1993
Annual Performance Report

New Mexico Environment Department
DOE Oversight Program
at Department of Energy Facilities in New Mexico
(Grant No. DE - FG04 - 91AL65779)

OVERSIGHT DOE PROGRAM

Environmental Oversight and Monitoring Program

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EXECUTIVE SUMMARY

Introduction

In October of 1990, The New Mexico Environment Department entered into an agreement with the U.S. Department of Energy (DOE) to create the Department of Energy Oversight and Monitoring Program. This program is designed to create an avenue for the State to ensure DOE facilities are in compliance with applicable environmental regulations, to allow the State oversight and monitoring independent of the DOE, to allow the State valuable input into remediation decision making, and to protect the environment and the public health and safety of New Mexicans concerning DOE facility activities. This agreement, called the Agreement in Principle (AIP), includes all four of New Mexico's DOE facilities: Los Alamos National Laboratory in Los Alamos; Sandia National Laboratories and the Inhalation Toxicology Research Institute on Kirtland Air Force Base in Albuquerque; and the Waste Isolation Pilot Plant near Carlsbad.

The New Mexico Environment Department (NMED) devotes 37 staff members to the DOE Oversight and Monitoring Program. The majority of New Mexico Environment Department AIP staff are scientists and other technical staff who specialize in ground water and surface water issues, air monitoring and hazardous and radioactive materials. AIP staff are stationed both at the four U.S. Department of Energy facilities and in Santa Fe. Additionally, Affidavit Agreements have been signed with the Scientific Laboratory Division, N.M. Department of Health and the N.M. Department of Public Safety. These two state agencies have hired additional staff to assist NMED with laboratory services and emergency response planning.

General Successes in 1993

The NMED Hazardous and Radioactive Materials Bureau AIP staff have initiated a national project to establish an electronic mail system to facilitate communications between state and tribal technical/management personnel involved in DOE cleanup oversight. A pilot electronic mail system test is scheduled for February of 1994.

An ambient air monitoring program at Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL) has been implemented. The state now has four air monitoring stations at each facility. The monitors were fully calibrated and filter exchanges are continuing on a bi-weekly basis. Filters are counted for gross beta using in-house equipment and procedures that are modeled after EPA's Environmental Radiation Ambient Monitoring System (ERAMS) program. The gross beta counts are being tabulated to establish long term trends and to monitor for elevated readings. The filters are being archived for eventual radiochemical analysis by a laboratory.

NMED Air Quality Bureau staff are using EPA computer models to estimate the dose to the public from actual emissions and possible scenarios. This ability allows NMED to verify the calculations required of the sites and insure that there is adequate protection of the public. Additionally, a data management system was installed at the Waste Isolation Pilot Plant (WIPP) which provides constant meteorological data for insertion into the models.

An environmental dosimetry program is operating at LANL, SNL and WIPP. Landauer, Inc., has been contracted to provide, anneal, and read the Aluminum Oxide phosphor thermoluminescent dosimeters.

NMED Ground Water Protection and Remediation Bureau and Surface Water Quality Bureau AIP staff completed a report entitled "Initial Inspection of Site Water Systems and Wells at DOE Facilities in New Mexico." A NMED Ground Water AIP staff member stationed at LANL was technical chairman for the Rocky Mountain Ground Water Conference in Albuquerque and coordinated special sessions on recent hydrogeologic work at LANL as well as SNL/ITRI.

Los Alamos National Laboratory

Air Monitoring

NMED Air Quality Bureau AIP staff have concentrated on review of LANL's air monitoring and surveillance activities and review of the lab's efforts to come into compliance with 40 CFR 61 Subpart H requirements regarding National Emission Standards for Hazardous Air Pollutants (NESHAP). LANL is out of compliance with some of the procedures used to determine radioactive emissions from certain stacks. Staff receives and reviews copies of the monthly NESHAP's reports submitted to EPA. Air Quality Bureau staff initiated a review of LANL's progress.

Sampling

Extensive sampling activities were conducted at LANL in 1993 and samples have been submitted to the Scientific Laboratory Division for analysis. Sampling is done in coordination with the LANL Environmental Surveillance Program in order to obtain split or duplicate samples. The activities included sampling of ground water, springs, stream bed sediment, snowmelt runoff, and locally grown vegetables.

Environmental Restoration

LANL staff at the radioactive waste water treatment plant expressed concern that slanted borings which were planned to penetrate below the locations of existing waste management facilities might intercept subsurface structures and result in release of contaminated water. NMED AIP staff found this concern to be valid and recommended against the procedure.

Site visits by NMED AIP staff at TA50 resulted in the determination that a liquid storage tank described as having never been used to store radioactive liquids had in fact been used for storage of both gamma and beta contaminated liquids.

NMED AIP's recommendations that potential ecological impacts be included in prioritization for future cleanups were incorporated by DOE in its rating system.

Releases and Corrective actions

A release of primary cooling waste into Los Alamos Canyon from the TA 2 Omega West Reactor was reported in January 1993. EM-8 staff sent water quality data to the NMED Surface Water Quality Bureau on a weekly basis.

LANL submitted a corrective action and sampling plan for the remediation of Solid Waste Management Unit (SWMU) #3-010 mercury release. LANL reported a release of mercury into a tributary of Pajarito Canyon according to WQCC Regulation 1-203 (spill reporting). Rains caused erosion to the water course. NMED Surface Water Quality Bureau staff attended meetings with DOE, LANL and contractors regarding the corrective actions and sampling plan. Representatives of the Los Alamos Area Office began working with NMED's site representative to determine the best means for providing NMED with information regarding the nature, quantities and hazards associated with hazardous, mixed and radioactive waste produced, stored or disposed of at LANL.

Sandia National Laboratories / Inhalation Toxicology Research Institute

Sampling

Sampling continued for the Kirtland/Sandia basewide background study designed to determine natural, non-contaminant associated levels of heavy metals in soils, sediments and groundwater. Samples are being analyzed for chromium, cadmium, vanadium, barium, boron lead and strontium, among other elements.

Sampling of soils, sediments, vegetation, surface water, and ground water was performed for radiochemical analysis. Sampling locations have been chosen as a subset of those sampled by DOE facility environmental surveillance and restoration programs. Incidental samples have been obtained by NMED in independent efforts.

NMED Hazardous and Radioactive Materials Bureau AIP staff are investigating the KAFB area background water quality. Samples are being taken from monitor and supply wells, indigenous rocks, drill cuttings, and drilling cores that will be analyzed for trace metals.

NMED Ground Water Protection and Remediation Bureau and Surface Water Quality Bureau AIP staff selected sites for sampling storm runoff, especially in Tijeras Arroyo and its tributaries, as a follow up to the NMED Ground Water Bureau's nitrate study. The NMED AIP representative at SNL/ITRI split samples from SNL Technical Area 2 leachfield monitoring wells and from ITRI's monitoring wells and assisted Hazardous and Radioactive Materials Bureau AIP personnel sample SNL's Chemical Waste Landfill background wells and Isleta Pueblo's monitoring wells. Additionally, NMED Groundwater staff helped select site wide monitoring wells for Hazardous and Radioactive Materials Bureau's chromium study at SNL.

NMED Surface Water staff instituted the Storm Water Monitoring Program at SNL in November of 1993. An automatic sampler and flow meter was placed at the stream below TA-1. Due to a lack of storm activity, no samples have been collected.

Environmental Restoration and Cleanup

The Environmental Restoration program at SNL will address approximately 226 suspected disposal or spill sites.

NMED staff provided both SNL and EPA technical comments on SNL's RFI workplans for TA-2 and the Liquid Waste Disposal Facility (LWDF). The major finding in both cases has been that neither facility includes an adequate groundwater monitoring system. At the LWDF, over 16 million gallons of radioactive primary reactor coolant water was disposed of in unlined trenches. As of the time of the workplan evaluation two wells had been established at the LWDF but neither had been sampled.

NMED AIP staff attending an SNL site tour learned that directional drilling cores under two unlined chromic acid pits identified chromium at 23,700 ppm. Staff observed that SNL's mathematical models failed to predict this level and rate of chromium movement in the subsurface.

Hazardous and Radioactive Materials Bureau AIP staff completed two reports on the adequacy of ground water monitoring program at SNL. The reports titled "Review of Ground-Water Monitoring at SNLA's Mixed Waste Landfill" and "Review of Ground Water Monitoring at SNLA's Chemical Waste Landfill" have been submitted to DOE for review. They will be released for general public review after DOE has had the opportunity to comment.

On January 7, 1993 a sewage spill occurred at TA-III. The spill was inspected by Surface Water AIP staff and recommendations for remediation were made.

A release of primary cooling water occurred at the TA-V reactor. Surface Water AIP staff inspected the spill site and toured the TA-V Reactor facility.

Hazardous and Radioactive Bureau AIP staff at SNL observed SNL response to a wastewater spill that occurred at TA-V. The spill was approximately 5,000 gallons of primary coolant water from the Annular Core Reactor Facility. The water is reported to have concentrations of approximately 9,000 pCi/l of tritium.

Waste Isolation Pilot Plant

Hazardous and Radioactive Materials Bureau staff participate in biotic surveys around the WIPP site to determine baseline levels of wildlife populations that will be compared to post-operations population surveys. Small nocturnal mammals are surveyed each summer at four sample location near WIPP sites. Also, a bird survey is conducted along a 25 mile transect, or pipeline right-of-way, and using a U.S. Fish and Wildlife Service observation method.

NMED Air Quality staff have focused on the existing environmental monitoring activities that relate to air emissions and surveillance. Emphasis has been on quality assurance of the data collected by DOE and its contractors. During 1993, procedures and checklist were developed to audit and observe routine volatile organic canister exchanges, monitoring audits, and the monthly functional continuous air monitor (CAM) tests.

Environmental Restoration and Cleanup Activities

An NMED sampling program was developed to quantify artificial levels of organics, hydrocarbons and heavy metal constituents as part of an assessment of solid waste management units at the WIPP site. One sampling event was initiated to investigate mudpits associated with WIPP exploratory wells/and private-venture oil and potash exploration wells inherited by DOE following the legislative withdrawal of the 16 section area. Three mudpits, out a total of approximately 46 units, were sampled as part of this event: DOE-1, Badger Unit, and Cotton Baby.

Data from these sampling activities is available in a report titled "Assessment of Solid Waste Management Units at the Waste Isolation Pilot Plant: Supporting Documentation for RCRA Facility Assessment" and was submitted to DOE and EPA. This report will provide the technical background for EPA to develop the Draft HSWA permit for WIPP.

Corrective Action

Westinghouse has been operating the ambient air monitoring station for criteria pollutants without a procedure in place for routine checks and quality assurance audits of the air monitoring equipment. Through urging from NMED staff Westinghouse developed and adopted a procedure that addresses these concerns.

Emergency Response Planning

The role of the State with respect to emergency response is to ensure that emergency response planning is adequate, that training is comprehensive and realistic, and that communication among all institutions involved and the populace is sufficiently prompt in an emergency.

The AIP provides for a number of activities by the State in emergency response. However, the necessary expertise to perform these activities does not rest within a single state agency. The Department of Public Safety (DPS) has the statutory responsibility to direct and coordinate the civil emergency preparedness activities of all state departments, agencies and political subdivisions and to maintain liaison with and cooperate with civil emergency agencies and organizations of the federal government.

Exercises which DPS and NMED staff participated in this year include:

"Blondie '93" a full scale exercise involving Albuquerque Fire Department, SNL, KAFB, OMI, Red Cross, Albuquerque Hospitals, and the State of New Mexico.

An appraisal exercise with DOE and Sandia national Laboratories

An exercise with DOE/Washington D.C. and ITRI

Planning for an upcoming LANL exercise initiated by DOE/Washington D.C.

1. INTRODUCTION AND GENERAL

1.1 Introduction

In October 1990 an Agreement-in-Principle (AIP) was entered into between the U.S. Department of Energy (DOE) and the State of New Mexico for the purpose of supporting State oversight activities at DOE facilities in New Mexico. The State's lead agency for the Agreement is the New Mexico Environment Department (NMED). DOE has agreed to provide the State with resources over a five year period to support State activities in environmental oversight, monitoring, access and emergency response to ensure compliance with applicable federal, state, and local laws at Los Alamos National Laboratory (LANL), Sandia National Laboratories (SNL), the Waste Isolation Pilot Plant (WIPP), and the Inhalation Toxicology Research Institute (ITRI). The Agreement is designed to assure the citizens of New Mexico that public health, safety and the environment are being protected through existing programs; DOE is in compliance with applicable laws and regulations; DOE has made substantial new commitments; cleanup and compliance activities have been prioritized; and a vigorous program of independent monitoring and oversight by the State is underway.

Attachment A, Section E, Paragraph 2 of the AIP states that the State will issue annual reports on the result of its oversight, monitoring and analysis activities, and State findings relating to the quality and effectiveness of the facilities' environmental monitoring and surveillance programs. This report satisfies that requirement for the January-December 1993 time frame.

1.2 Agreement and Grant Negotiations

At the outset of the AIP, DOE agreed to provide the State with $14,754,000 over a five year period (October 1, 1990 through September 30, 1995) with the requirement that the State submit on an annual basis, not later than June 1 each year, a proposed work scope and cost estimates for work and services to be performed by the State under the Grant during the upcoming budget period. On July 1, 1993, NMED submitted to DOE a completed Financial Assistance Application Kit requesting funding for Year 4 (Federal Fiscal Year 94) in the amount of $3,018,373. On September 2, 1993 DOE notified NMED of its obligation and authorization of funds in the amount of $3,018,373

(consisting of $2,485,168 in carry over funds and $533,205 in new obligations) as executed by Amendment No. A004 to Grant No. DE-FG04-91AL65779.

1.3 Personnel and Administrative Issues

In order to meet the State's obligations under the AIP, NMED has hired staff which are fully funded by the AIP. Staff have been placed in four bureaus within the Department (the Hazardous and Radioactive Materials Bureau, the Surface Water Quality Bureau, the Air Quality Bureau, and the Ground Water Protection and Remediation Bureau). Staff hired under the AIP augment the current regulatory and environmental protection activities being conducted by NMED at the four DOE facilities in the State. Additionally, staff have been hired and are placed on-site at all DOE facilities in the State. Figure 1 illustrates the organizational and hierarchical relationship of staff working in the AIP Program. At present, 6 vacancies exist, the majority of which are stationed at LANL. The State still continues to experience difficulties in hiring and retaining staff at Los Alamos because of competitive salaries and benefits offered by LANL.

Three additional Security Clearances (Q Clearances) have been issued to NMED staff members during 1993. Currently, clearances for six staff members are still in process by DOE.

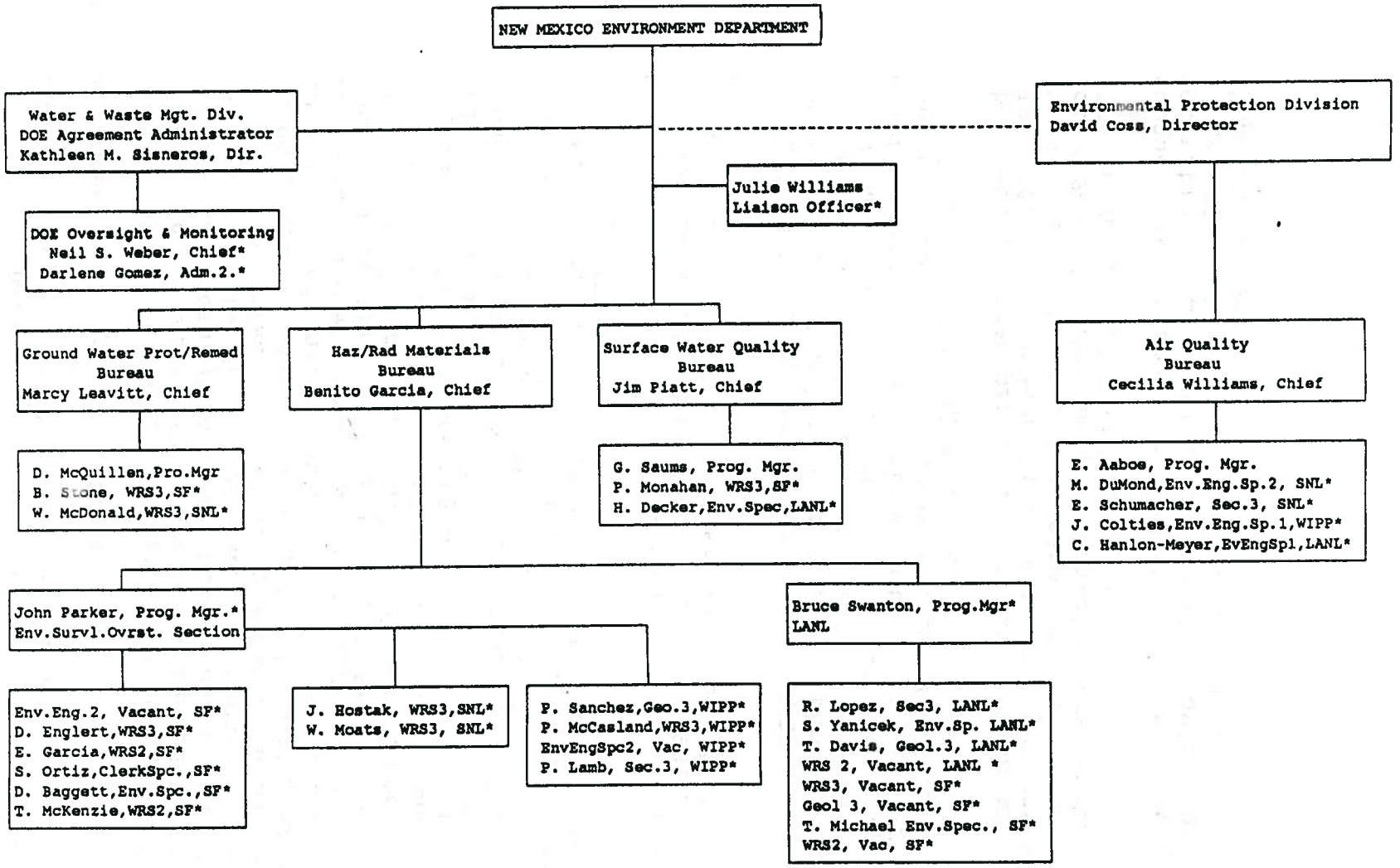
A detailed Security Plan pertaining to NMED staff use of cameras at DOE facilities in order to photographically document oversight and environmental restoration activities was submitted to DOE in February 1993. Numerous meetings were held with DOE security personnel. However, the issue of camera use by NMED staff at DOE facilities still remains unresolved.

The State has been provided with vehicles for use by the AIP staff in their monitoring and oversight activities. Twelve vehicles are being leased by NMED from the GSA Motor Pool in Albuquerque. Vehicles are stationed at WIPP, LANL, SNL/ITRI and Santa Fe.

Adequate office space for the NMED AIP staff overseeing activities at Los Alamos was finally provided by DOE in August 1993. Staff are now located in the White Rock Shopping Center.

FIGURE 1

DOE ENVIRONMENTAL OVERSIGHT AND MONITORING AGREEMENT



* Funded by DOE Agreement-in-Principle (AIP)

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1.4 Work Plan

Attachment A, Section E, Paragraph 1 of the AIP requires that the State prepare a plan for its independent oversight of programs for monitoring the environment at and in the vicinity of the facilities and for assessing compliance with applicable environmental laws and regulations. Additionally, the State is to provide this plan to DOE, the Environmental Protection Agency (EPA), other appropriate federal and state agencies, and affected local and tribal governments for review and consultation. NMED developed a Work Plan for its DOE Environmental Oversight and Monitoring activities, thus meeting its obligation of the aforementioned requirement. The Work Plan was finalized and provided to DOE on November 25, 1992. This Work Plan which is general in nature, is still current.

