	CS		50.2							0.04	0.53		0.0031	0.0046		194	157		6.8	708
MDA G-3	07/13	UF	DUP															197	158			708
MDA G-3	08/01	F	CS		26.6			107.0	5.1	< 1	23						388					
MDA G-3	08/01	F	DUP							< 1	23						392					
MDA G-3	08/01	UF	CS		29.4							0.02	0.22		< 0.0029	< 0.0029		144	163		6.7	1030
MDA G-3	08/01	UF	DUP															154	165			
MDA G-3	08/01	UF	TRP																169			
MDA G-3	08/04	F	CS		35.7			149.0	3.0	< 1	76						373					
MDA G-3	08/04	F	DUP														397					
MDA G-3	08/04	UF	CS		42.1							0.18	0.32		< 0.0029	0.0041		1,290	2,020		7.3	490
MDA G-3	08/04	UF	DUP																2,120			
MDA G-3	08/30	F	CS		8.9																	
MDA G-3	08/30	UF	CS		10.1							0.05	0.41		< 0.0029	0.0034		183	141		7.1	187
MDA G-3	08/30	UF	DUP									0.05	0.40		< 0.0029	0.0032			156		7.2	187
MDA G-4	04/06	F	CS	8.7	0.9	6.2	9.4	11.2	2.5	< 1	36						62			25.3	7.9	
MDA G-4	04/06	F	DUP					11.5	2.5								78				7.9	
MDA G-4	04/06	F	TRP														73					
MDA G-4	04/06	UF	CS		3.0							0.11	0.42		< 0.0028	< 0.0028		377				
MDA G-4	04/06	UF	DUP										0.42			< 0.0028		385				
MDA G-4	04/06	UF	CS															578				
MDA G-4	04/06	UF	DUP															580				
MDA G-4	06/07	F	CS		0.9																	
MDA G-4	06/07	UF	CS		6.8													1,600	1,690		7.3	151
MDA G-4	06/07	UF	DUP		6.6													1,680	1,710		7.3	151
MDA G-4	06/07	UF	TRP															1,790	1,760			
MDA G-4	06/27	F	CS		0.7																	
MDA G-4	06/27	UF	CS		4.2										< 0.0029	< 0.0029		1,100	717		7.5	98
MDA G-4	06/27	UF	DUP															1,360	748			
MDA G-4	07/02	F	CS		8.8																	
MDA G-4	07/02	UF	CS		12.6													865	2,960		7.9	257
MDA G-4	07/02	UF	DUP															876	3,180			
MDA G-4	07/13	F	CS		2.3																	
MDA G-4	07/13	UF	CS		3.1							0.06	0.68		< 0.0029	< 0.0029		126	114		6.9	138
MDA G-4	07/13	UF	DUP															128	119			
MDA G-4	07/17	UF	CS																611			
MDA G-4	07/17	UF	DUP																706			
MDA G-4	07/17	UF	CS		2.3										< 0.0029	< 0.0029		245	221		7.2	
MDA G-4	07/17	UF	DUP															247	224		7.2	
MDA G-4	07/17	UF	QUD															154				
MDA G-4	07/17	UF	TRP															142	228		7.2	
MDA G-4	07/26	F	CS		1.6																	
MDA G-4	08/01	UF	CS															188	220		7.3	
MDA G-4	08/01	UF	DUP															203	227			
MDA G-4	08/04	UF	CS		6.2													1,490	1,960		7.6	80
MDA G-4	08/04	UF	DUP															1,700	2,080		7.6	
MDA G-4	10/05	UF	CS		2.3											0.0042		98				

Table 5-11. Chemical Quality of Storm Runoff for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]		Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	PO_4-P	NO_3+ NO_2-N	ClO_4 (µg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Pajarito Canyon (includes Twomile, Threemile Canyons) (Cont.)																						
Pajarito above SR-4	06/27	F	CS		7.7			34.4	20.6	< 1	82						267					
Pajarito above SR-4	06/27	F	DUP														286					
Pajarito above SR-4	06/27	F	TRP														286					
Pajarito above SR-4	06/27	UF	CS		17.3							1.61	0.90	< 9.58	< 0.0029	0.0104		1,700	2,980		7.5	315
Pajarito above SR-4	06/27	UF	DUP															1,720	3,080			315
Pajarito above SR-4	08/06	F	CS		6.0			16.2	11.6	< 1	94						200				7.7	
Pajarito above SR-4	08/06	F	DUP		5.9			16.1	11.6	< 1	94						200				7.7	
Pajarito above SR-4	08/06	UF	CS		38.9							3.66	1.04	< 4.79	< 0.0029	0.0076		11,000	7,600		7.3	200
Pajarito above SR-4	08/06	UF	DUP		38.0							3.75	1.02	< 4.79	< 0.0029	0.0076		11,200	8,610		7.3	201
Pajarito above SR-4	08/06	UF	TRP															12,100				
Pajarito above SR-4	08/09	F	CS		5.0			10.6	7.9	< 1	84						196				7.3	
Pajarito above SR-4	08/09	F	DUP		4.9			10.6	7.8								206				7.3	
Pajarito above SR-4	08/09	F	TRP														202					
Pajarito above SR-4	08/09	UF	CS		33.9							3.42	1.07	< 1.92	< 0.0029	0.0131		6,400	7,660		7.3	199
Pajarito above SR-4	08/09	UF	DUP		34.0							3.39	1.12	< 1.92	< 0.0029	0.0141		7,200			7.3	199
Pajarito above SR-4	08/09	UF	TRP															7,340				
Pajarito above SR-4	08/16	F	CS		3.2			7.7	4.8	< 1	49						121				7.1	
Pajarito above SR-4	08/16	F	DUP														125					
Pajarito above SR-4	08/16	UF	CS		12.2							0.77	0.42	< 0.96	< 0.0029	0.0073		1,540	2,960		7.3	160
Pajarito above SR-4	08/16	UF	DUP															1,580	3,100			159
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons)																						
Water above SR-501	07/22	F	CS		8.2																	
Water above SR-501	07/22	UF	CS		80.1										< 0.0029	0.0156		32,300	14,000		7.4	367
Water above SR-501	07/22	UF	DUP		102.0										< 0.0029	0.0187		33,000	26,800		7.4	367
Water above SR-501	07/22	UF	TRP															32,900				
Cañon de Valle above SR-501	07/22	UF	CS																16,300			
Cañon de Valle above SR-501	07/22	UF	DUP																22,100			
Cañon de Valle above SR-501	07/26	F	CS		20.5																	
Cañon de Valle above SR-501	07/26	UF	CS		40.2							9.00	1.63					21,400	26,500		7.6	325
Cañon de Valle above SR-501	07/26	UF	DUP															24,700	29,500			
Water above S Site Canyon	07/22	UF	CS																12,100		7.4	
Water above S Site Canyon	07/22	UF	DUP																38,400			
S Site Canyon above Water	08/03	F	CS		1.5																	
S Site Canyon above Water	08/03	UF	CS		13.3													3,510	6,300		6.5	78
S Site Canyon above Water	08/03	UF	DUP															3,800	7,040			
Cañon de Valle above Water	08/05	UF	CS		84.9							7.90	1.84					27,700			7.2	317
Cañon de Valle above Water	08/05	UF	DUP															27,200	27,100			
Cañon de Valle above Water	08/05	UF	TRP															27,100	30,800			
Cañon de Valle above Water	08/05	F	CS		7.4																	
Cañon de Valle above Water	08/09	F	CS		4.0			7.2	4.5	< 1	72						167				7.4	
Cañon de Valle above Water	08/09	F	DUP														169					
Cañon de Valle above Water	08/09	UF	CS		75.5							5.20	1.05	< 4.79	< 0.0029	0.0172		20,700	27,200		7.2	184
Cañon de Valle above Water	08/09	UF	DUP															20,100	29,700			
Water below MDA AB	07/26	F	CS		6.8																	
Water below MDA AB	07/26	UF	CS		172.0													81,100	107,000		7.3	362
Water below MDA AB	07/26	UF	DUP															88,100	127,000			
Water below MDA AB	08/03	F	CS		2.8			2.1	3.6	< 1	11						160				6.0	
Water below MDA AB	08/03	F	DUP														173					
Water below MDA AB	08/03	F	TRP														153					
Water below MDA AB	08/03	UF	CS		27.2							2.17	0.56		< 0.0029	0.0074		7,260	33,400		6.8	94
Water below MDA AB	08/03	UF	DUP															8,630	34,400			
Water below MDA AB	08/08	F	CS		4.7																	
Water below MDA AB	08/08	UF	CS		72.1							4.14	2.01	< 3.83	< 0.0029	0.0110		17,300	21,400		6.9	185
Water below MDA AB	08/08	UF	DUP															22,300	25,800			
Water below MDA AB	08/08	UF	TRP																26,300			

Table 5-11. Chemical Quality of Storm Runoff for 2001 (mg/L[a]) (Cont.)

Station Name	Date	Codes[b]		Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	PO_4-P	NO_3+ NO_2-N	ClO_4 (μg/L)	CN (Amenable)	CN (Total)	TDS[c]	TSS[d]	TSS (max)	Hardness (as $CaCO_3$)	Lab pH[e]	Conductance (μS/cm)
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons)																						
Water at SR-4	07/26	F	CS		57.2																	
Water at SR-4	07/26	UF	CS		100.0							3.33	0.42					83,400	38,200		7.5	275
Water at SR-4	07/26	UF	DUP															95,100	43,200			
Water at SR-4	08/03	UF	CS		69.7													30,400	50,100		7.0	
Water at SR-4	08/03	UF	DUP															33,900	59,200			
Water at SR-4	08/03	F	CS		1.9																	
Water at SR-4	08/03	UF	CS		19.7							1.65	0.44		< 0.0029	0.0064		5,460	4,990		6.8	79
Water at SR-4	08/03	UF	DUP															5,520	5,620			
Water at SR-4	08/09	F	CS		3.7			10.7	5.2	< 1	57						164				7.4	
Water at SR-4	08/09	F	DUP														176					
Water at SR-4	08/09	UF	CS		37.3							7.05	0.73		< 0.0029	0.0062		64,900	33,600		7.0	904
Water at SR-4	08/09	UF	DUP															52,300	45,300			
Water below SR-4	08/03	UF	CS		70.9							4.80	0.64	< 4.79	< 0.0029	0.0088		30,100	8,680		6.9	
Water below SR-4	08/03	UF	DUP												< 0.0029	0.0088		33,200	9,280			
Water below SR-4	08/03	F	CS		2.1																	
Water below SR-4	08/03	UF	CS		19.8													4,990	6,230		6.9	92
Water below SR-4	08/03	UF	DUP															5,210	6,630		7.0	92
Water below SR-4	08/03	UF	TRP															5,070	6,310			
Water below SR-4	08/09	F	CS		4.4			11.7	4.6	< 1	82						168				7.6	
Water below SR-4	08/09	F	DUP														175					
Water below SR-4	08/09	UF	CS		64.5							6.15	0.63					34,200	26,900		7.1	194
Water below SR-4	08/09	UF	DUP															26,200	37,200			
Potrillo tributary Study Area	08/05	UF	CS															18,300	19,600		7.6	
Potrillo tributary Study Area	08/05	UF	DUP															19,300	23,100			
Potrillo tributary Study Area	08/11	F	CS		1.8																	
Potrillo tributary Study Area	08/11	UF	CS		80.0													18,500	33,400		7.4	253
Potrillo tributary Study Area	08/11	UF	DUP															18,800	33,900			
Potrillo tributary Study Area	08/30	F	CS		2.5			1.9	2.0	< 1	59						118					
Potrillo tributary Study Area	08/30	F	DUP					1.8	1.9	< 1	60						124					
Potrillo tributary Study Area	08/30	UF	CS		138.0							2.43	0.46	< 0.96	< 0.0029	< 0.0029		25,500	15,500		7.8	201
Potrillo tributary Study Area	08/30	UF	DUP		140.0													23,100	15,900			
Potrillo tributary Study Area	08/30	UF	TRP															26,300	15,900			
Ancho Canyon																						
Ancho Canyon spring tributary below SR-4	08/12	F	CS		1.2																	
Ancho Canyon spring tributary below SR-4	08/12	UF	CS		41.0							1.02	0.37					7,650	9,230		7.1	90
Ancho Canyon spring tributary below SR-4	08/12	UF	DUP															7,690	9,840			
Water Quality Standards[f]																						
EPA Primary Drinking Water Standard									500				10			0.2						
EPA Secondary Drinking Water Standard								250	250								500				6.8–8.5	
EPA Health Advisory							20															
NMWQCC Groundwater Limit								250	600				10			0.2	1,000				6–9	
NMWQCC Wildlife Habitat Standard															0.0052							

[a]Except where noted.
[b]Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate; TRP–laboratory triplicate; QUD–laboratory quadruplicate.
[c]Total dissolved solids.
[d]Total suspended solids.
[e]Standard units.
[f]Standards given here for comparison only; see Appendix A.
NOTE: Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L)

Station Name	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Guaje Canyon														
Guaje above Rendija	08/14	UF	CS	< 2.9[b]	1,260	< 2.6	23.9	38.8	< 0.25	22.5	< 0.7	1.0	< 1.9	744
Guaje above Rendija	08/14	UF	DUP	< 2.7	1,190	< 2.6	< 22.5	37.1	< 0.25	22.9	< 0.7	< 0.8	< 1.9	714
Guaje above Rendija	08/14	F	CS	< 4.8	166,000	45.5	72.2	4150.0	31.70	< 0.1	95.0	81.3	117.0	125,000
Guaje above Rendija	08/14	F	DUP	5.1	171,000	49.9	71.0	4030.0	31.10	< 0.1	93.9	86.0	122.0	132,000
Guaje above Rendija	08/11	UF	CS	< 4.4	313,000	83.7	95.8	5540.0	45.40	24.1	139.0	170.0	246.0	373,000
Guaje above Rendija	08/11	F	CS	< 2.6	2,450	< 2.6	29.4	78.1	< 0.25	< 0.3	< 2.0	1.4	< 1.9	1,390
Guaje above Rendija	08/09	UF	CS	< 0.3	1,040,000	140.0	162.0	20000.0	123.00	24.5	386.0	487.0	793.0	637,000
Guaje above Rendija	08/08	UF	CS	< 0.3	188,000	57.9	< 47.2	5540.0	34.70	9.1	137.0	93.0	136.0	159,000
Guaje above Rendija	08/08	F	CS	< 0.3	2,100	5.0	< 23.5	72.4	< 0.25	< 0.3	< 1.3	< 0.9	< 1.3	1,220
Rendija above Guaje	07/02	UF	CS	< 0.9	535,000	115.0	141.0	14300.0	53.60	6.6	362.0	289.0	376.0	327,000
Rendija above Guaje	07/02	F	CS	< 0.9	3,500	< 2.3	< 41.3	141.0	< 0.16	< 0.2	< 2.1	< 3.7	< 4.8	1,940
Rendija above Guaje	07/02	F	DUP	< 0.9	3,580	< 3.5	< 37.9	142.0	< 0.16		< 2.4	< 2.1	5.1	1,910
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons)														
Los Alamos below Ice Rink	08/09	UF	CS	< 0.3	115,000	23.6	< 24.9	1670.0	8.57	3.1	34.3	64.3	97.5	78,200
Los Alamos below Ice Rink	08/09	F	CS	< 0.3	102	< 2.6	< 20.2	87.0	< 0.25	< 0.1	< 1.0	< 1.5	< 3.6	52.1
Los Alamos below Ice Rink	07/13	UF	DUP	< 0.7	181,000	33.0	58.0	1950.0	11.40	3.0	39.2	87.3	131.0	108,000
Los Alamos below Ice Rink	07/13	UF	CS	< 0.7	176,000	29.2	74.5	1930.0	11.40	3.2	39.6	85.3	125.0	107,000
Los Alamos below Ice Rink	07/13	F	CS	< 0.7	53	< 3.5	< 43.5	144.0	< 0.21	< 0.1	< 1.5	< 0.6	< 2.0	66.7
Los Alamos below Ice Rink	07/13	F	DUP	< 0.7	58	5.4	< 43.2	142.0	< 0.21	< 0.1	< 1.4	< 0.6	< 1.3	79.5
Los Alamos below Ice Rink	07/02	UF	DUP	< 0.9	179,000	50.1	75.9	3640.0	15.30	6.4	63.3	91.5	166.0	133,000
Los Alamos below Ice Rink	07/02	UF	CS	< 0.9	187,000	57.1	100.0	3720.0	16.10	6.9	65.8	96.7	173.0	140,000
Los Alamos below Ice Rink	07/02	F	CS	< 0.9	505	< 2.3	< 37.5	84.8	< 0.16	< 0.1	< 1.2	< 0.6	< 3.7	375
Los Alamos above DP Canyon	08/16	UF	DUP	< 0.3	136,000	31.9	< 26.4	1670.0	11.40	3.8	43.3	87.0	123.0	105,000
Los Alamos above DP Canyon	08/16	UF	CS	< 0.3	153,000	38.6	< 23.5	1760.0	12.00	4.0	44.6	99.9	137.0	118,000
Los Alamos above DP Canyon	08/16	F	CS	< 0.3	1,240	< 2.8	< 17.2	38.4	< 0.25	< 0.0	< 1.0	< 1.4	< 3.0	679
Los Alamos above DP Canyon	08/16	F	DUP	< 0.3	1,180	< 2.6	< 15.2	38.1	< 0.25	< 0.0	< 1.0	< 1.0	< 3.5	649
Los Alamos above DP Canyon	08/09	UF	DUP	< 0.3	414,000	91.4	126.0	7020.0	48.60	11.4	177.0	271.0	365.0	332,000
Los Alamos above DP Canyon	08/09	UF	CS	< 0.3	197,000	38.9	54.2	3970.0	22.20	5.1	91.6	112.0	151.0	143,000
Los Alamos above DP Canyon	08/09	F	CS	< 0.3	1,580	< 2.6	< 31.9	313.0	< 1.12	< 0.6	< 3.3	< 0.6	< 4.7	626
Los Alamos above DP Canyon	08/09	F	DUP	< 0.3	1,580	< 4.5	< 31.4	313.0	< 1.09	< 0.6	< 3.3	< 0.7	< 4.9	621
Los Alamos above DP Canyon	08/05	UF	CS	< 0.3	150,000	36.9	< 19.3	2010.0	12.70	5.6	47.6	100.0	154.0	113,000
Los Alamos above DP Canyon	08/05	F	CS	< 0.3	829	< 4.7	< 12.9	40.6	< 0.25	0.3	< 1.0	< 1.5	< 3.2	473
Los Alamos above DP Canyon	07/26	UF	DUP	< 0.3	140,000	28.1	59.4	3360.0	19.90	8.1	68.4	73.9	117.0	92,200
Los Alamos above DP Canyon	07/26	UF	CS	< 0.3	125,000	26.0	54.4	3280.0	18.50	7.8	63.7	62.2	105.0	77,800
Los Alamos above DP Canyon	07/26	F	CS	< 0.3	1,380	< 4.4	< 45.8	713.0	< 1.65	0.7	7.6	< 1.5	7.8	714
Los Alamos above DP Canyon	07/26	F	DUP	< 0.3	1,370	6.1	< 44.7	720.0	< 1.63	< 0.8	7.7	< 1.5	7.8	702
Los Alamos above DP Canyon	07/14	UF	CS	< 0.7	249,000	47.6	118.0	4150.0	24.10	7.4	89.3	134.0	217.0	173,000
Los Alamos above DP Canyon	07/14	F	CS	< 0.7	180	< 3.7	< 40.6	148.0	< 0.21	< 0.2	< 1.2	< 0.6	< 2.0	83.2
Los Alamos above DP Canyon	07/02	UF	CS	< 0.9	158,000	43.2	< 49.0	2790.0	14.00	4.5	51.5	94.9	162.0	120,000
Los Alamos above DP Canyon	07/02	F	CS	< 0.9	1,140	< 2.3	< 35.2	76.9	< 0.16	< 0.1	< 0.8	< 1.9	< 4.0	734
DP above TA-21	08/16	UF	CS	< 0.3	11,700	< 4.5	< 8.9	141.0	< 0.86	< 0.8	< 2.7	11.9	34.2	7,870
DP above TA-21	08/16	F	CS	< 0.3	270	6.3	< 11.9	15.9	< 0.25	< 0.1	< 1.0	< 1.4	< 3.1	151
DP above TA-21	08/04	UF	CS	< 0.3	27,900	9.0	< 1.8	273.0	< 2.11	1.6	7.7	25.4	67.9	20,600

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons) (Cont.)														
DP above TA-21	08/04	F	CS	< 0.3	648	< 2.6	< 7.6	19.8	< 0.25	< 0.2	< 1.0	< 1.4	< 2.6	366
DP above TA-21	08/01	UF	CS	< 0.3	16,100	5.7	< 3.5	197.0	< 0.98	0.9	< 4.0	16.7	61.6	11,400
DP above TA-21	08/01	F	CS	< 0.3	159	< 2.6	< 11.6	25.3	< 0.25	< 0.1	< 1.0	< 1.7	9.2	127
DP above TA-21	07/02	UF	CS	< 0.9	24,300	10.8	< 3.6	256.0	< 2.50	1.4	7.6	21.9	52.1	17,800
DP above TA-21	07/02	F	CS	< 0.9	679	< 2.3	< 11.8	14.4	< 0.16	< 0.1	< 0.4	< 3.1	< 4.7	426
DP above TA-21	07/02	F	DUP							< 0.1				
DP above TA-21	06/27	UF	CS	< 0.9	52,100	18.4	< 3.6	645.0	< 4.85	3.5	16.0	55.6	145.0	39,700
DP above TA-21	06/27	F	CS	< 0.9	698	< 2.3	< 14.0	29.4	< 0.16	< 0.1	< 1.0	< 1.3	< 3.8	407
DP above TA-21	05/28	UF	CS	< 0.9	29,000	8.7	< 21.9	352.0	< 2.60	1.9	10.3	32.6	85.4	22,100
DP above TA-21	05/28	UF	DUP	< 0.9	32,900	9.6	< 22.8	367.0	< 2.59	2.0	11.0	35.9	91.7	25,800
DP above TA-21	05/28	F	CS	< 0.9	384	< 4.1	< 12.4	26.3	< 0.26	< 0.2	< 1.3	< 2.1	10.1	261
DP below Meadow at TA-21	07/02	UF	CS	< 0.9	52,500	16.1	< 3.6	519.0	< 3.76	1.6	14.5	45.4	83.2	41,300
DP below Meadow at TA-21	07/02	F	CS	< 0.9	1,130	< 3.3	< 14.2	25.7	< 0.16	< 0.1	< 0.4	< 3.7	< 4.5	702
DP below Meadow at TA-21	06/27	UF	CS	< 0.9	44,500	12.1	< 3.6	479.0	< 3.40	1.9	12.1	37.6	86.6	32,600
DP below Meadow at TA-21	06/27	F	CS	< 0.9	1,670	< 2.7	< 12.5	34.0	< 0.16	< 0.1	< 0.4	< 3.1	< 4.6	907
DP above Los Alamos Canyon	08/04	UF	CS	< 0.3	66,100	17.2	< 1.8	640.0	5.51	2.5	17.6	53.4	115.0	49,900
DP above Los Alamos Canyon	08/04	F	CS	< 0.3	1,330	< 2.6	< 13.9	35.9	< 0.22	< 0.4	< 1.0	< 1.9	< 4.6	743
DP above Los Alamos Canyon	06/27	UF	CS	< 0.9	41,500	13.4	< 3.6	819.0	6.88	3.4	19.2	33.0	117.0	26,900
DP above Los Alamos Canyon	06/27	F	CS	< 0.9	2,200	< 2.9	< 12.8	41.0	< 0.16	< 0.1	< 0.6	< 2.5	< 4.8	1,200
DP above Los Alamos Canyon	05/28	UF	CS	< 0.9	88,500	25.1	< 48.1	893.0	8.73	4.5	28.7	82.8	170.0	72,200
DP above Los Alamos Canyon	05/28	F	CS	< 0.9	1,040	< 4.1	< 21.7	59.6	< 0.27	< 0.2	< 1.2	< 1.2	5.1	620
DP above Los Alamos Canyon	05/13	UF	CS	< 0.9	153,000	40.8	< 36.3	1170.0	12.40	4.8	35.2	130.0	222.0	148,000
Los Alamos above SR-4	08/16	UF	CS	< 0.3	147,000	35.2	< 27.1	1840.0	13.00	4.5	47.4	93.5	138.0	109,000
Los Alamos above SR-4	08/16	UF	CS	< 0.3	43,100	8.0	< 18.7	573.0	< 3.65	1.1	10.7	23.9	33.8	27,600
Los Alamos above SR-4	08/16	F	CS	< 0.3	211	< 2.6	< 29.8	59.4	< 0.25	< 0.1	< 1.0	< 1.0	< 1.4	108
Los Alamos above SR-4	08/16	F	CS	< 0.3	1,380	< 4.1	< 17.1	48.6	< 0.25	< 0.1	< 1.0	< 1.4	< 2.7	736
Los Alamos above SR-4	08/09	UF	CS	< 0.3	114,000	33.0	< 11.6	1720.0	10.80	4.4	40.2	79.4	147.0	99,200
Los Alamos above SR-4	08/08	F	CS	< 0.3	471	7.2	< 21.0	67.6	< 0.25	< 0.2	< 1.0	< 1.1	< 1.4	251
Los Alamos above SR-4	08/04	UF	CS	< 0.3	122,000	32.3	< 28.0	1430.0	10.60	4.2	36.6	88.8	156.0	92,000
Los Alamos above SR-4	08/04	F	CS	< 0.3	743	5.4	< 13.5	47.9	< 0.25	0.3	< 1.0	< 0.8	< 2.2	414
Los Alamos above SR-4	08/01	UF	CS	< 0.3	46,300	9.4	< 17.2	640.0	< 3.33	1.2	11.2	24.7	37.3	29,400
Los Alamos above SR-4	08/01	F	CS	< 0.3	189	< 2.6	< 25.7	69.2	< 0.25	< 0.1	< 1.0	< 1.5	< 2.1	102
Los Alamos above SR-4	07/26	UF	CS	< 0.3	600,000	104.0	210.0	8220.0	47.30	17.7	189.0	350.0	550.0	477,000
Los Alamos above SR-4	07/14	UF	CS	< 0.7	254,000	50.6	101.0	4120.0	24.20	7.4	87.4	138.0	240.0	173,000
Los Alamos above SR-4	07/14	F	CS	< 0.7	188	7.0	< 40.4	130.0	< 0.21	< 0.2	< 1.0	< 0.6	13.0	121
Los Alamos above SR-4	07/02	UF	CS	< 0.9	90,700	25.6	< 8.5	1020.0	9.50	3.2	27.9	68.9	133.0	70,300
Los Alamos above SR-4	07/02	F	CS	< 0.9	1,470	< 2.3	< 19.2	33.5	< 0.16	< 0.1	< 0.5	< 3.1	< 3.9	861
Los Alamos below LA Weir	08/16	UF	CS	< 0.3	147,000	29.4	< 13.3	1520.0	11.20	3.4	38.4	89.4	117.0	105,000
Los Alamos below LA Weir	08/16	F	CS	< 0.3	979	< 2.8	< 15.0	38.1	< 0.25	< 0.0	< 1.0	< 1.3	< 2.3	507
Los Alamos below LA Weir	08/09	UF	CS	< 0.3	493,000	89.6	129.0	7440.0	52.80	14.1	178.0	300.0	429.0	359,000
Los Alamos below LA Weir	08/09	F	CS	< 0.3	922	< 2.6	< 32.4	182.0	< 0.36	< 0.3	< 1.6	< 1.5	6.4	390
Los Alamos below LA Weir	07/26	UF	CS	< 0.3	221,000	36.2	97.1	2950.0	18.50	5.2	63.4	117.0	175.0	144,000
Los Alamos below LA Weir	07/26	F	CS	< 0.3	240	< 2.6	< 36.1	86.8	< 0.25	0.0	< 1.0	< 1.5	< 3.7	160
Acid above Pueblo	08/03	F	CS	< 0.3	421	< 2.6	< 42.8	105.0	< 0.25	< 0.3	< 1.0	< 1.5	< 2.5	267

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons) (Cont.)														
Pueblo above SR-502	08/16	UF	CS	< 3.6	360,000	88.4	134.0	4680.0	32.30	11.2	149.0	249.0	348.0	327,000
Pueblo above SR-502	08/16	F	CS	< 0.3	1,400	5.0	< 34.9	63.0	< 0.25	< 0.1	< 1.0	< 0.8	< 3.8	848
Pueblo above SR-502	08/11	UF	CS	7.2	398,000	90.6	117.0	5670.0	35.60	17.4	173.0	251.0	353.0	385,000
Pueblo above SR-502	08/11	F	CS	< 3.0	2,160	< 2.6	48.4	109.0	< 0.25	< 0.3	< 1.9	1.4	< 1.9	1,150
Pueblo above SR-502	08/09	UF	CS	< 0.3	471,000	122.0	137.0	7480.0	49.60	15.3	215.0	275.0	435.0	366,000
Pueblo above SR-502	08/09	F	CS	< 0.3	567	< 2.6	< 44.3	91.5	< 0.25	< 0.1	< 1.0	< 1.5	5.4	333
Pueblo above SR-502	07/02	F	CS	< 0.9	1,110	< 2.3	< 35.4	99.9	< 0.16	< 0.1	< 1.8	< 0.6	< 3.7	679
Sandia Canyon														
Sandia tributary at Salvage Yard	08/01	UF	CS	< 0.3	15,100	< 3.3	< 7.5	152.0	< 0.59	0.6	< 2.4	8.9	21.6	9,960
Sandia tributary at Salvage Yard	08/01	F	CS	< 0.3	1,110	< 2.6	< 14.8	27.0	< 0.25	0.1	< 1.0	< 0.7	7.8	608
Sandia tributary at Salvage Yard	07/26	UF	CS	< 2.1	19,700	< 4.6	< 3.9	238.0	< 0.86	1.8	5.4	16.6	35.0	13,800
Sandia tributary at Salvage Yard	07/26	F	CS	< 0.3	703	< 2.6	< 10.8	28.9	< 0.25	0.3	< 1.0	< 1.2	8.6	390
Sandia tributary at Salvage Yard	06/27	UF	CS	< 0.9	2,490	< 2.3	< 31.3	80.7	< 0.16	< 0.3	< 1.1	< 3.6	25.3	1,460
Sandia tributary at Salvage Yard	06/27	UF	DUP							< 0.4				
Sandia tributary at Salvage Yard	06/27	F	CS	< 0.9	417	< 4.2	< 34.9	63.3	< 0.16	< 0.3	< 0.8	< 2.1	20.8	232
Sandia tributary at Salvage Yard	06/27	F	DUP	< 0.9	430	< 2.3	< 32.8	64.5	< 0.16	< 0.3	< 0.8	< 1.9	20.8	237
Sandia below Wetlands	08/05	UF	CS	17.3	46,800	18.9	< 8.8	447.0	< 2.80	2.3	12.4	292.0	122.0	39,700
Sandia below Wetlands	08/05	F	CS	< 0.3	832	< 4.3	< 29.6	31.8	< 0.25	< 0.1	< 1.0	< 4.4	5.6	531
Mortandad Canyon (includes Ten-Site Canyon, Cañada del Buey)														
TA-55 NW above Effluent Canyon	08/01	UF	CS	< 0.3	2,030	< 2.6	< 5.5	27.2	< 0.25	0.1	< 1.0	< 1.8	37.4	1,360
TA-55 NW above Effluent Canyon	07/02	UF	CS	< 0.9	5,790	6.4	< 5.4	65.9	< 0.28	< 0.4	< 1.5	< 4.9	48.9	3,890
TA-55 NW above Effluent Canyon	07/02	F	CS	< 0.9	< 8	< 2.3	< 8.0	13.8	< 0.16	< 0.1	< 0.4	< 0.9	12.8	< 22.1
TA-55 NW above Effluent Canyon	06/27	F	CS	< 0.9	115	< 2.3	< 4.8	17.5	< 0.16	< 0.1	< 0.4	< 0.6	6.1	75.1
MDA L	10/05	UF	CS	< 0.3		< 2.6				< 0.6				781
MDA L	10/05	UF	DUP											
MDA L	07/26	UF	CS	< 0.3	867	< 2.6	< 46.7	51.8	< 0.25	< 0.5	< 0.9	< 1.8	15.0	644
MDA L	07/26	F	CS	< 0.3	< 24	< 2.6	< 46.1	39.0	< 0.25	< 0.3	< 1.1	< 1.0	12.0	< 26.3
MDA L	07/02	UF	CS	< 0.9	676	5.1	< 12.4	25.5	< 0.16	< 0.3	< 0.5	< 1.7	7.7	539
MDA L	06/07	UF	CS	< 0.9	3,380	< 2.3	< 7.7	86.7	< 0.21	1.1	< 2.9	< 4.7	20.4	2,960
MDA L	06/07	UF	DUP							< 0.9				
MDA L	06/07	F	CS	< 0.9	< 38	< 2.3	< 8.9	20.4	< 0.16	< 0.3	< 0.4	< 0.6	< 4.3	< 23.5
MDA L	05/28	UF	CS	< 3.0	941	< 4.1	< 23.6	43.2	< 0.19	< 0.5	< 1.2	< 1.8	12.9	719
MDA L	05/28	UF	DUP	< 2.4	1,180	< 4.1	< 24.1	47.4	< 0.19	< 0.5	< 1.1	< 2.3	12.6	935
MDA L	05/28	F	CS	< 2.6	64	< 4.1	< 24.4	30.2	< 0.19	< 0.3	< 0.9	< 1.1	7.7	< 14.9
MDA L	04/27	UF	CS	< 0.9	3,860	< 4.1	< 14.2	92.7	< 0.27	< 0.7	< 4.5	5.9	22.4	3,700
MDA L	04/27	UF	DUP							< 0.6				
MDA L	04/06	UF	CS	< 1.4	1,080	< 4.1	< 31.6	41.9	< 0.32	< 0.6	< 0.9	< 1.8	13.8	1,050
Pajarito Canyon (includes Twomile, Threemile Canyons)														
Pajarito below SR-501	08/09	UF	CS	< 0.3	498,000	98.4	161.0	11300.0	31.00	10.2	197.0	286.0	380.0	303,000
Pajarito below SR-501	08/09	F	CS	< 0.3	824	5.1	< 27.9	83.0	< 0.25	< 0.3	< 1.0	< 1.1	< 1.3	418
Pajarito above Starmers	08/11	UF	CS	< 3.0	97,900	17.0	44.9	1500.0	5.15	2.6	32.4	54.3	63.5	62,400

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Pajarito Canyon (includes Twomile, Threemile Canyons) (Cont.)														
Pajarito above Starmers	08/11	F	CS	< 3.0	998	< 2.6	21.1	70.0	< 0.25	< 0.1	< 1.0	1.0	< 1.9	662
Pajarito above Starmers	08/05	UF	CS	< 0.3	210,000	42.8	< 42.4	4780.0	11.50	7.0	78.0	106.0	148.0	133,000
Pajarito above Starmers	08/05	F	CS	< 0.3	879	< 2.9	< 23.7	79.8	< 0.25	< 0.3	< 1.0	< 0.8	< 2.6	481
Pajarito above TA-18	08/05	UF	CS	< 1.8	162,000	45.0	< 27.1	2620.0	12.40	6.4	51.8	89.9	155.0	125,000
Pajarito above TA-18	08/05	F	CS	< 0.3	620	< 2.6	< 25.5	54.9	< 0.25	< 0.4	< 1.0	< 0.7	< 2.7	398
Pajarito above TA-18	07/02	UF	CS	< 0.9	55,800	17.7	< 12.9	682.0	< 4.92	1.7	13.8	28.2	50.7	39,600
Pajarito above TA-18	07/02	F	CS	< 0.9	1,880	< 2.3	< 22.8	48.3	< 0.16	< 0.1	< 0.4	< 0.9	< 3.2	969
MDA G-1	08/05	UF	CS	< 0.3	93,300	15.7	< 1.8	787.0	5.88	1.3	21.1	55.0	45.9	61,300
MDA G-2	08/30	UF	CS	< 1.3	153,000	41.3	124.0	1220.0	12.60	3.9	38.4	99.2	123.0	155,000
MDA G-2	08/30	F	CS	< 0.3	129	< 3.4	66.4	48.0	< 0.25	< 0.1	< 1.0	< 1.5	< 2.5	80.6
MDA G-3	08/30	UF	CS	< 0.3	6,510	< 4.5	54.2	72.4	< 0.60	< 0.1	< 1.7	4.8	6.8	3,780
MDA G-3	08/30	UF	DUP							< 0.1				
MDA G-3	08/30	F	CS	< 0.3	< 45	< 2.8	55.5	36.1	< 0.25	< 0.1	< 1.0	1.1	< 2.0	< 34.6
MDA G-3	08/04	UF	CS	< 1.5	25,100	5.8	116.0	268.0	< 1.71	< 0.7	< 3.8	16.2	21.4	14,200
MDA G-3	08/04	F	CS	< 0.3	16	< 2.6	128.0	99.9	< 0.25	< 0.3	< 1.0	< 1.5	< 2.0	< 7.13
MDA G-3	08/01	UF	CS	< 0.3	5,200	< 2.6	103.0	103.0	< 0.32	0.1	< 1.0	< 4.0	7.2	2,850
MDA G-3	08/01	F	CS	< 0.3	< 18	< 2.6	98.6	69.0	< 0.25	0.1	< 1.0	< 1.3	< 3.8	< 18
MDA G-3	07/13	UF	CS	< 0.7	8,670	6.3	156.0	165.0	< 0.41	< 0.4	< 0.7	5.2	7.5	4,310
MDA G-3	07/13	F	CS	< 0.7	52	< 3.6	164.0	126.0	< 0.21	< 0.2	< 0.7	< 0.8	< 2.9	< 36.3
MDA G-3	07/02	UF	CS	< 0.9	10,400	< 2.3	804.0	359.0	< 0.58	< 0.6	< 0.4	8.4	7.8	5,560
MDA G-3	07/02	F	CS	< 0.9	< 8	< 2.3	816.0	297.0	< 0.16	< 0.4	< 0.4	< 1.9	< 2.6	< 3.27
MDA G-3	06/07	UF	CS	< 0.9	26,000	5.7	< 33.1	244.0	< 1.66	< 0.6	5.2	18.2	22.8	17,900
MDA G-3	06/07	F	CS	< 0.9	211	< 2.3	< 41.1	67.5	< 0.16	< 0.2	< 0.6	< 2.2	5.8	136
MDA G-4	10/05	UF	CS	< 0.3		< 2.6				< 0.5				2,510
MDA G-4	08/04	UF	CS	< 0.3	28,500	5.9	< 1.8	288.0	< 1.90	1.1	< 4.8	13.9	40.9	16,200
MDA G-4	07/26	F	CS	< 0.3	315	< 2.6	< 28.6	28.8	< 0.25	< 0.1	< 1.0	< 1.5	7.4	160
MDA G-4	07/17	UF	CS	< 0.3	5,320	< 2.7	< 25.2	62.9	< 0.26	< 0.1	< 1.1	< 3.3	18.6	2,970
MDA G-4	07/13	UF	CS	< 0.7	4,250	5.9	< 28.5	56.3	< 0.21	< 0.3	< 0.7	< 1.9	13.5	2,170
MDA G-4	07/13	F	CS	< 0.7	206	5.6	< 29.4	29.1	< 0.21	< 0.1	< 0.7	< 0.6	6.2	104
MDA G-4	07/02	UF	CS	< 0.9	15,900	7.9	< 23.5	191.0	< 0.89	< 0.5	< 3.8	8.9	28.4	9,930
MDA G-4	07/02	F	CS	< 0.9	< 41	< 2.3	< 34.2	39.7	< 0.16	< 0.1	< 0.4	< 0.7	5.9	< 41
MDA G-4	06/27	UF	CS	< 0.9	17,500	< 4.9	< 9.2	211.0	< 0.97	< 0.7	< 3.5	11.2	57.5	11,000
MDA G-4	06/27	F	CS	< 0.9	229	< 3.8	< 20.0	26.2	< 0.16	< 0.1	< 0.4	< 0.8	7.1	131
MDA G-4	06/07	UF	CS	< 0.9	28,400	7.0	< 13.4	303.0	< 1.70	1.3	7.2	21.7	83.5	23,600
MDA G-4	06/07	UF	DUP	< 0.9	28,200	7.3	< 10.9	307.0	< 1.70	1.2	6.7	20.6	84.7	22,800
MDA G-4	06/07	F	CS	< 0.9	225	< 2.3	< 18.6	37.5	< 0.16	< 0.1	< 0.4	< 1.1	6.1	143
MDA G-4	04/06	UF	CS	< 1.7	11,300	5.2	< 31.7	125.0	< 0.95	< 0.5	< 3.6	7.9	32.3	7,980
MDA G-4	04/06	F	CS	< 1.5	1,720	< 4.1	< 30.7	26.6	< 0.48	< 0.2	< 0.8	< 1.5	< 4.8	973
Pajarito above SR-4	08/16	UF	CS	< 1.8	60,800	14.3	< 11.5	644.0	< 3.82	1.4	11.2	29.8	40.9	40,700
Pajarito above SR-4	08/16	F	CS	< 0.3	1,770	< 2.9	< 25.1	55.5	< 0.25	< 0.0	< 1.0	< 1.1	< 3.4	969
Pajarito above SR-4	08/09	UF	CS	26.0	220,000	43.3	64.3	3020.0	12.80	5.8	59.9	120.0	141.0	157,000
Pajarito above SR-4	08/09	UF	DUP	25.9	217,000	40.6	50.2	3110.0	12.40	5.7	59.1	120.0	143.0	157,000
Pajarito above SR-4	08/09	F	CS	< 0.3	548	< 2.6	< 43.4	114.0	< 0.25	< 0.1	< 1.0	< 1.5	5.3	310

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Pajarito Canyon (includes Twomile, Threemile Canyons) (Cont.)														
Pajarito above SR-4	08/09	F	DUP	< 0.3	471	< 2.6	< 40.4	111.0	< 0.25	< 0.2	< 1.0	< 1.5	5.4	279
Pajarito above SR-4	08/06	UF	CS	46.5	265,000	48.0	83.0	3080.0	12.90	5.4	58.9	134.0	133.0	170,000
Pajarito above SR-4	08/06	UF	DUP	46.4	257,000	45.2	78.2	3040.0	12.60	5.8	57.8	130.0	130.0	164,000
Pajarito above SR-4	08/06	F	CS	< 0.3	1,490	6.0	< 44.8	130.0	< 0.25	0.2	< 0.8	< 0.9	< 3.7	823
Pajarito above SR-4	08/06	F	DUP	< 0.3	1,450	< 3.5	< 44.3	130.0	< 0.25	< 0.4	< 1.2	< 0.8	< 3.7	817
Pajarito above SR-4	06/27	UF	CS	< 1.0	76,400	19.4	< 33.4	1080.0	6.36	2.5	15.2	31.3	54.3	44,100
Pajarito above SR-4	06/27	F	CS	< 0.9	289	< 4.2	50.6	99.4	< 0.16	< 0.1	< 0.5	< 0.6	< 4.5	194
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons)														
Water above SR-501	07/22	UF	CS	< 0.7	453,000	71.7	190.0	11800.0	29.90	8.2	187.0	220.0	323.0	289,000
Water above SR-501	07/22	UF	DUP	< 0.3	617,000	97.8	213.0	13900.0	41.20		229.0	317.0	454.0	368,000
Water above SR-501	07/22	F	CS	< 0.3	576	< 3.8	50.5	223.0	< 0.25	< 0.1	< 2.9	< 1.5	< 2.1	803
Cañon de Valle above SR-501	07/26	UF	CS	< 0.3	187,000	29.4	115.0	8590.0	18.40	12.9	130.0	75.1	104.0	96,500
Cañon de Valle above SR-501	07/26	F	CS	< 0.3	19,900	9.9	104.0	5210.0	7.24	5.0	28.3	< 3.5	10.0	5,930
S Site Canyon above Water	08/03	UF	CS	< 0.3	83,200	24.6	55.4	1730.0	5.46	2.8	25.8	43.0	80.3	56,600
S Site Canyon above Water	08/03	F	CS	< 0.3	1,350	< 2.8	60.3	74.4	< 0.25	0.4	< 1.0	< 0.8	< 2.4	774
Cañon de Valle above Water	08/09	UF	CS	267.0	468,000	91.9	132.0	24300.0	33.20	12.1	172.0	265.0	403.0	360,000
Cañon de Valle above Water	08/09	F	CS	< 1.6	2,560	< 2.6	< 30.5	434.0	< 0.25	< 0.2	< 1.2	< 0.7	< 4.3	1,190
Cañon de Valle above Water	08/05	UF	CS	301.0	494,000	79.4	59.3	29800.0	36.30	13.3	199.0	259.0	380.0	300,000
Cañon de Valle above Water	08/05	F	CS	11.8	17,000	6.7	< 35.1	989.0	< 0.57	0.5	< 4.2	7.7	11.4	8,930
Water below MDA AB	08/08	UF	CS	267.0	430,000	82.2	108.0	13700.0	34.80	10.9	167.0	245.0	348.0	315,000
Water below MDA AB	08/08	F	CS	< 0.7	2,390	< 2.6	< 18.7	236.0	< 0.25	< 0.1	< 1.0	< 0.7	< 5.0	1,120
Water below MDA AB	08/03	UF	CS	< 2.4	192,000	37.3	< 48.0	3040.0	15.80	3.7	54.0	93.6	113.0	127,000
Water below MDA AB	08/03	F	CS	< 0.3	546	< 3.1	< 29.9	305.0	< 0.79	0.6	< 3.0	< 1.5	< 2.2	262
Water below MDA AB	07/26	UF	CS	< 1.5	1,030,000	67.4	< 45.9	22700.0	61.60	25.9	382.0	302.0	436.0	353,000
Water below MDA AB	07/26	F	CS	< 0.3	627	< 3.1	< 25.4	133.0	< 0.25	< 0.1	< 0.9	< 1.5	< 3.5	301
Water at SR-4	08/09	UF	CS	157.0	170,000	36.9	< 49.0	15100.0	21.60	9.3	121.0	78.8	123.0	114,000
Water at SR-4	08/09	F	CS	< 2.0	2,040	< 3.5	< 25.6	239.0	< 0.25	< 0.2	< 0.7	< 1.3	< 1.8	1,070
Water at SR-4	08/03	UF	CS	5.4	417,000	81.3	142.0	8450.0	41.30	8.8	160.0	214.0	289.0	275,000
Water at SR-4	08/03	UF	CS	< 1.6	136,000	29.0	< 29.5	2310.0	10.40	3.7	36.6	64.4	87.6	84,400
Water at SR-4	08/03	F	CS	< 0.3	1,240	< 4.2	< 35.0	68.8	< 0.25	0.3	< 1.0	< 1.1	< 2.7	668
Water at SR-4	07/26	UF	CS	< 0.3	484,000	64.6	177.0	12500.0	31.90	22.6	196.0	253.0	317.0	302,000
Water at SR-4	07/26	F	CS	< 1.2	431,000	54.9	111.0	6100.0	24.70	4.4	122.0	235.0	262.0	274,000
Water below SR-4	08/09	UF	CS	307.0	401,000	79.7	112.0	15500.0	33.70	9.8	172.0	214.0	304.0	252,000
Water below SR-4	08/09	F	CS	< 1.4	2,110	< 2.6	< 25.7	292.0	< 0.25	< 0.3	< 1.2	< 0.7	< 2.0	1,040
Water below SR-4	08/03	UF	CS	< 4.4	429,000	85.4	137.0	8850.0	42.10	10.4	165.0	219.0	306.0	278,000
Water below SR-4	08/03	UF	CS	< 1.7	134,000	29.2	< 30.7	2200.0	10.80	3.3	36.0	63.4	86.3	85,000
Water below SR-4	08/03	F	CS	< 0.3	2,000	< 3.7	< 31.2	67.2	< 0.25	0.3	< 1.0	< 1.2	< 2.5	1,060
Potrillo tributary Study Area	08/30	UF	CS	< 0.3	869,000	105.0	216.0	6430.0	48.30	< 8.4	184.0	457.0	432.0	615,000
Potrillo tributary Study Area	08/30	UF	DUP	< 0.3	878,000	110.0	210.0	6560.0	49.30		188.0	461.0	443.0	625,000
Potrillo tributary Study Area	08/30	F	CS	< 0.3	1,150	6.0	15.6	78.4	< 0.25	< 0.1	< 1.3	1.1	< 3.4	581
Potrillo tributary Study Area	08/11	UF	CS	< 3.5	419,000	59.3	92.7	5080.0	32.90	6.2	132.0	239.0	282.0	334,000
Potrillo tributary Study Area	08/11	F	CS	< 2.5	541	< 2.6	18.6	69.4	< 0.25	< 0.1	< 0.7	< 1.5	< 1.9	290

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Ancho Canyon														
Ancho Canyon spring tributary below SR-4	08/12	UF	CS	< 3.7	231,000	36.9	70.1	2240.0	16.90	3.4	61.7	126.0	124.0	163,000
Ancho Canyon spring tributary below SR-4	08/12	F	CS	< 2.8	1,280	< 2.6	15.5	44.9	< 0.25	< 0.1	< 0.7	1.1	< 1.9	646
Water Quality Standards[c]														
EPA Primary Drinking Water Standard						10		2,000	4	5		100		
EPA Secondary Drinking Water Standard					50-200									300
EPA Action Level													1,300	
EPA Health Advisory														
NMWQCC Livestock Watering Standard					5,000	200	5,000			50	1,000	1,000	500	
NMWQCC Groundwater Limit				50.0	5,000	100	750	1,000		10	50	50	1,000	1,000
NMWQCC Wildlife Habitat Standard														

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Guaje Canyon															
Guaje above Rendija	08/14	UF	CS	0.26	217	2.2	1.82	765	0.794	< 2.38	< 3.5	62.4	6.3	2.6	5.18
Guaje above Rendija	08/14	UF	DUP	< 0.17	211	< 1.9	< 1.2	734	< 0.773	< 2.38	< 3.5	59.9	6.49	< 2.49	< 4.81
Guaje above Rendija	08/14	F	CS	< 0.07	28,500	3.4	132	0.461	0.805	16.9	< 3.5	1,080	< 0.014	163	946
Guaje above Rendija	08/14	F	DUP	< 0.07	25,800	< 2.9	134	< 0.422	< 0.806	16.1	< 3.5	1,040	< 0.014	169	958
Guaje above Rendija	08/11	UF	CS	< 0.07	43,700	3.1	222	804	0.752	17.6	< 3.5	1,350	7.57	264	1,510
Guaje above Rendija	08/11	F	CS	< 0.07	1,070	4.6	< 1.2	1.5	1.56	< 2.38	< 3.5	108	< 0.014	4.96	12.4
Guaje above Rendija	08/09	UF	CS	< 0.07	68,500	1.7	739	1270	0.785	34.5	< 9.25	4,200	9.99	631	3,170
Guaje above Rendija	08/08	UF	CS	< 0.07	37,300	3.8	173	249	0.519	17.3	8.29	1,480	2.57	203	1,140
Guaje above Rendija	08/08	F	CS	< 0.07	1,200	3.9	< 1.98	< 1.36	0.304	< 2.38	< 3.5	105	< 0.014	< 4.2	10.4
Rendija above Guaje	07/02	UF	CS	< 0.06	76,000	4.8	516	99.4	1.24	28.3	6.78	3,350	1.75	371	1,970
Rendija above Guaje	07/02	F	CS	< 0.06	824	< 7.0	6.53	< 1.91	< 1.67	< 2.93	< 2.97	214	< 0.077	5.71	13.5
Rendija above Guaje	07/02	F	DUP	< 0.06	824	< 4.8	6.26			< 2.93	< 2.48	215		5.11	13.4
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons)															
Los Alamos below Ice Rink	08/09	UF	CS	< 0.07	7,560	3.4	83.5	83.1	0.202	7.54	46.4	592	2.33	99.8	469
Los Alamos below Ice Rink	08/09	F	CS	< 0.07	147	4.0	< 1.2	0.055	0.147	< 2.38	< 3.5	244	< 0.014	< 2.37	< 2.67
Los Alamos below Ice Rink	07/13	UF	DUP	< 0.06	8,030	< 5.7	101	171	< 0.328	< 4.8	< 7.48	635	2.38	147	680
Los Alamos below Ice Rink	07/13	UF	CS	< 0.06	7,950	< 6.2	101	170	1.91	< 3.49	7.22	633	2.81	147	671
Los Alamos below Ice Rink	07/13	F	CS	< 0.06	1,870	< 4.3	< 3.2	< 0.235	0.355	< 3.49	< 1.94	255	0.224	5.63	< 3.08
Los Alamos below Ice Rink	07/13	F	DUP	< 0.06	1,840	< 4.9	< 3.47	< 0.355	< 0.282	< 3.49	< 1.94	250	< 0.218	5.26	< 2.69
Los Alamos below Ice Rink	07/02	UF	DUP	< 0.06	19,600	< 4.8	113	353	< 0.371	7.77	< 7.13	954	3.21	171	1,180
Los Alamos below Ice Rink	07/02	UF	CS	< 0.06	19,800	4.5	120	384	0.435	6.36	7.97	974	3.34	177	1,270
Los Alamos below Ice Rink	07/02	F	CS	< 0.06	591	< 2.9	< 2.76	< 0.429	< 0.553	< 2.93	< 2.31	179	< 0.077	< 3.1	5.81
Los Alamos above DP Canyon	08/16	UF	DUP	< 0.19	8,000	< 3.8	87.8	327	< 0.305	9.04	< 2.65	434	2.26	149	771
Los Alamos above DP Canyon	08/16	UF	CS	0.20	8,040	< 3.5	94.5	351	0.395	< 2.38	5.36	457	2.37	163	824
Los Alamos above DP Canyon	08/16	F	CS	< 0.15	11.7	< 2.0	< 1.2	0.961	0.178	< 2.38	< 3.5	77.5	< 0.014	< 3.04	7.91
Los Alamos above DP Canyon	08/16	F	DUP	< 0.16	11.4	< 1.5	< 1.2	< 0.949	< 0.146	< 2.38	< 3.5	77.2	< 0.014	< 2.69	7.37
Los Alamos above DP Canyon	08/09	UF	DUP	< 0.07	33,300	< 4.9	371	646	< 0.533	26.9	13	1,790	7.42	381	2,040
Los Alamos above DP Canyon	08/09	UF	CS	< 0.07	25,600	3.3	167	204	0.364	8.81	4.03	1,380	2.77	181	968
Los Alamos above DP Canyon	08/09	F	CS	< 0.07	1,650	3.3	< 4.97	8.22	0.661	< 2.38	< 3.5	204	< 0.042	< 4.98	29.3
Los Alamos above DP Canyon	08/09	F	DUP	< 0.07	1,650	< 3.3	5.22	8.16	< 0.682	< 2.38	< 3.5	204	< 0.026	5.08	28.9
Los Alamos above DP Canyon	08/05	UF	CS	< 0.07	9,810	4.5	98.4	367	0.711	5.21	3.82	524	2.43	170	1,070
Los Alamos above DP Canyon	08/05	F	CS	< 0.07	172	3.0	< 1.2	0.736	0.356	< 2.38	< 3.5	77.1	0.022	< 3.23	6.76
Los Alamos above DP Canyon	07/26	UF	DUP	< 0.07	18,400	< 4.1	114	589	< 0.85	8.15	< 6.21	976	5.13	175	943
Los Alamos above DP Canyon	07/26	UF	CS	< 0.07	18,200	< 3.4	102	553	1.14	6.3	< 4.46	965	4.85	158	871
Los Alamos above DP Canyon	07/26	F	CS	< 0.07	4,320	< 1.6	8.07	18.5	0.639	< 2.38	< 3.5	415	0.158	6.23	88.2
Los Alamos above DP Canyon	07/26	F	DUP	< 0.07	4,340	< 1.7	8.02	18.1	< 0.591	< 2.38	< 3.5	419	< 0.132	6.5	89.4
Los Alamos above DP Canyon	07/14	UF	CS	< 0.06	22,800	< 7.0	173	410	0.507	8.41	13.3	1,150	4.57	250	1,300
Los Alamos above DP Canyon	07/14	F	CS	< 0.06	2,070	< 6.7	< 3.77	< 0.552	0.677	< 3.49	< 1.94	249	0.378	7.24	8.12
Los Alamos above DP Canyon	07/02	UF	CS	< 0.06	14,300	5.0	97.2	142	0.728	< 4.13	6.69	738	1.08	153	1,080
Los Alamos above DP Canyon	07/02	F	CS	< 0.06	419	< 5.0	< 2.23	< 1.1	< 0.669	< 3.89	< 2.31	148	< 0.077	< 4.28	9.68
DP above TA-21	08/16	UF	CS	< 0.17	335	< 1.7	7.03	57.4	0.767	< 2.38	< 3.5	50	0.133	15.9	280
DP above TA-21	08/16	F	CS	< 0.15	33.1	< 1.5	< 1.2	0.388	0.246	< 2.38	< 3.5	23.4	< 0.014	< 1.97	20.3
DP above TA-21	08/04	UF	CS	< 0.07	743	< 1.7	16.8	109	< 1.93	< 2.38	< 2.67	80.5	< 0.434	35.5	481

Table 5-12. Trace Metals in Storm Runoff for 2001 (μg/L) (Cont.)

Station Name	Date	Codes[a]		Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons) (Cont.)															
DP above TA-21	08/04	F	CS	< 0.07	< 3.29	< 1.7	< 1.42	< 0.689	< 0.467	< 2.38	< 3.5	29	< 0.084	< 2.24	16.4
DP above TA-21	08/01	UF	CS	< 0.07	462	< 1.9	11	60.1	1.32	< 2.38	< 3.5	75.8	< 0.047	23.7	413
DP above TA-21	08/01	F	CS	< 0.07	< 4.71	< 1.7	< 1.2	< 0.257	0.59	< 2.38	< 3.5	37.5	< 0.014	< 2.33	45.2
DP above TA-21	07/02	UF	CS	< 0.06	990	4.1	16.4	98.5	1.27	< 2.93	< 2.31	76.7	< 0.475	30.7	427
DP above TA-21	07/02	F	CS	< 0.06	< 5.52	< 1.7	< 1.25	< 0.715	< 0.638	< 2.93	< 2.31	24.7	< 0.077	< 2.82	15.7
DP above TA-21	07/02	F	DUP					< 1.68	< 0.558				< 0.077		
DP above TA-21	06/27	UF	CS	< 0.06	1,860	< 3.3	37.7	259	1.83	< 2.93	< 6.75	184	0.941	73.1	1,160
DP above TA-21	06/27	F	CS	< 0.06	271	< 2.7	< 1.68	0.523	0.474	< 2.93	< 2.76	44.8	< 0.077	< 2.71	19.5
DP above TA-21	05/28	UF	CS	< 0.06	833	< 3.0	22.3	130	1.32	< 2.8	< 2.95	118	0.7	39.7	657
DP above TA-21	05/28	UF	DUP	< 0.06	868	< 1.9	23.5	139	< 1.45	< 2.8	< 2.95	122	< 0.408	44.9	672
DP above TA-21	05/28	F	CS	< 0.06	116	< 1.5	< 1.96	< 1.1	0.58	< 2.8	< 2.95	44.2	< 0.096	< 2.98	44.3
DP below Meadow at TA-21	07/02	UF	CS	< 0.06	1,370	4.4	28.9	129	1.4	5.76	3.99	136	< 0.47	66.3	599
DP below Meadow at TA-21	07/02	F	CS	< 0.06	106	< 1.3	< 2.57	< 0.83	< 0.672	< 2.93	< 2.31	37	< 0.077	< 3.98	23.2
DP below Meadow at TA-21	06/27	UF	CS	< 0.06	1,220	< 1.5	28.6	150	1.43	< 2.93	< 3.77	129	0.709	58.8	626
DP below Meadow at TA-21	06/27	F	CS	< 0.06	< 8.55	< 1.6	< 2.23	0.877	0.354	< 2.93	< 2.31	44	< 0.077	< 3.6	21.3
DP above Los Alamos Canyon	08/04	UF	CS	< 0.07	1,930	< 3.5	38.1	189	2.06	< 4.68	< 4.4	171	0.751	84	784
DP above Los Alamos Canyon	08/04	F	CS	< 0.07	< 5.61	< 2.1	< 1.34	< 1.07	< 0.554	< 2.38	< 3.11	50.3	< 0.148	< 3.31	17.4
DP above Los Alamos Canyon	06/27	UF	CS	< 0.06	2,440	< 1.5	33.6	239	1.71	< 2.93	< 2.31	208	0.536	68.1	952
DP above Los Alamos Canyon	06/27	F	CS	< 0.06	158	< 2.1	< 1.17	1.35	0.359	< 2.93	< 2.31	53.4	< 0.077	< 4.34	21.2
DP above Los Alamos Canyon	05/28	UF	CS	< 0.06	2,600	< 4.6	57.8	354	1.27	< 2.8	< 7.18	252	1.58	115	1,110
DP above Los Alamos Canyon	05/28	F	CS	< 0.06	322	< 1.5	< 3.16	< 1.77	0.733	< 2.8	< 2.95	83.9	< 0.077	< 3.08	26.4
DP above Los Alamos Canyon	05/13	UF	CS	< 0.06	4,390	12.3	82.2	384	< 1.72	< 2.93	21.2	318	1.59	196	1,670
Los Alamos above SR-4	08/16	UF	CS	0.21	8,890	< 2.8	97	382	0.46	6.72	4.19	466	2.66	155	878
Los Alamos above SR-4	08/16	UF	CS	< 0.17	2,440	< 4.6	27.8	70.5	0.305	< 4.08	4.34	286	1.09	41	208
Los Alamos above SR-4	08/16	F	CS	< 0.18	10.2	< 3.7	< 1.2	0.133	0.132	< 2.38	2.28	166	0.121	< 2.98	< 3.95
Los Alamos above SR-4	08/16	F	CS	< 0.12	35.6	< 1.8	< 1.43	1.05	0.223	< 2.38	< 3.5	70.8	< 0.014	< 3.33	13.4
Los Alamos above SR-4	08/09	UF	CS	< 0.07	7,540	5.7	82.3	254	0.737	8.33	5.28	502	1.43	136	961
Los Alamos above SR-4	08/08	F	CS	< 0.07	283	4.6	< 1.2	< 0.541	0.447	< 2.38	< 3.5	128	< 0.014	< 4.38	5.66
Los Alamos above SR-4	08/04	UF	CS	< 0.07	6,650	4.7	78.4	256	0.709	< 4.81	4.95	385	1.47	144	1,050
Los Alamos above SR-4	08/04	F	CS	< 0.07	209	2.7	< 1.42	0.61	0.492	< 2.38	< 3.5	84.9	0.041	< 3.33	7.21
Los Alamos above SR-4	08/01	UF	CS	< 0.07	2,750	< 4.1	25.9	73.2	0.531	< 2.38	< 3.5	343	0.643	49.2	263
Los Alamos above SR-4	08/01	F	CS	< 0.07	< 4.47	< 2.7	< 1.2	< 0.379	0.446	< 2.38	< 3.5	204	< 0.014	< 2.62	33.9
Los Alamos above SR-4	07/26	UF	CS	1.69	40,300	18.1	402	1020	1.83	18.8	19.2	1,920	7.29	615	3,290
Los Alamos above SR-4	07/14	UF	CS	< 0.06	20,800	< 6.6	176	433	0.552	9.04	10.4	1,120	5.11	242	1,330
Los Alamos above SR-4	07/14	F	CS	< 0.06	1,500	< 8.6	< 3.87	< 0.427	0.928	< 3.49	< 1.94	232	0.421	5.8	8.63
Los Alamos above SR-4	07/02	UF	CS	< 0.06	3,890	9.0	53.4	231	1.34	5.1	9.19	283	0.817	112	993
Los Alamos above SR-4	07/02	F	CS	< 0.06	42.6	< 6.6	< 2.39	< 0.981	< 0.663	< 2.93	< 2.31	55.7	< 0.077	< 4.43	15.8
Los Alamos below LA Weir	08/16	UF	CS	< 0.17	6,160	< 4.0	91.5	286	0.223	< 4.24	4.17	379	2.26	142	756
Los Alamos below LA Weir	08/16	F	CS	< 0.07	27.4	< 2.0	< 1.2	0.622	0.189	< 2.38	< 3.5	76.3	< 0.014	< 3.11	7.14
Los Alamos below LA Weir	08/09	UF	CS	< 0.07	33,800	2.2	393	961	0.203	22.7	< 5.66	1,700	7.67	399	2,180
Los Alamos below LA Weir	08/09	F	CS	< 0.07	739	4.4	< 2.56	3.86	0.509	< 2.38	< 3.5	205	< 0.014	< 3.13	17.7
Los Alamos below LA Weir	07/26	UF	CS	< 0.07	12,900	< 6.5	134	348	0.271	< 4.96	< 9.05	829	3.33	218	1,040
Los Alamos below LA Weir	07/26	F	CS	< 0.07	44.6	< 6.2	< 1.49	0.414	0.341	< 2.38	< 3.5	198	0.096	< 2.65	8.87
Acid above Pueblo	08/03	F	CS	< 0.07	449	< 7.2	< 2.27	< 0.528	< 0.468	< 2.38	< 3.5	179	< 0.062	< 4.22	< 4.44

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Los Alamos Canyon (includes Bayo, Acid, Pueblo, DP Canyons) (Cont.)															
Pueblo above SR-502	08/16	UF	CS	< 0.17	19,700	< 4.9	269	837	0.315	13.1	8.95	1,400	5.14	419	1,660
Pueblo above SR-502	08/16	F	CS	< 0.15	98.9	< 5.7	< 1.69	1.28	0.386	< 2.38	< 3.5	159	< 0.014	< 4.83	7.81
Pueblo above SR-502	08/11	UF	CS	< 0.07	24,600	2.4	325	857	0.5	15.1	< 3.5	1,370	6.25	376	1,460
Pueblo above SR-502	08/11	F	CS	< 0.07	536	5.0	2.39	1.87	0.506	< 2.38	< 3.5	193	< 0.014	5.19	7.21
Pueblo above SR-502	08/09	UF	CS	< 0.07	35,000	4.9	374	1150	0.341	26.8	< 5.34	1,770	6.68	485	1,860
Pueblo above SR-502	08/09	F	CS	< 0.07	219	6.1	< 1.85	0.397	0.6	< 3.66	< 3.5	181	< 0.014	< 3.26	< 4.83
Pueblo above SR-502	07/02	F	CS	< 0.06	656	< 4.5	< 3.11	< 0.841	< 0.809	< 2.93	< 2.31	178	< 0.077	< 2.62	18.5
Sandia Canyon															
Sandia tributary at Salvage Yard	08/01	UF	CS	< 0.07	230	< 2.6	8.51	15	1.18	< 2.38	< 3.5	59.2	< 0.014	19.1	523
Sandia tributary at Salvage Yard	08/01	F	CS	< 0.07	13.8	< 2.7	< 2.18	< 0.466	1.11	< 2.38	< 3.5	32.9	< 0.014	< 2.85	199
Sandia tributary at Salvage Yard	07/26	UF	CS	< 0.07	356	< 2.2	13.2	41.4	0.738	< 2.38	< 2.01	69.3	< 0.014	29	585
Sandia tributary at Salvage Yard	07/26	F	CS	< 0.07	25.3	< 1.7	< 2.35	3.88	0.348	< 2.38	< 3.5	25.9	< 0.014	< 2.04	133
Sandia tributary at Salvage Yard	06/27	UF	CS	< 0.06	137	< 4.0	10.2	3.91	1.72	< 2.93	< 2.31	92.3	< 0.077	6.86	2,770
Sandia tributary at Salvage Yard	06/27	UF	DUP					3.87	< 1.24				< 0.077		
Sandia tributary at Salvage Yard	06/27	F	CS	< 0.06	109	< 4.8	9.09	0.162	1.42	< 2.93	< 2.31	86	< 0.215	< 4.52	2,590
Sandia tributary at Salvage Yard	06/27	F	DUP	< 0.06	110	< 3.4	9.18	< 0.136	< 1.32	< 2.93	< 2.37	87.5	< 0.077	< 4.42	2,600
Sandia below Wetlands	08/05	UF	CS	< 0.07	1,700	80.8	32.7	96.9	1.04	< 2.38	6.24	135	1.45	63.8	960
Sandia below Wetlands	08/05	F	CS	< 0.07	40.8	82.6	< 1.96	< 0.906	0.685	< 2.38	< 3.5	58.6	< 0.286	9.09	42.2
Mortandad Canyon (includes Ten-Site Canyon, Cañada del Buey)															
TA-55 NW above Effluent Canyon	08/01	UF	CS	< 0.07	50.4	< 1.7	< 1.88	3.72	0.407	< 2.38	< 3.5	18.2	< 0.014	< 4.38	149
TA-55 NW above Effluent Canyon	07/02	UF	CS	< 0.06	117	1.8	< 2.23	9.15	0.381	< 2.93	< 2.31	26.1	< 0.143	7.42	318
TA-55 NW above Effluent Canyon	07/02	F	CS	< 0.06	< 4.07	< 1.3	< 1.5	< 0.037	< 0.153	< 2.93	< 2.31	14.1	< 0.077	< 1.48	60.3
TA-55 NW above Effluent Canyon	06/27	F	CS	< 0.06	< 2.13	< 1.3	< 0.82	< 0.037	< 0.153	< 2.93	< 2.39	17.9	< 0.077	< 1.39	21.3
MDA L	10/05	UF	CS	< 0.07				< 2.57		< 2.38					
MDA L	10/05	UF	DUP	< 0.07											
MDA L	07/26	UF	CS	< 0.07	99.4	< 1.7	< 2.92	< 1.24	0.896	< 2.38	< 3.5	36	< 0.063	< 3.94	727
MDA L	07/26	F	CS	< 0.07	80.3	< 1.7	< 1.46	< 0.077	0.596	< 2.38	< 3.5	32.7	< 0.014	< 3.04	662
MDA L	07/02	UF	CS	< 0.06	34.3	< 1.3	< 0.82	1.84	0.333	< 2.93	< 2.31	13	< 0.077	< 1.82	105
MDA L	06/07	UF	CS	< 0.04	125	< 1.3	< 4.05	12.3	< 1.31	< 2.93	< 2.31	29.2	< 0.284	6.18	254
MDA L	06/07	UF	DUP					12.6	< 1.31				< 0.077		
MDA L	06/07	F	CS	< 0.04	19.6	< 1.3	< 0.82	2.3	< 0.449	< 2.93	< 2.31	14.4	< 0.077	< 1.14	82.7
MDA L	05/28	UF	CS	< 0.06	64	< 3.1	< 2.87	< 1.73	< 0.595	< 2.8	< 2.95	27.6	< 0.077	< 3.39	212
MDA L	05/28	UF	DUP		69.8	< 1.5	< 2.33	< 1.69	< 0.574	< 2.8	< 2.95	29.8	< 0.077	< 3.43	215
MDA L	05/28	F	CS	< 0.06	41.7	< 2.2	< 1.37	< 0.037	< 0.568	< 2.8	< 2.95	24.9	< 0.077	< 1.67	149
MDA L	04/27	UF	CS	< 0.06	135	< 1.7	< 4.2	9.76	< 0.731	< 2.8	< 2.95	29.4	0.513	7.83	232
MDA L	04/27	UF	DUP	< 0.06				8.85	< 0.55				< 0.077		
MDA L	04/06	UF	CS	< 0.06	65.5	< 3.3	< 1.37	3.07	< 0.494	< 2.8	< 2.95	23.7	< 0.327	< 3.61	205
Pajarito Canyon (includes Twomile, Threemile Canyons)															
Pajarito below SR-501	08/09	UF	CS	< 0.73	35,300	4.2	286	482	0.564	29	9.42	2,690	4.28	468	1,600
Pajarito below SR-501	08/09	F	CS	< 0.07	201	2.8	< 1.36	< 0.296	0.384	< 2.38	2.38	153	< 0.014	< 2.78	5.31
Pajarito above Starmers	08/11	UF	CS	< 0.07	3,850	1.7	47	107	0.329	2.99	< 3.5	376	1.02	100	281

Table 5-12. Trace Metals in Storm Runoff for 2001 (μg/L) (Cont.)

Station Name	Date	Codes[a]		Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Canyon (includes Twomile, Threemile Canyons) (Cont.)															
Pajarito above Starmers	08/11	F	CS	< 0.07	76.3	< 1.7	< 1.2	0.47	0.272	< 2.38	< 3.5	116	< 0.014	4.9	4.72
Pajarito above Starmers	08/05	UF	CS	< 0.07	15,800	< 1.7	111	318	< 1.46	8.98	< 2.29	990	2.53	199	728
Pajarito above Starmers	08/05	F	CS	< 0.07	102	< 1.7	< 1.2	< 0.471	< 0.353	< 2.38	< 3.5	135	< 0.046	< 3.16	7.49
Pajarito above TA-18	08/05	UF	CS	< 0.07	9,910	< 4.1	94	286	< 1.65	8.89	< 4.71	546	2.1	175	813
Pajarito above TA-18	08/05	F	CS	< 0.07	10.8	< 1.5	< 1.2	< 0.781	< 0.462	< 2.38	< 3.5	88.2	< 0.085	< 2.94	5.83
Pajarito above TA-18	07/02	UF	CS	< 0.06	2,600	3.8	26.9	84.5	0.944	< 2.93	3.51	193	0.741	56.2	306
Pajarito above TA-18	07/02	F	CS	< 0.06	132	< 2.3	< 2.26	< 1.01	< 0.654	< 2.93	< 2.31	76.4	< 0.077	< 3.8	7.46
MDA G-1	08/05	UF	CS	< 0.07	1,400	< 1.7	45.3	78.4	< 0.733	< 3.73	< 3.5	190	0.993	105	226
MDA G-2	08/30	UF	CS	< 0.07	4,990	8.1	86.4	132	< 1.8	7.04	12.2	463	0.98	206	866
MDA G-2	08/30	F	CS	< 0.07	< 6.54	< 1.7	< 1.2	< 0.077	< 0.69	< 2.38	< 3.5	120	< 0.014	< 3.63	25.7
MDA G-3	08/30	UF	CS	< 0.07	131	3.0	3.51	4.13	< 1.72	< 2.38	2.74	96.7	0.626	8.83	127
MDA G-3	08/30	UF	DUP	< 0.07				4.09	< 1.73				< 0.172		
MDA G-3	08/30	F	CS	< 0.07	< 1.22	2.3	< 1.2	< 0.077	< 1.7	< 2.38	2.28	86.3	< 0.014	< 2.02	43.2
MDA G-3	08/04	UF	CS	< 0.07	535	< 1.4	11.2	20.5	< 1.17	< 2.38	< 3.5	338	< 0.391	26.5	203
MDA G-3	08/04	F	CS	< 0.07	< 3	< 1.7	< 1.2	< 0.077	< 0.612	< 2.38	< 3.5	288	< 0.034	< 2.64	7.26
MDA G-3	08/01	UF	CS	< 0.07	172	< 3.8	< 2.91	3.15	2.13	< 2.38	< 3.5	247	< 0.265	7.42	116
MDA G-3	08/01	F	CS	< 0.07	80.8	< 2.1	< 1.39	< 0.077	2.12	< 2.38	< 3.5	229	< 0.014	< 2.31	41.8
MDA G-3	07/13	UF	CS	< 0.06	285	< 2.5	< 4.78	4.88	3.06	< 3.49	< 1.94	364	0.441	11.2	159
MDA G-3	07/13	F	CS	< 0.06	196	< 2.7	< 2.32	< 0.2	3.29	< 3.49	< 1.94	359	0.264	< 4.06	75.2
MDA G-3	07/02	UF	CS	< 0.06	992	3.1	< 4.07	5.86	1.61	< 2.93	< 2.31	1,750	< 0.185	15.2	125
MDA G-3	07/02	F	CS	< 0.06	861	< 2.7	< 1.76	< 0.037	< 1.36	< 2.93	< 2.31	1,680	< 0.077	< 4.68	47.9
MDA G-3	06/07	UF	CS	< 0.04	511	< 3.8	13.7	22	2.55	< 2.93	< 2.31	168	< 0.105	33.9	257
MDA G-3	06/07	F	CS	< 0.04	99.9	< 3.7	< 2.16	2.14	2.91	< 3.37	< 2.31	125	< 0.077	6	15.7
MDA G-4	10/05	UF	CS	< 0.07				< 3.36		< 2.38					
MDA G-4	08/04	UF	CS	< 0.07	591	< 1.7	13.3	25.3	3.94	< 2.38	< 2.3	128	0.543	28.5	260
MDA G-4	07/26	F	CS	< 0.07	25.4	< 1.7	< 1.32	< 0.077	7.44	< 2.38	< 3.5	58.8	< 0.014	< 4.31	18
MDA G-4	07/17	UF	CS	< 0.07	104	< 1.7	< 3.58	4.48	7.46	< 2.38	< 3.5	67.7	< 0.014	9.29	79.7
MDA G-4	07/13	UF	CS	< 0.06	79.8	< 1.2	< 3.42	3.35	7.86	< 3.49	< 1.94	70.4	0.336	7.04	57.8
MDA G-4	07/13	F	CS	< 0.06	< 5.45	< 1.2	< 1.78	< 0.188	7.71	< 3.49	< 1.94	58.1	0.187	< 3.42	17.4
MDA G-4	07/02	UF	CS	< 0.06	365	2.4	7.42	14.1	3.94	< 2.93	< 2.31	160	< 0.169	18.4	190
MDA G-4	07/02	F	CS	< 0.06	< 1.55	< 1.3	< 1.2	< 0.037	3.14	< 2.93	< 2.31	102	< 0.077	< 2.06	7.39
MDA G-4	06/27	UF	CS	< 0.06	362	< 1.3	9.45	18.1	8.53	< 2.93	< 2.31	111	< 0.087	22.1	259
MDA G-4	06/27	F	CS	< 0.06	10.5	< 1.3	< 1.2	< 0.037	9.01	< 2.93	< 2.93	52.3	< 0.077	< 3.12	10.7
MDA G-4	06/07	UF	CS	< 0.04	615	< 3.0	18.9	27.7	6.98	< 3.39	< 2.31	150	0.831	40.9	434
MDA G-4	06/07	UF	DUP	< 0.04	613	< 1.6	17.9	27.4	7.2	< 2.93	< 2.31	152	< 0.364	39.8	439
MDA G-4	06/07	F	CS	< 0.04	40.4	< 4.3	< 1.75	2.27	8.16	< 3.14	< 2.31	57.7	< 0.077	< 3.43	15.4
MDA G-4	04/06	UF	CS	< 0.06	221	< 1.9	6.83	10.6	3.69	< 2.8	< 2.95	74.2	< 0.419	15.5	114
MDA G-4	04/06	F	CS	0.20	26.8	< 2.8	< 1.37	< 1.31	4.49	< 2.8	< 2.95	44.2	< 0.369	< 4.08	14.4
Pajarito above SR-4	08/16	UF	CS	< 0.17	1,820	< 3.8	26.8	84.4	0.365	< 2.38	2.09	242	0.862	58.9	223
Pajarito above SR-4	08/16	F	CS	< 0.15	17.5	< 3.4	< 1.49	0.979	0.114	< 2.38	3.38	99.2	< 0.014	< 3.13	6.35
Pajarito above SR-4	08/09	UF	CS	< 0.07	8,380	4.0	127	271	0.209	16.9	< 2.74	635	2.94	210	632
Pajarito above SR-4	08/09	UF	DUP	< 0.07	8,290	< 3.3	125	274	< 0.057	14.8	29.5	637	2.46	212	624
Pajarito above SR-4	08/09	F	CS	< 0.07	158	3.1	< 2.64	1.51	0.443	< 5	< 3.5	185	< 0.014	< 4.1	5.47

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Canyon (includes Twomile, Threemile Canyons) (Cont.)															
Pajarito above SR-4	08/09	F	DUP	< 0.07	155	< 3.0	< 1.88	< 0.233	< 0.446	< 4.76	< 3.5	182	< 0.014	< 3.36	5.9
Pajarito above SR-4	08/06	UF	CS	< 0.07	8,140	3.9	132	225	0.291	11.1	2.86	660	2.54	243	734
Pajarito above SR-4	08/06	UF	DUP	< 0.07	7,880	< 3.4	129	235	< 0.325	6.85	< 2.56	648	2.74	235	720
Pajarito above SR-4	08/06	F	CS	< 0.07	592	3.0	< 2.72	0.495	0.464	< 2.38	< 3.5	208	0.022	< 3.55	7.65
Pajarito above SR-4	08/06	F	DUP	< 0.07	588	< 2.7	< 2.05	< 0.395	< 0.449	< 2.38	< 3.5	207	< 0.014	< 3.44	6.38
Pajarito above SR-4	06/27	UF	CS	< 0.06	3,150	< 3.6	32.7	83.1	0.55	< 2.93	< 3.69	438	0.696	66.1	817
Pajarito above SR-4	06/27	F	CS	< 0.06	184	< 3.5	< 1.91	< 0.037	0.352	< 2.93	< 2.31	234	< 0.077	< 2.48	6.36
Water Canyon (includes Cañon de Valle, Potrillo, Fence, Indio Canyons)															
Water above SR-501	07/22	UF	CS	< 0.07	38,500	3.6	246	312	< 0.598	9.55	7.12	3,040	3.3	338	1,540
Water above SR-501	07/22	UF	DUP		39,600	< 4.0	343			9.17	12	3,300		455	2,040
Water above SR-501	07/22	F	CS	< 0.07	2,270	4.3	< 2.68	< 1.24	< 0.752	< 2.38	< 3.5	351	< 0.274	12.5	9.49
Cañon de Valle above SR-501	07/26	UF	CS	< 0.07	35,200	< 2.6	115	615	0.482	10.6	< 5.47	2,170	5.12	177	907
Cañon de Valle above SR-501	07/26	F	CS	< 0.07	12,200	< 1.7	21.7	11.3	0.502	< 2.38	< 3.5	1,770	0.406	17.4	342
S Site Canyon above Water	08/03	UF	CS	< 0.07	3,170	3.0	40.2	145	0.454	5.79	2.33	226	1.46	94	266
S Site Canyon above Water	08/03	F	CS	< 0.07	278	1.3	< 1.2	0.598	0.35	< 2.38	< 3.5	40.5	< 0.014	< 3.2	8.09
Cañon de Valle above Water	08/09	UF	CS	< 0.07	29,600	3.3	318	684	0.219	24.4	< 9.48	1,670	5.14	420	1,690
Cañon de Valle above Water	08/09	F	CS	< 0.73	460	2.9	< 2.24	1.12	0.139	< 2.38	< 3.5	150	< 0.014	< 3.27	7.49
Cañon de Valle above Water	08/05	UF	CS	< 0.07	38,700	< 1.7	301	543	0.435	14.9	< 3.5	2,210	4.73	384	1,880
Cañon de Valle above Water	08/05	F	CS	< 0.07	1,290	2.9	7.36	8.92	0.41	< 2.38	< 3.5	246	0.067	15.6	43.4
Water below MDA AB	08/08	UF	CS	< 0.07	26,400	3.3	261	687	0.374	27.1	< 8.11	1,650	5.49	405	1,470
Water below MDA AB	08/08	F	CS	< 0.73	46.4	2.1	< 1.2	0.93	0.15	< 3.56	< 3.5	150	< 0.014	< 4.4	9.14
Water below MDA AB	08/03	UF	CS	< 0.07	8,350	5.0	86.8	121	0.369	8.43	5.76	561	1.29	197	608
Water below MDA AB	08/03	F	CS	< 0.07	1,060	< 1.7	< 1.41	1.16	0.29	< 2.38	< 3.5	111	0.054	< 3.1	22.6
Water below MDA AB	07/26	UF	CS	< 0.07	71,500	< 1.7	530	1110	1.31	8.52	< 5.83	6,040	8.98	253	3,370
Water below MDA AB	07/26	F	CS	< 0.07	593	< 4.2	< 1.2	0.261	0.424	< 3.81	< 3.5	256	< 0.014	< 2.65	7.18
Water at SR-4	08/09	UF	CS	< 0.07	26,500	2.3	135	228	0.398	9.1	3.08	1,610	2.56	165	915
Water at SR-4	08/09	F	CS	< 0.07	442	3.3	< 1.78	< 1.02	0.425	< 2.38	< 3.5	127	< 0.014	< 3.59	8.08
Water at SR-4	08/03	UF	CS	< 0.07	26,400	6.4	231	124	0.412	14.7	18.7	1,720	1.5	390	1,610
Water at SR-4	08/03	UF	CS	< 0.07	5,210	4.0	60.4	159	0.375	< 2.38	5.27	380	1.9	135	410
Water at SR-4	08/03	F	CS	< 0.07	118	2.6	< 1.2	0.433	0.276	< 2.38	< 3.5	55.7	0.028	< 4.17	< 3.59
Water at SR-4	07/26	UF	CS	< 0.07	47,100	< 4.4	251	797	0.937	11.5	11.8	4,290	5.73	415	1,350
Water at SR-4	07/26	F	CS	< 0.07	15,900	< 4.6	212	42.1	0.099	8.94	< 8.92	1,440	0.321	388	1,020
Water below SR-4	08/09	UF	CS	< 0.07	29,500	4.2	251	392	0.474	28.8	10.2	1,810	4.07	364	1,500
Water below SR-4	08/09	F	CS	< 0.07	1,170	4.1	< 2.78	< 1.17	0.416	< 2.38	< 3.5	157	< 0.014	7.01	8.84
Water below SR-4	08/03	UF	CS	< 0.07	26,800	5.3	243	185	0.412	16	16.2	1,720	1.82	408	1,620
Water below SR-4	08/03	UF	CS	< 0.07	4,970	3.7	61.2	154	0.52	5.55	3.21	373	1.82	127	418
Water below SR-4	08/03	F	CS	< 0.07	196	2.1	< 1.2	0.751	0.322	< 2.38	< 3.5	57.4	0.028	< 4.53	6.25
Potrillo tributary Study Area	08/30	UF	CS	< 0.07	11,800	7.4	383	510	< 1.9	17.6	22.2	1,160	8.89	794	1,590
Potrillo tributary Study Area	08/30	UF	DUP		12,100	< 7.1	390			12.7	24.1	1,180		797	1,610
Potrillo tributary Study Area	08/30	F	CS	< 0.07	137	1.5	2.45	< 0.21	< 0.48	< 2.38	< 3.5	104	< 0.014	9.74	28.8
Potrillo tributary Study Area	08/11	UF	CS	< 0.07	8,270	1.2	261	288	0.075	5.45	< 3.5	909	5.09	355	990
Potrillo tributary Study Area	08/11	F	CS	< 0.07	43	< 1.7	< 1.2	0.137	0.458	< 2.38	< 3.5	90.9	< 0.014	11.2	3.41

Table 5-12. Trace Metals in Storm Runoff for 2001 (µg/L) (Cont.)

Station Name	Date	Codes[a]		Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Ancho Canyon															
Ancho Canyon spring tributary below SR-4	08/12	UF	CS	< 0.07	3,140	1.3	123	179	0.121	2.19	< 3.5	440	2.93	219	468
Ancho Canyon spring tributary below SR-4	08/12	F	CS	< 0.07	17.7	< 1.7	< 1.2	0.342	0.252	< 2.38	< 3.5	51.7	< 0.014	7.92	12.4
Water Quality Standards[c]															
EPA Primary Drinking Water Standard				2			100		6	50			2		
EPA Secondary Drinking Water Standard					50										5,000
EPA Action Level								15							
EPA Health Advisory												25,000–90,000		80-110	
NMWQCC Livestock Watering Standard				10				100		50				100	25,000
NMWQCC Groundwater Limit				2	200	1,000	200	50		50					10,000
NMWQCC Wildlife Habitat Standard				0.77						5					

[a]Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.
[b]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.
[c]Standards given here for comparison only; see Appendix A. Note that New Mexico Livestock Watering and Groundwater limits mostly are based on dissolved concentrations, whereas many of these analyses are of unfiltered samples; thus, concentration may include suspended sediment quantities.

Table 5-13. Summary of TA-50 Radionuclide, Nitrate, Fluoride, and Perchlorate Discharges[a]

	1963–1977	1999			2000			2001		
Radionuclide	Total Activity Released (mCi)[b]	Total Annual Activity (mCi)	Mean Activity (pCi/L)	Ratio of Activity to DCG[c]	Total Annual Activity (mCi)	Mean Activity (pCi/L)	Ratio of Activity to DCG[c]	Total Annual Activity (mCi)	Mean Activity (pCi/L)	Ratio of Activity to DCG[c]
^{3}H	25,150	485	24,252	0.01	907	48,713	0.024	126	9,297	0.0046
^{241}Am	7	1.1	55.0	1.83	0.041	2.25	0.075	0.056	4.11	0.1370
^{137}Cs	848	1.5	76.9	0.026	3.1	166.7	0.056	0.213	15.7	0.0052
^{238}Pu	51	2.4	121.3	3.03	0.063	3.39	0.085	0.074	5.46	0.1365
$^{239,240}Pu$	39	1.40	70.0	2.33	0.035	1.86	0.062	0.024	1.79	0.0597
^{89}Sr	<1	0.36	18.2	0.0009	0.332	17.8	0.0009	0.039	2.91	0.0001
^{90}Sr	295	0.52	26.0	0.026	0.170	9.1	0.009	0.029	2.14	0.0021
^{234}U	NA	0.17	8.6	0.017	0.037	1.98	0.004	0.027	2.03	0.0041
^{235}U	2	0.0047	0.24	0.0004	0.016	0.86	0.0014	0.0016	0.12	0.0002

Constituent	Total Annual Mass (kg)	Mean Concentration (mg/L)	Ratio of Concentration to MCL[d]	Total Annual Mass (kg)	Mean Concentration (mg/L)	Ratio of Concentration to MCL[d]	Total Annual Mass (kg)	Mean Concentration (mg/L)	Ratio of Concentration to MCL[d]
NO_4-N	486	24.2	2.4	46.6	2.50	0.25	52.5	3.86	0.39
F	22.6	1.12	0.7	5.29	0.28	0.17	9.96	0.73	0.46
ClO_4	No data			4.74	0.254	No standard	2.29	0.169	No standard
Total annual effluent volume (×10^7 liters)	2.00			1.86			1.36		

[a]Compiled from Radioactive Liquid Waste Group (FWO-RLW) Annual Reports. Data for 2001 are preliminary.
[b]DOE 1979; decay corrected through 12/77.
[c]Public dose limit.
[d]New Mexico Groundwater Limit.

Table 5-14. Radiochemical Analysis of Sediments for 2001 (pCi/g[a])

			^{3}H (pCi/L)			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U		
Station	**Date**	**Code**	**Result**	**Uncert**	**MDA[b]**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Regional Stations																				
Rio Chama at Chamita	06/20	CS	–27	42.5	151	0.0455	0.0287	0.123	0.0549	0.0399	0.0564	0.344	0.0331	0.0136	0.024	0.0064	0.0108	0.34	0.0327	0.0108
Rio Chama at Chamita	06/20	DUP	26.2	42.6	147															
Rio Grande at Embudo	06/20	CS	54.7	45.1	153	0.0265	0.0284	0.129	0.109	0.0176	0.0349	0.545	0.0489	0.0178	0.126	0.0171	0.0122	0.508	0.0461	0.0122
Rio Grande at Otowi (bank)	07/11	CS	–64.7	59.8	216	–0.0855	0.0617	0.319	0.0379	0.014	0.0348	0.567	0.0677	0.0584	0.0342	0.0132	0.0132	0.515	0.0631	0.0452
Rio Grande at Frijoles (bank)	09/26	CS	–138	56	204	–0.0668	0.053	0.252	0.111	0.0172	0.0316	0.533	0.0613	0.0316	0.0564	0.0171	0.0317	0.585	0.0656	0.0399
Rio Grande at Cochiti	09/26	CS	–164	54.8	203	0.0079	0.0603	0.271	0.114	0.0181	0.0309	0.325	0.0401	0.043	0.0132	0.0094	0.0329	0.373	0.0428	0.0225
Rio Grande at Bernalillo	06/06	CS	80.6	48.9	164	0.0597	0.0396	0.163	0.062	0.0133	0.0345	0.606	0.0651	0.0413	0.0351	0.0146	0.0462	0.594	0.0642	0.0413
Jemez River	06/06	CS	80.3	61.5	209	–0.0304	0.0481	0.232	0.032	0.0108	0.024	0.392	0.0488	0.068	0.0238	0.011	0.0337	0.41	0.0484	0.0266
Jemez River	06/06	DUP	–27.2	58.6	212															
Reservoirs on Rio Chama (New Mexico)																				
Heron Upper	08/30	CS				0.208	0.0928	0.36	0.299	0.044	0.0585	0.792	0.0862	0.0676	0.0362	0.0139	0.014	0.856	0.0909	0.0479
Heron Upper	08/30	CS				0.0366	0.0699	0.32	0.225	0.0219	0.0351	0.837	0.0874	0.0444	0.0575	0.0181	0.0446	0.71	0.0775	0.0352
Heron Upper	08/30	DUP				0.0097	0.0687	0.323	0.252	0.0366	0.0504	0.818	0.089	0.0902	0.096	0.0247	0.0559	0.725	0.0805	0.014
Heron Middle	08/30	CS				–0.0342	0.0808	0.386	0.255	0.0325	0.0578	0.974	0.103	0.106	0.0652	0.0216	0.0654	1.18	0.117	0.0504
Heron Lower	08/30	CS				–0.0709	0.0584	0.295	0.251	0.0302	0.0584	1.28	0.127	0.0431	0.109	0.027	0.0432	1.65	0.155	0.0159
El Vado Lower	08/30	CS				0.187	0.103	0.414	0.245	0.0291	0.0493	1.17	0.116	0.0637	0.0904	0.0247	0.0639	1.53	0.143	0.0493
El Vado Middle	08/30	CS				0.0999	0.0903	0.392	0.218	0.0212	0.034	1.09	0.11	0.0714	0.0078	0.0196	0.113	1.1	0.112	0.0586
El Vado Upper	08/30	CS				–0.0368	0.0715	0.347	0.224	0.0309	0.0565	0.98	0.104	0.0804	0.0686	0.0216	0.0531	0.935	0.0999	0.0529
Abiquiu Upper	08/20	CS				0.0131	0.0229	0.0766	0.0886	0.0236	0.0499	0.968	0.0844	0.0244	0.0449	0.015	0.0396	0.9	0.0799	0.0371
Abiquiu Middle	08/20	CS				0.0581	0.0263	0.0821	0.328	0.0322	0.0487	0.94	0.0984	0.0395	0.0385	0.0161	0.0396	1.03	0.105	0.0145
Abiquiu Lower	08/20	CS				–0.0086	0.0241	0.0817	0.208	0.0211	0.0348	1.15	0.107	0.0475	0.06	0.0206	0.0596	1.06	0.1	0.0659
Reservoirs on Rio Grande (Colorado)																				
Rio Grande Upper	10/16	CS				0.029	0.064	0.293	0.669	0.0618	0.0696	1.35	0.117	0.0405	0.044	0.0224	0.0701	1.1	0.0994	0.0507
Rio Grande Upper	10/16	DUP																		
Rio Grande Middle	10/16	CS				0.0966	0.0733	0.316	1.06	0.0753	0.0407	1.13	0.0997	0.0498	0.101	0.0216	0.0413	0.888	0.0818	0.0231
Rio Grande Lower	10/16	CS				–0.0167	0.0612	0.293	0.306	0.0279	0.0445	1.03	0.0926	0.0089	0.108	0.0208	0.0241	0.996	0.0904	0.024
Reservoirs on Rio Grande (New Mexico)																				
Cochiti Upper	08/22	CS				0.0646	0.028	0.0863	0.507	0.0403	0.0456	1.06	0.0982	0.0441	0.0848	0.0187	0.01	1.03	0.0952	0.01
Cochiti Upper	08/22	DUP				0.0583	0.0261	0.0793				1.06	0.0964	0.0257	0.0642	0.0168	0.0325	1.09	0.099	0.0324
Cochiti Middle	08/22	CS				0.0969	0.0222	0.061	0.739	0.0466	0.0391	1.16	0.102	0.0296	0.0473	0.0155	0.0419	1.16	0.102	0.0234
Cochiti Middle	08/22	CS				0.0775	0.0224	0.0659	0.66	0.0348	0.0384	1.16	0.101	0.0227	0.0701	0.0173	0.0372	1.31	0.112	0.0371
Cochiti Lower	08/22	CS				0.0583	0.0279	0.0873	1.09	0.0694	0.0313	0.993	0.0873	0.0364	0.0896	0.0173	0.0205	1.04	0.0902	0.0204
Perimeter Stations																				
Rio Grande at Sandia	09/24	CS	–135	54.9	200	0.118	0.0589	0.236	0.23	0.0192	0.0237	0.582	0.0592	0.0398	0.0369	0.0116	0.0224	0.748	0.0713	0.0365
Rio Grande at Mortandad	09/24	CS	–135	54.7	200	0.0993	0.0613	0.25	0.143	0.0229	0.0384	0.332	0.0407	0.0432	0.0344	0.012	0.0285	0.322	0.0391	0.0284
Rio Grande at Pajarito	09/25	CS	–218	52.9	202	0.0644	0.0651	0.279	0.119	0.0188	0.0297	0.409	0.0444	0.0256	0.0258	0.0107	0.0298	0.354	0.04	0.0203
Rio Grande at Water	09/25	CS	–136	55.2	202	–0.0379	0.0397	0.187	0.0603	0.0196	0.0354	0.48	0.0522	0.0299	0.0484	0.0152	0.0348	0.364	0.0429	0.0237
Rio Grande at Ancho	09/25	CS	–110	56.4	203	–0.0766	0.0434	0.208	0.0302	0.0112	0.025	0.385	0.0457	0.0396	0.0396	0.0143	0.0356	0.313	0.0392	0.0242
Rio Grande at Chaquehui	09/25	CS	–137	55.6	203	0.0546	0.0533	0.229	0.269	0.0271	0.0398	0.711	0.0659	0.0194	0.0533	0.0129	0.0195	0.74	0.0681	0.0245
Pajarito Plateau Stations																				
Guaje Canyon:																				
Guaje Reservoir	10/12	CS				0.16	0.0716	0.28	0.509	0.0477	0.0564	1.24	0.11	0.0534	0.0642	0.0166	0.0263	1.32	0.116	0.0262
Guaje Reservoir	10/12	DUP				0.0504	0.0637	0.285				1.16	0.106	0.0619	0.175	0.0307	0.0488	1.02	0.0962	0.0557
Guaje Canyon at SR-502	07/11	CS	–64.5	59.6	216	0.396	0.104	0.299	0.0863	0.0238	0.0696	0.563	0.0738	0.0679	0.0481	0.0217	0.076	0.623	0.0787	0.0586
Guaje Canyon at SR-502	07/11	CS	53.7	104	359	0.0831	0.061	0.266	0.601	0.0551	0.0603	0.891	0.0949	0.0385	0.0472	0.0161	0.0142	1.05	0.107	0.0142
Bayo Canyon:																				
Bayo at SR-502	07/11	CS	139	92	310	0.0573	0.0651	0.296	0	0.019	0.0546	0.625	0.0776	0.0559	0.0387	0.0166	0.0445	0.597	0.0755	0.0648
Acid/Pueblo Canyons:																				
Acid Weir	06/12	CS	267	53.9	163	0.243	0.0781	0.218	0.795	0.0691	0.0761	0.829	0.132	0.141	0.0305	0.0217	0.0413	1.03	0.151	0.112
Acid Weir	06/12	DUP										0.828	0.12	0.129	0.0393	0.0247	0.129	0.802	0.117	0.144

Table 5-14. Radiochemical Analysis of Sediments for 2001 (pCi/g[a]) (Cont.)

			^{3}H (pCi/L)			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U		
Station	**Date**	**Code**	**Result**	**Uncert**	**MDA[b]**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Pajarito Plateau Stations (Cont.)																				
Acid/Pueblo Canyons (Cont.):																				
Pueblo 1 R	06/12	CS	179	98.2	328	0.0281	0.0336	0.153	0.433	0.0241	0.0401	0.436	0.0446	0.0254	0.0118	0.0072	0.022	0.406	0.0423	0.0254
Pueblo 2	06/12	CS	399	148	487	0.076	0.032	0.125	0.278	0.0538	0.0727	0.67	0.0644	0.0264	0.0512	0.0132	0.021	0.71	0.0673	0.0264
Pueblo 2	06/12	CS	398	148	486	0.0875	0.0449	0.173	0.349	0.0293	0.0394	0.912	0.134	0.0374	0.0626	0.0317	0.129	0.884	0.131	0.0374
Hamilton Bend Spring	06/12	CS	544	298	996	0.119	0.0415	0.154	0.483	0.0365	0.0481	0.98	0.135	0.149	0.0343	0.0219	0.0915	0.874	0.125	0.115
Pueblo 3	06/12	CS	53.8	48.2	164	0.386	0.0746	0.142	2.05	0.122	0.0572	1.26	0.157	0.108	0.0669	0.0291	0.0855	1.32	0.162	0.0852
Pueblo 3	06/12	DUP							2.11	0.134	0.0708									
Pueblo at SR-502	06/12	CS	160	50.9	163	0.222	0.0541	0.131	1.26	0.0782	0.0564	1.39	0.124	0.0728	0.09	0.0202	0.0276	1.21	0.109	0.0347
DP/Los Alamos Canyons:																				
Los Alamos at Bridge	06/26	CS	137	54.4	178	0.0408	0.0755	0.344	0.891	0.0583	0.0317	0.69	0.0689	0.0569	0.0566	0.0208	0.0592	0.684	0.068	0.0498
Los Alamos at Bridge	06/26	DUP	222	64.6	206	–0.014	0.0622	0.298	0.839	0.0569	0.0334									
Los Alamos at Bridge	06/26	CS	125	61.4	204	0.0945	0.0771	0.332	0.901	0.0539	0.0361	0.8	0.0747	0.0557	0.0639	0.0141	0.0075	0.811	0.0744	0.0333
Los Alamos at LAO-1	06/26	CS	2,470	110	203	0.135	0.0793	0.326	0.346	0.0352	0.0512	0.683	0.0662	0.0222	0.0394	0.0113	0.0082	0.692	0.0667	0.0082
Los Alamos at Upper GS	06/26	CS	1,160	85.4	203	0.0879	0.0718	0.31	0.47	0.0428	0.0586	1.24	0.133	0.0535	0.051	0.0285	0.0876	1.13	0.126	0.0873
DPS-1	06/26	CS	3,030	118	201	1.82	0.322	0.235	0.145	0.0213	0.0383	0.555	0.0599	0.042	0.0526	0.0238	0.0726	0.458	0.0529	0.0493
DPS-4	06/26	CS	676	74	200	0.561	0.122	0.292	1.36	0.0863	0.0302	1.09	0.0983	0.0519	0.0394	0.0126	0.0242	1.09	0.0977	0.0304
Los Alamos at LAO-3	06/26	CS	188	63	203	–0.0163	0.064	0.307	1.07	0.0708	0.0338	1.12	0.0983	0.0224	0.0335	0.012	0.0283	1.03	0.0914	0.0082
Los Alamos at LAO-4.5	06/27	CS	340	66.4	201	0.126	0.0678	0.271	0.885	0.0598	0.0435	0.787	0.0732	0.0344	0.0344	0.0117	0.0267	0.778	0.0724	0.0266
Los Alamos at SR-4	06/26	CS	827	175	538	0.083	0.0655	0.279	1.35	0.0969	0.0576	0.936	0.0901	0.0359	0.031	0.0214	0.0703	0.878	0.0861	0.0464
Los Alamos at Totavi	07/11	CS	64.9	63.6	217	0.196	0.0706	0.26	0.539	0.0472	0.0556	1.39	0.138	0.101	0.0718	0.0222	0.0521	1.48	0.143	0.0602
Los Alamos at Totavi	07/11	CS	200	69	223	0.194	0.0736	0.278	0.585	0.0459	0.0618	1.21	0.122	0.0516	0.0546	0.0195	0.0517	0.971	0.103	0.0516
Los Alamos at Otowi	07/11	CS	40.2	77.7	269	–0.0112	0.0688	0.333	0.259	0.0318	0.0442	0.768	0.0867	0.0586	0.0513	0.018	0.0402	0.92	0.099	0.0713
Los Alamos at Otowi	07/11	DUP	64.1	62.8	215	0.0483	0.0523	0.238	0.274	0.0299	0.0578	1.18	0.114	0.0347	0.0689	0.0202	0.044	1.01	0.101	0.0128
Sandia Canyon:																				
Sandia at SR-4	07/11	CS	1,270	335	1,060	0.0223	0.0491	0.233	0	0.0371	0.0463	0.98	0.11	0.104	0.0877	0.0357	0.14	0.688	0.0941	0.212
Sandia at Rio Grande	09/24	CS	659	119	265	0.0512	0.0554	0.239	–0.0004	0.0093	0.0317	0.484	0.0559	0.0416	0.012	0.0085	0.0285	0.398	0.0483	0.0105
Sandia at Rio Grande	09/24	DUP				0.0394	0.0419	0.18	0.0161	0.0085	0.0207	0.449	0.0498	0.0434	0.0101	0.014	0.0514	0.532	0.0558	0.0403
Mortandad Canyon:																				
Mortandad near CMR Building	06/19	CS				0.0199	0.0244	0.112	0.0597	0.0192	0.0425	0.518	0.0495	0.0056	0.0234	0.0075	0.0152	0.475	0.0463	0.0056
Mortandad near CMR Building	06/19	DUP										0.511	0.0474	0.0212	0.0532	0.0113	0.0191	0.439	0.0418	0.013
Mortandad west of GS-1	06/19	CS	543	448	1,520	0.0687	0.034	0.138	0.0855	0.0167	0.0371	0.354	0.0406	0.0248	0.021	0.0092	0.0289	0.394	0.0441	0.035
Mortandad west of GS-1	06/19	DUP																		
Mortandad at GS-1	06/19	CS	5,940	132	152	0.86	0.129	0.143	27.9	0.17	0.0693	0.598	0.054	0.0311	0.037	0.0112	0.0349	0.559	0.0511	0.0283
Mortandad at GS-1	06/19	DUP				1.09	0.172	0.147												
Mortandad at MCO-5	06/19	CS	3,220	505	1,500	0.694	0.105	0.125	15.6	0.749	0.0566	0.45	0.042	0.0177	0.033	0.0077	0.0045	0.387	0.0373	0.0121
Mortandad at MCO-7	06/19	CS	794	443	1,480	1.25	0.196	0.129	8.22	0.476	0.0516	0.869	0.0761	0.0058	0.0488	0.0123	0.0303	0.762	0.0686	0.034
Mortandad at MCO-8.5	06/19	CS	2,890	581	1,790	0.542	0.0841	0.115	4.46	0.236	0.0314	0.54	0.0512	0.0219	0.0487	0.0113	0.022	0.522	0.0497	0.0055
Mortandad at MCO-8.5	06/19	DUP																		
Mortandad at MCO-8.5	06/19	CS	2,690	493	1,500	0.381	0.0668	0.136	3.11	0.0614	0.0505	0.537	0.0517	0.0302	0.0662	0.0135	0.0231	0.443	0.0445	0.023
Mortandad at MCO-9	06/19	CS	1,970	151	380	1.57	0.249	0.149	5.69	0.291	0.0492	1.07	0.0939	0.0067	0.0754	0.0152	0.0229	1.15	0.0996	0.0181
Mortandad at MCO-13 (A-5)	06/19	CS	945	239	756	0.38	0.0658	0.119	0.714	0.0466	0.0358	1.26	0.106	0.0269	0.0654	0.0139	0.027	1.21	0.102	0.0165
Mortandad A-6	07/11	CS	281	74.3	235	0.759	0.137	0.245	3.16	0.201	0.0719	1.82	0.167	0.0397	0.0693	0.0214	0.0503	1.96	0.178	0.0502
Mortandad A-7	07/11	CS	1,900	655	2,120	–0.0155	0.0548	0.268	0.103	0.0434	0.063	1.25	0.125	0.0733	0.128	0.0294	0.0521	1.16	0.118	0.0602
Mortandad at SR-4 (A-9)	07/11	CS	1,760	352	1,070	0.013	0.0533	0.256	0.18	0.0417	0.0826	1.2	0.124	0.0738	0.0702	0.0223	0.0453	1.35	0.136	0.0166
Mortandad at Rio Grande (A-11)	09/24	CS	–82.6	57.3	204	–0.0291	0.0558	0.257	0.0112	0.0101	0.0366	0.388	0.0496	0.0493	0.0416	0.0145	0.0303	0.333	0.0438	0.0111
Mortandad at Rio Grande (A-11)	09/24	DUP	–55.9	58.9	207															
TA-54 Area G:																				
MDA G-0	05/30	CS	1660	132	358	0.0966	0.0554	0.226	0.0904	0.0287	0.0498	0.816	0.0755	0.0311	0.0319	0.0122	0.0312	0.822	0.0758	0.0269
MDA G-1	05/31	CS	393	111	360	0.144	0.066	0.257	0.0724	0.014	0.0259	0.471	0.0485	0.0281	0.0288	0.0104	0.0244	0.468	0.0482	0.0243
MDA G-1	05/31	CS	197	108	361	0.0344	0.0601	0.273	0.0448	0.0132	0.0245	0.706	0.0721	0.0348	0.0536	0.0153	0.0276	0.659	0.0683	0.0101
MDA G-2	05/31	CS	147	158	538	0.0431	0.0337	0.145	0.0632	0.0194	0.0369	0.556	0.0635	0.0846	0.0276	0.0136	0.0466	0.58	0.0634	0.0464
MDA G-2	05/31	DUP	730	168	535															
MDA G-3	05/31	CS	1,280	126	360	0.0374	0.053	0.238	0.118	0.0125	0.021	0.614	0.0661	0.06	0.0464	0.0182	0.0602	0.73	0.0744	0.0454

Table 5-14. Radiochemical Analysis of Sediments for 2001 (pCi/g[a]) (Cont.)

			^{3}H (pCi/L)			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U		
Station	Date	Code	Result	Uncert	MDA[b]	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Pajarito Plateau Stations (Cont.)																				
TA-54 Area G (Cont.):																				
MDA G-4 R-1	05/31	CS	19,200	302	271	–0.0157	0.041	0.201	0.227	0.0338	0.0509	1.06	0.107	0.0668	0.0577	0.0186	0.0376	0.949	0.098	0.0375
MDA G-4 R-1	05/31	DUP				0.0739	0.0504	0.212	0.221	0.0174	0.0261									
MDA G-4 R-2	05/31	CS	9,930	207	270	0.204	0.0616	0.19	0.419	0.0339	0.036	1.17	0.116	0.0998	0.0711	0.0221	0.0553	1.13	0.113	0.0769
MDA G-5	05/31	CS	3,570	217	545	0.048	0.0448	0.196	0.0732	0.0163	0.0384	1.05	0.102	0.0961	0.0457	0.0225	0.0837	1.01	0.0981	0.0461
MDA G-6 R	05/31	CS	1,770	187	539	0.0479	0.0393	0.17	0.0955	0.0213	0.0315	1.06	0.102	0.0632	0.0167	0.015	0.0634	1.12	0.106	0.0391
MDA G-7	05/31	CS	2,350	143	358	0.107	0.0438	0.165	0.325	0.031	0.0331	0.796	0.0811	0.0604	0.0697	0.0181	0.0297	0.792	0.0802	0.0433
MDA G-7	05/31	DUP										0.818	0.0826	0.0803	0.0221	0.0139	0.0442	0.811	0.08	0.0441
MDA G-7 West	05/31	CS	1,060	179	554	0.0754	0.0373	0.15	0.486	0.0369	0.0307	1.18	0.114	0.0789	0.0325	0.0156	0.0511	1.86	0.164	0.0349
MDA G-8	05/31	CS	492	113	360	0.0086	0.024	0.112	0.157	0.0207	0.0337	0.782	0.0796	0.0561	0.0289	0.0166	0.0633	0.769	0.0785	0.0521
MDA-G-9	05/31	CS	876	325	1,070	–0.0105	0.0433	0.208	0.164	0.0311	0.0624	0.77	0.0801	0.077	0.0251	0.0138	0.0493	0.73	0.0758	0.038
MDA-G-9	05/31	CS				0.023	0.0387	0.176	0.122	0.0235	0.0478	0.805	0.0785	0.0264	0.0108	0.0063	0.0098	0.802	0.0784	0.0333
Cañada del Buey:																				
Cañada del Buey at SR-4	06/05	CS	943	160	494	0.0234	0.0479	0.22	0.0796	0.0135	0.0262	0.956	0.0991	0.0479	0.0273	0.0133	0.038	0.839	0.0902	0.0555
Cañada del Buey at SR-4	06/05	DUP				0.0203	0.0544	0.25	0.0824	0.0291	0.0496									
Pajarito Canyon:																				
Two-Mile at SR-501	06/05	CS				0.227	0.0689	0.192	0.638	0.0304	0.0421	0.532	0.0647	0.0745	0.0134	0.0121	0.0507	0.513	0.0617	0.0346
Pajarito at SR-501	06/05	CS	134	145	492	0.133	0.0571	0.205	0.148	0.0191	0.0332	0.441	0.0559	0.0551	0.0322	0.0124	0.0125	0.442	0.0553	0.0338
Pajarito at SR-4	06/05	CS	242	53.5	164	0.035	0.0478	0.215	0.213	0.0203	0.0243	0.805	0.0931	0.0903	0.0617	0.0274	0.0956	0.863	0.0981	0.1
Pajarito at SR-4	06/05	DUP	240	53	163															
Pajarito at SR-4	06/05	CS	241	53.2	163	0.108	0.0596	0.237	0.309	0.0277	0.0341	1.28	0.123	0.0815	0.0377	0.0193	0.0692	1.11	0.11	0.0587
Pajarito at Rio Grande	09/25	CS	–221	53.7	204	0.0161	0.0639	0.286	0.0605	0.0232	0.0414	0.473	0.0549	0.0523	0.0365	0.0182	0.059	0.315	0.043	0.0588
Potrillo Canyon:																				
Potrillo at SR-4	06/05	CS				0.116	0.0528	0.196	0.207	0.02	0.0312	1.09	0.11	0.0633	0.0793	0.0213	0.0143	1.1	0.11	0.0388
Fence Canyon:																				
Fence at SR-4	06/05	CS				0.163	0.0666	0.238	0.303	0.027	0.0347	1.07	0.107	0.0369	0.0553	0.0171	0.0136	1.08	0.108	0.0369
Cañon de Valle:																				
Cañon de Valle at SR-501	06/05	CS	277	54	169	0.168	0.061	0.204	0.586	0.0455	0.039	0.737	0.0739	0.0338	0.0687	0.018	0.0393	0.746	0.0743	0.0099
Water Canyon:																				
Water at SR-501	06/05	CS	357	101	327	–0.0299	0.0461	0.222	0.296	0.0314	0.0317	0.965	0.11	0.13	0.0125	0.0285	0.131	0.925	0.106	0.113
Water at SR-501	06/05	CS	134	144	491	0.0978	0.0513	0.199	0.219	0.0207	0.0346	0.894	0.0935	0.0866	0.118	0.0263	0.0445	0.789	0.0844	0.0574
Water Canyon at SR-4	06/05	CS	268	147	492	0.285	0.0881	0.246	1.14	0.0398	0.044	0.767	0.0804	0.0523	0.0493	0.0158	0.0321	0.824	0.0843	0.032
Water Canyon at SR-4	06/05	DUP										0.824	0.0906	0.0704	0.0399	0.0201	0.0706	1.06	0.108	0.0578
Water at Rio Grande	09/25	CS	178	185	430	0.0819	0.0624	0.261	0.104	0.0141	0.0276	0.351	0.042	0.0423	0.018	0.0142	0.0477	0.288	0.0376	0.0476
Water at Rio Grande	09/25	CS	283	149	342	0.0599	0.0428	0.179	0.364	0.0283	0.0332	0.744	0.0815	0.046	0.124	0.0264	0.0135	0.679	0.0765	0.046
Indio Canyon:																				
Indio Canyon at SR-4	06/05	CS				0.18	0.0717	0.257	0.182	0.0257	0.0447	0.701	0.0751	0.0516	0.0455	0.0159	0.0401	0.754	0.0796	0.0682
Ancho Canyon:																				
Ancho at SR-4	06/05	CS	1,610	314	984	0.064	0.0496	0.21	0.138	0.0245	0.0459	1.27	0.115	0.0478	0.0639	0.0166	0.0108	1.6	0.139	0.037
Ancho at SR-4	06/05	DUP																		
Above Ancho Spring	10/24	CS	541	180	575	0.174	0.0783	0.31	0.159	0.0361	0.0586	0.666	0.0719	0.0441	0.0555	0.0168	0.0443	0.943	0.0935	0.0493
Above Ancho Spring	10/24	DUP	261	169	555	0.0051	0.0556	0.262				0.885	0.0878	0.0792	0.0613	0.0173	0.0461	1.04	0.0987	0.0412
Above Ancho Spring	10/24	CS	189	54.6	172	0.048	0.0584	0.262	0.102	0.0344	0.0701	1.09	0.103	0.0641	0.0617	0.0174	0.0464	1.03	0.0988	0.0798
Ancho at Rio Grande	09/25	CS	–167	55.5	206	–0.009	0.0412	0.191	0.03	0.01	0.0273	0.281	0.0335	0.0072	0.008	0.007	0.0246	0.225	0.0292	0.0195
TA-49 Area AB:																				
MDA AB-1	05/22	CS	468	111	344	0.0952	0.0249	0.0714	0.173	0.0175	0.0274	0.605	0.0966	0.0825	0.045	0.0278	0.0828	0.605	0.0966	0.0825
MDA AB-1	05/22	CS	242	51.9	158	0.127	0.0301	0.0805	0.265	0.0245	0.0361	0.54	0.0908	0.135	0.0169	0.017	0.083	0.602	0.0953	0.0828
MDA AB-2	05/22	CS	189	50.7	159	0.0206	0.0206	0.0906	0.2	0.0302	0.0566	0.84	0.125	0.12	0.0713	0.0329	0.0954	0.976	0.137	0.0952

Table 5-14. Radiochemical Analysis of Sediments for 2001 (pCi/g[a]) (Cont.)

			^{3}H (pCi/L)			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U		
Station	**Date**	**Code**	**Result**	**Uncert**	**MDA[b]**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Pajarito Plateau Stations (Cont.)																				
TA-49 Area AB (Cont.):																				
MDA AB-2	05/22	DUP																		
MDA AB-3	05/22	CS	541	102	319	0.0607	0.0224	0.0817	0.0632	0.0243	0.0376	0.565	0.0864	0.102	0.0045	0.0197	0.125	0.527	0.0836	0.125
MDA AB-3 Alternate	05/23	CS	420	115	371	0.178	0.0367	0.0784	0.367	0.0322	0.0399	1.31	0.18	0.143	0.0352	0.028	0.143	1.74	0.218	0.113
MDA AB-4	05/22	CS	314	51.6	159	0.0879	0.0246	0.0791	0.207	0.0465	0.0739	0.931	0.117	0.133	0.0309	0.0214	0.0953	0.94	0.117	0.065
MDA AB-4A	05/22	CS	268	44	135	0.148	0.0327	0.0812	0.337	0.0673	0.0959	0.822	0.0893	0.0486	0.0577	0.022	0.0565	0.942	0.0989	0.0563
MDA AB-5	05/22	CS	324	54.4	159	0.0586	0.0255	0.101	0.408	0.0346	0.0475	0.977	0.123	0.145	0.134	0.0485	0.133	1.29	0.149	0.157
MDA AB-5	05/22	CS	294	53.2	158	0.0138	0.0219	0.0993	0.333	0.0338	0.053	1	0.114	0.122	0.0714	0.024	0.0477	0.893	0.102	0.0601
MDA AB-6	05/22	CS	302	56.1	170	–0.0114	0.0202	0.0978	0.122	0.0227	0.0399	0.664	0.117	0.255	0.0387	0.0261	0.108	0.652	0.113	0.176
MDA AB-7	05/22	CS	529	69.7	208	0.0824	0.0262	0.0846	0.414	0.0359	0.0565	0.372	0.0584	0.0617	0.0333	0.0151	0.0181	0.406	0.0607	0.0489
MDA AB-8	05/22	CS	478	63	188	–0.003	0.0186	0.0895	0.0933	0.0264	0.0665	0.519	0.0663	0.0155	0.0286	0.013	0.0155	0.547	0.0692	0.042
MDA AB-9	05/22	CS	400	107	337	0.163	0.032	0.0781	0.454	0.0389	0.0418	1.31	0.14	0.11	0.0555	0.0281	0.0833	1.61	0.161	0.0831
MDA AB-10	05/22	CS	525	141	442	0.0335	0.0182	0.075	0.214	0.0247	0.0462	0.48	0.0667	0.0587	0.0444	0.0193	0.0467	0.493	0.0683	0.068
MDA AB-11	05/23	CS	209	49.9	154	0.151	0.0377	0.0883	0.339	0.0284	0.0362	0.745	0.115	0.136	0.0634	0.0288	0.0344	0.771	0.116	0.0343
MDA AB-11	05/23	DUP	183	49.2	154															
Chaquehui Canyon:																				
Chaquehui at Rio Grande	09/25	CS	2,300	168	406	0.272	0.0711	0.227	0.746	0.0518	0.0471	1.36	0.115	0.0292	0.0637	0.016	0.0293	1.34	0.115	0.0472
Frijoles Canyon:																				
Frijoles at Monument Headquarters	06/27	CS	92.3	59.5	200	0.0073	0.0732	0.342	0.204	0.0305	0.0509	1.09	0.102	0.0727	0.0487	0.0167	0.0403	0.852	0.0832	0.0402
Frijoles at Monument Headquarters	06/27	CS	–92.1	54	200	0.0867	0.0655	0.279	0.174	0.017	0.0252	1.15	0.111	0.0546	0.0456	0.0185	0.049	0.949	0.0947	0.0123
Frijoles at Rio Grande	06/27	CS	–61.9	55.4	201	–0.0051	0.0621	0.293	0.301	0.0336	0.0634	1.64	0.138	0.0361	0.114	0.0223	0.0313	1.63	0.137	0.0403
Frijoles at Rio Grande	06/27	DUP										1.78	0.149	0.0262	0.0927	0.02	0.0262	1.65	0.14	0.0096
Frijoles at Rio Grande	09/26	CS	–163	54.4	201	0.137	0.066	0.259	0.104	0.0159	0.026	0.589	0.0602	0.0237	0.0197	0.0091	0.0238	0.58	0.0597	0.0299
TA-55 below E169	05/18	CS	484	58.4	158	0.0455	0.0261	0.106	0.202	0.0286	0.0439	0.845	0.123	0.133	0.0121	0.0248	0.149	1.17	0.152	0.0908
TA-55 below E169	05/18	DUP				0.0427	0.0203	0.0797	0.25	0.0258	0.0297	0.893	0.0981	0.0542	0.041	0.0213	0.063	0.905	0.0987	0.043
River Background[c]			3600			1.02			0.56											
Reservoir Background[c]			500			1.19			0.98											
Former Background[d]						0.87			0.44											
ER Canyon Sediments Background[e]						1.04			0.90			2.59			0.20			2.29		
SAL[f]			20,000			5.7			5.3			63			17			93		

Table 5-14. Radiochemical Analysis of Sediments for 2001 (pCi/g[a]) (Cont.)

