PROFILE OF

SANDIA NATIONAL LABORATORIES/NEW MEXICO

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Office of Oversight
Environment, Safety and Health
U.S. Department of Energy

FOREWORD

Site profiles provide senior Office of Environment, Safety and Health managers with relevant and current site environment, safety, and health performance information as well as communicating to Department of Energy line management the Office of Oversight's concerns and understanding of site conditions. Site profiles are a key management tool used by the Office of Oversight to focus and prioritize independent oversight evaluation activities and to optimize the allocation of Oversight resources. The Office of Oversight maintains site profiles on 20 major Department of Energy sites, and normally updates each profile semiannually through a process of soliciting Department of Energy line management review and comment on the revised site profile information. Upon resolution of any line management comments, the profile is considered validated and is disseminated.

Site profiles are developed using an institutionalized process of collecting data from multiple sources, and then collating, synthesizing, and analyzing this information to develop a balanced evaluation of environment, safety, and health performance at the site. The data that forms the basis of a site profile comes from sources both internal and external to the Department of Energy. Office of Oversight appraisal activities provide an important source of data. Data is also collected and synthesized from such sources as the Defense Nuclear Facilities Safety Board, the General Accounting Office, state regulators, and Department of Energy line management organizations. This information is reported in a format designed to highlight essential missions, performance, significant issues, and operational data at a management level. The process involves additional field verification of initial conclusions to confirm the validity and significance of the information. All Oversight offices participate in the collection, analysis, interpretation, and validation of site profile information.

As the site profile process matures, the Office of Oversight plans to incorporate additional information into the documents, including a presentation of quantitative measures and trends in environment, safety, and health performance, and a description of safeguards and security activities, performance, and issues.

PROFILE OF

SANDIA NATIONAL LABORATORIES/NEW MEXICO (SNL/NM)

OVERVIEW

SITE CHARACTERISTICS

Site characteristics include information on size and location, mission, organization, contractual status, and major initiatives and activities.

Additional information on site characteristics is provided in Section 1.0, starting on page 1.

Date Established: 1945.

Present Mission:

Primary - National security programs in defense and energy, with primary emphasis on nuclear weapons research and development.

Secondary - Perform work for others; entering into technology partnerships and commercialization.

Sandia/New Mexico is a multiprogram laboratory addressing defense, energy, environment, and national needs.

Size: Headquarters area covers approximately 105.6 acres (0.165 square mile). Total laboratory area incorporates 2,800 acres owned by Department of Energy (DOE), and another 20,342 acres controlled by formal agreement.

Employees: There are about 9,000 DOE, operating contractor, and subcontractor personnel (as of May 1996). Fifty-three DOE employees are assigned to the Kirtland Area Office (KAO).

Annual Budget: The Sandia National Laboratories (SNL) budget for fiscal year 1996 is $1.43 billion. A specific budget for each Sandia National Laboratories site does not exist.

Cognizant Secretarial Officer: Assistant Secretary for Defense Programs (DP) is the cognizant secretarial office; the principal DP Office is DP-23. The Office of Energy Research (ER) also has a significant interest and multiple programs on site.

Responsible Operations/Area Office: Albuquerque Operations Office (AL)/Kirtland Area Office (KAO).

Contractor: Lockheed Martin Corporation is the management and operating contractor under a cost-plus-fixed-fee contract.

Fissile Material: Approximately 10 kg of Pu-239 and approximately 800 kg of uranium in reactor fuel.

Significant Commitments to Stakeholders: Memorandum of understanding with the Air Force, defining support responsibilities between DOE and its contractors on Kirtland Air Force Base; Citizens Advisory Board for environmental matters, and the Sandia Tripartite ES&H Committee.

The Citizens Advisory Board for environmental matters provides valuable community input.

Unions: Atomic Projects and Production Workers, Metal Trades Council; Security Police Association; and Office and Professional Employees International.

Major Site Activities/Initiatives

Continuation of major environmental restoration project.

Proposed Production of Molybdenum-99 At TA-V/Annular Core Research Reactor.

ENVIRONMENT, SAFETY, AND HEALTH (ES&H) ISSUES

A sitewide issue is an issue present at multiple facilities or within ES&H programs that impact sitewide operations. A facility-specific issue is limited to a particular facility or building.

Additional information on sitewide issues is provided in Section 3.0, starting on page 10.

Sitewide Issue 1: The development, documentation, and implementation of a comprehensive safety analysis program at SNL/NM continues to need improvement. Several facilities at SNL/NM do not have approved safety analysis reports in accordance with DOE Order 5480.23. Two of five nuclear facilities has a DOE-issued safety evaluation report (SER).

There are four sitewide issues at SNL/NM.

Sitewide Issue 2: Conduct of operations principles have not been consistently implemented at SNL/NM.

Sitewide Issue 3: Chronic and severe subcontractor construction safety deficiencies have been noted at SNL/NM.

Sitewide Issue 4: Implementation of the radiological control program at SNL/NM has been deficient.

KEY FACILITIES

A key facility is a facility or building that is significant from an environment, safety, and health perspective. At some sites, a key

Additional information on key facilities is provided in Section 4.0, starting on page 16.

facility can be a group of facilities with similar missions, activities, hazards, or vulnerabilities.

There are ten key facilities at Sandia/New Mexico.

Building 858, Microelectronic Development Lab (MDL) - Provides microtechnology development and engineering capabilities.

Building 893, Laser Physics Laboratory - Investigates the physics of compound semiconductors and lattice structures.

Building 905, Explosives Components Facility - Testing of explosives and explosive devices, neutron generators, and batteries.

Building 981, Saturn Accelerator - Supports nuclear weapons effects testing and studies in the areas of imploding plasmas for x-ray production.

Building 983, Particle Beam Fusion Accelerator II (PBFA II) - Generates intense ion beams in support of the inertial confinement fusion program.

Building 970, Simulation Technology Laboratory, Hermes III , Sandia Advanced Beams Research Experiment (SABRE) - Evaluates radiation effects on materials.

Building 6580, Hot Cells Facility (HCF) - Conducts and supports research and development activities.

Building 6588, Annular Core Research Reactor/Old GIF Pool - Pool-type reactor capable of both pulsed and steady-state operation, and transient rod withdrawal.

Building 6590, Sandia Pulse Reactor (SPR), SPR II, SPR III - Provides a near fission spectrum radiation environment.

Manzano Storage Facilities - Stores nuclear material and waste.

SITE PERFORMANCE

Additional information on site performance is provided in Section 2.0, starting on page 5.

Site performance is based on an analysis of available data on facilities and programs. This includes information from Office of Oversight activities, augmented by valid and relevant external and internal sources. Site performance is evaluated in terms of three of the guiding principles for safety management.

Overall Safety Management Program - NOT EVALUATED

Principle #1 - Line Management Responsibility - NOT EVALUATED

There is some evidence that SNL supports, and is holding line managers accountable for safety, and is recognizing good performance.

KAO has established and implemented programs and policies to assure that Department ES&H expectations are met. These efforts are carried out largely by the Facility Representatives.

Most KAO ES&H professional expertise has been reassigned to AL. Line managers have the authority to make and implement ES&H decisions.

Hazard analysis has not always been complete and has not always met Department expectations.

Principle #2 - Comprehensive Requirements - NOT EVALUATED

KAO maintains an awareness of DOE requirements and frequently assesses SNL implementation. SNL complies with contract requirements, but implementation of facility- specific procedures has been inconsistent.

Some of the SNL workforce is not aware of the specific ES&H requirements that apply to their jobs.

Subcontractors frequently do not have a good awareness of DOE's ES&H requirements.

Principle #3 - Competence of Personnel - NOT EVALUATED

KAO has established a viable training program for its Facility Representatives. Two of the nine have completed the qualification program. AL is administering the technical qualification program, and it is on schedule.

SNL/NM has a competent, professional staff.

Training programs generally meet Department requirements for form and content; however, the effectiveness of the training in improving performance has not yet been confirmed.

SNL's reactor training program has been recognized as excellent.

PERFORMANCE MEASURES

Performance measures are quantitative and qualitative indications of ES&H performance taken from such sources as the Occurrence Reporting and Processing System and the Computerized Accident/Incident Reporting System, as well as contractually mandated indicators of performance.