Site specific Work Plans detailing specific activities and objectives were developed and finalized for WIPP and SNL/ITRI in August 1993 and November 1993, respectively. The Work Plan for LANL is still in draft form.

1.5 General

The NMED DOE Oversight Program Chief has established an open line of communication with SNL's External Interface Office. That office continues to arrange monthly tours of specific SNL activities of general interest to NMED. During 1993, overview tours of the following SNL programs and/or activities were arranged: Tech Area 3, Tech Area 4, Tech Area 5, the radioactive material and waste storage bunkers at Old Manzano Base, the Thermal Treatment Facility, the Radiant Heat Facility, and the Low Intensity Cobalt Array Facility.

2. GUIDANCE DEVELOPMENT

2.1 Umbrella Protocol - NMED/DOE

In order to provide general guidance for both NMED and DOE personnel involved in the AIP Program. The "Guidance Protocol for Implementation of the Environmental Oversight, Monitoring and Remediation Agreement at DOE Facilities in New Mexico" was developed and distributed to all staff in July 1992. The purpose of the document is twofold: (1) to establish an "umbrella" protocol that delineates procedures between DOE-AL and NMED for their effective interaction in fulfilling their respective responsibilities under the terms of the AIP,

and (2) to provide guidance to DOE Area and Project Offices and NMED "site representatives" in development of "site specific" protocols that establish procedures and guidelines for day-to-day operations between DOE/DOE Contractors and NMED. This protocol remained in effect during 1993.

2.2 Site Specific Protocols

Once the "Umbrella" Protocol was developed and distributed, each NMED site Point of Contact (POC) was directed to develop site specific protocols with their counterparts at the Kirtland Area Office (KAO), the Los Alamos Area Office (LAAO) and the WIPP Project Site Office (WPSO). The Site Specific Protocol for WIPP was developed, finalized and distributed to staff in 1992. The protocol for KAO was finalized and distributed to staff in February 1993. The protocol for LAAO is still in draft form.

3. ENVIRONMENTAL MONITORING, RESTORATION AND OVERSIGHT

3.1 General

Hazardous and Radioactive Materials Bureau (HRMB) AIP staff have initiated a national project to establish an electronic mail system to facilitate communications between state and tribal technical/management personnel involved in DOE cleanup oversight. A pilot electronic mail system test is scheduled for February of 1994.

The ambient air monitoring program at LANL and SNL is implemented. The state has four air monitoring stations at each facility. The monitors were fully calibrated and filter exchanges are continuing on a bi-weekly basis. Filters are counted for gross beta using in-house equipment and procedures that are modeled after EPA's Environmental Radiation Ambient Monitoring System (ERAMS) program. The gross beta counts are being tabulated to establish long term trends and to monitor for elevated readings. The filters are being archived for eventual radiochemical analysis by a laboratory.

The environmental dosimetry program is ongoing at LANL, SNL, and WIPP. Landauer, Inc., has been contracted to provide, anneal, and read the Aluminum Oxide phosphor thermoluminescent dosimeters (TLDs). During 1994, a few aspects of the program protocol will be changed to obtain more accurate results.

Air Quality Bureau (AQB) staff routinely use EPA computer models to estimate the dose to the public from actual emissions and possible scenarios. This ability allows NMED to verify the calculations required of the sites and insure that there is adequate protection of the public. Additionally, a data management system was installed at WIPP which provides constant meteorological data for insertion into the models.

Ground Water Protection and Remediation Bureau (GWPRB) and Surface Water Quality Bureau (SWQB) AIP staff completed a report entitled "Initial Inspection of Site Water Systems and Wells at DOE Facilities in New Mexico". The GWPRB LANL AIP representative was technical chairman for the Rocky Mountain Ground Water Conference in Albuquerque and coordinated special sessions on recent hydrogeologic work at LANL as well as SNL/ITRI.

3.2 LANL Oversight

3.2.1 General Oversight Activities

AIP staff accompanied EPA's Comprehensive Groundwater Monitoring Evaluation team at LANL and provided the following conclusions to that agency: 1) the current facility-wide groundwater monitoring system is inadequate, 2) regional groundwater flow direction has not been determined, nor can it be determined with the existing system, and 3) a groundwater monitoring waiver application for TA-54 states that no perched water exists and no hydraulic connection to the main aquifer exists (however, no wells are in place to verify that statement).

AIP staff response to reports indicating low levels of tritium in the main aquifer at LANL included the following comments: 1) existing wells of unknown construction may provide a pathway for contaminants to migrate from the surface or from perched aquifers to the main aquifer and should be plugged and abandoned, 2) a system of piezometers should be established to determine regional groundwater flow directions prior to locating replacement wells, and 3) temperature probes should be installed in all monitoring wells to provide information regarding the source of regional groundwater recharge.

AIP staff met with DOE and LANL representatives to determine the structure and content of a database designed to make environmental data more readily

available to NMED and the public.

Following discovery of radioactive debris at a borrow pit located on National Forest land, AIP staff recommended that all borrow pits which are candidates for 'no further action' (NFA) receive a thorough radiation survey before NFA status is conferred.

A radiological survey of four borrow pits areas in Bandelier National Monument was conducted by HRMB/AIP staff. An archeological team had raised the question of contamination when old debris (a hubcap) was found to have depleted uranium on it. It was determined that the land had once belonged to LANL, but was transferred to Bandelier National Monument in the 1950's. No radiological contamination was found.

AQB staff have concentrated on review of LANL's air monitoring and surveillance activities and review of the lab's efforts to come into compliance with 40 CFR 61 Subpart H requirements regarding National Emission Standards for Hazardous Air Pollutants (NESHAPs). LANL is out of compliance with some of the procedures used to determine radioactive emissions from some of their stacks. Staff receives and reviews copies of the monthly NESHAPs reports submitted to EPA. AQB staff initiated a review of LANL's progress report for NESHAPs compliance. Additionally, NMED staff have observed some of the air monitoring procedures used by LANL's Environmental Protection Group.

GWPRB and HRMB AIP personnel submitted a report entitled "Initial Assessment of the Ground Water Monitoring Program at Los Alamos National Laboratory, New Mexico". Also, the GWPRB LANL representative organized a field trip on the Geology of the Pajarito Plateau, led by former LANL geologist Margaret Anne Rogers, for participants from LANL, NMED, BIA and concerned citizen groups.

LANL submitted monthly Discharge Monitoring Reports (DMR) as required by their NPDES permit #NM0028355. LANL also submitted an appeal to the Water Quality Control Commission of their NPDES permit. SWQB AIP staff reviewed the DMRs and the appeal.

LANL EM-8 submitted spill reports and corrective action reports to SWQB staff. SWQB staff began meeting with EM-8 staff to facilitate communication and coordination. Spills that have been adequately remediated were closed.

SWQB staff attended a meeting on November 20, 1993 with TA-50 staff and Ken Zamora of Scientech, Inc. regarding primary cooling water from the TA-2 Omega West Reactor. LANL informed NMED that the water would be transported to the TA-53 evaporation lagoons.

LANL contracted with the U.S. Geological Survey (USGS) to install sixteen stream gaging stations to monitor snowmelt and storm water runon/runoff on DOE/LANL property. Staff toured the new USGS gaging stations set up for these monitoring purposes.

3.2.2 Sampling Activities

Extensive sampling activities were conducted at LANL in 1993 and samples have been submitted to the Scientific Laboratory Division (SLD) for analysis. Sampling is done in coordination with the LANL Environmental Surveillance Program in order to obtain split or duplicate samples. The activities included sampling of ground water, springs, stream bed sediment, snowmelt runoff, and locally grown vegetables. Data summaries for many sampling activities described below are provided in Attachment I.

AIP staff requested permission from LANL to sample wells associated with an old subsurface testing facility (TA-49) for lead, which was a principle component of the material disposed of at this site. HRMB and LANL staff obtained split samples at the site. Lead and antimony were identified in the samples at levels in excess of drinking water quality standards, the highest levels having been identified in well DT-5A. LANL, DOE, NMED and the Pueblo Office for Environmental Protection are cooperating on the follow-up to this discovery.

Staff followed up a referral from the San Ildefonso Pueblo regarding possible contamination of drinking water wells in the Los Alamos wellfield with radioactive cesium. Samples collected by AIP staff and submitted to an independent laboratory found no detectable cesium.

The ambient air monitoring program at LANL is in place. Results on radiochemicals of the composited samples will be included in subsequent reports.

The environmental dosimetry program is ongoing with twelve TLDs located at selected perimeter locations. Eleven TLDs are co-located with LANL's for quality control and for comparison purposes. One TLD is located in Santa Fe for regional background information.

Soil and sediment samples were taken within canyons which presently receive or previously received effluent from radioactive waste treatment practices. Samples were also taken within on-site areas adjacent to potential sources of contamination, from a number of locations in natural drainages, and from within radioactive waste disposal and storage areas.

Foodstuff samples were collected during 1993 at areas within the LANL boundaries, and within the towns of Los Alamos and White Rock. Samples were collected from plants whose produce is underground, vines, various fruits, and honey.

A number of springs and stream drainages were sampled in conjunction with the LANL White Rock Canyon Sampling Trip, the Rio Grande River Rafting Trip, and also at on site and perimeter locations. Samples have been sent to SLD and TMA Eberline to be analyzed for gross alpha, gross beta, tritium, and heavy metals.

Groundwater spilt samples were taken from deep test wells and production wells for the main aquifer. Samples to test the perched and alluvial waters were taken from observation wells.

The GWPRB AIP staff member at LANL was involved in several sampling events. He assisted SWQB and HRMB personnel in sampling lower Los Alamos Canyon runoff just below the U.S. Geological Survey (USGS) gage. He also observed sediment sampling on San Ildefonso Pueblo and LANL property for the 1993 Annual Surveillance effort.

The GWPRB AIP representative at LANL helped SWQB and HRMB AIP personnel sample runoff adjacent to the Omega West Reactor spill and advised on the hydrogeologic characterization of the spill site.

In the Spring of 1993 grab samples of snowmelt runoff were collected from Los Alamos Canyon, Pajarito Canyon and Ancho Canyon. SWQB held planning and coordinating meetings with members of EM-8 and HRMB to discuss continued sampling during the spring runoff period. During the summer, SWQB staff implemented the Storm Water Monitoring Program (SWMP). Accessibility to remote areas is being addressed at this time. The placement of automatic samplers was discussed with EM-8 and DOE. Sampling sites for the SWMP were located in DP Canyon, Los Alamos Canyon, and Pajarito Canyon.

Background radiation measurements were taken in DP Canyon

and Los Alamos Canyon stream beds and surrounding area. This sampling was coordinated with HRMB personnel. The ISCO automatic sampler and flow meter were installed in DP Canyon to monitor storm water runoff from Technical Area 21. Samples were later collected in Los Alamos Canyon below the TA 2 Omega Reactor and in Pajarito Canyon below the TA 54, Area G PCB disposal site.

Invertebrate samples were collected from three stations in Los Alamos Canyon, one station in DP Canyon, and one station in Sandia Canyon. Many invertebrates are sensitive to the presence of pollutants and can act as indicators of water quality. The samples were sorted to order by SWQB staff and then submitted to the Biology Department at New Mexico Highlands University for more detailed identification.

Sediment, water, and invertebrate samples were collected during LANL's annual White Rock Canyon Environmental Sampling and Surveillance trip Tuesday, October 12 through Friday, October 16. Samples were collected from fourteen of the twenty-eight springs and streams that flow into White Rock Canyon. The Rio Grande flows through White Rock Canyon parallel to the west boundary of LANL. The water from the springs is reported to originate from the main aquifer beneath the Pajarito Plateau. Stream flow sampled originates from the main aquifer springs in Mortandad Canyon and treated sanitary effluent from Mortandad Canyon.

Sediment and water samples were submitted to the New Mexico Scientific Laboratory Division for analysis. Results of analyses of nutrients, radiochemistry, major ion, and metals are pending at this time. Invertebrate samples were sorted to order and then submitted to the Biology Department of New Mexico Highlands University for further identification.

3.2.3 Environmental Restoration/Cleanup Activities

The largest and potentially most costly environmental program within DOE is Environmental Restoration (ER), which is designed to locate and assess contamination within 2000 sites at LANL. Each site is called a Solid Waste Management Unit (SWMU, pronounced "schmoo"), and generally a number of SWMU's are grouped into an Operable Unit (OU). It is DOE's intention to proceed as follows: if historical documentation does not rule out the possibility of hazardous materials disposal or spillage at a given SWMU, a sampling and analysis plan is included for the site in that OU's RCRA Facility Investigation

(RFI) Workplan. If contamination is identified at the site above acceptable levels, a corrective action plan is to be drafted. NMED's DOE Oversight Program includes a component whose objectives are 1) to review the RFI workplans to ensure they provide high confidence that all contaminated sites and all health risks they present will be identified, 2) to take samples of environmental media from these sites for analysis by an independent laboratory, 3) to see that the sample data from DOE's contractor laboratories is valid and that it is correctly interpreted, and 4) to provide for full public involvement in decision-making regarding the objectives and methodologies employed in the ER program, as well as to respond meaningfully to publicly expressed concerns regarding the direction and goals of NMED's own oversight program.

Specific findings by AIP program staff dedicated to oversight of the ER program in 1993 are as follows:

- LANL staff at the radioactive waste water treatment plant expressed concern that slanted borings which were planned to penetrate below the locations of existing waste management facilities might intercept subsurface structures and result in release of contaminated water. AIP staff found this concern to be valid and recommended against this procedure.

- Site visits by AIP staff at TA 50 resulted in the determination that a liquid storage tank described as having never been used to store radioactive liquids had in fact been used for storage of both gamma- and beta-contaminated liquids.

- AIP's recommendations that potential ecological impacts be included in prioritizations for future cleanups were incorporated by DOE in its rating system.

- Reviews of the RFI workplans for OU's 1144 (TA-49) and 1148 (TA54, Areas G, L, J) revealed that document DOE-JIO-025 was cited as the basis for limiting the timeframe over which material disposal areas had to be capable of containing their wastes. The limitation was said to be the 100 year 'period of administrative controls'. Review of this document found no such stated or implied limitation.

- Review of the RFI workplans for OU's 1122 and 1129

found these plans to be adequate.

A release of primary cooling water into Los Alamos Canyon from the TA 2 Omega West Reactor was reported in January 1993. EM-8 staff sent water quality data to the SWQB on a weekly basis.

LANL submitted a corrective action and sampling plan for the remediation of Solid Waste Management Unit (SWMU) #3-010 mercury release. LANL reported a release of mercury into a tributary of Pajarito Canyon according to WQCC Regulation 1-203 (spill reporting). Rains caused erosion to the water course. SWQB staff attended meetings with DOE, LANL, and contractors regarding the corrective actions and sampling plan.

3.2.4 Waste Management

Staff reviewed technical documentation provided in support of the appropriateness of the location for the proposed Mixed Waste Treatment, Storage and Disposal facility and found the site evaluation to provide inadequate information regarding the suitability of the location for the facility.

Representatives of the Los Alamos Area Office began working with NMED's site representative to determine the best means for providing NMED with information regarding the nature, quantities and hazards associated with hazardous, mixed and radioactive waste produced, stored or disposed of at LANL.

Staff reviewed the DOE report, "Framework for DOE Low-level and Mixed Low-level Waste Disposal: Current Overview". Issues requiring resolution are 1) comparative desirability of off-site versus on-site disposal options, 2) disposal of environmental restoration wastes, and 3) relations between treatment and disposal locations.

3.2.5 Corrective Action

HRMB AIP staff provided technical guidance to SWQB AIP staff regarding technical deficiencies in the voluntary corrective action at TA-3, SWMU 030 (mercury spill site). During the discussion surrounding the sampling plan, HRMB AIP staff developed the general position that regularly placed, grid-based sampling plans with some samples located according to best professional judgement were superior to grid-based, random sampling plans which do not make use of site-specific, professional judgement.

Spill sites were inspected at TA 3-419, TA 6, TA 3-216, TA 21 E storage tank, TA 35-86, TA 46 SWSC plant, TA 3-22, TA 53-28, TA 3-34, TA 3 SM-215, TA 3 mercury spill, TA 3-1702, TA 3-30, and TA 2. Recommendations for remediation were made to LANL staff.

3.2.6 Waste Characterization

Staff researched the fate of high explosives (HE) in soils as a result of learning LANL's position that HE does not persist in soils. However, after interviewing other LANL staff, it was determined that this is true only in locations with abundant moisture and organic carbon content, conditions not typical of most LANL locations.

LANL provided NMED with copies of Waste Stream Characterization Report (WSC) numbers 2-9, 11, 12-15, 16, 19, 20, 23, and 24. The reports contain information on industrial/sanitary waste from TA's 6, 8, 11, 14, 15, and 16.

3.2.7 Quality Assurance

AIP staff met with HRMB and GWPRB technical and enforcement staff as well as with LANL technical counterparts to discuss what LANL's groundwater monitoring objectives should be. NMED staff and LANL staff agreed as follows: 1) LANL should install groundwater monitoring wells downgradient of the two major tritiated water disposal sites in Los Alamos and Mortandad canyons, 2) there is an immediate need for accurate groundwater potentiometric maps, and 3) evaluations of threats to the main aquifer from source terms in the canyon bottoms should have priority over studies of migration mechanisms from the mesa tops.

3.3 SNL/ITRI Oversight

3.3.1 General Oversight Activities

A work plan for the investigation of KAFB Area background chromium concentrations was developed by HRMB AIP staff. The issue of background levels of chromium at KAFB has been debated between NMED and SNL for a number of years. Chromium is one of the contaminates found in monitor wells at the Chemical Waste Landfill, where chromic acid historically was disposed into unlined pits.

AQB staff have observed numerous R&D Tests at the Lurance Canyon Burn Site and confirmed that the operators follow all applicable air quality regulations. Staff also took part in a comprehensive baseline environmental audit of ITRI conducted by DOE/AL and have been routinely involved in the various permit applications to and inspections by the Air Pollution Control Division of the Albuquerque Environmental Health Department related to SNL/ITRI .

GWPRB staff completed a report entitled, "Initial Assessment of the Ground-Water Monitoring Programs at Sandia National Laboratory and the Inhalation Toxicology Research Institute, KAFB, New Mexico". AIP staff reviewed stable-isotope data and helped prepare an abstract of a paper ("Nitrate Contamination in Ground Water Along Tijeras and Hells Canyon Watersheds and the Mountainview Subdivision, New Mexico") for presentation at the Rocky Mountain Ground Water Conference, Albuquerque. Staff also reviewed ITRI's ground-water monitoring and sampling program, and organized/moderated a meeting between NMED, DOE, the Pueblo of Isleta, the USGS and BIA to initiate the sharing of regional ground-water data.

SWQB staff reviewed SNL's Wastewater Monitoring Quarterly Reports submitted to the City of Albuquerque Industrial Waste Pretreatment Program.

3.3.2 Sampling Activities

Sampling continued for the Kirtland/Sandia basewide background study designed to determine natural, non-contaminant associated levels of heavy metals in soils, sediments and groundwater. Samples are being analyzed for chromium, cadmium, vanadium, barium, boron lead and strontium, among other elements. Data for sampling activities is provided in Attachment I as available.

Sampling of soils, sediments, vegetation, surface water, and ground water was performed for radiochemical analysis. Sampling locations have been chosen as a subset of those sampled by DOE facility environmental surveillance and restoration programs. Incidental samples have been obtained by NMED in independent efforts. Results of these analyses are provided in Attachment I.

SNL/HRMB/AIP staff are investigating the KAFB-area background ground water quality. Samples are being taken from monitor and supply wells, indigenous rocks, drill cuttings, and drilling cores that will be analyzed for trace metals.

