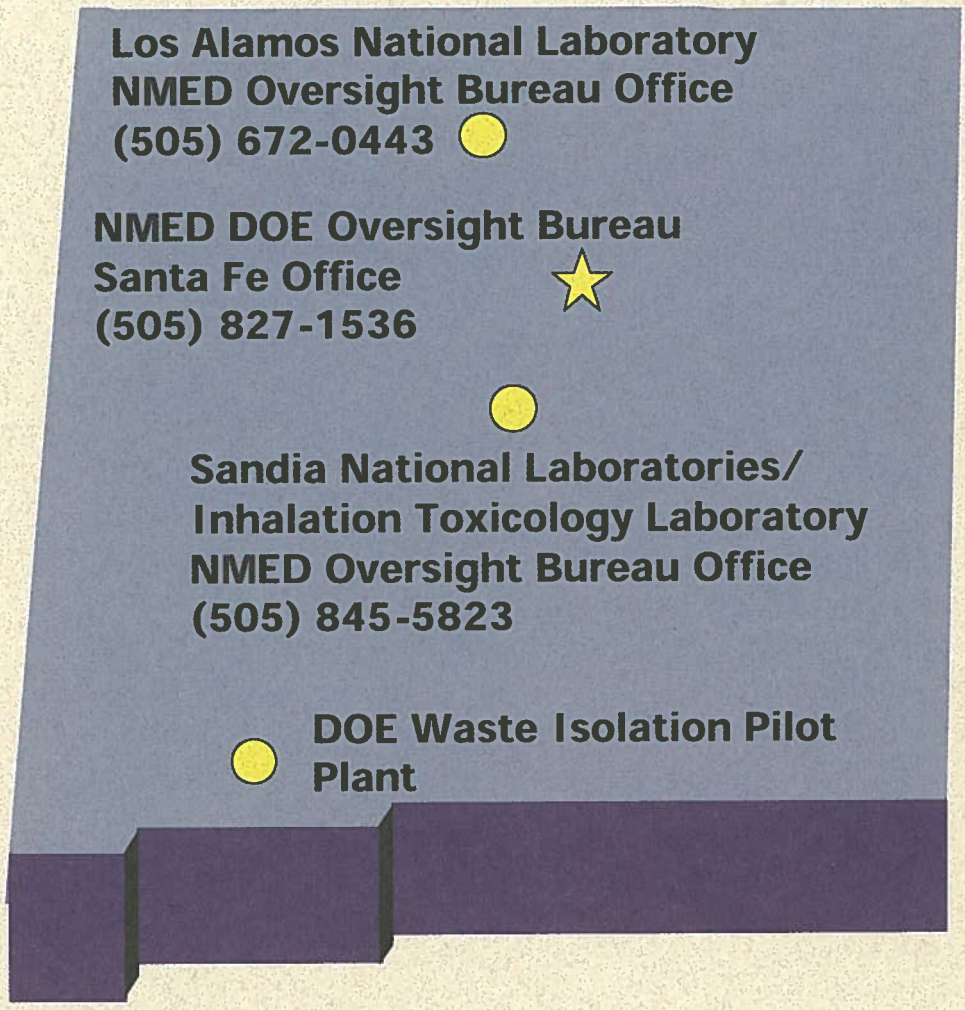
Los Alamos National Laboratory
NMED Oversight Bureau Office
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Inhalation Toxicology Laboratory
NMED Oversight Bureau Office
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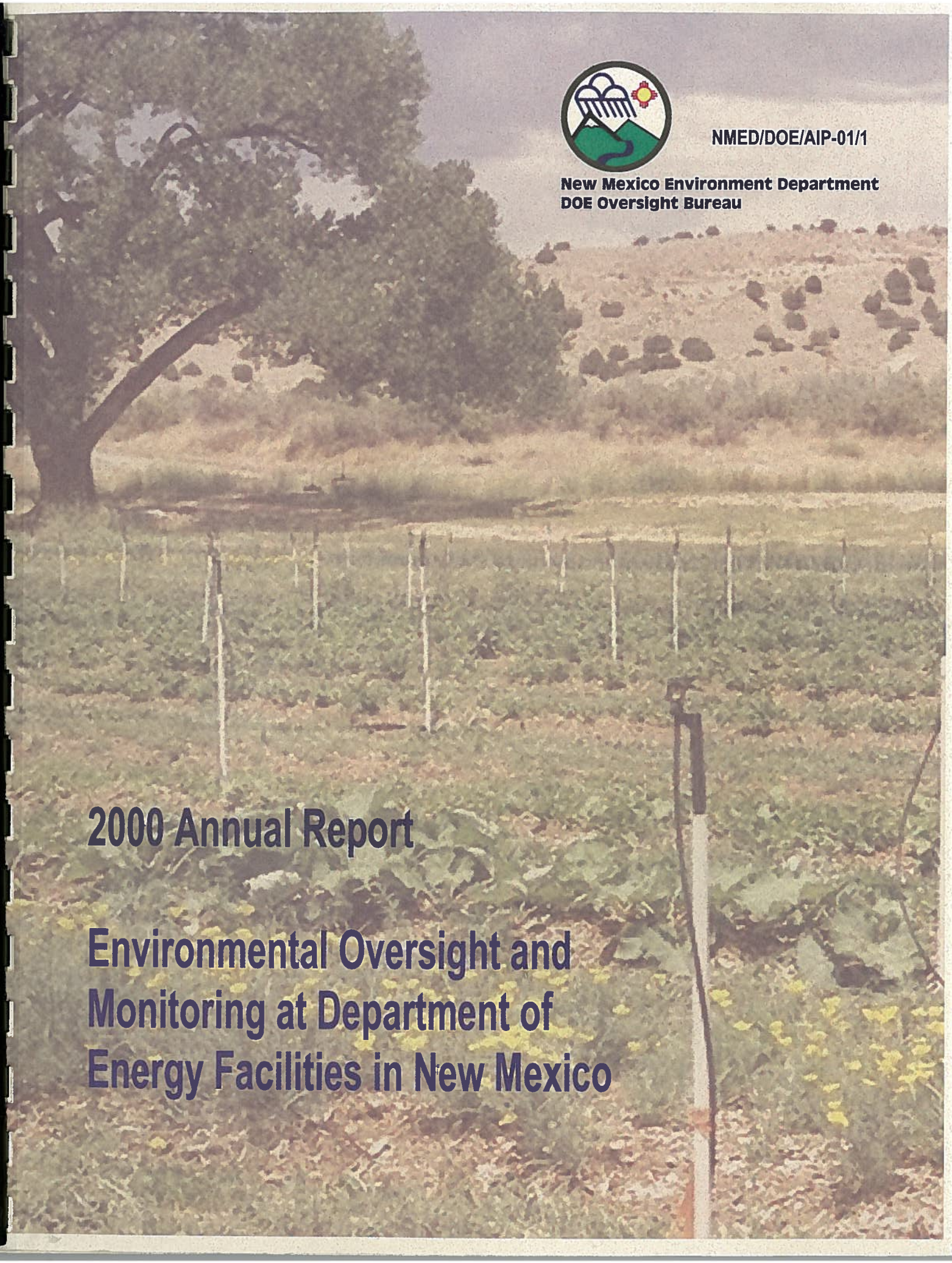
DOE Waste Isolation Pilot
Plant



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New Mexico Environment Department
DOE Oversight Bureau

2000 Annual Report

Environmental Oversight and Monitoring at Department of Energy Facilities in New Mexico

The 2000 Annual Report is a publication of the
New Mexico Environment Department DOE Oversight Bureau.

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Contents

Executive Summary

The New Mexico Environment Department's DOE Oversight Bureau is funded by a grant from the U.S. Department of Energy with provisions set forth in an *Agreement-in-Principle between the State of New Mexico and the U.S. Department of Energy.* The agreement provides for state oversight of environmental impacts at four DOE facilities: Sandia National Laboratories and the Inhalation Toxicology Research Institute in Albuquerque, Los Alamos National Laboratory in Los Alamos, and the Waste Isolation Pilot Project near Carlsbad. The agreement was renewed this year and will expire in 2005. This Annual Report highlights the activities of the DOE Oversight Bureau for calendar year 2000. Additional copies of this report may be obtained by contacting the Oversight Bureau. The Bureau's address is on the inside cover. This report is also posted on the New Mexico Environment Department's website at www.nmenv.state.nn.us.

For many of us the year 2000 will be remembered for the Cerro Grande fire, which swept through the mountains into Los Alamos and portions of Los Alamos National Laboratory property. Images of flames above the ridge tops, billowing clouds of smoke, and houses on fire will remain in the minds of many New Mexicans for years to come. Another legacy of the fire is the increased risk of flooding due to the blackened hillsides' susceptibility to erosion. A related concern is the potential for transport of contaminants from the Laboratory carried by the floods. In response to this concern, the Oversight Bureau conducted an expanded scope of monitoring funded by an additional grant from the Department of Energy.

During the fire, Oversight Bureau staff investigators took daily samples of air particulates from monitoring stations in and around Los Alamos and sampled ash from communities downwind of the fire such as Santa Clara, Española, Hernandez, and San Juan. Afterwards, produce from farms beneath the area blanketed by the smoke clouds was sampled. Runoff from storms centered over Los Alamos was sampled, as were ash and sediments from the burned area, receiving canyons, and the Rio Grande.

The Oversight Bureau participated in a number of public outreach initiatives associated with the fire. Bureau technical staff members served as panelists on several community-group-sponsored meetings and provided poster displays at multi-agency public meetings. Numerous phone calls were received, and the staff met privately with a number of community members. Data resulting from the monitoring activities were made available to the public through the Department website and the public meetings.

The Oversight Bureau contracted with Risk Assessment Corporation to conduct an independent assessment of risks to the public and workers from transport of contaminants from Los Alamos National Laboratory. The assessment will evaluate exposures and risks to the public, emergency response personnel, and firefighters resulting from airborne contamination released during the fire or contaminants carried by surface water runoff. The contractor is required to hold a series of public meetings to share the findings and recommendations resulting from its assessment.

Although slowed by events surrounding the fire, we continued to participate on teams with the Laboratory, DOE, and Hazardous Waste Bureau representatives intended to accelerate environmental restoration at contaminated sites through collaborative decision-making. Another collaborative effort involved assessing the effects of the fire on contaminated areas within the

burned areas known as potential release sites. Approximately 340 such sites were investigated by the Accelerated Remediation Team composed of Laboratory, DOE, and Environment Department representatives. Based on recommendations of the team, contaminated soil or debris at some of these sites required immediate removal.

As time permitted, we also evaluated the hydrogeologic and canyons investigations, and we continued to meet with DOE and local government officials regarding concerns about residual radioactive contamination on Los Alamos County property below a Manhattan Project era radioactive-waste-water treatment facility.

At Sandia National Laboratories, Oversight personnel conducted regular visits to the Chemical Waste Landfill as excavations there proceeded. Groundwater and soils at the landfill were sampled and staff members participated in a high-performing team to develop a risk-based approach to cleanup at this site. We also sampled soils from the Radioactive Waste Landfill. Recommendations were provided to DOE and Sandia pertaining to the management of wastes at the Corrective Action Management Unit.