Station	Date	Code	U (mg/kg, calc)		^{238}Pu Result	^{238}Pu Uncert	^{238}Pu MDA[b]	$^{239,240}Pu$ Result	$^{239,240}Pu$ Uncert	$^{239,240}Pu$ MDA	^{241}Am Result	^{241}Am Uncert	^{241}Am MDA	Gross Alpha Result	Gross Alpha Uncert	Gross Alpha MDA	Gross Beta Result	Gross Beta Uncert	Gross Beta MDA
Regional Stations																			
Rio Chama at Chamita	06/20	CS	1.02	0.10	0.001	0.0017	0.0072	0.0058	0.0028	0.0072	0.0062	0.0041	0.0133	5.71	1.03	2.3	22.4	1.46	3.12
Rio Chama at Chamita	06/20	DUP																	
Rio Grande at Embudo	06/20	CS	1.57	0.14	0.0073	0.0026	0.0025	0.0091	0.0029	0.0025	0.116	0.0411	0.0851	6.81	1.16	2.26	23.7	1.49	3.23
Rio Grande at Otowi (bank)	07/11	CS	1.55	0.19	0	0.0015	0.0079	0.0011	0.0019	0.0079	0.0105	0.0073	0.0275	5.4	1.18	2.07	18.2	1.08	1.43
Rio Grande at Frijoles (bank)	09/26	CS	1.77	0.20	0.0013	0.0013	0.0036	0.0067	0.0036	0.0098	0.0187	0.0079	0.0213	10.2	1.18	2.14	27.2	1.21	2.4
Rio Grande at Cochiti	09/26	CS	1.12	0.13	0.0026	0.0018	0.0035	0.0103	0.0037	0.0035	0.0199	0.0082	0.009	7.57	1.07	2.26	19.1	0.925	1.67
Rio Grande at Bernalillo	06/06	CS	1.78	0.19	0	1	0.0082	0.009	0.0052	0.0082	0.005	0.0044	0.0182	8.75	1.5	2.22	21.7	1.65	2.3
Jemez River	06/06	CS	1.23	0.14	0	1	0.0076	0	1	0.0076	0.0025	0.0031	0.0145	5.43	1.08	2.55	25.3	1.45	2.82
Jemez River	06/06	DUP																	
Reservoirs on Rio Chama (New Mexico)																			
Heron Upper	08/30	CS	2.56	0.27	0	1	0.0036	0.008	0.0063	0.0212	0.0021	0.0021	0.0076	6.94	0.768	1.47	17.9	1.2	3.04
Heron Upper	08/30	CS	2.14	0.23	0.0016	0.0016	0.0042	0.0047	0.0035	0.0114	0.0078	0.0026	0.0023	6.69	0.796	1.26	16.6	1.08	2.53
Heron Upper	08/30	DUP	2.20	0.24	–0.0096	0.0089	0.047	0.0151	0.0076	0.0268	0.0046	0.0022	0.0057	10.1	0.957	1.66	18.2	1.04	2.49
Heron Middle	08/30	CS	3.54	0.35	0.0033	0.0024	0.0045	0	1	0.0275	0.0102	0.0031	0.0025	16.4	1.24	1.51	28.4	1.29	2.58
Heron Lower	08/30	CS	4.96	0.46	0.0069	0.0042	0.0126	–0.0462	0.0104	0.049	0.0066	0.0024	0.0022	16.9	1.27	1.42	28.9	1.31	2.62
El Vado Lower	08/30	CS	4.60	0.43	0.0017	0.0029	0.0124	0.0203	0.006	0.0046	0.0032	0.0016	0.0022	11.3	1.06	1.67	21.6	1.27	2.98
El Vado Middle	08/30	CS	3.28	0.33	–0.0034	0.0042	0.0206	0.0309	0.0075	0.0047	0.0061	0.0027	0.0071	9.23	1.55	1.13	19.1	1.43	2.56
El Vado Upper	08/30	CS	2.81	0.30	0	1	0.0152	0	1	0.0388	0.0053	0.002	0.0021	9.25	1.27	1.58	17.4	1.32	2.39
Abiquiu Upper	08/20	CS	2.70	0.24	0.0008	0.0019	0.0122	0.0058	0.0034	0.0122	0.0109	0.0064	0.0229	16.6	1.71	1.77	24.1	0.736	1
Abiquiu Middle	08/20	CS	3.08	0.31	0.001	0.0022	0.0144	0.0049	0.0035	0.0144	0.0066	0.0062	0.0307	20.9	1.39	0.951	29.9	0.723	0.78
Abiquiu Lower	08/20	CS	3.18	0.30	0.0011	0.0024	0.0159	0.0043	0.0031	0.0059	0.0324	0.0104	0.0088	16.9	1.65	0.951	20.7	0.699	0.909
Reservoirs on Rio Grande (Colorado)																			
Rio Grande Upper	10/16	CS	3.29	0.30	0.0155	0.0102	0.0336	0.0293	0.0103	0.0287	0.0066	0.0139	0.0489	17	2.49	3.06	27.7	1.36	1.57
Rio Grande Upper	10/16	DUP												11.8	1.55	2.28	23.8	1.2	1.99
Rio Grande Middle	10/16	CS	2.69	0.24	0.012	0.0107	0.0364	0.0546	0.0117	0.0241	0.0364	0.0132	0.0389	17	2.27	3.98	36.7	1.57	1.98
Rio Grande Lower	10/16	CS	3.01	0.27	–0.0033	0.0058	0.0249	0.0116	0.006	0.0179	0.0188	0.01	0.0315	19.1	2.11	2.53	36.3	1.45	1.64
Reservoirs on Rio Grande (New Mexico)																			
Cochiti Upper	08/22	CS	3.10	0.28	0.0025	0.0032	0.0179	0.044	0.0091	0.0122	0.0251	0.0104	0.0113	19.1	1.53	1.21	26.9	0.752	1.06
Cochiti Upper	08/22	DUP	3.27	0.29	–0.0015	0.0011	0.0139	0.0509	0.0094	0.0139	0.0284	0.0104	0.0293						
Cochiti Middle	08/22	CS	3.47	0.30	0.0031	0.0022	0.0042	0.0358	0.0078	0.0042	0.0321	0.0099	0.0079	23.1	2.02	1.06	27.1	0.624	0.696
Cochiti Middle	08/22	CS	3.93	0.33	0.0039	0.0028	0.0053	0.0194	0.0062	0.0053	0.0103	0.0073	0.032	22.6	2.02	1.28	25.5	0.747	1.06
Cochiti Lower	08/22	CS	3.14	0.27	0.0038	0.0027	0.0051	0.0313	0.0081	0.014	0.0263	0.0085	0.0071	21.2	2.28	1.67	26.2	0.801	1.26
Perimeter Stations																			
Rio Grande at Sandia	09/24	CS	2.24	0.21	0	0.0022	0.0113	0.0154	0.0058	0.0143	0.006	0.0044	0.0179	17.7	1.09	1.38	29.3	0.86	1.53
Rio Grande at Mortandad	09/24	CS	0.97	0.12	–0.0014	0.0031	0.0151	0.0112	0.0057	0.0169	0.0127	0.0064	0.0086	8.43	1.44	2.55	24.9	1.17	2.3
Rio Grande at Pajarito	09/25	CS	1.07	0.12	0	1	0.0109	0.0134	0.005	0.0109	0.0226	0.0078	0.0176	9.12	1.29	1.41	22.4	1.03	1.5
Rio Grande at Water	09/25	CS	1.11	0.13	0.0059	0.003	0.004	0.003	0.0042	0.016	0.0027	0.0027	0.0073	9.99	1.16	1.77	24.1	1.03	1.72
Rio Grande at Ancho	09/25	CS	0.95	0.12	0.0028	0.002	0.0038	0.0014	0.0025	0.0104	0.0035	0.0063	0.0353	4.94	0.867	2.05	20.5	1	1.92
Rio Grande at Chaquehui	09/25	CS	2.23	0.20	0.0012	0.002	0.0086	0.0093	0.0037	0.0086	0.0174	0.0081	0.0235	14.4	1.27	1.84	27.6	1.1	1.71
Pajarito Plateau Stations																			
Guaje Canyon:																			
Guaje Reservoir	10/12	CS	3.96	0.35	–0.0038	0.0068	0.0269	0.0227	0.0063	0.0136	–0.005	0.0132	0.049	20.5	2.19	2.11	34.1	1.45	1.38
Guaje Reservoir	10/12	DUP	3.12	0.29	0.0015	0.0083	0.0309	0.0154	0.0066	0.0185	0.0114	0.0078	0.0257						
Guaje Canyon at SR-502	07/11	CS	1.88	0.23	–0.0023	0.0023	0.0123	0.0046	0.0028	0.0084	0.0115	0.0044	0.0129	8.21	1.67	2.79	24.1	1.23	1.55
Guaje Canyon at SR-502	07/11	CS	3.15	0.32	0.0053	0.0024	0.0029	0.0265	0.0057	0.0078	0.0076	0.0033	0.0096	13.3	2	2.51	27.5	1.31	1.63
Bayo Canyon:																			
Bayo at SR-502	07/11	CS	1.79	0.22	0	1	0.0033	0.0012	0.0021	0.0088	0.007	0.0029	0.0032	5.78	1.35	3	23	1.19	1.85
Acid/Pueblo Canyons:																			
Acid Weir	06/12	CS	3.08	0.45	0.0229	0.0074	0.0163	5.5	0.309	0.0189	0.0171	0.0079	0.0284	12.5	1.58	2.78	30.4	1.63	3.06
Acid Weir	06/12	DUP	2.41	0.35															

Table 5-14. Radiochemical Analysis of Sediments for 2001 (pCi/g[a]) (Cont.)

					^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station	**Date**	**Code**	**U (mg/kg, calc)**		**Result**	**Uncert**	**MDA[b]**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Pajarito Plateau Stations (Cont.)																			
Acid/Pueblo Canyons (Cont.):																			
Pueblo 1 R	06/12	CS	1.21	0.13	0.0054	0.0032	0.0049	0.0145	0.0052	0.0049	0.405	0.0401	0.0184	3.13	0.678	1.16	23.7	1.26	2.48
Pueblo 2	06/12	CS	2.14	0.20	0.024	0.0074	0.0159	4.08	0.234	0.0126	0.146	0.0193	0.0055	3.44	0.77	1.64	26.9	1.43	2.83
Pueblo 2	06/12	CS	2.66	0.39	0.0321	0.0055	0.0023	6.53	0.349	0.0062	0.122	0.0183	0.0207	5.39	0.972	1.62	25.5	1.49	2.74
Hamilton Bend Spring	06/12	CS	2.62	0.37	0.0078	0.0047	0.0145	1.37	0.0855	0.0234	0.0726	0.0132	0.0058	14.8	1.65	2.36	38.4	1.88	2.71
Pueblo 3	06/12	CS	3.96	0.48	0.0171	0.005	0.0039	1.96	0.115	0.0132	0.102	0.0161	0.0059	24.7	2.16	1.53	36.9	1.76	2.65
Pueblo 3	06/12	DUP			0.0066	0.0041	0.0122	1.94	0.118	0.0154	0.114	0.0195	0.0296	28.1	2.22	2.22	43	1.99	3.18
Pueblo at SR-502	06/12	CS	3.64	0.32	0.0145	0.0054	0.0119	2.3	0.136	0.0044	0.111	0.0163	0.0055	23.6	2.23	2.72	42.9	2.06	3.5
DP/Los Alamos Canyons:																			
Los Alamos at Bridge	06/26	CS	2.06	0.20	–0.0138	0.0097	0.0374	0.0196	0.0056	0.0124	0.0103	0.0075	0.0251	17.8	1.96	1.84	36.5	1.85	2.7
Los Alamos at Bridge	06/26	DUP			0.003	0.0041	0.0149	0.0129	0.0044	0.0107	0.0157	0.0075	0.0232	11.1	1.43	2.25	38.4	1.79	2.77
Los Alamos at Bridge	06/26	CS	2.44	0.22	–0.0092	0.0105	0.0392	0.0172	0.0053	0.0123	–0.0035	0.0077	0.0294	6.79	1.02	1.86	16.9	1.25	2.95
Los Alamos at LAO-1	06/26	CS	2.08	0.20	–0.0027	0.0121	0.0439	0.523	0.0391	0.0164	0.0134	0.0084	0.0272	13.9	2.55	1.65	38.4	2.54	2.53
Los Alamos at Upper GS	06/26	CS	3.39	0.38	0.0024	0.0034	0.0128	0.561	0.0396	0.0168	0.0189	0.0072	0.0206	27.9	2.54	2.45	44.8	2.18	2.84
DPS-1	06/26	CS	1.39	0.16	0.0179	0.0068	0.0198	0.0211	0.0057	0.0126	0.0097	0.0058	0.0187	6.64	1.1	2.23	31	1.42	2.24
DPS-4	06/26	CS	3.26	0.29	0.0011	0.0102	0.0363	0.0929	0.0116	0.0119	0.157	0.0181	0.0308	9.27	1.28	1.25	33	1.57	2.26
Los Alamos at LAO-3	06/26	CS	3.08	0.27	0.0215	0.0098	0.0307	0.276	0.0226	0.0116	0.143	0.0158	0.0181	15.7	1.76	2	41.8	1.94	3.13
Los Alamos at LAO-4.5	06/27	CS	2.33	0.22	0.0028	0.0116	0.0415	0.18	0.0194	0.0211	0.218	0.0217	0.0277	14.8	1.74	1.99	43.4	2	2.8
Los Alamos at SR-4	06/26	CS	2.63	0.26	0.0271	0.0114	0.0352	0.204	0.0198	0.0185	0.201	0.019	0.0142	10.7	1.44	1.54	35.7	1.74	2.83
Los Alamos at Totavi	07/11	CS	4.44	0.43	0.0058	0.0024	0.0026	0.579	0.0381	0.0071	0.0639	0.0093	0.0082	17	2.54	3.29	33	1.51	2.18
Los Alamos at Totavi	07/11	CS	2.92	0.31	0.0117	0.0036	0.0029	0.571	0.0386	0.0029	0.0666	0.0102	0.0165	13.4	2.1	2.93	34.8	1.49	1.75
Los Alamos at Otowi	07/11	CS	2.76	0.29	0	1	0.0087	0.0997	0.0121	0.0032	0.0141	0.0039	0.0068	5.55	1.31	2.61	26.6	1.28	1.66
Los Alamos at Otowi	07/11	DUP	3.04	0.30	0.002	0.0014	0.0027	0.0961	0.0109	0.0027	0.0195	0.006	0.0169	5.69	1.32	2.6	26.3	1.26	1.63
Sandia Canyon:																			
Sandia at SR-4	07/11	CS	2.09	0.28	0.0023	0.0024	0.0086	0.0023	0.0029	0.0109	0.015	0.0046	0.0091	8.85	1.52	2.06	30.5	1.38	1.46
Sandia at Rio Grande	09/24	CS	1.19	0.14	0.0435	0.0112	0.0074	0.0408	0.0148	0.0408	0.0149	0.0061	0.0067	6.68	0.679	1.33	28.5	0.82	1.22
Sandia at Rio Grande	09/24	DUP	1.59	0.17	0	1	0.0042	0.0047	0.0041	0.0144	0.0147	0.0079	0.0241						
Mortandad Canyon:																			
Mortandad near CMR Building	06/19	CS	1.42	0.14	0.0372	0.0069	0.0081	0.0153	0.0042	0.003	0.0114	0.0051	0.0149	6.77	1.19	2.52	31.5	1.72	3.33
Mortandad near CMR Building	06/19	DUP	1.33	0.12															
Mortandad west of GS-1	06/19	CS	1.18	0.13	0.0083	0.0036	0.0087	0.0236	0.0057	0.0087	0.0117	0.0044	0.0096	2.18	0.704	1.7	28.7	1.6	2.75
Mortandad west of GS-1	06/19	DUP			0.0038	0.002	0.0056	0.0107	0.0033	0.0071	0.0139	0.0041	0.0031						
Mortandad at GS-1	06/19	CS	1.68	0.15	7.26	0.384	0.0028	12.7	0.66	0.0112	13.2	0.914	0.057	32.9	2.68	1.68	56.1	2.24	2.76
Mortandad at GS-1	06/19	DUP																	
Mortandad at MCO-5	06/19	CS	1.17	0.11	5.3	0.329	0.017	13.4	0.799	0.017	8.13	0.606	0.0261	9.85	1.32	1.62	32	1.67	2.87
Mortandad at MCO-7	06/19	CS	2.29	0.20	2.74	0.156	0.0127	5.99	0.326	0.0087	10.6	0.749	0.0726	14	1.67	1.81	35.4	1.84	2.78
Mortandad at MCO-8.5	06/19	CS	1.58	0.15	0.35	0.0257	0.0026	1.13	0.0666	0.0071	1.96	0.221	0.0421	4.77	1.11	2.24	25.8	1.89	2.6
Mortandad at MCO-8.5	06/19	DUP									2.79	0.265	0.034						
Mortandad at MCO-8.5	06/19	CS	1.35	0.13	0.278	0.0241	0.0035	0.934	0.0608	0.0096	1.17	0.141	0.032	2.3	0.852	1.63	30.1	2.17	2.83
Mortandad at MCO-9	06/19	CS	3.46	0.30	0.525	0.0368	0.0083	2.67	0.15	0.0082	1.97	0.166	0.0165	12.8	1.56	2.69	35.7	1.85	3.23
Mortandad at MCO-13 (A-5)	06/19	CS	3.63	0.30	0.0071	0.0031	0.0074	0.099	0.0114	0.0094	0.0211	0.0054	0.0036	18.9	1.94	2.03	47.2	2.13	3.09
Mortandad A-6	07/11	CS	5.87	0.53	0.0056	0.0031	0.0096	0.125	0.0123	0.0127	0.0474	0.0116	0.0329	38.2	3.12	2.69	53.1	1.82	1.6
Mortandad A-7	07/11	CS	3.51	0.35	–0.001	0.0029	0.0126	–0.0019	0.0054	0.021	0.0106	0.0075	0.0282	10.6	1.83	2.75	56.7	1.88	2.25
Mortandad at SR-4 (A-9)	07/11	CS	4.05	0.40	0.0019	0.0014	0.0026	0.0106	0.0038	0.009	0.0084	0.0053	0.0194	17.3	1.91	2.41	35.2	1.5	1.86
Mortandad at Rio Grande (A-11)	09/24	CS	1.01	0.13	0.0016	0.0016	0.0043	–0.0079	0.0057	0.0262	0.0204	0.0073	0.0069	4.28	0.716	1.58	24.2	0.683	1.01
Mortandad at Rio Grande (A-11)	09/24	DUP																	
TA-54 Area G:																			
MDA G-0	05/30	CS	2.46	0.23	0.0072	0.0051	0.0097	0.0258	0.0083	0.007	0.0136	0.0062	0.0074	26	1.74	1.62	52.3	1.78	2.48
MDA G-1	05/31	CS	1.41	0.14	0.0028	0.0028	0.0076	0.006	0.0035	0.0055	0.009	0.0047	0.0168	15.6	1.45	1.28	45.9	1.83	2.7
MDA G-1	05/31	CS	1.99	0.20	–0.0037	0.0027	0.0343	–0.0013	0.0013	0.0196	0.0094	0.0048	0.0154	9.33	1.01	1.72	36.8	1.58	2.97
MDA G-2	05/31	CS	1.74	0.19	0.0033	0.0033	0.0089	0.0189	0.0068	0.0064	0.0134	0.0057	0.0178	9.57	1.73	1.39	38	2.37	2.79
MDA G-2	05/31	DUP																	
MDA G-3	05/31	CS	2.19	0.22	0.0241	0.0092	0.0093	0.0099	0.005	0.0067	0.0131	0.005	0.0051	8.32	1.37	2.25	41.7	2.55	2.73

Table 5-14. Radiochemical Analysis of Sediments for 2001 (pCi/g[a]) (Cont.)

					^{238}Pu			$^{239,240}Pu$			^{241}Am			Gross Alpha			Gross Beta		
Station	Date	Code	U (mg/kg, calc)		Result	Uncert	MDA[b]	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Pajarito Plateau Stations (Cont.)																			
TA-54 Area G (Cont.):																			
MDA G-4 R-1	05/31	CS	2.85	0.29	0.0145	0.0066	0.0079	0.0115	0.0059	0.0225	0.0149	0.0062	0.0169	22.1	4.24	5.19	40.2	4.18	8.63
MDA G-4 R-1	05/31	DUP			0.0101	0.0051	0.0068	0.0226	0.0071	0.0195	0.0236	0.0098	0.0107	15.7	1.31	2.14	40.2	1.62	3.41
MDA G-4 R-2	05/31	CS	3.40	0.34	0.0057	0.0041	0.0077	0.035	0.0087	0.0056	0.0148	0.0076	0.0275	17.5	1.38	1.89	41.6	1.56	2.61
MDA G-5	05/31	CS	3.03	0.29	0.0141	0.0071	0.0096	0.0178	0.0075	0.0236	0.0159	0.0058	0.0138	18.3	1.35	1.75	39.8	1.7	3.03
MDA G-6 R	05/31	CS	3.34	0.32	0.0105	0.0053	0.0071	0.169	0.0203	0.0139	0.506	0.0434	0.0174	12.7	1.25	2.18	40.7	1.73	3.33
MDA G-7	05/31	CS	2.39	0.24	0.26	0.0327	0.0232	0.248	0.0285	0.0378	0.0745	0.0139	0.0063	24.7	1.92	1.45	47.5	2.94	2.26
MDA G-7	05/31	DUP	2.42	0.24															
MDA G-7 West	05/31	CS	5.55	0.49	1.31	0.102	0.0084	0.392	0.0375	0.006	0.102	0.0188	0.0218	31.9	2.2	2.03	50.2	1.79	2.94
MDA G-8	05/31	CS	2.30	0.23	0.0425	0.0113	0.0202	0.0385	0.0095	0.0213	0.0304	0.0099	0.0213	12.4	1.2	1.79	39.3	1.64	3.11
MDA-G-9	05/31	CS	2.18	0.23	0.0493	0.0127	0.0084	0.0644	0.0125	0.006	0.0168	0.0092	0.0397	19.8	1.62	1.71	48	1.87	2.83
MDA-G-9	05/31	CS	2.39	0.23	0.0351	0.01	0.0073	0.0292	0.0077	0.0053	0.0168	0.0065	0.0065	11	1.16	1.94	37.7	1.65	2.41
Cañada del Buey:																			
Cañada del Buey at SR-4	06/05	CS	2.51	0.27	–0.0003	0.004	0.023	0.0076	0.0053	0.0199	0.0102	0.0079	0.0267	16.2	1.83	2.03	34.3	1.79	3.41
Cañada del Buey at SR-4	06/05	DUP												14.4	1.64	2.46	36.5	1.72	2.64
Pajarito Canyon:																			
Two-Mile at SR-501	06/05	CS	1.53	0.18	0	1	0.0075	0.029	0.0095	0.0204	0.011	0.007	0.0268	15.5	1.7	2.55	40.7	1.95	3.25
Pajarito at SR-501	06/05	CS	1.33	0.16	0.007	0.005	0.0095	0.007	0.005	0.0095	0.0108	0.0055	0.018	2.64	0.839	2.56	32.5	1.63	2.67
Pajarito at SR-4	06/05	CS	2.60	0.29	–0.0004	0.0045	0.0325	0.033	0.0114	0.0258	0.0105	0.0054	0.0175	10.6	1.41	1.21	33.1	1.69	2.54
Pajarito at SR-4	06/05	DUP																	
Pajarito at SR-4	06/05	CS	3.32	0.33	0.0055	0.0039	0.0075	0.0221	0.0079	0.0075	0.0158	0.0081	0.029	11.9	1.48	1.55	33.5	1.64	2.44
Pajarito at Rio Grande	09/25	CS	0.95	0.13	–0.0017	0.0017	0.0126	–0.0034	0.0048	0.0224	0.0182	0.0084	0.0246	6.09	1.15	1.9	30.8	1.22	1.86
Potrillo Canyon:																			
Potrillo at SR-4	06/05	CS	3.31	0.33	0.0012	0.0038	0.0202	0.0033	0.01	0.0464	0.0119	0.0057	0.0157	16.3	1.89	2.19	38.9	1.9	2.89
Fence Canyon:																			
Fence at SR-4	06/05	CS	3.24	0.32	–0.001	0.004	0.0224	0.0303	0.0087	0.0241	0.0178	0.006	0.0054	13.1	1.69	2.83	36.8	2	3.14
Cañon de Valle:																			
Cañon de Valle at SR-501	06/05	CS	2.25	0.22	0.0032	0.0032	0.0087	0.027	0.0099	0.0235	0.0194	0.0082	0.0238	15.3	1.89	1.88	40.4	1.97	2.8
Water Canyon:																			
Water at SR-501	06/05	CS	2.76	0.32	0.0086	0.005	0.0078	0.0058	0.0041	0.0078	0.011	0.0049	0.0059	12.8	1.6	2.37	38.2	1.87	3.03
Water at SR-501	06/05	CS	2.40	0.25	0	1	0.0089	0.0033	0.0033	0.0089	0.0073	0.0042	0.0066	17.2	3.13	1.86	50.5	3.19	2.55
Water Canyon at SR-4	06/05	CS	2.48	0.25	0.003	0.003	0.008	0.0266	0.009	0.008	0.0184	0.0056	0.0045	17.1	1.97	1.99	40.5	1.93	2.85
Water Canyon at SR-4	06/05	DUP	3.17	0.32															
Water at Rio Grande	09/25	CS	0.87	0.11	0.0046	0.0027	0.0042	0.0092	0.0049	0.0143	0.0101	0.0051	0.0068	5.15	1.11	2.15	24.9	1.08	1.71
Water at Rio Grande	09/25	CS	2.08	0.23	0.003	0.0036	0.0138	0.0193	0.0058	0.0109	0.0081	0.0047	0.0073	10.7	1.49	1.4	32.4	1.18	1.35
Indio Canyon:																			
Indio Canyon at SR-4	06/05	CS	2.27	0.24	–0.0035	0.0025	0.0287	0.0124	0.0062	0.0084	0.0268	0.0082	0.016	18.5	2.05	2.49	43.2	1.91	2.89
Ancho Canyon:																			
Ancho at SR-4	06/05	CS	4.79	0.41	–0.0018	0.0018	0.024	–0.0022	0.0045	0.035	0.0166	0.0085	0.0305	8.84	1.32	2.57	38.3	1.77	3.25
Ancho at SR-4	06/05	DUP			0.0012	0.0031	0.0201	0.0036	0.0054	0.0294	0.0114	0.0085	0.0344						
Above Ancho Spring	10/24	CS	2.83	0.28	0.0056	0.0032	0.005	0.0112	0.0059	0.0173	0.0043	0.0043	0.0117	6.87	1.44	3.32	31.4	1.43	1.59
Above Ancho Spring	10/24	DUP	3.12	0.29	0	0.0043	0.0189	0.007	0.0082	0.0293	0.004	0.0105	0.0428						
Above Ancho Spring	10/24	CS	3.09	0.29	0.0022	0.0022	0.0059	–0.0044	0.0069	0.0307	0.0194	0.0117	0.036	13.4	1.65	2.65	33.8	1.44	2.01
Ancho at Rio Grande	09/25	CS	0.67	0.09	0.0014	0.0014	0.0038	0.0056	0.0028	0.0038	0	1	0.0087	4.32	0.899	2.23	20.7	0.952	1.58
TA-49 Area AB:																			
MDA AB-1	05/22	CS	1.82	0.29	0	1	0.0026	0.0176	0.0042	0.0026	0.0133	0.0043	0.0036	7.77	0.811	1.42	31.4	1.31	2.67
MDA AB-1	05/22	CS	1.80	0.28	0.0012	0.003	0.0149	0.0166	0.0049	0.0038	0.0172	0.0049	0.0036	14	1.16	0.977	36.3	1.44	2.44
MDA AB-2	05/22	CS	2.94	0.41	0.0082	0.0031	0.0067	0.0593	0.008	0.0025	0.0121	0.0057	0.0162	22.7	1.65	1.71	33.2	1.58	3.44

Table 5-14. Radiochemical Analysis of Sediments for 2001 (pCi/g[a]) (Cont.)

					^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station	Date	Code	U (mg/kg, calc)		Result	Uncert	MDA[b]	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Pajarito Plateau Stations (Cont.)																			
TA-49 Area AB (Cont.):																			
MDA AB-2	05/22	DUP									0.027	0.0069	0.0046						
MDA AB-3	05/22	CS	1.57	0.25	0.0107	0.0043	0.0117	0.402	0.0286	0.0071	0.113	0.0141	0.0037	15.8	1.33	1.44	33	1.49	2.81
MDA AB-3 Alternate	05/23	CS	5.20	0.65	0.0141	0.0043	0.0035	0.721	0.0496	0.0095	0.155	0.0157	0.0029	25.2	1.9	2.78	38.6	1.9	3.24
MDA AB-4	05/22	CS	2.81	0.35	0.0027	0.0019	0.0037	0.0059	0.0031	0.0091	0.0064	0.0032	0.0043	19.6	1.63	1.76	32.1	1.69	3.26
MDA AB-4A	05/22	CS	2.83	0.29	0.0004	0.0017	0.0102	0.0156	0.005	0.0102	0.0153	0.0045	0.0035	22.5	1.54	1.1	31.6	1.26	2.34
MDA AB-5	05/22	CS	3.90	0.44	0.0062	0.0028	0.0034	0.0187	0.0049	0.0034	0.0196	0.0056	0.0041	19.2	1.46	1.51	39.3	1.68	3.26
MDA AB-5	05/22	CS	2.69	0.30	0.0013	0.0013	0.0034	0.0147	0.0048	0.0118	0.0117	0.0044	0.0109	16.8	1.36	1.39	39.5	1.63	2.84
MDA AB-6	05/22	CS	1.96	0.34	0.0028	0.002	0.0038	0.0125	0.0042	0.0038	0.0083	0.0034	0.0037	9.31	1.08	2.01	30.4	1.56	2.94
MDA AB-7	05/22	CS	1.22	0.18	–0.0002	0.0027	0.0156	0.013	0.0044	0.0039	0.0087	0.0036	0.0039	9.09	0.968	1.25	33.5	1.4	2.63
MDA AB-8	05/22	CS	1.64	0.21	–0.0011	0.0019	0.0103	0.0067	0.0027	0.003	0.0125	0.004	0.0034	8.9	1.02	1.62	35.1	1.49	2.72
MDA AB-9	05/22	CS	4.82	0.48	0.0011	0.0011	0.003	0.0412	0.0076	0.012	0.0223	0.0061	0.0122	22.6	1.22	0.857	44.3	1.16	1.38
MDA AB-10	05/22	CS	1.49	0.20	0	0.0022	0.0096	0.017	0.004	0.0024	0.0067	0.0028	0.003	7.6	0.751	1.35	37.8	1.36	2.14
MDA AB-11	05/23	CS	2.32	0.35	0.0009	0.0016	0.0068	0.0157	0.0045	0.0099	0.0162	0.0052	0.0044	21.2	1.6	1.78	36.8	1.55	2.67
MDA AB-11	05/23	DUP																	
Chaquehui Canyon:																			
Chaquehui at Rio Grande	09/25	CS	4.02	0.34	0.0028	0.0028	0.0103	0.0195	0.0072	0.0197	0.0026	0.0026	0.0072	24	1.77	2.06	42.9	1.41	2.16
Frijoles Canyon:																			
Frijoles at Monument Headquarters	06/27	CS	2.56	0.25	0	0.0087	0.0312	0.0132	0.0045	0.011	0.0156	0.0091	0.0295	21.1	2.03	1.61	39.7	1.8	2.43
Frijoles at Monument Headquarters	06/27	CS	2.85	0.28	–0.0047	0.005	0.0213	0.0223	0.0057	0.0109	0.0234	0.0079	0.0226	11	1.48	2.77	30.9	1.69	2.99
Frijoles at Rio Grande	06/27	CS	4.90	0.41	–0.0054	0.0074	0.0284	0.0225	0.0061	0.0141	0.0172	0.0057	0.0152	21.7	2.03	1.62	34.7	1.69	2.71
Frijoles at Rio Grande	06/27	DUP	4.95	0.42															
Frijoles at Rio Grande	09/26	CS	1.74	0.18	0	1	0.005	0.0019	0.0067	0.0262	0.0158	0.0065	0.0072	9.44	1.35	1.84	34.1	1.24	1.6
TA-55 below E169	05/18	CS	3.49	0.45	0.0155	0.0047	0.0038	0.0842	0.0118	0.0038	0.0511	0.0083	0.0032	15.1	1.33	0.997	41	1.63	2.55
TA-55 below E169	05/18	DUP	2.71	0.29	0.0099	0.0046	0.0132	0.0558	0.0085	0.0081	0.0503	0.0087	0.0036	15.5	1.48	1.63	44.2	2.88	2.62
River Background[c]			4.49		0.0087			0.0130			0.0760			15.7			17.6		
Reservoir Background[c]			4.58		0.0012			0.0201			0.0100			15.9			9.7		
Former Background[d]			4.40		0.0060			0.0230											
ER Canyon Sediments Background[e]			2.22		0.0060			0.0680			0.0400								
SAL[f]			29		49			44			39								

[a]Except where noted. Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytical laboratory measurement-specific minimum detectable activity.

[b]MDA=minimum detectable activity.

[c]Upper limit for background values (McLin and Lyons 2002).

[d]Purtymun et al. (1987a).

[e]Ryti (1998).

[f]Screening Action Level, LANL Environmental Restoration Project, 2001; see text for details.

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a]

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Regional Stations															
Rio Grande at Otowi (bank)	07/11	CS	Gross Beta	18.2	1.08	1.43	pCi/g		J-			17.6	1.03		
Rio Grande at Frijoles (bank)	09/26	CS	Gross Beta	27.2	1.21	2.4	pCi/g					17.6	1.55		
Rio Grande at Cochiti	09/26	CS	Gross Beta	19.1	0.925	1.67	pCi/g					17.6	1.09		
Rio Grande at Bernalillo	06/06	CS	Gross Beta	21.7	1.65	2.3	pCi/g					17.6	1.23		
Jemez River	06/06	CS	Gross Beta		25.3	1.45	2.82	pCi/g					17.6	1.44	
Pajarito Plateau Stations															
Guaje Canyon:															
Guaje Reservoir	10/12	CS	Gross Alpha	20.5	2.19	2.11	pCi/g					15.7	1.31		
Guaje Reservoir	10/12	CS	Gross Beta	34.1	1.45	1.38	pCi/g					17.6	1.94		
Guaje Reservoir	10/12	CS	$^{239,240}Pu$	0.0227	0.00629	0.0136	pCi/g			0.068	0.33	0.013	1.75		
Guaje Canyon at SR-502	07/11	CS	^{137}Cs	0.601	0.0551	0.0603	pCi/g			0.9	0.67	0.56	1.07		
Guaje Canyon at SR-502	07/11	CS	Gross Beta	27.5	1.31	1.63	pCi/g		J-			17.6	1.56		
Guaje Canyon at SR-502	07/11	CS	Gross Beta	24.1	1.23	1.55	pCi/g		J-			17.6	1.37		
Guaje Canyon at SR-502	07/11	CS	$^{239,240}Pu$	0.0265	0.00567	0.00779	pCi/g			0.068	0.39	0.013	2.04		
Bayo Canyon:															
Bayo at SR-502	07/11	CS	Gross Beta	23	1.19	1.85	pCi/g		J-			17.6	1.31		
Acid/Pueblo Canyons:															
Acid Weir	06/12	CS	^{137}Cs	0.795	0.0691	0.0761	pCi/g			0.9	0.88	0.56	1.42		
Acid Weir	06/12	CS	Gross Beta	30.4	1.63	3.06	pCi/g					17.6	1.73		
Acid Weir	06/12	CS	^{3}H	267	53.9	163	pCi/L					3,600	0.07		
Acid Weir	06/12	CS	^{238}Pu	0.0229	0.00735	0.0163	pCi/g			0.006	3.82	0.009	2.63		
Acid Weir	06/12	CS	$^{239,240}Pu$	5.5	0.309	0.0189	pCi/g			0.068	80.88	0.013	423.08		
Pueblo 1 R	06/12	CS	^{241}Am	0.405	0.0401	0.0184	pCi/g			0.04	10.13	0.076	5.33		
Pueblo 1 R	06/12	CS	Gross Beta	23.7	1.26	2.48	pCi/g					17.6	1.35		
Pueblo 2	06/12	CS	^{241}Am	0.146	0.0193	0.00551	pCi/g			0.04	3.65	0.076	1.92		
Pueblo 2	06/12	CS	^{241}Am	0.122	0.0183	0.0207	pCi/g			0.04	3.05	0.076	1.61		
Pueblo 2	06/12	CS	Gross Beta	26.9	1.43	2.83	pCi/g					17.6	1.53		
Pueblo 2	06/12	CS	Gross Beta	25.5	1.49	2.74	pCi/g					17.6	1.45		
Pueblo 2	06/12	CS	^{238}Pu	0.0321	0.00548	0.00229	pCi/g			0.006	5.35	0.009	3.69		
Pueblo 2	06/12	CS	^{238}Pu	0.024	0.00738	0.0159	pCi/g			0.006	4.00	0.009	2.76		
Pueblo 2	06/12	CS	$^{239,240}Pu$	6.53	0.349	0.00622	pCi/g			0.068	96.03	0.013	502.31		
Pueblo 2	06/12	CS	$^{239,240}Pu$	4.08	0.234	0.0126	pCi/g			0.068	60.00	0.013	313.85		
Hamilton Bend Spring	06/12	CS	^{241}Am	0.0726	0.0132	0.00579	pCi/g			0.04	1.82	0.076	0.96		
Hamilton Bend Spring	06/12	CS	Gross Beta	38.4	1.88	2.71	pCi/g					17.6	2.18		

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
Acid/Pueblo Canyons (Cont.):															
Hamilton Bend Spring	06/12	CS	$^{239,240}Pu$	1.37	0.0855	0.0234	pCi/g			0.068	20.15	0.013	105.38		
Pueblo 3	06/12	DUP	^{241}Am	0.114	0.0195	0.0296	pCi/g			0.04	2.85	0.076	1.50		
Pueblo 3	06/12	CS	^{241}Am	0.102	0.0161	0.0059	pCi/g			0.04	2.55	0.076	1.34		
Pueblo 3	06/12	DUP	^{137}Cs	2.11	0.134	0.0708	pCi/g			0.9	2.34	0.56	3.77		
Pueblo 3	06/12	CS	^{137}Cs	2.05	0.122	0.0572	pCi/g			0.9	2.28	0.56	3.66		
Pueblo 3	06/12	DUP	Gross Alpha	28.1	2.22	2.22	pCi/g					15.7	1.79		
Pueblo 3	06/12	CS	Gross Alpha	24.7	2.16	1.53	pCi/g					15.7	1.57		
Pueblo 3	06/12	DUP	Gross Beta	43	1.99	3.18	pCi/g					17.6	2.44		
Pueblo 3	06/12	CS	Gross Beta	36.9	1.76	2.65	pCi/g					17.6	2.10		
Pueblo 3	06/12	CS	^{238}Pu	0.0171	0.005	0.00385	pCi/g			0.006	2.85	0.009	1.97		
Pueblo 3	06/12	CS	$^{239,240}Pu$	1.96	0.115	0.0132	pCi/g			0.068	28.82	0.013	150.77		
Pueblo 3	06/12	DUP	$^{239,240}Pu$	1.94	0.118	0.0154	pCi/g			0.068	28.53	0.013	149.23		
Pueblo at SR-502	06/12	CS	^{241}Am	0.111	0.0163	0.00546	pCi/g			0.04	2.78	0.076	1.46		
Pueblo at SR-502	06/12	CS	^{137}Cs	1.26	0.0782	0.0564	pCi/g			0.9	1.40	0.56	2.25		
Pueblo at SR-502	06/12	CS	Gross Alpha	23.6	2.23	2.72	pCi/g					15.7	1.50		
Pueblo at SR-502	06/12	CS	Gross Beta	42.9	2.06	3.5	pCi/g					17.6	2.44		
Pueblo at SR-502	06/12	CS	$^{239,240}Pu$	2.3	0.136	0.00436	pCi/g			0.068	33.82	0.013	176.92		
DP/Los Alamos Canyons:															
Los Alamos at Bridge	06/26	CS	^{137}Cs	0.901	0.0539	0.0361	pCi/g			0.9	1.00	0.56	1.61		
Los Alamos at Bridge	06/26	CS	^{137}Cs	0.891	0.0583	0.0317	pCi/g			0.9	0.99	0.56	1.59		
Los Alamos at Bridge	06/26	DUP	^{137}Cs	0.839	0.0569	0.0334	pCi/g			0.9	0.93	0.56	1.50		
Los Alamos at Bridge	06/26	CS	Gross Alpha	17.8	1.96	1.84	pCi/g		J-			15.7	1.13		
Los Alamos at Bridge	06/26	DUP	Gross Beta	38.4	1.79	2.77	pCi/g		J			17.6	2.18		
Los Alamos at Bridge	06/26	CS	Gross Beta	36.5	1.85	2.7	pCi/g		J			17.6	2.07		
Los Alamos at Bridge	06/26	DUP	^{3}H	222	64.6	206	pCi/L		U			3,600	0.06		
Los Alamos at Bridge	06/26	CS	$^{239,240}Pu$	0.0196	0.00561	0.0124	pCi/g		J	0.068	0.29	0.013	1.51		
Los Alamos at Bridge	06/26	CS	$^{239,240}Pu$	0.0172	0.00533	0.0123	pCi/g		J	0.068	0.25	0.013	1.32		
Los Alamos at LAO-1	06/26	CS	Gross Beta	38.4	2.54	2.53	pCi/g		J			17.6	2.18		
Los Alamos at LAO-1	06/26	CS	^{3}H	2,470	110	203	pCi/L					3,600	0.69		
Los Alamos at LAO-1	06/26	CS	$^{239,240}Pu$	0.523	0.0391	0.0164	pCi/g			0.068	7.69	0.013	40.23		
Los Alamos at Upper GS	06/26	CS	Gross Alpha	27.9	2.54	2.45	pCi/g		J-			15.7	1.78		
Los Alamos at Upper GS	06/26	CS	Gross Beta	44.8	2.18	2.84	pCi/g		J			17.6	2.55		
Los Alamos at Upper GS	06/26	CS	^{3}H	1,160	85.4	203	pCi/L					3,600	0.32		
Los Alamos at Upper GS	06/26	CS	$^{239,240}Pu$	0.561	0.0396	0.0168	pCi/g			0.068	8.25	0.013	43.15		
DPS-1	06/26	CS	Gross Beta	31	1.42	2.24	pCi/g		J			17.6	1.76		

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
DP/Los Alamos Canyons (Cont.):															
DPS-1	06/26	CS	^{3}H	3,030	118	201	pCi/L					3,600	0.84		
DPS-1	06/26	CS	$^{239,240}Pu$	0.0211	0.00568	0.0126	pCi/g		J	0.068	0.31	0.013	1.62		
DPS-1	06/26	CS	^{90}Sr	1.82	0.322	0.235	pCi/g			1.04	1.75	1.02	1.78		
DPS-4	06/26	CS	^{241}Am	0.157	0.0181	0.0308	pCi/g			0.04	3.93	0.076	2.07		
DPS-4	06/26	CS	^{137}Cs	1.36	0.0863	0.0302	pCi/g			0.9	1.51	0.56	2.43		
DPS-4	06/26	CS	Gross Beta	33	1.57	2.26	pCi/g		J			17.6	1.88		
DPS-4	06/26	CS	^{3}H	676	74	200	pCi/L					3,600	0.19		
DPS-4	06/26	CS	$^{239,240}Pu$	0.0929	0.0116	0.0119	pCi/g			0.068	1.37	0.013	7.15		
Los Alamos at LAO-3	06/26	CS	^{241}Am	0.143	0.0158	0.0181	pCi/g			0.04	3.58	0.076	1.88		
Los Alamos at LAO-3	06/26	CS	^{137}Cs	1.07	0.0708	0.0338	pCi/g			0.9	1.19	0.56	1.91		
Los Alamos at LAO-3	06/26	CS	Gross Alpha	15.7	1.76	2	pCi/g		J-			15.7	1.00		
Los Alamos at LAO-3	06/26	CS	Gross Beta	41.8	1.94	3.13	pCi/g		J			17.6	2.38		
Los Alamos at LAO-3	06/26	CS	$^{239,240}Pu$	0.276	0.0226	0.0116	pCi/g			0.068	4.06	0.013	21.23		
Los Alamos at LAO-4.5	06/27	CS	^{241}Am	0.218	0.0217	0.0277	pCi/g			0.04	5.45	0.076	2.87		
Los Alamos at LAO-4.5	06/27	CS	^{137}Cs	0.885	0.0598	0.0435	pCi/g			0.9	0.98	0.56	1.58		
Los Alamos at LAO-4.5	06/27	CS	Gross Beta	43.4	2	2.8	pCi/g		J			17.6	2.47		
Los Alamos at LAO-4.5	06/27	CS	^{3}H	340	66.4	201	pCi/L		J			3,600	0.09		
Los Alamos at LAO-4.5	06/27	CS	$^{239,240}Pu$	0.18	0.0194	0.0211	pCi/g			0.068	2.65	0.013	13.85		
Los Alamos at SR-4	06/26	CS	^{241}Am	0.201	0.019	0.0142	pCi/g			0.04	5.03	0.076	2.64		
Los Alamos at SR-4	06/26	CS	^{137}Cs	1.35	0.0969	0.0576	pCi/g			0.9	1.50	0.56	2.41		
Los Alamos at SR-4	06/26	CS	Gross Beta	35.7	1.74	2.83	pCi/g		J			17.6	2.03		
Los Alamos at SR-4	06/26	CS	^{3}H	827	175	538	pCi/L		J			3,600	0.23		
Los Alamos at SR-4	06/26	CS	$^{239,240}Pu$	0.204	0.0198	0.0185	pCi/g			0.068	3.00	0.013	15.69		
Los Alamos at Totavi	07/11	CS	^{241}Am	0.0666	0.0102	0.0165	pCi/g			0.04	1.67	0.076	0.88		
Los Alamos at Totavi	07/11	CS	^{241}Am	0.0639	0.0093	0.00823	pCi/g			0.04	1.60	0.076	0.84		
Los Alamos at Totavi	07/11	CS	^{137}Cs	0.585	0.0459	0.0618	pCi/g			0.9	0.65	0.56	1.04		
Los Alamos at Totavi	07/11	CS	Gross Alpha	17	2.54	3.29	pCi/g		J-			15.7	1.08		
Los Alamos at Totavi	07/11	CS	Gross Beta	34.8	1.49	1.75	pCi/g		J-			17.6	1.98		
Los Alamos at Totavi	07/11	CS	Gross Beta	33	1.51	2.18	pCi/g		J-			17.6	1.88		
Los Alamos at Totavi	07/11	CS	^{238}Pu	0.0117	0.00357	0.00287	pCi/g			0.006	1.95	0.009	1.34		
Los Alamos at Totavi	07/11	CS	$^{239,240}Pu$	0.579	0.0381	0.00706	pCi/g			0.068	8.51	0.013	44.54		
Los Alamos at Totavi	07/11	CS	$^{239,240}Pu$	0.571	0.0386	0.00287	pCi/g			0.068	8.40	0.013	43.92		
Los Alamos at Otowi	07/11	CS	Gross Beta	26.6	1.28	1.66	pCi/g		J-			17.6	1.51		
Los Alamos at Otowi	07/11	DUP	Gross Beta	26.3	1.26	1.63	pCi/g		J-			17.6	1.49		
Los Alamos at Otowi	07/11	CS	$^{239,240}Pu$	0.0997	0.0121	0.00322	pCi/g			0.068	1.47	0.013	7.67		
Los Alamos at Otowi	07/11	DUP	$^{239,240}Pu$	0.0961	0.0109	0.00266	pCi/g			0.068	1.41	0.013	7.39		

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
Sandia Canyon:															
Sandia at SR-4	07/11	CS	Gross Beta	30.5	1.38	1.46	pCi/g		J-			17.6	1.73		
Sandia at SR-4	07/11	CS	^{3}H	1,270	335	1,060	pCi/L		J			3,600	0.35		
Sandia at Rio Grande	09/24	CS	Gross Beta	28.5	0.82	1.22	pCi/g					17.6	1.62		
Sandia at Rio Grande	09/24	CS	^{3}H	659	119	265	pCi/L					3,600	0.18		
Sandia at Rio Grande	09/24	CS	^{238}Pu	0.0435	0.0112	0.00737	pCi/g			0.006	7.25	0.009	5.00		
Mortandad Canyon:															
Mortandad near CMR Building	06/19	CS	Gross Beta	31.5	1.72	3.33	pCi/g		J			17.6	1.79		
Mortandad near CMR Building	06/19	CS	^{238}Pu	0.0372	0.00685	0.00806	pCi/g			0.006	6.20	0.009	4.28		
Mortandad near CMR Building	06/19	CS	$^{239,240}Pu$	0.0153	0.00417	0.00297	pCi/g			0.068	0.23	0.013	1.18		
Mortandad west of GS-1	06/19	CS	Gross Beta	28.7	1.6	2.75	pCi/g		J			17.6	1.63		
Mortandad west of GS-1	06/19	CS	$^{239,240}Pu$	0.0236	0.00566	0.00867	pCi/g		J	0.068	0.35	0.013	1.82		
Mortandad at GS-1	06/19	CS	^{241}Am	13.2	0.914	0.057	pCi/g			0.04	330.00	0.076	173.68		
Mortandad at GS-1	06/19	CS	^{137}Cs	27.9	0.17	0.0693	pCi/g			0.9	31.00	0.56	49.82	5.3	5.26
Mortandad at GS-1	06/19	CS	Gross Alpha	32.9	2.68	1.68	pCi/g					15.7	2.10		
Mortandad at GS-1	06/19	CS	Gross Beta	56.1	2.24	2.76	pCi/g		J			17.6	3.19		
Mortandad at GS-1	06/19	CS	^{3}H	5,940	132	152	pCi/L					3,600	1.65		
Mortandad at GS-1	06/19	CS	^{238}Pu	7.26	0.384	0.00283	pCi/g			0.006	1,210.00	0.009	834.48		
Mortandad at GS-1	06/19	CS	$^{239,240}Pu$	12.7	0.66	0.0112	pCi/g			0.068	186.76	0.013	976.92		
Mortandad at GS-1	06/19	DUP	^{90}Sr	1.09	0.172	0.147	pCi/g			1.04	1.05	1.02	1.07		
Mortandad at MCO-5	06/19	CS	^{241}Am	8.13	0.606	0.0261	pCi/g			0.04	203.25	0.076	106.97		
Mortandad at MCO-5	06/19	CS	^{137}Cs	15.6	0.749	0.0566	pCi/g			0.9	17.33	0.56	27.86	5.3	2.94
Mortandad at MCO-5	06/19	CS	Gross Beta	32	1.67	2.87	pCi/g		J			17.6	1.82		
Mortandad at MCO-5	06/19	CS	^{3}H	3,220	505	1,500	pCi/L		J			3,600	0.89		
Mortandad at MCO-5	06/19	CS	^{238}Pu	5.3	0.329	0.017	pCi/g			0.006	883.33	0.009	609.20		
Mortandad at MCO-5	06/19	CS	$^{239,240}Pu$	13.4	0.799	0.017	pCi/g			0.068	197.06	0.013	1,030.77		
Mortandad at MCO-7	06/19	CS	^{241}Am	10.6	0.749	0.0726	pCi/g			0.04	265.00	0.076	139.47		
Mortandad at MCO-7	06/19	CS	^{137}Cs	8.22	0.476	0.0516	pCi/g			0.9	9.13	0.56	14.68	5.3	1.55
Mortandad at MCO-7	06/19	CS	Gross Beta	35.4	1.84	2.78	pCi/g		J			17.6	2.01		
Mortandad at MCO-7	06/19	CS	^{238}Pu	2.74	0.156	0.0127	pCi/g			0.006	456.67	0.009	314.94		
Mortandad at MCO-7	06/19	CS	$^{239,240}Pu$	5.99	0.326	0.00868	pCi/g			0.068	88.09	0.013	460.77		
Mortandad at MCO-7	06/19	CS	^{90}Sr	1.25	0.196	0.129	pCi/g			1.04	1.20	1.02	1.23		
Mortandad at MCO-8.5	06/19	DUP	^{241}Am	2.79	0.265	0.034	pCi/g			0.04	69.75	0.076	36.71		
Mortandad at MCO-8.5	06/19	CS	^{241}Am	1.96	0.221	0.0421	pCi/g			0.04	49.00	0.076	25.79		
Mortandad at MCO-8.5	06/19	CS	^{241}Am	1.17	0.141	0.032	pCi/g			0.04	29.25	0.076	15.39		
Mortandad at MCO-8.5	06/19	CS	^{137}Cs	4.46	0.236	0.0314	pCi/g			0.9	4.96	0.56	7.96	5.3	0.84

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
Mortandad Canyon (Cont.):															
Mortandad at MCO-8.5	06/19	CS	^{137}Cs	3.11	0.0614	0.0505	pCi/g			0.9	3.46	0.56	5.55	5.3	0.59
Mortandad at MCO-8.5	06/19	CS	Gross Beta	30.1	2.17	2.83	pCi/g		J			17.6	1.71		
Mortandad at MCO-8.5	06/19	CS	Gross Beta	25.8	1.89	2.6	pCi/g		J			17.6	1.47		
Mortandad at MCO-8.5	06/19	CS	^{3}H	2,890	581	1,790	pCi/L		J			3,600	0.80		
Mortandad at MCO-8.5	06/19	CS	^{3}H	2,690	493	1,500	pCi/L		J			3,600	0.75		
Mortandad at MCO-8.5	06/19	CS	^{238}Pu	0.35	0.0257	0.0026	pCi/g			0.006	58.33	0.009	40.23		
Mortandad at MCO-8.5	06/19	CS	^{238}Pu	0.278	0.0241	0.00352	pCi/g			0.006	46.33	0.009	31.95		
Mortandad at MCO-8.5	06/19	CS	$^{239,240}Pu$	1.13	0.0666	0.00705	pCi/g			0.068	16.62	0.013	86.92		
Mortandad at MCO-8.5	06/19	CS	$^{239,240}Pu$	0.934	0.0608	0.00955	pCi/g			0.068	13.74	0.013	71.85		
Mortandad at MCO-9	06/19	CS	^{241}Am	1.97	0.166	0.0165	pCi/g			0.04	49.25	0.076	25.92		
Mortandad at MCO-9	06/19	CS	^{137}Cs	5.69	0.291	0.0492	pCi/g			0.9	6.32	0.56	10.16	5.3	1.07
Mortandad at MCO-9	06/19	CS	Gross Beta	35.7	1.85	3.23	pCi/g		J			17.6	2.03		
Mortandad at MCO-9	06/19	CS	^{3}H	1,970	151	380	pCi/L					3,600	0.55		
Mortandad at MCO-9	06/19	CS	^{238}Pu	0.525	0.0368	0.00825	pCi/g			0.006	87.50	0.009	60.34		
Mortandad at MCO-9	06/19	CS	$^{239,240}Pu$	2.67	0.15	0.00824	pCi/g			0.068	39.26	0.013	205.38		
Mortandad at MCO-9	06/19	CS	^{90}Sr	1.57	0.249	0.149	pCi/g			1.04	1.51	1.02	1.54		
Mortandad at MCO-13 (A-5)	06/19	CS	^{137}Cs	0.714	0.0466	0.0358	pCi/g			0.9	0.79	0.56	1.28		
Mortandad at MCO-13 (A-5)	06/19	CS	Gross Alpha	18.9	1.94	2.03	pCi/g					15.7	1.20		
Mortandad at MCO-13 (A-5)	06/19	CS	Gross Beta	47.2	2.13	3.09	pCi/g		J			17.6	2.68		
Mortandad at MCO-13 (A-5)	06/19	CS	^{3}H	945	239	756	pCi/L		J			3,600	0.26		
Mortandad at MCO-13 (A-5)	06/19	CS	$^{239,240}Pu$	0.099	0.0114	0.00938	pCi/g			0.068	1.46	0.013	7.62		
Mortandad A-6	07/11	CS	^{241}Am	0.0474	0.0116	0.0329	pCi/g		J	0.04	1.19	0.076	0.62		
Mortandad A-6	07/11	CS	^{137}Cs	3.16	0.201	0.0719	pCi/g			0.9	3.51	0.56	5.64	5.3	0.60
Mortandad A-6	07/11	CS	Gross Alpha	38.2	3.12	2.69	pCi/g		J-			15.7	2.43		
Mortandad A-6	07/11	CS	Gross Beta	53.1	1.82	1.6	pCi/g		J-			17.6	3.02		
Mortandad A-6	07/11	CS	^{3}H	281	74.3	235	pCi/L		J			3,600	0.08		
Mortandad A-6	07/11	CS	$^{239,240}Pu$	0.125	0.0123	0.0127	pCi/g		J-	0.068	1.84	0.013	9.62		
Mortandad A-7	07/11	CS	Gross Beta	56.7	1.88	2.25	pCi/g		J-			17.6	3.22		
Mortandad at SR-4 (A-9)	07/11	CS	Gross Alpha	17.3	1.91	2.41	pCi/g		J-			15.7	1.10		
Mortandad at SR-4 (A-9)	07/11	CS	Gross Beta	35.2	1.5	1.86	pCi/g		J-			17.6	2.00		
Mortandad at SR-4 (A-9)	07/11	CS	^{3}H	1,760	352	1,070	pCi/L		J			3,600	0.49		
Mortandad at Rio Grande (A-11)	09/24	CS	Gross Beta	24.2	0.683	1.01	pCi/g					17.6	1.38		
TA-54 Area G:															
MDA G-0	05/30	CS	Gross Alpha	26	1.74	1.62	pCi/g		J-			15.7	1.66		
MDA G-0	05/30	CS	Gross Beta	52.3	1.78	2.48	pCi/g		J-			17.6	2.97		

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
TA-54 Area G (Cont.):															
MDA G-0	05/30	CS	^{3}H	1,660	132	358	pCi/L					3,600	0.46		
MDA G-0	05/30	CS	^{239,240}Pu	0.0258	0.0083	0.00699	pCi/g			0.068	0.38	0.013	1.98		
MDA G-1	05/31	CS	Gross Beta	45.9	1.83	2.7	pCi/g		J-			17.6	2.61		
MDA G-1	05/31	CS	Gross Beta	36.8	1.58	2.97	pCi/g		J-			17.6	2.09		
MDA G-1	05/31	CS	^{3}H	393	111	360	pCi/L		J			3,600	0.11		
MDA G-2	05/31	CS	Gross Beta	38	2.37	2.79	pCi/g		J-			17.6	2.16		
MDA G-2	05/31	DUP	^{3}H	730	168	535	pCi/L		U			3,600	0.20		
MDA G-3	05/31	CS	Gross Beta	41.7	2.55	2.73	pCi/g		J-			17.6	2.37		
MDA G-3	05/31	CS	^{3}H	1,280	126	360	pCi/L					3,600	0.36		
MDA G-4 R-1	05/31	CS	Gross Alpha	22.1	4.24	5.19	pCi/g		J-			15.7	1.41		
MDA G-4 R-1	05/31	DUP	Gross Alpha	15.7	1.31	2.14	pCi/g		J-			15.7	1.00		
MDA G-4 R-1	05/31	CS	Gross Beta	40.2	4.18	8.63	pCi/g		J-			17.6	2.28		
MDA G-4 R-1	05/31	DUP	Gross Beta	40.2	1.62	3.41	pCi/g		J-			17.6	2.28		
MDA G-4 R-1	05/31	CS	^{3}H	19,200	302	271	pCi/L					3,600	5.33		
MDA G-4 R-1	05/31	DUP	^{239,240}Pu	0.0226	0.00708	0.0195	pCi/g		U	0.068	0.33	0.013	1.74		
MDA G-4 R-2	05/31	CS	Gross Alpha	17.5	1.38	1.89	pCi/g		J-			15.7	1.11		
MDA G-4 R-2	05/31	CS	Gross Beta	41.6	1.56	2.61	pCi/g		J-			17.6	2.36		
MDA G-4 R-2	05/31	CS	^{3}H	9,930	207	270	pCi/L					3,600	2.76		
MDA G-4 R-2	05/31	CS	^{239,240}Pu	0.035	0.00872	0.00558	pCi/g			0.068	0.51	0.013	2.69		
MDA G-5	05/31	CS	Gross Alpha	18.3	1.35	1.75	pCi/g		J-			15.7	1.17		
MDA G-5	05/31	CS	Gross Beta	39.8	1.7	3.03	pCi/g		J-			17.6	2.26		
MDA G-5	05/31	CS	^{3}H	3,570	217	545	pCi/L					3,600	0.99		
MDA G-6 R	05/31	CS	^{241}Am	0.506	0.0434	0.0174	pCi/g			0.04	12.65	0.076	6.66		
MDA G-6 R	05/31	CS	Gross Beta	40.7	1.73	3.33	pCi/g		J-			17.6	2.31		
MDA G-6 R	05/31	CS	^{3}H	1,770	187	539	pCi/L					3,600	0.49		
MDA G-6 R	05/31	CS	^{239,240}Pu	0.169	0.0203	0.0139	pCi/g			0.068	2.49	0.013	13.00		
MDA G-7	05/31	CS	^{241}Am	0.0745	0.0139	0.00631	pCi/g			0.04	1.86	0.076	0.98		
MDA G-7	05/31	CS	Gross Alpha	24.7	1.92	1.45	pCi/g		J-			15.7	1.57		
MDA G-7	05/31	CS	Gross Beta	47.5	2.94	2.26	pCi/g		J-			17.6	2.70		
MDA G-7	05/31	CS	^{3}H	2,350	143	358	pCi/L					3,600	0.65		
MDA G-7	05/31	CS	^{238}Pu	0.26	0.0327	0.0232	pCi/g			0.006	43.33	0.009	29.89		
MDA G-7	05/31	CS	^{239,240}Pu	0.248	0.0285	0.0378	pCi/g			0.068	3.65	0.013	19.08		
MDA G-7 West	05/31	CS	^{241}Am	0.102	0.0188	0.0218	pCi/g			0.04	2.55	0.076	1.34		
MDA G-7 West	05/31	CS	Gross Alpha	31.9	2.2	2.03	pCi/g		J-			15.7	2.03		
MDA G-7 West	05/31	CS	Gross Beta	50.2	1.79	2.94	pCi/g		J-			17.6	2.85		
MDA G-7 West	05/31	CS	^{3}H	1,060	179	554	pCi/L		J			3,600	0.29		

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
TA-54 Area G (Cont.):															
MDA G-7 West	05/31	CS	^{238}Pu	1.31	0.102	0.00837	pCi/g			0.006	218.33	0.009	150.57		
MDA G-7 West	05/31	CS	^{239,240}Pu	0.392	0.0375	0.00603	pCi/g			0.068	5.76	0.013	30.15		
MDA G-8	05/31	CS	Gross Beta	39.3	1.64	3.11	pCi/g		J-			17.6	2.23		
MDA G-8	05/31	CS	^{3}H	492	113	360	pCi/L		J			3,600	0.14		
MDA G-8	05/31	CS	^{238}Pu	0.0425	0.0113	0.0202	pCi/g		J	0.006	7.08	0.009	4.89		
MDA G-8	05/31	CS	^{239,240}Pu	0.0385	0.00949	0.0213	pCi/g		J	0.068	0.57	0.013	2.96		
MDA-G-9	05/31	CS	Gross Alpha	19.8	1.62	1.71	pCi/g		J-			15.7	1.26		
MDA-G-9	05/31	CS	Gross Beta	48	1.87	2.83	pCi/g		J-			17.6	2.73		
MDA-G-9	05/31	CS	Gross Beta	37.7	1.65	2.41	pCi/g		J-			17.6	2.14		
MDA-G-9	05/31	CS	^{238}Pu	0.0493	0.0127	0.00836	pCi/g			0.006	8.22	0.009	5.67		
MDA-G-9	05/31	CS	^{238}Pu	0.0351	0.00996	0.00732	pCi/g			0.006	5.85	0.009	4.03		
MDA-G-9	05/31	CS	^{239,240}Pu	0.0644	0.0125	0.00602	pCi/g			0.068	0.95	0.013	4.95		
MDA-G-9	05/31	CS	^{239,240}Pu	0.0292	0.00773	0.00527	pCi/g			0.068	0.43	0.013	2.25		
Cañada del Buey:															
Cañada del Buey at SR-4	06/05	CS	Gross Alpha	16.2	1.83	2.03	pCi/g					15.7	1.03		
Cañada del Buey at SR-4	06/05	DUP	Gross Beta	36.5	1.72	2.64	pCi/g					17.6	2.07		
Cañada del Buey at SR-4	06/05	CS	Gross Beta	34.3	1.79	3.41	pCi/g					17.6	1.95		
Cañada del Buey at SR-4	06/05	CS	^{3}H	943	160	494	pCi/L					3,600	0.26		
Pajarito Canyon:															
Two-Mile at SR-501	06/05	CS	^{137}Cs	0.638	0.0304	0.0421	pCi/g			0.9	0.71	0.56	1.14		
Two-Mile at SR-501	06/05	CS	Gross Beta	40.7	1.95	3.25	pCi/g					17.6	2.31		
Two-Mile at SR-501	06/05	CS	^{239,240}Pu	0.029	0.00948	0.0204	pCi/g			0.068	0.43	0.013	2.23		
Pajarito at SR-501	06/05	CS	Gross Beta	32.5	1.63	2.67	pCi/g					17.6	1.85		
Pajarito at SR-4	06/05	CS	Gross Beta	33.5	1.64	2.44	pCi/g					17.6	1.90		
Pajarito at SR-4	06/05	CS	Gross Beta	33.1	1.69	2.54	pCi/g					17.6	1.88		
Pajarito at SR-4	06/05	CS	^{3}H	242	53.5	164	pCi/L					3,600	0.07		
Pajarito at SR-4	06/05	CS	^{3}H	241	53.2	163	pCi/L					3,600	0.07		
Pajarito at SR-4	06/05	DUP	^{3}H	240	53	163	pCi/L					3,600	0.07		
Pajarito at Rio Grande	09/25	CS	Gross Beta	30.8	1.22	1.86	pCi/g					17.6	1.75		
Potrillo Canyon:															
Potrillo at SR-4	06/05	CS	Gross Alpha	16.3	1.89	2.19	pCi/g					15.7	1.04		
Potrillo at SR-4	06/05	CS	Gross Beta	38.9	1.9	2.89	pCi/g					17.6	2.21		

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
Fence Canyon:															
Fence at SR-4	06/05	CS	Gross Beta	36.8	2	3.14	pCi/g					17.6	2.09		
Fence at SR-4	06/05	CS	$^{239,240}Pu$	0.0303	0.00872	0.0241	pCi/g			0.068	0.45	0.013	2.33		
Cañon de Valle:															
Cañon de Valle at SR-501	06/05	CS	^{137}Cs	0.586	0.0455	0.039	pCi/g			0.9	0.65	0.56	1.05		
Cañon de Valle at SR-501	06/05	CS	Gross Beta	40.4	1.97	2.8	pCi/g					17.6	2.30		
Cañon de Valle at SR-501	06/05	CS	^{3}H	277	54	169	pCi/L					3,600	0.08		
Water Canyon:															
Water at SR-501	06/05	CS	Gross Alpha	17.2	3.13	1.86	pCi/g					15.7	1.10		
Water at SR-501	06/05	CS	Gross Beta	50.5	3.19	2.55	pCi/g					17.6	2.87		
Water at SR-501	06/05	CS	Gross Beta	38.2	1.87	3.03	pCi/g					17.6	2.17		
Water at SR-501	06/05	CS	^{3}H	357	101	327	pCi/L					3,600	0.10		
Water Canyon at SR-4	06/05	CS	^{137}Cs	1.14	0.0398	0.044	pCi/g			0.9	1.27	0.56	2.04		
Water Canyon at SR-4	06/05	CS	Gross Alpha	17.1	1.97	1.99	pCi/g					15.7	1.09		
Water Canyon at SR-4	06/05	CS	Gross Beta	40.5	1.93	2.85	pCi/g					17.6	2.30		
Water at Rio Grande	09/25	CS	Gross Beta	32.4	1.18	1.35	pCi/g					17.6	1.84		
Water at Rio Grande	09/25	CS	Gross Beta	24.9	1.08	1.71	pCi/g					17.6	1.41		
Water at Rio Grande	09/25	CS	$^{239,240}Pu$	0.0193	0.00583	0.0109	pCi/g			0.068	0.28	0.013	1.48		
Indio Canyon:															
Indio Canyon at SR-4	06/05	CS	Gross Alpha	18.5	2.05	2.49	pCi/g					15.7	1.18		
Indio Canyon at SR-4	06/05	CS	Gross Beta	43.2	1.91	2.89	pCi/g					17.6	2.45		
Ancho Canyon:															
Ancho at SR-4	06/05	CS	Gross Beta	38.3	1.77	3.25	pCi/g					17.6	2.18		
Ancho at SR-4	06/05	CS	^{3}H	1,610	314	984	pCi/L					3,600	0.45		
Above Ancho Spring	10/24	CS	Gross Beta	33.8	1.44	2.01	pCi/g					17.6	1.92		
Above Ancho Spring	10/24	CS	Gross Beta	31.4	1.43	1.59	pCi/g					17.6	1.78		
Above Ancho Spring	10/24	CS	^{3}H	189	54.6	172	pCi/L					3,600	0.05		
Ancho at Rio Grande	09/25	CS	Gross Beta	20.7	0.952	1.58	pCi/g					17.6	1.18		
TA-49 Area AB:															
MDA AB-1	05/22	CS	Gross Beta	36.3	1.44	2.44	pCi/g		J			17.6	2.06		
MDA AB-1	05/22	CS	Gross Beta	31.4	1.31	2.67	pCi/g		J			17.6	1.78		
MDA AB-1	05/22	CS	^{3}H	468	111	344	pCi/L					3,600	0.13		

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
TA-49 Area AB (Cont.):															
MDA AB-1	05/22	CS	^{3}H	242	51.9	158	pCi/L		J			3,600	0.07		
MDA AB-1	05/22	CS	$^{239,240}Pu$	0.0176	0.00424	0.00264	pCi/g			0.068	0.26	0.013	1.35		
MDA AB-1	05/22	CS	$^{239,240}Pu$	0.0166	0.00489	0.00376	pCi/g			0.068	0.24	0.013	1.28		
MDA AB-2	05/22	CS	Gross Alpha	22.7	1.65	1.71	pCi/g					15.7	1.45		
MDA AB-2	05/22	CS	Gross Beta	33.2	1.58	3.44	pCi/g		J			17.6	1.89		
MDA AB-2	05/22	CS	^{3}H	189	50.7	159	pCi/L		J			3,600	0.05		
MDA AB-2	05/22	CS	$^{239,240}Pu$	0.0593	0.00798	0.00247	pCi/g			0.068	0.87	0.013	4.56		
MDA AB-3	05/22	CS	^{241}Am	0.113	0.0141	0.0037	pCi/g			0.04	2.83	0.076	1.49		
MDA AB-3	05/22	CS	Gross Alpha	15.8	1.33	1.44	pCi/g					15.7	1.01		
MDA AB-3	05/22	CS	Gross Beta	33	1.49	2.81	pCi/g		J			17.6	1.88		
MDA AB-3	05/22	CS	^{3}H	541	102	319	pCi/L		J			3,600	0.15		
MDA AB-3	05/22	CS	$^{239,240}Pu$	0.402	0.0286	0.00714	pCi/g			0.068	5.91	0.013	30.92		
MDA AB-3 Alternate	05/23	CS	^{241}Am	0.155	0.0157	0.00291	pCi/g			0.04	3.88	0.076	2.04		
MDA AB-3 Alternate	05/23	CS	Gross Alpha	25.2	1.9	2.78	pCi/g					15.7	1.61		
MDA AB-3 Alternate	05/23	CS	Gross Beta	38.6	1.9	3.24	pCi/g		J			17.6	2.19		
MDA AB-3 Alternate	05/23	CS	^{3}H	420	115	371	pCi/L		J			3,600	0.12		
MDA AB-3 Alternate	05/23	CS	^{238}Pu	0.0141	0.00434	0.00349	pCi/g			0.006	2.35	0.009	1.62		
MDA AB-3 Alternate	05/23	CS	$^{239,240}Pu$	0.721	0.0496	0.00946	pCi/g			0.068	10.60	0.013	55.46		
MDA AB-4	05/22	CS	Gross Alpha	19.6	1.63	1.76	pCi/g					15.7	1.25		
MDA AB-4	05/22	CS	Gross Beta	32.1	1.69	3.26	pCi/g		J			17.6	1.82		
MDA AB-4	05/22	CS	^{3}H	314	51.6	159	pCi/L		J			3,600	0.09		
MDA AB-4A	05/22	CS	Gross Alpha	22.5	1.54	1.1	pCi/g					15.7	1.43		
MDA AB-4A	05/22	CS	Gross Beta	31.6	1.26	2.34	pCi/g		J			17.6	1.80		
MDA AB-4A	05/22	CS	^{3}H	268	44	135	pCi/L		J			3,600	0.07		
MDA AB-4A	05/22	CS	$^{239,240}Pu$	0.0156	0.00496	0.0102	pCi/g		J	0.068	0.23	0.013	1.20		
MDA AB-5	05/22	CS	Gross Alpha	19.2	1.46	1.51	pCi/g					15.7	1.22		
MDA AB-5	05/22	CS	Gross Alpha	16.8	1.36	1.39	pCi/g					15.7	1.07		
MDA AB-5	05/22	CS	Gross Beta	39.5	1.63	2.84	pCi/g		J			17.6	2.24		
MDA AB-5	05/22	CS	Gross Beta	39.3	1.68	3.26	pCi/g		J			17.6	2.23		
MDA AB-5	05/22	CS	^{3}H	324	54.4	159	pCi/L		J			3,600	0.09		
MDA AB-5	05/22	CS	^{3}H	294	53.2	158	pCi/L		J			3,600	0.08		
MDA AB-5	05/22	CS	$^{239,240}Pu$	0.0187	0.00494	0.00338	pCi/g			0.068	0.28	0.013	1.44		
MDA AB-5	05/22	CS	$^{239,240}Pu$	0.0147	0.00482	0.0118	pCi/g		J	0.068	0.22	0.013	1.13		
MDA AB-6	05/22	CS	Gross Beta	30.4	1.56	2.94	pCi/g		J			17.6	1.73		
MDA AB-6	05/22	CS	^{3}H	302	56.1	170	pCi/L		J			3,600	0.08		
MDA AB-7	05/22	CS	Gross Beta	33.5	1.4	2.63	pCi/g		J			17.6	1.90		

Table 5-15. Detections of Greater-Than-Background Radionuclides in River and Stream Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qual Code[e]	Valid Flag Code[e]	ER Canyon Sediment Background[f]	Result/ ER Canyon Sediment Background	River Background[g]	Result/ River Background	SAL[h]	Result/ SAL
Pajarito Plateau Stations (Cont.)															
TA-49 Area AB (Cont.):															
MDA AB-7	05/22	CS	^{3}H	529	69.7	208	pCi/L		J			3,600	0.15		
MDA AB-8	05/22	CS	Gross Beta	35.1	1.49	2.72	pCi/g		J			17.6	1.99		
MDA AB-8	05/22	CS	^{3}H	478	63	188	pCi/L		J			3,600	0.13		
MDA AB-9	05/22	CS	Gross Alpha	22.6	1.22	0.857	pCi/g					15.7	1.44		
MDA AB-9	05/22	CS	Gross Beta	44.3	1.16	1.38	pCi/g		J			17.6	2.52		
MDA AB-9	05/22	CS	^{3}H	400	107	337	pCi/L		J			3,600	0.11		
MDA AB-9	05/22	CS	$^{239,240}Pu$	0.0412	0.00762	0.012	pCi/g			0.068	0.61	0.013	3.17		
MDA AB-10	05/22	CS	Gross Beta	37.8	1.36	2.14	pCi/g		J			17.6	2.15		
MDA AB-10	05/22	CS	^{3}H	525	141	442	pCi/L					3,600	0.15		
MDA AB-10	05/22	CS	$^{239,240}Pu$	0.017	0.004	0.00243	pCi/g			0.068	0.25	0.013	1.31		
MDA AB-11	05/23	CS	Gross Alpha	21.2	1.6	1.78	pCi/g					15.7	1.35		
MDA AB-11	05/23	CS	Gross Beta	36.8	1.55	2.67	pCi/g		J			17.6	2.09		
MDA AB-11	05/23	CS	^{3}H	209	49.9	154	pCi/L					3,600	0.06		
MDA AB-11	05/23	DUP	^{3}H	49.2	154	pCi/L					3,600	0.05			
MDA AB-11	05/23	CS	$^{239,240}Pu$	0.0157	0.00449	0.00991	pCi/g		J	0.068	0.23	0.013	1.21		
Chaquehui Canyon:															
Chaquehui at Rio Grande	09/25	CS	^{137}Cs	0.746	0.0518	0.0471	pCi/g			0.9	0.83	0.56	1.33		
Chaquehui at Rio Grande	09/25	CS	Gross Alpha	24	1.77	2.06	pCi/g					15.7	1.53		
Chaquehui at Rio Grande	09/25	CS	Gross Beta	42.9	1.41	2.16	pCi/g					17.6	2.44		
Chaquehui at Rio Grande	09/25	CS	^{3}H	2,300	168	406	pCi/L					3,600	0.64		
Frijoles Canyon:															
Frijoles at Monument Headquarters	06/27	CS	Gross Alpha	21.1	2.03	1.61	pCi/g		J-			15.7	1.34		
Frijoles at Monument Headquarters	06/27	CS	Gross Beta	39.7	1.8	2.43	pCi/g		J			17.6	2.26		
Frijoles at Monument Headquarters	06/27	CS	Gross Beta	30.9	1.69	2.99	pCi/g		J			17.6	1.76		
Frijoles at Monument Headquarters	06/27	CS	$^{239,240}Pu$	0.0223	0.00574	0.0109	pCi/g		J	0.068	0.33	0.013	1.72		
Frijoles at Rio Grande	06/27	CS	Gross Alpha	21.7	2.03	1.62	pCi/g		J-			15.7	1.38		
Frijoles at Rio Grande	06/27	CS	Gross Beta	34.7	1.69	2.71	pCi/g		J			17.6	1.97		
Frijoles at Rio Grande	09/26	CS	Gross Beta	34.1	1.24	1.6	pCi/g					17.6	1.94		
Frijoles at Rio Grande	06/27	CS	$^{239,240}Pu$	0.0225	0.00609	0.0141	pCi/g		J	0.068	0.33	0.013	1.73		

[a]Above-background detection defined value as ≥ 3 × uncertainty and ≥ detection limit and ≥ background. Values indicated by entries in SAL column are greater than half of the SAL. Note that some results in this table were qualified as nondetections by the analytical laboratory. All tritium detections are shown.
[b]Codes: CS–customer sample; DUP–duplicate; TRP–triplicate; RE–reanalysis.
[c]One standard deviation radioactivity counting uncertainty.
[d]MDA=Minimum detectable activity.
[e]For Laboratory Qualifier Codes and Validation Flag Codes, see Table 5-4.
[f]Ryti (1998).
[g]Upper limit for background values (McLin and Lyons 2002).
[h]Screening Action Level, LANL Environmental Restoration Project, 2001; see text for details.

Table 5-16. Detections of Greater-Than-Background Radionuclides in Reservoir Sediments for 2001[a]

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qualifier Code[e]	Valid Flag Code[e]	Reservoir Background[f]	Result/ Background
Reservoirs on Rio Chama (New Mexico)											
Heron Upper	08/30	CS	Gross Beta	17.9	1.2	3.04	pCi/g		J-	9.7	1.85
Heron Upper	08/30	CS	Gross Beta	16.6	1.08	2.53	pCi/g		J-	9.7	1.71
Heron Upper	08/30	DUP	Gross Beta	18.2	1.04	2.49	pCi/g			9.7	1.88
Heron Middle	08/30	CS	^{241}Am	0.0102	0.00312	0.00251	pCi/g			0.01	1.02
Heron Middle	08/30	CS	Gross Alpha	16.4	1.24	1.51	pCi/g		J-	15.9	1.03
Heron Middle	08/30	CS	Gross Beta	28.4	1.29	2.58	pCi/g		J-	9.7	2.93
Heron Lower	08/30	CS	Gross Alpha	16.9	1.27	1.42	pCi/g		J-	15.9	1.06
Heron Lower	08/30	CS	Gross Beta	28.9	1.31	2.62	pCi/g		J-	9.7	2.98
El Vado Lower	08/30	CS	Gross Beta	21.6	1.27	2.98	pCi/g		J-	9.7	2.23
El Vado Lower	08/30	CS	^{239,240}Pu	0.0203	0.00595	0.00457	pCi/g			0.02	1.02
El Vado Middle	08/30	CS	Gross Beta	19.1	1.43	2.56	pCi/g		J-	9.7	1.97
El Vado Middle	08/30	CS	^{239,240}Pu	0.0309	0.00748	0.00466	pCi/g			0.02	1.55
El Vado Upper	08/30	CS	Gross Beta	17.4	1.32	2.39	pCi/g		J-	9.7	1.79
Abiquiu Upper	08/20	CS	Gross Alpha	16.6	1.71	1.77	pCi/g			15.9	1.04
Abiquiu Upper	08/20	CS	Gross Beta	24.1	0.736	1	pCi/g			9.7	2.48
Abiquiu Middle	08/20	CS	Gross Beta	20.9	1.39	0.951	pCi/g			15.9	1.31
Abiquiu Middle	08/20	CS	GrossB	29.9	0.723	0.78	pCi/g			9.7	3.08
Abiquiu Lower	08/20	CS	^{241}Am	0.0324	0.0104	0.00879	pCi/g			0.01	3.24
Abiquiu Lower	08/20	CS	Gross Alpha	16.9	1.65	0.951	pCi/g			15.9	1.06
Abiquiu Lower	08/20	CS	Gross Beta	20.7	0.699	0.909	pCi/g			9.7	2.13
Reservoirs on Rio Grande (Colorado)											
Rio Grande Upper	10/16	CS	Gross Alpha	17	2.49	3.06	pCi/g			15.9	1.07
Rio Grande Upper	10/16	CS	Gross Beta	27.7	1.36	1.57	pCi/g			9.7	2.86
Rio Grande Upper	10/16	DUP	Gross Beta	23.8	1.2	1.99	pCi/g			9.7	2.45
Rio Grande Middle	10/16	CS	^{137}Cs	1.06	0.0753	0.0407	pCi/g			0.98	1.08
Rio Grande Middle	10/16	CS	Gross Alpha	17	2.27	3.98	pCi/g			15.9	1.07
Rio Grande Middle	10/16	CS	Gross Beta	36.7	1.57	1.98	pCi/g			9.7	3.78
Rio Grande Middle	10/16	CS	^{239,240}Pu	0.0546	0.0117	0.0241	pCi/g			0.02	2.73
Rio Grande Lower	10/16	CS	Gross Alpha	19.1	2.11	2.53	pCi/g			15.9	1.2
Rio Grande Lower	10/16	CS	Gross Beta	36.3	1.45	1.64	pCi/g			9.7	3.74

Table 5-16. Detections of Greater-Than-Background Radionuclides in Reservoir Sediments for 2001[a] (Cont.)

Station Name	Date	Code[b]	Analyte	Result	Uncertainty[c]	MDA[d]	Units	Lab Qualifier Code[e]	Valid Flag Code[e]	Reservoir Background[f]	Result/ Background
Reservoirs on Rio Grande (New Mexico)											
Cochiti Upper	08/22	CS	Gross Alpha	19.1	1.53	1.21	pCi/g			15.9	1.2
Cochiti Upper	08/22	CS	Gross Beta	26.9	0.752	1.06	pCi/g			9.7	2.77
Cochiti Upper	08/22	CS	$^{239,240}Pu$	0.044	0.00905	0.0122	pCi/g			0.02	2.2
Cochiti Upper	08/22	DUP	$^{239,240}Pu$	0.0509	0.00939	0.0139	pCi/g			0.02	2.55
Cochiti Middle	08/22	CS	^{241}Am	0.0321	0.00986	0.0079	pCi/g			0.01	3.21
Cochiti Middle	08/22	CS	Gross Alpha	23.1	2.02	1.06	pCi/g			15.9	1.45
Cochiti Middle	08/22	CS	Gross Beta	27.1	0.624	0.696	pCi/g			9.7	2.79
Cochiti Middle	08/22	CS	$^{239,240}Pu$	0.0358	0.00775	0.00422	pCi/g			0.02	1.79
Cochiti Middle	08/22	CS	Gross Alpha	22.6	2.02	1.28	pCi/g			15.9	1.42
Cochiti Middle	08/22	CS	Gross Beta	25.5	0.747	1.06	pCi/g			9.7	2.63
Cochiti Lower	08/22	CS	^{241}Am	0.0263	0.00847	0.00713	pCi/g			0.01	2.63
Cochiti Lower	08/22	CS	^{137}Cs	1.09	0.0694	0.0313	pCi/g			0.98	1.11
Cochiti Lower	08/22	CS	Gross Alpha	21.2	2.28	1.67	pCi/g			15.9	1.33
Cochiti Lower	08/22	CS	Gross Beta	26.2	0.801	1.26	pCi/g			9.7	2.7
Cochiti Lower	08/22	CS	$^{239,240}Pu$	0.0313	0.00812	0.014	pCi/g			0.02	1.57

[a]Above-background detection defined as value ≥ 3 × uncertainty and ≥ detection limit and ≥ background. Values indicated by entries in SAL column are greater than half of the SAL. Note that some results in this table were qualified as nondetections by the analytical laboratory. All tritium detections are shown.
[b]Codes: CS-customer sample; DUP-duplicate; TRP-triplicate; RE-reanalysis.
[c]One standard deviation radioactivity counting uncertainty.
[d]MDA=minimum detectable activity.
[e]For Lab Qualifier and Validation Flag Codes, see Table 5-4.
[f]Upper limit for background values (McLin and Lyons 2002).

Table 5-17. Total Recoverable Trace Metals in Sediments for 2001 (mg/kg)

Station	Date	Code[a]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Regional Stations													
Rio Chama at Chamita	06/20	CS	<[b] 0.097	4,120	1.87	< 2.68	85.3	< 0.252	0.086	1.68	4.84	1.97	4,950
Rio Grande at Embudo	06/20	CS	< 0.097	4,420	2.37	< 1.43	107	< 0.275	0.151	4.17	10.7	5.76	11,800
Rio Grande at Otowi (bank)	07/11	CS	< 0.083	2,460	2.02	< 1.39	174	< 0.225	< 0.14	2.76	9.71	3.06	11,700
Rio Grande at Frijoles (bank)	09/26	CS	< 0.142	8,460	2.24	< 3.41	174	< 0.453	< 0.142	3.52	8.52	5.83	8,670
Rio Grande at Cochiti	09/26	CS	< 0.152	3,910	1.01	< 1.8	64.7	< 0.238	< 0.101	1.85	4.06	2.74	4,410
Rio Grande at Bernalillo	06/06	CS	< 0.12	7,690	3.05	< 4.28	178	< 0.43	< 0.227	4.04	8.62	6.83	9,880
Jemez River	06/06	CS	< 0.12	2,280	1.21	< 1.53	105	< 0.21	< 0.208	1.47	3.54	1.92	4,280
Reservoirs on Rio Chama (New Mexico)													
Heron Upper	08/30	CS	< 0.21	21,900	5.51	< 8.13	150	< 0.803	0.52	9.56	13.1	22.4	25,400
Heron Upper	08/30	CS	< 0.198	21,900	5.81	9.88	151	0.871	0.402	9.56	14.1	23.2	25,500
Heron Upper	08/30	DUP	< 0.208	21,700	6.11	< 8.18	152	< 0.81		9.69	13.3	22.9	25,700
Heron Middle	08/30	CS	< 0.365	30,100	10.9	16.7	175	< 1.22	< 0.476	10.8	23.2	27	28,300
Heron Lower	08/30	CS	< 0.429	32,200	8.49	19	188	< 1.36	< 0.507	10.1	27.1	26.4	27,200
El Vado Lower	08/30	CS	< 0.339	25,700	10.6	15.3	187	< 1.28	0.758	10.6	25.1	22.3	25,400
El Vado Middle	08/30	CS	< 0.271	22,300	9.94	< 10.9	171	< 1.14	0.677	10.5	24.5	23.4	24,500
El Vado Upper	08/30	CS	< 0.218	17,600	7.49	< 7.23	153	< 0.903	0.768	9.54	21.6	21.8	21,100
Abiquiu Upper	08/20	CS	< 1.02	23,300	5.93	16	178	< 1.11	0.547	8.5	20.7	19.3	20,600
Abiquiu Middle	08/20	CS	< 1.49	33,300	6.91	22.1	330	< 1.53	< 0.368	12.1	29.3	25.6	29,200
Abiquiu Lower	08/20	CS	1.96	25,200	4.37	15.5	292	< 1.2	< 0.348	10.6	25.7	22.4	25,700
Reservoirs on Rio Grande (Colorado)													
Rio Grande Upper	10/16	CS	< 0.191	16,900	4.35	< 0.891	216	0.869	< 0.27	7.98	6.67	15.5	22,100
Rio Grande Middle	10/16	CS	< 0.198	13,600	4.43	< 1.37	165	< 0.707	< 0.28	6.77	4.98	11.6	19,600
Rio Grande Lower	10/16	CS	< 0.185	10,200	3.57	< 0.986	167	< 0.522	< 0.248	6.75	5.02	9.25	20,600
Reservoirs on Rio Grande (New Mexico)													
Cochiti Upper	08/22	CS	< 0.83	17,900	3.3	< 8.7	366	< 0.99	< 0.387	7.67	12.9	13.7	15,000
Cochiti Upper	08/22	DUP	< 0.62	16,200	2.71	< 6.92	348	< 0.93	< 0.331	7.1	11.7	13.3	14,100
Cochiti Middle	08/22	CS	< 1.05	37,600	4.91	< 16.3	317	1.81	0.752	11.7	23.5	24.9	26,500
Cochiti Middle	08/22	CS	< 1.33	35,400	4.81	< 14.7	306	1.67	< 0.522	10.6	21.1	23.1	23,900
Cochiti Lower	08/22	CS	< 1.55	36,100	4.15	< 15.2	275	< 1.74	< 0.608	9.98	20.8	22.1	23,500
Perimeter Stations													
Rio Grande at Sandia	09/24	CS	< 0.137	7,170	1.7	< 2.95	177	< 0.38	< 0.154	3.03	6.45	4.58	7,140
Rio Grande at Mortandad	09/24	CS	< 0.158	7,100	1.8	< 3.03	131	< 0.367	< 0.08	2.65	6.26	4.27	6,800
Rio Grande at Pajarito	09/25	CS	< 0.15	13,000	2.67	< 4.87	353	0.679	< 0.167	4.92	9.41	9.16	9,800
Rio Grande at Water	09/25	CS	< 0.144	7,580	1.91	< 2.94	158	< 0.416	< 0.081	3.11	7.48	5.02	7,700
Rio Grande at Ancho	09/25	CS	< 0.142	8,020	1.74	< 2.65	119	< 0.398	< 0.149	4.41	8.2	5.91	8,880
Rio Grande at Chaquehui	09/25	CS	< 0.151	11,500	2.19	< 4.41	256	< 0.572	< 0.185	4.3	9.99	7.83	9,870
Pajarito Plateau Stations													
Guaje Canyon:													
Guaje Reservoir	10/12	CS	< 0.166	8,520	1.25	< 3.19	137	< 0.665	< 0.117	3.77	8.32	8.14	8,460
Guaje Reservoir	10/12	DUP	< 0.157	7,810	1.41	< 2.71	126	< 0.58	< 0.125	3.54	7.76	7.39	8,000
Guaje Canyon at SR-502	07/11	CS	< 0.093	7,430	2	< 2.79	202	< 0.502	< 0.263	3.9	8.15	7.28	9,550
Guaje Canyon at SR-502	07/11	CS	< 0.066	4,500	1.46	< 1.78	81	< 0.383	< 0.175	2.48	4.28	4.96	6,170

Table 5-17. Total Recoverable Trace Metals in Sediments for 2001 (mg/kg) (Cont.)

Station	Date	Code[a]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Pajarito Plateau Stations (cont.)													
Bayo Canyon:													
Bayo at SR-502	07/11	CS	< 0.064	4,390	1.06	< 1.41	98.9	< 0.303	< 0.129	2.91	5.94	5.35	8,320
Acid/Pueblo Canyons:													
Acid Weir	06/12	CS	< 0.093	5,950	2.32	< 2.91	90.4	< 0.469	0.391	2.6	5.93	7.84	6,610
Pueblo 1 R	06/12	CS	< 0.086	3,550	1.19	< 0.86	38.3	< 0.253	< 0.142	1.45	3.01	2.33	5,790
Pueblo 2	06/12	CS	< 0.087	3,010	1.05	< 0.717	50.2	< 0.261	< 0.167	1.12	3.34	2.17	4,900
Pueblo 2	06/12	CS	< 0.085	2,650	1.08	< 0.671	31.4	< 0.249	< 0.151	0.96	2.4	1.78	5,020
Hamilton Bend Spring	06/12	CS	< 0.082	5,050	1.39	< 1.56	56.4	< 0.424	0.202	1.68	3.63	3.94	5,420
Pueblo 3	06/12	CS	2.34	11,300	2.94	< 6.44	147	< 0.752	0.443	2.77	10.3	44.4	10,300
Pueblo 3	06/12	DUP	2.73	11,100	2.7	< 5.76	153	< 0.739	0.438	2.59	10.6	51.6	9,840
Pueblo at SR-502	06/12	CS	1.13	9,850	2.69	12.1	116	0.754	0.317	3.12	8.04	15.9	9,080
DP/Los Alamos Canyons:													
Los Alamos at Bridge	06/26	CS	< 0.112	6,810	1.48	< 2.48	90.1	< 0.478	< 0.175	2.5	6.21	5.52	8,350
Los Alamos at Bridge	06/26	DUP	< 0.107	7,730	1.67	< 2.63	100	< 0.526	< 0.218	2.68	6.67	6.45	9,150
Los Alamos at Bridge	06/26	CS	< 0.114	7,080	1.22	< 2.43	95.3	< 0.469	< 0.175	2.5	6.27	5.76	8,560
Los Alamos at LAO-1	06/26	CS	< 0.11	4,860	1.34	< 1.31	56.1	< 0.519	< 0.147	3.62	6.09	4.75	6,330
Los Alamos at Upper GS	06/26	CS	< 0.099	7,990	1.95	< 2.38	83.1	0.69	< 0.218	2.48	7.11	6.48	8,440
DPS-1	06/26	CS	< 0.098	2,460	1.36	< 0.483	33.8	< 0.259	< 0.13	1.7	2.29	2.87	6,220
DPS-4	06/26	CS	< 0.101	2,980	1.03	< 0.561	27.7	< 0.415	< 0.112	1.03	1.98	2.21	5,410
Los Alamos at LAO-3	06/26	CS	< 0.127	5,380	1.77	< 1.38	46.8	< 0.504	< 0.147	1.65	4.79	3.93	8,580
Los Alamos at LAO-4.5	06/27	CS	< 0.097	2,950	0.819	< 0.649	28.4	< 0.3	< 0.1	1.01	2.61	2.55	4,740
Los Alamos at SR-4	06/26	CS	< 0.092	7,210	1.57	< 1.87	63.8	0.565	0.217	2.94	8.28	4.79	17,900
Los Alamos at Totavi	07/11	CS	< 0.066	3,820	1.1	< 1.59	53.8	< 0.364	< 0.189	2.12	3.51	4.6	6,800
Los Alamos at Totavi	07/11	CS	< 0.064	4,570	1.39	< 1.72	62.4	< 0.433	0.205	2.3	3.87	5.4	7,250
Los Alamos at Otowi	07/11	CS	< 0.062	2,670	0.941	< 1.1	39.1	< 0.227	< 0.141	1.74	3.58	3.24	5,940
Los Alamos at Otowi	07/11	DUP	< 0.067	3,110	1.22	< 1.14	51	< 0.255	< 0.111	1.9	4.64	3.63	6,990
Sandia Canyon:													
Sandia at SR-4	07/11	CS	< 0.062	3,160	1.02	< 0.878	39.1	< 0.428	< 0.115	1.52	2.1	2.12	4,830
Sandia at Rio Grande	09/24	CS	< 0.113	5,430	0.872	< 1.22	71	< 0.308	< 0.101	2.98	5.05	4.13	6,550
Sandia at Rio Grande	09/24	DUP	< 0.109	5,360	0.839	< 1.12	67.1	< 0.31	< 0.076	2.82	4.8	3.94	6,340
Mortandad Canyon:													
Mortandad near CMR Building	06/19	CS	< 0.12	4,570	1.85	< 1.58	40.3	< 0.421	0.185	1.74	4.71	4.11	7,750
Mortandad west of GS-1	06/19	CS	< 0.087	3,130	1.44	< 1.07	24.5	< 0.299	0.132	0.966	3.08	1.61	5,040
Mortandad west of GS-1	06/19	DUP	< 0.086	3,920	2.2	< 1.11	33.9	< 0.362	< 0.087	1.31	4.25	2.01	6,130
Mortandad at GS-1	06/19	CS	< 0.094	5,910	1.89	< 1.8	36.6	0.569	0.173	1.6	7.3	9.86	7,800
Mortandad at MCO-5	06/19	CS	< 0.082	3,000	2.64	< 0.717	23.4	< 0.397	0.169	2.93	6.52	1.38	48,900
Mortandad at MCO-7	06/19	CS	< 0.087	6,330	2.1	< 2.03	50.4	0.549	0.179	1.8	4.66	4.71	7,120
Mortandad at MCO-8.5	06/19	CS	< 0.084	4,670	1.74	< 2.03	43.1	< 0.388	0.153	1.43	3.28	3.58	6,460
Mortandad at MCO-8.5	06/19	CS	< 0.079	5,920	1.92	< 2.81	53.3	< 0.449	0.214	1.78	4.33	4.19	7,690
Mortandad at MCO-9	06/19	CS	< 0.087	7,790	2.36	< 2.97	73	0.662	0.294	2.28	5.4	6.08	8,760
Mortandad at MCO-13 (A-5)	06/19	CS	< 0.087	13,000	3.42	6.39	134	1.08	0.344	4.12	8.71	8.16	13,100
Mortandad A-6	07/11	CS	< 0.065	11,000	3.93	7.08	216	1.33	0.87	5.3	7.64	20	12,300

Table 5-17. Total Recoverable Trace Metals in Sediments for 2001 (mg/kg) (Cont.)

Station	Date	Code[a]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Pajarito Plateau Stations (cont.)													
Mortandad Canyon: (Cont.)													
Mortandad A-7	07/11	CS	< 0.066	5,800	1.98	< 1.17	81	0.742	0.223	2.64	3.89	4.12	8,020
Mortandad at SR-4 (A-9)	07/11	CS	< 0.067	4,720	1.8	< 1.22	61.4	0.514	< 0.185	2.14	4.24	3.73	6,630
Mortandad at Rio Grande (A-11)	09/24	CS	< 0.121	3,520	1.04	< 1.17	55.7	< 0.268	< 0.062	4.19	5.96	10.7	9,940
TA-54 Area G:													
MDA G-0	05/30	CS	< 0.085	4,420	1.31	< 2.15	37	< 0.341	0.2	1.5	4.21	3	5,770
MDA G-0	05/30	DUP	< 0.084	4,130	1.21	< 1.67	34.2	< 0.32	< 0.16	1.4	3.84	2.88	5,490
MDA G-1	05/31	CS	< 0.087	5,220	1.64	< 1.58	50.8	< 0.394	< 0.176	1.98	4.22	2.68	6,620
MDA G-1	05/31	CS	< 0.088	5,450	1.64	< 1.57	56.4	< 0.409	< 0.189	1.94	4.17	2.73	6,130
MDA G-2	05/31	CS	< 0.087	5,670	1.74	< 1.95	46.1	< 0.436	0.218	1.71	3.89	3.3	5,970
MDA G-3	05/31	CS	< 0.243	3,600	1.25	< 1.05	29.6	< 0.324	< 0.192	1.23	3.69	2.33	5,520
MDA G-4 R-1	05/31	CS	0.479	6,420	1.76	< 2.1	47.1	0.503	0.334	1.75	5.18	3.93	6,330
MDA G-4 R-2	05/31	CS	< 0.145	7,530	2.31	< 2.41	58.7	0.691	0.334	1.82	5.04	4.43	8,180
MDA G-5	05/31	CS	0.508	7,510	2.22	< 2.19	66.8	0.565	0.258	2.31	6.3	4.65	7,330
MDA G-6 R	05/31	CS	< 0.088	4,410	1.47	< 1.5	52.3	< 0.369	0.295	1.53	3.7	7.02	5,470
MDA G-7	05/31	CS	< 0.082	5,160	1.28	< 1.16	38.2	< 0.32	0.243	1.65	3.12	3.71	4,900
MDA G-8	05/31	CS	< 0.082	6,480	1.78	< 1.42	65.1	0.536	0.23	3.6	7.06	2.47	13,900
MDA-G-9	05/31	CS	< 0.086	3,800	1.4	< 0.889	36.4	< 0.389	< 0.182	1.5	2.61	2.12	5,020
MDA-G-9	05/31	CS	< 0.086	5,210	1.26	< 1.36	51	< 0.446	0.245	2.05	3.86	2.77	6,090
Cañada del Buey:													
Cañada del Buey at SR-4	06/05	CS	< 0.22	9,790	2.26	< 2.51	105	0.69	0.26	4.52	7.12	4.63	9,420
Cañada del Buey at SR-4	06/05	DUP	< 0.19	9,910	2.65	< 2.48	108	0.7	0.233	4.56	7.43	4.92	9,780
Pajarito Canyon:													
Twomile at SR-501	06/05	CS	< 0.08	4,870	1.94	< 2.06	98.9	< 0.32	0.227	2.53	4.35	4	6,670
Pajarito at SR-501	06/05	CS	< 0.09	8,200	1.65	< 2.44	126	< 0.39	0.262	3.43	8.1	5.58	8,130
Pajarito at SR-4	06/05	CS	< 0.29	8,340	2.65	< 2.8	83.3	0.73	0.332	3.16	7.35	4.48	10,200
Pajarito at SR-4	06/05	CS	< 0.19	7,270	2.52	< 2.21	71.5	< 0.53	0.411	2.9	5.67	3.88	8,200
Pajarito at Rio Grande	09/25	CS	< 0.157	2,530	0.982	< 0.263	18.7	< 0.143	< 0.038	1.33	5.34	1.56	5,320
Potrillo Canyon:													
Potrillo at SR-4	06/05	CS	< 0.09	7,850	2.19	< 2.22	78.8	0.66	0.293	3.28	6.18	3.88	8,520
Potrillo at SR-4	06/05	DUP	< 0.09	7,730	1.92	< 2.11	74.5	0.63		3.04	5.95	3.81	8,120
Fence Canyon:													
Fence at SR-4	06/05	CS	< 0.09	8,980	2.59	< 2.42	95.2	0.72	0.296	3.55	6.59	5.25	9,440
Cañon de Valle:													
Canon de Valle at SR-501	06/05	CS	< 0.09	7,750	2.21	< 2.72	130	0.52	0.247	3.24	5.69	5.89	8,150
Water Canyon:													
Water at SR-501	06/05	CS	< 0.09	6,300	1.49	< 1.5	76.7	< 0.43	0.21	2.27	5.02	3.35	6,340
Water at SR-501	06/05	CS	< 0.09	4,590	1.09	< 0.87	49.2	< 0.3	< 0.148	1.9	5.69	2.03	7,040
Water Canyon at SR-4	06/05	CS	< 0.09	7,000	1.74	< 1.8	63.9	0.52	0.22	2.96	5.92	3.56	7,710

Table 5-17. Total Recoverable Trace Metals in Sediments for 2001 (mg/kg) (Cont.)

Station	Date	Code[a]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe
Pajarito Plateau Stations (cont.)													
Water Canyon:													
Water at Rio Grande	09/25	CS	< 0.112	2,530	0.488	< 0.561	38.1	< 0.192	< 0.052	1.03	2.03	1.37	3,500
Water at Rio Grande	09/25	CS	< 0.153	3,090	0.792	< 0.603	48.9	< 0.233	< 0.026	1.1	2.29	1.65	3,820
Indio Canyon:													
Indio Canyon at SR-4	06/05	CS	< 0.08	4,090	1.59	< 1.16	32.5	< 0.43	< 0.172	2.05	4.54	2.06	9,680
Ancho Canyon:													
Ancho at SR-4	06/05	CS	< 0.1	6,380	1.45	< 1.89	106	< 0.47	0.235	2.2	4.97	3.25	6,760
Above Ancho Spring	10/24	CS	< 0.116	4,690	1.64	< 1.24	45	< 0.386	< 0.049	2.23	5.4	3.44	9,580
Above Ancho Spring	10/24	CS	< 0.116	5,760	1.65	< 1.58	53.6	< 0.457	< 0.086	2.12	4.96	4.35	8,260
Ancho at Rio Grande	09/25	CS	< 0.153	7,470	1.19	< 1.89	53	< 0.466	< 0.082	1.81	8.33	3.98	5,830
TA-49 Area AB:													
MDA AB-1	05/22	CS	< 0.082	8,910	2.69	< 1.6	95.3	0.671	0.317	4.08	6.96	5.48	9,460
MDA AB-1	05/22	CS	< 0.088	7,950	2.35	< 1.52	73.6	0.547	0.294	3.53	6.67	3.93	8,860
MDA AB-1	05/22	DUP	< 0.088	8,740	2.78	< 1.4	82.6	0.574	0.306	4.59	7.12	4.31	9,400
MDA AB-2	05/22	CS	< 0.087	14,800	3.49	< 1.55	196	0.979	0.392	6.54	10.9	8.52	12,600
MDA AB-3	05/22	CS	< 0.083	4,550	1.53	< 0.788	69.4	< 0.382	0.212	2.44	3.96	4.54	6,290
MDA AB-3 Alternate	05/23	CS	< 0.084	8,560	2.21	< 1.54	107	0.541	0.377	2.8	5.4	5.59	7,070
MDA AB-4	05/22	CS	< 0.083	10,400	2.64	< 1.64	160	0.786	0.324	4.66	7.2	6.19	8,770
MDA AB-4A	05/22	CS	< 0.086	13,400	2.45	< 2.82	199	0.868	0.39	3.98	7.2	6.57	8,810
MDA AB-5	05/22	CS	< 0.09	10,500	2.9	< 1.99	110	0.735	0.592	3.97	7.07	7.22	8,900
MDA AB-5	05/22	CS	< 0.093	10,300	2.77	< 1.6	108	0.704	0.442	3.88	7.11	6.47	9,160
MDA AB-6	05/22	CS	< 0.081	7,460	2.55	< 1.1	91	0.527	0.264	4.36	6.85	3.73	8,590
MDA AB-7	05/22	CS	< 0.081	7,250	2.43	< 1.23	62.4	0.543	0.273	2.24	6.08	3.47	9,300
MDA AB-8	05/22	CS	< 0.085	5,790	2.36	< 0.857	58.1	< 0.476	0.24	2.23	4.8	3.36	7,460
MDA AB-9	05/22	CS	< 0.082	5,210	2.02	< 0.734	70.7	0.481	0.345	3.31	4.12	3.63	7,390
MDA AB-10	05/22	CS	< 0.083	7,190	2.23	< 2.01	120	0.602	< 0.189	3.87	5.71	5.77	8,720
MDA AB-11	05/23	CS	< 0.12	17,400	3.4	< 1.77	186	1.32	0.401	5.53	9.57	10	11,800
Chaquehui Canyon:													
Chaquehui at Rio Grande	09/25	CS	< 0.117	13,100	2.75	< 4.1	128	0.977	0.349	4.67	9.45	12.4	12,200
Frijoles Canyon:													
Frijoles at Monument Headquarters	06/27	CS	< 0.164	6,330	< 0.875	< 1.27	46.3	< 0.677	< 0.149	1.15	3.36	2.42	6,170
Frijoles at Monument Headquarters	06/27	CS	< 0.151	4,990	< 0.655	< 0.849	35.7	< 0.481	< 0.15	0.878	3.41	1.9	4,980
Frijoles at Rio Grande	06/27	CS	< 0.233	10,700	1.87	< 3.27	96.5	< 0.877	< 0.31	3.1	8.24	7.51	10,500
Frijoles at Rio Grande	09/26	CS	< 0.196	5,310	1.13	< 1.33	40.6	< 0.451	< 0.029	1.49	3.67	3.7	5,060
EPA Residential Soil Screening Level[c]			391	76,188	22	5,497	5,375	154	39	3,354	211	2,905	23,464
ER Canyon Sediment Background[d]			1	15,400	3.98		127	1.31	0.4	4.73	10.5	11.2	13,800

Table 5-17. Total Recoverable Trace Metals in Sediments for 2001 (mg/kg) (Cont.)

Station	Date	Code[a]	Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Regional Stations														
Rio Chama at Chamita	06/20	CS	< 0.006	99.7	< 0.142	3.31	2.62	< 0.036	< 0.326	< 0.258	38.1	0.023	13	11.9
Rio Grande at Embudo	06/20	CS	< 0.006	200	< 0.623	8.84	5.77	< 0.034	< 0.478	< 0.8	20.6	0.043	29.6	52.5
Rio Grande at Otowi (bank)	07/11	CS	< 0.004	112	< 0.144	4.41	4.27	< 0.038	< 0.432	< 1.22	16.9	< 0.037	32.6	18.7
Rio Grande at Frijoles (bank)	09/26	CS	< 0.011	188	< 0.155	6.81	6.22	< 0.0379	< 0.332	< 1.07	75.1	< 0.072	20.8	23.7
Rio Grande at Cochiti	09/26	CS	< 0.012	109	< 0.166	3.16	2.36	< 0.0412	< 0.355	< 1.19	21.7	< 0.022	10.1	13.1
Rio Grande at Bernalillo	06/06	CS	< 0.004	241	< 0.33	7.67	6.6	< 0.044	< 0.41	< 0.64	68.6	< 0.105	22.2	29
Jemez River	06/06	CS	< 0.004	284	< 0.23	2.79	2.56	< 0.04	< 0.4	< 0.35	36	< 0.054	8.92	15.4
Reservoirs on Rio Chama (New Mexico)														
Heron Upper	08/30	CS	0.019	580	< 0.876	13.3	12.7	< 0.027	< 0.765	1.76	91.9	0.307	49.5	71.3
Heron Upper	08/30	CS	0.037	571	< 1.27	14	10.8	< 0.0539	< 0.742	9.86	94.3	0.268	50.4	72.5
Heron Upper	08/30	DUP	0.035	572	< 0.781	13.5			1.38	1.74	94.1		49.9	72.4
Heron Middle	08/30	CS	< 0.018	804	< 2.41	23.8	15.7	< 0.1	< 1.43	2.64	80.1	0.672	62.2	90.1
Heron Lower	08/30	CS	0.037	618	< 2.59	27.4	17.3	< 0.114	< 1	3.52	72.6	0.819	66	95.4
El Vado Lower	08/30	CS	0.06	1000	< 1.92	26.3	18.5	< 0.047	< 1.18	3.07	65	0.641	63.2	91.1
El Vado Middle	08/30	CS	< 0.019	697	< 1.66	23.6	14.9	< 0.039	< 0.941	2.5	68	0.52	55.7	81.7
El Vado Upper	08/30	CS	0.022	568	< 1.29	18.8	13.3	< 0.076	1.05	1.63	76.8	0.394	49.9	64.8
Abiquiu Upper	08/20	CS	0.177	285	< 1.74	22.6	17	0.076	< 0.8	< 1.62	182	0.551	48.6	74.9
Abiquiu Middle	08/20	CS	0.225	710	< 1.38	27.4	19.3	0.052	< 1.28	< 3.57	102	0.38	57	83.1
Abiquiu Lower	08/20	CS	0.166	401	< 0.92	21.6	16.2	0.033	< 0.656	< 1.13	93.6	0.279	46.4	58.9
Reservoirs on Rio Grande (Colorado)														
Rio Grande Upper	10/16	CS	0.021	435	< 0.449	5.38	10.6	< 0.0479	< 0.446	2.61	74.3	< 0.156	46.4	79.2
Rio Grande Middle	10/16	CS	0.02	431	< 0.293	4.18	9.5	< 0.0503	< 0.462	2.86	60.5	< 0.144	37.5	58.2
Rio Grande Lower	10/16	CS	0.02	351	< 0.363	3.94	7.51	< 0.0466	< 0.432	2.78	56.5	< 0.102	46.6	58.2
Reservoirs on Rio Grande (New Mexico)														
Cochiti Upper	08/22	CS	0.077	433	< 1.04	13.2	15.8	0.051	< 0.48	2.53	179	< 0.191	27.3	49.8
Cochiti Upper	08/22	DUP	0.114	421	< 0.5	12.6	15.8	< 0.045	< 0.58	< 1.68	172	< 0.179	25.1	47.1
Cochiti Middle	08/22	CS	0.199	732	< 0.74	22.6	27.3	0.038	< 1.03	< 2.44	188	0.35	45	84.7
Cochiti Middle	08/22	CS	0.173	674	< 0.75	20.3	21.1	< 0.0983	< 0.67	< 2.13	180	< 0.278	40.6	76.8
Cochiti Lower	08/22	CS	0.267	929	< 0.71	19.3	27.8	0.035	< 1.11	< 1.67	139	< 0.311	39.2	83.6
Perimeter Stations														
Rio Grande at Sandia	09/24	CS	< 0.0051	265	< 0.151	5.3	6.11	0.015	< 0.322	1.23	88.7	< 0.068	16	18.6
Rio Grande at Mortandad	09/24	CS	0.012	147	< 0.173	4.98	3.44	0.016	< 0.37	< 1.07	54.5	< 0.033	15.4	17.6
Rio Grande at Pajarito	09/25	CS	0.019	367	< 0.165	9.31	8.79	0.064	< 0.352	1.42	177	< 0.106	20.6	31.2
Rio Grande at Water	09/25	CS	0.011	169	< 0.157	5.96	4.57	0.017	< 0.336	< 1.03	65.6	< 0.044	18.3	21.3
Rio Grande at Ancho	09/25	CS	0.013	265	< 0.155	7.84	4.4	0.015	< 0.332	< 0.887	53.7	< 0.043	21	21.4
Rio Grande at Chaquehui	09/25	CS	< 0.012	266	< 0.165	8.61	7.56	0.017	< 0.353	< 1.27	133	< 0.091	21.5	29.4
Pajarito Plateau Stations														
Guaje Canyon:														
Guaje Reservoir	10/12	CS	0.021	529	< 0.376	8.85	9.03	0.106	< 0.389	2.52	28.5	< 0.135	16.1	31.5
Guaje Reservoir	10/12	DUP	0.017	454	< 0.222	8.11	8.93	< 0.027	< 0.368	2.94	24.6	< 0.134	15.4	29.5
Guaje Canyon at SR-502	07/11	CS	< 0.006	238	< 0.22	7.89	6.48	< 0.042	< 0.489	2.13	112	< 0.1	17.7	30
Guaje Canyon at SR-502	07/11	CS	0.01	336	< 0.292	5.17	9.74	< 0.031	< 0.344	1.41	18.9	0.116	10.2	20.1

Table 5-17. Total Recoverable Trace Metals in Sediments for 2001 (mg/kg) (Cont.)

Station	Date	Code[a]	Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (cont.)														
Bayo Canyon:														
Bayo at SR-502	07/11	CS	< 0.005	226	< 0.25	6.38	5.13	< 0.03	< 0.392	1.48	21.5	< 0.072	17.2	21.5
Acid/Pueblo Canyons:														
Acid Weir	06/12	CS	0.022	468	< 0.73	5	33.5	0.099	< 0.312	< 0.81	23	< 0.109	11.5	63
Pueblo 1 R	06/12	CS	< 0.004	316	< 0.807	2.94	9.82	< 0.03	< 0.288	< 0.648	6.35	< 0.035	7.56	33.7
Pueblo 2	06/12	CS	0.015	217	< 0.576	2.72	7.91	0.058	< 0.293	< 0.827	7.02	< 0.041	6.05	31.1
Pueblo 2	06/12	CS	0.026	202	< 0.691	1.91	8.82	0.079	< 0.285	< 0.825	5.8	< 0.034	6.11	30.9
Hamilton Bend Spring	06/12	CS	0.009	295	< 0.462	3.23	12	0.046	< 0.348	1.15	11.6	< 0.066	7.61	34.9
Pueblo 3	06/12	CS	0.126	299	< 1.37	6.92	20.8	0.194	< 0.728	3.13	31.8	0.193	18.2	102
Pueblo 3	06/12	DUP	0.135	298	< 1.16	6.71	20.1	< 0.135	0.953	3.64	33.5	< 0.153	18	108
Pueblo at SR-502	06/12	CS	0.018	703	< 0.775	6.25	20.6	0.21	0.71	2.09	26.7	0.152	15.5	63.6
DP/Los Alamos Canyons:														
Los Alamos at Bridge	06/26	CS	< 0.01	614	< 0.679	5.81	12.4	0.05	< 0.376	1.4	18.6	< 0.128	13.2	47.1
Los Alamos at Bridge	06/26	DUP	< 0.006	667	< 0.516	5.69	11.2	< 0.076	< 0.358	1.54	21.9	< 0.116	14.6	52.6
Los Alamos at Bridge	06/26	CS	< 0.007	653	< 0.522	5.21	11.1	< 0.041	< 0.384	1.36	20.3	< 0.127	14.2	48.3
Los Alamos at LAO-1	06/26	CS	0.029	423	< 0.67	3.23	11.2	< 0.038	< 0.369	1.29	11.8	< 0.104	8.85	46.2
Los Alamos at Upper GS	06/26	CS	0.024	514	< 0.728	5.09	14.9	< 0.175	< 0.332	1.77	20	0.124	12.4	61.3
DPS-1	06/26	CS	< 0.003	290	< 0.51	2.12	9.83	0.312	< 0.33	< 1.01	5.04	< 0.021	6.6	46
DPS-4	06/26	CS	< 0.003	258	< 0.687	1.63	9.22	< 0.177	< 0.339	2.09	4.03	< 0.025	5	48.1
Los Alamos at LAO-3	06/26	CS	0.015	352	< 0.931	3.23	11.1	< 0.226	< 0.469	1.95	9.88	< 0.067	10.5	58.5
Los Alamos at LAO-4.5	06/27	CS	< 0.007	231	< 0.741	1.86	8.92	< 0.179	< 0.326	1.24	6.09	< 0.033	6.28	33.6
Los Alamos at SR-4	06/26	CS	< 0.008	582	2.77	5.75	16.8	< 0.163	< 0.309	1.84	14.1	< 0.086	20.1	116
Los Alamos at Totavi	07/11	CS	0.013	280	< 0.433	4.36	10.1	0.062	< 0.347	1.65	12.9	< 0.066	8.41	30.1
Los Alamos at Totavi	07/11	CS	0.013	308	< 0.457	4.6	11.7	< 0.031	< 0.387	1.74	15	< 0.068	10	31.2
Los Alamos at Otowi	07/11	CS	0.011	191	< 0.416	3.69	5.86	0.031	< 0.327	1.62	9.58	0.119	10.6	19.4
Los Alamos at Otowi	07/11	DUP	0.01	216	< 0.535	4.84	6.12	< 0.031	< 0.35	1.6	11.7	< 0.082	12.5	22.5
Sandia Canyon:														
Sandia at SR-4	07/11	CS	< 0.003	234	< 0.255	2.48	6.91	< 0.03	< 0.327	1.71	5.32	< 0.055	4.75	20.6
Sandia at Rio Grande	09/24	CS	< 0.0041	191	< 0.124	7.98	3.62	0.046	< 0.354	1.03	45.1	< 0.036	12.9	19.2
Sandia at Rio Grande	09/24	DUP	< 0.0043	182	< 0.119	6.66	3.66	< 0.014	< 0.255	< 0.903	44	< 0.016	12.9	18.8
Mortandad Canyon:														
Mortandad near CMR Building	06/19	CS	0.014	238	1.75	3.72	10.9	0.047	< 0.403	< 1.09	8.87	0.035	9.33	74.6
Mortandad west of GS-1	06/19	CS	< 0.009	219	< 0.929	1.86	5.05	0.051	< 0.301	< 0.343	4.5	0.107	5.79	29.3
Mortandad west of GS-1	06/19	DUP	< 0.007	294	< 0.824	2.52	5.36	< 0.03	< 0.287	< 0.47	5.77	< 0.019	7.91	34.1
Mortandad at GS-1	06/19	CS	0.04	293	1.48	5.13	7.5	0.036	< 0.317	1.27	7.98	0.069	8.43	111
Mortandad at MCO-5	06/19	CS	0.017	880	7.72	5.06	13.8	< 0.031	1.18	2.56	3.92	0.447	22.3	251
Mortandad at MCO-7	06/19	CS	0.027	272	< 0.686	3.57	8.28	< 0.031	< 0.407	< 0.621	9.18	0.082	9.04	37.4
Mortandad at MCO-8.5	06/19	CS	0.011	253	< 0.719	2.58	8.21	0.034	< 0.282	< 0.792	11	0.054	7.35	39.9
Mortandad at MCO-8.5	06/19	CS	0.013	295	< 0.741	3.15	13.1	0.04	< 0.304	< 0.845	13.6	0.072	9.25	45.4
Mortandad at MCO-9	06/19	CS	0.02	381	1.07	4.17	15	0.031	< 0.294	< 0.856	13.9	0.122	11	52.6
Mortandad at MCO-13 (A-5)	06/19	CS	0.016	564	< 0.828	7.06	15.6	0.09	< 0.337	1.61	32.2	0.131	18.2	63.8
Mortandad A-6	07/11	CS	0.026	802	< 0.497	8.44	36	0.036	0.861	2.31	63.8	0.234	16.5	79.7

Table 5-17. Total Recoverable Trace Metals in Sediments for 2001 (mg/kg) (Cont.)