Environmental radiation measurements are made using thermoluminescent dosimeters. Two types of TLDs are currently under study. These include aluminum oxide TLDs provided commercially by Landauer, Inc., and a second type of calcium sulfate/dysprosium TLDs which have been provided under a cooperative program involving the University of New Mexico (UNM) Chemical and Nuclear Engineering Department. Results of the Landauer TLDs are provided in Attachment I. Results of the UNM/NMED study are preliminary at this time, and will be provided under separate cover at a later date. The NMED TLD locations are chosen largely to duplicate DOE facility radiation measurement programs' locations. Quality assurance programs continue to develop for the TLD program.

AQB staff were involved in siting and commencement of the monitoring of meteorological parameters and criteria air pollutants. SNL implemented these programs in order to comply with a Tiger Team finding. Staff has also been involved in discussions that resulted in the placement of a particulate sampler located on private land adjacent to the lab's Test Area 9830.

GWPRB and SWQB AIP staff selected sites for sampling storm runoff, especially in Tijeras Arroyo and its tributaries, as a follow-up to the GWPRB's nitrate study. The GWPRB AIP representative at SNL/ITRI split samples from SNL Technical Area 2 leachfield monitoring wells and from ITRI's monitoring wells and assisted HRMB AIP personnel sample SNL's Chemical Waste Landfill background wells and Isleta Pueblo's monitoring wells. Additionally, GWPRB staff helped select site-wide monitoring wells for HRMB's chromium study at SNL.

SWQB staff instituted the Storm Water Monitoring Program (SWMP) at SNL in November of 1993. An automatic sampler and flow meter was placed at the permanent weir located in the stream below TA-1. Due to a lack of storm activity, no samples have been collected.

3.3.3 Environmental Restoration/Cleanup Activities

The Environmental Restoration program at SNL will address approximately 226 suspected disposal or spill sites.

Coordination between NMED AIP staff assigned to SNL and EPA Region VI staff has been established.

Staff provided both SNL and EPA technical comments on SNL's RFI workplans for TA-2 and the Liquid Waste Disposal Facility (LWDF). The major finding in both cases

has been that neither facility includes an adequate groundwater monitoring system. At the LWDF, over 16 million gallons of radioactive primary reactor coolant water was disposed of in unlined trenches. As of the time of the workplan evaluation two wells had been established at the LWDF but neither had been sampled.

AIP staff attending an SNL site tour learned that directional drilling cores under two unlined chromic acid pits identified chromium at 23,700 ppm. Staff observed that SNL's mathematical models failed to predict this level and rate of chromium movement in the subsurface.

HRMB/AIP staff completed two reports on the adequacy of ground water monitoring program at SNL. The reports titled "Review of Ground-Water Monitoring at SNLA's Mixed Waste Landfill" and "Review of Ground Water Monitoring at SNLA's Chemical Waste Landfill" have been submitted to DOE for review. They will be released for general public review after DOE has had the opportunity to comment.

On January 7, 1993 a sewage spill occurred at TA-III. The spill was inspected by SWQB staff and recommendations for remediation were made.

A release of primary cooling water occurred at the TA-V reactor. SWQB staff inspected the spill site and toured the TA-V Reactor facility.

3.3.4 Waste Management

HRMB staff met with DOE/KAO and SNL to discuss the handling of investigation derived waste. It was determined that NMED would need to be solely responsible for any such wastes due to restrictions of the SNL RCRA permit. SNL did volunteer to provide several 55 gallon drums to store purged water.

HRMB AIP staff at SNL observed SNL response to a wastewater spill that occurred at TA-V. The spill was approximately 5,000 gallons of primary coolant water from the Annular Core Reactor Facility. The water is reported to have concentrations of approximately 9,000 pCi/l of tritium. Recommendations were made to SNL staff regarding the appropriate handling and reporting of such instances in the future.

3.3.5 Waste Stream Audits

A draft report on the HRMB investigation of the ITRI

Lagoon Sludge Sampling was submitted for comment to HRMB management. AIP staff have provided comments on the draft and final revisions are being made.

Two sets of twenty-four hour composite samples were collected by SWQB staff from sanitary waste water monitoring sites WW006 and WW008. Samples were sent to SLD to be analyzed for radionuclides, metals, major ions, and nutrients. Results are pending.

3.3.6 Quality Assurance

GWPRB AIP staff attempted to verify lab results reported by SNL and ITRI consultants by splitting samples with them at various times throughout the year. Results are pending and in the process of being critiqued.

3.4 WIPP Oversight

3.4.1 General Oversight Activities

HRMB/AIP staff at WIPP completed the technical background document for the RCRA facility assessment (RFA) for WIPP. The report was transmitted to EPA Region VI office where it was incorporated by reference into the draft HSWA permit for WIPP. The assessment involves field verification of all the potentially contaminated sites within the WIPP facility boundary that are reported in the literature, as well as a systematic survey for any additional potentially contaminated sites.

The draft Environmental Radiation Surveillance Assessment of the WIPP Radiological Monitoring Program was "peer reviewed" and is undergoing final revisions prior to being submitted for management review and approval.

Staff participated in the New Mexico Geological Society Fall Field conference and took part in three days of lectures and discussion regarding environmental, Quaternary, and structural geology of the Delaware Basin, Guadalupe Mountains, and Southeastern New Mexico. The WIPP- specific topics and discussions of the conference include: the concept of sandstone stringers in the Bell Canyon formation (which contains the closest underlying aquifers below the WIPP site and which therefore has a significance on groundwater pathway analysis); utilization of the Sandia document "Preliminary Geohydrological conceptual Model of the Los Medanos Region...for the Purpose of Performance Assessment"; and

consideration of the possibility of man-made deep dissolution of evaporites (sinks) appearing at the WIPP site.

HRMB AIP staff coordinated a panel on seismic risk and engineering of WIPP for the EPA Region VI "Regional Response Team" meeting held in Carlsbad. Staff also presented a talk on the seismicity of the region.

The Effluent Monitoring Filter Exchange Protocol was finalized in early 1993. NMED now receives routine air monitor filters from the ventilation shaft for independent analysis.

HRMB staff participate in biotic surveys around the WIPP site to determine baseline levels of wildlife populations that will be compared to post-operations population surveys. Small nocturnal mammals are surveyed each summer at four sample location near WIPP sites. Also, a bird survey is conducted along a 25 mile transect or pipeline right-of-way and using a U.S. Fish and Wildlife Service observation method.

AQB staff have focused on the existing environmental monitoring activities that relate to air emissions and surveillance and emphasis has been on quality assurance of the data collected by DOE and its contractors. During 1993, procedures and checklists were developed to audit and observe routine volatile organic canister exchanges, low volume air sampling filter exchanges, ambient air monitoring audits and the monthly functional continuous air monitor (CAM) tests.

The CAM's are crucial devices in the planned operation of WIPP because they act as alarms to detect radiation within and exiting from the repository. In the event of an alarm, the air flow from the repository is to be diverted through filters to prevent releases to the atmosphere. Staff observed the monthly functional audits of the effluent CAMs and have made suggestions to the DOE WIPP staff to modify some of their procedures. Additionally, NMED staff developed a procedure for analyzing effluent CAM down times by examination of data supplied by Westinghouse.

Staff questioned the efficiency of the sampling probes operating in a wet environment. Westinghouse/DOE has created an additional committee to investigate and report.

SWQB staff inspected the WIPP sanitary lagoons and

consulted with staff members from Westinghouse, Inc. regarding WIPP's NPDES storm water permit.

3.4.2 Sampling Activities

Sampling during the 1992 and 1993 field season occurred according to the 1992 NMED/WIPP Sampling and Analysis Plan. Data summaries for the following sampling activities can be found in Attachment I.

The HRMB/AIP environmental dosimetry program is ongoing with regular TLD exchanges being made. The data accumulated from January - April 1993 indicates an estimated annual dose rate of 81.2 millirem/yr. The WIPP/WID Reuter-Stokes high pressure ionizing chamber deployed at the WIPP far field station provides data supporting an estimated annual dose of 65 millirem. A table of TLD data is provided.

Radiological soils samples were collected by HRMB in September, 1992 at six locations as reported in the 1992 annual report. Staff focused on analytical tests on split samples collected from WFF, Mills Ranch, and Smith Ranch for two reasons: 1) no analytical data has ever been collected for these sites and 2) preoperational baseline has already been established for Lo Vol stations. The gamma spectrum analyses indicate no unexpected environmental activity, only the presence of several members of the naturally occurring U-238 and Th-232 decay chains. There are no DOE/WIPP measurements for analysis.

HRMB and DOE/WIPP staff collected ground water samples at ten co-located well locations highlighted in the attached map (Attachment I). A schematic geologic cross-section illustrating the position of the two monitored water-bearing zones with respect to the repository location is also included.

Groundwater analytical results for the ten wells sampled in 1992 have been summarized. Some data exist for wells sampled in 1993, but the data set has not been verified and is not available at this time. A cursory comparison of 1992 data reveals general consistency between NMED data and unpublished DOE/WIPP 1992 data. There are a few discrepancies, however, which suggest a more detailed analyses and comparison is required for complete data verification.

An attached table (in Attachment I) shows selected

geochemical parameters versus hydrochemical type area/ geologic formation. The total dissolved solids are further presented in a graphic representation which emphasizes that most of the Culebra groundwater sampled in 1992 is about 10,000 TDS.

Heavy Metal analytical results from 1992 HRMB groundwater sampling for trace-element heavy metals appear in Attachment I. Characteristic of trace metallic species in groundwaters with high total dissolved solids, numerous values are reported below the detection limit. Two additional tables concerning heavy metals are also provided: 1) highlighting only those heavy metal constituents measured above the detection limit for this sampling round and 2) comparing 1992 HRMB and DOE/WIPP trace metal data at Barn Well and Ranch Well.

Groundwater samples from four WIPP observation wells were analyzed for gross alpha/beta, gamma contributions, and certain specific radionuclides.

AQB staff have implemented the split sampling program at the Fixed Air Sampler (FAS) at stations A & B. The sampling is required in the AIP and subsequently described in the WIPP Site Specific Work Plan. A procedure has been written and adopted and equipment was purchased for the implementation of this procedure. Basically, the filters are desiccated and weighed prior to installation in the CAM. The intent of this program is to have a way to measure alpha and beta particles exhausted from the mine. Currently, a more important purpose is to study the weight and content of the particulate matter (salt dust and diesel exhaust) and determine the effect on the accuracy of the continuous air monitors and other detection devices.

3.4.3 Environmental Restoration/Cleanup Activities

An NMED sampling program was developed to quantify artificial levels of organics, hydrocarbons and heavy metal constituents as part of an assessment of solid waste management units at the WIPP site. One sampling event was initiated to investigate mudpits associated with WIPP exploratory wells, and private-venture oil and potash exploration wells inherited by DOE following the legislative withdrawal of the 16 section area. Three mudpits, out a total of approximately 46 units, were sampled as part of this event: DOE-1, Badger Unit, and Cotton Baby.

Twenty-eight soil samples were collected by NMED staff

between 10/5/92 and 10/7/92 for 1992. Samples were collected by hand auger and placed in containers provided by the Scientific Laboratory Division. Stratigraphy and sample locations were logged by NMED staff. DOE/WIPP representatives were invited to the sampling events and collected duplicate samples in their own sample containers. Types of analyses requested from Scientific Laboratories Division include: aromatic and halogenated purgeables, aliphatic hydrocarbons, base neutral extractables, and heavy metals.

Data from these sampling activities is available in a report titled "Assessment of Solid Waste Management Units at the Waste Isolation Pilot Plant: Supporting Documentation for RCRA Facility Assessment" and was submitted to DOE and EPA. This report will provide the technical background for EPA to develop the Draft HSWA permit for WIPP. Many of the solid waste management units had previously not been characterized.

3.4.4 Waste Management

HRMB/AIP staff at WIPP have observed the inventory, labeling, and packaging of the WIPP site generated wastes.

3.4.5 Corrective Action

Westinghouse has been operating the ambient air monitoring station for criteria pollutants without a procedure in place for routine checks and quality assurance audits of the air monitoring equipment. Through urging from NMED staff Westinghouse developed and adopted a procedure that addresses these concerns.

4. ASSESSMENT OF COMPLIANCE

4.1 LANL

SWQB staff inspected spills at the TA 18 sanitary lift station and TA 35-85 and an assessment of compliance with applicable regulations is in draft form. Recommendations for remediation procedures and future preventive measures will be provided to LANL and DOE in the first quarter of 1994.

4.2 SNL/ITRI

AQB received and reviewed the 1992 NESHAPs annual report to EPA Region VI and has independently verified through calculations and model runs that both SNL/NM and ITRI are in compliance with 40 CFR 61 Subpart H NESHAPs requirements. The effective dose equivalent (EDE) from each of these facilities is well below the 10 mrem/year standard. SNL/NM has an EDE of .0034 mrem/year and ITRI has an EDE of 0.000016 mrem/year.

GWPRB staff assessed monitoring well construction and sampling protocol at ITRI.

5. DATA REVIEW AND TREATMENT

NMED AQB staff at WIPP have analyzed the differences in counts between two of the CAMs sampling the effluent airstream. Two related problems appeared evident. In order to determine that the CAMs are sampling a homogenous airstream which has been assumed for years, it is necessary to change filters at the different CAMs at the same time. At NMED's urging, the contractor has agreed to alter their procedure and make filter changes simultaneously. NMED contends that when differences exist, it demonstrates that the two CFM probes in the exhaust shaft cannot be relied upon to supply a continuous representative sample to the CAMs for alarm purposes and argues for further study of this issue. The head of Westinghouse's Radiological Engineering Department and the CAM Cognizant Engineer disagree and contend that the differences are not statistically significant. NMED has been asked to be a permanent member of the CAM Committee that meets weekly and in that capacity has been asked to analyze and submit monthly reports on this issue.

6. DOCUMENT REVIEW

The following reports and documents have been reviewed by NMED AIP staff:

- Reports prepared by the Environmental Evaluation Group (EEG) relative to WIPP
- The 1991 LANL Environmental Surveillance Report
- Monthly LANL NESHAPs Reports
- The SNL Nonnuclear Consolidation Environmental Assessment

- LANL's Ground Water Protection and Management Program Plan

- Framework for DOE Low-level and Mixed Low-level Waste Disposal: Current Overview

7. EMERGENCY RESPONSE PLANNING

The role of the State with respect to emergency response is to ensure that emergency planning is adequate, that training is comprehensive and realistic, and that communication among all institutions involved and the populace is sufficiently prompt in an emergency.

The AIP provides for a number of activities by the State in the area of emergency response. The necessary expertise to perform these activities does not rest within a single state agency, however, the Department of Public Safety (DPS) has the statutory responsibility to direct and coordinate the civil emergency preparedness activities of all state departments, agencies and political subdivisions and to maintain liaison with and cooperate with civil emergency agencies and organizations of the federal government. Therefore, the NMED entered into an agreement with DPS to accomplish the following:

- Update and maintain State Emergency Response Plans and assist local governments in updating and maintaining their emergency response plans, based on the threats identified by Response Offices.

- Conduct emergency response training and exercises jointly with the DOE, state agencies identified as having a role under the state Hazardous Materials Emergency Response Plan, and local governments (i.e. city, county). Ensure that local and county governments are properly trained to respond to a DOE generated hazardous, mixed or radioactive material emergency.

- Provide incident response support in accordance with the state Hazardous Materials Emergency Response Plan, state and local emergency response plans and appropriate memorandums of understanding between the State of New Mexico and DOE.

Emergency response planning and coordination required by the AIP was established on May 6, 1992 with the signing of an Affidavit Agreement between NMED and DPS. During the past two years a foundation has been set in place which will allow for the coordinated development of plans and agreements between

counties/cities which are impacted by DOE facilities.

Staff of the New Mexico Department of Public Safety continues work with local, state, and federal agencies in the development and execution of emergency response (ER) preparedness activities related to off-site response to an on-site incident at a DOE facility. This work includes participation in the orientation, drills, functional exercises, and full scale exercises for these emergency response operations; meeting with planning committees to assure a cohesive structure for the exercises; and training emergency manager in ER elements.

Exercises which DPS and NMED staff participated in this year include:

- "Blondie 93" a full scale exercise involving Albuquerque Fire Department, SNL, KAFB, OMI, Red Cross, Albuquerque Hospitals, and the State of New Mexico
- An appraisal exercise with DOE and Sandia
- An exercise with DOE/Washington DC and ITRI
- Planning for an upcoming LANL exercise initiated by DOE/Washington

DPS is working with Local Emergency Planning Committees (LEPC) in communities surrounding DOE facilities for emergency preparedness. The committee includes representatives from fire departments, public works, environmental health agencies, local businesses, hospitals, the Red Cross, and also concerned citizens.

DPS continues to facilitate development of emergency response planning through the use of the Emergency Information system (EIS) computer software and coordinates the implementation of EIS equipment upgrades, software training, and use of EIS for ER applications to those agencies under the AIP agreement.

8. PUBLIC INFORMATION/PUBLIC RELATIONS

8.1 General

In May 1993, a Liaison Officer was hired for the AIP Program whose responsibilities are: to develop public information and public relations documents for the AIP Program, assist in site specific public information meetings, assist staff in presentations to public interest groups, civic groups and other interested

constituents, and assist in the development of news releases. Two public information pamphlets have been drafted during 1993 and invaluable assistance has been provided to technical staff in their public information activities.

A "Program Brief" describing New Mexico's AIP Program was developed and finalized during 1993. This document provides the reader with an easy-to-understand overview of New Mexico's Program.

NMED AIP staff stationed at SNL/ITRI responded to a written request for information and made all records available for on-site inspection after withdrawing notes and confidential, preliminary and draft documents. Also NMED staff stationed at SNL/ITRI serve as members of the SNL/ITRI Community Relations Team.

8.2 Reports

8.2.1 Quarterly

As a management tool and to facilitate the development of an annual report each NMED bureau participating in the AIP Program submits quarterly reports to the Director of the Water and Waste Management Division and to the DOE Oversight Chief, describing significant activities and accomplishments during the 3 month reporting period. These reports are utilized as internal documents only.

8.2.2 Annual Report

As required by the AIP, NMED submits an Annual Performance Report for environmental monitoring and oversight at DOE facilities in New Mexico. The 1992 Annual Report was submitted on February 8, 1993. This document satisfies the requirement for the 1993 Annual Report.

8.3 INFORMATIONAL MEETINGS

8.3.1 General

On March 30, 1993, NMED hosted a Public Information Meeting at which time NMED AIP staff presented an overview of the State's oversight activities at LANL. A similar Public Information Meeting pertaining to NMED oversight activities at SNL/ITRI was held on August 23, 1993. Invitations were sent to over 200 parties, which

included state and federal agencies, local governments, tribal governments, state legislators and public interest groups. Additionally, notification of the meetings was provided to the printed and the electronic news media.

NMED/AIP staff attended the WIPP Land Use Management Plan public meeting in Carlsbad and Hobbs and also attended public meetings in Albuquerque on WIPP where staff explained selected portions of the Test Phase Plan.

8.3.2 Environmental Restoration/Cleanup

Staff attended all quarterly LANL environmental restoration public meetings.

A LANL-specific informational meeting was held by AIP staff and public input was compiled and a report delivered to all attendees. Input was as follows:

- The central desire by those present was to identify a means to gain influence over LANL's industrial future. AIP staff responded that this was outside the purview of the AIP program and in fact was outside the jurisdiction of the Environment Department in general.
- Great interest was expressed regarding participation in the Site Specific Advisory Board which will be established for public oversight of LANL environmental operations.
- AIP staff should focus more attention on sites known to be highly contaminated rather than dilute their efforts by spending time evaluating sites of low concern.
- AIP staff should become more familiar with waste-management issues in order to prevent additional environmental contamination.

8.3.3 Facility Meetings

NMED AIP staff attend the quarterly public information meetings sponsored by LANL and SNL/ITRI. These meetings provide the public an opportunity to be educated on DOE and DOE/Contractor activities in environmental restoration and address concerns on the facilities operations.