Environmental radiation monitors were maintained on a quarterly basis at the Waste Isolation Pilot Project site. We published a report entitled *Contaminant Migration Potential Due to Surface Water Erosion for 14 Solid Waste Management Units at the Department of Energy Waste Isolation Pilot Plant.*

Introduction and Program Overview

The mission of the New Mexico Environment Department's DOE Oversight Bureau is to help assure that activities at DOE facilities in New Mexico are protective of public health, safety, and the environment. The DOE Oversight Bureau's activities are funded by a grant from the U.S. Department of Energy in accordance with the provisions set forth in the Agreement-in-Principle between the State of New Mexico and the U.S. Department of Energy for Environmental Oversight and Monitoring. This agreement focuses on state oversight of environmental impacts at DOE facilities: Sandia National Laboratories and the Inhalation Toxicology Research Institute in Albuquerque, Los Alamos National Laboratory in Los Alamos, and the Waste Isolation Pilot Plant near Carlsbad. The New Mexico Agreement-in-Principle is part of a nationwide initiative by DOE to improve its accountability concerning public health, safety, and environmental protection. States hosting DOE facilities were provided resources to develop and maintain a credible oversight program. The agreement is intended to assist the state in the development and implementation of a vigorous program of independent monitoring and oversight, increase public knowledge of environmental matters about the facilities, and enhanced coordination with local and tribal governments.

The first Agreement-in-Principle became effective on October 11, 1990; the second five-year agreement expired on September 30, 2000. A new agreement was signed in October 2000 by Governor Gary Johnson, NMED Secretary Peter Maggiore, and DOE Albuquerque Operations Manager Richard Glass. The Agreement will expire September 30, 2005.

Personnel and Administration

The New Mexico Environment Department had 26 positions funded under the Agreement-in-Principle in 2000. A reduction in the level of funding from DOE required the Environment Department to leave three of these positions vacant in 2000.

NMED employees funded by the DOE grant are located at state offices in Santa Fe and at site offices in White Rock, and Kirtland Air Force Base in Albuquerque. Due to their limited scope, environmental oversight and monitoring activities relating to the Waste Isolation Pilot Plant are performed by Oversight Bureau staff based in Santa Fe.

Interagency Management Group

The DOE Oversight Bureau continues to participate in meetings of an interagency management group charged with overcoming technical, administrative, and regulatory barriers to the cleanup of contamination at Sandia and Los Alamos National Laboratories. The Management Implementation Group (MIG) is composed of representatives from the Environment Department, U.S. Environmental Protection Agency, Department of Energy, and Los Alamos and Sandia National Laboratories. The MIG meets every other month. The meetings help foster improved communication and are intended to provide a framework for ensuring progress in the cleanup programs. High performance teams composed of technical people from the respective organizations are working to address cleanup of contamination at priority sites at both Sandia and Los Alamos. The MIG continues to assess the progress of these teams in achie ving the goals that have been established.

Intergovernmental Coordination and Public Involvement

NEWNET and the Community Radiation Monitoring Group

The Neighborhood Environmental Watch Network (NEWNET) program promotes better understanding of the environment through collaboration between the public, government, educational institutions, and industry. Developed by Los Alamos National Laboratory, NEWNET provides real-time gamma radiation and meteorological information on the Internet at http://newnet.lanl.gov/. NEWNET monitoring stations collect information that is transmitted by satellite to earth stations at Los Alamos and Las Vegas, Nevada, where the data are made available through the Internet.

In 2000, the second independent audit of the Laboratory's Clean Air Act compliance programs was completed. At the request of Concerned Citizen's for Nuclear Safety, the independent auditor was asked to review the NEWNET program. The auditor recommended that additional emphasis be placed on NEWNET data quality. To accomplish this, the Laboratory transferred management responsibility to the Air Quality Group, ESH-17. A program was implemented to review data collection and data management hardware and software systems. Also, during the year, the NEWNET satellite communications and data management computers were moved from TA-16 to TA-35.

In New Mexico, the Oversight Bureau facilitates the community program for the NEWNET project through the Community Radiation Monitoring Group. It is composed of citizen volunteers, staff members from the Bureau, and representatives from environmental activist groups, the Department of Energy, Los Alamos National Laboratory, and several northern New Mexico Pueblos. The group helps develop policy and direction for the NEWNET program. During the year, at meetings held monthly, there were discussions about the NEWNET data, data quality, radiation monitoring at TA-3 and TA-18, and the capabilities of the system to provide useful information in the event of emergencies ranging from the Cerro Grande fire to Laboratory radiological releases.

Under the Consent Decree that resolved a 1994 lawsuit by Concerned Citizens for Nuclear Safety, the DOE is required to provide funding for the NEWNET program until September 30, 2002. In discussions with the Community Radiation Monitoring Group regarding funding beyond 2002, representatives of the Laboratory have expressed their interest in continuing funding of the NEWNET program in northern New Mexico. Laboratory funding to other NEWNET stations will be phased out beginning in 2001.

Accord Pueblos

The four northern pueblos in closest proximity to Los Alamos are San Ildefonso, Jemez, Santa Clara, and Cochiti. These pueblos are referred to as the Accord Pueblos. Each has a *Memorandum of Understanding* with the Laboratory for environmental monitoring on their contiguous lands. During the year, the Oversight Bureau developed a draft memorandum with San Ildefonso Pueblo, modeled after the one between the Pueblo and the Laboratory. The memorandum is intended to clarify protocols for site access and the review and return of data gathered on pueblo lands. It is currently being reviewed by the Pueblo.

We loaned the San Ildefonso Pueblo environmental staff three automatic samplers from the Surface Water Quality Bureau for collecting storm-water samples. After the Cerro Grande fire, we helped representatives of the Santa Clara Pueblo Environment Department set up an automatic water sampler to collect water quality samples, made observations to assess habitat changes in Santa Clara canyon, and collected samples to evaluate changes in aquatic insect communities.

Los Alamos County

This year, we met periodically with representatives of Los Alamos County, the DOE, and Los Alamos National Laboratory to discuss the status of issues relating to the Environmental Restoration Project and particular Solid Waste Management Units. Issues included land transfers from the DOE to the county, and conflicts between county utility work and environmental restoration activities. In discussions regarding county owned property in Acid Canyon, we shared our knowledge about the data that Bureau environmental investigators and others had collected and discussed our understanding of the parameters that were appropriate for use in the risk evaluation.

In 1999, we found low levels of tritium and perchlorate in a county water production well, Otowi-1. Because of misunderstandings about the way this information was released to the county and the DOE, the Oversight Bureau and the DOE developed a protocol for informing the county of environmental monitoring data that is collected on county property.

Citizens Advisory Groups and Long-Term Stewardship

DOE Oversight Bureau staff participated in meetings of the Northern New Mexico Citizens' Advisory Board, particularly the Environmental Monitoring and Environmental Restoration committees. We consulted with committee members as they formulated a recommendation on the Laboratory's Hydrogeologic Workplan and as they prepared a recommendation to DOE that funding be provided in the baseline for additional cleanup of radioactive hot spots in Acid Canyon.

In September, the Sandia Citizens' Advisory Board ceased to exist as a Federal Advisory Committee, and the DOE sought to continue public involvement by creating opportunities around specific topics. Until that time, the Albuquerque staff served as an information resource to the community primarily through the Citizens' Advisory Board and its subgroups.

Ralph Ford-Schmid and representatives of the Hazardous Waste and Surface Water Bureaus answer questions at a conference sponsored by Concerned Citizens for Nuclear Safety on the Cerro Grande fire.

The two primary topic areas on which Bureau staff interacted with the advisory board were Class III modifications to Sandia's Resource Conservation and Recovery Act (RCRA) Permit, and the Mixed Waste Landfill inside Sandia's Technical Area 3.

We attended two public meetings regarding the RCRA permit modifications, and contributed the Oversight Bureau's project knowledge and perspective on the Solid Waste Management Units for which No Further Action status was being requested. Sixty-four Solid Waste Management Units were included in the two permit modification requests DOE made to the Environment Department. Following the public meetings, we participated in the Board's subgroup that examined the details of corrective actions at each Solid Waste Management Unit. We provided information on how the state evaluates data, and how risk from any residual contamination is measured.

We also participated in the Citizens' Advisory Board subgroup formed to develop recommendations on a course of action for Sandia's Mixed Waste Landfill. The Environment Department is reviewing a proposal to cover the Mixed Waste Landfill. In response to interest regarding the landfill, the Bureau began planning public meetings to present the Environment Department's environmental assessment, to review the regulatory options, and to provide opportunities for members of the pubic to share their concerns.

As the Sandia Citizens' Advisory Board completed its charter, DOE held a public workshop in Albuquerque to form public work groups that will provide input on the subject of Long-Term Environmental Stewardship. We participated in all three work groups, which addressed management of the stewardship program, institutional controls, information management, and environmental monitoring. Our contributions focused on stewardship implementation issues based on our understanding of organizational structures, regulatory requirements, and the environmental conditions.

Long-term environmental stewardship can be considered post-closure care for sites that cannot be cleaned to unrestricted-use conditions. We supported the concept of using the existing RCRA permit as a regulatory driver for stewardship activities. We also agreed that information about the post-closure conditions should be readily available to the public, and that our continued oversight can contribute to the information base. We encouraged active cooperation between DOE and local governments on tracking land-use restrictions, and agreed with other members of the work group that a long-term funding commitment is needed to support stewardship.

Conference Participation and Educational Outreach

Roger Kennett, program manager of the Bureau's Sandia Oversight Office, continued as co-chair of the Interstate Technology and Regulatory Cooperation (ITRC) Work Group. The ITRC is a national coalition of state and environmental agencies: the Environmental Protection Agency, public, tribal, and industry stakeholders, and the Departments of Energy and Defense. The purpose of the group is to examine new technologies that may improve methods for environmental cleanups at federal and private sites. The ITRC has focused its attention on coordinating multi-state evaluations of technologies with application at DOE facilities, including facilitation of a demonstration at Sandia of a molten aluminum bath technology that has potential to treat several problematic categories of mixed waste across the DOE complex.

During the year, Roger planned a National Forum and Technology Exhibit to develop strategies to accelerate federal agency environmental cleanup. He also represented the Bureau at a technology colloquium where he encouraged early cooperation with regulatory agencies.

Bureau staff participated in the activities of the Radiation Education and Awareness Program, which was established during the autumn of 1999 with the goal of providing education and awareness of radiation to the citizens of New Mexico. In October, members of the group participated in a statewide education conference for New Mexico teachers and administrators. They presented nearly twenty 1-2 hour sessions dealing with various aspects of radiation ranging from the measurement of radiation and radon to concerns relating to the Waste Isolation Pilot Plant.

Lance Voss describes environmental careers at the "School to World" Career Day at the Albuquerque Convention Center.