Station	Date	Code[a]	Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (cont.)														
Mortandad Canyon: (Cont.)														
Mortandad A-7	07/11	CS	< 0.004	331	< 0.383	3.98	10.6	< 0.03	< 0.356	1.96	13.7	0.105	9.5	30.2
Mortandad at SR-4 (A-9)	07/11	CS	< 0.007	255	< 0.248	3.4	12.5	< 0.03	< 0.426	1.93	9.64	< 0.061	8.24	32
Mortandad at Rio Grande (A-11)	09/24	CS	0.022	204	< 0.132	10.8	3.71	0.013	< 0.282	1.1	13.2	< 0.021	18.3	25
TA-54 Area G:														
MDA G-0	05/30	CS	< 0.003	169	< 0.599	3.06	4.53	0.044	< 0.286	< 0.781	7.89	< 0.078	9.6	32
MDA G-0	05/30	DUP	< 0.005	157	< 0.404	2.83	4.69	< 0.041	< 0.283	< 0.685	7.8	< 0.049	9.09	30
MDA G-1	05/31	CS	< 0.003	218	< 0.394	3.09	6.03	< 0.029	< 0.291	< 0.938	8.88	< 0.058	10.2	30.6
MDA G-1	05/31	CS	< 0.003	231	< 0.311	3.12	7.07	0.038	< 0.294	< 0.981	9.37	< 0.067	9.33	28.7
MDA G-2	05/31	CS	< 0.005	215	< 0.398	3.23	5.6	< 0.03	< 0.292	< 0.826	9.4	< 0.052	8.18	33.5
MDA G-3	05/31	CS	< 0.009	196	< 0.367	2.24	5.98	< 0.03	< 0.285	< 0.741	4.75	< 0.033	7.93	34.9
MDA G-4 R-1	05/31	CS	0.02	219	< 0.406	3.33	10	< 0.031	< 0.318	1.06	8.91	< 0.068	8.76	33.7
MDA G-4 R-2	05/31	CS	0.015	292	< 0.534	3.72	10.5	0.031	< 0.295	1.72	11.7	< 0.06	9.94	46.6
MDA G-5	05/31	CS	0.021	250	< 0.39	4.03	7.61	< 0.031	< 0.294	1.13	12.5	< 0.073	11.1	40.4
MDA G-6 R	05/31	CS	< 0.006	199	< 0.525	3.26	6.09	0.075	< 0.294	< 0.809	13.7	< 0.05	8.77	49.4
MDA G-7	05/31	CS	< 0.003	177	< 0.297	3.23	6.03	< 0.031	< 0.276	< 0.808	9.41	< 0.04	6.47	25.5
MDA G-8	05/31	CS	< 0.003	427	1.22	5.26	8.81	0.038	< 0.275	1.09	8.91	< 0.087	21.6	54.1
MDA-G-9	05/31	CS	< 0.004	206	< 0.321	2.17	5.68	< 0.029	< 0.288	< 0.672	5.06	< 0.044	6.96	24.8
MDA-G-9	05/31	CS	< 0.003	255	< 0.407	3.04	8.09	< 0.03	< 0.29	< 0.98	7.61	< 0.064	9.27	30.3
Cañada del Buey:														
Cañada del Buey at SR-4	06/05	CS	< 0.004	276	< 0.36	6.35	9.44	0.038	< 0.26	< 0.75	17.8	0.2	14.3	30.2
Cañada del Buey at SR-4	06/05	DUP	< 0.004	280	< 0.31	7	10.8	< 0.03	< 0.28	< 0.71	18.4	0.151	14.9	32.5
Pajarito Canyon:														
Twomile at SR-501	06/05	CS	0.01	470	< 0.75	3.79	16.4	< 0.029	< 0.27	< 0.57	19.4	< 0.08	10.7	30.7
Pajarito at SR-501	06/05	CS	< 0.003	441	< 0.41	6.26	10.1	< 0.031	< 0.29	< 0.53	21.9	0.101	16.4	30.8
Pajarito at SR-4	06/05	CS	0.023	322	< 1.05	5.54	9.49	0.161	< 0.35	1.37	19.1	0.162	14.7	43.6
Pajarito at SR-4	06/05	CS	0.021	286	< 0.9	4.9	11.1	0.048	< 0.35	< 1	16.2	0.163	12.4	38.2
Pajarito at Rio Grande	09/25	CS	0.014	95.1	< 0.37	2.29	2.86	< 0.0423	< 0.367	< 1.34	7.33	< 0.0098	7.78	23.3
Potrillo Canyon:														
Potrillo at SR-4	06/05	CS	< 0.006	296	< 0.48	5.25	11	< 0.029	< 0.29	1.19	13.6	0.127	13.4	34.7
Potrillo at SR-4	06/05	DUP		280	< 0.45	5.03			< 0.3	1.12	13.2		12.9	33.4
Fence Canyon:														
Fence at SR-4	06/05	CS	< 0.009	357	< 0.57	5.44	10.9	< 0.031	< 0.29	1.33	15	0.134	14.2	42.1
Cañon de Valle:														
Canon de Valle at SR-501	06/05	CS	0.012	698	< 0.81	4.97	10.5	< 0.03	< 0.3	< 0.87	33.3	0.111	12.6	51.5
Water Canyon:														
Water at SR-501	06/05	CS	< 0.003	373	< 0.54	3.7	7.61	< 0.029	< 0.3	< 0.78	15.2	0.11	10.6	26.7
Water at SR-501	06/05	CS	< 0.003	270	< 0.68	3.25	4.92	< 0.031	< 0.29	< 0.59	9.1	< 0.063	11.7	27.5
Water Canyon at SR-4	06/05	CS	< 0.009	243	< 0.48	4.82	9.03	< 0.031	< 0.29	0.99	12.1	0.117	12.8	28.8

Table 5-17. Total Recoverable Trace Metals in Sediments for 2001 (mg/kg) (Cont.)

Station	Date	Code[a]	Hg	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn
Pajarito Plateau Stations (cont.)														
Water Canyon:														
Water at Rio Grande	09/25	CS	0.01	176	< 0.157	1.71	4.01	0.014	< 0.263	1.16	5.09	< 0.022	4.77	19.9
Water at Rio Grande	09/25	CS	< 0.008	185	< 0.186	2.03	3.71	< 0.0292	< 0.265	1.28	6.59	< 0.024	5.44	18.1
Indio Canyon:														
Indio Canyon at SR-4	06/05	CS	< 0.003	316	1.13	3.4	6.4	< 0.031	< 0.27	1.31	5.83	< 0.064	12.3	46
Ancho Canyon:														
Ancho at SR-4	06/05	CS	0.011	345	< 0.48	3.66	11.1	< 0.03	< 0.3	< 0.97	14.7	0.137	10.3	30.3
Above Ancho Spring	10/24	CS	0.01	228	< 0.706	4.27	4.69	< 0.0291	< 0.271	2.16	9.28	< 0.022	14.6	35.4
Above Ancho Spring	10/24	CS	0.01	231	< 0.461	4.19	5.89	< 0.0294	< 0.271	2.17	12.1	< 0.032	11.7	29.3
Ancho at Rio Grande	09/25	CS	0.014	76.6	< 0.205	4.06	3.56	0.013	< 0.358	1.5	13.1	< 0.053	13.2	19.8
TA-49 Area AB:														
MDA AB-1	05/22	CS	< 0.009	358	< 0.39	5.47	11.6	0.037	< 0.277	1.19	18.9	0.148	16.6	29.4
MDA AB-1	05/22	CS	< 0.008	292	< 0.509	4.76	10.9	0.055	< 0.297	1.39	13.5	0.179	15.9	27.3
MDA AB-1	05/22	DUP	< 0.007	369	< 0.385	5.25	11.1	< 0.041	< 0.297	1.36	14.1	0.163	17	30.7
MDA AB-2	05/22	CS	0.02	423	< 0.472	9.54	14.6	< 0.03	< 0.291	< 0.838	37.3	0.242	27.2	46
MDA AB-3	05/22	CS	< 0.002	213	< 0.453	4.55	6.48	< 0.03	< 0.28	< 0.76	11.6	< 0.07	10.6	51.3
MDA AB-3 Alternate	05/23	CS	0.01	245	< 0.26	4.7	13	0.043	< 0.283	< 0.819	21	0.118	11.1	30.4
MDA AB-4	05/22	CS	< 0.008	344	< 0.27	6.29	11.9	< 0.031	< 0.28	< 0.743	27.7	0.173	17.7	24.3
MDA AB-4A	05/22	CS	0.018	222	< 0.227	6.56	12.1	< 0.029	< 0.289	< 0.965	35.2	0.178	16.9	24.5
MDA AB-5	05/22	CS	0.013	326	< 0.539	6.17	17.1	0.049	< 0.301	1.33	24.5	0.167	15.7	700
MDA AB-5	05/22	CS	0.015	331	< 0.638	6	13.7	0.041	< 0.313	1.22	22.1	0.137	16.2	468
MDA AB-6	05/22	CS	< 0.003	322	< 0.294	4.97	9.89	0.037	< 0.273	1.34	14.2	0.145	18.2	21.7
MDA AB-7	05/22	CS	< 0.005	197	< 0.546	4.48	9.8	0.036	< 0.273	1.34	12	0.129	11.7	29.8
MDA AB-8	05/22	CS	< 0.006	232	< 0.738	3.91	9.53	< 0.03	< 0.286	1.46	10	0.262	11.2	29.8
MDA AB-9	05/22	CS	< 0.008	275	< 0.568	3.94	11.9	0.037	< 0.276	1.02	11.5	0.131	11.3	26.8
MDA AB-10	05/22	CS	< 0.003	383	< 0.477	5.09	8.73	< 0.031	< 0.342	< 0.874	23.7	< 0.083	15.9	32.7
MDA AB-11	05/23	CS	0.017	292	< 0.4	9.36	12.5	< 0.045	< 0.404	< 1.35	29.8	0.226	21.3	34
Chaquehui Canyon:														
Chaquehui at Rio Grande	09/25	CS	0.021	346	< 0.399	9.91	12.8	0.022	< 0.273	1.8	31.3	0.154	18.4	45.9
Frijoles Canyon:														
Frijoles at Monument Headquarters	06/27	CS	< 0.005	356	< 0.48	2.07	8.86	< 0.299	1.01	2.69	11.2	< 0.059	6.83	35.9
Frijoles at Monument Headquarters	06/27	CS	< 0.005	271	< 0.284	1.6	6.5	< 0.284	< 0.508	2.37	9.57	< 0.061	6.03	31.8
Frijoles at Rio Grande	06/27	CS	< 0.007	348	< 0.44	7.22	11.9	< 0.419	< 1.05	3.04	30.9	< 0.123	17.9	51.3
Frijoles at Rio Grande	09/26	CS	0.021	143	< 0.254	3.79	5.78	< 0.0525	< 0.46	2	13.5	< 0.0121	8.92	24
EPA Residential Soil Screening Level[c]				3,239	391	1,564	400	31	391	46,929	46,929		548	23,464
ER Canyon Sediment Background[d]			0.1	543		9.38	19.7	0.83	0.3			0.73	19.7	60.2

[a]Codes: CS-customer sample; DUP.-duplicate; TRP-triplicate; RE-reanalysis.
[b]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.
[c]EPA Region VI values *http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm*.
[d]Ryti et al., 1998.

Table 5-18. Number of Samples Collected for Each Suite of Organic Compounds in Sediments for 2001

		Organic Suite[a]		
Station Name	**Date**	**HE**	**PCB**	**Semivolatile**
Regional Stations				
Rio Chama at Chamita	06/20		1	1
Rio Grande at Embudo	06/20		1	1
Rio Grande at Otowi (bank)	07/11	1	1	1
Rio Grande at Frijoles (bank)	09/26	1	1	1
Rio Grande at Cochiti	09/26	1	1	1
Rio Grande at Bernalillo	06/06	1	1	1
Jemez River	06/06		1	1
Reservoirs on Rio Chama (New Mexico)				
Heron Upper	08/30		2	2
Heron Middle	08/30		1	1
Heron Lower	08/30		1	1
El Vado Lower	08/30		1	1
El Vado Middle	08/30		1	1
El Vado Upper	08/30		1	1
Abiquiu Upper	08/20		1	1
Abiquiu Middle	08/20		1	1
Abiquiu Lower	08/20		1	
Reservoirs on Rio Grande (Colorado)				
Rio Grande Upper	10/16		1	1
Rio Grande Middle	10/16		1	1
Rio Grande Lower	10/16		1	1
Reservoirs on Rio Grande (New Mexico)				
Cochiti Upper	08/22	1	1	1
Cochiti Middle	08/22	2	2	2
Cochiti Lower	08/22	1	1	1
Perimeter Stations				
Rio Grande at Sandia	09/24		1	1
Rio Grande at Mortandad	09/24		1	1
Rio Grande at Pajarito	09/25	1	1	1
Rio Grande at Water	09/25	1	1	1
Rio Grande at Ancho	09/25	1	1	1
Rio Grande at Chaquehui	09/25	1	1	1
Pajarito Plateau Stations				
Guaje Canyon:				
Guaje Reservoir	10/12		1	1
Guaje Canyon at SR-502	07/11	1	1	1
Guaje Canyon at SR-502	07/11		1	1
Bayo Canyon:				
Bayo at SR-502	07/11		1	1

Table 5-18. Number of Samples Collected for Each Suite of Organic Compounds in Sediments for 2001 (Cont.)

Station Name	Date	Organic Suite[a]		
		HE	PCB	Semivolatile
Pajarito Plateau Stations (Cont.)				
Acid/Pueblo Canyons:				
Acid Weir	06/12		1	1
Pueblo 1 R	06/12		1	1
Pueblo 2	06/12		2	2
Hamilton Bend Spring	06/12		1	1
Pueblo 3	06/12		1	1
Pueblo at SR-502	06/12		1	1
DP/Los Alamos Canyons:				
Los Alamos at Bridge	06/26		2	2
Los Alamos at LAO-1	06/26		1	1
Los Alamos at Upper GS	06/26		1	
DPS-1	06/26		1	1
DPS-4	06/26		1	1
Los Alamos at LAO-3	06/26		1	1
Los Alamos at LAO-4.5	06/27		1	1
Los Alamos at SR-4	06/26		1	1
Los Alamos at Totavi	07/11		2	2
Los Alamos at Otowi	07/11		1	1
Sandia Canyon:				
Sandia at SR-4	07/11		1	1
Sandia at Rio Grande	09/24		1	1
Pajarito Canyon:				
Twomile at SR-501	06/05	1	1	1
Pajarito at SR-501	06/05	1	1	1
Pajarito at SR-4	06/05	2	2	2
Pajarito at Rio Grande	09/25	1	1	1
Potrillo Canyon:				
Potrillo at SR-4	06/05	1		
Fence Canyon:				
Fence at SR-4	06/05	1		
Cañon de Valle:				
Cañon de Valle at SR-501	06/05	1	1	1
Water Canyon:				
Water at SR-501	06/05	2	2	2
Water Canyon at SR-4	06/05	1	1	1
Water at Rio Grande	09/25	2	2	2

Table 5-18. Number of Samples Collected for Each Suite of Organic Compounds in Sediments for 2001 (Cont.)

		Organic Suite[a]		
Station Name	**Date**	**HE**	**PCB**	**Semivolatile**
Pajarito Plateau Stations (Cont.)				
Indio Canyon:				
Indio Canyon at SR-4	06/05	1		
Ancho Canyon:				
Ancho at SR-4	06/05	1	1	1
Above Ancho Spring	10/24	2	2	1
Ancho at Rio Grande	09/25	1	1	1
Chaquehui Canyon:				
Chaquehui at Rio Grande	09/25	1	1	1
Frijoles Canyon:				
Frijoles at Monument Headquarters	06/27	2	2	2
Frijoles at Rio Grande	06/27	1	1	1
Frijoles at Rio Grande	09/26	1	1	1

[a]High explosives, polychlorinated biphenyls, and semivolatiles.

Table 5-19. Organic Compounds Detected in Sediment in 2001 (µg/kg)

Name	Date	Code[a]	Dilution Factor	Suite[b]	Analyte	Result	Lab Qualifier Code[c]	Valid Flag Code[c]	EPA Residential Soil Screening Level[d]	Result/ Screening Level
Reservoirs on Rio Chama (New Mexico)										
Heron Upper	08/30	CS	1	SVOA	Fluoranthene	256		J	2,293,610	0
Abiquiu Upper	08/20	RE	1	SVOA	Bis(2-ethylhexyl)phthalate	213			34,750	0.01
Abiquiu Lower	08/20	CS	1	PEST/PCB	Aroclor-1260	12	P		220	0.05
Pajarito Plateau Stations										
Acid/Pueblo Canyons:										
Acid Weir	06/12	CS	1	SVOA	Chrysene	44.5			62,180	0
Acid Weir	06/12	CS	1	SVOA	Fluoranthene	63.6			2,293,610	0
Acid Weir	06/12	CS	1	SVOA	Pyrene	79.4			2,308,750	0
Acid Weir	06/12	CS	1	SVOA	Benzo(k)fluoranthene	46.5			6,210	0.01
Acid Weir	06/12	CS	1	SVOA	Phenanthrene	41.1				
Pueblo 1 R	06/12	CS	1	SVOA	Fluoranthene	120			2,293,610	0
Pueblo 1 R	06/12	CS	1	SVOA	Phenanthrene	95				
Pueblo 1 R	06/12	CS	1	SVOA	Chrysene	65.1			62,180	0
Pueblo 1 R	06/12	CS	1	SVOA	Pyrene	148			2,308,750	0
Hamilton Bend Spring	06/12	CS	1	SVOA	Fluoranthene	78.2			2,293,610	0
Hamilton Bend Spring	06/12	CS	1	SVOA	Phenanthrene	73.3				
Hamilton Bend Spring	06/12	CS	1	SVOA	Pyrene	101			2,308,750	0
Hamilton Bend Spring	06/12	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	163			34,750	0
Pueblo 3	06/12	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	56.1			34,750	0
Pueblo at SR-502	06/12	CS	10	SVOA	Bis(2-ethylhexyl)phthalate	1,120			34,750	0.03
DP/Los Alamos Canyons:										
Los Alamos at Bridge	06/26	CS	1	SVOA	Pyrene	382		J+	2,308,750	0
Los Alamos at Bridge	06/26	CS	1	SVOA	Fluoranthene	68			2,293,610	0
Los Alamos at Bridge	06/26	CS	1	SVOA	Chrysene	53.6			62,180	0
Los Alamos at Bridge	06/26	CS	1	SVOA	Pyrene	324			2,308,750	0
Los Alamos at Bridge	06/26	CS	1	SVOA	Benzo(a)anthracene	45.8			620	0.07
Los Alamos at LAO-1	06/26	CS	1	SVOA	Acenaphthene	370		J	3,683,390	0
Los Alamos at LAO-1	06/26	CS	1	PEST/PCB	Aroclor-1260	25.2	P	J-	220	0.11
Los Alamos at LAO-1	06/26	CS	1	PEST/PCB	Aroclor-1254	14.4	P	R	1,120	0.01
Los Alamos at LAO-1	06/26	CS	1	SVOA	Benzo(g,h,i)perylene	692		J+		
Los Alamos at LAO-1	06/26	CS	1	SVOA	Benzo(b)fluoranthene	758		J+	620	1.22
Los Alamos at LAO-1	06/26	CS	1	SVOA	Chrysene	1,010		J+	62,180	0.02

Table 5-19. Organic Compounds Detected in Sediment in 2001 (µg/kg) (Cont.)

Name	Date	Code[a]	Dilution Factor	Suite[b]	Analyte	Result	Lab Qualifier Code[c]	Valid Flag Code[c]	EPA Residential Soil Screening Level[d]	Result/ Screening Level
Pajarito Plateau Stations (Cont.)										
DP/Los Alamos Canyons: (Cont.)										
Los Alamos at LAO-1	06/26	CS	1	SVOA	Benzo(a)anthracene	785		J+	620	1.27
Los Alamos at LAO-1	06/26	CS	1	SVOA	Anthracene	152			21,899,670	0
Los Alamos at LAO-1	06/26	CS	1	SVOA	Phenanthrene	1,120				
Los Alamos at LAO-1	06/26	CS	1	SVOA	Fluorene	360			2,644,480	0
Los Alamos at LAO-1	06/26	CS	1	SVOA	Fluoranthene	1,310			2,293,610	0
Los Alamos at LAO-1	06/26	CS	1	SVOA	Benzo(a)pyrene	915		J+	60	15.25
Los Alamos at LAO-1	06/26	CS	1	SVOA	Benzo(k)fluoranthene	701		J+	6,210	0.11
Los Alamos at LAO-1	06/26	CS	1	SVOA	Indeno(1,2,3-cd)pyrene	507		J+	620	0.82
Los Alamos at LAO-1	06/26	CS	1	SVOA	Pyrene	2,410		J+	2,308,750	0
Los Alamos at Upper GS	06/26	CS	1	PEST/PCB	Aroclor-1254	13.2	P	J	1,120	0.01
Los Alamos at Upper GS	06/26	RE	1	SVOA	Benzo(g,h,i)perylene	422				
Los Alamos at Upper GS	06/26	RE	1	SVOA	Benzo(b)fluoranthene	1,670			620	2.69
Los Alamos at Upper GS	06/26	RE	1	SVOA	Anthracene	429			21,899,670	0
Los Alamos at Upper GS	06/26	RE	1	SVOA	Fluorene	186			2,644,480	0
Los Alamos at Upper GS	06/26	RE	1	VOA	Acenaphthene	120			3,683,390	0
Los Alamos at Upper GS	06/26	RE	1	SVOA	Phenanthrene	2,150				
Los Alamos at Upper GS	06/26	RE	1	SVOA	Benzo(a)anthracene	1,260			620	2.03
Los Alamos at Upper GS	06/26	RE	1	SVOA	Fluoranthene	2,810			2,293,610	0
Los Alamos at Upper GS	06/26	RE	1	SVOA	Indeno(1,2,3-cd)pyrene	400			620	0.65
Los Alamos at Upper GS	06/26	RE	1	SVOA	Chrysene	1,160			62,180	0.02
Los Alamos at Upper GS	06/26	CS	1	PEST/PCB	Aroclor-1260	12.7		J-	220	0.06
Los Alamos at Upper GS	06/26	RE	1	SVOA	Pyrene	2,340		J+	2,308,750	0
Los Alamos at Upper GS	06/26	RE	1	SVOA	Benzo(a)pyrene	938			60	15.63
DPS-1	06/26	CS	1	SVOA	Pyrene	408		J	2,308,750	0
DPS-1	06/26	CS	1	SVOA	Fluoranthene	138			2,293,610	0
DPS-1	06/26	CS	1	SVOA	Phenanthrene	49.8				
DPS-1	06/26	CS	1	SVOA	Chrysene	109			62,180	0
DPS-1	06/26	CS	1	SVOA	Benzo(a)anthracene	83.1			620	0.13
DPS-4	06/26	CS	1	SVOA	Pyrene	358		J	2,308,750	0
DPS-4	06/26	CS	1	SVOA	Phenanthrene	54.2				
DPS-4	06/26	CS	1	SVOA	Chrysene	77.2			62,180	0
DPS-4	06/26	CS	1	SVOA	Fluoranthene	121			2,293,610	0
DPS-4	06/26	CS	1	SVOA	Benzo(a)anthracene	63.9			620	0.1

Table 5-19. Organic Compounds Detected in Sediment in 2001 (µg/kg) (Cont.)

Name	Date	Code[a]	Dilution Factor	Suite[b]	Analyte	Result	Lab Qualifier Code[c]	Valid Flag Code[c]	EPA Residential Soil Screening Level[d]	Result/ Screening Level
Pajarito Plateau Stations (Cont.)										
DP/Los Alamos Canyons: (Cont.)										
Los Alamos at LAO-3	06/26	CS	1	SVOA	Chrysene	176		J	62,180	0
Los Alamos at LAO-3	06/26	CS	1	SVOA	Acenaphthene	406		J	3,683,390	0
Los Alamos at LAO-3	06/26	CS	1	SVOA	Anthracene	51.2			21,899,670	0
Los Alamos at LAO-3	06/26	CS	1	SVOA	Phenanthrene	226				
Los Alamos at LAO-3	06/26	CS	1	SVOA	Fluorene	401			2,644,480	0
Los Alamos at LAO-3	06/26	CS	1	SVOA	Fluoranthene	285			2,293,610	0
Los Alamos at LAO-3	06/26	CS	1	SVOA	Pyrene	658		J+	2,308,750	0
Los Alamos at LAO-3	06/26	CS	1	PEST/PCB	Aroclor-1254	5.5	P	R	1,120	0
Los Alamos at LAO-3	06/26	CS	1	SVOA	Benzo(a)pyrene	139		J+	60	2.32
Los Alamos at LAO-3	06/26	CS	1	SVOA	Benzo(a)anthracene	177		J+	620	0.29
Los Alamos at LAO-4.5	06/27	CS	1	PEST/PCB	Aroclor-1260	4.6	P	J	220	0.02
Los Alamos at LAO-4.5	06/27	CS	1	SVOA	Benzo(a)pyrene	92.2		J+	60	1.54
Los Alamos at LAO-4.5	06/27	CS	1	SVOA	Phenanthrene	66.5				
Los Alamos at LAO-4.5	06/27	CS	1	SVOA	Fluoranthene	130			2,293,610	0
Los Alamos at LAO-4.5	06/27	RE	1	SVOA	Benzo(b)fluoranthene	312		J+	620	0.5
Los Alamos at LAO-4.5	06/27	CS	1	SVOA	Benzo(a)anthracene	101		J+	620	0.16
Los Alamos at LAO-4.5	06/27	CS	1	SVOA	Chrysene	104		J+	62,180	0
Los Alamos at LAO-4.5	06/27	RE	1	SVOA	Pyrene	239		J+	2,308,750	0
Los Alamos at LAO-4.5	06/27	CS	1	SVOA	Pyrene	426		J+	2,308,750	0
Los Alamos at LAO-4.5	06/27	CS	1	SVOA	Benzo(b)fluoranthene	132		J+	620	0.21
Los Alamos at LAO-4.5	06/27	CS	1	SVOA	Benzo(k)fluoranthene	91		J+	6,210	0.01
Los Alamos at LAO-4.5	06/27	RE	1	SVOA	Phenanthrene	84				
Los Alamos at LAO-4.5	06/27	RE	1	SVOA	Fluoranthene	208			2,293,610	0
Los Alamos at LAO-4.5	06/27	RE	1	SVOA	Benzo(g,h,i)perylene	83.7				
Los Alamos at LAO-4.5	06/27	RE	1	SVOA	Indeno(1,2,3-cd)pyrene	72.8			620	0.12
Los Alamos at SR-4	06/26	CS	1	SVOA	Pyrene	358		J	2,308,750	0
Los Alamos at SR-4	06/26	CS	1	PEST/PCB	Aroclor-1260	5.3		J-	220	0.02
Los Alamos at SR-4	06/26	CS	1	SVOA	Phenanthrene	69.3				
Los Alamos at SR-4	06/26	CS	1	SVOA	Benzo(b)fluoranthene	83.5			620	0.13
Los Alamos at SR-4	06/26	CS	1	SVOA	Benzo(k)fluoranthene	84.1			6,210	0.01
Los Alamos at SR-4	06/26	CS	1	SVOA	Benzo(a)anthracene	74.4			620	0.12
Los Alamos at SR-4	06/26	CS	1	SVOA	Fluorene	281			2,644,480	0
Los Alamos at SR-4	06/26	CS	1	SVOA	Chrysene	82.7			62,180	0
Los Alamos at SR-4	06/26	CS	1	SVOA	Fluoranthene	129			2,293,610	0

Table 5-19. Organic Compounds Detected in Sediment in 2001 (µg/kg) (Cont.)

Name	Date	Code[a]	Dilution Factor	Suite[b]	Analyte	Result	Lab Qualifier Code[c]	Valid Flag Code[c]	EPA Residential Soil Screening Level[d]	Result/ Screening Level
Pajarito Plateau Stations (Cont.)										
DP/Los Alamos Canyons: (Cont.)										
Los Alamos at Totavi	07/11	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	67.1			34,750	0
Los Alamos at Totavi	07/11	CS	1	SVOA	Benzo(b)fluoranthene	49.3			620	0.08
Los Alamos at Totavi	07/11	CS	1	SVOA	Benzo(a)pyrene	64.9			60	1.08
Los Alamos at Totavi	07/11	CS	1	SVOA	Indeno(1,2,3-cd)pyrene	144			620	0.23
Los Alamos at Totavi	07/11	CS	1	SVOA	Pyrene	123			2,308,750	0
Los Alamos at Totavi	07/11	CS	1	SVOA	Benzo(a)anthracene	58.2			620	0.09
Los Alamos at Totavi	07/11	CS	1	SVOA	Phenanthrene	70.7				
Los Alamos at Totavi	07/11	CS	1	SVOA	Benzo(k)fluoranthene	51.8			6,210	0.01
Los Alamos at Totavi	07/11	CS	1	SVOA	Chrysene	65.8			62,180	0
Los Alamos at Totavi	07/11	CS	1	SVOA	Fluoranthene	101			2,293,610	0
Sandia Canyon:										
Sandia at SR-4	07/11	CS	1	SVOA	Benzo(b)fluoranthene	54.7			620	0.09
Sandia at SR-4	07/11	CS	1	SVOA	Benzo(a)pyrene	50.4			60	0.84
Sandia at SR-4	07/11	CS	1	SVOA	Benzo(k)fluoranthene	61.8			6,210	0.01
Sandia at SR-4	07/11	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	87.5			34,750	0
Sandia at SR-4	07/11	CS	1	SVOA	Benzo(g,h,i)perylene	123				
Pajarito Canyon:										
Twomile at SR-501	06/05	CS	1	HEXP	RDX	664			4,420	0.15
Twomile at SR-501	06/05	CS	1	SVOA	Aniline	509			85,370	0.01
Twomile at SR-501	06/05	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	118			34,750	0
Twomile at SR-501	06/05	CS	1	HEXP	2,4,6-Trinitrotoluene	106			16,220	0.01
Twomile at SR-501	06/05	CS	1	HEXP	HMX	580			3,055,150	0
Cañon de Valle:										
Cañon de Valle at SR-501	06/05	CS	1	HEXP	RDX	115			4,420	0.03
Water Canyon:										
Water at SR-501	06/05	CS	1	HEXP	HMX	94.4			3,055,150	0
Water at SR-501	06/05	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	37			34,750	0
Water at SR-501	06/05	CS	1	HEXP	RDX	131			4,420	0.03

Table 5-19. Organic Compounds Detected in Sediment in 2001 (μg/kg) (Cont.)

Name	Date	Code[a]	Factor	Suite[b]	Dilution Analyte	Result	Lab Qualifier Code[c]	Valid Flag Code[c]	EPA Residential Soil Screening Level[d]	Result/ Screening Level
Pajarito Plateau Stations (Cont.)										
Indio Canyon:										
Indio Canyon at SR-4	06/05	CS	1	HEXP	2,4,6-Trinitrotoluene	152			16,220	0.01
Indio Canyon at SR-4	06/05	CS	1	HEXP	HMX	699			3,055,150	0
Indio Canyon at SR-4	06/05	CS	1	HEXP	RDX	874			4,420	0.2
Frijoles Canyon:										
Frijoles at Rio Grande	06/27	CS	1	SVOA	4-Methylphenol	1,110			305,510	0

[a]Codes: CS-customer sample; DUP-duplicate; TRP-triplicate; RE-reanalysis.
[b]PEST/PCB-pesticides and polychlorinated biphenyls; SVOA-semivolatile organics; VOA-volatile organics; and HEXP-high-explosive compounds.
[c]For Lab Qualifier Codes and Validation Flag Codes, see Table 5-4.
[d]EPA Region VI values *http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm*.

Table 5-20. Radiochemical Analysis of Groundwater for 2001 (pCi/L[a])

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U		
Station	Date	Codes[b]		Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Regional Aquifer Wells																					
Test Wells:																					
Test Well 1	06/05	UF	CS	186	51.3		0.017	0.037		1.01	0.94	3.58	1.94	0.157	0.0499	0.0562	0.0159	0.0424	1.07	0.0946	0.036
Test Well 3	06/04	UF	CS	53.1	47.5		0.0571	0.0433		0.6	1.83	3.04	0.294	0.0356	0.0327	0.00819	0.00477	0.0074	0.11	0.0195	0.0253
Test Well 3	06/04	UF	DUP							-0.986	0.933	3.18									
Test Well 3	10/04	UF	CS	-133	50.8	179	0.0136	0.0451	0.151	0.33	0.681	2.51	0.408	0.0406	0.0153	0.0188	0.0087	0.0251	0.146	0.0209	0.025
Test Well 3	10/04	UF	DUP				0.0632	0.0502	0.162	-0.4	0.696	2.39	0.444	0.0435	0.0269	0.00412	0.00583	0.0222	0.162	0.0218	0.0191
Test Well 3	10/04	UF	TRP				-0.071	0.0491	0.165												
Test Well 3	10/04	UF	CS	-107	51.8	180	0.0272	0.0398	0.133	-0.405	0.762	2.58	0.439	0.0418	0.0052	0.00766	0.00608	0.0206	0.183	0.0229	0.0177
Test Well 4	06/04	UF	CS	53.4	47.8		0.0498	0.0361		0.371	0.963	3.6	0.0352	0.0117	0.0322	0.00883	0.00576	0.0198	0.0222	0.00843	0.0198
Test Well 4	06/04	UF	DUP				0.0473	0.0332													
Test Well 8	06/04	UF	CS	0	45.9		0.0037	0.044		2.3	1.8	3.47	0.388	0.0462	0.0516	0.0191	0.0102	0.0351	0.128	0.0226	0.024
Test Well DT-5A	06/06	UF	CS	0	45.1		0.0932	0.0484		0.149	1.39	4.98	0.192	0.0267	0.0311	0.0052	0.00369	0.00704	0.128	0.0205	0.0191
Test Well DT-9	06/07	UF	CS	0	45		0.0035	0.0414		1.48	0.939	3.58	0.283	0.035	0.0264	0.00811	0.00733	0.0307	0.142	0.0225	0.00771
Test Well DT-9	06/07	UF	DUP	26.3	46.2								0.252	0.0341	0.0434	0.0026	0.0066	0.0333	0.152	0.0244	0.0227
Test Well DT-10	06/06	UF	CS	0	44.6		0.0125	0.0456		-0.232	0.843	2.99	0.457	0.048	0.0293	0.0035	0.00434	0.0201	0.225	0.0297	0.0253
Water Supply Wells:																					
O-1	05/09	UF	CS	-142	53.2	192	0.0332	0.0783	0.262	0.15	0.647	2.25	0.862	0.0741	0.0404	0.0262	0.0168	0.055	0.45	0.0442	0.0302
O-1	05/09	UF	DUP	-121	57.6	205	0.0349	0.0588	0.196	0.723	0.807	2.93	0.823	0.076	0.0204	0.0313	0.0101	0.0205	0.442	0.0474	0.0204
O-1	05/09	UF	TRP				-0.0205	0.0464	0.158												
O-1	05/09	UF	CS	-84.2	54.3	190	-0.0353	0.0703	0.239	0.377	0.546	2	0.902	0.0792	0.0065	0.0387	0.0101	0.00655	0.511	0.0506	0.0177
O-1	05/09	UF	DUP				-0.0115	0.0422	0.143												
O-4	05/09	UF	CS	-116	55.1	196	-0.212	0.102	0.334	0.26	0.843	3.05	0.641	0.0582	0.0223	0.0271	0.00927	0.0224	0.243	0.0284	0.0153
O-4	05/09	UF	DUP				-0.0109	0.045	0.153												
PM-1	05/09	UF	CS	-144	54.1	195	0.0925	0.0731	0.238	0.0679	0.764	2.71	1.2	0.0981	0.0375	0.0311	0.0106	0.0272	0.592	0.0544	0.0152
PM-1	05/09	UF	DUP				-0.0041	0.041	0.139												
PM-2	05/09	UF	CS	-203	52.7	196	-0.0019	0.0694	0.235	0.164	0.688	2.5	0.257	0.0307	0.029	0.00888	0.00705	0.0239	0.106	0.0173	0.0163
PM-2	05/09	UF	DUP				0.0542	0.0443	0.145												
PM-3	05/09	UF	CS	-148	55.5	200	-0.0447	0.0701	0.239	0.322	1.51	2.34	0.797	0.0736	0.0463	0.0564	0.015	0.0336	0.345	0.0391	0.0275
PM-3	05/09	UF	DUP				0.0946	0.0473	0.15												
PM-4	05/09	UF	CS	-171	52.8	193	0.224	0.0938	0.28	0.0205	1.41	2.28	0.275	0.0302	0.0143	0.00777	0.00479	0.0143	0.136	0.0188	0.00525
PM-4	05/09	UF	DUP				0.0338	0.0531	0.176												
PM-5	05/09	UF	CS	-170	52.5	192	0.0387	0.0714	0.238	0.482	0.913	3.25	0.323	0.0335	0.0254	0.0127	0.00977	0.0328	0.144	0.0193	0.0167
G-1A	05/09	UF	CS	-142	53.3	192	0.0665	0.0614	0.201	-0.071	0.724	2.58	0.27	0.0308	0.0196	0.00847	0.00522	0.0156	0.135	0.0194	0.00572
G-1A	05/09	UF	DUP				-0.0025	0.0441	0.15												
G-1A	05/09	UF	TRP				0.0895	0.0575	0.15												
G-2A	05/09	UF	CS	-143	53.8	194	0.0065	0.0527	0.178	0.931	0.842	3.03	0.286	0.0364	0.0325	0.0234	0.0105	0.0326	0.161	0.0254	0.028
G-2A	05/09	UF	DUP				0.019	0.0432	0.118												
G-3A	05/09	UF	CS	-116	55.2	196	-0.002	0.0595	0.201	0.403	0.83	2.64	0.535	0.0497	0.0181	0.0235	0.00699	0.00531	0.268	0.0298	0.0181
G-3A	05/09	UF	DUP				-0.0179	0.0449	0.123												
G-4A	05/09	UF	CS	-225	50.4	190	0.0446	0.0572	0.189	-0.597	0.836	2.85	0.536	0.058	0.0489	0.0348	0.0166	0.0592	0.268	0.0364	0.0427
G-4A	05/09	UF	DUP				0.0687	0.0476	0.125												
Regional Aquifer Springs																					
White Rock Canyon Group I:																					
Sandia Spring	09/24	F	CS				0.0512	0.0709	0.272	-0.057	0.652	2.29	0.519	0.0708	0.0798	0.0567	0.0207	0.049	0.239	0.0435	0.018
Sandia Spring	09/24	F	CS				0.114	0.0656	0.242	-0.288	0.584	2.06	0.361	0.0538	0.0446	0.0335	0.0154	0.0447	0.23	0.0416	0.0562
Sandia Spring	09/24	UF	CS	-110	53.5	186															
Sandia Spring	09/24	UF	CS	-109	52.9	184															
Spring 3	09/24	F	CS				0.0084	0.0748	0.291	-0.929	0.643	2.17	1.02	0.108	0.0822	0.0762	0.0229	0.0543	0.513	0.0665	0.0541
Spring 3	09/24	UF	CS	-109	52.9	184															
Spring 4	09/24	UF	CS	-135	51.7	183															
Spring 4	09/24	UF	DUP	-108	52.6	183															
Spring 4	09/24	UF	CS				-0.0296	0.0658	0.259	0.374	0.727	2.26	0.462	0.0645	0.0685	0.0352	0.0161	0.047	0.286	0.0475	0.0172
Spring 4	09/24	UF	DUP				0.048	0.0714	0.273	0.699	0.731	2.73	0.67	0.0788	0.0423	0.00305	0.00637	0.0424	0.282	0.0456	0.0534
Spring 4A	09/25	F	CS				-0.0715	0.0826	0.324	-0.567	0.714	2.43	0.56	0.0675	0.0481	0.0341	0.0155	0.056	0.319	0.0469	0.0382
Spring 4A	09/25	UF	CS	-79.5	52.3	179															
Spring 5	09/25	F	CS				0.0176	0.0706	0.275	1.22	1.53	2	0.455	0.0592	0.0145	0.0378	0.0159	0.0499	0.196	0.0356	0.0394
Spring 5	09/25	UF	CS	-110	53.6	187															

Table 5-20. Radiochemical Analysis of Groundwater for 2001 (pCi/L[a]) (Cont.)

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			^{235,236}U			^{238}U		
Station	Date		Codes[b]	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Regional Aquifer Springs (Cont.)																					
White Rock Canyon Group I: (Cont.)																					
Ancho Spring	10/24	F	CS				0.3	0.0865	0.221	0.314	1.21	4.75	0.191	0.0245	0.016	0.0087	0.00618	0.0202	0.0802	0.015	0.0201
Ancho Spring	10/24	F	DUP				0.111	0.0606	0.191	0.724	1.21	4.7	0.178	0.029	0.0446	-0.00205	0.00808	0.0448	0.0778	0.0184	0.0367
Ancho Spring	10/24	UF	CS	-53.8	49.1	167															
Ancho Spring	10/24	UF	DUP	-26.6	49.3	165															
White Rock Canyon Group II:																					
Spring 6A	09/25	UF	CS	-27.4	55.5	185															
Spring 6A	09/25	F	CS				0.0883	0.0789	0.297	1.14	0.885	3.23	0.592	0.0747	0.0733	0.0279	0.016	0.0659	0.284	0.0467	0.0449
Spring 9	09/25	UF	CS	-136	52.2	184															
Spring 9	09/26	F	CS				-0.0454	0.0558	0.22	0.47	0.744	2.77	0.135	0.0295	0.0502	0.0325	0.0135	0.0147	0.0867	0.0234	0.0502
White Rock Canyon Group III:																					
Spring 1	09/24	UF	CS	-138	52.8	186															
Spring 1	09/24	F	CS				-0.0624	0.0721	0.285	0.0445	0.609	2.18	1.28	0.128	0.0984	0.0764	0.0319	0.139	0.584	0.0738	0.0936
Spring 1	09/24	F	DUP																		
Spring 2	09/24	UF	CS	-129	49.3	174															
Spring 2	09/24	F	CS				0.0253	0.0856	0.332	0.0061	0.628	2.19	0.67	0.0781	0.0412	0.031	0.0142	0.0414	0.37	0.0532	0.052
White Rock Canyon Group IV:																					
La Mesita Spring	10/23	UF	CS	-186	50.8	184															
La Mesita Spring	10/23	F	CS				0.174	0.1	0.367	-0.927	1.21	4.24	5.42	0.4	0.0365	0.241	0.0324	0.0452	3.54	0.267	0.019
Other Springs:																					
Sacred Spring	10/23	F	CS				0.144	0.0982	0.363	0	1.63	3.48	0.927	0.0811	0.0435	0.0241	0.0149	0.0484	0.528	0.0521	0.0339
Sacred Spring	10/23	F	DUP				0.198	0.0906	0.324	-2.64	3.05	10.4	1.16	0.106	0.0329	0.0269	0.0114	0.033	0.54	0.0586	0.0261
Sacred Spring	10/23	UF	CS	-54.1	52.5	178															
Sacred Spring	10/23	UF	DUP	-108	51.1	178															
Sacred Spring	10/23	F	CS				0.0657	0.0656	0.25	-2.31	1.47	4.67	0.984	0.0848	0.0181	0.0172	0.00895	0.0265	0.419	0.044	0.0264
Sacred Spring	10/23	UF	CS	-184	50.2	182															
Canyon Alluvial Groundwater Systems																					
Acid/Pueblo Canyons:																					
APCO-1	04/03	UF	CS	0	52.8	177	1.31	0.131	0.26	-0.356	0.666	2.31	0.407	0.0482	0.0265	0.0108	0.0096	0.0336	0.278	0.0372	0.00977
APCO-1	04/03	F	CS				1.27	0.123	0.306	0.461	0.804	2.39	0.355	0.043	0.0308	0.0133	0.00821	0.0245	0.199	0.0293	0.009
APCO-1	04/03	F	DUP				1.42	0.128	0.293												
DP/Los Alamos Canyons:																					
LAO-C	04/03	UF	CS	0	52.8	177	0.154	0.1	0.326	-0.16	0.523	1.83	0.0456	0.0174	0.0447	0.0166	0.0118	0.0386	0.0249	0.0156	0.0498
LAO-C	04/03	F	CS				0.264	0.0872	0.281	0.964	0.593	2.45	0.105	0.0211	0.0258	0.0351	0.0114	0.00951	0.063	0.0163	0.0258
LAO-C	04/03	F	DUP										0.0519	0.0155	0.0322	0.00695	0.00494	0.00941	0.0346	0.0112	0.00939
LAO-0.7	03/29	UF	CS	-27.9	50.7	173	0.0478	0.0696	0.237	-1.33	0.628	2.02	0.102	0.0218	0.0417	0.0415	0.0142	0.0343	0.0763	0.0177	0.0295
LAO-0.7	03/29	F	CS				0.0999	0.065	0.218	-0.731	0.926	2.73	0.0903	0.0209	0.0423	0.0194	0.00925	0.0238	0.0451	0.0148	0.0347
LAO-0.7	03/29	F	DUP				0.0461	0.0482	0.164												
LAO-1	04/05	UF	CS	225	58.2	175	8.28	1.07	0.372	0.362	0.679	2.38	0.0583	0.0223	0.0651	-0.00325	0.00563	0.0302	0.0292	0.0109	0.0238
LAO-1	04/05	UF	DUP										0.0044	0.0261	0.0967	-0.0133	0.0183	0.0772	0.00442	0.0159	0.0623
LAO-1	04/05	F	CS				9.61	0.401	0.408	-0.077	0.666	2.28	0.0386	0.0139	0.0326	-0.0176	0.0094	0.0497	0.0105	0.00932	0.0326
LAO-1	04/05	F	DUP							-0.47	0.638	2.19									
DP Spring	04/03	F	CS				115	5.57	0.205	-0.16	0.676	2.3	0.428	0.0493	0.0256	0.0245	0.0094	0.00947	0.0279	0.0122	0.0323
DP Spring	04/03	UF	CS	455	64.5	177	113	14.2	0.211	-0.423	0.509	1.68	0.378	0.0468	0.0468	0.0107	0.00625	0.0097	0.0285	0.0125	0.0331
LAO-2	03/29	UF	CS	197	57.4	175	29.1	0.904	0.21	0.307	0.623	2.19	0.0829	0.0194	0.0277	0.0189	0.0114	0.0351	0.0151	0.0131	0.0452
LAO-2	03/29	F	CS				26.3	1.13	0.217	-0.062	0.592	2.08	0.0873	0.0236	0.045	0.0243	0.013	0.0358	0.0339	0.0147	0.0357
LAO-3A	03/28	UF	CS	85.2	54.9	176	47.2	1.39	0.282	0.199	0.632	1.93	0.138	0.0248	0.0101	0.03	0.0132	0.0348	0.127	0.0236	0.0101
LAO-3A	03/28	F	CS				37	2.07	0.235	0	1.81	1.99	0.12	0.0232	0.0358	0.0134	0.00823	0.0246	0.0832	0.0183	0.0245
LAO-3A	03/28	F	DUP										0.137	0.0312	0.0663	0.0355	0.0156	0.0412	0.0795	0.0206	0.0325
LAO-3A	03/28	F	CS				52.1	1.44	0.209	-1.31	0.614	1.93	0.134	0.0258	0.0424	0.0177	0.00946	0.0261	0.0565	0.0147	0.00957
LAO-3A	03/28	UF	CS	171	57.3	177	46.1	3.25	0.186	-1.23	0.772	2.57	0.168	0.0285	0.0281	0.0307	0.0123	0.0282	0.0726	0.019	0.0355
LAO-3A	03/28	UF	DUP	195	55.4	168															
LAO-4	04/05	UF	CS	85.5	55.1	177	5.19	0.33	0.548	-0.708	0.67	2.21	0.0581	0.0176	0.041	0.00685	0.00841	0.0318	0.0444	0.0152	0.0368

Table 5-20. Radiochemical Analysis of Groundwater for 2001 (pCi/L[a]) (Cont.)

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station	**Date**	**Codes[b]**		**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
Canyon Alluvial Groundwater Systems (Cont.)																					
DP/Los Alamos Canyons:																					
LAO-4	04/05	UF	DUP																		
LAO-4	04/05	F	CS				5.46	0.911	0.433	1.14	0.703	2.64	0.0632	0.016	0.0101	0.00745	0.00747	0.0274	0.026	0.0113	0.0273
LAO-4.5C	03/28	UF	CS	56.5	53.8	175	2.13	0.122	0.222	0.559	0.725	2.65	0.0875	0.0216	0.0495	0.0094	0.00547	0.00849	0.0406	0.0116	0.00847
LAO-4.5C	03/28	F	CS				2.13	0.151	0.246	-0.135	0.634	2.19	0.0521	0.017	0.0401	0.00373	0.00835	0.0347	0.0335	0.0126	0.0274
LAO-6A	03/28	UF	CS	112	55	174	1.71	0.104	0.219	1.31	1.28	2.16	0.126	0.0219	0.0087	0.00646	0.00914	0.0347	0.0483	0.0158	0.0387
LAO-6A	03/28	F	CS				1.37	0.094	0.228	-1.11	0.621	2.06	0.0715	0.0175	0.0263	0.00717	0.00509	0.00971	0.0286	0.0125	0.0332
Mortandad Canyon:																					
MCO-3	07/31	UF	CS	4,790	134	168	39.3	5.17	0.176	3.81	3.27	4.92	0.908	0.0892	0.0103	0.0825	0.0197	0.0355	0.333	0.0435	0.0281
MCO-5	08/02	UF	CS	6,820	159	166	38.1	5.23	0.178	0	1.01	4.07	0.887	0.0826	0.0224	0.0361	0.0123	0.0329	0.278	0.0355	0.0224
MCO-5	08/02	UF	DUP	6,690	154	158				-0.768	0.965	3.34	0.917	0.0835	0.0388	0.0442	0.0133	0.0297	0.292	0.0359	0.0297
MCO-7.5	08/07	UF	DUP				-0.082	0.0596	0.16												
Cañada del Buey:																					
CDBO-6	05/01	UF	CS	-29	56	191	0.154	0.13	0.438	0.429	0.658	2.17	0.202	0.0257	0.027	0.0124	0.00831	0.0271	0.161	0.0226	0.029
CDBO-6	11/07	UF	CS																		
Pajarito Canyon:																					
PCO-1	04/10	F	CS				0.142	0.116	0.393	0.942	0.677	2.47	0.0346	0.0179	0.0644	-0.0105	0.00613	0.0748	0.0277	0.014	0.0188
PCO-1	04/10	UF	CS	-57.6	54.9	190	0.21	0.0929	0.294	0.253	0.645	2.27	0.0137	0.0155	0.0831	-0.0142	0.014	0.11	-0.014	0.00707	0.0831
PCO-1	04/10	UF	DUP							0.106	0.669	2.32	0.0384	0.0174	0.0208	0.0115	0.0116	0.0568	0.00381	0.00862	0.0566
PCO-1	04/10	F	CS				0.197	0.11	0.357	-0.078	0.589	2.11	0.0219	0.018	0.0917	-0.003	0.00301	0.0919	0.0125	0.0125	0.0337
PCO-1	04/10	UF	CS	-85.5	53.5	188	0.107	0.129	0.439	0.188	0.64	2.26	0.0138	0.0138	0.0373	0	1	0.0374	0	1	0.0373
PCO-3	04/10	F	CS				0.393	0.121	0.351	-0.393	0.637	2.21	0.918	0.135	0.0371	0.0654	0.0314	0.101	0.655	0.109	0.101
PCO-3	04/10	UF	CS	28.6	56.8	188	0.366	0.138	0.449	0.0391	0.724	2.56	1.08	0.154	0.0394	0.0694	0.0333	0.107	0.869	0.134	0.107
Intermediate Perched Groundwater Systems																					
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:																					
POI-4	08/01	UF	CS	-80.7	49.9	172	0.0256	0.0383	0.124	-0.291	0.91	3.21	1.12	0.111	0.0538	0.0545	0.019	0.054	0.688	0.0763	0.0416
Test Well 2A	07/30	UF	CS	1,110	76.1	165	-0.0167	0.0422	0.139	6.58	3.19	4.93	0.0463	0.0129	0.0296	-0.00398	0.00283	0.0256	0.00154	0.0048	0.0256
Basalt Spring	10/23	F	CS				0.611	0.128	0.301	-0.173	1.42	5.08	0.673	0.0622	0.0309	0.113	0.0188	0.0219	0.424	0.0433	0.00638
Basalt Spring	10/23	UF	CS	-78.4	53	181															
Perched Groundwater System in Volcanics:																					
Water Canyon Gallery	11/29	F	CS				-0.0043	0.0628	0.171	-0.881	0.806	2.76				0.0293	0.00808	0.00567	0.0417	0.00976	0.00565
Water Canyon Gallery	11/29	F	DUP				0.134	0.0631	0.134	0.0624	0.919	3.3				0.0167	0.006	0.00564	0.0311	0.00832	0.00563
Water Canyon Gallery	11/29	UF	CS	-162	50.9	183															
Water Canyon Gallery	11/29	UF	DUP	-107	51.9	181															
San Ildefonso Pueblo																					
LA-5	06/19	UF	CS	-51.3	45.9	159	0.104	0.0931	0.355	0	1.72	6.08	0.508	0.0525	0.0306	0.0207	0.00844	0.021	0.259	0.0329	0.0209
LA-5	06/19	UF	CS																		
LA-5	10/03	UF	CS																		
LA-5	10/03	UF	DUP																		
LA-5	10/03	UF	CS																		
Eastside Artesian Well	06/20	UF	CS	-26.2	47.7	163	-0.033	0.0915	0.368	0.557	0.823	2.98	0.0218	0.0122	0.0447	0.00192	0.00597	0.0318	0.00533	0.00687	0.0317
Pajarito Well (Pump 1)	06/19	UF	CS	-52.3	46.8	162	0.249	0.115	0.402	-1.14	0.996	3.43	10.2	0.812	0.0468	0.163	0.036	0.0592	3.29	0.289	0.0172
Pajarito Well (Pump 1)	06/19	UF	DUP																		
Pajarito Well (Pump 1)	06/19	UF	CS																		
Pajarito Well (Pump 1)	06/19	UF	CS	-26.3	47.9	163	0.0753	0.0945	0.365	0.393	0.707	2.48	9.1	0.699	0.0658	0.847	0.0889	0.0504	2.99	0.249	0.0434
Pajarito Well (Pump 1)	06/19	UF	DUP				-0.0396	0.0884	0.372												
Pajarito Well (Pump 1)	06/19	UF	CS																		
Pajarito Well (Pump 1)	10/03	UF	CS																		
Pajarito Well (Pump 1)	10/03	UF	CS																		
Don Juan Playhouse Well	06/20	UF	CS	-51.9	46.4	161	0.25	0.147	0.527	0.575	1.12	2.07	4.07	0.31	0.0291	0.116	0.0208	0.00851	2.16	0.174	0.00848
Don Juan Playhouse Well	06/20	UF	CS																		
Don Juan Playhouse Well	10/03	UF	CS																		
Don Juan Playhouse Well	10/03	UF	CS																		

Table 5-20. Radiochemical Analysis of Groundwater for 2001 (pCi/L[a]) (Cont.)

				^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$			^{238}U		
Station	Date	Codes[b]		Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
San Ildefonso Pueblo (Cont.)																					
Martinez House Well	12/04	UF	CS	-134	51.3	181	0.0506	0.0226	0.0561	-0.625	0.65	2.23				0.166	0.0232	0.0175	1.89	0.147	0.0174
Martinez House Well	12/04	UF	DUP							-0.747	0.72	2.37									
Otowi House Well	06/19	UF	CS	0	49.2	165	0.165	0.0923	0.353	0	0.99	4.02	1.71	0.147	0.0632	0.0592	0.0167	0.0353	1.03	0.0974	0.0455
Otowi House Well	06/19	UF	DUP	-27	49.1	168							1.68	0.143	0.0427	0.0135	0.0144	0.062	0.934	0.0893	0.0644
Otowi House Well	06/19	UF	CS																		
Otowi House Well	10/03	UF	CS																		
Otowi House Well	10/03	UF	CS																		
New Community Well	06/19	UF	CS	0	47.2	158	0.0371	0.114	0.448	0.37	0.631	2.32	11.3	0.862	0.066	0.342	0.0501	0.0817	7.12	0.554	0.0702
New Community Well	06/19	UF	CS																		
New Community Well	10/03	UF	CS																		
New Community Well	10/03	UF	CS																		
Santa Fe Water Supply Wells																					
Buckman 1	08/16	UF	CS				-0.16	0.0819	0.215				3.49	0.269	0.0377	0.144	0.0251	0.0258	2.07	0.168	0.042
Buckman 1	08/16	UF	DUP										3.75	0.285	0.0092	0.108	0.0222	0.0364	2.09	0.169	0.0248
Buckman 1	10/31	UF	CS				-0.0834	0.0653	0.222							0.301	0.0346	0.0388	5.29	0.419	0.0341
Buckman 1	10/31	UF	DUP				-0.0861	0.0733	0.247							0.396	0.0417	0.0302	5.47	0.437	0.0325
Buckman 1	10/31	UF	TRP													0.786	0.0693	0.0162	5.91	0.461	0.0212
Buckman 2	08/16	UF	CS				0.133	0.0598	0.151				92.6	6.99	0.141	4.7	0.402	0.0221	73.7	5.57	0.0753
Buckman 2	08/16	UF	RE										91.6	6.98	0.14	4.09	0.386	0.14	74.5	5.69	0.14
Buckman 2	08/16	UF	REDP										87.4	6.6	0.154	3.74	0.35	0.0868	74	5.6	0.0866
Buckman 2	10/31	UF	CS				0.0293	0.0548	0.183							0.347	0.0365	0.00475	6.79	0.539	0.0129
Buckman 2	10/31	UF	DUP													1.12	0.0959	0.015	6.52	0.51	0.0118
Buckman 2	10/31	UF	TRP													0.211	0.0219	0.0115	2.79	0.213	0.00288
Buckman 3	10/31	UF	CS				-0.0205	0.0551	0.188							0.147	0.0184	0.0104	2.86	0.226	0.0104
Buckman 3	10/31	UF	DUP													0.539	0.0493	0.0202	2.59	0.205	0.0176
Buckman 3	10/31	UF	TRP													0.688	0.0586	0.00854	2.91	0.224	0.0125
Buckman 4	10/31	UF	CS				0.0109	0.0494	0.166							0.297	0.029	0.0139	3	0.229	0.0162
Buckman 4	10/31	UF	DUP													0.208	0.0219	0.00832	2.99	0.23	0.0121
Buckman 4	10/31	UF	TRP													0.266	0.028	0.0147	3.1	0.242	0.0192
Buckman 6	10/31	UF	CS				0.0053	0.0673	0.226							0.165	0.0194	0.0146	1.67	0.133	0.0131
Buckman 6	10/31	UF	DUP													0.324	0.0352	0.019	1.9	0.158	0.0231
Buckman 6	10/31	UF	TRP													0.136	0.0177	0.0108	1.87	0.151	0.00397
Buckman 7	08/16	UF	CS				-0.0114	0.0578	0.159				5.12	0.378	0.0232	0.113	0.019	0.0185	1.76	0.141	0.0232
Buckman 7	08/16	UF	DUP										5.01	0.369	0.0182	0.149	0.0225	0.0231	1.68	0.135	0.0349
Buckman 7	10/31	UF	CS				-0.0197	0.0674	0.228							0.11	0.0149	0.00989	1.9	0.152	0.0124
Buckman 7	10/31	UF	DUP													0.198	0.0226	0.0172	1.8	0.144	0.0121
Buckman 7	10/31	UF	TRP													0.12	0.0179	0.0208	1.83	0.151	0.0147
Buckman 8	10/31	UF	CS				0.146	0.0616	0.187							0.261	0.0285	0.0176	4.17	0.328	0.0206
Buckman 8	10/31	UF	DUP													0.24	0.0271	0.0118	4.6	0.364	0.0148
Buckman 8	10/31	UF	TRP													0.212	0.0256	0.016	4.68	0.373	0.0126
Buckman 8	10/31	UF	CS				0.125	0.0579	0.179							0.692	0.0605	0.0124	4.06	0.315	0.016
Buckman 8	10/31	UF	DUP													0.234	0.0257	0.0176	4.55	0.354	0.0161
Buckman 8	10/31	UF	TRP													0.275	0.0289	0.013	3.98	0.311	0.0129
Water Quality Standards[c]																					
DOE DCG for Public Dose				2,000,000			1,000			3,000			500			600			600		
DOE Drinking Water System DCG				80,000			40			120			20			24			24		
EPA Primary Drinking Water Standard				20,000			8														
EPA Screening Level																					
NMWQCC Groundwater Limit																					

Table 5-20. Radiochemical Analysis of Groundwater for 2001 (pCi/L[a]) (Cont.)

				U (μg/L, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station	Date	Codes[b]		Result	Uncert	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Regional Aquifer Wells																				
Test Wells:																				
Test Well 1	06/05	UF	CS	3.21	0.28	0.00662	0.00664	0.018	0.00477	0.00478	0.0129	0.0398	0.0135	0.0308	1.99	0.698		4.2	0.917	
Test Well 3	06/04	UF	CS	0.33	0.06	0	1	0.0152	0.00807	0.00808	0.0297	0.0279	0.0107	0.0108	-0.52	0.364		3.12	0.735	
Test Well 3	06/04	UF	DUP																	
Test Well 3	10/04	UF	CS	0.44	0.06	0.00227	0.00393	0.0167	0.0272	0.00972	0.0244	0.0114	0.00606	0.0177	-0.333	0.474	2.22	2.33	0.418	1.33
Test Well 3	10/04	UF	DUP	0.48	0.06	0.0149	0.00613	0.00673	0.0124	0.00826	0.0267	0.00954	0.0043	0.00517	0.444	0.452	1.89	1.6	0.393	1.41
Test Well 3	10/04	UF	TRP																	
Test Well 3	10/04	UF	CS	0.55	0.07	0.00614	0.00459	0.0151	0.00614	0.00542	0.019	0.0115	0.00609	0.0178	0.715	0.469	1.74	1.66	0.364	1.21
Test Well 4	06/04	UF	CS	0.07	0.03	0	1	0.0205	0.00546	0.00946	0.0402	0.0256	0.0129	0.0173	0.429	0.391		2.87	0.748	
Test Well 4	06/04	UF	DUP												-0.444	0.31		2.64	0.812	
Test Well 8	06/04	UF	CS	0.39	0.07	0	1	0.0203	0.0108	0.0132	0.0501	0.0164	0.0136	0.0463	0.96	0.43		3.01	0.71	
Test Well DT-5A	06/06	UF	CS	0.38	0.06	0	1	0.017	0.00902	0.00904	0.0332	0.00609	0.0105	0.0399	0.242	0.437		1.33	0.667	
Test Well DT-9	06/07	UF	CS	0.43	0.07	0.00677	0.00678	0.0183	0.0135	0.00961	0.0183	0.00329	0.0033	0.00891	0.173	0.386		1.28	0.737	
Test Well DT-9	06/07	UF	DUP	0.45	0.07	0	1	0.0194	0.00515	0.00516	0.014	0.022	0.00743	0.00661						
Test Well DT-10	06/06	UF	CS	0.67	0.09	0	1	0.0196	-0.0104	0.00741	0.0485	0.0257	0.0116	0.0139	-0.257	0.408		0.8	0.764	
Water Supply Wells:																				
O-1	05/09	UF	CS	1.35	0.13	0.0183	0.00754	0.00826	0.00914	0.0053	0.00826	0.0221	0.00847	0.00857	0.209	0.534	2.02	4.06	1.02	3.02
O-1	05/09	UF	DUP	1.33	0.14	0.00497	0.00417	0.0162	0.0022	0.00221	0.00597	0.00542	0.00699	0.0323	0.691	0.448	1.44	3.63	0.9	2.68
O-1	05/09	UF	TRP																	
O-1	05/09	UF	CS	1.54	0.15	0.0124	0.00561	0.00674	0.00746	0.00433	0.00674	0.0312	0.0112	0.0106	1.72	1.08	2.82	6.1	0.866	2.38
O-1	05/09	UF	DUP																	
O-4	05/09	UF	CS	0.74	0.08	0.0165	0.00745	0.00896	0.000839	0.00412	0.0243	0.00107	0.00473	0.0282	1.49	0.893	2.68	4.94	0.793	2.24
O-4	05/09	UF	DUP																	
PM-1	05/09	UF	CS	1.78	0.16	0.0101	0.00602	0.0209	0	1	0.00609	0.00331	0.00332	0.00897	2.33	1.07	3	8.06	0.894	2.2
PM-1	05/09	UF	DUP																	
PM-2	05/09	UF	CS	0.32	0.05	0.00978	0.00692	0.0259	0.00279	0.00279	0.00756	0.0256	0.0106	0.0116	1.03	0.851	2.7	3.55	0.746	2.22
PM-2	05/09	UF	DUP																	
PM-3	05/09	UF	CS	1.05	0.12	0.00882	0.00624	0.0234	0.00315	0.00402	0.0185	0.0124	0.00683	0.0213	0.448	0.85	3.14	5.68	0.807	2.17
PM-3	05/09	UF	DUP																	
PM-4	05/09	UF	CS	0.41	0.06	0.0168	0.00693	0.0076	-0.000669	0.00537	0.0302	0.00534	0.00688	0.0318	0.721	0.691	2.33	6.03	0.836	2.27
PM-4	05/09	UF	DUP																	
PM-5	05/09	UF	CS	0.43	0.06	0.000766	0.00378	0.0223	0.000766	0.00377	0.0223	0.012	0.00602	0.0081	0.553	0.597	2.08	4.01	0.777	2.3
G-1A	05/09	UF	CS	0.41	0.06	0.008	0.00527	0.0181	0.00246	0.00246	0.00666	0.0152	0.00767	0.0103	0.667	0.706	2.53	6.25	0.819	2.16
G-1A	05/09	UF	DUP																	
G-1A	05/09	UF	TRP																	
G-2A	05/09	UF	CS	0.49	0.08	0.00401	0.00284	0.00544	0	1	0.0148	0.00609	0.00432	0.00825	0.116	0.406	1.57	1.32	0.785	2.62
G-2A	05/09	UF	DUP																	
G-3A	05/09	UF	CS	0.81	0.09	0.00868	0.00503	0.00784	0.0022	0.00625	0.0311	0.0317	0.0122	0.0123	0.639	0.406	1.27	-1.33	0.781	2.86
G-3A	05/09	UF	DUP																	
G-4A	05/09	UF	CS	0.81	0.11	0.00922	0.00379	0.00416	0.00615	0.00378	0.0113	0.0103	0.00715	0.0269	0.681	0.356	1.06	1.47	0.652	2.13
G-4A	05/09	UF	DUP																	
Regional Aquifer Springs																				
White Rock Canyon Group I:																				
Sandia Spring	09/24	F	CS	0.74	0.13	0.00245	0.00245	0.00663	-0.00734	0.00648	0.0321	0.0346	0.0106	0.00853	1	0.425	1.41	2.77	0.4	1.11
Sandia Spring	09/24	F	CS	0.70	0.12	0.00733	0.00425	0.00662	0.00977	0.00978	0.0344	0.00542	0.00543	0.0199	0.624	0.409	1.54	2.51	0.382	1.06
Sandia Spring	09/24	UF	CS																	
Sandia Spring	09/24	UF	CS																	
Spring 3	09/24	F	CS	1.56	0.20	0.00965	0.00765	0.026	0.00965	0.00485	0.00653	0.0112	0.00562	0.00757	0.601	0.517	1.98	2.68	0.399	1.09
Spring 3	09/24	UF	CS																	
Spring 4	09/24	UF	CS																	
Spring 4	09/24	UF	DUP																	
Spring 4	09/24	UF	CS	0.87	0.14	0.00626	0.00468	0.0154	-0.00208	0.00466	0.0224	0.0354	0.0118	0.0237	-0.251	0.313	1.68	2.62	0.407	1.18
Spring 4	09/24	UF	DUP	0.84	0.14	-0.0023	0.00399	0.0214	0.00461	0.00565	0.0214	0.015	0.00939	0.03	-0.372	0.376	1.99	1.92	0.41	1.42
Spring 4A	09/25	F	CS	0.97	0.14	0.074	0.015	0.0195	0.00264	0.00699	0.0284	0.0237	0.00849	0.00804	0.688	0.36	1.23	2.16	0.352	0.977
Spring 4A	09/25	UF	CS																	
Spring 5	09/25	F	CS	0.60	0.11	0	1	0.00677	0.00499	0.00612	0.0232	0.027	0.00912	0.00812	1.18	0.457	1.25	2.34	0.362	0.949
Spring 5	09/25	UF	CS																	

Table 5-20. Radiochemical Analysis of Groundwater for 2001 (pCi/L[a]) (Cont.)

Station	Date		Codes[b]	U (µg/L, calc) Result	U (µg/L, calc) Uncert	^{238}Pu Result	^{238}Pu Uncert	^{238}Pu MDA	^{239,240}Pu Result	^{239,240}Pu Uncert	^{239,240}Pu MDA	^{241}Am Result	^{241}Am Uncert	^{241}Am MDA	Gross Alpha Result	Gross Alpha Uncert	Gross Alpha MDA	Gross Beta Result	Gross Beta Uncert	Gross Beta MDA
Regional Aquifer Springs (Cont.)																				
White Rock Canyon Group I: (Cont.)																				
Ancho Spring	10/24	F	CS	0.24	0.04	0.0114	0.00905	0.0307	6.8E-10	0.00699	0.0307	0.00586	0.00587	0.0216	0.9	0.4	1.45	2.87	0.711	2.8
Ancho Spring	10/24	F	DUP	0.23	0.05	0.00279	0.00623	0.0259	0.00279	0.00483	0.0205	0.0217	0.0126	0.039						
Ancho Spring	10/24	UF	CS																	
Ancho Spring	10/24	UF	DUP																	
White Rock Canyon Group II:																				
Spring 6A	09/25	UF	CS																	
Spring 6A	09/25	F	CS	0.86	0.14	0.00803	0.006	0.0197	-0.0134	0.0111	0.0485	0.0216	0.00827	0.00838	0.491	0.44	1.68	2.86	0.423	1.21
Spring 9	09/25	UF	CS																	
Spring 9	09/26	F	CS	0.27	0.07	0.00226	0.00392	0.0167	0.00226	0.0109	0.041	0.0316	0.0102	0.0226	0.0913	0.347	1.64	0.445	0.26	1.06
White Rock Canyon Group III:																				
Spring 1	09/24	UF	CS																	
Spring 1	09/24	F	CS	1.77	0.22	0.0053	0.00376	0.00718	0.00529	0.00375	0.00717	0.00881	0.00727	0.0284	1.59	0.626	2.16	2.3	0.432	1.44
Spring 1	09/24	F	DUP									0.0173	0.0087	0.0117						
Spring 2	09/24	UF	CS																	
Spring 2	09/24	F	CS	1.12	0.16	0.0049	0.0049	0.018	0.00978	0.00601	0.018	0.0239	0.00856	0.00809	1.1	0.542	1.92	1.26	0.398	1.52
White Rock Canyon Group IV:																				
La Mesita Spring	10/23	UF	CS																	
La Mesita Spring	10/23	F	CS	10.65	0.79	0.00538	0.00381	0.00728	0.00269	0.00891	0.0352	0.019	0.011	0.0341	11.3	1.24	1.31	7.4	0.827	2.53
Other Springs:																				
Sacred Spring	10/23	F	CS	1.58	0.16	0.00771	0.00928	0.0337	0.00257	0.00575	0.0239	-0.00342	0.0123	0.0513	2.24	0.604	1.65	4.3	0.691	2.34
Sacred Spring	10/23	F	DUP	1.62	0.17	-0.00456	0.00323	0.0212	0.00455	0.00789	0.0298	0.0371	0.0133	0.0126	2.28	0.566	1.5	3.44	0.695	2.48
Sacred Spring	10/23	UF	CS																	
Sacred Spring	10/23	UF	DUP																	
Sacred Spring	10/23	F	CS	1.26	0.13	0.00715	0.0086	0.0312	0.00477	0.00338	0.00646	-0.00272	0.0112	0.0453	2.17	0.577	1.7	4.97	0.786	2.84
Sacred Spring	10/23	UF	CS																	
Canyon Alluvial Groundwater Systems																				
Acid/Pueblo Canyons:																				
APCO-1	04/03	UF	CS	0.83	0.11	0.0134	0.00672	0.00906	0.157	0.0248	0.0246	0.00364	0.00962	0.0391	2.97	1.33	1.39	18.6	3.03	2.84
APCO-1	04/03	F	CS	0.60	0.09	0.00395	0.00396	0.0107	0.0948	0.02	0.0107	0.0398	0.0143	0.0135	1.03	0.64	2.02	18.7	1.64	2.98
APCO-1	04/03	F	DUP												1.89	0.999	2.98	17.6	1.64	3.32
DP/Los Alamos Canyons:																				
LAO-C	04/03	UF	CS	0.08	0.05	0.0104	0.00603	0.0094	0.0173	0.00922	0.0255	0.0155	0.00781	0.0105	-0.0845	0.613	2.42	4	1.05	3.22
LAO-C	04/03	F	CS	0.20	0.05	0.0151	0.00931	0.0279	0.00757	0.00537	0.0103	0.013	0.0115	0.0402	0.528	0.411	1.4	4.4	0.977	2.87
LAO-C	04/03	F	DUP	0.11	0.03	0.0105	0.00612	0.00953	0.00351	0.00786	0.0326	0.0223	0.0092	0.0101						
LAO-0.7	03/29	UF	CS	0.25	0.05	-4.55E-10	0.00539	0.0281	0.103	0.0212	0.0281	0.0258	0.0103	0.0238	1.72	0.607	1.66	3.37	0.937	2.92
LAO-0.7	03/29	F	CS	0.14	0.04	1.11E-09	0.00657	0.0342	0.0232	0.0124	0.0342	0.273	0.0362	0.0106	1.24	0.612	1.65	3.67	0.876	2.65
LAO-0.7	03/29	F	DUP																	
LAO-1	04/05	UF	CS	0.09	0.03	0	1	0.0179	0.0237	0.0107	0.0129	0.017	0.0105	0.0314	0.523	0.63	2.05	24.4	3.99	2.73
LAO-1	04/05	UF	DUP	0.01	0.05	0	1	0.015	0.0239	0.0113	0.0293	0.0421	0.0168	0.0388						
LAO-1	04/05	F	CS	0.02	0.03	0.00653	0.0113	0.0481	0.00941	0.0115	0.0437	0.0209	0.0086	0.00942	-0.0118	0.402	1.51	23.8	1.99	2.47
LAO-1	04/05	F	DUP												-0.705	0.407	1.68	23.6	1.95	2.66
DP Spring	04/03	F	CS	0.09	0.04	0.0179	0.00953	0.0264	0.00716	0.00508	0.00971	0.025	0.0103	0.0113	2.43	0.862	1.54	214	13.5	3.06
DP Spring	04/03	UF	CS	0.09	0.04	0.0131	0.00758	0.0118	0.00871	0.00618	0.0118	0.0293	0.0156	0.0454	-0.315	0.596	2.49	228	11.6	2.93
LAO-2	03/29	UF	CS	0.05	0.04	0.0191	0.0096	0.0129	0	1	0.0129	0.0237	0.00905	0.00916	1.89	0.798	1.97	92	6.27	2.53
LAO-2	03/29	F	CS	0.11	0.04	1.08E-09	0.00643	0.0335	0.00454	0.00455	0.0123	0.0313	0.0149	0.0384	2.6	0.818	0.89	51.5	3.6	2.34
LAO-3A	03/28	UF	CS	0.39	0.07	0.00449	0.0045	0.0122	-0.00449	0.0045	0.033	0.0245	0.00878	0.00831	3.08	0.727	1.33	93.4	5.26	2.32
LAO-3A	03/28	F	CS	0.25	0.05	0.00464	0.00464	0.0126	0.00463	0.00464	0.0126	0.0246	0.0101	0.0111	2.41	0.707	1.16	89.2	5.7	2.36
LAO-3A	03/28	F	DUP	0.25	0.06	0.0197	0.0114	0.0178	0	1	0.0178	0.0179	0.00807	0.0097						
LAO-3A	03/28	F	CS	0.18	0.04	0	1	0.0159	-0.00586	0.00587	0.0431	0	1	0.0124	1.55	0.474	1.1	7.05	0.885	2.2
LAO-3A	03/28	UF	CS	0.23	0.06	0	1	0.0158	0.00584	0.00585	0.0158	0.0312	0.0112	0.0106	2.86	1.2	1.77	97.4	14.2	2.53
LAO-3A	03/28	UF	DUP																	
LAO-4	04/05	UF	CS	0.14	0.05	0	1	0.0165	0.0131	0.00762	0.0119	0.0269	0.0111	0.0121	1.02	0.509	1.56	13.8	1.35	2.62

Table 5-20. Radiochemical Analysis of Groundwater for 2001 (pCi/L[a]) (Cont.)

				U (µg/L, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station	Date	Codes[b]		Result	Uncert	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
Canyon Alluvial Groundwater Systems (Cont.)																				
DP/Los Alamos Canyons:																				
LAO-4	04/05	UF	DUP																	
LAO-4	04/05	F	CS	0.08	0.03	0.0241	0.0121	0.0163	-1.04E-09	0.00868	0.0403	0.053	0.0163	0.0131	1.08	0.616	1.29	19.7	3.95	2.59
LAO-4.5C	03/28	UF	CS	0.13	0.03	0.00551	0.00552	0.0149	-0.00551	0.00954	0.0511	0.0273	0.0128	0.0367	0.614	0.558	1.87	8.51	1.21	2.73
LAO-4.5C	03/28	F	CS	0.10	0.04	0	1	0.0202	0	1	0.0202	0.044	0.0125	0.00917	1.46	0.723	2.1	8.63	1.12	2.66
LAO-6A	03/28	UF	CS	0.15	0.05	0.0234	0.0136	0.0211	0.00778	0.00779	0.0211	0.0553	0.0171	0.0367	0.169	0.368	1.36	7.61	1.68	2.36
LAO-6A	03/28	F	CS	0.09	0.04	-0.00532	0.00532	0.0391	-0.00531	0.00532	0.0391	0.0245	0.0116	0.03	0.301	0.345	1.22	8	1.02	2.41
Mortandad Canyon:																				
MCO-3	07/31	UF	CS	1.03	0.13	0.315	0.0387	0.01	0.122	0.0224	0.01	0.927	0.0706	0.0169	2.99	0.911	2.7	161	2.41	1.88
MCO-5	08/02	UF	CS	0.84	0.11	0.0139	0.012	0.0417	0.0104	0.00778	0.0255	0.207	0.0238	0.0149	-0.372	0.896	2.36	120	2.17	2.13
MCO-5	08/02	UF	DUP	0.89	0.11	0.027	0.00969	0.00914	0.054	0.0139	0.00914	0.179	0.0223	0.0221	1.53	1.37	2.93	117	2.3	2.21
MCO-7.5	08/07	UF	DUP																	
Cañada del Buey:																				
CDBO-6	05/01	UF	CS	0.48	0.07	0.00553	0.00621	0.0296	0.00636	0.00451	0.00862	0.00247	0.00247	0.0067	3.73	1.08	2.2	6.72	1.27	3.6
CDBO-6	11/07	UF	CS												19.3	1.32	1.33	21.4	1.17	2.8
Pajarito Canyon:																				
PCO-1	04/10	F	CS	0.08	0.04	0	1	0.0175	0.00928	0.00658	0.0126	0.0345	0.0174	0.0233	-0.119	0.35	1.51	5.04	0.926	2.6
PCO-1	04/10	UF	CS	-0.05	0.02	0	1	0.014	0.00744	0.00528	0.0101	0.0536	0.0192	0.0181	0.807	0.569	1.6	8.34	1.56	2.63
PCO-1	04/10	UF	DUP	0.02	0.03	0	1	0.0248	0.0198	0.0115	0.0179	0.0221	0.0112	0.015	0.954	0.489	1.45	12.9	1.24	2.54
PCO-1	04/10	F	CS	0.04	0.04	0	1	0.0184	0.00488	0.00489	0.0132	0.00548	0.00549	0.0148	0.926	0.741	1.89	4.74	1.3	2.75
PCO-1	04/10	UF	CS	0.00	3.01	-0.00564	0.00565	0.0415	0.00813	0.0115	0.0438	0.0294	0.014	0.0361	-0.562	0.504	2.17	7.83	1.08	2.81
PCO-3	04/10	F	CS	1.98	0.32	0.0238	0.0107	0.0129	0.00685	0.00839	0.0318	0.0561	0.0232	0.0253	0.821	0.8	2.11	1.93	1.09	3.38
PCO-3	04/10	UF	CS	2.62	0.40	0	1	0.0134	0.0107	0.00619	0.00965	0.0576	0.0221	0.0223	1.83	1.05	2.05	2.31	0.988	3.01
Intermediate Perched Groundwater Systems																				
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglon																				
POI-4	08/01	UF	CS	2.07	0.23	0	1	0.0306	0.0166	0.0132	0.0448	0.0154	0.00552	0.00522	0.631	0.747	2.64	12.6	0.995	2.85
Test Well 2A	07/30	UF	CS	0.00	0.01	0.00851	0.0121	0.0458	0.00425	0.00737	0.0313	0.00752	0.00596	0.0202	-0.682	0.703	2.8	1.45	0.539	1.89
Basalt Spring	10/23	F	CS	1.31	0.13	-0.00645	0.00646	0.0347	0.0161	0.0155	0.0537	0.0338	0.0142	0.0403	2.51	0.725	1.81	15.7	1.08	2.51
Basalt Spring	10/23	UF	CS																	
Perched Groundwater System in Volcanics:																				
Water Canyon Gallery	11/29	F	CS			0.00689	0.00515	0.0169	0.0138	0.00567	0.00622	0.0192	0.00984	0.0301	0.849	0.403	1.4	1.49	0.39	1.41
Water Canyon Gallery	11/29	F	DUP			-0.00216	0.00375	0.0201	0.0173	0.00971	0.0305	0.0127	0.00639	0.0086	0.882	0.459	1.66	2.54	0.421	1.25
Water Canyon Gallery	11/29	UF	CS																	
Water Canyon Gallery	11/29	UF	DUP																	
San Ildefonso Pueblo																				
LA-5	06/19	UF	CS	0.78	0.10	0	1	0.0214	0.00291	0.00291	0.00788	0.0143	0.00685	0.019	1.25	0.598	2.15	1.9	0.776	3.12
LA-5	06/19	UF	CS			0	1	0.0118	0	1	0.0118									
LA-5	10/03	UF	CS			-0.00671	0.00476	0.0312	0.0168	0.0121	0.0403									
LA-5	10/03	UF	DUP			0.00753	0.00534	0.0102	0	1	0.0405									
LA-5	10/03	UF	CS			0.000561	0.00549	0.0306	0.00943	0.00975	0.0386									
Eastside Artesian Well	06/20	UF	CS	0.02	0.02	0.00284	0.00285	0.00771	0.00284	0.00285	0.0077	0.0179	0.011	0.0329	-0.0089	0.385	1.88	-0.121	0.654	3
Pajarito Well (Pump 1)	06/19	UF	CS	9.87	0.86	0	1	0.0169	0	1	0.00623	0.0053	0.00376	0.00718	12.5	1.3	2.67	5.79	0.895	2.69
Pajarito Well (Pump 1)	06/19	UF	DUP												9.25	1.09	2.23	4.23	0.882	2.75
Pajarito Well (Pump 1)	06/19	UF	CS			0.00992	0.00499	0.00672	-0.00496	0.00352	0.023									
Pajarito Well (Pump 1)	06/19	UF	CS	9.29	0.74	0.00447	0.00447	0.0164	0.00223	0.00387	0.0164	0.0169	0.00645	0.00653	9.81	1.04	1.63	5.05	0.84	2.55
Pajarito Well (Pump 1)	06/19	UF	DUP																	
Pajarito Well (Pump 1)	06/19	UF	CS			0	1	0.00808	-0.00298	0.00298	0.0219									
Pajarito Well (Pump 1)	10/03	UF	CS			-0.0037	0.00642	0.0344	-0.0111	0.0111	0.0522									
Pajarito Well (Pump 1)	10/03	UF	CS			0	1	0.0118	0.000586	0.00574	0.032									
Don Juan Playhouse Well	06/20	UF	CS	6.48	0.52	0.00889	0.00664	0.0218	0.00296	0.00784	0.0319	0.0307	0.011	0.0259	6.44	1.09	1.91	2.23	0.743	2.88
Don Juan Playhouse Well	06/20	UF	CS			-0.00681	0.00483	0.0316	0.00681	0.00682	0.0251									
Don Juan Playhouse Well	10/03	UF	CS			0	1	0.0265	0.00359	0.00623	0.0264									
Don Juan Playhouse Well	10/03	UF	CS			-0.00384	0.00384	0.0283	-0.00384	0.00384	0.0282									

Table 5-20. Radiochemical Analysis of Groundwater for 2001 (pCi/L[a]) (Cont.)

				U (µg/L, calc)		^{238}Pu			^{239,240}Pu			^{241}Am			Gross Alpha			Gross Beta		
Station	Date	Codes[b]		Result	Uncert	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
San Ildefonso Pueblo (Cont.)																				
Martinez House Well	12/04	UF	CS			0.00482	0.00342	0.00653	0.0144	0.00685	0.0177	0.0144	0.00684	0.0177	6.81	1.28	2.69	3.52	0.56	1.83
Martinez House Well	12/04	UF	DUP																	
Otowi House Well	06/19	UF	CS	3.09	0.29	0.00241	0.00241	0.00652	0.0024	0.00538	0.0223	0.00309	0.00535	0.0227	0.539	0.556	2.43	4.17	0.894	3.27
Otowi House Well	06/19	UF	DUP	2.79	0.27	0.0148	0.0129	0.0444	0.00296	0.00296	0.00802	0.00838	0.00928	0.0336						
Otowi House Well	06/19	UF	CS			0	1	0.00981	0.00362	0.00362	0.0098									
Otowi House Well	10/03	UF	CS			0.00343	0.00595	0.0253	0	1	0.0369									
Otowi House Well	10/03	UF	CS			0	1	0.0248	0.00337	0.00338	0.00914									
New Community Well	06/19	UF	CS	21.35	1.65	-0.0127	0.00674	0.0357	0.00253	0.00567	0.0235	0.00572	0.00573	0.021	19.4	1.97	2.03	5.91	0.99	3.38
New Community Well	06/19	UF	CS			1.77E-10	0.00421	0.0219	0.00297	0.00298	0.00806									
New Community Well	10/03	UF	CS			0.00341	0.00341	0.00924	0	1	0.0447									
New Community Well	10/03	UF	CS			0	1	0.0268	0.00364	0.00631	0.0268									
Santa Fe Water Supply Wells																				
Buckman 1	08/16	UF	CS	6.23	0.50															
Buckman 1	08/16	UF	DUP	6.27	0.50															
Buckman 1	10/31	UF	CS																	
Buckman 1	10/31	UF	DUP																	
Buckman 1	10/31	UF	TRP																	
Buckman 2	08/16	UF	CS	221.54	16.58															
Buckman 2	08/16	UF	RE	223.63	16.94															
Buckman 2	08/16	UF	REDP	221.98	16.67															
Buckman 2	10/31	UF	CS																	
Buckman 2	10/31	UF	DUP																	
Buckman 2	10/31	UF	TRP																	
Buckman 3	10/31	UF	CS																	
Buckman 3	10/31	UF	DUP																	
Buckman 3	10/31	UF	TRP																	
Buckman 4	10/31	UF	CS																	
Buckman 4	10/31	UF	DUP																	
Buckman 4	10/31	UF	TRP																	
Buckman 6	10/31	UF	CS																	
Buckman 6	10/31	UF	DUP																	
Buckman 6	10/31	UF	TRP																	
Buckman 7	08/16	UF	CS	5.29	0.42															
Buckman 7	08/16	UF	DUP	5.07	0.40															
Buckman 7	10/31	UF	CS																	
Buckman 7	10/31	UF	DUP																	
Buckman 7	10/31	UF	TRP																	
Buckman 8	10/31	UF	CS																	
Buckman 8	10/31	UF	DUP																	
Buckman 8	10/31	UF	TRP																	
Buckman 8	10/31	UF	CS																	
Buckman 8	10/31	UF	DUP																	
Buckman 8	10/31	UF	TRP																	
Water Quality Standards[c]																				
DOE DCG for Public Dose				800		40			30			30			30			1,000		
DOE Drinking Water System DCG				30		1.6			1.2			1.2			1.2			40		
EPA Primary Drinking Water Standard				30											15					
EPA Screening Level																		50		
NMWQCC Groundwater Limit				5,000																

[a] Except where noted. Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytical laboratory measurement-specific minimum detectable activity.
[b] Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.
[c] Standards given here for comparison only; see Appendix A.

Table 5-21. Detections of Radionuclides[a] and Comparison to Standards[b] in Groundwater for 2001

Station	Date		Code[c]	Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Valid Flag Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Regional Aquifer Wells															
Test Wells:															
Test Well 1	06/05	UF	CS	^{3}H	186	51.3		pCi/L							
Water Supply Wells:															
PM-4	11/28	UF	CS	^{90}Sr	0.134	0.0373	0.0741	pCi/L							
Regional Aquifer Springs															
White Rock Canyon Group I:															
Sandia Spring	09/24	F	CS	^{241}Am	0.0346	0.0106	0.00853	pCi/L							
Spring 4	09/24	UF	CS	^{241}Am	0.0354	0.0118	0.0237	pCi/L							
Spring 4A	09/25	F	CS	^{238}Pu	0.074	0.015	0.0195	pCi/L							
Ancho Spring	10/24	F	CS	^{90}Sr	0.3	0.0865	0.221	pCi/L							
White Rock Canyon Group II:															
Spring 9	09/26	F	CS	^{241}Am	0.0316	0.0102	0.0226	pCi/L							
White Rock Canyon Group IV:															
La Mesita Spring	10/23	F	CS	Gross Alpha	11.3	1.24	1.31	pCi/L			0.75	15	EPA PRIM DW STD	30	0.38
La Mesita Spring	10/23	F	CS	^{234}U	5.42	0.4	0.0365	pCi/L							
Canyon Alluvial Groundwater Systems															
Acid/Pueblo Canyons:															
APCO-1	04/03	F	DUP	^{90}Sr	1.42	0.128	0.293	pCi/L							
APCO-1	04/03	UF	CS	^{90}Sr	1.31	0.131	0.26	pCi/L							
APCO-1	04/03	F	CS	^{90}Sr	1.27	0.123	0.306	pCi/L							
APCO-1	04/03	UF	CS	^{239,240}Pu	0.157	0.0248	0.0246	pCi/L							
APCO-1	04/03	F	CS	^{239,240}Pu	0.0948	0.02	0.0107	pCi/L							
DP/Los Alamos Canyons:															
LAO-0.7	03/29	F	CS	^{241}Am	0.273	0.0362	0.0106	pCi/L							
LAO-0.7	03/29	UF	CS	^{239,240}Pu	0.103	0.0212	0.0281	pCi/L							
LAO-1	04/05	F	CS	^{90}Sr	9.61	0.401	0.408	pCi/L			1.20	8	EPA PRIM DW STD		
LAO-1	04/05	UF	CS	^{90}Sr	8.28	1.07	0.372	pCi/L			1.04	8	EPA PRIM DW STD		
LAO-1	04/05	UF	CS	Gross Beta	24.4	3.99	2.73	pCi/L	J						
LAO-1	04/05	F	CS	Gross Beta	23.8	1.99	2.47	pCi/L	J						
LAO-1	04/05	F	DUP	Gross Beta	23.6	1.95	2.66	pCi/L	J						
LAO-1	04/05	UF	CS	^{3}H	225	58.2	175	pCi/L							
DP Spring	04/03	UF	CS	Gross Beta	228	11.6	2.93	pCi/L	J		4.56	50	EPA SEC DW LVL		
DP Spring	04/03	F	CS	Gross Beta	214	13.5	3.06	pCi/L	J		4.28	50	EPA SEC DW LVL		
DP Spring	04/03	F	CS	^{90}Sr	115	5.57	0.205	pCi/L			14.38	8	EPA PRIM DW STD		
DP Spring	04/03	UF	CS	^{90}Sr	113	14.2	0.211	pCi/L			14.13	8	EPA PRIM DW STD		
DP Spring	04/03	UF	CS	^{3}H	455	64.5	177	pCi/L	J						
LAO-2	03/29	UF	CS	Gross Beta	92	6.27	2.53	pCi/L	J		1.84	50	EPA SEC DW LVL		
LAO-2	03/29	F	CS	Gross Beta	51.5	3.6	2.34	pCi/L	J		1.03	50	EPA SEC DW LVL		
LAO-2	03/29	UF	CS	^{90}Sr	29.1	0.904	0.21	pCi/L			3.64	8	EPA PRIM DW STD		
LAO-2	03/29	F	CS	^{90}Sr	26.3	1.13	0.217	pCi/L			3.29	8	EPA PRIM DW STD		
LAO-2	03/29	UF	CS	^{3}H	197	57.4	175	pCi/L	J						
LAO-3A	03/28	UF	CS	Gross Beta	97.4	14.2	2.53	pCi/L	J		1.95	50	EPA SEC DW LVL		
LAO-3A	03/28	UF	CS	Gross Beta	93.4	5.26	2.32	pCi/L	J		1.87	50	EPA SEC DW LVL		
LAO-3A	03/28	F	CS	Gross Beta	89.2	5.7	2.36	pCi/L	J		1.78	50	EPA SEC DW LVL		
LAO-3A	03/28	F	CS	^{90}Sr	52.1	1.44	0.209	pCi/L			6.51	8	EPA PRIM DW STD		
LAO-3A	03/28	UF	CS	^{90}Sr	47.2	1.39	0.282	pCi/L			5.90	8	EPA PRIM DW STD		
LAO-3A	03/28	UF	CS	^{90}Sr	46.1	3.25	0.186	pCi/L			5.76	8	EPA PRIM DW STD		
LAO-3A	03/28	F	CS	^{90}Sr	37	2.07	0.235	pCi/L			4.63	8	EPA PRIM DW STD		
LAO-3A	03/28	UF	DUP	^{3}H	195	55.4	168	pCi/L	U						

Table 5-21. Detections of Radionuclides[a] and Comparison to Standards[b] in Groundwater for 2001 (Cont.)

Station	Date		Code[c]	Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Valid Flag Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Canyon Alluvial Groundwater Systems															
DP/Los Alamos Canyons:															
LAO-4	04/05	F	CS	^{90}Sr	5.46	0.911	0.433	pCi/L			0.68	8	EPA PRIM DW STD		
LAO-4	04/05	UF	CS	^{90}Sr	5.19	0.33	0.548	pCi/L			0.65	8	EPA PRIM DW STD		
LAO-4	04/05	F	CS	^{241}Am	0.053	0.0163	0.0131	pCi/L							
LAO-4.5C	03/28	F	CS	^{90}Sr	2.13	0.151	0.246	pCi/L							
LAO-4.5C	03/28	UF	CS	^{90}Sr	2.13	0.122	0.222	pCi/L							
LAO-4.5C	03/28	F	CS	^{241}Am	0.044	0.0125	0.00917	pCi/L							
LAO-6A	03/28	UF	CS	^{90}Sr	1.71	0.104	0.219	pCi/L							
LAO-6A	03/28	F	CS	^{90}Sr	1.37	0.094	0.228	pCi/L							
LAO-6A	03/28	UF	CS	^{241}Am	0.0553	0.0171	0.0367	pCi/L		J					
Mortandad Canyon:															
MCO-3	07/31	UF	CS	Gross Beta	161	2.41	1.88	pCi/L		J	3.22	50	EPA SEC DW LVL		
MCO-3	07/31	UF	CS	^{90}Sr	39.3	5.17	0.176	pCi/L			4.91	8	EPA PRIM DW STD		
MCO-3	07/31	UF	CS	^{241}Am	0.927	0.0706	0.0169	pCi/L			0.77	1.2	DOE DW DCG		
MCO-3	07/31	UF	CS	^{3}H	4790	134	168	pCi/L							
MCO-3	07/31	UF	CS	^{238}Pu	0.315	0.0387	0.01	pCi/L							
MCO-3	07/31	UF	CS	^{239,240}Pu	0.122	0.0224	0.01	pCi/L		J					
MCO-5	08/02	UF	CS	Gross Beta	120	2.17	2.13	pCi/L		J	2.40	50	EPA SEC DW LVL		
MCO-5	08/02	UF	DUP	Gross Beta	117	2.3	2.21	pCi/L			2.34	50	EPA SEC DW LVL		
MCO-5	08/02	UF	CS	^{90}Sr	38.1	5.23	0.178	pCi/L			4.76	8	EPA PRIM DW STD		
MCO-5	08/02	UF	CS	^{3}H	6820	159	166	pCi/L							
MCO-5	08/02	UF	DUP	^{3}H	6690	154	158	pCi/L							
MCO-5	08/02	UF	CS	^{241}Am	0.207	0.0238	0.0149	pCi/L							
MCO-5	08/02	UF	DUP	^{241}Am	0.179	0.0223	0.0221	pCi/L							
MCO-5	08/02	UF	DUP	^{239,240}Pu	0.054	0.0139	0.00914	pCi/L							
Cañada del Buey:															
CDBO-6	11/07	UF	CS	Gross Alpha	19.3	1.32	1.33	pCi/L			1.29	15	EPA PRIM DW STD	30	0.64
CDBO-6	11/07	UF	CS	Gross Beta	21.4	1.17	2.8	pCi/L							
Pajarito Canyon:															
PCO-3	04/10	F	CS	^{90}Sr	0.393	0.121	0.351	pCi/L							
Intermediate Perched Groundwater Systems															
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:															
Test Well 2A	07/30	UF	CS	^{3}H	1110	76.1	165	pCi/L							
Basalt Spring	10/23	F	CS	^{90}Sr	0.611	0.128	0.301	pCi/L							
San Ildefonso Pueblo															
Pajarito Well (Pump 1)	06/19	UF	CS	Gross Alpha	12.5	1.3	2.67	pCi/L			0.83	15	EPA PRIM DW STD	30	0.42
Pajarito Well (Pump 1)	06/19	UF	CS	Gross Alpha	9.81	1.04	1.63	pCi/L			0.65	15	EPA PRIM DW STD	30	0.33
Pajarito Well (Pump 1)	06/19	UF	DUP	Gross Alpha	9.25	1.09	2.23	pCi/L			0.62	15	EPA PRIM DW STD	30	0.31
Pajarito Well (Pump 1)	06/19	UF	CS	^{234}U	10.2	0.812	0.0468	pCi/L			0.51	20	DOE DW DCG		
Pajarito Well (Pump 1)	06/19	UF	CS	^{234}U	9.1	0.699	0.0658	pCi/L							
Martinez House Well	12/04	UF	CS	Gross Alpha	6.81	1.28	2.69	pCi/L							
Don Juan Playhouse Well	06/20	UF	CS	Gross Alpha	6.44	1.09	1.91	pCi/L							
New Community Well	06/19	UF	CS	Gross Alpha	19.4	1.97	2.03	pCi/L			1.29	15	EPA PRIM DW STD	30	0.65
New Community Well	06/19	UF	CS	^{234}U	11.3	0.862	0.066	pCi/L			0.57	20	DOE DW DCG		
New Community Well	06/19	UF	CS	^{238}U	7.12	0.554	0.0702	pCi/L							

Table 5-21. Detections of Radionuclides[a] and Comparison to Standards[b] in Groundwater for 2001 (Cont.)

Station	Date	Code[c]		Analyte	Result	Uncertainty[d]	MDA[e]	Units	Lab Qual Code[f]	Valid Flag Code[f]	Result/ Minimum Standard	Minimum Standard	Minimum Standard Type	DOE DCG	Result/ DOE DCG
Santa Fe Water Supply Wells															
Buckman 2	08/16	UF	CS	^{234}U	92.6	6.99	0.141	pCi/L		J+	4.63	20	DOE DW DCG		
Buckman 2	08/16	UF	RE	^{234}U	91.6	6.98	0.14	pCi/L			4.58	20	DOE DW DCG		
Buckman 2	08/16	UF	REDP	^{234}U	87.4	6.6	0.154	pCi/L			4.37	20	DOE DW DCG		
Buckman 2	08/16	UF	RE	^{238}U	74.5	5.69	0.14	pCi/L			3.10	24	DOE DW DCG		
Buckman 2	08/16	UF	REDP	^{238}U	74	5.6	0.0866	pCi/L			3.08	24	DOE DW DCG		
Buckman 2	08/16	UF	CS	^{238}U	73.7	5.57	0.0753	pCi/L		J+	3.07	24	DOE DW DCG		
Buckman 2	10/31	UF	CS	^{238}U	6.79	0.539	0.0129	pCi/L		R					
Buckman 2	10/31	UF	DUP	^{238}U	6.52	0.51	0.0118	pCi/L							
Buckman 7	08/16	UF	CS	^{234}U	5.12	0.378	0.0232	pCi/L		J-					
Buckman 7	08/16	UF	DUP	^{234}U	5.01	0.369	0.0182	pCi/L							

[a]Detection defined as value ≥ 3× uncertainty and ≥ detection limit, except values shown for uranium isotopes ≥ DOE DW DCG/4, for gross alpha ≥ 5 pCi/L, and for gross beta ≥ 20 pCi/L.
Note that some results in this table were qualified as nondetections by the analytical laboratory or during validation.

[b]Values indicated by entries in right-hand columns are greater than half the minimum standard shown. The minimum standard is either a DOE 4-mrem drinking water DCG or an EPA drinking water standard.

[c]Codes: UF-unfiltered, F-filtered; CS-customer sample; DUP.-duplicate; TRP-triplicate; RE-reanalysis.

[d]One standard deviation radioactivity counting uncertainty.

[e]MDA=mimimum detectable activity.

[f]For Lab Qualifier Codes and Validation Flag Codes, see Table 5-4.

Table 5-22. Special Regional Aquifer Sampling for Strontium-90 During 2001 (pCi/L)[a]

Station Name	Date	Codes[b]		Result	Uncertainty	MDA	Detect?[c]
Test Wells							
Test Well 1	03/22	UF	CS	0.101	0.0704	0.236	
Test Well 1	06/05	UF	CS	0.017	0.037		
Test Well 1	07/31	UF	CS	0.0982	0.0516	0.157	
Test Well 1	10/04	UF	CS	–0.0003	0.0457	0.154	
Test Well 3	03/22	UF	CS	–0.112	0.111	0.388	
Test Well 3	06/04	UF	CS	0.0571	0.0433		
Test Well 3	07/30	UF	CS	–0.0236	0.0473	0.155	
Test Well 3	10/04	UF	CS	0.0136	0.0451	0.151	
Test Well 3	10/04	UF	DUP	0.0632	0.0502	0.162	
Test Well 3	10/04	UF	TRP	–0.071	0.0491	0.165	
Test Well 3	10/04	UF	CS	0.0272	0.0398	0.133	
Test Well 4	03/22	UF	CS	–0.027	0.0878	0.304	
Test Well 4	03/22	UF	CS	–0.084	0.121	0.419	
Test Well 4	03/22	UF	DUP	0.0364	0.117	0.401	
Test Well 4	06/04	UF	CS	0.0498	0.0361		
Test Well 4	06/04	UF	DUP	0.0473	0.0332		
Test Well 4	07/30	UF	CS	0.0589	0.0374	0.117	
Test Well 4	10/04	UF	CS	0.0031	0.0463	0.156	
Test Well 8	03/22	UF	CS	0.0616	0.104	0.354	
Test Well 8	06/04	UF	CS	0.0037	0.044		
Test Well 8	07/30	UF	CS	–0.0553	0.0455	0.149	
Test Well 8	10/05	UF	CS	0.137	0.0539	0.157	
Test Well DT-5A	06/06	UF	CS	0.0932	0.0484		
Test Well DT-5A	11/14	UF	CS	–0.0352	346	0.0723	
Test Well DT-9	06/07	UF	CS	0.0035	0.0414		
Test Well DT-9	11/14	UF	CS	–0.0099	98.8	0.0532	
Test Well DT-9	11/14	UF	DUP	0.0075	76.2	0.0479	
Test Well DT-10	06/06	UF	CS	0.0125	0.0456		
Test Well DT-10	11/14	UF	CS	0.0113	98.1	0.0502	
Water Supply Wells							
O-1	02/14	UF	CS	0.229	0.123	0.41	
O-1	02/14	UF	CS	0.0067	0.129	0.448	
O-1	05/09	UF	CS	0.0332	0.0783	0.262	
O-1	05/09	UF	DUP	0.0349	0.0588	0.196	
O-1	05/09	UF	TRP	–0.0205	0.0464	0.158	
O-1	05/09	UF	CS	–0.0353	0.0703	0.239	
O-1	05/09	UF	DUP	–0.0115	0.0422	0.143	
O-1	08/08	UF	CS	0.007	0.0391	0.107	
O-1	08/08	UF	CS	0.0206	0.048	0.131	
O-1	11/28	UF	CS	–0.0089	0.0169	0.0465	
O-4	02/14	UF	CS	0.0449	0.076	0.26	
O-4	05/09	UF	CS	–0.212	0.102	0.334	
O-4	05/09	UF	DUP	–0.0109	0.045	0.153	
O-4	08/08	UF	CS	0.0628	0.0487	0.129	
O-4	11/28	UF	CS	0.0364	0.0213	0.0555	
PM-1	02/14	UF	CS	–0.384	0.124	0.462	

Table 5-22. Special Regional Aquifer Sampling for Strontium-90 During 2001 (pCi/L)[a] (Cont.)

Station Name	Date	Codes[b]		Result	Uncertainty	MDA	Detect?[c]
Water Supply Wells (Cont.)							
PM-1	05/09	UF	CS	0.0925	0.0731	0.238	
PM-1	05/09	UF	DUP	-0.0041	0.041	0.139	
PM-1	08/08	UF	CS	0.0934	0.0475	0.123	
PM-1	11/28	UF	CS	0.0076	0.0273	0.0743	
PM-2	02/14	UF	CS	–0.0317	0.104	0.368	
PM-2	05/09	UF	CS	–0.0019	0.0694	0.235	
PM-2	05/09	UF	DUP	0.0542	0.0443	0.145	
PM-2	08/08	UF	CS	–0.031	0.0455	0.125	
PM-2	11/28	UF	CS	0.0301	0.0273	0.0725	
PM-2	11/28	UF	CS	–0.0126	0.0348	0.0953	
PM-3	05/09	UF	CS	–0.0447	0.0701	0.239	
PM-3	05/09	UF	DUP	0.0946	0.0473	0.15	
PM-3	08/08	UF	CS	0.0137	0.0665	0.286	
PM-3	11/28	UF	CS	0.0707	0.0278	0.0681	
PM-4	02/14	UF	CS	0.0159	0.119	0.415	
PM-4	05/09	UF	CS	0.224	0.0938	0.28	
PM-4	05/09	UF	DUP	0.0338	0.0531	0.176	
PM-4	08/08	UF	CS	0.081	0.0455	0.118	
PM-4	11/28	UF	CS	0.134	0.0373	0.0741	Detect
PM-4	11/28	UF	RE	–0.0516	0.0203	0.0613	
PM-5	02/14	UF	CS	0.0441	0.111	0.386	
PM-5	05/09	UF	CS	0.0387	0.0714	0.238	
PM-5	05/09	UF	DUP	–0.0558	0.0518	0.175	
PM-5	08/08	UF	CS	–0.0765	0.0562	0.25	
PM-5	11/28	UF	CS	0.0141	0.0328	0.089	
G-1A	02/14	UF	CS	–0.0156	0.0939	0.325	
G-1A	02/14	UF	DUP	0.0279	0.0937	0.328	
G-1A	05/09	UF	CS	0.0665	0.0614	0.201	
G-1A	05/09	UF	DUP	–0.0025	0.0441	0.15	
G-1A	05/09	UF	TRP	0.0895	0.0575	0.15	
G-1A	08/08	UF	CS	0.0326	0.0502	0.136	
G-1A	11/28	UF	CS	–0.0059	0.029	0.0793	
G-2A	05/09	UF	CS	0.0065	0.0527	0.178	
G-2A	05/09	UF	DUP	0.019	0.0432	0.118	
G-2A	08/08	UF	CS	0.0909	0.0478	0.124	
G-2A	11/28	UF	CS	–0.011	0.0318	0.087	
G-3A	02/14	UF	CS	0.0625	0.0671	0.229	
G-3A	02/14	UF	DUP	–0.0643	0.0564	0.201	
G-3A	05/09	UF	CS	–0.002	0.0595	0.201	
G-3A	05/09	UF	DUP	–0.0179	0.0449	0.123	
G-3A	08/08	UF	CS	0.0026	0.0438	0.12	
G-3A	11/28	UF	CS	0.0113	0.0201	0.0544	
G-4A	02/14	UF	CS	–0.128	0.0829	0.293	
G-4A	05/09	UF	CS	0.0446	0.0572	0.189	
G-4A	05/09	UF	DUP	0.0687	0.0476	0.125	
G-4A	08/08	UF	CS	–0.0241	0.0504	0.138	
G-4A	11/28	UF	CS	–0.0088	0.026	0.0712	

Table 5-22. Special Regional Aquifer Sampling for Strontium-90 During 2001 (pCi/L)[a] (Cont.)

Station Name	Date	Codes[b]		Result	Uncertainty	MDA	Detect?[c]
G-5A	08/08	UF	CS	0.0484	0.0423	0.113	
G-5A	11/28	UF	CS	–0.0134	0.0307	0.0841	

Water Quality Standards[d]	
DOE DCG for Public Dose	1,000
DOE Drinking Water System DCG	40
EPA Primary Drinking Water Standard	8

[a]Three columns are listed: the first is the analytical result, the second is the radioactive counting uncertainty (1 standard deviation), and the third is the analytical laboratory measurement-specific minimum detectable activity.
[b]Codes: UF-unfiltered; F-filtered; CS-customer sample; RE-reanalysis; DUP-laboratory duplicate; TRP-laboratory triplicate.
[c]Detection defined as value ≥ 3 × uncertainty and ≥ detection limit.
[d]Standards given here for comparison only; see Appendix A.

Table 5-23. Special Water Supply Sampling for Tritium during 2001 (pCi/L)[a]

Station Name	Date	Result	Uncertainty	Detect?[b]
Los Alamos Water Supply Wells				
PM-1	02/14	1.34	0.29	Detect
PM-2	02/14	–0.13	0.29	
PM-3	05/09	–0.19	0.29	
PM-4	02/14	0.00	0.29	
PM-5	02/14	0.00	0.29	
O-1	01/09	29.06	0.96	Detect
O-1	01/09	30.33	0.96	Detect
O-1	02/14	38.00	1.28	Detect
O-1	02/14	36.40	1.28	Detect
O-1	03/13	32.57	0.96	Detect
O-1	03/13	33.53	0.96	Detect
O-1	04/11	28.10	0.96	Detect
O-1	05/09	35.44	1.28	Detect
O-1	06/13	33.85	1.28	Detect
O-1	07/11	33.53	0.96	Detect
O-1	08/08	31.29	0.96	Detect
O-1	09/05	27.59	0.89	Detect
O-1	09/05	26.69	0.93	Detect
O-1	10/24	24.46	0.80	Detect
O-1	10/24	23.18	0.77	Detect
O-1	11/28	32.89	0.96	Detect
O-1	12/15	40.23	1.28	Detect
O-4	02/14	–0.10	0.29	
G-1A	02/14	0.26	0.29	
G-2A	05/09	0.06	0.35	
G-3A	02/14	0.10	0.29	
G-4A	02/14	0.00	0.29	
G-5A	08/08	–0.10	0.29	
G-5A	08/08	0.16	0.29	
Santa Fe Water Supply Wells				
Buckman 1	08/16	0.00	0.29	
Buckman 1	10/31	–0.03	0.29	
Buckman 2	08/16	–0.19	0.29	
Buckman 2	10/31	0.29	0.29	
Buckman 3	10/31	0.03	0.29	
Buckman 4	10/31	–0.10	0.29	
Buckman 6	10/31	0.03	0.29	
Buckman 7	08/16	0.22	0.29	
Buckman 7	10/31	–0.35	0.29	
Buckman 8	10/31	–0.06	0.29	

[a]Two columns are listed: the first is the analytical result, and the second is the radioactive counting uncertainty (1 standard deviation).
[b]Detection defined as value ≥ 3 × uncertainty and ≥ detection limit.

