Overview of Environmental Surveillance at Los Alamos during 2001

Los Alamos
NATIONAL LABORATORY
Los Alamos, New Mexico 87545
A US Department of Energy Laboratory

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 dose 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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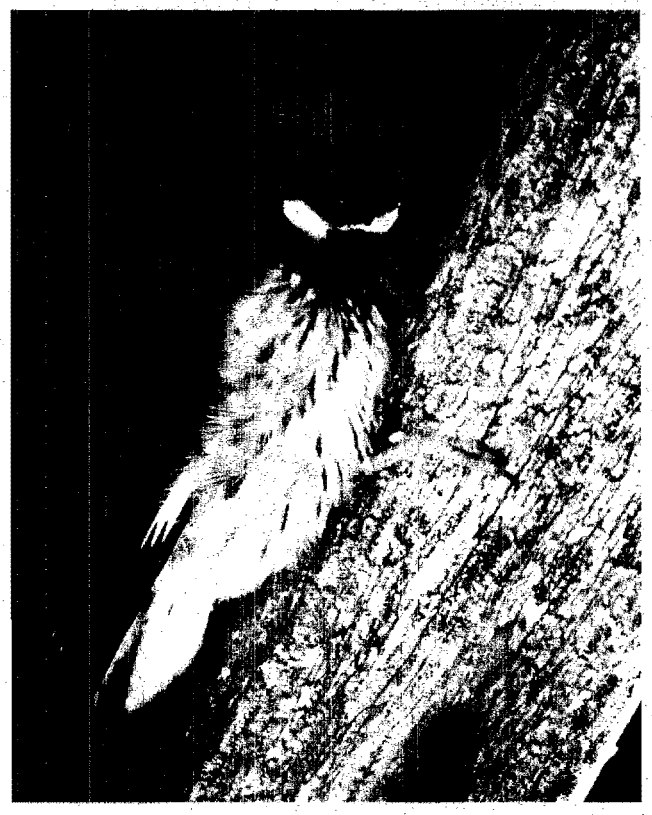


Most of the information presented in this overview booklet is explained in greater detail in Environmental Surveillance at Los Alamos during 2001. If you would like a copy, please contact the Laboratory's Ecology Group at 505-665-8961. The complete report is also available on the World Wide Web at http://lib-www.lanl.gov/cgi-bin/getfile?LA-13979.htm. *This overview booklet is available on the World Wide Web at* http://lib-www.lanl.gov/cgi-bin/getfile?00783121.pdf.

Introduction to the Los Alamos National Laboratory

Linking the Rio Grande Valley and the Jemez Mountains, New Mexico's Pajarito Plateau is home to a world-class scientific institution. Los Alamos National Laboratory (or the Laboratory), managed by the Regents of the University of California, is a government-owned facility that is supervised by the Department of Energy (DOE)/National Nuclear Security Administration (NNSA). This research complex investigates all areas of science and technology for the purposes of national defense and global security.

Today, the Laboratory's central missions are (1) to ensure the safety and reliability of the nation's nuclear weapons stockpile, (2) to develop the technical means for reducing the global threat from weapons of mass destruction and terrorism, and (3) to solve national problems in energy, environment, infrastructure, and health security.

The 43 square miles of the Laboratory contain 47 technical areas (TAs) that are used for scientific and support building sites, experimental areas, waste disposal locations, roads and utilities, and safety and security buffers. The Laboratory shares Los Alamos County with two residential communities: Los Alamos town site and White Rock. Most of the other land surrounding the Laboratory is undeveloped, owned by the Pueblo of San Ildefonso, the Bureau of Land Management, the Santa Fe National Forest, and Bandelier National Monument, or is rural, supported by ranching and light farming. Santa Fe, the state capital, is 25 miles southeast of Los Alamos; Española is located 20 miles to the east; and Albuquerque, New Mexico's largest city, is 60 miles to the south-southwest. In 2001, more than 277,000 people lived within a 50-mile radius of the Laboratory. The Laboratory and its contractors employed over 13,000 people; the Laboratory is the largest employer in Los Alamos County and northern New Mexico. Other local economic activity is fostered by technology transfer, supporting businesses, and tourism.

