# Request for Permit Modification

# Units Proposed for NFA

# Volume II

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A Department of Energy Environmental Cleanup Program



Los Alamos
NATIONAL LABORATORY

LA-UR-96-3357

## SWMU 3-050(d) — Potential Soil Contamination From Active Exhaust Stack Emissions

### 1.0 Introduction

### 1.1 Description

SWMU 3-050(d) is potential soil contamination attributed to the emission of the exhaust system (specifically the air pollution control device, a shaker type baghouse) located at the south side of TA-3-102. TA-3-102 is fenced off to maintain security, and radiation signs are posted to indicate that the building is a facility contaminated with radioactivity, specifically low-level concentrations of uranium (LANL no date, 17-424) (Attachment A).

TA-3-102 was built in 1957 specifically for machining uranium-235 and -238. Machining of lithium hydride started in the 1970s and was associated with uranium work for the Rover Program reactor fuel rods.

Because of the pyrophoric characteristics of uranium, it was machined while submerged in water (LANL 1993, 17-999; LANL 1986, 17-003) (Attachments B, C). The water not only prevents the uranium from causing a fire when exposed to the atmosphere but also acts as a primary air pollution control device to minimize uranium graphite particulates from entering the exhaust system. The baghouse was used as a secondary air pollution control device to remove uranium graphite particulates in the gas stream to the stack (Enders 1973, 17-177) (Attachment D). However, lithium hydride, also pyrophoric and explosive, was machined dry. The baghouse was the primary air pollution control device to remove lithium hydride particulates in the gas stream to the stack. In addition, small amounts of metals were machined in this building on occasion, but nonroutinely (LANL 1993, 17-999) (Attachment B).

The baghouse (also known as the lithium hydride exhaust system) was installed when TA-3-102 was built; it is situated on a concrete pad south of TA-3-102. The operation of the baghouse ceased in 1992 due to a failure in the dioctyl phthalate penetration test, which measures the efficiency of the collection system. All ventilation ducts associated with machining operations were then diverted to a high-flow-rate ventilation system connected to an operational baghouse located east of the inactive baghouse. HEPA filter banks are planned for installation in TA-3-102 to control air pollution (LANL 1993, 17-999) (Attachment B).

### 1.2 No Further Action Basis

SWMU 3-050(d) is recommended for NFA because the site has been characterized in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk. Radionuclide air emissions at the currently inactive baghouse stack were monitored from the beginning of its use and are documented (LANL 1994, 17-1008) (Appendix A Attachment 2). Available data showed a total release of 580 µCi of uranium-235 and -238 (LANL 1994, 17-1028) (Appendix A Attachment 3). Normalizing the available data to 37 years of building operations, the total release of uranium-235 and -238 is calculated to be 890 µCi. The EPA-approved CAP88-PC Gaussian model was then used to determine the ground deposition of radionuclides, and results indicate a minimum of 5.7x103 Ci of uranium-235 and -238 would be necessary to cause soil contamination exceeding SALs (LANL 1994, 17-1028) (Appendix A Attachment 3). Therefore, no contamination from routine radioactive air emissions from the baghouse is in excess of SALs. In addition, LANL does not identify locations suspected of radiological only contamination as SWMUs, but as AOCs. This distinction is made because DOE is the regulatory authority for radiological concerns.

Release of radioactive uranium particulates to the concrete pad through the inactive baghouse fabric filter has also been documented; including a uranium spill due to a leak at a weld joint of the ventilation system (LASL 1966, 17-122) (Attachment E). Accumulation of lithium hydride particulates on the fabric filter may have caused spontaneous combustion and burned a hole on the fabric filter, thus allowing particulates to escape (LANL 1993, 17-999) (Attachment B). The concrete pad underlying the inactive baghouse was later painted to immobilize any existing uranium particulates (LANL 1991, 17-292) (Attachment F). Radiological survey results showed no detectable activity on the concrete pad or on the soil around it (LANL 1994, 17-1129) (Attachment G).

The information stated above and in Section 3.0 clearly indicates that there is no potential soil contamination exceeding an acceptable level of risk from the emission of the air pollution control device (a shaker type baghouse) located at the south side of TA-3-102. No potential pathway for the migration of uranium has been identified based on existing data. In addition, due to the high reactivity with water to form lithium hydroxide and the pyrophoric characteristic of lithium hydride, any spill of lithium hydride to the ground would no longer be present.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-050(d) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

## 2.0 History

### 2.1 Historical Operations

The machining of uranium-235, -238, and lithium hydride. Also associated with uranium work for the Rover Program reactor fuel rods.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Document Excerpt, "Contaminated Facilities Currently In Use," (LANL no date, 17-424).

Attachment B: LANL Memorandum, "SWMU 3-050(d) Lithium Hydride Exhaust System," (LANL 1993, 17-999).

Attachment C: LANL Report, "Environmental Surveillance at Los Alamos During 1987," (LANL 1986, 17-003).

Attachment D: LASL Report, "Solid Radioactive Waste Disposal/Storage Current Practices and Procedures," (Enders 1973, 17-177).

Attachment E: LASL Memorandum, "Dust Collector System," (LASL 1966, 17-122).

Attachment F: LANL Memorandum, "TA-3-102 Ventilation System Modification, L. J. 10977-3," (LANL 1991, 17-292).

Attachment G: LANL Report, "Direct Survey of Cement Pad Outside South End of SM-102 and Soil Along Fence April 20, 1994," (LANL 1994, 17-1129)

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

Appendix A Attachment 2: LANL Memorandum, "Available Radioactive Air Emissions Reports Concerning SWMUs 3-050 (a through g)," (LANL 1994, 17-1008)

Appendix A Attachment 3: LANL Memorandum, "Radioactive Air Emissions from TA-3 SM-16, 29, 34, 35, 40, and 102," (LANL 1994, 17-1028).

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

The EPA requires use of CAP-88 (Clean Air Act Assessment Package-1988) or AIRDOS-PC computer models for determining compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAPS) for emissions of radionuclides at DOE facilities (EPA 1995) (Appendix A Attachment 4).

Comparisons made between the CAP-88 predictions of annual average ground-level concentration and actual environmental measurements taken by the Office of Radiation Programs indicate agreement between these two approaches. CAP-88 has been used by the LANL Radionuclide Air Emission Management (RAEM) group to determine the effective dose equivalents for NESHAPS compliance for airborne radionuclide emissions. Meteorological data and most of the radioactive air emission data are obtained from the LANL RAEM group, and those parameters are input to the CAP-88 PC model to calculate the radionuclide ground deposition from TA-3 stack releases. CAP-88 tends to overestimate radiation doses in the complex terrain around Los Alamos because it does not take into account dilution of airborne radionuclides by terrain-induced turbulence.

CAP88-PC uses Pasquill's modified Gaussian plume equation to estimate the average dispersion of stack-released radionuclides. In the CAP88-PC calculation, all the stacks from SWMU 3-050 (d) are considered as one point source of radioactive air emissions due to their geographic locations. Additionally, all radioactive air emissions are assumed in the form of particulates. Heavier annual precipitation, slower stack gas exit velocity, lower mixing height, and lower stack height of one meter were used instead of the actual parameters in the CAP88-PC calculation to ensure conservative results. The release height of the stack is the sum of the stack height and the plume rise. The plume rise is calculated based on momentum of the exit gas at ambient temperature. Meteorological data collected at TA-6 (the nearest meteorological station) and Los Alamos population data were used for the CAP88-PC calculation.

Air concentration, dry deposition rate, wet deposition rate, and ground deposition rate of radionuclides in 16 directions at various distances around the stack were computed. The ground deposition rate is the highest deposition rate, and therefore represents the most conservative radionuclide deposition scenario. For this reason, it is used to calculate the emission necessary to cause the radioactivity concentration in soil to exceed screening action level (SAL). Soil density of 1.8 g/cm$^3$, and 0.1 cm of soil mixing depth were employed to estimate the total emission necessary to cause the radioactivity concentrations in soil to exceed current SALs.

Available annual data on the total known radioactive releases from the associated stacks range from 2 to 40 years. To ensure conservative results, the actual data were normalized in the calculation to show the potential radioactive air emission within 40 years of operation. These values are shown in the table, Radioactive Air Emission Summary, below.

These radioactive releases are at least four orders of magnitude lower than the minimum radioactivity necessary to cause soil contamination exceeding SALs (Radian 1993, 17-1192) (Appendix A Attachment 5).

In addition, actual data from preliminary soil screening results in locations surrounding TA-3 from 1991 through 1993 show alpha, beta, and gamma activities at background levels (Fresquez 1991, 17-259; Fresquez 1992, 17-1026) (Appendix A Attachments 6 and 7).

**RADIOACTIVE AIR EMISSION SUMMARY**

| RADIONUCLIDES | RADIOACTIVE AIR EMISSION WITHIN 40 YEARS OF OPERATION (Ci) | ESTIMATED VALUE TO TRIGGER SOIL SALS[a] (Ci) |
|---|---|---|
| Tritium | 360,000 | $4.8 \times 10^9$ |
| Plutonium-238 and -239 | 0.081 | $7.6 \times 10^3$ |
| Uranium-235 and -238 | 0.0081 | $5.7 \times 10^3$ |
| Mixed fission products | 0.0067 | $2.8 \times 10^3$ |
| Iodine-129/-131 | 0.025 | $8.7 \times 10^2$ |
| Beryllium | —[b] | —[b] |

* Based on 0.1 cm of soil mixing depth.

** No report on TA-3-40 is available; no beryllium data were found; however, in 1955 2 air samples and 14 swipe tests showed negligible amounts of beryllium.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0, 2.0, and 3.0, SWMU 3-050(d) is recommended for NFA under Criterion 5.

## 5.0 References


Enders, J., September, 1973. "Solid Radioactive Waste Disposal/Storage Current Practices and Procedures," Los Alamos Scientific Laboratory Report, Los Alamos, New Mexico. (Enders 1973, 17-177)

Environmental Protection Agency, July 1995. "National Emission Standards for Hazardous Air Pollutants," Code of Federal Regulations, Title 40, Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," Washington, DC. (EPA 1995)

Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Fresquez, P., October 22, 1992. "Collection of Soil Samples at SWMU 3-010(a)," Los Alamos National Laboratory Memorandum EM-8:92-3234 to E. Griggs (CLS-DO) from P. Fresquez (EM-8), Los Alamos, New Mexico. (Fresquez 1992, 17-1026)

Fresquez, P., August 12, 1991. "Results of an Environmental Restoration Interim Action (ERIA) Waste Survey at the Van De Graff Underground Storage Tank Removal Project at TA-3," Los Alamos National Laboratory Memorandum EM-8:91-52 to R. Gonzales (EM-13) from P. Fresquez (EM-8), Los Alamos, New Mexico. (Fresquez 1991, 17-259)

Los Alamos National Laboratory, January 25, 1994. "Available Radioactive Air Emissions Reports Concerning SWMUs 3-050(a through g)," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1994, 17-1008)

Los Alamos National Laboratory, no date. "Contaminated Facilities Currently In Use," Excerpt from unknown document, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL no date, 17-424)

Los Alamos National Laboratory, April 20, 1994. "Direct Survey of Cement Pad Outside South End of SM-102 and Soil Along Fence April 20, 1994," Los Alamos National Laboratory Direct Survey Results, Los Alamos, New Mexico. (LANL 1994, 17-1129)

Los Alamos National Laboratory, May 1988. "Environmental Surveillance at Los Alamos During 1987," Los Alamos National Laboratory Report (LA-11306-ENV), Los Alamos, New Mexico. pp 1, 2, 29 through 36. (LANL 1986, 17-003)

Los Alamos National Laboratory, February 9, 1994. "Radioactive Air Emissions from TA-3 SM-16, 29, 34, 35, 40, and 102," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1994, 17-1028)

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, pp 6-31 through 6-33, 6-34 through 6-36. (LANL 1995, 1291)

Los Alamos National Laboratory, December 14, 1993. "SWMU 3-050(d) Lithium Hydride Exhaust System," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1993, 17-999)

Los Alamos National Laboratory, March 25, 1991. "TA-3-102 Ventilation System Modification, L. J. 10977-3," Los Alamos National Laboratory Memorandum ENG-3/M/91-090 to C. Loggains from A. Bridge (ENG-3), Los Alamos, New Mexico. (LANL 1991, 17-292)

Los Alamos Scientific Laboratory, LASL (Los Alamos Scientific Laboratory), September 8, 1966. "Dust Collector System," Los Alamos Scientific Laboratory Memorandum, SD-6 To R. Headron, from A.M. Zervas, Los Alamos, New Mexico. (LASL 1966, 17-122)

Radian Corp., December 22, 1993. " Air Emission SWMUs," Radian Corp. Memorandum prepared by R. Hueske to OU 1114 Technical Team, Los Alamos National Laboratory, New Mexico. (Radian 1993, 17-1192)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

Section not applicable.

### 6.3 Other Survey/Investigation Data

Section not applicable.

# 3-050(d)

# ATTACHMENTS

## Attachment A ~~5-000424.~~

TABLE V

CONTAMINATED FACILITIES CURRENTLY IN USE

| Tech Area (Fig. 2) | Description | Location Bldg.# | Location Dwg.#[13] | Contamination Category[a] | Radioactive Contaminant(s) |
|---|---|---|---|---|---|
| TA-2 | Omega Reactors | 1 | ENG-R 2409 | M | FP, IA |
| TA-2 | Stack Gas Valve | 19 | " " " | M | FP, IA |
| TA-2 | Equipment Building | 44 | " " " | M | FP, IA |
| TA-2 | Cooling Tower | 49 | " " " | M | FP, IA |
| TA-3 | Van de Graaff Laboratory | 16 | ENG-R 2414 | L | T, IA |
| TA-3 | CMR Building | 29 | " " " | M | TRU, U, FP, IA, T |
| TA-3 | Cryogenics Building"B" | 34 | " " " | L | T |
| TA-3 | Press Building | 35 | " " " | M | U |
| TA-3 | Tech Shop, Rm 42 | 39 | " " " | L | U |
| TA-3 | Physics Laboratories | 40 | " " " | L | T, TRU, FP, IA |
| TA-3 | Source Storage Building | 65 | " " " | L | Ra |
| TA-3 | Sigma Building | 66 | " " " | L | U |
| TA-3 | Tech Shops | 102 | " " " | L | U |
| TA-3 | Rolling Mill Building | 141 | " " " | L | U |
| TA-3 | Liquid Waste Pump House | 154 | " " " | M | TRU, U, FP, IA |
| TA-3 | Shop Storage Building | 164 | " " " | S | TRU, U |
| TA-3 | Acid Neutral. & Pump Bldg. | 700 | " " " | M | TRU, U, FP, IA |
| TA-8 | Betatron Building | 23 | ENG-R 2422 | M | IA, FP, TRU, U |
| TA-8 | Isotope Building | 24 | " " " | S | IA |
| TA-8 | Radiation Laboratory | 26 | " " " | S | IA |
| TA-8 | Non-Destruct. Test Facility | 70 | " " " | L | U |
| TA-9 | Laboratory Building (Rms 119 and 120) | 21 | ENG-R 2424 | L | T |
| TA-16 | Assembly Building | 410 | ENG-R-2441 | S | TRU, U, T |
| TA-16 | Rest House | 411 | " " " | S | TRU, U, T |
| TA-18 | Assembly Bldg. (Kiva 1) | 23 | ENG-R 2446 | M | U, IA |
| TA-18 | Vault | 26 | " " " | M | U, TRU |
| TA-18 | Assembly Bldg. (Kiva 2) | 32 | " " " | M | TRU, U, IA |
| TA-18 | Assembly Bldg. (Kiva 3) | 116 | " " " | M | TRU, U, IA |
| TA-18 | Reactor Sub-Assembly Bldg. | 129 | " " " | L | U |
| TA-18 | Dynam. Crit. Assay Facil. | 168 | " " " | M | U, FP, IA |
| TA-46 | Laboratory Building (Ducts and Drains) | 1 | ENG-R 2480 | M | U |
| TA-46 | Test Cell No. 1 & 2 | 16 | " " " | M | U |
| TA-48 | Laboratory Building | 1 | ENG-R 2483 | H | TRU, U, FP, IA, T |
| TA-50 | Liquid Disposal Plant | 1 | ENG-R 2493 | M | TRU, U, FP, IA, T |
| TA-53 | Accelerator Building | 3 | ENG-R 2500 | L | IA |

[a]ERDA recommended classification criteria applied with addition of Suspect (S) category for facilities where health physics surveys do not indicate contamination; however, a more intensive survey would be advisable if facility were to be removed or used for other purposes.

