

# Sandia National Laboratories/New Mexico 1994 Site Environmental Report

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# Summary Pamphlet Summary Pamphlet

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Sandia National Laboratories at a Glance .....	3
Radiation Facts .....	4
What is Radiation and Where Does it Come From? .....	4
Sources of Radiation .....	5
Environmental Monitoring .....	6
Terrestrial Surveillance .....	6
Air Monitoring .....	8
Wastewater Monitoring .....	10
Groundwater Monitoring .....	11
Waste Management .....	13
Environmental Restoration .....	14
Quality Assurance .....	15
Question and Answer Section .....	15
Touring Sandia National Laboratories .....	16
For More Information .....	16



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As required in U.S. Department of Energy (DOE) Order 5400.1, a Site Environmental Report (SER) has been prepared for Sandia National Laboratories/New Mexico (SNL/NM) for 1994. This summary of that report contains environmental data that characterize site environmental management performance, confirm compliance with federal, state, and local environmental standards and requirements, and highlight significant programs and efforts. The SER represents a key component of the DOE's effort to keep the public informed about environmental conditions at SNL/NM, contains summary information about the radiological and nonradiological conditions of the site environment, and identifies trends with regard to effluent releases and environmental conditions.

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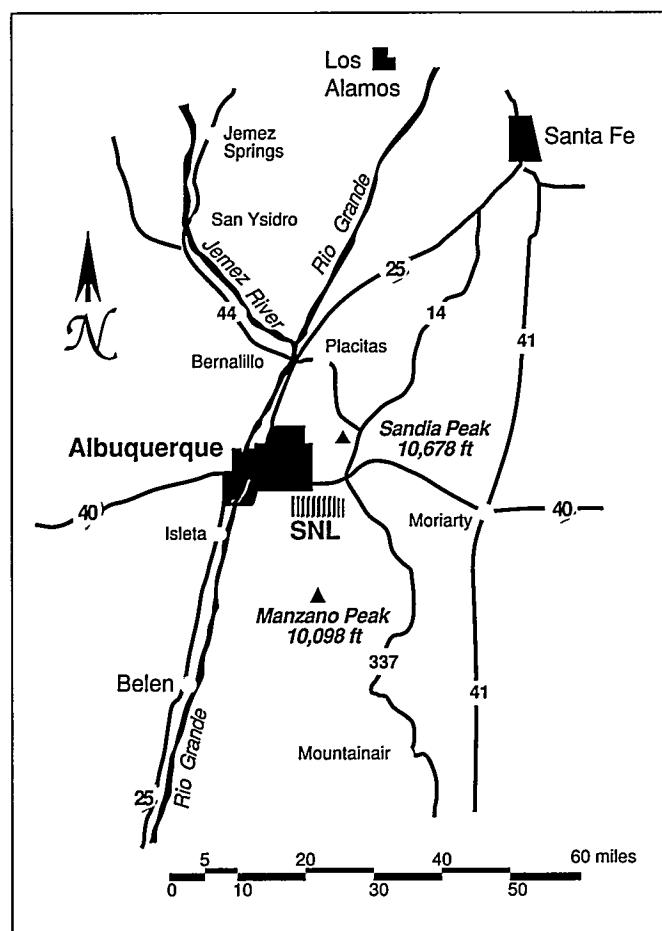
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# Sandia National Laboratories at a Glance

Sandia National Laboratories/New Mexico (SNL/NM) is managed and operated by Sandia Corporation, a prime contractor of the U.S. Department of Energy (DOE). Sandia Corporation is a wholly owned subsidiary of Lockheed Martin Corporation.

The laboratory consists of five technical areas and several remote test areas situated on the eastern half of the 118-square-mile Kirtland Air Force Base (KAFB). The closest population centers are the City of Albuquerque and the Isleta Indian Reservation (Figure 1).

SNL/NM is located southeast of Albuquerque on KAFB at the foot of the Manzano Mountains. East of KAFB, an area of the Manzano Mountains has been withdrawn from the U.S. Forest Service for the exclusive use of the U.S. Air Force and DOE.



SNL/NM's major responsibility is meeting national needs in nuclear weapons and related defense systems, energy security, and environmental integrity. Its mission includes weaponization of nuclear explosives and the designing of arming, fusing, and firing systems used in nuclear bombs. Safety, reliability, and survivability of weapon systems receive primary emphasis.

Other projects include nuclear reactor safety studies for the U.S. Nuclear Regulatory Commission, development of safe transport and storage systems for special nuclear materials, radioactive waste disposal techniques and site studies, pulsed power research, thermonuclear fusion research, solar energy research, and fossil fuel and geothermal energy research.