Table 5-24. Chemical Quality of Groundwater in 2001 (mg/L[a])

Station Name	Date	Code[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+N O_2-N	ClO_4 (µg/L)	CN (Total)	TDS[c]	TSS[d]	Hardness ($CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Regional Aquifer Wells																					
Test Wells:																					
Test Well 1	06/05	F CS															306				
Test Well 1	06/05	UF CS	44.9	48.5	9.44	3.93	19.3	32.9	21.5	<[f] 0.725	104	0.379	0.07	5.8	1.37	< 0.0028		1.8	160	7.95	170
Test Well 3	06/04	F CS															174				
Test Well 3	06/04	UF CS	68.1	15.2	4.71	2.32	12	2.75	2.62	< 0.725	71.4	0.454	0.05	0.53	< 0.958	< 0.0028		1.4	57.5	7.74	130
Test Well 4	06/04	F CS															108				
Test Well 4	06/04	UF CS	27.7	9.78	5.34	2.39	10.5	1.74	< 0.06	< 0.725	60.6	0.227	0.07	0.01	< 0.958	< 0.0028		2	46.4	8.05	109
Test Well 8	06/04	F CS															150				
Test Well 8	06/04	F DUP															150				
Test Well 8	06/04	UF CS	64.3	11	3.78	1.64	10.4	1.77	1.96	< 0.725	57.3	0.188	0.06	0.23	3.26	< 0.0028		< 0.699	43	7.59	131
Test Well 8	06/04	UF DUP											0.08							7.59	131
Test Well 8	11/06	UF CS													2.37						
Test Well 8	11/06	UF DUP													1.74						
Test Well 8	11/06	UF CS													< 0.958						
Test Well DT-5A	06/06	F CS															140				
Test Well DT-5A	06/06	UF CS	66.9	8.47	2.35	1.75	11.1	1.46	1.35	< 0.725	47.5	0.25	0.06	0.29	< 0.958	< 0.0028		< 0.699	30.8	7.95	3.28
Test Well DT-9	06/07	F CS															143				
Test Well DT-9	06/07	UF CS	66.2	9.61	2.56	0.973	10.7	1.69	1.59	< 0.725	49.4	0.315	0.05	0.31	< 0.958	< 0.0028		< 0.699	34.6	8.04	125
Test Well DT-10	06/06	F CS															146				
Test Well DT-10	06/06	UF CS	60.7	11.1	3.24	1.33	11	1.44	1.35	< 1.45	56.4	0.271	0.07	0.23	< 0.958	< 0.0028		< 0.699	41	8.19	114
Test Well DT-10	06/06	UF DUP	60.6	11.1	3.24	1.33	10.9			< 1.45	55.5	0.282		0.23	< 0.958	< 0.0028					
Water Supply Wells:																					
O-1	05/09	F CS															164				
O-1	05/09	F DUP															175				
O-1	05/09	F TRP															171				
O-1	05/09	UF CS	69.6	19.3	3.09	3.66	21.4	5.36	6.04	1.44	89.4	0.452	< 0.0194	1.3		< 0.0028		< 1.06	61	8.07	158
O-1	05/09	UF DUP		20	3.2		22.2	5.38	6.15	1.39	88.4	0.462		1.26		< 0.0028		< 1.06		8.09	
O-1	05/09	F CS															167				
O-1	05/09	F DUP															173				
O-1	05/09	UF CS	69.7	19.5	3.11	3.65	22.2	5.25	5.95	1.52	88.4	0.464	< 0.0194	1.26		< 0.0028		< 0.699	61.4	8.1	157
O-4	05/09	F CS															214				
O-4	05/09	F DUP															216				
O-4	05/09	UF CS	96.7	21.9	8.88	3.7	20.8	6.91	4.98	< 0.725	117	0.343	< 0.0194	0.39		< 0.0028		< 0.699	91.4	7.31	187
PM-1	05/09	F CS															199				
PM-1	05/09	F DUP															204				
PM-1	05/09	UF CS	80.4	25.6	6.69	3.7	20	5.23	4.57	1.44	118	0.297	< 0.0194	0.48		0.0038		< 0.699	91.4	7.91	189
PM-2	05/09	F CS															143				
PM-2	05/09	F DUP															146				
PM-2	05/09	UF CS	93.5	10.7	3.88	2.25	12.1	1.95	1.96	< 0.725	58.8	0.326	< 0.0194	0.29		< 0.0028		1.6	42.6	7.68	97
PM-2	05/09	UF DUP																2			
PM-3	05/09	F CS															207				
PM-3	05/09	F DUP															213				
PM-3	05/09	UF CS	91.4	24.5	8.41	3.69	18	6.28	5.06	1.08	113	0.347	< 0.0194	0.46	1.35	< 0.0028		3	95.7	7.7	185
PM-3	05/09	UF DUP																3.2			
PM-4	05/09	F CS															141				
PM-4	05/09	F DUP															143				
PM-4	05/09	UF CS	91.9	10.3	3.76	2.1	11.4	1.73	2	< 0.725	56.3	0.312	< 0.0194	0.28		< 0.0028		< 0.699	41.2	7.63	154
PM-5	05/09	F CS															147				
PM-5	05/09	F DUP															156				

Table 5-24. Chemical Quality of Groundwater in 2001 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N	ClO_4 (µg/L)	CN (Total)	TDS[c]	TSS[d]	Hardness ($CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Regional Aquifer Wells (Cont.)																					
Water Supply Wells: (Cont.)																					
PM-5	05/09	UF CS	94.1	10.8	4.25	2.09	12.5	1.97	2.21	< 0.725	65.3	0.303	< 0.0194	0.27	< 0.958	< 0.0028		< 0.699	44.5	7.73	96
PM-5	05/09	UF DUP																			96
G-1A	05/09	F CS															177				
G-1A	05/09	F DUP															178				
G-1A	05/09	UF CS	74.1	10	0.47	2.63	33.2	2.9	3.86	1.71	82.9	0.629	< 0.0194	0.42		< 0.0028		< 0.699	26.9	8.17	143
G-1A	05/09	UF DUP	70.1	9.99	0.46	2.62	31.7	2.87	3.86					0.42						8.18	
G-2A	05/09	F CS															148				
G-2A	05/09	F DUP															149				
G-2A	05/09	UF CS	59.6	11	0.91	2.09	25.7	2.01	3.19	0.776	77.9	0.433	< 0.0194	0.41	< 0.958	< 0.0028		< 0.699	31.2	8.14	120
G-3A	05/09	F CS															136				
G-3A	05/09	F DUP															138				
G-3A	05/09	UF CS	52.6	16.3	3.02	1.88	14.9	2.29	3.13	0.907	75.9	0.344	< 0.0194	0.58		< 0.0028		< 0.699	53.2	8.05	116
G-4A	05/09	F CS															138				
G-4A	05/09	F DUP															143				
G-4A	05/09	UF CS	53.8	16	3.11	1.96	13.2	2.16	2.88	0.77	73.9	0.303	< 0.0194	0.51		< 0.0028		< 0.699	52.7	8.1	215
G-4A	05/09	UF DUP											< 0.0194								
Regional Aquifer Springs																					
White Rock Canyon Group I:																					
Sandia Spring	09/24	F CS	55.3	35.5	4.26	2.64	15	3.56	5.89	< 0.725	145	0.662	0.02	0.05			206		106	7.22	259
Sandia Spring	09/24	F CS	55.2	36.2	4.33	2.69	15.3	3.49	5.84	< 0.725	116	0.623	< 0.0194	0.04			198		108	7.22	258
Sandia Spring	09/24	UF CS													< 0.958	< 0.0029		< 0.699			
Sandia Spring	09/24	UF CS													< 0.958	< 0.0029		< 0.699			
Spring 3	09/24	F CS	51.3	22.8	1.9	2.97	16	4.35	5.31	0.735	131	0.457	< 0.0194	1.27			167		64.8	7.9	198
Spring 3	09/24	UF CS													< 0.958	< 0.0029		7.45			
Spring 4	09/24	UF CS													< 0.958	< 0.0029		6.54			
Spring 4	09/24	UF DUP													< 0.958	< 0.0029		8.46			
Spring 4	09/24	UF CS	57.3	23.4	4.66	2.73	13.8	5.72	8.54	< 0.725	72.5	0.511	0.02	1.23			173		77.5	7.48	206
Spring 4	09/24	UF DUP	59.2	23.3	4.65	2.72	13.7	5.7	8.72	< 0.725	73.1	0.519	0.02	1.25			165			7.5	206
Spring 4	11/01	UF CS													2.35						
Spring 4B	03/09	UF CS													6.62						
Spring 4B	03/09	UF RE													< 0.801						
Spring 4B	11/01	UF CS													1.4						
Spring 4C	11/01	UF CS													2.63						
Spring 4C	11/01	UF DUP													2.5						
Spring 4A	09/25	F CS	74	20.6	4.75	2.3	12.4	4.37	5.34	< 0.725	87	0.472	< 0.0194	0.86			171		71.1	7.94	181
Spring 4A	09/25	UF CS													< 0.958	< 0.0029		< 0.672			
Spring 4A	09/25	UF DUP													< 0.958						
Spring 4A	11/01	UF CS													1.71						
Spring 4AA	11/01	UF CS													1.57						
Spring 5	09/25	F CS	70.2	18.5	4.76	2.02	11.9	3.91	4.62	< 0.725	87	0.42	< 0.0194	0.7			163		65.8	7.97	176
Spring 5	09/25	UF CS													1.29	< 0.0029		3.27			
Ancho Spring	10/24	F CS	74.6	12.1	2.96	1.84	10.4	1.89	2.21	< 0.725	71.4	0.315	< 0.0194	0.34			144		42.4	7.45	118
Ancho Spring	10/24	F DUP	78.5	12.4	3.03	1.88	10.6	1.85	2.32	< 0.725	71.4	0.314	< 0.0194	0.34			147			7.47	118
Ancho Spring	10/24	UF CS													< 0.958	< 0.0029		8.2			
Ancho Spring	10/24	UF DUP													< 0.958	< 0.0029		7			

Table 5-24. Chemical Quality of Groundwater in 2001 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+N O_2-N	ClO_4 (µg/L)	CN (Total)	TDS[c]	TSS[d]	Hardness ($CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Regional Aquifer Springs (Cont.)																					
White Rock Canyon Group II:																					
Spring 6A	09/25	UF CS													< 0.958	< 0.0029		117			
Spring 6A	09/25	F CS	78.9	11.7	2.58	1.89	11.4	2.15	2.72	< 0.725	81.2	0.39	< 0.0194	0.38			149		39.9	7.18	130
Spring 9	09/25	UF CS													< 0.958	< 0.0029		11.7			
Spring 9	09/26	F CS	77.9	11	3.09	1.6	11.4	1.91	2.14	< 0.725	59.2	0.425	< 0.0194	0.15			147		40.1	7.64	125
Spring 9	09/26	F DUP																		7.68	
White Rock Canyon Group III:																					
Spring 1	09/24	UF CS													< 0.958	< 0.0029		60.9			
Spring 1	09/24	F CS	36.1	18.8	1.21	2.29	32	2.7	6.18	0.835	110	0.565	0.03	0.23			167		51.8	7.86	224
Spring 2	09/24	UF CS													< 0.958	< 0.0029		10.7			
Spring 2	09/24	F CS	34.7	16.3	0.7	1.6	51.7	2.84	5.12	2.07	151	1.16	0.02	0.01			204		43.6	8.18	274
White Rock Canyon Group IV:																					
La Mesita Spring	10/23	UF CS													< 0.958	< 0.0029		715			
La Mesita Spring	10/23	F CS	29.7	36.1	1.19	4.92	34.6	6.44	13.4	0.969	125	0.234	0.02	2.41			207		94.9	7.94	279
Other Springs:																					
Sacred Spring	10/23	F CS	45	31.3	1.39	2.76	21.7	2.6	7.32	0.775	117	0.436	0.03	0.2			177		83.8	7.55	223
Sacred Spring	10/23	F DUP	44.4	30.8	1.37	2.74	21.4	2.67	7.46	0.81	120	0.446	< 0.0194	0.2			179			7.56	222
Sacred Spring	10/23	UF CS													< 0.958	< 0.0029		260			
Sacred Spring	10/23	UF DUP													1.95	< 0.0029		294			
Sacred Spring	10/23	F CS	44.2	30.8	1.37	2.65	21.3	2.51	7.17	0.741	110	0.446	0.04	0.19			177		82.5	7.78	226
Sacred Spring	10/23	UF CS													< 0.958	< 0.0029		3.2			
Canyon Alluvial Groundwater Systems																					
Acid/Pueblo Canyons:																					
APCO-1	04/03	UF CS	61.1		7.17										< 0.801	< 0.0028		3.2			
APCO-1	04/03	UF DUP	60.1	35.4	7.08	14.5	59.5									< 0.0028					
APCO-1	04/03	F CS	61.9	35.6	7.12	14.5	58.5	45.5	3.18	< 1.45	211	0.452	4.75	0.52			377		118	6.82	604
APCO-1	04/03	F DUP															385			6.81	605
DP/Los Alamos Canyons:																					
LAO-C	04/03	UF CS													< 0.801	< 0.0028		< 1.4			
LAO-C	04/03	F CS	37.7	16.7	3.93	3.54	42.8	50.5	17.6	< 1.45	52.3	0.131	< 0.0194	0.32			251		57.8	6.65	352
LAO-C	04/03	F DUP						50.5	17.6												
LAO-0.7	03/29	UF CS													< 0.801	< 0.0028		46.4			
LAO-0.7	03/29	UF DUP														0.0031		42.2			
LAO-0.7	03/29	F CS	28.7	20.2	4.15	3.27	42.6	61.3	14.3	< 0.725	56.4	0.15	0.07	0.55			232		67.6	7.13	276
LAO-0.7	03/29	F DUP	28.9	20.3	4.17	3.29	43.9	61.2	13.8	< 0.725	58.4						224			7.13	275
LAO-1	04/05	UF CS													< 0.801	< 0.0028		2.8			
LAO-1	04/05	UF DUP													< 0.801						
LAO-1	04/05	F CS	30.3	26	5.5	3.9	45.2	77.7	13.6	< 1.45	61.3	0.179	0.03	0.49			267		87.7	7.33	291
LAO-1	04/05	F DUP	30.6	26.3	5.54	3.9	43.4	77.5	13.8			0.17	0.02							7.34	292
DP Spring	04/03	F CS	12.4	30.7	3.2	10.8	56.1	106	11.4	< 1.45	53.3	0.7	0.03	0.49			321		89.9	7.5	555
DP Spring	04/03	UF CS													< 0.801	< 0.0028		1.6			
LAO-2	03/29	UF CS													< 0.801	< 0.0028		< 0.699			
LAO-2	03/29	F CS	37.4	28	6.48	8.33	36.5	69.6	12.1	< 0.725	63	0.514	0.06	0.58			270		96.5	6.81	316
LAO-3A	03/28	UF CS													1.17	< 0.0028		1.4			
LAO-3A	03/28	F CS	49.6	30	7.24	6.13	36.2	66.2	13.3	< 0.725	76.4	0.487	0.12	0.85			275		105	7.58	310
LAO-3A	03/28	F CS	49	29.5	7.13	6.08	35.6	65.7	13.8	< 0.725	74.8	0.495	0.11	0.84			272		103	7.2	304
LAO-3A	03/28	UF CS				5.99									1.28	< 0.0028		< 0.699			
LAO-4	04/05	UF CS													< 0.801	< 0.0028		< 1.4			

Table 5-24. Chemical Quality of Groundwater in 2001 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N	ClO_4 (µg/L)	CN (Total)	TDS[c]	TSS[d]	Hardness ($CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Canyon Alluvial Groundwater Systems (Cont.)																						
DP/Los Alamos Canyons: (Cont.)																						
LAO-4	04/05	F	CS	35.2	21.2	5.72	5.3	29.1	42.6	14	< 1.45	67.3	0.491	< 0.0194	0.19			217		76.5	7.05	221
LAO-4.5C	03/28	UF	CS													< 0.801	< 0.0028		0.889			
LAO-4.5C	03/28	F	CS	34.4	16.6	4.92	4.74	32.8	46.9	12.7	< 0.725	56.4	0.577	< 0.0194	< 0.0069			201		61.7	7.26	231
LAO-6A	03/28	UF	CS													< 0.801	< 0.0028		< 0.699			
LAO-6A	03/28	F	CS	38	15.4	4.91	3.6	35	46.4	13.4	< 0.725	55.4	0.456	< 0.0194	0.13			199		58.8	7.14	227
Mortandad Canyon:																						
MCO-3	03/12	F	CS										0.793		1.46			259				
MCO-3	03/12	F	DUP										0.805					262				
MCO-3	03/12	UF	CS													140						
MCO-3	05/24	F	CS										0.705		2.72			338				
MCO-3	05/24	F	DUP										0.705		2.76			350				
MCO-3	05/24	F	TRP															346				
MCO-3	05/24	UF	CS													107						
MCO-3	07/31	UF	CS		46.4											114	< 0.0029		< 0.647			
MCO-3	07/31	F	CS	47.3	45.2	2.96	8.17	68.9	19.5	89.1	< 0.725	149	0.435	0.04	3.48			425		125	7.57	507
MCO-3	09/07	F	CS										0.667		3.06	53.6		347				
MCO-3	09/07	F	DUP										0.657		3.06	57.1		336				
MCO-3	11/16	F	CS										0.585		3.87	132		405				
MCO-4B	05/24	F	CS										1.07		4.22			311				
MCO-4B	05/24	F	DUP															312				
MCO-4B	05/24	UF	CS													157						
MCO-5	08/02	UF	CS		31.9											157	< 0.0029		0.943			
MCO-5	08/02	UF	DUP	32.9	31.7	3.05	13.6	53.1								156	< 0.0029					
MCO-5	08/02	F	CS	33.1	31.1	2.95	15	55	25.6	38	0.739	141	0.743	0.02	2.88			335		89.7	7.5	576
MCO-5	08/02	F	DUP																		7.49	
MCO-6	03/12	F	CS										1.43		4.77			289				
MCO-6	03/12	UF	CS													220						
MCO-6	05/24	F	CS										1.44		4.64			313				
MCO-6	05/24	F	DUP															313				
MCO-6	05/24	F	CS										1.51		4.46			312				
MCO-6	05/24	F	DUP															314				
MCO-6	05/24	UF	CS													145						
MCO-6	05/24	UF	CS													139						
MCO-6	08/06	F	CS	33.6	32.2	2.96	15.6	54	25.3	36.6	< 0.725	141	1.34	0.04	3.9			323		92.7	7.28	486
MCO-6	08/06	F	DUP						26	36.2			1.35					317			7.29	
MCO-6	09/10	F	CS										1.22		4.02	139		319				
MCO-6	11/16	F	CS										1.24		2.91	109		329				
MCO-6	11/16	F	DUP															326				
MCO-7	03/12	F	CS										1.56		9.2			330				
MCO-7	03/12	F	CS										1.61		9.05			331				
MCO-7	03/12	UF	CS													180						
MCO-7	05/24	F	CS										1.74		6.88			320				
MCO-7	05/24	F	DUP															326				
MCO-7	05/24	UF	CS													141						
MCO-7	08/07	F	CS	33.2	19	4.68	11.5	79.3	13.9	33.7	< 0.725	160	1.79	0.04	10.9			357		66.7	7.21	198
MCO-7	09/10	F	CS										1.61		5.37	148		308				
MCO-7.5	08/07	UF	DUP	33.6	18.8	4.64	11.5	80.6								204						
MCO-7.5	08/07	F	CS	35.7	18.1	4.38	16.6	61.4	19.8	31.6	1.44	139	1.72	0.29	5.75			318		63.2	8.06	256

Table 5-24. Chemical Quality of Groundwater in 2001 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]		SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+N O_2-N	ClO_4 (µg/L)	CN (Total)	TDS[c]	TSS[d]	Hardness ($CaCO_3$)	Lab pH[e]	Conductance (µS/cm)
Canyon Alluvial Groundwater Systems (Cont.)																						
Cañada del Buey:																						
CDBO-6	05/01	F	CS	61	12.4	2.91	2.11	19.8	17.7	8.37	< 1.45	54.3	0.229	0.14	0.06			175		42.9	6.94	52.1
CDBO-6	05/01	F	DUP	60.1	12.7	2.96	2.16	20.3					0.221		0.06			172			6.95	52
CDBO-6	05/01	F	TRP															183				
CDBO-6	05/01	UF	CS													2.38	0.0052		25.6			
CDBO-6	05/01	UF	DUP																28			
CDBO-6	09/10	F	CS						16.4						0.07			172				
CDBO-6	11/07	UF	CS														< 0.0029					
CDBO-6	11/07	UF	DUP														< 0.0029					
CDBO-6	11/07	F	CS										0.148		9.1			165				
CDBO-6	11/07	F	DUP						15.5	9.37			0.156		9.1			169				
Pajarito Canyon:																						
PCO-1	04/10	F	CS	35.8	36	10.5	5.15	44.4	101	19.2	< 1.45	48.2	0.095	< 0.0194	2.27			326		133	1.25	335
PCO-1	04/10	F	DUP										0.096					338			1.24	336
PCO-1	04/10	UF	CS	37												< 0.801	< 0.0028		1.8			
PCO-1	04/10	UF	DUP	38	37.2	10.9	5.29	48.7									< 0.0028					
PCO-1	04/10	F	CS	36.9	36.3	10.6	5.23	43.1	99.7	18.7	< 1.45	50.3	0.093	< 0.0194	2.25			308		134	1.19	410
PCO-1	04/10	F	DUP															330				
PCO-1	04/10	UF	CS	37.4												< 0.801	< 0.0028		1			
PCO-1	04/10	UF	DUP																1.2			
PCO-3	04/10	F	CS	38.6	91.2	20.2	2.47	280	204	131	< 1.45	359	0.394	< 0.0194	< 0.0069			1020		311	1.22	1140
PCO-3	04/10	F	DUP															984				
PCO-3	04/10	UF	CS	39.1												< 3.2	0.0072		1.52			
PCO-3	04/10	UF	DUP																1.82			
PCO-3	04/10	UF	TRP																1.82			
Intermediate Perched Groundwater Systems																						
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:																						
POI-4	08/01	F	CS															355				
POI-4	08/01	UF	CS	53	42.1	10.7	8.01	41.1	38.9	21.6	2.52	164	0.217	1.1	2.23	1.73	< 0.0029		0.5	149	8.24	165
Test Well 2A	07/30	UF	CS		34.8									< 0.0194	< 0.0069	< 0.958						
Basalt Spring	10/23	F	CS	58.5	42.8	10.6	13	50.5	34.7	19.7	< 0.725	189	0.325	1.68	1.2			359		151	6.93	468
Basalt Spring	10/23	UF	CS													1.3	< 0.0029		26			
Perched Groundwater System in Volcanics:																						
Water Canyon Gallery	11/29	F	CS	36	6	2.4	1.39	4.87	0.98	1.68	< 0.725	43.4	0.08	0.13	0.33			100		24.9	7.59	60.8
Water Canyon Gallery	11/29	F	DUP	36.7	6.11	2.44	1.42	4.97	0.98	1.74			0.08	0.12	0.33			101			7.6	60.8
Water Canyon Gallery	11/29	UF	CS													2.35	< 0.0029		16			
Water Canyon Gallery	11/29	UF	DUP														0.003		17.2			
San Ildefonso Pueblo																						
LA-5	06/19	F	CS															133				
LA-5	06/19	UF	CS	38	17.8	0.59	2.11	18.2	2.44	4.91	0.824	94.8	0.464	0.04	0.51	< 0.958	< 0.0028		< 0.699	46.8	8.34	165
Eastside Artesian Well	06/20	F	CS															240				
Eastside Artesian Well	06/20	UF	CS	2.62	3.32	0.18	0.963	96.5	3.51	15.9	15.9	197	0.885	0.03	0.01	< 0.958	< 0.0028		< 0.699	9.04	9.05	388
Pajarito Well (Pump 1)	06/19	F	CS															876				
Pajarito Well (Pump 1)	06/19	UF	CS	33.9	45.1	4.33	4	296	159	47.6	4.13	433	0.977	0.09	0.33	< 0.958	< 0.0028		< 0.699	131	7.53	1370
Pajarito Well (Pump 1)	06/19	UF	DUP											0.1	0.32		< 0.0028				7.54	1380
Pajarito Well (Pump 1)	06/19	F	CS															860				
Pajarito Well (Pump 1)	06/19	UF	CS	34.4	44.9	4.31	3.94	290	158	46	4.37	448	0.962	0.04	0.32	< 0.958	< 0.0028		< 0.699	130	7.97	1360

Table 5-24. Chemical Quality of Groundwater in 2001 (mg/L[a]) (Cont.)

Station Name	Date	Code[b]	SiO_2	Ca	Mg	K	Na	Cl	SO_4	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+N O_2-N	ClO_4 (μg/L)	CN (Total)	TDS[c]	TSS[d]	Hardness ($CaCO_3$)	Lab pH[e]	Conductance (μS/cm)
San Ildefonso Pueblo (Cont.)																					
Don Juan Playhouse Well	06/20	F CS															229				
Don Juan Playhouse Well	06/20	UF CS	24.8	6.51	0.49	0.987	73.1	3.32	16.6	3.4	141	0.653	0.03	2	< 0.958	< 0.0028		< 0.699	18.3	8.69	321
Martinez House Well	12/04	UF CS	38.6					13.4	25.3	< 1.45	179	0.636	0.09	3.39	< 0.801	0.0044	277	< 1.4		8.25	315
Martinez House Well	12/04	UF DUP	39.3							< 1.45	174		0.11		2.42	0.0048	283	< 1.4		8.25	
Otowi House Well	06/19	F CS															386				
Otowi House Well	06/19	F DUP															381				
Otowi House Well	06/19	UF CS	56.3	69.8	5.36	3.59	43.6	36.6	27.5	< 0.725	195	0.385	0.05	1.02	< 0.958	< 0.0028		< 0.699	196	7.2	543
Otowi House Well	06/19	UF DUP	56.1	69.7	5.35	3.53	43.3			< 0.725	195	0.41			< 0.958			< 0.699			
New Community Well	06/19	F CS															299				
New Community Well	06/19	UF CS	25.6	18.5	1.04	0.975	87.8	7.75	34.9	3.23	179	0.168	0.04	1.67	1.04	< 0.0028		< 0.699	50.6	8.28	447
Santa Fe Water Supply Wells																					
Buckman 1	08/16	UF CS												1.17	< 0.958						
Buckman 1	10/31	UF CS		11.5	0.84	2.59	102	2.58	14.1	3.12	249	0.683		1.13	1.89		306				
Buckman 1	10/31	UF DUP		11.6	0.84	2.61	101	2.68	14.5	2.76	236	0.689		1.13	< 0.958		310				
Buckman 2	08/16	UF CS												0.79	< 0.958						
Buckman 2	10/31	UF CS		45.9	7.76	5.06	124	3.16	21.7	1.13	417	0.392		1.18	2.65		475				
Buckman 3	10/31	UF CS		41.2	5.69	5.42	114	3.22	21.5	1.7	362	0.435		1.6	< 0.958		414				
Buckman 4	10/31	UF CS		87.9	12.3	6.76	103	3.99	18.3	< 0.725	501	0.281		1.4	< 0.958		537				
Buckman 6	10/31	UF CS		65.7	8.81	5.16	87.6	3.44	18.3	< 0.725	399	0.477		1.5	< 0.958		441				
Buckman 7	08/16	UF CS												1.42							
Buckman 7	08/16	UF DUP												1.41	< 0.958						
Buckman 7	10/31	UF CS		34.4	4.92	4.57	85.1	3.2	22.7	1.98	273	0.432		1.55	< 0.958		323				
Buckman 8	10/31	UF CS		14.5	2.19	2.56	98.1	1.87	8.79	1.96	242	0.439		0.62	1.25		296				
Buckman 8	10/31	UF CS		14.5	2.19	2.56	98.1	1.93	8.41	1.87	252	0.435		0.63	2.16		292				
Water Quality Standards[g]																					
EPA Primary Drinking Water Standard									500			4		10		0.2					
EPA Secondary Drinking Water Standard								250	250								500			6.8-8.5	
EPA Health Advisory							20														
NMWQCC Groundwater Limit								250	600			2		10		0.2	1,000			6-9	

[a]Except where noted.
[b]Codes: UF-unfiltered; F-filtered; CS-customer sample; DUP-laboratory duplicate; TRP-laboratory triplicate.
[c]Total dissolved solids.
[d]Total suspended solids.
[e]Standard units.
[f]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.
[g]Standards given here for comparison only; see Appendix A.

Table 5-25. Perchlorate in Groundwater during 2001 (µg/L)[a]

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Regional Aquifer Wells										
Test Wells:										
Test Well 1	06/05/01	06/19/01	UF	CS		1.37	0.958	J		GELC
Test Well 3	06/04/01	06/19/01	UF	CS		<0.958	0.958	U		GELC
Test Well 4	06/04/01	06/19/01	UF	CS		<0.958	0.958	U		GELC
Test Well 8	06/04/01	06/19/01	UF	CS	FB	<0.958	0.958	U		GELC
Test Well 8	06/04/01	06/19/01	UF	CS		3.26	0.958	J		GELC
Test Well 8	11/06/01	12/04/01	UF	CS	FD	<0.25	0.25	U		ACCU
Test Well 8	11/06/01	12/04/01	UF	CS		<0.25	0.25	U		ACCU
Test Well 8	11/06/01	12/02/01	UF	CS		<0.958	0.958	U		GELC
Test Well 8	11/06/01	12/02/01	UF	CS		2.37	0.958	J		GELC
Test Well 8	11/06/01	12/02/01	UF	DUP		1.74	0.958	J		GELC
Test Well DT-5A	06/06/01	06/19/01	UF	CS		<0.958	0.958	U		GELC
Test Well DT-9	06/07/01	06/19/01	UF	CS		<0.958	0.958	U		GELC
Test Well DT-10	06/06/01	06/19/01	UF	DUP		<0.958	0.958	U		GELC
Test Well DT-10	06/06/01	06/19/01	UF	CS		<0.958	0.958	U		GELC
Water Supply Wells:										
O-1	01/09/01	01/10/01	UF	CS		1.5	1	J		BABC
O-1	01/09/01	01/10/01	UF	CS		1.5	1	J		BABC
O-1	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC
O-1	02/14/01	02/21/01	UF	CS	FB	<1.2	1.2	U		BABC
O-1	02/14/01	03/05/01	UF	CS		<0.958	0.958	U	UJ	GELC
O-1	02/14/01	03/05/01	UF	CS	FD	<0.958	0.958	U	UJ	GELC
O-1	03/13/01	03/20/01	UF	CS		<1.2	1.2	U		BABC
O-1	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
O-1	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
O-1	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
O-1	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
O-1	04/11/01	05/01/01	UF	CS		<0.801	0.801	U		GELC
O-1	04/11/01	05/01/01	UF	CS		2.24	0.801	J		GELC
O-1	04/11/01	05/01/01	UF	CS		1.18	0.801	J		GELC
O-1	04/11/01	05/01/01	UF	CS		1.16	0.801	J		GELC
O-1	05/09/01	05/18/01	UF	CS		<1.2	1.2	U		BABC
O-1	06/13/01	06/28/01	UF	CS		<2.17	2.17	U		BABC
O-1	06/13/01	06/20/01	UF	DUP		1.71	0.958	J		GELC
O-1	06/13/01	06/20/01	UF	CS		1.12	0.958	J		GELC
O-1	07/11/01	08/06/01	UF	CS		5.85	0.958			GELC
O-1	07/11/01	08/06/01	UF	CS		3.74	0.958	J		GELC
O-1	08/08/01	08/30/01	UF	CS		3.48	0.958	J		GELC
O-1	08/08/01	08/30/01	UF	CS	FD	3.32	0.958	J		GELC
O-1	08/08/01	10/03/01	UF	CS		<0.958	0.958	U		GELC
O-1	09/05/01	09/12/01	UF	CS		<2.17	2.17	U		BABC
O-1	09/05/01	09/12/01	UF	CS	FD	<2.17	2.17	U		BABC
O-1	09/05/01	10/01/01	UF	TRP		<2.17	2.17	U		BABC
O-1	09/05/01	10/01/01	UF	DUP		<2.17	2.17	U		BABC
O-1	09/05/01	09/14/01	UF	CS		3.86	0.958	J		GELC
O-1	09/05/01	10/03/01	UF	DUP		3.24	0.958	J		GELC

Table 5-25. Perchlorate in Groundwater during 2001 (µg/L)[a] (Cont.)

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Regional Aquifer Wells (Cont.)										
Water Supply Wells: (Cont.)										
O-1	09/05/01	10/03/01	UF	TRP		2.55	0.958	J		GELC
O-1	09/05/01	10/04/01	UF	QUD		3.07	0.958	J		GELC
O-1	09/05/01	10/04/01	UF	QNT		2.92	0.958	J		GELC
O-1	10/24/01	12/04/01	UF	CS		<2.1	0.25	B		ACCU
O-1	10/24/01	11/05/01	UF	CS		<2.17	2.17	U		BABC
O-1	10/24/01	11/01/01	UF	CS		3.16	0.958	J	J	GELC
O-1	11/28/01	01/21/02	UF	CS		2	0.25			ACCU
O-1	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
O-1	11/28/01	12/02/01	UF	CS		3.27	0.958	J		GELC
O-1	12/15/01	01/22/02	UF	CS		1.8	0.25			ACCU
O-1	12/15/01	01/22/02	UF	DUP		1.7	0.25			ACCU
O-1	12/15/01	12/18/01	UF	CS		<1.51	1.51	U		BABC
O-1	12/15/01	12/28/01	UF	CS		3.04	0.801	J		GELC
O-4	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC
O-4	02/14/01	03/05/01	UF	CS		<0.958	0.958	U	UJ	GELC
O-4	08/08/01	08/30/01	UF	CS		1.65	0.958	J		GELC
O-4	08/08/01	10/10/01	UF	CS		1.43	0.958	J		GELC
O-4	10/24/01	12/04/01	UF	CS		<0.55	0.25	B		ACCU
O-4	10/24/01	11/05/01	UF	CS		<2.17	2.17	U		BABC
O-4	10/24/01	11/02/01	UF	CS		<0.958	0.958	U	UJ	GELC
O-4	11/28/01	01/21/02	UF	CS		<0.25	0.25	U		ACCU
O-4	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
O-4	11/28/01	12/02/01	UF	CS		3.6	0.958	J		GELC
PM-1	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC
PM-1	02/14/01	03/05/01	UF	CS		<0.958	0.958	U	UJ	GELC
PM-1	05/09/01	05/25/01	UF	CS	FB	<0.958	0.958	U		GELC
PM-1	08/08/01	08/28/01	UF	CS		2.12	0.958	J	U	GELC
PM-1	08/08/01	10/03/01	UF	CS		1.88	0.958	J		GELC
PM-1	10/24/01	12/04/01	UF	CS		<0.52	0.25	B		ACCU
PM-1	10/24/01	11/05/01	UF	CS		<2.17	2.17	U		BABC
PM-1	10/24/01	11/01/01	UF	CS		1.3	0.958	J	R	GELC
PM-1	11/28/01	01/21/02	UF	DUP		<0.25	0.25	U		ACCU
PM-1	11/28/01	01/21/02	UF	CS		<0.25	0.25	U		ACCU
PM-1	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
PM-1	11/28/01	12/02/01	UF	CS		1.92	0.958	J		GELC
PM-2	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC
PM-2	02/14/01	03/05/01	UF	CS		<0.958	0.958	U	UJ	GELC
PM-2	08/08/01	08/28/01	UF	CS		<0.958	0.958	U		GELC
PM-2	11/28/01	01/21/02	UF	CS		<0.25	0.25	U		ACCU
PM-2	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
PM-2	11/28/01	12/02/01	UF	CS		<0.958	0.958	U		GELC
PM-2	11/28/01	12/02/01	UF	CS	FD	1.54	0.958	J		GELC
PM-3	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
PM-3	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
PM-3	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
PM-3	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC

Table 5-25. Perchlorate in Groundwater during 2001[a] (µg/L) (Cont.)

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Regional Aquifer Wells (Cont.)										
Water Supply Wells: (Cont.)										
PM-3	04/11/01	05/01/01	UF	CS		<0.801	0.801	U		GELC
PM-3	04/11/01	05/01/01	UF	CS		2.29	0.801	J		GELC
PM-3	04/11/01	05/02/01	UF	CS		<0.801	0.801	U		GELC
PM-3	04/11/01	05/02/01	UF	CS		1.01	0.801	J		GELC
PM-3	05/09/01	05/18/01	UF	CS		<1.2	1.2	U		BABC
PM-3	05/09/01	05/25/01	UF	CS		1.35	0.958	J		GELC
PM-3	06/13/01	06/28/01	UF	CS		<2.17	2.17	U		BABC
PM-3	06/13/01	06/20/01	UF	CS		<0.958	0.958	U		GELC
PM-3	07/11/01	08/06/01	UF	CS		<0.958	0.958	U		GELC
PM-3	07/11/01	08/06/01	UF	CS		3.96	0.958	J		GELC
PM-3	08/08/01	08/30/01	UF	DUP		<0.958	0.958	U		GELC
PM-3	08/08/01	08/30/01	UF	CS		<0.958	0.958	U		GELC
PM-3	09/05/01	09/12/01	UF	CS		<2.17	2.17	U		BABC
PM-3	09/05/01	09/12/01	UF	CS	FD	<2.17	2.17	U		BABC
PM-3	09/05/01	10/01/01	UF	TRP		<2.17	2.17	U		BABC
PM-3	09/05/01	10/01/01	UF	DUP		<2.17	2.17	U		BABC
PM-3	09/05/01	09/14/01	UF	CS		<0.958	0.958	U		GELC
PM-3	09/05/01	09/14/01	UF	CS	FD	2.56	0.958	J		GELC
PM-3	09/05/01	10/04/01	UF	QUD		<0.958	0.958	U		GELC
PM-3	09/05/01	10/04/01	UF	DUP		<0.958	0.958	U		GELC
PM-3	09/05/01	10/04/01	UF	QNT		1.62	0.958	J		GELC
PM-3	09/05/01	10/04/01	UF	TRP		1.47	0.958	J		GELC
PM-3	10/24/01	12/04/01	UF	DUP		<0.58	0.25	B		ACCU
PM-3	10/24/01	12/04/01	UF	QUD		<0.57	0.25	B		ACCU
PM-3	10/24/01	12/04/01	UF	TRP		<0.57	0.25	B		ACCU
PM-3	10/24/01	12/04/01	UF	QNT		<0.51	0.25	B		ACCU
PM-3	10/24/01	12/04/01	UF	CS		<0.5	0.25	B		ACCU
PM-3	10/24/01	11/02/01	UF	QUD		<2.17	2.17	U		BABC
PM-3	10/24/01	11/02/01	UF	DUP		<2.17	2.17	U		BABC
PM-3	10/24/01	11/02/01	UF	CS		<2.17	2.17	U		BABC
PM-3	10/24/01	11/02/01	UF	TRP		<2.17	2.17	U		BABC
PM-3	10/24/01	11/02/01	UF	QNT		<2.17	2.17	U		BABC
PM-3	10/24/01	11/19/01	UF	DUP		<0.958	0.958	U		GELC
PM-3	10/24/01	11/19/01	UF	QNT		<0.958	0.958	U		GELC
PM-3	10/24/01	11/19/01	UF	QUD		<0.958	0.958	U		GELC
PM-3	10/24/01	11/19/01	UF	TRP		<0.958	0.958	U		GELC
PM-3	10/24/01	11/19/01	UF	CS		1.62	0.958	J	U	GELC
PM-3	11/28/01	01/21/02	UF	CS		<0.4	0.25	B		ACCU
PM-3	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
PM-3	11/28/01	12/16/01	UF	DUP		<0.801	0.801	U		GELC
PM-3	11/28/01	12/16/01	UF	CS		2.42	0.801	J		GELC
PM-3	12/15/01	01/22/02	UF	CS		<0.25	0.25	U		ACCU
PM-3	12/15/01	12/18/01	UF	CS		<1.51	1.51	U		BABC
PM-3	12/15/01	12/28/01	UF	CS		<0.801	0.801	U		GELC
PM-3	12/15/01	12/28/01	UF	DUP		<0.801	0.801	U		GELC
PM-4	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC

Table 5-25. Perchlorate in Groundwater during 2001 (µg/L)[a] (Cont.)

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Regional Aquifer Wells (Cont.)										
Water Supply Wells: (Cont.)										
PM-4	02/14/01	03/05/01	UF	CS		<0.958	0.958	U	UJ	GELC
PM-4	08/08/01	08/30/01	UF	CS		<0.958	0.958	U		GELC
PM-4	11/28/01	01/21/02	UF	CS		<0.3	0.25	B		ACCU
PM-4	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
PM-4	11/28/01	12/02/01	UF	CS		1.71	0.958	J		GELC
PM-5	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC
PM-5	02/14/01	03/05/01	UF	CS		1.06	0.958	J	J	GELC
PM-5	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
PM-5	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
PM-5	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
PM-5	04/11/01	04/18/01	UF	CS		<1.2	1.2	U		BABC
PM-5	04/11/01	05/02/01	UF	CS		<0.801	0.801	U		GELC
PM-5	04/11/01	05/02/01	UF	CS		<0.801	0.801	U		GELC
PM-5	04/11/01	05/02/01	UF	CS		<0.801	0.801	U		GELC
PM-5	04/11/01	05/02/01	UF	CS		<0.801	0.801	U		GELC
PM-5	05/09/01	05/18/01	UF	CS		<1.2	1.2	U		BABC
PM-5	05/09/01	05/25/01	UF	CS		<0.958	0.958	U		GELC
PM-5	06/13/01	06/15/01	UF	CS		<2.17	2.17	U		BABC
PM-5	06/13/01	06/20/01	UF	CS		<0.958	0.958	U		GELC
PM-5	07/11/01	08/06/01	UF	CS		2.42	0.958	J		GELC
PM-5	08/08/01	08/30/01	UF	CS		<0.958	0.958	U		GELC
PM-5	09/05/01	09/12/01	UF	CS		<2.17	2.17	U		BABC
PM-5	09/05/01	09/13/01	UF	CS	FD	<2.17	2.17	U		BABC
PM-5	09/05/01	10/01/01	UF	DUP		<2.17	2.17	U		BABC
PM-5	09/05/01	10/01/01	UF	TRP		<2.17	2.17	U		BABC
PM-5	09/05/01	09/13/01	UF	DUP	FD	<0.958	0.958	U		GELC
PM-5	09/05/01	09/13/01	UF	CS	FD	<0.958	0.958	U		GELC
PM-5	09/05/01	09/13/01	UF	CS		2.05	0.958	J		GELC
PM-5	09/05/01	10/03/01	UF	QNT		<0.958	0.958	U		GELC
PM-5	09/05/01	10/03/01	UF	DUP		<0.958	0.958	U		GELC
PM-5	09/05/01	10/03/01	UF	QUD		1.66	0.958	J		GELC
PM-5	09/05/01	10/03/01	UF	TRP		1.49	0.958	J		GELC
PM-5	10/24/01	12/05/01	UF	DUP		<0.3	0.25	B		ACCU
PM-5	10/24/01	12/05/01	UF	CS		<0.3	0.25	B		ACCU
PM-5	10/24/01	12/05/01	UF	QNT		<0.25	0.25	U		ACCU
PM-5	10/24/01	12/05/01	UF	QUD		<0.25	0.25	U		ACCU
PM-5	10/24/01	12/05/01	UF	TRP		<0.25	0.25	U		ACCU
PM-5	10/24/01	11/01/01	UF	CS		<2.17	2.17	U		BABC
PM-5	10/24/01	11/01/01	UF	DUP		<2.17	2.17	U		BABC
PM-5	10/24/01	11/01/01	UF	TRP		<2.17	2.17	U		BABC
PM-5	10/24/01	11/01/01	UF	QUD		<2.17	2.17	U		BABC
PM-5	10/24/01	11/01/01	UF	QNT		<2.17	2.17	U		BABC
PM-5	10/24/01	11/20/01	UF	CS		<0.958	0.958	U	U	GELC
PM-5	10/24/01	11/20/01	UF	DUP		<0.958	0.958	U		GELC
PM-5	10/24/01	11/20/01	UF	QNT		<0.958	0.958	U		GELC
PM-5	10/24/01	11/20/01	UF	TRP		<0.958	0.958	U		GELC

Table 5-25. Perchlorate in Groundwater during 2001 (µg/L)[a] (Cont.)

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Regional Aquifer Wells (Cont.)										
Water Supply Wells: (Cont.)										
PM-5	10/24/01	11/20/01	UF	QUD		1.05	0.958	J		GELC
PM-5	11/28/01	01/21/02	UF	CS		<0.25	0.25	U		ACCU
PM-5	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
PM-5	11/28/01	12/02/01	UF	DUP		1.61	0.958	J		GELC
PM-5	11/28/01	12/02/01	UF	CS		1.29	0.958	J		GELC
PM-5	12/15/01	01/22/02	UF	CS	FD	<0.3	0.25	B		ACCU
PM-5	12/15/01	01/22/02	UF	CS		<0.25	0.25	U		ACCU
PM-5	12/15/01	12/18/01	UF	CS		<1.51	1.51	U		BABC
PM-5	12/15/01	12/28/01	UF	CS		<0.801	0.801	U		GELC
G-1A	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC
G-1A	02/14/01	03/05/01	UF	DUP		<0.958	0.958	U	UJ	GELC
G-1A	02/14/01	03/05/01	UF	CS		<0.958	0.958	U	UJ	GELC
G-1A	08/08/01	08/30/01	UF	CS		<0.958	0.958	U		GELC
G-1A	10/24/01	12/05/01	UF	QUD		<0.62	0.25	B		ACCU
G-1A	10/24/01	12/05/01	UF	DUP		<0.5	0.25	B		ACCU
G-1A	10/24/01	12/05/01	UF	CS		<0.5	0.25	B		ACCU
G-1A	10/24/01	12/05/01	UF	TRP		<0.5	0.25	B		ACCU
G-1A	10/24/01	12/05/01	UF	QNT		<0.3	0.25	B		ACCU
G-1A	10/24/01	11/01/01	UF	QNT		<2.17	2.17	U		BABC
G-1A	10/24/01	11/01/01	UF	TRP		<2.17	2.17	U		BABC
G-1A	10/24/01	11/01/01	UF	CS		<2.17	2.17	U		BABC
G-1A	10/24/01	11/01/01	UF	DUP		<2.17	2.17	U		BABC
G-1A	10/24/01	11/01/01	UF	QUD		<2.17	2.17	U		BABC
G-1A	10/24/01	11/19/01	UF	TRP		<0.958	0.958	U		GELC
G-1A	10/24/01	11/19/01	UF	CS		<0.958	0.958	U	U	GELC
G-1A	10/24/01	11/19/01	UF	SXT		<0.958	0.958	U		GELC
G-1A	10/24/01	11/19/01	UF	QNT		<0.958	0.958	U		GELC
G-1A	10/24/01	11/19/01	UF	DUP		1.52	0.958	J		GELC
G-1A	10/24/01	11/19/01	UF	QUD		1.4	0.958	J		GELC
G-1A	11/28/01	01/21/02	UF	CS		<0.25	0.25	U		ACCU
G-1A	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
G-1A	11/28/01	12/17/01	UF	CS		2.9	0.801	J		GELC
G-2A	05/09/01	05/18/01	UF	CS		<1.2	1.2	U		BABC
G-2A	05/09/01	05/25/01	UF	CS		<0.958	0.958	U		GELC
G-2A	08/08/01	08/30/01	UF	CS		<0.958	0.958	U		GELC
G-2A	11/28/01	01/21/02	UF	CS		<0.25	0.25	U		ACCU
G-2A	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
G-2A	11/28/01	12/17/01	UF	CS		2.63	0.801	J		GELC
G-3A	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC
G-3A	02/14/01	03/05/01	UF	CS		<0.958	0.958	U	UJ	GELC
G-3A	08/08/01	08/30/01	UF	CS		<0.958	0.958	U		GELC
G-3A	11/28/01	01/21/02	UF	CS		<0.3	0.25	B		ACCU
G-3A	11/28/01	01/21/02	UF	CS	FB	<0.25	0.25	U		ACCU
G-3A	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
G-3A	11/28/01	12/17/01	UF	CS		2.64	0.801	J		GELC
G-4A	02/14/01	02/21/01	UF	CS		<1.2	1.2	U		BABC

Table 5-25. Perchlorate in Groundwater during 2001 (µg/L) [a] (Cont.)

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Regional Aquifer Wells (Cont.)										
Water Supply Wells: (Cont.)										
G-4A	02/14/01	03/05/01	UF	CS		<0.958	0.958	U	UJ	GELC
G-4A	08/08/01	08/30/01	UF	CS		<0.958	0.958	U		GELC
G-4A	11/28/01	01/21/02	UF	CS		<0.3	0.25	B		ACCU
G-4A	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
G-4A	11/28/01	12/17/01	UF	CS		2.69	0.801	J		GELC
G-5A	08/08/01	08/30/01	UF	CS		1.75	0.958	J		GELC
G-5A	08/08/01	10/10/01	UF	CS		1.2	0.958	J		GELC
G-5A	09/05/01	09/13/01	UF	CS	FD	<2.17	2.17	U		BABC
G-5A	09/05/01	09/13/01	UF	CS		<2.17	2.17	U		BABC
G-5A	09/05/01	10/01/01	UF	TRP		<2.17	2.17	U		BABC
G-5A	09/05/01	10/01/01	UF	DUP		<2.17	2.17	U		BABC
G-5A	09/05/01	09/13/01	UF	CS		<0.958	0.958	U		GELC
G-5A	09/05/01	09/14/01	UF	CS	FD	2.61	0.958	J		GELC
G-5A	09/05/01	10/03/01	UF	DUP		<0.958	0.958	U		GELC
G-5A	09/05/01	10/03/01	UF	QNT		<0.958	0.958	U		GELC
G-5A	09/05/01	10/03/01	UF	TRP		1.47	0.958	J		GELC
G-5A	09/05/01	10/03/01	UF	QUD		1.29	0.958	J		GELC
G-5A	10/24/01	12/04/01	UF	CS		<0.54	0.25	B		ACCU
G-5A	10/24/01	11/05/01	UF	CS		<2.17	2.17	U		BABC
G-5A	10/24/01	11/02/01	UF	CS		1.28	0.958	J	R	GELC
G-5A	11/28/01	01/21/02	UF	CS		<0.3	0.25	B		ACCU
G-5A	11/28/01	12/04/01	UF	CS		<2.17	2.17	U		BABC
G-5A	11/28/01	12/17/01	UF	CS		2.65	0.801	J		GELC
Regional Aquifer Springs										
White Rock Canyon Group I:										
Sandia Spring	09/24/01	10/09/01	UF	CS	FD	<0.958	0.958	U		GELC
Sandia Spring	09/24/01	10/09/01	UF	CS		<0.958	0.958	U		GELC
Spring 3	09/24/01	10/09/01	UF	CS		<0.958	0.958	U		GELC
Spring 3	09/24/01	10/09/01	UF	CS	FB	<0.958	0.958	U		GELC
Spring 4	09/24/01	10/09/01	UF	DUP		<0.958	0.958	U		GELC
Spring 4	09/24/01	10/09/01	UF	CS		<0.958	0.958	U		GELC
Spring 4	11/01/01	12/04/01	UF	CS		<0.65	0.25	B		ACCU
Spring 4	11/01/01	11/29/01	UF	CS		2.35	0.958	J	U	GELC
Spring 4B	03/09/01	04/06/01	UF	CS		6.62	0.958			GELC
Spring 4B	03/09/01	05/02/01	UF	RE		<0.801	0.801	U		GELC
Spring 4B	11/01/01	12/04/01	UF	CS		<0.58	0.25	B		ACCU
Spring 4B	11/01/01	12/04/01	UF	DUP		<0.5	0.25	B		ACCU
Spring 4B	11/01/01	11/29/01	UF	CS		1.4	0.958	J	U	GELC
Spring 4C	11/01/01	12/04/01	UF	CS		<0.67	0.25	B		ACCU
Spring 4C	11/01/01	11/29/01	UF	CS		2.63	0.958	J	U	GELC
Spring 4C	11/01/01	11/29/01	UF	DUP		2.5	0.958	J		GELC
Spring 4A	09/25/01	10/09/01	UF	DUP		<0.958	0.958	U		GELC
Spring 4A	09/25/01	10/09/01	UF	CS		<0.958	0.958	U		GELC
Spring 4A	11/01/01	12/04/01	UF	CS		<0.5	0.25	B		ACCU

Table 5-25. Perchlorate in Groundwater during 2001 (µg/L)[a] (Cont.)

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Regional Aquifer Springs (Cont.)										
White Rock Canyon Group I:										
Spring 4A	11/01/01	11/29/01	UF	CS		1.71	0.958	J	U	GELC
Spring 4AA	11/01/01	12/04/01	UF	CS		<0.55	0.25	B		ACCU
Spring 4AA	11/01/01	11/29/01	UF	CS		1.57	0.958	J	U	GELC
Spring 5	09/25/01	10/09/01	UF	CS		1.29	0.958	J		GELC
Ancho Spring	10/24/01	11/01/01	UF	CS		<0.958	0.958	U		GELC
Ancho Spring	10/24/01	11/01/01	UF	DUP		<0.958	0.958	U		GELC
White Rock Canyon Group II:										
Spring 6A	09/25/01	10/09/01	UF	CS		<0.958	0.958	U		GELC
Spring 9	09/25/01	10/09/01	UF	CS		<0.958	0.958	U		GELC
White Rock Canyon Group III:										
Spring 1	09/24/01	10/09/01	UF	CS		<0.958	0.958	U		GELC
Spring 2	09/24/01	10/09/01	UF	CS		<0.958	0.958	U		GELC
White Rock Canyon Group IV:										
La Mesita Spring										
	10/23/01	11/01/01	UF	CS		<0.958	0.958	U		GELC
Other Springs:										
Sacred Spring	10/23/01	11/01/01	UF	CS		<0.958	0.958	U		GELC
Sacred Spring	10/23/01	11/01/01	UF	CS		<0.958	0.958	U		GELC
Sacred Spring	10/23/01	11/01/01	UF	DUP		1.95	0.958	J		GELC
Canyon Alluvial Groundwater Systems										
Acid/Pueblo Canyons:										
APCO-1	04/03/01	04/27/01	UF	CS		<0.801	0.801	U		GELC
DP/Los Alamos Canyons:										
LAO-C	04/03/01	04/27/01	UF	CS		<0.801	0.801	U		GELC
LAO-0.7	03/29/01	04/25/01	UF	CS		<0.801	0.801	U		GELC
LAO-1	04/05/01	05/01/01	UF	DUP		<0.801	0.801	U		GELC
LAO-1	04/05/01	05/01/01	UF	CS		<0.801	0.801	U		GELC
DP Spring	04/03/01	04/27/01	UF	CS		<0.801	0.801	U		GELC
LAO-2	03/29/01	04/25/01	UF	CS		<0.801	0.801	U		GELC
LAO-3A	03/28/01	04/25/01	UF	CS	FD	1.28	0.801	J		GELC
LAO-3A	03/28/01	04/25/01	UF	CS		1.17	0.801	J		GELC
LAO-4	04/05/01	05/01/01	UF	CS		<0.801	0.801	U		GELC
LAO-4.5C	03/28/01	04/25/01	UF	CS		<0.801	0.801	U		GELC
LAO-6A	03/28/01	04/25/01	UF	CS		<0.801	0.801	U		GELC
Mortandad Canyon:										
MCO-3	03/12/01	03/20/01	UF	CS		140	1.2			BABC
MCO-3	05/24/01	06/07/01	UF	CS	FB	3.36	0.958	J		GELC
MCO-3	05/24/01	06/08/01	UF	CS		107	1.92			GELC
MCO-3	07/31/01	08/07/01	UF	CS		114	1.92			GELC
MCO-3	09/07/01	09/17/01	F	DUP		57.1	1.92			GELC

Table 5-25. Perchlorate in Groundwater during 2001 (µg/L)[a] (Cont.)

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Canyon Alluvial Groundwater Systems (Cont.)										
Mortandad Canyon: (Cont.)										
MCO-3	09/07/01	09/17/01	F	CS		53.6	1.92		J	GELC
MCO-3	11/16/01	12/02/01	F	CS		132	9.58		J	GELC
MCO-4B	05/24/01	06/08/01	UF	CS		157	3.83			GELC
MCO-5	08/02/01	08/08/01	UF	CS		157	4.79			GELC
MCO-5	08/02/01	08/08/01	UF	DUP		156	4.79			GELC
MCO-6	03/12/01	03/20/01	UF	CS		220	1.2			BABC
MCO-6	05/24/01	06/07/01	UF	CS	FD	139	3.83			GELC
MCO-6	05/24/01	06/08/01	UF	CS		145	3.83			GELC
MCO-6	09/10/01	09/17/01	F	CS		139	1.92		J	GELC
MCO-6	11/16/01	12/02/01	F	CS		109	9.58		J	GELC
MCO-7	03/12/01	03/20/01	UF	CS		180	1.2			BABC
MCO-7	05/24/01	06/07/01	UF	CS		141	3.83			GELC
MCO-7	05/24/01	06/07/01	UF	CS	FB	3.03	0.958	J	U	GELC
MCO-7	09/10/01	09/17/01	F	CS		148	1.92		J	GELC
MCO-7.5	08/07/01	08/28/01	UF	DUP		204	4.79			GELC
Cañada del Buey:										
CDBO-6	05/01/01	05/08/01	UF	CS		2.38	0.958	J	U	GELC
Pajarito Canyon:										
PCO-1	04/10/01	05/01/01	UF	CS		<0.801	0.801	U		GELC
PCO-1	04/10/01	05/01/01	UF	CS		<0.801	0.801	U		GELC
PCO-3	04/10/01	05/02/01	UF	CS		<3.2	3.2	U		GELC
Intermediate Perched Groundwater Systems										
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:										
POI-4	08/01/01	08/08/01	UF	CS		1.73	0.958	J		GELC
Test Well 2A	07/30/01	08/07/01	UF	CS		<0.958	0.958	U		GELC
Basalt Spring	10/23/01	11/01/01	UF	CS		1.3	0.958	J		GELC
Water Canyon Gallery	11/29/01	12/17/01	UF	CS		2.35	0.801	J		GELC
San Ildefonso Pueblo										
LA-5	06/19/01	07/09/01	UF	CS		<0.958	0.958	U		GELC
Eastside Artesian Well	06/20/01	07/09/01	UF	CS		<0.958	0.958	U		GELC
Pajarito Well (Pump 1)	06/19/01	07/09/01	UF	CS		<0.958	0.958	U		GELC
Pajarito Well (Pump 1)	06/19/01	07/09/01	UF	CS		<0.958	0.958	U		GELC
Don Juan Playhouse Well	06/20/01	07/09/01	UF	CS		<0.958	0.958	U		GELC
Martinez House Well	12/04/01	12/16/01	UF	CS		<0.801	0.801	U		GELC
Martinez House Well	12/04/01	12/16/01	UF	DUP		2.42	0.801	J		GELC
Otowi House Well	06/19/01	07/09/01	UF	CS		<0.958	0.958	U		GELC
Otowi House Well	06/19/01	07/09/01	UF	DUP		<0.958	0.958	U		GELC
New Community Well	06/19/01	07/09/01	UF	CS		1.04	0.958	J		GELC

Table 5-25. Perchlorate in Groundwater during 2001 (µg/L)[a] (Cont.)

Station Name	Sample Date	Analysis Date	Codes[b]		Field QC Type Code[c]	Result	MDL	Lab Qual Code[d]	Valid Flag Code[d]	Lab[e]
Quality Assurance Samples										
DI Blank	10/31/01	12/04/01	UF	CS	PEB	<0.25	0.25	U		ACCU
DI Blank	11/27/01	12/04/01	UF	CS	PEB	<2.17	2.17	U		BABC
DI Blank	06/06/01	06/19/01	UF	CS	PEB	<0.958	0.958	U		GELC
DI Blank	06/13/01	06/20/01	UF	CS	PEB	<0.958	0.958	U		GELC
DI Blank	06/20/01	07/09/01	UF	CS	PEB	<0.958	0.958	U		GELC
DI Blank	08/03/01	08/07/01	UF	CS	PEB	<0.958	0.958	U		GELC
DI Blank	08/07/01	08/28/01	UF	CS	PEB	<0.958	0.958	U		GELC
DI Blank	09/07/01	09/14/01	F	CS	PEB	<0.958	0.958	U	UJ	GELC
DI Blank	10/24/01	11/01/01	UF	CS	PEB	<0.958	0.958	U	UJ	GELC
Santa Fe Water Supply Wells										
Buckman 1	08/16/01	08/24/01	UF	CS	FB	<2.17	2.17	U		BABC
Buckman 1	08/16/01	08/24/01	UF	CS		<2.17	2.17	U		BABC
Buckman 1	08/16/01	09/06/01	UF	CS		<0.958	0.958	U		GELC
Buckman 1	08/16/01	09/06/01	UF	CS	FB	<0.958	0.958	U		GELC
Buckman 1	10/31/01	12/04/01	UF	CS		<0.3	0.25	B		ACCU
Buckman 1	10/31/01	11/28/01	UF	DUP		<0.958	0.958	U		GELC
Buckman 1	10/31/01	11/28/01	UF	CS		1.89	0.958	J	U	GELC
Buckman 2	08/16/01	08/27/01	UF	CS		<2.17	2.17	U		BABC
Buckman 2	08/16/01	09/06/01	UF	CS		<0.958	0.958	U		GELC
Buckman 2	10/31/01	12/04/01	UF	CS		<0.25	0.25	U		ACCU
Buckman 2	10/31/01	11/29/01	UF	CS		2.65	0.958	J	U	GELC
Buckman 3	10/31/01	12/04/01	UF	CS		<0.25	0.25	U		ACCU
Buckman 3	10/31/01	11/29/01	UF	CS		<0.958	0.958	U		GELC
Buckman 4	10/31/01	12/04/01	UF	CS		<0.25	0.25	U		ACCU
Buckman 4	10/31/01	11/06/01	UF	CS	FD	<2.17	2.17	U		BABC
Buckman 4	10/31/01	11/29/01	UF	CS		<0.958	0.958	U		GELC
Buckman 6	10/31/01	12/04/01	UF	CS		<0.25	0.25	U		ACCU
Buckman 6	10/31/01	11/29/01	UF	CS		<0.958	0.958	U		GELC
Buckman 7	08/16/01	08/24/01	UF	CS		<2.17	2.17	U		BABC
Buckman 7	08/16/01	09/06/01	UF	DUP		<0.958	0.958	U		GELC
Buckman 7	08/16/01	09/06/01	UF	CS		0.999	0.958	J		GELC
Buckman 7	08/16/01	10/10/01	UF	CS		1.12	0.958	J		GELC
Buckman 7	10/31/01	12/04/01	UF	CS		<0.25	0.25	U		ACCU
Buckman 7	10/31/01	11/29/01	UF	CS		<0.958	0.958	U		GELC
Buckman 8	10/31/01	12/04/01	UF	CS		<0.3	0.25	B		ACCU
Buckman 8	10/31/01	11/29/01	UF	CS	FD	2.16	0.958	J	U	GELC
Buckman 8	10/31/01	11/29/01	UF	CS		1.25	0.958	J	U	GELC

[a]Detections are shaded.
[b]Codes: UF–unfiltered; F–filtered; CS–customer sample; RE–reanalysis; DUP–laboratory duplicate; TRP–laboratory triplicate; QUD–laboratory quadruplicate; QNT–laboratory quintuplicate.
[c]FTB–trip blank; FD–field duplicate; FB–field blank; PEB–performance evaluation blank.
[d]For Lab Qualifier Codes and Valid Flag Codes, see Table 5-4.
[e]GEL-General Engineering Labs; ACCU-Acculabs; BABC-Edward S. Babcock and Sons, Inc.

Table 5-26. Trace Metals in Groundwater for 2001 (µg/L)

Station	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Regional Aquifer Wells															
Test Wells:															
Test Well 1	6/5	UF	CS	<[b] 0.871	< 31.9	< 2.33	78.3	84.6	< 0.158	< 0.096	< 0.638	< 0.582	< 2.15	434	< 0.057
Test Well 1	6/5	UF	DUP												< 0.057
Test Well 3	6/4	UF	CS	< 0.871	< 7.57	< 2.33	< 22.9	33.2	< 0.158	< 0.092	< 0.419	< 1.21	< 3.28	2,220	< 0.057
Test Well 4	6/4	UF	CS	< 0.871	< 22.6	< 2.33	< 25.4	59.1	< 0.158	< 0.595	< 0.419	< 0.75	14.1	376	< 0.057
Test Well 8	6/4	UF	CS	< 0.871	88.3	< 2.33	< 9.71	7.78	< 0.158	< 0.066	< 0.419	< 3.73	< 1.36	121	< 0.057
Test Well DT-5A	6/6	UF	CS	< 0.871	< 7.57	< 2.33	< 7.23	24.5	< 0.158	< 0.066	< 0.419	< 1.65	< 0.83	104	< 0.057
Test Well DT-9	6/7	UF	CS	< 0.871	< 7.57	< 2.33	< 11.4	17.1	< 0.158	< 0.066	< 0.419	< 1.94	< 0.886	< 3.27	< 0.057
Test Well DT-10	6/6	UF	CS	< 0.871	< 14.6	< 2.33	< 3.61	7.55	< 0.158	< 0.066	< 0.419	< 2.65	< 0.834	169	< 0.057
Test Well DT-10	6/6	UF	DUP	< 0.871	< 18.1	< 2.33	< 3.61	7.6	< 0.158	< 0.066	< 0.419	< 2.9	< 0.879	168	< 0.057
Regional Aquifer Springs															
White Rock Canyon Group I:															
Sandia Spring	9/24	F	CS	< 0.197	< 34.3	< 4.57	< 18.2	57.1	< 0.203		< 0.295	< 1.48	< 2.67	< 20.6	
Sandia Spring	9/24	F	CS	< 0.197	< 11.2	< 4.57	< 22	58.3	< 0.203		8.57	< 1.44	< 2.37	< 20.6	
Sandia Spring	9/24	UF	CS												< 0.073
Sandia Spring	9/24	UF	CS												< 0.073
Spring 3	9/24	F	CS	< 0.197	34.3	< 4.57	< 15.3	42.5	< 0.203		< 0.295	< 3.7	< 2.67	< 20.6	
Spring 3	9/24	UF	CS												< 0.073
Spring 4	9/24	UF	CS												< 0.365
Spring 4	9/24	UF	DUP												< 0.073
Spring 4	9/24	UF	CS	< 2.56	< 34.3	< 4.57	< 8.72	46.1	< 0.203		< 1.24	< 3.35	< 2.67	< 20.6	
Spring 4	9/24	UF	DUP	< 0.879	< 34.3	< 4.57	< 7.33	45.9	< 0.203		< 0.789	< 2.96	< 2.67	< 20.6	
Spring 4A	9/25	F	CS	< 0.197	< 34.3	< 4.57	< 24.8	43.6	< 0.203		< 4.97	< 3.92	< 2.67	< 20.6	
Spring 4A	9/25	UF	CS												< 0.073
Spring 5	9/25	F	CS	< 0.197	< 34.3	< 4.57	< 31.5	28.4	< 0.203		< 0.295	< 3.92	< 2.67	< 20.6	
Spring 5	9/25	UF	CS												< 0.073
Ancho Spring	10/24	F	CS	< 0.197	< 34.3	< 3.05	< 22.8	25.7	< 0.203	< 0.19	< 0.295	< 3.47	< 2.67	< 20.6	
Ancho Spring	10/24	F	DUP	< 0.197	< 34.3	< 4.57	< 19.6	26.2	< 0.203	< 0.26	< 0.295	< 3.08	< 2.67	< 20.6	
Ancho Spring	10/24	UF	CS												< 0.073
Ancho Spring	10/24	UF	DUP												< 0.073
White Rock Canyon Group II:															
Spring 6A	9/25	UF	CS												< 0.073
Spring 6A	9/25	F	CS	< 0.197	< 34.3	< 4.57	< 13	20.3	< 0.203		< 0.295	< 3.73	< 2.67	< 20.6	
Spring 9	9/25	UF	CS												< 0.073
Spring 9	9/25	UF	DUP												
Spring 9	9/26	F	CS	< 0.197	< 34.3	< 4.57	< 12.7	18.6	< 0.203		5.36	< 1.74	< 2.67	< 20.6	

Table 5-26. Trace Metals in Groundwater for 2001 (µg/L) (Cont.)

Station	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Regional Aquifer Springs (Cont.)															
White Rock Canyon Group III:															
Spring 1	9/24	UF	CS												< 0.073
Spring 1	9/24	F	CS	< 0.197	< 21.7	< 4.29	51.6	42	< 0.203		< 0.295	< 4.19	< 2.67	< 16.1	
Spring 2	9/24	UF	CS												< 0.073
Spring 2	9/24	F	CS	< 0.197	< 34.3	23	65.9	24.4	< 0.203		< 1.4	< 0.669	< 2.67	< 3	
White Rock Canyon Group IV:															
La Mesita Spring	10/23	UF	CS												< 0.073
La Mesita Spring	10/23	F	CS	< 0.197	< 45.6	< 4.57	58.8	118	< 0.203	< 0.29	< 0.295	< 1.41	< 2.36	57.4	
Other Springs:															
Sacred Spring	10/23	F	CS	< 0.197	< 34.3	< 3.68	< 27.4	81.1	< 0.203	< 0.28	< 0.295	< 1.96	< 2.67	< 20.6	
Sacred Spring	10/23	F	DUP	< 0.197	< 34.3	< 4.57	< 24.8	80.1	< 0.203	< 0.26	< 0.295	< 1.93	< 2.67	< 7.65	
Sacred Spring	10/23	UF	CS												< 0.073
Sacred Spring	10/23	UF	DUP												< 0.073
Sacred Spring	10/23	F	CS	< 0.197	< 34.3	< 4.57	< 28.7	81.2	< 0.203	< 0.24	< 0.81	< 1.61	< 2.67	< 20.6	
Sacred Spring	10/23	UF	CS												< 0.073
Canyon Alluvial Groundwater Systems															
Acid/Pueblo Canyons:															
APCO-1	4/3	UF	CS	< 0.871	< 20.2	< 2.85	295	55.2	< 0.203	< 0.251	< 4.47	< 0.781	< 4.33	934	< 0.108
APCO-1	4/3	UF	DUP	< 0.197	< 18.3	< 3.78	290	53.7	< 0.203	< 0.329	< 4.44	< 0.781	< 4.51	913	< 0.073
APCO-1	4/3	F	CS	< 0.871	< 34.3	< 4.57	290	43.2	< 0.203	< 0.375	< 4.28	< 0.781	< 3.52	621	< 0.073
DP/Los Alamos Canyons:															
LAO-C	4/3	UF	CS	< 0.871	1,190	< 4.57	< 3.61	62.3	< 0.203	< 0.251	< 0.295	< 0.618	< 2.34	699	< 0.073
LAO-C	4/3	F	CS	< 0.871	2,440	< 4.57	< 3.61	63.1	< 0.203	< 0.251	< 1.47	< 0.943	< 3.07	1290	< 0.073
LAO-0.7	3/29	UF	CS	< 0.197	1,240	< 4.57	< 12.7	60.8	< 0.203	< 0.251	< 0.295	< 0.781	< 2.3	671	< 0.073
LAO-0.7	3/29	UF	DUP												
LAO-0.7	3/29	F	CS	< 0.197	203	< 4.57	< 13.6	43.8	< 0.203	< 0.251	< 0.295	< 0.781	< 0.882	126	< 0.073
LAO-0.7	3/29	F	DUP	< 0.197	< 201	< 4.57	< 13	44.2	< 0.203	< 0.251	< 0.295	< 0.781	< 1.1	< 100	< 0.073
LAO-1	4/5	UF	CS	< 0.197	150	< 4.57	< 6.34	58.8	< 0.203	< 0.251	< 0.295	8.86	< 1.16	137	< 0.073
LAO-1	4/5	F	CS	< 0.197	77	< 4.57	< 15.1	58.1	< 0.203	< 0.251	< 0.295	8.9	< 0.902	< 38.5	< 0.073
LAO-1	4/5	F	DUP	< 0.197	73.8	< 4.57	< 13.3	59.1	< 0.203	< 0.251	< 0.295	8.96	< 0.919	< 39.4	
DP Spring	4/3	F	CS	< 0.871	< 34.3	< 4.57	< 3.61	83	< 0.203	< 0.251	< 0.295	< 0.781	< 2.67	< 5.43	< 0.073
DP Spring	4/3	UF	CS	< 0.871	< 34.8	< 4.57	< 3.61	83.4	< 0.203	< 0.251	< 0.295	< 0.781	< 2.75	< 26.6	< 0.073
LAO-2	3/29	UF	CS	< 0.197	< 33.8	< 4.57	< 23.4	78.7	< 0.203	< 0.251	< 0.295	< 0.781	< 1.33	59.8	< 0.073
LAO-2	3/29	F	CS	< 0.197	< 19.7	< 4.57	< 27.2	77.6	< 0.203	< 0.251	< 0.295	< 0.781	< 1.36	< 38.8	0.331
LAO-3A	3/28	UF	CS	< 0.197	< 45.6	< 4.57	< 15.9	65.4	< 0.203	< 0.251	< 0.295	< 0.781	< 1.03	< 26.5	< 0.073
LAO-3A	3/28	F	CS	< 0.197	< 34.3	< 4.57	< 23.8	68	< 0.203	< 0.251	< 0.295	< 0.781	< 2.07	< 20.6	< 0.073

Table 5-26. Trace Metals in Groundwater for 2001 (µg/L) (Cont.)

Station	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Canyon Alluvial Groundwater Systems (Cont.)															
DP/Los Alamos Canyons: (Cont.)															
LAO-3A	3/28	F	CS	< 0.197	< 34.3	< 4.57	< 26.2	68.9	< 0.203	< 0.251	< 0.295	< 0.727	< 1.18	< 20.6	< 0.073
LAO-3A	3/28	UF	CS	< 0.197	< 10.3	< 4.57	< 24	66.3	< 0.203	< 0.251	< 0.295	< 0.781	< 1.07	< 18.9	< 0.073
LAO-4	4/5	UF	CS	< 0.197	76.9	< 4.57	< 12.1	58.6	< 0.203	< 0.251	< 0.295	< 0.629	< 1.24	< 42	< 0.073
LAO-4	4/5	F	CS	< 0.197	< 31.6	< 4.57	< 13.4	57.6	< 0.203	< 0.251	< 0.295	< 0.687	< 1.28	< 16.4	< 0.073
LAO-4.5C	3/28	UF	CS	< 0.197	111	< 4.57	< 18.3	50.4	< 0.203	< 0.251	< 0.295	< 0.781	< 1.19	53.9	< 0.073
LAO-4.5C	3/28	F	CS	< 0.197	69.1	< 4.57	< 13.6	48.7	< 0.203	< 0.251	< 0.295	< 0.781	< 2.04	< 33.5	< 0.073
LAO-6A	3/28	UF	CS	< 0.197	64.3	< 4.57	< 17.9	36.5	< 0.203	< 0.251	< 0.295	< 0.781	< 1.23	< 27.9	< 0.073
LAO-6A	3/28	F	CS	< 0.197	< 49.6	< 4.57	< 15.7	37	< 0.203	< 0.317	< 0.295	< 0.781	< 1.28	< 28.4	< 0.073
Mortandad Canyon:															
MCO-3	7/31	UF	CS	< 0.666	< 9.54	< 2.6	69.2	36.2	< 0.212	< 0.243	< 0.737	< 1.82	32.8	< 4.25	< 0.064
MCO-3	7/31	F	CS	< 0.666	< 9.54	< 2.6	58.1	35.9	< 0.212	< 0.249	< 0.737	< 1.88	33	< 2.24	< 0.064
MCO-5	8/2	UF	CS	< 0.666	< 9.54	< 2.6	60.2	92.3	< 0.212	< 0.112	< 0.737	< 0.759	< 4.66	< 2.24	< 0.064
MCO-5	8/2	UF	DUP	< 1.45			60.5	92		< 0.093		< 1.81	< 4.37		< 0.064
MCO-5	8/2	F	CS	< 0.666	< 9.54	< 2.6	63.3	92.8	< 0.212	< 0.114	< 0.737	< 1.03	< 4.64	< 2.24	< 0.064
MCO-6	8/6	F	CS	< 0.197	< 14.8	< 4.57	80.3	89.7	< 0.203	< 0.153	< 3.87	< 0.728	< 4.48	< 20.6	< 0.073
MCO-7	8/7	F	CS	< 0.197	< 40.2	< 4.57	72.9	154	< 0.203	< 0.05	< 0.295	< 1.34	< 1.66	< 18.4	< 0.073
MCO-7.5	8/7	UF	DUP	< 0.197	104	< 4.57	68.5	156	< 0.203	< 0.05	< 0.295	< 1.22	< 1.99	57.8	< 0.073
MCO-7.5	8/7	F	CS	< 0.197	173	< 3.43	79.1	162	< 0.203	< 0.05	< 2.3	< 1.2	< 2.7	87.3	< 0.073
Cañada del Buey:															
CDBO-6	5/1	F	CS	< 0.871	2,580	< 3.89	58.1	80.9	< 0.158	< 0.338	44.1	< 1.48	< 2.37	1,310	< 0.057
CDBO-6	5/1	F	DUP	< 0.871	2,530	< 2.33	59.6	85.1	< 0.158	< 0.386	45.6	< 1.3	< 2.59	1,290	
CDBO-6	5/1	UF	CS	< 0.871	6,900	< 2.74	54.7	106	< 0.343	< 0.704	< 2.12	< 3.16	< 4.2	3,690	< 0.057
CDBO-6	5/1	UF	DUP												< 0.057
CDBO-6	11/7	F	CS	< 0.197		< 4.57		163		1.17		< 0.781	< 2.8	313	< 0.073
CDBO-6	11/7	F	DUP	< 0.197		< 4.57		164		1.29		< 0.781	< 2.66	300	< 0.073
Pajarito Canyon:															
PCO-1	4/10	F	CS	< 0.871	987	< 2.33	< 29.3	188	< 0.158	< 0.272	< 0.419	< 0.759	< 0.587	516	< 0.062
PCO-1	4/10	UF	CS	< 0.871	1,200	< 2.33	< 26.6	188	< 0.158	< 0.272	< 0.419	< 0.994	< 0.587	652	< 0.057
PCO-1	4/10	UF	DUP	< 0.871	1,270	< 2.33	< 26.8	192	< 0.158	< 0.272	< 0.419	< 0.594	< 0.587	676	< 0.057
PCO-1	4/10	F	CS	< 0.871	1,150	< 2.33	< 25.9	189	< 0.158	< 0.272	< 0.514	< 0.743	< 0.587	614	< 0.057
PCO-1	4/10	UF	CS	< 0.871	1,040	< 2.33	< 27.2	195	< 0.158	< 0.272	< 0.419	< 1.1	< 0.587	556	< 0.057
PCO-1	4/10	UF	DUP												
PCO-3	4/10	F	CS	< 0.871	< 47.3	< 2.33	51.2	77.6	< 0.158	< 0.272	5	< 0.582	< 2.13	136	< 0.057
PCO-3	4/10	UF	CS	< 0.871	142	< 2.33	< 47.7	83.8	< 0.158	< 0.272	5.13	< 1.34	< 2.03	214	< 0.057
PCO-3	4/10	UF	DUP												
PCO-3	4/10	UF	TRP												

Table 5-26. Trace Metals in Groundwater for 2001 (µg/L) (Cont.)

Station	Date	Codes[a]		Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Intermediate Perched Groundwater Systems															
Pueblo/Los Alamos/Sanda Canyon Area Perched Systems in Conglomerates and Basalt:															
POI-4															
Test Well 2A	8/1	UF	CS	< 0.666	< 9.54	5.16	211	95.4	< 0.212	< 0.017	< 4.2	< 0.57	< 4.96	< 2.24	< 0.064
Basalt Spring	7/30	UF	CS	< 0.666	< 9.54	< 2.6	78	63.4	< 0.212	< 0.266	< 2.96	< 0.57	< 4.23	4,610	< 0.128
Basalt Spring	10/23	F	CS	< 0.197	< 34.3	< 3.75	209	137	< 0.203	< 0.36	< 4.05	< 0.781	6.52	< 20.6	
	10/23	UF	CS												0.474
Perched Groundwater System in Volcanics:															
Water Canyon Gallery															
Water Canyon Gallery	11/29	F	CS	< 0.197	147	< 4.57	< 12.9	12	< 0.203	< 0.05	< 0.295	< 1.28	< 2.67	289	
Water Canyon Gallery	11/29	F	DUP	< 0.197	154	< 4.57	< 12.6	12.3	< 0.203	< 0.05	< 0.295	< 0.781	< 1.79	54.2	
Water Canyon Gallery	11/29	UF	CS												< 0.073
	11/29	UF	DUP												< 0.073
San Ildefonso Pueblo															
LA-5															
Eastside Artesian Well	6/19	UF	CS	< 0.871	< 24.8	5.25	< 25.7	62.8	< 0.158	< 0.19	< 0.419	< 4.72	< 0.587	< 3.27	< 0.057
Pajarito Well (Pump 1)	6/20	UF	CS	< 0.871	55.4	< 4.5	135	< 3.63	< 0.158	< 0.13	< 0.419	< 0.582	< 0.587	141	< 0.057
Pajarito Well (Pump 1)	6/19	UF	CS	< 0.871	< 23.8	8.58	1,270	75.1	< 0.158	< 0.066	< 0.419	< 3.81	5.41	< 4.14	< 0.057
Pajarito Well (Pump 1)	6/19	UF	DUP												< 0.057
Don Juan Playhouse Well	6/19	UF	CS	< 0.871	< 8.69	9.49	1,260	74.9	< 0.158	< 0.066	< 0.419	< 3.82	9.66	< 3.27	< 0.057
Martinez House Well	6/20	UF	CS	< 0.871	< 33.7	6.39	93.7	< 3.74	< 0.158	< 0.16	< 1.39	10.3	< 0.587	< 3.27	< 0.057
Martinez House Well	12/4	UF	CS	< 0.197	< 21.1	7.84	107	151	< 0.203	< 0.05	< 0.295	< 1.77	7.55	< 13.2	< 0.073
Otowi House Well	12/4	UF	DUP	< 0.197	< 34.3	7.86	107	153	< 0.203		< 0.295	< 1.36	7.18	< 20.6	
Otowi House Well	6/19	UF	CS	< 0.871	< 19.9	< 2.86	72.6	312	< 0.158	< 0.18	< 0.419	< 0.582	22.7	63.6	< 0.057
New Community Well	6/19	UF	DUP	< 0.871	< 17	< 2.33	73.1	311	< 0.158	< 0.2	< 0.419	< 0.582	22.7	68.2	
	6/19	UF	CS	< 0.871	< 28	< 2.33	56.4	16.1	< 0.158	< 0.15	< 0.419	< 1.3	< 4.56	< 7.23	< 0.057
Water Quality Standards[c]															
EPA Primary Drinking Water Standard															
EPA Secondary Drinking Water Standard						10		2,000	4	5		100			2
EPA Action Level					50-200									300	
EPA Health Advisory													1,300		
NMWQCC Livestock Watering Standard															
NMWQCC Groundwater Limit					5,000	200	5,000			50	1,000	1,000	500		10
NMWQCC Wildlife Habitat Standard				50	5,000	100	750	1,000		10	50	50	1,000	1,000	2
															0.77

Table 5-26. Trace Metals in Groundwater for 2001 (µg/L)

Station	Date	Codes[a]		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn	TSS (mg/L)
Regional Aquifer Wells															
Test Wells:															
Test Well 1	6/5	UF	CS	16.8	< 1.36	< 3.14	15.4	1.89	< 2.93	< 2.31	292	< 0.077	< 2.58	513	1.8
Test Well 1	6/5	UF	DUP												
Test Well 3	6/4	UF	CS	75.3	< 1.59	< 0.815	3.64	< 0.153	< 2.93	< 2.31	72.8	< 0.077	5.87	196	1.4
Test Well 4	6/4	UF	CS	61.3	< 1.28	< 0.815	30.4	< 0.153	< 2.93	< 2.31	51.2	< 0.077	< 0.638	543	2
Test Well 8	6/4	UF	CS	< 1.97	< 2.01	< 0.815	4.26	0.453	< 2.93	< 2.31	54.1	< 0.452	5.3	328	< 0.699
Test Well DT-5A	6/6	UF	CS	< 8.72	< 1.28	< 1.7	< 0.505	1.21	< 2.93	< 2.31	47.3	< 0.077	8.32	246	< 0.699
Test Well DT-9	6/7	UF	CS	< 0.338	< 1.28	< 0.815	< 1.12	0.531	< 2.93	< 2.31	50.4	< 0.077	6.1	124	< 0.699
Test Well DT-10	6/6	UF	CS	< 6.31	< 1.67	< 0.815	< 0.701	0.209	< 2.93	< 2.31	49.2	< 0.077	< 4.44	87	< 0.699
Test Well DT-10	6/6	UF	DUP	< 6.13	< 1.28	< 0.874	< 0.659	< 0.153	< 2.93	< 2.31	49	< 0.077	< 4.62	85	
Regional Aquifer Springs															
White Rock Canyon Group I:															
Sandia Spring	9/24	F	CS	18.2	< 0.594	< 0.743	< 0.077	< 0.111		< 2.4		< 0.014	7.85	< 0.889	
Sandia Spring	9/24	F	CS	18.6	< 0.594	< 0.743	< 0.077	< 0.111		< 2.83		< 0.014	7.8	< 2.79	
Sandia Spring	9/24	UF	CS						< 3.09						< 0.699
Sandia Spring	9/24	UF	CS						< 3.09						< 0.699
Spring 3	9/24	F	CS	< 2.94	< 0.594	< 0.743	< 0.077	< 0.111		< 9.86		< 0.014	14.2	< 1.47	
Spring 3	9/24	UF	CS						< 3.09						7.45
Spring 4	9/24	UF	CS						< 3.09						6.54
Spring 4	9/24	UF	DUP						< 3.09						8.46
Spring 4	9/24	UF	CS	< 2.94	< 2.08	< 0.743	< 0.077	< 0.07		< 2.4		< 0.014	9.6	< 1.17	
Spring 4	9/24	UF	DUP	< 2.94	< 0.594	< 0.743	< 0.077	< 0.06		< 2.4		< 0.014	9.56	< 2.81	
Spring 4A	9/25	F	CS	< 2.94	< 0.594	< 0.743	< 0.077	< 0.111		< 5.73		< 0.014	8.45	< 2.35	
Spring 4A	9/25	UF	CS						< 3.09						< 0.672
Spring 5	9/25	F	CS	< 0.53	< 0.594	< 0.743	< 0.077	< 0.111		< 7.1		< 0.014	10.1	< 0.696	
Spring 5	9/25	UF	CS						< 3.09						3.27
Ancho Spring	10/24	F	CS	< 3.46	< 3.29	< 0.743	< 0.18	< 0.35		< 2.19	56.7	< 0.05	6.72	< 1.51	
Ancho Spring	10/24	F	DUP	< 3.43	< 1.55	< 0.743	< 0.23	< 0.15		< 2.4	58	< 0.04	7.09	< 1.18	
Ancho Spring	10/24	UF	CS						< 3.09						8.2
Ancho Spring	10/24	UF	DUP						< 3.09						7
White Rock Canyon Group II:															
Spring 6A	9/25	UF	CS						< 3.09						117
Spring 6A	9/25	F	CS	< 2.94	< 0.594	< 0.743	< 0.077	< 0.06		< 4.5		< 0.014	10.3	< 0.798	
Spring 9	9/25	UF	CS						< 3.09						11.7
Spring 9	9/25	UF	DUP						< 3.09						
Spring 9	9/26	F	CS	< 2.94	< 0.594	< 0.743	< 0.077	< 0.111		< 4.57		< 0.014	8.35	< 1.54	

Table 5-26. Trace Metals in Groundwater for 2001 (µg/L) (Cont.)

Station	Date	Codes[a]		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn	TSS (mg/L)
Regional Aquifer Springs (Cont.)															
White Rock Canyon Group III:															
Spring 1	9/24	UF	CS						< 4.99						60.9
Spring 1	9/24	F	CS	< 1.79	< 2.21	< 0.743	< 0.077	< 0.111		< 2.4		< 0.014	16.4	< 1.53	
Spring 2	9/24	UF	CS						< 3.09						10.7
Spring 2	9/24	F	CS	< 8.29	< 2.9	< 0.743	< 0.077	< 0.111		< 2.4		< 0.014	22.2	< 2.81	
White Rock Canyon Group IV:															
La Mesita Spring	10/23	UF	CS						< 3.09						715
La Mesita Spring	10/23	F	CS	< 2.5	< 3.3	< 0.743	< 0.18	< 0.36		< 2.4	799	< 0.25	< 4.04	< 2.78	
Other Springs:															
Sacred Spring	10/23	F	CS	< 2.29	< 1.48	< 0.743	< 0.16	< 0.05		< 2.4	436	< 0.12	8.87	< 1.43	
Sacred Spring	10/23	F	DUP	< 2.17	< 2.33	< 0.743	< 0.15	< 0.111		< 2.4	430	< 0.09	8.57	< 1.3	
Sacred Spring	10/23	UF	CS						< 3.09						260
Sacred Spring	10/23	UF	DUP						< 3.09						294
Sacred Spring	10/23	F	CS	< 2.29	< 1.62	< 0.743	< 0.14	< 0.111		< 2.4	434	< 0.17	9.15	< 1.46	
Sacred Spring	10/23	UF	CS						< 3.09						3.2
Canyon Alluvial Groundwater Systems															
Acid/Pueblo Canyons:															
APCO-1	4/3	UF	CS	1440	< 2.78	8.25	< 2.77	< 0.168	< 3.09	< 2.4	171	< 0.471	< 4.55	25.6	3.2
APCO-1	4/3	UF	DUP	1410	< 3.28	8.64	< 1.83	< 0.181	< 3.09	< 2.4	167	< 0.119	< 4.34	26.6	
APCO-1	4/3	F	CS	1510	< 2.64	6.51	< 3.44	< 0.111	< 3.09	< 2.4	169	< 0.158	< 4.5	15.6	
DP/Los Alamos Canyons:															
LAO-C	4/3	UF	CS	21	< 0.594	< 0.929	< 2.64	< 0.188	< 3.09	< 2.4	104	0.626	< 1.74	5.12	< 1.4
LAO-C	4/3	F	CS	< 9.14	< 0.594	< 0.941	< 1.9	< 0.268	< 3.09	< 2.4	105	< 0.124	< 2.43	7.76	
LAO-0.7	3/29	UF	CS	417	< 0.594	< 1.04	< 2.65	< 0.111	< 3.09	< 2.4	131	< 0.077	< 2.26	12.1	46.4
LAO-0.7	3/29	UF	DUP												42.2
LAO-0.7	3/29	F	CS	64.7	< 0.594	< 0.743	< 3.44	< 0.111	< 3.09	< 2.4	136	0.683	< 0.9	10.1	
LAO-0.7	3/29	F	DUP	64.9	< 0.594	< 0.743	< 3.44	< 0.111	< 3.09	< 2.4	137	< 0.121	< 1.14	< 3.52	
LAO-1	4/5	UF	CS	< 2.99	11.6	< 0.743	< 3.44	< 0.111	< 3.09	< 2.4	174	< 0.014	< 1.86	< 2.58	2.8
LAO-1	4/5	F	CS	< 0.375	12.1	< 0.743	< 3.44	< 0.111	< 3.09	< 2.4	174	< 0.014	< 1.89	< 0.936	
LAO-1	4/5	F	DUP	< 0.416	11.3	< 0.743	< 3.44		< 3.39	< 2.4	177		< 1.42	< 1.28	
DP Spring	4/3	F	CS	< 2.94	< 1.43	< 0.743	< 1.53	< 0.267	< 3.09	< 2.4	197	< 0.014	< 2.09	< 1.64	
DP Spring	4/3	UF	CS	< 0.636	< 0.594	< 0.743	< 1.56	< 0.245	< 3.09	< 2.4	197	< 0.235	< 2.19	< 2.36	1.6
LAO-2	3/29	UF	CS	< 3.91	228	< 0.743	< 1.62	< 0.173	< 3.09	< 2.4	187	< 0.077	< 1.25	< 4.66	< 0.699
LAO-2	3/29	F	CS	< 2.89	232	< 0.743	< 2.45	< 0.237	< 3.09	< 2.4	186	< 0.129	< 1.02	< 4.89	
LAO-3A	3/28	UF	CS	< 1.06	706	< 0.743	< 3.44	< 0.111	< 3.09	< 2.4	178	< 0.077	< 2.46	< 2	1.4
LAO-3A	3/28	F	CS	< 7.96	745	< 0.743	< 2.2	< 0.176	< 3.09	< 2.4	187	< 0.086	< 2.66	< 2.78	

Table 5-26. Trace Metals in Groundwater for 2001 (µg/L) (Cont.)

Station	Date	Codes[a]		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn	TSS (mg/L)
Canyon Alluvial Groundwater Systems (Cont.)															
DP/Los Alamos Canyons: (Cont.)															
LAO-3A	3/28	F	CS	< 0.712	736	< 0.743	< 3.44	< 0.111	< 3.09	< 2.4	186	< 0.077	< 2.67	< 4.76	
LAO-3A	3/28	UF	CS		719	< 0.743	< 3.44	< 0.157	< 3.09	< 2.4	181	< 0.077	< 2.52	9.84	< 0.699
LAO-4	4/5	UF	CS	< 0.393	319	< 0.743	< 3.44	< 0.206	< 3.09	< 2.4	136	< 0.014	< 1.24	< 2.9	< 1.4
LAO-4	4/5	F	CS	< 0.392	318	< 0.743	< 3.44	< 0.213	< 3.09	< 2.4	135	< 0.014	< 1.5	< 1.72	
LAO-4.5C	3/28	UF	CS	< 0.932	20.1	< 0.743	< 1.63	< 0.111	< 3.09	< 2.4	117	< 0.077	< 0.784	< 4.33	0.889
LAO-4.5C	3/28	F	CS	40.6	19.5	< 0.743	< 1.93	< 0.111	< 3.09	< 2.4	113	< 0.077	< 0.765	< 3.79	
LAO-6A	3/28	UF	CS	< 1.44	< 8.61	< 0.743	< 1.9	< 0.111	< 3.09	< 2.4	110	< 0.077	< 0.93	< 3.73	< 0.699
LAO-6A	3/28	F	CS	< 0.362	< 8.57	< 0.743	< 3.44	< 0.111	< 3.09	< 2.4	112	< 0.077	< 0.926	< 3.68	
Mortandad Canyon:															
MCO-3	7/31	UF	CS	< 0.812	57.1	7.03	< 0.15	< 0.685	< 3.49	< 1.94	97.7	< 0.244	< 2	8.8	< 0.647
MCO-3	7/31	F	CS	< 0.437	55.2	7.04	< 0.051	< 0.665	< 3.49	< 1.94	97.6	< 0.232	< 1.92	7.96	
MCO-5	8/2	UF	CS	< 0.369	75	5.49	< 0.159	< 0.373	< 3.49	< 1.94	134	< 0.06	< 0.99	9.13	0.943
MCO-5	8/2	UF	DUP		76.1	< 4.51	< 0.213	< 0.294		< 2.75	134		< 2.14	9.05	
MCO-5	8/2	F	CS	< 0.369	74.6	< 4.81	< 0.135	< 0.233	< 3.49	< 1.94	135	< 0.021	< 0.904	9.92	
MCO-6	8/6	F	CS	< 0.486	87.7	6.37	< 0.077	< 0.248	< 3.09	< 2.4	137	< 0.014	< 1.03	14.7	
MCO-7	8/7	F	CS	< 2.94	92.1	7.38	< 0.077	< 0.111	< 3.09	< 2.4	127	< 0.014	< 1.92	< 4.18	
MCO-7.5	8/7	UF	DUP	< 1.52	90.1	7.34	< 0.077	< 0.102	< 3.09	< 2.4	127	< 0.014	< 2.05	< 2.71	
MCO-7.5	8/7	F	CS	< 0.577	108	5.74	< 0.077	< 0.067	< 3.09	< 2.4	121	< 0.014	< 2.97	< 4.71	
Cañada del Buey:															
CDBO-6	5/1	F	CS	< 5.91	< 1.28	7.98	< 1.47	< 0.153	< 2.93	< 2.31	81.6	0.576	5.98	13	
CDBO-6	5/1	F	DUP	< 6.05	< 1.29	8.32	7.52		< 2.93	< 2.31	83.4		6.04	12.6	
CDBO-6	5/1	UF	CS	31.3	< 1.48	< 2.84	< 2.03	< 0.203	< 2.93	< 2.31	86.3	< 0.352	10.5	18.3	25.6
CDBO-6	5/1	UF	DUP					< 0.153				< 0.156			28
CDBO-6	11/7	F	CS	< 9.96			3.32		< 4.31					10.8	
CDBO-6	11/7	F	DUP	< 9.9			3.35		< 3.8					10.2	
Pajarito Canyon:															
PCO-1	4/10	F	CS	< 3.2	< 1.28	< 0.815	< 1.47	< 0.153	< 2.93	< 2.31	255	0.588	< 1.55	< 3.38	
PCO-1	4/10	UF	CS	< 5.58	< 1.28	< 0.815	< 1.47	< 0.153	< 2.93	< 2.31	254	< 0.148	< 1.82	< 3.51	1.8
PCO-1	4/10	UF	DUP	< 5.63	< 1.28	< 0.815	< 2.53	< 0.153	< 2.93	< 2.31	260	< 0.077	< 1.72	< 3.95	
PCO-1	4/10	F	CS	< 4.12	< 1.28	< 0.815	< 1.47	< 0.193	< 2.93	< 2.31	255	< 0.077	< 1.72	9.59	
PCO-1	4/10	UF	CS	< 4.5	< 1.28	< 0.815	< 2.11	< 0.153	< 2.93	< 2.31	263	< 0.077	< 1.86	< 4.24	1
PCO-1	4/10	UF	DUP												1.2
PCO-3	4/10	F	CS	1,550	< 5.99	6.1	< 1.47	< 0.237	< 2.93	< 2.31	463	< 0.182	< 2.24	< 0.72	
PCO-3	4/10	UF	CS	1,700	< 6.88	6.79	< 1.47	< 0.285	< 2.93	< 2.31	475	< 0.077	< 2.28	< 2.02	1.52
PCO-3	4/10	UF	DUP												1.82
PCO-3	4/10	UF	TRP												1.82

Table 5-26. Trace Metals in Groundwater for 2001 (μg/L) (Cont.)

Station	Date	Codes[a]		Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Tl	V	Zn	TSS (mg/L)
Intermediate Perched Groundwater Systems															
Pueblo/Los Alamos/Sanda Canyon Area Perched System in Conglomerates and Basalt:															
POI-4															
Test Well 2A	8/1	UF	CS	< 0.369	< 3.19	9.93	< 0.011	< 0.283	< 3.49	< 1.94	216	< 0.039	< 4.07	< 2.33	0.5
Basalt Spring	7/30	UF	CS	514	< 1.28	< 1.8	3.57	< 0.086	< 3.49	< 1.94	203	< 0.021	< 0.482	20,800	
Basalt Spring	10/23	F	CS	15.4	< 7.15	9.89	< 0.35	< 0.11		< 2.4	229	< 0.22	7.06	< 3.58	
	10/23	UF	CS						< 3.09						26
Perched Groundwater System in Volcanics:															
Water Canyon Gallery															
Water Canyon Gallery	11/29	F	CS	< 3.63	< 1.45	< 0.743	< 0.077	< 0.09		< 2.4	42	< 0.014	< 2.79	< 2.49	
Water Canyon Gallery	11/29	F	DUP	< 1.41	< 0.594	< 4.22	< 0.077	< 0.08	< 3.09	< 2.4	42.7	< 0.014	< 2.85	< 3.33	
Water Canyon Gallery	11/29	UF	CS						< 3.09						16
	11/29	UF	DUP												17.2
San Ildefonso Pueblo															
LA-5															
Eastside Artesian Well	6/19	UF	CS	< 0.615	< 1.42	< 0.815	< 0.037	< 0.153	< 2.93	< 2.31	201	< 0.077	13.8	21.4	< 0.699
Pajarito Well (Pump 1)	6/20	UF	CS	10.4	< 5.93	< 0.815	< 0.037	< 0.153	< 2.97	< 2.31	47.9	< 0.077	< 0.638	11.4	< 0.699
Pajarito Well (Pump 1)	6/19	UF	CS	< 0.338	10.2	< 0.815	< 0.28	< 0.153	< 4.11	< 2.31	1010	< 0.077	17.2	6.58	< 0.699
Pajarito Well (Pump 1)	6/19	UF	DUP												
Don Juan Playhouse Well	6/19	UF	CS	< 0.338	< 9.08	< 0.815	< 0.25	< 0.153	< 2.93	< 2.31	1010	< 0.077	16.9	7.61	< 0.699
Martinez House Well	6/20	UF	CS	< 0.338	< 3.27	< 0.815	< 0.037	< 0.153	< 3.15	< 2.31	90	< 0.077	17.5	< 1.4	< 0.699
Martinez House Well	12/4	UF	CS	< 2.94	< 4.73	< 0.743	< 0.4	< 0.1	< 3.09	< 2.4	470	< 0.014	21.7	50.1	< 1.4
Otowi House Well	12/4	UF	DUP	< 2.94	< 3.96	< 0.743			< 3.09	< 2.4	477		22.1	50.9	< 1.4
Otowi House Well	6/19	UF	CS	< 1	< 1.28	< 0.815	< 0.72	< 0.76	< 2.93	< 2.31	766	< 0.077	6.36	46.7	< 0.699
New Community Well	6/19	UF	DUP	< 1.02	< 1.28	< 0.815	< 0.81	< 0.2	5.29	< 2.31	765	< 0.077	6.48	47.1	< 0.699
	6/19	UF	CS	< 0.338	< 1.28	< 0.815	< 0.25	< 0.153	< 2.93	< 2.31	216	< 0.077	5.73	7.59	< 0.699
Water Quality Standards[c]															
EPA Primary Drinking Water Standard															
EPA Secondary Drinking Water Standard						100		6	50			2			
EPA Action Level				50										5,000	
EPA Health Advisory							15								
NMWQCC Livestock Watering Standard											25,000-90,000		80-110		
NMWQCC Groundwater Limit							100		50				100	25,000	
NMWQCC Wildlife Habitat Standard				200	1,000	200	50		50					10,000	
									5						

[a]Codes: UF-unfiltered; F-filtered; CS-customer sample; DUP-laboratory duplicate.

[b]Less than symbol (<) means measurement was below the specified limit of detection of the analytical method.

[c]Standards given here for comparison only; see Appendix A. Note that New Mexico Livestock Watering and Groundwater limitsare based on dissolved concentrations, whereas many of these analyses are of unfiltered sample; thus, concentrations may include suspended sediment quantities.

Table 5-27. Number of Samples Collected for Each Suite of Organic Compounds in Groundwater in 2001

		Organic Suite[a]				
Station Name	**Date**	**Herbicide**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Regional Aquifer Wells						
Test Wells:						
Test Well 1	06/05		1			
Test Well 3	10/04		1			
Test Well 4	10/04		1			
Test Well 8	06/04			1	1	1
Test Well 8	06/04			1	1	1
Test Well 8	10/04		1			
Test Well 8	10/05		1			
Test Well DT-5A	06/06		1			
Test Well DT-9	06/07		1			
Test Well DT-10	06/06		1			
Water Supply Wells:						
O-1	02/14		1			
O-1	02/14		1			
O-1	05/09		1			
O-1	05/09		1			
O-1	09/05	1		1	1	2
O-1	09/05	1		1	1	1
O-4	02/14		1			
O-4	05/09		1			
PM-1	02/14		1			
PM-1	05/09		1			
PM-1	05/09		1			
PM-2	02/14		1			
PM-2	05/09		1			
PM-2	09/05		1			
PM-2	11/28		2			
PM-3	05/09		1			
PM-4	02/14		1			
PM-4	05/09		1			
PM-4	09/05		1			
PM-4	11/28		1			
PM-5	02/14		1			
PM-5	05/09		1			
PM-5	09/05		1			
PM-5	09/05		1			
PM-5	11/28		1			
G-1A	02/14		1			
G-1A	05/09		1			
G-2A	05/09		1			
G-3A	02/14		1			
G-3A	05/09		1			
G-4A	02/14		1			
G-4A	05/09		1			
G-5A	09/05		1			

Table 5-27. Number of Samples Collected for Each Suite of Organic Compounds in Groundwater in 2001 (Cont.)

		Organic Suite[a]				
Station Name	**Date**	**Herbicide**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Regional Aquifer Springs						
White Rock Canyon Group I:						
Sandia Spring	09/24		2	2	2	2
Spring 3	09/24			2	2	2
Spring 3	09/24			1	1	1
Spring 4	09/24					1
Spring 4	09/24		1	2	2	2
Spring 4A	09/25		1	1	1	1
Spring 5	09/25		1	1	1	1
White Rock Canyon Group II:						
Ancho Spring	10/24		1	1	1	2
Spring 6A	09/25		1	1	1	1
Spring 7	09/25					1
Spring 9	09/25		1	1	1	1
White Rock Canyon Group III:						
Spring 1	09/24			1	1	1
Spring 2	09/24			1	1	1
White Rock Canyon Group IV:						
La Mesita Spring	10/23			1	1	1
Other Springs:						
Sacred Spring	10/23					1
Sacred Spring	10/23			1	1	1
Sacred Spring	10/23			1	1	1
Canyon Alluvial Groundwater Systems						
Acid/Pueblo Canyons:						
APCO-1	04/03			1	1	2
DP/Los Alamos Canyons:						
LAO-C	04/03			1	1	1
LAO-0.7	03/29			1	1	1
LAO-1	04/05			1	1	1
DP Spring	04/03			1	1	1
LAO-2	03/29			1	1	1
LAO-3A	03/28			1	1	1
LAO-3A	03/28			1	1	2
LAO-4	04/05			1	1	1
LAO-4.5C	03/28			1	1	1
LAO-6A	03/28			1	1	1

Table 5-27. Number of Samples Collected for Each Suite of Organic Compounds in Groundwater in 2001 (Cont.)

		Organic Suite[a]				
Station Name	**Date**	**Herbicide**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Canyon Alluvial Groundwater Systems						
Mortandad Canyon:						
MCO-3	07/31			1	1	1
MCO-5	08/02					1
MCO-5	08/02			1	1	1
MCO-6	08/06			1		
MCO-7	08/07			1		
MCO-7.5	08/07					1
MCO-7.5	08/07			1		
Cañada del Buey:						
CDBO-6	11/07				1	1
Pajarito Canyon:						
PCO-1	04/10		1	1	1	1
PCO-1	04/10		1	1	1	1
PCO-3	04/10		1	1	1	1
Intermediate Perched Groundwater Systems						
Pueblo/Los Alamos/Sandia Canyon Area Perched System in Conglomerates and Basalt:						
POI-4	08/01		1	1	1	1
Test Well 2A	07/30		1	1	1	1
Basalt Spring	10/23			1	1	1
Perched Groundwater System in Volcanics:						
Water Canyon Gallery	11/29					1
Water Canyon Gallery	11/29			1	1	1
San Ildefonso Pueblo:						
Don Juan Playhouse Well	06/19					1
Martinez House Well	12/04					1
Martinez House Well	12/04			1	1	1
Otowi House Well	06/19			1	1	1
Santa Fe Water Supply Wells						
Buckman 1	08/16		2			
Buckman 1	10/31		1			
Buckman 2	08/16		1			
Buckman 2	10/31		1			
Buckman 3	10/31		1			
Buckman 4	10/31		1			
Buckman 6	10/31		1			
Buckman 7	08/16		1			
Buckman 7	10/31		1			
Buckman 8	10/31		2			

Table 5-27. Number of Samples Collected for Each Suite of Organic Compounds in Groundwater in 2001 (Cont.)

		Organic Suite[a]				
Station Name	**Date**	**Herbicide**	**HE**	**PCB**	**Semivolatile**	**Volatile**
Quality Assurance Samples						
DI Blank	4/10/01					1
DI Blank	6/4/01					1
DI Blank	6/6/01		1	1	1	1
DI Blank	8/3/01			1	1	1
DI Blank	10/24/01		1	1	1	1
Organics Trip Blank	11/7/01					1

[a]Herbicides, high explosives, polychlorinated biphenyls, semivolatiles, and volatiles.

Table 5-28. Organic Compounds Detected in Groundwater in 2001 (μg/L)

Station Name	Field QC Sample Date	Type Code[a]	Lab Field Prep[b]	Sample Type	Dilution Factor	Suite[c]	Analyte	Result	Lab Qualifier Code[d]	Valid Flag Code[d]	EPA Tap Screen Level[e]	Result/ Screening Level
Test Well 8	06/04	FB	UF	CS	1	VOA	Butanone[2-]	5.3			1,904.34	0
Spring 3	09/24	FB	UF	CS	1	VOA	Butanone[2-]	8.4			1,904.34	0
LAO-3A	03/28		UF	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	1		J-	4.8	0.21
PCO-3	04/10		UF	CS	1	SVOA	Bis(2-ethylhexyl)phthalate	1.4			4.8	0.29
Otowi House Well	06/19		UF	CS	1	VOA	Trichloroethane[1,1,1-]	1.2			792.24	0

[a]FTB–trip blank; FD–field duplicate; FB–field blank; PEB–performance evaluation blank.
[b]Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.
[c]SVOA–semivolatile organics; VOA–volatile organics.
[d]For Lab Qualifier and Validation Flag Codes, see Table 5-4.
[e]EPA Region VI values *http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm*.

Table 5-29. Quality Assurance Sample Results for Radiochemical Analysis by GEL of Water Samples in 2001[a] (pCi/L)

Matrix[b]	Station Name	Date	Field QC Type[c]	Codes[d]	^{3}H			^{90}Sr			^{137}Cs			^{234}U			$^{235,236}U$		
					Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
WG	DI Blank	02/14	PEB	UF CS				–0.316	0.109	0.416									
WM	Los Alamos above Ice Rink	03/15	FB	UF CS				0.138	0.076	0.247	–1.47	0.66	2.03	0.0361	0.0231	0.0964	–0.0095	0.0055	0.1410
WM	Los Alamos above Ice Rink	03/15	FB	UF CS	–145	49	180	0.235	0.083	0.268	0.59	0.84	2.96	0.0205	0.0143	0.0625	0.0073	0.0134	0.0811
WM	DI Blank	04/04	PEB	UF CS	–29	53	180	0.083	0.069	0.233	3.00	1.37	4.87	0.0202	0.0112	0.0347	0.0142	0.0083	0.0128
WS	Jemez River	04/18	FB	UF CS	–167	50	184	0.222	0.079	0.251	1.51	1.09	3.84	–0.0102	0.0100	0.0623	0.0037	0.0095	0.0477
WM	Pajarito above SR-4	05/02	FB	UF CS				–0.034	0.059	0.205	–0.29	1.35	4.70	0.0501	0.0228	0.0879	0.0202	0.0117	0.0182
WM	Pajarito above SR-4	05/02	FB	UF DUP								3.36	2.85	5.36					
WM	Pajarito above SR-4	05/02	FB	UF CS	–142	52	187	–0.066	0.071	0.247	3.14	1.10	4.12	0.0187	0.0085	0.0260	0.0160	0.0080	0.0261
WG	PM-1	05/09	FB	UF CS	–115	55	195	–0.040	0.073	0.249	0.95	0.81	3.05	0.0718	0.0272	0.0760	0.0240	0.0160	0.0517
WG	PM-1	05/09	FB	UF DUP				0.046	0.042	0.137									
WG	Test Well 8	06/04	FB	UF CS	–26	44		0.045	0.042		0.09	1.05	3.68	0.0245	0.0087	0.0194	–0.0038	0.0027	0.0246
WG	DI Blank	06/06	PEB	UF CS	–26	44		0.057	0.048		1.18	0.85	3.22	0.0165	0.0107	0.0418	0.0056	0.0071	0.0318
WG	DI Blank	06/20	PEB	UF CS	–26	47	159	0.293	0.126	0.444	0.61	0.75	2.87	0.0142	0.0084	0.0290	0.0018	0.0055	0.0291
WG	DI Blank	06/20	PEB	UF DUP							–1.11	1.01	3.42						
WS	DI Blank	07/17	PEB	UF CS	0	50	168	0.102	0.090	0.241	–0.78	1.91	6.74	0.0081	0.0057	0.0187	0.0000	0.0041	0.0188
WG	Test Well 3	07/30	FB	UF CS				0.068	0.050	0.156									
WG	DI Blank	08/03	PEB	UF CS	–79	49	169	0.140	0.061	0.181	1.41	1.31	4.89	–0.0024	0.0056	0.0333	0.0051	0.0066	0.0300
WG	DI Blank	08/07	PEB	UF CS				–0.049	0.058	0.158									
WG	Buckman 1	08/16	FB	UF CS				–0.044	0.066	0.181				–0.0073	0.0137	0.0579	–0.0110	0.0142	0.0610
WG	Spring 3	09/24	FB	UF CS				–0.050	0.095	0.370	0.31	0.70	2.44	0.0913	0.0274	0.0851	0.0070	0.0158	0.0960
WG	Spring 3	09/24	FB	UF CS	–136	52	184												
WS	Pajarito at Rio Grande	09/25	FB	UF CS	–84	55	188	0.120	0.069	0.222	0.78	0.87	2.93	0.0516	0.0210	0.0653	–0.0060	0.0160	0.0774
WG	DI Blank	10/24	PEB	UF CS				0.103	0.057	0.182	3.03	1.41	5.83	0.0136	0.0100	0.0398	0.0076	0.0063	0.0244
WG	DI Blank	10/24	PEB	UF CS	0	50	166												
WG	Test Well DT-10	11/14	FB	UF CS				–0.026	281.000	0.084									
Average of Blank Values					–75			0.049			0.96			0.0261			0.0051		
Standard Deviation of Blank Values					60			0.132			1.50			0.0280			0.0101		

Table 5-29. Quality Assurance Sample Results for Radiochemical Analysis by GEL of Water Samples in 2001[a] (pCi/L) (Cont.)

			Field QC		^{238}U			U-Total	^{238}U			^{239,240}Pu			^{241}AM		
Matrix[b]	Station Name	Date	Type[c]	Codes[d]	Result	Uncert	MDA	(ug/L)	Result	Uncert	MDA	Result	Uncert	MDA	Result	Uncert	MDA
WG	DI Blank	02/14	PEB	UF CS													
WM	Los Alamos above Ice Rink	03/15	FB	UF CS	–0.0131	0.0131	0.0355	<0.006	0.0140	0.0070	0.0095	0.0105	0.0061	0.0095	0.0444	0.0194	0.0515
WM	Los Alamos above Ice Rink	03/15	FB	UF CS	–0.0065	0.0046	0.0625	<0.004	0.0000	1.0000	0.0128	0.0000	0.0067	0.0346	0.0666	0.0189	0.0139
WM	DI Blank	04/04	PEB	UF CS	0.0107	0.0089	0.0347	<0.004	0.0000	1.0000	0.0348	0.0000	1.0000	0.0250	0.0120	0.0085	0.0163
WS	Jemez River	04/18	FB	UF CS	–0.0032	0.0032	0.0325		0.0910	0.0227	0.0145	0.0039	0.0039	0.0105	0.0000	1.0000	0.0250
WM	Pajarito above SR-4	05/02	FB	UF CS	0.0201	0.0117	0.0182	<0.004	0.0159	0.0093	0.0144	–0.0014	0.0071	0.0493	0.0375	0.0281	0.0921
WM	Pajarito above SR-4	05/02	FB	UF DUP													
WM	Pajarito above SR-4	05/02	FB	UF CS	0.0122	0.0066	0.0206	<0.004	0.0055	0.0039	0.0074	0.0010	0.0032	0.0201	–0.0051	0.0071	0.0475
WG	PM-1	05/09	FB	UF CS	0.0192	0.0118	0.0353		0.0102	0.0051	0.0069	0.0026	0.0026	0.0069	0.0121	0.0067	0.0207
WG	PM-1	05/09	FB	UF DUP													
WG	Test Well 8	06/04	FB	UF CS	0.0079	0.0046	0.0072		0.0246	0.0143	0.0222	-0.0059	0.0059	0.0435	0.0293	0.0148	0.0199
WG	DI Blank	06/06	PEB	UF CS	0.0101	0.0073	0.0284		–0.0072	0.0072	0.0527	0.0103	0.0103	0.0380	0.0135	0.0096	0.0184
WG	DI Blank	06/20	PEB	UF CS	0.0089	0.0080	0.0336		0.0059	0.0042	0.0080	0.0029	0.0029	0.0080	0.0103	0.0060	0.0093
WG	DI Blank	06/20	PEB	UF DUP													
WS	DI Blank	07/17	PEB	UF CS	–0.0020	0.0035	0.0187		0.0061	0.0101	0.0366	0.0040	0.0057	0.0217	0.0134	0.0054	0.0124
WG	Test Well 3	07/30	FB	UF CS													
WG	DI Blank	08/03	PEB	UF CS	0.0019	0.0079	0.0391		0.0000	1.0000	0.0128	0.0000	1.0000	0.0128	0.0110	0.0059	0.0163
WG	DI Blank	08/07	PEB	UF CS													
WG	Buckman 1	08/16	FB	UF CS	0.0073	0.0127	0.0478										
WG	Spring 3	09/24	FB	UF CS	–0.0051	0.0133	0.0958		0.0033	0.0033	0.0090	0.0133	0.0106	0.0359	0.0242	0.0087	0.0082
WG	Spring 3	09/24	FB	UF CS													
WS	Pajarito at Rio Grande	09/25	FB	UF CS	0.0276	0.0170	0.0607		–0.0098	0.0073	0.0393	–0.0131	0.0093	0.0461	0.0163	0.0082	0.0111
WG	DI Blank	10/24	PEB	UF CS	0.0184	0.0095	0.0308		0.0029	0.0050	0.0210	0.0086	0.0064	0.0210	0.0369	0.0107	0.0194
WG	DI Blank	10/24	PEB	UF CS													
WG	Test Well DT-10	11/14	FB	UF CS													
Average of Blank Values					0.0088				0.0108			0.0024			0.0215		
Standard Deviation of Blank Values					0.0099				0.0238			0.0067			0.0186		

Table 5-29. Quality Assurance Sample Results for Radiochemical Analysis by GEL of Water Samples in 2001[a] (pCi/L) (Cont.)

Matrix[b]	Station Name	Date	Field QC Type[c]	Codes[d]	Gross Alpha Result	Gross Alpha Uncert	Gross Alpha MDA	Gross Beta Result	Gross Beta Uncert	Gross Beta MDA
WG	DI Blank	02/14	PEB	UF CS						
WM	Los Alamos above Ice Rink	03/15	FB	UF CS	–0.4	0.3	1.1	0.9	0.6	2.1
WM	Los Alamos above Ice Rink	03/15	FB	UF CS	0.3	0.3	1.1	0.7	0.7	2.3
WM	DI Blank	04/04	PEB	UF CS	–0.2	0.4	1.7	13.0	1.5	3.0
WS	Jemez River	04/18	FB	UF CS	0.4	0.5	1.6	0.6	0.8	2.6
WM	Pajarito above SR-4	05/02	FB	UF CS	0.0	0.3	1.1	0.0	0.5	1.6
WM	Pajarito above SR-4	05/02	FB	UF DUP						
WM	Pajarito above SR-4	05/02	FB	UF CS	–0.2	0.4	1.9	–0.2	0.8	2.7
WG	PM-1	05/09	FB	UF CS	0.3	0.3	1.2	3.5	0.7	2.0
WG	PM-1	05/09	FB	UF DUP						
WG	Test Well 8	06/04	FB	UF CS	0.3	0.3		1.3	0.6	
WG	DI Blank	06/06	PEB	UF CS	–0.1	0.3		1.1	0.8	
WG	DI Blank	06/20	PEB	UF CS	0.2	0.3	1.1	–0.1	0.6	2.8
WG	DI Blank	06/20	PEB	UF DUP						
WS	DI Blank	07/17	PEB	UF CS	0.2	0.3	1.6	0.9	0.7	3.1
WG	Test Well 3	07/30	FB	UF CS						
WG	DI Blank	08/03	PEB	UF CS	–0.2	0.4	1.6	0.7	0.4	1.5
WG	DI Blank	08/07	PEB	UF CS						
WG	Buckman 1	08/16	FB	UF CS						
WG	Spring 3	09/24	FB	UF CS	–0.1	0.2	1.1	0.8	0.3	1.1
WG	Spring 3	09/24	FB	UF CS						
WS	Pajarito at Rio Grande	09/25	FB	UF CS	0.2	0.3	1.3	0.3	0.3	1.3
WG	DI Blank	10/24	PEB	UF CS	0.8	0.4	1.5	0.8	0.6	2.5
WG	DI Blank	10/24	PEB	UF CS						
WG	Test Well DT-10	11/14	FB	UF CS						
Average of Blank Values					0.1			1.6		
Standard Deviation of Blank Values					0.3			3.3		

[a]Three colums are listed: the first is the value; the second is the radioactive counting uncertainty (1 standard deviation); the third is the measurement-specific minimum detectable activity.
Radioactivity counting uncertainties may be less than analytical method uncertainties.

[b]Matrix with which QA sample was submitted; WG-groundwater, WM-snowmelt, WS-surface water.

[c]PEB-Performance Evaluation Blank; FB-Field Blank.

[d]Codes: F–filtered; UF–unfiltered; CS–customer sample; DUP–laboratory duplicate.

Table 5-30. Quality Assurance Sample Results for Chemical Quality Analysis of Water Samples in 2001 (mg/L)[a]

Matrix[b]	Station Name	Date	QC Type[c]	Code[d]		Analytical Laboratory[e]	SiO_2	Ca	Mg	K	Na	Cl	SO_4
WG	DI Blank	02/07	PEB	UF	CS	ESB							
WG	DI Blank	02/07	PEB	UF	CS	GEL							
WG	DI Blank	02/07	PEB	UF	CS	GEL						0.4	0.5
WG	O-1	02/14	FB	UF	CS	ESB							
WG	DI Blank	02/14	PEB	UF	CS	ESB							
WG	DI Blank	02/14	PEB	UF	CS	GEL							
WM	Los Alamos above Ice Rink	03/15	FB	UF	CS	GEL			< 0.01			0.2	< 0.1
WM	Los Alamos above Ice Rink	03/15	FB	UF	CS	GEL			< 0.01				
WM	DI Blank	04/04	PEB	UF	CS	GEL			< 0.02				
WS	Jemez River	04/18	FB	UF	CS	GEL							
WE	DI Blank	05/02	PEB	UF	CS	GEL							
WE	DI Blank	05/02	PEB	UF	CS	GEL						0.5	
WG	DI Blank	05/02	PEB	UF	CS	GEL							
WG	DI Blank	05/02	PEB	UF	CS	GEL						0.2	
WG	DI Blank	05/02	PEB	UF	DUP	GEL							
WM	Pajarito above SR-4	05/02	FB	UF	CS	GEL		< 0.03	0.03	< 0.03	< 0.02	0.2	< 0.1
WM	Pajarito above SR-4	05/02	FB	UF	CS	GEL			0.03				
WG	PM-1	05/09	FB	UF	CS	GEL							
WG	PM-1	05/09	FB	UF	CS	GEL	< 0.04	< 0.03	< 0.00	< 0.07	< 0.01	< 0.0	< 0.1
WG	PM-1	05/09	FB	UF	DUP	GEL							
WG	MCO-7	05/24	FB	UF	CS	GEL							
WG	MCO-3	05/24	FB	UF	CS	GEL							
WG	MCO-3	05/24	FB	UF	DUP	GEL							
WG	MCO-3	05/24	FB	UF	CS	GEL							
WG	Test Well 8	06/04	FB	UF	CS	GEL							
WG	Test Well 8	06/04	FB	UF	CS	GEL	0.32	< 0.04	0.04	< 0.02	0.12	0.2	0.3
WG	DI Blank	06/06	PEB	UF	CS	GEL							
WG	DI Blank	06/06	PEB	UF	CS	GEL	0.33	< 0.03	0.03	< 0.02	0.11	0.2	< 0.1
WG	DI Blank	06/13	PEB	UF	CS	GEL							
WG	DI Blank	06/20	PEB	UF	CS	GEL							
WG	DI Blank	06/20	PEB	UF	CS	GEL	1.02	< 0.04	0.05	< 0.01	< 0.06	0.2	0.3
WS	DI Blank	07/17	PEB	UF	CS	GEL							
WS	DI Blank	07/17	PEB	UF	CS	GEL	0.46	< 0.04	< 0.01	< 0.02	0.15	< 0.0	< 0.1
WS	DI Blank	07/17	PEB	UF	CS	GEL							

Table 5-30. Quality Assurance Sample Results for Chemical Quality Analysis of Water Samples in 2001 (mg/L)[a] (Cont.)

Matrix[b]	Station Name	Date	QC Type[c]	Code[d]		Analytical Laboratory[e]	SiO_2	Ca	Mg	K	Na	Cl	SO_4
WG	DI Blank	08/03	PEB	UF	CS	GEL		< 0.03					
WG	DI Blank	08/03	PEB	UF	DUP	GEL							
WG	DI Blank	08/07	PEB	UF	CS	GEL							
WG	Buckman 1	08/16	FB	UF	CS	ESB							
WG	Buckman 1	08/16	FB	UF	CS	GEL							
WG	DI Blank	09/07	PEB	UF	CS	GEL							
WG	Spring 3	09/24	FB	UF	CS	GEL	< 0.02	< 0.04	< 0.01	< 0.01	< 0.01	< 0.0	< 0.1
WG	Spring 3	09/24	FB	UF	CS	GEL							
WS	Pajarito at Rio Grande	09/25	FB	UF	CS	GEL	< 0.08	< 0.03	< 0.01	< 0.01	< 0.01	0.2	< 0.1
WS	Pajarito at Rio Grande	09/25	FB	UF	CS	GEL							
WG	DI Blank	10/24	PEB	UF	CS	GEL	0.58	< 0.04	< 0.00	< 0.01	0.10	< 0.0	< 0.1
WG	DI Blank	10/24	PEB	UF	CS	GEL							
WS	SCS-1	11/27	FB	UF	CS	GEL							
WG	DI Blank	11/27	PEB	UF	CS	ESB							

Table 5-30. Quality Assurance Sample Results for Chemical Quality Analysis of Water Samples in 2001 (mg/L)[a] (Cont.)

Matrix[b]	Station Name	Date	QC Type[c]	Code[d]	Analytical Laboratory[e]	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N	ClO_4 (µg/L)	CN (Amenable)
WG	DI Blank	02/07	PEB	UF CS	ESB						< 1.000	
WG	DI Blank	02/07	PEB	UF CS	GEL							
WG	DI Blank	02/07	PEB	UF CS	GEL					< 0.01		
WG	O-1	02/14	FB	UF CS	ESB						< 1.200	
WG	DI Blank	02/14	PEB	UF CS	ESB						1.500	
WG	DI Blank	02/14	PEB	UF CS	GEL						< 0.960	
WM	Los Alamos above Ice Rink	03/15	FB	UF CS	GEL	< 1	< 0.7					
WM	Los Alamos above Ice Rink	03/15	FB	UF CS	GEL				< 0.02	< 0.01	7.830	< 0.000
WM	DI Blank	04/04	PEB	UF CS	GEL				< 0.02	< 0.01	< 0.800	< 0.000
WS	Jemez River	04/18	FB	UF CS	GEL						< 0.800	
WE	DI Blank	05/02	PEB	UF CS	GEL							
WE	DI Blank	05/02	PEB	UF CS	GEL					0.02		
WG	DI Blank	05/02	PEB	UF CS	GEL							
WG	DI Blank	05/02	PEB	UF CS	GEL					0.02		
WG	DI Blank	05/02	PEB	UF DUP	GEL					0.02		
WM	Pajarito above SR-4	05/02	FB	UF CS	GEL	< 1	1.5					
WM	Pajarito above SR-4	05/02	FB	UF CS	GEL				< 0.02	0.02	1.270	< 0.000
WG	PM-1	05/09	FB	UF CS	GEL							
WG	PM-1	05/09	FB	UF CS	GEL	< 1	1.5	0.04	< 0.02	0.01	< 0.960	
WG	PM-1	05/09	FB	UF DUP	GEL				< 0.02			
WG	MCO-7	05/24	FB	UF CS	GEL						3.030	
WG	MCO-3	05/24	FB	UF CS	GEL			0.03		20		
WG	MCO-3	05/24	FB	UF DUP	GEL							
WG	MCO-3	05/24	FB	UF CS	GEL						3.360	
WG	Test Well 8	06/04	FB	UF CS	GEL							
WG	Test Well 8	06/04	FB	UF CS	GEL	< 1	0.9	0.03	0.04	0.01	< 0.960	
WG	DI Blank	06/06	PEB	UF CS	GEL							
WG	DI Blank	06/06	PEB	UF CS	GEL	< 1	1.9	0.04	0.04	0.01	< 0.960	
WG	DI Blank	06/13	PEB	UF CS	GEL						< 0.960	
WG	DI Blank	06/20	PEB	UF CS	GEL							
WG	DI Blank	06/20	PEB	UF CS	GEL	< 1	12.8	0.04	0.04	0.01	< 0.960	
WS	DI Blank	07/17	PEB	UF CS	GEL							
WS	DI Blank	07/17	PEB	UF CS	GEL	< 1	8.0	0.06	< 0.02	< 0.01		
WS	DI Blank	07/17	PEB	UF CS	GEL						< 0.960	

Table 5-30. Quality Assurance Sample Results for Chemical Quality Analysis of Water Samples in 2001 (mg/L)[a] (Cont.)

Matrix[b]	Station Name	Date	QC Type[c]	Code[d]		Analytical Laboratory[e]	CO_3 Alkalinity	Total Alkalinity	F	PO_4-P	NO_3+NO_2-N	ClO_4 (μg/L)	CN (Amenable)
WG	DI Blank	08/03	PEB	UF	CS	GEL						< 0.960	
WG	DI Blank	08/03	PEB	UF	DUP	GEL							
WG	DI Blank	08/07	PEB	UF	CS	GEL						< 0.960	
WG	Buckman 1	08/16	FB	UF	CS	ESB						< 2.170	
WG	Buckman 1	08/16	FB	UF	CS	GEL					1.2	< 0.960	
WG	DI Blank	09/07	PEB	UF	CS	GEL			0.02		< 0.01	< 0.960	
WG	Spring 3	09/24	FB	UF	CS	GEL	< 1	2.9	0.02	< 0.02	0.01		
WG	Spring 3	09/24	FB	UF	CS	GEL						< 0.960	
WS	Pajarito at Rio Grande	09/25	FB	UF	CS	GEL	< 1	17.4	0.02	< 0.02	0.01		
WS	Pajarito at Rio Grande	09/25	FB	UF	CS	GEL						< 0.960	
WG	DI Blank	10/24	PEB	UF	CS	GEL	< 1	17.9	0.02	< 0.02	0.01		
WG	DI Blank	10/24	PEB	UF	CS	GEL						< 0.960	
WS	SCS-1	11/27	FB	UF	CS	GEL						< 0.800	
WG	DI Blank	11/27	PEB	UF	CS	ESB						< 2.170	

Table 5-30. Quality Assurance Sample Results for Chemical Quality Analysis of Water Samples in 2001 (mg/L)[a] (Cont.)