8.4 NMED/DOE MEETINGS

8.4.1 General

Weekly meetings are held between NMED staff and DOE staff at WIPP. Bi-weekly meetings are held with NMED and LAAO staff. Monthly meetings are held with NMED staff and DOE/KAO staff. The purpose of these regularly scheduled meetings is to discuss upcoming activities, monitoring and sampling schedules and to provide an open line of communication between NMED on-site personnel and DOE Area Office staff.

Five NMED AIP staff attended the States/Tribes AIP Forum held in May 1993 at Boise, Idaho and sponsored by the State of Idaho AIP Program. The Forum provided staff the opportunity to share experiences and concerns with other state AIP personnel, as well as the opportunity to communicate with DOE/Headquarters.

In December 1993, a DOE/State Agreement-in-Principle Program Review Meeting sponsored by DOE/Headquarters was held in Albuquerque and attended by approximately 100 individuals including all 13 state AIP Programs, DOE, and DOE contractors. Eight NMED staff attended and participated in panel discussions on an Overview of New Mexico's Program, Administrative, Grant and Budget Concerns, and Emergency Response Issues.

8.4.2 Bi-Monthly Meetings

A schedule of bi-monthly meetings has been developed for NMED and DOE AIP staff. The purpose of the meetings is to discuss site specific technical issues, administrative matters and to provide an avenue for improved coordination between DOE and NMED. Six such meetings were held during 1993 and were attended by both NMED and DOE site Points of Contact (POCs), a representative from each NMED Bureau involved in the AIP Program, the NMED DOE Oversight Program Chief and DOE/AL personnel responsible for administering the AIP.

8.4.3 Annual Meetings

Each year an annual meeting is scheduled between NMED and DOE to develop an integrated schedule and prioritization of clean-up, environmental restoration, environmental compliance and permitting activities for the upcoming year. The 1993 meeting was held on July 8.

9. TRAINING

9.1 Technical Training

Staff attended the following courses, workshops, seminars conferences, and training sessions during 1993:

- the Basic Total Quality Management Course presented by the Environmental Protection Agency.
- a seminar on the WIPP Waste Acceptance Criteria (WAC) presented by DOE.
- a seminar on Measuring Modeling and Mitigating Toxic Aerosols sponsored by ITRI.
- a workshop on Sampling and Analysis Methods for Measuring Radionuclide Emissions sponsored by EPA.
- a workshop sponsored by EPA on Conducting Radionuclide NESHAPs Inspections at DOE Facilities.
- a Risk Assessment Seminar presented by EPA.
- a Seminar in Hazardous Waste Management.
- a seminar on Ionizing Radiation presented by Radiation Safety Engineering, Inc.
- a seminar in Hazardous Waste Management sponsored by UNM.
- a Visible Emissions Training and Recertification Course conducted by the Albuquerque Environmental Health Department.
- a workshop sponsored by EPA on Mixed Waste Incineration.
- the Rocky Mountain Ground Water Conference.
- the New Mexico Geological Society's Annual Fall Field Conference.
- the Environmental Resources and Compliance Conference.
- the Hazard Communication, Radiation Worker I, and Radiation II training presented by LANL, ES&H.
- Introduction to Arc Info, a geographical

information system (GIS)

- RESRAD, a predictive modeling software
- Radiation Safety Engineering course: Radiation Safety and Environmental Monitoring
- DOE Basic Radiological Risk Assessment Workshop
- DOE Basic Risk Assessment Workshop

9.2 Worker Health and Safety

9.2.1 Training of Staff

In accordance with OSHA 29 CFR 1910.120, all NMED AIP Oversight staff whose job entails work in the field, attended a Hazardous Waste Worker Training, either the 40 hour course or the 8 hour refresher for those having already completed the 40 hour course within the appropriate time frame.

9.2.2 Health and Safety Plans

In 1992 an "umbrella" Health and Safety Plan was finalized and distributed to all NMED staff involved in the DOE Environmental Oversight and Monitoring Program along with a directive that all such staff adhere to the policies, procedures and directives outlined in the plan. Additionally, a "site specific" Health and Safety Plan for WIPP was developed, finalized and distributed to NMED staff in November 1992. These two Health and Safety Plans remained in effect during 1993. The "site specific" Health and Safety Plan for SNL/ITRI was finalized and distributed to staff in March 1993. The "site specific" Health and Safety Plan for LANL is in draft form.

ATTACHMENT I

ENVIRONMENTAL MONITORING DATA

LIST OF TABLES

LANL

ENVIRONMENTAL MONITORING

NEW MEXICO ENVIRONMENT DEPARTMENT
HAZARDOUS AND RADIOACTIVE MATERIALS BUREAU
THERMOLUMINESCENT DOSIMETRY RESULTS

Station Number	Station Location	Gross (mrem)	
		1993-2nd Q	1993-3rd Q
1	Barranca	34.4	35.5
2	48th Street	36.3	NA
3	Shell Station	38.8	49.5
4	McDonald's	39.1	44.5
5	Airport	33.5	42.4
6	Eastgate	40.2	43.0
7	Well PM-1	43.7	47.4
8	WR Fire Station	33.9	37.9
9	WR Nazarene	30.4	30.9
10	Pajarito Acres	34.2	37.7
11	Royal Crest	35.9	40.2
12	Santa Fe	31.6	NA

Station Number	Station Location	Net (mrem)	
		1993-2nd Q	1993-3rd
1	Barranca	9.6	11.0
2	48th Street	11.5	NA
3	Shell Station	14.1	25.0
4	McDonald's	14.3	20.0
5	Airport	8.7	17.9
6	Eastgate	15.4	18.5
7	Well PM-1	18.9	22.9
8	WR Fire Stati	9.1	13.4
9	WR Nazaren	5.6	6.4
10	Pajarito Acre	9.5	13.2
11	Royal Crest	11.1	15.7
12	Santa Fe	6.8	NA

Station Number	Station Location	Annual Equivalent (mrem)	
		1993-2nd Q	1993-3rd Q
1	Barranca	41.2	41.4
2	48th Street	49.4	NA
3	Shell Station	60.5	94.1
4	McDonald's	61.4	75.3
5	Airport	37.4	67.4
6	Eastgate	66.1	69.6
7	Well PM-1	81.2	86.2
8	WR Fire Station	39.1	50.4
9	WR Nazarene	24.0	24.1
10	Pajarito Acres	40.8	49.7
11	Royal Crest	47.7	59.1
12	Santa Fe	29.2	NA

he NMED has chosen 12 stations that are co-located with monitors deployed by LANL. This facilitates data comparison, ith data validation being their purpose. The control chips maintained by NMED in a low background cation (a lead container), have had such high readings that when subtracted from those deployed in the field, ie net exposure has been unrealistically low. We are changing our procedures in an attemt to resolve this roblem, however the enclosed data should be viewed as having little value in absolute terms, but can be instrumental identifying trends. In this latter context it must be borne in mind that there are seasonal trends in nvironmental parameters, and two quarters of data is in most cases inadequate for the determination of any trends.

he TLDs deployed by NMED utilize a different "chip" material than used by LANL in their TLD network. (TLD chips re made of a material which when heated after collection, emits an amount of light proportional to ie amount of radiation to which it has been exposed.) The aluminum oxide chips used by NMED are more sensitive ian the lithium fluoride traditionally used for this purpose, which allows for measurement of lower levels f radiation in the environment.

NMED 1993 AMBIENT AIR MONITORING AT LANL
GROSS BETA COUNT (CPM) *

DATE	White Rock Fire Station	ROYAL CREST Trailer Park	McDONALD'S Restaurant	Los Alamos Airport
06/16/93	120	80	NA	120
06/30/93	100	110	NA	80
07/14/93	140	160	NA	100
07/28/93	80	90	80	80
08/11/93	70	60	50	70
08/25/93	100	80	80	80
09/08/93	120	70	100	80
09/21/93	240	120	140	120
10/05/93	300	120	140	100
10/19/93	180	120	160	160
11/02/93	220	100	160	220
11/16/93	120	100	80	120
12/01/93	200	110	60	80
12/14/93	140	60	80	NA
01/04/94	220	80	100	80

* The results in the table are from four perimeter sites around the Los Alamos National Laboratory. The counts were done in-house, at the Hazardous and Radioactive Materials Bureau with an Eberline Pulse Rate meter, model PRM-6 and an Eberline Scintilator model HP-210. The readings shown have had background readings subtracted. Background readings varied from 60 to 100 cpm.

Foreword: LANL Water, Sediment and Food Stuff Sampling

Introduction

The New Mexico Environment Department/Hazardous and Radioactive Materials Bureau/ DOE AIP program collected environmental samples from seventy seven locations in and around the Los Alamos National Laboratory facility during 1993. Thirty sampling locations were within the LANL boundaries, forty seven locations were at the perimeter and within the neighboring regions of the LANL boundaries. Samples were taken up and down gradient of LANL facilities and within historical and active effluent release areas.

The samples were collected in conjunction with routine sampling activities by the LANL ES program as well as independently and in response to "hits" from prior sampling events.

Sampled media included surface water, ground water, sediment and food stuff. The surface water results from snow melt, rain fall, effluent release, and spring discharges. Ground Water samples are from shallow alluvial monitoring wells, perched aquifer monitoring wells, and monitoring and production wells and springs emanating from the "main aquifer" which supplies water to Los Alamos, White Rock and LANL. Sediments were collected from the Cochiti Lake bottom, and within stream channels within the Pajarito Plateau. Foodstuffs included apples, squash and cucumbers from White Rock and Los Alamos and from locations on the LANL facility.

Results

Radiochemical and Metals analysis data for on-site and perimeter locations are presented in the following tables. Data that is not yet available is indicated by NA and will be included in subsequent reports. Method and Laboratory detection limits are listed as provided by the laboratories and analytical results below those limits are indicated by ND.

The analytical results confirmed a number of areas of concern, to which LANL is investigating appropriate responses. Samples collected from some main aquifer observation wells indicated elevated levels of lead. Well DT-5A had a lead concentration of 4.6 mg/l measured. Los Alamos Canyon was extensively monitored during 1993 in response to leaks from the Omega Reactor within that canyon. NMED analytical results were comparable to LANL's and monitoring is continuing. Elevated levels of tritium were measured at DP Springs within DP Canyon and Spring 3 within White Rock Canyon. Additional investigation and discussions with LANL regarding necessary follow-up actions are required. Radiochemical analysis continue to indicate that Mortandad Canyon is impacted by discharge from TA-50, the Radioactive Waste Treatment facility. Analysis of waters from alluvial monitoring wells PCO-2 and PCO-3 within Pajarito Canyon indicate impact by an anthropogenic source.

Radiochemical Analysis of 1993 NMED/LANL On-Site Samples

ANALYTE	Mortandad Gaging Station			Mortandad Pond, Sediment			Mortandad Below Pond, Sediment			Mortandad @ A6B, Sediment		
	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry
G-Alpha w/ Am241 ref	3.20	0.80	1.00	108.00	17.00	2.70	20.00	4.00	2.10	28.00	4.00	1.20
G-Alpha w/ U-nat ref	4.30	1.00	1.30	142.00	18.00	3.50	31.00	5.00	3.30	45.00	5.00	2.00
G-Beta w/ Cs-127 ref	135.00	9.00	1.70	114.00	10.00	4.10	46.00	4.00	2.90	49.00	4.00	2.50
G-Beta w/ Sr-y90 ref.	131.00	7.00	1.60	105.00	8.00	3.80	41.00	3.00	2.60	46.00	4.00	2.40
Gamma Spectroscopy	seven peaks d			several peaks			several peaks			several peaks		
Tritium	16673.00	1291.00		NA			NA			NA		
U-238	0.88	0.24		NA			NA			NA		
U-234	0.90	0.24		NA			NA			NA		
U Total (mg/L)	0.10	0.07		NA			NA			NA		
Th-230			0.07	NA			NA			NA		
Th-232			0.07	NA			NA			NA		
Pu-239,240	0.20	0.11		NA			NA			NA		
Pu-238	0.13	0.09		NA			NA			NA		
SR-90	0.40	0.10		NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL On-Site Samples

ANALYTE	LA-01			LAOR-1			LA-07			SCS-2		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	2.40	0.50	0.70	93.00	14.00	3.00	4200.00	600.00	100.00	2.30	0.70	1.00
G-Alpha w/ U-nat ref	3.60	0.70	0.90	166.00	15.00	5.00	7900.00	700.00	200.00	3.60	1.10	1.60
G-Beta w/ Cs-127 ref	64.00	4.00	1.30	276.00	15.00	4.00	5700.00	400.00	150.00	13.50	1.70	1.80
G-Beta w/ Sr-y90 ref.	62.00	3.00	1.20	250.00	12.00	4.00	5100.00	400.00	150.00	12.50	1.40	1.70
Gamma Spectroscopy	zero peak			two peaks, ann			thirteen peaks,			zero peak		
Tritium	8600.00	771.00		9177.00	811.00		ND		384.00	638.00	261.00	
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL ON-Site Samples

ANALYTE	DT-5A			DT-9			DT-10			LA-2		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	0.20	0.40	0.80	4.60	1.00	0.80	1.10	0.40	0.80	NA		
G-Alpha w/ U-nat ref	0.20	0.40	0.80	4.80	0.90	0.80	1.10	0.50	0.80	NA		
G-Beta w/ Cs-127 ref	0.80	0.80	1.60	5.50	1.30	1.60	1.40	0.90	1.60	NA		
G-Beta w/ Sr-y90 ref.	0.80	0.80	1.60	5.70	1.30	1.60	1.40	1.00	1.60	NA		
Gamma Spectroscopy	one peak,K-40			zero peak			one peak, K-40			NA		
Tritium	NA			NA			NA			ND		740.60
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			ND		0.68
Cs-137	NA			NA			NA			ND		3.24

Radiochemical Analysis of 1993 NMED/LANL ON-Site Samples

ANALYTE	Acid Canyon Weir			Canada del Buey			LA Canyon @ Omega Reactor			DP Springs		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	11.40	2.00	0.90	5.10	1.00	0.80	NA			4.40	0.70	0.60
G-Alpha w/ U-nat ref	15.00	2.00	1.10	6.50	1.10	1.00	NA			5.80	0.80	0.80
G-Beta w/ Cs-127 ref	27.60	2.30	1.70	8.30	1.30	1.90	NA			234.00	12.00	1.20
G-Beta w/ Sr-y90 ref.	27.00	2.00	1.70	8.20	1.30	1.80	NA			230.00	10.00	1.20
Gamma Spectroscopy	zero peak			zero peak			NA			one peak		
Tritium	ND		378.00	ND		418.00	67525.00			1023.00	294.00	
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL On-Site Samples

ANALYTE	PM-2			Pueblo 3			TW-1A			TW-2A		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	-0.20	0.30	0.80	1.70	0.60	0.90	0.60	0.50	1.00	0.30	0.40	0.90
G-Alpha w/ U-nat ref	-0.20	0.30	0.80	2.40	0.80	1.30	0.80	0.70	1.30	0.40	0.50	1.10
G-Beta w/ Cs-127 ref	1.00	0.90	1.60	16.00	1.80	1.70	6.20	1.10	1.70	2.60	0.90	1.70
G-Beta w/ Sr-y90 ref.	1.00	0.90	1.60	15.30	1.60	1.70	6.00	1.00	1.70	2.60	0.90	1.70
Gamma Spectroscopy	zero peak			zero peak			zero peak			zero peak		
Tritium	NA			ND		377.00	NA			NA		
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL ON-Site Samples

ANALYTE	TW-1			TW-2			TW-3			TW-4		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	2.60	0.60	0.70	-0.10	0.30	0.80	0.60	0.40	0.80	0.00	0.30	0.80
G-Alpha w/ U-nat ref	3.20	0.60	0.80	-0.10	0.30	0.80	0.70	0.50	0.90	0.00	0.30	0.80
G-Beta w/ Cs-127 ref	4.20	0.70	1.20	2.20	0.80	1.80	1.00	0.90	1.60	1.70	0.80	1.60
G-Beta w/ Sr-y90 ref.	4.10	0.70	1.20	2.20	0.90	1.60	1.00	0.90	1.60	1.80	0.90	1.60
Gamma Spectroscopy	zero peak			zero peak			one peak, K-40			one peak,K-40		
Tritium	NA			NA			NA			NA		
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL On-Site Samples

ANALYTE	Foodstuff, Pajarito Canyon, TA-3		
	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry
G-Alpha w/ Am-241 ref.	NA		
G-Alpha w/ u-nat ref.	NA		
G-Beta w/ Cs-137 ref.	NA		
G-Beta w/ Sr-y90 ref.	NA		
Gamma Spectroscopy	NA		
Tritium	3096.00	513.00	
U-238	ND		0.04
U-234	ND		0.06
U-235	ND		0.03
Th-230	NA		
Th-232	NA		
Pu-239,240	ND		0.01
Pu-238	ND		0.01
SR-90	ND		0.80
Cs-137	ND		0.27
K-40	26.30	6.80	

ANALYTE	Foodstuff, Pajarito @ Area G		
	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry
G-Alpha w/ Am-241 ref.	NA		
G-Alpha w/ u-nat ref.	NA		
G-Beta w/ Cs-137 ref.	NA		
G-Beta w/ Sr-y90 ref.	NA		
Gamma Spectroscopy	NA		
Tritium	ND		1000.00
U-238	ND		0.06
U-234	ND		0.07
U-235	ND		0.02
Th-230	NA		
Th-232	NA		
Pu-239,240	ND		0.01
Pu-238	ND		0.01
SR-90	ND		0.70
Cs-137	ND		0.25

ANALYTE	Beta Site		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
Gross Alpha	ND		1.80
Gross Beta	6.80	2.90	
Tritium	373.00	230.00	
U-238	1.16	0.19	
U-234	0.88	0.17	
U-235	ND		0.05
Th-228	0.04	0.03	
Th-230	0.04	0.03	
Th-232	0.04	0.03	
Pu-239	0.02	0.02	
Pu-238	ND		0.03
Am-241	ND		0.02
SR-90	NA		
Cs-137	ND		35.00

Radiochemical Analysis of 1993 NMED/LANL On-Site Samples

ANALYTE	PCO-1		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	5.00	1.10	0.70
G-Alpha w/ U-nat ref	6.30	1.10	0.90
G-Beta w/ Cs-127 ref	11.50	1.40	1.90
G-Beta w/ Sr-y90 ref.	11.40	1.30	1.80
Gamma Spectroscopy	zero peak		
Tritium	594.00	270.00	
U-238	NA		
U-234	NA		
U Total (mg/L)	NA		
Th-230	NA		
Th-232	NA		
Pu-239,240	NA		
Pu-238	NA		
SR-90	NA		
Cs-137	NA		

ANALYTE	PCO-2		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	NA		
G-Alpha w/ U-nat ref	NA		
G-Beta w/ Cs-127 ref	NA		
G-Beta w/ Sr-y90 ref.	NA		
Gamma Spectroscopy	NA		
Tritium	462.00	263.00	
U-238	NA		
U-234	NA		
U Total (mg/L)	NA		
Th-230	NA		
Th-232	NA		
Pu-239,240	NA		
Pu-238	NA		
SR-90	NA		
Cs-137	NA		

ANALYTE	PCO-3		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	92.00	18.00	8.00
G-Alpha w/ U-nat ref	113.00	18.00	10.00
G-Beta w/ Cs-127 ref	92.00	13.00	17.00
G-Beta w/ Sr-y90 ref.	92.00	12.00	17.00
Gamma Spectroscopy	two peaks, K-4		
Tritium	479.00	264.00	
U-238	NA		
U-234	NA		
U Total (mg/L)	NA		
Th-230	NA		
Th-232	NA		
Pu-239,240	NA		
Pu-238	NA		
SR-90	NA		
Cs-137	NA		