Figure 1. Albuquerque Regional Setting

# Radiation Facts

## What Is Radiation and Where Does It Come From?

All matter is made up of extremely small particles called atoms. Atoms are bundles of even smaller particles called protons, neutrons, and electrons. When an atom has the proper mix of protons and neutrons, it is stable, or nonradioactive; however, because of natural or man-made processes, some atoms do not have the proper mix of protons and neutrons. In this case, these unstable atoms break apart, or decay, in an attempt to become stable. As atoms decay, energy is released in the form of particles and/or electromagnetic waves; this energy is called radiation. Radiation exists in different forms: alpha particles, beta particles, and gamma rays (Figure 2). Not all radioactive materials emit all three types of radiation, and each type can be blocked by different materials.

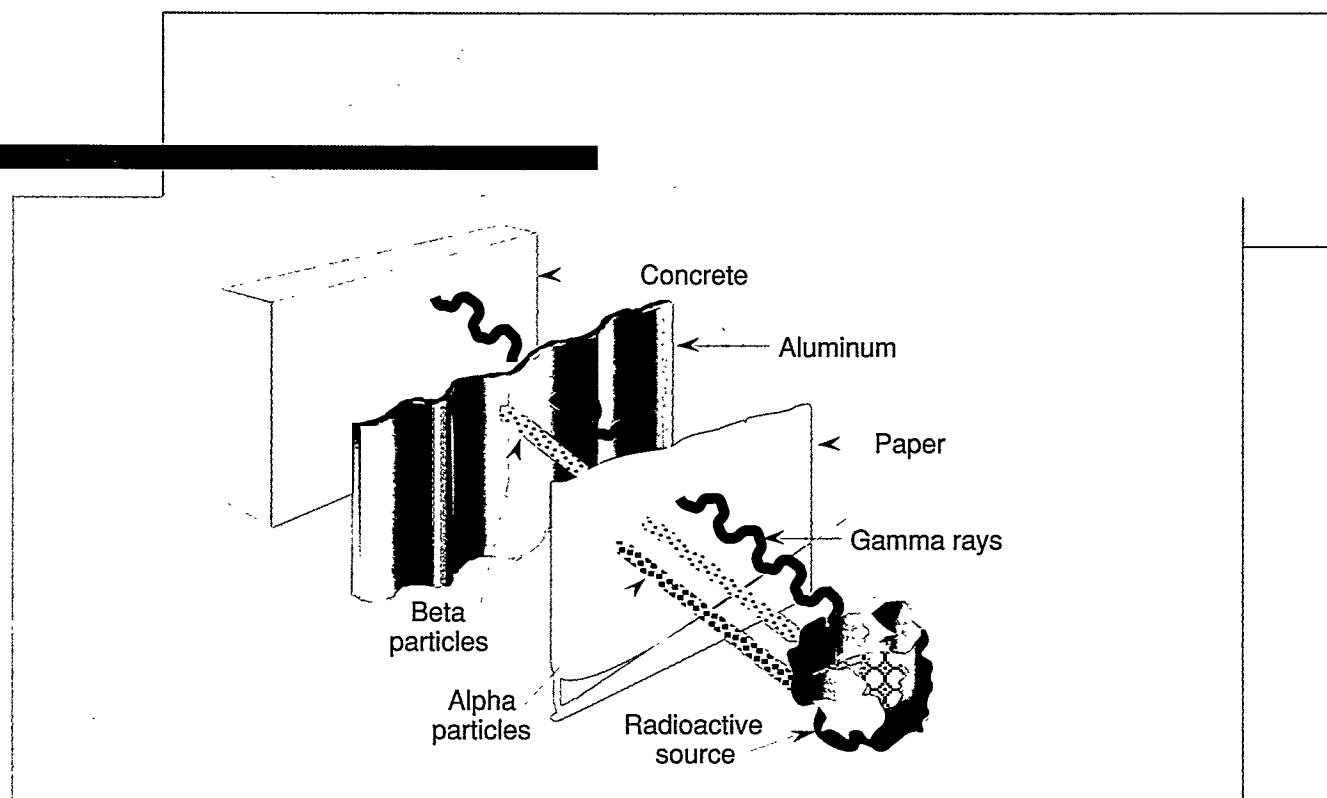
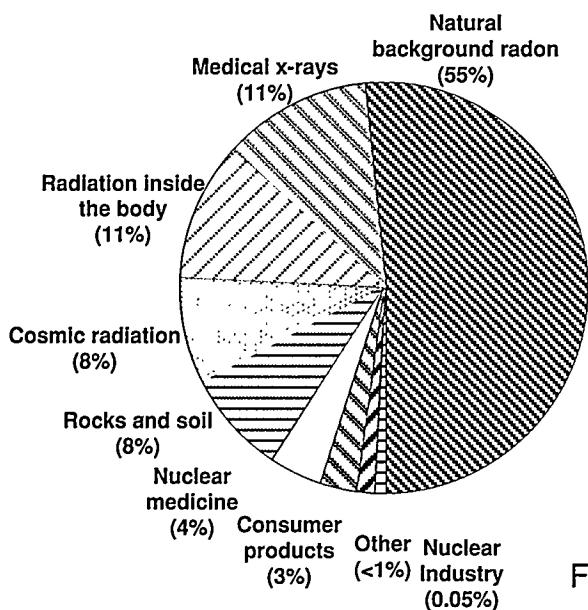


Figure 2. Types of Radiation. Skin or a sheet of paper acts as a barrier to alpha particles. Aluminum foil blocks beta particles; gamma rays pass through both of these barriers but are blocked by concrete.