Matrix[b]	Station Name	Date	QC Type[c]	Code[d]		Analytical Laboratory[e]	CN (Total)	TDS[f]	TSS[g]	Hardness (as $CaCO_3$)	Lab pH[h]	Conductance (uS/cm)
WG	DI Blank	02/07	PEB	UF	CS	ESB						
WG	DI Blank	02/07	PEB	UF	CS	GEL		118				
WG	DI Blank	02/07	PEB	UF	CS	GEL						4.11
WG	O-1	02/14	FB	UF	CS	ESB						
WG	DI Blank	02/14	PEB	UF	CS	ESB						
WG	DI Blank	02/14	PEB	UF	CS	GEL						
WM	Los Alamos above Ice Rink	03/15	FB	UF	CS	GEL		< 5			5	
WM	Los Alamos above Ice Rink	03/15	FB	UF	CS	GEL	< 0.003		< 0.9			17.6
WM	DI Blank	04/04	PEB	UF	CS	GEL	< 0.003		< 1.2			36.7
WS	Jemez River	04/18	FB	UF	CS	GEL	0.003		< 1.4			
WE	DI Blank	05/02	PEB	UF	CS	GEL		< 5				
WE	DI Blank	05/02	PEB	UF	CS	GEL						
WG	DI Blank	05/02	PEB	UF	CS	GEL		< 5				
WG	DI Blank	05/02	PEB	UF	CS	GEL						
WG	DI Blank	05/02	PEB	UF	DUP	GEL						
WM	Pajarito above SR-4	05/02	FB	UF	CS	GEL		< 5		0.2	6	
WM	Pajarito above SR-4	05/02	FB	UF	CS	GEL	< 0.003		< 1.0			11500
WG	PM-1	05/09	FB	UF	CS	GEL		< 5				
WG	PM-1	05/09	FB	UF	CS	GEL	< 0.003		< 0.7	< 0.1	6	101
WG	PM-1	05/09	FB	UF	DUP	GEL						
WG	MCO-7	05/24	FB	UF	CS	GEL						
WG	MCO-3	05/24	FB	UF	CS	GEL		29				
WG	MCO-3	05/24	FB	UF	DUP	GEL		33				
WG	MCO-3	05/24	FB	UF	CS	GEL						
WG	Test Well 8	06/04	FB	UF	CS	GEL		< 5				
WG	Test Well 8	06/04	FB	UF	CS	GEL	< 0.003		< 0.7	0.3	6	417
WG	DI Blank	06/06	PEB	UF	CS	GEL		< 5				
WG	DI Blank	06/06	PEB	UF	CS	GEL	< 0.003		< 0.7	0.2	6	4.93
WG	DI Blank	06/13	PEB	UF	CS	GEL						
WG	DI Blank	06/20	PEB	UF	CS	GEL		< 5				
WG	DI Blank	06/20	PEB	UF	CS	GEL	< 0.003		< 0.7	0.3	6	5.06
WS	DI Blank	07/17	PEB	UF	CS	GEL		< 5				
WS	DI Blank	07/17	PEB	UF	CS	GEL				0.1	8	122
WS	DI Blank	07/17	PEB	UF	CS	GEL	< 0.003		< 0.7			

Table 5-30. Quality Assurance Sample Results for Chemical Quality Analysis of Water Samples in 2001 (mg/L)[a] (Cont.)

Matrix[b]	Station Name	Date	QC Type[c]	Code[d]		Analytical Laboratory[e]	CN (Total)	TDS[f]	TSS[g]	Hardness (as $CaCO_3$)	Lab pH[h]	Conductance (uS/cm)
WG	DI Blank	08/03	PEB	UF	CS	GEL	< 0.003		< 0.7			
WG	DI Blank	08/03	PEB	UF	DUP	GEL	< 0.003					
WG	DI Blank	08/07	PEB	UF	CS	GEL						
WG	Buckman 1	08/16	FB	UF	CS	ESB						
WG	Buckman 1	08/16	FB	UF	CS	GEL						
WG	DI Blank	09/07	PEB	UF	CS	GEL		< 5				
WG	Spring 3	09/24	FB	UF	CS	GEL		< 5		< 0.1	6	4.22
WG	Spring 3	09/24	FB	UF	CS	GEL	< 0.003		< 0.6			
WS	Pajarito at Rio Grande	09/25	FB	UF	CS	GEL		< 5		< 0.1	6	2
WS	Pajarito at Rio Grande	09/25	FB	UF	CS	GEL	< 0.003		< 0.6			
WG	DI Blank	10/24	PEB	UF	CS	GEL		< 5		< 0.1	6	4.71
WG	DI Blank	10/24	PEB	UF	CS	GEL	< 0.003		< 0.7			
WS	SCS-1	11/27	FB	UF	CS	GEL						
WG	DI Blank	11/27	PEB	UF	CS	ESB						

[a]Except where otherwise noted.
[b]Matrix with which QA sample was submitted; WG-groundwater, WM-snowmelt, WS-surface water.
[c]PEB-Performance Evaluation Blank; FB-Field Blank.
[d]Codes: UF-unfiltered; F-filtered; CS-customer sample; DUP-laboratory duplicate; TRP-laboratory triplicate.
[e]Analytical Laboratory: GELC-General Engineering Laboratories, Inc; BABC-Edward S. Babcock and Sons, Inc.
[f]TDS=total dissolved solids.
[g]TSS=total suspended solids.
[h]Standard units.

Table 5-31. Quality Assurance Sample Results for Metals Analysis by GEL of Water Samples in 2001 (µg/L)

Matrix[a]	Station Name	Date	Codes[b]	QC Type[c]	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
WM	Los Alamos above Ice Rink	03/15	UF CS	FB	<0.3	<13	<3	<2	<0.5	0.47	<0.1	7.2	<1	8	<9	
WM	Los Alamos above Ice Rink	03/15	UF CS	FB	<0.3	<30	<3	<14	<0.2	0.24	<0.1	6.4	<1	7	<5	<0.07
WM	DI Blank	04/04	UF CS	PEB	<0.9	<38	<2	<9	<0.2	0.19	<0.1	<0.4	<1	<1	<10	<0.06
WS	Jemez River	04/18	UF CS	FB												<0.06
WM	Pajarito above SR-4	05/02	UF CS	FB	<0.9	42	<4	<10	<1.3	1.34	<0.1	<1.7	<1	<3	<8	<0.06
WM	Pajarito above SR-4	05/02	UF CS	FB	<0.9	63	<4	<22	<1.3	1.34	<0.1	<3.9	<1	<5	<13	<0.06
WG	Test Well 8	06/04	UF CS	FB	<0.9	<20	<2	<7	<0.6	<0.16	<0.1	<0.4	<1	6	<12	<0.06
WG	DI Blank	06/06	UF CS	PEB	<0.9	<26	<2	<11	<0.4	<0.16	<0.1	<0.4	<1	<4	<16	<0.06
WG	DI Blank	06/20	UF CS	PEB	<0.9	<42	<2	<14	<0.5	<0.16	<0.2	<0.4	<1	<3	<4	<0.06
WS	DI Blank	07/17	UF CS	PEB	<0.7	<10	<3	<7	<0.2	<0.21	<0.4	<0.7	<1	<1	<16	<0.06
WS	DI Blank	07/17	UF CS	PEB												<0.06
WG	DI Blank	08/03	UF CS	PEB	<0.7	<28	<3	<19	<0.4	<0.21	<0.02	6.7	<1	7[d]	<6	<0.06
WG	Spring 3	09/24	UF CS	FB	<0.2	<21	<5	<14	<0.4	<0.20	0.2	<0.3	9	<3	67	
WG	Spring 3	09/24	UF CS	FB												<0.07
WS	Pajarito at Rio Grande	09/25	UF CS	FB	<0.3	<27	<3	<7	<0.5	<0.25	<0.5	<0.9	<1	<2	<5	<0.07
WS	Pajarito at Rio Grande	09/25	UF CS	FB												<0.07
WG	DI Blank	10/24	UF CS	PEB	<0.2	<16	<3	<28	<0.3	<0.20	<0.3	<0.3	<1	<3	<3	
WG	DI Blank	10/24	UF CS	PEB												<0.07

Table 5-31. Quality Assurance Sample Results for Metals Analysis by GEL of Water Samples in 2001 (µg/L) (Cont.)

Matrix[a]	Station Name	Date	Codes[b]	QC Type[c]	Mn	Mo	Ni	Pb	Sb	Se	Sn	Sr	Ti	V	Zn
WM	Los Alamos above Ice Rink	03/15	UF CS	FB	<0	<2	<2	0.31	<0.11	<2	<4	<0.19	<0.01	<1.0	29
WM	Los Alamos above Ice Rink	03/15	UF CS	FB	<1	<2	<1	0.46	<0.11	<3	<4	<0.19	<0.10	<1.0	35
WM	DI Blank	04/04	UF CS	PEB	<1	<1	<1	0.08	<0.15	<3	<2	<0.16	<0.08	<0.6	38
WS	Jemez River	04/18	UF CS	FB						<3					
WM	Pajarito above SR-4	05/02	UF CS	FB	<1	<2	<1	<0.04	<0.15	<3	<3	<0.21	<0.08	<0.7	66
WM	Pajarito above SR-4	05/02	UF CS	FB	<1	<2	<2	<0.04	<0.15	<3	<3	<0.21	<0.08	<0.7	77
WG	Test Well 8	06/04	UF CS	FB	<2	<1	<1	<0.59	<0.15	<3	<2	<0.16	<0.08	<0.6	110
WG	DI Blank	06/06	UF CS	PEB	<1	<1	<1	<0.47	<0.15	<3	<3	<0.16	<0.08	<0.6	75
WG	DI Blank	06/20	UF CS	PEB	<2	<1	<1	<0.32	<0.15	<3	<2	<0.16	<0.08	<0.6	124
WS	DI Blank	07/17	UF CS	PEB	<0.4	<1	<1	<2.43	<0.42	<3	<2	<0.19	<0.36	<0.5	<3
WS	DI Blank	07/17	UF CS	PEB						<3					
WG	DI Blank	08/03	UF CS	PEB	<1	<1	<2	<0.64	<0.14	<3	<2	<0.19	<0.16	<0.5	50
WG	Spring 3	09/24	UF CS	FB	<1	<1	<1	<0.08	<0.11		<7		<0.01	<1.1	<3
WG	Spring 3	09/24	UF CS	FB						<3					
WS	Pajarito at Rio Grande	09/25	UF CS	FB	<0	<2	<1	<2.57	<0.11		<4	<0.19	<0.01	<1.0	<3
WS	Pajarito at Rio Grande	09/25	UF CS	FB						<2					
WG	DI Blank	10/24	UF CS	PEB	<3	<2	<1	<0.15	<0.11		<2	<0.17	<0.16	<1.1	<3
WG	DI Blank	10/24	UF CS	PEB						<3					

[a]Matrix with which QA sample was submitted; WG-groundwater, WM-snowmelt, WS-surface water.

[b]Codes: UF–unfiltered; F–filtered; CS–customer sample; DUP–laboratory duplicate.

[c]QC Type: PEB-Performance Evaluation Blank; FB-Field Blank.

[d]Reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).

Table 5-32. Radiological Detections in Quality Assurance Water Samples by GEL in 2001 (pCi/L)[a]

					^{241}Am			^{234}U			^{238}Pu			Gross Beta		
Matrix[b]	**Station Name**	**Date**	**QC Type[c]**	**Codes[d]**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**	**Result**	**Uncert**	**MDA**
WM	Los Alamos above Ice Rink	03/15	FB	UF CS	0.0666	0.0189	0.0139									
WM	DI Blank	04/04	PEB	UF CS										13.0	1.5	3.0
WS	Jemez River	04/18	FB	UF CS							0.0910	0.0227	0.0145			
WG	PM-1	05/09	FB	UF CS										3.5	0.7	2.0
WG	Spring 3	09/24	FB	UF CS				0.0913	0.0274	0.0851						
WG	DI Blank	10/24	PEB	UF CS	0.0369	0.0107	0.0194									

[a]Three colums are listed: the first is the value; the second is the radioactive counting uncertainty (1 standard deviation); the third is the minimum detectable activity. Radioactivity counting uncertainties may be less than analytical method uncertainties.
[b]Matrix with which QA sample was submitted; WG-groundwater, WM-snowmelt, WS-surface water.
[c]PEB-Performance Evaluation Blank; FB-Field Blank.
[d]Codes: UF–unfiltered; CS–customer sample.

Table 5-33. Chemical Quality Detections in Quality Assurance Water Samples in 2001 (mg/L)[a]

Matrix[b]	Station Name	Date	QC Type[c]	Codes[d]		Analytical Laboratory[e]	SiO_2	Mg	Na	Cl	SO_4	Total Alkalinity	F	PO_4-P
WG	DI Blank	02/07	PEB	UF	CS	GEL								
WG	DI Blank	02/07	PEB	UF	CS	GEL				0.4	0.53			
WG	DI Blank	02/14	PEB	UF	CS	ESB								
WM	Los Alamos above Ice Rink	03/15	FB	UF	CS	GEL				0.2				
WM	Los Alamos above Ice Rink	03/15	FB	UF	CS	GEL								
WM	DI Blank	04/04	PEB	UF	CS	GEL								
WS	Jemez River	04/18	FB	UF	CS	GEL								
WE	DI Blank	05/02	PEB	UF	CS	GEL				0.5				
WG	DI Blank	05/02	PEB	UF	CS	GEL				0.2				
WG	DI Blank	05/02	PEB	UF	DUP	GEL								
WM	Pajarito above SR-4	05/02	FB	UF	CS	GEL		0.03		0.2		1.5		
WM	Pajarito above SR-4	05/02	FB	UF	CS	GEL		0.03						
WG	PM-1	05/09	FB	UF	CS	GEL						1.5	0.04	
WG	MCO-7	05/24	FB	UF	CS	GEL								
WG	MCO-3	05/24	FB	UF	CS	GEL							0.03	
WG	MCO-3	05/24	FB	UF	DUP	GEL								
WG	MCO-3	05/24	FB	UF	CS	GEL								
WG	Test Well 8	06/04	FB	UF	CS	GEL	0.3	0.04	0.12	0.2	0.33	0.9	0.03	0.04
WG	DI Blank	06/06	PEB	UF	CS	GEL	0.3	0.03	0.11	0.2		1.9	0.04	0.04
WG	DI Blank	06/20	PEB	UF	CS	GEL	1.0	0.05		0.2	0.26	12.8	0.04	0.04
WS	DI Blank	07/17	PEB	UF	CS	GEL	0.5		0.15			8.0	0.06	
WG	Buckman 1	08/16	FB	UF	CS	GEL								
WG	DI Blank	09/07	PEB	UF	CS	GEL							0.02	
WG	Spring 3	09/24	FB	UF	CS	GEL						2.9	0.02	
WS	Pajarito at Rio Grande	09/25	FB	UF	CS	GEL				0.2		17.4	0.02	
WG	DI Blank	10/24	PEB	UF	CS	GEL	0.6		0.10			17.9	0.02	

.

Table 5-33. Chemical Quality Detections in Quality Assurance Water Samples in 2001 (mg/L)[a] (Cont.)

Matrix[b]	Station Name	Date	QC Type[c]	Codes[d]		Analytical Laboratory[e]	NO_3+ NO_2-N	ClO_4 (µg/L)	CN (Total)	TDS[f]	Hardness as ($CaCO_3$)	Lab pH[g]	Conductance (µS/cm)
WG	DI Blank	02/07	PEB	UF	CS	GEL				118			
WG	DI Blank	02/07	PEB	UF	CS	GEL							4
WG	DI Blank	02/14	PEB	UF	CS	ESB		1.5					
WM	Los Alamos above Ice Rink	03/15	FB	UF	CS	GEL						5.4	
WM	Los Alamos above Ice Rink	03/15	FB	UF	CS	GEL		7.8					18
WM	DI Blank	04/04	PEB	UF	CS	GEL							37
WS	Jemez River	04/18	FB	UF	CS	GEL			0.00				
WE	DI Blank	05/02	PEB	UF	CS	GEL	0.02						
WG	DI Blank	05/02	PEB	UF	CS	GEL	0.02						
WG	DI Blank	05/02	PEB	UF	DUP	GEL	0.02						
WM	Pajarito above SR-4	05/02	FB	UF	CS	GEL					0.2	5.7	
WM	Pajarito above SR-4	05/02	FB	UF	CS	GEL	0.02	1.3					11,500
WG	PM-1	05/09	FB	UF	CS	GEL	0.01					5.5	101
WG	MCO-7	05/24	FB	UF	CS	GEL		3.0					
WG	MCO-3	05/24	FB	UF	CS	GEL	20			29			
WG	MCO-3	05/24	FB	UF	DUP	GEL				33			
WG	MCO-3	05/24	FB	UF	CS	GEL		3.4					
WG	Test Well 8	06/04	FB	UF	CS	GEL	0.01				0.3	5.7	417
WG	DI Blank	06/06	PEB	UF	CS	GEL	0.01				0.2	6.0	5
WG	DI Blank	06/20	PEB	UF	CS	GEL	0.01				0.3	6.1	5
WS	DI Blank	07/17	PEB	UF	CS	GEL					0.1	8.4	122
WG	Buckman 1	08/16	FB	UF	CS	GEL	1.2						
WG	DI Blank	09/07	PEB	UF	CS	GEL							
WG	Spring 3	09/24	FB	UF	CS	GEL	0.01					5.8	4
WS	Pajarito at Rio Grande	09/25	FB	UF	CS	GEL	0.01					6.2	2
WG	DI Blank	10/24	PEB	UF	CS	GEL	0.01					6.0	5

[a]Unless otherwise noted.
[b]Matrix with which QA sample was submitted; WG-groundwater, WM-snowmelt, WS-surface water.
[c]PEB-Performance Evaluation Blank; FB-Field Blank.
[d]Codes: UF-unfiltered; F-filtered; CS-customer sample; DUP-laboratory duplicate.
[e]Analytical Laboratory; GEL-General Engineering Laboratories, ESB-Edward S. Babcock & Sons, Inc.
[f]TDS=total dissolved solids.
[g]Standard units.

Table 5-34. Trace Metal Detections in Quality Assurance Water Samples in 2001 (µg/L)

Matrix[a]	Station Name	Date	Code[b]		QC Type[c]	Analytical Laboratory[d]	Al	Co	Cr	Cu	Fe	Pb	Zn
WM	Los Alamos above Ice Rink	03/15	UF	CS	FB	GEL		7.2		8		0.3	29
WM	Los Alamos above Ice Rink	03/15	UF	CS	FB	GEL		6.4		7		0.5	35
WM	DI Blank	04/04	UF	CS	PEB	GEL							
WM	Pajarito above SR-4	05/02	UF	CS	FB	GEL	42						66
WM	Pajarito above SR-4	05/02	UF	CS	FB	GEL	63						77
WG	Test Well 8	06/04	UF	CS	FB	GEL				6			110
WG	DI Blank	06/06	UF	CS	PEB	GEL							75
WG	DI Blank	06/20	UF	CS	PEB	GEL							124
WG	DI Blank	08/03	UF	CS	PEB	GEL		6.7		7[e]			50
WG	Spring 3	09/24	UF	CS	FB	GEL			9		67		

[a]Matrix with which QA sample was submitted; WG-groundwater, WM-snowmelt.
[b]Codes: UF–unfiltered; F–filtered; CS–customer sample.
[c]QC Type: FB–field blank; PEB–performance evaluation blank.
[d]Analytical Laboratory; GEL-General Engineering Laboratories.
[e]Reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).

I. Figures

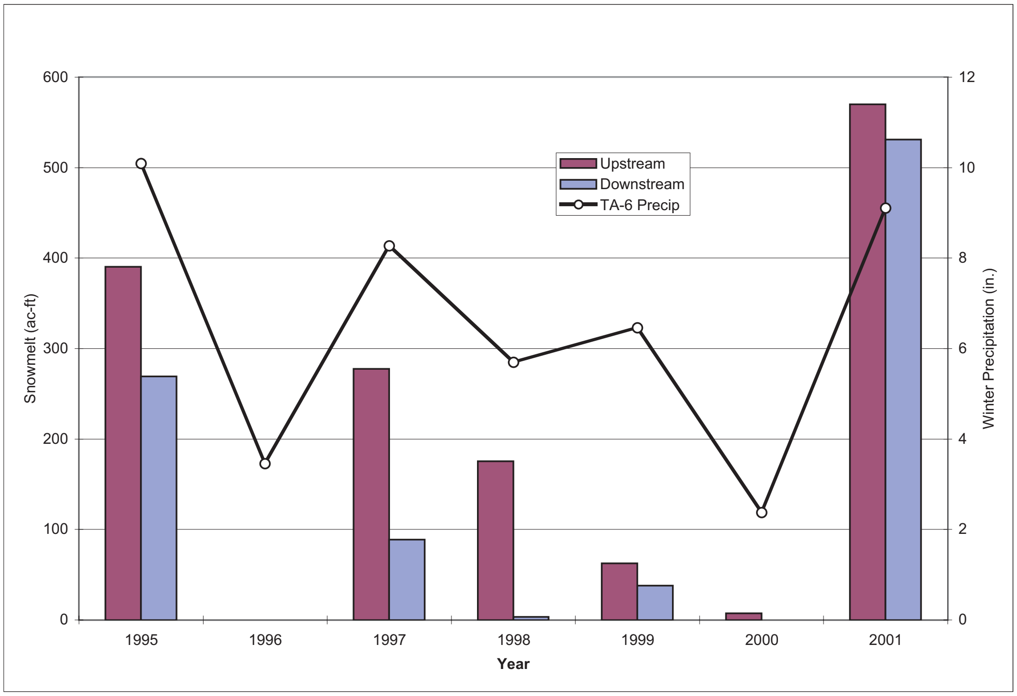


Figure 5-1. Annual snowmelt runoff at upstream and downstream LANL gages amd cumulative precipitaton for November through May.

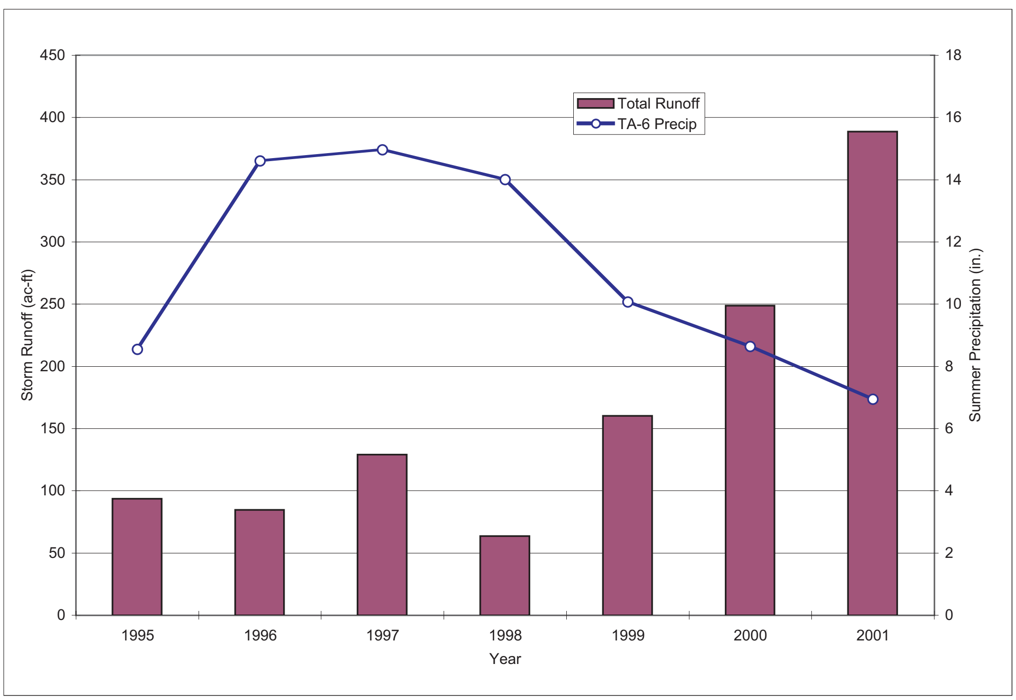


Figure 5-2. Annual seasonal precipitation (June through October) and storm runoff at downstream LANL gages.

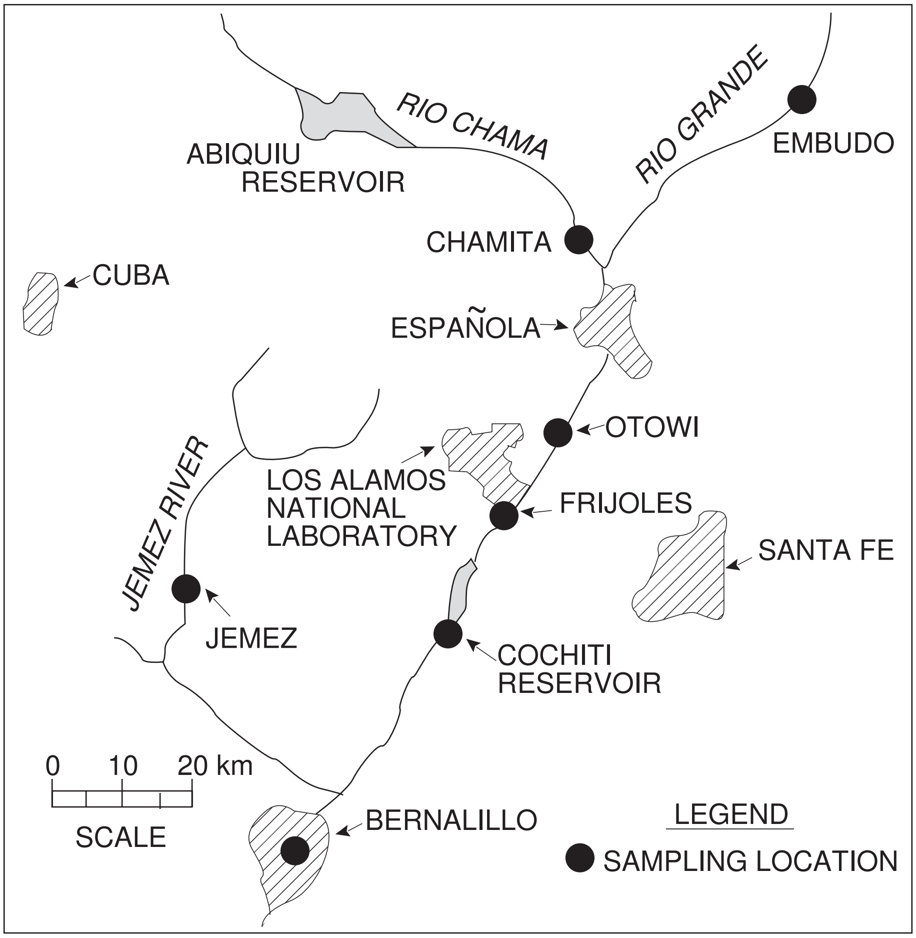


Figure 5-3. Regional base flow and sediment sampling locations.

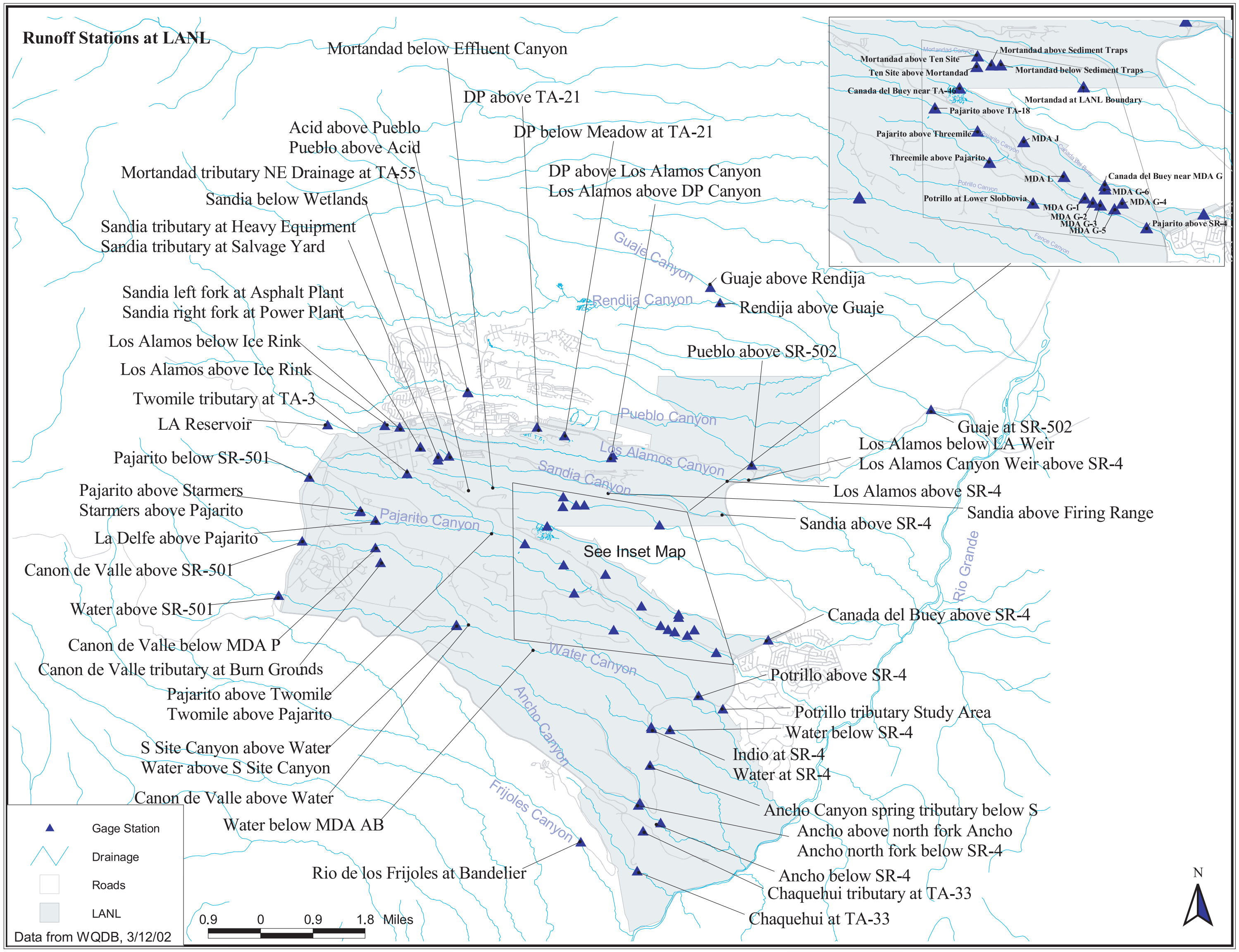


Figure 5-4. Storm runoff sampling (gaging) stations in the vicinity of Los Alamos National Laboratory.

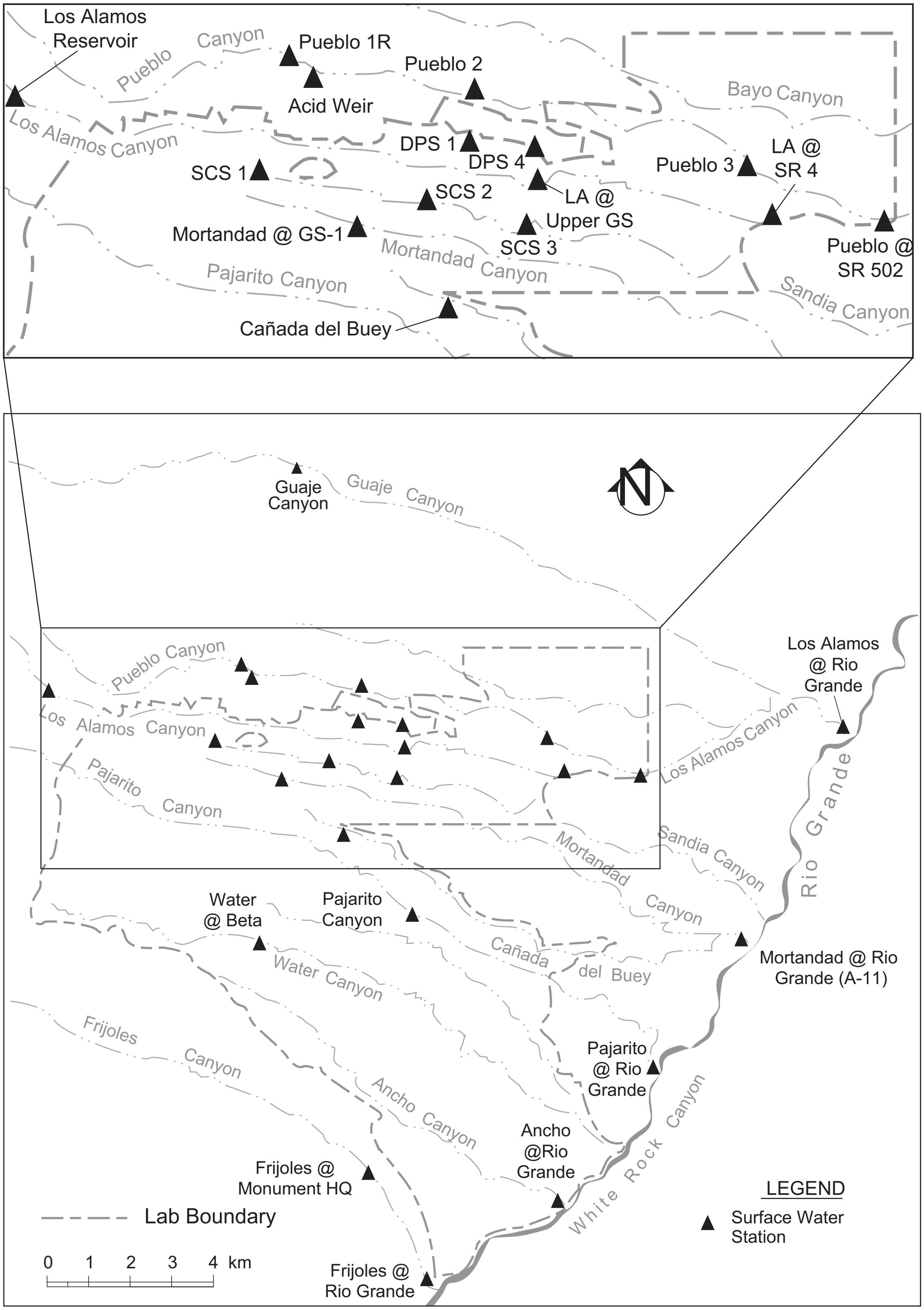


Figure 5-5. Base flow sampling locations in the vicinity of Los Alamos National Laboratory.

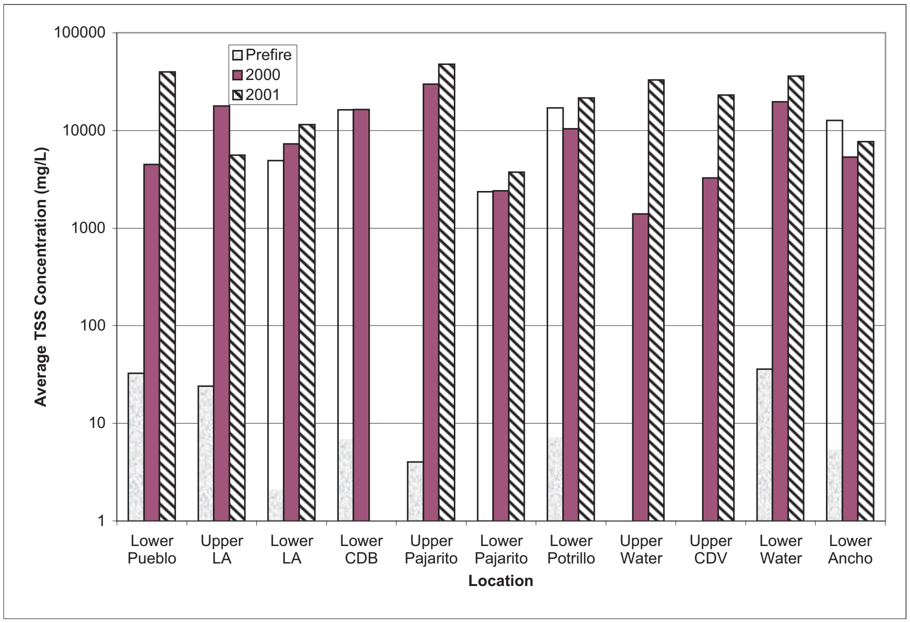


Figure 5-6. Average (volume-weighted) suspended sediment loads in summer storm runoff before and after the Cerro Grande fire.

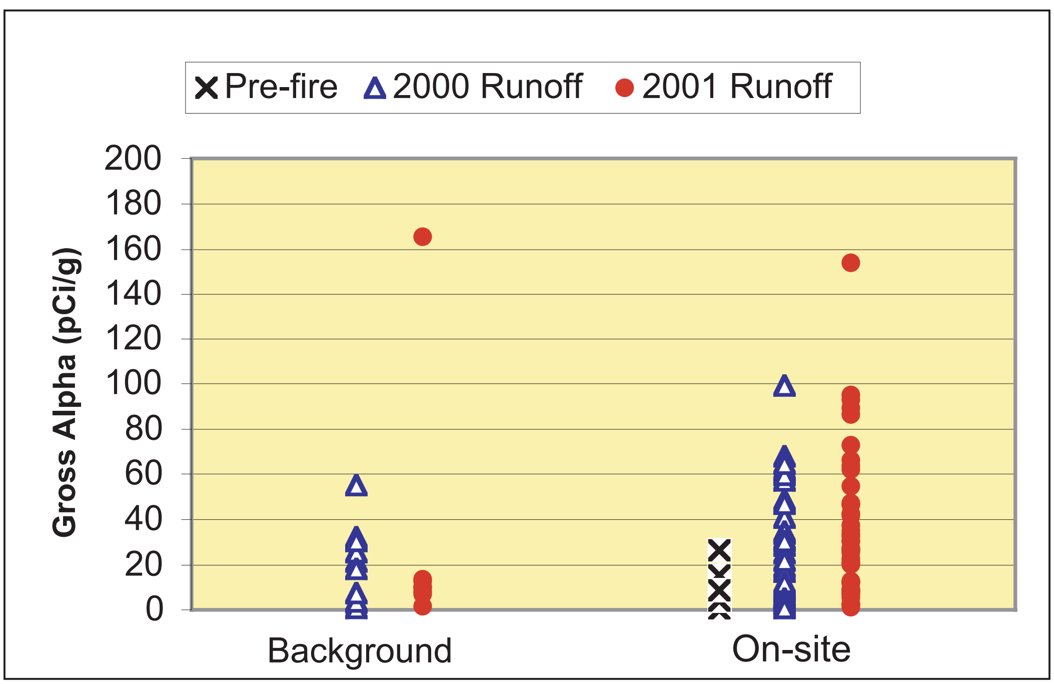


Figure 5-7. Gross alpha activity (calculated) in suspended sediment carried by storm runoff before and after the Cerro Grande fire. Background stations include those upstream or north of the Laboratory. There were no large storm runoff events at background stations before the fire.

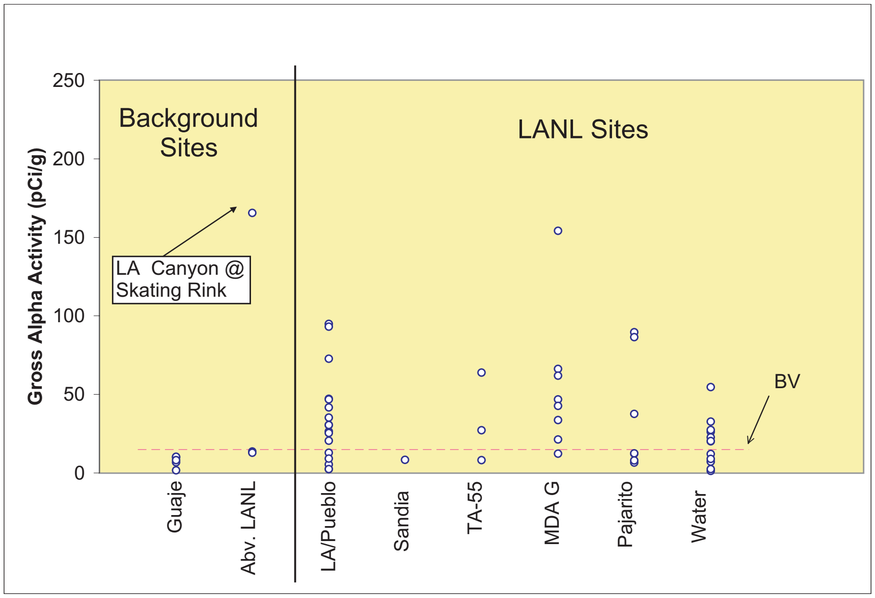


Figure 5-8. Gross alpha activity (calculated) in suspended sediment in various drainages in 2001.

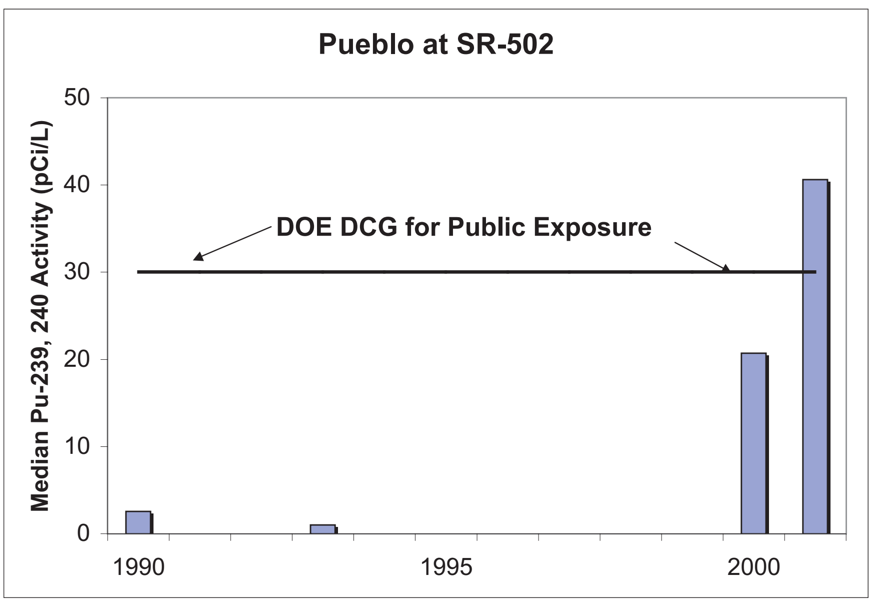
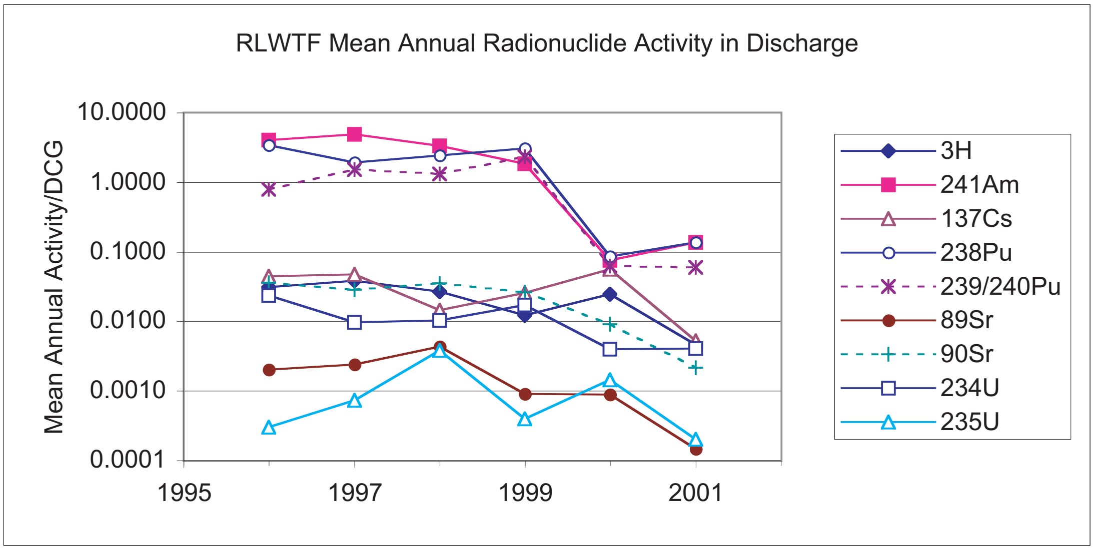


Figure 5-9. History of plutonium-239, -240 activities in unfiltered storm runoff in lower Pueblo Canyon.



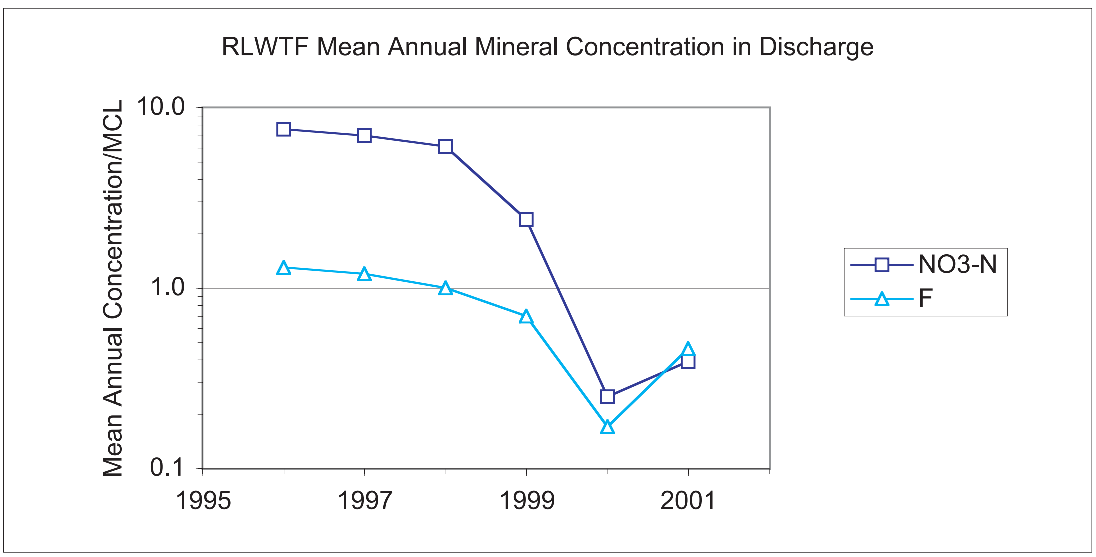


Figure 5-10. Relationship of annual average radionuclide activity and mineral concentration in RLWTF discharges to DOE DCGs or New Mexico groundwater standards for1996 to 2001.

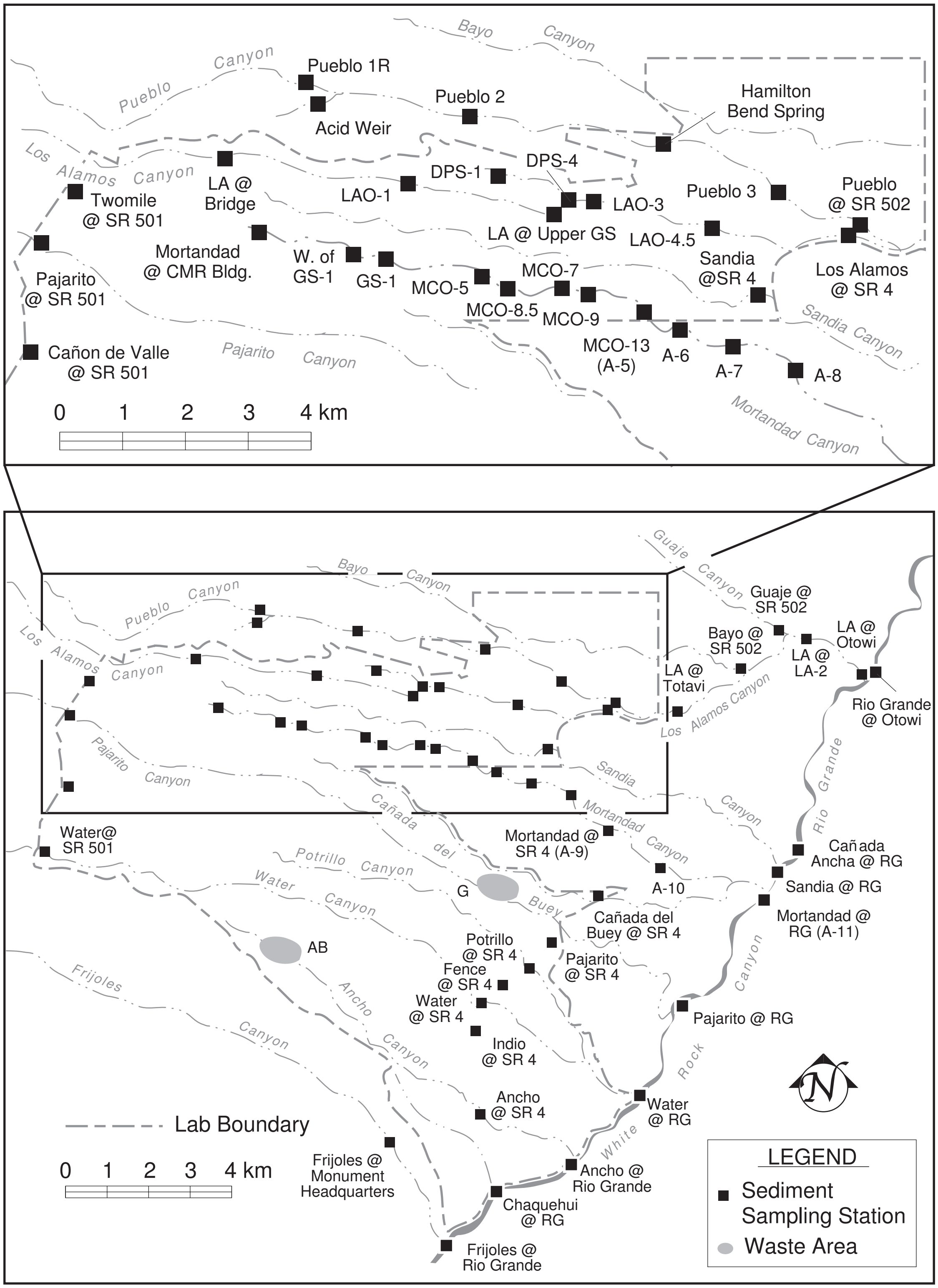


Figure 5-11. Sediment sampling stations on the Pajarito Plateau near Los Alamos National Laboratory. Solid waste management areas with multiple sampling locations are shown in Figures 5-12 and 5-13.

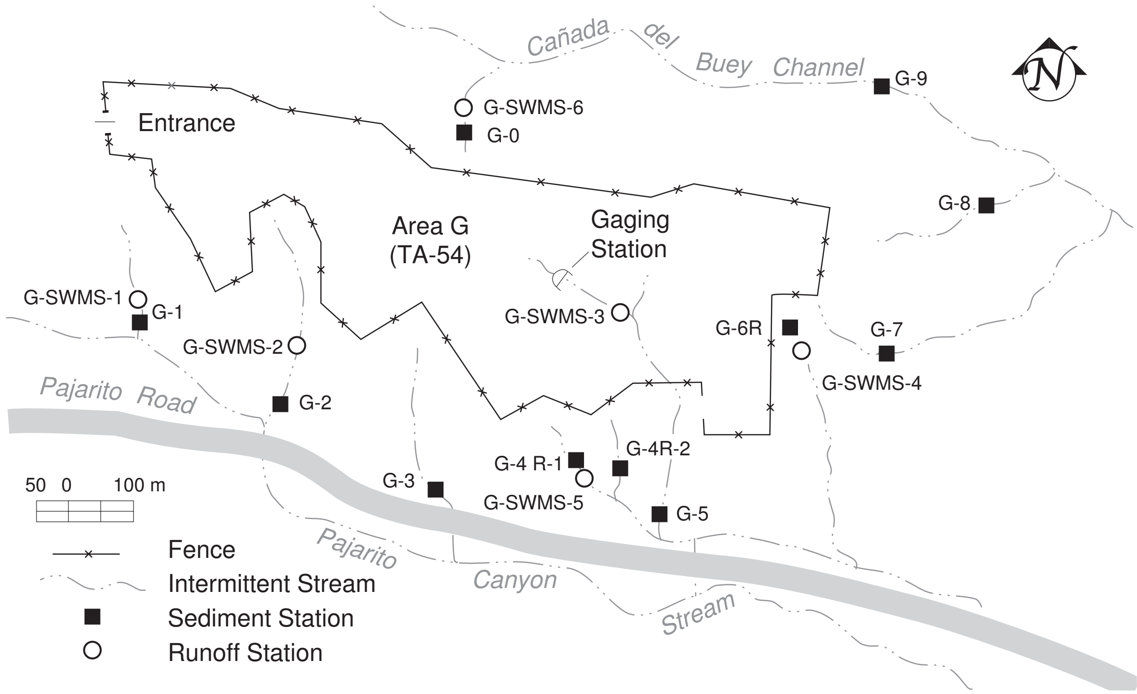


Figure 5-12. Sediment and runoff sampling stations at TA-54, Area G.

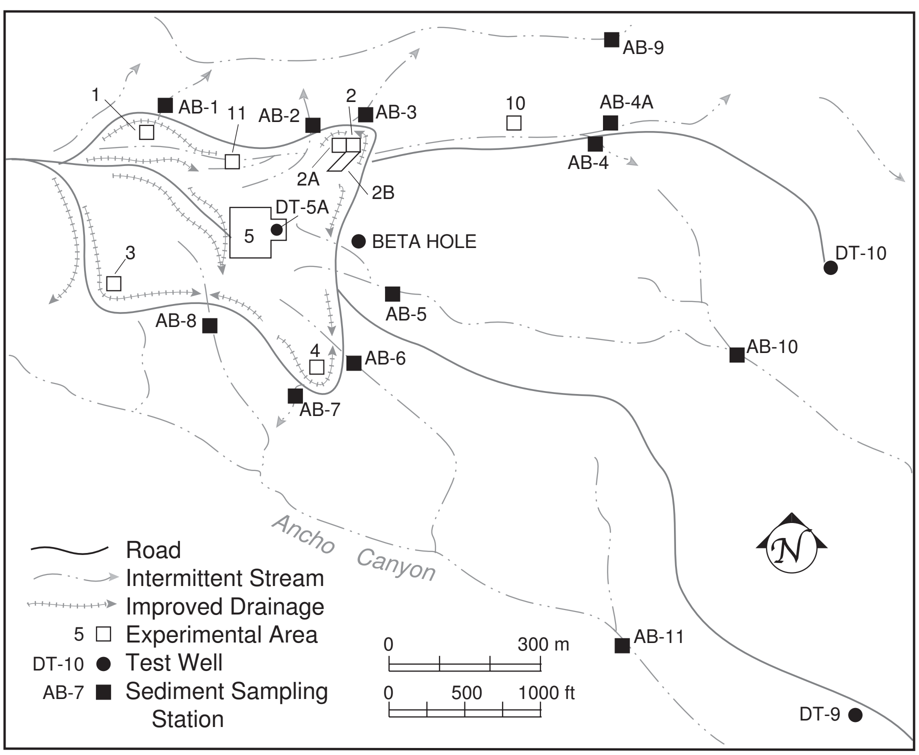


Figure 5-13. Sediment sampling stations at TA-49, MDA AB.

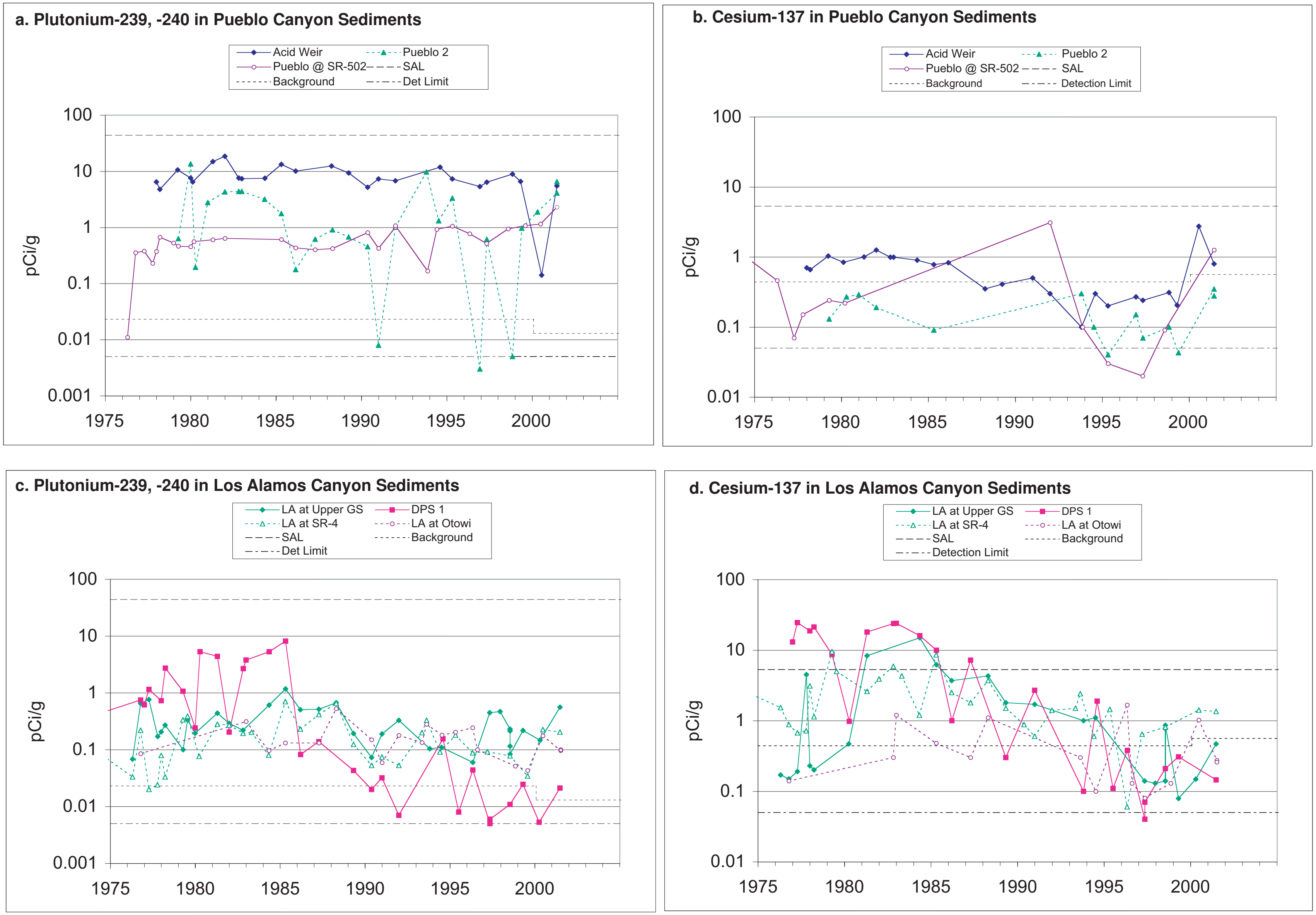


Figure 5-14. Sediment radioactivity histories for selected stations in Acid, Pueblo, DP, and Los Alamos Canyons. Only detections are shown although data are available for most years.

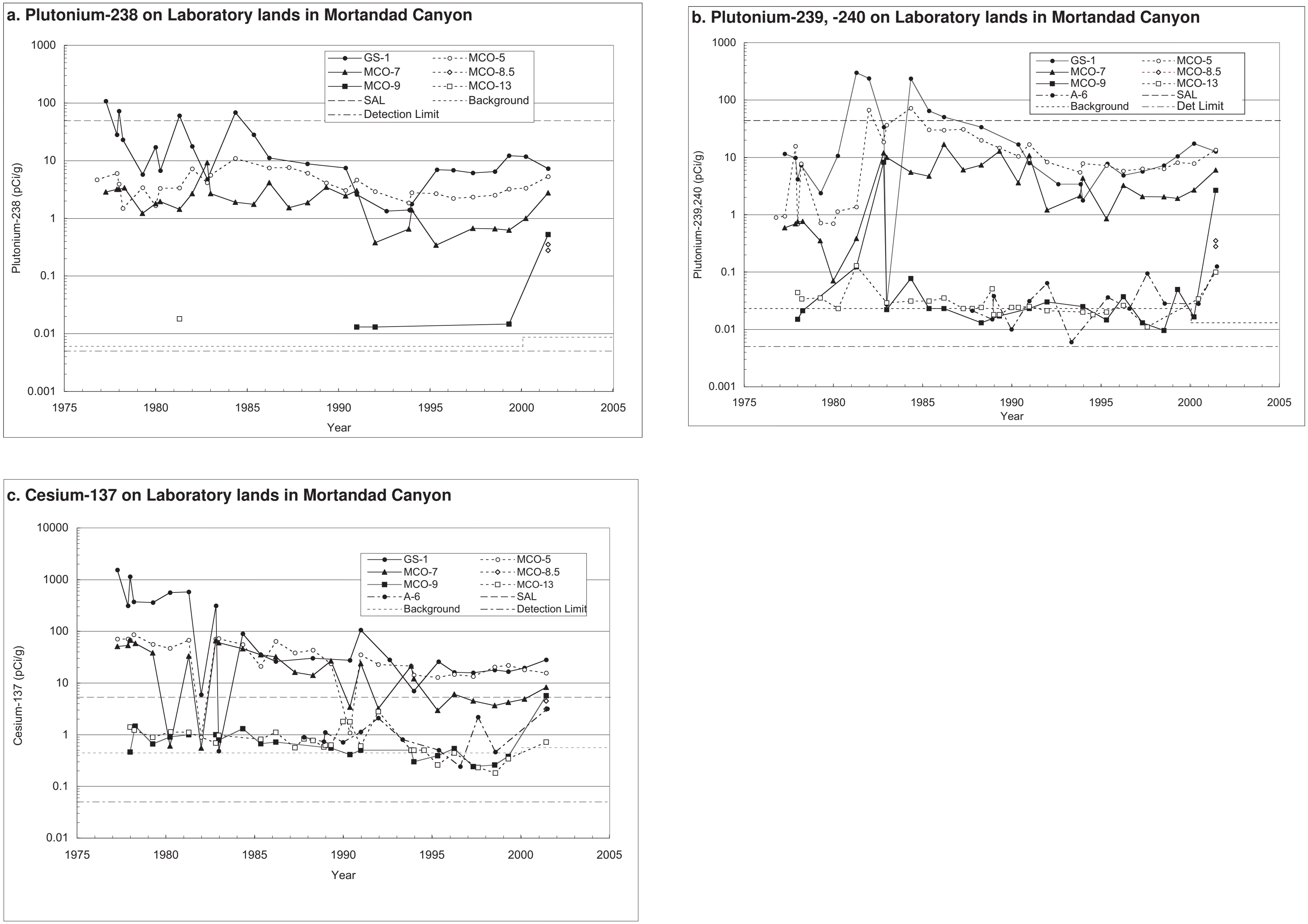


Figure 5-15. Sediment radioactivity histories for stations on Laboratory lands in Mortandad Canyon.

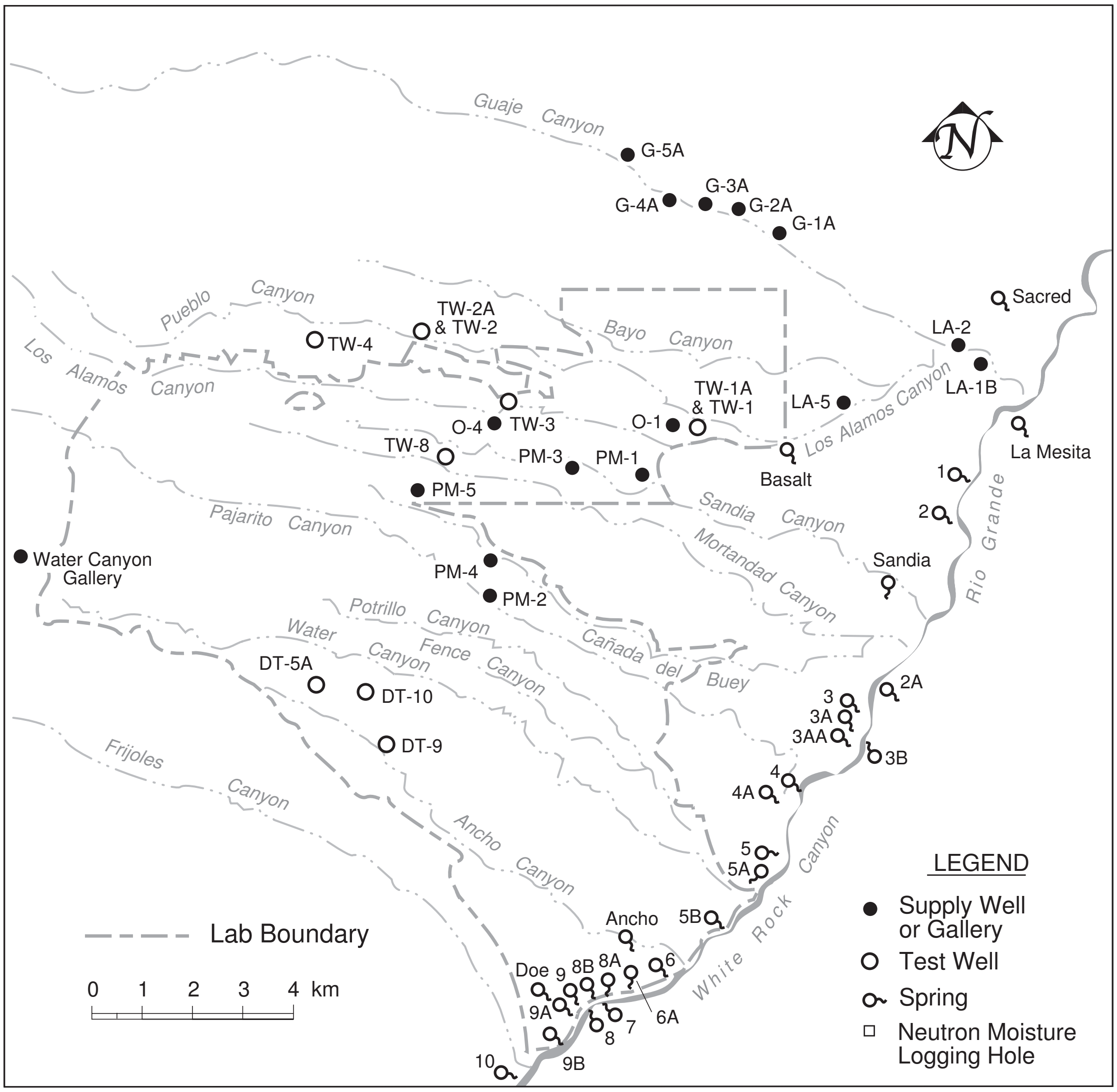


Figure 5-16. Springs and deep and intermediate wells used for groundwater sampling.

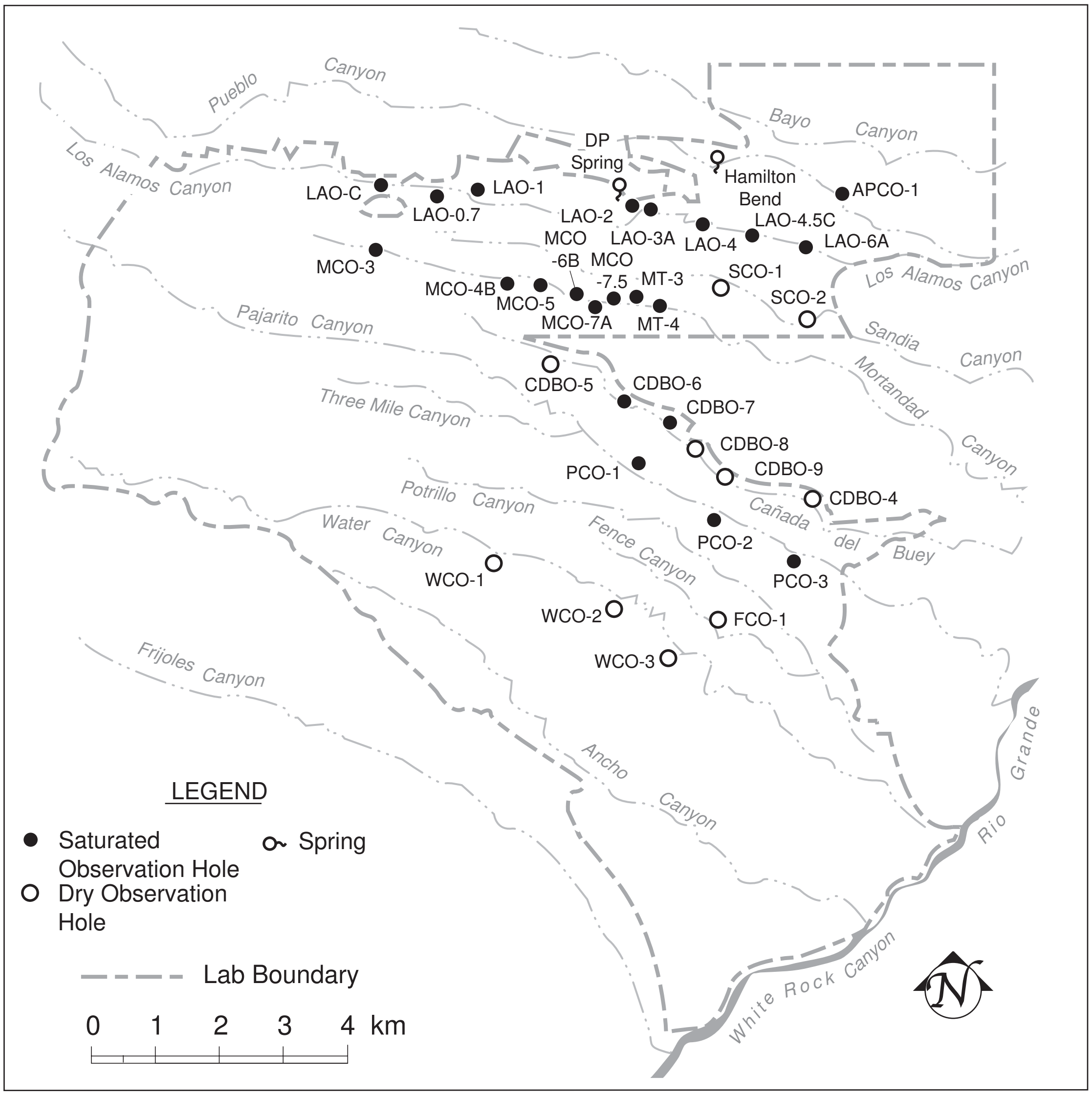


Figure 5-17. Observation wells and springs used for alluvial groundwater sampling.

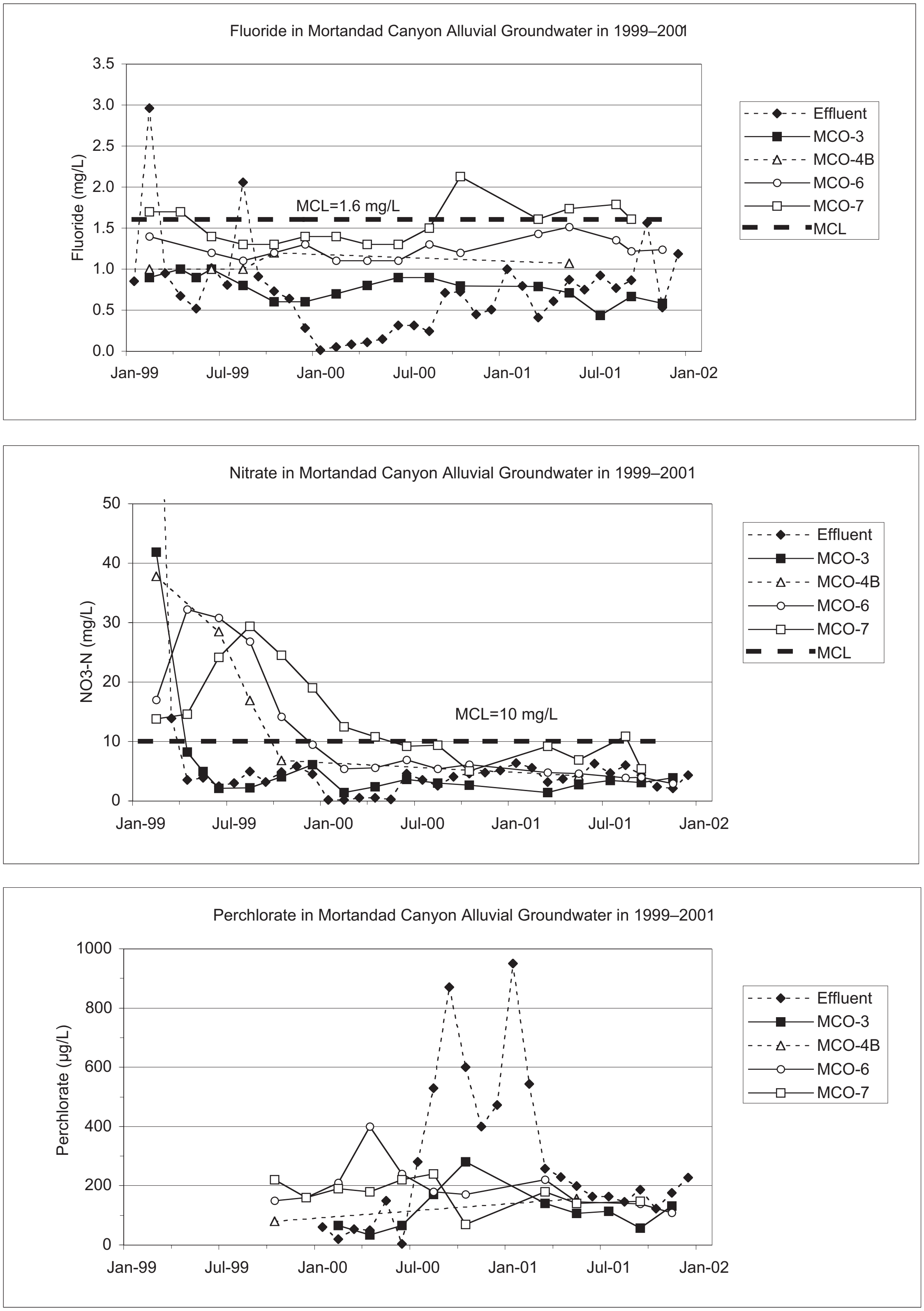


Figure 5-18. Fluoride, nitrate, and perchlorate in RLWTF effluent and Mortandad Canyon groundwater from 1999 through 2001.

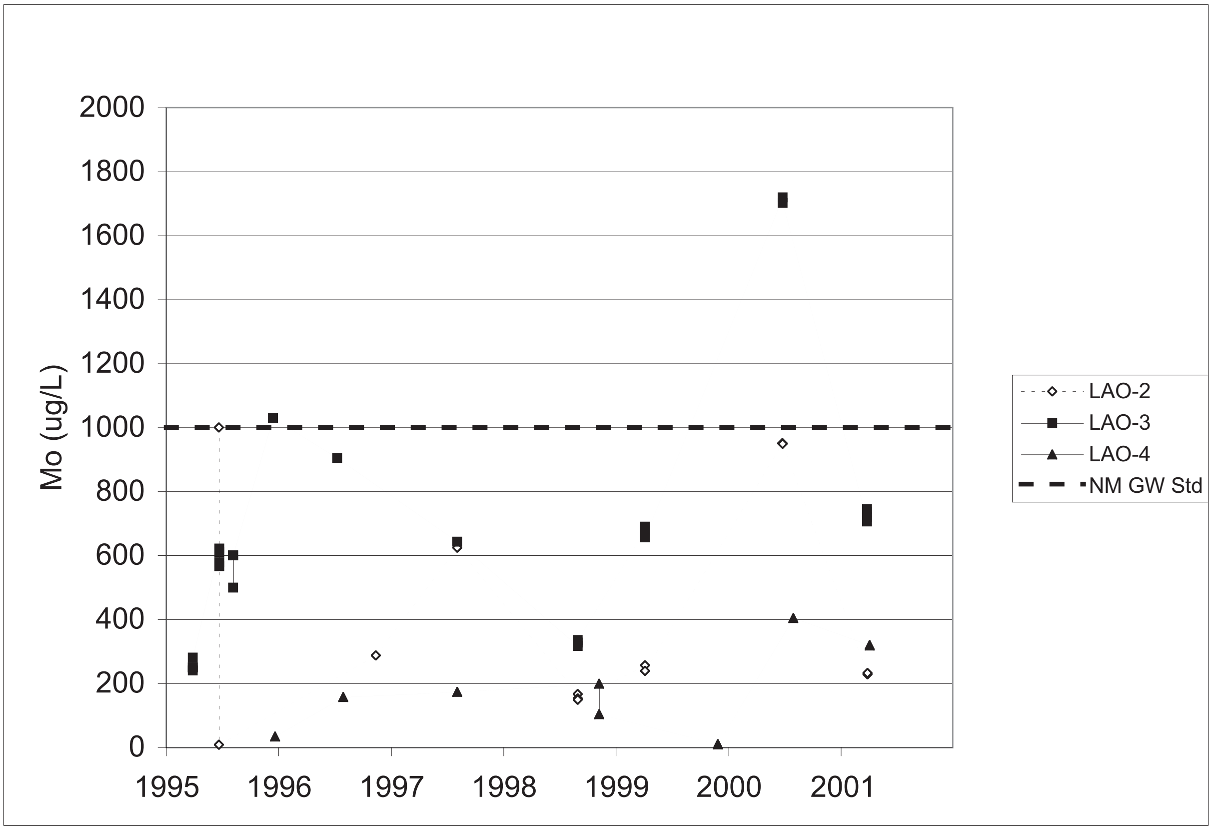


Figure 5-19. Molydenum history in Los Alamos Canyon alluvial groundwater.

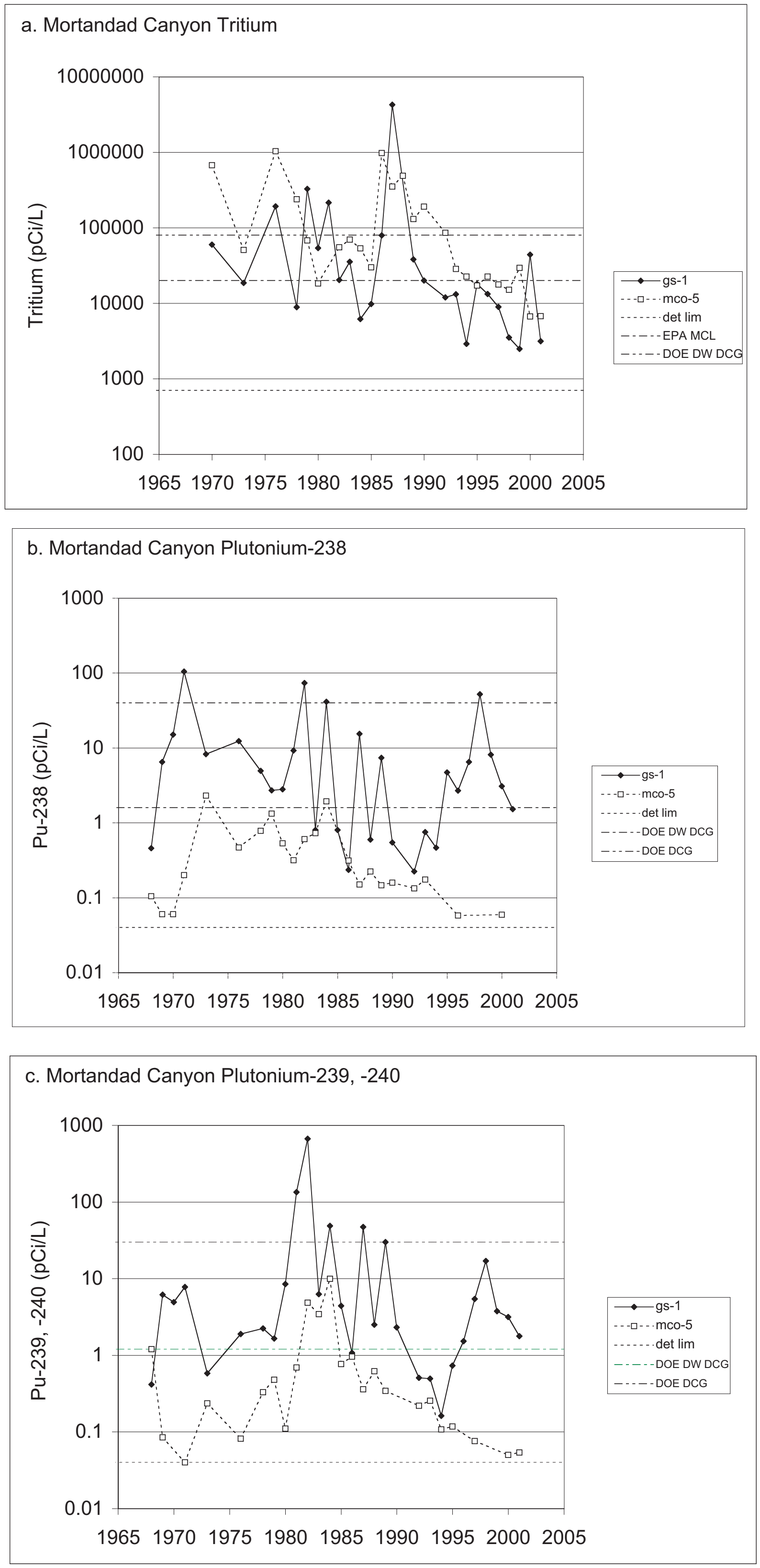
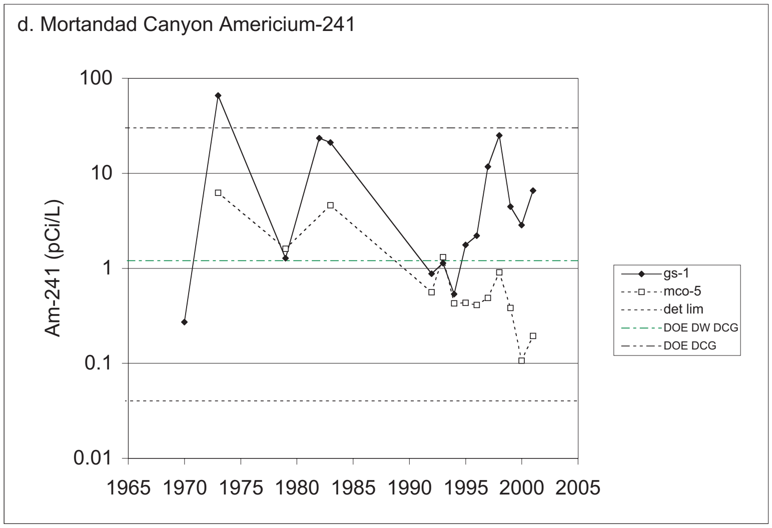


Figure 5-20. Annual average radioactivity in Mortandad Canyon (Cont. on page 412).



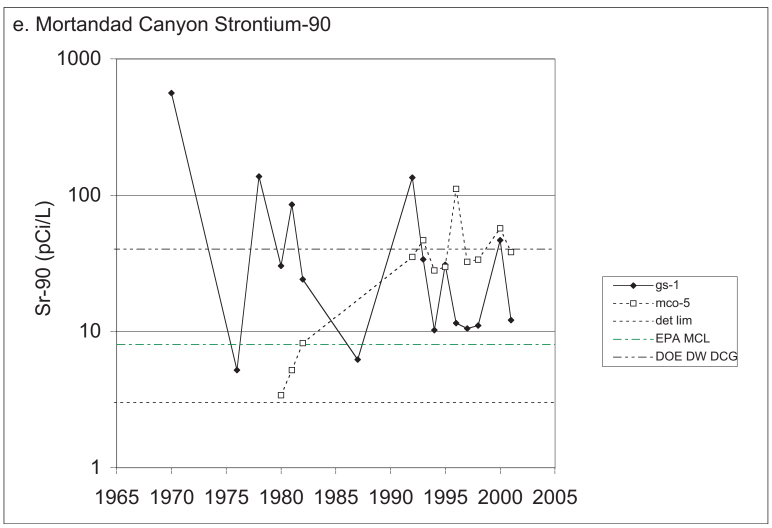


Figure 5-20. Annual average radioactivity in Mortandad Canyon (Cont. from page 411).

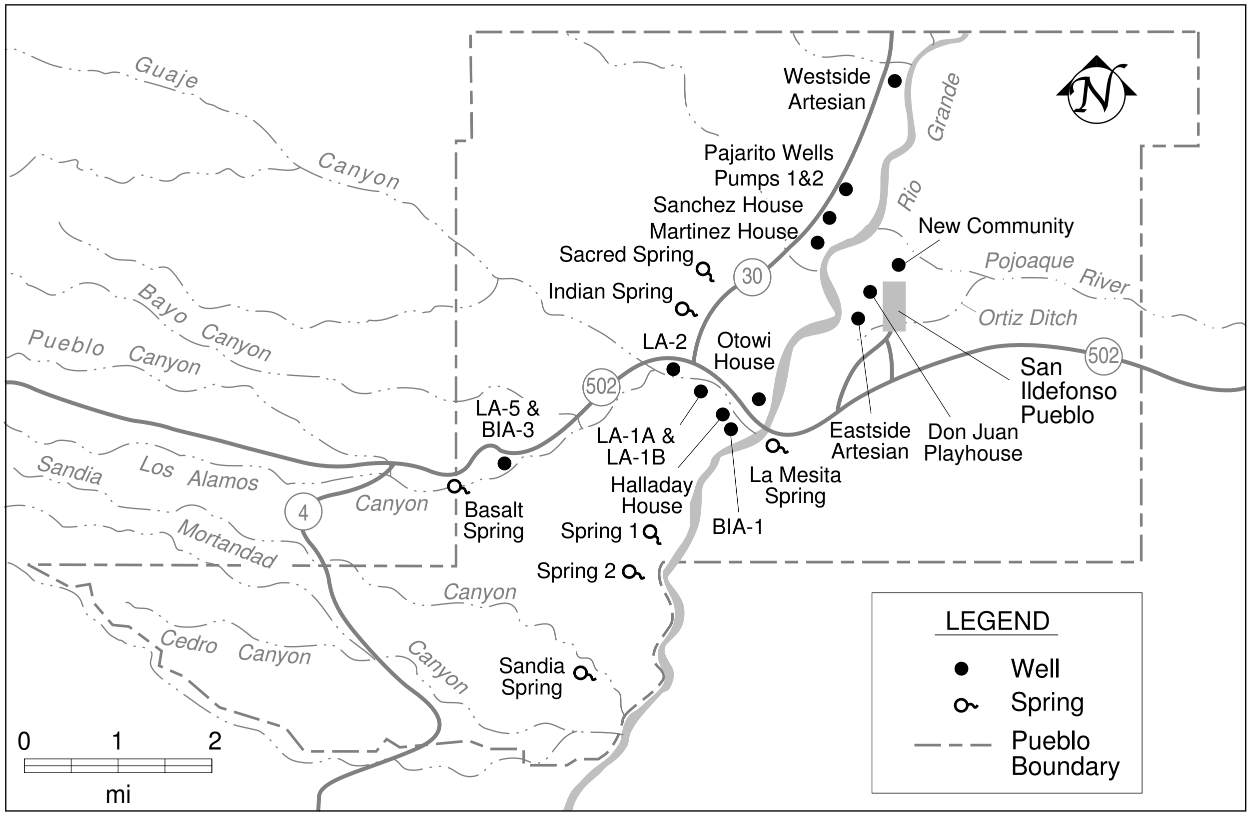


Figure 5-21. Springs and groundwater stations on or adjacent to San Ildefonso Pueblo.

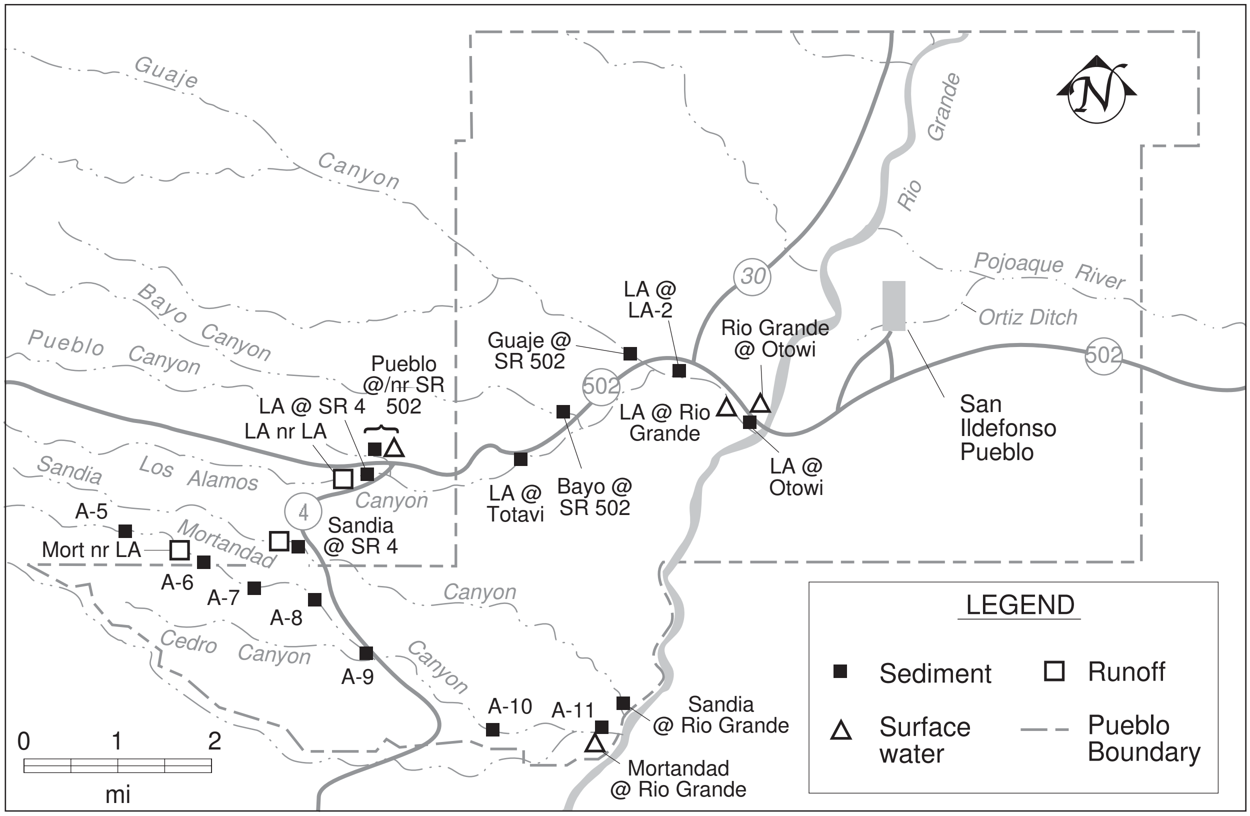


Figure 5-22. Sediment and surface water stations on or adjacent to San Ildefonso Pueblo.

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6. Soil, Foodstuffs, and Associated Biota

contributing authors:
Philip Fresquez, Gil Gonzales, John Nyhan, Tim Haarmann, Lars Soholt, Bruce Gallaher

Abstract

Soils, foodstuffs, and biota were collected within and around Los Alamos National Laboratory (LANL or the Laboratory) to help determine the impacts of Laboratory operations on human health and the human food chain. The first monitoring program, soils, included sampling surface materials from 12 on-site and 10 perimeter areas around LANL. We analyzed these samples for radiological and trace element constituents and then compared them with soils collected from regional locations in northern New Mexico. Also, these samples, which were collected in the second sampling year after the Cerro Grande fire—a catastrophic wildfire that burned nearly 50,000 acres, including 7,500 at LANL—were compared with samples collected in 1999. Most radionuclide concentrations (activity) in soils from individual sites were nondetectable or within upper-level regional concentrations. As a group (and using detectable and nondetectable values), uranium (mostly naturally occurring) and plutonium-239, -240 concentrations in soils collected from LANL and perimeter areas were statistically higher ($\alpha = 0.05$) than regional areas. The differences were very low (pCi/g range), however, and all concentrations were far below screening action levels (SALs). Similarly, most trace elements, with the exception of beryllium and lead in soils from on-site and perimeter areas, were within regional concentrations; beryllium and lead, however, were far below SALs. Nearly all mean radionuclide and trace element concentrations in soils collected from LANL and perimeter areas after two sampling seasons following the Cerro Grande fire were statistically ($\alpha = 0.05$) similar to soils collected before the fire.

We collected foodstuffs samples (produce, fish, elk, deer, and wild prickly pear fruit) from Laboratory and surrounding perimeter areas, including several Native American pueblo communities. The concentrations of radionuclides and trace elements in foodstuffs collected from the Laboratory and perimeter areas were within upper-level regional concentrations and were statistically ($\alpha = 0.05$) indistinguishable from foodstuffs collected before the Cerro Grande fire. Produce and fish (fillets), in particular, because of the concern for airborne contaminants from smoke and fallout ash and contaminants in storm runoff, were not significantly affected. Although soils from on-site and perimeter areas contained significantly higher concentrations of beryllium and lead, beryllium was below detection levels in produce, and lead was not significantly higher in produce collected from on-site and perimeter areas as compared with regional areas.

Biota monitoring included sampling catfish from Abiquiu and Cochiti reservoirs and analyzing the fish for polychlorinated biphenyl (PCB) congeners, organochlorine pesticides, and dioxins/furans. Some fish were partitioned to determine the contribution of these contaminants from edible versus nonedible portions of the fish. Mean total dioxin-like, whole-body PCB concentrations were 7.86E-04 parts per million (ppm)-fresh weight (FW) and 8.14E-03 ppm-FW for Abiquiu and Cochiti samples, respectively. These levels were statistically ($\alpha = 0.05$) similar. A comparison to PCB levels measured in the Rio Grande in 1997 implies that sources of PCBs above LANL influences may exist. Dioxins and furans were detected in 62% (48 of 78) of the possible total results in Cochiti fish, and all detected values were below even the most stringent (lowest) toxicological limit. Tetrachlorodibenzodioxin (TCDD) is the most toxic of the dioxins and furans. The mean TCDD levels for whole-body fish from Cochiti Reservoir were 1.14E-07 ppm. All detected levels of dioxins and furans in fish were below the recommended dietary limits for the protection of fish-eating animals. The mean total DDT and metabolites (DDT+DDD+DDE) concentration at Cochiti (5.9E-02 ppm-FW) was significantly higher ($\alpha = 0.05$) than the mean concentration for Abiquiu (1.5E-02 ppm-FW). The primary source of DDT is thought to be a massive aerial application in 1963. These levels of DDT are within regional and national levels and are within limits suggested for the protection of piscivores and fish. We determined that the portion of catfish not usually

consumed by humans contains about 75% of the PCBs and 74% of the total DDT and metabolites in whole catfish. No impacts of the Cerro Grande fire on PCB and organochlorine levels in fish at Cochiti Reservoir were discernable.

Other biota monitoring projects we conducted this year included tritium concentrations in elk inhabiting the Pajarito Plateau; contaminant concentrations in conifer tree bark and wood following the Cerro Grande fire; effects of herbivory on vegetation recovery following the Cerro Grande fire; spring and fall small mammal sampling for Cañon de Valle and Pajarito Canyon; medium and large mammal spotlight surveys; surveys of fire effects, rehabilitation treatments, ecosystem recovery, and residual fire hazards, second year after the Cerro Grande fire; and biodiversity of fauna after the Cerro Grande fire.

In addition to monitoring Laboratory-wide areas, we assessed several facilities. We monitored radionuclide and trace elements in soil, vegetation, bees, small mammals, and predators at Technical Area (TA) 54, Area G, the Laboratory's primary low-level radioactive waste disposal area. Also soil, vegetation, and bees were collected within and around DARHT, the Laboratory's Dual Axis Radiographic Hydrodynamic Test facility, and we also report the results of soil, collected from around the plutonium processing facility at TA-55 on three different occasions (1984, 1990, and 2001) for plutonium isotope analysis.

To Read About — **Turn to Page**

A. Soil Monitoring *(Philip Fresquez)*

1. Introduction

A soil sampling and analysis program provides the most direct means of determining the concentration (activity), inventory, and distribution of radionuclides and radioactivity around nuclear facilities (DOE 1991). Department of Energy (DOE) Orders 5400.1 and 5400.5 mandate this program. Soil provides an integrating medium that can account for contaminants released to the atmosphere, either directly in gaseous effluents (such as air stack emissions) or indirectly from resuspension of on-site contamination (such as firing sites and waste disposal areas) or through liquid effluents released to a stream that is subsequently used for irrigation (Purtymun et al., 1987). The knowledge gained from a soil radiological sampling program is critical for providing information about potential pathways (such as soil ingestion, food crops, resuspension into the air, and contamination of groundwater) that may result in a radiation dose to a person (Fresquez et al., 1998a).

The soil surveillance program at Los Alamos National Laboratory (LANL or the Laboratory) consists of an institutional program that monitors soil contaminants within and around LANL and a facility program that monitors soil contaminants directly around the perimeter of major facilities at LANL. The two main facilities where soil monitoring takes place on an annual basis are the Laboratory's principal low-level radioactive waste disposal site (Area G) at Technical Area (TA) 54 and the Dual Axis Radiographic Hydrodynamic Test (DARHT) facility at TA-15. In additon, we collected soil samples around TA-55—the Laboratory's Plutonium Research Facility. Although not previously documented, this is the third time that we have collected soil samples around TA-55; samples have been collected in 1984, 1990, and 2001, and we report the results of plutonium activity concentrations.

The main objectives of these programs include evaluating (1) radionuclide and nonradionuclide (trace element and organic) concentrations in soils collected from potentially impacted areas (institution- and facility-wide); (2) trends over time (that is, whether radionuclides and nonradionuclides are increasing or decreasing over time); and (3) committed effective dose equivalent (CEDE) to surrounding area residents.

The Ecology Group's (ESH-20's) Contaminant Monitoring Team compares soil samples collected from on-site and perimeter areas at LANL with regional areas; regional areas are located at such a distance away from the Laboratory that their radionuclide and nonradionuclide contents are mostly due to naturally occurring elements or to worldwide fallout. See Chapter 3 for potential radiation doses to individuals from exposure to soils.

On May 4, 2000, a catastrophic wildfire burned across the Los Alamos area (see section 1.D). Because the fire burned over 7,500 acres of LANL lands and some areas are known to contain radionuclides and chemicals in soils and plants above regional concentrations (Fresquez et al., 1998a; Gonzales et al., 2000a), some of these materials might have been suspended in smoke and ash and transported by wind—principally downwind of the fire (the predominant wind direction during the fire was to the northeast of LANL). Last year, we collected and compared many soil samples from areas impacted by the fire with samples collected before the fire. This year, we continue this evaluation by including summarization tables that compare data collected before the fire (1999) with data collected one and two sampling years after the fire (2000 and 2001).

2. Institutional Monitoring

a. Monitoring Network. We collect soil surface samples (0- to 2-in. depth) from relatively level, open, and undisturbed areas at regional locations (three sites), LANL's perimeter (10 sites), and at LANL (12 sites) (see Figure 6-1). Areas sampled at LANL are not from solid waste management units (SWMUs). Instead, the majority of on-site soil-sampling stations are located on mesa tops close to and downwind from major facilities or operations at LANL in an effort to assess radionuclides and nonradionuclides in soils that may have been contaminated as a result of air stack emissions and fugitive dust (the resuspension of dust from SWMUs and active firing sites).

The 10 perimeter stations are located within 4 km (2.5 mi.) of the Laboratory. These stations reflect the soil conditions of the inhabited areas to the north (Los Alamos town site area—four stations) and east (White Rock area and San Ildefonso Pueblo lands—four stations) of the Laboratory. The other two stations, one located on US Forest Service land to the west and the other located on US Park Service land (Bandelier) to the southwest, provide additional coverage. We compare soil samples from all these areas with soils collected from regional locations in northern New Mexico surrounding the Laboratory where radionuclides, radioactivity, and trace elements are from natural or worldwide fallout events; these areas are located around Embudo to the north, Cochiti Pueblo to the south, and Jemez Pueblo to the southwest. All are more than 32 km (20 mi.) from the Laboratory and are beyond the range of potential influence from normal Laboratory operations (DOE 1991).

b. Sampling Procedures, Data Management, and Quality Assurance. Collection of samples for chemical analyses follows a set procedure to ensure proper collection, processing, submittal, and posting of analytical results. Stations and samples have unique identifiers to provide chain-of-custody control from the time of collection through analysis and reporting. The ESH-20 operating procedure (OP) entitled "Soil Sampling for the Soil Monitoring Program," LANL-ESH-20-SF-OP-007, R0, 1997, contains all quality assurance/quality control (QA/QC) protocols, chemical analyses, data handling, validation, and tabulation information. Paragon Analytics, Inc., of Fort Collins, CO, analyzed the radionuclides, and an on-site laboratory at LANL (the Inorganic Trace Analysis Group, CST-9), analyzed the trace elements (light, heavy, and nonmetals). Both laboratories met all QA/QC requirements.

c. Radiochemical Analytical Results (On-Site, Perimeter, and Regional Background Soils). Table 6-1 shows data from soils collected in 2001. Most radionuclide concentrations (activity) and radioactivity in soils collected from on-site and perimeter stations were nondetectable (i.e., the analytical result was lower than three times the counting uncertainty = 99% confidence level) (Corely et al., 1981) or within regional statistical reference levels (RSRLs); and, the few that were detected and above RSRLs were still very low (e.g., in the pCi/g range). The RSRL is the upper-level regional concentration (mean plus two standard deviations = 95% confidence level) (Purtymun et al., 1987) from data collected from regional areas from 1994 through 2001 for worldwide fallout and natural sources of tritium; strontium-90; cesium-137; americium-241; plutonium-238; plutonium-239, -240; total uranium; and gross alpha, beta, and gamma radioactivity.

As a group (and using detectable and nondetectable values), the average concentrations of total uranium (and uranium isotopes, particularly uranium-234 and uranium-238) and plutonium-239 in soils collected from both perimeter and on-site areas were significantly higher ($\alpha = 0.05 = 95\%$ confidence level) than concentrations in soils from regional locations. These data are similar to past years (Fresquez et al., 1998a), and although the mean concentrations of these radionuclides, particularly plutonium-239, were statistically higher than regional areas, the differences in concentrations between the sites were very small. Also, mean concentrations of all radionuclides were far below LANL screening action levels (SALs) used to discern risk to humans. LANL SALs, developed by the Environmental Restoration (ER) Project at the Laboratory, identify the contaminants of concern on the basis of a 15-mrem/yr protective dose limit (ERP 2001).

Average concentrations of tritium in soils collected from perimeter and on-site areas were similar to soils collected from regional background areas. In the past, tritium concentrations in soils from perimeter and especially from on-site areas were higher than regional background concentrations, albeit the concentrations in soils from on-site areas have been generally decreasing over time. The average levels of tritium in soils collected from on-site areas in 2000, for example, were 0.59 pCi/mL (Fresquez et al., 2001) as compared with 0.80 pCi/mL of tritium in soils from on-site areas collected in 1996 (Fresquez et al., 1998a). This year, average concentrations of tritium in soils from on-site areas decreased further to 0.43 pCi/mL.

The higher levels of uranium detected in soil samples collected from perimeter and on-site areas may be a result of either geologic or soil differences between the areas rather than any contamination effects. Soils in the Los Alamos area, for example, are derived from Bandelier (volcanic) tuff and have higher-than-average natural uranium concentrations, ranging from 3 to 11 µg of uranium per gram of soil (Crowe et al., 1978). These results are similar to past years and are not changing (Fresquez et al., 1998a).

Table 6-2 shows the results of radionuclide concentrations in soils collected in 2000 and 2001 after the Cerro Grande fire and the results of soils collected in 1999 before the fire. Because only one regional site, Embudo, was predominantly downwind of the fire (Fresquez and Gonzales 2000), it was the only regional station compared with pre-fire soil conditions. With the exception of the regional station, we made statistical comparisons within LANL and perimeter sites and years (e.g., 1999 versus 2000 and 2001). All mean radionuclide concentrations in soils collected from LANL and perimeter areas after the Cerro Grande fire in 2000 and 2001were statistically similar ($\alpha = 0.05$) to soils collected before the fire in 1999. And, in fact, most radionuclides in soils collected from all three sites were lower in concentrations in 2001 than in 1999. Individual soil stations in LANL TAs most affected by the fire—TA-06 (Twomile Mesa), TA-15 (R-Site Road East), and TA-16 (S-Site)—contained radionuclides similar to concentrations in soils collected in 1999. Similarly, soils collected from the perimeter of LANL lands directly within the predominant path of the smoke plume (airport area, North Mesa area, Sportsman's Club area, and Tsankawi area) contained radionuclides similar to concentrations in soils collected in 1999. For a more detailed discussion of these data comparisons in 2000, see the report by Fresquez et al. (2000).

d. Nonradiochemical Analytical Results (On-Site, Perimeter, and Regional Background Soils). We analyzed soils for 22 light (barium, beryllium, titanium), heavy (silver, cadmium, cobalt, chromium, copper, mercury, molybdenum, nickel, lead, antimony, tin, thallium, vanadium, zinc), and nonmetal (arsenic, boron, selenium, cyanide) trace elements (occur at <1000 µg/g in soil) and three light (aluminum) and heavy (iron, manganese) abundant elements (occur at >1000 µg/g in soil). Table 6-3 contains the results of the 2001 soil-sampling survey. In general, nine (silver, cadmium, mercury [partly], molybdenum, antimony, selenium, selenium, thallium, and cyanide) out of the 24 elements measured in surface soils collected from regional, perimeter, and on-site stations were below the limits of detection (LOD; the analytical reporting limit). Of those elements (aluminum, arsenic, boron, barium, beryllium, cobalt, chromium, copper, iron, manganese, nickel, lead, titanium, vanadium, and zinc) that were above the LOD in soils collected from perimeter and on-site areas, most were within RSRLs. The RSRLs were derived from regional data averaged over eight years (1992–1999). In addition, all trace element concentrations in soils from perimeter and on-site areas were far below SALs derived by the Environmental Protection Agency (EPA 2000a).

As a group, beryllium and lead concentrations in soils collected from perimeter and on-site areas were significantly higher ($\alpha = 0.05$) than in soils from regional locations. These results are similar to those reported in past years (Fresquez 1999; Fresquez and Gonzales 2000; Fresquez et al., 2001). However, all individual and average lead (on-site and perimeter means = 11.0 and 11.6 µg/g, respectively) and beryllium (mean = 0.88 and 0.75 µg/g, respectively) concentrations in soils were far below the SALs of 400 µg/g and 150 µg/g, respectively (EPA 2000a). Like uranium, natural beryllium concentrations in the Los Alamos area are at higher-than-average regional levels. Ferenbaugh et al. (1990) and Longmire et al. (1995), for example, report that naturally occurring beryllium in soils in the Los Alamos area ranges from 1.0 to 4.4 µg/g.

See Table 6-4 for the results of a comparison of trace elements before (1999) and after (2000 and 2001) the fire. Most mean trace elements in soils collected from perimeter and LANL areas after the Cerro Grande fire were statistically ($\alpha = 0.05$) similar to soils collected before the fire in 1999. Chromium and copper concentrations were significantly higher in soils collected from perimeter and on-site areas in 2001 than in soils collected before the fire in 1999; the differences, however, were small. Although the regional site could not be statistically compared between years, all of the elements in soils collected after the fire were equal to concentrations in soils collected before the fire in 1999 and were well within the long-term regional statistical range (Fresquez and Gonzales 2000). Also, cyanide, a compound ion of high concern because increased levels had been reported in storm runoff after the fire (Gallaher 2000), appears to be similar at all three sites (and lower in 2001 than in 2000) and is within regional concentrations (1.0 µg/g) from other regional areas (Eisler 2000). Individual soil stations in LANL TAs most affected by the fire (TA-06, TA-15, and TA-16) and from the perimeter of LANL lands directly within the predominant path of the smoke plume (airport area, North Mesa area, Sportsman's Club area, and Tsankawi area) contained trace elements similar to concentrations in soils collected in 1999. For a more detailed discussion of these data comparisons, see Fresquez et al. (2000).

e. Long-Term Trends. We performed a Mann-Kendal test for trend analysis on radionuclides and radioactivity in soils collected from on-site and perimeter stations from 1974 through 1996 (Fresquez et al., 1996a; Fresquez et al., 1998a). Although radionuclide and radioactivity levels were significantly higher in soils from on-site stations (9 out of 10) and perimeter stations (4 out of 10, including plutonium-239, -240) when compared with regional levels, most radionuclides, with the exception of plutonium-238 in soils from perimeter areas, exhibited significantly decreasing concentrations over time. The statistically significant (but very small) increase of plutonium-238 in perimeter soils over this interval may be related to the resuspension and redistribution of global fallout. Plutonium-238 and plutonium-239, -240 in soils from regional areas also exhibited statistically increasing trends; however, the plutonium levels in regional soils were still well within worldwide fallout concentrations.

The decreasing concentrations of the other isotopes in soils collected from on-site and perimeter areas over time may be a result of (1) cessation of aboveground nuclear weapons testing in the early 1960s, (2) weathering (water and wind erosion and leaching), (3) radioactive decay (half-life), and (4) reductions in operations or better engineering controls at LANL. Tritium, which has a half-life of about 12 years, exhibited the greatest decrease in activity over the 20-plus-year period of this study at all three areas: regional, perimeter, and on-site. Indeed, by 1996, the majority of radionuclide and radioactivity values in soils collected from both perimeter and on-site areas were statistically similar to values detected in regional locations. (Note: This trend analysis is the most current to date; however, concentrations of all radionuclides in soils collected from on-site and perimeter areas during the 2001 year, including tritium and uranium, were lower or similar to concentrations in 1996.)

Recently, these (long-term) data (1974 through 1999), particularly cesium-137 and plutonium-239, -240 data, were employed to determine the extent of LANL-added plutonium to the perimeter area environment. The ratio of cesium-137 to plutonium-239, -240 concentrations from worldwide fallout is about 33 (Hodge et al., 1996). Results (using median numbers) from data summarized over the 26-year period show cesium-137 (decay corrected)/plutonium-239, -240 ratios ranging from 2 to 27 in on-site soils and from 5 to 37 in perimeter soils; regional soils averaged 33, which compares well with cesium-137/plutonium-239, -240 ratios from other "background" areas. Maps of the ratios tend to show possible LANL-derived plutonium in a north to northeasterly direction generally concurrent with the major wind direction in the area. (Note: Plutonium-239 concentrations in soils collected from both perimeter and on-site areas in 2001 were significantly higher [α= 0.05] than concentrations in soils from regional background locations [Table 6-1].) These interpretations are preliminary, and a more detailed study is currently underway that may show the extent of LANL-derived plutonium with distance from the Laboratory (Fresquez and Gallaher 2002).

3. Facility Monitoring

a. Area G (TA-54). (*John Nyhan*) Low-level, radioactive solid waste has been disposed below ground at LANL since operations began in the 1940s. The 63-acre site (Area G) is located in TA-54 at the east end of the Laboratory, adjacent to San Ildefonso Pueblo lands and near the village of White Rock. We have been collecting and analyzing soils from the perimeter of Area G since the 1980s. For some of the more recent work at Area G, see reports by Conrad et al. (1995 and 1996), Fresquez et al. (1995a, 1996c, 1997d, 1998c, and 1999a), and Nyhan et al. (2000 and 2001a).

This year (2001), we collected 16 soil samples within and around the perimeter of Area G (Figure 6-2). Collection of soil samples for chemical analyses followed a set procedure to ensure proper collection, processing, submittal, and posting of analytical results. Stations and samples have unique identifiers to provide chain-of-custody control from the time of collection through analysis and reporting. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled "Sampling and Sample Processing for the Waste-Site Monitoring Program," LANL-ESH-20-SF-OP/HCP-011, 1999. Paragon Analytics, Inc., analyzed the soil samples for tritium; plutonium-238 and plutonium-239, -240; strontium-90; americium-241; cesium-137; and total uranium, and all QA/QC requirements were met. Results are available in Table 6-5.

Over 60% of the samples contained detectable concentrations of radionuclides of interest (results that were greater than three times the counting uncertainty), yet all of the radionuclide concentrations in soils collected within and around Area G were far less than LANL SALs. More specifically, of the 16 soil samples collected in and around Area G, 75%, 93%, 56%, and 44% of the samples contained plutonium-239, -240, tritium, americium-241, and plutonium-238, respectively, at greater than the RSRL concentrations of these radionuclides. The concentrations of plutonium-238 and plutonium-239, -240 in soils were largest in samples collected on the northern and eastern sides of Area G, whereas tritium concentrations were largest on the southwestern and southern sides of Area G; both of these trends were consistent with results from previous years (Nyhan et al., 2001a).

b. DARHT (TA-15). (*John Nyhan*) At the DARHT facility, very intense x-ray sources are employed to radiograph a full-scale, nonnuclear mockup of a nuclear weapon's primary during the late stages of the explosively driven implosion of the device. Although explosive tests are conducted in containment vessels, the mitigation action plan (MAP) for DARHT mandates the collection of a variety of samples to identify any inadvertent releases of toxic and/or radioactive materials to the general environment. Therefore, under the MAP, we first collected baseline data on (potential) contaminants that may be inadvertently released at the facility during the operational phase. These (baseline) results, completed in 2001, list the concentrations of radionuclides and trace elements in soils, sediments, vegetation, small mammals, birds, and bees around the DARHT facility during the construction phase (1996 through 1999) (Nyhan et al., 2001b). These concentrations of radionuclides and trace elements now represent preoperational baseline statistical reference levels (BSRLs), which are calculated from the mean DARHT facility sample concentration plus two standard deviations. The BSRL for soils and sediments can be found in the section authored by Fresquez et al. (2001b).

In 2001, we collected four soil and four sediment samples during the operational phase within and around the DARHT facility (Figure 6-3). Collection, processing, and analysis of soil and sediment samples follow the protocols described in Section A.3.a. Paragon Analytics, Inc., analyzed the soil samples for tritium; plutonium-238 and plutonium-239, -240; strontium-90; americium-241; cesium-137; and total uranium. An internal laboratory at LANL—CST-9—analyzed for trace elements silver, arsenic, barium, beryllium, cadmium, chromium, copper, mercury, nickel, lead, antimony, selenium, and thallium. Tables 6-6 and 6-7 contain the results of radionuclides and trace elements for these soil and sediment samples.

Results show that most radionuclides and trace elements in soil and sediment samples were below BSRLs (Fresquez et al., 2001b). Exceptions were concentrations of uranium; cesium-137; and plutonium-239, -240 found in the soil and sediment samples collected at the east sample location, although a few other soil samples had slightly higher total uranium and cesium-137 concentrations than the

BSRLs and a few sediment samples had slightly higher concentrations of silver and copper than the BSRLs.

c. Plutonium Processing Facility (TA-55). (*Philip Fresquez*) We collected soil samples around the perimeter of the plutonium processing facility at TA-55, a facility that processes plutonium and conducts research on plutonium metallurgy, in 1984, 1990, and 2001. These data have not been published in prior reports. Collection, processing, and analysis of soil and sediment samples followed the protocols described in Section A.3.a. CST-9 analyzed the soil samples collected in 1984 and in 1990 for plutonium-238 and plutonium-239, -240. Paragon Analytics, Inc., analyzed the soil samples in 2001 for the same radionuclides, and all QA/QC requirements were met. Results are available in Table 6-8.

Soil samples were collected on each side (north, south, east and west) of the plutonium processing facility and ranged from four to six samples. Results show that most concentrations of plutonium-238 in soils around the TA-55 facility were low and were nondetectable or within regional concentrations. The mean concentrations of plutonium-238 (and using detectable and nondetectable values) were highest in soils collected in 1990 and lowest in soils collected in 2001.

Concentrations of plutonium-239, -240 in most soil samples collected from all three years are detectable and above the regional statistical reference level (0.021 pCi/g dry). Concentrations of plutonium-239, -240 ranged from 0.008 to 0.155 pCi/g dry in 1984, from 0.003 to 0.455 pCi/g dry in 1990, and from 0.020 to 0.227 pCi/g dry in 2001. The mean concentrations of plutonium-239, -240 were lowest in 1984 and highest in 1990; they later decrease by almost one-half by 2001, although the differences are not statistically different from one another. In all cases, however, the concentrations of plutonium-239, -240 in soils collected around the plutonium processing facility at TA-55 are still low and far below the LANL SAL of 44 pCi/g dry.

B. Foodstuffs Monitoring (*Philip Fresquez*)

1. Introduction

A wide variety of wild and domestic edible plant, fruit, and animal products are grown or harvested in the area surrounding the Laboratory. Ingestion of foodstuffs constitutes a critical pathway by which radionuclides can be transferred to humans (Whicker and Schultz 1982). For this reason, we collect or have collected a wide host of foodstuffs (e.g., milk, eggs, produce [wild and domestic fruits, vegetables, and grains], fish, honey, herbal teas, mushrooms, piñon, domestic animals, and large and small game animals) from Laboratory property and from the surrounding communities. DOE Orders 5400.1 and 5400.5 mandate this Foodstuffs Monitoring program.

The three main objectives of the program are to determine (1) radioactive and nonradioactive (light, heavy, and nonmetal trace elements) constituents in foodstuffs from on-site LANL, perimeter, and regional areas; (2) trends; and (3) dose. Chapter 3 presents potential radiation doses to individuals from the ingestion of foodstuffs. This year, we report on produce, fish, and elk and deer collected around the Laboratory environs.

2. Produce

a. Monitoring Network. We collect fruits, vegetables, and grains each year from on-site, perimeter, and regional locations (Figure 6-4). We also collect samples of produce from Cochiti and San Ildefonso Pueblos, which are located in the general vicinity of LANL. We compare produce from areas within and around the perimeter of LANL with produce collected from regional gardens in northern New Mexico; this year, the gardens sampled from regional areas were located in the Chamita, Chimayo, Española, Ojo Sarco, and Jemez areas. The regional sampling locations are far enough from the Laboratory that they are unaffected by Laboratory airborne emissions.

b. Sampling Procedures, Data Management, and Quality Assurance. We collect produce samples from gardens in the summer and fall of each year. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Produce Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-001, R0, 1997. Paragon Analytics, Inc., of Fort Collins, CO, analyzed produce samples for radionuclides and heavy metals. All QA/QC requirements for analyzing the radionuclides and other trace metals of interest were met.

c. Radiochemical Analytical Results. See Table 6-9 for concentrations of radionuclides in produce collected from on-site, perimeter, and regional locations during the 2001 growing season.

All radionuclide concentrations in fruits, vegetables, and grains collected from on-site, perimeter, and regional areas were low (pCi/g range), and most were nondetectable or within RSRLs. The very few radionuclides that were detected and that exceeded RSRLs were found primarily in lettuce plants—one sample each from Los Alamos, White Rock, and Sile (near Cochiti Pueblo). These three plant samples had higher amounts of strontium-90 and uranium compared with the other crop (nonleafy) plant species, and a comparison of past data (1995 through 2001) shows that lettuce plants collected from all sites, including regional areas, were significantly higher ($\alpha = 0.05$) in strontium-90 (average = 173E-03 pCi/g dry) and total uranium (average = 64 ng/g dry) concentrations than other nonleafy crop plants (the average mean for strontium-90 and total uranium was 29E-03 pCi/g dry and 5 ng/g dry, respectively). Radionuclides differ in concentration from plant species to plant species (Seel et al., 1995), and tissues associated with the top growth (stems and leaves) tend to accumulate more radionuclides than the fruiting bodies of the same plant species (Menzel 1965). Strontium-90, in particular, accumulates in leaves and growing shoots (Carini and Lombi 1977), and Morishima et al. (1977) and Hayes et al. (2002) found that leafy (lettuce) vegetables have a higher uptake of uranium than tomato, pumpkin, and squash.

Another leafy crop plant—broccoli rabe—sampled this year from a regional location bears note because it also contained higher amounts of strontium-90 and total uranium than the other nonleafy crop plants. Last year (2000), strontium-90 in broccoli rabe collected from a regional site (Ojo Sarco) was not reported because it fell outside the boundaries of a normal distribution at the 99% confidence level. In other words, it was identified as an outlier and not reported. However, we resampled broccoli rabe collected from the same regional site in 2001, and the amount of strontium-90 (92E-03 pCi/g dry) was similar to concentrations detected in 2000 (118E-03 pCi/g dry). These results are similar, albeit lower, to the lettuce results, and the higher concentrations of these elements in broccoli rabe as compared with nonleafy plants are probably due to the same mechanisms of nutrient uptake and/or to leaf surface airborne deposition as for lettuce plants. (Note: Both lettuce and broccoli rabe plant leaves were washed thoroughly, and thus the main pathway for higher strontium-90 [which behaves like calcium] and uranium [which behaves like sulfur] levels may be from root uptake rather than from airborne deposition.)

As a group (and using detectable and nondetectable values), most radionuclides, with the exception of tritium, in crops collected from perimeter and on-site areas were not significantly higher ($\alpha = 0.05$) than in produce collected from regional locations. The only radionuclide in produce that was statistically higher between sites was tritium; concentrations of tritium were significantly higher in produce from Los Alamos and on-site areas as compared with regional areas. The differences, however, between the sites were small, and the results compare well with past years (Fresquez et al., 1995b; Fresquez et al., 2001).

See Table 6-10 for mean concentrations of radionuclides in produce collected from regional, perimeter, and on-site areas before (1997–1999) and after the fire (2000 and 2001). In general, most radionuclides, with the exception of tritium, in produce collected at most sites after the Cerro Grande fire were statistically ($\alpha = 0.05$) similar to produce collected before the fire. Tritium in produce collected from White Rock/Pajarito Acres in both 2000 and 2001 was in significantly higher concentrations than in pre-fire years (1997–1999). Because tritium is closely associated with the hydrologic cycle (Whicker and Schulz 1982), these "post-fire" results are probably not related to the burning of vegetation, however, but rather to Laboratory operations, although they are not as high as tritium in produce collected from on-site stations.

d. Nonradiochemical Analytical Results. The trace elements silver, arsenic, beryllium, cadmium, chromium (for the most part), mercury, and thallium in produce from on-site, perimeter, and regional locations were below the LOD (i.e., below the reporting limits) (Table 6-11). These findings are not unexpected because metal uptake in plants is restricted in many alkaline semiarid soils in the western portions of the US as a result of the formation of insoluble carbonate and phosphate complexes (Fresquez et al., 1991). In those cases where produce samples contained trace elements above the LOD (for barium, nickel, lead, selenium, and zinc), very few individual samples exceeded RSRLs. The uptake of trace elements by plants is dependent on natural sources, fertilization, and plant species (Hausenbuiller 1974).