(H = high, M = medium, L = low)

Attachment B 3-000999

# MEMORANDUM

ERM/GOLDER Los Alamos Project Team

**To:** Operable Unit 1114 File

**From:** Michelle Y. Morgenstern *myn*

**Date:** December 14, 1993

**Regarding:** SWMU 3-050(D) LITHIUM HYDRIDE EXHAUST SYSTEM

On December 14, 1993, I spoke with Mr. Bill Hodges on the phone regarding SWMU 3-050(d), the lithium hydride exhaust system at TA-3 building 102. In the same day, Margo Buksa and I went to the parking lot directly south of TA-3-102 to meet with Mr. Hodges who showed us the air pollution control devices for building 102 outside the security fence. Special materials machining work is conducted in building 102, and Mr. Hodges is the section leader of WX-13 (now ESA-10), Mechanical Fabrication, who has been working been working in building 102 since July 1980.

Mr. Hodges indicated that approximately ninety percent of the work involved in building 102 includes machining depleted uranium-$^{238}$U and enriched uranium-$^{235}$U. In addition to uranium, other materials are also machined in this building. A list of all the materials machined in bldg 102 was provided by Mr. Hodges (see attachment). Mr. Hodges reported that a lot of the materials that are machined in bldg. 102 are pyrophoric, including uranium and lithium hydride. Mr. Hodges then explained that most of the machining work are performed with the pyrophoric materials submerged in water. However, lithium hydride is highly flammable, explosive, and reactive with water, therefore, it is machined dry. Mr. Hodges explained that lithium hydride is commonly used in the making of the hydrogen bombs, and it is *not* part of the exhaust system. The term "lithium hydride exhaust system" is simply a nickname used by the workers in the building.

While we were standing by bldg 102, Mr. Hodges pointed out a tan room that was added to the building in 1982 exclusively for machining lithium hydride. Mr. Hodges indicated that the entire building 102 became a radiological controlled area before he joined the group in 1980. Then, Mr. Hodges showed us the three air pollution control devices used in building 102 ventilation system. All three control devices are situated on a concrete pad located south of the building. According to Mr. Hodges, these three devices were installed when the building was built (either in 1952 or 1954). The company which made these devices went out of business a few years later, and parts were no longer available commercially.

The cyclone (Mr. Hodges addressed it as a baghouse however) on the west end failed the 85% Dioctyl Phthlate (DOP) removal efficiency test in August 1991, and the operation of this cyclone ceased in 1992. The baghouse in the middle *is* the "lithium hydride exhaust system" addressed in the SWMU report as SWMU 3-050(d). This baghouse also failed the 85% DOP removal efficiency test, and the operation of this device ceased in 1992. The two inactive air pollution control devices will be replaced with HEPA filter banks possibly in FY94.

The baghouse located on the east end is the only air pollution control device which is still operational, and it is presently used to remove particulates in the gas stream from all the building 102 ductworks. The fan connected to the operational baghouse has the capability of producing high flowrate through the exhaust system. Therefore, the baghouse and the exhasut system is called the "high vac". The outlets from these three control devices are connected to a stack located next to the south wall of building 102.

Mr. Hodges suspected that the "lithium hydride exhaust system" was written up as a SWMU because of an explosion caused by lithium hydride accumulation on the bag filters. The explosion burned the bag filters and blew a hole in the ductwork, thus allowing pollutants in the gas stream emitted to the atmosphere. Mr. Hodges reported that this explosion occurred before his tenure at building 102, and he learned about the explosion from coworkers. Mr. Hodges suspected the explosion occurred in the 1970's since the machining of the special material was conducted in the Main Mech. Shop in TA-3-39 before. He then suggested previous building supervisor-Dan Richards and an old timer-Leroy Wampler to be contacted.

Mr. Hodges also reported that some sampling were performed in the area, and the results from the dust blown to the cement pad showed all the special materials on the list he provided.

cc: Project File 17020

MATERIALS MACHINED AT VARIOUS TIMES IN SHOP-13
AS OF FEBRUARY 5, 1991

ALUMINUM OXIDE: Low level nuisance. Dry grinding and machining causes dust particle irritant and fire hazard.

ANTIMONY: Severe health problem (poison). Can be fatal if inhaled.

ARSENIC: Known carcinogen, Cumulative systemic poison.

BARIUM: Heavy metal salts causes baritosis. Highly toxic. Severe life threat.

BERYLLIUM: Suspect carcinogen. Toxic. Causes Berylliosis.

BISMUTH: Low level toxic. Requires ventilation.

BROMINE: Poison danger, burns, causes fumes, use ventilation.

CADMIUM: Fumes and dust are poison. A fatal dose can be acquired before irritation gives prior warning.

CYANIDE (POTASSIUM): Severe health threat (poison), severe contact threat (life). Inhalation, absorption, and ingestion are harmful and may be fatal. Affects cardiovascular system, central nervous system, liver, kidneys, and skin.

EUROPIUM: Irritates eyes and skin. Inhalation causes irritation to lungs and mucous membranes.

GADOLINIUM: Moderate toxic skin irritant.

GALLIUM: Harmful if inhaled.

GALLIUM ARSINIDE: Toxic when heated. Emits very toxic fumes. Known carcinogen.

GERMANIUM: Harmful if inhaled. Irritates mucous membranes.

HAFNIUM: Harmful if inhaled. Skin and eye irritant.

HOLMIUM: Harmful if inhaled. Mechanical exhaust required. Will burn. Salts form, will cause harm.

INDIUM OXIDE: Harmful if inhaled. Irritates mucous membranes.

IRIDIUM: May be harmful by inhalation, ingestion, or skin absorption. Causes skin and eye irritation.

LANTHANUM: Inhalation irritant.

LEAD: Toxic damage to brain and kidneys.

LITHIUM METAL: Reacts chemically causing burns. Gives off fumes.

LITHIUM HYDRIDE: Harmful if inhaled or absorbed through skin. Extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin. Inhalation may be fatal as a result of spasm and edema.

LUTETIUM: Slight irritation to skin. May be harmful if inhaled. Emits toxic fumes under fire conditions.

NICKEL: Severe health threat (Cancer Causing). Harmful if inhaled or absorbed through skin. Exceptional contact hazard. Inhalation of dust may cause headache, coughing, dizziness, or difficult breathing. Warnings are based on inhalation of dust or fumes.

NIOBIUM (COLUMBIUM): Nuisance dust>

OSMIUM: Harmful if inhaled. Severe eye irritant.

PALLADIUM: Avoid contact with fumes and dust. Irritant. Emits toxic fumes under fire conditions.

PHOSPHIDE (PHOSPHATE): Possible carcinogen. Harmful if inhaled. Eye irritant.

RHENIUM: Harmful if inhaled. Eye irritant>

RHODIUM: May be harmful by inhalation or skin absorption. Cause eye and skin irritation.

RUBIDIUM: Harmful if inhaled. Extremely toxic to mucous membranes.

SCANDIUM: Harmful if inhaled or absorbed through skin. Irritates skin and eyes.

SELENIUM: Poison danger. Severe life threat.

TELLURIUM: May be fatal if inhaled or absorbed through skin.

THALLIUM: Extremely toxic to nervous system. Causes hair loss.

THORIUM OXIDE: Toxic and radioactive inhalation problem. Use
TH-02 ventilation. Known carcinogen.

THULIUM: May be harmful by inhalation or skin absorption. Causes eye and skin irritation.

SILVER: Toxic dust and vapor. Use ventilation.

URANIUM: Toxic and radioactive inhalation problem. Use ventilation.

URANIUM OXIDE 2: Exposure can cause renal failure.

YTTRIUM: Low toxic skin irritant.

NOTE: THIS LIST IS NOT COMPLETE. IT WAS ASSEMBLED FROM RECORDS AND MEMORY.

Attachment C



# ENVIRONMENTAL SURVEILLANCE AT

# LOS ALAMOS DURING 1987

by

ENVIRONMENTAL SURVEILLANCE GROUP

## ABSTRACT

This report describes the environmental surveillance program conducted by Los Alamos National Laboratory during 1987. Routine monitoring for radiation and radioactive or chemical materials is conducted on the Laboratory site as well as in the surrounding region. Monitoring results are used to determine compliance with appropriate standards and to permit early identification of potentially undesirable trends. Results and interpretation of data for 1987 cover: external penetrating radiation; quantities of airborne emissions and liquid effluents; concentrations of chemicals and radionuclides in ambient air, surface and ground waters, municipal water supply, soils and sediments, and foodstuffs; and environmental compliance. Comparisons with appropriate standards, regulations, and background levels provide the basis for concluding that environmental effects from Laboratory operations are insignificant and do not pose a threat to the public, Laboratory employees, or the environment.

Attachment C



# I. EXECUTIVE SUMMARY

## A. Monitoring Operations

The Laboratory maintains an ongoing environmental surveillance program as required by US Department of Energy (DOE) Orders 5480.1A ("Environmental Protection, Safety, and Health Protection Programs," August 1981) and 5484.1 ("Environmental Protection, Safety, and Health Protection Information Reporting Requirements," February 1981). The surveillance program maintains routine monitoring for radiation, radioactive materials, and chemical substances on the Laboratory site and in the surrounding region. These activities document compliance with appropriate standards, identify trends, provide information for the public, and contribute to general environmental knowledge. More detailed, supplemental environmental studies are carried out to determine the extent of the potential problems, to provide the basis for any remedial actions, and to provide further information on surrounding environments. The monitoring program also supports the Laboratory's policy to protect the public, employees, and environment from harm that could be caused by Laboratory activities and to reduce environmental impacts to the greatest degree practicable. Environmental monitoring information complements data on specific releases, such as those from radioactive liquid-waste treatment plants and stacks at nuclear research facilities.

Monitoring and sampling locations for various types of measurements are organized into three groups: (1) Regional stations are located within the five counties surrounding Los Alamos County (Fig. 1) at distances up to 80 km (50 mi) from the Laboratory. They provide a basis for determining conditions beyond the range of potential influence from normal Laboratory operations. (2) Perimeter stations are located within about 4 km (2.5 mi) of the Laboratory boundary, and many are in residential and community areas. They document conditions in areas regularly occupied by the public and potentially affected by Laboratory operations. (3) On-site stations are within the Laboratory boundary, and most are in areas accessible only to employees during normal working hours. They document environmental conditions at the Laboratory where the public has limited access.

Samples of air particulates and gases, waters, soils, sediments, and foodstuffs are routinely collected at these stations for subsequent analyses (Table 1). External penetrating radiation from cosmic, terrestrial, and Laboratory sources is also measured.

Additional samples are collected and analyzed to gain information about particular events, such as major surface run-off events, nonroutine releases, or special studies. More than 25 000 analyses for chemical and radiochemical constituents were carried out for environmental surveillance during 1987. Resulting data were used for dose calculations, for comparisons with standards and background levels, and for interpretation of the relative risks associated with Laboratory operations.

## B. Estimated Doses and Risks from Radiation Exposure

**1. Radiation Doses.** Estimated individual radiation doses to the public attributable to Laboratory operations are compared with applicable standards in this report. Doses are expressed as a percentage of DOE's Radiation Protection Standard (RPS). The RPS is for doses from exposures excluding contributions from natural background, fallout, and radioactive consumer products. Estimated doses are those believed to be potential doses to individuals under realistic conditions of exposure.

Historically, estimated doses from Laboratory operations have been less than 7% of the 500 mrem/yr standard that was in effect prior to 1985 (Fig. 2). These doses have principally resulted from external radiation from the Laboratory's airborne releases. In 1985, DOE issued interim guidelines that lowered its RPS to 100 mrem/yr (effective dose equivalent) from all exposure pathways. In addition, exposure via the air pathway is further limited to 25 mrem/yr (whole body) in accordance with requirements of the US Environmental Protection Agency (EPA) (Appendix A). In 1987 the estimated maximum individual dose was 6.1 mrem, 24% of the EPA's 25-mrem standard. This dose resulted mostly from external radiation from short-lived airborne emissions from a linear particle accelerator, the Los Alamos Meson Physics Facility (LAMPF).

Another perspective is gained by comparing these estimated doses with the estimated whole-body dose attributable to background radiation. The highest estimated dose caused from Laboratory operations was about 2% of the 327 mrem received from background radioactivity in Los Alamos during 1987.

# V. AIR MONITORING

**Airborne radioactive emissions were released from 87 points at the Laboratory during 1987. The largest airborne release was 150 000 Ci of short-lived (2 to 20 minute half-lives) air activation products from the Los Alamos Meson Physics Facility (LAMPF). Ambient air is routinely sampled at several locations on-site, along the Laboratory perimeter, and in distant areas which serve as regional background stations. Concentrations of airborne tritium, uranium, plutonium, americium, and gross beta activity are measured. The highest measured and annual average activity concentrations of these radioactive materials were much less than 0.1% of levels that exceed DOE's Radiation Protection Standards. Nonradiological airborne emissions from the Laboratory remained below federal and state limits.**

1.1 milli Amp.
Meson - operates 5 months/yr
beam activates air

## A. Radionuclides in Ambient Air

**1. Background.** The ambient air sampling network for radioactivity consists of 26 continuously operating stations (see Appendix B for a complete description of sampling procedures). The regional monitoring stations, 28 to 44 km (18 to 28 mi) from the Laboratory, are located at Espanola, Pojoaque, and Santa Fe (Fig. 8). The results from these stations are used as reference points for determining regional background levels of airborne radioactivity. The 11 perimeter stations are within 4 km (2.5 mi) of the Laboratory boundary; 12 stations are located within the Laboratory boundary (Fig. 8, Table G-4).