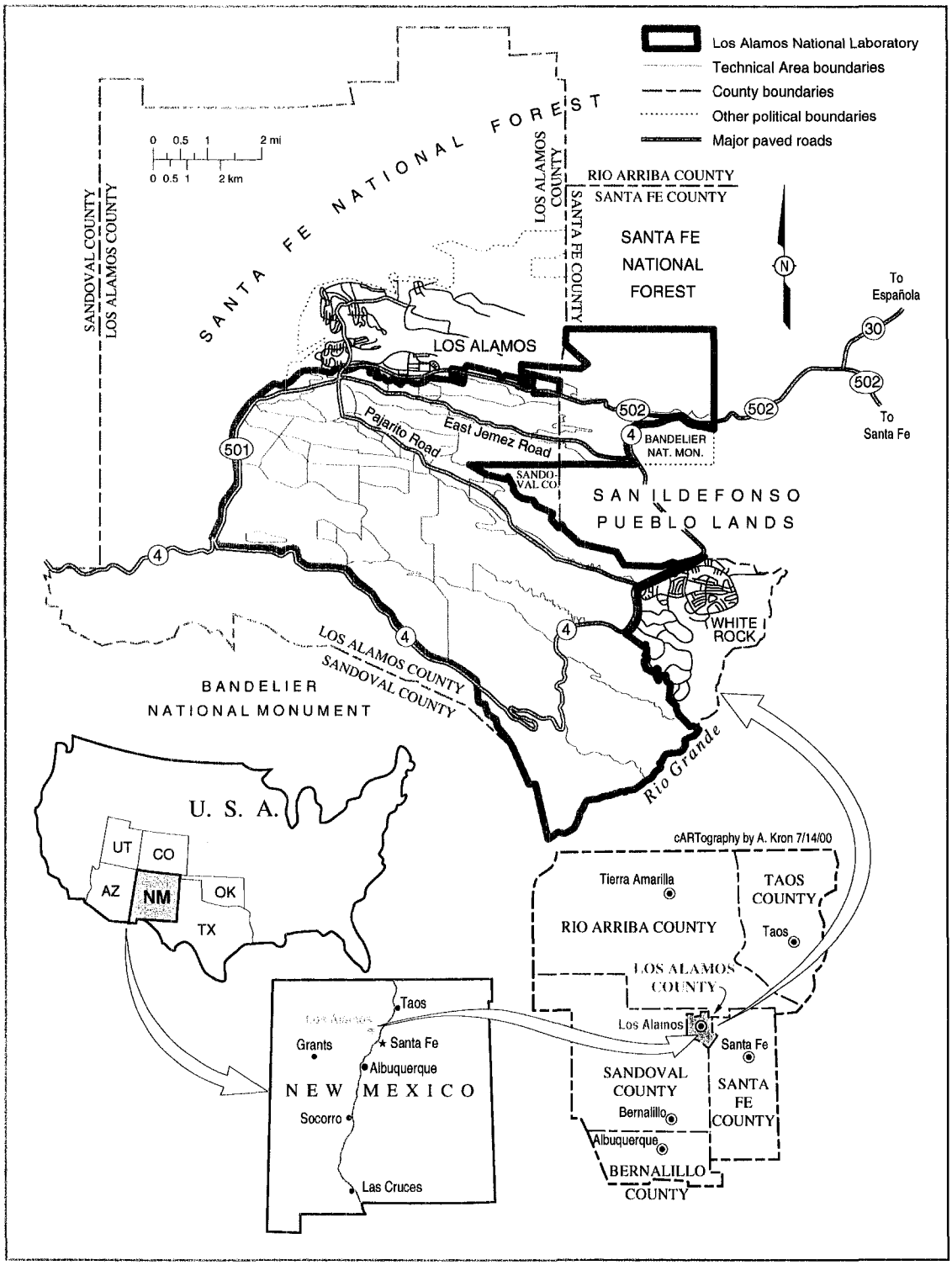
The geography and ecology of Los Alamos are diverse. The terrain of the Pajarito Plateau, where Los Alamos is situated, alternates between mesas and deep canyons. The natural borders of Los Alamos—the Rio Grande Valley and the Jemez Mountains—are significantly lower and higher in elevation than the mesas, which range from 6,200 feet to 7,800 feet. Six vegetation types, piñon-juniper, mixed conifer, ponderosa pine, juniper-grassland, spruce-fir, and subalpine grassland, are well represented in the Los Alamos environs. Hundreds of species of wildlife reside on or near Laboratory property.

Many of the activities and operations at the Laboratory involve or produce solids, liquids, and gases that contain radioactive and/or nonradioactive hazardous materials. Such activities include conducting research and development programs in basic and applied chemistry, biology, and physics; fabricating and testing explosives; cleaning chemically contaminated equipment; and working with radioactive materials.

Laboratory policy requires that operations be conducted in a manner that protects human health and the environment and addresses compliance with applicable federal and state environmental protection regulations. This policy is in accordance with DOE requirements to protect the public, environment, and worker health and safety and to comply with applicable environmental laws, regulations, and federal orders.

For more than 30 years, the Laboratory has published an annual environmental surveillance report. This overview booklet provides a summary of the monitoring results and regulatory compliance status that the *Environmental Surveillance at Los Alamos during 2001* complete report explains at length. This booklet also offers brief explanations of important concepts, such as radiation and associated risks. It is organized into five sections: Radiation, 2001 Dose and Risk Estimates, Management of the Environment, Environmental Monitoring, and Environmental Compliance.

Please call the Laboratory's Ecology Group at 505-665-8961 if you have any questions about the information presented in this booklet.


Los Alamos National Laboratory
Technical Area boundaries
County boundaries
Other political boundaries
Major paved roads
0 0.5 1 2 mi
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SANTA FE NATIONAL FOREST
SANDOVAL COUNTY
LOS ALAMOS COUNTY
RIO ARRIBA COUNTY
SANTA FE COUNTY
SANTA FE NATIONAL FOREST
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To Española
To Santa Fe
LOS ALAMOS
Pajarito Road
East Jemez Road
501
502
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BANDELIER NAT. MON.
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TAOS COUNTY
Taos
RIO ARRIBA COUNTY
LOS ALAMOS COUNTY
Los Alamos
Santa Fe
SANDOVAL COUNTY
SANTA FE COUNTY
Bernalillo
Albuquerque
BERNALILLO COUNTY
Grants
Albuquerque
NEW MEXICO
Socorro
Las Cruces

Radiation

Background radiation

Although some radiation is the result of human activities, most radiation comes from natural sources. Earth and its inhabitants are exposed to naturally occurring radiation every day. Background radiation includes natural radiation and a very small amount of man-made contributions from our various uses of radioactivity. Although our understanding of radiation is relatively new and is constantly being improved, radiation has always been a part of life on Earth.