For the third year in a row, members of the Bureau's Albuquerque office served as judges at the Northwest New Mexico Regional Science Fair at the University of New Mexico. This year, staff members evaluated projects in the Junior Botany and Junior Environmental Science categories. The Albuquerque office also presented materials about Bureau oversight activities and employment opportunities with the Environment Department at the "School to World" career day at the Albuquerque Convention Center. Two representatives from the Santa Fe office made presentations to middle school students in Santa Fe. The presentations introduced students to the study of aquatic insects and microorganisms.

At the October 2000 New Mexico Environmental Health Conference, Bob Weeks presented a paper "An Overview of Radiological Monitoring: Capabilities and Surprises." The paper discussed techniques for monitoring airborne radiation and emphasized that no single technique provides all the information needed to make informed decisions during emergencies.

Publications

The following publications were issued during 2000:

Contaminant Migration Potential due to Surface Water Erosion for 14 Solid Waste Management Units at the Department of Energy Waste Isolation Pilot Plant, Ralph Ford-Schmid, January 2000

Newsletter, *Environmental Reporter*, Spring/Summer 2000

A complete list of Bureau reports and publications is available upon request by contacting the DOE Oversight Bureau, 2905 Rodeo Park Drive East, Building 1, Santa Fe, New Mexico 87505, (505) 827-1536.

Los Alamos National Laboratory

Cerro Grande Fire

Early in May, what began as a prescribed burn within Bandelier National Monument grew into a wildfire that may have been the most significant event in the state during 2000. The fire became known as the Cerro Grande fire. It burned almost 50,000 acres of forest and residential land, including about 7,500 acres of the Los Alamos National Laboratory site. One hundred twelve Laboratory and 235 residential structures were either damaged or destroyed. The Laboratory was closed for two weeks, and the towns of Los Alamos and White Rock were evacuated for several days.

Many people in northern New Mexico opened their homes to Los Alamos families who had been evacuated or who had lost their homes. Some participated in emergency operations, and provided food and supplies to those fighting the fire or who lost their possessions. After the fire, others helped in efforts to restore the slopes of the mountains that had been burned.

The fire redirected the work of the Oversight Bureau, and had significant impacts on the work of the rest of the Environment Department. Los Alamos National Laboratory was significantly impacted by the fire, especially the environmental programs. We collected data on and around the Laboratory to better understand and predict any potential risks to human health risks. We also increased our environmental monitoring efforts to evaluate the effects of erosion-caused contaminant transport.

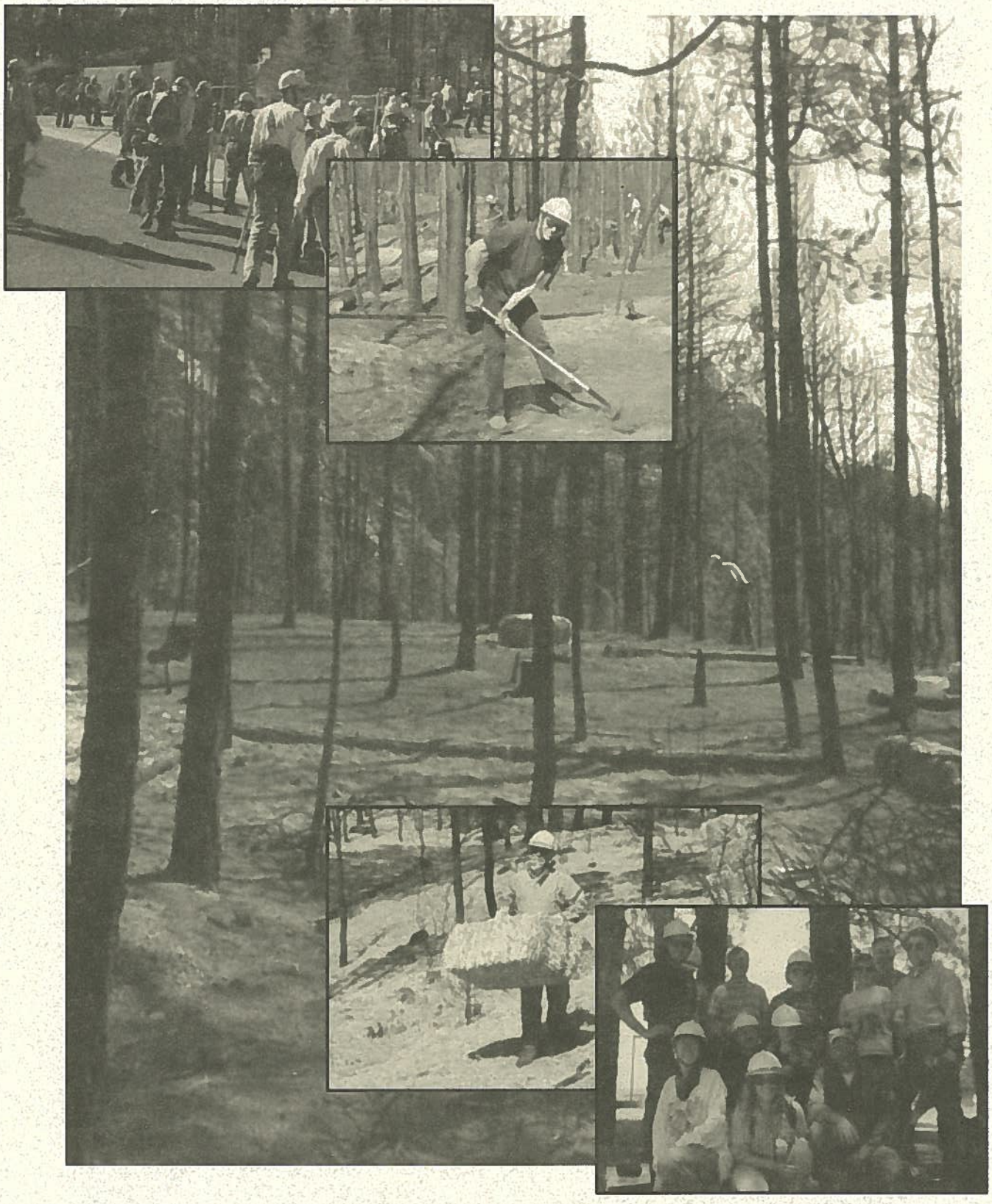
In the days immediately following the fire, we participated in daily Burned Area Emergency Response team meetings, providing surface water-quality data to the team. We worked with DOE and the Laboratory to provide Forest Service restoration workers information on possible health hazards associated with their work on Laboratory property. Bureau representatives participated in the work of the Interagency Flood Risk Assessment Team, or IFRAT, which was formed shortly after the Cerro Grande fire, to communicate to the public information on flood and contamination risks related to the aftermath of the fire.

The Cerro Grande fire destroyed property and damaged forested lands. However, it brought communities together in the relief effort, with many individuals donating their time and money. Besides a better understanding of fires and fire risks, we hope that the lasting outcome of the Cerro Grande fire will be better communication between the public and government agencies, and improved systems for responding to emergencies of all kinds.

Risks to Forest Service Workers

In June, we worked with DOE and the Laboratory to provide Forest Service workers information on possible health hazards associated with their work on Laboratory property. The Forest Service had established two camps to house personnel working on erosion mitigation efforts on the charred slopes near Los Alamos and Española.

The Los Alamos camp was located at Technical Area 49, approximately 100 yards from a barbed wire fence that encloses Material Disposal Area AB. The disposal area contains the Laboratory's second largest inventory of plutonium, buried in a series of shafts. Some of the workers expressed concerns about the location of the camp near the disposal area. Others were concerned about the inhalation of ash and dust during the deployment of erosion controls on the slopes near Los Alamos. They were concerned about possible radioactive contamination in the ash.



Environment Department volunteers work with hundreds of other New Mexicans to reclaim hillsides after the Cerro Grande Fire.

To address these concerns, the Forest Service requested the help of the DOE, the Laboratory, and the Oversight Bureau. We conducted a gamma radiation survey in the camp and accompanied some work details. We found no levels of gamma radioactivity above background levels in the base camp or at the selected work sites in the mountains. Forest workers were also allowed to use the instruments to measure radioactivity. In addition, the DOE distributed personal gamma monitors to all the workers.

At a well-attended meeting after the survey, many of the workers expressed that they felt reassured that their safety was not compromised as they performed their duties. However, a third of the workers elected to seek other work locations in western states the following week.

Bureau staff also addressed concerns of members of the public after the fire. For example, a mother expressed concern that her son had been exposed to plutonium and cyanide in October at the Cave of the Winds in Los Alamos Canyon, near the Quemazon Trail and just below the canyon's north lip. We surveyed the clothing worn by the child and found no evidence of radiation above background.

IFRAT

We participated in the work of the Interagency Flood Risk Assessment Team (IFRAT), which was formed shortly after the Cerro Grande fire, to communicate to the public information on flood and contamination risks related to the aftermath of the fire. The team includes managers and scientists from the Environment Department, the Laboratory and the DOE, other organizations, and interested members of the public. In December, the IFRAT held an open house where investigators shared flood and water quality data, and discussed preliminary runoff models and flood mitigation measures. Bureau investigators shared much of their preliminary data, and continue to share data with IFRAT risk assessors as they evaluate potential risks.

Fire Risk Assessment

At meetings in Santa Fe and Española after the Cerro Grande fire, members of the public expressed concerns regarding potential exposure to contaminants in smoke from the Cerro Grande fire. The public was also concerned about the possibility that contaminants might be transported by surface water because of damage to vegetation and watersheds.

In response to these concerns, and in recognition of the need for an independent assessment of fire risks, the Oversight Bureau, with the support of DOE and Los Alamos National Laboratory, began a search for a consultant to perform an independent assessment of risks from the fire. At year's end, contract negotiations were being finalized with *Risk Assessment Corporation*, a nationally recognized company that has performed similar environmental transport and health risk assessments at other U.S. Department of Energy sites. The contract is intended to provide an independent assessment of risks from exposure to radionuclides and chemicals transported by air and surface water, to the public, emergency response personnel, and firefighters, and to summarize lessons learned from the fire regarding monitoring and public information efforts.

Legacy Waste Cleanup

As part of our response to the Cerro Grande fire, the DOE Oversight Bureau participated in team efforts to assess potential release sites that were in areas impacted by the fire. We also continued our work with the Laboratory and regulators on "high performing teams" established to facilitate the completion of investigations and cleanups. Our work in the field and technical review of no further action proposals has served to help remove some sites from the facility's hazardous

waste permit and clarify the regulatory status of others.

Accelerated Remediation After the Cerro Grande Fire

The Cerro Grande fire either burned over or burned lands directly above 340 contaminated areas, known as potential release sites. It caused damage to soil and vegetation, and increased the potential for erosion and for the transport of contaminants from the sites. Therefore, shortly after the fire, the Laboratory and the Environment Department recognized the need to identify the threatened sites and take appropriate restoration or control measures. The Laboratory's Environmental Restoration project formed a group, which became known as the Accelerated Remediation Team, to direct activities at these sites. The group included representatives from the Laboratory, the DOE, and the Environment Department.

The team quickly identified five sites generally in the western portion of the facility, in Technical Areas 15, 16, 36, and 40, that had been burned over by the fire and were obviously impacted. The team agreed on the need for immediate soil or debris removal at these sites.