Natural fallout radioactivity levels in air fluctuate and affect measurements made by the Laboratory's air sampling program. Worldwide background airborne radioactivity is largely composed of fallout from past above-ground nuclear weapon tests, natural radionuclides from the transformation products of thorium and uranium attached to dust particles, and materials resulting from interactions with cosmic radiation (e.g., tritiated water vapor produced by interactions of cosmic radiation and stable water). Background, airborne radioactivity concentrations are summarized in Table G-5.

Particulate matter in the atmosphere is primarily caused by resuspension of soil which is dependent upon meteorological conditions. Windy, dry days can increase soil resuspension, whereas precipitation (rain or snow) can wash out particulate matter from the atmosphere. Consequently, there are often large daily and seasonal fluctuations in airborne radioactivity concentrations caused by changing meteorological conditions.

**2. Airborne Emissions.** Radioactive airborne emissions are discharged at the Laboratory from 87 stacks. These emissions consist primarily of filtered exhausts from gloveboxes, experimental facilities, operational facilities (such as liquid waste treatment plants), a nuclear research reactor, and a linear particle accelerator at LAMPF. The emissions receive appropriate treatment prior to discharge, such as filtration for particulates as well as catalytic conversion and adsorption for activation gases. Quantities of airborne radioactivity released depend on the nature of ongoing research activities and vary significantly from year to year (Figs. 9-11).

~~During 1987, as~~ in previous years, the most ~~significant releases were from~~ LAMPF (Fig. 11 and Table G-2). The amount released for the year was 150 ~~000 Ci of air activation products~~ (gases, particulates, and vapors). These emissions were about 30% above 1986 amounts. The principal airborne activation products (half-lives in parentheses) were $^{11}C$ (20 min), $^{13}N$ (10 min), $^{14}O$ (71 sec), $^{15}O$ (123 sec), and $^{41}Ar$ (1.83 h). Over 95% of the radioactivity was from $^{11}C$, $^{13}N$, $^{14}O$, and $^{15}O$. However, the radioactivity from these radionuclides declines rapidly because of the short half-lives.

Airborne tritium emissions decreased by 70% from 10 700 Ci in 1986 to 3180 Ci in 1987 (Table 3). This was principally due to decreases in tritium releases from facilities at TA-3, TA-33, and TA-41.

In addition to releases from facilities, some depleted uranium (uranium consisting primarily of $^{238}U$) is dispersed by experiments that use conventional high explosives. About 98 kg (220 lb) of depleted uranium was used in such experiments in 1987 (Table G-6). This mass contains about 46 mCi of radioactivity.

Attachment C

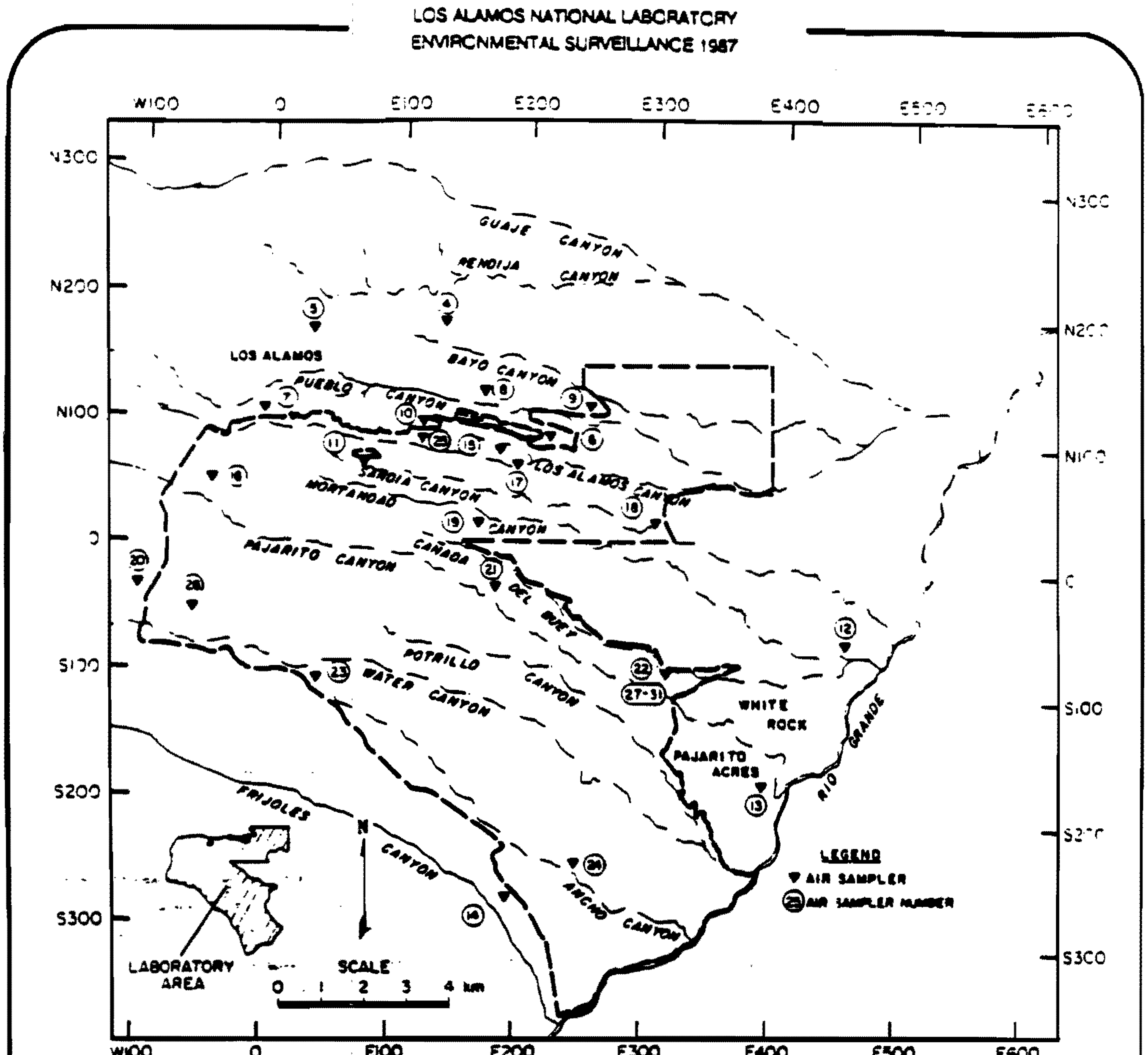



**Fig. 8. Air sampler locations on or near the Laboratory site.**

Most of the debris from these experiments is deposited on the ground in the vicinity of the firing sites. Limited experimental data indicate that about 10% of the depleted uranium becomes airborne. Dispersion calculations indicate that resulting airborne concentrations are in the same range as attributable to the natural abundance of uranium resuspended in dust particles originating from the earth's crust. This is confirmed by monitoring of airborne uranium concentrations (see below).

**3. Gross Beta Radioactivity.** Gross beta analyses help in evaluating general radiological air quality. Figure 12 shows gross beta concentrations at a regional sampling location (Espanola), about 30 km (20 mi) from the Laboratory, and at an on-site sampling location (TA-59).

**4. Tritium.** In 1987, the regional mean ($4.1 \times 10^{-12}$ µCi/mL) and the perimeter annual mean ($11.0 \times 10^{-12}$ µCi/mL) were slightly but statistically

## Attachment C



10000

500

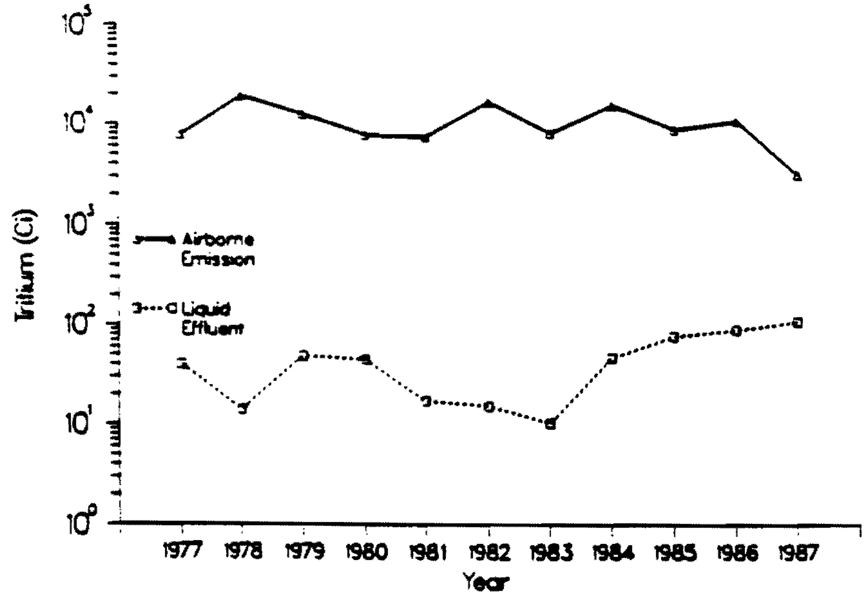



**Fig. 9. Summary of tritium releases (airborne emissions and liquid effluents).**

$$\frac{1\times10^{3}\,\mu Ci}{\frac{.07\,\mu Ci}{\mu g}} = 0.14\times10^{5}\,\mu g$$

$.014\times10^{6}\,\mu g$

$.014$ g

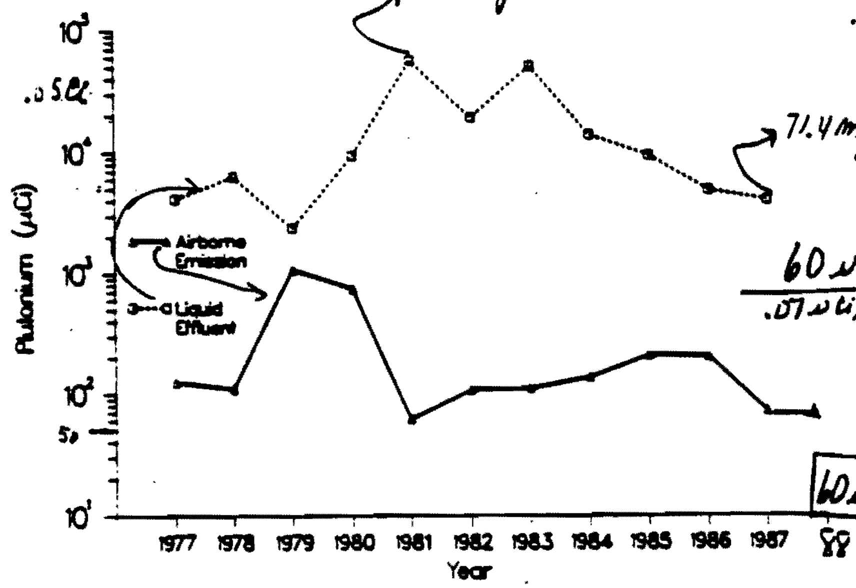
14 mg

710 mg Pu

$5\times10^{4}\times10^{-6} = .05\,Ci$

$\mu Ci = 10^{-6}$

71.4 mg Pu




$$\frac{60\,\mu Ci}{.07\,\mu Ci/\mu g\,Pu} = 857\,\mu g\,Pu$$

$$= \frac{857\,\mu g\,Pu}{1000\,\mu g/mg}$$

$= .857$ mg Pu

$\boxed{60\,\mu Ci = .86\text{ mg Pu}}$

**Fig. 10. Summary of plutonium releases (airborne emissions and liquid effluents).**

# Attachment C



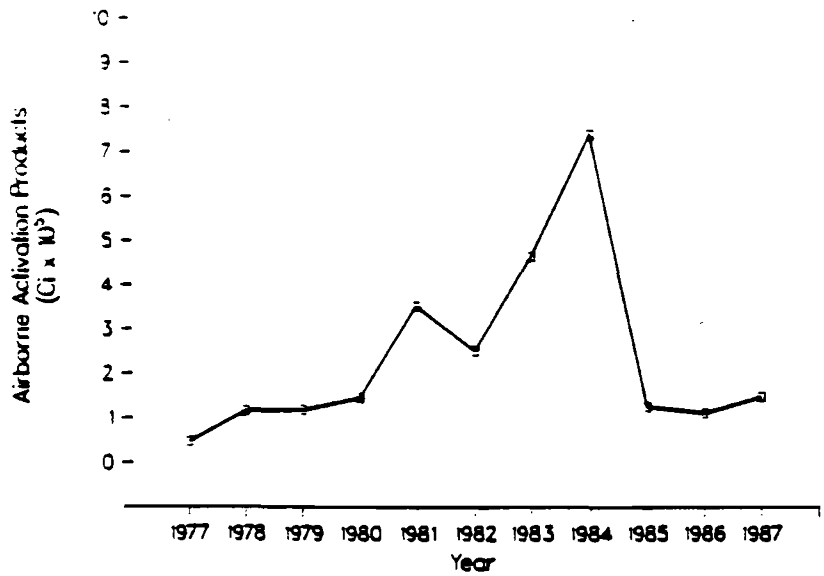
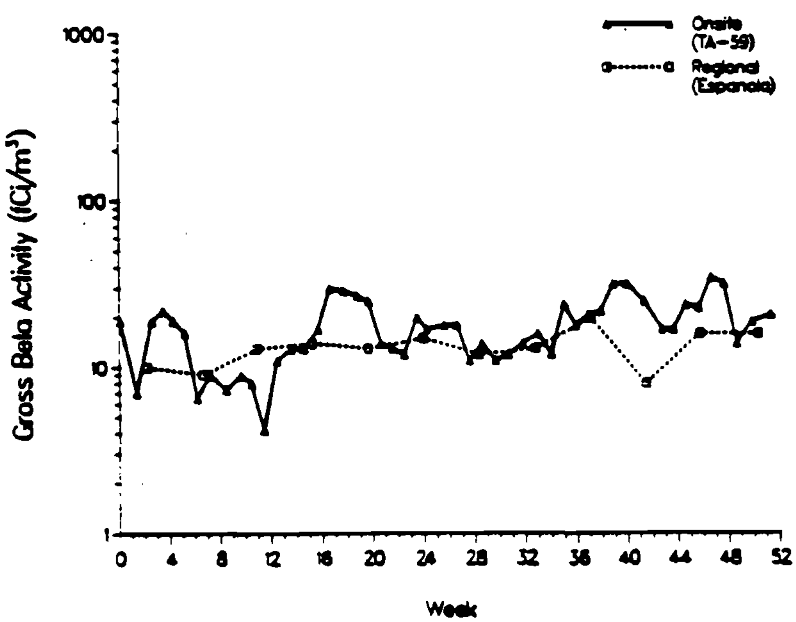



Fig. 11. Airborne activation product emissions (principally $^{11}C$, $^{10}C$, $^{13}N$, $^{16}N$, $^{14}O$, $^{15}O$, $^{41}Ar$) from the Los Alamos Meson Physics Facility (TA-53).




fCi = $10^{-15}$ Ci

Fig. 12. Atmospheric gross beta activity at a regional (background) station and an on-site station during 1987.

significantly lower than the on-site annual mean (21.7 x $10^{-12}$ $\mu$Ci/mL) (Table G-7). This reflects the slight impact of Laboratory operations. The TA-21 (Station 15) and TA-54 (Station 22) annual means of 51.8 x $10^{-12}$ and 32.3 x $10^{-12}$ $\mu$Ci/mL, respectively, were the two highest means measured in 1987. Both of these stations are located within the Laboratory boundary near areas where tritium is disposed of or used in operations. These tritium concentrations are <0.1% of the concentration guide for tritium in air based on DOE's RPS for Controlled Areas (Appendix A).