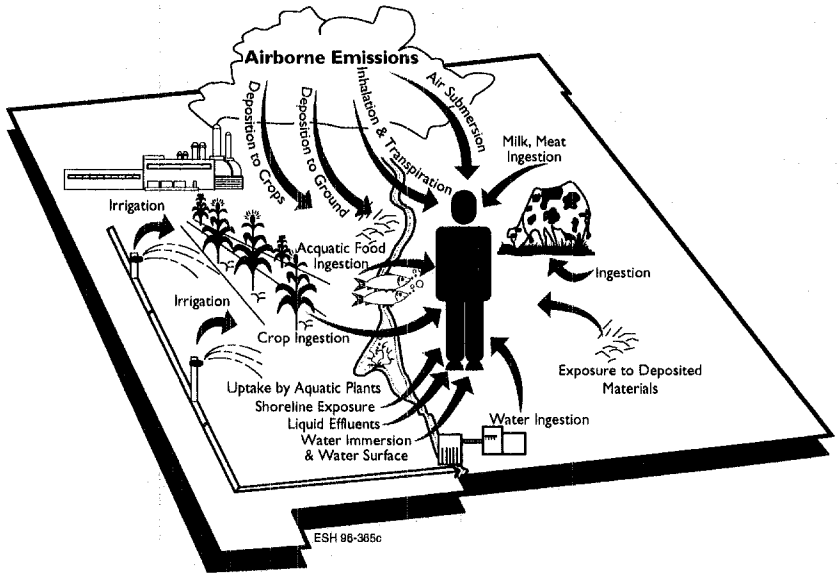
Radiation from cosmic rays and terrestrial sources (for example, radon released as natural uranium in rocks decays to radium and then to radon) contributes the most to an individual's estimated dose. Compared with the national average, Los Alamos and White Rock residential areas have more naturally occurring radiation because of the high altitude and naturally occurring uranium in rocks and soil. The total dose from background radiation, greater than 99% of which is from natural sources, is about 360 mrem in this area and can easily vary by 10 mrem from year to year.

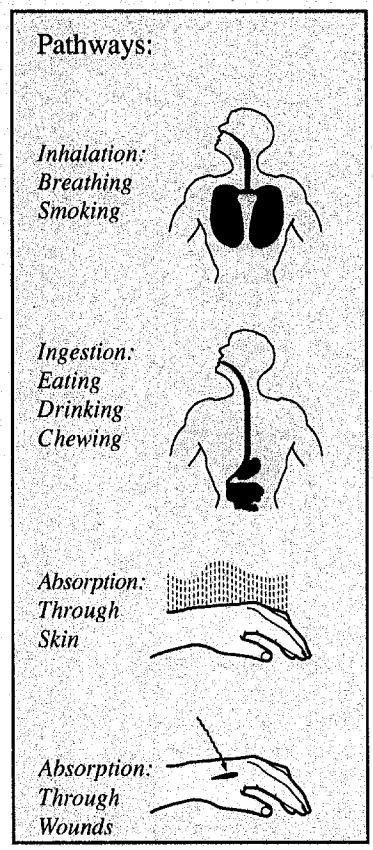
Human-produced radiation

Medical procedures and industrial operations also produce radiation. Medical x-rays are a source of radiation, as are consumer goods such as tobacco products, porcelain dentures, television sets, and smoke detectors. Some of the radiation in the environment is due to fallout from past weapons testing in various countries and to nuclear research.

Pathways

Both background and human-produced radiation have the potential to reach the public. A pathway outlines the route a radioactive contaminant may follow to reach the human population. Radioactive releases may enter the local environment by air or water and pass through soil, plants, livestock, or wildlife, ultimately reaching humans through inhalation, ingestion, absorption through skin or wounds, or external exposure, i.e., direct irradiation of the body.





2001 Dose and Risk Estimates

Dose

The effects of radiation arc related to dose, which is the amount of radiation received and is measured in millirem. To protect public health and safety, DOE maintains dose limits based on guidance from the Environmental Protection Agency, the National Council on Radiation Protection and Measurements, and the International Commission on Radiological Protection. The DOE's public dose limit is 100 millirem per year for **all** radiation that results from operations at the Laboratory.

In 2001, the maximum potential public doses were 4.2 millirem on-site and 1.9 millirem off-sile. A person who travels frequently on Pajarito Road and is near TA-18 during several experiments could potentially receive the 4.2 millirem on-site dose. A person who works or resides continuously at East Gate, north of TA-53, could potentially receive the 1.9-millirem off-site dose.

The Environmental Protection Agency limits the dose to any member of the public from radioactive airborne releases from the Laboratory to I0 millirem per year. The 2001 maximum dose from airborne releases **is** calculated to be 1.84 millirem and is to an individual at East Gate north of TA-53.