The Laboratory's Environmental Restoration Project also identified 77 areas in the most fire-damaged watersheds (Pajarito, Pueblo, Los Alamos, Water, and Cañon de Valle) that required corrective action investigation or remediation and could be impacted by flooding. Five of them were the canyons themselves; the remaining sites were located within the floodplains of the Pajarito and Los Alamos watersheds. Meetings were held weekly to make determinations on appropriate actions for each site. The team developed brief status sheets to document and facilitate the work. The Laboratory protected many of the sites using a variety of erosion controls, including jute matting, rock check dams, log-silt barriers, straw wattles, hand-raking and seeding, and hydro-mulching. Approximately 93 acres were treated in this manner.

By the end of the year, 2300 cubic yards of material in an old dumpsite known as MDA-R had been excavated and 280 cubic yards of soils in the drainage at a site known as the Silver Outfall had been removed. The Laboratory cleaned up debris in TAs 15, 36, and 40. For the floodplains, the primary achievement was the characterization of sites in TA-2. Other efforts by the Laboratory and the Army Corps of Engineers resulted in modifications that lessened potential impacts to sites at TA-18.

High-Performing Teams

Members of the DOE Oversight Bureau continue to work on High-Performing Teams (HPTs), which include representatives from the DOE, Los Alamos National Laboratory, and the Environment Department. They are involved in the following teams: Building 260 Outfall, Airport Landfill, Material Disposal Areas (MDAs), and Ecorisk. The teams are intended to accelerate environmental restoration through interagency communication and collaborative decision-making.

The Building 260 Outfall HPT was formed to expedite the remediation of a drainage

Workers install straw wattles to reduce erosion in areas affected by the Cerro Grande fire.

contaminated with high explosives, located below the building's 13 sumps and outfall. Building 260 is located in TA-16, the center of high explosives production for weapons and non-weapons research and development. This year, the Laboratory began removing soil and tuff from the drainage as part of the interim measures plan. Several regulatory decisions faced the team during the implementation of the interim measures. Among them were how to best classify the "blending" of contaminated and non-contaminated soil, and how to categorize and manage the different waste streams created during the soil removal. The team also determined whether to perform on-site treatment of waste and under what regulatory purview.

The Airport Landfill HPT was formed to expedite the remediation and subsequent conveyance of the Airport Tract to Los Alamos County. To reduce monetary support from the DOE and to promote the self-sufficiency of Los Alamos County, Congress enacted Public Law 105-119. This law, in part, mandates that the Department of Energy convey undeveloped land currently under its administrative control to the county. One of the land parcels identified for conveyance under this law is the Airport Tract, which includes the Los Alamos airport landfill. The airport landfill is located on the north side of State Road 502, northeast of the airport and east of the Los Alamos townsite. It consists of five separate solid waste management units: the main landfill, a debris disposal area landfill, a waste oil pit, bunker debris disposal areas, and a former landfill-office septic system. The airport landfill team agreed on the regulatory and technical approaches to remediation. Once additional soil, water, and soil gas samples have been collected to fill some data gaps, the landfill will be capped with a cover designed to limit infiltration and erosion. The drainages on the hillside below the landfill will be remediated by removing refuse and disposing of it at a designated off-site landfill or recycling it. The sediment in the drainages will also be sampled to determine whether contaminants are moving away from the landfill and posing an unacceptable risk to the public.

The MDA HPT was initially formed to expedite the review and for approval of remedial activities at MDAs. In September, the team was redirected to focus on selecting and approving a remedy for MDA H. This material disposal area, located in the northwest part of TA-54, consists of nine subsurface disposal shafts. The waste consists of classified shapes contaminated with tritium, plutonium, and other hazardous chemicals. After reviewing a draft report on the site, the team concluded that the Laboratory needed to perform a corrective measures study because contaminants at the site may present an unacceptable threat to humans and the environment over the lifetime of the waste. The corrective measures study will evaluate corrective action alternatives and assess the need for and design features of alternative remedies. The team also agreed that further investigation to fill data gaps should be done concurrently with the corrective measures study.

Areas of Concern

Solid Waste Management Units (SWMUs) that are contaminated with both radioactive materials and hazardous chemicals are regulated by the New Mexico Environment Department. Sites contaminated with radioactive materials and not with hazardous chemicals are regulated by the DOE. Sites with radioactive-only contamination at Los Alamos are called Areas of Concern, or AOCs.

In March 1995, September 1995, and September 1996, the Laboratory submitted three requests to modify its Resource Conservation and Recovery (RCRA) Permit. The requests were to remove 190 SWMUs and 512 AOCs from the permit because they required no further action. To date, the Environment Department has granted no further action status to 132 of the 190 SWMUs.

For the past two years, a group including representatives from the Hazardous Waste and Oversight Bureaus has been examining these requests. The group is attempting to determine if (1) the site does not pose a risk, (2) the site contains hazardous chemicals in addition to radioactive materials, and should be listed on the Laboratory's RCRA Permit, or (3) the site has radioactive materials but does not have hazardous chemicals and is regulated by the DOE. At this time, some 200 sites have been reviewed. Representatives of the Oversight Bureau are supporting this effort through technical review of documents and provision of site-specific knowledge and information.

Environmental Monitoring

During the year, we continued our radiation and airborne radionuclide monitoring around the Laboratory. We intensified our monitoring efforts during the Cerro Grande fire. Afterwards, we expanded our soil, sediment, and monitoring program to evaluate possible health and environmental impacts caused by airborne materials or sediment transport. We collected samples of ash and soil in the forested areas burned by the fire, samples of soils and produce from farms in the path of the smoke cloud, and storm water and sediments derived from ash deposits.

Air Monitoring during the Cerro Grande Fire

Our air particulate monitors continued to operate during the Cerro Grande fire. As the smoke from the fire intensified, we changed the filters on a daily basis and checked for gamma radiation using field instruments.

Seven days after the fire started, on May 11, the smoke plume extended over Santa Fe. We began daily exchanges of the filters on high-volume samplers located in Santa Fe. Because the NEWNET real-time gamma monitoring stations were not transmitting to the satellites, we traveled to stations in Santa Fe, Española, and Okay Owingeh to visually read the stations.

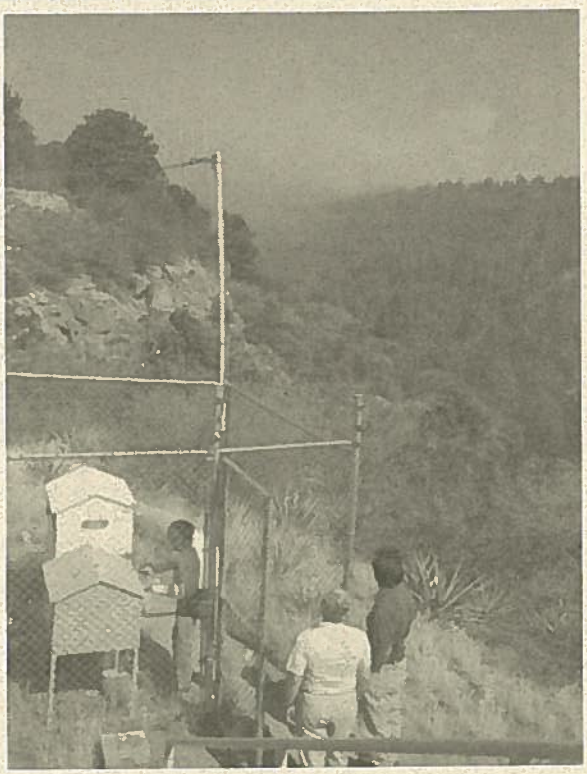
We also collected samples of ash fall particulates on smooth surfaces using small swatches or "swipes" of filter media. The swipes were collected from Cochiti Reservoir to Okay Owingeh, and counted for alpha radiation at the Bureau office in Santa Fe. The swipes initially showed elevated alpha counts rates, which declined rapidly to normal levels.

On Friday, May 12, emergency management personnel ordered the evacuation of White Rock. We continued to collect filters from perimeter air monitors throughout the weekend and into Monday and collected another round of swipe samples.

The results of our sampling indicated that gross alpha and gross beta levels were elevated during the fire. However, based on the isotopic analysis of air monitor filters and the rapid drop radioactivity of the swipe samples, it appeared that the elevated readings resulted from short-lived radionuclides from the natural decay of radon.

In early June, the Viveash fire burned about 30,000 acres in the Pecos District of the Santa Fe National Forest. We worked with

Bob Weeks checks Los Alamos High School NEWNET station during the Cerro Grande fire.



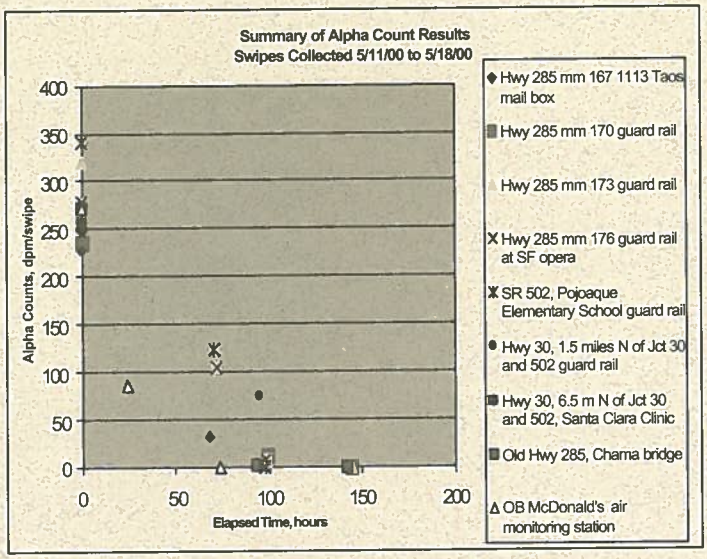
Steve Yanicak, Bob Weeks, and Michael Dale change filters at air monitoring station behind Los Alamos McDonald's during the Cerro Grande fire.

representatives of the Air Quality Bureau to collect particulates samples from the Viveash fire so we could compare data from the Viveash fire to data from the Cerro Grande fire. The Air Quality Bureau supplied two portable samplers and personnel to exchange the filters and service the generator. Samples were collected from two locations in the smoke plume. Isotopic analyses showed that uranium, plutonium, and americium were at background levels, but gross alpha and beta concentrations increased to about the same levels as we measured during the Cerro Grande fire.

After the majority of the Cerro Grande fire was out, some tree stumps and lumber at a disposal site known as MDA-R continued to smolder. We analyzed air filter samples that the Laboratory's Air Quality group collected using a portable air monitor located near the site. Analysis of the filters showed nothing above background levels.

Tritium in Pajarito Canyon Rain and Snow

The Weapons Engineering Tritium Facility is located in Technical Area 16 (TA-16) on the western edge of Los Alamos National Laboratory property. The Laboratory continuously monitors tritium releases from the facility using "bubbler" vials located in the exhaust stack. Also, an ambient air monitoring station is located near the facility exhaust stack. Ambient samples are collected continuously and analyzed every two weeks. Ambient air quality data is posted on the Laboratory's air quality web page, http://www.air-quality.lanl.gov/AIRNET.htm.