ANALYTE			
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	NA		
G-Alpha w/ U-nat ref	NA		
G-Beta w/ Cs-127 ref	NA		
G-Beta w/ Sr-y90 ref.	NA		
Gamma Spectroscopy	NA		
Tritium	NA		
U-238	NA		
U-234	NA		
U Total (mg/L)	NA		
Th-230	NA		
Th-232	NA		
Pu-239,240	NA		
Pu-238	NA		
SR-90	NA		
Cs-137	NA		

Metal Analysis of 1993 NMED/LANL On Site Samples

ANALYTE	DT-5A			DT-9			DT-10			LA-2		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	0.00					0.00	0.00			NA		0.00
Al			0.05	0.07			0.09			NA		
As			0.01			0.01			0.01	NA		0.01
B			0.01			0.10			0.01	NA		0.10
Ba	0.02			0.02		0.10			0.01	NA		0.10
Be			0.00			0.00			0.00	NA		0.10
Cd	0.00					0.00	0.00		0.00	NA		0.00
Cr	0.00		0.01			0.00	0.00		0.01	NA		0.01
Co			0.01			0.01			0.01	NA		0.05
Cu	0.00		0.10	0.09		0.10	0.01		0.10	NA		0.10
Fe	0.62			1.77			0.87			NA		
Hg			0.00			0.00			0.00	NA		0.00
Lithium			0.05			0.05			0.05	NA		
Mg	2.30			2.80			3.60			NA		0.05
Mn	0.03		0.05	0.04		0.05	0.02		0.05	NA		0.10
Mo			0.02			0.02			0.02	NA		0.10
Ni			0.02			0.02			0.02	NA		0.01
Pb	4.60		0.01	0.02		0.01	0.04		0.01	NA		0.01
Antimony	0.22					0.05			0.05	NA		
Se			0.01			0.01			0.01	NA		0.10
Si	32.60			32.80			28.40			NA		0.10
Sn			0.03			0.03			0.03	NA		0.01
Sr	0.04			0.05		0.10	0.05		0.10	NA		0.10
Thallium			0.01			0.01			0.01	NA		0.10
U	NA		0.01	NA		0.01	NA		0.01	NA		
V			0.01			0.01			0.01	NA		
Zn	1.86		0.10	0.68		0.10	2.30		0.10	NA		

Metal Analysis of 1993 NMED/LANL On Site Samples

ANALYTE	Acid Canyon Weir			Canada Del Buey			Los Alamos Canyon @ Omega			DP Spring		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag			0.00	0.00		0.00			0.00			0.00
Al	6.00			13.00						0.50		
As			0.01			0.01			0.01			0.01
B			0.10			0.10			0.10			0.10
Ba	0.10		0.10	0.20		0.10			0.10	0.10		0.10
Be			0.10			0.10			0.10			0.10
Cd			0.00			0.00			0.00			0.00
Cr	0.01		0.01	0.01		0.01			0.01			0.01
Co			0.05			0.05			0.05			0.05
Cu			0.10			0.10			0.10			0.10
Fe	4.40			8.10						0.20		
Hg			0.00			0.00			0.00			0.00
Mg	2.00			3.10						2.40		
Mn	0.14		0.05	0.36		0.05			0.05			0.05
Mo			0.10			0.10			0.10			0.10
Ni			0.10			0.10			0.10			0.10
Pb	0.03		0.01	0.01		0.01			0.01			0.01
Se			0.01			0.01			0.01			0.01
Si	0.60			1.10						0.70		
Sn			0.10			0.10			0.10			0.10
Sr			0.10			0.10			0.10	0.20		0.10
U			0.01			0.01			0.01			0.01
V			0.10			0.10			0.10			0.10
Zn			0.10			0.10			0.10			0.10

Metal Analysis of 1993 NMED/LANL On Site Samples

ANALYTE	PM-2			Pueblo-3			TW-2A			TW-1A			
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l		REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	NA		0.00	0.00		0.00	NA		0.00	Ag			0.00
Al	NA			1.00			NA			Al			0.05
As	NA		0.01	0.01		0.01	NA		0.01	As			0.01
B	NA		0.10	0.20		0.10	NA		0.10	B	0.15		0.10
Ba	NA		0.10			0.10	NA		0.10	Ba	0.08		0.10
Be	NA		0.10			0.10	NA		0.10	Be			0.00
Cd	NA		0.00			0.00	NA		0.00	Cd			0.00
Cr	NA		0.01			0.01	NA		0.01	Cr			0.00
Co	NA		0.05			0.05	NA		0.05	Co			0.01
Cu	NA		0.10			0.10	NA		0.10	Cu	0.00		0.10
Fe	NA			0.90			NA			Fe	0.66		
Hg	NA		0.00			0.00	NA		0.00	Hg			0.00
Mg	NA			4.70			NA			Litium			0.05
Mn	NA		0.05	0.06		0.05	NA		0.05	Mg	8.80		
Mo	NA		0.10			0.10	NA		0.10	Mn	0.08		0.05
Ni	NA		0.10			0.10	NA		0.10	Mo			0.02
Pb	NA		0.01	0.01		0.01	NA		0.01	Ni			0.02
Se	NA		0.01			0.01	NA		0.01	Pb			0.00
Si	NA			0.80			NA			Litium			0.05
Sn	NA		0.10			0.10	NA		0.10	Se			0.01
Sr	NA		0.10			0.10	NA		0.10	Si	26.90		
U	NA		0.01			0.01	NA		0.01	Sn			0.03
V	NA		0.10			0.10	NA		0.10	Sr	0.16		0.10
Zn	NA		0.10			0.10	NA		0.10	Thallium			0.01
										U	NA		0.01
										V			0.01
										Zn	0.55		0.10

Metal Analysis of 1993 NMED/LANL On Site Samples

ANALYTE	PM-2			Pueblo 3			TW-1A			TW-2A		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	NA		0.00	0.00		0.00			0.00	NA		0.00
Al	NA			1.00					0.05	NA		
As	NA		0.01	0.01		0.01			0.01	NA		0.01
B	NA		0.10	0.20		0.10	0.15		0.10	NA		0.10
Ba	NA		0.10			0.10	0.08		0.10	NA		0.10
Be	NA		0.10			0.10			0.00	NA		0.10
Cd	NA		0.00			0.00			0.00	NA		0.00
Cr	NA		0.01			0.01			0.00	NA		0.01
Co	NA		0.05			0.05			0.01	NA		0.05
Cu	NA		0.10			0.10	0.00		0.10	NA		0.10
Fe	NA			0.90			0.66			NA		
Hg	NA		0.00			0.00			0.00	NA		0.00
Mg	NA			4.70					0.05	NA		
Mn	NA		0.05	0.06		0.05	8.80			NA		0.05
Mo	NA		0.10			0.10	0.08		0.05	NA		0.10
Ni	NA		0.10			0.10			0.02	NA		0.10
Pb	NA		0.01	0.01		0.01			0.02	NA		0.01
Se	NA		0.01			0.01			0.00	NA		0.01
Si	NA			0.80					0.05	NA		
Sn	NA		0.10			0.10			0.01	NA		0.10
Sr	NA		0.10			0.10	26.90			NA		0.10
U	NA		0.01			0.01			0.03	NA		0.01
V	NA		0.10			0.10	0.16		0.10	NA		0.10
Zn	NA		0.10			0.10			0.01	NA		0.10

Metal Analysis of 1993 NMED/LANL On Site Samples

ANALYTE	TW-1			TW-2			TW-3			TW-4		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	0.00		0.00	NA		0.00	0.00		0.00	NA		0.00
Al	0.07			NA					0.05	NA		
As			0.01	NA		0.01			0.01	NA		0.01
B			0.10	NA		0.10			0.10	NA		0.10
Ba	0.07		0.10	NA		0.10	0.34		0.10	NA		0.10
Be			0.00	NA		0.10			0.00	NA		0.10
Cd			0.00	NA		0.00			0.00	NA		0.00
Cr			0.00	NA		0.01	0.00		0.01	NA		0.01
Co			0.01	NA		0.05			0.01	NA		0.05
Cu	0.00			NA		0.10	0.00		0.10	NA		0.10
Fe	0.46			NA			1.94			NA		
Hg			0.00	NA		0.00			0.00	NA		0.00
Mg			0.05	NA					0.05	NA		
Mn	5.70			NA		0.05	5.20			NA		0.05
Mo	0.02		0.05	NA		0.10	0.03		0.05	NA		0.10
Ni			0.02	NA		0.10			0.02	NA		0.10
Pb			0.02	NA		0.01			0.02	NA		0.01
Se	0.24		0.01	NA		0.01	0.01		0.01	NA		0.01
Si			0.05	NA					0.05	NA		
Sn			0.01	NA		0.10			0.01	NA		0.10
Sr	23.90			NA		0.10	36.80			NA		0.10
U	0.03		0.10	NA		0.01			0.03	NA		0.01
V	0.26		0.10	NA		0.10	0.07		0.10	NA		0.10
Zn			0.01	NA		0.10			0.01	NA		0.10

Metal Analysis of 1993 NMED/LANL On Site Samples

ANALYTE	Mortandad Canyon @ Gaging Station			Mortandad Retention Pond			Mortandad Canyon below Pond			Mortandad @ Station A6B		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g
Ag	NA			NA		0.00			0.00	NA		0.00
Al	NA			NA			14.00			NA		
As	NA			NA		0.01			0.01	NA		0.01
B	NA			NA		0.10			0.10	NA		0.10
Ba	NA			NA		0.10			0.10	NA		0.10
Be	NA			NA		0.10			0.10	NA		0.10
Cd	NA			NA		0.00			0.00	NA		0.00
Cr	NA			NA		0.01	0.01		0.01	NA		0.01
Co	NA			NA		0.05			0.05	NA		0.05
Cu	NA			NA		0.10			0.10	NA		0.05
Fe	NA			NA			7.70			NA		
Hg	NA			NA		0.00			0.01	NA		0.00
Mg	NA			NA			3.10			NA		
Mn	NA			NA		0.05			0.05	NA		0.05
Mo	NA			NA		0.10			0.10	NA		0.10
Ni	NA			NA		0.10			0.10	NA		0.10
Pb	NA			NA		0.01	0.01		0.01	NA		0.01
Se	NA			NA		0.01	2.10		0.01	NA		0.01
Si	NA			NA						NA		
Sn	NA			NA		0.10			0.10	NA		0.10
Sr	NA			NA		0.10			0.10	NA		0.10
U	NA			NA		0.01			0.01	NA		0.01
V	NA			NA		0.10			0.10	NA		0.10
Zn	NA			NA		0.10			0.10	NA		0.10

Metal Analysis of 1993 NMED/LANL On Site Samples

ANALYTE	LA-01			LAOR-1			LA-07			SCS-2		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag			0.00	0.00		0.00	0.00		0.00			0.00
Al	0.80			70.00			450.00			0.90		
As			0.01	0.01		0.01	0.02		0.01	0.01		0.01
B			0.10			0.10			0.10			0.10
Ba	0.10		0.10	0.60		0.10	4.20		0.10			0.10
Be			0.10			0.10			0.10			0.10
Cd			0.00			0.00	0.00		0.00			0.00
Cr	0.01		0.01	0.08		0.01	0.12		0.01	0.02		0.01
Co			0.05	0.03			0.15		0.05			0.05
Cu			0.10			0.05	0.15		0.10			0.10
Fe	0.50			55.00			110.00			0.70		
Hg			0.00	0.00		0.00			0.00			0.00
Mg	7.50			14.00			24.00			4.50		
Mn			0.05	3.73		0.05	44.00		0.05			0.05
Mo			0.10			0.10			0.10	0.30		0.10
Ni			0.10			0.10	0.20		0.10			0.10
Pb			0.01	0.09		0.01	0.32		0.01			0.01
Se			0.01			0.01			0.01			0.01
Si	1.00			2.80			2.90			1.20		
Sn			0.10			0.10			0.10			0.10
Sr	0.30		0.10	0.40		0.10	0.60		0.10	0.10		0.10
U			0.01			0.01	0.03		0.01			0.01
V			0.10			0.10	0.30		0.10			0.10
Zn			0.10	0.30		0.10	0.90		0.10			0.10

Metal Analysis of 1993 NMED/LANL On Site Samples

ANALYTE	PCO-1			PCO-2			PCO-3		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag			0.00			0.00			0.00
Al	6.40			38.00			110.00		
As			0.01	0.01		0.01	0.02		0.01
B			0.10			0.10			0.10
Ba	0.20		0.10	0.50		0.10	2.30		0.10
Be			0.10			0.10			0.10
Cd			0.00			0.00	0.00		0.00
Cr	0.03		0.01	0.38		0.01	0.34		0.01
Co	0.01		0.05	0.01		0.05	0.05		0.05
Cu			0.10			0.10	0.08		0.10
Fe	5.20			39.00			84.00		
Hg			0.00			0.00			0.00
Mg	5.00			8.80			35.00		
Mn	0.57		0.05	1.06		0.05	9.76		0.05
Mo			0.10			0.10			0.10
Ni			0.10			0.10			0.10
Pb	0.01		0.01	0.04		0.01	0.11		0.01
Se			0.01			0.01			0.01
Si	1.10			1.90			1.80		
Sn			0.10			0.10			0.10
Sr	0.10		0.10	0.20		0.10	0.90		0.10
U			0.01			0.01	0.01		0.01
V			0.10			0.10			0.10
Zn			0.10	0.10		0.10	0.30		0.10

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	White Rock Canyon, Spring 3			White Rock Canyon, Spring 4A			White Rock Canyon, Spring 5			White Rock Canyon, Doe Spring		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	1.40	0.40	0.60	1.20	0.60	0.80	NA			0.00	0.30	0.80
G-Alpha w/ U-nat ref	1.60	0.40	0.70	1.30	0.60	0.90	NA			0.00	0.40	0.90
G-Beta w/ Cs-127 ref	3.40	0.70	1.20	3.00	1.10	1.60	NA			2.90	0.90	1.60
G-Beta w/ Sr-y90 ref.	3.40	0.70	1.20	2.90	1.00	1.60	NA			2.90	0.90	1.60
Gamma Spectroscopy	zero peaks			zero peaks			NA			zero peaks		
Tritium	1873.10	185.80		ND		712.90	ND		712.90	ND		712.90
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	White Rock Canyon, Ancho Spring			White Rock Canyon, Spring 8A			White Rock Canyon, Frijoles Canyon		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	-0.10	0.30	0.80	-0.30	0.30	0.80	NA		
G-Alpha w/ U-nat ref	-0.10	0.30	0.80	-0.30	0.30	0.90	NA		
G-Beta w/ Cs-127 ref	2.90	0.90	1.60	2.20	0.90	1.60	NA		
G-Beta w/ Sr-y90 ref.	2.90	0.90	1.60	2.20	0.80	1.60	NA		
Gamma Spectroscopy	zero peaks			zero peaks			NA		
Tritium	ND		712.90	ND		712.90	ND		712.90
U-238	NA			NA			NA		
U-234	NA			NA			NA		
U Total (mg/L)	NA			NA			NA		
Th-230	NA			NA			NA		
Th-232	NA			NA			NA		
Pu-239,240	NA			NA			NA		
Pu-238	NA			NA			NA		
SR-90	NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Water Canyon @ SR 4, Sediment			Upper Cochiti Lake, Sediment			Mid Cochiti Lake, Sediment			Lower Cochiti Lake, Sediment		
	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g
G-Alpha w/ Am241 ref	44.00	8.00	2.20	11.80	2.50	1.40	26.00	5.00	2.40	25.00	5.00	2.50
G-Alpha w/ U-nat ref	66.00	9.00	3.30	16.60	2.80	2.00	28.00	5.00	2.60	27.00	4.00	2.70
G-Beta w/ Cs-127 ref	80.00	7.00	3.10	26.50	2.70	3.00	34.00	5.00	5.80	33.00	5.00	6.10
G-Beta w/ Sr-y90 ref.	72.00	5.00	2.60	25.40	2.40	2.90	34.00	5.00	5.90	34.00	5.00	6.20
Gamma Spectroscopy	several naturall			Several natural			several peaks			several peaks		
Tritium	NA			NA			NA			NA		
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			ND		0.72
Cs-137	NA			NA			NA			ND		4.29

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	White Rock Canyon, Spring 1			White Rock Canyon, Spring 2			White Rock Canyon, Sandia Spring			White Rock Canyon, Mortandad Streamflo		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	7.00	1.30	0.90	54.00	8.00	3.00	1.70	0.70	1.00	0.90	0.60	1.10
G-Alpha w/ U-nat ref	8.90	1.40	1.20	78.00	8.00	4.30	2.30	0.90	1.30	1.40	0.90	1.80
G-Beta w/ Cs-127 ref	8.20	1.20	1.70	66.00	5.00	4.90	5.40	1.10	1.70	14.60	1.60	1.80
G-Beta w/ Sr-y90 ref.	7.80	1.10	1.60	62.00	5.00	4.60	5.10	1.00	1.60	13.30	1.30	1.60
Gamma Spectroscopy	zero peaks			zero peaks			zero peaks			zero peaks		
Tritium	ND		712.90	ND		712.90	ND		712.90	ND		712.90
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Los Alamos Townsite, Tomatoes			Los Alamos Townsite, Apples			White Rock Townsite, Squash-duplicate			Canada Del Buey, Sediment		
	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry	REPORTED VALUE pCi/g-Dry	SIGMA pCi/g-Dry	DETECTION LIMIT pCi/g-Dry
G-Alpha w/ Am241 ref	NA			NA			NA			22.00	5.00	2.20
G-Alpha w/ U-nat ref	NA			NA			NA			34.00	5.00	3.30
G-Beta w/ Cs-127 ref	NA			NA			NA			39.00	4.00	3.10
G-Beta w/ Sr-y90 ref.	NA			NA			NA			35.00	3.00	2.20
Gamma Spectroscopy	NA			NA			NA			Several peaks		
Tritium	ND		1000.00	ND		1000.00	ND		1000.00	NA		
U-238	ND		0.02	ND		0.04	ND		0.04	NA		
U-234	0.06	0.04		ND		0.04	ND		0.04	NA		
U Total (mg/L)	ND		0.02	ND		0.04	ND		0.04	NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	ND		0.02	ND		0.02	ND		0.01	NA		
Pu-238	ND		0.01	ND		0.01	ND		0.01	NA		
SR-90	ND		0.80	ND		0.60	ND		0.60	NA		
Cs-137	ND		0.08	ND		0.68	ND		0.68	NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Los Alamos Canyon @ SR 4, Sediment			Los Alamos Canyon @ Totavi, Sed			Pajarito Canyon @ SR 4, Sediment			Sandia Canyon @ SR 4, Sediment		
	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTION LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTION LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTION LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTION LIMIT pCi/g
G-Alpha w/ Am241 ref	17.00	4.00	2.60	27.00	5.00	1.20	19.00	4.00	2.60	10.50	2.20	1.40
G-Alpha w/ U-nat ref	22.00	4.00	3.50	45.00	6.00	2.00	26.00	5.00	3.40	15.30	2.50	2.00
G-Beta w/ Cs-127 ref	47.00	5.00	4.00	49.00	4.00	2.30	32.00	4.00	3.90	38.00	3.00	2.80
G-Beta w/ Sr-y90 ref.	44.00	4.00	3.70	45.00	3.00	2.20	30.00	3.00	3.60	36.00	3.00	2.60
Gamma Spectroscopy	Several Peaks			Several Peaks			Several Peaks			several pesks		
Tritium	incomplete			NA			NA			NA		
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Halladay Well			LA-1A Well			LA-1B Well			LA-2 Well		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	NA			1.20	0.50	0.70	NA			1.20	0.50	0.70
G-Alpha w/ U-nat ref	NA			1.30	0.50	0.80	NA			1.30	0.50	0.70
G-Beta w/ Cs-127 ref	NA			4.00	1.00	1.70	NA			2.10	0.90	1.70
G-Beta w/ Sr-y90 ref.	NA			3.80	0.90	1.70	NA			2.10	0.90	1.70
Gamma Spectroscopy	NA			one peak, K-40			NA			zero peaks		
Tritium	ND		740.60	NA			ND		740.60	NA		
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	ND		0.68	NA			ND		0.72	NA		
Cs-137	ND		3.10	NA			ND		4.29	NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Pajarito Canyon 2			Pajarito Canyon at SR 4			Valle Canyon at SR 4			Ancho Canyon at SR 4, Sediment		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/g dry	SIGMA pCi/g dry	DETECTION LIMIT pCi/g dry
G-Alpha w/ Am241 ref	11.90	2.60	1.10	1.10	0.50	0.90	0.30	0.10	0.30	23.00	4.00	2.20
G-Alpha w/ U-nat ref	19.70	3.20	1.90	1.30	0.50	1.00	0.40	0.20	0.30	34.00	5.00	3.30
G-Beta w/ Cs-127 ref	4.30	1.10	1.80	3.90	1.30	1.70	2.60	0.30	0.50	43.00	4.00	3.10
G-Beta w/ Sr-y90 ref.	3.90	1.00	1.70	3.90	1.30	1.70	2.60	0.30	0.50	39.00	3.00	2.80
Gamma Spectroscopy	zero peaks			zero peaks			zero peaks			several peaks		
Tritium	NA			NA			NA			NA		
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	BIA-3, Sand point			BIA-1, Sandpoint			Los Alamos Canyon at Ottowi			Ancho Canyon East		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	50.00	10.00	2.10	80.00	16.00	4.90	8.70	1.30	0.70	4.00	0.90	1.00
G-Alpha w/ U-nat ref	84.00	10.00	3.50	124.00	16.00	7.60	13.30	1.50	1.00	5.30	1.10	1.30
G-Beta w/ Cs-127 ref	61.00	6.00	3.80	130.00	12.00	9.20	21.10	1.40	1.20	10.60	1.30	1.80
G-Beta w/ Sr-y90 ref.	55.00	5.00	3.40	118.00	10.00	8.40	19.70	1.20	1.20	10.30	1.20	1.70
Gamma Spectroscopy	One peak, ann-			Two peaks, Tl-			zero peaks			zero peaks		
Tritium	NA			NA			588.00	269.00				461.00
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Indian Springs			Basalt Springs			La Mesita Springs			Sacred Springs		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	1.00	0.50	0.80	1.00	0.50	0.80	10.00	1.80	0.80	2.80	0.50	0.50
G-Alpha w/ U-nat ref	1.20	0.50	0.90	1.20	0.50	1.00	11.90	1.70	0.90	3.20	0.50	0.60
G-Beta w/ Cs-127 ref	3.30	1.00	1.80	6.60	1.10	1.70	6.50	1.10	1.70	5.60	0.80	1.30
G-Beta w/ Sr-y90 ref.	3.10	0.90	1.70	6.50	1.00	1.70	6.50	1.10	1.70	5.40	0.80	1.30
Gamma Spectroscopy	zero peaks			one peak K-40			zero peaks			one peak, K-40		
Tritium	ND		740.60	580.00	254.00		ND		361.00	ND		740.60
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	ND		0.67	NA			NA			NA		
Cs-137	ND		3.15	NA			NA			ND		0.67
										ND		3.00