Roentgen equivalent man (rem)

The rem is a unit for measuring dose equivalence. It is the most commonly used unit and pertains to people. The rem takes into account the energy absorbed (dose) and the biological effect on the body (quality factor) resulting from **the** different types of radiation.

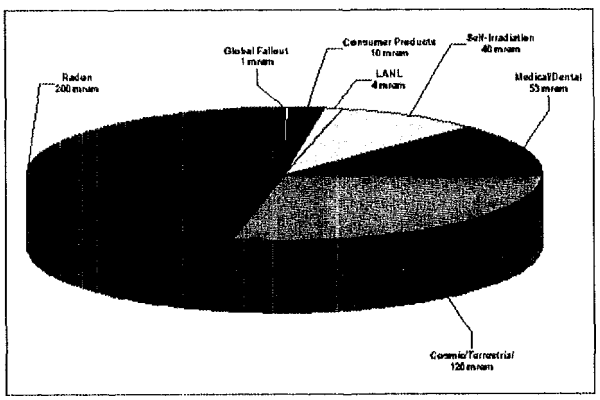
mrem = 1/1000 rem

Risk

In March 1996, the Health Physics Society published a position paper on the risks of radiation exposures. They concluded that below an individual dose of 5,000 millirem in one year "risk estimates should not be used; expressions of risk should only be qualitative emphasizing the inability to detect any increased health detriment (i.e., zero health effect is the most likely outcome)." They further noted that health effects (primarily cancer) from radiation exposure are observed in humans only at doses in excess of 10 rem, or 10,000 millirem, delivered at intense dose rates.

The risk of cancer mortality for every United States resident is one chance in five. The added risk caused by Laboratory operations is too small to measure.

Total contributions to 2001 dose for the Laboratory's maximally exposed individual.



Environmental protection

The Laboratory's Environment, Safety, and Health Division prepares permits, adheres to regulations, performs and documents environmental monitoring and compliance activities, and provides technical advice in the analysis of air, water, sediments, soil, food, flora and fauna, and hazardous materials. Division personnel also gather data on measurements of natural radiation and Laboratory radiation sources, monitor weather conditions to assess the movement of airborne contaminants to the environment, and conduct cultural and biological investigations across the site.

Environmental oversight

The Environmental Oversight and Monitoring Agreement-in-Principle between the Department of Energy and the State of New Mexico provides technical and financial support from DOE for state activities in environmental oversight, environmental surveys and sampling, site visits, and document review. The New Mexico Environment Department/Department of Energy Oversight Bureau carries out the requirements. The bureau holds public meetings and publishes reports on its independent assessments of environmental quality at the Laboratory.

During 2001, the Oversight Bureau reviewed several of the Laboratory's environmental programs. This independent monitoring program allows the Laboratory's data to be verified.

Oversight Bureau review highlights

Air Quality

The Oversight Bureau monitored air quality at 12 stations; data were consistent with the levels the Laboratory measured.

Water Quality

Storm runoff was collected in canyons when sufficiently large flows occurred. Concentrations of metals and radionuclides were generally elevated in suspended sediments in fire-affected canyons. This finding was consistent with the Laboratory's surveillance program sampling.

Environmental Restoration

Oversight Bureau personnel continued to integrate the regulatory and technical requirements of the regulations governing the Environmental Restoration Project. The Oversight Bureau worked closely with the project this year, primarily with the canyons' investigation work. Members of the bureau participated with the Acid Canyon cleanup, locating alluvial wells within the canyon systems, and worked with the Laboratory's surface water assessment team (SWAT) to identify best management practice locations.

Soil/Foodstuffs/Biota Quality

Oversight Bureau personnel collected samples of soil and produce from farms after the Cerro Grande fire. Analysis of the samples showed that the concentrations of radionuclides and other chemicals were below levels

that pose short-term or acute threat to human health. These findings were consistent with the Laboratory's surveillance program sampling. Also, the bureau analyzed fish collected from Cochiti Reservoir for mercury, dioxins, and polychlorinated biphenyls (PCBs). Two fish from Cochiti were greater than 1 mg/kg for mercury, dioxins were either not detected or were found near the detection limit, and PCBs were higher in Cochiti fish than in Abiquiu fish. These findings are also consistent with Laboratory findings.

Environmental, safety, and health training

The Laboratory maintains an extensive training program of environmental, safety, and health courses that meet the requirements of the Environmental Protection Agency, the Occupational Safety and Health Administration/Act, Department of Transportation regulations, and DOE regulations. Subject matter experts validate the technical content of all Laboratory-wide training.

Integrated safety management

Integrated Safety Management (ISM) is the Laboratory's system for performing work safely and for protecting employees, the public, and the environment. Its objectives include conducting Laboratory operations in full compliance with all environmental laws and regulations, preventing adverse environmental impacts and enhancing environmental protection, and adopting proactive approaches to achieve environmental excellence. The environmental management activities at the Laboratory are fully integrated into the ISM process.