Bureau investigators collected samples of rain and snow near TA-16 and analyzed the samples for tritium. The purpose of the sampling was to independently measure the concentration of tritium near Pajarito Canyon and to gather information that would be useful for

ongoing hydrogeologic studies. The precipitation collector was located in the Pajarito Canyon watershed just north of TA-16. Samples were collected following five rain and snow events over the course of the year. The samples were analyzed for tritium and stable isotopes, and compared to (1) stack tritium releases/ambient air results obtained by the Laboratory for the year 2000 and (2) tritium results from precipitation collected at S-Site (located near our precipitation collector) during 1990 – 1993.

The average of the tritium levels measured by the Laboratory for the period 1990 – 1993 was 85.8 pCi/L. The Oversight Bureau's average of four tritium values (excluding one anomalous value) was 53.8 pCi/L. Our measurements tend to confirm the decreasing levels of tritium reported in the Laboratory's annual Environmental Surveillance Reports.

Quarterly Gamma and Air Particulate Monitoring

Our environmental gamma radiation and air monitoring stations are co-located with some of Los Alamos National Laboratory's environmental monitoring stations. At these stations, we monitor levels of gamma radiation and collect samples of air particulates and water vapor to measure levels of airborne radionuclides and tritium.

Using thermoluminescent dosimeters, we measured gamma radiation at 12 locations, 11 on or near the Laboratory boundary and at a single location in Santa Fe. Our gamma radiation measurements were consistent with and slightly lower than the Laboratory's. The measurements were within the range of natural background for our region.

We measured air particulate radionuclides at five locations, also on or near the facility boundary. The particulate filters were composited quarterly and analyzed by an independent laboratory for isotopes of uranium, plutonium, and americium. The results were consistent with the Laboratory's, with very low values for plutonium and americium, and slightly higher values for naturally occurring uranium. All values were well below applicable health standards.

We measured tritium in its water vapor state at the same five locations. Levels increased at one station due to a release of tritium from the Technical Area 21 facility. The Laboratory measured comparable levels after the release. The other stations showed background levels.

Data for calendar year 2000 is available on the Internet at www.nmenv.state.nm.us/DOE_Oversight/doetop.html.

Investigations at the Calibration Facility

In the fall of 1999, the Laboratory assessed locations where radiation monitoring could be improved. Among other locations, the Laboratory reviewed monitoring at the Calibration Facility in TA-3, where sources of both gamma and neutron radiation are used to calibrate instruments and equipment.

Estimates made by the Laboratory in 2000 indicate that activities at the Calibration Facility could result in public doses in the same range as the doses from TA-18. Bureau investigators conducted field surveys during the year that showed gamma radiation readings at the Calibration Facility fence line were higher than background levels. To further monitor this location, we located our own gamma monitors on the perimeter and made plans to begin monitoring for neutron radiation.

Post Cerro Grande Fire Monitoring

After the Cerro Grande fire, the Bureau expanded its monitoring program to evaluate possible environmental impacts. In particular, we collected samples to evaluate pathways of human exposure to Los Alamos National

Calculation of Public Dose at Los Alamos National Laboratory

The Laboratory calculates potential radiological doses to members of the public. Laboratory investigators calculate doses to nearby populations, to potentially maximally exposed individuals on- and off-site, and to "average" residents of Los Alamos and White Rock. The population and individual doses include consideration of all potential exposure pathways (primarily inhalation, ingestion, and direct exposure).

According to the 1999 Environmental Surveillance Report, annual public doses due to Laboratory operations from all pathways were:

Max off-site (Shell Station on Trinity Drive)	0.7 mrem
Max on-site (passer-by on Pajarito Road near the TA-18 Criticality Facility)	3 mrem
Los Alamos Average Resident	0.6 mrem
White Rock Average Resident	0.6 mrem

Based on operational knowledge and monitoring data, the Laboratory selects the on-site location where a hypothetical member of the public could receive the maximum radiological exposure. This hypothetical person is known as the "on-site maximally exposed individual" (on-site MEI). Using a scenario that estimates the length of time that this hypothetical member of the public might spend at or be in transit through this location, the Laboratory calculates an "effective dose equivalent" or dose, to this hypothetical person.

In 1999, the location where this hypothetical person received the largest exposure (and subsequent dose) was considered to be near the TA-18 Criticality Facility. The dose to this hypothetical person (a passer-by on Pajarito Road near the TA-18 Criticality Facility) was 3 mrem.

Laboratory contaminants. These included samples of ash and soil in the forested areas burned by the fire, samples of soils and produce from farms in the path of the smoke cloud, and storm water and sediments derived from ash deposits.

Analysis of the samples showed that the concentrations of radionuclides and other chemicals were below levels that pose a short-term or acute threat to human health. However, some of the ash, sediment, and soil samples had radionuclides and metals at concentrations in excess of U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department screening levels designed to be protective of human health for long-term exposures. Although it is unlikely that storm-water runoff would be directly consumed by humans, some storm-water samples contained radionuclides (strontium-90, uranium, potassium-40, and ruthenium-106) at levels that exceeded EPA radionuclide screening levels for drinking water.

Samples of ash from the burned areas and stream-course sediments below the fire contained higher levels of radionuclides and metals than are typical of soils and sediments from the area. Samples of ash-laden sediments along the Rio Grande in White Rock Canyon also had higher levels than typical for area sediments, but lower than levels measured in sediments closer to the burned areas. Post-fire concentrations in farm soils were found to be similar to those measured before the fire.

Our data, and data from samples collected by the EPA and Los Alamos National Laboratory, are

Darlene Goering samples farm soils after the Cerro Grande fire.

being used by two groups in the assessment of potential health risks to people living in the surrounding communities. The first group is the Interagency Flood Risk Assessment Team composed of scientists from the Environment Department, Los Alamos National Laboratory, and other agencies. The second group is *Risk Assessment Corporation*, an independent organization under contract to the Environment Department. Results from *Risk Assessment Corporation* are expected in April 2002.

Sediment from the Viveash Fire

Even as the embers from the Cerro Grande fire continued to smolder, the Viveash fire burned about 30,000 acres in the Pecos District of the Santa Fe National Forest. In August, we sampled ash-laden sediment from Cow Creek and a small tributary below areas burned by the Viveash fire. The purpose of the sampling was to compare concentrations of radioisotopes and other chemicals in Viveash sediments to concentrations of these materials in sediments resulting from the Cerro Grande fire. Particularly, we desired to compare the Viveash results to results from canyons on Laboratory property and in White Rock Canyon along the Rio Grande.

Analytical results showed that average concentrations of radionuclides in Viveash sediments were generally lower than those found in Los Alamos canyon sediments and were similar to concentrations in White Rock Canyon. Concentrations of most metals were also lower than in Los Alamos canyon sediments and were similar to concentrations found in White Rock Canyon. However, the Viveash sediments contained higher concentrations of cobalt, chromium, iron, magnesium, and nickel. Although there were differences in the analytical results, natural variability resulting from the different origins and depositional environments of the sediments made it impossible to attribute these differences to specific Laboratory influences.

Storm-Water Monitoring

The Oversight Bureau collected 33 storm-water samples from canyons potentially affected by the Cerro Grande fire. We collected six additional samples from canyons that were not impacted by the fire. The U.S. Geological Service collected six samples for us in the Rio Grande. More than two-thirds of the samples were collected during two storms in October. Samples were collected of storm water flowing in canyons including South Fork Acid, Acid, Pueblo, Los Alamos, Guaje, Pajarito, Water, Potrillo, Sandia, Mortandad, and Cañada del Buey, and from the Rio Grande.

Steve Yanicak and Michael Dale investigate changes in water quality in Upper Pajarito Canyon following the Cerro Grande Fire.

The samples were collected as grab samples (dipped from the flowing stream). For most analyses, the suspended sediment was centrifuged and filtered to separate it from the water. The filtered water was analyzed for dissolved metals and radioisotopes. The suspended sediment was analyzed for radioisotopes, metals, pesticides, and dioxin/furans. Whole water samples (without separation) were analyzed for total cyanide and weak acid dissociable cyanide (the most biologically available form), polychlorinated biphenyls (PCBs), nutrients, mercury, selenium, pesticides, and total suspended sediment load.

Metals in Water

Metals in storm water did not exceed the livestock watering standards and generally appeared not to be elevated. Only selenium in Pajarito canyon exceeded the wildlife habitat standard. Elevated concentrations of aluminum were found in most canyons while silver was slightly elevated in Potrillo and Water canyons, and Cañada del Buey.

Radionuclides in Water

The highest levels of strontium-90 were found in South Fork Acid canyon, followed by Mortandad and Pueblo canyons. The highest levels of plutonium-239/241 were found in South Fork Acid canyon, followed by Potrillo and Mortandad canyons. The highest levels of plutonium-238 were found in Mortandad canyon, followed by South Fork Acid and Pajarito canyons. The highest levels of uranium were found in the Rio Grande followed by Pajarito and Guaje canyons. The highest levels of americium were found in Mortandad canyon, followed by Pueblo North tributary and Pueblo canyon. The only detection of cesium-137 was in Mortandad.

Metals in Sediment

Metals in sediment were generally elevated and exceeded NMED soil screening levels for arsenic and iron. The highest levels of arsenic were found in Water canyon, followed by Cañada del Buey and then Los Alamos canyon. The highest levels of iron were found in Pajarito canyon, followed by Cañada del Buey and then Los Alamos canyon. Mercury was detected in only Los Alamos and Sandia canyons.

Radionuclides in Sediment

Radionuclides in suspended sediment separated from storm water were higher than those levels found in sediment deposited in the canyons. The highest levels of strontium-90 were found in Pajarito, followed by Water and then Mortandad canyons. The highest levels of cesium-137 were found in Mortandad, followed by Los Alamos and then Pueblo canyons. The highest levels of plutonium-238 were found in Mortandad followed by Water then Cañada del Buey. The highest levels of plutonium-239/240 were found in South Fork Acid canyon, followed by Mortandad and then Pueblo canyons. The highest levels of americium-241 were found in Mortandad canyon, followed by Los Alamos and then Pueblo canyons. The highest levels of total uranium were found in Cañada del Buey, followed by Los Alamos and then Sandia canyons.

Dioxins and Furans in Sediment

The highest levels of dioxins and furans found in sediments were from Pueblo North tributary to Pueblo Canyon, which drains the North Community of Los Alamos that was impacted heavily by the Cerro Grande fire. The next highest levels were found in Cañada del Buey at White Rock, followed by mid-Pueblo Canyon near the Bayo Sewage Treatment Plant.

PCBs in Whole Water Samples

PCBs were present at levels that exceeded the wildlife habitat standard from three canyons on Laboratory property and one draining the Los Alamos town site. The highest levels were found in Pueblo Canyon and Pueblo North tributary, which drains the North Community of Los Alamos. The Cerro Grande fire heavily damaged the North Community. The next highest levels were found in Sandia Canyon about two miles downstream from the Sandia wetlands, followed by Los Alamos Canyon below the rock weir, near the eastern end of Los Alamos National Laboratory.