**5. Plutonium and Americium.** Of the 101 air sample analyses performed in 1987 for $^{238}$Pu, only three were above the minimum detectable limit of 2 x $10^{-18}$ $\mu$Ci/mL. The highest concentration occurred at TA-54 (6.3 $\pm$ 1.4 x $10^{-18}$ $\mu$Ci/mL) and represents <0.1% of the DOE's Derived Concentration Guide for $^{238}$Pu in off-site areas, 2 x $10^{-12}$ $\mu$Ci/mL (Appendix A). The results of the $^{238}$Pu analyses are not tabulated in this report because of the large number of results below the minimum detectable activity.

The 1987 annual means for $^{239,240}$Pu concentrations in air for the regional (0.7 x $10^{-18}$ $\mu$Ci/mL), perimeter (0.9 x $10^{-18}$ $\mu$Ci/mL), and on-site (1.8 x $10^{-18}$ $\mu$Ci/mL) stations were all <0.1% of concentration guides.

Measured concentrations of $^{241}$Am were also <0.1% of the concentration guides for Controlled and Uncontrolled Areas (Appendix A).

The detailed results are in Tables G-8 and G-9.

**6. Uranium.** Because uranium is a naturally occurring radionuclide in soil, it is found in airborne soil particles that have been resuspended by wind or mechanical forces (for example, vehicles or construction activity). As a result, uranium concentrations in air are heavily dependent on the immediate environment of the air sampling station. Those stations with relatively higher annual averages or maximums are in dusty areas, where a higher filter dust loading accounts for collection of more natural uranium from resuspended soil particles.

The 1987 means were: regional, 74 pg/m$^3$; perimeter, 33 pg/m$^3$; and on-site, 31 pg/m$^3$ (Table G-10). All measured annual means were less than 0.1% of the concentration guides for uranium in off-site and on-site areas (Appendix A). No effects attributable to Laboratory operations were observed.

**B. Nonradioactive Chemicals in Ambient Air**

**1. Air Quality**

*a. Bandelier National Atmospheric Deposition Program Station.* The Laboratory operates a wet deposition station located at the Bandelier National Monument. The station is part of the National Atmospheric Deposition Program Network. The sampling results are presented in Section IX.

*b. Particulate Air Quality Measurements.* Measurements of total suspended particulates (TSP) in Los Alamos and White Rock and applicable state and federal standards are reported in Table 8. The measurements are made once every 6 days at a site on West Road in Los Alamos and at the sewage treatment plant in White Rock by the NMEID. The 24-hour average standards are not to be exceeded more than once per year. There is both a primary and a secondary standard for TSP. The primary standard is to protect human health and the secondary standard is to protect general welfare, such as the prevention of soiling and material damage. The state 24-hour standard is as stringent as the federal secondary standard.

The state and federal ambient air quality standards were met in both Los Alamos and White Rock. The seasonally averaged TSP concentrations are shown in Table 9.

**2. Beryllium Operations.** Beryllium machining operations are located in shop 4 at TA-3-39, in shop 13 at TA-3-102, and the beryllium shop at TA-35-213. Beryllium machining takes place intermittently, a few days per year. A new beryllium processing facility located at TA-3-141 began operation in 1987. Exhaust air from each of these operations passes through air pollution control equipment before exiting from a stack. A baghouse type filter is used to control emissions from shop 4. The other operations use HEPA filters to control emissions. The air pollution control systems have >99.9% particulate removal efficiencies.

**3. Steam Plants and Power Plant.** Fuel consumption and emissions estimates for the three steam plants and the TA-3 power plant are reported in Table G-12. The $NO_x$ emissions from the TA-3 power plant

# Attachment C



Table 8. Particulate Air Quality ($\mu g/m^3$)

| Federal and State Ambient Air Quality Standards | | Measurements | |
|---|---|---|---|
| Type | Concentration | Los Alamos | White Rock |
| 24-hour average[a] | | 70.2[b] (150.8)[c] | 46.2[b] (53.3)[c] |
| State[c] | 150 | | |
| Federal | | | |
| Primary | 260 | | |
| Secondary | 150 | | |
| 7-day average[d] | 110 | | |
| 30-day average[d] | 90 | | |
| Annual Geometric Mean | | 23.8 | 29.7 |
| Primary | 75 | | |
| Secondary | 60 | | |

[a]Not to be exceeded more than once per year.
[b]Second highest
[c]Highest.
[d]New Mexico state standard only.

Table 9. Particulate Air Quality, Seasonal Averages ($\mu g/m^3$)

| | Winter | Spring | Summer | Fall |
|---|---|---|---|---|
| Los Alamos | 22.5 | 26.4 | 24.0 | 17.8 |
| White Rock | 19.6 | 34.7 | 29.0 | 45.9 |

were estimated based upon boiler exhaust gas measurements. Exhaust gas measurements indicated that $SO_x$ levels exhaust gases were below minimum detectable levels. Emission factors from EPA were used in making the other emission estimates (EPA 1984). The change in emissions from 1986 to 1987 reflects the change in fuel consumption. The Western Area steam plant, used as a standby plant, was operated only one month during 1987.

4. **Motor Vehicle Emissions.** Estimates of air pollutant emissions associated with the operation of the motor vehicle fleet are reported in Table 10. Emissions increased due to increases in mileage and fuel use. Direct emissions from the vehicles as well as emissions caused by evaporative losses from fuel storage tanks were estimated. Hydrocarbons, carbon monoxide, nitrogen oxides, sulfur oxides, and particulate emissions were estimated based upon motor

**Table 10. Estimate of Air Pollutant Emissions Associated With the Operation of the Vehicle Fleet (metric tons)**

| | 1986 | 1987 | Incremental % Change |
|---|---|---|---|
| Fuel Storage Evaporative Losses | 4.8 | 6.7 | 39.8 |
| Hydrocarbons | 10.4 | 12.4 | 18.9 |
| Carbon Monoxide | 120.2 | 133.6 | 11.2 |
| Nitrogen Oxides | 11.9 | 13.3 | 11.4 |
| Sulfur Oxides | 1.4 | 1.8 | 30.6 |
| Particulates | | | |
| Exhaust | 0.6 | 0.8 | 32.7 |
| Tire Wear | 1.3 | 1.7 | 30.1 |

**Table 11. Asphalt Plant Particulate Emissions**

| Year | Production (tons/yer) | Emissions (lb/year) | Incremental % Change from 1986 |
|---|---|---|---|
| 1986 | 6 980 | 232 | --- |
| 1987 | 8 083 | 269 | 15.8 |

vehicle class, age, and the vehicle miles traveled (EPA 1981, EPA 1984). Fuel storage evaporative losses were estimated based upon the fuel usage.

5. **Asphalt Plant.** Annual production figures and estimates of particulate emissions from the asphalt concrete plant are found in Table 11. The particulate emissions from the plant are low, but have increased from 1986 to 1987 because of an increase in production. There has been a substantial decrease in production since 1985 because of the purchase of the asphalt from outside vendors. A multicyclone and a wet scrubber are used to clean the exhaust gas stream before it is released into the atmosphere. The particulate emission estimate was based upon stack testing data (Kramer 1977) and production data.

6. **Burning and Detonation of Explosives.** During 1987, a total of 18 400 kg (20 tons) of high-explosive wastes were disposed of by open burning at the TA-16 burn ground. Estimates of emissions resulting from this burning are reported in Table 12. The emissions were 7.7% lower than those for 1986. These estimates were made by using data from experimental work carried out by Mason and Hanger - Silas Co., Inc. (MHSM 1976).

Dynamic experiments employing conventional explosives are routinely conducted in certain test areas at the Laboratory. In some experiments these explosives contain toxic metals including uranium, beryllium, and lead. Through November 1987, uranium emissions had decreased 51.3%, lead emissions

## Attachment C



**Table 12. Estimated Air Pollutant Emissions from the Open Burning of Waste Explosives (kg)**

| Pollutant | 1986 | 1987 |
|---|---|---|
| Oxides of Nitrogen | 602.1 | 555.7 |
| Particulates | 358.9 | 331.2 |
| Carbon Monoxide | 155.5 | 143.5 |
| Hydrocarbons | 2.0 | 1.8 |

decreased 26.9%, and beryllium emissions decreased 4.8% from 1986 levels.

Estimates of average concentrations of these toxic metals downwind from the detonations are reported in Table G-6. Applicable standards are also presented in this table. Estimated concentrations were <0.01% of applicable standards. These estimates are based upon information concerning the proportion of material aerosolized provided from limited field experiments involving aircraft sampling and the amounts of toxic metals used in the experiments through November 1987.

**7. Lead Pouring Facility.** Pan Am World Services operates a lead pouring facility for producing lead castings that is located at TA-3-38. Approximately 11 700 kg (25 800 lb) of lead were estimated to have been poured during 1987. The estimated 1987 annual lead emissions from this facility were 5.1 kg (11.2 lb); maximum quarterly emissions were 1.8 kg (3.9 lb). The emission estimates were based upon the amounts of lead poured and an EPA emission factor for lead casting operations (EPA 1984).

Both federal and state ambient air quality standards for lead are 1.5 g/m$^3$ averaged over a calendar quarter. Air dispersion procedures recommended by the EPA (EPA 1977, 1986) were used to estimate the maximum quarterly average lead concentrations caused by emissions from the lead pouring facility. These procedures provide conservative concentration estimates. The maximum quarterly concentration for 1987 was estimated to be 0.11 $\mu$g/m$^3$, 7% of the standard.

**Attachment D**

# SOLID RADIOACTIVE WASTE DISPOSAL/STORAGE CURRENT PRACTICES AND PROCEDURES

SOURCES OF SOLID RADIOACTIVE WASTE:

1. CMR Building (SM-29, TA-3)

The CMR Building is a research and development facility consisting of eight wings. Six wings are used for work with radioactive material. The areas of the building, where the potential exists for radioactive contamination, are designated as restricted areas. All solid waste generated in restricted areas is treated as radioactive waste which is sent to TA-54, Area G. Waste generated in nonrestricted areas is sent (via Dempster Dumpster) to the Los Alamos County disposal area.

There are 15 different groups represented in the building. Those groups working with radioactive materials and their work locations are as follows: CMB-1, Wgs 3, 7, and S 1/2 of Wg 5. CNC-2, N 1/2, Wg 5 and N 1/2, Wg 5 basement. CMB-8, N 1/2, Wg 4, N 1/2, Wg 4 basement, first floor, Wg 1, basement of Wg 1 and Wg 3 basement. CNC-4, Wg 4. CMB-7, S 1/2 Wg 5 basement, N 1/2, Wg 1, second floor. CMB-14, all of Wg 9.

At the CMR Building, "line-generated trash" and room trash are synonomous. Material that could be classified as TRU retrievable (>10 nCi/g) is handled on a case by case basis. Retrievable material that has been generated

Disposal Permit form is filled out by the individual discarding the residue. The Permit provides necessary information as to quantity of material, composition, etc. Much of the information is needed to provide the AEC information on waste disposal.

Other types of solid waste include, but is not limited to bulky items, such as machinery, laboratory fixtures, etc. Packaging for transport to Area G is not required if there is no loose contamination. Otherwise, packaging must be carried out in such a manner as to prevent any contamination being released during transport to Area G.

3. Shops Dept. (TA-3, SM-102)

Solid radioactive waste generated by Shops Dept. such as rubber gloves, etc., is placed in plastic bag lined cardboard boxes. When filled, the boxes are sealed, identified as to room, building and date, and loaded into Dempster Dumpsters. All waste generated by the Shops Dept. is classified as uranium waste as no TRU type materials are permitted in this area.

During machine operations, D-38, chips and turnings are generated. These are placed in 30 gallon metal drums. When full, the drums are sealed, identified and loaded onto a skip type Dempster Dumpster for transport to Area G. Because of the potential for fire in these drums, each load of drums is escorted to Area G by H-8, using a vehicle equipped with three radio-transcievers that permit radio communication on the H-Division

Net, Zia Net and the Los Alamos Fire and Police Net.

A shaker-bag filter system, located at the south end of SM-102 collects uranium contaminated graphite. The graphite is loaded into 55 gallon metal drums. When the drums are filled, the lids are put on, bolted, and the drums loaded onto a skip type Dempster Dumpster container for transport to Area G.

The Shops Dept., on an infrequent basis, discard old, worn out machinery. This equipment does not require packaging for transport to Area G if there is no loose contamination. Should packaging be required, the package must contain the item (s) in such a way as to prevent contamination of anything during transport to Area G.

4. SM-30 (TA-3, SM-30)

Supply and Property Dept. through its Safety Stock Section, descard used, worn out protective clothing, such as coveralls and booties. This clothing is loaded into cardboard boxes, the boxes are sealed, indentified and loaded into a Dempster Dumpster. This waste is classified as TRU, $<10$ nCi/q, non-retrievable, since the major portion of the radioactive contamination fixed on the clothing is due to $^{239}$Pu.

5. TA-43-1 (HRL Bldg.)

Health Division Groups 4, 9, 10 and 11 occupy this facility. Solid

TA1236

Attachment E

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544
TELEPHONE:

0-14-5-93-2

# OFFICE MEMORANDUM

TO : Robert Hendren, [illegible]-6

DATE: September 8, 1966

FROM : A. M. [illegible] thru F. E. Stack

SUBJECT: Dust Collector System

SYMBOL : [illegible]-6

See the next page for a more readable copy.

The high velocity collector system located at the south end of Bldg. [illegible]-102 is used for the recovery of U-235 in fuel element machining. This system developed a leak at a weld joint resulting in the third spill since installation and necessitating a decontamination crew clean up. We request an investigation of this system by your group and recommendations to prevent future contamination trouble in this area.

This unit and other systems in this area are now operating continuously around the clock to prevent blow back of dust into the shop area due to weather conditions. Your recommendations are also requested for a positive way to seal these units when they are shut down. This would enable us to clean these units better and operate them on a forty hour week basis.

We appreciate the attention you are giving this matter.

A. M. [illegible]
Research & Development
Shop Department

cc: R. H. Mitchell, H-5 ← OK
D. E. Smith, H-2
R. I. [illegible], [illegible]-2
File

# Best Available Copy



[illegible]

## Attachment E

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544
TELEPHONE:

# OFFICE MEMORANDUM

To: Robert Headron, ENG-6

DATE: September 8, 1966

FROM: A. M. Zervas thru F. E. Stack

SUBJECT: Dust Collector System

SYMBOL: ??-6

Memo was retyped because best available copy would not yield a readable copy.