To be provided in future versions of the site profile.

Additional information on performance measures will be provided in Section 5.0 of future versions of the site profile

Figure 1. SNL/NM Site Map

SITE PROFILE--SANDIA NATIONAL LABORATORY/NEW MEXICO

1.0 SITE CHARACTERISTICS

1.1 SITE LOCATION AND SIZE

Sandia National Laboratories/New Mexico (SNL/NM) is located at the foot of the Manzano Mountains adjacent to the city of Albuquerque, New Mexico.

The SNL/NM site is essentially surrounded by Kirtland Air Force Base (KAFB). DOE has one-to five -year land-use permits for some of the Air Force property. An area of the Manzano Mountains east of KAFB has also been withdrawn from the Forest Service for the exclusive use of the Air Force and DOE.

SNL/NM has 546 major buildings, totaling 4.6 million gross square feet. Operations are conducted in six locations, called Technical Areas I, II, III, IV, and V, and the Coyote Test Field.

Technical Area I contains the site's administrative, site support, technical support, component development, research, energy programs, microelectronics, defense programs, and exploratory systems.

Technical Area II was established for casting and assembling chemical high-explosive main charges for nuclear weapons and is now in the process of being cleaned up.

Technical Area III is used for testing and simulation of a variety of natural and induced environments for nuclear weapons and other non-weapons programs and includes two rocket-sled tracks, two centrifuges, and a radiant heat facility.

Technical Area IV is a remote research location for pulsed power sources. These include x-ray, gamma-ray, particle-beam fusion, and accelerators, all of which are used to simulate nuclear weapon effects and to conduct research on inertial-confinement fusion and particle-beam weapons.

Technical Area V is the remote research area where experimental and engineering nuclear reactors, hot cells, and gamma irradiation facilities are located.

The Coyote Test Field contains testing operations that require large land areas and unusual terrain, separated by large buffer zones. Facilities include explosively driven shock tubes, aerial cable sites for high-speed ground target impact tests, a test site where large quantities of cased conventional explosives can be detonated, numerous small explosive sites, igloos for storing explosives, and a laser strain seismometer. Some of these facilities are seldom used.

1.2 SITE MISSION

SNL/NM is a multi-program laboratory, addressing defense, energy, environment, and national needs. SNL/NM is involved in several research applications, including advanced manufacturing technologies, space program technologies, information systems, transportation systems, and health care.

Activities at SNL/NM include process development, environmental testing, radiation research, combustion research, computing and microelectronics research and production. During SNL/NM's five decades of service, its mission has expanded from nuclear weapons research and development to include research on other advanced military technologies, energy programs; arms verification; control technology; and applied research in numerous scientific fields, including extensive programs in material research.

Nuclear weapons programs for DOE and the Department of Defense (DoD) at SNL/NM include several major programmatic activities:

- Conducting science-based stewardship of the nuclear weapons stockpile to ensure that it remains effective and that the nuclear weapons development capabilities and expertise necessary to meet the nation's future needs are maintained

- Implementing new structures and streamlining approaches for future nuclear weapons production requirements

- Providing strategic surety for nuclear weapons by developing the technical means to assure confidence in the safety, security, and control of nuclear weapons in all environments.

- Maintaining competencies and capabilities for the nuclear weapons mission.

- Responding to changing threats to U.S national security.

Energy and Environmental Programs

These programs, sponsored by DOE and the Nuclear Regulatory Commission, often support U.S. industry and involve two activities -- improvement of national energy security through identifying, developing, and deploying full system solutions for safe, clean, and affordable energy options and enhancement of the nation's environment through environmentally conscious operations in industry, remediation of contaminated DOE sites, and solutions to problems associated with the disposal of radioactive waste.

- Energy efforts include combustion research, integrated geosciences research, and solar and wind power programs.

- SNL/NM environmental projects include programs in waste reduction, and research for environmentally conscious manufacturing.

SNL/NM must restore contaminated SNL sites, comply with applicable environmental laws and regulations, and undertake corrective actions as required by the Resource Conservation and Recovery Act.

Work For Others

Work for others is performed for DoD and other Federal and non-Federal agencies involves:

- Using SNL/NM's status as a national laboratory to provide science-based solutions for problems of national importance.

- Serving as a catalyst for precompetitive research and development alliances with external organizations.

- Strengthening and enhancing SNL's ability to continue serving DOE by emphasizing and selecting programs that nurture SNL's core technical competencies while satisfying critical customer needs.

Technology Partnerships and Commercialization

SNL/NM promotes and facilitates the transfer of federally developed technologies, processes, and special technical expertise to the private sector and promotes the collaborative development of technologies.

1.3 SITE ORGANIZATIONS AND CONTRACT STATUS

Site Organization

Oversight of SNL/NM is provided by the Albuquerque Operations Office (AL) through the Kirtland Area Office (KAO).

AL is responsible for developing plans and estimates related to DOE's capability to develop and stockpile new weapons. AL carries out programs for nuclear weapons production, field non-nuclear testing, and stockpile maintenance and surveillance. AL also provides guidance and policy to SNL/NM and works closely with the Rocky Flats Field

Office, the Oak Ridge Operations Office, and the Savannah River Operations Office.

The KAO Manager has line management responsibility for activities at SNL/NM, the Tonopah Test Range, Sandia National Laboratories/California, the Kauai Test Range in Hawaii, and the Inhalation Toxicology Research Institute. KAO consists of four branches, including the Assistant Area Managers for Facilities and Project Management; Operations; Environment, Safety, and Health; and Security, Contracts, and Business Management.

There are approximately 9,000 DOE, operating contractor, and subcontractor personnel at SNL/NM.

Contract Status

SNL/NM is operated for DOE by the Sandia Corporation, a subsidiary of Lockheed Martin Corporation under a cost-plus-fixed-fee contract. The KAO Manager is the Administrative Contracting Officer for the contract.

The most recent modification to the SNL operating contract (No. DE-AC04-94AL8500) established SNL's operating budget for fiscal year 1996 at $1.43 billion. There is no stand-alone budget for SNL/NM.

Significant activities are ongoing at AL in establishing an environment, safety, and health (ES&H) management planning process; however, contractual requirements for an ES&H management plan are lacking in most facilities' contracts.

1.4 MAJOR SITE INITIATIVES/ACTIVITIES

Decontamination and Decommissioning

The Office of Environmental Management (EM) is not currently funding decontamination and decommissioning (D&D) activities at the site; however, five facilities are under consideration for decommissioning using line program funds.

Privatization Activities

None.

Environmental Restoration

The Sandia Environmental Restoration (ER) Project has met or exceeded all of its performance commitments as documented in the action plan and the SNL contract. SNL cleaned up 34 sites in fiscal year 1995, exceeding the action plan commitment of 19.

A revised action plan shows that the ER project could be accomplished by the year 2000 at approximately the same per year funding levels specified in the original action plan. This constitutes an acceleration of the schedule by six years and a total estimated cost savings of $100 million.

Remediation

There is currently one active remediation project. A two-acre radioactive waste landfill is being removed by a subcontractor. The project is estimated to cost $2,000,000 and should be completed in September 1996.