In September, we collected samples of storm water in Pueblo Canyon. The samples were collected west of Diamond Drive, below areas of the community that were damaged by the Cerro Grande fire. Using high-resolution methods, we measured levels of PCBs in storm water in excess of the New Mexico Water Quality Control Commission wildlife standards. These levels may be the result of a release or mobilization of PCBs resulting from the fire.

Storm-Water Samples Show Contaminant Migration from South Fork Acid Canyon

The South Fork of Acid Canyon received untreated radioactive wastewater from 1944 to 1951 and treated radioactive wastewater from 1951 to 1964. The area underwent two cleanups during the late 70's and early 80's. In 1967, the property was transferred to Los Alamos County.

Because of concerns about residual contamination, Bureau investigators sampled sediments in the canyon in 1999. The samples were collected using a methodology developed by the Laboratory's Environmental Restoration group specifically for characterizing contamination in sediments. As reported last year, our results indicated higher levels of contaminants than previously found by Laboratory investigators. Laboratory investigators also collected samples that confirmed our results.

This year, we collected samples of stormwater in the South Fork of Acid Canyon and in Acid Canyon, upstream from its confluence with the South Fork. We had the samples filtered and had the filtered water and the suspended sediments analyzed for radionuclides. The filtered water from the South Fork had higher concentrations of strontium-90 and plutonium-239/240 than the samples from Acid Canyon. In addition, the suspended sediments from the South Fork had higher concentrations of plutonium-239/240 than the samples from Acid Canyon. As a result of these investigations, the Surface Water Assessment Team, with representatives from the Laboratory's Water Quality and Hydrology and Environmental Restoration Groups, and the Environment Department recommended stabilization of the "hot spots" of contaminated sediment while the Laboratory develops its cleanup plans. The Oversight Bureau will monitor the effectiveness of these measures until a planned remediation is conducted.

White Rock Canyon

In September, the Oversight Bureau sampled post-fire sediments deposited along the Rio Grande in White Rock Canyon. We collected samples from bands of black sediment deposited along the river during the summer monsoon rains, at locations above and below Pajarito, Water, and Frijoles canyons. The samples were analyzed for radionuclides, metals and cyanide, and other persistent organic compounds, including PCBs.

The results indicated concentrations of most analytes in the White Rock Canyon sediment deposits were lower than the concentrations of these analytes in sediments from canyons directly below the Cerro Grande fire. This may have been because other flows to the Rio Grande were diluting sediments in White Rock Canyon. The summer's most significant storm events were in canyons draining the northern portion of the Cerro Grande burn area (Rendija, Guaje, Garcia, and Santa Clara canyons). For this reason, the sediments that we sampled may be more representative of flows from northern canyons than sediments from canyons on Laboratory property.

PCBs and Mercury

The Bureau continued its ongoing environmental surveillance data collection and evaluation. We collected samples of soil, storm water, fish, and macroinvertebrates to evaluate levels of persistent environmental contaminants, particularly mercury, dioxins, and PCBs. The Laboratory's Ecology Group helped us to collect samples of fish from Cochiti and Abiquiu Reservoirs.

Our results showed concentrations of mercury greater than 1 mg/kg in two fish from Cochiti reservoir. Dioxins were either not detected or

were found near the detection limit. As discussed in last year's annual report, the Bureau put significant effort into identifying improved methods for analyzing environmental samples for PCBs. Using high-resolution methods, we are able to measure low levels of individual PCB compounds. Based on the analysis of a small number of samples, we found PCBs at higher concentrations in Cochiti fish than in Abiquiu fish, although data indicated concentrations of PCBs less than 100 ppb.

Discharges and Emissions

TA-50 Radioactive Treatment Facility Effluent Quality Improves

The quality of discharges from the TA-50 Radioactive Liquid Treatment Facility improved considerably in 2000 due to recent upgrades in the treatment process and improved procedures for limiting the wastewater requiring treatment. Monthly composite samples of the effluent from the plant met DOE guidelines for radionuclides every month in 2000 for the first time in the facility's history. TA-50 now regularly meets its National Pollution Discharge Elimination System (NPDES) permit and DOE discharge requirements.

DOE initiated a performance measure to significantly reduce discharges of tritium, strontium-90, and perchlorate by the end of 2003. These contaminants were targeted because they are mobile in groundwater systems. The average concentrations of these substances discharged in 2000 were for tritium (44,767 pCi/L), strontium-90 (9 pCi/L), and perchlorate (509 µg/L). DOE's goal is to reduce tritium and strontium levels to below EPA's drinking water standards (20,000 and 8 pCi/L respectively), and reduce perchlorate to below California's drinking water action level (18 µg/L).

A pilot study was conducted to determine the best available technology for the treatment of perchlorate. Based on the study, ion exchange is the preferred treatment technology. The strontium pilot project, also to evaluate ion exchange, is currently underway. Methods under consideration to reduce discharges of tritium from TA-50 include separation and/or a combination of separation and evaporation at the TA-53 lagoons. Investigators have also completed a survey of laboratory facilities that discharge to TA-50 to determine the source of these substances.

The final step will be installation and operation of the treatment technologies and separation systems, expected in 2002 and 2003. Following this, regular monitoring will assess how well the new treatments are working.

Fire Damage in Pajarito Canyon

By Friday, May 12, the Cerro Grande fire had destroyed more than 200 homes. Smoke and flames could be seen from Española or Santa Fe as the fire spread north toward Santa Clara Canyon.

Even as the fire still burned on portions of Laboratory property, we were invited to tour parts of the Laboratory. Like many other people in northern New Mexico, we wanted to know – did facilities that contained radioactive and hazardous materials burn? What was the fate of radioactive wastes contained in the tent-like structures at TA-54?

As we approached from the south, Pajarito Canyon was still smoldering and helicopters with great buckets of water were dousing open flames. We could see that there was no damage to the plutonium facility at TA-55, even though the fire had actually crossed the fence on the west and intensely burned Mortandad Canyon just behind the facility. To the east, down Pajarito Road, we found that the fire had crept

near to, but had been stopped just yards away from the entrance to radioactive waste repository. The large white tent-structures that house radioactive waste were intact. Although these two facilities had been spared, other sites didn't fare as well. The fire burned with high intensity in Mortandad Canyon and firing sites at Technical Area 15. Also, an underground fire at Material Disposal Area R in TA-16 smoldered through July.

Sandia National Laboratories

Legacy Waste Cleanup

The Oversight Bureau monitors the progress of Sandia National Laboratories' Environmental Restoration Project at all stages of implementation, offering recommendations to promote successful cleanups that are protective of human health and the environment. Bureau staff members provide input on documents prior to formal submission to the administrative authority, and then follow up to determine conformance with planned activities. They then relate the state's perspective on the projects to the public, based on their comprehensive involvement.

Staff members provided information as sites were considered for No Further Action status under Sandia's Hazardous Waste permit. Some 64 sites were granted No Further Action status during 2000. Staff members also contributed to public work groups, addressing issues associated with post-closure care and long-term stewardship.

As Sandia schedules its corrective action activities, Bureau investigators identify environmental restoration projects for which it is important to collect samples of soil, waste, or groundwater. By comparing our sampling results to a portion of Sandia's, Bureau investigators verify the accuracy of Sandia's data.

During the year, we observed field activities that were based on participation in previous years' planning of sampling or cleanup activities. For example, based on knowledge gained from our sampling in 1998 and 1999, we monitored the progress of excavations at Site 30 and the Lurance Canyon Burn Site. We continued regular visits to the Chemical Waste Landfill to track progress of the excavation Voluntary Corrective Measure. We sampled groundwater and soils at the landfill, and participated in a high-performing team to develop a risk-based approach to closing the landfill in response to unanticipated higher waste volumes and lower contaminant concentrations.

Risk-Based Cleanup at Sandia's Chemical Waste Landfill

The Bureau participated in the development of a risk-based approach for cleanup at the Chemical Waste Landfill. We worked with Sandia project personnel to develop a risk-based approach to determine where to stop the excavation, and to allow Sandia to replace excess soil into the landfill excavation.

When the excavation began in September 1998, it was estimated that approximately 28,000 cubic yards of soil and waste would be removed from the landfill. By the end of 2000, the excavation was 80 percent complete, and the actual volume had grown to approximately 36,000 cubic yards. Although the Corrective Action Management Unit (CAMU) was designed and built to accept treated waste from the landfill, the CAMU disposal cell will hold only 37,000 cubic yards of material. Based on these estimates, the Environment Department and Sandia considered options for managing the excess contaminated soil.

As we tracked the progress of excavation and waste management at the Chemical Waste Landfill, we noted that volatile organic contaminant concentrations in soil were lower than originally expected. According to the approved plan, some residual contamination could remain following closure of the landfill. Both of these points allowed consideration of replacing some soils into the excavation, provided that replaceable soil concentrations do not exceed appropriate risk-based levels,

coupled with optimal utilization of the CAMU capacity.

We were concerned that the proposed levels were too conservative and felt that residual contamination in replaced soils would not contaminate groundwater. Sandia was able to demonstrate that at a concentration of 87 mg/kg in soil, tricholorethylene would not contaminate water in excess of the Environmental Protection Agency (EPA) drinking water standard of 0.005 mg/liter. Groundwater at the landfill is approximately 375 feet below ground surface.

Risk-based thresholds for replaceable soils were established for non-radiological constituents at an excess cancer risk of less than one person in 100,000 for the zone that extends from five feet below the surface to the bottom of the excavation and for unexcavated material left in place. The replaceable soil threshold for radiological constituents was set at 0.6 millirem-per-year (mrem/year). DOE's current guidance for unrestricted radiological release is a potential dose rate of less than 15 mrem/year. According to EPA guidance, wastes remaining at the landfill may contain polychlorinated biphenyl concentrations of up to 100 parts per million if the site is properly capped.

In addition to helping establish the risk-based closure approach, we sampled soil and groundwater at the Chemical Waste Landfill. The purpose of the soil sampling was to provide independent analysis of verification soil samples taken at the bottom of the southwest area that had been excavated to a depth of 12 feet. Samples were analyzed for volatile and semi-volatile organic compounds, persistent organic compounds, metals, tritium, and radionuclides. The sample results were free of any significant contamination and helped to verify that the extent of the excavation is adequate in the southwest area.

During the first quarter of 2000, we sampled groundwater at five wells located adjacent and down gradient of the landfill. The samples were split with Sandia and analyzed for volatile organics, total chromium, hexavalent chromium, and tritium. Volatile organics and hexavalent chromium were undetected in all samples. Total chromium was detected at 0.018 mg/l in one well; the drinking water standard for chromium is 0.1 mg/l. Negative results for tritium indicate that the tritium level is below background for all samples. These results compared well with Sandia's and provided confidence that Sandia's ongoing quarterly groundwater sampling program is generating reliable information.

Cleanup Verification at the Radioactive Waste Landfill

In October, we collected four samples from soil piles that Sandia had excavated from the Radioactive Waste Landfill. The samples were analyzed by an independent laboratory for metals, tritium, and radionuclides using gamma spectroscopy. We compared our results to Sandia's results to verify the accuracy of their data, and to help assure that the soil meets unrestricted release criteria.