The high velocity collector system located at the south end of Bldg. SM-102 is used for the recovery of U-235 in fuel element machining. This system developed a leak at the weld joint resulting in the third spill since installation and necessitating a decontamination crew clean up. We request an investigation of this system by your group and recommendation to prevent future contamination trouble in the area.

This unit and other systems in this area are now operating continuously around the clock to prevent blow back of dust into the shop area due to weather conditions. Your recommendations are also requested for a positive way to seal these units when they are shut down. This would enable us to clean these units better and operate them on a forty hour week basis.

We appreciate the attention you are giving this matter.

A. M. Zervas
Research & Development
Shop Department

cc: R. N. Mitchell, ?-5
D. R. Smith, ?-2
???, ?-2
File

Los Alamos

Attachment F

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

# memorandum

TO C. Loggains, ENG-1, MS M723

DATE March 25, 1991

FROM A. Bridge AB

MAIL STOP/TELEPHONE M984/7-5448

SYMBOL ENG-3/M/91-090

SUBJECT [redacted]

I was called by Bob Huggard of MEC-1 to help them determine ES&H requirements and procedures to be followed to do construction work in the SWMU south of Building SM-102.

A meeting was held on March 15, 1991 and was attended by the following:

| | |
|---|---|
| Bob Huggard, MEC-1 | Robert Gonzales, HSE-ER |
| Bob Schuch, MEC-1 | Al Bridge, ENG-3 |

Robert Gonzales was asked "What procedure must MEC and ENG take to work in the SWMU south of Building SM-102?" Robert mentioned that this is a lithium hydride SWMU as lithium hydride had been stored in that area.

Bob Huggard thought that uranium had been spilled in the area. This area is cordoned off as a radiation area and booties must be worn. (From information received in past meetings, I assumed that there was a concrete area pad poured around the equipment footings when the filter equipment was installed in the early 1960's. This pad was overlaid with asphalt to immobilize and shield a radioactive spill. However, this did not agree with the filter system design drawing C 29220 which shows footings poured six inches above grade. Bob Huggard, Bob Schuch and I looked at the site after the meeting ended. There is a thin, 2" to 3" thick slab poured in the area. This slab is painted and may have been used to cover lithium hydride. The paint may be an epoxy paint used to immobilize a later uranium spill.)

We were told by Robert Gonzales to do the Title II design for the new work and submit the design for quality assurance review. The HSE review, coordinated by Dick Heineman, would include:

A review of the history of the SWMU including interviews of people who might have knowledge of how the SWMU got defined.

A statistical sample schedule to characterize the SWMU based on the areas disturbed by construction.

## Attachment F



Robert thought eight or nine soil samples would be required at a cost of $2.3K to $5K per sample. This is based on the size and number of areas requiring excavation to put in new footings for equipment. The cost per sample would probably be toward the $2.3K figure because testing for the presence of organics probably would not be required. Samples usually take two to three weeks for analysis.

Keith Dowler of CLS-2 is the Operable Unit Project Leader for this SWMU and writes SWMU mitigation plans for EPA approval. Keith must be involved to interface with the EPA.

These eight or nine soil samples are not enough to characterize the whole SWMU. The cleanup of the SWMU will <u>not</u> be done during the construction of the new filtration system. The SWMU will remain until Building SM-102 is closed at the end of its useful life. The SWMU remediation would be done using environmental restoration money. The EPA, in the past, has agreed to this kind of arrangment.

Bob Huggard stated that the two large filter systems, SG-2 and SG-1, are shutdown permanently.

The environmental restoration program does not have funds to do any characterization in FY90. Characterization costs would have to come from the $100K of Tiger Team money or from MEC Division.

ENG-3's concept of the sequence of construction was to install new systems south of the existing equipment. The existing equipment would then be removed at a later date after the material in the filter equipment had been characterized using environmental restoration money; this could be years in the future. This sequence requires more real estate south of SM-102 and would require relocating the 8' security fence south into the parking lot or relocating the fence southward (but not into the parking lot) and raising the height of the fence to 16' high because it would be too close to the HEPA filter housing which is 7' - 6" high (this was checked with Pat Trujillo of OS-10).

Since Systems SG-1 and SG-2 are shutdown, Bob Huggard wants to first remove that equipment to TA-54 and then install the new filter housings and fans closer to SM-102, thereby using less real estate and not having to relocate the fence. The asbestos insulation on the outside of the filter housings would be removed from the housings, properly packaged and sent to a permitted disposal site off Lab property before the equipment would be moved to TA-54. Ideally, each bag filter housing would be moved in one piece after duct inlets and

Attachment F

C. Loggains, ENG-1, MS M721 — March 25, 1991
ENG-3/M/91-090 — Page 3

outlets were capped to seal mixed waste contamination inside the housings.

Robert mentioned that TA-54 may not be permitted to store mixed wastes. Dave McInroy of HSE-8 should be involved in the removal of the housings.

ENG-3 will contact Dick Heineman of HSE-QA regarding the details of the SWMU review during QA. Major design changes to save money could be brought to light during this review. A SWMU review at this stage of design is too late.

Other areas of discussion were that Bob Huggard thought that the Engineering estimate was low for the renovation of the mens' change room. ENG-3 and ENG-4 will verify the estimated cost for this portion of the proposed work.

AB:ks

Cy: Attendees
R. Eastburn, ES&H $S^2$, MS K303
M. Heineman, HSE-3, MS K489
H. Lindberg, HSE-3, MS J566
D. McInroy, HSE-8, MS K490
K. Dowler, CLS-1, MS G742
[redacted]
M. Garcia, ENG-3, MS M984
L. J. 10977, ENG-3/M, MS M984
L. J. 10977, ENG-7, MS M984
ENG-3/M File

003.2487.4

006.2487.4

3-001129

# DIRECT SURVEY RESULTS

**SAMPLE DESCRIPTION**

Sample Date: 4-20-94 Sample Time:
TA: 3 Bldg: 102 Room(s)/Area(s): Outside Rm-118 SM-102
RCT: Ben Rybal Printed Name: Ben Rybal
Mail Stop: 0471 Phone: 5-4325

**ADDITIONAL INFORMATION**

☐ Occurrence No.:
☐ Incident No.:
☐ RWP No.:

**DISTRIBUTION**

G. Gourney - K487 - Gilbert Garcia
R. Hodges 0471

**JOB DESCRIPTION**

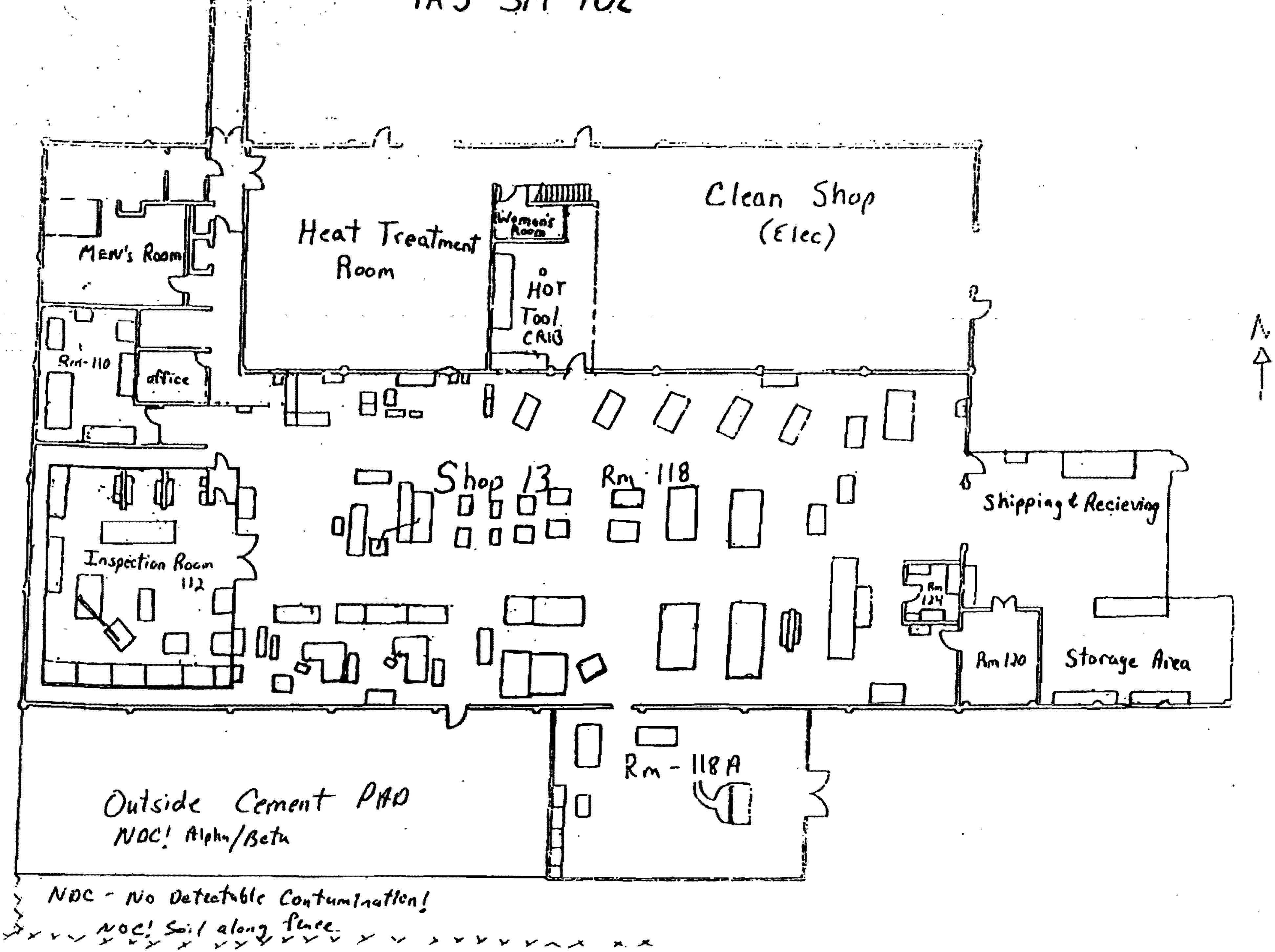
Direct survey of cement pad outside South end of SM-102 and soil along fence

**INSTRUMENTATION**

| Instrument | HSE Number | Cal Due Date | Efficiency | Background |
|---|---|---|---|---|
| Lud-M00-3 | 6199 | 9-23-94 | 50% | 100 cpm |
| Lud-Lum 139 FM | 2258 | 9-22-94 | 20% | 100 cpm |
| | | | | |
| | | | | |

| Item/Area | Alpha cpm | Alpha dpm | Beta/Gamma cpm | Beta/Gamma dpm | Remarks |
|---|---|---|---|---|---|
| Cement PAD | NDA! | | NDA! | | |
| soil by fence | NDA! | | NDA! | | |

TA-3 SM-102




Attachment G

# 3-050(e)

# ATTACHMENTS

## SWMU 3-050(e) — Filter Unit (Inactive)

### 1.0 Introduction

SWMU 3-050(e) is located in former Operable Unit (OU) 1114 (Figure 1-1) within Technical Area (TA)-3 (Figure 1-2 and Index Map) at Los Alamos National Laboratory, Los Alamos, New Mexico.

### 1.1 Description

SWMU 3-050(e) [Map 3-050(e)] is the inactive filter unit located on the east side of machine shop TA-3-39. The filter unit was used from 1953 until 1993 to remove grinding particulates containing tool steels, carbide, and carborundom grinding wheel residue. The grinding residue, which is not hazardous, was collected in a 55-gal. barrel located at the exhaust end of the collector (Buksa 1995, 17-1255). (Attachment A).

SWMU 3-050(e) is recommended for NFA because the site has never been used for the management (i.e., generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes or constituents, or other CERCLA hazardous substances. The filter unit was used to remove nonhazardous particulates containing tool steels, carbide, and carborundom grinding wheel residue.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-050(e) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

Machining shop.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Memorandum, "Interview with Bill Hodges Regarding Filter Unit Located at TA-3-39, SWMU 3-050(e)," (Buksa 1995, 17-1255)

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

### 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

### 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-050(e) is recommended for NFA under Criterion 2.

## 5.0 References

Buksa, M., June 21, 1995. "Interview with Bill Hodges Regarding Filter Unit Located at TA-3-39, SWMU 3-050(e)," Los Alamos National Laboratory Memorandum MJB 95-007 to File from M. Buksa (CST-18), Los Alamos, New Mexico. (Buksa 1995, 17-1255)

Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, p 6-36. (LANL 1995, 1291)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