Hazardous and solid waiste

The Laboratory is continuing its self-assessment program *to* assess its performance in the proper storage and handling of hazardous and mixed waste. In 2001, the Hazardous and Solid Waste Group completed 1,134 quarterly self-assessments. The New Mexico Environment Department conducted an annual hazardous waste compliance inspection at the Laboratory from April 23 to the end of August 2001. On October 9, 2001, the New Mexico Environmental Department issued a Notice of Violation to the University of California and DOE, citing 18 categories of alleged noncompliance with the Hazardous Waste Facility permit.

Laboratory personnel continued to work on the application to renew its Hazardous Waste Facility permit by providing both Laboratory-wide and technical area-specific applications and by responding to requests for additional information from the New Mexico Environment Department.

The Laboratory met all 2001 Site Treatment Plan deadlines and milestones. The Laboratory treated and disposed of over 650 cubic meters of mixed waste through 2001.

The Laboratory had two underground storage tanks in operation during 2001. One 10,000-gallon tank holds gasoline at a single-pump fueling station; the other 10,000-gallon tank is used as a secondary container during an accidental spill. Three old underground storage tanks were discovered during a decommissioning action and were removed.

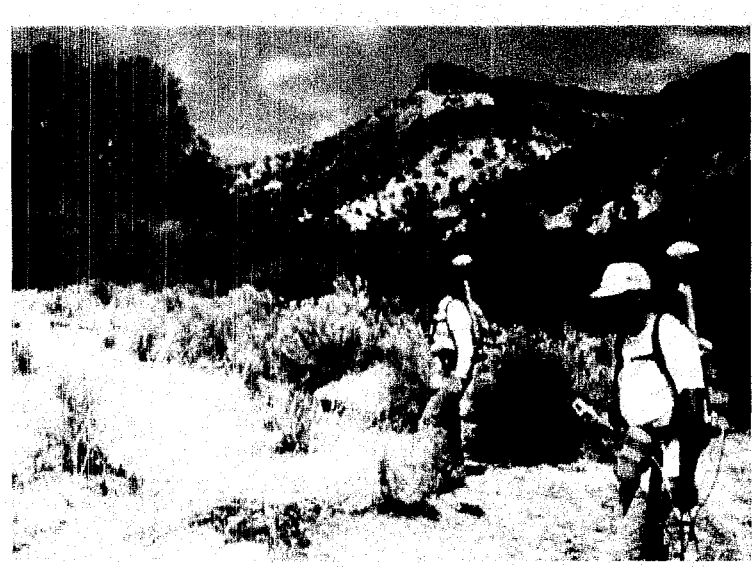
During 2001, the Laboratory had 46 off-site shipments of PCB waste. The five-year Letter of Authorization to use TA-54, Area G, for disposing PCB waste expired in July 2001, and Region 6 of the Environmental Protection Agency granted an extension while they conducted the renewal process. Inspectors visited Areas G and L in February 2001.

The Laboratory contributed 9% of the material disposed at the Los Alamos County landfill, a significant decrease from last year's volume that is attributable to the Laboratory's waste reduction program. During 2001, the Laboratory sent 5,110 tons to the county landfill: 1,977 tons trash; 2.504 tons of concrete/rubble; 452 tons of construction and demolition debris; 140 tons of brush for composting; and 36 tons of metal for recycling.

Environmental restoration (ER)

The Environmental Restoration Project at the Laboratory complements the Laboratory's environmental surveillance program by identifying and characterizing potential threats to human health, ecology, and the environment from past operations. The ER mission is to mitigate those threats through cleanup or stabilization actions. They base cleanup decisions on risks to the environment in addition to human-health risks. In 2001, the ER Project remained in compliance with Module VIII of the Resource Conservation and Recovery Act (RCRA) permit.

The ER Project originally involved approximately 2,100 potential release sites (PRSs). By the end of 2001, only 840 discrete PRSs remained to be addressed. The project made significant progress characterizing and cleaning up sites including the south fork



of Acid Canyon, a historical tank farm, six inactive septic tanks, an underground storage tank, a former wastewater treatment facility, a container storage area, a PCB-contaminated hillside, and an outfall. The project also installed five groundwater monitoring wells. Project personnel also completed a significant amount of work associated with the reengineering of ER's information management system.

The ER Project anticipates that the corrective action process for all PRSs will be complete by 2013.

Ambient air quality

The ambient air quality in and around the Laboratory meets all Environmental Protection Agency and DOE standards for protecting the public and workers. No radioactive air emissions required reporting under Environmental Protection Agency or the New Mexico Environment Department requirements for unplanned releases.

Air monitoring stations record concentrations of various radionuclides in the air. Laboratory staff calculate concentrations of gross alpha and beta activity and tritium, plutonium, americium, and uranium from these readings. Gross alpha and beta activities result almost entirely from the decay of natural radionuclides, primarily radon, and are dependent on variations in natural conditions such as atmospheric pressure, atmospheric mixing, temperature, soil moisture, and the "age" of the radon. The differences typically seen in gross alpha and beta results for the various air monitoring stations are most likely attributable to these natural factors.

The DOE's derived air concentration guides and Environmental Protection Agency regulations control the concentration levels of radionuclides allowed in the air. The Air Quality Group routinely publishes air quality data at *http://www.lanl.gov/orgs/rres/maq/index.htm* on the World Wide Web.