The Radioactive Waste Landfill is located in the eastern portion of Technical Area II at Sandia

Rick Kilbury samples waste piles at the Radioactive Waste Landfill as Ed Vigil and Sandia investigators look on.

National Laboratories. This site received low-level radioactive waste for disposal from 1949 to 1959. The 0.3-acre site consisted of three pits and three trenches. Although there is no inventory of the disposed material, DOE records show that an estimated 11,110 cubic feet of radioactive waste was buried, with an estimated total activity of 2,847 curies. In 1996, Sandia remediated the site by excavating and separating contaminated soil and debris. In August and September 1998, Sandia shipped all soil characterized as contaminated or exceeding risk-based criteria to the Nevada Test Site for disposal.

The soil that was only slightly contaminated, some 3000 cubic yards, was set aside. Sandia plans to return the soil to the landfill excavation before closing the site. In July, DOE granted approval to Sandia to return the 3,000 cubic yards of soil to the bottom of the excavation as an unrestricted radiological release. Replaced residual contaminated soils will be about two meters thick in the bottom of the former excavation, covered by another three meters of uncontaminated fill.

As part of the approval process, Sandia estimated the risk this material poses to the public using RESRAD, a computerized model for estimating risk caused by radionuclides. Both maximum and average measured radionuclide concentrations were used as inputs to the RESRAD model. Total dose equivalents were estimated for residential and industrial scenarios both with and without the cover material. For the residential use scenario, only the condition with the cover material was below proposed EPA guidance of 15 mrem/year. For the industrial scenario, the dose was below 15 mrem/year even without the cover. The most likely future land use is industrial, and with a three-meter cover thickness, a dose of 1.2×10^{-11} mrem/year is projected using weighted average pile concentrations.

Our gamma spectroscopy results for radionuclides were comparable to those provided by Sandia in support of its request for unrestricted radiological release, and to those reported by Sandia for its split of our four samples. Our tritium results were slightly higher than Sandia's; for this reason, we recommended that the dose estimate for the industrial land use scenario (with three-meter cover) be recalculated using a higher value for tritium.

Update on Sandia's Mixed Waste Landfill

Near the end of 2000, Sandia installed two additional monitoring wells at the Mixed Waste Landfill, bringing the total number to six. The wells are intended to better define local groundwater conditions and replace older monitor wells that are expected to become unusable due to declining water levels. We observed some of the well drilling and installation activities, and collected samples from the newly completed wells. Sandia will sample the new wells quarterly to establish baseline water chemistry. The older wells are now sampled every six months.

We also observed Sandia's down-hole video survey of the Mixed Waste Landfill wells. The video surveys are being used to evaluate casing corrosion, which may be associated with trace nickel and cadmium levels observed in groundwater samples. Most recently, we participated in sampling well MW-4 to assess possible volatile organic chemical contamination.

The New Mexico Environment Department Hazardous Waste Bureau is evaluating a DOE proposal to install an alternative earthen cover as an interim corrective measure for the landfill. The proposed cover would be an alternative to the standard RCRA Subtitle C cover, and has been demonstrated to out-perform a standard cover in the arid southwest environment. The

Oversight Bureau has begun to plan public meetings to discuss the Environment Department's position on this and other issues related to the Mixed Waste Landfill.

Voluntary Corrective Actions at the Lurance Canyon Burn Site

Fire survivability tests are currently conducted at the active portions of the Lurance Canyon Burn Site. Past activities at the site, including explosive and burn testing, resulted in the listing of 13 Solid Waste Management Units (SWMUs) near the site. During the year, we monitored Voluntary Corrective Actions at several of the SWMUs.

When the Light Airtransport Accident Resistant Container (LAARC) was in operation, what is now SWMU 94F received wastewater containing residual jet fuel associated with suppression of test fires in the LAARC unit. The discharge pit was unlined and the wastewater infiltrated the soil under the pit. Investigations confirmed that subsurface soil under the pit was contaminated with fuel-related compounds, which extended downward to bedrock. Split sampling from groundwater monitoring wells installed in 1997 and 1999 verified low levels of fuel-derived compounds.

Partly based on the results of our 1998 sampling that verified soil contamination by fuel-related compounds, we made recommendations on the original Voluntary Corrective Action Plan for SWMU 94F. Sandia conducted the Voluntary Corrective Action from March through July 2000, and removed approximately 1,200 cubic yards of contaminated soil.

In the field, we observed that the excavation was limited by bedrock and physical hazards. Although samples from the sides and bottom of the excavation indicated that some contamination remained, we agreed that the excavation could be backfilled with clean soil.

While acknowledging that the Voluntary Corrective Action was conducted within practical limits, we remain concerned that the site may continue as a source of groundwater contamination. We recommended further assessment of the contamination left between the bottom of the excavation and groundwater.

We also monitored the completion of the cleanup of SWMU 94C, the bomb-burner area and discharge line at the Burn Site. The bomb-burner discharge line was an inactive buried corrugated metal pipe, approximately 300 feet long, that conveyed water used to extinguish fires at the bomb-burner area to an unlined discharge pit.

During a Voluntary Corrective Action started in late 1999, the entire discharge line was removed based on our input. A seam of depleted uranium was discovered on the west bank of the excavation above the discharge line. The seam was approximately two feet below the surface, two inches thick, and 34 feet long. In the spring of 2000, work continued to determine the extent of the contamination, remove the contaminated soil, and properly dispose of the discharge line and soil. We provided additional input to the Voluntary Corrective Action plan, and observed the excavation of the depleted uranium seam.

Excavation of petroleum contaminated oils below the Lurance Canyon Burn Site.

Despite previous investigations at the Lurance Canyon Burn Site, a new release, listed as Site 94H, was discovered in 2000. The site was found when workers excavating a trench north of the open pool test area detected a fuel odor. The pool had not been used for several years and was being removed to upgrade the piping system for operations at the Burn Site. Operational information indicates that the release is not due to current operations.

Sandia began removing the contaminated soils at site 94H, but because of scheduled tests at the facility, had to stop before the removal was complete. Before the work was stopped, approximately 250 cubic yards of soil had been removed from the area and stockpiled. Samples from the base of the excavation contained concentrations of diesel-range organics ranging from non-detect to 8,800 ppm. The excavation was temporarily lined with plastic sheeting and backfilled with clean soil. To address any remaining contaminated soil at site 94H, we had preliminary discussions with Sandia investigators about developing a formal Voluntary Corrective Action plan for the summer of 2001.

A second release in the area of 94H was reported in October when Sandia discovered a leak from a water storage tank above the open pool test area. We joined state regulators to inspect the spill location. Sandia personnel excavated the buried water pipeline and discovered two locations where leaks had occurred. Soil and water samples collected by Sandia personnel indicated that there was no contamination due to the leaks. Bureau observers indicated that a redesigned, aboveground, double-walled pipe system was an appropriate remedy to reduce impacts from potential future system failures.

PCB Cleanup at Site 30

Sandia completed the cleanup of PCB contamination at Site 30 during 2000. We worked closely with Sandia Environmental Restoration Project staff throughout all phases of the project. In prior years, we reviewed site characterization reports on the extent of contamination, and discussed cleanup options with Sandia investigators and state and federal regulators.

The six-acre site located at Technical Area I was used as a reclamation yard where surplus supplies and scrap materials were collected and sold. During its approximately 40-year history, the site became contaminated, probably because of the storage of PCB-containing objects, and the use of waste oil for dust control.

Sandia submitted a "Notification of Self-implementing Cleanup and Disposal of PCBs" to the EPA and the Environment Department describing a proposed plan for cleaning the site to meet Toxic Substances Control Act requirements. The notification included a series of figures showing the areas of the site that exceeded the cleanup goal of one ppm of total PCBs. Eleven separate PCB soil contamination areas or hotspots required cleanup, including three locations in the storm drain channel on the west side of the site with PCB levels around one ppm. The highest concentrations of PCBs were detected in the upper one-foot of soil; the samples collected at the five-foot depth showed extremely low or nonexistent levels of PCBs.

Sandia removed soil until all onsite Laboratory field-screening results indicated that PCB concentrations were less than one ppm in each of the hotspots. Three hundred and forty-one verification samples (for off-site Laboratory analysis) were collected during the excavation. We observed the excavation at various stages and conducted a final inspection to verify that all 11 hotspots were remediated according to the Notification of Self-implementing Cleanup.

During 1998 and 1999, we collected three storm-water samples where runoff from Site 30 entered the storm drain channel. No PCBs were

detected in any of our samples. With the excavation of soils containing greater than one ppm PCBs, we feel confident that surface water quality is adequately protected.

Environmental Monitoring

Part of the Oversight Bureau's mission is to monitor potential exposure pathways related to operations at Sandia National Laboratories. The environmental monitoring program is used to examine potential impacts from ongoing activities at the facility. Sandia's manufacturing and research operations and several small nuclear reactors may produce radioactive emissions.

The Bureau samples ambient gamma radiation, groundwater, wastewater, soil, and vegetation at periodic intervals and established locations. Some of our samples are split with Sandia personnel, allowing us to verify the adequacy of their data and monitoring programs. Although no storm water samples were collected in 2000, we continued to work with the Sandia monitoring programs to determine the best way to monitor impacts to surface water from past and current activities.

Rich Kilbury and Lance Voss move the Bureau's air monitor near the southern boundary of Kirtland Air Force Base.

Gamma Radiation and Airborne Radionuclides

The Bureau continuously monitors air at three locations on Kirtland Air Force Base, and at the University of New Mexico campus. The three on-site monitoring stations are located at the Four Hills community near the northern base boundary, the USGS Albuquerque Seismological Laboratory at the southern base boundary, and the southwestern corner of the base. The University of New Mexico station represents a location not affected by Sandia operations. Each pump draws about four liters per minute, which approximates the volume of air inhaled by a typical adult in the same period.

A resting adult breathes 10 to 15 times per minute, inhaling and exhaling about 500 milliliters (half a liter) of air with each breath

We moved two of our ambient air monitoring stations during the year. The Four Hills station was located adjacent to the fence marking the northern boundary of Kirtland Air Force Base since 1996. We moved the station in June at the request of a nearby homeowner who was concerned about the noise from the pump motor. The station is now approximately 200 yards south of its original location, within the same general area so that the air quality data is still relevant to the Four Hills community.

The air monitor at the USGS Albuquerque Seismological Laboratory was moved in September. The Seismological Laboratory and the air station were actually on the Pueblo of Isleta near the southern boundary of Kirtland Air Force Base. The Seismological Laboratory was relocated because the lease with the Pueblo expired. Because we relied on the Seismological Laboratory to power the pump for the air monitoring station, we had to move the air monitoring station. The relocated USGS

station is near its original location, so the air quality data will remain consistent.

Despite the changes in the air-monitoring program during the year 2000, the Bureau was able to obtain good quality air monitoring data. No samples exceeded State Air Quality or Federal Standards for radionuclide concentrations in air.