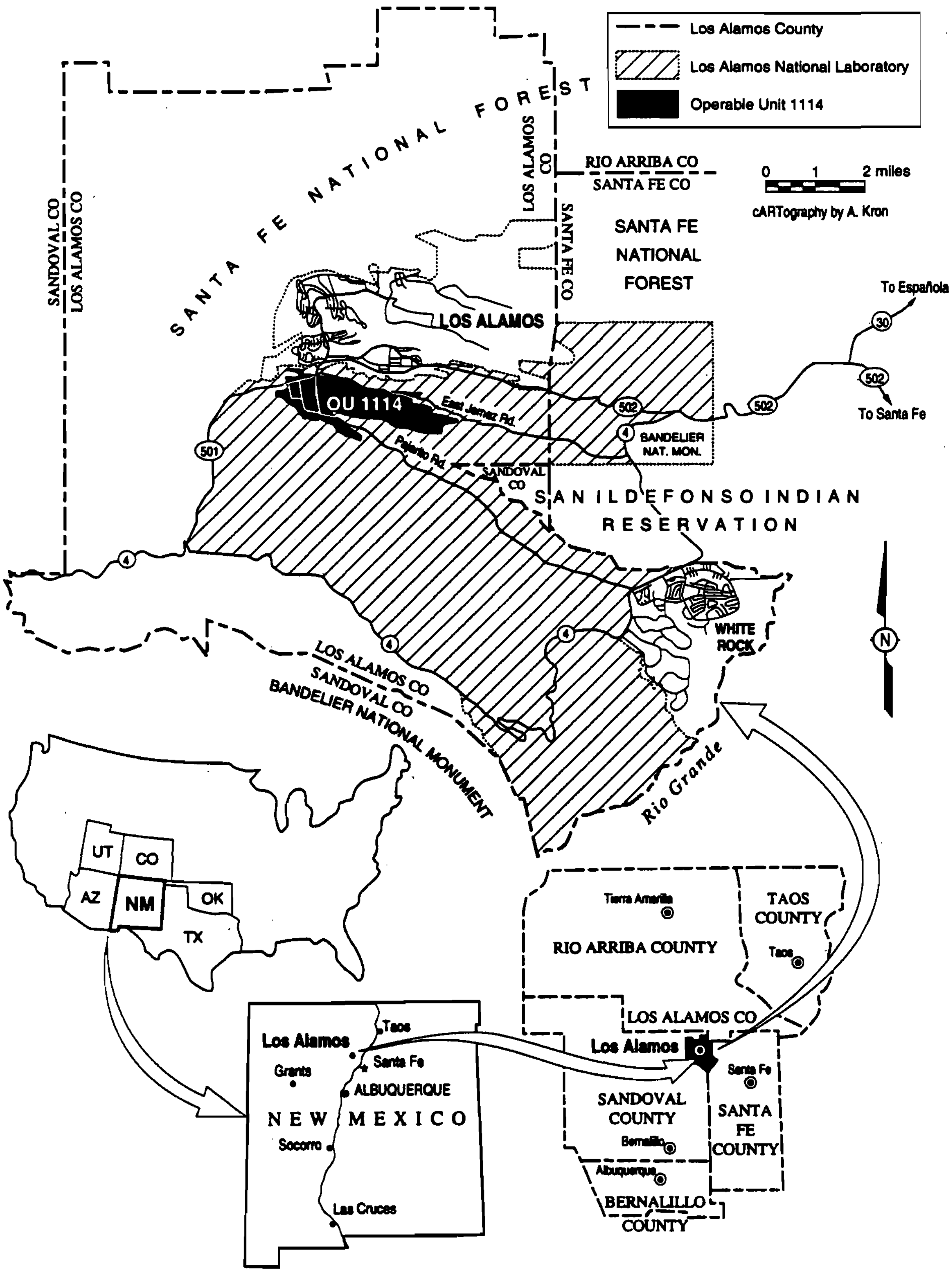



**Fig. 1-1. Location of Operable Unit 1114.**

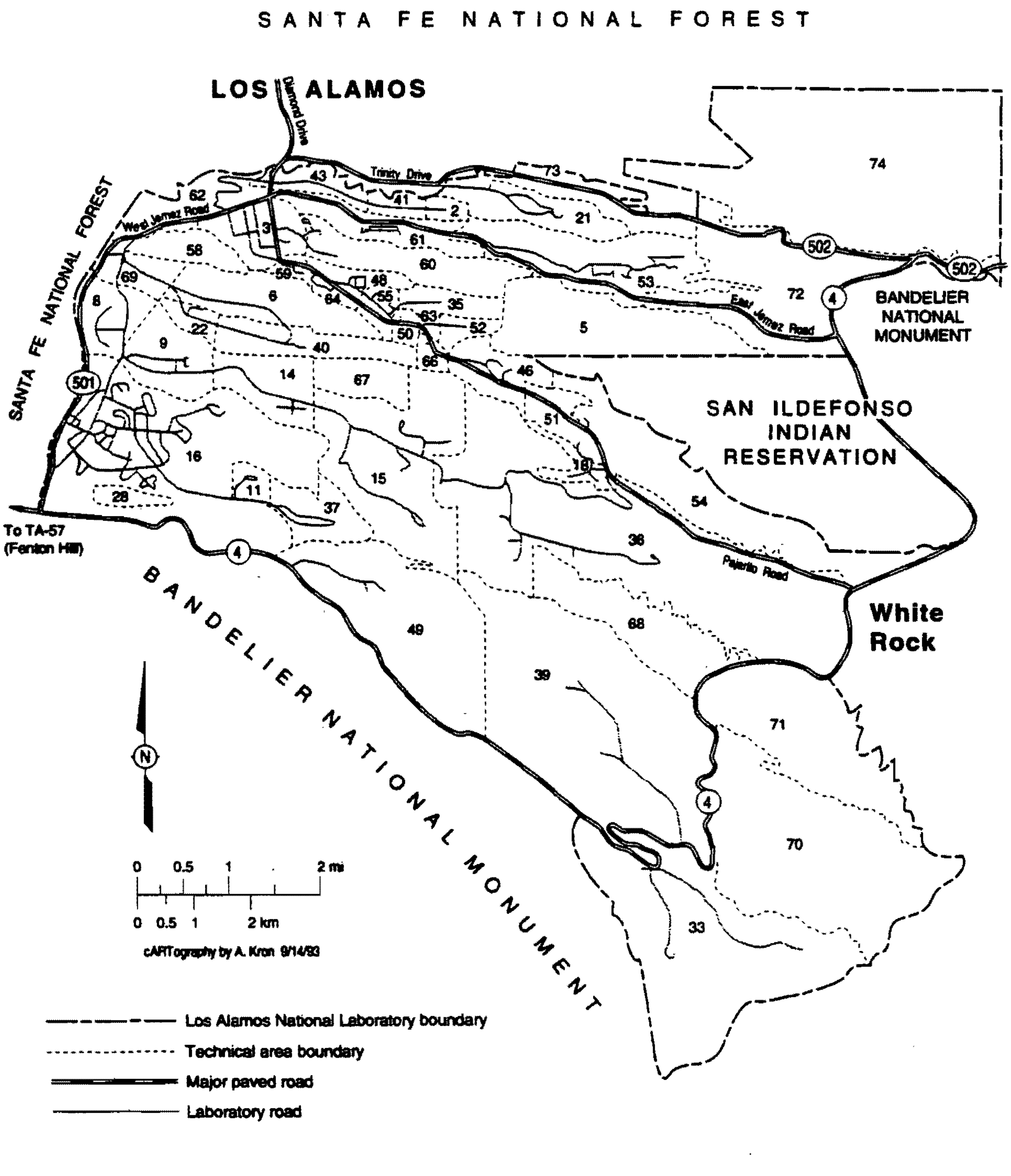
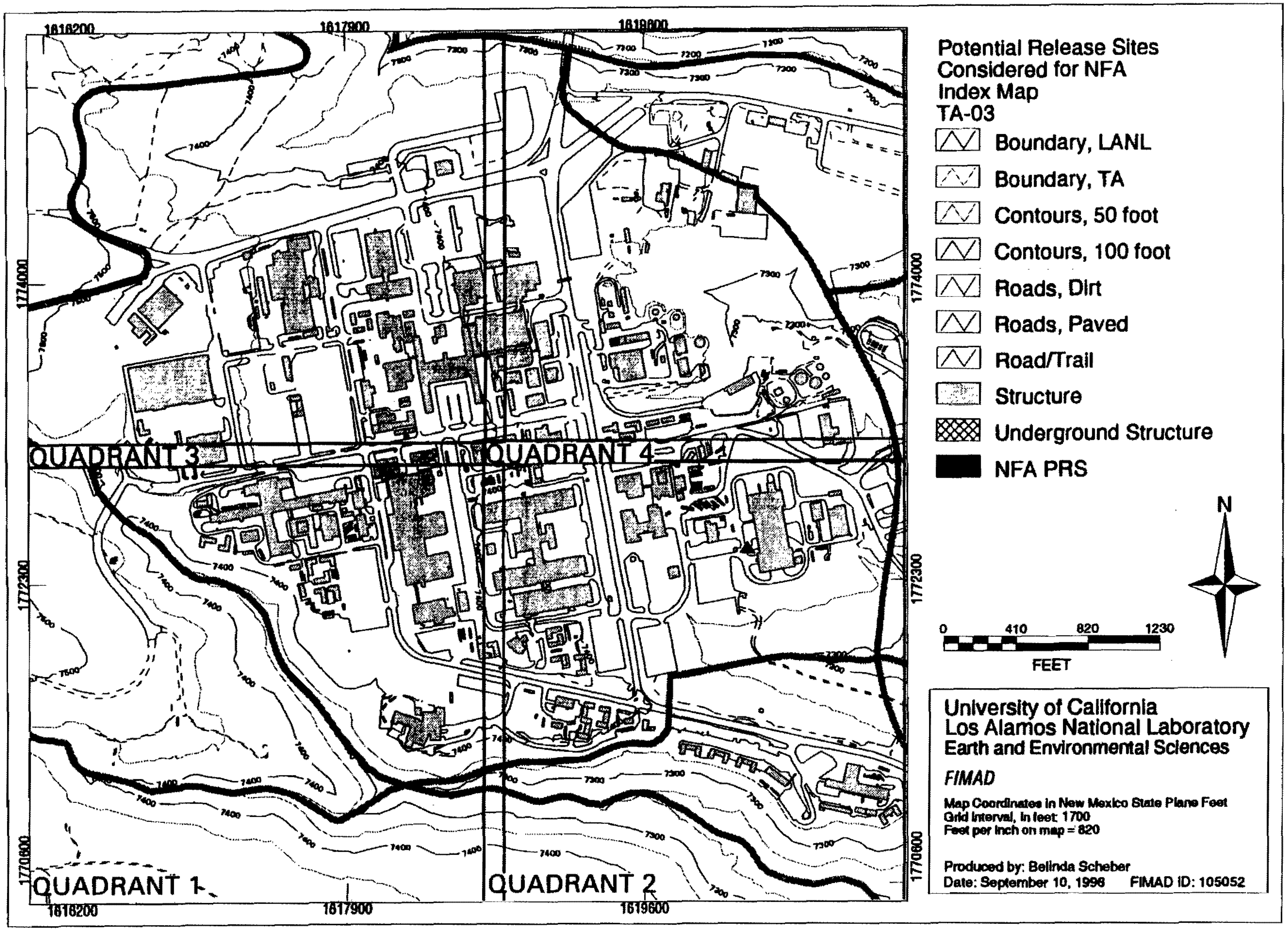
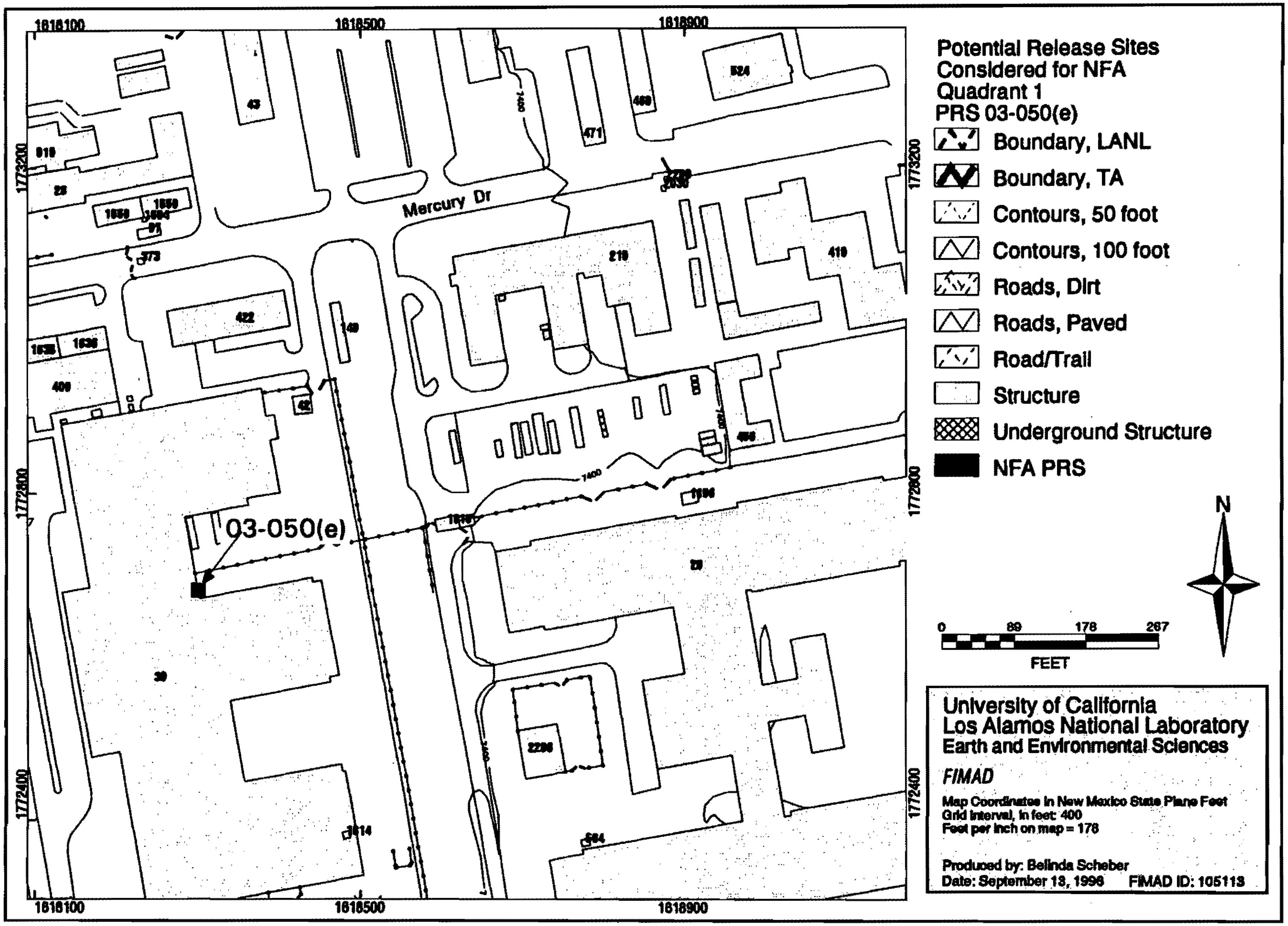



**Figure 1-2. Technical areas at Los Alamos National Laboratory.**




**Potential release sites considered for NFA, TA-03**
**INDEX MAP**




Potential release sites considered for NFA, TA-03, PRS 03-050(e)

# 3-050(f)

# ATTACHMENTS

## SWMU 3-050(f) — Potential Soil Contamination From Active Exhaust Stack Emissions

## 1.0 Introduction

### 1.1 Description

SWMU 3-050(f), is potential soil contamination attributed to the emissions of exhaust stacks located at building TA-3-40. Beryllium foil was made in room S-118 of TA-3-40 in the mid-1950s. In the 1960s beryllium windows were cleaned with acetone or other solvents in room E-116. The cleaning solvents were allowed to evaporate in the exhaust hood. Beryllium residue was put into a special container and then removed by the janitor (Toca 1969, 17-155) (Attachment A). Tritium work in the calibration laboratory (room W-10 of TA-3-40) has caused 0.67 Ci of tritium to be released from the stack since 1986 (LANL 1994, 17-1028) (Appendix A Attachment 3). Laser experiments employing inert gases, e.g., argon, nitrogen, and helium-neon, as lasting media have also been conducted at TA-3-40. High-molecular-weight, nonvolatile laser dyes are used in the laser experiments, but no airborne chemicals are released from the experiments.

### 1.2 No Further Action Basis

SWMU 3-050(f) is recommended for NFA because the site has been characterized in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk. CAP88-PC calculation for the emissions indicates that the emissions were not sufficient to cause radioactive deposition in excess of SALs. Radioactive air emissions from the exhaust stacks at TA-3-40 are monitored and documented (LANL 1994, 17-1008) (Appendix A Attachment 2).

The information stated above and in Section 3.0 clearly indicates that there is no potential soil contamination from the exhaust stacks located at building TA-3-40. In addition, LANL does not identify locations suspected of radiological only contamination as SWMUs, but as AOCs. This distinction is made because DOE is the regulatory authority for radiological concerns. This area of suspected soil contamination was not the site of hazardous waste management, but rather incorrectly designated as a SWMU based solely on erroneous supposition of the potential for the presence of radioactivity.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-050(f) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit ((Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

## 2.0 History

### 2.1 Historical Operations

The manufacture of beryllium foil, the cleaning of beryllium windows with solvents, calibration work with tritium, and laser experiments employing inert gases (e.g., argon, nitrogen, and helium-neon) and high-molecular-weight, nonvolatile laser dyes (no airborne chemicals are released in the laser experiments).