Several environmental remediation projects are planned at SNL/NM. These projects address approximately 190 individual sites:

- Foothills Test Area -- Estimated total remediation cost through 2000: $5,358,000*
- Canyons Test Area -- Estimated total remediation cost through 2000: $4,429,000*
- Central Coyote Test Area -- Estimated total remediation cost through 2000: $9,300,000*
- Southwest Test Area -- Estimated total remediation cost through 2000: $5,655,000*

- Technical Area I -- Estimated total remediation cost through 2000: $17,499,000*

- Technical Area II -- Estimated total remediation cost through 2000: $11,231,000*

- Technical Area III, Liquid Waste Disposal System -- Estimated total remediation costs through 2000: $3,565,000*

- Technical Area III, Chemical Waste Landfill -- Estimated total remediation cost through 2000: $20,959,000*

- Technical Area III, Mixed Waste Landfill - Estimated total remediation cost through 2000: $9,315,000*

- Tijeras Arroyo -- Estimated total remediation cost through 2000: $3,602,000*

- Site-wide Characterization Study - Estimated Cost through 2000: $15,040,000*

- Treatment, storage, and disposal facility - Estimated cost through 2000: $17,088,000*

- SNL North Ground Water Assessment - Estimated cost through 2000: $1,700,000*

- Technical Area V, ground water assessment--Estimated cost through 2000: $3,819,000*

- Technical Areas III and V, individual projects --Estimated cost through 2000: $7,926,000*

Septic Tanks and Drain Fields -- Estimated cost through 2000: $6,470,000*

* *KAO environmental remediation personnel emphasize that funding for remediation is not firm and is dependent on Congressional budget actions.*

Proposed Production of Molybdenum-99 At TA-V/Annular Core Research Reactor

Proposed use of the Annular Core Research Reactor (ACRR) to produce medical radioisotopes at SNL/NM TA-V will require some modifications of existing facilities.

Medical radioisotopes, consisting of primarily molybdenum (Mo-99), are used in medical diagnosis and treatment. The demand for this radiopharmaceutical is significant. This isotope is highly perishable (half-life is 66 hours), and a continuous and stable supply of the isotope for medical use is required by the medical community. Currently, only one reactor in Canada is supplying Mo-99; as a result, any shutdown of the reactor would jeopardize the US supply.

SNL has proposed a medical radioisotope production program to provide a backup supply of medical isotopes, including Mo-99, for North American medical care use. The production program would use existing DOE facilities at the Los Alamos National Laboratory (LANL) and SNL/NM to produce these isotopes.

The major proposed activities include fabricating uranium targets at the LANL Chemistry and Metallurgy Research facility; shipping the targets to SNL/NM's TA-V; irradiating the targets in SNL/NM TA-V's Annular Core Research Reactor (ACRR); processing irradiated targets in SNL/NM's TA-V Hot Cell Facility (HCF) to extract the radioisotopes; shipping the medical radioisotopes to radio-pharmaceutical companies; and shipping the waste to disposal facilities.

Some modifications of existing facilities/operations would be required to implement the medical isotope production program at SNL. These modifications include:

- At the ACRR, procure/install heat exchangers; remove the central reactor cavity; upgrade hardware and install redundant systems; remove extraneous hardware; upgrade ventilation and environmental monitoring and redundancy; provide special handling equipment; add air

lock and backup electrical power; and install a new material balance area.

- At the HCF, upgrade the ventilation; install a quality control laboratory; reconfigure the HCF to streamline the process; install steel containment boxes; and add a waste storage area.

According to the fiscal year Multiprogram Laboratory Appraisal, some management concerns include: project planning has been slow, and some planning projects have not been completed; line managers have been caught unaware more than once that they were about to run out of funds.

Mentoring Activities

There are no mentoring activities at this time; however, future activities are anticipated in support of the pilot oversight program for line ES&H management by AL.

2.0 SITE PERFORMANCE

2.1 CONCEPTUAL BASIS FOR EVALUATION

The essential characteristic of successful programs and projects is the recognition and understanding of the need for an effective management system that ensures adequate control over all aspects of the program or project. In 1994, the Secretary of Energy forwarded to Congress and the Defense Nuclear Facilities Safety Board (DNFSB) the principles and criteria that the Department deemed necessary for an effective safety management program. These principles include:

- Principle #1: Line managers are responsible and accountable for safety.

- Principle #2: Comprehensive requirements exist, are executed, and are appropriate.

- Principle #3: Competence is commensurate with responsibilities.

2.2 SAFETY MANAGEMENT PROGRAM IMPLEMENTATION OF THE GUIDING PRINCIPLES

This interim evaluation was developed using the results of surveillances performed by the Office of EH Residents and other Office of Oversight data sources. The absence of an independent oversight evaluation at SNL/NM suggests that the information presented should not necessarily be considered representative of overall ES&H performance across SNL/NM, but rather an indication of the ES&H performance of the program and/or facility identified. Where sufficient information was not available to make a comprehensive assessment of either the implementation of a guiding principle (Section 2.2) or an implementing program (Section 2.3), a limited evaluation or specific example of performance based on the best available information is provided.

Principle #1 - Line Management Responsibility for Safety

KAO has demonstrated its commitment to safety by establishing and implementing programs and policies to assure that Department environment, safety, and health expectations are met. These efforts are carried out largely by the Facility Representatives. Most KAO ES&H professional expertise has been reassigned to AL. SNL/NM has embraced the concept that its line managers are responsible for safety. Line managers have the authority to make and implement ES&H decisions. Hazard analysis has not always been current or met Department expectations. There is some evidence that SNL is holding its line managers accountable for safety and recognizing good performance.

Principle #2 - Comprehensive Requirements

KAO maintains an awareness of DOE requirements and frequently assesses SNL implementation. SNL/NM has in place a comprehensive ES&H Manual that is

consistent with contract requirements, but implementation of facility-specific proced-ures has been inconsistent. Some of the SNL workforce is not aware of the specific ES&H requirements applying to their jobs. Subcontractors are frequently less aware of DOE's ES&H requirements.

Principle #3 - Competence Commensurate with Responsibilities

KAO has established a viable training program for its Facility Representatives. Two of nine have completed the qualification program. The Technical Qualification Program is being administered by AL and is on schedule.

SNL/NM has a competent professional staff, and its reactor training program has been recognized as excellent. Training programs generally meet Department requirements for form and content; however, the training's effectiveness in improving performance has not yet been determined.

2.3 IMPLEMENTING PROGRAMS

Environmental Protection Program

The Sandia National Laboratories Fiscal Year 1995 Multiprogram Laboratory Appraisal identified some concerns. These involve timeliness and quality of Sandia National Environmental Policy Act (NEPA) submittals, especially environmental assessments (EAs). Multiple revisions have been required for several EAs, including those prepared for the Environmental Restoration (ER) Project, the Gamma Irradiation Facility, and the medical isotope production program. Some revisions were required by DOE directed changes in the scope of the EAs and for technical and editorial corrections. Additional schedule delays were caused by DOE extending the public comment periods and from implementing the process for delegating NEPA compliance authority to AL. No project schedules were missed because of delays in these EAs.

Effective NEPA procedures have not been implemented laboratories-wide, even though SNL has a well defined NEPA compliance program and NEPA training program. SNL/NM has not implemented measures to ensure appropriate NEPA reviews prior to resolve committments for all programs, projects, and activities.

SNL's operation of the air quality program and environmental monitoring program in support of the line organizations to meet program objectives in conjunction with applicable regulations was considered excellent.

Nuclear Safety Program

The fiscal year 1995 Laboratory appraisal found the nuclear criticality safety program to be well established and performing the required elements of nuclear safety. However, there had been no progress on the development of a DOE approved implementation plan since the last evaluation.

There is a two-tier criticality safety review structure and a comprehensive supplement in the ES&H manual for criticality safety. An SNL memorandum has been submitted to DOE providing a description of actions with the schedules that will bring the program into compliance with the nuclear criticality safety order.

Worker Safety and Health Program

Incident investigations identified some deficiencies in safety management, as illustrated below.

On February 1, 1995, an individual was injured while performing a non-planned activity to explore the effects of air flow disturbances on a classified test apparatus. At the completion of the final test sequence, the individual moved his hand around the vicinity of the fans to create disturbances. While conducting this non-planned activity, the individual inadvertently got his hand too close to one of the two high-speed axial fans. When temporarily distracted, he got his thumb

caught in the fan blades, resulting in the loss of the end of his thumb and laceration of adjacent fingers. Although the fan was unguarded, it was not close to the areas where planned test activities were conducted. The investigation of this incident resulted in the following significant findings:

- The preliminary hazard assessment (PHA) process was used incorrectly by the project personnel.
- The design of the test apparatus did not incorporate adequate safety features to prevent the accident.
- Project personnel did not use personnel trained in safety assessment who were available for independent assessment of the project test configuration.
- Project personnel working in the vicinity of the test apparatus lacked sufficient knowledge to deal with potential biological hazards.