As a group, the levels of barium, nickel, lead, selenium, and zinc in produce from all perimeter areas were not significantly higher ($\alpha = 0.05$) than in produce collected from regional areas. Conversely, selenium concentrations in produce collected from Laboratory locations were significantly higher than regional concentrations. This finding was the same as last year's. Although the concentrations of selenium in produce collected from on-site stations were higher than regional areas, the differences between the sites were low (e.g., a difference of only 0.16 µg/g).

Of special note is that beryllium and lead, which were significantly higher in soils collected in perimeter and on-site areas, were not significantly higher ($\alpha = 0.05$) in produce collected from perimeter or on-site areas as compared with produce collected from regional areas.

Table 6-12 shows trace elements in produce collected before (1999) and after (2000 and 2001) the Cerro Grande fire. With the exception of selenium, which was significantly higher in produce collected from all locations—including regional areas—in 2000 and 2001, none of the concentrations of trace elements in produce collected after the Cerro Grande fire were significantly different ($\alpha = 0.05$) from trace element concentrations in produce collected before the fire. It is hard to say that selenium in produce increased in concentration because of the Cerro Grande fire because (1) selenium in produce collected upwind of the fire (Cochiti/Peña Blanca) also showed statistical differences between the years, (2) no other trace elements were elevated after the fire, and (3) selenium in soil samples collected from these same sites in 2000 (Fresquez et al., 2001) and 2001 (Table 6-3) was not significantly higher than selenium concentrations in soils collected in 1999 (Fresquez and Gonzales 2000). Instead, the statistically higher concentrations of selenium in produce collected in 2000 and 2001 from all sites as compared with selenium in produce collected in 1999 may be a result of a negative analytical laboratory bias, as selenium was not detected (< reporting limit) in any of the samples/sites in 1999.

3. Milk

a. Monitoring Network. No dairy operates in the immediate vicinity of LANL. At this time, the closest working dairy is no longer in operation; it was located approximately 30 miles east of LANL. We evaluated the milk produced there from 1994 to 1997. For the last four years (1997 to 2000), we have been evaluating goat milk obtained from the Los Alamos and White Rock/Pajarito Acres areas. These samples are compared with goat milk collected from Albuquerque, NM (regional); Albuquerque is located approximately 80 miles upwind of LANL.

This year, we did not collect milk. The last collection occurred in 2000, and we will collect milk again during the 2002 season. However, results from the 2000 year are reported here for general information.

b. Sampling Procedures, Data Management, and Quality Assurance. The farmer collected the milk and delivered it to our team. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Milk and Tea Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-005, R0, 1997. CST-9 analyzed the milk for radionuclides, and all QA/QC requirements were met.

c. Radiochemical Analytical Results. All radionuclide concentrations, including iodine-131, in goat milk from the perimeter areas in 2000 were nondetectable or within upper-level regional concentrations. Moreover, most radionuclides were lower than or similar to radionuclides in goat milk collected before the Cerro Grande fire in 1999 (Fresquez 1999; Fresquez and Gonzales 2000), and tritium and strontium-90 levels, in particular, were similar to tritium and strontium-90 levels in milk from other states around the country (Black et al., 1995). The data for these results can be found in Fresquez et al. (2001).

4. Fish

a. Monitoring Network. We collect fish annually upstream and downstream of the Laboratory—mainly because 19 canyons cut through Laboratory property, and some flow resulting from excessive storm events may eventually reach the Rio Grande (Figure 6-4). Cochiti Reservoir, a 10,690-acre flood and sediment control project, is located on the Rio Grande approximately five miles downstream from the Laboratory. We compared radionuclides and nonradionuclides in fish collected from Cochiti Reservoir with fish collected from a regional reservoir. The regional reservoir, Abiquiu, is located on the Rio Chama, upstream from the confluence of the Rio Grande and intermittent streams that cross Laboratory lands (Fresquez et al., 1994).

The samples include two types of fish: game (predators) and nongame (bottom-feeders). This year, game fish included northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides salmoides*), smallmouth bass (*Micropterus dolomieui*), white crappie (*Pomoxis annularis*), brown trout (*Salmo trutta*), white bass (*Morone chrysops*), and walleye (*Stizostedion vitreum*). Nongame fish included the white sucker (*Catostomus commersoni*), channel catfish (*Ictalurus punctatus*), carp (*Cyprinus carpio*), and carp sucker (*Carpiodes carpio carpio*). (Note: Bottom-feeding fish are better indicators of environmental contamination than the predator game fish because they forage on the bottom where contaminants [e.g., radionuclides] readily bind to sediments [Whicker and Schultz 1982]).

b. Sampling Procedures, Data Management, and Quality Assurance. We collected fish by gill nets and transported them under ice to the laboratory for preparation. At the laboratory, fish were gutted, had their heads and tails removed, and were washed. We submitted muscle (plus associated bone) tissue for radiochemical analysis as an ash sample and submitted muscle (fillet) in a wet frozen state for trace element analysis. All QA/QC protocols, chemical analyses, data handling, validation and tabulation can be found in the ESH-20 OP entitled, "Fish Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-002, R0, 1997. Paragon Analytics, Inc., from Fort Collins, CO, analyzed the fish samples for radionuclides, and all QA/QC requirements were met. CST-9 analyzed the fish samples for heavy metals collected from Cochiti Reservoir in April (4/25/01) and from Abiquiu Reservoir in June (6/19/01), and Paragon Analytics, Inc., analyzed the fish samples for heavy metals collected from Cochiti in May (5/30/01) and August (8/14/01).

c. Radiochemical Analytical Results. Since the Cerro Grande fire in May 2000, we have collected fish on three occasions in 2000 (June, July, and August) (Fresquez et al., 2001) and on three occasions in 2001 (April, May, and August), mainly to monitor the effects of runoff, if any, into the Rio Grande. Table 6-13 shows the game fish results for 2001, and Table 6-14 shows nongame fish results. In general, most radionuclide concentrations (activity) in game and nongame fish collected from Cochiti Reservoir were nondetectable or within upper-level regional concentrations; the few detectable values that were above the RSRL were still very low (pCi/g range). These results were similar to radionuclide contents in crappie, trout, and salmon from comparable (background) reservoirs and lakes in Colorado (Whicker et al., 1972; Nelson and Whicker 1969) and New Mexico (Fresquez et al., 1996b; Fresquez et al., 1998b) and, more recently, to radionuclide contents in fish collected along the length of the Rio Grande from Colorado to Texas (Booher et al., 1998). Also, they compare well with fish collected in the Rio Grande below LANL in 1998 (Fresquez et al., 1999b).

As a group (and using detectable and nondetectable values), all radionuclide concentrations in both game and nongame fish collected downstream of LANL at Cochiti reservoir in April, May, or August were not significantly higher ($\alpha = 0.05$) than radionuclide concentrations in fish collected upstream of LANL at Abiquiu Reservoir.

As expected, the bottom-feeding fish from both downstream and upstream reservoirs from LANL contained significantly higher ($\alpha = 0.05$) average uranium contents (15 ng per dry gram) than the predator fish (5 ng per dry gram). The higher concentration of uranium in bottom-feeding fish compared with predator fish is attributed to the ingestion of sediments on the bottom of the lake (Gallegos et al., 1971). Radionuclides readily bind to sediments (Whicker and Schultz 1982).

Table 6-15 contains a comparison of radionuclide concentrations in fish collected at Abiquiu and Cochiti Reservoirs before (1999) and after (2000 and 2001) the Cerro Grande fire. With respect to fish collected at Cochiti after the Cerro Grande fire, all mean radionuclide concentrations in fish were not statistically higher ($\alpha = 0.05$) than radionuclide concentrations in fish from Cochiti collected before the fire in 1999. In fact, game and nongame fish collected in 1999 at Cochiti were generally higher in mean concentrations of strontium-90, total uranium, plutonium-238, plutonium-239, -240, and americium-241 than in fish collected after the fire, and particularly as compared with 2001. Comparing radionuclide concentration trends in both game and nongame fish collected from Cochiti from 1999 to 2001, the majority of radionuclides appear not to have changed. Some radionuclides like strontium-90 and plutonium-239 in nongame fish from Cochiti, however, appear to be decreasing in concentration during this time period.

d. Long-Term (Radionuclide) Trends. Fresquez et al. (1994) conducted a summary and trend analysis of radionuclides in game and nongame fish collected from reservoirs upstream (Abiquiu, Heron, and El Vado Reservoirs) and downstream (Cochiti Reservoir) of LANL from 1981 to 1993. In general, the average levels of strontium-90, cesium-137, plutonium-238, and plutonium-239, -240 in game and nongame fish collected from Cochiti Reservoir were not significantly different ($\alpha = 0.05$) from concentrations in fish collected from reservoirs upstream of the Laboratory. Total uranium was the only radionuclide that we found to be significantly higher in both game and nongame fish from Cochiti Reservoir when compared with fish from Abiquiu, Heron, and El Vado Reservoirs. Sources of the higher uranium concentrations in fish from Cochiti as compared with fish upstream include (1) Cochiti receives greater amounts of sediments than the other reservoirs, (2) the Cochiti area has more uranium-bearing minerals, and (3) some uranium may be entering Cochiti reservoir by way of the Santa Fe River as it flows past the edge of an abandoned uranium mine site (La Bajada uranium mine). Uranium concentrations in fish collected from Cochiti Reservoir, however, significantly decreased from 1981 to 1993, and fish samples collected from Cochiti Reservoir in 1993 showed no evidence of depleted uranium (DU) (Fresquez and Armstrong 1996). (Note: This trend analysis is the most current to date; however, concentrations of all radionuclides in fish collected downstream of LANL during the 2001 sampling year were lower than or similar to concentrations in 1993.)

e. Nonradiological Analytical Results. Total recoverable trace elements in the muscle (fillet) of game and nongame fish collected upstream and downstream of LANL at three different sampling times are available in Table 6-16 and Table 6-17, respectively. In general, most of the trace elements in both game and nongame fish collected upstream and downstream of LANL were below the LOD. Of those elements that were above the LOD (barium, mercury, and selenium), we found that barium concentrations in game and nongame fish collected upstream of LANL at Abiquiu Reservoir were significantly higher ($\alpha = 0.05$) than in fish collected from Cochiti Reservoir on the last two collection periods (May and August). In contrast, selenium concentrations in both game and nongame fish collected from Cochiti Reservoir on the last two collection periods were significantly higher than fish collected from Abiquiu. As described in section b, "Sampling Procedures, Data Management, and Quality Assurance," an in-house Laboratory group, CST-9, analyzed the fish samples for heavy metals collected in April (Cochiti) and June (Abiqiui), and Paragon Analytics, Inc., analyzed the fish samples for heavy metals collected in May (Cochiti) and August (Cochiti). These above-described differences in barium and selenium in fish collected from Abiquiu and Cochiti reservoirs, then, may be a result of a laboratory analytical bias rather than any effects of the Cerro Grande fire. (Note: The same selenium bias was also noted in Section B.2.d for produce.)

As for mercury, which was detected in game and nongame fish collected from both reservoirs, all concentrations in fish collected from Cochiti reservoir were statistically similar ($\alpha = 0.05$) to concentrations in fish collected upstream of the Laboratory at Abiquiu Reservoir on all three sampling dates. The results of the trace element analysis in bottom-feeding fish samples from Cochiti and Abiquiu Reservoirs in past years showed that mercury was the only element to be consistently detected above the LOD, and, this year as in past years, the concentrations of mercury in bottom-feeding fish from Cochiti reservoir were within the RSRL of 0.48 μg mercury per gram (wet weight basis) (Fresquez et al., 1999c). These data also compare well with bottom-feeding fish samples the New Mexico Environment Department (NMED) collected from Cochiti reservoir in July of 2000; we show 0.18 to 0.26 μg mercury per wet gram in fillet samples (N = 18), and they detected an average of 0.30 μg mercury per wet gram in gutted whole samples (N = 4) (Yanicak 2001). As for predator fish, we show 0.12 to 0.76 μg mercury per wet gram in fillet samples (N = 17), and NMED shows an average of 1.4 g mercury per wet gram in gutted whole samples (N = 4). Also, it should be noted that total cyanide, a compound ion that was detected in elevated concentrations in storm runoff as a result of the Cerro Grande fire (Gallaher 2000), was not detected in fish downstream of LANL in April of 2001. These results are similar to results from 2000 (Fresquez et al., 2001).

A comparison of mercury concentrations in predator (N = 4) and bottom-feeding (N = 4) fish collected from both Abiquiu and Cochiti Reservoirs (the data were pooled) shows that mercury concentrations in predator fish (mean = 0.32; std dev = 0.03) were significantly higher ($\alpha = 0.05$) than mercury in bottom-feeding fish (mean = 0.23; std dev = 0.04). These results are not surprising as methyl mercury, which is fat- and water-soluble and easily taken up by living cells (Hammond and Foulkes 1986), readily bioaccumulates (e.g., larger fish > smaller fish) (Bache et al., 1971) and biomagnifies (e.g., carnivorous fish > omnivorous fish > herbivorous fish) (Ochiai 1995). Some predator fish, for example, particularly some of the large pike (≈10 lb fish) (0.76 µg mercury per wet gram) and bass (≈3 lb fish) (0.57 µg mercury per wet gram) collected at Cochiti Reservoir this year, contained some of the highest levels of mercury and exceeded the RSRL for game fish (<0.41 µg mercury per wet gram). All and all, however, the levels of mercury in predator fish muscle (fillets) collected at Cochiti Reservoir were still below the US Food and Drug Administration's ingestion limit of 1 µg mercury/gram wet weight (Torres 1998).

See Table 6-18 for a comparison of mercury in bottom-feeding fish collected before (1991–1999) and after (2000 and 2001) the Cerro Grande fire. (Note: Because most of the trace elements, with the exception of mercury, in past years were below the LOD, we collected only mercury data, for the most part, and comparisons over time are described here.) Results show no significant differences ($\alpha = 0.05$) in mercury concentrations in bottom-feeding fish collected at Cochiti Reservoir after the Cerro Grande fire (2000 and 2001) as compared with fish collected at Cochiti before the fire, and there appears to be no trend, either decreasing or increasing, as a result of the fire.

f. Long-Term (Nonradiological) Trends. From 1991 to 1999, we conducted a summary and trend analysis of major trace elements, with special reference to mercury, in mostly nongame fish (muscle fillets) collected from Abiquiu, Heron, and El Vado Reservoirs upstream of LANL (hereafter referred to collectively as Abiquiu Reservoir) and Cochiti Reservoir downstream of LANL (Fresquez et al., 1999c). With the exception of mercury, most trace elements in fish muscle collected from Abiquiu and Cochiti over a nine-year period were below the LOD. Mean mercury concentrations in all years in fish from Abiquiu Reservoir, upstream of LANL, were generally higher than mercury concentrations in fish from Cochiti Reservoir, and the statistical analysis of the mean of means showed that mercury in fish from Abiquiu Reservoir was significantly higher ($\alpha = 0.10$) than mercury in fish collected from Cochiti Reservoir. The highest individual mercury concentrations [1.0 µg/g wet weight] were detected in a single catfish each from Abiquiu and Cochiti Reservoirs in 1994, and the only carnivorous fish collected, brown trout from Abiquiu Reservoir and white crappie from Cochiti Reservoir in 1991, contained 0.30 and 0.36 µg/g of mercury (wet weight basis), respectively.

Mean concentrations of mercury in fish muscle from both Abiquiu and Cochiti Reservoirs were below the US Food and Drug Administration's ingestion limit of 1 µg mercury/g wet weight (Torres 1998). Concentrations of mercury in catfish from this study were very similar to mercury levels in catfish recently collected from Conchas Lake, which averaged 0.25 µg/g wet weight, and Santa Rosa Lake, which ranged from 0.22 to 0.33 µg/g wet weight (Bousek 1996; Torres 1998). These authors concluded that the health risks that mercury in fish from Conchas and Santa Rosa Lakes poses to the average sport fisherman were negligible.

Overall, mean mercury concentrations in fish collected from both reservoirs show significantly decreasing trends over time; Abiquiu ($p = 0.045$) was significant at the 0.05 probability level, and Cochiti ($p = 0.066$) was significant at the 0.10 probability level. It is not completely known why concentrations of mercury are decreasing in fish collected from Abiquiu and Cochiti, but the reduction of emissions in coal-burning power plants or the reduction of carbon sources within the reservoirs may be part of the reason. Since the early 1980s, for example, coal-burning power plants in the northwest corner of New Mexico have been required to install venturi scrubbers and baghouses to capture particulates and reduce air emissions (Martinez 1999). Additionally, because the conversion of mercury to methyl mercury is primarily a biological process, it has been demonstrated that mercury concentrations in fish tissue rise significantly in impoundments that form behind new dams and then gradually decline to an equilibrium level as the carbon provided by flooded vegetation is depleted (NMED 1999). (Note: This trend analysis is the most current to date; however, concentrations of most trace elements, including mercury, in fish muscle (fillet) collected downstream of LANL during the 2001 year [average = 0.23 µg/g wet weight] were statistically similar ($\alpha = 0.05$) to concentrations in 1999 [average = 0.14 µg/g wet weight].)

5. Game Animals (Elk and Deer)

a. Monitoring Network. Mule deer (*Odocoileus hemionus*) and Rocky Mountain elk (*Cervus elaphus*) are common inhabitants of LANL lands. Resident populations of deer number from 50 to 100; elk number from 100 to 200 and increase to as many as 2,000 animals during the winter months (Fresquez et al., 1999d), reflecting large mammal migration to lower elevations. We collect samples of elk and deer as roadkills; therefore, the availability of samples is beyond our control, but usually the collection of one or two animals per year from Laboratory and perimeter areas is possible. At this point, we have collected approximately 23 elk and 11 deer from Laboratory property and approximately 7 elk and 4 deer from the perimeter of LANL property. When an animal is collected, the muscle and bone are processed and analyzed for a host of radionuclides—the muscle because it is the major organ that humans consume and the bone because it may also be consumed, albeit indirectly, and many radionuclides like strontium and plutonium are deposited there. We then compare these data with meat and bone samples from elk and deer collected from regional locations.

b. Sampling Procedures, Data Management, and Quality Assurance. We collected samples of elk and deer meat and bone tissue (1000 g each) from fresh roadkills around and within the Laboratory. The New Mexico Department of Game and Fish collected regional samples. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Game Animal Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-003, R0, 1997. Laboratory group CST-9 analyzed the samples. We collected the samples reported here in late 1999 and early 2000. (Note: These data were received late, so we could not report the results in the 2000 ESR; they are reported here, however, for completeness.)

c. Radiochemical Analytical Results. All radionuclide concentrations, with the exception of tritium in meat and bone tissue of a cow elk collected from LANL lands within TA-53, were nondetectable or below upper-level regional concentrations (Table 6-19) and were within concentrations from past years (Fresquez et al., 1998c). Although tritium concentrations in meat and bone samples collected from an elk at TA-53 were higher than regional background elk, the differences were quite low, just 1.4 times higher than the RSRL. The slightly higher levels of tritium in this elk collected at TA-53 as compared with background may be due to operations at TA-53—the Los Alamos Neutron Science Center (LANSCE)—that produce tritium as an activation product and/or from coolant water used at the target cell. Activities at TA-53 include the use of a high-energy linear particle accelerator, which, upon contact with the atmosphere, converts water vapor to tritium. Bees collected at TA-53 in the past have shown elevated concentrations of tritium as compared with regional levels (Fresquez et al., 1997b; Haarmann 1998).

All radionuclide concentrations in meat and bone tissue of a deer collected from a perimeter area, San Ildefonso Pueblo lands off State Road 502, were nondetectable or within RSRLs (Table 6-20). The deer collected off US Highway 84/285 near Tesuque was considered a regional animal and was added to the data base as such. All radionuclide concentrations in the deer collected from perimeter and regional areas were similar to past years (Fresquez et al., 1998c).

d. Long-Term Trends. A 1998 report summarized radionuclide concentrations (tritium, strontium-90; cesium-137; plutonium-238 and plutonium-239, -240; americium-241; and uranium) determined in meat and bone tissue of deer and elk collected from LANL lands from 1991 through 1998 (Fresquez et al., 1998c). Also, we estimated the CEDE to people who ingest meat and bone from deer and elk collected from LANL lands. Most radionuclide concentrations in meat and bone from individual deer and elk collected from LANL lands were at less than detectable quantities or within upper-level regional concentrations. As a group (and using detectable and nondetectable values), most radionuclides in meat and bone of deer and elk from LANL lands were not significantly higher ($\alpha = 0.05$) than in similar tissues from deer and elk collected from regional locations. Also, elk that had been tracked for two years with radio collars and spent an average time of 50% on LANL lands were not significantly different in most radionuclide levels from roadkill elk that have been collected on LANL lands as part of the Environmental Surveillance Program (ESP). All CEDEs were far below the International Commission on Radiological Protection guideline of 100 mrem/yr. (Note: This trend analysis is the most current to date; however, concentrations of all radionuclides in elk and deer collected from LANL lands during 1999 were lower or similar to concentrations in 1998.)

The modeling study, Ferenbaugh et al., 1999 and 2002, also takes long-term elk and deer data into account. That study used soil and vegetation data from the perimeter of Area G to estimate the dose to humans from tissue consumption of elk and deer that foraged around Area G. We compared results with the aforementioned study of Fresquez et al. (1998c) and found them to be on the same order of magnitude. Also, an estimate of the dose to deer and elk that foraged around the perimeter of Area G showed that the doses were significantly less than established exposure limits or guidelines (<0.1 rad/day).

6. Honey

a. Monitoring Network. We did not sample honey bee (*Apis mellifera ligustica*) hives during the 2001 season; honey is generally collected every other year from two perimeter areas—Los Alamos town site and White Rock/Pajarito Acres. The last collection occurred in 2000 after the Cerro Grande fire, and we will collect it again during the 2002 season. We compare the honey from these hives with honey collected from regional hives located in Jemez and Española, New Mexico, and report the results here for general information.

b. Sampling Procedures, Data Management, and Quality Assurance. Honey is collected directly from the producer in their bottles. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Honey Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-004, RO, 1997.

c. Radiochemical Analytical Results. All radionuclide concentrations in honey collected from perimeter hives in 2000 were either nondetectable or within upper-level regional concentrations and were similar to past years (Fresquez et al., 1997a; Fresquez et al., 1997b; Fresquez and Gonzales 2000).

d. Long-Term Trends. Several long-term data evaluations have examined radionuclide concentrations, particularly tritium, in bees and honey within the LANL environs. The first study evaluated a host of radionuclides (tritium; cobalt-57; cobalt-60; europium-152; potassium-40; beryllium-7; sodium-22; manganese-54; rubidium-83; cesium-137; plutonium-238 and plutonium-239, -240; strontium-90; americium-241; and total uranium) in honey collected from hives located around the perimeter of LANL (Los Alamos and White Rock/Pajarito Acres) over a 17-year period (Fresquez et al., 1997a). All radionuclides, with the exception of tritium, in honey collected from perimeter hives around LANL were not significantly different ($\alpha = 0.05$) from regional areas. Overall, the maximum total net positive CEDE—based on the average concentration plus two standard deviations of all the radionuclides measured over the years after the subtraction of background—from consuming 11 lb. of honey (maximum consumption rate) collected from Los Alamos and White Rock/Pajarito Acres was 0.031 mrem/yr and 0.006 mrem/yr, respectively. The highest CEDE was <0.04% of the International Commission on Radiological Protection permissible dose limit of 100 mrem/yr from all pathways. (Note: This trend analysis is the most current to date; however, concentrations of all radionuclides in honey collected from perimeter locations during the 2000 year were lower or similar to concentrations in 1997.)

The second study examined tritium concentrations in bees and honey collected from within and around LANL over an 18-year period (Fresquez et al., 1997b). Based on the long-term average, bees from nine out of 11 hives and honey from six out of 11 hives on LANL lands contained tritium that was significantly higher ($\alpha = 0.05$) than regional areas. The bees with the highest average concentration of tritium (435 pCi/mL) collected over the years were from LANL's low-level radioactive waste disposal site (Area G) at TA-54. Similarly, the honey with the highest average concentration of tritium (709 pCi/mL) came from a hive located near three tritium-contaminated storage ponds at LANL TA-53. The average concentrations of tritium in bees and honey from regional hives were 1.0 pCi/mL and 1.5 pCi/mL, respectively. Although the concentrations of tritium in bees and honey from most LANL and perimeter (White Rock/Pajarito Acres) areas were significantly higher than regional areas, most areas, with the exception of TA-53 and TA-54, generally exhibited decreasing tritium concentrations over time. (Note: This trend analysis is the most current to date; however, concentrations of tritium in honey collected from perimeter and LANL lands in 2000 were lower or similar to concentrations in 1997.)

7. Special Foodstuffs Monitoring Studies

a. Prickly Pear. We collected prickly pear (fruit) (*Opuntia phaecantha*) from two perimeter areas in 2001: Los Alamos town site on the north and San Ildefonso Pueblo lands on the east. We also collected fruit from prickly pear in the Española/Santa Fe/Jemez area as a regional comparison. The regional sampling locations were far enough from the Laboratory that they were mostly unaffected by Laboratory airborne emissions. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Produce Sampling and Processing for the Foodstuffs Monitoring Program," LANL-ESH-20-SF-OP-001, R0, 1997. Paragon

Analytics, Inc., of Fort Collins, CO, analyzed the samples for radiological and trace element constituents, and all QA/QC requirements were met.

Tables 6-21 and 6-22 present the radionuclide and trace element results of the prickly pear fruit samples collected during 2001, respectively. Most radionuclides, with the exception of tritium, in prickly pear fruit collected from perimeter areas during the 2001 year were in nondetectable quantities or within RSRLs. These data, with the exception of tritium, were similar to the past year's data (Fresquez et al., 2001). Although tritium concentrations in prickly pear fruit collected from perimeter areas were two times higher than the RSRLs, the overall mean differences, based on 1999 and 2001 pooled data (San Ildefonso = 0.64 [± 0.50] pCi/mL and Los Alamos = 0.43 [± 0.81] pCi/mL), showed no significant differences ($\alpha = 0.05$) in tritium concentrations in prickly pear fruit between perimeter and regional (0.07 ± 0.23 pCi/mL) sites. Prickly pear fruit tended to have higher strontium-90 concentrations than other produce crops. For example, the overall average concentration for strontium-90 in prickly pear fruit from all sites (regional background and perimeter sites; N = 6) over two years of measurement was 678E-03 pCi/g dry versus the overall upper range (mean plus two std dev) amount for produce crops of 112E-03 pCi/g dry.

Of the 12 trace elements in prickly pear fruit collected from the perimeter areas, only five (barium, cadmium, nickel, lead, and selenium) were measured above the LOD (Table 6-22). And, of these five elements, only selenium was higher than the RSRL, although it was over by just a half of a ppm. In any case, most of these elements agree with past data, with the exception of barium.

In 2000, we reported that barium concentrations in prickly pear fruit collected in 1999 from the perimeter areas (120 µg/g) were relatively higher than in regional background fruit (23 µg/g) (Fresquez et al., 2001). This year (2001), barium concentrations in prickly pear fruit collected from regional areas (130 µg/g) were similar to concentrations in the perimeter areas (63 to 140 µg/g) and to the past year; therefore, the higher amounts of barium in prickly pear fruit detected in perimeter areas as compared with regional areas in 1999 were a result of natural variation.

b. Herbal Teas. We did not collect herbal teas this year for analysis as in past years. Please refer to past environmental surveillance reports for a description of radiological results from the analysis of Navajo Tea (*Thelesperma subnudum*) (Armstrong and Fresquez 1997; Fresquez 1998; Fresquez 1999; Fresquez and Gonzales 2000), Saint John's Wort (*Hypericum perforatum*), and Elderberry (*Sambucus canadensis*) (Fresquez et al., 2001).

C. Biota Monitoring (*Gil Gonzales*)

1. Introduction

In addition to mandating the monitoring of human foodstuffs for contaminants, DOE Orders 5400.1 and 5400.5 mandate the monitoring of nonfoodstuffs biota for the protection of ecosystems (DOE 1991). Although monitoring of biota mostly in the form of facility-specific or site-specific studies began in the 1970s with the ESP, in 1994 the DOE requested additional emphasis on nonfoodstuffs biota. Nonfoodstuffs biota, such as small mammals, amphibians, birds, and vegetation, are monitored within and around LANL on a systematic or special study basis for radiological and nonradiological constituents. We also monitor or study some human foodstuffs that serve as an important link in ecological food chains, such as fish consumed by bald eagles. We are currently emphasizing organic chemical analysis because research has determined that the highest risk to nonhuman biota at the Laboratory is generally not from radionuclides but rather from organic compounds such as pesticides and polychlorinated biphenyls (PCBs) (Gonzales 2000).

In 2000, we reported on vegetation that was collected at the 25 routine soil sampling stations within and around LANL (Fresquez and Gonzales 2000). Vegetation is one of the media that we will periodically sample as part of the routine surveillance program because it is the foundation of ecosystems as it provides a usable form of energy and nutrients that are transferred through food chains. Because of this function in the food chain, vegetation can serve as an important pathway of contaminants to biological systems including the ingestion of soil that occurs during the consumption of plants. Fish and small mammals are also on the routine surveillance list. As reported below, we sampled fish in the year 2000 at Cochiti Reservoir, which is downstream of LANL, and analyzed them for organic contaminants. We have sampled small mammals in special monitoring studies but never on a Laboratory-wide, routine basis.

The biota portion of the ESP is also important to ecological risk assessments conducted at LANL. Ecological risk assessment is becoming an important tool at LANL and other DOE sites because it helps risk managers prioritize the contaminants, areas, and biological species that need studying. Site-specific special monitoring studies, also discussed in this chapter, are important in establishing site-specific coefficients of contaminant transfer between different feeding levels so that accurate dose estimates can be made (Whicker and Schultz 1982; Calabrese and Baldwin 1993; EPA 1998). The relationship between ecological risk assessment and environmental surveillance is several-fold. First, the ESP provides contaminant data for assessing trend, exposure, and potential effects on ecological entities. The data collected for surveillance programs include concentrations of contaminants in living and nonliving media, both of which are useful in ecological risk assessments. The data on contaminant levels in living organisms can also validate ecological risk models by comparing the accuracy of model predictions with real data. Second, the results of ecological risk assessments can help identify gaps in the ESP. For example, ecological risk assessments on threatened and endangered (T&E) species at LANL established the need to develop an organic-contaminant focus area as a component of the LANL ESP (Gonzales et al., 1998). Another example is the need for knowledge of contaminant levels in reptiles and amphibians native to the LANL environment and related potential risk.

The monitoring of organic contaminants in the environment for the ESP helps to focus additional ecological risk assessments. Thus, the relationship between the ESP and ecological risk assessment is mutualistic and iterative. As does the ESP, ecological risk assessments help identify special studies that enhance the basis on which environmental compliance is founded, and this is probably the most useful outcome of ecological risk assessments. Last year's edition of the ESR contains a short summary of the history of ecological risk assessment.

The two main historical objectives of the biota program are to determine (1) on-site contaminant concentrations in biota and compare them with off-site regional background concentrations and (2) trends over time. On-site concentrations are the result of potentially Laboratory-added contamination plus, in many cases, natural sources. With the issuance of the interim standard on evaluating radiation doses to aquatic and terrestrial biota (DOE 2000), a new and third objective is providing data for use in evaluating compliance with specified limits on radiation dose to plants and animals. The standard will be implemented incrementally over time. Chapter 3 has the results of the applications of the standard that were made in 2001.

2. Institutional Surveillance of Organic Analytes in Fish

a. Monitoring Network. As discussed in Section 6.B.4, we sample and analyze fish from bodies of water that are adjacent to or potentially influenced by LANL as part of the routine surveillance program. In calendar year 2001, we sampled catfish at Cochiti Reservoir in April and August and Abiquiu Reservoir in June. Cochiti Reservoir is downriver from where canyons that traverse LANL meet the Rio Grande, and Abiquiu Reservoir is on the Chama River above LANL. Abiquiu Reservoir discharges into the Rio Grande above LANL. The Rio Grande discharges into Cochiti Reservoir. Though there are no perfect reference sites for comparing to Cochiti, we used Abiquiu as a reference site from which "background" data are compared with data obtained at Cochiti. The purpose is to try and determine whether any contamination at LANL is moving into Cochiti Reservoir and reservoir fish through hydrologic transport of any kind, though we know that there are/were sources of organic contaminants into Abiquiu Reservoir and the Rio Grande above LANL. We analyzed whole-body and partitioned samples for PCB congeners (i.e., individual PCBs), organochlorine pesticides, and dioxins/furans.

The presence of PCBs, DDT, and other organic contaminants in fish in the Los Alamos area and more broadly is not at all new. The pervasiveness of these compounds in fish worldwide and in the US has been documented since at least the 1970s (Stoker and Seager 1976; Schmitt et al., 1990), regionally and within New Mexico (Eisler 1986), and in the Rio Grande above and below Los Alamos as well as at Cochiti Reservoir (Roy et al., 1992; Carter 1997).

b. Sampling Procedures, Data Management, and Quality Assurance. The sampling procedure, data management, and quality assurance were generally the same as described in Section 6.B.4.b. Whole-body (head, tail, skin, viscera, bone, and muscle) fresh weight (FW) samples were homogenized and analyzed using a modified EPA Method 1668—high-resolution gas chromatography and high-resolution mass spectrometry (HRGC/HRMS). The organochlorine pesticides measured were hexachlorobenzene; alpha, beta, and gamma hexachlorohexane; heptachlor, aldrin, oxychlordane, trans-chlordane, cis-chlordane, dichlorodiphenyltrichloroethane (DDT); dichlorodiphenyldichloroethane (DDD); dichlorodiphenylethane (DDE); trans-nonachlor, cis-nonachlor, mirex, alpha-endosulfan (I); dieldrin, endrin, beta-endosulfan (II); endosulfan sulfate; methoxychlor; delta HCH; and heptachlor epoxide. Theoretically, PCBs have 209 different possible congeners, but only about 130 have ever been detected, and the majority of the toxicity exhibited by PCBs is from the group of 13 coplanar PCBs that behave like dioxins ("dioxin-like PCBs"). The toxicities of the non-dioxin-like PCBs are still somewhat unknown. We analyzed the fish for the 13 dioxin-like PCBs: PCB No. 77 (3,3',4,4'-TeCB), 81 (3,4,4',5-TeCB), 105 (2,3,3',4,4'-PeCB), 114 (2,3,4,4',5-PeCB), 118 (2,3',4,4',5-PeCB), 123 (2',3,4,4',5-PeCB), 126 (3,3',4,4',5-PeCB), 156 (2,3,3',4,4',5-HxCB), 167 (2,3',4,4',5,5'-HxCB), 169 (3,3',4,4',5,5'-HxCB), 170 (2,2',3,3',4,4',5-HpCB), 180 (2,2',3,4,4',5,5'-HpCB), and 189 (2,3,3',4,4',5,5'-HpCB). We compared the results (1) between Abiquiu and Cochiti reservoirs, (2) to various ecological health "benchmarks," (3) to results obtained in previous years, and (4) to results NMED obtained on fish that were given to them by LANL.

Detection limits ranged from 0.01–15 pg/g (parts per trillion [ppt]) for the PCB congeners and 0.01–2.1 ng/g (parts per billion [ppb]) for the pesticides. Measured levels were generally two to four orders of magnitude above the detection limits. Axys, Inc., documented the specifics of the analytical method in a statement of qualification (Axys 1999).

To assess the toxicity of PCBs and dioxins, we computed one other parameter—Toxicity Equivalence Quotients (TEQs)—as follows. Some structurally related aromatic hydrocarbons, such as the 13 dioxin-like PCBs and dioxins, invoke a number of common toxic responses. The relative toxicity or potency of the 13 dioxin-like PCBs in comparison with the toxicity of tetrachlorodibenzodioxin (TCDD) is known. On this basis, the World Health Organization has developed TCDD equivalency factors (TEFs) for the 13 congeners and a method by which their toxicity can be assessed. To evaluate the dioxin-like toxicity PCBs cause, the concentration of each congener in biological tissue is multiplied by its TEF, and the 13 resulting values are summed, resulting in a total TEQ. The TEQ can then be used in a number of ways such as comparing it with a screening value or other benchmarks for TCDD.

In order to apply the contaminant data reported in this study to human risk endpoints, one needs to consider the portion of the whole fish that is edible. Contribution by tissue (e.g., bone) and media (e.g., sediment in the stomach) not usually consumed by humans should not be used to assess risk to humans. Because catfish are typically filleted when prepared for human consumption, we analyzed some of this year's samples (five August samples) partitioned into skin-on fillet, viscera (gills, gut [including stomach content], and organs), and carcass (bone, head, tail, fins, and muscle [meat] adhered to the skeleton). We measured the contributions of total dioxin-like PCBs, total dioxins, and total DDT and metabolites in these partitions. We calculated, based on the contribution to the whole by these parts, percentages of whole-body PCB and DDT concentration contributed by the partitions. We determined that viscera make up about 10% by wt. of a whole catfish and contribute about 32% of the PCBs in the whole fish; fillets make up about 26% by wt. of a whole catfish and contribute about 25% of the PCBs; and the carcass makes up about 64% by wt. of a whole catfish and contributes about 43% of the PCBs. We determined that viscera contribute about 34% of the total DDT and metabolites (DDT+DDD+DDE) in the whole fish, fillets contribute about 26%, and the carcass contributes about 40%. Thus, the portion of catfish not usually consumed by humans contains about 75% of the PCBs and 74% of the total DDT in a whole catfish.

c. Analytical Results (PCBs and TEQs). [Note: When used here, the phrase "total PCBs" means total dioxin-like PCBs.] Table 6-23 shows the congener analytical results, TEQs, and totals. With very low detection limits (ppt), we detected PCBs in all 13 samples (8 Cochiti and 5 Abiquiu). Total dioxin-like PCBs ranged from 5.4E-04 to 1.5E-03 μg/g-[or parts per million (ppm)]-fresh weight (FW) in Abiquiu reservoir and 3.0E-03 to 3.2E-02 ppm-FW in Cochiti Reservoir. Mean total whole-body PCB levels in Cochiti were 1.5E-02 ppm-FW in April and 4.2E-03 ppm-FW in August. To determine whether to combine data from the two sampling periods at Cochiti such that a combined set of Cochiti data is compared with Abiquiu, we statistically analyzed the effect of time (April versus August) for the Cochiti data. The effect of time for the Cochiti samples was nonsignificant

($P = 0.34$, $t_{0.05, 2} = 1.2$). The mean total PCB concentration for Abiquiu was 7.9E-04 ppm-FW and 8.1E-03 ppm-FW for Cochiti.

In 1999, the NMED analyzed for PCBs two fish (one carp, one catfish) given to them by LANL. The mean dioxin-like total PCB concentration from the two Cochiti fish was 6.9E-03 ppm (whole-body) (NMED 2002), which is within our range and in good agreement with our mean. The NMED mean total dioxin-like PCB concentration for fillets from three individual game fish taken from Cochiti in 2000—1.2E-03 ppm-FW (NMED 2002)—is in good agreement with our mean for catfish fillets—2.6E-03 ppm. The national mean concentration of total PCB mixtures in whole fish in 1984 was 0.39 ppm (EPA 1999); however, declines have occurred since then. The five Abiquiu values had a standard deviation of 54% of the mean. April values ($N = 3$) for Cochiti have a coeffience of variation of 100% of the mean, and August values ($N = 5$) varied by 25% of the mean.

The mean PCB concentration of fish from Cochiti Reservoir (8.1E-03 ppm) was not statistically higher ($P = 0.07$, $t_{0.05, 7} = 2.7$) than the Abiquiu mean (7.9E-04 ppm). The mean total PCB concentration in catfish (8.1E-03 ppm) from Cochiti in 2001 (Table 6-23) is very close to the mean concentration (7.1E-03 ppm) that we measured in carp and carp sucker at Cochiti in 2000 (Figure 6-5) (Fresquez et al., 2001). The difference in PCBs between Cochiti and Abiquiu fish in 2000 was significant at the 95% confidence level ($P = 0.02$, $t_{0.05, 12} = 2.2$) (Fresquez et al., 2001).

PCB Contribution from LANL. In 1997, we sampled three species of fish (catfish, common carp, and white sucker) at various points along the Rio Grande and analyzed them for PCB mixtures (Aroclors) using gas chromatography/electron capture detectors following EPA Method 8082 (Gonzales et al., 1999). Four of the sampling locations were within the potential influence of LANL (at or below LANL), and one was outside of the influence of LANL (above LANL on the Rio Grande). With low sensitivity (detections limits 0.1–0.5 ppm) when analyzing PCB mixtures, many of the results were "nondetections." Eight of 18 fish had measurable levels of Aroclor-1254, and 1 in 18 fish had Aroclor-1260. We did not detect Aroclors-1016, -1221, -1232, -1242, and -1248. Aroclor analysis is believed to be less accurate than congener analysis. Nevertheless, some comparison can be made. If "nondetects" for Aroclors-1254 and 1260 are replaced with one-half the detection limit (DL), the mean total PCB concentration from Aroclors at the "above-LANL" Rio Grande location was 1.6E-01 (Figure 6-6) (Gonzales et al., 1999), which is about 60 times the mean total PCB concentration in catfish fillets at Cochiti in 2001—2.6E-03 ppm-FW (August samples only). The mean total PCB concentration in fillets from Aroclors at the "below-LANL" Rio Grande location (1.9E-01 ppm-FW with one-half the DL for nondetects) is 119% of the above-LANL Rio Grande concentration, but the difference was not statistically significant. Thus, the data imply non-LANL sources of PCBs into the Rio Grande and Cochiti Reservoir. PCB distribution is known to be worldwide (Stoker and Seager 1976; EPA 1999). In addition to the local areas already mentioned where PCBs have been detected, PCBs have been detected at McAllister Lake east of Las Vegas, NM (NMED 2002). Thus, PCBs are pervasive. The contribution of PCBs into Cochiti Reservoir from LANL operations, if any, cannot be discerned from data only on Abiquiu and Cochiti reservoirs. To discern the LANL contribution, sampling of all adjacent waters on a long-term basis is needed as well as other studies.

Comparison to Safe Limits. In our 2001 data, the Cochiti mean total PCB concentration of 8.14 μg/kg and the maximum total PCB concentration of 31.6 μg/kg compare to a recommended whole-body total PCB concentration of <400 μg/kg FW for the protection of fish (Eisler and Belisle 1996). Niimi (1996) cites concentrations of >50 ppm as necessary to affect reproduction or growth and concludes that concentrations in the high ppb to low ppm can cause cellular or biochemical changes but also notes that the ecotoxicological significance of these changes is largely unknown. Barron et al. (1995) cites a dietary no-observable-adverse-effects-concentration (NOAEC) of 0.5 ppm in the American kestrel. Lastly, Giesy et al. (1995) estimated a dietary NOAEC of 0.14 mg total PCBs/kg fish for the protection of the bald eagle from "egg lethality." The highest PCB concentration in Cochiti Reservoir fish was about four times lower than the bald eagle NOAEC, and the mean concentration was about 17 times lower. Thus, both the fish themselves and predators of fish should be adequately protected from the potential effects of PCBs in Cochiti Reservoir.

TEQs for Cochiti ranged from 1.1E-06 to 6.3E-06 ppm. The maximum TEQ was the same as the maximum in carp and carp sucker in 2000 (Fresquez et al., 2001). The mean total TEQ for Cochiti fish was 2.17E-06 ppm, and the maximum total TEQ was 6.29E-06 ppm. Giesy and Kurunthachalam (1998) cite a dietary NOAEC of 3.0E-07 ppm for the protection of mink. Mink are known to be extremely sensitive to PCBs. The whole-body PCB concentrations measured in this study are not suitable for comparison with human risk screening values because they include contribution by tissue (e.g., bone) and media (e.g., sediment in the stomach) not usually consumed by humans. The information provided at the end of Section C.2.b on percentage of PCB contribution from fillet portions of catfish can be used to derive PCB concentrations in fillets. These values would be suitable for comparison with human risk screening values. The concentrations of total PCBs that we measured in catfish fillets at Cochiti could result in minor consumption limits as based on EPA recommendations (EPA 2000b).

Cerro Grande Fire Impact. In 2000, we collected fish samples at Cochiti in June, July, and August after the Cerro Grande fire that occurred in May. Although the PCB concentrations at Cochiti showed a decreasing trend over the three-month period, it was concluded that the variation within each sampling time was too great to imply any effect from the fire. The same trend in PCB concentrations that occurred in 2000 (a 65% decrease in mean total PCBs) appeared again in 2001 (a 75% decrease in mean total PCBs), further supporting the notion that the peak concentration in the summer of 2000 was unrelated to the Cerro Grande fire. However, the length of time that would be required for a spike in the inflow of a contaminant into the Rio Grande to appear in fish is unknown. The mean total PCB concentration in 2001 was a slight increase (14%) from 2000. Although this increase could have been related to the Cerro Grande fire (i.e., an inflow of PCBs into the Rio Grande had a one-year lag to appear in fish), there may be too many variables to discern any impact of the Cerro Grande fire on PCB concentrations in fish at Cochiti Reservoir.

d. Analytical Results (Dioxins and Furans). Dioxin is the common name for a group of 75 related organic compounds. They have never been intentionally manufactured; they are an unwanted byproduct of the manufacture of other chemicals such as PCBs, wood preservatives (e.g. pentachlorophenol), and herbicides (e.g., 2,4-D) and of the combustion of organic matter. Combustion of organic matter is the largest source of dioxins in the environment. Thus, dioxins have both natural and human sources. Dioxins can be emitted in gaseous form or as particulates and are distributed through air, water, and sediment.

Although many dioxin compounds are toxic, the most toxic to humans is 2,3,7,8-TCDD (tetrachlorodibenzodioxin), sometimes referred to as the most toxic human-made chemical known. Few studies have documented the effects of dioxins on wildlife, but enough toxicology studies have been done to know that, in addition to humans, dioxins are quite toxic to nonhuman organisms. The primary source of dioxin toxicology is laboratory studies on mice and rats from which No-Observable-Adverse-Effect-Levels (NOAELs) are derived for wildlife species (Sample et al., 1996). The minimum (lowest or most stringent) ecological screening level (ESL) used in ecological risk screening at LANL is 1.8E-06 mg TCDD/kg soil-dry (ppt) based on the vagrant shrew (*Sorex vagrans*) (LANL 2000). ESLs for various organisms for TCDD range from 1.8 ppt to 5 ppm. Chronic effects from dioxins are a subject of controversy. Animal studies have shown that chronic exposure can result in reproductive dysfunction, birth defects, and cancer (EPA 2000c). Mammals tend to be more sensitive than birds. TCDD is known to be persistent in the environment and may last in excess of 10 years in soils. Like PCBs, the toxicity and persistence of dioxins likely increase with an increasing number of chlorine atoms. Also like PCBs, dioxins are poorly soluble in water but have a high affinity and solubility for lipids and fats. As a result, dioxins tend to bioaccumulate and biomagnify, at times resulting in their detection in animal life when they could not be detected in soil, sediment, or water.

The NOAEL-based benchmarks do not imply that adverse reactions occur above this level but suggest further investigation on the specific contaminants and potential environmental effects specific to a site when concentrations above this level are detected in the environment. Because of the gap in data pertaining to toxicity levels for wildlife, Sample et al. (1996) extrapolated NOAEL- and lowest-observable-adverse-effect-levels (LOAEL)-based benchmarks for 85 chemicals on 19 wildlife species based on previous studies. These values represent the most conservative NOAEL and LOAEL in that the study used the test animal with the most analogous physiological traits to the wildlife receptors of interest and the most stringent values.

In our study, dioxins are evaluated on an individual analyte basis, so comparisons are made either directly with TCDD or with the TEQ of another dioxin or furan. Detection limits for all dioxin/furan analytes were very low at 0.1 pg/g (1.0E-07 ppm). Table 6-24 shows the results of dioxin and furan analyses. TCDD was largely undetected, and detections at Cochiti Reservoir averaged 1.14E-07 ppm and had a maximum range of –1.53E-07 ppm. The lowest benchmark ("safe limit") concentration for dietary consumption that we found in the literature is for the little brown bat—3.0E-07 ppm (Sample et al., 1996); however, the bat is not a piscivore. The lowest dietary consumption benchmark for a mammalian piscivore from Sample's (1996) study was the river otter (*Lutra canadensis*) at 4.1E-07 ppm, and the belted kingfisher (*Ceryle alcyon*), an avian piscivore, has a dietary NOAEL benchmark of 2.76E-05 ppm. A concentration of 3.19E-07 ppm was the highest individual TEQ value for a fish caught from Cochiti for all analytes and is still below the NOAEL for the most sensitive piscivore in Sample's (1996) report. TCDD was not detected in any of the samples from Abiquiu Reservoir; therefore, we assume it was not present.

Studies show that dioxins settle in sediment (EPA 2000c), and, therefore, benthic feeders such as carp and catfish could accumulate dioxins at a higher rate than other fish. However, predator fish can, through biomagnification, accumulate relatively high levels of dioxins. Some piscivores such as the osprey (*Pandion haliaetus*) are not particular about the type of fish that they eat but will hunt only those that are within three feet of the water's surface (Alaska Department of Fish and Game 1994). Others, such as the river otter, prefer slow-moving fish such as the carp and catfish but will also consume other animals such as insects and crustaceans (USDA 2002). Mink (*Mustela vison*) and the belted kingfisher, both piscivores, have similar habits of eating at the water's surface but have also been known to eat a wide variety of foods such as eggs, birds, and insects (USDA 2002; Ivory 1997). Osprey and river otters occur in New Mexico, but bald eagles are much more ubiquitous, and a resident population resides at Cochiti Reservoir and the Rio Grande adjacent to LANL. Bald eagles are second-order piscivores and carnivores and also forage as opportunistic scavengers.

e. Analytical Results (Pesticides). Table 6-25 shows the analytical results for the pesticides. With very low detection limits (<ppb), we detected DDT, DDD, and DDE in all 13 samples (8 from Cochiti Reservoir and 5 from Abiquiu Reservoir). Total DDT and metabolites (DDT+DDD+DDE) ranged from 9.6E-03 to 2.5E-02 µg/g- or ppm-FW in Abiquiu fish and 4.6E-02 to 9.6E-02 ppm-FW in Cochiti fish. The mean total DDT (*o,p'*- and *p,p'*- isomers summed) concentration in Cochiti fish was 4.8E-03 ppm compared with the mean DDT concentration in Abiquiu fish of 3.5E-03 ppm. The mean total DDE concentration (*o,p'*- and *p,p'*- isomers summed) in Cochiti fish was 4.9E-02 ppm-FW compared with the mean DDE concentration in Abiquiu fish of 1.1 E-02 ppm-FW. These data cannot be directly compared with data in last year's ESR because only *p,p'*-DDT was reported last year. The mean and maximum *p,p'*-DDE concentrations in Cochiti fish were 4.8E-02 ppm-FW and 7.8E-02 ppm-FW, respectively. These values compare with the Abiquiu mean and maximum of 1.1 E-02 ppm-FW and 1.8E-02. All concentrations are below a dietary NOAEC of 0.16 ppm *p,p'*-DDE/kg fish for the protection of the bald eagle from "egg lethality" (Giesy et al., 1995). The 1990 national geometric mean concentration for this DDE isomer was 1.9E-01 ppm-FW (Schmitt et al., 1990). Our values are also below the upper end of the range (0.02–0.08 ppm) in whole-body concentration of Aroclors measured by Carter (1997) in the common carp in the Rio Grande at three locations below Cochiti Reservoir in 1992–1993. In 1985–1987, concentrations of *p,p'*-DDE up to 0.24 ppm-FW in fish were measured in the Rio Grande south of the Colorado border and up to 0.15 ppm-FW south of Santa Fe (Roy et al., 1992). A 1997 study of fish in the Rio Grande showed no statistical differences in concentrations of DDE between carp and catfish (Gonzales et al., 1999).

As with PCBs, to determine whether data from both sampling periods at Cochiti could be combined, we statistically analyzed the effect of time on total DDT and metabolites. The result was that the differences between the two data sets (April and August) are nonsignificant ($P = 0.49$, $t\ 0.05{,}10 = 0.8$); thus, the two Cochiti data sets are statistically similar.

The mean total DDT and metabolites concentration at Cochiti (5.9E-02 ppm) was significantly higher ($P < 0.01$, $t_{0.05,10} = 6.8$) than the mean concentration for Abiquiu (1.5E-02 ppm). The largest historical source of DDT and metabolites into the area is unrelated to LANL operations. A previous study identified an aerial application of ~141,000 ppm of DDT in 1963 to half a million acres west of the Rio Grande as a timber pest control agent (Gonzales et al., 1999). This application was most likely greater in the vicinity of Cochiti Reservoir than Abiquiu because of greater areas of conifer forest west and directly upslope of Cochiti. Localized use of DDT was also common in the 1960s and early 1970s. For example, isolated use of DDT in the Rito de los Frijoles watershed is documented (Allen 1989). Cochiti Reservoir is the second reservoir on the Rio Grande from its origin in Colorado, and many nonpoint sources from historical use are likely to exist. The distribution of DDT and its metabolites is known to be worldwide (Stoker and Seager 1976), and Carter (1997) documents detections in the Rio Grande upriver of LANL. The contribution, if any, of DDT and its metabolites into Cochiti Reservoir from LANL operations cannot be discerned from data only on these reservoirs. To discern the LANL contribution would require sampling of the Rio Grande, such as done in 1997 (Gonzales et al., 1999), on a long-term basis as well as other studies. DDT and DDE have been detected in fish at upriver locations in New Mexico and Colorado (Carter 1997) and more locally at locations just above and below LANL at higher concentrations than at the confluence of LANL's canyons with the Rio Grande (Gonzales et al., 1999).

The mean total DDE (*o,p'*-DDE + *p,p'*-DDE) concentration at Cochiti (4.85E-02 ppm) was significantly higher ($P < 0.01$, $t_{0.01,9} = 7.4$) than at Abiquiu (1.1E-02 ppm). The mean and maximum (7.92E-02 ppm) DDE concentrations compare with a recommended limit of 1.0 ppm in the diet of piscivores for protection from eggshell thinning. The effects of DDT and its metabolites on eggshell thinning, one of the most sensitive endpoints, are well documented.

3. Facility Monitoring

a. Area G.

Vegetation. (*John Nyhan*) We collected vegetation samples at the same sites and time at Area G as the soil collections described in Section A.3.a. For this segment of the overall Area G monitoring program, unwashed overstory and understory vegetation samples were collected at 11 locations within and around Area G in 2001 (Figure 6-2). Collection of vegetation samples for chemical analyses follows a set procedure to ensure proper collection, processing, submittal, and posting of analytical results. Stations and samples have unique identifiers to provide chain-of-custody control from the time of collection through analysis and reporting. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled "Sampling and Sample Processing for the Waste-Site Monitoring Program," LANL-ESH-20-SF-OP/HCP-011, 1999. Paragon Analytics, Inc., analyzed the vegetation samples for tritium; plutonium-238 and plutonium-239, -240; strontium-90; americium-241; cesium-137; and total uranium; all QA/QC requirements were met.

Results show that most of the radionuclide concentrations in the unwashed vegetation samples collected in 2001 were below RSRLs, except for tritium and americium-241 (Table 6-26). Of the 15 vegetation samples collected in and around Area G (excluding samples collected at sampling locations 8 and 9), 87% and 40% of the samples contained tritium and americium-241, respectively, greater than both total propagated analytical uncertainty and RSRL values. Tritium concentrations in vegetation samples were largest on the southwestern and southern sides of Area G and were consistent with results from previous years (Nyhan et al., 2001a).

Bees. (*Tim Haarmann*) We collected honeybee samples in 2001 at Area G. Two colonies were established on the south end of Area G near the tritium shafts. We brought these colonies into the study site from a regional area. In addition, a reference (regional) site with one colony was established 10 km (6 mi.) south of Jemez Springs, NM. In the early fall 2001, we collected bee tissue samples from all of the colonies. Each of the three separate 100-g samples (one from each colony) consisted of approximately 1,000 bees. We used a small, rechargeable vacuum to collect the bee samples. Bees were vacuumed off frames that were removed from the hive, transferred to a plastic resealable bag, weighed, and double bagged into plastic resealable bags. We kept all samples in a cooler and froze them upon returning to the laboratory. After collecting each sample, we thoroughly cleaned the vacuum collection area to avoid cross-contamination of samples. All samples were analyzed for tritium; cesium-137; americium-241; plutonium-238; plutonium-239, -240; and total uranium; see Fresquez et al. (1997a) for a description of the methods. All QA/QC protocols, chemical analyses, data handling, validation, and tabulation can be found in the ESH-20 OP entitled, "Managing Bee Colonies," LANL-ESH-20-BIO-OP-024, RO, 1997. Paragon Analytics Inc., (Ft. Collins, CO) analyzed the bee samples, and all QA/QC requirements were met.

Five honeybee samples were above the RSRLs for tritium, plutonium-239, and uranium (data not given but can be found in Haarmann and Fresquez 2002). The RSRL is the upper-level regional concentration derived from the combined 1997, 1998, 1999, and

2001 control data (Haarmann and Fresquez 1998, 1999, 2002). Similar to our previous years' results, the largest concentration difference between Area G and the RSRL was in the tritium levels. Tritium levels in the Area G bees, for example, were at 559 and 1100 pCi/mL; the control colony contained -0.05 pCi/mL, with a RSRL of 4.7 pCi/mL. Concentrations of plutonium-239 were higher in both Area G colonies than the RSRL. Additionally, concentrations of total uranium in one of the Area G colonies were higher than the RSRL.

Small Mammals. (*Kathy Bennett*) In 1998, we sampled rodents at four locations at Area G, a control site within the proposed Area G expansion area, and a background site on Frijoles Mesa. The purpose of the sampling was (1) to identify radionuclides that are present within rodent tissues at waste burial sites, (2) to compare the amount of radionuclide uptake by small mammals at waste burial sites with the amount of uptake at a control site, and (3) to identify the primary mode of contamination to small mammals, either through surface contact or ingestion/inhalation. We collected three composite samples of approximately five animals per sample at each site. Pelts and carcasses were separated and analyzed independently. Samples were analyzed for americium-241, strontium-90, plutonium-238 and -239, total uranium, cesium-137, and tritium. The analysis detected higher levels of total uranium, plutonium-239, and cesium-137 in pelts as compared with the carcasses of small mammals, and strontium-90 was found to be higher in carcasses than pelts. Concentrations of other measured radionuclides in carcasses were not found to be statistically different ($\alpha = 0.05$) from that measured in pelts. However, pelts generally had higher concentrations than carcasses, indicating surface contamination may be the primary contamination mode. Mean concentrations of plutonium-239 and total uranium in small mammal carcasses were statistically greater at the active waste pits, whereas the mean concentrations of tritium in carcasses and pelts were the highest at the tritium shaft area. When we conducted a year-to-year comparison between sites, we found that mean carcass concentrations of americium-241, plutonium-238, plutonium-239, and tritium at the transuranic waste pad #2 area were the highest in 1997, and cesium-137 was the highest in 1996. We did not detect differences for any of the other contaminants of concern. For a more detailed discussion of these results, please see Bennett et al. (2002).

Predators. (*Lars Soholt*) Over the last decade, environmental surveillance activities at Area G have focused on evaluating the presence and mobilization of radionuclides in surface soils, bees, vegetation, and small rodents (Haarmann and Fresquez 2000; Gonzales et al., 2000b; Nyhan et al., 2001a; Bennett et al., 2002). Radionuclides at Area G are known to be transported through the food chain and could lead to elevated doses to nonhuman biota foraging in areas where they have been released to the environment.

The DOE recently released a dose assessment model for nonhuman biota to support the DOE's environmental radiation protection requirements for ecological systems (DOE 2000). At the same time, the department established an interim dose limit of 0.1 rad/day (0.001 Gy/day) for protection of terrestrial animal resources. We focused on the evaluation of doses to predators that forage on Area G to establish whether operations are in compliance with the DOE interim standard—predators like the American Kestrel (*Falco sparverius sparverius*), the great horned owl (*Bubo virginianus*). and the red tail hawk (*Buteo jamaicensis*) cannot be sacrificed for radionuclide analysis, hence the necessity for modeling the dose. The coyote (*Canis latrans*) also was included in this study because it is a major predator species within the LANL environs.

The source term data employed for this evaluation were from small mammals that were collected at Area G during the period 1994 to 1999 (Biggs et al., 1995 and 1997; Bennett et al., 1996, 1998, 2002; Soholt 2002a). In general, these data showed that, with the exception of strontium-90, the average activity concentrations on a live-weight basis are higher for small mammals captured on the Area G site than in the off-site areas (background). However, on-site and off-site data sets for cesium-137, strontium-90, and americium-241 were statistically indistinguishable from each other (α= 0.05; Student's t-test for unequal variances); the others (tritium, plutonium-238, and plutonium-239) exhibited statistical differences between on-site and off-site data sets. We calculated doses to predators using the following parameters: (1) literature values for predator body weights and prey ingestion rates, (2) average measured concentrations in the prey, (3) fractional food-to-tissue transfer factors from the Laboratory's dose assessment methodology, (4) dose conversion factors assuming 100% deposition of decay product energy in the predator's body, and (5) radionuclide retention time based on radiological and biological half-lives and estimated life spans. Many of these parameters were available from the biota dose assessment methodology developed by the Laboratory's Environmental Restoration Project (ERP 1999, LANL 2002). See Soholt et al. (2002b) for the specific values used.

The doses calculated for predators foraging on Area G ranged from 9E-07 rad/day for the American kestrel to 2E-04 rad/day for the coyote; generally, these doses were about 4 times those found for predators that would forage off-site, but they are still several orders of magnitude below the interim dose limit. The differences in the doses were dominated by tritium, plutonium, and americium.

The doses calculated here are deemed to be representative of upper bounding limits for predators foraging in the area because of the following factors:

The dose conversion factors were developed assuming that 100% of the energy released in decay is deposited in the body. This assumption may not be true for the gamma emitters dependent upon the track and energy of a given photon emission. However, because of the lack of dosimetric models specific to nonhuman biota, all models that we use for ecological dose assessment make this simplifying assumption.

The dose conversion factors are based on the assumption that alpha emissions carry a factor of 20 to account for their higher biological effectiveness over beta and gamma emissions. Some information in the literature indicates this factor is high. Because development of this factor for radiation protection of humans is based upon evaluating stochastic endpoints (cancer) and nonhuman endpoints of interest are deterministic (systemic), the factor of 20 may be too high. Limited studies suggest that a factor of 5 to 10 is more appropriate.

The dose estimates carry an implied area use factor of 1; i.e., the predators spend 100% of their foraging effort either on Area G or off-site. The area occupied by Area G is about 63 acres (0.1 mi^2). The medium-sized predators have foraging ranges that extend from 0.5 to 30 mi^2, dependent upon season and habitat. Thus, average medium-sized predator use of Area G would approach <1% to 20% of the foraging period. The smaller American kestrel could forage 100% of its time on Area G on occasion, but its foraging range can reach 1 mi^2; it is also migratory and can spend much of the year off the Pajarito Plateau.

Based on these bounding assumptions, we can conclude that, under current conditions at Area G, the calculated doses to predators foraging here are well within the protective dose limit of 0.1 rad/day, and the facility is operating in compliance with DOE Order 5400.5 requirements for protection of the environment.

b. DARHT.

Vegetation. (*John Nyhan*) We completed baseline concentrations of radionuclides and trace elements in vegetation around the DARHT facility during the construction phase (1996 through 1999) in 2000 (Fresquez et al., 2001b). The Mitigation Action Plan for the DARHT facility at LANL mandated the establishment of baseline concentrations for potential environmental contaminants. These concentrations of radionuclides and trace elements now represent preoperational BSRLs, which are calculated from the mean DARHT facility sample concentration plus two standard deviations. In 2001, we collected unwashed overstory and understory vegetation samples at four sampling locations during the operational phase within and around the DARHT facility. Collection, processing, submittal, and analysis of vegetation samples follow a set procedure described in Section C.3.a, with the exception that an internal laboratory at LANL—CST-9—analyzed trace elements silver, arsenic, barium, beryllium, cadmium, chromium, copper, mercury, nickel, lead, antimony, selenium, and thallium.

Tables 6-27 and 6-28 present the analytical results of radionuclides and trace elements, respectively. See Figure 6-3 for the locations of sampling points. None of the radionuclide concentrations found in overstory and understory vegetation samples were above BSRLs (Fresquez et al., 2001b), except for the concentration of total uranium found in overstory samples collected at the east and south sampling locations. Even these samples were not significantly different than the BSRL concentration because they were within one standard deviation of the BSRL concentration. Table 6-28 shows that the trace element concentrations in all of the samples were less than BSRL concentrations.

Bees. (*Tim Haarmann*) We sampled honeybees around the DARHT facility in 2000 and 2001. We collected bee samples from five colonies, established at the DARHT site approximately 100 m northwest of the DARHT facility. In addition, a control (regional) site with one colony was established 10 km (6 mi.) south of Jemez Springs, NM. We collected, processed, and analyzed these samples for the constituents described in Section C.3.a.

The 2000 samples were analyzed for various radionuclides and heavy metals (Tables 6-29 and

6-30). DARHT facility sample results from one colony were higher than the upper-level regional concentration for plutonium-238. Sample results from another colony were higher in plutonium-239 and copper. Sample results from all five colonies were higher than the upper-level regional concentration for barium. Of the results that exceeded the RSRL, the plutonium-238 concentration was the only sample concentration greater than the BSRLs (DARHT Construction Phase Level). For more details, see Haarmann 2001.

During the 2001 sampling, because of unforeseen sampling problems, we had to composite our radionuclide samples from all five hives into one sample. Therefore, we only have one analytical result per analyte. We sampled for tritium, cesium-137, americium-241, and plutonium-238 and -239. No radionuclide analytical results exceeded RSRLs (data not given but can be found in Haarmann 2002).

4. Special Biological Monitoring Studies

a. Tritium Concentrations in Elk Inhabiting the Pajarito Plateau. During several elk capturing and radio collaring exercises on Bandelier National Monument (BNM), Santa Clara Pueblo (SCP), and LANL lands, blood was drawn to determine several potential disease vectors and concentrations of the radioisotope tritium. Tritium follows the hydrologic cycle and enters animals through ingestion, inhalation, and direct absorption through the skin (Whicker and Schultz 1982). This section reports the results of the tritium analysis conducted on blood samples from approximately 69 elk trapped on BNM lands during the years 2000–2001, 5 elk trapped on SCP lands during 2001, and 28 elk that were trapped on LANL lands during the years 1995 to 2001 (Table 6-31). Tritium concentrations in elk that were trapped from the various locations were the following: BNM ranged from –0.29 to 2.96 pCi/mL, SCP ranged from –0.14 to 0.83 pCi/mL, and LANL ranged from 0.04 to 2.25 pCi/mL. Only the mean concentration of tritium in elk collected on LANL lands (0.55 ± 0.53 pCi/mL) was significantly higher than tritium in elk collected from regional areas (0.21 ± 0.16 pCi/mL). See Fresquez (2002) for more information on this subject.

b. Contaminant Concentrations in Burned Conifer Tree Bark Collected Within the Los Alamos National Laboratory. Immediately after the Cerro Grande fire of 2000, we sampled ponderosa pine (*Pinus ponderosa*) bark ash and surface ash at three of the 12 stations that are sampled for soils on an annual basis as part of the ESP. The three stations were at TA-06 (Twomile Mesa), TA-15 (R-Site Road East), and TA-16 (S-Site) and were the only routine sampling stations impacted by the fire for which pre-fire data exist. The primary intent was to infer whether conifer trees within the southwest area of the Laboratory might have contributed more contaminants (especially uranium isotopes) to ash than trees in off-site areas. We also compared our data with results from several other similar sampling efforts. Mean on-site concentrations of uranium-234, uranium-235, uranium-238, plutonium-239, and americium-241 in bark ash were above regional (reference) concentrations, and mean on-site concentrations of strontium-90 and cesium-137 were below regional concentrations. The relative differences were consistent with duplicate sample analyses that NMED made. Metal and non-metal trace elements concentrations in bark ash were also relatively low, although the TA-16 sample had slightly higher levels of boron, barium, aluminum, chromium, copper, iron, nickel, titanium, and zinc than the reference sample. We did not detect organochlorine pesticides or Aroclors in bark ash. In surface ash, the analytes for which on-site concentrations exceeded regional concentrations were 1,2,3,4,6,7,8-HpCDD, OCDD, Total HxCDD, and Total HpCDD, a result generally consistent with the analytical results for soil samples taken from the same locations after the fire. No detections of 2,3,7,8-TCDD, the most toxic of the dioxins, were made in any of the samples. For a more detailed description of results, please see Gonzales and Fresquez (2002).

c. Contaminant Concentrations in Conifer Tree Bark and Wood following the Cerro Grande Fire. After the Cerro Grande fire, conifer trees in Mortandad Canyon within the Laboratory were felled as a hazard reduction effort. Several potential disposal options and uses of those trees and of trees that continue to be thinned throughout LANL have been identified. There was interest in knowing whether on-site samples of conifer trees contained elevated levels of radionuclides or other contaminants. After the fire, we measured radioactivity in three samples each of bark and wood from ponderosa pine trees in Mortandad Canyon. We also made preliminary estimates of radiation dose to the public that could result from burning trees and wood waste material in air curtain destructors. In bark, plutonium-238, plutonium-239, and uranium-235 were two to three orders of magnitude higher in Mortandad Canyon samples than in an off-site sample, and uranium-234, uranium-238, cesium-137, and strontium-90 were one order higher. In wood, strontium-90, tritium, cesium-137, and plutonium-239 concentrations in Mortandad Canyon were between one and two orders of magnitude higher than in the reference site sample. The actinides were generally two to three orders of magnitude higher in bark than in wood, and the strontium-90 concentration was about one order of magnitude higher in wood than in bark. The 50-year CEDE to the maximally exposed individual (MEI) resulting from one year of burning was 9.7E-03 mrem, which is about a 0.002% increase in the annual average radiation dose to individuals from other, non-Laboratory, sources of radiation. The 50-year CEDE to the MEI resulting from 10 years of burning was 0.097 mrem, and the risk to the surrounding population would be negligible (<0.01 latent cancer fatalities). No health effects from the inhalation of radionuclides are expected because doses are well below the >10,000 mrem dose at which health effects from radiation exposure have been observed in humans. We believe that the proposed burning operations will be safe to the public with regard to radiation dose. Additional broader, statistically robust sampling of wood, bark, and slash is ongoing. See Gonzales et al. (2001) for a complete description of results.

d. The Evaluation of Techniques for the Collection and Use of Scat and Hair for Noninvasive Genetic Analysis of Free-Ranging Carnivores. The loss of suitable habitat because of the Cerro Grande fire has likely affected carnivore numbers and distribution. For these reasons and the need to implement effective management strategies to reduce the potential for human-animal encounters, the Laboratory needs to develop and implement a long-term, cost-effective, and accurate method for monitoring carnivore populations. Current research procedures to study carnivore species provide limited information because they involve invasive, costly, and time-consuming techniques. The use of scat and hair for noninvasive genetic analysis to study natural populations is a relatively new method with the potential to answer many questions currently unanswered by traditional research methods. Hair snares are a common method of obtaining hair samples for genetic analysis from free-ranging carnivores. The objective of our study is to test four different techniques, including a carpet snare, a barbed-wire snare, and a cubby snare, to determine the most effective method for collecting carnivore hair and scat on LANL property. Scat collection is another method for gathering data to monitor carnivores. We will collect scat samples using line transects located in three canyon systems and one mesa top on LANL property. Transects are along dirt roads and drainage beds. We plan to collect and then store the samples until they are needed for genetic analysis. See Quintana et al. (2002) for more details.

e. The Use of Noninvasive Genetic Analysis to Study Distribution and Population Characteristics of Mountain Lion (*Puma concolor*) and Black Bear (*Ursus americanus*) in New Mexico. Long-term management of mountain lions (*Puma concolor*) and black bears (*Ursus americanus*) focuses on issues such as conservation, habitat loss and fragmentation caused by increased human encroachment, and nuisance animal control. To develop long-term management strategies, data collection typically involves labor-intensive and expensive invasive techniques such as radio collaring and mark-recapture. More recently, incorporating noninvasive genetic analysis into wildlife studies has decreased the time, cost, and handling of animals. Our research evaluates the efficacy of using hair and scat genetic analysis as a noninvasive technique for long-term studies of large carnivore distribution and population characteristics. The Laboratory is currently evaluating sample collection and processing techniques. We are collecting the fecal and hair samples of large carnivores in the east Jemez Mountains using a combination of hair snares and line transects (to collect scat). Eventually, the study area (east and central Jemez Mountains) will contain systematically placed sampling stations and transects for collecting hair and scat. We are plotting sample collection locations using the Global Positioning System (GPS) and the Geographical Information System (GIS). Microsatellites are amplified from DNA isolated from hair and scat samples and used for individual identification. We can then match individuals identified through genetic analysis with individuals that have been radio collared to evaluate the efficiency of sampling techniques and genetic analysis. We will also evaluate the distribution and population information gained from the genetic analysis and compare it with the radio-collared individuals. For a more detailed discussion of these results, see Alexander et al. (2001).

f. Assessing Effects of Herbivory on Vegetation Recovery Following the Cerro Grande Fire. Effects of the Cerro Grande fire will likely lead to alterations in the distribution of large herbivores such as Rocky Mountain elk (*Cervus elaphus nelsoni*). Early growth stages following wildfires typically provide forage species that are highly desirable to large ungulates. Excessive use of recently burned areas by ungulates results in adverse impacts to the topsoil (e.g., erosion) and vegetation recovery and succession rates. We propose to monitor changes in vegetation attributes over time to attempt to identify emerging adverse effects to and by wildlife species in order to implement mitigation measures to reduce the level of impact(s). We will track the effects of large herbivores on aspen regeneration and vegetation recovery and assess them using a series of exclosure plots located within the burn area on Forest Service property.

After inventorying the herbaceous and woody species and making standard measurements of frequency, density, foliar cover, stems per hectare (woody species), and species height, we will compare the results from the exclosure plots with the results from the control plots. Within two overstory vegetation types, mixed conifer and mixed conifer/aspen, four replicates will be established (a total of 8 fenced plots). Each replicate will consist of a 3-plot system: 1 plot = control, 1 plot = permanent exclosure, 1 = plot with 2 mobile 5   8   6 ft exclosures. We will divide the plot with mobile exclosures into a series of grid cells whereby the exclosures will be rotated annually.

The objective is to quantify the potential vegetation response for that growing season. The permanent exclosure will be 25   55 m in size and 3.3 meters in height and would be placed at 20–30 meters from the mobile exclosure plots and the control plots to minimize behavioral responses by animals to the exclosure. Within the permanent exclosure, we will use the modified Whitaker technique for understory measurement and line transects for overstory. We will also establish pellet transects near each set of plots to quantify elk and deer pellets for use as an indicator of herbivore grazing/browsing intensity in the vicinity of the exclosures. See Biggs and Orr (2001) for a more detailed description of results.

g. Relationship Between Home Range Characteristics and the Probability of Obtaining Successful Global Positioning System (GPS) Collar Positions for Elk in New Mexico. We compared the ability of GPS radio collars deployed on elk (*Cervus elaphus nelsoni)* to obtain valid positions (position acquisition rate [PAR]) in seasonal home ranges with differing vegetation and topographical characteristics. We also compared GPS collar PARs under varying levels of cloud cover and between differing daily time periods. We recorded a mean PAR of 69% (n = 10 elk, s = 14%) for collared elk. Multiple regression analysis of seasonal home range characteristics indicated that vegetation cover type and slope, either as individual variables or in combination with one another, were not significant predictors of GPS collar PARs. We did not observe statistical differences in position acquisition rates between cloud cover classes or varying cloud base heights. The PAR was significantly higher between 1600–2000 h (Mountain Standard Time) compared with 0000–1200 h, which may have been due to elk behavior. We believe the use of GPS collars is a more effective and efficient method of tracking elk in our study area than of very high frequency (VHF) collars because GPS collars can be programmed to obtain fixes automatically, have fewer logistical problems, and are more economical with long-term data collection efforts. Please see Biggs et al. (2001a) for a more detailed description of results.

h. Presumptuous Assumptions: Elk and the Pristine. Frequently, conservation biologists, naturalists, wildlife managers, and others suggest that biological resources should be managed to reflect a "pristine" state (a landscape that has not been culturally modified and that falls outside of human influence). However, pristine is rarely defined by researchers and, in the American West, is usually equated with the early 16th century or a pre-European cultural landscape. The use of pristine in this capacity is inaccurate and misleading when developing management strategies because it is still based on a culturally modified environment. In fact, recent literature suggests that Native Americans may have significantly impacted wildlife populations, particularly game species.

In developing species-specific management strategies, resource managers should select a target population level at some given point in time to reflect both the suspected environmental conditions of that time and the current management needs (i.e., biodiversity, animal health, and ecosystem health). To arbitrarily select a point in time, assuming that human influence on game populations was negligible and therefore more "natural," may be inappropriate. To elaborate on this issue, we use Rocky Mountain elk populations in the Jemez Mountains as an example. Some researchers have suggested that elk populations in the Jemez Mountains were never large. This argument is based on the low abundance of elk remains relative to other ungulate species in the archaeological record. If this supposition is true, then frequencies of ungulate remains in the archaeological record should parallel the paleontological record. If both records indicate low abundances of elk relative to other ungulate species, then the assumption that elk populations were low may have merit. In other words, the number of elk hunted was proportional to the number of elk available. Conversely, if the paleontological record indicates more elk than the archaeological record, then other alternatives must be considered to explain the low numbers (i.e., cultural selection against elk, hunting strategies, trade). But, if the paleontological and archaeological records parallel each other and given that pre-16th century environmental conditions were likely as able to support populations as those found today, then possible reasons for the similarities need further examination.

We discuss possible alternatives to explain why elk populations were not necessarily at high levels in the Jemez. The Jemez Mountains were not a sparsely populated “pristine land” when Europeans initially arrived. A pre-European cultural landscape, and one that represented trial and error as well as the achievement of countless human generations, was already in place. It is upon this imprint that the more familiar Euro-American landscape was grafted and not necessarily created anew. The West at the time of the earliest European exploration was most likely past any “pristine” condition that might serve as an absolute benchmark for resource managers if managing towards the more traditional definition of “pristine.” See Schmidt and Biggs (2001) for more information.

i. Development and Implementation of a Wildlife Management Plan for the Los Alamos National Laboratory. Recent large-scale wildfires, landscape development, and day-to-day operations on and near Laboratory property in north-central New Mexico may be resulting in large-scale alterations in behavior and landscape use by wildlife species. Wildlife management concerns include human/animal conflicts (animal/vehicle collisions), habitat loss affecting biological diversity, and ecosystem health.

We have developed and implemented a plan to minimize threats to people and property, protect important habitats, and assess ecological roles and values of wildlife species without adversely affecting optimum species numbers, movement patterns, or animal health. This plan is part of a larger Biological Resources Management Plan that integrates wildlife management with forest and range management, wildfire management, and watershed management. The plan also includes strategies to monitor and minimize the potential adverse impacts to biological resources resulting from the recent Cerro Grande fire. Monitoring and research efforts include making spotlight surveys to establish distribution and population trends of large herbivores; establishing plots for long-term wildlife monitoring and vegetation responses to herbivory; conducting food habits analyses of herbivores; analyzing wildlife population genetics; and integrating GPS telemetry studies and GIS to identify activity patterns and movements of large game species in relation to vegetation, fire burn intensity, water sources, human uses and disturbances, and topography. The Laboratory is using the data collected as part of the monitoring efforts to develop habitat suitability models, mitigate impacts of wildlife on humans and LANL operations, and mitigate impacts of humans and LANL operations on wildlife. See Biggs et al. (2001b) for more information.

j. A Comparison of Elk and Mule Deer Diets on Los Alamos National Laboratory. Increased population size and expansion of elk (*Cervus elaphus nelsoni*) in New Mexico has raised questions about the management of this species. Throughout the southwestern US, concern is also growing about a decline in mule deer (*Odocoileus hemionus*) populations. This study compares the seasonal food habits and dietary overlap of elk and mule deer on Laboratory property for two years. We are currently determining seasonal food habits by microhistological analysis of feces, and we processed all collected samples using standard microhistological techniques. Results of the winter diets of mule deer for 1998 consisted of 65% browse, 27% forbs, and 8% grasses. Results of the winter diets of elk for 1998 consisted of 26% browse, 18% forbs, and 56% grasses. The inverse relationship between elk and mule deer winter diets for 1998 shows little dietary overlap. Knowledge and understanding of the food habits of these animals are essential for the management of these species for evaluating diet quality, preference, and competition. Please see Sandoval et al. (2001) for a more detailed discussion of results.

k. Spring and Fall Small Mammal Sampling Report for Cañon de Valle and Pajarito Canyon, 2001. We performed a screening ecological risk assessment for Cañon de Valle. Six contaminants of potential ecological concern (COPECs) failed the screen for the terrestrial and riparian systems in the canyon, establishing a need for further site-specific evaluations. We initiated a small mammal study as a means for assessing potential adverse effects in the canyon that could be attributed to the COPECs in the terrestrial and riparian systems. The study resulted in sampling small mammals in late spring to early summer and again in early fall in Cañon de Valle and a reference canyon, Pajarito Canyon. Species composition, body weights, and general reproductive status of small mammals in both Cañon de Valle and Pajarito Canyon were similar. Cañon de Valle samples had a slightly lower mean body weight of males than did Pajarito Canyon during spring sampling, but weights were similar during fall sampling. Capture rates for both Cañon de Valle and Pajarito Canyon were very low when compared with other years in similar locations and habitat. This low capture rate also resulted in low density estimates in both canyons. Low capture rates have also been seen through spring and summer at other sites within the Laboratory during 2001. Low capture rates and density estimates may be attributed to previous drought years as well as impacts from the Cerro Grande fire. However, Cañon de Valle had higher capture rates, density estimates, and species diversity than the reference site, Pajarito Canyon. Based on these limited data from just two sampling periods, Cañon de Valle did not show adverse population characteristics when compared with the reference site, Pajarito Canyon. Please see Bennett et al. (2001) for more information about this study.

l. Medium and Large Mammal Spotlight Surveys, 2000–2002. We initiated spotlight surveys in fiscal year (FY) 2000 as a monitoring technique to detect trends in abundance of medium and large mammals on LANL lands. This information allows us to quantify changes in animal populations and to correlate such changes to human-caused and natural events impacting the LANL area. The surveys also provide baseline information for environmental analyses required in project planning. Spotlight surveys are conducted along 27 km of paved and dirt roads on the interior of LANL property. We repeat all transects on four consecutive nights (weather permitting) twice a year (in February and July) and calculate an average abundance index value for each species in each season as numbers seen per kilometer traveled. As of February 2002, we have three years of winter data and two years of summer data. The most common animals seen during spotlight surveys are Rocky Mountain elk, mule deer, and cottontail rabbits. Other animals occasionally seen have included gray fox, bobcat, and coyote. Rocky Mountain elk occur on LANL year-round. However, the greatest short-term impact on elk numbers is the movement of migratory elk onto LANL during winters with deep snow cover. A peak in abundance of elk during February 2001 documented an up to 10-fold increase in the numbers of elk wintering on LANL in a wet winter versus the drier winters of 2000 and 2002. There have been anecdotal reports of increases in mule deer numbers in the years since the Cerro Grande fire. We did observe more mule deer in February 2002 than we have seen in previous winters; however, we do not know if this represents a long-term increase. Mule deer survival is known to increase in years with mild, snow-free winters. Therefore, the recent trend toward mild, drier winters may be favoring mule deer in this region. In addition, fewer elk winter on LANL under dry conditions, and this situation may reduce potential competition between elk and mule deer for forage at critical times of the year. Although cottontail rabbit abundance remained relatively high the summer after the Cerro Grande fire, we saw a steep decline in rabbit numbers during the winter of 2001. Deep snow cover during this winter may have made rabbits more vulnerable to predation and starvation. Although rabbit abundance indices have not increased markedly, we did observe juvenile rabbits during our February 2002 surveys. This evidence of winter breeding suggests that rabbits are in good condition this winter and that the rabbit population is starting to recover. The greatest value in spotlight surveys lies in the trend information gained from repeated measurements over time. We plan to continue doing spotlight surveys using the protocols we developed in FY 2000. See Hansen et al. (2002) for a more complete description of results.

m. Surveys of Fire Effects, Rehabilitation Treatments, Ecosystem Recovery, and Residual Fire Hazards: Second Year after the Cerro Grande Fire. During the summer of 2001, we sampled site characteristics, topographic conditions, and vegetation structures at 51 permanent plots in the Los Alamos region. Twenty-five of these plots had been previously sampled from 1997 to 2000, whereas twenty-six plots were newly established. The purpose of this sampling effort is to evaluate the effects of the Cerro Grande fire on selected vegetation types, assess the effectiveness of rehabilitation treatments, document recovery of ecosystems, quantify the residual fire hazards that remain after the fire, and assess the reduction of fire hazards after the application of treatments. Because this is a multiagency collaborative effort, we sampled plots on several land ownerships including the Laboratory (25), US Forest Service (14), Bandelier National Monument (6), Los Alamos County (3), and the Valles Caldera National Preserve (3). We permanently marked the plots and recorded the coordinates with a global positioning system. The recent fire history of the plots ranged from unburned (22) to burned at low (4), moderate (4), or high (21) burn severities. Of the plots that were burned, 21 were rehabilitated with one or more treatments. We are currently analyzing the data to determine the effects of the rehabilitation treatments and for the presence and abundance of weedy plant species.

n. Biodiversity of Fauna after the Cerro Grande Fire. This study assesses the impacts of the Cerro Grande fire on fauna at the Laboratory. We chose ten plots, each 20 m × 50 m, within ponderosa pine areas. Five of the plots were located in severely burned areas and are characterized by having 100% tree mortality. We chose five unburned areas as the control sites for comparisons. Target species during 2001 included bats, small mammals, large mammals, and arthropods. Monitoring techniques varied according to the particular target species. We monitored bats using the Anabat 5 system for four nights per plot. Small mammals were monitored for five days per plot using tracking tubes, which are open-ended PVC tubes that contain ink padded inserts. When the small mammal steps through the tube, it leaves behind footprints that can be identified. We used photostations to monitor large mammals for a month. Finally, we monitored arthropods for eight weeks using pitfall traps. We will also monitor birds during the summer of 2002 using the Eco-Pro Digital Audio Processor. The Eco-Pro records all audible sounds and can be preprogrammed for a specific frequency and signal strength. We reported 53 small mammal visitations in burned areas and 30 small mammal visitations in unburned areas. Photostations detected five deer, one elk, and two ravens in burned areas as opposed to two deer and three ravens in the unburned areas. We counted 445 bat calls in burned areas and 425 bat calls in the unburned areas. We are currently identifying the species. Biodiversity will be a measure of species richness within burned and unburned areas over a two-year period. For more information about this project, see Nathanson-Hargis et al. (2002).

D. Acknowledgements

In this second sampling year after the Cerro Grande fire, we collected and analyzed more samples than usual. Thanks to the staff of ESH-20, Rick Velasquez, and Louie Naranjo for collecting and processing samples and to many of the ESH-20 undergraduate students (David Lujan, Julie Hill, Adrian Martinez, Amanda Chavez, and Jennifer Montoya) for helping summarize, tabulate, and QA the data.

Table 6-1. Radionuclide Concentrations in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations during 2001

Location	^{3}H (pCi/mL)	^{90}Sr (pCi/g dry)	^{137}Cs (pCi/g dry)	^{tot}U (µg/g dry)	^{238}Pu (pCi/g dry)	^{239,240}Pu (pCi/g dry)	^{241}Am (pCi/g dry)	Gross Alpha (pCi/g dry)	Gross Beta (pCi/g dry)	Gross Gamma (pCi/g dry)
Regional Background Stations:										
Embudo	0.38 (0.40)[a]	0.24 (0.14)	0.24 (0.04)	1.77 (0.13)	0.003 (0.001)	0.014 (0.003)	0.005 (0.002)	3.9 (0.47)	4.4 (0.44)	7.0 (0.3)
Cochiti	0.94 (0.44)	0.07 (0.13)	0.25 (0.05)	1.79 (0.13)	0.001 (0.001)	0.009 (0.002)	0.004 (0.002)	3.7 (0.47)	3.7 (0.38)	8.0 (0.3)
Jemez	0.26 (0.25)	0.05 (0.14)	0.13 (0.45)	2.52 (0.19)	–0.001 (0.001)	0.006 (0.002)	0.002 (0.001)	4.2 (0.90)	4.5 (0.75)	8.0 (0.3)
Mean (std dev)	0.53 (0.36)	0.12 (0.10)	0.21 (0.07)	2.03 (0.43)	0.001 (0.002)	0.010 (0.004)	0.004 (0.002)	3.9 (0.24)	4.2 (0.43)	7.7 (0.6)
RSRL[c]	0.98	0.60	0.49	3.12	0.009	0.021	0.012	7.9	7.5	6.2
SAL[d]	6,4000[e]	5.70	5.30	100.00	49.00	44.000	39.000	---	---	---
Perimeter Stations:										
Otowi	–0.01 (0.12)[b]	0.14 (0.15)	0.26 (0.04)	3.37 (0.24)	0.001 (0.001)	0.098 (0.010)	0.026 (0.004)	3.5 (0.40)	3.8 (0.35)	10.0 (0.4)
TA-8 (GT Site)	0.33 (0.13)	0.45 (0.14)	0.65 (0.11)	2.71 (0.21)	0.001 (0.001)	0.022 (0.004)	0.014 (0.005)	4.5 (0.46)	4.0 (0.37)	11.0 (0.5)
Near TA-49 (BNP)	0.02 (0.16)	0.16 (0.15)	0.39 (0.06)	4.02 (0.29)	–0.000 (0.001)	0.011 (0.003)	0.002 (0.003)	7.7 (0.75)	6.1 (0.55)	9.0 (0.4)
East Airport	0.56 (0.14)	0.21 (0.13)	0.26 (0.07)	3.19 (0.24)	0.001 (0.001)	0.029 (0.004)	0.005 (0.003)	5.4 (0.55)	4.5 (0.41)	11.0 (0.4)
West Airport	0.19 (0.23)	0.12 (0.14)	0.26 (0.04)	4.17 (0.29)	0.001 (0.001)	0.110 (0.010)	0.008 (0.003)	4.6 (0.50)	4.5 (0.43)	9.0 (0.3)
North Mesa	0.53 (0.18)	0.07 (0.13)	0.24 (0.06)	3.37 (0.24)	–0.001 (0.001)	0.018 (0.003)	0.009 (0.003)	6.1 (0.65)	4.5 (0.43)	11.0 (0.4)
Sportsman’s Club	0.01 (0.16)	0.14 (0.12)	0.30 (0.07)	3.79 (0.27)	0.000 (0.001)	0.017 (0.003)	0.006 (0.003)	6.3 (0.65)	5.7 (0.50)	11.0 (0.4)
Tsankawi/PM-1	0.25 (0.25)	0.10 (0.14)	0.19 (0.04)	6.97 (0.49)	0.000 (0.001)	0.008 (0.002)	0.006 (0.002)	3.6 (0.40)	3.3 (0.33)	16.0 (0.6)
White Rock (East)	0.24 (0.17)	0.13 (0.12)	0.33 (0.07)	2.32 (0.17)	–0.001 (0.001)	0.012 (0.003)	0.004 (0.002)	7.0 (1.00)	5.2 (0.80)	12.0 (0.4)
San Ildefonso	0.90 (0.65)	0.27 (0.14)	0.23 (0.06)	2.14 (0.16)	0.006 (0.002)	0.023 (0.004)	0.008 (0.003)	3.5 (0.38)	3.2 (0.31)	11.0 (0.4)
Mean (std dev)	0.30 (0.29)	0.18 (0.11)	0.31 (0.13)	3.61 (1.36)*[f]	0.001 (0.002)	0.035 (0.037)*	0.009 (0.007)	5.2 (1.52)*	4.5 (0.98)	11.1 (2.0)*
On-Site Stations:										
TA-16 (S-Site)	0.33 (0.13)	0.27 (0.14)	0.61 (0.08)	5.64 (0.41)	0.003 (0.001)	0.029 (0.004)	0.010 (0.003)	8.0 (0.75)	8.1 (0.65)	12.0 (0.5)
TA-21 (DP-Site)	0.38 (0.17)	0.00 (0.12)	0.07 (0.03)	2.42 (0.18)	0.000 (0.001)	0.058 (0.007)	0.005 (0.002)	4.1 (0.45)	3.6 (0.34)	11.0 (0.4)
Near TA-33	0.31 (0.13)	0.12 (0.12)	0.33 (0.06)	3.34 (0.25)	–0.001 (0.002)	0.010 (0.003)	0.008 (0.002)	6.1 (0.60)	4.8 (0.41)	10.0 (0.4)
TA-50	0.22 (0.13)	–0.04 (0.15)	0.03 (0.03)	2.41 (0.18)	0.004 (0.002)	0.022 (0.004)	0.006 (0.003)	5.0 (0.55)	3.7 (0.39)	10.0 (0.4)
TA-51	0.26 (0.13)	0.07 (0.14)	0.26 (0.07)	3.35 (0.24)	0.000 (0.001)	0.026 (0.004)	0.010 (0.003)	5.6 (0.60)	5.2 (0.48)	11.0 (0.5)
West of TA-53	0.68 (0.31)	0.13 (0.13)	0.13 (0.04)	3.63 (0.26)	0.004 (0.002)	0.015 (0.003)	0.004 (0.002)	5.8 (0.60)	4.7 (0.45)	10.0 (0.4)
East of TA-53	0.28 (0.49)	0.15 (0.12)	0.46 (0.08)	3.04 (0.22)	0.004 (0.002)	0.039 (0.005)	0.015 (0.004)	6.8 (0.70)	4.5 (0.44)	13.0 (0.5)
East of TA-54	0.79 (0.18)	0.16 (0.13)	0.20 (0.06)	2.70 (0.20)	0.004 (0.003)	0.027 (0.004)	0.018 (0.004)	5.5 (0.50)	2.9 (0.29)	13.0 (0.5)
Potrillo Drive/TA-36	0.40 (0.17)	0.09 (0.13)	0.15 (0.05)	2.62 (0.19)	–0.001 (0.002)	0.005 (0.002)	0.003 (0.002)	4.9 (0.50)	3.6 (0.35)	11.0 (0.5)
Near Test Well DT-9	0.22 (0.24)	0.01 (0.14)	0.42 (0.08)	2.98 (0.21)	0.001 (0.002)	0.022 (0.004)	0.010 (0.003)	5.2 (0.55)	5.5 (0.50)	12.0 (0.5)
R-Site Road East	0.23 (0.23)	0.16 (0.12)	0.21 (0.05)	4.98 (0.36)	0.002 (0.001)	0.013 (0.003)	0.007 (0.003)	6.5 (0.70)	6.1 (0.55)	10.0 (0.4)
Two-Mile Mesa	1.08 (0.29)	0.04 (0.13)	0.43 (0.08)	3.52 (0.26)	0.002 (0.001)	0.022 (0.004)	0.009 (0.003)	5.9 (0.60)	4.5 (0.43)	11.0 (0.4)
Mean (std dev)	0.43 (0.27)	0.10 (0.09)	0.28 (0.18)	3.39 (1.00)*	0.002 (0.002)	0.024 (0.014)*	0.009 (0.004)	5.8 (1.02)*	4.8 (1.39)	11.2 (1.1)*

Table 6-1. Radionuclide Concentrations in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations during 2001 (Cont.)

Location	^{234}U (pCi/g dry)	^{235}U (pCi/g dry)	^{238}U (pCi/g dry)
Regional Background Stations:			
Embudo	0.55 (0.04)	0.033 (0.005)	0.59 (0.04)
Cochiti	0.55 (0.04)	0.057 (0.007)	0.59 (0.04)
Jemez	0.76 (0.06)	0.077 (0.009)	0.84 (0.06)
Mean (std dev)	0.62 (0.12)	0.056 (0.022)	0.68 (0.14)
RSRL[c]	0.85	0.090	0.93
SAL[d]	63.0	17.0	93.0
Perimeter Stations:			
Otowi	1.15 (0.08)	0.083 (0.009)	1.12 (0.08)
TA-8 (GT Site)	0.78 (0.06)	0.053 (0.008)	0.90 (0.07)
Near TA-49 (BNP)	1.25 (0.09)	0.099 (0.011)	1.34 (0.10)
East Airport	0.98 (0.07)	0.067 (0.008)	1.06 (0.08)
West Airport	1.23 (0.09)	0.129 (0.013)	1.38 (0.10)
North Mesa	1.13 (0.08)	0.084 (0.009)	1.12 (0.08)
Sportsman's Club	1.12 (0.08)	0.101 (0.010)	1.26 (0.09)
Tsankawi/PM-1	2.25 (0.16)	0.188 (0.017)	2.32 (0.16)
White Rock (East)	0.77 (0.06)	0.086 (0.009)	0.77 (0.06)
San Ildefonso	0.70 (0.05)	0.047 (0.006)	0.71 (0.05)
Mean (std dev)	1.14 (0.44)*	0.094 (0.041)*	1.20 (0.45)*
On-Site Stations:			
TA-16 (S-Site)	1.64 (0.12)	0.152 (0.015)	1.87 (0.14)
TA-21 (DP-Site)	0.77 (0.06)	0.065 (0.008)	0.80 (0.06)
Near TA-33	1.13 (0.09)	0.053 (0.008)	1.12 (0.08)
TA-50	0.75 (0.06)	0.047 (0.006)	0.80 (0.06)
TA-51	1.10 (0.08)	0.056 (0.007)	1.12 (0.08)
West of TA-53	1.14 (0.08)	0.071 (0.008)	1.21 (0.09)
East of TA-53	1.00 (0.07)	0.048 (0.006)	1.01 (0.07)
East of TA-54	0.86 (0.06)	0.044 (0.006)	0.90 (0.07)
Potrillo Drive/TA-36	0.82 (0.06)	0.056 (0.007)	0.87 (0.06)
Near Test Well DT-9	0.95 (0.07)	0.052 (0.007)	1.00 (0.07)
R-Site Road East	1.38 (0.10)	0.086 (0.010)	1.66 (0.12)
Two-Mile Mesa	1.10 (0.08)	0.076 (0.009)	1.17 (0.09)
Mean (std dev)	1.05 (0.26)*	0.067 (0.030)	1.13 (0.33)*

[a] (±1 counting uncertainty);values are the uncertainty of the analytical results at the 65% confidence level.
[b] See Appendix B for an explanation of the presence of negative values.
[c] Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1994 to 2001; isotopic U is from 2000 and 2001.
[d] Los Alamos National Laboratory Screening Action Level (ER 2001).
[e] Equivalent to the SAL of 880 pCi/g dry soil at 12% moisture.
[f] Means from perimeter and on-site stations within the same column followed by an * were statistically higher than regional background using a Student's t-test at the 0.05 probability level.

Table 6-2. Mean (±SD) Radionuclide Concentrations in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations Before (1999) and After (2000 and 2001) the Cerro Grande Fire[a]

Location Date	^{3}H (pCi/mL)	^{90}Sr (pCi/g dry)	^{137}Cs (pCi/g dry)	^{tot}U (g/g dry)	^{238}Pu (pCi/g dry)	$^{239,240}Pu$ (pCi/g dry)	^{241}Am (pCi/g dry)	Alpha (pCi/g dry)	Beta (pCi/g dry)	Gamma (pCi/g dry)
Regional Background Stations[b]										
1999[c]	0.21	0.30	0.23	1.78	0.001	0.012	0.011	3.1	2.8	2.1
	(0.64)	(0.07)	(0.06)	(0.18)	(0.001)	(0.002)	(0.003)	(0.6)	(0.3)	(0.2)
2000[d]	0.03	0.34	0.31	1.57	0.002	0.011	0.014	4.1	3.2	2.5
	(0.45)	(0.09)	(0.05)	(0.16)	(0.001)	(0.002)	(0.004)	(1.3)	(1.0)	(0.2)
2001	0.38	0.24	0.24	1.77	0.003	0.014	0.005	3.9	4.4	7.7
	(0.40)	(0.14)	(0.04)	(0.13)	(0.001)	(0.003)	(0.002)	(0.5)	(0.4)	(0.6)
Perimeter Stations[e]										
1999	0.32	0.34	0.45	2.93	0.007	0.039	0.007	5.0	4.3	4.4
	(0.09)	(0.18)	(0.29)	(0.58)	(0.006)	(0.040)	(0.004)	(1.1)	(1.2)	(1.6)
2000	0.23	0.29	0.28	2.99	0.002	0.033	0.009	5.6	3.7	3.1
	(0.13)	(0.08)	(0.13)	(1.23)	(0.001)	(0.036)	(0.014)	(1.7)	(1.0)	(0.6)
2001	0.30	0.18	0.31	3.61	0.001	0.035	0.009	5.2	4.5	11.1
	(0.29)	(0.11)	(0.13)	(1.36)	(0.002)	(0.037)	(0.007)	(1.5)	(1.0)	(2.0)*
On-Site Stations (LANL)[f]										
1999	0.39	0.42	0.36	4.12	0.005	0.025	0.014	5.9	4.1	3.4
	(0.59)	(0.18)	(0.16)	(1.75)	(0.006)	(0.015)	(0.015)	(1.4)	(1.2)	(0.7)
2000	0.59	0.27	0.30	3.50	0.003	0.032	0.013	6.3	4.0	3.2
	(0.60)	(0.10)	(0.14)	(0.78)	(0.004)	(0.023)	(0.015)	(1.7)	(1.0)	(0.2)
2001	0.43	0.10	0.28	3.39	0.002	0.024	0.009	5.8	4.8	11.2
	(0.27)	(0.09)	(0.18)	(1.00)	(0.002)	(0.014)	(0.004)	(1.0)	(1.4)	(1.1)*

[a]Means from 2000 and 2001 within the same column and location followed by an * were significantly higher than 1999 using a Student's t-test at the 0.05 probability level.
[b]Represents Embudo only; this was the only regional background station out of three that was located predominantly downwind of the Cerro Grande fire (and LANL).
[c]Data from Fresquez and Gonzales (2000).
[d]Data from Fresquez et al. (2001c).
[e]Represents 10 perimeter stations; four located on north side, four on east side, one on west side, and one on southwest side of LANL.
[f]Represents 12 on-site (LANL) stations.
[g]Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean (99% confidence level).

Table 6-3. Total Recoverable Trace Element Concentrations (g/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations during 2001[a]

Location	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
Regional Background Stations												
Embudo	1.0[b]	11,000	1.1	10.0	107	0.62	0.20[b]	5.3	15.2	10.1	11,700	0.005[b]
Cochiti	1.0[b]	8,600	1.6	7.0	114	0.48	0.20[b]	4.3	9.8	9.2	10,200	0.040
Jemez	1.0[b]	11,100	2.7	13.0	154	0.74	0.20[b]	7.9	22.7	10.7	15,300	0.020
Mean	1.0	10,233	1.8	10.0	125	0.61	0.20	5.8	15.9	10.0	12,400	0.020
(std dev)	(0.0)	(1,415)	(0.8)	(3.0)	(25)	(0.13)	(0.00)	(1.9)	(6.5)	(0.8)	(2,621)	(0.020)
RSRL[c]	<2.0	36,600	6.1	16.7	194	0.73	<0.40	6.7	14.7	11.0	21,800	0.040
SAL[d]	390.0	76,000	6.1	5,500.0	5,400	150.00	39.00	3,400.0	210.0	2,900.0	23,000	23.000
Perimeter Stations												
Otowi	1.0[b]	5,100	0.5	5.0	72	0.48	0.20[b]	3.3	9.4	6.6	7,500	0.005[b]
TA-8 (GT Site)	1.0[b]	6,570	1.7	7.0	98	0.46	0.20[b]	3.8	10.1	6.7	7,840	0.020
TA-49 (BNP)	1.0[b]	10,800	2.3	6.0	153	0.87	0.20[b]	6.8	12.9	10.1	11,300	0.005[b]
East Airport	1.0[b]	9,380	2.3	6.0	88	0.74	0.20[b]	5.0	12.3	7.4	9,610	0.010
West Airport	1.0[b]	8,950	2.7	5.0	130	0.77	0.20[b]	6.5	12.3	9.6	10,600	0.010
North Mesa	1.0[b]	7,830	1.9	4.0	60	0.62	0.20[b]	4.4	11.2	10.0	8,830	0.050
Sportsman's Club	1.0[b]	13,100	2.0	3.0	185	0.91	0.20[b]	3.1	9.2	9.2	7,720	0.005[b]
Tsankawi/PM-1	1.0[b]	5,760	0.3[b]	4.0	35	0.82	0.20[b]	1.7	6.5	7.3	5,580	0.005[b]
White Rock (East)	1.0[b]	11,400	2.1	5.0	129	1.08	0.20[b]	4.5	11.3	11.7	9,980	0.005[b]
San Ildefonso	1.0[b]	6,870	1.2	4.0	67	0.70	0.20[b]	4.6	10.4	12.1	8,580	0.005[b]
Mean	1.0	8,576	1.7	4.9	102	0.75	0.20	4.4	10.6	9.1	8,754	0.010
(std dev)	(0.0)	(2,618)	(0.8)	(1.2)	(47)	(0.19)	(0.00)	(1.5)	(1.9)	(2.0)	(1,690)	(0.010)

Table 6-3. Total Recoverable Trace Element Concentrations (g/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations during 2001[a] (Cont.)

Location	Ag	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Hg
On-Site Stations												
TA-16 (S-Site)	1.0[b]	9,380	1.8	4.0	120	0.81	0.20[b]	6.5	13.6	9.7	11,300	0.040
TA-21 (DP-Site)	1.0[b]	12,800	1.8	9.0	121	0.95	0.20[b]	4.6	14.1	10.1	11,900	0.005[b]
Near TA-33	1.0[b]	6,920	1.3	4.0	60	0.65	0.20[b]	2.9	8.7	7.7	8,470	0.005[b]
TA-50	1.0[b]	10,600	1.5	5.0	101	0.72	0.20[b]	6.6	15.0	11.3	11,300	0.005[b]
TA-51	1.0[b]	15,700	1.6	7.0	142	0.84	0.20[b]	6.2	16.5	9.6	11,800	0.005[b]
West of TA-53	1.0[b]	12,700	2.2	3.0	183	0.91	0.20[b]	3.2	9.1	10.6	7,600	0.005[b]
East of TA-53	1.0[b]	13,500	1.9	6.0	120	0.80	0.20[b]	6.1	17.4	8.2	12,400	0.005[b]
East of TA-54	1.0[b]	10,000	2.1	4.0	114	0.76	0.20[b]	4.5	11.3	8.8	9,680	0.020
Potrillo Drive/TA-36	1.0[b]	9,160	1.1	4.0	126	0.77	0.20[b]	4.6	11.5	7.3	8,670	0.005[b]
Near Test Well DT-9	1.0[b]	15,300	3.2	7.0	186	1.09	0.20[b]	9.9	20.1	13.9	15,700	0.070
R-Site Road	1.0[b]	22,800	2.6	12.0	200	1.33	0.20[b]	9.4	22.5	16.8	15,900	0.010
Two-Mile Mesa	1.0[b]	15,800	2.9	8.0	135	0.89	0.20[b]	7.8	20.6	13.4	12,400	0.010
Mean	1.0	12,888	2.0	6.1	134	0.88*[e]	0.20	6.0	15.0	10.6	11,427	0.020
(std dev)	(0.0)	(4,224)	(0.6)	(2.6)	(39)	(0.18)	(0.00)	(2.2)	(4.5)	(2.8)	(2,604)	(0.020)

Table 6-3. Total Recoverable Trace Element Concentrations (g/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations during 2001[a] (Cont.)

Location	Mn	Mo	Ni	Pb	Sb	Se	Sn	Ti	Tl	V	Zn	CN
Regional Background Stations												
Embudo	290	1.0	9.0	7.8	0.20[b]	0.20[b]	0.50[b]	240	0.20[b]	22.1	32	0.06
Cochiti	311	1.0	6.0	7.6	0.20[b]	0.20[b]	0.50[b]	60	0.20[b]	19.0	30	0.01[b]
Jemez	639	1.0	15.0	9.3	0.20[b]	1.10	0.50[b]	62	0.20[b]	26.6	67	0.01[b]
Mean	413	1.0	10.0	8.2	0.20	0.50	0.50	121	0.20	22.6	43	0.03
(std dev)	(196)	(0.0)	(4.6)	(0.9)	(0.00)	(0.50)	(0.00)	(103)	(0.00)	(3.8)	(21)	(0.03)
RSRL[e]	421	0.8	10.5	14.0	<0.40	0.60	15.90	201	<0.40	40.1	49	0.50
SAL[f]	3,200	390.0	1,600.0	400.0	31.00	390.00	47,000.00	NA	5.50	550.0	23,000	1,200.0
Perimeter Stations												
Otowi	226	1.0	6.0	8.3	0.20[b]	0.20[b]	0.50[b]	176	0.20[b]	14.3	25	0.01[b]
TA-8 (GT Site)	412	1.0	5.0	15.0	0.20[b]	0.20[b]	0.50[b]	237	0.20[b]	13.5	30	0.01[b]
TA-49 (BNP)	455	1.0	8.0	14.5	0.20[b]	0.20[b]	0.50[b]	214	0.20[b]	21.0	28	0.01[b]
East Airport	334	1.0	7.0	13.0	0.20[b]	0.20[b]	0.50[b]	161	0.20[b]	17.5	26	0.01[b]
West Airport	465	1.0	8.0	16.6	0.20[b]	0.20[b]	0.50[b]	104	0.20[b]	20.1	34	0.01[b]
North Mesa	316	1.0	5.0	9.4	0.20[b]	0.20[b]	1.00	239	0.20[b]	15.7	29	0.01[b]
Sportsman’s Club	197	0.0	6.0	9.7	0.20[b]	0.20[b]	0.50[b]	132	0.20[b]	10.2	19	0.01[b]
Tsankawi/PM-1	236	1.0	4.0	10.3	0.20[b]	0.20[b]	1.00	101	0.20[b]	6.2	29	0.01[b]
White Rock (East)	324	1.0	8.0	11.6	0.20[b]	0.20[b]	1.00	39	0.20[b]	14.0	35	0.01[b]
San Ildefonso	345	1.0	6.0	7.9	0.20[b]	0.20[b]	1.00	112	0.20[b]	14.2	27	0.01[b]
Mean	331	0.9	6.3	11.6*	0.20	0.20	0.70	152	0.20	14.7	28	0.01
(std dev)	(93)	(0.3)	(1.4)	(3.0)	(0.00)	(0.00)	(0.30)	(66)	(0.00)	(4.4)	(5)	(0.00)

Table 6-3. Total Recoverable Trace Element Concentrations (g/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations during 2001[a] (Cont.)

Location	Mn	Mo	Ni	Pb	Sb	Se	Sn	Ti	Tl	V	Zn	CN
On-Site Stations:												
TA-16 (S-Site)	451	1.0	8.0	9.8	0.20[b]	0.20[b]	0.50[b]	143	0.20[b]	21.1	27	0.01[b]
TA-21 (DP-Site)	397	1.0	7.0	19.5	0.20[b]	0.20[b]	0.50[b]	215	0.20[b]	17.9	45	0.01[b]
Near TA-33	340	1.0	4.0	10.3	0.20[b]	0.20[b]	0.50[b]	170	0.20[b]	10.7	41	0.01[b]
TA-50	401	1.0	8.0	9.3	0.20[b]	0.20[b]	0.50[b]	269	0.20[b]	24.0	28	0.01[b]
TA-51	341	1.0	8.0	9.4	0.20[b]	0.20[b]	0.50[b]	378	0.20[b]	23.8	26	0.01[b]
West of TA-53	196	0.0	6.0	12.1	0.20[b]	0.20[b]	0.50[b]	125	0.20[b]	10.4	18	0.01[b]
East of TA-53	319	1.0	8.0	10.4	0.20[b]	0.20[b]	0.50[b]	273	0.20[b]	24.3	32	0.01[b]
East of TA-54	301	1.0	7.0	8.9	0.20[b]	0.20[b]	0.50[b]	122	0.20[b]	15.7	38	0.01[b]
Potrillo Drive/TA-36	238	1.0	8.0	7.0	0.20[b]	0.20[b]	0.50[b]	80	0.20[b]	12.5	22	0.01[b]
Near Test Well DT-9	677	1.0	12.0	13.2	0.20[b]	0.20[b]	0.50[b]	372	0.20[b]	31.3	37	0.01[b]
R-Site Road	697	1.0	11.0	10.8	0.20[b]	0.20[b]	0.50[b]	502	0.20[b]	36.2	38	0.01[b]
Two-Mile Mesa	561	1.0	9.0	11.5	0.20[b]	0.20[b]	0.50[b]	372	0.20[b]	32.2	25	0.01[b]
Mean	410	0.9	8.0	11.0*	0.20	0.20	0.50	252	0.20	21.7	32	0.01
(std dev)	(161)	(0.3)	(2.1)	(3.1)	(0.00)	(0.00)	(0.00)	(132)	(0.00)	(8.6)	(8)	(0.00)

[a]Trace elements were digested using EPA method 3051 and analyzed using EPA method 6020 (Sb, Tl, Pb), 7000A (As, Se), 7471A (Hg), and 6010B (all others).

[b]All less-than values were converted to one-half the concentration.

[c]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1992 to 1999 (Fresquez and Gonzales 2000; Fresquez et al., 2001a).

[d]Los Alamos National Laboratory Screening Action Level (EPA 2000a).

[e]Means from perimeter and on-site stations within the same column followed by an * were statistically higher than regional background using a Student's t-test at the 0.05 probability level.

Table 6-4. Mean (±SD) Total Recoverable Trace Element Concentrations (g/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations Before (1999) and After (2000 and 2001) the Cerro Grande Fire[a]

Location/Date	Ag	Al	As	Ba	Be	Cd	Co	Cr	Cu	Fe
Regional Background Stations[b]										
1999[c]	1.0	2.9	1.0	87	0.62	0.20	4.3	12.0	5.7	1.4
2000[d]	1.0	0.6	1.1	79	0.41	0.20	3.7	7.0	3.7	0.8
2001	1.0	1.1	1.1	107	0.62	0.20	5.3	15.2	10.1	1.2
Perimeter Stations[e]										
1999	1.0	3.3	1.9	91	0.84	0.23	4.7	8.1	5.9	1.2
	(0.00)	(0.09)	(0.8)	(29)	(0.25)	(0.09)	(1.7)	(3.2)	(1.5)	(0.23)
2000	1.0	0.9	2.1	106	0.85	0.20	6.1	8.6	5.5	1.0
	(0.00)	(0.02)	(0.7)	(35)	(0.22)	(0.00)	(3.1)	(1.9)	(1.0)	(0.02)
2001	1.0	0.86	1.7	102	0.75	0.20	4.4	10.6*	9.1*	0.88
	(0.00)	(0.26)	(0.8)	(47)	(0.19)	(0.00)	(1.5)	(1.9)	(2.0)	(0.17)
On-Site Stations (LANL)[f]										
1999	1.0	3.4	2.4	109	0.87	0.23	5.2	7.7	6.0	1.3
	(0.0)	(0.46)	(0.7)	(29)	(0.16)	(0.09)	(1.4)	(2.5)	(1.8)	(0.25)
2000	1.0	1.1	2.3	109	0.82	0.23	5.5	8.9	4.6	1.1
	(0.0)	(0.04)	(1.0)	(34)	(0.16)	(0.10)	(1.9)	(3.9)	(1.7)	(0.03)
2001	1.0	1.3	2.0	134	0.88	0.20	6.0	15.0*	10.6*	1.1
	(0.0)	(0.42)	(0.6)	(39)	(0.18)	(0.00)	(2.2)	(4.5)	(2.8)	(0.26)

Table 6-4. Mean (±SD) Total Recoverable Trace Element Concentrations (g/g dry) in Surface (0- to 2-inch depth) Soils Collected from Regional, Perimeter, and On-Site Locations Before (1999) and After (2000 and 2001) the Cerro Grande Fire[a] (Cont.)

Location/Date	Hg	Mn	Ni	Pb	Sb	Se	Tl	V	Zn	CN
Regional Background Stations[c]										
1999	0.01	229	6.4	12	0.10	0.20	0.10	20	26	
2000	0.01	190	5.1	7	0.10	0.40	0.10	12	23	0.20
2001	0.01	290	9.0	8	0.20	0.20	0.20	22	32	0.06
Perimeter Stations[e]										
1999	0.02	382	4.8	20	0.10	0.20	0.20	15	33	
	(0.01)	(135)	(2.2)	(7.8)	(0.07)	(0.00)	(0.08)	(6.7)	(8.4)	
2000c	0.01	443	7.3*	17	0.10	0.50	0.20	16	40	0.50
	(0.01)	(280)	(2.6)	(4.0)	(0.00)	(0.10)	(0.10)	(4.5)	(12.2)	(0.50)
2001	0.01	331	6.3	12	0.20	0.20	0.20	15	28	0.01
	(0.01)	(93)	(1.4)	(3.0)	(0.00)	(0.00)	(0.00)	(4.4)	(5.0)	(0.00)
On-Site Stations (LANL)[f]										
1999	0.05	349	5.2	14	0.20	0.20	0.20	21	34	
	(0.13)	(129)	(1.7)	(2.8)	(0.00)	(0.00)	(0.06)	(4.5)	(7.4)	
2000	0.02	347	6.3	15	0.10	0.50	0.30	16	32	0.30
	(0.01)	(111)	(2.4)	(5.0)	(0.00)	(0.20)	(0.20)	(7.1)	(6.5)	(0.20)
2001	0.02	410	8.0*	11	0.20	0.20	0.20	22	32	0.01
	(0.02)	(161)	(2.1)	(3.1)	(0.00)	(0.00)	(0.00)	(8.6)	(8.0)	(0.00)

[a]All trace elements, with the exception of Al and Fe, are reported on a ppm basis. Al and Fe are reported on a percent basis.

[b]Represents Embudo only; this was the only regional station out of three that was located predominantly downwind of the Cerro Grande fire (and LANL).

[c]Fresquez and Gonzales (2000).

[d]Data from Fresquez et al., (2001c).

[e]Represents 10 perimeter stations; four located on north side, four on east side, one on west side, and one on southwest side of LANL.

[f]Represents 12 on-site (LANL) stations.

[g]Means from 2000 and 2001 within the same column and respective station followed by an * were statistically higher than 1999 (before the Cerro Grande fire) using a Student's t-test at the 0.05 probability level.

Table 6-5. Mean Radionuclide Concentrations (Total Propagated Analytical Uncertainty, 99% Confidence Level) in Soils (Dry Weight) Collected from Area G in 2001[a]. [Bold values are equal to or greater than both the total propagated analytical uncertainty and regional statistical reference level (RSRL) values.]

	Radionuclide													
Sample Locations	^{3}H (pCi/mL)[b]		^{241}Am (pCi/g)		^{137}Cs (pCi/g)		^{238}Pu (pCi/g)		$^{239,240}Pu$ (pCi/g)		^{90}Sr (pCi/g)		^{tot}U (g/g)	
1	411.0	(78.0)	0.0053	(0.0129)	0.188	(0.149)	0.000	(0.005)	0.008	(0.011)	–0.04	(0.29)	3.05	(0.72)
2	616.0	(117)	0.013	(0.020)	0.26	(0.15)	0.011	(0.014)	0.022	(0.020)	0.04	(0.26)	3.14	(0.72)
3	2.83	(1.10)	0.028	(0.023)	0.17	(0.17)	0.008	(0.014)	0.040	(0.021)	–0.06	(0.30)	3.02	(0.68)
3b	2.82	(1.10)	0.0076	(0.0123)	0.44	(0.17)	0.011	(0.015)	0.014	(0.017)	0.32	(0.32)	3.05	(0.68)
4	6.0	(3.6)	0.079	(0.044)	0.28	(0.17)	0.189	(0.068)	0.262	(0.084)	0.12	(0.30)	3.57	(0.81)
6b	2.8	(2.3)	0.174	(0.071)	0.345	(0.134)	0.032	(0.101)	0.790	(0.200)	0.03	(0.27)	2.78	(0.63)
7a	18.0	(4.2)	0.0033	(0.0126)	0.003	(0.066)	0.029	(0.021)	0.004	(0.009)	0.11	(0.29)	2.94	(0.68)
7b	6.0	(1.5)	0.019	(0.018)	0.071	(0.080)	0.006	(0.009)	0.100	(0.041)	0.09	(0.29)	2.76	(0.63)
7c	7.5	(3.0)	0.179	(0.065)	0.47	(0.21)	0.126	(0.053)	1.90	(0.44)	0.03	(0.30)	3.18	(0.72)
8	0.54	(0.89)	0.0056	(0.0144)	0.23	(0.15)	0.003	(0.011)	0.017	(0.015)	0.12	(0.35)	2.96	(0.68)
G-29-03	1,450	(270)	0.019	(0.021)	0.256	(0.144)	0.024	(0.023)	0.025	(0.023)	0.06	(0.27)	3.32	(0.77)
G-31-01	910	(180)	0.028	(0.026)	0.54	(0.21)	0.009	(0.014)	0.027	(0.020)	0.09	(0.26)	3.14	(0.72)
G-41-02	10.2	(6.90)	0.105	(0.048)	0.48	(0.20)	2.13	(0.48)	0.479	(0.129)	0.15	(0.29)	3.84	(0.86)
G-43-01	20.9	(9.9)	0.065	(0.038)	0.29	(0.17)	0.187	(0.066)	0.314	(0.093)	0.15	(0.30)	2.90	(0.68)
G-48-02	19.0	(7.8)	0.390	(0.128)	0.26	(0.17)	0.214	(0.071)	2.850	(0.615)	0.12	(0.32)	3.18	(0.72)
G-58-01	NA[c]		0.0120	(0.0128)	0.70	(0.29)	0.008	(0.017)	0.032	(0.024)	0.16	(0.29)	3.11	(0.68)
BG (9)	0.31	(0.45)	0.0057	(0.0110)	0.43	(0.21)	–0.001	(0.011)	0.020	(0.017)	–0.02	(0.26)	3.15	(0.72)
RBG[d]	0.53	(0.36)	0.004	(0.002)	0.21	(0.07)	0.001	(0.002)	0.010	(0.004)	0.12	(0.10)	2.03	(0.43)
RSRL[e]	0.98		0.012		0.49		0.009		0.021		0.60		3.12	
SAL[f]	6,400		39.0		5.30		49.0		44.0		5.7		100	

[a]See Figure 6-2 for sample location points; samples without a G prefix collected at the 0- to 2-inch depth; samples with a G prefix collected at the 0- to 6-inch depth.