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Pajarito Canyon at SR 501			Pueblo Canyom West			Water Canyon @ SR 501			Guaje Canyon		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	2.50	0.60	0.60	5.50	1.10	0.70	1.50	0.60	0.60	1.00	0.40	0.60
G-Alpha w/ U-nat ref	2.60	0.60	0.60	6.60	1.10	0.80	1.60	0.60	0.70	1.00	0.40	0.60
G-Beta w/ Cs-127 ref	4.20	0.90	1.50	9.00	1.20	1.60	6.90	1.10	1.50	4.40	1.10	1.80
G-Beta w/ Sr-y90 ref.	4.20	0.90	1.60	9.00	1.10	1.60	7.10	1.10	1.60	4.60	1.10	1.80
Gamma Spectroscopy	zero peaks			zero peaks			one peak, ann-			zero peaks		
Tritium	439.00	255.00		671.00	280.00		NA					424.00
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-90	NA			NA			NA			NA		
Cs-137	NA			NA			NA			NA		

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Los Alamos Reservoir			Los Alamos Canyon at Gaging Station			Los Alamos Canyon at SR 4			Los Alamos Canyon at Totavi		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
G-Alpha w/ Am241 ref	0.60	0.30	0.60	NA			2.80	0.60	0.70	2.30	0.60	0.70
G-Alpha w/ U-nat ref	0.60	0.30	0.60	NA			3.40	0.60	0.80	2.60	0.60	0.80
G-Beta w/ Cs-127 ref	1.80	0.90	1.80	NA			15.30	1.20	1.20	11.90	1.30	1.50
G-Beta w/ Sr-y90 ref.	1.80	1.00	1.80	NA			15.30	1.10	1.20	12.10	1.20	1.60
Gamma Spectroscopy	one peak,ann-r			NA			zero peaks			zero peaks		
Tritium	ND		415.00	1070.00	299.00		920.00	309.00		1187.00	305.00	
U-238	NA			NA			NA			NA		
U-234	NA			NA			NA			NA		
U Total (mg/L)	NA			NA			NA			NA		
Th-230	NA			NA			NA			NA		
Th-232	NA			NA			NA			NA		
Pu-239,240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
SR-	NA			ND		0.72	NA			NA		
	NA			ND		4.29	NA			NA		
				AM-241,ND								

Radiochemical Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	White Rock Canyon, Pajarito Sediment			White Rock Canyon, Mortandad Sedim		
	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTION LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTION LIMIT pCi/g
G-Alpha w/ Am241 ref	17.00	4.00	1.70	9.60	2.40	2.00
G-Alpha w/ U-nat ref	26.00	4.00	2.60	13.00	3.00	2.70
G-Beta w/ Cs-127 ref	39.00	4.00	3.20	33.00	4.00	3.90
G-Beta w/ Sr-y90 ref.	35.00	3.00	2.80	30.00	4.00	3.60
Gamma Spectroscopy	several peaks			several peaks		
Tritium	NA			NA		
U-238	NA			NA		
U-234	NA			NA		
U Total (mg/L)	NA			NA		
Th-230	NA			NA		
Th-232	NA			NA		
Pu-239,240	NA			NA		
Pu-238	NA			NA		
SR-90	NA			NA		
Cs-137	NA			NA		

Metal Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Los Alamos Reservoir			Los Alamos at Gaging Station			Los Alamos Canyon at SR 4			Los Alamos Canyon at Totavi		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag			0.00	NA		0.00	NA		0.00			0.00
Al	2.10			NA			NA			2.50		
As			0.01	NA		0.01	NA		0.01			0.01
B			0.10	NA		0.10	NA		0.10			0.10
Ba			0.10	NA		0.10	NA		0.10			0.10
Be			0.10	NA		0.10	NA		0.10			0.10
Cd			0.00	NA		0.00	NA		0.00			0.00
Cr			0.01	NA		0.01	NA		0.01			0.01
Co			0.05	NA		0.05	NA		0.05			0.05
Cu			0.10	NA		0.10	NA		0.10			0.10
Fe	0.80			NA			NA			1.40		
Hg			0.00	NA		0.00	NA		0.00			0.00
Mg	2.00			NA			NA			4.10		
Mn			0.05	NA		0.05	NA		0.05	0.05		0.05
Mo			0.10	NA		0.10	NA		0.10			0.10
Ni			0.10	NA		0.10	NA		0.10			0.10
Pb			0.01	NA		0.01	NA		0.01			0.01
Se			0.01	NA		0.01	NA		0.01			0.01
Si	18.00			NA			NA			1.40		
Sn			0.10	NA		0.10	NA		0.10			0.10
Sr			0.10	NA		0.10	NA		0.10			0.10
U			0.01	NA		0.01	NA		0.01			0.01
V			0.10	NA		0.10	NA		0.10			0.10
Zn			0.10	NA		0.10	NA		0.10			0.10

Metal Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	BIA-3, sandpoint			BIA-1, Sandpoint			Los Alamos Canyon at Ottawi			Ancho East		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	NA		0.10	NA		0.00			0.00			0.10
Al	NA			NA		0.10	6.50			14.00		
As	NA		0.01	NA					0.01			0.01
B	NA		0.10	NA		0.01			0.10			0.10
Ba	NA		0.10	NA		0.10	0.10		0.10			0.10
Be	NA		0.10	NA		0.10			0.10			0.10
Cd	NA		0.00	NA		0.10			0.00			0.00
Cr	NA			NA		0.00	0.01		0.01	0.01		
Co	NA		0.05	NA					0.05			0.05
Cu	NA		0.10	NA		0.05			0.10			0.10
Fe	NA			NA		0.10	4.70			7.70		
Hg	NA		0.00	NA					0.00			0.00
Mg	NA			NA		0.00	5.60			3.10		
Mn	NA		0.05	NA			0.21		0.05			0.05
Mo	NA		0.10	NA		0.05			0.10			0.10
Ni	NA		0.10	NA		0.10			0.10			0.10
Pb	NA			NA		0.10	0.01		0.01	0.01		
Se	NA			NA					0.01	2.10		
Si	NA		0.10	NA			1.90					0.10
Sn	NA		0.10	NA		0.10			0.10			0.10
Sr	NA		0.10	NA		0.10	0.20		0.10			0.10
U	NA		0.10	NA		0.10			0.01			0.10
V	NA			NA		0.10			0.10			
Zn	NA			NA					0.10	NA		

Metal Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Indian Springs			Basalt Springs			La Mesita Springs			Sacred Springs		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	NA		0.00			0.10			0.00	NA		0.00
Al	NA			2.00			1.40			NA		
As	NA		0.01			0.01			0.01	NA		0.01
B	NA		0.10	0.10		0.10			0.10	NA		0.10
Ba	NA		0.10	0.10		0.10	0.20		0.10	NA		0.10
Be	NA		0.10			0.10			0.10	NA		0.10
Cd	NA		0.00			0.00			0.00	NA		0.00
Cr	NA		0.01			0.01	0.01		0.01	NA		0.01
Co	NA		0.05			0.05			0.05	NA		0.05
Cu	NA		0.10			0.10			0.10	NA		0.10
Fe	NA			1.30			1.40			NA		
Hg	NA		0.00			0.00			0.00	NA		0.00
Mg	NA			8.20			1.30			NA		
Mn	NA		0.05			0.05			0.05	NA		0.05
Mo	NA		0.10			0.10			0.10	NA		0.10
Ni	NA		0.10			0.10			0.10	NA		0.10
Pb	NA		0.01			0.01			0.01	NA		0.01
Se	NA		0.01	0.70					0.01	NA		0.01
Si	NA					0.10	1.10			NA		
Sn	NA		0.10	0.20		0.10			0.10	NA		0.10
Sr	NA		0.10			0.10	0.80		0.10	NA		0.10
U	NA		0.10			0.10	0.01			NA		0.01
V	NA		0.10						0.10	NA		0.10
Zn	NA		0.10	NA					0.10	NA		0.10

Metal Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Halladay Well			LA-1A Well			LA-1B Well			LA-2 Well		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	NA		0.00	NA		0.00	NA			NA		0.00
Al	NA			NA			NA		0.00	NA		
As	NA		0.01	NA		0.01	NA			NA		0.01
B	NA		0.10	NA		0.10	NA		0.01	NA		0.10
Ba	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Be	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Cd	NA		0.00	NA		0.00	NA		0.10	NA		0.00
Cr	NA		0.01	NA		0.01	NA		0.00	NA		0.01
Co	NA		0.05	NA		0.05	NA		0.01	NA		0.05
Cu	NA		0.10	NA		0.10	NA		0.05	NA		0.10
Fe	NA			NA			NA		0.10	NA		
Hg	NA		0.00	NA		0.00	NA			NA		0.00
Mg	NA			NA			NA		0.00	NA		
Mn	NA		0.05	NA		0.05	NA			NA		0.05
Mo	NA		0.10	NA		0.10	NA		0.05	NA		0.10
Ni	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Pb	NA		0.01	NA		0.01	NA		0.10	NA		0.01
Se	NA		0.01	NA		0.01	NA		0.01	NA		0.01
Si	NA			NA			NA		0.01	NA		
Sn	NA		0.10	NA		0.10	NA			NA		0.10
Sr	NA		0.10	NA		0.10	NA		0.10	NA		0.10
U	NA		0.01	NA		0.01	NA		0.10	NA		0.01
V	NA		0.10	NA		0.10	NA		0.01	NA		0.10
Zn	NA		0.10	NA		0.10	NA		0.10	NA		0.10

Metal Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Pajarito Canyon 2			Pajarito Canyon at SR 4			Valle Canyon at SR 4			Ancho Canyon at SR 4, Sediment		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g
Ag			0.00			0.00	NA		0.10			0.10
Al	0.05			5.00			NA			14.00		
As	0.01		0.01			0.01	NA		0.01			0.01
B	0.40		0.10			0.10	NA		0.10			0.10
Ba	0.11		0.10			0.10	NA		0.10			0.10
Be			0.00			0.10	NA		0.10			0.10
Cd			0.00			0.00	NA		0.00			0.00
Cr	0.00		0.00			0.01	NA			0.01		
Co			0.01			0.05	NA		0.05			0.05
Cu	0.00		0.10			0.10	NA		0.10			0.10
Fe	0.06			2.90			NA			7.70		
Hg			0.00			0.00	NA		0.00			0.00
Mg	0.11			4.80			NA			3.10		
Mn	1.90					0.05	NA		0.05			0.05
Mo			0.01			0.10	NA		0.10			0.10
Ni			0.02			0.10	NA		0.10			0.10
Pb			0.02			0.01	NA			0.01		
Se			0.00			0.01	NA			2.10		
Si			0.05	1.60			NA		0.10			0.10
Sn			0.01			0.10	NA		0.10			0.10
Sr	17.80			0.10		0.10	NA		0.10			0.10
U			0.03			0.01	NA		0.10			0.10
V	0.54		0.10			0.10	NA					
Zn			0.01			0.10	NA			NA		

Metal Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Pajarito Canyon at SR 501			Pueblo Canyon West			Water Canyon at SR 501			Guaje Canyon		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	NA		0.00	NA		0.00	NA		0.00	NA		0.00
Al	NA			NA			NA			NA		
As	NA		0.01	NA		0.01	NA		0.01	NA		0.01
B	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Ba	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Be	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Cd	NA		0.00	NA		0.00	NA		0.00	NA		0.00
Cr	NA		0.01	NA		0.01	NA		0.01	NA		0.01
Co	NA		0.05	NA		0.05	NA		0.05	NA		0.05
Cu	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Fe	NA			NA			NA			NA		
Hg	NA		0.00	NA		0.00	NA		0.00	NA		0.00
Mg	NA			NA			NA			NA		
Mn	NA		0.05	NA		0.05	NA		0.05	NA		0.05
Mo	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Ni	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Pb	NA		0.01	NA		0.01	NA		0.01	NA		0.01
Se	NA		0.01	NA		0.01	NA		0.01	NA		0.01
Si	NA			NA			NA			NA		
Sn	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Sr	NA		0.10	NA		0.10	NA		0.10	NA		0.10
U	NA		0.01	NA		0.01	NA		0.01	NA		0.01
V	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Zn	NA		0.10	NA		0.10	NA		0.10	NA		0.10

Metal Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	Water Canyon @ SR 4, Sediment			Upper Cochiti Lake, Sediment			Middle Cochiti Lake, Sediment			Lower Cochiti Lake, Sediment		
	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g	REPORTED VALUE mg/g	SIGMA mg/g	DETECTION LIMIT mg/g
Ag			0.10	NA		0.00	NA		0.00	NA		0.00
Al	14.00			NA			NA			NA		
As			0.01	NA		0.01	NA		0.01	NA		0.01
B			0.10	NA		0.10	NA		0.10	NA		0.10
Ba			0.10	NA		0.10	NA		0.10	NA		0.10
Be			0.10	NA		0.10	NA		0.10	NA		0.10
Cd			0.00	NA		0.00	NA		0.00	NA		0.00
Cr	0.01			NA		0.01	NA		0.01	NA		0.01
Co			0.05	NA		0.05	NA		0.05	NA		0.05
Cu			0.10	NA		0.10	NA		0.10	NA		0.10
Fe	7.70			NA			NA			NA		
Hg			0.00	NA		0.00	NA		0.00	NA		0.00
Mg	3.10			NA			NA			NA		
Mn			0.05	NA		0.05	NA		0.05	NA		0.05
Mo			0.10	NA		0.10	NA		0.10	NA		0.10
Ni			0.10	NA		0.10	NA		0.10	NA		0.10
Pb	0.01			NA		0.01	NA		0.01	NA		0.01
Se	2.10			NA		0.01	NA		0.01	NA		0.01
Si			0.10	NA			NA			NA		
Sn			0.10	NA		0.10	NA		0.10	NA		0.10
Sr			0.10	NA		0.10	NA		0.10	NA		0.10
U			0.10	NA		0.01	NA		0.01	NA		0.01
V				NA		0.10	NA		0.10	NA		0.10
Zn	NA			NA		0.10	NA		0.10	NA		0.10

Metal Analysis of 1993 NMED/LANL Perimeter Samples

ANALYTE	White Rock Canyon, Spring 1			White Rock Canyon, Spring 2			White Rock Canyon, Sandia Spring			White Rock Canyon, Mortandad Stream		
	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l	REPORTED VALUE mg/l	SIGMA mg/l	DETECTION LIMIT mg/l
Ag	NA		0.10	NA		0.00	NA		0.10	NA		0.10
Al	NA		0.10	NA			NA		0.10	NA		0.10
As	NA		0.01	NA		0.01	NA		0.01	NA		0.01
B	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Ba	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Be	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Cd	NA		0.00	NA		0.00	NA		0.00	NA		0.00
Cr	NA		0.10	NA		0.01	NA		0.10	NA		0.10
Co	NA			NA		0.05	NA			NA		
Cu	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Fe	NA			NA			NA			NA		
Hg	NA		0.00	NA		0.00	NA		0.00	NA		0.00
Mg	NA			NA			NA			NA		
Mn	NA		0.05	NA		0.05	NA		0.05	NA		0.05
Mo	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Ni	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Pb	NA		0.01	NA		0.01	NA		0.01	NA		0.01
Se	NA			NA		0.01	NA			NA		
Si	NA		0.10	NA			NA		0.10	NA		0.10
Sn	NA		0.10	NA		0.10	NA		0.10	NA		0.10
Sr	NA		0.10	NA		0.10	NA		0.10	NA		0.10
U	NA		0.10	NA		0.01	NA		0.10	NA		0.10
V	NA			NA		0.10	NA			NA		
Zn	NA			NA		0.10	NA			NA		

SNL

ENVIRONMENTAL MONITORING

1993 Albuquerque Ambient Dose Equivalent						
STATION	2nd Quarter 1993		3rd Quarter 1993		Projected Annual, 1993	
	Gross ADE mREM	Net ADE mREM	Gross ADE mREM	Net ADE mREM	Gross ADE mREM	Net ADE mREM
(1) West of SNL TA II, KAFB	32.50	11.20	31.50	9.90	128.00	42.20
(2) South of SNL TA IV, KAFB	32.50	11.20	33.90	12.40	132.80	47.20
(2a) South of SNL TA IV, KAFB (duplicate)	33.20	11.90	NA	NA	132.80	47.60
(3) Tijeras Arroyo at Pennsylvania Avenue, KAFB	NA	NA	33.80	12.40	135.20	49.60
(4) North of TA V Stack, KAFB	28.30	7.00	32.20	10.80	121.00	35.60
(5) SNL Mixed Waste Landfill, TA III	32.90	11.70	30.70	9.10	127.20	41.60
(6) SNL Radioactive Waste Management Facility, TA III	30.80	9.50	33.70	12.10	129.00	43.20
(7) SNL TA V North Exclusion Fence, KAFB	32.50	11.20	33.00	11.40	131.00	45.20
(8) East of SNL HERMES Facility, KAFB	29.40	8.10	33.00	11.40	124.80	39.00
(9) USGS Seismological Laboratory, KAFB	35.70	14.50	31.80	10.30	135.00	49.60
(10) Four Hills: KAFB Well 11	33.70	12.40	40.60	19.00	148.60	62.80
(11) Albuquerque FD Station 11, Albuquerque	30.80	9.50	32.50	10.90	126.60	40.80
(12) Albuquerque Westside, Paradise Hills	29.00	7.70	28.20	6.60	114.40	28.60