Ambient air concentrations of plutonium at TA-54, Area G, were lower during 2001. Radioactive ambient air quality for Laboratory-derived radionuclides at other locations during 2001 was very similar to 2000. In 2001, the Laboratory investigated several instances of elevated air concentrations. These elevated air concentrations were produced during routine Laboratory operations None of these elevated air concentrations exceeded DOE or Environmental Protection Agency protective standards for workers or the public.

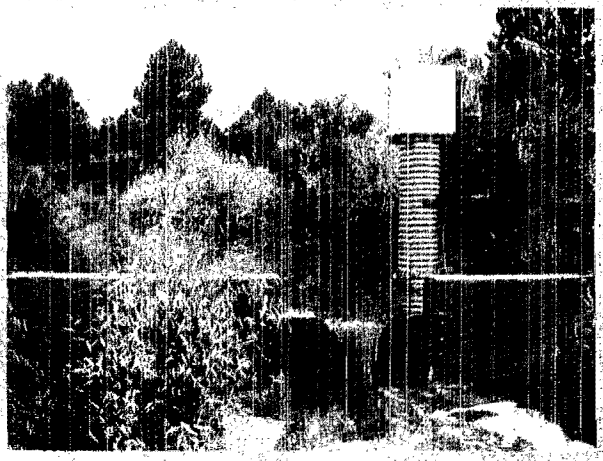
Stack air emissions

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 materials to the ambient air.

Radioactive air emissions were somewhat higher in 2001 than in 2000. Changes in the Los Alamos Neutron Science Center operating systems produced increased emissions. Increased tritium emissions occurred when a container of legacy waste at TA-16 failed. Radioactive air emissions were well below the amounts that could result in an off-site individual receiving a dose equal to the regulatory limit of 10 mrem/year.

External penetrating radiation

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; TA-53, the Los Alamos Neutron Science Center; TA-21, Area T; TA-18, Pajarito site; and the Calibration Facility, TA-3-130.



Surface water

Within the Laboratory boundary, types of surface water include spring snowmelt, summer storm runoff, and base flow. Base flow is persistent stream flow but not necessarily perennial water. The base flow source may be effluent discharge from outfalls that are regulated by the National Pollutant Discharge Elimination System of the Clean Water Act or shallow groundwater that discharges in canyons. Surface water is monitored on and adjacent to the Laboratory and at regional locations. At these stations, we analyze the water for content of general chemistry compounds, metals, organic compounds (including high explosives), and radioactivity to detect possible contamination resulting from Laboratory operations. Storm runoff samples are collected from usually dry drainages after storm events using automatic sampling devices. Base flow is sampled from drainages where flow is present for longer periods. Surface waters at the Laboratory are not a source of drinking or household water.

None of the 2001 snowmelt or base flow samples contained radioactivity greater than DOE Derived Concentration Guide (DCG) 100-mrem public dose values. Radioactivity measurements that were greater than drinking water or livestock watering standards occurred at locations with current or former radioactive liquid waste discharges: Acid/Pueblo Canyon, DP/Los Alamos Canyon, and Mortandad Canyon. For the second consecutive year, americium-241, plutonium-238, and plutonium-239, -240 in effluent from the TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) outfall did not exceed the public dose DCGs. The average TA-50 RLWTF effluent nitrate and fluoride concentrations were below the New Mexico groundwater standards.

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-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 public dose DCGs in runoff in lower Pueblo Canyon and were partly attributable to mobilization of Laboratory 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 the Laboratory are indicated at several locations, most pronounced in Pueblo and Los Alamos Canyons and around Material Disposal Area G. Selenium exceeded the New Mexico wildlife habitat standard in nearly half of the samples and appears to be of natural origin.

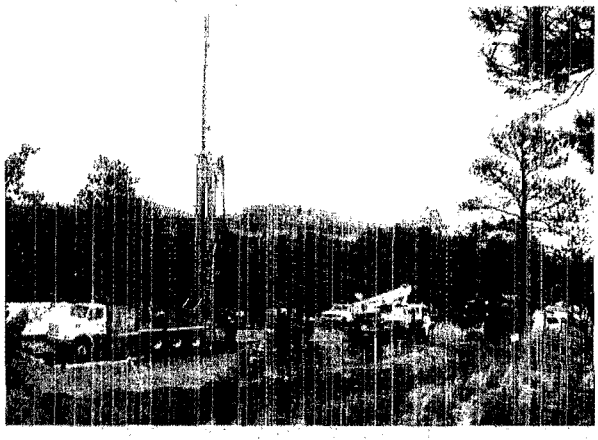
Groundwater

The Laboratory also monitors groundwater to determine its quality. We analyze groundwater for content of general chemistry compounds, metals, organic compounds (including high explosives), and radioactivity to detect possible contamination resulting from Laboratory operations. The regional aquifer beneath Los Alamos is the primary source of drinking water for the Laboratory and the residents of Los Alamos County and 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 1/50 of the drinking water standard. 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. Radioactivity measurements in perched alluvial groundwater that exceeded DOE's 4-mrem DCGs for drinking water or Environmental Protection Agency 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 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 the 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.



Sediments

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, and 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.