The investigation resulted in the following probable causes:

- Inconsistent implementation of ES&H processes among SNL organizations.
- Inadequate SNL processes or procedures for establishing roles and responsibilities where project team personnel are matrixed from multiple organizations.
- The PHA document development process is sufficiently complicated that responsibility for learning the process is frequently delegated to one individual in the organization, who then develops all PHAs for the organization.
- No one project team member or organizational ES&H coordinator was assigned responsibility for ES&H issues for the project. A policy has been developed and is in review that clarifies and assigns ES&H roles and responsibilities in technical projects. The PHA process is also being simplified and streamlined.

Another event occurred while maintenance was being conducted on an overhead crane system in the HCF. Later, when exiting the HCF radiation monitoring station, one of the two contract service workers had a radioactive particle on the sole of one boot. Contamination surveys of the work area were conducted. An unposted high radiation area was discovered on the top of the shielded glove boxes in the general area where the workers had been working. Analysis of personal dosimeters showed small exposures for both of the workers (< 20 mrems).

A comprehensive post-event survey did not identify any significant radioactive contamination but, it did re-identify sources of radiation "streaming" where the manipulators penetrated the glove box top. The survey identified:

- Less than adequate monitoring of out-of-service equipment and programmatically inactive facilities
- Lack of preservation of the knowledge of potential radiation hazards from programmatically inactive equipment
- Lack of communication and action to adequately protect against radiation relative to work performed in normally unoccupied areas
- Less than adequate facility-specific training of the radiation protection staff; especially with regard to transfer of responsibilities
- Inadequate definition, communication, and performance of the roles and responsibilities of all parties involved with HCF operations.

Since then, in order to clean up legacy waste materials, the boxes have been decontaminated, the lead has been removed, and personnel have been retrained to the satisfaction of SNL/NM and KAO.

A review of the Computerized Accident/Incident Reporting System (CAIRS) data (1990-1994 and the first three quarters of 1995) showed that AL's accident, loss, injury, and illness rates are generally higher than other DOE sites, and do not in most cases compare favorably with the DOE averages. Because CAIRS does not provide definitive data by site, AL performance should be used only as a indicator of safety management effectiveness at AL sites and not necessarily descriptive of SNL/NM. For example, out of the 20 DOE field organizations:

- AL ranked in the top half of the field offices for the highest rates in all three categories (lost workday case [LWC] rate, lost work day incident [LWI] rate, total recordable case [TRC] rate) for every quarter in 1995.

- The injury/illness TRC rate has improved since 1990-1994, but has shown an increase in each of the first three quarters of 1995.

There were 175 occurrence reports submitted by SNL/NM from 1993 to 1995 (as of May 7, 1996). Of these 175 occurrences:

- The nature of occurrence was identified as a facility condition in 97 of the occurrences, environmental was identified in 32 of the occurrences, and safeguards and security was identified in 15 occurrences.

- The direct cause of the occurrences was divided among personnel error, 39 percent; equipment/material failure, 37 percent; and management problems, 3 percent.

- The contributing cause of the occurrences was apportioned among management problems, 21 percent, personnel error, 13 percent, and equipment/material failure, 3 percent.

- The root cause of the occurrences was identified as management problems in 45 percent of the occurrences, equipment/material failure was identified in 45 percent of the occurrences, and personnel error identified in 17 percent of the occurrences.

SNL reports that the number of occurrences has steadily decreased over the period 1993 through 1995.

Facility Safety Program

DOE studies conducted during the 1993-1994 period identified some deficiencies in chemical safety, spent fuels vulnerability, and plutonium vulnerability. The DNFSB also identified emergency preparedness weaknesses during the emergency response exercise "Rubble Glow."

A DOE Chemical Safety Vulnerability Study in September 1994 identified three deficient areas:

- Inadequate integrated work control of maintenance and construction activities in multiuser facilities. Eight service organizations from different research and matrix support groups were identified, each of which may be involved with maintenance functions in a single facility. Although these organizations each have their own effective safety procedures, their approaches to work control vary. There was no clear indication that work is being controlled in a fully integrated manner to ensure chemical safety, or that chemical-related work procedures are uniformly applied, or well coordinated.

- Weaknesses in, and lack of integration among, the SNL/NM programs for identifying, characterizing, and mitigating chemical hazards. SNL/NM has not implemented integrated and effective programs for the identification, analysis, and mitigation of chemical hazards. Sufficient rigor is not always applied commensurate with the level of hazard. Facility maintenance and design engineering processes do not ensure a level of safety review, approval, and testing commensurate with the consequences of failure, or with the risk involved. Plans for emergency

preparedness are not always kept current, differ in quality and usefulness, and do not necessarily correlate to the hazards present.

- Inadequate configuration management in aging laboratory facilities. For example, inadequate configuration management in an aging SNL/NM hazardous-chemical-containing laboratory complex has resulted in the gradual degradation of essential utility and ventilation systems. The chemical research laboratories undergo many small-scale modifications that are not normally funded for full system engineering evaluations during the design phase. The problem is exacerbated by the many independent tenant organizations attempting to exert control over portions of the building without a responsible individual who is cognizant of and controls all facility operations and maintenance activities. As a result, there is a significant potential for the exposure of laboratory personnel to hazardous chemicals when essential ventilation and other equipment fails.

In response to the above, SNL/NM developed a corrective action plan with multiple milestones that have been approved by KAO.

A Plutonium Vulnerability Study in September 1994 recorded two issues of concern: lack of safety authorization basis for the material storage facilities, and the storage of an uncharacterized package containing a plutonium metal disk. The package in question, containing a single 2,000 gram piece of metal, was believed to be packaged in a welded can, which in turn was packaged in a food pack can. This package was stored in a 2R container within a 6M shipping drum. This package was inspected, characterized, and repackaged in the fall of 1995 and was shipped to LANL in May 1996. During the inspection, a radiograph was taken and no oxidation was found to exist.

SNL reports that the corrective actions for the plutonium vulnerability study have been completed.

A Spent Fuel Study in October 1993 identified several deficiencies. These deficiencies have been corrected as follows.

The lack of current, approved safety analysis for spent fuel and reactor irradiated nuclear material storage at Manzano. Bases for interim operations (BIOs) were prepared to include fuel storage. The Manzano facility has a safety analysis report (SAR) and technical safety requirement (TSR), which were submitted to DOE in February 1996.

The current safety analysis for the Sandia Pulse Reactor includes the yard storage area.

During exercise "Rubble Glow," May 17, 1995, the DFNSB concluded that SNL marginally demonstrated its ability to respond to emergencies. DNFSB cited weak command and control. Treatment of casualties was slow, accountability of personnel was ineffective, a hazard/consequence assessment was not completed, misinformation was not corrected in a timely manner, and the Joint Information Center did not have the resources to keep the public adequately informed. Defense Programs evaluated the exercise and reported similar weaknesses; however, none of the weaknesses were categorized as “deficiencies” (violations of DOE order requirements).

SNL/NM responded to DOE on November 22, 1995, listing their proposed corrective actions for the exercise "Rubble Glow."

3.0 SITEWIDE ES&H ISSUES

3.1 ISSUE DESCRIPTIONS

Sitewide Issue 1: Safety Analysis

Development, documentation, and implementation of a comprehensive safety analysis program at SNL/NM continue to need improvement. Several nuclear facilities at SNL/NM do not have approved safety analysis reports in accordance with DOE Order 5480.23. Two of the five nuclear facilities have a DOE approved safety evaluation report.

DOE's 1993 Multiprogram Laboratory Appraisal of Sandia identified weaknesses in SNL/NM'S safety analysis program and rated it marginal. The appraisal noted that three of five findings from a 1991 appraisal remained open. KAO noted that although SNL/NM was pursuing closure of an approved DOE action plan, the protracted response to these findings did not indicate a strong management commitment to development of a comprehensive safety analysis program had been made. The need for an SNL policy regarding safety analysis has been identified in three separate DOE appraisals.

A June 1993 appraisal of the safety analysis program by the AL Safety Programs Division (SPD) resulted in an additional significant finding. In August 1993, an action plan for this finding was forwarded to KAO within 30 days.