# Sources of Radiation

Radiation, or radiant energy, is in the form of waves or particles moving through space. Gamma rays, x-rays, and alpha and beta particles are examples of ionizing radiation. Ionizing radiation is capable of removing electrons from atoms and turning them into ions. This process causes biological damage and is potentially harmful to human health. Visible light, heat, and radio waves are examples of nonionizing radiation. When people feel warmth from sunlight, they are actually absorbing the energy emitted by the sun. In the discussion that follows, the term radiation is used to describe ionizing radiation.

There are two major categories of radiation sources: natural and man-made. Even though people cannot feel, taste, see, or hear radiation, it is everywhere, and radiation from natural sources is much more common than that from man-made sources.



Natural radiation has always been present, and every person who has ever lived has been exposed to it (Figure 3). Exposure to man-made radiation varies greatly based on individual product choices, lifestyles, and medical treatment (Figure 4).

## Natural Radiation

- Cosmic
- Terrestrial
- Internal

## Man-made Radiation

- Consumer products
- Medical sources
- Other resources

Figure 3. Sources of Radiation

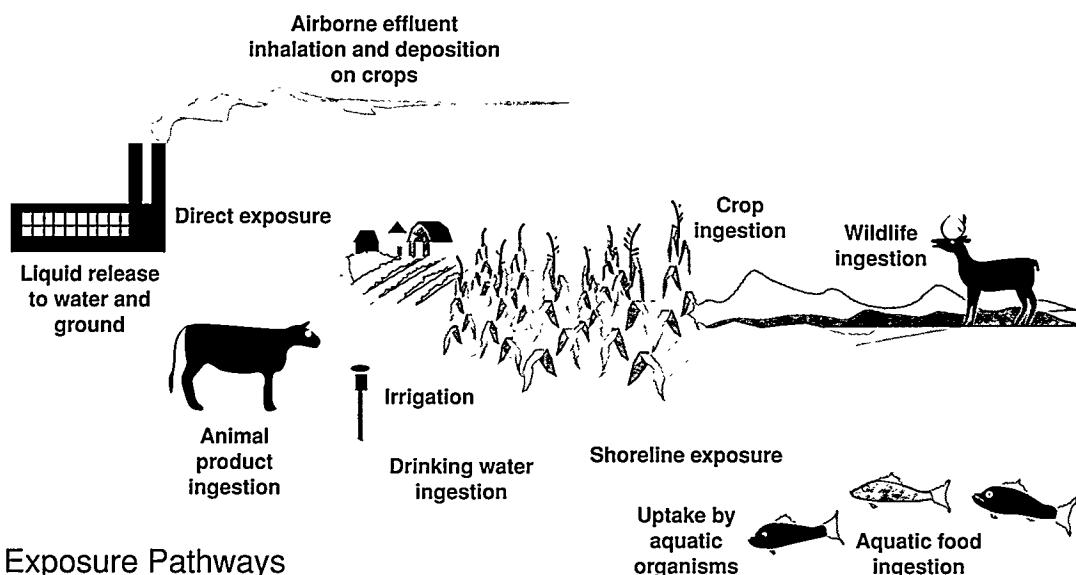


Figure 4. Exposure Pathways

# Environmental Monitoring

Monitoring at SNL/NM is necessary to ensure that radioactive and nonradioactive contaminants are not migrating off-site. Federal, state, and local regulations determine what is excessive, that is, what the discharge limits are (Figure 5).

SNL/NM's environmental monitoring program consists of:

- Terrestrial surveillance
- Air quality monitoring
- Water quality monitoring

## How does SNL/NM choose sampling locations?

On-Site: SNL/NM locations near areas of known contamination, potential sources of contamination, or areas where contamination would be expected to accumulate.

Perimeter: Locations at the SNL/NM site boundary to detect potential contamination that may be moving to off-site locations.

Community: Off-site locations unrelated to SNL/NM activities and used as background for comparison with perimeter and on-site locations.

## Terrestrial Surveillance

SNL/NM has been conducting radiological surveillance of the environment since 1959. In 1993, SNL/NM began conducting stable metal surveillance as well. Data from these monitoring activities were used to show whether contaminants were transported to surrounding areas outside SNL/NM and whether there is an increasing trend in contaminant levels. For terrestrial monitoring, SNL/NM studies radiological and stable metal levels by surveying air, soil, arroyo sediment, vegetation, and surface water.