At each air station, dust particles are collected on spun glass fiber filters and water vapor is collected in a silica gel filled cartridge. Once every three months, an independent analytical laboratory analyzes all samples for radioactivity. Using a method known as gamma spectroscopy, the laboratory analyzes the particulate for various radioactive elements. The gross alpha and beta activity of the particulate is also measured. The water vapor caught in the silica gel is analyzed for tritium, a radioactive isotope of hydrogen.

Gamma spectroscopy identifies individual radioactive elements by measuring the gamma energies emitted from a sample. Some radioactive elements decay by producing gamma photons at specific energies. A photon of specific energy may be considered the "gamma signature" of that element. Measuring the number of gamma photons having similar energies tells us how much of a given radioactive isotope is in the sample.

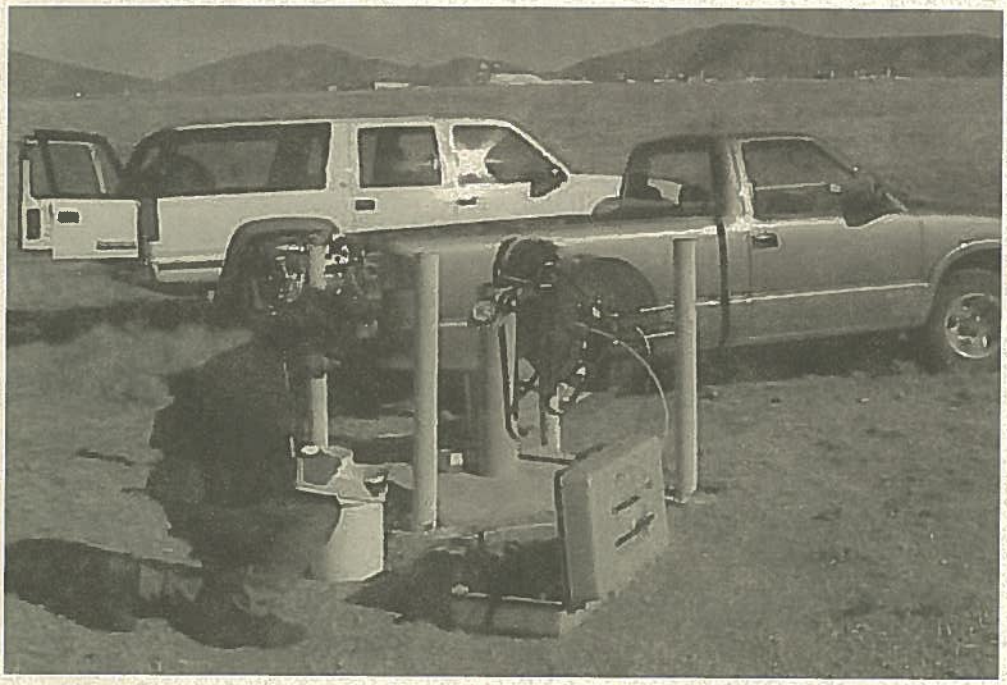
Ambient Gamma Monitoring

The Bureau monitors ambient gamma and beta radiation at twelve locations in the greater Albuquerque area. Six of the radiation monitors, or thermoluminescent dosimeters, are located on Kirtland Air Force Base. Six others are located in the surrounding communities. All are placed next to Sandia monitors to allow for data comparison. The data obtained by both organizations for each location are compared by evaluating the quarterly and annual calculated dose rate. The data obtained by the Bureau for the year were comparable to data collected by Sandia and were within the normal background range for each location. Using this data comparison, the Bureau staff is able to determine whether Sandia operations produce any adverse impact to areas surrounding Kirtland Air Force Base. According to our monitors, Sandia operations have not contributed elevated beta or gamma radiation doses to areas within Kirtland or the neighborhoods adjacent to the base.

The annual average radiation doses for the years 1994 through 1999 as measured by NMED for the Four Hills station averaged 106.10 millirem. During the same period, The USGS station averaged 94.10 millirem. Both values represent background radiation. The differences are best explained by natural variations between the air-monitor locations.

Groundwater Monitoring at the Lovelace Respiratory Research Institute

Entering the last year (2001) of mandatory semiannual sampling, groundwater impacts associated with the closed wastewater disposal ponds at the former Inhalation Toxicology Research Institute continue to attenuate. The DOE Oversight Bureau has split groundwater samples with the facility, now called the Lovelace Respiratory Research Institute, since 1993. This year, groundwater monitoring was reduced, with the Bureau sampling six of the eleven wells in place around the closed wastewater disposal ponds. These six wells included the three wells installed by NMED on Isleta Pueblo land to monitor any migration of contaminants from the Lovelace Respiratory Research Institute toward pueblo property.



Ed Vigil checks field parameters before sampling a monitor well near the Lovelace Respiratory Research Institute.

This year, we coordinated the sampling schedule with NMED's Hazardous Waste Bureau to add the chemical perchlorate to the list of constituents we normally analyze. Historically, nitrate, chloride, sulfate, fluoride, and total dissolved solids have been the focus of the sampling program.

Perchlorate is a relatively new constituent of concern. Only in recent years have laboratory techniques been able to detect it at small concentrations. Perchlorate generally enters the environment as a solid salt of ammonium, potassium, or sodium perchlorate. Ammonium perchlorate is used as an oxygenating compound in solid rocket boosters and is used in certain munitions, fireworks, match manufacturing, and in analytical chemistry. Perchlorate is very soluble in water and exceedingly mobile in aqueous systems. Therefore, due to the analytical chemistry waste released to the Lovelace Respiratory Research Institute ponds, these wells were included as part of an EPA-funded environmental reconnaissance sampling program performed by NMED personnel throughout New Mexico. All groundwater sample results from the institute during this study have been negative for perchlorate.

Overall, the observed trend for groundwater contamination at the Lovelace Respiratory Research Institute shows generally stable or decreasing concentrations. The current semiannual sampling at the institute will continue, pursuant to the requirements of the NMED-issued Discharge Plan Renewal and Modifications (DP-519, October 15, 1997), until October 15, 2001. At that time, the Bureau will reevaluate contaminant levels and explore a permanent resolution for the facility.

Discharges and Emissions

CAMU Waste Storage, Treatment, and Disposal

Management of remediation wastes at Sandia's Corrective Action Management Unit (CAMU) is directly linked to hazardous waste generated from the cleanup of the Chemical Waste Landfill. As unexpected quantities and types of wastes were excavated from the landfill, the Bureau coordinated with Sandia personnel from both projects along with state and federal regulators on changes in CAMU operations to properly manage the wastes.

The CAMU is located adjacent to the Chemical Waste Landfill at the southeast corner of Technical Area III. Most contaminated soils from the landfill are stockpiled in the Bulk Waste Staging Area. Three anchored covers were installed at the Staging Area in 2000 to protect stored soils and improve waste operations efficiency. Bureau staff members inspected these structures and found the improvements to be consistent with the CAMU permit. They also evaluated several erosion control devices constructed along CAMU drainage channels.

A treatment pad that will support treatment technologies is located next to the lined waste containment cell. The CAMU permit authorizes two treatment technologies: low-temperature thermal desorption used to treat soils contaminated with volatile organic compounds and soil washing/stabilization for soils contaminated with metals. To date, no waste has been treated or disposed of in the CAMU containment cell. To establish baseline values in the vadose zone next to the containment cell, we collected vapor samples from boreholes next to the containment cell. The sampling was completed during 2000, and we are currently comparing our data to Sandia's.

We recommended that Sandia request a modification to the CAMU permit that would change the CAMU and Chemical Waste Landfill boundaries to allow more efficient storage of waste soils. As increased quantities and concentrations of PCB-contaminated soils were discovered, we helped identify issues related to treating these soils and suggested consideration of treatment alternatives to thermal desorption. We also researched regulatory options for storage, treatment, and disposal of PCB-contaminated soils, and presented our findings in coordination meetings.

Mixed Waste Accomplishments at Sandia

Under a compliance order issued by the New Mexico Environment Department in 1995, Sandia National Laboratories is required to store, manage, treat, and dispose of mixed wastes (both radiological and hazardous components) according to schedules and milestones listed in the Site Treatment Plan. The requirements apply to all mixed wastes, regardless of the time of generation, including newly generated wastes. During 2000, Sandia successfully achieved all required mixed waste compliance milestones.

Bureau staff facilitated the processing of fifteen waste deletion requests for a variety of covered mixed wastes stored at the Radioactive and Mixed Waste Management Facility in Technical Area III. Mixed wastes can be sent off-site for treatment, treated at Sandia, or re-characterized as non-radioactive or non-hazardous. Re-characterization usually involves a separation process in which the hazardous and radioactive waste components are physically separated, allowing the waste components to be managed separately as hazardous or low-level radioactive waste. Deletion requests contain data used to verify that wastes have been appropriately re-characterized or treated.

Our technical oversight facilitated more timely regulatory approval of the 15 deletion requests. In two cases, additional information and data were requested to verify that some waste quantities had been re-characterized appropriately. Deleted wastes processed at Sandia in 2000 included various forms of thorium hydride, mixed debris, oxidizers, reactive metals, residual ash, septage, and corrosive liquids.

Wastewater Sampling

Bureau investigators sampled wastewater four times during the year. Each wastewater sample was taken from a sampling access point near Technical Area V, a potential source of radioactive wastewater discharge to the City of Albuquerque sewer system. The discharge is authorized under a permit issued by the City. The samples were split with Sandia and the City, and submitted to an independent laboratory for gross alpha/beta and gamma spectroscopy analysis.

Concentrations of radionuclides in each sample did not exceed the values set forth in the permit for release to sewer. The sample concentrations averaged around 200 times lower than the regulatory target concentrations. The Bureau's data was also compared to data obtained by Sandia. In each case, we were able to verify that Sandia's data was accurate.

Burn Tests

Oversight Bureau staff members observed two burn tests at Sandia's Lurance Canyon Burn Site Facility. The tests involved calibration of instrumentation required for other destructive or survivability burn tests commonly performed by Sandia at the facility. Burn tests at the site are carried out on a pad, which includes a concrete-lined pit filled with water on which the petroleum based combustion source is floated. The tests typically consume approximately 1,000 gallons of JP-4 aviation fuel and last approximately 20 minutes.

The tests were conducted in the early morning between 7:00 and 9:00 am in order to take advantage of normal low wind and stable air conditions. The smoke plume from the tests rose several thousand feet into the air, drifting slowly northeast before dissipating toward the surrounding Manzano Mountains. During one test, the smoke was visible from Albuquerque and the east mountain area, and caused concerned property owners to notify authorities of a potential wildfire threat.

Burn test at the Lurance Canyon burn site.

Waste Isolation Pilot Plant

We maintained our network of gamma radiation monitors around the perimeter of the Waste Isolation Pilot Plant or WIPP. As a result of a review of efforts by DOE and Westinghouse to remove a number of sites from the facility's hazardous waste permit, we published a report, *Contaminant Migration Potential due to Surface Water Erosion for 14 Solid Waste Management Units a the Department of Energy Waste Isolation Pilot Plant.*