[b]Concentration for ^{3}H is based on soil moisture.

[c]NA means no analysis because of a lack of soil water in the sample.

[d]Regional background is the mean background concentration for samples from Embudo, Cochiti, and Jemez collected in 2001 (Table 6-1).

[e]Regional Statistical Reference Level; this is the upper- (95%) level background concentration (mean + 2 std dev) from 1994–2001 (Table 6-1); Isptopic U is from 2000 and 2001 (Table 6-1).

[f]Screening Action Level (ERP 2001).

Table 6-6. Radionuclide Concentrations (Total Propagated Analytical Uncertainty, 99% Confidence Level) in Surface Soil, and Sediment Collected around the DARHT Facility in 2001[a]. [Bold values are equal to or greater than both the total propagated analytical uncertainty and Baseline Statistical Reference Level (BSRL) values.]

Sample Locations	Sample Element Concentration (dry weight basis) ^{3}H (pCi/mL)[b]	^{90}Sr (pCi/g)	^{tot}U (g/g)	^{137}Cs (pCi/g)	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)
Soil							
North	0.24 (0.39)	0.04 (0.30)	5.68 (1.35)	0.13 (0.09)	0.001 (0.006)	0.006 (0.009)	0.002 (0.009)
East	0.31 (0.39)	0.13 (0.29)	7.80 (2.07)	0.39 (0.15)	0.003 (0.008)	0.014 (0.014)	0.011 (0.015)
South	0.20 (0.23)	0.23 (0.30)	8.19 (1.94)	0.36 (0.21)	0.004 (0.014)	0.008 (0.017)	0.001 (0.008)
West	0.24 (0.38)	0.10 (0.32)	4.46 (1.26)	0.16 (0.15)	0.006 (0.015)	–0.000 (0.009)	0.007 (0.012)
Mean (SD)	0.25 (0.05)	0.13 (0.08)	6.53 (1.77)	0.26 (0.13)	0.004 (0.002)	0.007 (0.006)	0.005 (0.005)
Sediment							
North	0.11 (0.39)	–0.03 (0.32)	5.71 (1.49)	0.09 (0.08)	–0.001 (0.005)	0.009 (0.011)	–0.004 (0.011)
East	1.07 (1.41)	0.22 (0.32)	18.47 (4.49)	1.18 (0.39)	0.003 (0.008)	0.042 (0.024)	0.010 (0.015)
South	2.90 (5.70)	–0.01 (0.30)	3.16 (0.95)	0.04 (0.08)	0.001 (0.006)	0.002 (0.006)	0.008 (0.015)
Southwest	0.51 (0.63)	0.01 (0.29)	3.79 (0.95)	0.04 (0.09)	0.002 (0.006)	0.002 (0.006)	0.003 (0.008)
Mean (SD)	1.15 (1.23)	0.05 (0.12)	7.78 (7.21)	0.34 (0.56)	0.001 (0.002)	0.014 (0.019)	0.004 (0.006)
RBG[c]	0.53 (0.36)	0.12 (0.10)	2.03 (0.43)	0.21 (0.07)	0.001 (0.002)	0.010 (0.004)	0.004 (0.002)
Soil BSRL[d]	0.53	0.34	6.5	0.27	0.003	0.017	0.008
Sediment BSRL[d]	0.90	0.26	9.99	0.51	0.005	0.026	0.015
LANL SAL[e]	6,400	5.7	100	5.30	49.0	44.0	39.0

[a]See Figure 6-3 for locations of sampling sites.
[b]Concentration for ^{3}H is based on soil moisture: a value of 6400 is equivalent to a SAL value of 880 pCi/g ^{3}H for a soil at a water content of 12%.
[c]Regional background is the mean background concentration for samples from Embudo, Cochiti, and Jemez collected in 2001 (Table 6-1).
[d]Baseline Statistical Reference Level (Fresquez et al., 2001b).
[e]Screening Action Level (ERP 2001).

Table 6-7. Trace Element Concentrations (g/g dry) in Surface Soils and Sediments Collected Around the DARHT Facility in 2001[a]

Location	Ag	As	Ba	Be	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Se	Tl
Soil													
North	1.0[b]	1.70	124.0	0.80	0.20[b]	8.2	7.0	0.015	7.0	11.6	0.2[b]	0.4	0.2[b]
East	1.0[b]	1.80	87.0	0.60	0.20[b]	6.3	7.0	0.015	6.0	12.7	0.2[b]	0.2[b]	0.2[b]
South	1.0[b]	1.00	114.0	0.80	0.20[b]	7.5	5.0	0.028	6.0	11.0	0.2[b]	0.4	0.2[b]
West	1.0[b]	1.60	122.0	0.80	0.20[b]	8.4	6.0	0.015	7.0	10.4	0.2[b]	0.5	0.2[b]
Mean	1.0	1.53	111.8	0.75	0.20	7.6	6.3	0.018	6.5	11.4	0.02	0.4	0.2
(SD)	(0.0)	(0.4)	(17.1)	(0.1)	(0.00)	(0.9)	(0.9)	(0.007)	(0.6)	(0.9)	(0.0)	(0.1)	(0.0)
Sediment													
North	25.0	1.4	73.7	0.40	0.20[b]	5.1	5.0	0.011	5.0	8.2	0.2[b]	0.2[b]	0.2[b]
East	1.0[b]	1.1	64.3	0.30	0.20[b]	3.5	7.0	0.015	3.0	12.9	0.2[b]	0.2[b]	0.2[b]
South	1.0[b]	0.6	68.0	0.50	0.20[b]	3.8	4.0	0.005[b]	4.0	7.2	0.2[b]	0.2[b]	0.2[b]
Southwest	30.0	1.7	113.0	0.70	0.20[b]	8.9	13.3	0.011	7.0	8.9	0.2[b]	0.2[b]	0.2[b]
Mean	14.3	1.2	79.8	0.48	0.20	5.3	7.3	0.01	4.8	9.3	0.2	0.2	0.2
(SD)	(15.4)	(0.5)	(22.5)	(0.17)	(0.0)	(2.5)	(4.2)	(0.004)	(1.7)	(2.5)	(0.0)	(0.0)	(0.0)
RBG[c] (SD)	1.0	1.8	125	0.61	0.20	15.9	10.0	0.02	10.0	8.2	0.20	0.50	0.20
	(0.0)	(0.8)	(25)	(0.13)	(0.00)	(6.5)	(0.8)	(0.02)	(4.6)	(0.9)	(0.0)	(0.5)	(0.0)
Soil BSRL[d]	1.62	3.16	147	1.08	0.52	14.4	7.02	0.04	9.62	13.5	0.40	0.55	0.40
Sediment BSRL[d]	1.56	3.48	161	1.19	0.55	12.0	7.90	0.04	9.45	15.4	0.38	0.43	0.30
LANL SAL[e]	390	6.1	5,400	150	39.0	210	2,900	23.0	1,600	400	31.0	390	5.5

[a]See Figure 6-3 for locations of sampling sites.
[b]Less than values are reported as one-half the detection limit.
[c]Regional background is the mean background concentration (±SD) for samples from Embudo, Cochiti, Jemez, and Bandelier collected in 2001 (Table 6-3).
[d]Baseline Statistical Reference Level (Fresquez et al., 2001b).
[e]Screening Action Level (EPA 2000).

Table 6-8. Plutonium Concentrations in Surface Soils Collected Around the Plutonium Processing Facility (TA-55) in Current and Past Years

Year/Location	^{238}Pu (pCi/g dry)		^{239}Pu (pCi/g dry)	
1984[a]				
North	0.0000	(0.0005)[f]	0.009	(0.002)
	0.0041	(0.0018)	0.008	(0.002)
	0.0474	(0.0051)	0.049	(0.005)
	0.0094	(0.0029)	0.101	(0.009)
Northwest	0.0008	(0.0013)	0.013	(0.003)
Northeast	0.0035	(0.0020)	0.155	(0.011)
Mean (±std dev)	0.0109	(0.0182)	0.056	(0.060)
1990[b]				
North	0.0043	(0.0010)	0.036	(0.003)
Northeast	0.0117	(0.0017)	0.130	(0.007)
East	0.1270	(0.0067)	0.264	(0.012)
South	0.0002	(0.0004)	0.003	(0.001)
West	0.0087	(0.0015)	0.455	(0.017)
Mean (±std dev)	0.0304	(0.0542)	0.178	(0.185)
2001				
North	0.0108	(0.0053)	0.227	(0.037)
East	0.0011	(0.0032)	0.020	(0.007)
South	0.0014	(0.0027)	0.057	(0.012)
West	0.0029	(0.0027)	0.063	(0.013)
Mean (±std dev)	0.0041	(0.0046)	0.092	(0.092)
RBG[c]	0.0010	(0.0016)	0.010	(0.004)
RSRL[d]	0.0090		0.021	
SAL[e]	49.0		44.0	

[a]These soil samples were collected on July 16, 1984, as part of a preoperational survey.
[b]These soil samples were collected on October 23, 1990, as part of a preoperational survey.
[c]Regional Background from Table 6-1.
[d]Regional Statistical Reference Level from Table 6-1.
[e]Screening Action Level from Table 6-1.
[f](±1 counting uncertainity); values are the uncertainity of the analytical results at the 65% confidence level.

Table 6-9. Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a]

Location	^{3}H (pCi/mL)		^{137}Cs (10^{-3} pCi/g dry)		^{90}Sr (10^{-3} pCi/g dry)		^{tot}U (ng/g dry)		^{238}Pu (10^{-5} pCi/g dry)		^{239}Pu (10^{-5} pCi/g dry)		^{241}Am (10^{-5} pCi/g dry)	
Regional Background Stations														
Chamita (C)/Chimayo (Ch)/Espanola Valley (EV)/Jemez (J)/Ojo Sarco (OS):														
Apricots (J/EV)	0.06	(0.16)[b]	18.04	(37.72)	7.71	(2.30)	4.43	(1.64)	21.32	(25.42)	0.00	(17.22)	11.48	(31.16)
Beets (OS)	–0.07	(0.16)[c]	–0.67	(15.75)	13.27	(1.54)	10.65	(2.08)	–4.02	(5.36)	–4.02	(5.36)	8.04	(12.06)
Broccoli Rabe (OS)	–0.10	(0.15)	–13.14	(32.12)	91.98	(8.76)	27.74	(3.80)	14.60	(14.60)	0.00	(13.87)	23.36	(21.17)
Cabbage (OS)	0.10	(0.16)	–31.62	(28.56)	17.14	(3.01)	1.43	(0.87)	–1.02	(17.85)	9.18	(10.71)	49.98	(24.48)
Cherries (Ch)	–0.02	(0.16)	–83.30	(31.36)	[d]		16.17	(3.09)	–29.40	(16.66)	3.92	(16.17)	68.60	(25.48)
Cucumbers (C)	–0.13	(0.15)	–14.63	(36.58)	40.70	(5.19)	6.52	(2.40)	–42.56	(53.87)	27.93	(27.93)	93.10	(33.92)
Cucumbers (OS)	–0.03	(0.15)	9.31	(23.94)	13.83	(2.39)	6.78	(2.06)	–25.27	(24.61)	33.25	(19.29)	5.32	(21.95)
Green Beans (EV)	0.00	(0.16)	–24.18	(19.50)	45.24	(4.29)	18.41	(2.07)	–3.12	(7.41)	–3.12	(7.41)	11.70	(16.38)
Plums (OS)	0.31	(0.16)	34.44	(29.52)	8.49	(1.85)	0.74	(0.68)	0.00	(17.22)	17.22	(12.30)	–9.84	(15.38)
Plums (OS)	0.24	(0.16)	–19.68	(27.06)	3.44	(1.66)	0.74	(0.80)	8.61	(12.92)	8.61	(12.92)	8.61	(11.07)
Pumpkin (OS)	–0.02	(0.15)	–19.20	(21.00)	8.04	(2.04)	3.84	(1.32)	13.20	(9.60)	–4.80	(7.20)	–48.00	(114.00)
Ruby Chard (OS)	0.00	(0.16)	–40.48	(42.32)	46.00	(4.88)	19.50	(3.40)	40.48	(38.64)	12.88	(22.08)	23.92	(19.32)
Squash (EV)	0.37	(0.16)	3.93	(37.34)	47.29	(4.78)	12.97	(2.49)	9.17	(11.12)	–5.24	(7.21)	–11.79	(27.51)
Mean (std dev)	0.05	(0.16)	–13.94	(29.43)	28.59	(26.24)	9.99	(8.46)	0.15	(22.32)	7.37	(12.56)	18.04	(36.21)
RSRL[e]	0.54		78.5		112.4		26.6		46.8		67.6		113.8	
Perimeter Stations														
Los Alamos:														
Apples	0.16	(0.14)	–7.56	(14.76)	32.40	(4.14)	1.19	(0.50)	8.64	(9.72)	15.84	(8.82)	6.48	(6.84)
Apricots	0.11	(0.14)	22.96	(27.06)	17.22	(2.71)	0.51	(0.76)	1.64	(20.50)	0.00	(17.22)	18.04	(29.52)
Cherries	0.07	(0.14)	–7.84	(16.17)	22.54	(2.40)	1.86	(0.78)	16.66	(20.58)	8.82	(16.66)	–1.96	(10.29)
Green Beans	0.15	(0.14)	–13.26	(14.82)	114.66	(10.53)	3.82	(0.94)	10.92	(9.36)	–6.24	(4.68)	21.84	(21.45)
Lettuce	–0.10	(0.14)	–42.50	(52.50)	167.50	(16.25)	72.25	(9.25)	35.00	(42.50)	32.50	(22.50)	–5.00	(37.50)
Peaches	0.20	(0.14)	3.04	(11.78)	10.72	(1.37)	1.75	(0.68)	–16.72	(9.88)	25.84	(19.00)	85.12	(37.62)
Plums	0.30	(0.15)	3.69	(20.30)	15.50	(2.15)	1.10	(0.92)	–13.53	(13.53)	–4.92	(12.92)	23.37	(17.22)
Squash	–0.04	(0.14)	13.10	(27.51)	158.51	(14.41)	2.88	(1.57)	5.24	(23.58)	22.27	(17.03)	–15.72	(12.45)
Squash	0.09	(0.14)	–17.03	(13.76)	30.00	(3.34)	1.57	(1.05)	–17.03	(12.45)	22.27	(14.41)	–6.55	(30.13)
Mean (std dev)	0.10	(0.12)	–5.04	(18.98)	63.23	(64.67)	9.66	(23.49)	3.42	(17.23)	12.93	(14.15)	13.96	(30.00)

Table 6-9. Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a] (Cont.)

Location	^{3}H (pCi/mL)		^{137}Cs (10^{-3} pCi/g dry)		^{90}Sr (10^{-3} pCi/g dry)		^{tot}U (ng/g dry)		^{238}Pu (10^{-5} pCi/g dry)		^{239}Pu (10^{-5} pCi/g dry)		^{241}Am (10^{-5} pCi/g dry)	
Perimeter Stations (Cont.)														
White Rock (WR)/Pajarito Acres (PA):														
Apples (WR)	0.24	(0.16)	–5.04	(10.08)	5.47	(0.79)	0.18	(0.20)	1.08	(7.92)	–1.44	(4.50)	1.80	(5.04)
Apricots (WR)	0.18	(0.16)	–24.60	(37.72)	–0.66	(2.21)	1.80	(0.98)	4.92	(33.62)	–6.56	(18.86)	68.88	(45.92)
Cherries (WR)	0.11	(0.16)	–24.50	(21.56)	3.43	(1.27)	0.32	(0.33)	24.50	(21.07)	23.52	(16.66)	32.34	(24.01)
Cucumbers (WR)	0.10	(0.16)	–37.24	(40.57)	d		4.66	(2.46)	7.98	(23.94)	0.00	(15.30)	45.22	(25.27)
Green Beans (PA)	0.19	(0.16)	33.54	(20.28)	25.51	(2.57)	7.41	(1.72)	–7.02	(10.14)	–4.68	(6.63)	15.60	(12.87)
Lettuce (WR)	0.64	(0.17)	–270.00	(105.00)	322.50	(33.75)	52.75	(9.13)	65.00	(77.50)	15.00	(42.50)	52.50	(66.25)
Peaches (WR)	0.28	(0.16)	–15.96	(16.34)	1.60	(1.06)	0.076	(0.53)	6.08	(8.74)	17.48	(12.16)	5.32	(14.44)
Rhubarb (PA)	0.16	(0.16)	–1.56	(18.33)	77.22	(7.41)	2.50	(0.70	14.04	(17.16)	–1.56	(10.53)	0.00	(9.36)
Squash (WR)	0.47	(0.17)	–13.10	(36.03)	30.00	(3.47)	2.10	(1.44)	–23.58	(28.82)	–13.10	(17.69)	–9.17	(26.86)
Mean (std dev)	0.26	(0.18)*	–39.83	(88.60)	58.13	(109.89)	7.98	(16.96)	10.33	(24.48)	3.18	(12.42)	23.61	(27.23)
Cochiti (C)/Peña Blanca (PB)/ Sile (S):														
Apricots (PB)	–0.14	(0.15)	9.84	(28.70)	7.05	(2.30)	5.25	(1.64)	–8.20	(12.30)	–11.48	(8.20)	44.28	(30.34)
Bell Peppers (S)	0.68	(0.17)	–40.88	(21.17)	d		4.23	(1.31)	–8.76	(17.89)	12.41	(14.60)	23.36	(13.14)
Cherries (C/PB)	–0.15	(0.15)	–8.82	(19.60)	4.80	(1.47)	4.61	(1.23)	3.92	(10.29)	4.90	(5.39)	–21.56	(36.75)
Lettuce (S)	0.24	(0.16)	–42.50	(50.00)	59.75	(6.63)	180.00	(16.25)	–20.00	(27.50)	0.00	(13.75)	100.00	(57.50)
Tomatos (S)	0.14	(0.16)	–29.00	(22.00)	d	8.10	(1.80)	–1.00	(11.00)	18.00	(10.50)	3.00	(12.00)	
Mean (std dev)	0.15	(0.34)	–22.27	(22.43)	23.87	(31.10)	40.44	(78.03)	–6.81	(9.06)	4.77	(11.40)	29.82	(46.19)
San Ildefonso (SI)/El Rancho (ER):														
Apples (SI)	0.03	(0.14)	–15.48	(6.66)	28.44	(2.88)	10.37	(1.48)	–1.44	(4.86)	18.00	(8.64)	1.80	(5.94)
Apricots (ER)	–0.03	(0.14)	–18.04	(38.54)	4.76	(1.97)	2.95	(1.23)	18.04	(18.86)	–11.48	(17.22)	11.48	(32.80)
Cherries (ER)	–0.01	(0.14)	8.82	(32.34)	47.04	(5.39)	26.75	(3.87)	–20.58	(15.19)	15.68	(11.27)	27.44	(15.68)
Corn (SI)	–0.01	(0.14)	–9.60	(14.72)	5.82	(1.09)	1.79	(0.54)	0.64	(7.68)	–1.92	(6.40)	0.00	(8.00)
Squash (SI)	–0.10	(0.14)	5.24	(34.72)	17.55	(2.36)	2.36	(1.24)	0.00	(13.76)	–3.93	(13.76)	51.09	(33.41)
Mean (std dev)	0.02	(0.05)	–5.81	(12.18)	20.72	(17.60)	8.84	(10.60)	–0.67	(13.69)	3.27	(12.92)	18.36	(21.29)

Table 6-9. Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a] (Cont.)

Location	^{3}H (pCi/mL)		^{137}Cs (10^{-3} pCi/g dry)		^{90}Sr (10^{-3} pCi/g dry)		^{tot}U (ng/g dry)		^{238}Pu (10^{-5} pCi/g dry)		^{239}Pu (10^{-5} pCi/g dry)		^{241}Am (10^{-5} pCi/g dry)	
On-Site Stations														
LANL (Mesa):														
Apples (TA-21)	1.93	(0.22)	–9.36	(14.22)	[d]		0.40	(0.27)	–16.56	(7.74)	–6.48	(5.94)	0.72	(6.84)
Apples (TA-52)	0.40	(0.16)	–17.28	(9.54)	[d]		1.15	(0.56)	–10.08	(7.38)	9.36	(7.38)	–1.08	(7.56)
Apricots (TA-21)	0.24	(0.16)	31.16	(39.36)	43.62	(4.59)	4.26	(1.39)	1.64	(9.02)	–5.41	(8.12)	–41.00	(18.04)
Apricots (TA-35)	0.47	(0.17)	–29.52	(37.72)	18.37	(2.79)	1.31	(0.82)	–21.32	(12.30)	32.80	(20.50)	93.48	(36.08)
Nectarines (TA-3)	0.10	(0.16)	17.16	(17.55)	2.81	(1.05)	1.01	(0.51)	9.36	(10.92)	–5.46	(3.90)	–23.40	(10.14)
Peaches (TA-21)	3.07	(0.28)	–6.08	(16.34)	6.38	(1.10)	2.96	(0.76)	–6.08	(7.98)	12.16	(7.98)	17.48	(10.26)
Peaches (TA-3)	0.11	(0.16)	5.32	(14.82)	1.52	(1.06)	–0.038	(0.26)	25.84	(12.16)	3.80	(3.80)	4.56	(9.12)
Peaches (TA-53)	0.56	(0.17)	21.28	(17.10)	7.45	(1.33)	0.99	(0.46)	–9.88	(7.22)	–3.04	(4.18)	1.52	(11.40)
Mean (std dev)	0.86	(1.07)*	1.59	(20.77)	13.36	(15.97)	1.51	(1.41)	–3.39	(15.27)	4.72	(13.41)	6.54	(39.56)

Table 6-9. Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a] (Cont.)

Location	^{234}U (10^{-3} pCi/g dry)		^{235}U (10^{-4} pCi/g dry)		^{238}U (10^{-3} pCi/g dry)	
Regional Background Stations						
Chamita (C)/Chimayo (Ch)/Espanola Valley (EV)/Jemez (J)/Ojo Sarco (OS):						
Apricots (J/EV)	1.67	(0.59)	3.28	(2.21)	1.43	(0.53)
Beets (OS)	2.21	(0.40)	–1.61	(0.74)	1.81	(0.34)
Broccoli Rabe (OS)	18.83	(1.97)	20.73	(5.33)	9.05	(1.17)
Cabbage (OS)	1.22	(0.38)	0.71	(1.53)	0.48	(0.26)
Cherries (Ch)	4.70	(0.93)	3.72	(2.79)	5.39	(0.98)
Cucumbers (C)	2.13	(0.86)	5.19	(5.59)	2.13	(0.73)
Cucumbers (OS)	3.86	(1.00)	1.73	(4.06)	2.25	(0.63)
Green Beans (EV)	9.83	(0.94)	3.28	(1.21)	6.16	(0.66)
Plums (OS)	0.07	(0.25)	–1.48	(1.85)	0.26	(0.20)
Plums (OS)	0.14	(0.26)	–0.74	(1.35)	0.26	(0.25)
Pumpkin (OS)	0.82	(0.39)	1.20	(2.04)	1.27	(0.41)
Ruby Chard (OS)	10.67	(1.47)	9.57	(4.05)	6.44	(1.10)
Squash (EV)	6.29	(0.92)	1.05	(3.41)	4.32	(0.79)
Mean (std dev)	4.80	(5.45)	3.59	(5.97)	3.17	(2.81)
RSRL[e]	13.5		11.7		8.7	
Perimeter Stations						
Los Alamos:						
Apples	0.43	(0.20)	–1.30	(0.88)	0.42	(0.15)
Apricots	1.66	(0.51)	4.59	(3.36)	0.10	(0.21)
Cherries	1.11	(0.30)	0.29	(1.72)	0.62	(0.23)
Green Beans	2.73	(0.47)	0.78	(1.25)	1.28	(0.30)
Lettuce	24.00	(3.00)	17.50	(7.75)	24.00	(3.00)
Peaches	0.73	(0.32)	0.25	(1.72)	0.37	(0.27)
Plums	0.95	(0.28)	–1.37	(1.14)	0.62	(0.21)
Squash	1.59	(0.54)	6.55	(3.47)	0.88	(0.47)
Squash	1.32	(0.43)	3.80	(2.82)	0.48	(0.30)
Mean (std dev)	3.84	(7.59)	3.45	(5.93)	3.20	(7.81)

Table 6-9. Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a] Cont.)

Location	^{234}U (10^{-3} pCi/g dry)		^{235}U (10^{-4} pCi/g dry)		^{238}U (10^{-3} pCi/g dry)	
Perimeter Stations (Cont.)						
White Rock (WR)/Pajarito Acres (PA):						
Apples (WR)	0.23	(0.09)	0.76	(0.72)	0.05	(0.06)
Apricots (WR)	1.26	(0.45)	2.79	(2.13)	0.57	(0.30)
Cherries (WR)	0.26	(0.17)	1.27	(0.88)	0.09	(0.10)
Cucumbers (WR)	1.46	(0.73)	2.53	(5.99)	1.46	(0.73)
Green Beans (PA)	3.82	(0.70)	2.26	(2.26)	2.50	(0.55)
Lettuce (WR)	25.25	(3.63)	37.50	(15.00)	17.25	(2.88)
Peaches (WR)	–0.045	(0.24)	–1.67	(1.60)	0.045	(0.16)
Rhubarb (PA)	1.01	(0.25)	0.23	(0.66)	0.83	(0.23)
Squash (WR)	1.32	(0.48)	–0.66	(2.88)	0.72	(0.45)
Mean (std dev)	3.84	(8.11)	5.00	(12.28)	2.61	(5.55)
Cochiti (C)/Peña Blanca (PB)/Sile (S):						
Apricots (PB)	1.61	(0.55)	2.79	(1.97)	1.72	(0.52)
Bell Peppers (S)	1.10	(0.44)	–0.80	(1.50)	1.46	(0.40)
Cherries (C/PB)	2.06	(0.47)	0.20	(1.37)	1.54	(0.38)
Lettuce (S)	79.25	(6.88)	50.75	(11.25)	59.75	(5.50)
Tomatos (S)	5.30	(0.90)	0.90	(1.85)	2.70	(0.60)
Mean (std dev)	17.86	(34.36)	10.77	(22.39)	13.43	(25.90)
San Ildefonso (SI)/El Rancho (ER):						
Apples (SI)	3.35	(0.47)	1.15	(1.33)	3.49	(0.47)
Apricots (ER)	0.92	(0.40)	3.77	(2.21)	0.93	(0.37)
Cherries (ER)	10.09	(1.37)	2.25	(3.63)	8.92	(1.23)
Corn (SI)	0.67	(0.19)	1.02	(0.77)	0.60	(0.17)
Squash (SI)	0.68	(0.30)	–3.80	(2.23)	0.84	(0.37)
Mean (std dev)	3.14	(4.04)	0.88	(2.84)	2.96	(3.54)

Table 6-9. Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a] (Cont.)

Location	^{234}U (10^{-3} pCi/g dry)		^{235}U (10^{-4} pCi/g dry)		^{238}U (10^{-3} pCi/g dry)	
On-Site Stations						
LANL (Mesa):						
Apples (TA-21)	0.51	(0.17)	–0.36	(0.65)	0.14	(0.08)
Apples (TA-52)	0.65	(0.23)	–1.19	(0.97)	0.40	(0.17)
Apricots (TA-21)	0.066	(0.35)	0.66	(1.64)	1.44	(0.46)
Apricots (TA-35)	1.03	(0.41)	2.62	(3.36)	0.39	(0.22)
Nectarines (TA-3)	0.40	(0.19)	0.94	(1.29)	0.33	(0.16)
Peaches (TA-21)	0.53	(0.20)	0.84	(0.87)	0.98	(0.24)
Peaches (TA-3)	0.57	(0.20)	–0.15	(0.76)	–0.02	(0.08)
Peaches (TA-53)	0.52	(0.19)	–0.76	(0.87)	0.33	(0.14)
Mean (std dev)	0.53	(0.27)	0.33	(1.21)	0.50	(0.48)

[a]There are no concentration guides for produce, and with the exception of tritium, there were no statistical differences in any of the mean values from perimeter and on-site locations when compared with regional background at the 0.05 probability level using a Student's t-test. Means followed by an * were statistically higher than regional background.

[b](+1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.

[c]See Appendix B for an explanation of the presence of negative values.

[d]Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean (99% confidence level).

[e]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1994 to 2001; total uranium is based on data from 1999–2001.

Table 6-10. Mean (±SD) Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations Before (1997–1999) and After (2000 and 2001) the Cerro Grande Fire

Location/Date	^{3}H (pCi/mL)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Regional Background Stations							
Abiquiu/Arroyo Seco/Embudo/Espanola Valley/La Puebla/Ojo Sarco:							
1997–1999[a]	–0.03 (0.22)	34.60 (22.9)	165.5 (91.8)	6.0 (4.9)	–7.8 (8.1)	13.2 (12.8)	19.6 (28.4)
2000	0.13 (0.21)	–0.78 (12.7)	13.3 (17.3)	7.8 (8.7)	25.2 (28.5)*[b]	33.9 (42.8)	58.6 (57.7)
2001	0.05 (0.16)	–13.94 (29.4)	28.6 (26.2)	10.0 (8.5)	0.15 (22.3)	7.4 (12.6)	18.0 (36.2)
Perimeter Stations							
Los Alamos:							
1997–1999[a]	0.19 (0.36)	6.60 (4.0)	47.0 (50.8)	2.9 (1.1)	33.2 (39.0)	12.6 (25.4)	38.9 (45.3)
2000	0.30 (0.11)	4.07 (13.9)	10.2 (3.6)	4.0 (3.1)	26.1 (65.0)	40.8 (45.9)	85.5 (36.7)
2001	0.10 (0.12)	–5.04 (19.0)	63.2 (64.7)	9.7 (23.5)	3.4 (17.2)	12.9 (14.2)	14.0 (30.0)
White Rock/Pajarito Acres							
1997–1999[a]	–0.03 (0.26)	30.60 (38.4)	115.9 (85.3)	4.7 (3.1)	48.7 (74.8)	9.3 (16.4)	33.9 (30.1)
2000	0.24 (0.12)*	0.66 (7.8)	20.0 (22.5)	8.2 (10.9)	21.1 (64.4)	28.0 (41.7)	59.2 (61.7)
2001	0.26 (0.18)*	–39.83 (88.6)	58.1 (109.9)	8.0 (17.0)	10.3 (24.5)	3.2 (12.4)	23.6 (27.2)
Cochiti/Peña Blanca/Sile:							
1997–1999[a]	0.04 (0.29)	16.70 (12.8)	118.7 (147.8)	11.4 (8.3)	41.9 (49.6)	18.6 (38.8)	59.6 (58.3)
2000	0.25 (0.15)	6.03 (9.4)	14.6 (21.2)	14.6 (30.4)	26.5 (59.9)	62.1 (72.2)	105.2 (134.1)
2001	0.15 (0.34)	–22.37 (22.4)	23.9 (31.1)	40.4 (78.0)	–6.8 (9.1)	4.8 (11.4)	29.8 (46.2)
San Ildefonso/El Rancho:							
1997–1999[a]	–0.12 (0.31)	12.40 (23.9)	64.5 (54.7)	7.7 (6.3)	31.4 (27.2)	8.7 (24.2)	20.0 (31.6)
2000	0.32 (0.05)*	0.63 (3.2)	9.6 (12.5)	4.4 (2.4)	33.3 (42.1)	35.4 (37.9)	42.4 (31.9)
2001	0.02 (0.05)	–5.81 (12.2)	20.7 (17.6)	8.8 (10.6)	–0.7 (13.7)	3.3 (12.9)	18.4 (21.3)
On-Site Stations							
LANL (Mesa):							
1997–1999[a]	1.49 (1.11)	13.60 (18.1)	37.1 (39.3)	1.8 (0.5)	10.9 (14.3)	7.8 (10.5)	11.3 (7.7)
2000	1.59 (2.21)	–0.56 (5.0)	8.9 (11.9)	1.9 (1.1)	26.5 (34.2)	17.3 (19.2)	13.0 (23.1)
2001	0.86 (1.07)	1.59 (20.8)	13.4 (16.0)	1.5 (1.4)	–3.4 (15.3)	4.7 (13.4)	6.5 (39.6)

Table 6-10. Mean (±SD) Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations Before (1997–1999) and After (2000 and 2001) the Cerro Grande Fire (Cont.)

Location/Date	^{234}U (10^{-3} pCi/g dry)		^{235}U (10^{-4} pCi/g dry)		^{238}U (10^{-3} pCi/g dry)	
Regional Background Stations:						
Abiquiu/Arroyo Seco/Embudo/Espanola Valley/La Puebla/Ojo Sarco:						
1997–1999[a]	4.47	(3.24)	1.65	(1.86)	3.63	(3.35)
2000	3.90	(4.46)	2.90	(3.68)	2.60	(2.88)
2001	4.80	(5.45)	3.59	(5.97)	3.17	(2.81)
Perimeter Stations						
Los Alamos:						
1997–1999[a]	0.50	(0.61)	0.51	(1.06)	0.60	(0.43)
2000	1.16	(0.70)	3.97	(4.21)*	1.28	(1.02)
2001	3.84	(7.59)	3.45	(5.93)	3.20	(7.81)
White Rock/Pajartio Acres:						
1997–1999[a]	0.93	(0.81)	0.60	(1.50)	0.75	(0.82)
2000	3.48	(3.66)	7.81	(7.87)*	2.63	(3.55)
2001	3.84	(8.11)	5.00	(12.28)	2.61	(5.55)
Cochiti/Peña Blanca/Sile:						
1997–1999[a]	0.60	(0.76)	–1.37	(1.25)	0.70	(0.90)
2000	6.38	(13.11)	5.31	(5.26)*	4.82	(10.20)
2001	17.86	(34.36)	10.77	(22.39)	13.43	(25.90)
San Ildefonso/El Rancho:						
1997–1999[a]	6.02	(5.91)	1.65	(1.95)	4.97	(4.50)
2000	1.92	(0.62)	1.83	(5.84)	1.45	(0.81)
2001	3.14	(4.04)	0.88	(2.84)	2.96	(3.54)

Table 6-10. Mean (±SD) Radionuclide Concentrations in Produce Collected from Regional, Perimeter, and On-Site Locations Before (1997–1999) and After (2000 and 2001) the Cerro Grande Fire (Cont.)

Location/Date	^{234}U (10^{-3} pCi/g dry)		^{235}U (10^{-4} pCi/g dry)		^{238}U (10^{-3} pCi/g dry)	
On-Site Stations						
LANL (Mesa):						
1997–1999[a]	0.52	(0.47)	–0.09	(0.45)	0.40	(0.27)
2000	0.81	(0.54)	2.66	(3.54)	0.61	(0.34)
2001	0.53	(0.27)	0.33	(1.21)	0.50	(0.48)

[a]These data are the mean of means Fresquez and Gonzales (2000).

[b]Means from 2000 and 2001 within the same column and location followed by an * were statistically different from 1997–1999 (before the Cerro Grande fire) using a using a Student's t-test at the 0.05 probability level.

Table 6-11. Total Recoverable Trace Element Concentrations (g/g dry) in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a]

Location	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
Regional Background Stations												
Chamita (C)/Chimayo (Ch)/Espanola Valley (EV)/Jemez (J)/Ojo Sarco (OS):												
Apricots (J/EV)	U[b]	U	6.5	U	U	U	U	U	3.40	0.49	U	8.4
Beets (OS)	U	U	13.0	U	U	U	U	6.5	5.20	0.61	U	5.3
Broccoli Rabe (OS)	U	U	96.0	U	U	U	U	U	U	0.66	U	32.0
Cabbage (OS)	U	U	23.0	U	U	U	U	U	0.55	0.83	U	25.0
Cherries (Ch)	U	U	4.7	U	U	U	U	U	0.50	0.32	U	5.9
Cucumbers (C)	U	U	3.2	U	U	U	U	U	0.69	0.42	U	24.0
Cucumbers (OS)	U	U	5.4	U	U	U	U	U	0.58	0.67	U	40.0
Green Beans (EV)	U	U	15.0	U	U	U	U	1.4	0.77	0.67	U	32.0
Plums (OS)	U	U	35.0	U	U	U	U	U	1.50	0.53	U	24.0
Plums (OS)	U	U	6.0	U	U	U	U	2.6	3.40	0.32	U	6.2
Pumpkin (OS)	U	U	16.0	U	U	U	U	U	1.10	0.72	U	26.0
Ruby Chard (OS)	U	U	71.0	U	U	U	U	3.0	0.50	0.57	U	29.0
Squash (EV)	U	U	11.0	U	U	U	U	U	1.60	0.62	U	33.0
Mean			23.5					1.5	1.37	0.57		22.4
(std dev)			(28.5)					(1.8)	(1.49)	(0.15)		(11.9)
RL[c]	<0.50	<0.50	<0.20	<0.20	<0.25	<0.50	<0.05	<1.0	<0.15	<0.25	<0.40	<1.0
RSRL[d]	0.96	0.52	26.5	0.40	0.60	1.56	0.05	19.5	14.27	0.70	0.28	27.8
Perimeter Stations												
Los Alamos:												
Apples	U	U	30.0	U	U	0.71	U	U	0.57	0.79	U	29.0
Apricots	U	U	4.9	U	U	U	U	U	0.76	0.65	U	14.0
Cherries	U	U	4.4	U	U	U	U	2.6	1.10	0.48	U	6.4
Green Beans	U	U	4.2	U	U	U	U	U	1.20	0.71	U	5.1
Lettuce	U	U	17.0	U	U	U	U	U	0.94	0.72	U	41.0
Peaches	U	U	1.3	U	U	0.69	U	7.2	1.20	0.58	U	13.0
Plums	U	U	2.3	U	U	U	U	U	1.40	0.41	U	8.0
Squash	U	U	7.9	U	U	U	U	U	1.10	0.82	U	40.0
Squash	U	U	6.5	U	U	0.53	U	14.0	7.40	0.75	U	43.0
Mean			8.7			0.38		3.0	1.74	0.66		22.2
(std dev)			(9.2)			(0.20)		(4.7)	(2.14)	(0.14)		(16.0)

Table 6-11. Total Recoverable Trace Element Concentrations (g/g dry) in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a] (Cont.)

Location	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
Perimeter Stations (Cont.)												
White Rock (WR)/Pajarito Acres (PA):												
Apples (WR)	U	U	3.5	U	U	U	U	U	0.76	0.33	U	2.4
Apricots (WR)	U	U	6.1	U	U	U	U	2.1	4.20	0.49	U	11.0
Cherries (WR)	U	U	2.9	U	U	U	U	U	U	0.43	U	5.0
Cucumbers (WR)	U	U	19.0	U	U	U	U	U	0.27	0.62	U	35.0
Green Beans (PA)	U	U	11.0	U	U	U	U	1.9	0.66	0.50	U	33.0
Lettuce (WR)	U	U	38.0	U	U	U	U	U	0.73	0.61	U	24.0
Peaches (WR)	U	U	3.2	U	U	0.55	U	1.2	0.24	0.52	U	8.7
Rhubarb (PA)	U	U	86.0	U	U	U	U	8.2	3.70	0.49	U	9.1
Squash (WR)	U	U	7.0	U	U	0.53	U	4.7	1.30	0.71	U	54.0
Mean			19.6			0.31		2.2	1.33	0.52		20.2
(std dev)			(27.3)			(0.13)		(2.6)	(1.53)	(0.11)		(17.4)
Cochiti (C)/Peña Blanca (PB)/Sile (S):												
Apricots (PB)	U	U	2.3	U	U	U	U	4.40	1.90	0.42	U	8.5
Bell Peppers (S)	U	U	1.9	U	U	U	U	U	2.10	0.53	U	14.0
Cherries (C/PB)	U	U	5.0	U	U	U	U	U	1.30	0.69	U	6.5
Lettuce (S)	U	U	26.0	U	0.32	U	U	U	2.10	0.74	U	40.0
Tomatoes (S)	U	U	4.8	U	U	1.40	U	2.80	2.20	0.85	U	21.0
Mean			8.0		0.16	0.48		1.7	1.92	0.65		18.0
(std dev)			(10.2)		(0.09)	(0.51)		(1.8)	(0.36)	(0.17)		(13.5)
San IldefonsoPueblo (SI)/El Rancho (ER):												
Apples (SI)	U	U	1.6	U	U	U	U	U	2.50	0.43	U	2.0
Apricots (ER)	U	U	6.0	U	U	U	U	[e]	18.00	0.72	U	11.0
Cherries (ER)	U	U	4.9	U	U	U	U	2.50	3.20	0.84	U	7.6
Corn (SI)	U	U	0.3	U	U	U	U	U	5.10	0.62	U	30.0
Squash (SI)	U	U	15.0	U	U	U	U	17.00	3.60	0.81	U	27.0
Mean			5.6					5.1	6.48	0.68		15.5
(std dev)			(5.8)					(8.0)	(6.51)	(0.17)		(12.3)

Table 6-11. Total Recoverable Trace Element Concentrations (g/g dry) in Produce Collected from Regional, Perimeter, and On-Site Locations during the 2001 Growing Season[a] (Cont.)

Location	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
On-Site Stations												
LANL (Mesa):												
Apples (TA-21)	U	U	5.1	U	U	U	U	1.3	3.80	0.77	U	2.9
Apples (TA-52)	U	U	4.1	U	U	U	U	1.3	1.60	0.78	U	2.0
Apricots (TA-21)	U	U	16.0	U	U	U	U	1.5	0.87	0.71	U	6.0
Apricots (TA-35)	U	U	13.0	U	U	U	U	70.0	34.00	0.77	U	7.3
Nectarines (TA-3)	U	U	5.0	U	U	U	U	U	0.30	0.69	U	8.8
Peaches (TA-21)	U	U	4.7	U	U	U	U	4.7	3.40	0.58	U	6.2
Peaches (TA-3)	U	U	4.5	U	U	U	U	2.8	1.40	0.72	U	9.2
Peaches (TA-53)	U	U	2.5	U	U	U	U	10.0	8.30	0.85	U	11.0
Mean			6.9					11.5	6.71	0.73		6.7
(std dev)			(4.9)					(23.8)	(11.31)	(0.08)*[f]		(3.1)

[a]Analysis by EPA Method 3051 for total recoverable metals.

[b]U = undetected; an analyte was analyzed but not detected above the reporting limit and was given a value of one-half the concentration (of the reporting limit when a statistical calculation was needed. (Note: A mean was calculated when at least one number within the respective field was above the reporting limit.)

[c]Reporting Limit

[d]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1994 to 2001.

[e]Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean (99% confidence level).

[f]Means within the same column followed by an * were statistically higher than regional background using a using a Student's t-test at the 0.05 probability level.

Table 6-12. Mean (±SD) Total Recoverable Trace Element Concentrations (g/g dry) in Produce Collected from Background, Perimeter, and On-Site Locations Before (1999) and After (2000 and 2001) the Cerro Grande Fire

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
Regional Background Stations												
Chamita/Chimayo/Española Valley/Jemez/Ojo Sarco:												
1999[a]	U[f]	U	7.6	U	U	0.80	U	4.4	8.6	U	U	19.5
			(6.2)			(0.73)		(7.7)	(12.8)			(14.2)
2000[b]	U	U	19.7	U	0.53	1.03	U	8.9	4.4	0.39	U	24.5
			(35.5)		(0.12)	(2.06)		(15.0)	(5.7)	(0.22)*[g]		(16.7)
2001[c]	U	U	23.5	U	U	U	U	1.5	1.4	0.57	U	22.4
			(28.5)					(1.8)	(1.5)	(0.15)*		(11.9)
RL[d]	<0.50	<0.50	<0.20	<0.20	<0.25	<0.50	<0.05	<1.0	<0.15	<0.25	<0.40	<1.0
RSRL[e]	1.3	0.57	19.5	0.45	0.65	1.56	0.06	21.9	15.9	0.63	0.27	22.3
Perimeter Stations												
Los Alamos:												
1999	U	U	4.7	U	U	U	U	3.4	9.2	U	U	16.2
			(3.1)					(6.5)	(8.9)			(18.4)
2000	U	U	5.2	U	U	1.60	U	21.5	13.5	1.19	U	9.6
			(5.3)			(1.38)		(32.0)	(12.5)	(0.26)*		(9.6)
2001	U	U	8.7	U	U	0.38	U	3.0	1.7	0.66	U	22.1
			(9.2)			(0.20)		(4.7)	(2.1)	(0.14)*		(16.0)
White Rock/Pajarito Acres:												
1999	U	U	7.2	U	U	0.58	U	3.5	7.5	U	U	20.0
			(10.0)			(0.20)		(6.1)	(6.6)			(11.6)
2000	U	U	6.5	U	U	1.21	U	6.3	4.0	1.33	U	16.4
			(4.4)			(1.40)		(3.2)	(4.4)	(0.33)*		(10.7)
2001	U	U	19.6	U	U	0.31	U	2.2	1.3	0.52	U	20.2
			(27.3)			(0.13)		(2.6)	(1.5)	(0.11)*		(17.4)

Table 6-12. Mean (±SD) Total Recoverable Trace Element Concentrations (g/g dry) in Produce Collected from Background, Perimeter, and On-Site Locations Before (1999) and After (2000 and 2001) the Cerro Grande Fire (Cont.)

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Se	Tl	Zn
Cochiti/Peña Blanca:												
1999	U	U	4.4 (7.1)	U	U	0.72 (0.49)	U	2.3 (1.2)	4.8 (3.2)	U	U	19.0 (12.0)
2000	U	U	2.4 (2.3)	U	U	1.02 (0.60)	U	5.0 (4.4)	3.6 (1.8)	0.88 (0.08)*	U	12.6 (5.9)
2001	U	U	8.0 (10.2)	U	0.16 (0.09)	0.48 (0.51)	U	1.7 (1.8)	1.9 (0.4)	0.65 (0.17)*	U	18.0 (13.5)
San Ildefonso Pueblo:												
1999	U	U	7.7 (9.0)	U	U	U	U	4.6 (7.0)	6.9 (5.1)	U	U	19.6 (10.3)
2000	U	U	3.6 (4.2)	U	0.53 (0.22)	1.23 (0.96)	U	4.3 (5.2)	2.8 (1.3)	0.76 (0.28)*	U	17.1 (8.8)
2001	U	U	5.6 (5.8)	U	U	U	U	5.1 (8.0)	6.5 (6.5)	0.68 (0.17)*	U	15.5 (12.3)
On-Site Stations												
LANL (Mesa):												
1999	U	U	6.5 (4.9)	U	U	U	U	U	4.8 (1.9)	U	U	6.0 (2.8)
2000	U	U	5.6 (2.1)	0.18 (0.18)	U	1.42 (1.60)	U	10.1 (9.4)	1.9 (1.0)	1.16 (0.27)*	U	8.1 (4.0)
2001	U	U	6.9 (4.9)	U	U	U	U	11.5 (23.8)	6.7 (11.3)	0.73 (0.08)*	U	6.7 (3.1)

[a]Data from Fresquez and Gonzales (2000).
[b]Data from Fresquez et al. (2001c).
[c]Data from Table 6-11.
[d]Reporting Limit = Reporting Limit.
[e]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1994 to 2000.
[f]U = undetected; an analyte was analyzed but not detected above the reporting limit and was given a value of one-half the concentration (of the reporting limit) when a statistical calculation was needed. (Note: A mean was calculated when at least one number within the respective field was above the reporting limit.)
[g]Post-fire means (2000 or 2001) within the same column and location followed by an * were significantly higher than pre-fire means using a Student's t-test at the 0.05 probability level.

Table 6-13. Radionuclide Concentrations in Game (Predators) Fish Upstream and Downstream of Los Alamos National Laboratory during 2001

Location	^{90}Sr (10^{-2}pCi/g dry)	^{137}Cs (10^{-2}pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5}pCi/g dry)	^{239}Pu (10^{-5}pCi/g dry)	^{241}Am (10^{-5}Ci/g dry)	^{234}U (10^{-3}pCi/g dry)	^{235}U (10^{-4}pCi/g dry)	^{238}U (10^{-3}pCi/g dry)
Upstream (Abiquiu Reservoir)									
6-19-01									
Brown Trout	0.71 (0.15)[a]	–0.36 (2.96)[b]	8.47 (4.17)	–6.05 (17.55)	13.31 (19.97)	35.09 (24.20)	2.06 (1.15)	3.0 (5.9)	2.78 (1.33)
Crappie	3.50 (0.37)	–0.97 (2.60)	12.71 (5.26)	14.52 (21.78)	58.08 (36.91)	20.57 (21.18)	4.60 (1.69)	16.9 (10.3)	3.99 (1.57)
Smallmouth Bass	2.08 (0.26)	–1.94 (1.50)	3.27 (2.78)	20.57 (20.57)	20.57 (20.57)	–3.63 (21.18)	3.15 (1.39)	15.7 (9.7)	0.85 (0.79)
Walleye	1.08 (0.20)	0.97 (2.72)	–0.36 (2.12)	–18.15 (18.15)	41.14 (28.44)	9.68 (33.28)	5.08 (1.82)	12.1 (9.1)	–0.31 (0.57)
Walleye	1.15 (0.21)	4.96 (2.78)	2.42 (2.24)	–8.47 (25.41)	–8.47 (25.41)	14.52 (30.25)	3.03 (1.39)	25.4 (12.7)	0.42 (0.56)
Mean (std dev)	1.70 (1.12)	0.53 (2.69)	5.30 (5.23)	0.48 (16.36)	24.93 (25.65)	15.25 (14.23)	3.58 (1.23)	14.6 (8.1)	1.55 (1.78)
RSRL[c]	17.0	27.7	6.5	23.6	28.3	28.9	6.04	30.8	5.11
Downstream (Cochiti Reservoir)									
4-25-01									
Pike	1.42 (0.23)	4.84 (2.72)	3.51 (2.12)	10.89 (10.29)	–4.84 (9.08)	16.94 (29.04)	5.45 (1.33)	–3.6 (2.7)	1.21 (0.67)
Pike	1.14 (0.24)	1.21 (2.96)	7.87 (2.96)	–6.05 (14.52)	27.83 (12.10)	45.98 (29.65)	1.82 (0.79)	5.6 (4.4)	2.54 (0.91)
Pike	1.40 (0.25)	3.99 (2.42)	5.93 (2.60)	–20.57 (29.04)	26.62 (18.67)	16.94 (21.78)	2.30 (0.91)	–3.5 (2.6)	2.06 (0.85)
Walleye	1.74 (0.25)	0.12 (2.72)	6.53 (2.84)	12.10 (19.36)	6.05 (13.92)	43.56 (29.04)	3.75 (1.21)	7.1 (5.0)	2.06 (0.85)
Smallmouth Bass	3.19 (0.37)	2.78 (3.27)	2.78 (2.00)	44.77 (21.18)	–13.31 (15.73)	0.00 (19.97)	3.39 (1.15)	–1.5 (3.2)	0.97 (0.61)
White Bass	3.52 (0.39)	0.85 (2.36)	1.69 (1.39)	15.73 (11.50)	15.73 (15.13)	–70.18 (49.61)	2.78 (0.91)	6.7 (4.8)	0.45 (0.39)
White Bass	3.33 (0.38)	–0.61 (2.66)	2.30 (1.75)	–16.94 (9.08)	49.61 (18.15)	52.03 (29.04)	3.75 (1.15)	4.1 (4.2)	0.71 (0.52)
Mean (std dev)	2.25 (1.05)[d]	1.88 (2.03)	4.37 (2.38)	5.70 (22.49)	15.38 (21.49)	15.04 (42.10)	3.32 (1.19)	2.1 (4.8)	1.43 (0.79)
5-30-01									
Walleye	0.68 (0.20)	–3.75 (2.54)	2.18 (2.84)	20.57 (30.25)	0.00 (26.62)	–10.89 (18.76)	2.18 (1.45)	–1.2 (7.3)	0.73 (0.85)
Pike	1.26 (0.19)	4.11 (3.03)	3.63 (3.09)	121.00 (66.55)	49.61 (48.40)	14.52 (15.13)	2.90 (1.39)	10.9 (9.1)	1.09 (0.91)
Pike	4.48 (0.45)	–2.42 (1.45)	5.45 (3.45)	–30.25 (34.49)	21.78 (41.75)	47.19 (27.23)	3.63 (1.39)	1.5 (5.4)	1.82 (1.09)
Crappie	3.41 (0.36)	–0.73 (2.72)	12.95 (5.02)	52.03 (33.88)	19.36 (19.36)	12.10 (41.75)	5.81 (1.82)	15.7 (9.1)	4.11 (1.57)
White Bass	1.00 (0.18)	–4.24 (2.90)	8.11 (4.30)	20.57 (20.57)	–6.05 (18.76)	15.73 (32.67)	3.51 (1.51)	–0.7 (5.3)	2.78 (1.33)
Mean (std dev)	2.17 (1.68)	–1.40 (3.37)	6.46 (4.25)	36.78 (55.55)	16.94 (21.86)	15.73 (20.69)	3.61 (1.36)	5.2 (7.6)	2.11 (1.37)
8-14-01									
Pike	1.37 (0.21)	4.11 (2.84)	2.78 (0.85)	10.89 (19.97)	2.42 (12.10)	81.07 (26.02)	1.00 (0.31)	0.73 (0.85)	0.93 (0.27)
Walleye	1.44 (0.22)	0.24 (1.27)	3.15 (0.91)	3.63 (16.34)	20.57 (13.92)	24.20 (13.92)	1.79 (0.38)	0.61 (1.63)	1.06 (0.27)
White Bass	3.84 (0.41)	0.12 (2.48)	6.90 (1.45)	–10.89 (14.52)	–4.84 (10.29)	21.78 (20.57)	3.56 (0.55)	2.42 (2.06)	2.26 (0.45)
Walleye	1.74 (0.25)	–1.94 (2.60)	2.90 (0.91)	–2.42 (12.10)	0.00 (9.68)	36.30 (15.73)	(0.33) 0.00	(1.21) 0.98	(0.29)
Largemouth Bass	3.59 (0.38)	2.78 (2.18)	5.81 (1.09)	0.00 (20.57)	24.20 (16.94)	1.21 (15.13)	2.14 (0.38)	0.48 (0.61)	1.94 (0.34)
Mean (std dev)	2.40 (1.22)	1.06 (2.39)	4.31 (1.91)	0.24 (8.00)	8.47 (13.03)	32.91 (29.73)	1.87 (1.09)	0.85 (0.92)	1.43 (0.62)

[a](+1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[b]See Appendix B for an explanation of the presence of negative values.
[c]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1981–1999. For U isotopes, the RSRL is based on current (2001) data.
[d]Means within the same column and fish type followed by an * were significantly different from Abiquiu (background) using a Student's t-test at the 0.05 probability level. (Note: Mean concentrations in fish collected from Cochiti were not significantly higher than fish collected from Abiquiu on any given date.)

Table 6-14. Radionuclide Concentrations in Nongame (Bottom-Feeding) Fish Upstream and Downstream of Los Alamos National Laboratory during 2001

Location	^{90}Sr (10^{-2}pCi/g dry)	^{137}Cs (10^{-2}pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5}pCi/g dry)	^{239}Pu (10^{-5}pCi/g dry)	^{241}Am (10^{-5}Ci/g dry)	^{234}U (10^{-3}pCi/g dry)	^{235}U (10^{-4}pCi/g dry)	^{238}U (10^{-3}pCi/g dry)
Upstream (Abiquiu Reservoir)									
6-19-01									
Carp Sucker	3.32 (0.35)[a]	1.33 (2.23)	12.26 (4.51)	17.10 (22.80)	–4.75 (13.78)[b]	–50.35 (25.65)	2.76 (1.24)	9.5 (7.1)	3.99 (1.43)
Catfish	1.93 (0.22)	–0.38 (2.00)	5.80 (3.42)	1.90 (17.58)	16.15 (15.68)	–11.40 (20.90)	6.94 (2.00)	7.6 (7.1)	1.81 (1.05)
Carp	3.76 (0.38)	0.95 (1.14)	24.70 (5.70)	24.70 (20.90)	5.70 (15.68)	36.10 (27.08)	11.02 (2.19)	27.6 (10.5)	7.98 (1.85)
Carp	3.26 (0.34)	–1.71 (2.14)	19.95 (5.70)	–13.30 (19.95)	–24.70 (14.73)	6.65 (18.53)	10.26 (2.23)	8.6 (6.2)	6.75 (1.81)
Catfish	1.95 (0.24)	–0.57 (2.38)	14.25 (4.75)	6.65 (16.63)	15.20 (15.20)	54.15 (26.60)	9.60 (2.23)	19.0 (9.5)	4.37 (1.47)
Mean (std dev)	2.84 (0.85)	–0.08 (1.23)	15.39 (7.26)	7.41 (14.60)	1.52 (16.92)	7.03 (40.92)	8.12 (3.37)	14.5 (8.6)	4.98 (2.43)
RSRL[c]	13.2	26.9	16.2	9.8	19.2	16.1	14.86	31.7	9.84
Downstream (Cochiti Reservoir)									
4-25-01									
Carp	2.96 (0.31)	2.00 (2.28)	30.40 (5.23)	20.90 (13.78)	3.80 (5.23)	11.40 (11.40)	19.48 (2.52)	13.3 (6.2)	9.98 (1.71)
Carp Sucker	4.07 (0.41)	–0.67 (1.90)	4.47 (2.04)	3.80 (9.03)	3.80 (9.03)	22.80 (15.58)	2.95 (0.95)	5.1 (3.6)	1.43 (0.62)
Catfish	1.28 (0.19)	0.86 (2.76)	12.92 (3.47)	–31.35 (15.68)	4.75 (7.60)	23.75 (16.15)	6.08 (1.38)	2.9 (2.8)	4.28 (1.14)
Catfish	1.57 (0.21)	–0.10 (2.19)	13.49 (3.71)[c]	–8.55 (6.18)	–4.75 (5.23)	–8.55 (19.00)	7.03 (1.52)	4.1 (4.2)	4.47 (1.19)
Mean (std dev)	2.47 (1.29)[d]	0.52 (1.17)	15.32 (10.87)	–3.80 (21.98)	1.90 (4.46)	12.35 (15.02)	8.89 (7.28)	6.4 (4.7)	5.04 (3.57)
5-30-01p									
Catfish	1.44 (0.19)	–0.95 (2.09)	15.20 (4.75)	43.70 (25.18)	–4.75 (13.30)	38.00 (28.50)	11.78 (2.42)	8.6 (6.7)	5.13 (1.52)
Catfish	1.44 (0.18)	–2.95 (2.33)	6.08 (3.23)	16.15 (16.15)	–4.75 (14.73)	–10.45 (19.00)	5.23 (1.62)	–2.2 (4.0)	2.09 (1.05)
Carp	3.52 (0.35)	1.14 (0.71)	19.95 (5.23)	22.80 (23.28)	6.65 (17.10)	71.25 (38.95)	14.82 (2.47)	18.1 (8.1)	6.56 (1.57)
Carp Sucker	2.41 (0.25)	0.57 (2.47)	6.84 (2.95)	–16.15 (18.05)	–4.75 (13.30)	0.00 (26.13)	4.09 (1.28)	25.7 (10.0)	1.90 (0.86)
Carp Sucker	2.56 (0.28)	3.71 (2.38)	9.79 (4.13)	22.80 (37.53)	–16.15 (15.68)	55.10 (27.55)	4.09 (1.47)	9.5 (7.1)	3.14 (1.28)
Carp Sucker	2.56 (0.28)	–2.19 (1.19)	17.10 (5.23)	31.35 (31.35)	–10.45 (15.68)	51.30 (30.88)	13.59 (2.66)	4.2 (4.7)	5.61 (1.66)
Mean (std dev)	2.32 (0.79)	–0.11 (2.43)	12.49 (5.74)	20.11 (20.14)	–5.70 (7.58)	34.20 (32.49)	8.93 (5.00)	10.7 (9.9)	4.07 (1.96)

Table 6-14. Radionuclide Concentrations in Nongame (Bottom-Feeding) Fish Upstream and Downstream of Los Alamos National Laboratory during 2001 (Cont.)

Location	^{90}Sr (10^{-2}pCi/g dry)	^{137}Cs (10^{-2}pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5}pCi/g dry)	^{239}Pu (10^{-5}pCi/g dry)	^{241}Am (10^{-5}Ci/g dry)	^{234}U (10^{-3}pCi/g dry)	^{235}U (10^{-4}pCi/g dry)	^{238}U (10^{-3}pCi/g dry)
Downstream (Cochiti Reservoir) (Cont.)									
8-14-01									
Catfish	1.62 (0.20)	1.05 (1.90)	16.91 (1.90)	4.75 (9.03)	4.75 (9.03)	17.10 (11.88)	7.79 (0.76)	3.90 (1.52)	5.61 (0.62)
Carp Sucker	2.25 (0.25)	–1.43 (2.23)	3.90 (0.90)	29.45 (21.85)	17.10 (15.20)	1.90 (12.83)	3.03 (0.42)	–0.38 (1.09)	1.30 (0.29)
Carp Sucker	2.32 (0.26)	0.00 (2.33)	4.37 (0.95)	–9.50 (7.60)	–2.85 (7.60)	0.00 (7.60)	3.08 (0.42)	–0.76 (1.43)	1.50 (0.29)
Carp Sucker	2.81 (0.30)	–0.19 (1.81)	17.96 (1.90)	–1.90 (6.18)	–1.90 (6.18)	5.70 (12.35)	8.27 (0.76)	4.56 (1.52)	5.99 (0.62)
Carp Sucker	2.23 (0.25)	1.43 (1.81)	5.70 (1.00)	–2.85 (7.60)	4.75 (8.55)	54.15 (21.38)	3.16 (0.41)	1.62 (1.24)	1.88 (0.31)
Carp	3.51 (0.35)	–1.90 (2.38)	14.82 (1.71)	–12.35 (7.13)	9.50 (10.93)	30.40 (18.05)	7.32 (0.76)	0.86 (1.19)	4.94 (0.57)
Carp	2.76 (0.31)	–0.38 (1.00)	24.61 (2.47)	–32.30 (11.40)	3.80 (16.15)	–14.25 (17.58)	14.63 (1.24)	3.90 (1.66)	8.17 (0.81)
Carp	2.81 (0.32)	1.24 (2.09)	20.52 (2.28)	–17.10 (8.08)	–3.80 (7.60)	36.10 (19.48)	12.45 (1.14)	2.38 (2.04)	6.84 (0.71)
Mean (std dev)	2.54 (0.56)	–0.02 (1.23)	13.60 (7.95)	–5.23 (17.97)	3.92 (7.03)	16.39 (22.50)	7.47 (4.38)	2.01 (2.02)	4.53 (2.64)

[a](+1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[b]See Appendix B for an explanation of the presence of negative values.
[c]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on data from 1981–1999. For U isotopes, the RSRL is based on current (2001) data.
[d]Means within the same column and fish type followed by an * were significantly different from Abiquiu (background) using a Student's t-test at the 0.05 probability level. (Note: Mean concentrations in fish collected from Cochiti were not significantly higher than fish collected from Abiquiu on any given date.)

Table 6-15. Mean (±SD) Radionuclide Concentrations in Game (Predators) and Nongame (Bottom-Feeding) Fish Upstream and Downstream of Los Alamos National Laboratory Before (1999) and After (2000 and 2001) the Cerro Grande Fire

Location Date	^{90}Sr (10^{-2} pCi/g dry)	^{137}Cs (10^{-2} pCi/g dry)	^{tot}U (ng/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Game Fish (Predators)						
Upstream (Abiquiu Reservoir):						
1999[a]	1.57 (2.4)	0.90 (0.41)	2.7 (0.61)	11.2 (1.5)	22.39 (14.7)	22.3 (21.6)
2000[b]	–0.10 (1.3)	–0.61 (0.80)	2.1 (1.05)	15.9 (40.3)	6.78 (3.3)	–22.9 (8.3)
2001[c]	1.70 (1.1)	0.53 (2.69)	5.3 (5.23)	0.5 (16.4)	24.93 (25.7)	15.3 (14.2)
Downstream (Cochiti Reservoir):						
1999[a]	3.73 (2.5)	0.54 (0.79)	4.6 (1.99)	17.6 (31.3)	30.55 (22.1)	67.9 (103.3)
2000[b]	1.69 (3.0)	0.06 (0.97)	5.3 (2.24)	7.7 (35.5)	0.48 (13.7)	–11.7 (13.6)
2001[c]	2.27 (0.1)	0.51 (1.70)	5.1 (1.22)	14.2 (19.7)	13.60 (4.5)	21.2 (10.1)
Nongame Fish (Bottom Feeders)						
Upstream (Abiquiu Reservoir):						
1999[a]	5.24 (2.3)	0.24 (0.23)	10.3 (3.96)	2.5 (25.8)	10.93 (11.8)	14.4 (12.2)
2000[b]	3.84 (1.9)	–0.77 (0.69)	8.3 (5.20)	32.1 (23.4)*[d]	12.16 (7.4)	–1.5 (5.9)
2001[c]	2.84 (0.9)	–0.08 (1.23)	15.4 (7.26)	7.4 (14.6)	1.52 (16.9)	7.0 (40.9)
Downstream (Cochiti Reservoir):						
1999[a]	4.56 (3.0)	0.05 (0.23)	21.1 (10.13)	11.4 (5.9)	22.80 (13.5)	30.2 (42.7)
2000[b]	1.15 (3.8)	–0.25 (0.60)	10.7 (6.85)	11.7 (50.1)	6.87 (7.3)	–1.9 (26.4)
2001[c]	2.44 (0.1)	0.13 (0.34)	13.8 (1.43)	3.7 (14.2)	0.04 (5.1)	21.0 (11.6)

[a]Data from Fresquez and Gonzales (2000).

[b]Data from Fresquez et al. (2001c).

[c]2001 year data are the mean and standard deviation of three sampling dates at Cochiti Reservoir.

[d]Means from 2000 and 2001 (after the Cerro Grande fire) within the same column, fish type, and location followed by an * were significantly higher than 1999 (before the Cerro Grande fire) using a Student's t-test at the 0.05 probability level. (Note: Most mean concentrations in fish collected post-fire were not significantly higher than fish collected pre-fire.)

Table 6-16. Total Recoverable Trace Element Concentrations (g/g wet weight) in Game (Predators) Fish (Muscle Fillet) Collected Upstream and Downstream of Los Alamos National Laboratory in 2001

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Sb	Se	CN
Upstream (Abiquiu Reservoir)												
6-19-01												
B. Trout	U[a]	[d]	0.30	U	U	U	0.33	U	U	U	0.50	U
Crappie	[d]	[d]	U	U	U	U	0.23	U	U	U	0.60	U
S. Bass	U	[d]	1.70	U	U	U	0.38	U	U	U	U	U
Walleye	U	[d]	0.50	U	U	U	0.30	U	U	U	U	U
Walleye	U	[d]	0.70	U	U	U	0.30	U	U	U	0.40	U
Mean			0.66				0.31				0.35	
(std dev)			(0.62)				(0.05)				(0.22)	
RL[b]	<0.50	<0.50	<0.20	<0.20	<0.25	<0.50	<0.05	<1.0	<0.15	<0.40	<0.25	<0.50
RSRL[c]	1.00		1.88	0.10	0.50	0.50	0.41	1.00	0.20	0.20	0.74	0.03
Downstream (Cochiti Reservoir)												
4-25-01												
Pike	[d]	U	0.68	U	U	U	0.42	U	U	U	U	U
Pike	U	U	0.60	U	U	U	0.48	U		U	U	U
Pike	U	U	0.53	U	U	U	0.76	U	[d]	U	U	U
Walleye	U	U	U	U	U	U	0.19	U	U	U	U	U
S.M.Bass	2.60	U	0.36	U	U	U	0.19	U	U	U	U	U
W. Bass	U	U	U	U	U	U	0.19	U	U	U	U	U
W. Bass	U	U	U	U	U	U	0.22	U	U	U	U	U
Mean	0.64		0.35				0.35					
(std dev)	(0.96)		(0.26)				(0.22)					
5-30-01												
Walleye	U	U	U	U	U	U	0.42	U	U	U	0.54	[d]
Pike	U	U	U	U	U	U	0.24	U	U	U	0.47	[d]
Pike	U	U	U	U	U	U	0.42	U	U	U	0.55	[d]
Crappie	U	U	U	U	U	U	0.17	U	U	U	0.58	[d]
W. Bass	U	U	U	U	U	U	0.15	U	U	U	0.77	[d]
Mean							0.28				0.58	
(std dev)							(0.13)				(0.11)*	

Table 6-16. Total Recoverable Trace Element Concentrations (g/g wet weight) in Game (Predators) Fish (Muscle Fillet) Collected Upstream and Downstream of Los Alamos National Laboratory in 2001(Cont.)

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Sb	Se	CN
Downstream (Cochiti Reservoir) (Cont.)												
8-14-01												
Pike	U	U	U	U	U	U	0.25	U	U	U	0.60	[d]
Walleye	U	U	U	U	U	U	0.31	U	U	U	0.62	[d]
W. Bass	U	U	U	U	U	U	0.12	U	U	U	0.77	[d]
Walleye	U	U	U	U	U	U	0.34	U	U	U	0.78	[d]
L. Bass	U	U	U	U	U	U	0.57	U	U	U	0.57	[d]
Mean							0.32				0.67	
(std dev)							(0.16)				(0.10)*[e]	

[a]U = undetected; an analyte was analyzed but not detected above the reporting limit and was given a value of one-half the concentration (of the reporting limit) when a statistical calculation was needed. (Note: A mean was calculated when at least one number within the respective field was above the reporting limit.)

[b]Reporting Limit.

[c]Regional Statistical Reference Level is the upper-limit background (mean plus two standard deviations) from present data for the game fish. CN is from 1999 data.

[d]Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean.

[e]Means within the same column and date followed by an * were significantly different from Abiquiu (background) using a Student's t-test at the 0.05 probability level.

Table 6-17. Total Recoverable Trace Element Concentrations (g/g wet weight) in Nongame (Bottom-Feeding) Fish (Muscle Fillet) Collected Upstream and Downstream of Los Alamos National Laboratory in 2001

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Sb	Se	CN
Nongame Fish (Bottom Feeders)												
Upstream (Abiquiu Reservoir)												
6-19-01												
C. Sucker	U[a]	[d]	4.90	U	U	U	0.21	U	U	U	U	U
Catfish	U	[d]	0.30	U	U	U	0.26	U	U	U	U	U
Carp	U	[d]	0.40	U	U	U	0.32	U	U	U	0.60	U
Carp	U	[d]	3.60	U	U	U	0.28	U	U	U	U	U
Catfish	U	[d]	0.30	U	U	U	0.12	U	U	U	U	U
Mean			1.90				0.24				0.20	
(std dev)			(2.19)				(0.08)				(0.19)	
RL[b]	<0.50	<0.50	<0.20	<0.20	<0.25	<0.50	<0.05	<1.0	<0.15	<0.40	<0.25	<0.50
RSRL[c]	1.4	0.62	1.30	1.20	1.50	1.80	0.48	1.5	3.50	1.74	1.48	2.96
Downstream (Cochiti Reservoir)												
4-25-01												
Carp	U	U	0.21	U	U	U	0.34	U	U	U	U	U
C. Sucker	U	U	U	U	U	U	0.10	U	U	U	U	U
Catfish	U	U	2.38	U	[d]	U	0.10	[d]	U	U	U	U
Catfish	U	U	U	U	U	U	0.16	U	U	U	U	U
Mean			0.70				0.18					
(std dev)			(1.12)				(0.11)					
5-30-01												
Catfish	U	U	U	U	U	U	0.30	U	U	U	0.41	d
Catfish	U	U	U	U	U	U	0.30	U	U	U	0.42	d
Carp	U	U	U	U	U	U	0.08	U	U	U	0.53	d
C. Sucker	U	U	0.44	U	U	U	0.28	U	U	U	0.46	d
C. Sucker	U	U	0.24	U	U	U	0.37	U	U	U	0.63	d
C. Sucker	U	U	U	U	U	U	0.20	U	U	U	0.54	d
Mean			0.18				0.26				0.50	
(std dev)			(0.14)				(0.10)				(0.08)*[e]	

Table 6-17. Total Recoverable Trace Element Concentrations (g/g wet weight) in Nongame (Bottom-Feeding) Fish (Muscle Fillet) Collected Upstream and Downstream of Los Alamos National Laboratory in 2001 (Cont.)

Location/Date	Ag	As	Ba	Be	Cd	Cr	Hg	Ni	Pb	Sb	Se	CN
8-14-01												
Catfish	U	U	U	U	U	U	0.20	U	U	U	0.42	d
C. Sucker	U	U	U	U	U	U	0.23	U	U	U	0.47	d
C. Sucker	U	U	0.36	U	U	U	0.25	U	U	U	0.54	d
C. Sucker	U	U	0.27	U	d	U	0.19	U	U	U	0.54	d
C. Sucker	U	0.56	U	U	U	U	0.10	U	U	U	0.55	d
Carp	U	U	U	U	U	U	0.18	U	U	U	0.74	d
Carp	U	U	U	U	U	U	0.36	U	U	U	0.60	d
Carp	U	U	U	U	U	U	0.42	U	U	U	0.53	d
Mean		0.29	0.15				0.24				0.55	
(std dev)		(0.11)	(0.10)				(0.10)				(0.09)*	

[a]U = undetected; an analyte was analyzed but not detected above the reporting limit and was given a value of one-half the concentration (of the reporting limit) when a statistical calculation was needed. (Note: A mean was calculated when at least one number within the respective field was above the reporting limit.)

[b]Reporting Limit.

[c]Regional Statistical Reference Level is the upper-limit background (mean plus two standard deviations) from present data for the game fish. CN is from 1999 data.

[d]Sample lost in analysis or not analyzed or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean.

[e]Means within the same column and date followed by an * were significantly different from Abiquiu (background) using a Student's t-test at the 0.05 probability level.

Table 6-18. Mean (±SD) Total Recoverable Mercury Concentrations (g/g wet weight) in Bottom-Feeding Fish (Muscle) Collected Upstream and Downstream of Los Alamos National Laboratory Before (1991–1999) and after (2000 and 2001) the Cerro Grande Fire[a]

Location/Date	Hg
Upstream (Abiquiu Reservoir)	
1991–1999[b]	0.30 (0.10)
2000[c]	0.10 (0.06)
2001[d]	0.31 (0.05)
Downstream (Cochiti Reservoir)	
1991–1999[b]	0.20 (0.10)
2000[c]	0.17 (0.05)
2001[d]	0.23 (0.04)

[a]Game fish were not collected and analyzed for trace elements before the Cerro Grande fire, so only the bottom-feeders are given.
[b]Data from Fresquez and Gonzales (2000).
[c]Data from Fresquez et al. (2001c) and are the average of all three sampling dates.
[d]Data from Table 6-17 and are the average of all three sampling dates.

Table 6-19. Radionuclide Concentrations in Muscle and Bone Tissues of Elk Collected from On-Site, Perimeter, and Regional Areas during 1999 and 2000

Tissue/Location Sample	^{3}H (pCi/mL)[a]	^{tot}U (ng/g dry)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Muscle:							
LANL Elk[b]							
TA-53	0.81 (0.27)[c]	[h]	8.4 (12.8)	0.88 (1.32)	–16.3 (22.0)[d]	3.52 (12.8)	8.8 (17.6)
TA-18	0.29 (0.24)	0.53 (0.75)	3.5 (12.8)	2.20 (1.76)	3.1 (11.0)	0.00 (11.0)	20.2 (21.6)
San Ildefonso Pueblo Elk[e]							
	0.74 (0.26)	1.32 (0.88)	4.0 (14.1)	2.64 (1.32)	–3.1 (13.2)	18.92 (16.7)	5.3 (20.3)
Jemez Pueblo Elk[f]							
	–0.02 (0.23)	1.28 (0.97)	–22.0 (48.4)	[h]	–11.4 (16.7)	–2.64 (16.7)	–11.9 (31.7)
Regional Background Elk							
Mean (std dev)[g]	0.08 (0.25)	0.88 (0.61)	72.9 (107.8)	1.20 (2.05)	3.1 (16.5)	4.02 (13.7)	3.9 (10.2)
RSRL[g]	0.58	2.10	288.5	5.3	36.2	31.4	24.2
Leg Bone:							
LANL Elk[b]							
TA-53	0.95 (0.28)	8.12 (8.12)	0.0 (133.4)	864.2 (156.6)	–156.6 (156.6)	0.00 (150.8)	[h]
TA-18	0.40 (0.25)	8.70 (8.70)	–34.8 (139.2)	1374.6 (249.4)	0.0 (139.2)	0.00 (139.2)	58.0 (203.0)
San Ildefonso Pueblo Elk[e]							
	0.77 (0.27)	4.12 (5.63)	–58.0 (179.8)	1270.2 (232.0)	46.4 (150.8)	75.40 (133.4)	[h]
Jemez Pueblo Elk[f]							
	0.44 (0.71)	8.12 (6.96)	–58.0 (156.6)	922.2 (168.2)	–11.6 (150.8)	–29.00 (150.8)	[h]
Regional Background Elk							
Mean (std dev)[g]	0.08 (0.30)	3.02 (2.75)	30.5 (80.2)	1253.4 (827.9)	10.6 (44.9)	–9.83 (11.9)	41.0 (5.3)
RSRL[g]	0.68	8.52	190.8	2909.4	100.4	14.0	51.6

Table 6-19. Radionuclide Concentrations in Muscle and Bone Tissues of Elk Collected from On-Site, Perimeter, and Regional Areas during 1999 and 2000 (Cont.)

[a]pCi/mL of tissue moisture.
[b]Harvested on LANL lands on December 17, 1999, and November 19, 1999, respectively.
[c](± counting uncertainty); values are the uncertainty of the analytical results at 65% confidence level.
[d]See Appendix B for an explanation of the presence of negative values.
[e]This cow elk was radiocollared by LANL on March 31, 1999 (#1603503), and spent approximately 90% of the time in TAs-03 and -53 (James Biggs, personnel communication, 2001). She was harvested on San Ildefonso lands near Mortandad Canyon on January 29, 2000.
[f]Harvested on Jemez Pueblo lands on February 23, 2000.
[g]The mean (std dev) and the Regional Statistical Reference Level (mean + 2 std dev) are based on data collected from 1991 to 2000 (n=9).
[h]Sample lost in analysis or not analyzed, or outlier omitted. An outlier was omitted when the result was greater than three standard deviations of the mean (99% confidence level).

Table 6-20. Radionuclide Concentrations in Muscle and Bone Tissues of Deer Collected from On-Site, Perimeter, and Regional Areas during 2000

Tissue/Location Sample	^{3}H (pCi/mL)[a]	^{tot}U (ng/g dry)	^{137}Cs (10^{-3} pCi/g dry)	^{90}Sr (10^{-3} pCi/g dry)	^{238}Pu (10^{-5} pCi/g dry)	^{239}Pu (10^{-5} pCi/g dry)	^{241}Am (10^{-5} pCi/g dry)
Muscle:							
LANL Deer (none collected during 2000)							
San Ildefonso Deer[b]	0.36 (0.44)[c]	0.99 (0.90)	–1.4 (11.7)	4.15 (1.80)	1.35 (13.05)	–0.09 (13.05)	4.5 (17.1)
Tesuque Deer[d]	–0.05 (0.22)[e]	0.09[e] (0.77)	18.9 (16.7)	0.90 (1.35)	1.80 (16.65)	–2.70 (15.75)	3.2 (25.2)
Regional Background Deer							
Mean (std dev)[f]	0.09 (0.20)	0.86 (0.64)	13.7 (6.9)	20.47 (23.91)	2.33 (7.67)	4.97 (8.31)	–4.1 (22.7)
RSRL[f]	0.49	2.14	27.5	68.30	17.67	21.59	41.2
Leg Bone:							
LANL Deer (none collected during 2000)							
San Ildefonso Deer[b]	0.07 (0.22)	0.11 (0.33)	–17.6 (110.0)	831.6 (154.0)	–0.90 (12.60)	1.35 (12.60)	4.5 (16.2)
Tesuque Deer[d]	–0.09 (0.22)	0.41 (0.45)	17.6 (110.0)	585.2 (105.6)	–5.85 (11.25)	4.50 (11.25)	12.6 (18.5)
Regional Background Deer							
Mean (std dev)[f]	0.01 (0.20)	1.30 (1.80)	10.5 (18.8)	959.0 (335.1)	–11.73 (14.96)	10.06 (19.1)	38.2 (35.7)
RSRL[f]	0.41	4.90	48.1	1629.2	18.19	48.18	109.6

[a]pCi/mL of tissue moisture.
[b]A roadkill buck deer collected on October 4, 2000.
[c](±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[d]A roadkill doe collected on August 4, 2000.
[e]See Appendix B for an explanation of the presence of negative values.
[f]The mean (std dev) and the Regional Statistical Reference Level (mean + 2 std dev) are based on data collected from 1991 to 2000 (n=5).

Table 6-21. Radionuclide Concentrations in Prickly Pear (Fruit) Collected from Regional and Perimeter Areas during the 2001 Growing Season

Location	^{3}H (pCi/mL)		^{tot}U (ng/g dry)		^{137}Cs (10^{-3}pCi/g dry)		^{90}Sr (10^{-3}pCi/g dry)		^{238}Pu (10^{-5}pCi/g dry)		^{239}Pu (10^{-5}pCi/g dry)		^{241}Am (10^{-5}pCi/g dry)	
Regional Background:														
Española/Santa Fe/ Jemez	0.23	(0.16)[a]	1.4	(0.81)	–32.3	(23.8)[b]	212.8	(19.5)	8.6	(10.5)	18.1	(10.9)	13.3	(12.4)
RSRL[c]	0.54		26.6		75.5		112.4		46.8		67.6		113.8	
RSRL[d]	0.52		11.7		11.2		1,253.1		19.5		39.0		24.0	
Off-Site Perimeter:														
San Ildefonso	0.99	(0.18)	9.50	(1.52)	–6.7	(19.5)	552.5	(47.0)	1.90	(11.9)	14.3	(8.1)	–1.9	(10.0)
Los Alamos Town Site	1.00	(0.18)	9.21	(1.62)	36.1	(24.2)	523.5	(47.5)	–6.7	(4.8)	5.7	(7.1)	37.1	(13.3)

Table 6-21. Radionuclide Concentrations in Prickly Pear (Fruit) Collected from Regional and Perimeter Areas during the 2001 Growing Season (Cont.)

Location	^{234}U (10^{-3}pCi/g dry)	^{235}U (10^{-4}pCi/g dry)	^{238}U (10^{-4}pCi/g dry)
Regional Background:			
Española/Santa Fe/ Jemez	0.89 (0.32)	0.48 (2.33)	0.48 (0.23)
RSRL[c]	6.5	2.6	5.6
RSRL[d]	1.5	5.1	1.0
Off-Site Perimeter:			
San Ildefonso	1.90 (0.37)	2.38 (1.47)	3.14 (0.48)
Los Alamos Town Site	2.95 (0.48)	2.00 (1.81)	3.04 (0.52)

[a](±1 counting uncertainty); values are the uncertainty of the analytical results at the 65% confidence level.
[b]See Appendix B for an explanation of the presence of negative values.
[c]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on produce data from 1994 to 2001 (Table 6-12).
[d]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on prickly pear data in 1999 and 2001.

Table 6-22. Total Recoverable Trace Element Concentrations (g/g dry) in Prickly Pear (Fruit) Collected from Regional and Perimeter Areas during the 2001 Growing Season[a]

Location	Ag	As	Ba	Be	Cd	Cu	Hg	Ni	Pb	Sb	Se	Tl	Zn
Regional Background:													
Española/Santa Fe/Jemez	U[b]	U	130.0	U	U	U	U	1.2	1.7	U	0.43	U	11
RL[c]	<0.50	<0.50	<0.20	<0.20	<0.25	<0.50	<0.05	<1.0	<0.15	<0.40	<0.25	<0.40	<1
RSRL[d]	0.96	0.52	26.5	0.40	0.60	1.56	0.05	19.5	14.3	0.60	0.70	0.28	28
RSRL[e]	<0.50	<0.50	227.8	<0.20	<0.25	<0.50	<0.05	108.0	101.8	0.60	0.70	<0.40	11
Off-Site Perimeter:													
San Ildefonso	U	U	63.0	U	0.26	U	U	2.3	7.7	U	1.1	U	25
Los Alamos	U	U	140.0	U	0.45	U	U	4.2	3.6	U	1.3	U	27

[a]Analysis by EPA Method 3051 for total recoverable metals.

[b]U = undetected; an analyte was analyzed but not detected above the reporting limit and was given a value of one-half the concentration (of the reporting limit) when a statistical calculation was needed (e.g., RSRL).

[c]Reporting Limit.

[d]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on produce data from 1994 to 2001 (Table 6-11).

[e]Regional Statistical Reference Level; this is the upper-limit background concentration (mean + 2 std dev) based on prickly pear data from 1999 and 2001.

Table 6-23. Whole-Body Concentrations (g/g fresh wt.) of PCBs and TEQs for Catfish Collected from Cochiti and Abiquiu Reservoirs

IUPAC No.:	#77		#81		#105		#114		#118		#123		#126	
Compound:	3,3',4,4'-TeCB		3,4,4',5-TeCB		2,3,3',4,4'-PeCB		2,3,4,4',5-PeCB		2,3',4,4',5-PeCB		2',3,4,4',5-PeCB		3,3',4,4',5-PeCB	
Sample ID	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**
Abiquiu Reservoir														
June														
6ARCAT1	9.36E-07	9.36E-11	5.38E-07	5.38E-11	5.35E-05	5.35E-09	4.20E-06	2.10E-09	1.48E-04	1.48E-08	3.38E-06	3.38E-10	3.36E-06	3.36E-07
6ARCAT2	[R]7.15E-07	7.15E-11	[R]7.79E-07	7.79E-11	1.39E-04	1.39E-08	1.04E-05	5.20E-09	3.72E-04	3.72E-08	7.52E-06	7.52E-10	5.20E-06	5.20E-07
6ARCAT3	9.81E-07	9.81E-11	[U]2.67E-07	2.67E-11	4.54E-05	4.54E-09	3.40E-06	1.70E-09	1.28E-04	1.28E-08	2.58E-06	2.58E-10	2.91E-06	2.91E-07
6ARCAT4	[R]7.21E-07	7.21E-11	[U]3.98E-07	3.98E-11	5.47E-05	5.47E-09	[R]3.91E-06	1.96E-09	1.61E-04	1.61E-08	3.51E-06	3.51E-10	[R]2.94E-06	2.94E-07
6ARCAT5	[R]1.04E-06	1.04E-10	[U]1.83E-07	1.83E-11	4.91E-05	4.91E-09	3.81E-06	1.91E-09	1.39E-04	1.39E-08	3.12E-06	3.12E-10	[R]3.10E-06	3.10E-07
Mean	8.79E-07	8.79E-11	4.33E-07	4.33E-11	6.83E-05	6.83E-09	5.14E-06	2.57E-09	1.90E-04	1.90E-08	4.02E-06	4.02E-10	3.50E-06	3.50E-07
Std Deviation	1.51E-07	1.51E-11	2.36E-07	2.36E-11	3.97E-05	3.97E-09	2.95E-06	1.48E-09	1.03E-04	1.03E-08	1.99E-06	1.99E-10	9.66E-07	9.66E-08
Cochiti Reservoir														
April														
4CRCAT1	2.12E-04	2.12E-08	[U]7.78E-07	7.78E-11	6.58E-04	6.58E-08	3.89E-05	1.95E-08	1.77E-03	1.77E-07	4.34E-05	4.34E-09	1.06E-05	1.06E-06
4CRCAT2	7.61E-06	7.61E-10	[U]1.74E-06	1.74E-10	1.10E-03	1.10E-07	7.28E-05	3.64E-08	3.30E-03	3.30E-07	7.43E-05	7.43E-09	1.33E-05	1.33E-06
4CRCAT3	8.89E-06	8.89E-10	[U]1.60E-06	1.60E-10	[D]5.65E-03	5.65E-07	4.18E-04	2.09E-07	[D]1.57E-02	1.57E-06	2.74E-04	2.74E-08	2.18E-05	2.18E-06
Mean	7.62E-05	7.62E-09	1.37E-06	1.37E-10	2.47E-03	2.47E-07	1.77E-04	8.83E-08	6.92E-03	6.92E-07	1.31E-04	1.31E-08	1.52E-05	1.52E-06
Std Deviation	1.18E-04	1.18E-08	5.20E-07	5.20E-11	2.76E-03	2.76E-07	2.10E-04	1.05E-07	7.64E-03	7.64E-07	1.25E-04	1.25E-08	5.85E-06	5.84E-07
August														
8CRCAT1*	3.64E-05	3.64E-09	2.99E-06	2.99E-10	5.17E-04	5.17E-08	3.30E-05	1.65E-08	1.68E-03	1.68E-07	4.80E-05	4.80E-09	1.06E-05	1.06E-06
8CRCAT2*	6.07E-06	6.07E-10	1.53E-06	1.42E-10	3.93E-04	3.93E-08	2.35E-05	1.17E-08	1.26E-03	1.26E-07	3.23E-05	3.23E-09	7.50E-06	7.50E-07
8CRCAT3*	5.24E-06	5.24E-10	2.53E-06	2.53E-10	5.00E-04	5.00E-08	3.07E-05	1.53E-08	1.77E-03	1.77E-07	4.53E-05	4.53E-09	1.08E-05	1.07E-06
8CRCAT4*	1.15E-05	1.15E-09	1.04E-06	1.33E-11	5.87E-04	5.87E-08	3.69E-05	1.85E-08	1.76E-03	1.76E-07	4.06E-05	4.06E-09	8.94E-06	8.94E-07
8CRCAT5*	6.17E-06	6.17E-10	[U]6.54E-07	6.54E-11	7.34E-04	7.34E-08	4.50E-05	2.25E-08	2.54E-03	2.54E-07	5.97E-05	5.97E-09	1.33E-05	1.33E-06
Mean	1.31E-05	1.31E-09	1.75E-06	1.54E-10	5.46E-04	5.46E-08	3.38E-05	1.69E-08	1.80E-03	1.80E-07	4.52E-05	4.52E-09	1.02E-05	1.02E-06
Std Deviation	1.33E-05	1.33E-09	9.85E-07	1.21E-10	1.26E-04	1.26E-08	7.95E-06	3.98E-09	4.64E-04	4.64E-08	1.00E-05	1.00E-09	2.16E-06	2.16E-07

Table 6-23. Whole-Body Concentrations (g/g fresh wt.) of PCBs and TEQs for Catfish Collected from Cochiti and Abiquiu Reservoirs (Cont.)

IUPAC No.:	#156		#167		#169		#170		#180		#189			
Compound:	2,3,3',4,4',5-HxCB		2,3',4,4',5,5'-HxCB		3,3',4,4',5,5'-HxCB		2,2',3,3',4,4',5-HpCB		2,2',3,4,4',5,5'-HpCB		2,3,3',4,4',5,5'-HpCB			
Sample ID	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Total Conc.	Total TEQ
Abiquiu Reservoir														
June														
6ARCAT1	2.65E-05	1.33E-08	1.59E-05	1.59E-10	6.12E-06	6.12E-08	7.91E-05	7.91E-09	2.64E-04	2.64E-09	3.13E-06	3.13E-10	6.09E-04	4.44E-07
6ARCAT2	6.72E-05	3.36E-08	3.69E-05	3.69E-10	9.33E-06	9.33E-08	2.22E-04	2.22E-08	6.62E-04	6.62E-09	7.63E-06	7.63E-10	1.54E-03	7.34E-07
6ARCAT3	2.28E-05	1.14E-08	1.38E-05	1.38E-10	5.61E-06	5.61E-08	7.27E-05	7.27E-09	2.35E-04	2.35E-09	2.71E-06	2.71E-10	5.36E-04	3.88E-07
6ARCAT4	2.60E-05	1.30E-08	1.59E-05	1.59E-10	[U]1.47E-05	1.47E-07	7.96E-05	7.96E-09	2.70E-04	2.70E-09	2.82E-06	2.82E-10	6.36E-04	4.89E-07
6ARCAT5	2.56E-05	1.28E-08	1.52E-05	1.52E-10	4.89E-06	4.89E-08	8.54E-05	8.54E-09	2.73E-04	2.73E-09	3.09E-06	3.09E-10	6.07E-04	4.05E-07
Mean	3.36E-05	1.68E-08	1.95E-05	1.95E-10	8.13E-06	8.13E-08	1.08E-04	1.08E-08	3.41E-04	3.41E-09	3.88E-06	3.88E-10	7.86E-04	4.92E-07
Std Deviation	1.88E-05	9.41E-09	9.74E-06	9.74E-11	4.05E-06	4.05E-08	6.40E-05	6.40E-09	1.80E-04	1.80E-09	2.11E-06	2.11E-10	4.24E-04	1.41E-07
Cochiti Reservoir														
April														
4CRCAT1	2.43E-04	1.22E-07	1.38E-04	1.38E-09	[U]2.50E-06	2.50E-08	3.13E-04	3.13E-08	9.85E-04	9.85E-09	1.18E-05	1.18E-09	4.43E-03	1.54E-06
4CRCAT2	5.00E-04	2.50E-07	2.82E-04	2.82E-09	[U]9.00E-06	9.00E-08	6.93E-04	6.93E-08	2.10E-03	2.10E-08	2.40E-05	2.40E-09	8.18E-03	2.25E-06
4CRCAT3	2.82E-03	1.41E-06	9.68E-04	9.68E-09	[U]7.12E-06	7.12E-08	2.02E-03	2.02E-07	3.63E-03	3.63E-08	8.17E-05	8.17E-09	3.16E-02	6.29E-06
Mean	1.19E-03	5.94E-07	4.63E-04	4.63E-09	6.21E-06	6.21E-08	1.01E-03	1.01E-07	2.24E-03	2.24E-08	3.92E-05	3.92E-09	1.47E-02	3.36E-06
Std Deviation	1.42E-03	7.10E-07	4.44E-04	4.44E-09	3.35E-06	3.34E-08	8.96E-04	8.96E-08	1.33E-03	1.33E-08	3.73E-05	3.73E-09	1.47E-02	2.56E-06
August														
8CRCAT1*	2.03E-04	1.01E-07	1.44E-04	1.44E-09	[U]2.25E-06	2.25E-08	2.81E-04	2.81E-08	9.50E-04	9.50E-09	9.91E-06	9.91E-10	3.92E-03	1.47E-06
8CRCAT2*	1.46E-04	7.30E-08	1.13E-04	1.13E-09	[U]2.60E-06	2.60E-08	2.29E-04	2.29E-08	7.86E-04	7.86E-09	7.98E-06	7.98E-10	3.01E-03	1.06E-06
8CRCAT3*	2.03E-04	1.02E-07	1.76E-04	1.76E-09	[U]4.59E-06	4.59E-08	2.85E-04	2.85E-08	1.10E-03	1.10E-08	1.06E-05	1.06E-09	4.15E-03	1.51E-06
8CRCAT4*	2.37E-04	1.19E-07	1.35E-04	1.35E-09	[U]2.31E-06	2.31E-08	2.86E-04	2.86E-08	9.01E-04	9.01E-09	1.07E-05	1.07E-09	4.01E-03	1.33E-06
8CRCAT5*	3.37E-04	1.69E-07	2.64E-04	2.64E-09	[U]2.95E-06	2.95E-08	3.51E-04	3.51E-08	1.48E-03	1.48E-08	1.44E-05	1.44E-09	5.84E-03	1.93E-06
Mean	2.25E-04	1.13E-07	1.66E-04	1.66E-09	2.94E-06	2.94E-08	2.86E-04	2.86E-08	1.04E-03	1.04E-08	1.07E-05	1.07E-09	4.19E-03	1.46E-06
Std Deviation	7.05E-05	3.53E-08	5.91E-05	5.91E-10	9.62E-07	9.62E-09	4.30E-05	4.30E-09	2.67E-04	2.67E-09	2.33E-06	2.33E-10	1.03E-03	3.17E-07

* Whole-body concentrations are based on weight ratio of carcass, filet, and viscera times their respective concentrations.

[D] Indicates a value that resulted from the analysis of a diluted sample after the original concentration exceeded the calibrated linear range.

[R] Indicates that a peak was detected but did not meet quantification criteria; therefore, an estimated value was used.

[U] Indicates a concentration that was far enough below the detection limit that an estimate of concentration could not be made, thereby yielding a result of "nondetect." If the analyte was detected or quantified in other samples of the group of samples, the detection limit was entered as a conservative value.

Table 6-24. Whole-Body Concentration (g/g wet weight) of PCDD/PCDF and TEQs[A] in Catfish From Cochiti and Abiquiu Reservoirs

Compound: Sample ID	2,3,7,8-TCDD	1,2,3,7,8-PeCDD[4]		1,2,3,4,7,8-HxCDD		1,2,3,6,7,8-HxCDD		1,2,3,7,8,9-HxCDD		1,2,3,4,6,7,8-HpCDD		OCDD	
		Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ	Conc.	TEQ
Abiquiu Reservoir													
June													
6ARCAT1	U	U	0.00E-06	U	0.00E-06	[U]1.00E-07	1.00E-08	U	0.00E-06	1.39E-07	1.39E-09	2.71E-07	2.71E-11
6ARCAT2	U	U	0.00E-06	U	0.00E-06	1.30E-07	1.30E-08	U	0.00E-06	1.79E-07	1.79E-09	2.46E-07	2.46E-11
6ARCAT3	U	U	0.00E-06	U	0.00E-06	[U]1.00E-07	1.00E-08	U	0.00E-06	[U]1.00E-07	1.00E-09	2.20E-07	2.20E-11
6ARCAT4	U	U	0.00E-06	U	0.00E-06	3.12E-07	3.12E-08	U	0.00E-06	9.80E-07	9.80E-09	6.37E-06	6.37E-10
6ARCAT5	U	U	0.00E-06	U	0.00E-06	[U]1.00E-07	1.00E-08	U	0.00E-06	[R]2.18E-07	2.18E-09	1.01E-06	1.01E-10
Mean	–	–	0.00E-06	–	0.00E-06	1.48E-07	1.48E-08	–	0.00E-06	3.23E-07	3.23E-09	1.62E-06	1.62E-10
Std Dev	–	–	0.00E-06	–	0.00E-06	9.24E-08	9.24E-09	–	0.00E-06	3.70E-07	3.70E-09	2.67E-06	2.67E-10
Cochiti Reservoir													
April													
4CRCAT1	1.08E-07	1.94E-07	1.94E-07	[R]1.09E-07	1.09E-08	[R]3.57E-07	3.57E-08	[R]1.16E-07	1.16E-08	[R]6.09E-07	6.09E-09	1.34E-06	1.34E-10
4CRCAT2	1.53E-07	3.19E-07	3.19E-07	1.31E-07	1.31E-08	[R]4.79E-07	4.79E-08	1.45E-07	1.45E-08	3.45E-07	3.45E-09	[R]4.73E-07	4.73E-11
4CRCAT3	[R]1.36E-07	[R]1.70E-07	1.70E-07	[U]1.00E-07	1.00E-08	2.57E-07	2.57E-08	[U]1.00E-07	1.00E-08	3.49E-07	3.49E-09	8.11E-07	8.11E-11
Mean	1.32E-07	2.28E-07	2.28E-07	1.13E-07	1.13E-08	3.64E-07	3.64E-08	1.20E-07	1.20E-08	4.34E-07	4.34E-09	8.75E-07	8.75E-11
Std Dev	2.27E-08	8.00E-08	8.00E-08	1.59E-08	1.59E-09	1.11E-07	1.11E-08	2.28E-08	2.28E-09	1.51E-07	1.51E-09	4.37E-07	4.37E-11
August													
8CRCAT1*	1.04E-07	1.52E-07	1.52E-07	1.01E-07	1.01E-08	2.43E-07	2.43E-08	1.01E-07	1.01E-08	3.28E-07	3.28E-09	6.74E-07	6.74E-11
8CRCAT2*	1.09E-07	1.17E-07	1.17E-07	[U]1.00E-07	1.00E-08	1.43E-07	1.43E-08	[U]1.00E-07	1.00E-08	2.12E-07	2.12E-09	4.69E-07	4.69E-11
8CRCAT3*	[U]1.00E-07	2.01E-07	2.01E-07	1.00E-07	1.00E-08	2.47E-07	2.47E-08	[U]1.00E-07	1.00E-08	3.14E-07	3.14E-09	3.87E-07	3.87E-11
8CRCAT4*	[U]1.00E-07	1.12E-07	1.12E-07	[U]1.00E-07	1.00E-08	1.31E-07	1.31E-08	[U]1.00E-07	1.00E-08	2.18E-07	2.18E-09	2.99E-07	2.99E-11
8CRCAT5*	[U]1.00E-07	1.38E-07	1.38E-07	[U]1.00E-07	1.00E-08	1.72E-07	1.72E-08	[U]1.00E-07	1.00E-08	1.94E-07	1.94E-09	2.95E-07	2.95E-11
Mean	1.03E-07	1.44E-07	1.44E-07	1.00E-07	1.00E-08	1.87E-07	1.87E-08	1.00E-07	1.00E-08	2.53E-07	2.53E-09	4.25E-07	4.25E-11
Std Dev	4.13E-09	3.57E-08	3.57E-08	4.51E-10	4.51E-11	5.50E-08	5.50E-09	5.54E-10	5.54E-11	6.29E-08	6.29E-10	1.57E-07	1.57E-11
Mean April + Aug.	1.14E-07												

Table 6-24. Whole-Body Concentration (g/g wet weight) of PCDD/PCDF and TEQs[A] in Catfish From Cochiti and Abiquiu Reservoirs (Cont.)

Compound:	2,3,7,8-TCDF		2,3,7,8-TCDF		1,2,3,7,8-PeCDF		2,3,4,7,8-PeCDF		1,2,3,4,7,8-HxCDF		1,2,3,6,7,8-HxCDF		1,2,3,7,8,9-HxCDF	
Sample ID	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**
Abiquiu Reservoir														
June														
6ARCAT1	1.15E-07	1.15E-08	[U]1.00E-07	1.00E-08	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06
6ARCAT2	[U]1.00E-07	1.00E-08		0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06
6ARCAT3	1.25E-07	1.25E-08	[U]1.00E-07	1.00E-08	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06
6ARCAT4	[U]1.00E-07	1.00E-08		0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06
6ARCAT5	[U]1.00E-07	1.00E-08		0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06	U	0.00E-06
Mean	1.08E-07	1.08E-08	4.00E-08	4.00E-09	–	0.00E-06	–	0.00E-06	–	0.00E-06	–	0.00E-06	–	0.00E-06
Std Dev	1.15E-08	1.15E-09	0.00E-06	5.48E-09	–	0.00E-06	–	0.00E-06	–	0.00E-06	–	0.00E-06	–	0.00E-06
Cochiti Reservoir														
April														
4CRCAT1	2.12E-07	2.12E-08	1.93E-07	1.93E-08	U	0.00E-06	1.44E-07	7.20E-08	U	0.00E-06	U	0.00E-06	U	0.00E-06
4CRCAT2	[R]1.26E-07	1.26E-08	1.68E-07	1.68E-08	U	0.00E-06	[R]2.42E-07	1.21E-07	U	0.00E-06	U	0.00E-06	U	0.00E-06
4CRCAT3	2.46E-07	2.46E-08	2.57E-07	2.57E-08	U	0.00E-06	1.88E-07	9.40E-08	U	0.00E-06	U	0.00E-06	U	0.00E-06
Mean	1.95E-07	1.95E-08	2.06E-07	2.06E-08	–	0.00E-06	1.91E-07	9.57E-08	–	0.00E-06	–	0.00E-06	–	0.00E-06
Std Dev	6.18E-08	6.18E-09	4.59E-08	4.59E-09	–	0.00E-06	4.91E-08	2.45E-08	–	0.00E-06	–	0.00E-06	–	0.00E-06
August														
8CRCAT1*	3.77E-07	3.77E-08	3.57E-07	3.57E-08	1.02E-07	5.09E-09	1.73E-07	8.63E-08	U	0.00E-06	U	0.00E-06	U	0.00E-06
8CRCAT2*	2.59E-07	2.59E-08	2.64E-07	2.64E-08	1.03E-07	5.14E-09	1.95E-07	9.76E-08	U	0.00E-06	U	0.00E-06	U	0.00E-06
8CRCAT3*	1.45E-07	1.45E-08	1.36E-07	1.36E-08	1.01E-07	5.05E-09	2.13E-07	1.06E-07	U	0.00E-06	U	0.00E-06	U	0.00E-06
8CRCAT4*	3.34E-07	3.34E-08	3.10E-07	3.10E-08	[U]1.00E-07	5.00E-09	1.23E-07	6.16E-08	U	0.00E-06	U	0.00E-06	U	0.00E-06
8CRCAT5*	2.53E-07	2.53E-08	2.35E-07	2.35E-08	[U]1.00E-07	5.00E-09	1.57E-07	7.87E-08	U	0.00E-06	U	0.00E-06	U	0.00E-06
Mean	2.74E-07	2.74E-08	2.60E-07	2.60E-08	1.01E-07	5.05E-09	1.72E-07	8.61E-08	–	0.00E-06	–	0.00E-06	–	0.00E-06
Std Dev	8.87E-08	8.87E-09	8.37E-08	8.37E-09	1.18E-09	5.91E-11	3.46E-08	1.73E-08	–	0.00E-06	–	0.00E-06	–	0.00E-06

Table 6-24. Whole-Body Concentration (g/g wet weight) of PCDD/PCDF and TEQs[A] in Catfish From Cochiti and Abiquiu Reservoirs (Cont.)

Compound:	2,3,4,6,7,8-HxCDF		1,2,3,4,6,7,8-HpCDF		1,2,3,4,7,8,9-HpCDF		OCDF		Total Tetra-Dioxins[b]		Total Penta-Dioxins[b]	
Sample ID	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**
Abiquiu Reservoir												
June												
6ARCAT1	U	0.00E-06	[R]1.04E-07	1.04E-09	U	0.00E-06	1.11E-07	1.11E-11	U	0.00E-06	U	0.00E-06
6ARCAT2	U	0.00E-06	[U]1.00E-07	1.00E-09	U	0.00E-06	1.23E-07	1.23E-11	U	0.00E-06	U	0.00E-06
6ARCAT3	U	0.00E-06	[U]1.00E-07	1.00E-09	U	0.00E-06	[R]1.03E-07	1.03E-11	U	0.00E-06	U	0.00E-06
6ARCAT4	U	0.00E-06	[R]1.20E-07	1.20E-09	U	0.00E-06	1.16E-07	1.16E-11	U	0.00E-06	U	0.00E-06
6ARCAT5	U	0.00E-06	[U]1.00E-07	1.00E-09	U	0.00E-06	[U]1.00E-07	1.00E-11	U	0.00E-06	U	0.00E-06
Mean	–	0.00E-06	1.05E-07	1.05E-09	–	0.00E-06	1.11E-07	1.11E-11	–	0.00E-06	–	0.00E-06
Std Dev	–	0.00E-06	8.67E-09	8.67E-11	–	0.00E-06	9.40E-09	9.40E-13	–	0.00E-06	–	0.00E-06
Cochiti Reservoir												
April												
4CRCAT1	U	0.00E-06	[R]3.29E-07	3.29E-09	U	0.00E-06	1.97E-07	1.97E-11	1.08E-07	1.08E-07	1.94E-07	9.70E-08
4CRCAT2	U	0.00E-06	[R]6.56E-07	6.56E-09	U	0.00E-06	[U]1.00E-07	1.00E-11	1.53E-07	1.53E-07	3.19E-07	1.60E-07
4CRCAT3	U	0.00E-06	[R]4.85E-07	4.85E-09	U	0.00E-06	1.21E-07	1.21E-11	[U]1.00E-07	1.00E-07	[U]1.00E-07	5.00E-08
Mean	–	0.00E-06	4.90E-07	4.90E-09	–	0.00E-06	1.39E-07	1.39E-11	1.20E-07	1.20E-07	2.04E-07	1.02E-07
Std Dev	–	0.00E-06	1.64E-07	1.64E-09	–	0.00E-06	5.10E-08	5.10E-12	2.86E-08	2.86E-08	1.10E-07	5.49E-08
August												
8CRCAT1*	U	0.00E-06	[R]4.03E-07	4.03E-09	U	0.00E-06	1.01E-07	1.01E-11	1.78E-07	1.78E-07	1.52E-07	7.62E-08
8CRCAT2*	U	0.00E-06	[R]3.38E-07	3.38E-09	U	0.00E-06	1.05E-07	1.05E-11	1.73E-07	1.73E-07	1.15E-07	5.75E-08
8CRCAT3*	U	0.00E-06	1.03E-07	1.03E-09	U	0.00E-06	[U]1.00E-07	1.00E-11	[U]1.00E-07	1.00E-07	1.21E-07	6.06E-08
8CRCAT4*	U	0.00E-06	1.03E-07	1.03E-09	U	0.00E-06	[U]1.00E-07	1.00E-11	[U]1.00E-07	1.00E-07	1.15E-07	5.77E-08
8CRCAT5*	U	0.00E-06	[U]1.00E-07	1.00E-09	U	0.00E-06	[U]1.00E-07	1.00E-11	[U]1.00E-07	1.00E-07	1.37E-07	6.84E-08
Mean	–	0.00E-06	2.10E-07	2.10E-09	–	0.00E-06	1.01E-07	1.01E-11	1.30E-07	1.30E-07	1.28E-07	6.41E-08
Std Dev	–	0.00E-06	1.49E-07	1.49E-09	–	0.00E-06	2.29E-09	2.29E-13	4.14E-08	4.14E-08	1.62E-08	8.08E-09

Table 6-24. Whole-Body Concentration (g/g wet weight) of PCDD/PCDF and TEQs[A] in Catfish From Cochiti and Abiquiu Reservoirs (Cont.)

Compound:	Total Hexa-Dioxins		Total Hepta-Dioxins		Total Tetra-Furans		Total Penta-Furans		Total Hexa-Furans		Total Hepta-Furans		Total Dioxin/Furan	
Sample ID	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**	**Conc.**	**TEQ**
Abiquiu Reservoir														
June														
6ARCAT1	[U]1.00E-07	1.00E-08	1.39E-07	1.39E-09	1.15E-07	1.15E-08	U	0.00E-06	[U]1.00E-07	1.00E-08	U	0.00E-06	1.39E-12	6.72E-14
6ARCAT2	1.30E-07	1.30E-08	1.79E-07	1.79E-09	[U]1.00E-07	1.00E-08	U	0.00E-06	[U]1.00E-07	1.00E-08	U	0.00E-06	1.39E-12	6.09E-14
6ARCAT3	[U]1.00E-07	1.00E-08	[U]1.00E-07	1.00E-09	1.25E-07	1.25E-08	U	0.00E-06	[U]1.00E-07	1.00E-08	U	0.00E-06	1.27E-12	6.83E-14
6ARCAT4	3.12E-07	3.12E-08	1.20E-06	1.20E-08	[U]1.00E-07	1.00E-08	U	0.00E-06	1.22E-07	1.22E-08	U	0.00E-06	9.73E-12	1.24E-13
6ARCAT5	[U]1.00E-07	1.00E-08	1.63E-07	1.63E-09	[U]1.00E-07	1.00E-08	U	0.00E-06	[U]1.00E-07	1.00E-08	U	0.00E-06	2.09E-12	5.59E-14
Mean	1.48E-07	1.48E-08	3.56E-07	3.56E-09	1.08E-07	1.08E-08	–	0.00E-06	1.04E-07	1.04E-08	–	0.00E-06	3.18E-12	7.53E-14
Std Dev	9.24E-08	9.24E-09	4.73E-07	4.73E-09	1.15E-08	1.15E-09	–	0.00E-06	9.84E-09	9.84E-10	–	0.00E-06	3.68E-12	2.77E-14
Cochiti Reservoir														
April														
4CRCAT1	[U]1.00E-07	1.00E-08	2.51E-07	2.51E-09	2.12E-07	2.12E-08	2.44E-07	1.22E-07	[U]1.00E-07	1.00E-08	U	0.00E-06	5.22E-12	7.62E-13
4CRCAT2	2.76E-07	2.76E-08	3.45E-07	3.45E-09	[U]1.00E-07	1.00E-08	3.46E-07	1.73E-07	1.41E-07	1.41E-08	U	0.00E-06	5.12E-12	1.09E-12
4CRCAT3	2.57E-07	2.57E-08	3.49E-07	3.49E-09	4.62E-07	4.62E-08	1.88E-07	9.40E-08	[U]1.00E-07	1.00E-08	U	0.00E-06	4.88E-12	7.55E-13
Mean	2.11E-07	2.11E-08	3.15E-07	3.15E-09	2.58E-07	2.58E-08	2.59E-07	1.30E-07	1.14E-07	1.14E-08	–	0.00E-06	5.07E-12	8.71E-13
Std Dev	9.66E-08	9.66E-09	5.55E-08	5.55E-10	1.85E-07	1.85E-08	8.01E-08	4.01E-08	2.37E-08	2.37E-09	–	0.00E-06	1.75E-13	1.94E-13
August														
8CRCAT1*	6.62E-07	6.62E-08	4.64E-07	4.64E-09	5.30E-07	5.30E-08	3.74E-07	1.87E-07	U	0.00E-06	U	0.00E-06	6.28E-12	1.01E-12
8CRCAT2*	1.43E-07	1.43E-08	1.99E-07	1.99E-09	2.72E-07	2.72E-08	2.31E-07	1.15E-07	U	0.00E-06	U	0.00E-06	4.35E-12	8.04E-13
8CRCAT3*	2.86E-07	2.86E-08	6.06E-07	6.06E-09	1.46E-07	1.46E-08	2.35E-07	1.18E-07	U	0.00E-06	U	0.00E-06	4.44E-12	7.69E-13
8CRCAT4*	1.04E-07	1.04E-08	2.57E-07	2.57E-09	3.34E-07	3.34E-08	1.02E-07	5.09E-08	U	0.00E-06	U	0.00E-06	3.84E-12	6.31E-13
8CRCAT5*	1.74E-07	1.74E-08	5.29E-07	5.29E-09	2.53E-07	2.53E-08	1.57E-07	7.87E-08	U	0.00E-06	U	0.00E-06	4.09E-12	6.89E-13
Mean	2.74E-07	2.74E-08	4.11E-07	4.11E-09	3.07E-07	3.07E-08	2.20E-07	1.10E-07	–	0.00E-06	–	0.00E-06	4.60E-12	7.81E-13
Std Dev	2.28E-07	2.28E-08	1.76E-07	1.76E-09	1.42E-07	1.42E-08	1.02E-07	5.12E-08	–	0.00E-06	–	0.00E-06	9.66E-13	1.47E-13

[A] Indicates Toxicity Equivalence Quotient (TEQ) values as established by the World Health Organization.
[B] Values were based on World Health Organization for other dioxins/furans of similar composition.
* Whole-body concentrations are based on weight ratio of carcass, filet, and viscera times their respective concentrations.
[U] Indicates a concentration that was far enough below the detection limit that an estimate of concentration could not be made, thereby yielding a result of "nondetect." If the analyte was detected or quantified in other samples of the group of samples, the detection limit was entered as a conservative value.
[R] Indicates that a peak was detected but did not meet quantification criteria; therefore, an estimated value was used.

Table 6-25. Concentration (ng/g fresh wt.) of Organochlorine Pesticides in Whole-Body Catfish Collected from Cochiti and Abiquiu Reservoirs

Sample ID	Hexachloro-benzene	Alpha HCH	Beta HCH	Gamma HCH	Heptachlor	Aldrin	Oxychlordane	Trans-Chlordane	cis-Chlordane	Mirex
Abiquiu Reservoir										
June										
6ARCAT1	0.543	0.216	[U]0.105	[R]0.172	[U]0.063	[U]0.529	[U]0.571	0.162	0.554	[R]0.134
6ARCAT2	0.482	0.123	[U]0.120	[R]0.198	[R]0.487	[U]0.573	[U]0.638	0.126	0.440	0.180
6ARCAT3	0.433	[U]0.183	[U]0.212	[R]0.177	[R]1.380	[U]0.810	[R]3.88	0.102	0.356	[U]0.196
6ARCAT4	0.495	[U]0.805	[U]0.933	[R]0.293	[R]0.931	[U]0.981	[U]0.285	0.125	0.425	[R]0.122
6ARCAT5	0.442	0.208	[U]0.115	[R]0.248	[R]0.531	[U]1.18	[U]0.458	0.151	0.491	0.133
Mean	0.479	0.307	0.297	0.218	0.679	0.815	1.17	0.133	0.453	0.153
Std Deviation	0.044	0.281	0.358	0.052	0.498	0.274	1.52	0.024	0.074	0.033
Cochiti Reservoir										
April										
4CRCAT1	0.736	[U]0.076	[U]0.147	0.328	[U]0.080	[U]0.066	[R]0.413	2.12	3.93	0.145
4CRCAT2	0.761	[U]0.093	[U]0.108	[R]0.187	[U]0.117	[U]0.100	0.894	4.11	7.39	[R]0.260
4CRCAT3	0.696	[U]0.144	[U]0.166	[R]0.314	[R]0.147	[U]0.913	[R]0.692	3.76	6.03	0.291
Mean	0.731	0.104	0.140	0.276	0.115	0.359	0.666	3.33	5.78	0.232
Std Deviation	0.033	0.035	0.030	0.078	0.034	0.480	0.242	1.06	1.74	0.077
August										
8CRCAT1*	0.643	[U]0.143	[U]0.165	[U]0.191	0.114	[U]0.425	0.464	2.22	3.39	[R]0.195
8CRCAT2*	0.464	0.116	0.125	0.122	[U]0.050	0.088	[U]0.198	1.45	2.54	0.168
8CRCAT3*	0.485	0.251	[U]0.276	[U]0.371	[U]0.257	0.081	[U]0.452	1.81	3.37	0.168
8CRCAT4*	0.408	[U]0.101	[U]0.112	[U]0.196	0.126	[U]0.081	[U]0.168	1.52	2.65	0.194
8CRCAT5*	0.281	[U]0.109	[U]0.120	[U]0.154	[U]0.096	[U]0.073	0.311	1.33	2.87	0.224
Mean	0.456	0.144	0.160	0.207	0.129	0.149	0.319	1.67	2.96	0.190
Std Deviation	0.131	0.062	0.068	0.097	0.077	0.154	0.138	0.357	0.398	0.023

Table 6-25. Concentration (ng/g fresh wt.) of Organochlorine Pesticides in Whole-Body Catfish Collected from Cochiti and Abiquiu Reservoirs (Cont.)

Sample ID	*o,p′* -DDT	*p,p′* -DDT	Total DDT	*o,p′* -DDD	*p,p′* -DDD	Total DDD	*o,p′* -DDE	*p,p′* -DDE	Total DDE	Total DDT, DDD, and DDE (ppm)
Abiquiu Reservoir										
June										
6ARCAT1	0.11	0.901	1.01	0.052	0.515	0.567	0.138	10.0	10.1	0.012
6ARCAT2	0.10	0.693	0.795	0.043	0.554	0.597	0.093	18.2	18.3	0.020
6ARCAT3	[R]13.5	[NQ]0.719	[NQ]14.2	[U]0.376	[U]0.412	[U]0.788	[R]0.427	9.39	9.82	0.025
6ARCAT4	0.083	0.677	0.760	0.061	0.503	0.564	0.178	8.10	8.28	0.010
6ARCAT5	0.087	0.605	0.692	0.051	0.516	0.567	[R]0.132	8.85	8.98	0.010
Mean	2.78	0.719	3.50	0.117	0.500	0.617	0.194	10.9	11.1	0.015
Std Deviation	6.00	0.110	6.00	0.145	0.053	0.097	0.134	4.14	4.09	0.007
Cochiti Reservoir										
April										
4CRCAT1	0.320	2.53	2.85	0.423	4.84	5.26	0.476	38.5	39.0	0.047
4CRCAT2	0.721	6.04	6.76	0.757	9.04	9.80	1.05	[D]78.1	[D]79.2	0.096
4CRCAT3	[R]0.393	3.57	3.96	0.625	5.49	6.12	0.636	[D]47.5	[D]48.1	0.058
Mean	0.478	4.05	4.53	0.6017	6.46	7.06	0.721	54.7	55.4	0.067
Std Deviation	0.214	1.80	2.02	0.1682	2.26	2.41	0.296	20.8	21.1	0.026
August										
8CRCAT1*	0.706	5.48	6.19	0.965	6.86	7.83	1.10	47.1	48.2	0.062
8CRCAT2*	0.479	3.59	4.07	0.599	4.44	5.04	0.666	36.4	37.1	0.046
8CRCAT3*	0.671	5.23	5.90	0.439	3.86	4.30	0.834	49.6	50.5	0.061
8CRCAT4*	0.689	3.57	4.26	0.479	3.38	3.86	0.442	38.4	38.9	0.047
8CRCAT5*	0.428	4.21	4.63	0.186	3.52	3.71	0.473	47.0	47.5	0.056
Mean	0.594	4.42	5.01	0.534	4.41	4.94	0.703	43.7	44.4	0.054
Std Deviation	0.131	0.901	0.972	0.284	1.43	1.69	0.273	5.89	6.02	0.008

Table 6-25. Concentration (ng/g fresh wt.) of Organochlorine Pesticides in Whole-Body Catfish Collected from Cochiti and Abiquiu Reservoirs (Cont.)