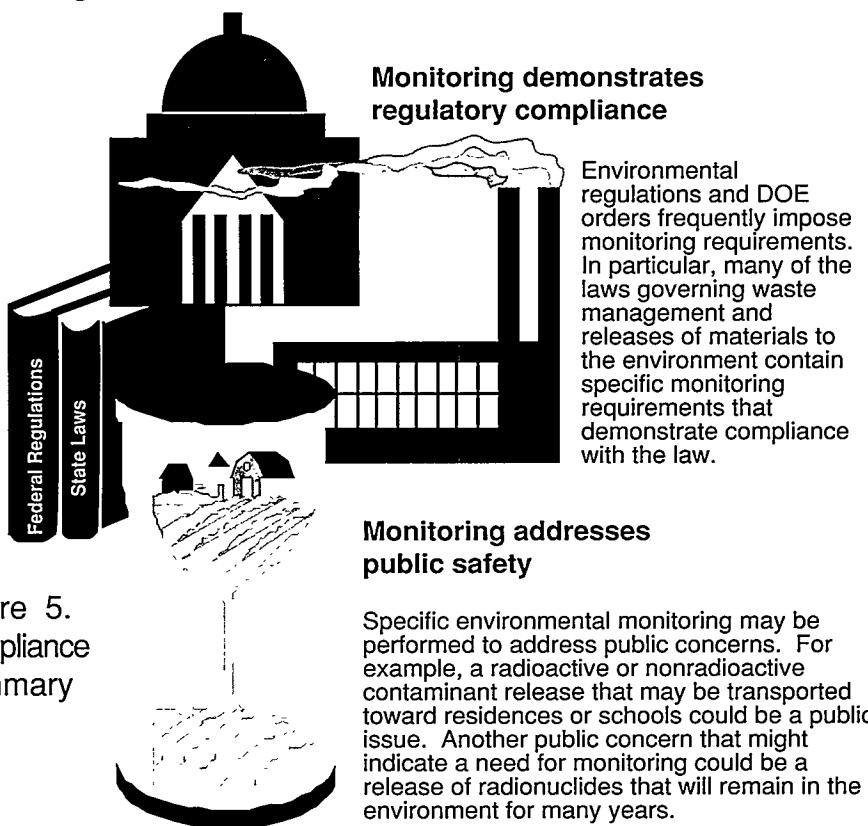


Figure 5.  
Compliance  
Summary

## Samples

- TLDs—Thermoluminescent dosimeters (TLDs) are located at various sites to measure ambient levels of gamma radiation. Every 10 years, DOE performs an aerial survey using a helicopter outfitted with detector pods to measure the amount of gamma radiation from SNL/NM and surrounding areas.
- Soil—Samples are collected at various on-site and off-site areas.
- Arroyo Sediment—Samples are collected from Tijeras Arroyo and from the Rio Grande upgradient and downgradient of SNL/NM to assess potential contamination migration.
- Surface Water—Water samples are collected from the Rio Grande upgradient and downgradient of SNL/NM to detect potential contamination from SNL/NM.
- Vegetation—Native vegetation, usually grasses, is collected to detect any increase in contamination shown by plant uptake at SNL/NM and surrounding areas (Figure 6).

### Thermo-luminescent Dosimeters (TLDs)

These instruments measure the total gamma radiation dose. SNL/NM places these instruments at various sites. SNL/NM also offers TLDs in the form of badges to employees who may potentially be exposed to radiation. These TLDs are the size of a driver's license and are worn over the chest.

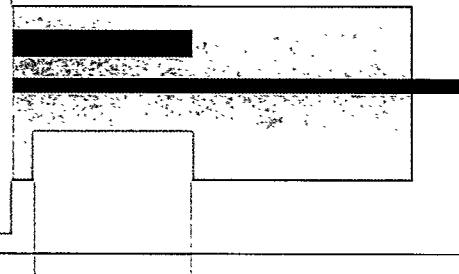


Figure 6.  
Vegetation  
Sampling at  
SNL/NM

## **Terrestrial Surveillance Results**

**Vegetation:** Eight sites had elevated tritium levels compared to the community locations. Six of these are associated with Environmental Restoration (ER) sites and located in controlled areas.

**Soil:** Two sites had elevated cesium and titanium levels compared to the community locations. Seven sites had elevated tritium levels compared to the community; these locations are associated with ER sites and located in controlled areas.

**Surface water, sediment, and TLDs:** Analyses showed no elevated contamination levels.

## **Air Monitoring**

Air monitoring measures radiological and nonradiological air contaminants and their transport throughout SNL/NM and surrounding areas. Air monitoring programs provide information to protect the health of members of the public on KAFB and the surrounding communities, and to demonstrate compliance with city and federal air quality regulations.

There are three components involved in monitoring and controlling air quality at SNL/NM:

1. Meteorological monitoring
2. Ambient air surveillance
3. Effluent monitoring

### **Meteorological Monitoring**

A meteorological monitoring program was implemented at SNL/NM in January 1994. The main objective of the program is to provide data on the meteorology at SNL/NM for use in studies on contaminant dispersion. The data are collected via a nine-tower meteorological monitoring network which consists of six 10-m (33-ft) towers, two 60-m (197-ft) towers, and one 50-m (164-ft) tower. Data are collected on wind speed and direction, and temperature. There are also two atmospheric pressure sensors and three rain gauges in the meteorological network.