SNL's SAR/TSR upgrade plan, stated that upgraded SARs would comply with DOE Order 5480.23. However, KAO noted that the upgraded SARs submitted to DOE for the ACRR and the Sandia Pulse Reactor (SPR) had minor data gaps in meeting the DOE information requirements. These deficiencies were weaknesses in the draft SARs.

An October 24, 1994, memorandum from the KAO Manager to SNL/NM Organization 10100 noted that the quality of the nuclear safety documentation developed by SNL/NM during the year had been inconsistent. An unreviewed safety question determination (USQD) for the cracked plates at the SPR was timely, thorough, and logical. However, the facility modification request for the SPR plant protect systems upgrades had gaps in its design analysis. Similarly, SNL/NM developed, on very short notice, a stand-alone BIO for the Low Intensity Cobalt Array; but in a similar situation, SNL/NM submitted a BIO to DOE for the Manzano Nuclear Materials Storage Bunkers that relied primarily upon a PHA. KAO found the PHA to be weak and requested that it be rewritten. The PHA was rewritten following the guidance in DOE-SRD-3011--94 (which was not available until November 1994). The PHA was submitted with the BIO in July 1995.

In the fall of 1995, sources were transferred from the Low Intensity Cobalt Array facility to the Old Gamma Irradiation Facility (OGIF), and the Low Intensity Cobalt Array facility was downgraded to a radiological facility.

In a memorandum from AL on July 18, 1995, DOE approved the SNL/NM SAR Implementation Plans, including related BIOs for ACRR, the Hot Cell, and SPR III. Approval of the Manzano Storage BIO awaits DOE review. DOE has issued Standard 3011-94, which specifies the format and content of SAR Implementation Plans and BIOs. AL intends direct transition from SAR implementation plans for rules without additional revision. SNL/NM submitted an updated implementation schedule in March 1996. AL has provided comments on the revised BIOs for OGIF and Manzano bunkers. A new GIF preliminary SAR was submitted, and AL has provided comments.

At a result of attention by KAO and SNL the process to update safety authorization bases is good and is being implemented in accordance with the schedule.

Sitewide Issue 2: Conduct Of Operations

KAO identified that SNL/NM was not effectively implementing conduct of operations elements. Issues include the achievement of consistent performance by qualified personnel using approved procedures, and management involvement assessing and monitoring the workplace.

KAO conducted a performance-based conduct of operations assessment of explosive activities at SNL/NM April 11-15, 1994. The assessment determined that implementation of conduct of operations at SNL/NM was not making expected progress. The assessment noted that senior management's commitment and support were not apparent at the middle-management and working levels. Specific issues identified include:

- The current program being used to implement a comprehensive conduct of operations program at SNL/NM was not significantly different from the previously unsuccessful program.

- The procedures for explosive operations were generally not in accordance with the DOE explosive safety manual, DOE Order 5480.19, and SNL/NM guidance.

- Training of personnel involved in explosives handling and operations did not meet all requirements of Chapter 5 of the DOE explosive safety manual and Appendix F of the SNL/NM explosives safety manual.

- There was no formal management oversight system for review and approval of explosives process changes or for new or unusual explosive operations.

- Internal audits were not conducted by line managers, supervisors, and operators as required,

- Operational logs were generally inadequate and not in accordance with requirements.

- Only one facility was observed to have a formalized required reading program in accordance with requirements.

- The requirements for personnel accountability and warning systems varied among facilities.

- Practices were noted that were not consistent with DOE hoisting and rigging manual requirements.
- Explosive hazardous wastes were not removed from collection points on a regular basis as required. This assessment noted that the specific issues identified during the KAO explosive safety conduct of operations assessment were indicative of the general problems experienced by SNL/NM in implementing the conduct of operations program. Many topics included in this assessment had been identified in previous reviews, investigation reports, and occurrences.

In response to the above, SNL completed a corrective action plan that was reviewed and accepted by KAO on May 23, 1995.

During a subsequent conduct of operations assessment conducted March 6 through October 1995, KAO again determined that conduct of operations implementation and philosophy at Technical Area-V (TA-V) was not fully developed and was inconsistently applied among facilities. The assessment noted resistance toward conduct of operations principles, rather than a recognition of the benefits in using the principles to improve operations.

The KAO assessment further noted that senior Laboratory management commitment, involvement, and support were not applied consistently to ensure performance and critical self-evaluation down through the worker level.

The 1995 assessment also determined that area management had not developed teamwork and coordination within TA-V, and with outside organizations through involvement, coaching, and mentoring. Selected assessment findings include:

- The facilities at TA-V have each implemented some parts of conduct of operations, but they lack a consistent, coordinated program that supports all operations and activities.

- TA-V did not consistently coordinate facility operations and maintenance activities, nor was adequate coordination provided for organizations performing work in areas that could impact area operations or activities.

- The Departmental procedure and instruction program was not implemented in a consistent manner.

- Procedure use and the level of compliance with procedures was inconsistent. The lockout/tagout procedure did not follow the requirements specified in the SNL/NM ES&H manual, nor was it consistently implemented in the TA-V facilities.

KAO noted that senior SNL/NM managers support the principles of conduct of operations, but that additional attention was needed to instill these principles at the working level. In an effort to improve, SNL/NM is piloting a new program in explosives safety conduct of operations that will eventually be expanded to the entire Laboratory.

While the effectiveness of these initiatives can only be judged over time, interviews with KAO personnel indicate the initial results are promising, as evidenced by SNL/NM's buy-in and ownership of the new conduct of operations program in explosives safety. The recently published Multiprogram Laboratory Appraisal (February 5, 1996) confirmed that improvement is still required in the conduct of operations program. For example:

- The revised conduct of operations implementation plan was delivered to DOE; however, a number of milestones in the plan have not been met, including development of a detailed line implementation process, development of conduct of operations implementation guides, and the development and implementation of training.

- Although the documentation of the conduct of operations program at Sandia is well under way, line implementation of the principles is lagging. SNL management has not effectively addressed this concern, and the SNL conduct of operations program has yet to be published.

Sitewide Issue 3: Construction Safety

Chronic and severe deficiencies exist in subcontractor construction safety at SNL/NM. Improvements achieved during 1993 and 1994 are not yet sufficient and have not been sustained:

A June 1993 KAO assessment of the SNL/NM construction safety program concluded that the program had improved since the last appraisal conducted in 1991. KAO further stated that the construction safety program generally met the requirements of DOE Order 5480.9 and Occupational Safety and Health Administration (OSHA) standards. The appraisal did find that line organization construction-related service contracts were not receiving sufficient safety oversight. An action plan was submitted and found to be acceptable. Statements contained in the appraisal noted that construction projects, other than service contracts, were receiving a high level of safety oversight.

In the fiscal year 1994 Multiprogram Laboratory Appraisal, KAO noted that numerous compliance safety inspections and worksite surveillances were conducted during the year. However, during KAO inspectors' visitations they again observed worksite and management discrepancies that are routinely associated with active construction sites (i.e., scaffolding, workplace lighting, fall protection, personal protective equipment, and hoisting and rigging).

KAO further noted that SNL/NM has made a concerted effort to increase construction safety inspections, thus reducing the types and numbers of discrepancies. This action reflects a change in Sandia focus from reactive, rote documentation to a proactive approach. The change in focus resulted in an observed decrease in violations of construction safety criteria.

KAO also noted that large project construction contractors had fielded full time, onsite safety personnel in response to the increased pressure by SNL/NM. Improvements in worksite conditions and work practices were attributed to this action, and the appraisal noted that a strong, continuing effort was being maintained. Sandia has one of the largest ongoing construction efforts, with an

incident rate of about one half that of the industry average.

In July 1995, the Office of EH Residents conducted a surveillance of DOE's oversight and management of the construction safety program at SNL/NM. During their surveillance, the EH Residents concluded that chronic and severe deficiencies continued to exist in construction subcontractor safety at SNL. A review of KAO and SNL/NM inspection documentation and interviews with their construction safety technical specialists suggest that both organizations were aware of the persistent programmatic problems associated with construction safety. However, KAO had not been successful in assuring that the level of safety at subcontractor construction sites consistently met the Department's expectations. In 1994 the I/Os and construction safety engineer logged over 2,900 OSHA violations. For fiscal year 1995, the inspection team logged 2109 violations, 2803 jobsite inspections that averaged to 233 documented inspections per month.