Radiochemical Analyses, 1993 Albuquerque Area Soils

ANALYTE	North of SNL TA V Stack, KAFB			Sandia Research Park, Albuquerqu			Coyote Springs, KAFB			Four Hills: KAFB Well 11		
	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g
Gamma Spectra:				(Ra Th series)			(Ra Th series)			(Ra Th series)		
Cs-137	ND		0.10	ND		0.10	0.34	0.10	0.10	0.29	0.13	*
K-40	15.30	1.90	*	16.70	2.10	*	13.20	2.00	*	27.10	2.50	*
Radium: Ra-226	0.30	0.10	*	1.20	0.30	*	0.73	0.18	*	0.96	0.19	*
Ra-228	NA		*	1.06	0.36	*	0.43	0.41	*	1.61	0.48	*
Uranium: U-238	0.59	0.15	*	1.13	0.20	*	0.53	0.14	*	0.29	0.13	*
U-234	0.91	0.17	*	1.15	0.19	*	0.91	0.17	*	0.71	0.24	*
U-235	0.06	0.03	*	0.03	0.02	*	0.04	0.02	*	ND		0.05
Plutonium: Pu-239/240	NA			NA			NA			NA		
Pu-238	NA			NA			NA			NA		
Tritium (H-3)	ND		0.02	ND		0.59	ND		0.04	0.04	0.02	*
Gross alpha [Am-241]	NA			NA			NA			NA		
Gross alpha [natural U]	NA			NA			NA			NA		
Gross beta [Cs-137]	NA			NA			NA			NA		
Gross beta [Sr(Y)-90]	NA			NA			NA			NA		

Radiochemical Analyses, 1993 Albuquerque Area Soils												
ANALYTE	Northeast Perimeter, KAFB			Las Huertas Creek, Placitas (Sedimen			Southeast KAFB, near USGS Lab			Building 9939, SNL TA III		
	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g
Gamma Spectra:	(Ra Th series)											
Cs-137	0.66	0.12	0.10	NA			ND		0.04	0.14	0.03	*
K-40	22.30	2.20	*	NA			NR			NR		
Radium: Ra-226	0.73	0.21	*	0.90	0.20	*	NA			NA		
Ra-228	1.07	0.37	*	NA			NA			NA		
Uranium: U-238	0.30	0.14	*	0.60	0.15	*	0.36	0.09	*	0.72	0.14	*
U-234	0.52	0.16	*	0.63	0.15	*	0.43	0.10	*	0.85	0.15	*
U-235	ND		0.03	0.07	0.03	*	0.04	0.02	*	0.06	0.03	0.05
Plutonium: Pu-239/240	NA			NA			ND		0.05	ND		0.05
Pu-238	NA			NA			ND		0.02	ND		0.01
Tritium (H-3)	0.87	0.39	*	ND		0.13	NA			NA		
Gross alpha [Am-241]	NA			NA			NA			NA		
Gross alpha [natural U]	NA			NA			NA			NA		
Gross beta [Cs-137]	NA			NA			NA			NA		
Gross beta [Sr(Y)-90]	NA			NA			NA			NA		

Radiochemical Analyses, 1993 Albuquerque Area Surface Water												
ANALYTE	Las Huertas Creek, Placitas			Las Huertas Creek, Placitas (duplicat			Las Huertas Creek, Placitas (unpres.)			Tijeras Creek, Carnue		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L
Gross alpha [Am-241]	ND		1.50	2.00	1.50	1.50	3.60	1.90	1.50	3.30	1.80	2.40
Gross alpha [natural U]	NA			NA			NA			3.90	2.20	2.90
Gross beta [Cs-137]	NA			NA			NA			7.00	3.00	4.10
Gross beta [Sr(Y)-90]	4.20	0.90	1.50	9.00	1.20	1.60	6.90	1.10	1.50	7.00	3.30	4.10
Gamma Spectra:										No peaks		(0.5 gps/L)
Cs-137	ND		32.00	ND		34.00	NA			ND		24.00
Radium: Ra-226	ND		0.10	NA			NA			NA		
Uranium: U-238	0.38	0.16	0.10	NA			NA			NA		
U-234	0.77	0.21	*	NA			NA			NA		
U-235	ND		0.06	NA			NA			NA		
Tritium (H-3)	NA			NA			ND		366.00	NA		

Radiochemical Analyses, 1993 Albuquerque Basin Surface Water

ANALYTE	Rio Grande at Isleta Diversion Works			RG at Isleta Diversion Works (duplica			Rio Grande at Corrales Bridge			Lagoon East of SNL TA IV, KAFB		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L
Gross alpha [Am-241]	4.00	2.20	*	3.70	2.00	1.50	NA			3.30	1.80	2.40
Gross alpha [natural U]	NA			NA			NA			3.90	2.20	2.90
Gross beta [Cs-137]	NA			NA			NA			7.00	3.00	4.10
Gross beta [Sr(Y)-90]	3.70	2.20	*	6.30	2.70	1.60	NA			7.00	3.30	4.10
Gamma Spectra:										No peaks		(0.5 gps/L)
Cs-137	ND		32.00	ND		30.00	NA			ND		27.00
Radium: Ra-226	ND		0.10	ND		0.20	NA			NA		
Uranium: U-238	0.65	0.20	0.10	0.67	0.20	0.10	0.71	0.21	0.10	NA		
U-234	1.06	0.24	*	1.00	0.24	*	1.25	0.27	*	NA		
U-235	ND		0.02	ND		0.05	NA			NA		
Tritium (H-3)	ND		370.00	ND		369.00	NA			ND		362.00

Radiochemical Analyses, 1993 Albuquerque Area Vegetation (grams wet weight)												
ANALYTE	Rocket Sled Track, SNL TA III, KAFB			North of SNL TA V Stack, KAFB			Coyote Springs, KAFB			Four Hills: KAFB Well 11		
	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g	REPORTED VALUE pCi/g	SIGMA pCi/g	DETECTIO LIMIT pCi/g
Gamma Spectra:												
Cs-137	ND		0.08	ND		0.08	ND		0.08	ND		0.08
K-40	6.10	1.00	*	5.70	1.20	*	5.40	0.88	*	5.81	0.79	*
Be-7	2.78		*	3.01	0.84	*	1.32	0.46	*	2.05	0.41	*
Other	ND		*	ND		*	ND		*	(Th-232 ser)		*
Uranium: U-238	NA			NA			NA			0.05	0.02	*
U-234	NA			NA			NA			0.05	0.02	*
U-235	NA			NA			NA		ND	NA		0.002
Tritiium (H-3)	ND		2.30	ND		4.80	ND		4.30	4.80	1.60	*
Percent moisture (% w/w)	63.40		43.70	NA			64.50			34.40		

Radiochemical Analyses, Albuquerque Area Ground Water Samples						
ANALYTE	Coyote Springs, whole water sample			Coyote Springs, field filtered sample		
	REPORTED VALUE pCl/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTIO LIMIT pCi/L
Gross alpha [Am-241]	22.70	12.60	5.00	19.80	13.50	5.00
Gross beta [Sr(Y)-90]	16.10	6.00	1.60	26.20	7.60	*
Gamma Spectra:						
Cs-137	ND		29.00	ND		27.00
Tritium (H-3)	ND		379.00	NA		
Uranium: U-238	2.25	0.25	0.10	NA		
U-234	10.81	0.76	*	NA		
U-235	0.14	0.44	*	NA		

Radiochemical Analyses of SNL Ground-Water Samples						
ANALYTE	G-Spring (10/27/1992)			TA2-SW1-309 (12/17/1992)		
	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L	REPORTED VALUE pCi/L	SIGMA pCi/L	DETECTION LIMIT pCi/L
Gross-Alpha w/ Am241 ref	7.50	1.80	3.00	4.80	0.80	0.90
Gross-Alpha w/ U-nat ref	12.00	3.00	4.70	8.40	1.70	1.60
Gross-Beta w/ Cs-137 ref	29.00	5.00	4.60	13.80	1.20	1.40
Gross-Beta w/ Sr-y90 ref.	29.00	5.00	4.60	13.50	1.20	1.30
Gamma Spectroscopy	zero peaks	******	******	Pb-214, Bi-214	******	******
Tritium	NA	******	******	NA	******	******
U-238	2.40	0.60	******	0.80	0.10	******
U-234	7.40	1.70	******	1.60	0.20	******
U Total (mg/L)	NA	******	******	NA	******	******
Th-230	NA	******	******	NA	******	******
Th-232	NA	******	******	NA	******	******
Pu-239 and Pu-240	0.06	0.04	******	NA	******	******
Pu-238	0.07	0.04	******	NA	******	******
SR-90	NA	******	******	NA	******	******
Cs-137	NA	******	******	NA	******	******

Note: NA means "not analyzed".

SNL/ITRI Ground-Water Data Summary - Total Metal Analyses

Well	G-Spring	TA2-SW1-3	ITRI-MW3	ITRI-MW2	ITRI-MW6	CWL-BW3	CWL-BW3	MWL-MW2	MWL-BW1
Date	10/27/92	12/17/92	05/27/92	02/25/93	02/25/93	05/01/92	05/20/92	07/17/92	07/17/92
Units	mg/L (1)	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	<0.005	<0.005	<0.005	NA	NA	NA	NA	NA	NA
Barium	0.2600	0.2450	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	<0.005	<0.001	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	<0.001	<0.0005	<0.001	<0.0005	<0.0005	NA	NA	NA	NA
Chromium	<0.005	0.0230	<0.005	0.0050	0.0050	0.1500	0.1200	0.0220	0.0070
Cobalt	NA	<0.010	NA	<0.010	<0.010	NA	NA	NA	NA
Copper	NA	0.0120	<0.050	<0.010	<0.010	NA	NA	NA	NA
Iron	NA	NA	NA	<0.020	<0.020	NA	NA	NA	NA
Lead	<0.005	0.0060	<0.005	NA	NA	NA	NA	NA	NA
Mercury	<0.0005	<0.0002	<0.0005	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	<0.010	<0.010	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	<0.020	NA	<0.020	<0.020	<0.0500	0.1400	<0.0500	<0.0500
Selenium	<0.005	<0.005	NA	NA	NA	NA	NA	NA	NA
Silicon	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	<0.001	<0.010	NA	NA	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	<0.03	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	<0.005	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	0.0160	NA	<0.010	0.0140	NA	NA	NA	NA
Zinc	NA	0.0400	<0.050	<0.010	0.0470	NA	NA	NA	NA

Note: NA means "not analyzed"

SNL/ITRI Ground-Water Data Summary - General Chemistry

Well	G-Spring	Coyote Spring	TA2-SW1-309	ITRI-MW2	ITRI-MW6
Date	10/27/92	10/27/92	12/17/92	02/25/93	02/25/93
Units	mg/L	mg/L	mg/L	mg/L	mg/l
Total Dissolved Solids	NA	NA	368.00	440.00	360.00
Calcium	NA	NA	64.00	43.90	52.20
Magnesium	NA	NA	11.00	22.00	20.00
Potassium	NA	NA	3.00	7.10	1.90
Sodium	NA	NA	19.00	77.20	47.00
Hardness	NA	NA	205.00	NA	NA
Total Suspended Solids	NA	NA	NA	NA	NA
Alkalinity	NA	NA	NA	147.00	128.00
Bicarbonate	NA	NA	374.00	147.00	128.00
Chloride	NA	NA	47.00	32.00	25.00
Fluoride	NA	NA	NA	1.82	1.55
Sulfate	NA	NA	18.60	160.00	110.00
Dissolved Oxygen	1.40	2.40	NA	NA	NA
Conductivity (mhos)	1500.00	2275.00	529.00	NA	NA
Temperature (deg. C)	13.00	15.00	NA	NA	NA
pH	6.38	6.08	8.22	8.20	8.00

Note: NA means "not analyzed".

WIPP

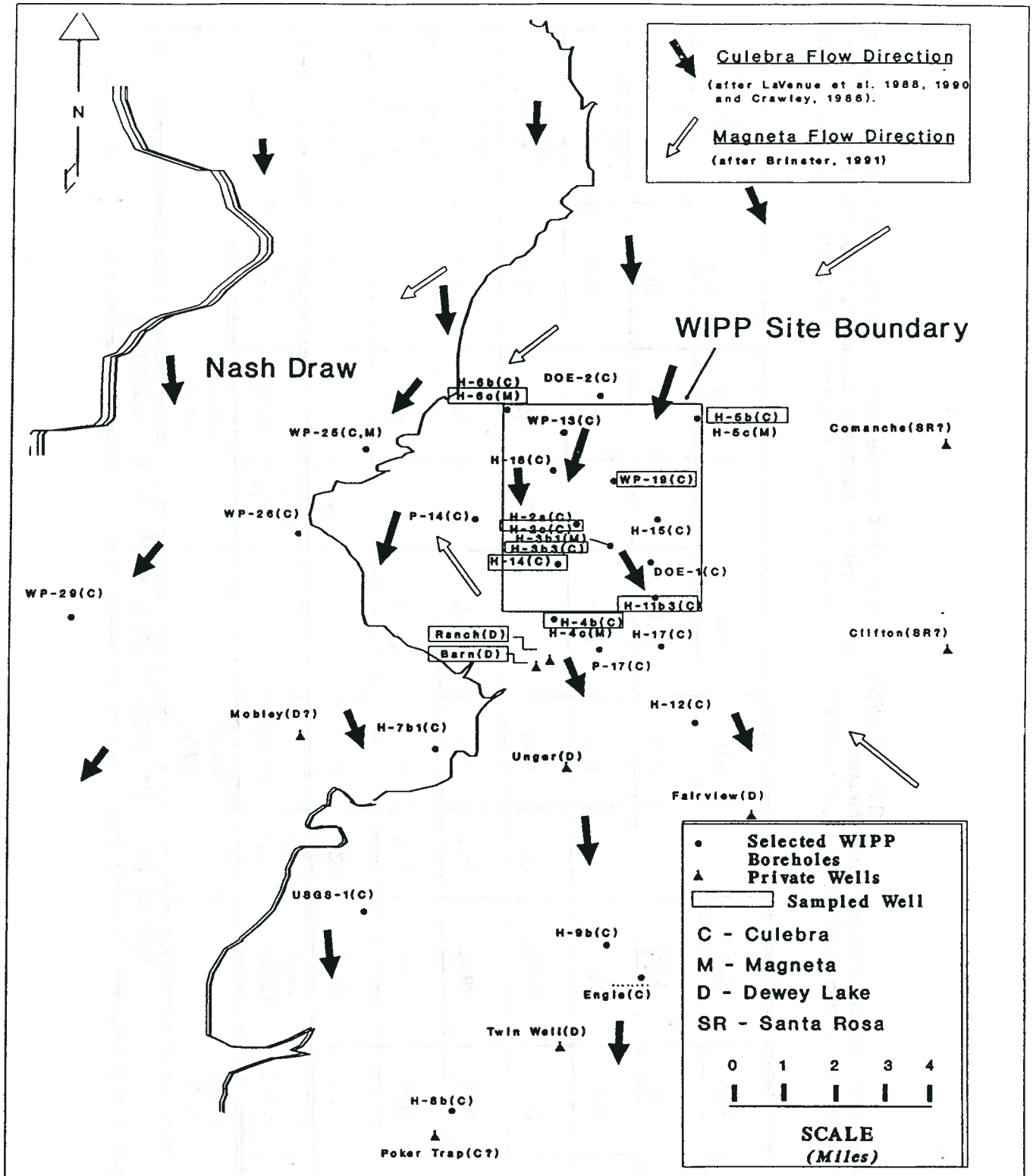
ENVIRONMENTAL MONITORING

Environmental Dosimetry Data
WIPP 1993

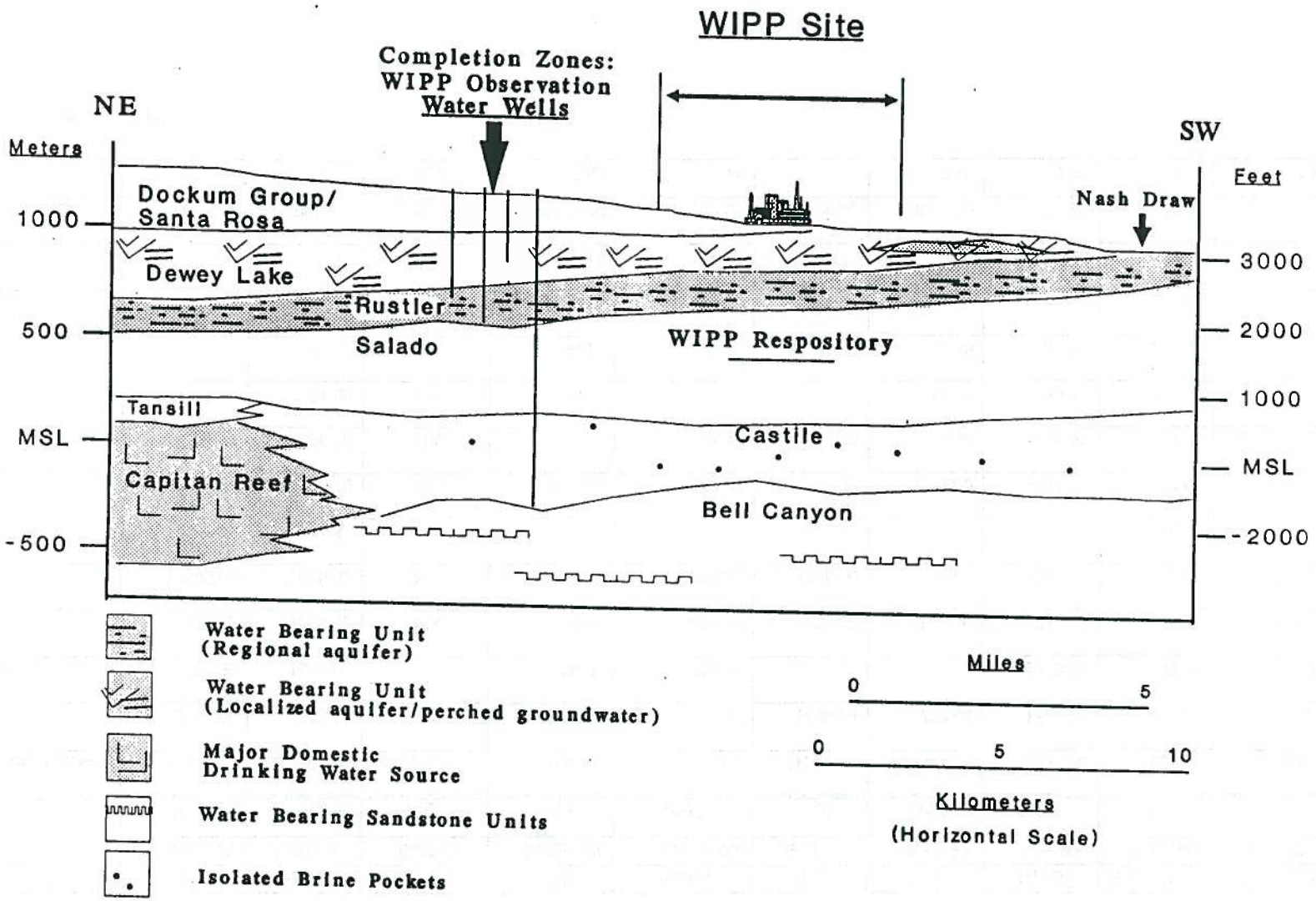
Thermoluminescent Dosimetry Results - 1993			
TLD Number	Location	Dose Second Quarter millirems	Dose Third Quarter millirems
00000	Transit Control	16.8	18.1
000X9	Deploy Control	16.5	16.1
00001	Site Entrance	17.2	21.7
00002	WWW (Due West on the Secured Area Boundary Fence)	17.7	18.1
00003	WFF (WIPP Far Field)	17.8	18.8
00004	WNN (Due North on the Secured Area boundary Fence)	18.9	17.8
00005	WEE (Due East on the Secured Area Boundary Fence)	17.9	18.5
00006	WSS (Due South on the Secured Area Boundary Fence	18.4	18.6
	Average	18.0 mR/91 days	18.9 mR/92 days
	Estimated Annual Dose Rate	73.6 mR/year	

Radiochemical Analyses of 1992 NMED/WIPP Soil Samples									
Analyte	Smith Ranch			WIPP Far Field			Mills Ranch		
	Activity pCi/g	Sigma[1]	MDL[1] pCi/g	Activity pCi/g	Sigma	MDL pCi/g	Activity pCi/g	Sigma	MDL pCi/g
G-Alpha Am-241 ref.	6.20	1.40	1.60	2.40	0.90	1.20	12.60	1.60	1.80
G-Alpha U-nat ref.	9.60	2.40	2.40	12.00	6.00	5.70	18.00	3.00	2.60
G-Beta Cs-137 ref.	16.40	1.70	1.90	7.00	0.70	0.60	24.80	2.30	2.20
G-Beta Sr/Y90 ref.	16.30	1.60	1.90	6.10	0.60	0.50	24.80	2.20	2.20
Am-241 Alpha Spec	.002	.006		-.019	.009		-.011	.009	
Pu-239 Alpha Spec	.018	.012		.009	.017		.011	.014	
Pu-238 Alpha Spec	-.004	.006		.009	.013		.005	.014	

The error term reported for gross alpha and beta analysis includes net count rate statistics (95%) confidence, cross-talk correction, and calibration curve and mass of residue factors. Detectability is defined as N=(Kd) * (standard deviation of N), where Kd =1.96. Gross alpha and beta activities reported using reference standards Am-241 and Cs-137 are preferred by SLD.