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LASL Memorandum, "Usage of Beryllium in Rooms E-116 and E-118, SM-40, TA-3," (Toca 1969, 17-155)

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

Appendix A Attachment 2: LANL Memorandum, "Available Radioactive Air Emissions Reports Concerning SWMUs 3-050 (a through g)," (LANL 1994, 17-1008)

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Air samples and wipe tests were taken during the operation period (1950s and 1960s). The results showed negligible amounts of beryllium (Shipman 1955, 17-062) (Attachment B).

The EPA requires use of CAP-88 (Clean Air Act Assessment Package-1988) or AIRDOS-PC computer models for determining compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAPS) for emissions of radionuclides at DOE facilities (EPA 1995) (Appendix A Attachment 4).

Comparisons made between the CAP-88 predictions of annual average ground-level concentration and actual environmental measurements taken by the Office of Radiation Programs indicate agreement between these two approaches. CAP-88 has been used by the LANL Radionuclide Air Emission Management (RAEM) group to determine the effective dose equivalents for NESHAPS compliance for airborne radionuclide emissions. Meteorological data and most of the radioactive air emission data are obtained from the LANL RAEM group, and those parameters are input to the CAP-88 PC model to calculate the radionuclide ground deposition from TA-3 stack releases. CAP-88 tends to overestimate radiation doses in the complex terrain around Los Alamos because it does not take into account dilution of airborne radionuclides by terrain-induced turbulence.

CAP88-PC uses Pasquill's modified Gaussian plume equation to estimate the average dispersion of stack-released radionuclides. In the CAP88-PC calculation, all the stacks from SWMU 3-050 (f) are considered as one point source of radioactive air emissions due to their geographic locations. Additionally, all radioactive air emissions are assumed in the form of particulates. Heavier annual precipitation, slower stack gas exit velocity, lower mixing height, and lower stack height of one meter were used instead of the actual parameters in the CAP88-PC calculation to ensure conservative results. The release height of the stack is the sum of the stack height and the plume rise. The plume rise is calculated based on momentum of the exit gas at ambient temperature. Meteorological data collected at TA-6 (the nearest meteorological station) and Los Alamos population data were used for the CAP88-PC calculation.

Air concentration, dry deposition rate, wet deposition rate, and ground deposition rate of radionuclides in 16 directions at various distances around the stack were computed. The ground deposition rate is the highest deposition rate, and therefore represents the most conservative radionuclide deposition scenario. For this reason, it is used to calculate the emission necessary to cause the radioactivity concentration in soil to exceed screening action level (SAL). Soil density of 1.8 g/cm$^3$, and 0.1 cm of soil mixing depth were employed to estimate the total emission necessary to cause the radioactivity concentrations in soil to exceed current SALs.

Available annual data on the total known radioactive releases from the associated stacks range from 2 to 40 years. To ensure conservative results, the actual data were normalized in the calculation to show the potential radioactive air emission within 40 years of operation. These values are shown in the table, Radioactive Air Emission Summary, below.

These radioactive releases are at least four orders of magnitude lower than the minimum radioactivity necessary to cause soil contamination exceeding SALs (Radian 1993, 17-1192) (Appendix A Attachment 5).

## RADIOACTIVE AIR EMISSION SUMMARY

| RADIONUCLIDES | RADIOACTIVE AIR EMISSION WITHIN 40 YEARS OF OPERATION (Ci) | ESTIMATED VALUE TO TRIGGER SOIL SALS[a] (Ci) |
|---|---|---|
| Tritium | 360,000 | $4.8 \times 10^9$ |
| Plutonium-238 and -239 | 0.081 | $7.6 \times 10^3$ |
| Uranium-235 and -238 | 0.0081 | $5.7 \times 10^3$ |
| Mixed fission products | 0.0067 | $2.8 \times 10^3$ |
| Iodine-129/-131 | 0.025 | $8.7 \times 10^2$ |
| Beryllium | ---[b] | ---[b] |

* Based on 0.1 cm of soil mixing depth.

** No report on TA-3-40 is available; no beryllium data were found; however, in 1955 2 air samples and 14 swipe tests showed negligible amounts of beryllium.

In addition, actual data from preliminary soil screening results in locations surrounding TA-3 from 1991 through 1993 show alpha, beta, and gamma activities at background levels (Fresquez 1991, 17-259; Fresquez 1992, 17-1026) (Appendix A Attachments 6 and 7).

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0, 2.0, and 3.0, SWMU 3-050(f) is recommended for NFA under Criterion 5.

## 5.0 References


Environmental Protection Agency, July 1995. "National Emission Standards for Hazardous Air Pollutants," Code of Federal Regulations, Title 40, Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," Washington, DC. (EPA 1995)

Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Fresquez, P., October 22, 1992. "Collection of Soil Samples at SWMU 3-010(a)," Los Alamos National Laboratory Memorandum EM-8:92-3234 to E. Griggs (CLS-DO) from P. Fresquez (EM-8), Los Alamos, New Mexico. (Fresquez 1992, 17-1026)

Fresquez, P., August 12, 1991. "Results of an Environmental Restoration Interim Action (ERIA) Waste Survey at the Van De Graff Underground Storage Tank Removal Project at TA-3," Los Alamos National Laboratory Memorandum EM-8:91-52 to R. Gonzales (EM-13) from P. Fresquez (EM-8), Los Alamos, New Mexico. (Fresquez 1991, 17-259)

Los Alamos National Laboratory, January 25, 1994. "Available Radioactive Air Emissions Reports Concerning SWMUs 3-050(a through g)," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1994, 17-1008)

Los Alamos National Laboratory, February 9, 1994. "Radioactive Air Emissions from TA-3 SM-16, 29, 34, 35, 40, and 102," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1994, 17-1028)

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, pp 6-31 through 6-33, 6-36 through 6-37. (LANL 1995, 1291)

Radian Corp., December 22, 1993. " Air Emission SWMUs," Radian Corp. Memorandum prepared by R. Hueske to OU 1114 Technical Team, Los Alamos National Laboratory, New Mexico. (Radian 1993, 17-1192)

Shipman, T. L., September 1955. "H-Division Progress Report," Los Alamos Scientific Laboratory H-Division Report, Los Alamos, New Mexico. (Shipman 1955, 17-062)

Toca, F. M., June 2, 1969. "Usage of Beryllium in Rooms E-116 and E-118, SM-40, TA-3," Los Alamos Science Laboratory Memorandum H5 to File (P-4) from F. M. Toca (H-5), Los Alamos, New Mexico. (Toca 1969, 17-155)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

Section not applicable.

### 6.3 Other Survey/Investigation Data

Section not applicable.

Attachment A

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544
TELEPHONE:

# OFFICE MEMORANDUM

TO : THE FILE (Group P-4) ✓ DATE: June 2, 1969

FROM : Frederick M. Toca

SUBJECT: USAGE OF BERYLLIUM IN ROOMS E-116 AND E-118, SM-40, TA-3

SYMBOL : H-5

At the present time, usage of beryllium in these areas is only in the cleaning of beryllium windows. The windows are used in satellite detectors; they were prepared in bulk several years ago in different configurations and are stored in a locked case in Room E-116. Whenever it is necessary to use one of these, it is cleaned with acetone, or Hi-tri, or some other solvent, then affixed to the proper apparatus. The remaining solvent, which contains some beryllium residue, is then permitted to evaporate off in one of the hoods. Once evaporated, the residue is put into a special container. This container is removed by the Zia janitor in the area.

Group P-4 workers in this area are:

1. Ralph Greenwood
2. William R. Everett
3. Dave Deck

All of the above have worked in these areas for several years, and during the periods when beryllium usage was more frequent and hazardous.

cp

Frederick M. Toca
Engineering Section
Industrial Hygiene Group

Attachment B [redacted]

H-DIVISION PROGRESS REPORT
August 20 - September 20, 1955

V. GROUP H-5, INDUSTRIAL HYGIENE (H. F. Schulte, Leader)

A. Beryllium

The Beryllium Shop operated 16 days during this period and a total of 55 air samples were collected. The maximum concentration found was 0.16 $\mu g/M^3$.

At the request of Group W-1, an investigation was made of dusty conditions in the area where sintered beryllium pieces had been worked. A considerable amount of dust had been deposited on the work benches as a result of pulling a vacuum on the sintered pieces. However, seven swipe tests analyzed for beryllium showed only a negligible amount of contamination.

A study was made at TA-33 to determine the amount of beryllium given off during operation of the Method X machine. Three air samples were collected and all were found to be well below tolerance. In the Physics Building, Group P-12 began making beryllium foil in Room S-118. To date, two air samples and 14 swipe tests have been made, all showing negligible amounts of beryllium. Air samples will be collected continuously whenever this process is in operation. At Two Mile Mesa, swipe tests were made following bench work with beryllium. No contamination was found and the scrap was disposed of by Group H-5.

The study on the solubility of beryllium compounds is continuing. Work on selected beryllium oxides has been completed and studies are to begin on beryllium metal.

Classification changed to Unclassified
by authority of the U.S.E.R.D.A.
Per Sharon Anderson

# 3-050(g)

# ATTACHMENTS

## SWMU 3-050(g) — Potential Soil Contamination From Active Exhaust Stack Emissions

## 1.0 Introduction

### 1.1 Description

SWMU 3-050(g) is potential soil contamination attributed to tritium emissions from exhaust stacks located at the Van de Graaff Accelerator Facility, TA-3-16. Since 1952, tritium was used at the Van de Graaff Accelerator Facility to accelerate the beam in ion sources and, less frequently, for aiming targets (Buksa 1995, 17-1256) (Attachment A).

### 1.2 No Further Action Basis

SWMU 3-050(g) is recommended for NFA because the site has been characterized in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk. CAP88-PC calculation for the emissions indicates that the emissions were not sufficient to cause radioactive deposition in excess of SALs. Soil screening results show no contamination exceeding SALs. Radioactive air emissions from the exhaust stacks at TA-3-16 are monitored and documented (LANL 1994, 17-1008) (Appendix A Attachment 2).

Information stated in Section 3.0 clearly indicates that there is no potential soil contamination from the exhaust stacks located at TA-3-16. In addition, LANL does not identify locations suspected of radiological only contamination as SWMUs, but as AOCs. This distinction is made because DOE is the regulatory authority for radiological concerns. This area of suspected soil contamination was not the site of hazardous waste management, but rather incorrectly designated as a SWMU based solely on erroneous supposition of the potential for the presence of radioactivity.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-050(g) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

## 2.0 History

### 2.1 Historical Operations

Tritium was used at the Van de Graaff Accelerator Facility to accelerate the beam in ion sources and, less frequently, as aiming targets

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Memorandum, "Telephone Interview with Lloyd Hunt Regarding SWMU 3-050(g), at TA-3-16," (Buksa 1995, 17-1256).

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

Appendix A Attachment 2: LANL Memorandum, "Available Radioactive Air Emissions Reports Concerning SWMUs 3-050 (a through g)," (LANL 1994, 17-1008)

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Research and development and analytical chemistry laboratories that conduct various operations that involve the handling of radioactive materials containing uranium, plutonium, iodine, mixed fission products, and tritium.

### 3.2 Results of Sampling/Surveys

The available radioactive air emissions data show 14,000 Ci of tritium gas were released from the laboratory from the 1960s through 1992 (LANL 1994, 17-1028) (Appendix A Attachment 3)

The EPA requires use of CAP-88 (Clean Air Act Assessment Package-1988) or AIRDOS-PC computer models for determining compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAPS) for emissions of radionuclides at DOE facilities (EPA 1995) (Appendix A Attachment 4).

Comparisons made between the CAP-88 predictions of annual average ground-level concentration and actual environmental measurements taken by the Office of Radiation Programs indicate agreement between these two approaches. CAP-88 has been used by the LANL Radionuclide Air Emission Management (RAEM) group to determine the effective dose equivalents for NESHAPS compliance for airborne radionuclide emissions. Meteorological data and most of the radioactive air emission data are obtained from the LANL RAEM group, and those parameters are input to the CAP-88 PC model to calculate the radionuclide ground deposition from TA-3 stack releases. CAP-88 tends to overestimate radiation doses in the complex terrain around Los Alamos because it does not take into account dilution of airborne radionuclides by terrain-induced turbulence.

CAP88-PC uses Pasquill's modified Gaussian plume equation to estimate the average dispersion of stack-released radionuclides. In the CAP88-PC calculation, all the stacks from SWMUs 3-050 (f) are considered as one point source of radioactive air emissions due to their geographic locations. Additionally, all radioactive air emissions are assumed in the form of particulates. Heavier annual precipitation, slower stack gas exit velocity, lower mixing height, and lower stack height of one meter were used instead of the actual parameters in the CAP88-PC calculation to ensure conservative results. The release height of the stack is the sum of the stack height and the plume rise. The plume rise is calculated based on momentum of the exit gas at ambient temperature. Meteorological data collected at TA-6 (the nearest meteorological station) and Los Alamos population data were used for the CAP88-PC calculation.

Air concentration, dry deposition rate, wet deposition rate, and ground deposition rate of radionuclides in 16 directions at various distances around the stack were computed. The ground deposition rate is the highest deposition rate, and therefore represents the most conservative radionuclide deposition scenario. For this reason, it is used to calculate the emission necessary to cause the radioactivity concentration in soil to exceed screening action level (SAL). Soil density of 1.8 $g/cm^3$, and 0.1 cm of soil mixing depth were employed to estimate the total emission necessary to cause the radioactivity concentrations in soil to exceed current SALs.

Available annual data on the total known radioactive releases from the associated stacks range from 2 to 40 years. To ensure conservative results, the actual data were normalized in the calculation to show the potential radioactive air emission within 40 years of operation. These values are shown in the table, Radioactive Air Emission Summary, below.

These radioactive releases are at least four orders of magnitude lower than the minimum radioactivity necessary to cause soil contamination exceeding SALs (Radian 1993, 17-1192) (Appendix A Attachment 5).

In addition, actual data from preliminary soil screening results in locations surrounding TA-3 from 1991 through 1993 show alpha, beta, and gamma activities at background levels (Fresquez 1991, 17-259; Fresquez 1992, 17-1026) (Appendix A Attachments 6 and 7).

## RADIOACTIVE AIR EMISSION SUMMARY

| RADIONUCLIDES | RADIOACTIVE AIR EMISSION WITHIN 40 YEARS OF OPERATION (Ci) | ESTIMATED VALUE TO TRIGGER SOIL SALS* (Ci) |
|---|---|---|
| Tritium | 360,000 | $4.8 \times 10^9$ |
| Plutonium-238 and -239 | 0.081 | $7.6 \times 10^3$ |
| Uranium-235 and -238 | 0.0081 | $5.7 \times 10^3$ |
| Mixed fission products | 0.0067 | $2.8 \times 10^3$ |
| Iodine-129/-131 | 0.025 | $8.7 \times 10^2$ |
| Beryllium | ---[b] | ---[b] |

* Based on 0.1 cm of soil mixing depth.