Data can be useful in providing emergency response support and in determining transport and diffusion of actual or potential pollutants. For example, if a spill occurred containing radionuclides or some other form

of contaminants, important data can be taken from a meteorological tower concerning wind speed and wind direction at the time of the incident. Meteorological data are also collected to perform regulatory air dispersion modeling for permitting applications and supporting laboratory research and engineering design.

### Ambient Air Surveillance

The term "ambient," when referring to air, means the air present in the surrounding environment. Monitoring of ambient air includes sampling for radioactive and nonradioactive materials. The main objective of SNL/NM's ambient air surveillance program is to establish background concentration levels for pollutants of concern, show compliance with the National Ambient Air Quality Standards (NAAQS), and evaluate effects of laboratory emissions on the public and environment. Ambient air monitoring equipment has been installed at seven locations on-site to collect the following data:

- Criteria Pollutant Data—Sulfur dioxide ( $\text{SO}_2$ ), oxides of nitrogen ( $\text{NO}_x$ ), ozone ( $\text{O}_3$ ), carbon monoxide (CO), and airborne lead (Pb).
- PM-10 Data—Respirable airborne particulate matter 10 microns or smaller in diameter (Figure 7).
- Volatile Organic Compounds (VOCs) Data—Primarily solvents and fuels.

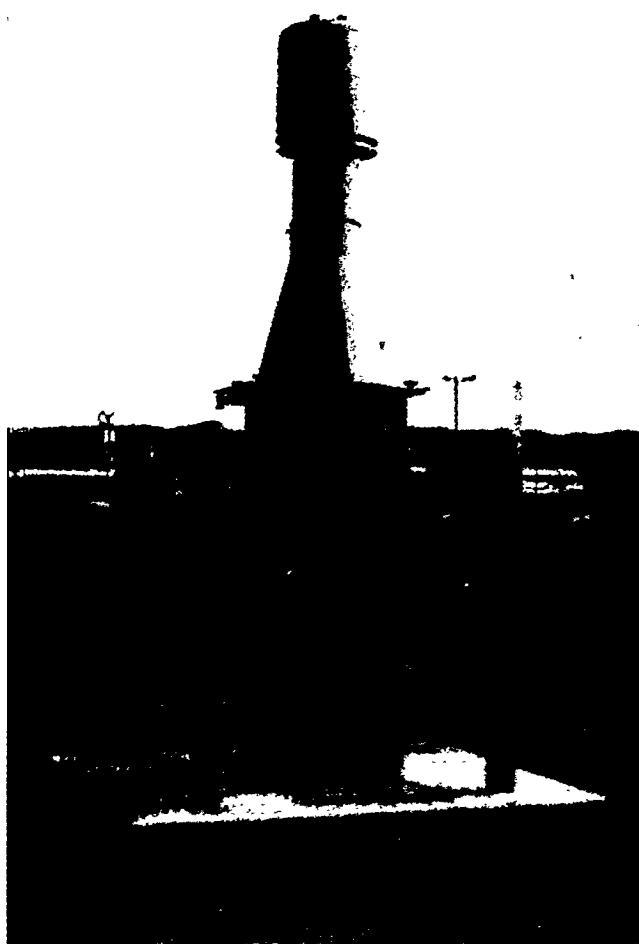
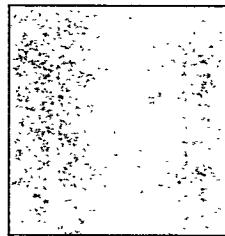


Figure 7. PM-10 Monitoring Station

### Effluent Monitoring

When speaking about air, the term "effluent" refers to air that flows from a source out into the environment. Few facilities within SNL/NM routinely generate effluents or emissions. In fact, SNL/NM's radioactive air emissions are so small they are difficult to measure.



## Air Monitoring Results

**Meteorological Monitoring:** Data on maximum wind speeds, temperature extremes, and precipitation levels were collected in 1994. In general, the annual temperature and relative humidity statistics for each tower were similar. Wind speeds and directions varied across the site, showing differences between National Weather Service wind information and conditions at SNL/NM.

**Ambient Air Monitoring:** Critical pollutants data indicated that no standards were violated. PM-10 concentrations were quite low except for sampling days in July when hot, dry weather aided the production of airborne dust. VOC concentrations were also found to be quite low in 1994.

**Effluent Monitoring:** Based on the measurements taken at three facilities, the dose was calculated to be less than that permitted by federal regulations.

## Wastewater Monitoring Results

### Waste-water Programs:

Only encountered four permit violations in 1994.

### Storm Water Program:

Still in the process of permit application.

### Surface Discharge Program:

No tests exceeded the maximum allowable standards.

## Wastewater Monitoring

SNL/NM contains over 15 miles of sewer lines that are connected to KAFB lines. SNL/NM has two pretreatment operations and four general wastewater streams that discharge to the City of Albuquerque treatment works. SNL/NM has created a Liquid Effluent Control System that holds process wastewater for radionuclide screening prior to discharge into the sanitary sewer.