Soils

Soil provides an integrating medium that can account for contaminants released to the atmosphere, either directly in gaseous effluents or indirectly from resuspension of on-site contamination. Therefore, the Laboratory, on an annual basis, collects soil samples within (12 sites) and around (10 sites) its boundary for the analysis of a host of radionuclides (e.g., tritium, strontium, cesium, uranium, plutonium, and americium), trace elements (e.g., arsenic, beryllium, cadmium, mercury, lead) and organic (e.g., PCBs,

organochlorinepesticides, dioxins, high explosives, polynuclear aromatic hydrocarbons) constituents. We compare these samples with soil samples collected from regional sites where the constituents of interest are **From** natural and/or from worldwide **fallout** sources. We also compared these samples, collected in the second sampling year after the Cerro Grande fire, with samples collected in 1999.

Most radionuclide concentrations (activity) in soils from the 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. As a group (and using detectable and nondetectable values), uranium and plutonium-239, -240 concentrations in soils collected from Laboratory and perimeter areas were statistically higher than in soils collected from regional areas; these small differences are expected as a result of the increased precipitation closer to the mountains. 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 in the 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-site and perimeter areas have been decreasing over time, so that today most radionuclides are approaching or are similar to values close to regional levels.

In addition to monitoring Laboratory-wide areas, several facilities were assessed. We monitored radionuclides in soil at the Laboratory's primary low-level radioactive waste disposal area (Area G), the Laboratory's Dual Axis Radiographic Hydrodynamic Test (DARHT) facility, and the Plutonium Processing Facility at TA-55 on three different occasions (1984, 1990, and 2001).

Foodstuffs and associated biota

The principal pathways by which foods become contaminated are by deposition from airborne materials and from surface waters. Therefore, during 2001, the Laboratory collected samples of produce (vegetables, grains, and fruit), fish, deer, elk, and wild prickly pear **fruit** from the Laboratory and surrounding areas, including several Native American Pueblo communities, to determine the impact of Laboratory operations on the human food chain. Radionuclides, heavy metals, and organic constituents are routinely analyzed in most of these materials on an annual basis.

Foodstuff samples from Laboratory and perimeter locations showed that most radioactivity and metals were 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 from smoke and fallout ash and contaminants in storm 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 uranium, plutonium-239, and lead were not significantly higher in produce collected from on-site and perimeter areas compared with regional areas.

Catfish from Cochiti Reservoir, an impoundment located on the Rio Grande approximately five miles downstream of the Laboratory, were analyzed for PCB congeners, organochlorine pesticides, and dioxins/furans. We compared these fish with fish collected from Abiquiu Reservoir, which is upstream of the Laboratory. Mean total dioxin-like, whole-body PCB concentrations were 7.9E–04 parts per million (ppm)-fresh weight (FW) and 8.14E–03 ppm-FW for Abiquiu and Cochiti samples, respectively. These levels were statistically similar. Comparison with PCB levels measured in the Rio Grande in 1997 implies that sources may exist for PCBs above Laboratory influences. The analysis detected dioxins and furans in 62% (48 of 78) of possible total results in Cochiti fish, and

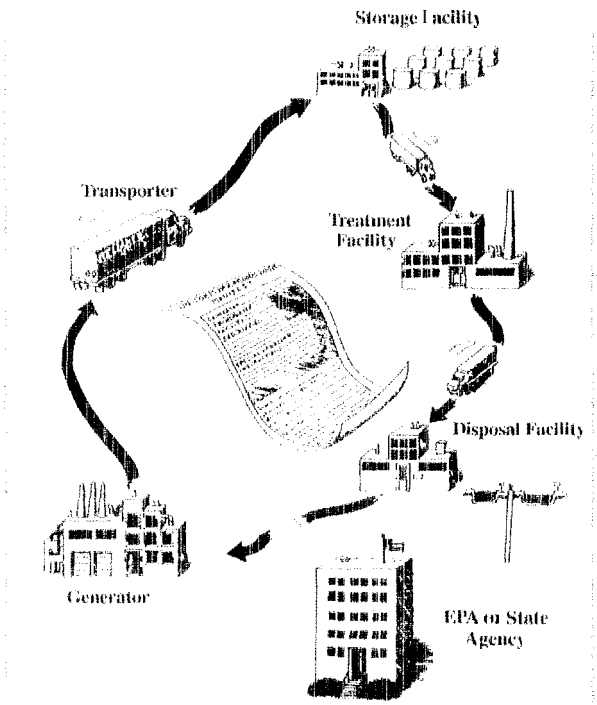
all detected values were below even the most stringent (lowest) toxicological limit for nonhuman biota. The mean total DDT and metabolites (DDT+DDD+DDE) concentration at Cochiti (5.9E–02 ppm-FW) was significantly higher than the mean concentration for Abiquiu (1.5E–02 ppm-FW). The primary source of DDT is likely a massive aerial application in 1963 to the nearby national forests. 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 impact of the Cerro Grande fire on PCB and organochlorine levels in fish at Cochiti Reservoir was 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; assessing 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 hazard one year after the Cerro Grande fire; and biodiversity of fauna after the Cerro Grande fire.

In addition to monitoring Laboratory-wide areas, we assessed the following at several facilities: radionuclides in vegetation, deer, small mammals, and predators at Area G and vegetation and deer within and around the DARHT facility.