The fiscal year 1995 AL Multiprogram Laboratory Appraisal stated that improvements had been made during the year; repeat findings did occur during construction safety inspections; and additional enforceable contract language is required to impress on the contractors the need for providing a safe and healthful workplace for construction personnel.

SNL/NM disagrees with the EH Residents' conclusion in this area. They believe that SNL has implemented a sound subcontractor construction program.

Sitewide Issue 4: Radiological Control

Weaknesses exist in the SNL/NM implementation of the radiological control program. DOE appraisals and assessments have identified numerous programmatic deficiencies requiring SNL/NM management attention and resolution.

During 1994, the SNL/NM Multiprogram Laboratory Appraisal noted that the Sandia radiological protection program is in the process of implementing various programs required to meet the DOE Radiological Control (RadCon) Manual and 10 CFR 835 implementation schedules. The following programmatic weaknesses were identified in the SNL/NM radiation protection program:

- Deficiencies existed in the SNL/NM RadCon Manual implementation program, including not issuing the SNL/NM site specific RadCon Manual to line organizations.

- Development of the radiological technical basis document needed to be expedited. Without this document, the entire implementation plan for radiological control could not proceed because SNL/NM organizations did not know what radiological hazards to protect against. Of special importance is that the radiological technical basis document identify the radioisotopes to be monitored by the internal dosimetry program.

- Training of radiological control technicians (RCTs) to meet the requirements of the RadCon Manual was not completed.

- Radiological operations were identified in numerous field observations and in the DOE Headquarters Assessment as deficient.

- Compensatory actions were not developed and implemented for those RCTs who received poor results on the SNL/NM basic skills placement examination.

- The internal dosimetry program lacked a documented technical basis.

- Inconsistent or poor contamination control and posting/labeling practices were identified.

- The radiation generating devices program mandated by DOE Order 5480.4 was being implemented slowly.

In response to a series of radiological incidents, on May 5, 1995, SNL/NM and KAO management impaneled a joint investigation team (JIT) to investigate the common precursors and failures for the events. The final report was published on July 5, 1995.

The JIT found that the control of radiological hazards at SNL/NM is impacted by a culture that permits non-compliance with established policies and procedures and impedes required communications between line organizations and radiation protection personnel. For example, during the JIT review, evidence of numerous violations of commonly accepted, standard industry radiation protection practices were identified. Pre-planning was performed without an adequate assessment of the radiological condtions associated with the work, and in three of the four occurrences reviewed, pre-planning was performed without the knowledge or participation of the radiation protection organizations (RPOs). Lack of pre-planning and disregard for compliance precludes effective implementation of the As Low As Reasonably Achievable (ALARA) process. In addition, occurrence investigations of the events reviewed, did not adequately identify root causes, therefore, the recommended corrective actions are not effective. Without appropriate recommendations, recurrence of these events is likely.

While these problems are serious and must be dealt with promptly, the radiation protection infrastructure at SNL/NM is sound, and since most problems result from failure to comply with procedures, solutions to this problem should minimally impact funding. Through a more effective teaming of KAO, SNL/NM RPO, and all levels of line management, the necessary culture changes can be affected, and progress toward that end is on-going.

SNL has completed its technical base documentation, trained its technicians, and issued Radiological Protection Procedures and Radiological Control Manuals. In December 1995, the Executive Vice President and Deputy Director issued a letter to SNL/NM line management emphasizing that it is their responsibility to assure compliance with 10 CFR 835. KAO recognizes SNL's intent to comply; however, KAO continues to see weaknesses in line management performance in this area. KAO's Certified Health Physicist is partnering with SNL/NM to change the safety culture.

Notable improvements have been made during the last nine months in the implementation of the radiation protection program at SNL/NM, including letters of commendation from DOE on the radiological assistance program, dosimetry programs, and instrumentation maintenance and calibration programs. Other notable improvements include:

- The waste management and environmental restoration programs had notable success in implementing radiological controls, including the startup of the Radioactive and Mixed Waste Management facility.

- Preplanning for radiological activities in TA-V have achieved significant dose savings during recent high exposures activities.

- Facilities management improved the implementation of radiological programs at other DOE sites.

3.2 SITEWIDE ISSUE STATUS

Table 1 characterizes sitewide issues in terms of an issue statement, primary concerns, site activities, and a progress evaluation.

4.0 KEY FACILITIES

4.1 FACILITY MISSION

Microelectronics Development Lab (MDL) Building 858

The MDL provides microtechnology development and engineering capabilities to support programs in the national interest. The MDL is used for the fabrication and study of radiation hardened microelectronics and the physics underlying their per-formance, design, and manufacture. The silicon microelectronics projects currently under way in the MDL will support future Defense Programs work in radiation hardened integrated circuits, smart sensors, advanced packaging, and smart micro-mechanical devices. The integrated circuitry technology used for these projects is a modified version of SNL/NM's radiation hardened technology. The MDL serves as an alternative supplier of radiation hardened circuits for government applications.

The MDL emergency response center (ERC) is located in the office space adjacent to the north side of the clean rooms. The ERC houses the toxic gas detection analyzers, hydrogen gas detection control panel, fire alarm data gathering panel, uninterruptible power supply (UPS), a computer display of the status of these units, their monitoring points, and the switchboard for activating automatic equipment shutdowns and auto dialers in the event of an alarm detection.

Building 893, Laser Physics Laboratory

This laboratory is used to investigate the physics of compound semiconductors and lattice structures. The facility also supports the fabrication of optoelectronic and digital compound semiconductor devices for both research and prototyping purposes. The building houses the Compound Semiconductor Research Laboratory (CSRL). Advanced research and development will be conducted at the CSRL in the areas of high speed electronics, microwave control circuits, laser arrays, infrared detectors, and nonvolatile memories.

Table 1. Sitewide Issues

ISSUE	PRIMARY CONCERNS	SITE ACTIVITIES	PROGRESS EVALUATION
1. The development, documentation, and implementation of a comprehensive safety analysis program at SNL/NM continues to need improvement	Early safety assessments for SNL/NM did not address the maximum quantities and forms of hazardous materials possessed, utilized, or stored in facilities as required; safety assessments did not include a documented evaluation of the adequacy of the preventive or mitigative design features and administrative controls to limit this risk as required. The USQD for the SPR plant protection system upgrades had gaps in its analysis. SNL/NM submitted, in March 1995, a BIO for the Manzano Nuclear Storage Bunkers to DOE that relied primarily upon a PHA. Subsequently, KAO found the PHA to be weak and requested that it be rewritten. A revised BIO has been submitted.	KAO management will work with SNL/NM to develop new or updated safety analyses for SNL/NM facilities with potential hazards. Nuclear facilities are a current priority at the site due to DNFSB oversight and a proposed nuclear safety rule on SARs. SNL Risk Management and NEPA Department (Organization 7315) has received additional resources and is improving the quality and timeliness of submittals Regular meetings between SAR/Technical safety requirements authors and DOE/AL reviewers. Annual SAR updates are planned. The Annual USQD Negative Summary Report was submitted in January 1996.	KAO noted improvement in SNL/NM's submission of safety documentation. However, based upon sampling during various assessment activities, KAO concluded that SNL/NM needs to place more emphasis on consistently delivering quality safety documentation for the preliminary hazard assessments. All nuclear facility SARs have been submitted to KAO. **(updated 5/96)**

Table 1 (cont'd). Sitewide Issues

ISSUES	PRIMARY CONCERNS	SITE ACTIVITIES	PROGRESS EVALUATION
2. Conduct of operations principles have not been consistently implemented at SNL/NM.	Achievement of consistent performance by qualified personnel using approved procedures; management involvement in assessing and monitoring the workplace.	KAO has stated that DOE will assist SNL/NM in implementing conduct of operation principles at the operating level in SNL/NM facilities. KAO Facility Representatives will oversee the degree to which this is being accomplished. A conduct of operations manual has been completed for TA-V and orientation training was conducted on 4/17/96, with an expanded followup training program. The SNL Defense Programs Production Activities developed a Conduct of Operations Manual and are in the process of implementing it. A schedule for development and issuance of a laboratory level program policy and manual for conduct of operations has been revised. SNL/NM is piloting a new program in explosives safety conduct of operations that will eventually be expanded to the entire Laboratory.	Interviews with cognizant KAO personnel indicate that SNL has issued a Conduct of Explosive Operations Manual. As part of the implementation, line organizations have nearly completed the first round of annual self-assessments. **(updated 5/96)**