The City of Albuquerque requires that SNL/NM obtain permits for wastewater discharge to ensure that the wastewater quality is within acceptable limits. Samples are collected routinely and tested for gross alpha particle activity, gross beta particle activity, tritium, and gamma emitters. Comparison samples are also collected from tap water.

### Storm Water Program

A storm water program is being implemented at SNL/NM to regulate storm water discharges associated with SNL/NM activities.

### Surface Discharge Program

Surface water from pulsed-power operations is discharged to two containment areas. Water levels are measured quarterly and samples are collected semiannually.

## Groundwater Monitoring

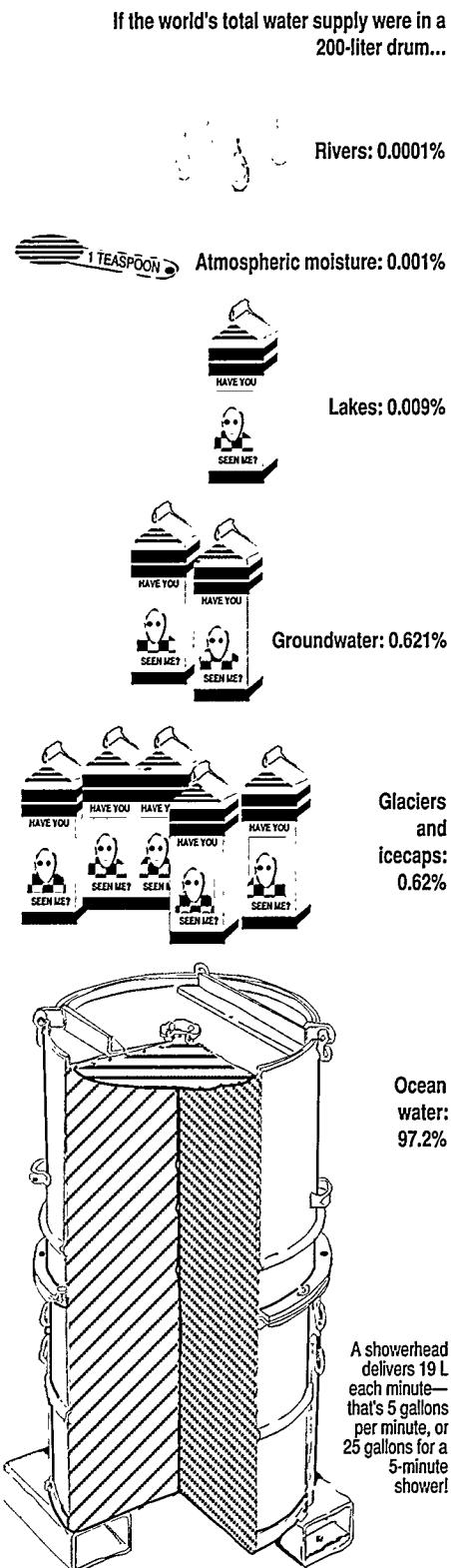


Figure 9.  
Water Supply

Groundwater, or water found below the surface of the land, exists in pores within sediment and in cracks within solid rocks. The hydrologic cycle (Figure 8) describes the continuous circulation of water through the environment and shows that the production of groundwater is a significant process in the cycle. Groundwater currently accounts for a considerable portion of the earth's water (Figure 9).

It is important to detect whether groundwater contamination is occurring; therefore, groundwater monitoring is conducted throughout SNL/NM and KAFB. Springs and wells are sampled quarterly for baseline hydrogeochemical characterization and contamination detection, and water levels at 34 wells are measured monthly to establish groundwater flow patterns. This allows SNL/NM to determine if any contamination is in the water and how it may be migrating. Groundwater monitoring at SNL/NM is discussed in the following list.

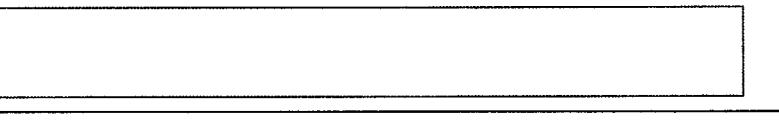
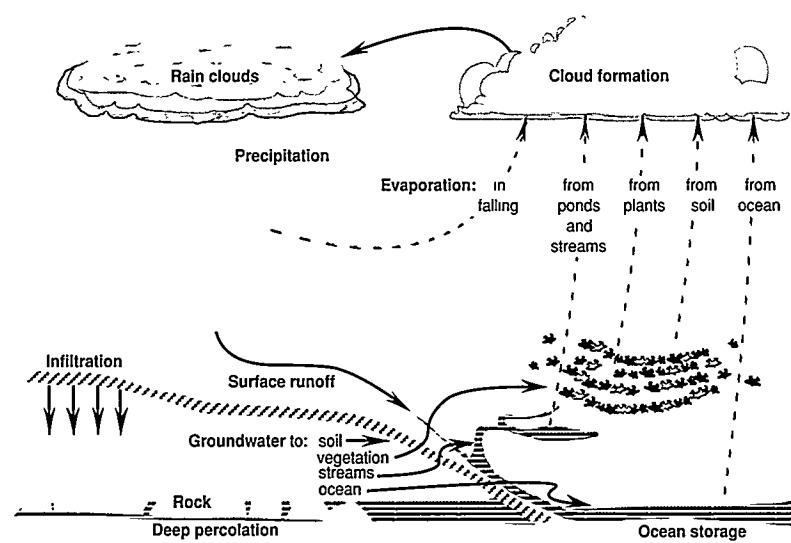