Sample ID	Alpha Endosulphan	Dieldrin	Endrin	Beta Endosulphan	Endosulphan Sulphate	Methoxychlor	Delta HCH	Heptachlor Epoxide	trans-Nonachlor	cis-Nonachlor
Abiquiu Reservoir										
June										
6ARCAT1	0.056	0.123	[U]0.014	[U]0.019	0.220	[U]0.003	[U]0.003	0.039	0.945	0.402
6ARCAT2	[U]0.017	[R]0.087	[R]0.017	[U]0.022	0.135	[U]0.020	[U]0.002	0.029	0.993	0.406
6ARCAT3	0.066	[J]0.121	[U]0.008	[U]0.041	[J]0.142	[U]0.004	[U]0.004	0.019	0.712	0.307
6ARCAT4	0.076	0.116	[U]0.011	[U]0.016	0.179	[U]0.004	[U]0.002	0.043	0.713	0.320
6ARCAT5	[R]0.090	0.112	[U]0.018	[U]0.030	0.199	[U]0.007	[U]0.003	0.041	0.749	0.328
Mean	0.061	0.112	0.014	0.026	0.175	0.008	0.003	0.034	0.822	0.353
Std Deviation	0.028	0.015	0.004	0.010	0.036	0.007	0.001	0.010	0.136	0.048
Cochiti Reservoir										
April										
4CRCAT1	[R]0.099	0.229	[U]0.018	[U]0.018	0.420	[U]0.010	[R]0.005	0.124	3.63	1.31
4CRCAT2	0.090	0.210	[U]0.020	0.072	0.320	[U]0.008	0.003	0.100	5.95	2.15
4CRCAT3	[R]0.129	0.254	[U]0.023	0.055	0.365	[U]0.009	0.005	0.168	4.11	1.46
Mean	0.106	0.231	0.021	0.048	0.368	0.009	0.004	0.131	4.56	1.64
Std Deviation	0.020	0.022	0.003	0.027	0.050	0.001	0.001	0.035	1.23	0.448
August										
8CRCAT1*	0.214	0.322	[U]0.023	0.076	0.873	[U]0.010	[U]0.003	0.125	2.98	1.03
8CRCAT2*	0.124	0.298	0.009	0.029	0.470	[U]0.003	[U]0.004	0.078	2.57	1.05
8CRCAT3*	0.084	[J]0.356	[U]0.010	[U]0.029	[J]0.542	[U]0.006	[U]0.004	0.088	3.14	1.18
8CRCAT4*	0.086	[J]0.331	[U]0.010	[U]0.033	[J]0.589	[U]0.004	[U]0.004	0.080	2.91	1.11
8CRCAT5*	0.058	0.186	[U]0.010	[U]0.036	[J]0.332	[U]0.003	[U]0.004	0.042	3.69	1.45
Mean	0.113	0.299	0.012	0.041	0.561	0.005	0.004	0.082	3.06	1.16
Std Deviation	0.061	0.066	0.006	0.020	0.200	0.003	0.001	0.029	0.412	0.172

* Whole concentration values are based on weight ratio of carcass, filet, and viscera times their respective concentrations.

[D] Indicates a value that resulted from the analysis of a diluted sample after the original concentration exceeded the calibrated linear range.

[R] Indicates that a peak was detected but did not meet quantification criteria; therefore, an estimated value was used.

[U] Indicates a concentration that was far enough below the detection limit that an estimate of concentration could not be made, thereby yielding a result of "nondetect." If the analyte was detected or quantified in other samples of the group of samples, the detection limit was entered as a conservative value.

[NQ] Indicates a concencentration for p,p' DDT could not be quantified. A value consisting of the mean of the other samples was entered to allow for evaluation.

[J] Denotes "J" Lab Flags indicating a concentration between the required detection limit of 0.10 and Axys detection limit of 0.5.

Table 6-26. Radionuclide Concentrations (Total Propagated Analytical Uncertainty, 99% Confidence Level) in Unwashed Vegetation Collected from Area G in 2001[a]

Sample Location and Type[1]	^{3}H (pCi/mL)[b]	^{241}Am (pCi/g ash)	^{137}Cs (pCi/g ash)	^{238}Pu (pCi/g ash)	^{239,240}Pu (pCi/g ash)	^{90}Sr (pCi/g ash)	^{tot}U (g/g ash)
1-OS	481 (91.5)	0.028 (0.014)	–0.14 (0.75)	0.0015 (0.0047)	0.0073 (0.0074)	2.00 (0.56)	0.33 (0.11)
1-US	900 (165)	0.003 (0.008)	–0.16 (0.69)	0.0010 (0.0051)	0.0012 (0.0039)	1.77 (0.48)	0.22 (0.08)
2-OS	256 (48.0)	0.283 (0.075)	–0.39 (0.72)	0.0179 (0.0146)	0.0710 (0.0285)	13.2 (3.60)	0.44 (0.14)
2-US	418 (79.5)	0.003 (0.006)	0.14 (0.78)	0.0000 (0.0023)	0.0038 (0.0051)	1.91 (0.53)	0.14 (0.06)
3-OS	3.71 (0.86)	0.030 (0.018)	–0.04 (0.39)	0.0061 (0.0065)	0.0260 (0.0141)	2.07 (0.57)	0.79 (0.23)
3-US	3.78 (0.87)	0.004 (0.008)	0.42 (0.69)	0.0035 (0.0054)	0.0019 (0.0044)	1.80 (0.50)	0.20 (0.08)
3b-OS	1.75 (0.53)	0.007 (0.006)	–0.01 (0.69)	0.0038 (0.0053)	0.0047 (0.0062)	7.60 (2.10)	0.55 (0.17)
3b-US	1.63 (0.51)	0.002 (0.005)	–0.23 (0.77)	–0.0001 (0.0027)	0.0038 (0.0053)	2.89 (0.78)	0.20 (0.08)
4-OS	2.27 (0.62)	0.019 (0.012)	0.04 (0.36)	–0.0002 (0.0036)	0.0029 (0.0068)	4.16 (1.13)	0.36 (0.11)
4-US	2.06 (0.39)	0.086 (0.029)	–0.19 (0.77)	0.0151 (0.0137)	0.0210 (0.0150)	4.26 (1.16)	0.16 (0.06)
6b-OS	0.77 (0.41)	0.006 (0.008)	–0.13 (0.80)	0.0008 (0.0041)	0.0054 (0.0065)	5.27 (1.43)	0.37 (0.11)
7a-US	8.00 (1.65)	0.006 (0.009)	–0.50 (0.74)	–0.0001 (0.0029)	0.0015 (0.0032)	0.51 (0.14)	0.28 (0.09)
7b-US	7.15 (1.47)	0.004 (0.009)	–0.12 (0.36)	–0.0018 (0.0057)	0.0110 (0.0092)	0.97 (0.27)	0.13 (0.06)
7c-OS	3.64 (0.84)	0.003 (0.006)	0.20 (0.83)	0.0031 (0.0081)	0.0034 (0.0065)	3.40 (0.93)	0.31 (0.09)
7c-US	2.74 (0.69)	0.096 (0.035)	–0.23 (0.77)	0.0620 (0.027)	0.2560 (0.0705)	2.06 (0.56)	0.38 (0.12)
8-OS	0.71 (0.39)	0.000 (0.005)	0.22 (0.78)	0.0043 (0.0080)	0.0010 (0.0048)	3.45 (0.93)	0.30 (0.11)
8-US	0.11 (0.35)	0.001 (0.005)	0.01 (0.38)	–0.0045 (0.0050)	0.0016 (0.0048)	0.96 (0.27)	0.15 (0.06)
BG-OS (9)	0.32 (0.36)	0.044 (0.020)	0.04 (0.59)	0.0105 (0.0087)	0.0610 (0.0225)	9.10 (2.40)	0.49 (0.14)
BG-US (9)	0.23 (0.36)	0.004 (0.005)	0.17 (0.39)	–0.0013 (0.0023)	0.0014 (0.0030)	1.17 (0.32)	0.16 (0.06)
RSRL-OS[c]	1.9	0.017	1.7	0.038	0.075	17.09	1.6
RSRL-US[c]	1.6	0.010	0.94	0.005	0.011	3.8	1.5

[a]See Figure 6-3 for locations of sampling sites.
[b]Concentration for ^{3}H is based on moisture in vegetation.
[c]Regional Statistical Reference Level; this is the upper- (95%) level background concentration (mean + 2 std dev) from 1994–1997.

Table 6-27. Radionuclide Concentrations (Total Propagated Analytical Uncertainty, 99% Confidence Level) in Overstory (OS) and Understory (US) Vegetation Collected Around the DARHT Facility in 2001[a]

	Element Concentration (Ash Weight Basis)						
Sample Location	^{3}H (pCi/mL)	^{90}Sr (pCi/g)	^{tot}U (g/g)	^{137}Cs (pCi/g)	^{238}Pu (pCi/g)	$^{239,240}Pu$ (pCi/g)	^{241}Am (pCi/g)
North							
OS	–0.09 (0.35)	0.40 (0.12)	0.46 (0.15)	0.21 (0.54)	0.004 (0.011)	0.006 (0.011)	–0.006 (0.009)
US	–0.06 (0.35)	0.44 (0.14)	0.49 (0.14)	–0.07 (0.66)	0.002 (0.006)	0.001 (0.003)	0.000 (0.006)
East							
OS	0.22 (0.36)	6.40 (1.80)	6.46 (1.40)	0.22 (0.57)	–0.000 (0.002)	0.001 (0.002)	0.000 (0.024)
US	-0.12 (0.35)	3.95 (1.08)	1.85 (0.42)	0.08 (0.60)	–0.002 (0.005)	0.001 (0.005)	0.001 (0.005)
South							
OS	0.21 (0.36)	4.34 (1.17)	7.39 (1.58)	–0.18 (0.74)	0.001 (0.005)	–0.001 (0.003)	0.009 (0.011)
US	–0.09 (0.35)	1.12 (0.32)	7.45 (1.58)	0.02 (0.84)	–0.001 (0.003)	0.001 (0.005)	0.003 (0.008)
West							
OS	0.07 (0.35)	6.50 (1.80)	0.99 (0.24)	–0.10 (0.30)	0.002 (0.006)	0.002 (0.005)	0.005 (0.009)
US	0.16 (0.35)	0.99 (0.27)	1.01 (0.24)	–0.05 (0.62)	–0.001 (0.003)	0.000 (0.003)	0.001 (0.005)
Mean(SD)							
OS	0.10 (0.15)	4.41 (2.85)	3.83 (3.61)	0.04 (0.21)	0.002 (0.002)	0.002 (0.003)	0.002 (0.006)
US	–0.03 (0.13)	1.63 (1.58)	2.70 (3.22)	–0.01 (0.07)	–0.001 (0.002)	0.001 (0.001)	0.001 (0.001)
RBG[b]							
OS	0.063 (0.64)	2.08 (0.32)	0.373 (0.040)	0.39 (0.59)	0.001 (0.001)	0.002 (0.001)	0.005 (0.002)
US	0.287 (0.66)	2.08 (0.39)	0.240 (0.027)	0.23 (0.47)	0.001 (0.001)	0.003 (0.002)	0.004 (0.002)
BSRL[c]							
OS	1.02	8.03	1.97	1.33	0.028	0.006	0.016
US	0.99	4.75	2.89	0.98	0.004	0.013	0.011

[a] See Figure 6-3 for locations of sample sites.

[b] RBG is the mean regional background concentration for samples from Embudo, Cochiti, and Jemez collected in 1999 (Tables 6-24 and 6-25 in Fresquez and Gonzales 2000).

[c] BSRL is the Baseline Statistical Reference Level (Fresquez et al., 2001b).

Table 6-28. Total Trace Element Concentrations (g/g dry) in Overstory (OS) and Understory (US) Vegetation Collected Around the DARHT Facility in 2001[a]

Location	Ag	As	Ba	Be	Cd	Cr	Cu	Hg	Ni	Pb	Sb	Se	Tl
North													
OS	1.00[b]	0.25[b]	8.80	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.5	0.2[b]	0.2[b]	0.2[b]
US	1.00[b]	0.25[b]	13.0	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.9	0.2[b]	0.2[b]	0.2[b]
East													
OS	1.00[b]	0.25[b]	31.5	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.7	0.2[b]	0.2[b]	0.2[b]
US	1.00[b]	0.25[b]	43.3	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.2[b]	0.2[b]	0.2[b]	0.2[b]
South													
OS	1.00[b]	0.25[b]	25.6	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	1.0	0.2[b]	0.2[b]	0.2[b]
US	1.00[b]	0.25[b]	36.4	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.2[b]	0.2[b]	0.2[b]	0.2[b]
West													
OS	1.00[b]	0.25[b]	17.6	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.5	0.2[b]	0.2[b]	0.2[b]
US	1.00[b]	0.25[b]	19.7	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.5	0.2[b]	0.2[b]	0.2[b]
OS Mean	1.00[b]	0.25[b]	20.87	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.68	0.20[b]	0.20[b]	0.20[b]
(SD)	(0.00)	(0.00)	(9.86)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.24)	(0.00)	(0.00)	(0.00)
US Mean	1.00[b]	0.25[b]	28.1	0.10[b]	0.50[b]	0.50[b]	RR[c]	0.03[b]	1.00[b]	0.45	0.20[b]	0.20[b]	0.20[b]
(SD)	(0.00)	(0.00)	(14.2)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.33)	(0.00)	(0.00)	(0.00)
RBG[d]													
OS	0.13[b]	0.10[b]	32.5	0.06[b]	0.13[b]	0.63	NA[e]	0.05[b]	1.10[b]	0.40	0.20[b]	0.20[b]	0.50[b]
US	0.13[b]	0.10[b]	69.0	0.06[b]	0.25	0.63	4.8	0.05	1.10[b]	0.70	0.20[b]	0.20[b]	0.50[b]
BSRL[f]													
OS	1.03	0.28	67.9	0.13	0.56	1.00	4.60	0.06	4.95	6.10	8.55	0.35	0.27
US	1.11	0.28	82.0	0.12	0.56	0.77	12.4	0.09	5.58	3.19	8.54	0.27	0.27

[a]See Figure 6-3 for locations of sampling sites.
[b]Analysis was below the specific detection limit of the analytical method, so these values are reported as one-half the detection limit.
[c]Analytical results suspected of being incorrect; resampling and reanalysis underway (RR).
[d]Regional background (RBG) overstory and understory vegetation samples collected 1996 (Fresquez et al., 1997c).
[e]No analysis (NA).
[f]BSRL is the Baseline Statistical Reference Level (Fresquez et al., 2001b).

Table 6-29. Radionuclide Analytical Results from Honey Bee Samples Collected from Colonies Near DARHT and a Control Site in 2000

	Units	DARHT Colony 1	Analytical Uncertainty[a]	DARHT Colony 2	Analytical Uncertainty	DARHT Colony 3	Analytical Uncertainty	DARHT Colony 4	Analytical Uncertainty	DARHT Colony 5	Analytical Uncertainty	Control Colony	Analytical Uncertainty	RSRL
^{3}H	pCi/L	180	410	1,530	540	270	420	1,800	560	90	400	–270	360	4763.20[b]
^{137}Cs	pCi/g	–9.32	27.46	0.00	6.61	–5.76	44.29	–1.84	9.85	–1.13	5.31	0.00	13.41	0.38[b]
^{241}Am	pCi/g	0.1520	0.1033	0.0715	0.0507	0.0169	0.0127	–0.0053	0.0079	–0.0078	0.1139	0.0091	0.0049	0.0268[b]
^{7}Be	pCi/g	116	68	0.00	44.33	0.0	124	25.88	19.05	16.73	11.20	–15.9	143.5	29.16[c]
^{214}Bi	pCi/g	20.0	7.1	3.63	1.64	13.32	4.59	2.44	1.77	2.31	1.19	13.50	3.72	17.59[c]
^{57}Co	pCi/g	–2.20	7.42	0.335	0.850	–2.33	18.67	1.88	1.48	2.22	0.85	0.00	11.85	0.86[c]
^{60}Co	pCi/g	–0.71	3.67	–1.51	2.67	–1.03	3.26	0.00	7.86	–1.10	2.03	0.68	2.62	26.31[c]
^{40}K	pCi/g	101	50	69.1	19.9	218.64	50.40	101	24	180	25	229	46	628.69[c]
^{54}Mn	pCi/g	0.00	16.18	0.314	0.484	1.19	2.30	–0.46	1.05	0.00	4.66	0.28	1.92	2.44[c]
^{214}Pb	pCi/g	20.2	7.3	2.16	2.59	11.74	4.40	1.82	3.54	2.39	2.10	13.9	4.5	27.10[c]
^{208}Tl	pCi/g	–4.7	21.2	–2.10	2.32	–3.95	4.23	–1.28	1.96	–0.85	1.67	–4.16	15.80	–0.85[c]
^{238}Pu	pCi/g	0.1996	0.0203	0.0166	0.0105	0.0054	0.0071	–2.5019	3.4058	0.0044	0.0034	0.0006	0.0052	0.0070[b]
^{239}Pu	pCi/g	0.0065	0.0072	0.0312	0.0096	0.0191	0.0089	–1.7870	4.4424	0.0108	0.0037	0.0010	0.0069	0.0193[b]
^{90}Sr	pCi/g	–0.93	1.69	1.34	1.49	–0.10	1.56	1.68	1.49	1.74	1.08	0.41	0.95	2.75[d]

[a]Analytical Uncertainty. Values are the uncertainty in the analytical results at the 65% confidence level (one sigma).
[b]Regional Statistical Reference Level. The upper- (95%) level background concentration (mean + two sigma) from 1997, 1998, 1999, and 2000 control data.
[c]Regional Statistical Reference Level. The upper- (95%) level background concentration (mean + two sigma) from 1998 and 2000 control data.
[d]Regional Statistical Reference Level. The upper- (95%) level background concentration (mean + two sigma) from 1999 and 2000 control data.
Note: Results are considered valid if they are >2 times the analytical uncertainty.

Table 6-30. Heavy Metal Analytical Results from Honey Bee Samples Collected from Colonies Near DARHT and a Control Site in 2000

	Units	DARHT Colony 1	Analytical Uncertainty[a]	DARHT Colony 2	Analytical Uncertainty	DARHT Colony 3	Analytical Uncertainty	DARHT Colony 4	Analytical Uncertainty	DARHT Colony 5	Analytical Uncertainty	Control Colony	Analytical Uncertainty	RSRL[b]
Ag	mg/kg	<2	0	<2	0	<2	0	<2	0	<2	0	<2	0	1.00
Ba	mg/kg	1.8	0.2	3.2	0.3	2.2	1	3.1	1	3.2	1	0.78	0.2	1.39
Be	mg/kg	<0.2	0	<0.2	0	<0.2	0	<0.2	0	<0.2	0	<0.2	0	0.15
Cr	mg/kg	<1	0	<1	0	<1	0	<1	0	<1	0	<1	0	0.55
Cu	mg/kg	6.6	1	7	1	5.8	7	6.5	1	5.1	1	6	1	6.96
Ni	mg/kg	<2	0	<2	0	<2	0	<2	0	2	2	<2	0	2.91
Pb	mg/kg	<0.4	0	<0.4	0	<0.4	0	<0.4	0	<0.4	0	<0.4	0	0.25
Sb	mg/kg	<0.4	0	<0.4	0	<0.4	0	<0.4	0	<0.4	0	<0.4	0	0.25
Tl	mg/kg	<0.4	0	<0.4	0	<0.4	0	<0.4	0	<0.4	0	<0.4	0	0.25
As	mg/kg	<0.5	0	<0.5	0	<0.5	0	<0.5	0	<0.5	0	<0.5	0	0.30
Se	mg/kg	0.9	0.4	0.9	0.9	0.8	0.9	0.9	2	1.6	0.7	1.5	0.5	2.73
Hg	mg/kg	<0.05	0	<0.05	0	<0.05	0	<0.05	0	<0.05	0	<0.05	0	0.03

[a]Analytical Uncertainty. Values are the uncertainty in the analytical results at the 65% confidence level (one sigma).
[b]Regional Statistical Reference Level. The upper- (95%) level background concentration (mean + two sigma) from 1997 and 2000 control data.
Note: Results are considered valid if they are >2 times the analytical uncertainty.

Table 6-31. Tritium Concentrations (± Counting Uncertainty) in Blood from Elk Collected from LANL and Perimeter Areas 1995–2001

Location and Date of Collection	Game Animal/ Identification Number[a]	pCi/mL
LANL/TA-49/2-03-95	Elk Cow/#43251	0.30 (0.15)
LANL/TA-49/2-28-95	Elk Cow/#43253	0.60 (0.15)*
LANL/TA-49/3-21-95	Elk Bull/#43250	0.80 (0.15)*
LANL/TA-18/3-21-95	Elk Cow/#43254	0.40 (0.15)
LANL/TA-18/3-12-96	Elk Cow/#16037	0.30 (0.20)
LANL/TA-18/3-15-96	Elk Cow/#16036	0.50 (0.20)
LANL/TA-18/3-19-96	Elk Cow/#1603401	2.20 (0.20)*
LANL/TA-18/3-27-96	Elk Cow/#1603501	0.50 (0.20)
LANL/TA-16/4-02-96	Elk Cow/#1603301	0.20 (0.20)
LANL/TA-16/4-23-96	Elk Bull/#1603801	0.20 (0.20)
LANL/TA-8/4-22-96	Elk Cow	0.40 (0.20)
LANL/TA-15/3-14-97	Elk Cow/#1603802	0.40 (0.22)
LANL/TA-15/1-06-98	Elk Cow/#E3002	0.27 (0.24)
LANL/TA-36/1-15-98	Elk Bull/#E3003	0.10 (0.23)
LANL/TA-40/2-26-98	Elk Cow/#1603502	0.63 (0.25)
LANL/TA-40/3-10-98	Elk Cow/#1603302	0.65 (0.25)
LANL/TA-40/3-11-98	Elk Cow/#1603402	0.14 (0.24)
LANL/TA-22/3-31-99	Elk Cow/1603503	0.21 (0.21)
LANL/TA-36/1-24-01	Elk Cow/#21	0.79 (0.13)*[d]
LANL/TA-54/1-24-01	Elk Cow/#37	0.10 (0.12)
LANL/TA-36/1-24-01	Elk Bull/#23	0.79 (0.13)*
LANL/TA-36/1-30-01	Elk Cow/#22	0.82 (0.14)*
LANL/TA-36/1-31-01	Elk/#L27	2.25 (0.22)*
LANL/TA-54/1-31-01	Elk/#L28	0.28 (0.12)
LANL/TA-54/1-31-01	Elk/#CDBY1	0.38 (0.12)*
LANL/TA-54/1-31-01	Elk/#L25	0.73 (0.13)*
LANL/TA-54/2-01-01	Elk/#L31	0.51 (0.13)*
LANL/TA-36/2-06-01	Elk/#24	0.04 (0.11)
Min.		0.04
Max.		2.25
Mean (std dev)		*0.55 (0.53)***[e]
Bandelier National Park/1-06-00	Elk/#52	0.07 (0.23)
Bandelier National Park/1-06-00	Elk/#58	0.71 (0.27)
Bandelier National Park/1-06-00	Elk/#59	0.69 (0.23)*
Bandelier National Park/1-06-00	Elk/#62	0.64 (0.23)
Bandelier National Park/1-06-00	Elk/#63	0.11 (0.24)
Bandelier National Park/1-06-00	Elk/#65	0.71 (0.23)*
Bandelier National Park/1-06-00	Elk/#68	0.10 (0.24)
Bandelier National Park/1-06-00	Elk/#70	–0.17 (0.23)
Bandelier National Park/1-07-00	Elk/#5	0.55 (0.26)
Bandelier National Park/1-07-00	Elk/#69	–0.10 (0.23)
Bandelier National Park/1-07-00	Elk/#13	–0.16 (0.23)
Bandelier National Park/1-07-00	Elk/#17	0.10 (0.24)
Bandelier National Park/1-07-00	Elk/#20	0.02 (0.23)

Table 6-31. Tritium Concentrations (± Counting Uncertainty) in Blood from ElkCollected from LANL and Perimeter Areas 1995–2001 (Cont.)

Location and Date of Collection	Game Animal/ Identification Number[a]	pCi/mL
Bandelier National Park/1-08-00	Elk/#26	0.35 (0.24)
Bandelier National Park/1-08-00	Elk/#28	–0.29 (0.22)
Bandelier National Park/1-08-00	Elk/#8	0.24 (0.23)
Bandelier National Park/1-08-00	Elk/#9	0.02 (0.23)
Bandelier National Park/1-10-01	Elk/#L1-471958	1.15 (0.15)*
Bandelier National Park/1-10-01	Elk/#33	1.14 (0.15)*
Bandelier National Park/1-10-01	Elk/#34	0.74 (0.13)*
Bandelier National Park/1-10-01	Elk/#35	0.28 (0.12)
Bandelier National Park/1-10-01	Elk/#37	0.25 (0.12)
Bandelier National Park/1-10-01	Elk/#38	–0.01 (0.11)
Bandelier National Park/1-10-01	Elk/#39	0.29 (0.12)
Bandelier National Park/1-10-01	Elk/#40	0.70 (0.13)*
Bandelier National Park/1-11-01	Elk/#L13	0.22 (0.12)
Bandelier National Park/1-11-01	Elk/#L14	0.59 (0.13)*
Bandelier National Park/1-11-01	Elk Bull/#L15	0.77 (0.13)*
Bandelier National Park/1-11-01	Elk/#L18	0.34 (0.12)
Bandelier National Park/1-11-01	Elk/#L11	0.10 (0.12)
Bandelier National Park/1-11-01	Elk/#L12	0.21 (0.12)
Bandelier National Park/1-11-01	Elk/#L8	0.15 (0.12)
Bandelier National Park/1-11-01	Elk/#L7	2.96 (0.23)*
Bandelier National Park/1-11-01	Elk/L4	0.87 (0.14)*
Bandelier National Park/1-11-01	Elk/#L3	0.05 (0.11)
Bandelier National Park/1-12-01	Elk/#44	0.29 (0.12)
Bandelier National Park/1-12-01	Elk/#L6	0.28 (0.12)
Bandelier National Park/1-12-01	Elk/#L5	0.43 (0.12)*
Bandelier National Park/1-12-01	Elk/#L9	0.31 (0.12)
Bandelier National Park/1-12-01	Elk/#L10	0.25 (0.12)
Bandelier National Park/1-12-01	Elk/#L19	0.36 (0.12)*
Bandelier National Park/1-12-01	Elk/#L20	0.20 (0.12)
Bandelier National Park/1-12-01	Elk/#43	1.36 (0.16)*
Bandelier National Park/1-12-01	Elk/#L16	0.38 (0.12)*
Bandelier National Park/1-12-01	Elk/#L17	0.13 (0.12)
Bandelier National Park/1-16-01	ElkCow/#50	0.03 (0.11)
Bandelier National Park/1-16-01	Elk/#48	1.10 (0.15)*
Bandelier National Park/1-16-01	ElkCow/#46	0.15 (0.12)
Bandelier National Park/2-03-01	ElkCow/#127	0.83 (0.14)*
Bandelier National Park/2-03-01	ElkCow/#30	2.05 (0.19)*
Bandelier National Park/2-03-01	ElkCow/#47	0.10 (0.11)
Bandelier National Park/2-03-01	Elk/#45	0.43 (0.12)*
Bandelier National Park/2-03-01	ElkCow/#128	0.00 (0.11)
Bandelier National Park/2-03-01	ElkBull/#BM16	0.31 (0.12)
Bandelier National Park/2-03-01	ElkCow/#126	–0.09 (0.11)
Bandelier National Park/2-03-01	ElkCow/#54	0.11 (0.12)
Bandelier National Park/2-03-01	ElkCow/#51	0.09 (0.12)
Bandelier National Park/2-03-01	ElkCow/#32	-0.03 (0.11)

Table 6-31. Tritium Concentrations (± Counting Uncertainty) in Blood from Elk Collected from LANL and Perimeter Areas 1995–2001 (Cont.)

Location and Date of Collection	Game Animal/ Identification Number[a]	pCi/mL
Bandelier National Park/2-03-01	ElkCow/#36	0.06 (0.11)
Bandelier National Park/2-03-01	ElkCow/#49	0.20 (0.12)
Bandelier National Park/2-03-01	Elk Cow/#41	–0.07 (0.11)
Bandelier National Park/2-03-01	Elk Cow/#121	–0.13 (0.11)
Bandelier National Park/2-03-01	Elk Cow/#31	0.57 (0.13)*
Bandelier National Park/2-04-01	Elk Bull/#131	0.15 (0.12)
Bandelier National Park/2-04-01	Elk Cow/#133	0.11 (0.12)
Bandelier National Park/2-04-01	Elk Bull/#132	0.17 (0.12)
Bandelier National Park/2-04-01	Elk Bull/#53	–0.09 (0.11)
Bandelier National Park/2-04-01	Elk Cow/#129	–0.10 (0.11)
Bandelier National Park/2-04-01	Elk/#130	0.20 (0.12)
Min.		–0.29
Max.		2.96
Mean (std dev)		*0.36 (0.52)*
Santa Clara Pueblo/2-05-01	Elk/#42	0.02 (0.11)
Santa Clara Pueblo/2-05-01	Elk/#462926	0.60 (0.13)*
Santa Clara Pueblo/2-05-01	Elk/#462928	–0.04 (0.11)
Santa Clara Pueblo/2-05-01	Elk/#462924	–0.14 (0.11)
Santa Clara Pueblo/2-05-01	Elk/#462927	0.83 (0.14)*
Min.		–0.14
Max.		0.83
Mean (std dev)		*0.25 (0.43)*
Regional Background (mean ± std dev.)[b]		0.21 (0.16)
RSRL[c]		0.53

[a]Refers to a radio collar number or ear tag placed on the animal at time of capture.
[b]Represents tissue moisture from elk muscle (Fresquez et al., 1999c); a statistical test at the 0.05 probability level using a Student's t-test shows no significant differences between tritium distilled from muscle collected from elk on LANL lands (n=18) versus tritium distilled from blood collected from elk on LANL lands (n=28).
[c]Regional Statistical Reference Level (mean plus two standard deviations).
[d]* Denotes a detectable value; one that is greater than three times its analytical uncertainty.
[e]** Denotes a statistical significant difference with regional background at the 0.05 probability level using a Student's t-test.

F. Figures

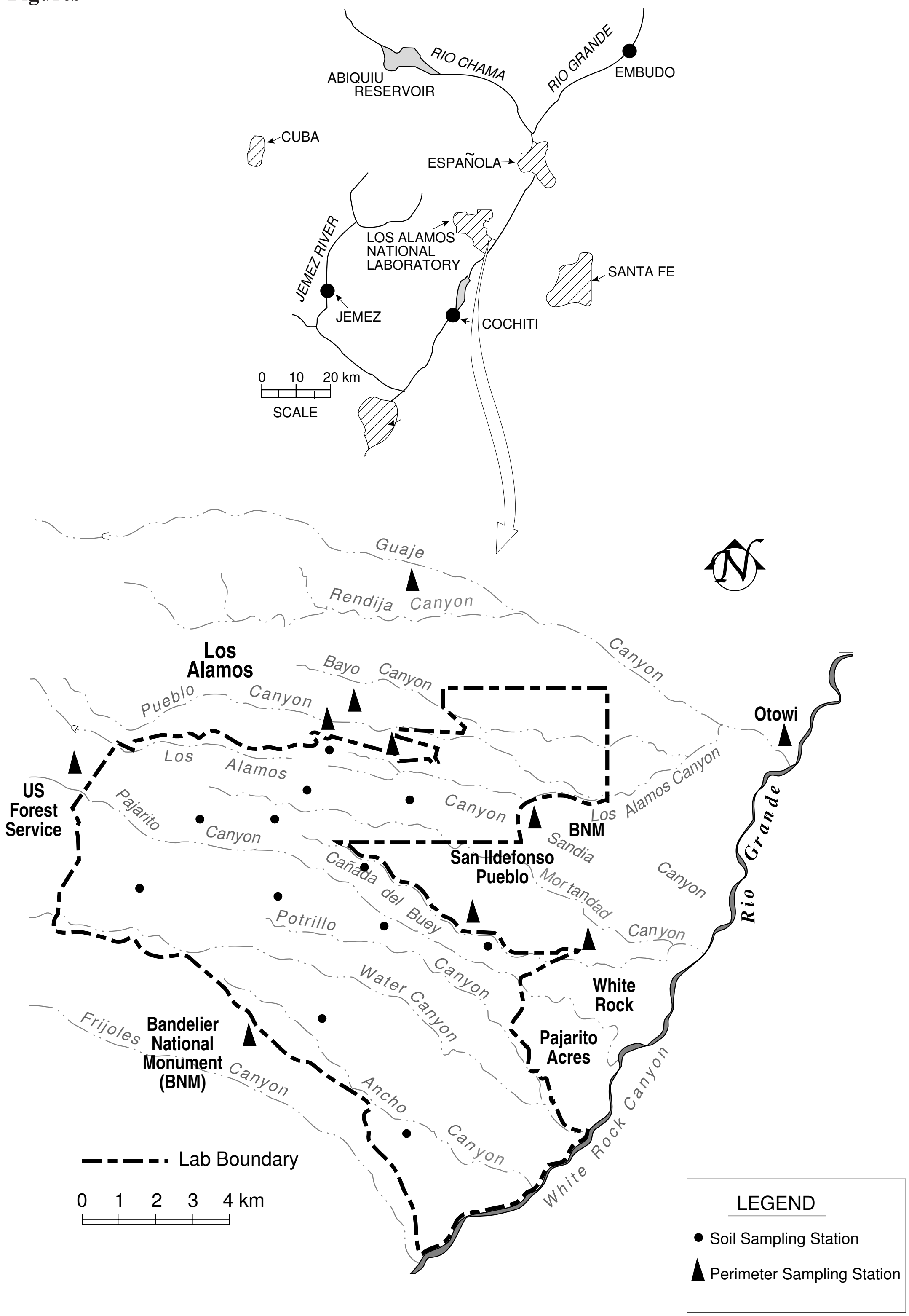

Figure 6-1. Off-site regional (top) and perimeter and on-site (bottom) Laboratory soil sampling locations.

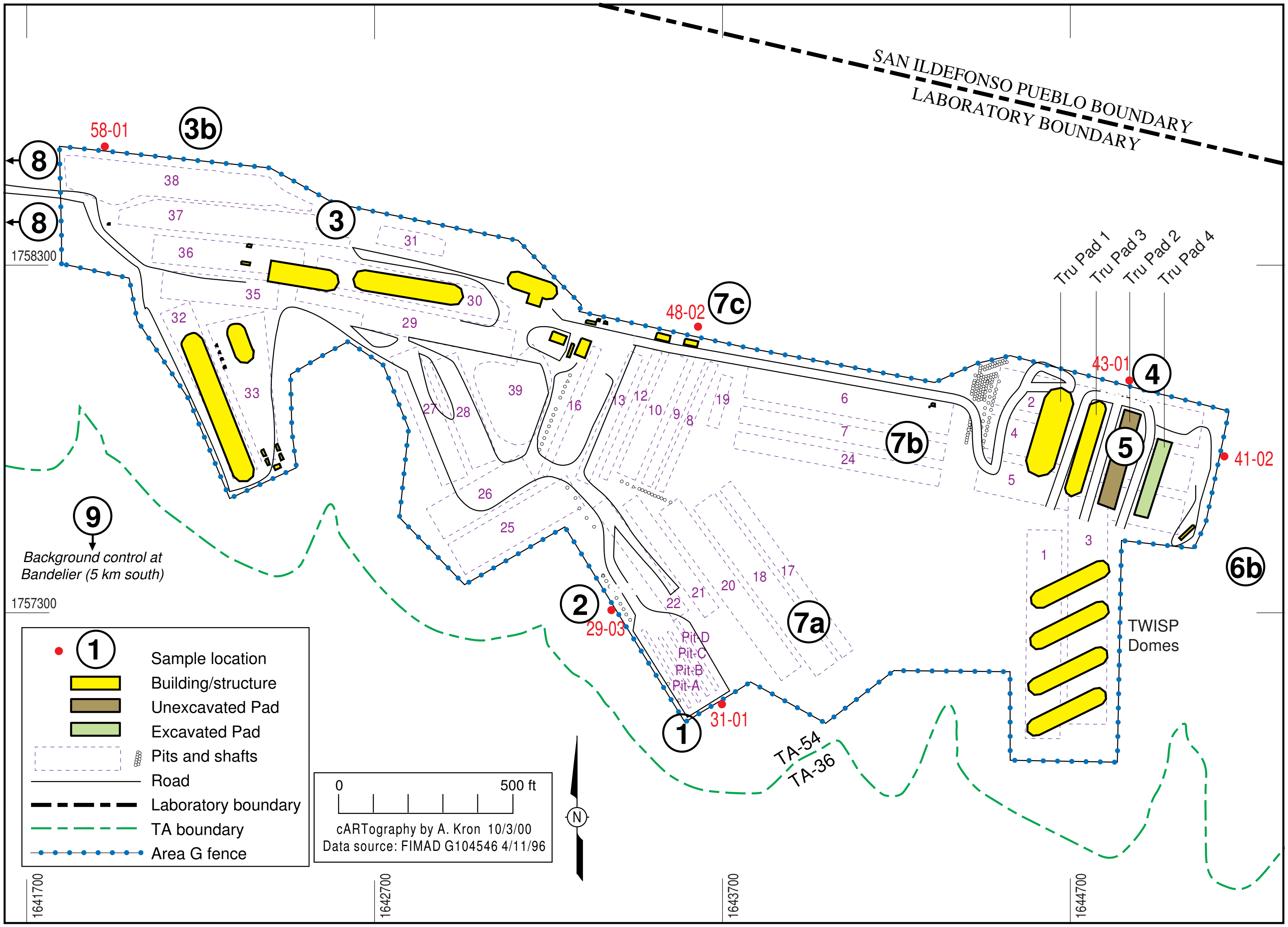

Figure 6-2. Site/sample locations of soils and vegetation at Area G. Site #8 is located farther west and Site #9 is located farther south than what is shown here.

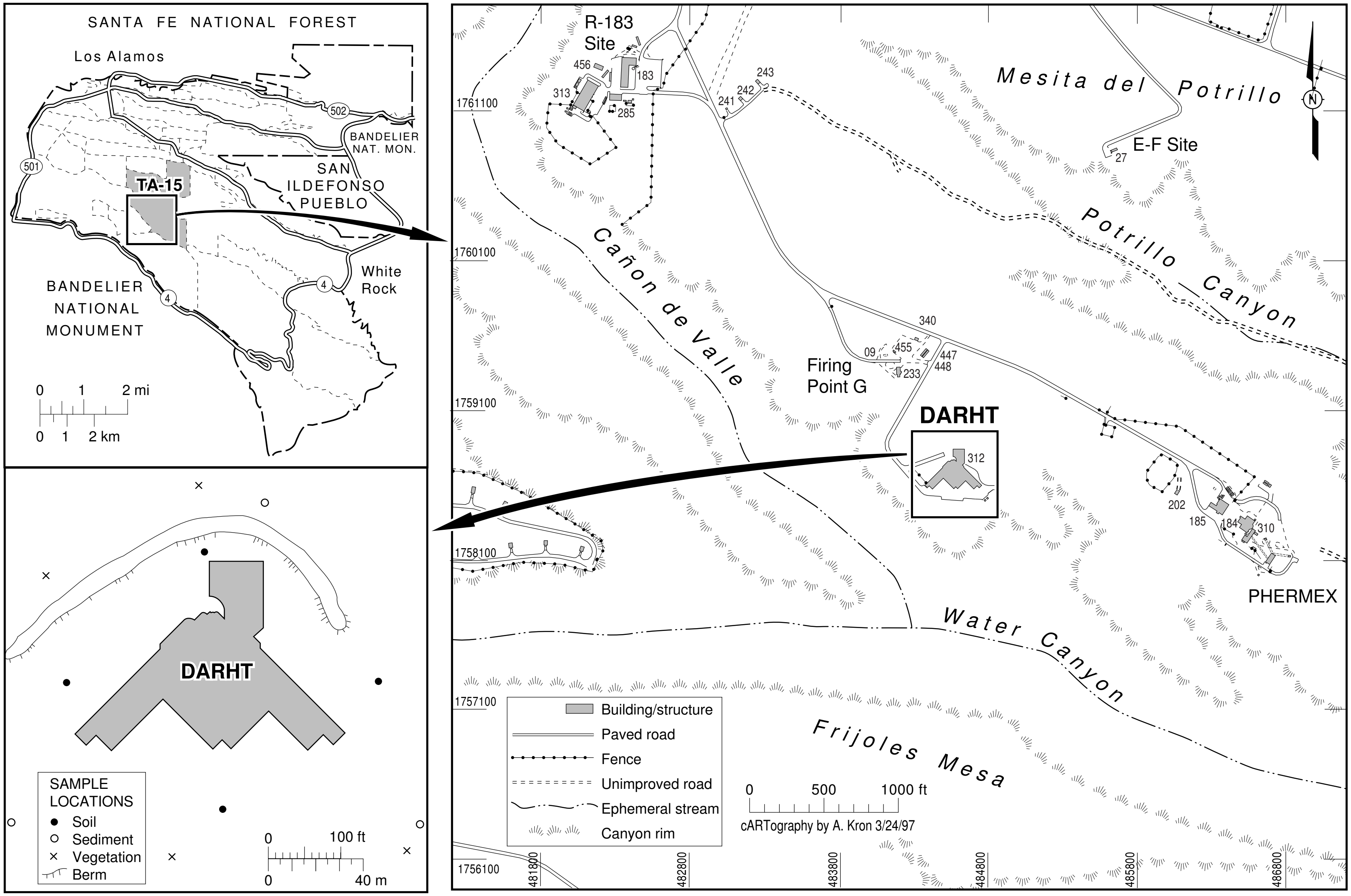

Figure 6-3. Sampling locations at the DARHT facility at TA-15.

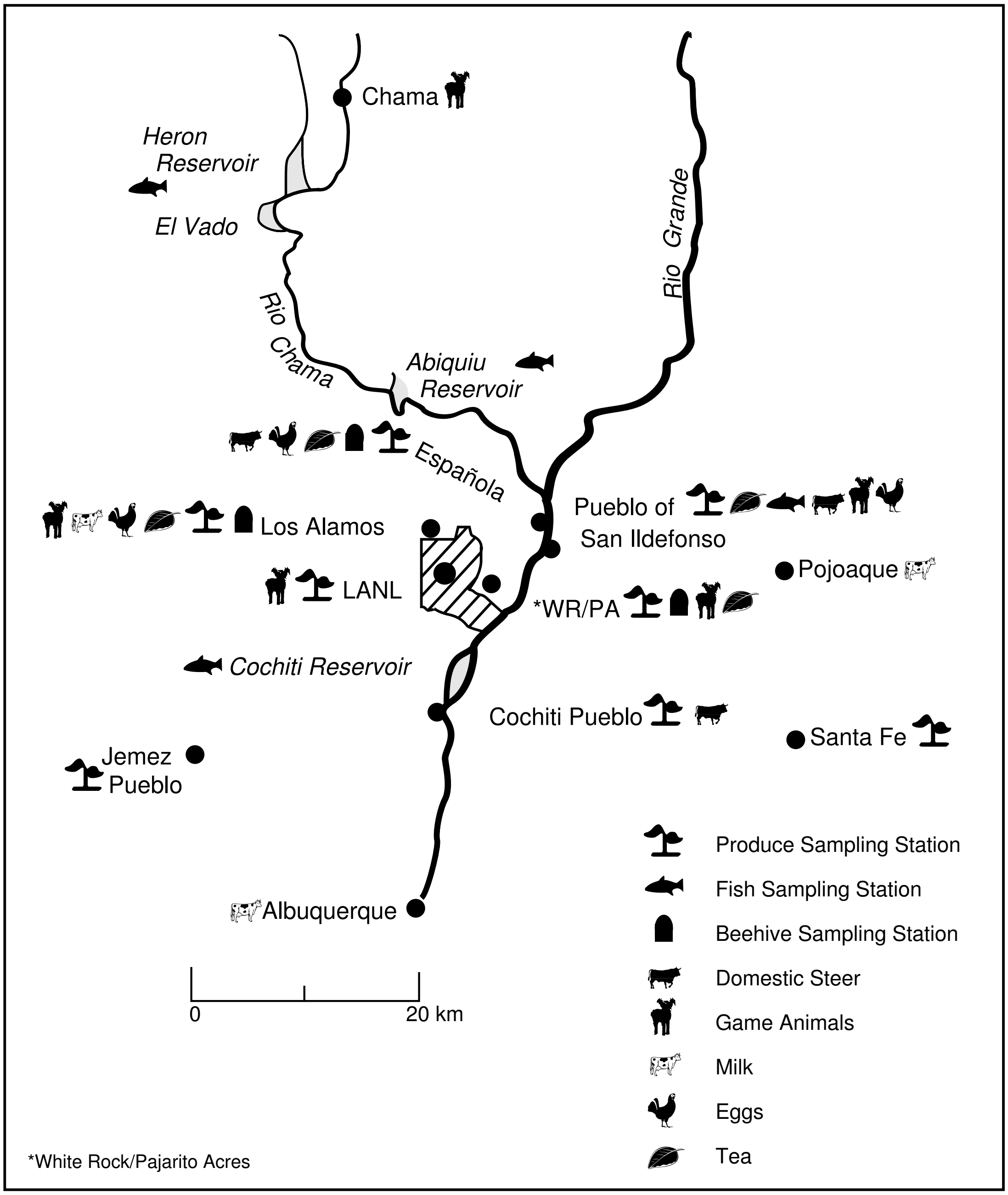

Figure 6-4. Produce, fish, milk, eggs, tea, domestic and game animals, and beehive sampling locations. (Map denotes general locations only.)

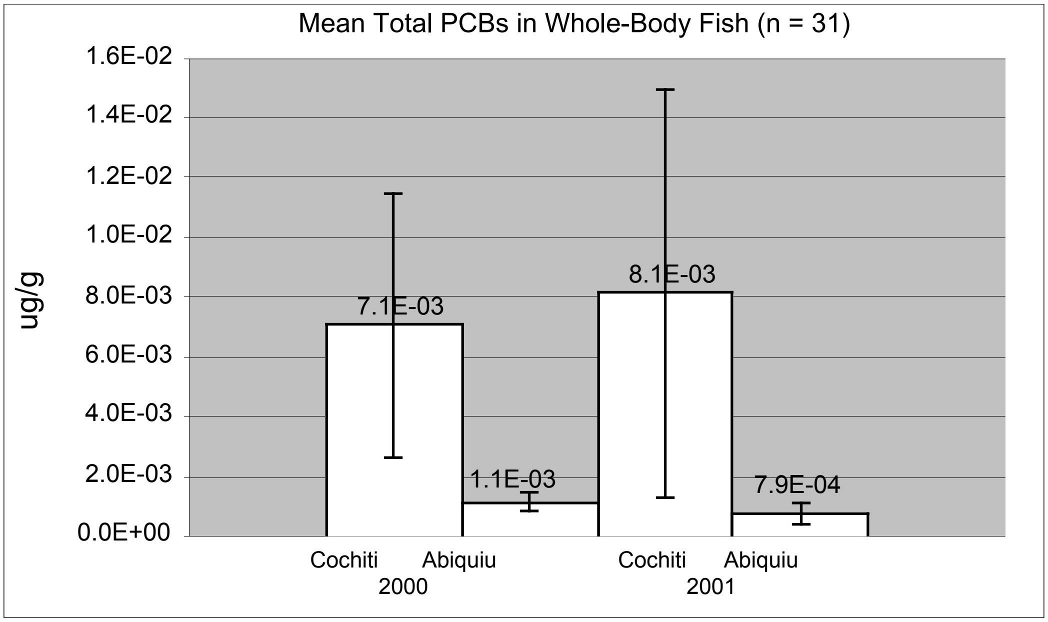

Figure 6-5. Mean concentration of total PCBs (from congeners) in whole-body fish from Cochiti and Abiquiu reservoirs. Error bars are 2 the standard error of the mean.

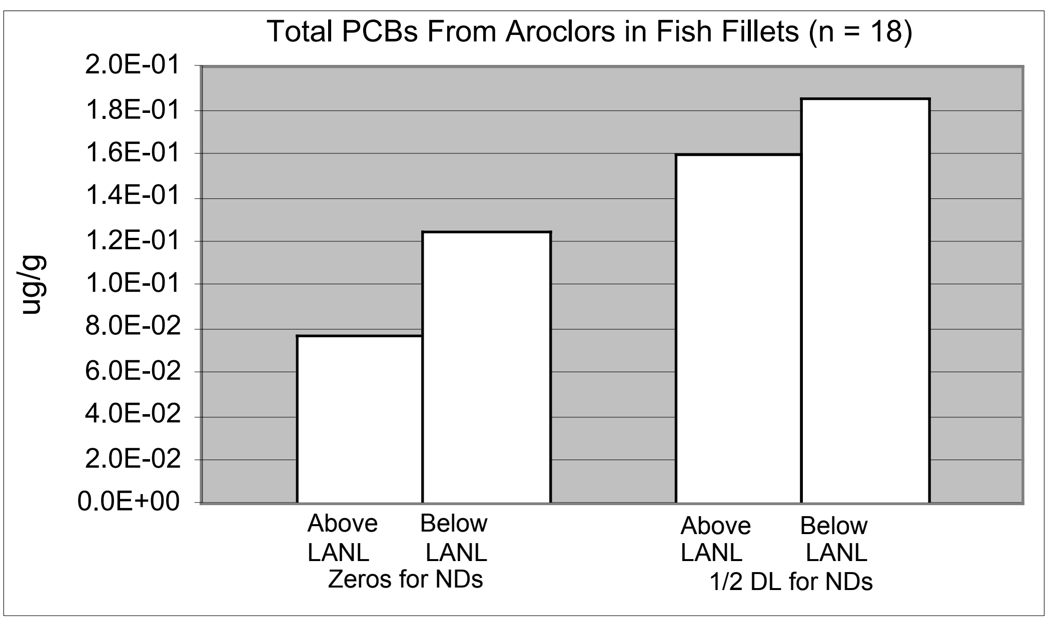

Figure 6-6. Total PCBs from Aroclors in fish fillets from the Rio Grande in 1997. First bar pair had non-detects replaced by zeros; second pair had nondetects replaced by 1/2 the detection limit. source of data: Gonzales et al. (1999).

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Standards for Environmental Contaminants

Throughout this report, we compare concentrations of radioactive and chemical constituents in air and water samples with pertinent standards and guidelines in regulations of federal and state agencies. No comparable standards for soils, sediments, or foodstuffs are available. Los Alamos National Laboratory (LANL or the Laboratory) operations are conducted in accordance with directives for compliance with environmental standards. These directives are contained in Department of Energy (DOE) Orders 5400.1, "General Environmental Program;" 5400.5, "Radiation Protection of the Public and the Environment;" and 231.1, "Environmental Safety and Health Reporting."

Radiation Standards. DOE regulates radiation exposure to the public and the worker by limiting the radiation dose that can be received during routine Laboratory operations. Because some radionuclides remain in the body and result in exposure long after intake, DOE requires consideration of the dose commitment caused by inhalation, ingestion, or absorption of such radionuclides. This evaluation involves integrating the dose received from radionuclides over a standard period of time. For this report, 50-yr dose commitments were calculated using the DOE dose factors from DOE 1988a and DOE 1988b. The dose factors DOE adopted are based on the recommendations of Publication 30 of the International Commission on Radiological Protection (ICRP 1988).

In 1990, DOE issued Order 5400.5, which finalized the interim radiation protection standard (RPS) for the public (NCRP 1987). Table A-1 lists currently applicable RPSs, now referred to as public dose limits (PDLs), for operations at the Laboratory. DOE's comprehensive PDL for radiation exposure limits the effective dose equivalent (EDE) that a member of the public can receive from DOE operations to 100 mrem per year. The PDLs and the DOE dose factors are based on recommendations in ICRP (1988) and the National Council on Radiation Protection and Measurements (NCRP 1987).

The EDE is the hypothetical whole-body dose that would result in the same risk of radiation-induced cancer or genetic disorder as a given exposure to an individual organ. It is the sum of the individual organ doses, weighted to account for the sensitivity of each organ to radiation-induced damage. The weighting factors are taken from the recommendations of the ICRP. The EDE includes doses from both internal and external exposure.

Radionuclide concentrations in air or water are compared to DOE's Derived Concentration Guides (DCGs) to evaluate potential impacts to members of the public. The DCGs for air are the radionuclide concentrations in air that, if inhaled continuously for an entire year, would give a dose of 100 mrem. Similarly, the DCGs for water are those concentrations in water that if consumed at a maximum rate of 730 liters per year, would give a dose of 100 mrem per year. Derived air concentrations (DACs) were developed for protection of workers and are the air concentrations that, if inhaled throughout a "work year," would give the limiting allowed dose to the worker. Table A-2 shows the DCGs and DACs.

In addition to DOE standards, in 1985 and 1989, the EPA established the National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities, 40 CFR 61, Subpart H. This regulation states that emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr. DOE has adopted this dose limit (Table A-1). This dose is calculated at the location of a residence, school, business or office. In addition, the regulation requires monitoring of all release points that can produce a dose of 0.1 mrem to a member of the public. A complete listing a 40 CFR 61 Subpart H is available in ESH-17 2000.

Nonradioactive Air Quality Standards. Table A-3 shows federal and state ambient air quality standards for nonradioactive pollutants.

National Pollutant Discharge Elimination System. Table A-4 presents a summary of the outfalls, the types of monitoring required under National Pollutant Discharge Elimination System (NPDES), and the limits established for sanitary and industrial outfalls. Table A-5 presents NPDES annual water quality parameters for all outfalls.

Drinking Water Standards. For chemical constituents in drinking water, regulations and standards are issued by the Environmental Protection Agency (EPA) and adopted by the New Mexico Environment

Department (NMED) as part of the New Mexico Drinking Water Regulations (Table A-6) (NMEIB 1995). EPA's secondary drinking water standards, which are not included in the New Mexico Drinking Water Regulations and are not enforceable, relate to contaminants in drinking water that primarily affect aesthetic qualities associated with public acceptance of drinking water (EPA 1989b). There may be health effects associated with considerably higher concentrations of these contaminants.

Radioactivity in drinking water is regulated by EPA regulations contained in 40 CFR 141 (EPA 1989b) and New Mexico Drinking Water Regulations, Sections 206 and 207 (NMEIB 1995). These regulations provide that combined radium-226 and radium-228 may not exceed 5 pCi per liter. Gross alpha activity (including radium-226, but excluding radon and uranium) may not exceed 15 pCi per liter.

A screening level of 5 pCi per liter for gross alpha is established to determine when analysis specifically for radium isotopes is necessary. In this report, plutonium concentrations are compared with both the EPA gross alpha standard for drinking water (Table A-6) and the DOE guides calculated for the DCGs applicable to drinking water (Table A-2).

For man-made beta- and photon-emitting radionuclides, EPA drinking water standards are limited to concentrations that would result in doses not exceeding 4 mrem per year, calculated according to a specified procedure. In addition, DOE Order 5400.5 requires that persons consuming water from DOE-operated public water supplies do not receive an EDE greater than 4 mrem per year. DCGs for drinking water systems based on this requirement are in Table A-2.

Surface Water Standards. Concentrations of radionuclides in surface water samples may be compared to either the DOE DCGs (Table A-2) or the New Mexico Water Quality Control Commission (NMWQCC) stream standard, which references the state's radiation protection regulations. However, New Mexico radiation levels are in general two orders of magnitude greater than DOE's DCGs for public dose, so only the DCGs will be discussed here. The concentrations of nonradioactive constituents may be compared with the NMWQCC Livestock Watering and Wildlife Habitat stream standards (NMWQCC 1995). (See Tables A-7 and A-8.) The NMWQCC groundwater standards can also be applied in cases where discharges may affect groundwater.

Organic Analysis of Surface and Groundwaters: Methods and Analytes. Organic analyses of surface waters, groundwaters, and sediments are made using SW-846 methods as shown in Table A-9. This table shows the number of analytes included in each analytical suite. The specific compounds analyzed in each suite are listed in Tables A-10 through A-13.

Table A-1. Department of Energy Public Dose Limits for External and Internal Exposures

	Effective Dose Equivalent[a] at Point of Maximum Probable Exposure
Exposure of Any Member of the Public[b]	
All Pathways	100 mrem/yr[c]
Air Pathway Only[d]	10 mrem/yr
Drinking Water	4 mrem/yr
Occupational Exposure[b]	
Stochastic Effects	5 rem (annual EDE[e])
Nonstochastic Effects	
Lens of eye	15 rem (annual EDE[e])
Extremity	50 rem (annual EDE[e])
Skin of the whole body	50 rem (annual EDE[e])
Organ or tissue	50 rem (annual EDE[e])
Unborn Child	
Entire gestation period	0.5 rem (annual EDE[e])

[a] As used by DOE, effective dose equivalent (EDE) includes both the EDE from external radiation and the committed EDE to individual tissues from ingestion and inhalation during the calendar year.

[b] In keeping with DOE policy, exposures must be limited to as small a fraction of the respective annual dose limits as practicable. DOE's public dose limit (PDL) applies to exposures from routine Laboratory operation, excluding contributions from cosmic, terrestrial, and global fallout; self-irradiation; and medical diagnostic sources of radiation. Routine operation means normal, planned operation and does not include actual or potential accidental or unplanned releases. Exposure limits for any member of the general public are taken from DOE Order 5400.5 (DOE 1990). Limits for occupational exposure are taken from 10 CFR 835, Occupational Radiation Protection.

[c] Under special circumstances and subject to approval by DOE, this limit on the EDE may be temporarily increased to 500 mrem/yr, provided the dose averaged over a lifetime does not exceed the principal limit of 100 mrem per year.

[d] This level is from EPA's regulations issued under the Clean Air Act, (40 CFR 61, Subpart H) (EPA 1989a).

[e] Annual EDE is the EDE received in a year.

Table A-2. Department of Energy's Derived Concentration Guides for Water and Derived Air Concentrations[a]

Nuclide	f_1[b]	DCGs for Water Ingestion in Uncontrolled Areas (pCi/L)	DCGs for Drinking Water Systems (pCi/L)	DCGs for Air Inhalation by the Public (µCi/mL)	Class[b]	DACs for Occupational Exposure (µCi/mL)
^{3}H	—	2,000,000	80,000	1×10^{-7}[c]	—	2×10^{-5}[c]
^{7}Be	5×10^{-3}	1,000,000	40,000	4×10^{-8}	Y	8×10^{-6}
^{89}Sr	3×10^{-1}	20,000	800	3×10^{-10}	Y	6×10^{-8}
^{90}Sr	3×10^{-1}	1,000	40	9×10^{-12}	Y	2×10^{-9}
^{137}Cs	1×10^{0}	3,000	120	4×10^{-10}	D	7×10^{-8}
^{234}U	5×10^{-2}	500	20	9×10^{-14}	Y	2×10^{-11}
^{235}U	5×10^{-2}	600	24	1×10^{-13}	Y	2×10^{-11}
^{238}U	5×10^{-2}	600	24	1×10^{-13}	Y	2×10^{-11}
^{238}Pu	1×10^{-3}	40	1.6	3×10^{-14}	W	3×10^{-12}
^{239}Pu	1×10^{-3}	30	1.2	2×10^{-14}	W	2×10^{-12}
^{240}Pu	1×10^{-3}	30	1.2	2×10^{-14}	W	2×10^{-12}
^{241}Am	1×10^{-3}	30	1.2	2×10^{-14}	W	2×10^{-12}

[a]Guides for uncontrolled areas are based on DOE's public dose limit for the general public (DOE 1990); those for occupational exposure are based on radiation protection standards in 10 CFR 835. Guides apply to concentrations in excess of those occurring naturally or that are due to worldwide fallout.
[b]Gastrointestinal tract absorption factors (f_1) and lung retention classes (Class) are taken from ICRP30 (ICRP 1988). Codes: Y = year, D = day, W = week.
[c]Tritium in the HTO form.

Table A-3. National (40 CFR 50) and New Mexico (20 NMAC 2.3) Ambient Air Quality Standards

Pollutant	Averaging Time	Unit	New Mexico Standard	Federal Standards Primary	Federal Standards Secondary
Sulfur dioxide	Annual	ppm	0.02	0.030[a]	
	24 hours	ppm	0.10	0.14[b]	
	3 hours	ppm			0.5[b]
Hydrogen sulfide	1 hour	ppm	0.010[b]		
Total reduced sulfur	1/2 hour	ppm	0.003[b]		
Total Suspended Particulates	Annual	μg/m^3	60	50	50
	30 days	μg/m^3	90		
	7 days	μg/m^3	110		
	24 hours	μg/m^3	150		
PM_{10}[c]	Annual	μg/m^3		50	50
	24 hours	μg/m^3		150	150
$PM_{2.5}$[d]	Annual	μg/m^3		15[e]	15[e]
	24 hours	μg/m^3		65[e]	65[e]
Carbon monoxide	8 hours	ppm	8.7	9[b]	
	1 hour	ppm	13.1	35[b]	
Ozone[f]	1 hour	ppm		0.12	0.12
	8 hours	ppm		0.08	0.08
Nitrogen dioxide	Annual	ppm	0.05	0.053	0.053
	24 hours	ppm	0.10		
Lead and lead compounds	Calendar quarter	μg/m^3		1.5	1.5

[a]Not to be exceeded in a calendar year.
[b]Not to be exceeded more than once in a calendar year.
[c]Particles ≤10 μm in diameter.
[d]Particles ≤2.5 μm in diameter.
[e]Applicable when the EPA approves changes to the NM State Implementation Plan. Until then, PM_{10} is the regulated pollutant.
[f]As the result of a May 14, 1999, court ruling, EPA does not have the authority to implement the eight-hour ozone standard. Currently, LANL must meet the one-hour ozone standard. EPA has appealed the court decision.

Table A-4. Limits Established by National Pollutant Discharge Elimination System Permit No. NM0028355 for Sanitary and Industrial Outfall Discharges for 2001

Discharge Category	Permit Parameter		Daily Average		Daily Maximum	
Sanitary						
13S TA-46 SWS Facility	BOD[a]	concentration	30	mg/L	45	mg/L
		loading limit	100	lb/day	N/A[b]	
	TSS[c]	concentration	30	mg/L	45	mg/L
		loading limit	100	lb/day	N/A	
	Fecal coliform bacteria[d]		500	colonies/100 mL	500	colonies/100 mL
	pH		6.0–9.0 s.u.		6.0–9.0 s.u.	
	Flow[e]		Report		Report	

Discharge Category	Number of Outfalls	Sampling Frequency	Permit Parameter	Daily Average	Daily Maximum	Unit of Measurement
Industrial						
001 Power Plant	1	Monthly	TSS	30	100	mg/L
			Free available CL_2	0.2	0.5	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.
02A Boiler Blowdown	1	Every 3 months	TSS	30	100	mg/L
			Total Fe	10	40	mg/L
			Total Cu	1.0	1.0	mg/L
			Total P	20	40	mg/L
			Sulfite	35	70	mg/L
			Total Cr	1.0	1.0	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.
03A Treated Cooling Water	16	Every 3 months	TSS	30	100	mg/L
			Free available Cl	0.2	0.5	mg/L
			Total P	20	40	mg/L
			Total As	0.04	0.04	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.
04A Noncontact Cooling Water	13	Every 3 months	pH	6.0–9.0	6.0–9.0	s.u.
			Total residual CL_2	Report[f]	Report	mg/L
051 Radioactive Liquid Waste Treatment Facility (TA-50)	1	Variable: weekly to monthly	COD[g]	94	156	lb/day
			TSS	18.8	62.6	lb/day
			Total Cd	0.06	0.30	lb/day
			Total Cr	0.19	0.38	lb/day
			Total Cu	0.63	0.63	lb/day
			Total Fe	1.0	2.0	lb/day
			Total Pb	0.06	0.15	lb/day
			Total Hg	0.003	0.09	lb/day
			Total Zn	0.62	1.83	lb/day
			TTO[h]	1.0	1.0	mg/L
			Total Ni[f]	Report	Report	mg/L
			Total N[f]	Report	Report	mg/L
			Nitrate-Nitrate as N[f]	Report	Report	mg/L
			Ammonia (as N)[f]	Report	Report	mg/L

Table A-4. (Cont.)

Discharge Category	Number of Outfalls	Sampling Frequency	Permit Parameter	Daily Average	Daily Maximum	Unit of Measurement
051 (Cont.)			pH	6.0–9.0	6.0–9.0	s.u.
			COD	125	125	mg/L
			Total Cd	0.2	0.2	mg/L
			Total Cr	5.1	5.1	mg/L
			Total Cu	1.6	1.6	mg/L
			Total Pb	0.4	0.4	mg/L
			Total Zn	95.4	95.4	mg/L
			^{226}Ra and ^{228}Ra	30.0	30.0	pCi/L
05A High Explosive Wastewater	2	Every 3 months	Oil & Grease	15	15	mg/L
			COD	125	125	mg/L
			TSS	30.0	45.0	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.
06A Photo Wastewater	1	Every 3 months	Total Ag	0.5	1.0	mg/L
			pH	6.0–9.0	6.0–9.0	s.u.

[a]Biochemical oxygen demand.
[b]Not applicable.
[c]Total suspended solids.
[d]Logarithmic mean.
[e]Discharge volumes are reported to EPA but are not subject to limits.
[f]Concentrations are reported to EPA but are not subject to limits.
[g]Chemical oxygen demand.
[h]Total toxic organics.
Note: Sampling frequency for the sanitary outfall varies from once a week to once every three months, depending on the parameter.

Table A-5. Annual Water Quality Parameters Established by National Pollutant Discharge Elimination System Permit No. NM0028355 for Sanitary and Industrial Outfall Discharges for 2000

Discharge Category	Number of Outfalls	Sampling Frequency	Permit Parameter	Daily Average	Daily Maximum	Unit of Measurement
All Outfall Categories: Annual Water Quality Parameters	36	Annually	Total Al	5.0	5.0	mg/L
			Total As	0.04	0.04	mg/L
			Total B	5.0	5.0	mg/L
			Total Cd	0.2	0.2	mg/L
			Total Cr	5.1	5.1	mg/L
			Total Co	1.0	1.0	mg/L
			Total Cu	1.6	1.6	mg/L
			Total Pb	0.4	0.4	mg/L
			Total Hg	0.01	0.01	mg/L
			Total Se	0.05	0.05	mg/L
			Total V	0.1	0.1	mg/L
			Total Zn	95.4	95.4	mg/L
			^{226}Ra and ^{228}Ra	30.0	30.0	pCi/L
			^{3}H[a]	3,000,000	3,000,000	pCi/L

[a]When accelerator produced.

Table A-6. Safe Drinking Water Act Maximum Contaminant Levels in the Water Supply for Radiochemicals, Inorganic Chemicals, and Microbiological Constituents

Contaminants	Level
Radiochemical:	**Maximum Contaminant Level**
Gross alpha	15 pCi/L
Gross beta & photon	4 mrem/yr
^{226}Ra & ^{228}Ra	5 pCi/L
U	30 µg/L[a]
Radon	300/4000 pCi/L[b]
	Screening Level
Gross alpha	5 pCi/L
Gross beta	50 pCi/L
Inorganic Chemical:	
Primary Standards	**Maximum Contaminant Level (mg/L)**
Asbestos	7 million fibers/L (longer than 10 µm)
As	0.05[c]
Ba	2
Be	0.004
Cd	0.005
CN	0.2
Cr	0.1
F	4
Hg	0.002
Ni	0.1
NO_3 (as N)	10
NO_2 (as N)	1
SO_4	500[d]
Se	0.05
Sb	0.006
Tl	0.002
	Action Levels (mg/L)
Pb	0.015
Cu	1.3
Secondary Standards	**(mg/L)**
Cl	250
Cu	1
Fe	0.3
Mn	0.05
Zn	5
Total Dissolved Solids	500
pH	6.5–8.5
Microbiological:	**Maximum Contaminant Level**
Presence of total coliforms	5% of samples/month
Presence of fecal coliforms or Escherichia coli	No coliform-positive repeat samples following a fecal coliform-positive sample

[a]Effective December 2003.
[b]Radon standard is 4000 pCi/L with an approved state Multimedia Mitigation program and 300 pCi/L in states without an approved program.
[c]Proposed standard. Scheduled for revision in 2001.
[d]The proposed MCL for sulfate was suspended by the EPA on August 6, 1996.

Table A-7. Livestock Watering Standards[a]

Livestock Contaminant	Concentration	
Dissolved Al	5	mg/L
Dissolved As	0.2	mg/L
Dissolved B	5	mg/L
Dissolved Cd	0.05	mg/L
Dissolved Cr	1	mg/L
Dissolved Co	1	mg/L
Dissolved Cu	0.5	mg/L
Dissolved Pb	0.1	mg/L
Total Hg	0.01	mg/L
Dissolved Se	0.05	mg/L
Dissolved V	0.1	mg/L
Dissolved Zn	25	mg/L
^{226}Ra and ^{228}Ra	30	pCi/L
^{3}H	20,000	pCi/L
Gross alpha	15	pCi/L

[a]NMWQCC 1995.

Table A-8. Wildlife Habitat Stream Standards[a]

The following narrative standard shall apply:

1. Except as provided below in Paragraph 2 of this section, no discharge shall contain any substance, including, but not limited to selenium, DDT, PCBs, and dioxin, at a level which, when added to background concentrations, can lead to bioaccumulation to toxic levels in any animal species. In the absence of site-specific information, this requirement shall be interpreted as establishing a stream standard of 2 µg per liter for total recoverable selenium and of 0.012 µg per liter for total mercury.
2. The discharge of substances that bioaccumulate in excess of levels specified above in Paragraph 1 is allowed if, and only to the extent that, the substances are present in the intake waters which are diverted and utilized prior to discharge, and then only if the discharger utilizes best available treatment technology to reduce the amount of bioaccumulating substances which are discharged.
3. Discharges to waters which are designated for wildlife habitat uses, but not for fisheries uses, shall not contain levels of ammonia or chlorine in amounts which reduce biological productivity and/or species diversity to levels below those which occur naturally and in no case shall contain chlorine in excess of 1 mg per liter nor ammonia in excess of levels that can be accomplished through best reasonable operating practices at existing treatment facilities.
4. A discharge which contains any heavy metal at concentrations in excess of the concentrations set forth in Section 3101.J.1 of these standards shall not be permitted in an amount, measured by total mass, which exceeds by more than 5% the amount present in the intake waters which are diverted and utilized prior to the discharge, unless the discharger has taken steps (an approved program to require industrial pretreatment or a corrosion program) appropriate to reduce influent concentration to the extent practicable.

[a]NMWQCC 1995.

Table A-9. Organic Analytical Methods

Test	SW-846 Method	Number of Compounds
Volatiles	624, 8260B	68
Semivolatiles	625, 8270C	69
PCB[a]	608, 8082, 8081	8
HE[b]	8330	14

[a] Polychlorinated biphenyls.
[b] High explosives.

Table A-10. Volatile Organic Compounds

Analytes	Limit of Quantitation Water (μg/L)
1,1,1,2-Tetrachloroethane	1
1,1,1-Trichloroethane	1
1,1,2,2-Tetrachloroethane	1
1,1,2-Trichloroethane	1
1,1-Dichloroethane	1
1,1-Dichloroethylene	1
1,1-Dichloropropene	1
1,2,3-Trichloropropane	1
1,2,4-Trimethylbenzene	1
1,2-Dibromo-3-chloropropane	1
1,2-Dibromoethane	1
1,2-Dichlorobenzene	1
1,2-Dichloroethane	1
1,2-Dichloropropane	1
1,3,5-Trimethylbenzene	1
1,3-Dichlorobenzene	1
1,3-Dichloropropane	1
1,4-Dichlorobenzene	1
2,2-Dichloropropane	1
2-Butanone	5
2-Chloroethylvinyl ether	5
2-Chlorotoluene	1
2-Hexanone	5
4-Chlorotoluene	1
4-Isopropyltoluene	1
4-Methyl-2-pentanone	5
Acetone	5
Acrolein	10
Acrylonitrile	10
Benzene	1

Table A-10. Volatile Organic Compounds (Cont.)

Analytes	Limit of Quantitation Water (μg/L)
Bromobenzene	1
Bromochloromethane	1
Bromodichloromethane	1
Bromoform	1
Bromomethane	1
Carbon disulfide	5
Carbon tetrachloride	1
Chlorobenzene	1
Chloroethane	1
Chloroform	1
Chloromethane	1
cis-1,3-Dichloropropylene	1
Dibromochloromethane	1
Dibromomethane	1
Dichlorodifluoromethane	1
Ethylbenzene	1
Hexachlorobutadiene	1
Iodomethane	5
Isopropylbenzene	1
m,p-Xylenes	2
Methylene chloride	5
Naphthalene	1
n-Butylbenzene	1
n-Propylbenzene	1
o-Xylene	1
sec-Butylbenzene	1
Styrene	1
tert-Butylbenzene	1
Tetrachloroethylene	1
Toluene	1
Toluene-d8	1
trans-1,2-Dichloroethylene	1
trans-1,3-Dichloropropylene	1
Trichloroethylene	1
Trichlorofluoromethane	1
Trichlorotrifluoroethane	5
Vinyl chloride	1
Xylenes (total)	3

Table A-11. Semivolatile Organic Compounds

Analytes	Limit of Quantitation Water (μg/L)	Sediments (mg/kg)
1,2,4-Trichlorobenzene	10	0.33
1,2-Dichlorobenzene	10	0.33
1,2-Diphenylhydrazine	10	0.33
1,3-Dichlorobenzene	10	0.33
1,4-Dichlorobenzene	10	0.33
2,4,5-Trichlorophenol	10	0.33
2,4,6-Trichlorophenol	10	0.33
2,4-Dichlorophenol	10	0.33
2,4-Dimethylphenol	10	0.33
2,4-Dinitrophenol	20	0.67
2,4-Dinitrotoluene	10	0.33
2,6-Dinitrotoluene	10	0.33
2-Chloronaphthalene	1	0.03
2-Chlorophenol	10	0.33
2-Methyl-4,6-dinitrophenol	10	0.33
2-Methylnaphthalene	1	0.03
2-Nitrophenol	10	0.33
2-Picoline	10	0.33
3,3'-Dichlorobenzidine	10	0.33
4-Bromophenylphenylether	10	0.33
4-Chloro-3-methylphenol	10	0.33
4-Chloroaniline	10	0.33
4-Chlorophenylphenylether	10	0.33
4-Nitrophenol	10	0.33
Acenaphthene	1	0.03
Acenaphthylene	1	0.03
Aniline	10	0.33
Anthracene	1	0.03
Benzidine	50	1.67
Benzo(a)anthracene	1	0.03
Benzo(a)pyrene	1	0.03
Benzo(b)fluoranthene	1	0.03
Benzo(ghi)perylene	1	0.03
Benzo(k)fluoranthene	1	0.03
Benzoic acid	20	0.67
Benzyl alcohol	10	0.33
bis(2-Chloroethoxy)methane	10	0.33
bis(2-Chloroethyl) ether	10	0.33
bis(2-Chloroisopropyl)ether	10	0.33
bis(2-Ethylhexyl)phthalate	10	0.03
Butylbenzylphthalate	10	0.33
Chrysene	1	0.03
Dibenzo(a,h)anthracene	1	0.03
Dibenzofuran	10	0.33

Table A-11. Semivolatile Organic Compounds (Cont.)

Analytes	Limit of Quantitation Water (µg/L)	Limit of Quantitation Sediments (mg/kg)
Diethylphthalate	10	0.33
Dimethylphthalate	10	0.33
Di-n-butylphthalate	10	0.33
Di-n-octylphthalate	10	0.33
Fluoranthene	1	0.03
Fluorene	1	0.03
Hexachlorobenzene	10	0.33
Hexachlorobutadiene	10	0.33
Hexachlorocyclopentadiene	10	0.33
Hexachloroethane	10	0.33
Indeno(1,2,3-cd)pyrene	1	0.03
Isophorone	10	0.33
m-Nitroaniline	10	0.33
Naphthalene	1	0.03
Nitrobenzene	10	0.33
N-Methyl-N-nitrosomethylamine	10	0.33
N-Nitrosodiphenylamine	10	0.07
N-Nitrosodipropylamine	10	0.33
o-Nitroaniline	10	0.33
p-(Dimethylamino)azobenzene	10	0.33
Pentachlorophenol	10	0.33
Phenanthrene	1	0.03
Phenol	10	0.33
Pyrene	1	0.03
Pyridine	10	0.33

Table A-12. Polychlorinated Biphenyls

Analytes	Limit of Quantitation Water (µg/L)	Limit of Quantitation Sediments (mg/kg)
Aroclor 1016	0.5	0.003
Aroclor 1221	0.5	0.003
Aroclor 1232	0.5	0.003
Aroclor 1242	0.5	0.003
Aroclor 1248	0.5	0.003
Aroclor 1254	0.5	0.003
Aroclor 1260	0.5	0.003
Aroclor 1262	0.5	0.003

Table A-13. High-Explosives Compounds		
	Limit of Quantitation	
Analytes	Water (μg/L	Sediments (mg/kg)
1,3,5-Trinitrobenzene	0.105	0.08
2,4,6-Trinitrotoluene	0.105	0.08
2,4-Dinitrotoluene	0.105	0.08
2,6-Dinitrotoluene	0.105	0.08
2-Amino-4,6-dinitrotoluene	0.105	0.08
4-Amino-2,6-dinitrotoluene	0.105	0.08
HMX	0.105	0.08
Nitrobenzene	0.105	0.08
RDX	0.105	0.08
Tetryl	0.105	0.08
m-Dinitrobenzene	0.105	0.08
m-Nitrotoluene	0.105	0.08
o-Nitrotoluene	0.105	0.08
p-Nitrotoluene	0.105	0.08

References

DOE 1988a: US Department of Energy, "Internal Dose Conversion Factors for Calculation of Dose to the Public," US Department of Energy report DOE/EH-0071 (July 1988).

DOE 1988b: US Department of Energy, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," US Department of Energy report DOE/EH-0070 (July 1988).

DOE 1990: US Department of Energy, "Radiation Protection of the Public and the Environment," US Department of Energy Order 5400.5 (February 8, 1990).

EPA 1989a: US Environmental Protection Agency, "40CFR 61, National Emission Standards for Hazardous Air Pollutants, Radionuclides; Final Rule and Notice of Reconsideration," Federal Register 54, 51 653-51 715 (December 15, 1989).

EPA 1989b: US Environmental Protection Agency, "National Interim Primary Drinking Water Regulations," Code of Federal Regulations, Title 40, Parts 141 and 142 (1989), and "National Secondary Drinking Water Regulations," Part 143 (1989).

ESH-17 2000: Air Quality Group, "Quality Assurance Project Plan for the Rad-NESHAP Compliance Project," Air Quality Group Document ESH-17-RN, R1 (January 2000).

ICRP 1988: International Commission on Radiological Protection, "Limits for Intakes of Radionuclides by Workers," ICRP Publication 30, Parts 1, 2, and 3, and their supplements, Annals of the ICRP 2(3/4) -8(4) (1979-1982), and Publication 30, Part 4, 19(4) (1988).

NCRP 1987: National Council on Radiation Protection and Measurements, "Recommendations on Limits for Exposure to Ionizing Radiation," NCRP report No. 91 (June 1987).

NMEIB 1995: New Mexico Environmental Improvement Board, "New Mexico Drinking Water Regulations," (as amended through January 1995).

NMWQCC 1995: New Mexico Water Quality Control Commission, "State of New Mexico Water Quality Standards for Interstate and Intrastate Streams," Section 3-101.K (as amended through January 23, 1995).

Units of Measurement

Throughout this report the International System of Units (SI) or metric system of measurements has been used, with some exceptions. For units of radiation activity, exposure, and dose, US Customary Units (that is, curie [Ci], roentgen [R], rad, and rem) are retained as the primary measurement because current standards are written in terms of these units. The equivalent SI units are the becquerel (Bq), coulomb per kilogram (C/kg), gray (Gy), and sievert (Sv), respectively.

Table B-1 presents prefixes used in this report to define fractions or multiples of the base units of measurements. Scientific notation is used in this report to express very large or very small numbers. Translating from scientific notation to a more traditional number requires moving the decimal point either left or right from the number. If the value given is 2.0×10^3, the decimal point should be moved three numbers (insert zeros if no numbers are given) to the **right** of its present location. The number would then read 2,000. If the value given is 2.0×10^{-5}, the decimal point should be moved five numbers to the **left** of its present location. The result would be 0.00002.

Table B-2 presents conversion factors for converting SI units into US Customary Units. Table B-3 presents abbreviations for common measurements.

Data Handling of Radiochemical Samples

Measurements of radiochemical samples require that analytical or instrumental backgrounds be subtracted to obtain net values. Thus, net values are sometimes obtained that are lower than the minimum detection limit of the analytical technique. Consequently, individual measurements can result in values of positive or negative numbers. Although a negative value does not represent a physical reality, a valid long-term average of many measurements can be obtained only if the very small and negative values are included in the population calculations (Gilbert 1975).

For individual measurements, uncertainties are reported as one standard deviation. The standard deviation is estimated from the propagated sources of analytical error.

Standard deviations for the station and group (off-site regional, off-site perimeter, and on-site) means are calculated using the following equation:

$$s = \sqrt{\frac{\sum_{i=1}^{N} \left(\bar{c} - c_i\right)^2}{(N - 1)}},$$

where

c_i = sample i,

$\bar{c}$ = mean of samples from a given station or group, and

N = number of samples a station or group comprises.

This value is reported as one standard deviation (1*s*) for the station and group means.

Tables

Table B-1. Prefixes Used with SI (Metric) Units

Prefix	Factor	Symbol
mega	1 000 000 or 10^6	M
kilo	1 000 or 10^3	k
centi	0.01 or 10^{-2}	c
milli	0.001 or 10–3	m
micro	0.000001 or 10^{-6}	µ
nano	0.000000001 or 10^{-9}	n
pico	0.000000000001 or 10^{-12}	p
femto	0.000000000000001 or 10^{-15}	f
atto	0.000000000000000001 or 10^{-18}	a

Table B-2. Approximate Conversion Factors for Selected SI (Metric) Units

Multiply SI (Metric) Unit	by	to Obtain US Customary Unit
Celsius (°C)	9/5 + 32	Fahrenheit (°F)
centimeters (cm)	0.39	inches (in.)
cubic meters (m^3)	35.3	cubic feet (ft^3)
hectares (ha)	2.47	acres
grams (g)	0.035	ounces (oz)
kilograms (kg)	2.2	pounds (lb)
kilometers (km)	0.62	miles (mi)
liters (L)	0.26	gallons (gal.)
meters (m)	3.28	feet (ft)
micrograms per gram (µg/g)	1	parts per million (ppm)
milligrams per liter (mg/L)	1	parts per million (ppm)
square kilometers (km^2)	0.386	square miles (mi^2)

Table B-3. Common Measurement Abbreviations and Measurement Symbols

aCi	attocurie
Bq	becquerel
Btu/yr	British thermal unit per year
Ci	curie
cm^3/s	cubic centimeters per second
cpm/L	counts per minute per liter
fCi/g	femtocurie per gram
ft	foot
ft^3/min	cubic feet per minute
ft^3/s	cubic feet per second
kg	kilogram
kg/h	kilogram per hour
lb/h	pound per hour
lin ft	linear feet
m^3/s	cubic meter per second
µCi/L	microcurie per liter
µCi/mL	microcurie per milliliter
µg/g	microgram per gram
µg/m^3	microgram per cubic meter
mL	milliliter
mm	millimeter
µm	micrometer
µmho/cm	micro mho per centimeter
mCi	millicurie
mg	milligram
mR	milliroentgen

Table B-3. Common Measurement Abbreviations and Measurement Symbols (Cont.)

m/s	meters per second
mrad	millirad
mrem	millirem
mSv	millisievert
nCi	nanocurie
nCi/dry g	nanocurie per dry gram
nCi/L	nanocurie per liter
ng/m^3	nanogram per cubic meter
pCi/dry g	picocurie per dry gram
pCi/g	picocurie per gram
pCi/L	picocurie per liter
pCi/m^3	picocurie per cubic meter
pCi/mL	picocurie per milliliter
pg/g	picogram per gram
pg/m^3	picogram per cubic meter
PM_{10}	small particulate matter (less than 10 µm diameter)
$PM_{2.5}$	small particulate matter (less than 2.5 µm diameter)
R	roentgen
s, SD, or σ	standard deviation
s.u.	standard unit
sq ft (ft^2)	square feet
TU	tritium unit
>	greater than
<	less than
≥	greater than or equal to
≤	less than or equal to
±	plus or minus
~	approximately

Reference

Gilbert 1975: R. O. Gilbert, "Recommendations Concerning the Computation and Reporting of Counting Statistics for the Nevada Applied Ecology Group," Batelle Pacific Northwest Laboratories report BNWL-B-368 (September 1975).

Description of Technical Areas and Their Associated Programs

Locations of the technical areas (TAs) operated by the Laboratory in Los Alamos County are shown in Figure 1-2. The main programs conducted at each of the areas are listed in this Appendix.

TA-0: The Laboratory has about 180,000 sq ft of leased space for training, support, architectural engineering design, and unclassified research and development in the Los Alamos town site and White Rock. The publicly accessible Community Reading Room and the Bradbury Science Museum are also located in the Los Alamos town site.

TA-2, Omega Site: Omega West Reactor, an 8-MW nuclear research reactor, is located here. It was placed into a safe shutdown condition in 1993 and was removed from the nuclear facilities list. The reactor will be transferred to the institution for placement into the decontamination and decommissioning (D&D) program beginning in 2006.

TA-3, Core Area: The Administration Complex contains the Director's office, administrative offices, and support facilities. Laboratories for several divisions are in this main TA of the Laboratory. Other buildings house central computing facilities, chemistry and materials science laboratories, earth and space science laboratories, physics laboratories, technical shops, cryogenics laboratories, the main cafeteria, and the Study Center. TA-3 contains about 50% of the Laboratory's employees and floor space.

TA-5, Beta Site: This site contains some physical support facilities such as an electrical substation, test wells, several archaeological sites, and environmental monitoring and buffer areas.

TA-6, Twomile Mesa Site: The site is mostly undeveloped and contains gas cylinder staging and vacant buildings pending disposal.

TA-8, GT Site (or Anchor Site West): This is a dynamic testing site operated as a service facility for the entire Laboratory. It maintains capability in all modern nondestructive testing techniques for ensuring quality of material, ranging from test weapons components to high-pressure dies and molds. Principal tools include radiographic techniques (x-ray machines with potentials up to 1,000,000 V and a 24-MeV betatron), radioisotope techniques, ultrasonic and penetrant testing, and electromagnetic test methods.

TA-9, Anchor Site East: At this site, fabrication feasibility and physical properties of explosives are explored. New organic compounds are investigated for possible use as explosives. Storage and stability problems are also studied.

TA-11, K Site: Facilities are located here for testing explosives components and systems, including vibration testing and drop testing, under a variety of extreme physical environments. The facilities are arranged so that testing may be controlled and observed remotely and so that devices containing explosives or radioactive materials, as well as those containing nonhazardous materials, may be tested.

TA-14, Q Site: This dynamic testing site is used for running various tests on relatively small explosive charges for fragment impact tests, explosives sensitivities, and thermal responses.

TA-15, R Site: This is the home of PHERMEX (the pulsed high-energy radiographic machine emitting x-rays), a multiple-cavity electron accelerator capable of producing a very large flux of x-rays for weapons development testing. It is also the site where DARHT (the dual-axis radiographic hydrotest facility) is being constructed. This site is also used for the investigation of weapons functioning and systems behavior in nonnuclear tests, principally through electronic recordings.

TA-16, S Site: Investigations at this site include development, engineering design, prototype manufacture, and environmental testing of nuclear weapons warhead systems. TA-16 is the site of the Weapons Engineering Tritium Facility for tritium handled in gloveboxes. Development and testing of high explosives, plastics, and adhesives and research on process development for manufacture of items using these and other materials are accomplished in extensive facilities.

TA-18, Pajarito Laboratory Site: This is a nuclear facility that studies both static and dynamic behavior of multiplying assemblies of nuclear materials. The Category I quantities of special nuclear materials (SNM) are used to support a wide variety of programs such as Stockpile Management, Stockpile Stewardship, Emergency Response, Nonproliferation, Safeguards, etc. Experiments near critical are operated by remote control using low-power reactors called critical assemblies. The machines are housed in buildings known as kivas and are used primarily to provide a controlled means of assembling a critical amount of fissionable material so that the effects of various shapes, sizes, and configurations can be studied. These machines are also used as a large-quantity source of fission neutrons for experimental purposes. In addition, this facility provides the capability to perform hands-on training and experiments with SNM in various configurations below critical.

TA-21, DP Site: This site has two primary research areas: DP West and DP East. DP West has been in the D&D program since 1992, and six buildings have been demolished. The programs conducted at DP West, primarily in inorganic and biochemistry, were relocated during 1997, and the remainder of the site was scheduled for D&D in future years. DP East is a tritium research site.

TA-22, TD Site: This site is used in the development of special detonators to initiate high-explosive systems. Fundamental and applied research in support of this activity includes investigating phenomena associated with initiating high explosives and research in rapid shock-induced reactions.

TA-28, Magazine Area A: This is an explosives storage area.

TA-33, HP Site: An old, high-pressure, tritium-handling facility located here is being phased out. An intelligence technology group and the National Radio Astronomy Observatory's Very Large Baseline Array Telescope are located at this site.

TA-35, Ten Site: This site is divided into five facility management units. Work here includes nuclear safeguards research and development that are concerned with techniques for nondestructive detection, identification, and analysis of fissionable isotopes. Research is also done on reactor safety, laser fusion, optical sciences, pulsed-power systems, high-energy physics, tritium fabrication, metallurgy, ceramic technology, and chemical plating.

TA-36, Kappa Site: Phenomena of explosives, such as detonation velocity, are investigated at this dynamic testing site.

TA-37, Magazine Area C: This is an explosives storage area.

TA-39, Ancho Canyon Site: The behavior of nonnuclear weapons is studied here, primarily by photographic techniques. Investigations are also made into various phenomenological aspects of explosives, interactions of explosives, explosions involving other materials, shock wave physics, equation state measurements, and pulsed-power systems design.

TA-40, DF Site: This site is used in the development of special detonators to initiate high-explosive systems. Fundamental and applied research in support of this activity includes investigating phenomena associated with the physics of explosives.

TA-41, W Site: Personnel at this site engage primarily in engineering design and development of nuclear components, including fabrication and evaluation of test materials for weapons.

TA-43, Health Research Laboratory: This site is adjacent to the Los Alamos Medical Center in the town site. Research performed at this site includes structural, molecular, and cellular radiobiology, biophysics, mammalian radiobiology, mammalian metabolism, biochemistry, and genetics. The Department of Energy Los Alamos Area Office is also located within TA-43.

TA-46, WA Site: This TA contains two facility management units. Activities include applied photochemistry research including the development of technology for laser isotope separation and laser enhancement of chemical processes. A new facility completed during 1996 houses research in inorganic and materials chemistry. The Sanitary Wastewater System Facility is located at the east end of this site. Environmental management operations are also located here.

TA-48, Radiochemistry Site: Laboratory scientists and technicians perform research and development (R&D) activities at this site on a wide range of chemical processes including nuclear and radiochemistry, geochemistry, biochemistry, actinide chemistry, and separations chemistry. Hot cells are used to produce medical radioisotopes.

TA-49, Frijoles Mesa Site: This site is currently restricted to carefully selected functions because of its location near Bandelier National Monument and past use in high-explosive and radioactive materials experiments. The Hazardous Devices Team Training Facility is located here.

TA-50, Waste Management Site: This site is divided into two facility management units, which include managing the industrial liquid and radioactive liquid waste received from Laboratory technical areas and activities that are part of the waste treatment technology effort.

TA-51, Environmental Research Site: Research and experimental studies on the long-term impact of radioactive waste on the environment and types of waste storage and coverings are performed at this site.

TA-52, Reactor Development Site: A wide variety of theoretical and computational activities related to nuclear reactor performance and safety are done at this site.

TA-53, Los Alamos Neutron Science Center: The Los Alamos Neutron Science Center, including the linear proton accelerator, the Manuel Lujan Jr. Neutron Scattering Center, and a medical isotope production facility is located at this TA. Also located at TA-53 are the Accelerator Production of Tritium Project Office, including the Low-Energy Demonstration Accelerator, and R&D activities in accelerator technology and high-power microwaves.

TA-54, Waste Disposal Site: This site is divided into two facility management units for the radioactive solid and hazardous chemical waste management and disposal operations and activities that are part of the waste treatment technology effort.

TA-55, Plutonium Facility Site: Processing of plutonium and research on plutonium metallurgy are done at this site.

TA-57, Fenton Hill Site: This site is located about 28 miles west of Los Alamos on the southern edge of the Valles Caldera in the Jemez Mountains and was the location of the Laboratory's now decommissioned Hot Dry Rock geothermal project. The site is used for the testing and development of downhole well-logging instruments and other technologies of interest to the energy industry. The high elevation and remoteness of the site make Fenton Hill a choice location for astrophysics experiments. A gamma ray observatory is located at the site.

TA-58: This site is reserved for multiuse experimental sciences requiring close functional ties to programs currently located at TA-3.

TA-59, Occupational Health Site: Occupational health and safety and environmental management activities are conducted at this site. Emergency management offices are also located here.

TA-60, Sigma Mesa: This area contains physical support and infrastructure facilities, including the Test Fabrication Facility and Rack Assembly and the Alignment Complex.

TA-61, East Jemez Road: This site is used for physical support and infrastructure facilities, including the Los Alamos County sanitary landfill.

TA-62: This site is reserved for multiuse experimental science, public and corporate interface, and environmental research and buffer zones.

TA-63: This is a major growth area at the Laboratory with expanding environmental and waste management functions and facilities. This area contains physical support facilities operated by Johnson Controls Northern New Mexico.

TA-64: This is the site of the Central Guard Facility and headquarters for the Laboratory Hazardous Materials Response Team.

TA-66: This site is used for industrial partnership activities.

TA-67: This is a dynamic testing area that contains significant archeological sites.

TA-68: This is a dynamic testing area that contains archeological and environmental study areas.

TA-69: This undeveloped TA serves as an environmental buffer for the dynamic testing area.

TA-70: This undeveloped TA serves as an environmental buffer for the high-explosives test area.

TA-71: This undeveloped TA serves as an environmental buffer for the high-explosives test area.

TA-72: This is the site of the Protective Forces Training Facility.

TA-73: This area is the Los Alamos Airport.

TA-74, Otowi Tract: This large area, bordering the Pueblo of San Ildefonso on the east, is isolated from most of the Laboratory and contains significant concentrations of archeological sites and an endangered species breeding area. This site also contains Laboratory water wells and future well fields.

Related Web Sites

For more information on environmental topics at Los Alamos National Laboratory, access the following Web sites:

http://lib-www.lanl.gov/cgi-bin/getfile?LA-13979.htm provides access to *Environmental Surveillance at Los Alamos during 2001*.

http://lib-www.lanl.gov/cgi-bin/getfile?00783121.pdf provides access to *Overview of Environmental Surveillance at Los Alamos during 2001*.

http://www.lanl.gov reaches the Los Alamos National Laboratory Web site.

http://www.energy.gov reaches the national Department of Energy Web site.

http://labs.ucop.edu provides information on the three laboratories managed by the University of California.

http://www.esh.lanl.gov/~AirQuality accesses LANL's Air Quality Group.

http://www.esh.lanl.gov/~esh18/ accesses LANL's Water Quality and Hydrology Group.

http://www.esh.lanl.gov/~esh19/ accesses LANL's Hazardous and Solid Waste Group.

http://www.esh.lanl.gov/%7Eesh20/ accesses LANL's Ecology Group.

http://erproject.lanl.gov provides information on LANL's Environmental Restoration Project.

activation products — Radioactive products generated as a result of neutrons and other subatomic particles interacting with materials such as air, construction materials, or impurities in cooling water. These activation products are usually distinguished, for reporting purposes, from fission products.

albedo dosimeters — Albedo dosimeters are used to measure neutrons around TA-18. They use a neutron-sensitive polyethylene phantom to capture neutron backscatter to simulate the human body.

alpha particle — A positively charged particle (identical to the helium nucleus) composed of two protons and two neutrons that are emitted during decay of certain radioactive atoms. Alpha particles are stopped by several centimeters of air or a sheet of paper.

ambient air — The surrounding atmosphere as it exists around people, plants, and structures. It is not considered to include the air immediately adjacent to emission sources.

aquifer — A saturated layer of rock or soil below the ground surface that can supply usable quantities of groundwater to wells and springs. Aquifers can be a source of water for domestic, agricultural, and industrial uses.

artesian well — A well in which the water rises above the top of the water-bearing bed.

background radiation — Ionizing radiation from sources other than the Laboratory. This radiation may include cosmic radiation; external radiation from naturally occurring radioactivity in the earth (terrestrial radiation), air, and water; internal radiation from naturally occurring radioactive elements in the human body; worldwide fallout; and radiation from medical diagnostic procedures.

beta particle — A negatively charged particle (identical to the electron) that is emitted during decay of certain radioactive atoms. Most beta particles are stopped by 0.6 cm of aluminum.

biota — The types of animal and plant life found in an area.

blank sample — A control sample that is identical, in principle, to the sample of interest, except that the substance being analyzed is absent. The measured value or signals in blanks for the analyte is believed to be caused by artifacts and should be subtracted from the measured value. This process yields a net amount of the substance in the sample.

blind sample — A control sample of known concentration in which the expected values of the constituent are unknown to the analyst.

BOD — Biochemical (biological) oxygen demand. A measure of the amount of oxygen in biological processes that breaks down organic matter in water; a measure of the organic pollutant load. It is used as an indicator of water quality.

CAA — Clean Air Act. The federal law that authorizes the Environmental Protection Agency (EPA) to set air quality standards and to assist state and local governments to develop and execute air pollution prevention and control programs.

CERCLA — Comprehensive Environmental Response, Compensation, and Liability Act of 1980. Also known as Superfund, this law authorizes the federal government to respond directly to releases of hazardous substances that may endanger health or the environment. The EPA is responsible for managing Superfund.

CFR — Code of Federal Regulations. A codification of all regulations developed and finalized by federal agencies in the *Federal Register*.

COC — Chain-of-Custody. A method for documenting the history and possession of a sample from the time of collection, through analysis and data reporting, to its final disposition.

contamination — (1) Substances introduced into the environment as a result of people's activities, regardless of whether the concentration is a threat to health (see pollution). (2) The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or personnel.

controlled area — Any Laboratory area to which access is controlled to protect individuals from exposure to radiation and radioactive materials.

Ci — Curie. Unit of radioactivity. One Ci equals 3.70 10^{10} nuclear transformations per second.

cosmic radiation — High-energy particulate and electromagnetic radiations that originate outside the earth's atmosphere. Cosmic radiation is part of natural background radiation.

CWA — Clean Water Act. The federal law that authorizes the EPA to set standards designed to restore and maintain the chemical, physical, and biological integrity of the nation's waters.

DOE — US Department of Energy. The federal agency that sponsors energy research and regulates nuclear materials used for weapons production.

dose — A term denoting the quantity of radiation energy absorbed.

- ***EDE*** — Effective dose equivalent. The hypothetical whole-body dose that would give the same risk of cancer mortality and serious genetic disorder as a given exposure but that may be limited to a few organs. The effective dose equivalent is equal to the sum of individual organ doses, each weighted by degree of risk that the organ dose carries. For example, a 100-mrem dose to the lung, which has a weighting factor of 0.12, gives an effective dose that is equivalent to 100 0.12 = 12 mrem.

  CEDE: committed effective dose equivalent

  TEDE: total effective dose equivalent

- ***maximum individual dose*** — The greatest dose commitment, considering all potential routes of exposure from a facility's operation, to an individual at or outside the

	Laboratory boundary where the highest dose rate occurs. It takes into account shielding and occupancy factors that would apply to a real individual.
population dose	The sum of the radiation doses to individuals of a population. It is expressed in units of person-rem. (For example, if 1,000 people each received a radiation dose of 1 rem, their population dose would be 1,000 person-rem.)
whole body dose	A radiation dose commitment that involves exposure of the entire body (as opposed to an organ dose that involves exposure to a single organ or set of organs).
EA	Environmental Assessment. A report that identifies potentially significant environmental impacts from any federally approved or funded project that may change the physical environment. If an EA shows significant impact, an Environmental Impact Statement is required.
effluent	A liquid waste discharged to the environment.
EIS	Environmental Impact Statement. A detailed report, required by federal law, on the significant environmental impacts that a proposed major federal action would have on the environment. An EIS must be prepared by a government agency when a major federal action that will have significant environmental impacts is planned.
emission	A gaseous waste discharged to the environment.
environmental compliance	The documentation that the Laboratory complies with the multiple federal and state environmental statutes, regulations, and permits that are designed to ensure environmental protection. This documentation is based on the results of the Laboratory's environmental monitoring and surveillance programs.
environmental monitoring	The sampling of contaminants in liquid effluents and gaseous emissions from Laboratory facilities, either by directly measuring or by collecting and analyzing samples in a laboratory.
environmental surveillance	The sampling of contaminants in air, water, sediments, soils, food-stuffs, and plants and animals, either by directly measuring or by collecting and analyzing samples in a laboratory.
EPA	Environmental Protection Agency. The federal agency responsible for enforcing environmental laws. Although state regulatory agencies may be authorized to administer some of this responsibility, EPA retains oversight authority to ensure protection of human health and the environment.
exposure	A measure of the ionization produced in air by x-ray or gamma ray radiation. (The unit of exposure is the roentgen.)
external radiation	Radiation originating from a source outside the body.
gallery	An underground collection basin for spring discharges.

gamma radiation Short-wavelength electromagnetic radiation of nuclear origin that has no mass or charge. Because of its short wavelength (high energy), gamma radiation can cause ionization. Other electromagnetic radiation (such as microwaves, visible light, and radiowaves) has longer wavelengths (lower energy) and cannot cause ionization.

GENII Computer code used to calculate doses from all pathways (air, water, foodstuffs, and soil).

gross alpha The total amount of measured alpha activity without identification of specific radionuclides.

gross beta The total amount of measured beta activity without identification of specific radionuclides.

groundwater Water found beneath the surface of the ground. Groundwater usually refers to a zone of complete water saturation containing no air.

^{3}H Tritium.

half-life, radioactive The time required for the activity of a radioactive substance to decrease to half its value by inherent radioactive decay. After two half-lives, one-fourth of the original activity remains (1/2   1/2), after three half-lives, one-eighth (1/2   1/2   1/2), and so on.

hazardous waste Wastes exhibiting any of the following characteristics: ignitability, corrosivity, reactivity, or yielding toxic constituents in a leaching test. In addition, EPA has listed as hazardous other wastes that do not necessarily exhibit these characteristics. Although the legal definition of hazardous waste is complex, the term generally refers to any waste that EPA believes could pose a threat to human health and the environment if managed improperly. Resource Conservation and Recovery Act (RCRA) regulations set strict controls on the management of hazardous wastes.

hazardous waste constituent The specific substance in a hazardous waste that makes it hazardous and therefore subject to regulation under Subtitle C of RCRA.

HSWA Hazardous and Solid Waste Amendments of 1984 to RCRA. These amendments to RCRA greatly expanded the scope of hazardous waste regulation. In HSWA, Congress directed EPA to take measures to further reduce the risks to human health and the environment caused by hazardous wastes.

hydrology The science dealing with the properties, distribution, and circulation of natural water systems.

internal radiation Radiation from a source within the body as a result of deposition of radionuclides in body tissues by processes such as ingestion, inhalation, or implantation. Potassium-40, a naturally occurring radionuclide, is a major source of internal radiation in living organisms. Also called self-irradiation.

ionizing radiation Radiation possessing enough energy to remove electrons from the substances through which it passes. The primary contributors to

	ionizing radiation are radon, cosmic and terrestrial sources, and medical sources such as x-rays and other diagnostic exposures.
isotopes	Forms of an element having the same number of protons in their nuclei but differing in the number of neutrons. Isotopes of an element have similar chemical behaviors but can have different nuclear behaviors. • long-lived isotope - A radionuclide that decays at such a slow rate that a quantity of it will exist for an extended period (half-life is greater than three years). • short-lived isotope - A radionuclide that decays so rapidly that a given quantity is transformed almost completely into decay products within a short period (half-life is two days or less).
LLW	Low-level waste. The level of radioactive contamination in LLW is not strictly defined. Rather, LLW is defined by what it is not. It does not include nuclear fuel rods, wastes from processing nuclear fuels, transuranic (TRU) waste, or uranium mill tailings.
MCL	Maximum contaminant level. Maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet of the ultimate user of a public water system (see Appendix A and Table A-6). The MCLs are specified by the EPA.
MEI	Maximally exposed individual. The average exposure to the population in general will always be less than to one person or subset of persons because of where they live, what they do, and their individual habits. To try to estimate the dose to the MEI, one tries to find that population subgroup (and more specifically, the one individual) that potentially has the highest exposure, intake, etc. This becomes the MEI.
mixed waste	Waste that contains a hazardous waste component regulated under Subtitle C of the RCRA and a radioactive component consisting of source, special nuclear, or byproduct material regulated under the federal Atomic Energy Act (AEA).
mrem	Millirem. See definition of rem. The dose equivalent that is one-thousandth of a rem.
NEPA	National Environmental Policy Act. This federal legislation, passed in 1969, requires federal agencies to evaluate the impacts of their proposed actions on the environment before decision making. One provision of NEPA requires the preparation of an EIS by federal agencies when major actions significantly affecting the quality of the human environment are proposed.
NESHAP	National Emission Standards for Hazardous Air Pollutants. These standards are found in the CAA; they set limits for such pollutants as beryllium and radionuclides.
nonhazardous waste	Chemical waste regulated under the Solid Waste Act, Toxic Substances Control Act, and other regulations, including asbestos, PCB, infectious

wastes, and other materials that are controlled for reasons of health, safety, and security.

NPDES — National Pollutant Discharge Elimination System. This federal program, under the Clean Water Act, requires permits for discharges into surface waterways.

nuclide — A species of atom characterized by the constitution of its nucleus. The nuclear constitution is specified by the number of protons, number of neutrons, and energy content—or alternately, by the atomic number, mass number, and atomic mass. To be a distinct nuclide, the atom must be capable of existing for a measurable length of time.

outfall — The location where wastewater is released from a point source into a receiving body of water.

PCB — Polychlorinated biphenyls. A family of organic compounds used since 1926 in electric transformers, lubricants, carbonless copy paper, adhesives, and caulking compounds. PCB are extremely persistent in the environment because they do not break down into new and less harmful chemicals. PCB are stored in the fatty tissues of humans and animals through the bioaccumulation process. EPA banned the use of PCB, with limited exceptions, in 1976.

PDL — Public Dose Limit. The new term for Radiation Protection Standards, a standard for external and internal exposure to radioactivity as defined in DOE Order 5400.5 (see Appendix A and Table A-1).

perched groundwater — A groundwater body above a slow-permeablity rock or soil layer that is separated from an underlying main body of groundwater by a vadose zone.

person-rem — A quantity used to describe the radiological dose to a population. Population doses are calculated according to sectors, and all people in a sector are assumed to get the same dose. The number of person-rem is calculated by summing the modeled dose to all receptors in all sectors. Therefore, person-rem is the sum of the number of people times the dose they receive.

pH — A measure of the hydrogen ion concentration in an aqueous solution. Acidic solutions have a pH less than 7, basic solutions have a pH greater than 7, and neutral solutions have a pH of 7.

pollution — Levels of contamination that may be objectionable (perhaps because of a threat to health [see contamination]).

point source — An identifiable and confined discharge point for one or more water pollutants, such as a pipe, channel, vessel, or ditch.

ppb — Parts per billion. A unit measure of concentration equivalent to the weight/volume ratio expressed as g/L or ng/mL. Also used to express the weight/weight ratio as ng/g or g/kg.

ppm Parts per million. A unit measure of concentration equivalent to the weight/volume ratio expressed as mg/L. Also used to express the weight/weight ratio as g/g or mg/kg.

QA Quality assurance. Any action in environmental monitoring to ensure the reliability of monitoring and measurement data. Aspects of quality assurance include procedures, interlaboratory comparison studies, evaluations, and documentation.

QC Quality control. The routine application of procedures within environmental monitoring to obtain the required standards of performance in monitoring and measurement processes. QC procedures include calibration of instruments, control charts, and analysis of replicate and duplicate samples.

rad Radiation absorbed dose. The rad is a unit for measuring energy absorbed in any material. Absorbed dose results from energy being deposited by the radiation. It is defined for any material. It applies to all types of radiation and does not take into account the potential effect that different types of radiation have on the body.

1 rad = 1,000 millirad (mrad)

radionuclide An unstable nuclide capable of spontaneous transformation into other nuclides through changes in its nuclear configuration or energy level. This transformation is accompanied by the emission of photons or particles.

RESRAD A computer modeling code designed to model radionuclide transport in the environment.

RCRA Resource Conservation and Recovery Act of 1976. RCRA is an amendment to the first federal solid waste legislation, the Solid Waste Disposal Act of 1965. In RCRA, Congress established initial directives and guidelines for EPA to regulate hazardous wastes.

release Any discharge to the environment. Environment is broadly defined as water, land, or ambient air.

rem Roentgen equivalent man. The rem is a unit for measuring dose equivalence. It is the most commonly used unit and pertains only to people. The rem takes into account the energy absorbed (dose) and the biological effect on the body (quality factor) from the different types of radiation.

rem = rad quality factor

1 rem = 1,000 millirem (mrem)

SAL Screening Action Limit. A defined contaminant level that if exceeded in a sample requires further action.

SARA Superfund Amendments and Reauthorization Act of 1986. This act modifies and reauthorizes CERCLA. Title III of this act is known as the Emergency Planning and Community Right-to-Know Act of 1986.

saturated zone Rock or soil where the pores are completely filled with water, and no air is present.

SWMU Solid waste management unit. Any discernible site at which solid wastes have been placed at any time, regardless of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released, such as waste tanks, septic tanks, firing sites, burn pits, sumps, landfills (material disposal areas), outfall areas, canyons around LANL, and contaminated areas resulting from leaking product storage tanks (including petroleum).

terrestrial radiation Radiation emitted by naturally occurring radionuclides such as internal radiation source; the natural decay chains of uranium-235, uranium-238, or thorium-232; or cosmic-ray-induced radionuclides in the soil.

TLD Thermoluminescent dosimeter. A material (the Laboratory uses lithium fluoride) that emits a light signal when heated to approximately 300°C. This light is proportional to the amount of radiation (dose) to which the dosimeter was exposed.

TRU Transuranic waste. Waste contaminated with long-lived transuranic elements in concentrations within a specified range established by DOE, EPA, and Nuclear Regulatory Agency. These are elements shown above uranium on the chemistry periodic table, such as plutonium, americium, and neptunium, that have activities greater than 100 nanocuries per gram.

TSCA Toxic Substances Control Act. TSCA is intended to provide protection from substances manufactured, processed, distributed, or used in the United States. A mechanism is required by the act for screening new substances before they enter the marketplace and for testing existing substances that are suspected of creating health hazards. Specific regulations may also be promulgated under this act for controlling substances found to be detrimental to human health or to the environment.

tuff Rock formed from compacted volcanic ash fragments.

uncontrolled area An area beyond the boundaries of a controlled area (see controlled area in this glossary).

unsaturated zone See vadose zone in this glossary.

UST Underground storage tank. A stationary device, constructed primarily of nonearthen material, designed to contain petroleum products or hazardous materials. In a UST, 10% or more of the volume of the tank system is below the surface of the ground.

vadose zone The partially saturated or unsaturated region above the water table that does not yield water for wells. Water in the vadose zone is held to rock or soil particles by capillary forces and much of the pore space is filled with air.

water table	The water level surface below the ground at which the unsaturated zone ends and the saturated zone begins. It is the level to which a well that is screened in the unconfined aquifer would fill with water.
water year	October through September.
watershed	The region draining into a river, a river system, or a body of water.
wetland	A lowland area, such as a marsh or swamp, that is inundated or saturated by surface water or groundwater sufficient to support hydrophytic vegetation typically adapted for life in saturated soils.
wind rose	A diagram that shows the frequency and intensity of wind from different directions at a particular place.
worldwide fallout	Radioactive debris from atmospheric weapons tests that has been deposited on the earth's surface after being airborne and cycling around the earth.

AA-2	Internal Assessment Group (LANL)
AEC	Atomic Energy Commission
AIP	Agreement in Principle
AIRFA	American Indian Religious Freedom Act
AIRNET	Air Monitoring Network
AL	Albuquerque Operations Office (DOE)
AO	Administrative Order
AQCR	Air Quality Control Regulation (New Mexico)
ARPA	Archeological Resources Protection Act
ATDSR	Agency for Toxic Substances and Disease Registry
BAER	Burned Area Rehabilitation Team
BCG	Biota Concentration Guides
BEIR	biological effects of ionizing radiation
BOD	biochemical/biological oxygen demand
BRMP	Biological Redources Management Plan
BSRL	baseline statistical reference level
BTEX	total aromatic hydrocarbon
Btu	British thermal unit
C	Chemistry Division
CAA	Clean Air Act
C-ACS	Analytical Chemistry Services Group
CAS	Connected Action Statement
CCNS	Concerned Citizens for Nuclear Safety
CEDE	committed effective dose equivalent
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRO	Community Relations Office (LANL)
CMR	Chemistry and Metallurgy Research (LANL building)
CO	compliance order
COC	chain-of-custody
COD	chemical oxygen demand
COE	Army Corps of Engineers
CRMP	Cultural Resources Management Plan
CWA	Clean Water Act
CY	calendar year
DAC	derived air concentration (DOE)
DARHT	Dual Axis Radiographic Hydrotest facility
DCG	Derived Concentration Guide (DOE)
D&D	decontamination and decommissioning
DEC	DOE Environmental Checklist
DOE	Department of Energy
DOE-EM	DOE, Environmental Management
DOU	Document of Understanding

EA	Environmental Assessment
EDE	effective dose equivalent
EIS	Environmental Impact Statement
EML	Environmental Measurements Laboratory
EO	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ER	Environmental Restoration
ESH	Environment, Safety, & Health
ESH-4	Health Physics Measurements Group (LANL)
ESH-13	ESH Training Group (LANL)
ESH-14	Quality Assurance Support Group (LANL)
ESH-17	Air Quality Group (LANL)
ESH-18	Water Quality & Hydrology Group (LANL)
ESH-19	Hazardous & Solid Waste Group (LANL)
ESH-20	Ecology Group (LANL)
ESO	Environmental Stewardship Office (LANL)
EST	Ecological Studies Team (ESH-20)
FFCA	Federal Facilities Compliance Agreement
FFCAct	Federal Facilities Compliance Act
FFCAgreement	RCRA Federal Facility Compliance Agreement
FFCO	Federal Facility Compliance Order
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FIMAD	Facility for Information Management, Analysis, and Display
FONSI	Finding of No Significant Impact
FWO	Facilities and Waste Operations Division (LANL)
FY	fiscal year
GENII	Generation II
GIS	geographic information system
G/MAP	gaseous/mixed air activation products
GPS	global positioning system
GWPMPP	Groundwater Protection Management Program Plan
HAP	hazardous air pollutants
HAZWOPER	hazardous waste operations (training class)
HE	high-explosive
HEWTP	High-Explosive Wastewater Treatment Plant
HMPT	Hazardous Materials Packaging and Transportation
HPTL	High Pressure Tritium Labortory
HPAL	Health Physics Analytical Laboratory
HSWA	Hazardous and Solid Waste Amendments
HWA	Hazardous Waste Act (New Mexico)
HWMR	Hazardous Waste Management Regulations (New Mexico)
ICRP	International Commission on Radiological Protection
IRMP	Integrated Resources Management Plan

JCNNM	Johnson Controls Northern New Mexico
JENV	JCNNM Environmental Laboratory
LAAO	Los Alamos Area Office (DOE)
LANSCE	Los Alamos Neutron Science Center
LANL	Los Alamos National Laboratory (or the Laboratory)
LEDA	Low-Energy Demonstration Accelerator
LLW	low-level radioactive waste
LLMW	low-level mixed waste
LOD	limits of detection
LOQ	limit of quantitation
MAP	Mitigation Action Plan
MCL	maximum contaminant level
MDA	minimum detectable activity
MEI	maximally exposed individual
MRL	minimum risk level
MSGP	Multi-Sector General Permit
NAGPRA	Native American Grave Protection and Repatriation Act
NCB	NEPA, Cultural, and Biological
NCF	neutron correction factor
NCRP	National Council on Radiation Protection and Measurements
NEPA	National Environmental Policy Act
NERF	NEPA Review Form
NESHAP	National Emission Standards for Hazardous Air Pollutants
NEWNET	Neighborhood Environmental Watch Network
NHPA	National Historic Preservation Act
NMDA	New Mexico Department of Agriculture
NMDOB	New Mexico DOE Oversight Bureau
NMED	New Mexico Environment Department
NMED-SWQB	New Mexico Environment Department's Surface Water Quality Bureau
NMEIB	New Mexico Environmental Improvement Board
NMWQCA	New Mexico Water Quality Control Act
NMWQCC	New Mexico Water Quality Control Commission
NPDES	National Pollutant Discharge Elimination System
NRC	US Nuclear Regulatory Commission
NTISV	Nontraditional In Situ Vitrification
NWP	Nationwide Work Permit
OB/OD	open burning/open detonation
OCP	organochlorine pesticides
ODS	ozone depleting substance
O&G	oil and grease
OHL	Occupational Health Laboratory (LANL)
OSHA	Occupational Safety and Health Act/Administration
PCB	polychlorinated biphenyls
PDL	public dose limit

PE	performance evaluation
PHERMEX	Pulsed high-energy radiographic machine emitting x-rays
ppb	parts per billion
ppm	parts per million
PRS	potential release site
P/VAP	particulate/vapor activation products
QA	quality assurance
QAP	Quality Assurance Program
QC	quality control
RAC	Risk Assessment Corporation
RAWS	Remote Automated Weather System
RCRA	Resource Conservation and Recovery Act
RD&D	research, development, and demonstration
RESRAD	residual radioactive material computer code
RLWTF	Radioactive Liquid Waste Treatment Facility (LANL)
RSRL	regional statistical reference level
SA	supplement assessment
SAL	screening action level
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SEA	Special Environmental Analysis
SHPO	State Historic Preservation Officer (New Mexico)
SLD	Scientific Laboratory Division (New Mexico)
SOC	synthetic organic compound
SOW	statement of work
SPCC	Spill Prevention Control and Countermeasures
SVOC	semivolatile organic compound
SWA	Solid Waste Act
SWEIS	site-wide environmental impact statement
SWIPO	Site-Wide Projects Office
SWPP	Storm Water Prevention Plan
SWMR	solid waste management regulations
SWMU	solid waste management unit
SWS	Sanitary Wastewater Systems Facility (LANL)
TA	Technical Area
TDS	total dissolved solids
T&E	threatened and endangered
TEDE	total effective dose equivalent
TLD	thermoluminescent dosimeter
TLDNET	thermoluminescent dosimeter network
TRI	toxic chemical release inventory
TRU	transuranic waste
TRPH	total recoverable petroleum hydrocarbon
TSCA	Toxic Substances Control Act
TSFF	Tritium Science and Fabrication Facility

TSS	total suspended solids
TTHM	total trihalomethane
TWISP	Transuranic Waste Inspectable Storage Project (LANL)
UC	University of California
USFS	United States Forest Service
USGS	United States Geological Survey
UST	underground storage tank
VAP	vaporous activation products
VCA	voluntary corrective action
VOC	volatile organic compound
WASTENET	Waste Management Areas Network (for air monitoring)
WETF	Weapons Engineering Tritium Facility
WM	Waste Management (LANL)
WSC	Waste Stream Characterization
WWW	World Wide Web

Elemental and Chemical Nomenclature

Actinium	Ac
Aluminum	Al
Americium	Am
Argon	Ar
Antimony	Sb
Arsenic	As
Astatine	At
Barium	Ba
Berkelium	Bk
Beryllium	Be
Bicarbonate	HCO_3
Bismuth	Bi
Boron	B
Bromine	Br
Cadmium	Cd
Calcium	Ca
Californium	Cf
Carbon	C
Cerium	Ce
Cesium	Cs
Chlorine	Cl
Chromium	Cr
Cobalt	Co
Copper	Cu
Curium	Cm
Cyanide	CN
Carbonate	CO_3
Dysprosium	Dy
Einsteinium	Es
Erbium	Er
Europium	Eu
Fermium	Fm
Fluorine	F
Francium	Fr
Gadolinium	Gd
Gallium	Ga
Germanium	Ge
Gold	Au
Hafnium	Hf
Helium	He
Holmium	Ho
Hydrogen	H
Hydrogen oxide	H_2O
Indium	In
Iodine	I
Iridium	Ir
Iron	Fe
Krypton	Kr
Lanthanum	La
Lawrencium	Lr (Lw)
Lead	Pb
Lithium	Li
Lithium fluoride	LiF
Lutetium	Lu
Magnesium	Mg
Manganese	Mn
Mendelevium	Md
Mercury	Hg
Molybdenum	Mo
Neodymium	Nd
Neon	Ne
Neptunium	Np
Nickel	Ni
Niobium	Nb
Nitrate (as Nitrogen)	NO_3-N
Nitrite (as Nitrogen)	NO_2-N
Nitrogen	N
Nitrogen dioxide	NO_2
Nobelium	No
Osmium	Os
Oxygen	O
Palladium	Pd
Phosphaeus	P
Phosphate (as Phosphous)	PO_4-P
Platinum	Pt
Plutonium	Pu
Polonium	Po
Potassium	K
Praseodymium	Pr
Promethium	Pm
Protactinium	Pa
Radium	Ra
Radon	Rn
Rhenium	Re
Rhodium	Rh
Rubidium	Rb
Ruthenium	Ru
Samarium	Sm
Scandium	Sc
Selenium	Se
Silicon	Si
Silver	Ag
Sodium	Na
Stronium	Sr
Sulfate	SO_4
Sulfite	SO_3
Sulfur	S
Tantalum	Ta
Technetium	Tc
Tellurium	Te
Terbium	Tb
Thallium	Tl
Thorium	Th
Thulium	Tm
Tin	Sn
Titanium	Ti
Tritiated water	HTO
Tritium	^3H
Tungsten	W
Uranium	U
Vanadium	V
Xenon	Xe
Ytterbium	Yb
Yttrium	Y
Zinc	Zn
Zirconium	Zr

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- The New Mexican, Santa Fe, NM
- The Reporter, Santa Fe, NM
- The Rio Grande Sun, Española, NM
- The Taos News, Taos, NM
- Albuquerque Journal, Albuquerque, NM
- Albuquerque Journal North, Santa Fe, NM
- Albuquerque Tribune, Albuquerque, NM
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Group ESH-19, Hazardous and Solid Waste
Group ESH-20, Ecology Group
Other Laboratory Groups

The following Los Alamos National Laboratory organizations perform environmental surveillance, ensure environmental compliance, and provide environmental data for this report:

Meteorology and Air Quality Group, RRES-MAQ (Jean Dewart, Coordinator)
Water Quality and Hydrology Group, RRES-WQH (David B. Rogers and Robert Beers, Coordinators)
Solid Waste Regulatory Compliance Group, RRES-SWRC (Karen Lyncoln, Coordinator)
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Technical coordination by Lars Soholt and John Huchton, Group RRES-ECO

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NATIONAL LABORATORY

Los Alamos, New Mexico 87545
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