Table 1 (cont'd). Sitewide Issues

ISSUE	PRIMARY CONCERNS	SITE ACTIVITIES	PROGRESS EVALUATION
3. Chronic and severe subcontractor construction safety deficiencies have been noted at SNL/NM.	Both KAO and SNL/NM were aware of the persistent programmatic problems associated with construction safety; however, KAO had not been successful in assuring that the level of safety at subcontractor construction sites consistently met the Department's expectations.	In 1994: • SLN/NM increased safety inspections and changed the inspection process to be more proactive. • Large project contractors fielded full-time onsite safety personnel. SNL plans to visit Oak Ridge to discuss contract methods to improve compliance. SNL has been tracking construction violations for three years to understand subcontractor performance. KAO is making a determination of the number of safety personnel to be onsite during the project planning process. This will then be reflected in the Request for Proposal. The EH Residents' surveillance report was transmitted to the KAO on 7/27/95, and a formal response was received.	Increased safety inspections have reportedly decreased the number and type of safety discrepancies. Improvements in worksite conditions and practices are attributed to the fielding of contractor safety personnel. SNL reports that construction-related lost time injury rate has been running less than half the national average. A 1995 EH Resident review indicated that similar subcontractor safety discrepancies still exist. **(updated 5/96)**

Table 1 (cont'd). Sitewide Issues

ISSUE	PRIMARY CONCERNS	SITE ACTIVITIES	PROGRESS EVALUATION
4. SNL/NM's implementation of the radiological control program has been deficient.	Failure to follow radiological control procedures in the field.	KAO indicates that DOE will work with SNL/NM overseeing their progress toward implementing an effective radiological control program.	Occurrence investigations of the events reviewed did not adequately identify root causes; therefore, the recommended corrective actions are not effective. Without appropriate recommendations, recurrence of these events is considered likely by the joint investigation team. The KAO health physicist has been partnering with the SNL Radiation Protection Organization during the last six months. KAO has noted improvement in the program and program implementation. **(updated 5/96)**

Building 905, Explosive Components Facility

These laboratory spaces are devoted to the routine testing of explosives and explosive devices, neutron generators, and batteries. Chemical and material analyses are performed in some of the laboratory spaces; in others small amounts of explosives or pyrotechnics are initiated inside self-contained test chambers. The firing pads are designed to withstand the effects of detonations of up to 1000 grams of explosives. The pad walls, ceiling, and floor in the vicinity of the test are lined with steel plates to preserve the concrete surfaces. The High Explosive Chamber rooms contain chambers for testing charge weights up to 1000 grams.

Building 981, Saturn Accelerator

This particle beam fusion accelerator facility supports nuclear weapon effects testing and mission in x-ray lasers and radiation flow experiments for weapons physics, and for inertial confinement fusion experiments.

Building 983, Particle Beam Fusion Accelerator II (PBFA II)

This building is used as laboratory space to generate intense ion beams in support of the inertial confinement fusion program. It has produced a lithium ion beam with 10 million volts of kinetic energy and has focused this beam to a world's record intensity of 1.5 trillion watts per square centimeter, resulting in a specific power deposition of 1500 trillion watts per gram.

Building 970, Simulation Technology Laboratory

This facility is used to evaluate radiation effects on materials. The facility contains two operating accelerators. Hermes III is a 22 MeV, 730 KA gamma ray simulator that can deliver $5x10^{12}$ rads during a nanosecond pulse. SABRE operates at 10 MeV and 250 KA and produces a 50 nanosecond pulse.

Building 6580, Hot Cell Facility (HCF)

The HCF is located in TA-V, in the basement of Building 6580. It consists of the Hot Cell itself, which contains the steel confinement boxes; the glove box laboratory; ancillary analytical equipment; support areas; and fissile- and radioactive-material storage areas. The HCF primarily conducts and supports research and development activities. Therefore, the types and quantities of materials handled, the operations carried out, and the types and quantities of wastes produced vary from project to project. In addition to routine research support operations, the building is planned to support medical isotope production (Mo-99) in the near future.

The Hot Cell contains three steel con-finement boxes and a shielded support area, and provides SNL/NM with an onsite capability for working with experiments and materials containing up to a nominal maximum of 6000 Ci of fission products and 500 Ci of plutonium or other fissile material.

This facility is designed to permit safe handling and experimentation with SNM, both irradiated and non-irradiated. Research programs at SNL/NM--material studies, fuel studies, and safety studies--require that experiments containing radioactive materials be assembled and/or disassembled, samples prepared, and microscopic and chemical analyses performed.

Building 6588, Annular Core Research Reactor(ACRR)/Old Gamma Irradiation Facility (OGIF) Pool

The ACRR, located in TA-V, is a pool-type reactor capable of both pulsed and steady state operation, and tailored transient rod withdrawal. Its primary function is to test electronics, materials, and fissile components.

Also housed in this building is the OGIF, which consists of two adjoining irradiation cells. The sources provide a variety of radioactive source geometries for irradiating experiments. The

OGIF contains approximately 150,000 Ci of Co-60 and is used mainly for radiation certification of satellites and weapons systems, electronic components, dosimetry calibration, and radiation damage to materials studies.

The ACRR has been proposed for use in future medical isotope production (Mo-99). The ACRR has been in operation since 1978, performing 6000 operations without incident. The reactor is operated in two basic modes: 1) short duration steady-state power (2 megawatts maximum), and 2) fast pulses. Typically, the maximum yield for pulse operations is in the range of 300 megajoules. The reactor is designed to produce a high yield of epithermal neutrons in the central radiation cavity over a very short time range.

Building 6590, Sandia Pulse Reactor Bldg. (SPR) SPR II, SPR III

This facility is located in TA-V. The SPR II and SPR III reactors provide a unique, near-fission-spectrum radiation environment in which to test a wide variety of technologies that support defense and non-defense activities. The primary mission of the facility is to meet high neutron fluency or pulsed high dose requirements in the testing of electronic subsystems and components.

Two fast burst reactors are presently operated at the SPR facility. The reactors are similar in design, construction, and operation, and are designated SPR II and SPR III. The operational characteristics and modes of operation of the two reactors are essentially the same, the principal difference being that SPR III has a larger central irradiation cavity than SPR II. SPR II has been operational since 1966 and has performed over 8,000 operations; SPR III has been operational since 1975. performing over 10,000 operations without incident. The reactors are operated in two basic modes: 1) short duration steady state at low power (a few kilowatts), and 2) fast pulses. Typically, the maximum yield for pulse operations is in the range of 68 megajoules. The reactors were designed to be operated from the same reactor control console. With only one control console, only one reactor can be operated at any one time. The nonoperational reactor is placed in temporary storage when not in use.

In addition to routine research, the SPRs are used to support work-for-others activities.

Manzano Storage Facilities

These structures are authorized to store nuclear material and waste. The classified nuclear and radioactive materials (fissile and non-fissile) are stored on a long-term basis. No Sandia personnel are permanently assigned to Manzano. The structures are visited randomly several times a week and inspected at least once a month.

The Manzano facilities currently used for nuclear material storage includes structures 37045, 37055, 37057, 37063, 37078 and 37118. The material in these bunkers is currently being designated as either radioactive waste or non-waste material. The non-waste material in these structures will be relocated to structures 37003, 37007, 37008, 37010, 37011 and 37012 sometime in the future.