Figure 8. The Hydrologic Cycle—A Descriptive Presentation



1. Groundwater Surveillance—Monitoring is carried out by groundwater surveillance as a base-wide program for the following purposes:
  - Obtaining data to establish baseline conditions.
  - Complying with applicable regulations and DOE orders.
  - Providing data to permit the early detection of groundwater pollution and contamination, and for decision making about groundwater resources.
  - Measuring water levels in monitor wells to determine groundwater flow direction and monitor water table fluctuations.
2. Regulatory Site-Specific Programs—The Chemical Waste Landfill, the Mixed Waste Landfill, Technical Area II, the Liquid Waste Disposal System, and the Site-Wide Hydrogeological Characterization Project are all part of site-specific groundwater investigations.

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## **Groundwater Monitoring Results**

**Groundwater Surveillance:** Some metals were detected above maximum contaminant levels, and concentrations of radium isotopes occasionally exceeded DOE guidelines. VOCs, inorganic compounds, and gamma-emitting radionuclides were within acceptable limits.

**Chemical Waste Landfill:** All radiological and nonradiological monitoring results were within acceptable limits except for nickel and chromium.

**Mixed Waste Landfill:** No contaminants of concern were detected.

**Liquid Waste Disposal System:** No contaminants of concern were detected except for levels of TCE.

**Technical Area II:** Gross alpha and beta activities were detected above DOE guidelines at one well; otherwise, no chemical contaminants of concern were detected.

# Waste Management

Waste is material that is no longer of use in activities at SNL/NM. SNL/NM currently generates and accepts the following wastes from various on-site locations:

## Waste Minimization at SNL/NM

In 1989, SNL/NM initiated a waste minimization and pollution prevention program. Other programs were initiated in 1994:

Earth Day Festival—The theme was "Pollution Prevention: Today's Gift for Tomorrow."

Corporate Pollution Prevention Plan—This plan is used as a reference tool and provides guidance to reduce the amount of waste at SNL/NM.

Pollution Prevention Team—This team was formed to motivate and help Sandians incorporate pollution prevention within their activities.

Pollution Reduction Team—This team's activities include promoting pollution prevention, gathering information, evaluating pollution prevention opportunities, and identifying and implementing alternatives.

Affirmative Procurement Team—This team develops and improves procurement to maximize reuse and recycling, and to emphasize the purchase of post-consumer products.

## Solid Waste

SNL/NM managed 86,369 kilograms (kg) of hazardous waste in 1994. Hazardous waste consists primarily of chemicals and chemical contaminated materials. The solid waste, nonhazardous waste, and recycled material managed was 605,324 kg.

## Radioactive Waste

Low-Level Waste (LLW)—SNL/NM accepted 1,886 cubic feet ( $\text{ft}^3$ ) of low-level waste in 1994. This waste is contaminated with radionuclides that typically have small amounts of radioactivity.

Mixed Waste (MW)—SNL/NM accepted 59  $\text{ft}^3$  of mixed waste in 1994. This waste consists of a combination of radioactive and chemical materials.

## Asbestos Waste

SNL/NM disposed of 16,043 kg of facilities and nonfacilities asbestos waste in 1994. This waste is made up of fibrous material that is heat resistant. Asbestos materials create a health hazard if they are in a friable (easily disturbed) form.

## Polychlorinated Biphenyl (PCB) Waste

SNL/NM is in the process of ending PCB waste as quickly as possible. During 1994, SNL/NM disposed of approximately 5,400 kg of PCB-contaminated material. PCB is a chemical compound used in various types of electrical equipment at SNL/NM.

# Environmental Restoration

DOE Environmental Restoration (ER) Project activities identify, assess, and remediate sites at its facilities across the United States. Remediation ensures compliance with environmental regulations and statutes that prescribe the reduction of contamination risk.

ER Project activities include:

- Initial site identification
- Site assessment
- Site remediation

Sites of potential contamination include:

- Underground storage tanks
- Septic systems
- Radioactive and nonradioactive waste sites
- High-explosives firing sites

There are currently 183 sites at SNL/NM that have been identified as potentially contaminated with hazardous and/or radioactive materials.

The SNL/NM ER project staff determine whether these sites are contaminated above standard limits. Sites that exceed contamination limits are subject to remediation.