NMED Co-located Sample Locations FY 1992
(rectangular box) and General Groundwater Flow Direction



Schematic geologic cross-section illustrating key hydrogeologic units.
(Modified after Kenney, 1991)

Groundwater Data Summary - General Chemistry Analyses

Well	H-6B	H-5B	WIPP-19	H-2C	H-3B3	H-14	H-4B	H-11B3	Barn Well	Ranch Well
Date	05/04/92	06/02/92	06/29/92	07/20/92	08/03/92	08/27/92	09/17/92	10/06/92	06/16/92	06/23/92
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Total Dissolved Resid.	61848.00	157334.00	NA	9740.00	54884.00	21550.00	20680.00	116934.00	680.00	3635.00
Calcium	2130.00	1630.00	NA	685.00	1423.00	1830.00	730.00	1800.00	59.00	578.00
Magnesium	1020.00	1990.00	NA	178.00	724.00	541.00	420.00	1200.00	33.00	127.00
Potassium	360.00	11000.00	NA	94.00	400.00	236.00	184.00	740.00	2.00	9.00
Sodium	17900.00	52900.00	NA	2258.00	17280.00	3896.00	6140.00	41200.00	91.00	177.00
Other Cations (1)	38.91	64.81	NA						19.71	28.71
Hardness	9520.00	12260.00	NA	2443.00	6530.00	6804.00	3552.00	9435.00	283.00	1966.00
Total Suspended Solid	36.00	139.00	NA	23.00	17.00	9.00	9.00	35.00	< 3.00	No Analyses
Alkalinity	77.00	31.00	NA	46.00	40.60	27.50	51.50	46.10	234.00	153.00
Bicarbonate	93.90	37.80	NA	56.10	49.50	33.70	61.80	55.30	285.00	187.00
Chloride	32000.00	85600.00	NA	3125.00	27900.00	8800.00	7900.00	59500.00	38.80	265.00
Fluoride	1.22	0.79	NA	2.18	1.53	1.71	2.02	1.06	2.57	1.26
Sulfate	NA	7650.00	NA	2970.00	4900.00	1870.00	5850.00	6875.00	173.00	1700.00
pH	7.08	6.92	NA	7.63	7.41	7.40	7.55	7.37	8.17	7.89

Note: NA refers to "not analyzed".

(1) Heavy metals measured above PQL (see heavy metal data)

Selected Chemical Parameters vs Hydrochemical Type Area/Geologic Formation

NMED DOE/WIPP Annual
Environmental Oversight
Field Year: 1992

Formation	Well	TDS(1) mg/l	Calcium mg/l	Magnesium mg/l	Potassium mg/l	Sodium mg/l	Chloride mg/l	Fluoride mg/l	Sulfate mg/l
Culebra "Zone C"	H-6B	61848.00	2095.00	1005.00	360.00	17900.00	32000.00	1.22	NA
Culebra "Zone A"	H-5B	157334.00	1685.00	2000.00	11000.00	52900.00	85600.00	0.79	7650.00
Culebra "Zone C"	WIPP-19	NA	1500.00	1060.00	NA	NA	NA	NA	NA
Culebra "Zone C"	H-2C	9740.00	685.00	178.00	94.00	2258.00	3125.00	2.18	2970.00
Culebra "Zone C"	H-3B3	54884.00	1377.00	662.00	400.00	17280.00	27900.00	1.53	4900.00
Culebra "Zone C"	H-14	21550.00	1695.00	480.50	236.00	3896.00	8800.00	1.71	1870.00
Culebra "Zone C"	H-4B	20680.00	745.00	445.00	184.00	6140.00	7900.00	2.02	5850.00
Culebra "Zone A"	H-11B3	116934.00	1650.00	1200.00	740.00	41200.00	59500.00	1.06	6875.00
Dewey Lake	Barn Well	680.00	57.50	33.00	2.00	91.00	38.80	2.57	173.00
Dewey Lake	Ranch Well	3635.00	578.50	128.50	9.00	177.00	265.00	1.26	1700.00

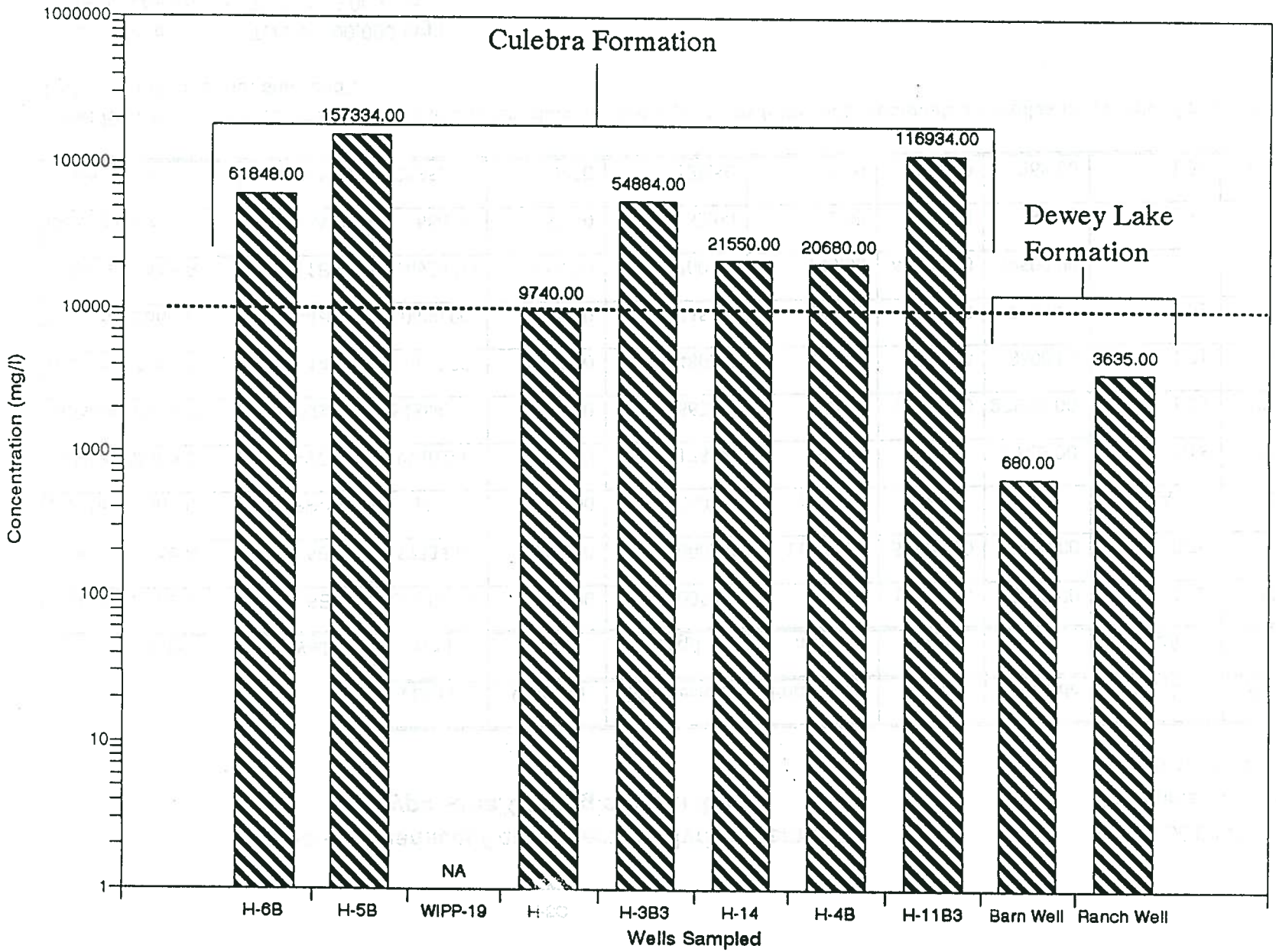
Note: Except for WIPP-19, magnesium and calcium data are average values from NMED colocated samples (heavy metal and chemical data)
Note: NA refers to "not analyzed".

Zone A/Type Area 1 - TDS > 100,000 mg/l
Zone B/Type Area 2 - TDS < 10,000 mg/l
Zone C/Type Area 3 - TDS 10,000-100,000 mg/l

Type areas after Siegel et al. 1991

Total Dissolved Solids - Groundwater

NMED/WIPP Oversight 1992



Groundwater Data Summary - Heavy Metal Analyses

NMED DOE/WIPP Annual
Environmental Oversight
Field Year: 1992

Well	H-6B	H-5B	WIPP-19	H-2C	H-3B3	H-14	H-4B	H-11B3	Barn Well	Ranch Well	
Date	05/04/92	06/02/92	06/29/92	07/20/92	08/03/92	08/27/92	09/17/92	10/06/92	06/16/92	06/23/92	
Units	mg/l (1)	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	PQL (2)
Aluminum	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	0.10	**0.10**	**0.10**
Arsenic	**0.0050**	**0.0050**	**0.0050**	**0.0050**	**0.0050**	**0.0050**	**0.0050**	**0.0100**	**0.0050**	**0.0050**	**0.0050**
Barium	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Beryllium	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Boron	8.70	35.00	30.00	11.00	20.00	8.20	19.00	31.00	0.50	0.30	**0.10**
Cadmium	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Chromium	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Cobalt	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Copper	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Iron	0.50	1.50	2.30	2.00	0.30	1.40	1.40	0.80	**0.10**	**0.10**	**0.10**
Lead	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Mercury	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**	**0.0005**
Manganese	0.67	0.11	0.48	0.24	0.10	0.08	**0.05**	0.1	**0.05**	**0.05**	**0.05**
Molybdenum	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Nickel	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Selenium	0.2400	1.0000	**0.2000**	**0.0500**	**0.0500**	**0.0250**	**0.0500**	**0.5000**	0.0140	0.0090	**Varied**
Silicon	6.80	3.70	3.60	7.00	4.50	4.70	5.90	3.00	27.00	14.00	**0.10**
Silver	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Strontium	22.00	27.00	17.00	8.30	17.00	21.00	17.00	24.00	1.00	5.30	**0.10**
Tin	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Thallium	No Data	No Data	0.1000	**0.0500**	0.0060	0.0080	**0.0250**	**0.1000**	**0.0050**	No Data	**Varied**
Vanadium	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**
Zinc	**0.10**	0.20	**0.10**	**0.10**	**0.10**	**0.10**	0.20	**0.10**	**0.10**	0.20	**0.10**

(1) mg/l = ppm

(2) PQL = Practical Quantitation Limit. This detection limit is the detection limit reportable within the laboratory-specified limits of accuracy and precision.

Note:EPA Methods - As (7060A), Hg (7470A), Se (7740A) Tl (7841A); all other analytes determined by method 6010A EPA SW-846 (1990 Rev. 1).

BOLD VALUES: Represent Detection Limit/Less than Detectable

Selected Metals vs Hydrochemical Type Area/Formation

NMED DOE/WIPP Annual
Environmental Oversight
Field Year: 1992

Formation	Well	Aluminum mg/l	Boron mg/l	Iron mg/l	Manganese mg/l	Selenium mg/l	Silicon mg/l	Strontium mg/l	Zinc mg/l
Culebra "Zone C"	H-6B	DL	8.70	0.50	0.67	0.2400	6.80	22.00	DL
Culebra "Zone A"	H-5B	DL	35.00	1.50	0.11	1.0000	3.70	27.00	0.20
Culebra "Zone C"	WIPP-19	DL	30.00	2.30	0.48	DL	3.60	17.00	DL
Culebra "Zone C"	H-2C	DL	11.00	2.00	0.24	DL	7.00	8.30	DL
Culebra "Zone C"	H-3B3	DL	20.00	0.30	0.10	DL	4.50	17.00	DL
Culebra "Zone C"	H-14	DL	8.20	1.40	0.08	DL	4.70	21.00	DL
Culebra "Zone C"	H-4B	DL	19.00	1.40	DL	DL	5.90	17.00	0.20
Culebra "Zone A"	H-11B3	DL	31.00	0.80	0.01	DL	3.00	24.00	DL
Dewey Lake	Barn Well	0.10	0.30	DL	DL	0.0090	14.00	5.30	DL
Dewey Lake	Ranch Well	DL	0.50	DL	DL	0.0140	27.00	1.00	0.20

Note: DL refers to practical quantitation limit (see heavy metal data sheet)

Zone A/Type Area 1 - TDS > 100,000 mg/l
Zone B/Type Area 2 - TDS < 10,000 mg/l
Zone C/Type Area 3 - TDS 10,000-100,000 mg/l

Type areas after Siegel et al. 1991

Ground Water Trace Metals

Comparison of NMED/WIPP and DOE/WIPP Trace Metal Data				
	NMED/WIPP (mg/l)		DOE/WIPP (mg/l)	
	Barn	Ranch	Barn	Ranch
Silicon	27	14	24 - 54	20 - 49
Strontium	1.0	5.3	0.6 - 1.2	2.3 - 5.9
Boron	.50	.30	.28 - .44	.12 - .33
Zinc	<.10	.20	<.03	.02 - .15
Aluminum	.10	<.10	<2	<2
Selenium	.014	.0090	<.05	<.079

Note: DOE/WIPP data is baseline data 1985-1990; NMED data is from 1992

Except for aluminum and selenium, preliminary comparison between NMED/WIPP data and DOE/WIPP baseline data reveal general consistency in trace metal concentrations. It should be noted, however, that a cursory comparison with 1992 DOE/WIPP data shows several differences. DOE/WIPP 1992 values for zinc and iron are two orders of magnitude higher than NMED/WIPP values, suggesting the data may be outliers and invalid. Additionally, DOE/WIPP detection limits for beryllium, cadmium, chromium, copper, lead and zinc are two to three orders of magnitude lower than those reported by the State laboratory. For adequate comparison, NMED/WIPP staff will need to confirm the type of detection limit being reported and sigma values for reported DOE/WIPP parameters. If the laboratory method being utilized by the DOE/WIPP laboratory is in fact more sensitive, the precise methods should be reported to facilitate a similar analytical resolution by the NMED/WIPP DOE oversight program.

Groundwater Radiochemistry

WIPP 19 Sample date 6/29/92				
Analyte	Analytical Method	Activity pCi/L	Sigma	Detection Limit pCi/L
G-Alpha	Am-241 ref.	170.00	70.00	130.00
G-Alpha	U-nat ref.	330.00	150.00	250.00
G-Beta	Cs-137 ref.	680.00	100.00	170.00
G-Beta	Sr/Y90 ref.	660.00	100.00	160.00
U-238	Alpha Spec.	2.70	1.10	
U-234	Alpha Spec.	15.00	4.00	
Th-230	Alpha Spec.	0.60	0.70	
Th-232	Alpha Spec.	0.06	0.10	
Am-241	Alpha Spec.	0.13	0.25	
Pu-239	Alpha Spec.	-0.01	0.11	
Pu-238	Alpha Spec.	0.03	0.19	

Well H2C Sample date 7/20/92				
Analyte	Analytical Method	Activity pCi/L	Sigma	Detection Limit pCi/L
G-Alpha	Am-241 ref.	39.00	16.00	30.00
G-Alpha	U-nat ref.	51.00	21.00	40.00
G-Beta	Cs-137 ref.	50.00	30.00	50.00
G-Beta	Sr/Y90 ref.	50.00	30.00	50.00
U-238	Alpha Spec.	1.20	0.40	
U-234	Alpha Spec.	8.70	2.00	
Th-230	Alpha Spec.	0.20	0.21	
Th-232	Alpha Spec.	0.02	0.02	
Am-241	Alpha Spec.	0.27	0.25	
Pu-239	Alpha Spec.	0.05	0.05	
Pu-238	Alpha Spec.	0.02	0.04	

Groundwater Radiochemistry

Well H3b3 Sample date 8/5/92				
Analyte	Analytical Method	Activity pCi/L	Sigma	Detection Limit pCi/L
G-Alpha	Am-241 ref.	190.00	70.00	110.00
G-Alpha	U-nat ref.	280.00	100.00	160.00
G-Beta	Cs-137 ref.	300.00	100.00	160.00
G-Beta	Sr/Y90 ref.	300.00	100.00	160.00
U-238	Alpha Spec.	1.80	1.00	
U-234	Alpha Spec.	12.00	3.00	
Th-230	Alpha Spec.	0.40	0.80	
Th-232	Alpha Spec.	0.02	0.08	
Am-241	Alpha Spec.	-0.02	0.11	
Pu-239	Alpha Spec.	-0.02	0.14	
Pu-238	Alpha Spec.	0.40	0.30	

Well H-14 Sample date 8/27/92				
Analyte	Analytical Method	Activity pCi/L	Sigma	Detection Limit pCi/L
G-Alpha	Am-241 ref.	70.00	40.00	80.00
G-Alpha	U-nat ref.	80.00	50.00	100.00
G-Beta	Cs-137 ref.	300.00	90.00	140.00
G-Beta	Sr/Y90 ref.	300.00	90.00	140.00
U-238	Alpha Spec.	0.00	0.60	
U-234	Alpha Spec.	5.30	1.60	
Th-230	Alpha Spec.	0.90	1.20	
Th-232	Alpha Spec.	-0.03	0.08	
Am-241	Alpha Spec.	-0.02	0.09	
Pu-239	Alpha Spec.	-0.04	0.12	
Pu-238	Alpha Spec.	0.16	0.20	