Activities are under way to reduce SNL's inventory of nuclear materials. In November 1994, Laboratory Services Division directed that a comprehensive Corporate Surplus Nuclear Material Disposition Plan be prepared. The plan identifies surplus nuclear material and make disposition recommendations to DOE. Several items have already been identified as surplus, and activities are already under way to: donate approximately 10 metric tons of usable depleted uranium metal to Manufacturing Sciences Corporation in Oak Ridge, Tennessee; dispose of approximately 12 metric tons of unirradiated thorium oxide; request authorization to advertise the availability of fresh nuclear reactor fuel from the retired nuclear freighter, Savannah; and to return several PuBe sources to Los Alamos National Laboratory. If the activities to reduce

the SNL/NM inventory are successful, this may lower the inventory in each structure to below Hazard Category 3.

A BIO was submitted as part of the SNL/NM SAR upgrade implementation plan, dated September 30, 1993. Comments were received in a memo on SAR/TSR upgrade plan for SNL/NM, from KAO to SNL/NM organization 10100, dated August 25, 1994. The main comments addressed the lack of analyses. Accident analyses that were not available for the September 30, 1993, BIO were completed and are included in the July 1995 revision to the BIO. The July 1995 BIO describes the facility, identifies hazards, describes the controls in place to reduce risk, and identifies the controls that must be developed. The BIO presents reasonable arguments and explanations that provide assurance that the facilities under consideration can be operated at an acceptable level of risk, until it is determined whether the facilities will remain a nuclear facilities or whether steps that are being taken to will be sufficient to reduce the inventory to below Hazard Category 3. A BIO, SAR, and TSR have been submitted to DOE for approval.

4.2 FACILITY SUMMARY

Table 2 summarizes key facility characteristics, including status, hazard classification, authorization basis, worst case design basis accident, and principal hazards and vulnerabilities.

Unless otherwise noted, worst case design basis accidents were not available. The data in this column of the table represent an unmitigated event, using the highest risk, highest consequence preliminary hazard analysis scenario.

5.0 PERFORMANCE MEASURES

This section is under development and will be presented in future versions of the site profile.

Table 2. Facility Summary

KEY FACILITY	STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN ACCIDENT BASIS	PRINCIPAL HAZARDS AND VULNERABILITIES
Microelectronics Development Lab (MDL) (Building 858)	Operational	Low hazard class . Safety analysis 1993; hazards assessment document (HAD), June 1995. EH Resident disagrees with the low hazard class determination	A bulk HCl leak could result in "immediately dangerous to life and health" concentration for a radius of 0.8 miles out from MDL.	**Hazards:** The major facility hazards involve the handling, use, movement, and storage of numerous toxic and/or hazardous materials. These include ammonia, ammonium hydroxide, arsine, boron trifluoride, carbon monoxide, chlorine, chloroform, diborane, fluorine, hydrochloric acid, hydrofluoric acid, hydrogen bromide, hydrogen peroxide, nitric acid, nitrogen trifluoride, nitrous oxide, phosphine, and silane.
Laser Physics Laboratory - Building 893	Operational	Low hazard class EH Resident disagrees with the low hazard class. A hazard assessment document has been developed and is in SNL internal review.	Not reported, but the postulated worst-case accident for this facility involves the release of arsine with onsite health consequences.	**Hazards:** High voltage, laser dyes, toxic gases, and acids.

Table 2 (cont'd). Facility Summary

KEY FACILITY	STATUS	HAZARDS CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN ACCIDENT BASIS	PRINCIPAL HAZARDS AND VULNERABILITIES
Explosive Components Facility - Building 905	Operational	Moderate hazard class. Safety assessment were approved July 31, 1995. Individual readiness assessments have been conducted on 90 percent of the laboratories.	Unintentional detonation resulting in up to four local fatalities. No significant offsite release.	**Hazards:** Shipping, receiving and storage of explosives, pyrotechnics, and propellants; physical and chemical testing of explosives, pyrotechnics, and propellants; neutron generator research, development, and testing; battery research, development, and testing; stockpile surveillance activities involving explosives, pyrotechnics, and propellants.
Saturn Accelerator - Building 981	Operational	Accelerator: Low hazard class. Updated safety analysis document was submitted to DOE on September 29, 1995 for review. DOE approval has not been received.	Earthquake and local fire.	**Hazards**: Major hazards include high voltage, various types of radiation, noxious or hazardous gases and gaseous products, high pressure systems.
Particle Beam Fusion Accelerator II (PBFA II) -Building 983	Operational	Low hazard class. A preliminary hazard assessment was approved July 18, 1995.SAD submitted 3/21/96.	Earthquake and local fire.	**Hazards:** Major hazards include high voltage, various types of radiation, noxious or hazardous gases and gaseous products, high pressure systems, and class IV lasers.
Bldg. 970 Simulation Technology Laboratory, Hermes III, Sandia Advance Beams Research Experiment. (SABRE)	Operational	Accelerator: Low hazard class. Updated SADs for HERMES III (9/15/95) and SABRE(10/12/95) were submitted to DOE for review. DOE approval has not been received.	Earthquake and local fire.	**Hazards:** Major hazards include high voltage, various types of radiation, noxious or hazardous gases and gaseous products, high pressure systems, and class II lasers.

Table 2 (cont'd). Facility Summary

KEY FACILITY	STATUS	HAZARD CLASSIFICATION/AUTHORIZATION BASIS	WORST CASE DESIGN ACCIDENT BASIS	PRINCIPAL HAZARDS AND VULNERABILITIES
Hot Cell Facility (HCF) - Building 6580	Operational	Hazard category 2 non-reactor nuclear facility. SAR dated October 14, 1994; DOE/AL provided comments to SNL in June 1995; BIO was approved by DOE/AL July 18, 1995. DOE comments on SAR are being resolved.	A fire in the steel confinement boxes could result in onsite doses up to 10.6 rem plutonium-bone and 3.6 rem plutonium-lung. No significant offsite dose would result.	**Hazards:** Major facility hazards include exposure to ionizing radiation, airborne radioactive material, reactive metals, criticality, nitrogen, and standard industrial hazards.
Annular Core Research Reactor/Old GIF Pool - Building 6588	Operational	Category B research reactor; hazard-category 2 nuclear facility. AL is currently preparing safety evaluation report. OGIF transferring mission to new GIF. SAR approved May 15, 1996.	Experiment withdrawn during power pulse. The two hour site boundary lung dose may approach 15 rem with an external gamma dose of 0.23 rem.	**Hazards:** The predominant hazards at the ACRR are related to incidents involving source materials. A typical inventory includes 23.9 kg U-235 matrixes as BeO (ACRR fuel in the core); 9.8 kg of U-235 matrixes as ZrH (ACRR fuel in the GIF Pool or FREC II); about 0.5 kg of U-235 (experiments in various storage locations); and approximately 110,000 curies Co-60 in the GIF pool, with a little over 50,000 curies available to either of the two cells. Other hazards associated with the ACRR include potentially high intensity radioactive sources as part of experiments; handling fuel elements; high pressure; and explosives.

Table 2 (cont'd). Facility Summary

KEY FACILITY	STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN ACCIDENT BASIS	PRINCIPAL HAZARDS AND VULNERABILITIES
Sandia Pulse Reactor Bldg. (SPR) SPR II, SPR III - Building 6590	Operational	Hazard category 2; Category B research reactor; nuclear facility. Safety evaluation report issued September 1995. Approved SAR dated September 11, 1995. TSR in SNL internal review.	Inadvertent movement of an experiment during a wait period would result in core damage. Whole body public dose may approach 1.2 rem.	**Hazards**: Possibility of an accidental release of fission products to the environment. The analyses indicate that, for all events, radiation doses at the exclusion radius would be significantly below the limits of 10 CFR 100.
Manzano Storage Facilities	Operational	Hazard category 2 non-reactor nuclear facilities. BIO was updated April 19, 1996 SAR submitted for approval February 23, 1996. TSR submitted for approval.	Fire outside the bunker while transporting material could result in 0.78 rem committed effective dose equivalent at 100 meters, and concentration of some hazardous material in excess of TLV at site boundary.	**Hazards:** The major hazards involve the handling, movement and storage of containerized nuclear and waste materials (criticality, radiation exposure, contamination control, and transportation accidents). Radioactive material includes plutonium, depleted uranium (U-238), lithium enriched in Li-6, normal uranium, deuterium, and thorium.