Contamination assessment is an ongoing process that indicates whether certain sites need to be decontaminated, remediated, or decommissioned. The ER Project consists of two phases:

- **Assessment**—During this phase, it is necessary to determine the extent and type of contamination at each site, and to assess the risk to human health and the environment. Sites of potential contamination identified during this assessment are grouped together within geographic and event-related boundaries. This grouping allows samples to be collected efficiently and economically.
- **Remediation**—During this phase, an action design is created that considers methods for remediating the site.

# Quality Assurance

Quality Assurance is a series of planned or systematic actions required to provide adequate confidence that a product or service will satisfy given needs.

When monitoring releases and measuring radiation in the environment, there must be confidence that the data are reliable. SNL/NM has a quality assurance and quality control (QA/QC) program to ensure that environmental monitoring is conducted properly and that results are reliable. State and federal guidelines and U.S. Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) quality control requirements are incorporated into the SNL/NM QA/QC programs.

The subcontractor laboratories that provide analytical services for SNL/NM must have established QA/QC programs and must participate in interlaboratory comparisons and on-site evaluations and audits.

## Question a n d Answer Section



**Q:** What is done with radioactive waste at SNL/NM?

**A:** On-site disposal of LLW at SNL/NM was terminated in December 1988 as a result of a DOE order. Presently, all newly generated LLW and MW are stored temporarily aboveground at generator sites or in transportation containers at the Technical Area III inactive disposal site. Ultimately, the waste generated at SNL/NM will primarily be disposed of at the Nevada Test Site (NTS).

**Q:** Do activities at SNL/NM have an impact on the wildlife in the surrounding area?

**A:** SNL/NM recently has proposed an ecological surveillance program that will help identify the effects of radiation potentially released by SNL/NM on the wildlife inhabiting the area. The project will study any effects SNL/NM activities may have on the density and mortality of species on KAFB and SNL/NM property.

# Touring SNL/NM

The SNL/NM Visitors Program provides the public with a firsthand look at the site and its activities. Each tour is designed to meet the specific needs and interests of the visiting group.

The program is open to all U.S. citizens at least 16 years of age. A minimum of 10 people is requested per tour. Groups will be asked to provide the name, home address, and social security number of each visitor in advance, and each visitor must bring some form of photo identification. The tour coordinator will try to accommodate special requests for dates and times, but no tours are conducted on weekends or holidays. Requests must be made at least three weeks before the desired tour date. To arrange tours, contact:

Sandia National Laboratories  
Community Relations Department  
Attn: Tours Coordinator  
P.O. Box 5800  
Albuquerque, NM 87185  
Phone: (505) 844-1307

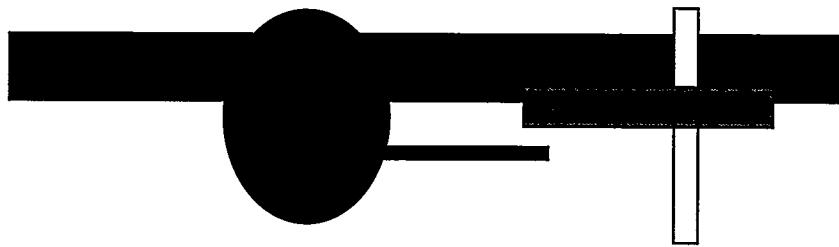
## For More Information

This booklet has been developed to highlight information given in the 1994 Site Environmental Report, Sandia National Laboratories/New Mexico, and to present that knowledge in language less technical than that used in the formal report.

To obtain copies of this booklet or the 1994 Site Environmental Report, contact:

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U.S. Department of Commerce  
5285 Port Royal Road  
Springfield, VA 22161

# Sandia National Laboratories (SNL/NM)



**Please take a few minutes to let us know how well the 1994 Summary Pamphlet provided information.**

**Please circle the appropriate answer.**

**1.** The information presented in the 1994 Summary Pamphlet provided the reader with an understanding of the environmental programs at SNL/NM.

**Agree**

**Disagree**

**Unsure**

**2.** The information presented was easy to follow and understand.

**Agree**

**Disagree**

**Unsure**

**3.** The 1994 Summary Pamphlet increased your awareness of the environmental activities taking place at SNL/NM.

**Agree**

**Disagree**

**Unsure**

**4.** What else would you like to see in the Summary Pamphlet?

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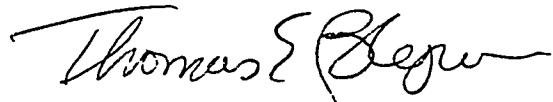


# Sandia National Laboratories

Albuquerque, New Mexico 87185-1315

date: October 23, 1995

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from: Thomas E. Blejwas, MS-1315 (7500)

subject: 1994 Site Environmental Report Summary Pamphlet

The 1994 Site Environmental Report Summary Pamphlet was created to provide the general public with a better understanding of the environmental monitoring activities conducted at Sandia National Laboratories, New Mexico (SNL/NM). This pamphlet summarizes the technical information presented in the 1994 Site Environmental Report, as well as highlights SNL/NM accomplishments in environmental protection programs.

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