Resource Conservation and Recovery Act (RCRA) and its Hazardous and Solid Waste Amendments (HSWA)

RCRA requires the Laboratory to regulate hazardous and solid waste from generation to disposal. Also, RCRA requires the Laboratory to attempt to reduce the amount of hazardous waste it produces and to reduce the toxicity of generated hazardous waste by treatment before disposal. The HSWA emphasize reducing the volume and toxicity of hazardous waste.



RCRA - From Cradle to Grave Tracking of Hazardous Materials

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA outlines the appropriate responses to certain substance releases to the environment. Based on site assessments and inspections, the Environmental Protection Agency ranks potentially health threatening or environmentally unsound hazards at facilities. Special attention is given to these hazardous sites, which are maintained on a national priority list. The Laboratory is not included on the national priority list but is subject to the CERCLA guidelines for remediating Environmental Restoration Project sites that contain certain hazardous substances not covered by RCRA. The Laboratory and Department of Energy also consider CERCLA Natural Resource Damage Assessment issues and resolve them with other natural resource trustees as part of the Environmental Restoration remedy. Environmental Restoration cleanup considers integrated resource management activities including biological resource management, watershed management, and groundwater protection.

Emergency Planning and Community Right-to-Know Act (EPCRA)

EPCRA requires the Laboratory to prepare emergency plans for more than **360** extremely hazardous substances if stored in amounts above threshold limits; provide emergency release notification of leaks, spills, and other releases of certain chemicals; and provide an annual inventory of the quantity and location of hazardous chemicals present above specified thresholds. EPCRA also requires all federal facilities to report total annual releases of listed toxic chemicals. The Laboratory's Emergency Management Plan describes the entire process of planning, responding to, and mitigating the potential consequences of an emergency.

Clean Water Act (CWA)

The primary goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The Laboratory has three primary programs to comply with the CWA: the National Pollutant Discharge Elimination System (NPDES) outfall and storm runoff programs, the Spill Prevention Control and Countermeasures program, and the Section 404/401 Dredge and Fill Permit program.

The NPDES permits establish specific chemical, physical, and biological criteria that an effluent must meet before it is released to the environment. 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.

Toxic Substances Control Act (TSCA)

TSCA regulates the Laboratory's use, storage, handling, and disposal of products and equipment containing PCBs, which are commonly found in oil products, hydraulic fluids, and sanitary treatment solids and may cause adverse health effects in humans.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

FIFRA regulates the manufacturing and application of pesticides. The Laboratory is subject to FIFRA and sections of the New Mexico Pesticide Control Act that include requirements for certification of workers who apply pesticides.

Clean Air Act (CAA) and New Mexico Air Quality Control Act

The CAA and the Air Quality Control Act are federal and state air quality and emissions codes that require careful screening of both radioactive and nonradioactive emissions to the air to protect the public, the ozone layer, and the environment.

Safe Drinking Water Act (SDWA)

On September 5, 2001, DOE completed 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. Responsibility for compliance monitoring under the SDWA and the New Mexico Drinking Water Regulations was also transferred to the county in September 1998. Los Alamos County is now responsible for collecting drinking water samples from the Laboratory's, Los Alamos County's, and Bandelier National Monument's water distribution systems and the Laboratory's water supply wellheads to determine the levels of microbiological organisms, organic and inorganic chemical constituents, and radioactivity in the drinking water.

Endangered Species Act

The Department of Energy and the Laboratory prepare habitat management plans for the threatened and endangered species that could potentially reside on the Laboratory property. The habitat management plan provides guidelines to protect these species and their habitats from disturbance or adverse habitat alteration caused by the Laboratory's operations.

Cultural Resource Compliance Acts

The National Historic Preservation Act requires federal agencies to evaluate the impact of all proposed actions on cultural resources. Federal agencies must also consult with the State Historic Preservation Officer and/or National Advisory Council on Historic Preservation about possible effects on identified resources. The American Indian Religious Freedom Act 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 states that if burials or cultural objects are inadvertently disturbed by federal activities, work must stop in that location for 30 days, and the closest lineal descendant must be consulted for disposition of the remains. The Archaeological Resources Protection Act provides protection of cultural resources and sets penalties for their damage or removal from federal land without a permit.

National Environmental Policy Act (NEPA)

NEPA's objective is to maintain or restore compatibility between humanity and the environment, in the present and in the future. NEPA requires federal agencies to consider the environmental impact of their actions before deciding to proceed with those actions. NEPA also requires a decision-making process open to public scrutiny. DOE, as the Laboratory's sponsoring agency, is responsible for preparation and approval of NEPA documents. Under DOE's compliance strategy for NEPA, a Site-Wide Environmental Impact Statement (SWEIS) was prepared to examine the environmental impacts of operations at a multiprogram site. An earlier SWEIS was prepared in 1979. DOE completed a new SWEIS in January 1999. The Record of Decision was signed on September 13, 1999.

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 this report.

http://www.lanl.gov/worldview/
reaches the Los Alamos National Laboratory public 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.lanl.gov/orgs/rres/maq/index.htm
accesses LANL's Air Quality Group.

http://eshint.lanl.gov/%7Eesh18/18_index.shtml
accesses LANL's Water Quality and Hydrology Group.

http://www.esh.lanl.gov/%7Eesh19/
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.