** No report on TA-3-40 is available; no beryllium data were found; however, in 1955 2 air samples and 14 swipe tests showed negligible amounts of beryllium.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0, 2.0, and 3.0, SWMU 3-050(g) is recommended for NFA under Criterion 5.

## 5.0 References

Buksa, M., July 5, 1995. "Telephone Interview with Lloyd Hunt Regarding SWMU 3-050(g), at TA-3-16," Los Alamos National Laboratory Memorandum MJB 95-008 to L. Hunt from M. Buksa (CST-18), Los Alamos, New Mexico. (Buksa 1995, 17-1256)

Environmental Protection Agency, July 1995. "National Emission Standards for Hazardous Air Pollutants," Code of Federal Regulations, Title 40, Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," Washington, DC. (EPA 1995)

Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Fresquez, P., October 22, 1992. "Collection of Soil Samples at SWMU 3-010(a)," Los Alamos National Laboratory Memorandum EM-8:92-3234 to E. Griggs (CLS-DO) from P. Fresquez (EM-8), Los Alamos, New Mexico. (Fresquez 1992, 17-1026)

Fresquez, P., August 12, 1991. "Results of an Environmental Restoration Interim Action (ERIA) Waste Survey at the Van De Graff Underground Storage Tank Removal Project at TA-3," Los Alamos National Laboratory Memorandum EM-8:91-52 to R. Gonzales (EM-13) from P. Fresquez (EM-8), Los Alamos, New Mexico. (Fresquez 1991, 17-259)

Los Alamos National Laboratory, January 25, 1994. "Available Radioactive Air Emissions Reports Concerning SWMUs 3-050(a through g)," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1994, 17-1008)

Los Alamos National Laboratory, February 9, 1994. "Radioactive Air Emissions from TA-3 SM-16, 29, 34, 35, 40, and 102," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1994, 17-1028)

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, pp 6-31 through 6-33, 6-37. (LANL 1995, 1291)

Radian Corp., December 22, 1993. " Air Emission SWMUs," Radian Corp. Memorandum prepared by R. Hueske to OU 1114 Technical Team, Los Alamos National Laboratory, New Mexico. (Radian 1993, 17-1192)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

Section not applicable.

### 6.3 Other Survey/Investigation Data

Section not applicable.

3-001256

Attachment A

# Los Alamos
NATIONAL LABORATORY

## memorandum

*Chemical Science and Technology*
*Responsible Chemistry for America*
Environmental Restoration Program/CST-18
Los Alamos, New Mexico 87545

*To/MS:* Lloyd Hunt, P-23
*From/MS:* Margo Buksa, CST-18, E525
*Phone/FAX:* 6673189/665-4632
*Symbol:* MJB-95 008
*Date:* July 5, 1995

Reference # 3-001256

**Subject: Telephone Interview with Lloyd Hunt Regarding SWMU 3-050(g), at TA-3-16**

On June 28, 1995, I had a telephone interview with Lloyd Hunt in regards to SWMU 3-050(g), at TA-3-16, the Van De Graff Accelerator Laboratory. Lloyd Hunt has worked for LANL since 19??. He gave a thorough description of what details "active tritium work" at TA-3-16. He stated that tritium was used in ion sources to accelerate the beam and was sometimes used as aiming targets. Lloyd Hunt also said that tritium has not been used fro the past 3 to 5 years at this facility. The last tritium inventory was taken last year, which was < 10 g.

# 3-052(c)

# ATTACHMENTS

## SWMU 3-052(c) — One-Time Release

SWMU 3-052(c) is located in former Operable Unit (OU) 1114 (Figure 1-1) within Technical Area (TA)-3 (Figure 1-2 and Index Map) at Los Alamos National Laboratory, Los Alamos, New Mexico.

### 1.0 Introduction

### 1.1 Description

SWMU 3-052(c) [Map 3-052(c)] is a one-time release of hydraulic oil of unknown quantity. The spill occurred in 1986 at an underground storm drain near office building TA-3-422 when a hydraulic line for operating the security gate on Mercury Road was flushed to clear a dirt clog (LANL 1986, 17-356) (Attachment A). The maintenance crew disposed of the dirt-contaminated oil by pouring it down the storm sewer drain. The oil flowed down the storm drainpipe and daylighted southwest of the Steam Plant, TA-3-22.

In 1991, a diesel fuel release associated with two diesel tanks at building TA-3-22, occurred near the area, southwest of TA-3-22, where the storm drainpipe daylighted. As a result of the corrective action following this release, the soil surrounding the drainpipe was removed and replaced with clean fill.

### 1.2 No Further Action Basis

SWMU 3-052(c) is recommended for NFA because it was managed under another authority which adequately addressed corrective action and documentation is available. Although the amount of hydraulic oil released did not result in severe contamination of the outfall area southwest of TA-3-22, the soil surrounding that outfall was removed and replaced with clean fill as part of a corrective action associated with the diesel fuel release (LANL 1992, 17-834; Bellows 1991, 17-835; Bohn, 1991; NMED 1992, 17-832) (Attachments B through E). Any potentially contaminated soil from SWMU 3-052(c) would have been removed as a result of this corrective action.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-052(c) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

One-time release of hydraulic oil of unknown quantity.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Memorandum, "...oil dumped into storm drain around SM-422...," (LANL 1986, 17-356).

Attachment B: LANL Occurrence Report, (LANL 1992, 17-834)

Attachment C: DOE Letter, "Notification of Discharge, NPDES Permit No. NM 0028355," (Bellows 1991, 17-835).

Attachment D: LANL Memorandum, "TA-3 SM-22 Diesel Spill on 9/25/91," Bohn, Sept. 27, 1991.

Attachment E: NMED, "Spill Report pursuant to 1-203 A.3. and 1-203 A.6. of the New Mexico Quality Control Commission (WQCL) Regulations," (NMED 1992, 17-832)

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Based on evidence outlined in Sections 1.0 and 2.0, no unacceptable risk is presented by this site.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-052(c) is recommended for NFA under Criterion 4.

## 5.0 References


Bellows, J. L., October 2, 1991. "Notification of Discharge, NPDES Permit No. NM0028355," letter to J. Piatt, Chief, Surface Water Quality Bureau, New Mexico Environment Department, from J. L. Bellows, Area Manager, Department of Energy, Albuquerque Operations, Los Alamos Area Office, Los Alamos, New Mexico. (Bellows 1991, 17-835)

Bohn,R, September 27, 1991. "TA-3 SM-22 Diesel Spill on 9/25/91," Los Alamos National Laboratory Memorandum EM-8:91-349 to Robert Greuter, Johnson Controls World Services, Inc., from Roy Bohn, EM-8, Los Alamos, New Mexico.

Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, June 3, 1992. "ALO-LA-LANL-PHYSTECH-1991-1007," Los Alamos National Laboratory Occurrence Report, Los Alamos, New Mexico. (LANL 1992, 17-834)

Los Alamos National Laboratory, June 27, 1986. "...oil dumped into storm drain around SM-422...," Pan Am Memorandum 108 to File from A. Atencio (Pan Am), Los Alamos, New Mexico. (LANL 1986, 17-356)

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, pp 6-78. (LANL 1995, 1291)

New Mexico Environment Department, June 1992. "Spill Report pursuant to 1-203 A.3. and 1-203 A.6. of the New Mexico Quality Control Commission (WQCL) Regulations," New Mexico Environment Department Report, New Mexico. (NMED 1992, 17-832)


## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

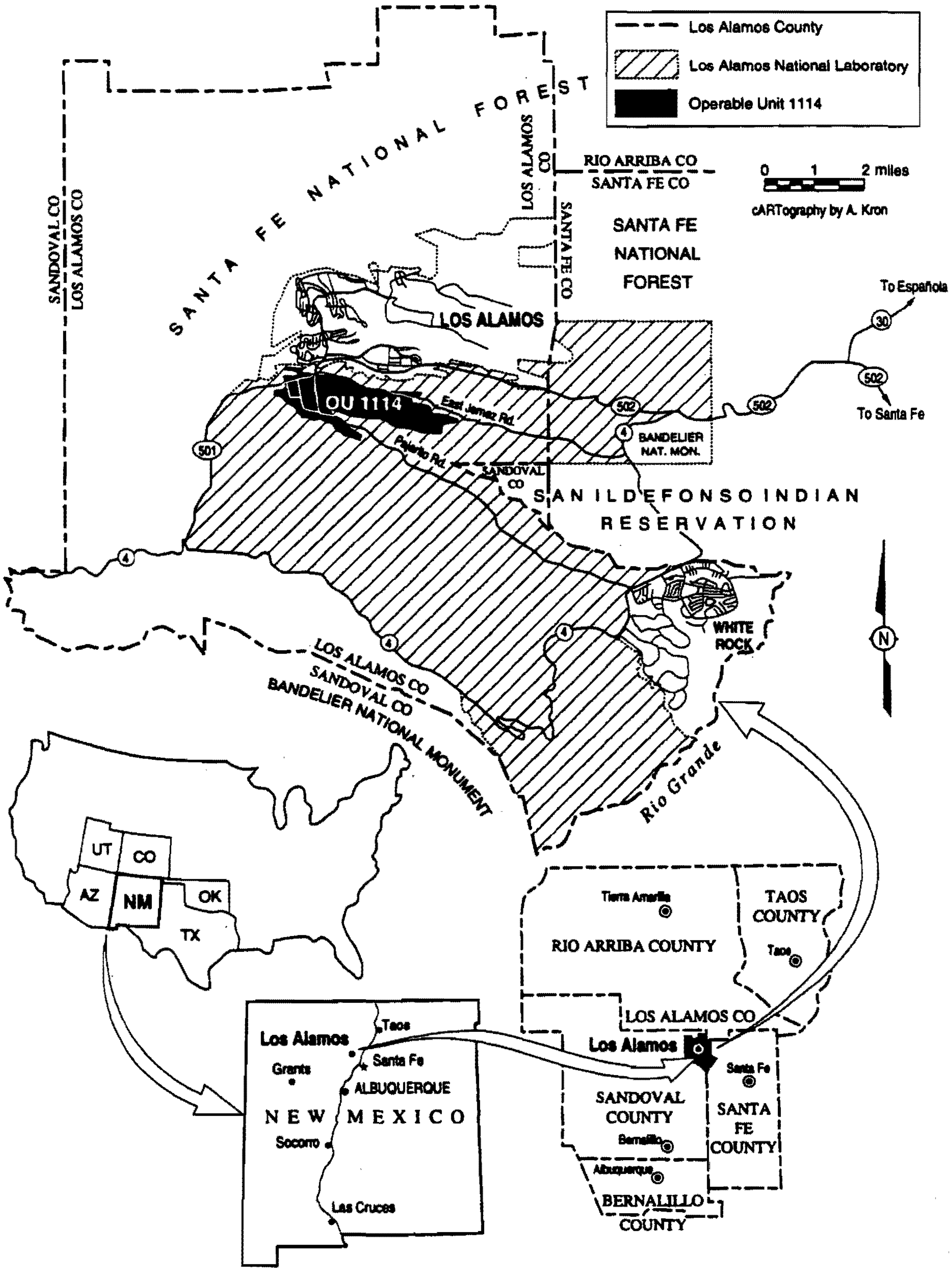



Fig. 1-1. Location of Operable Unit 1114.

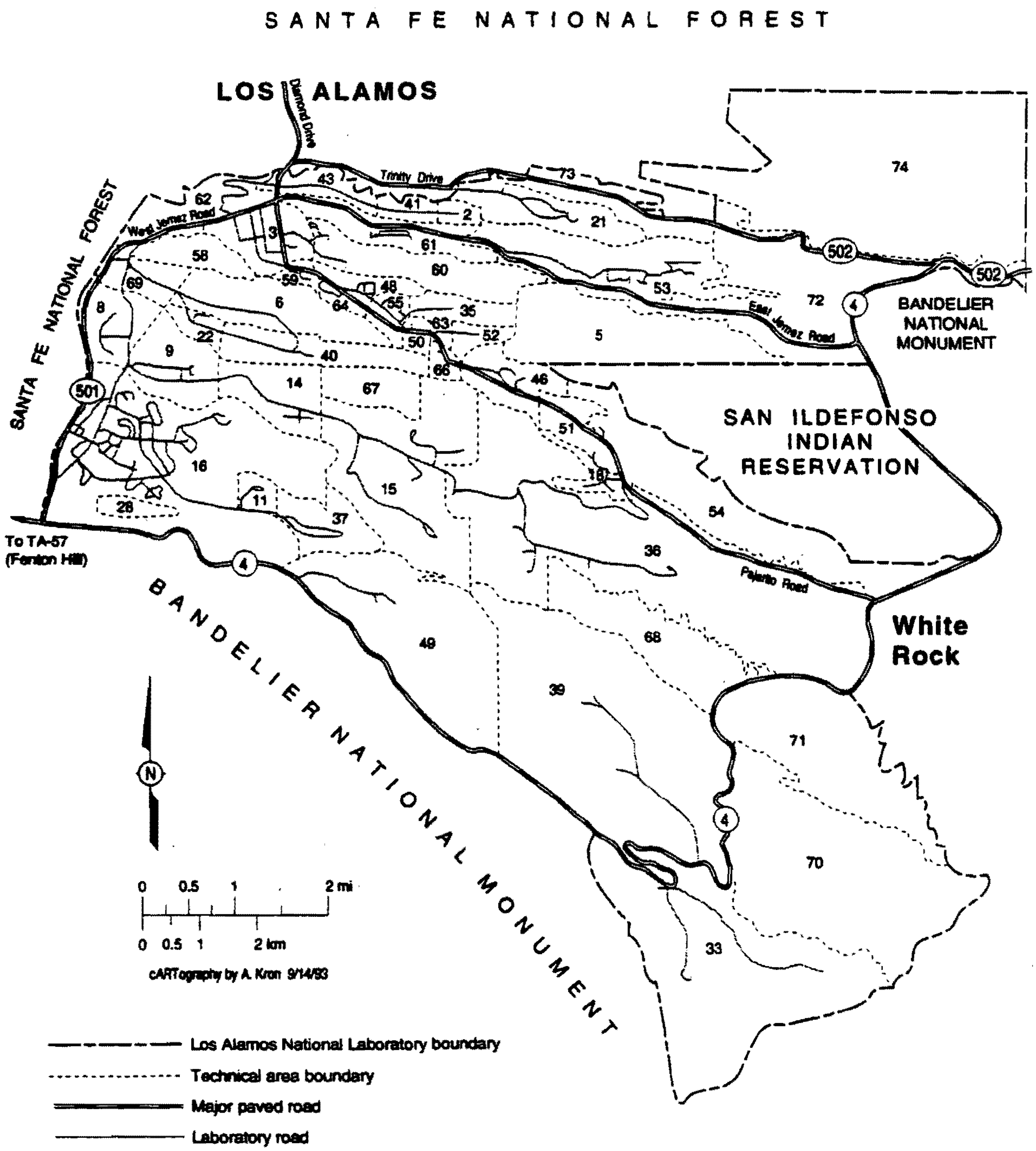
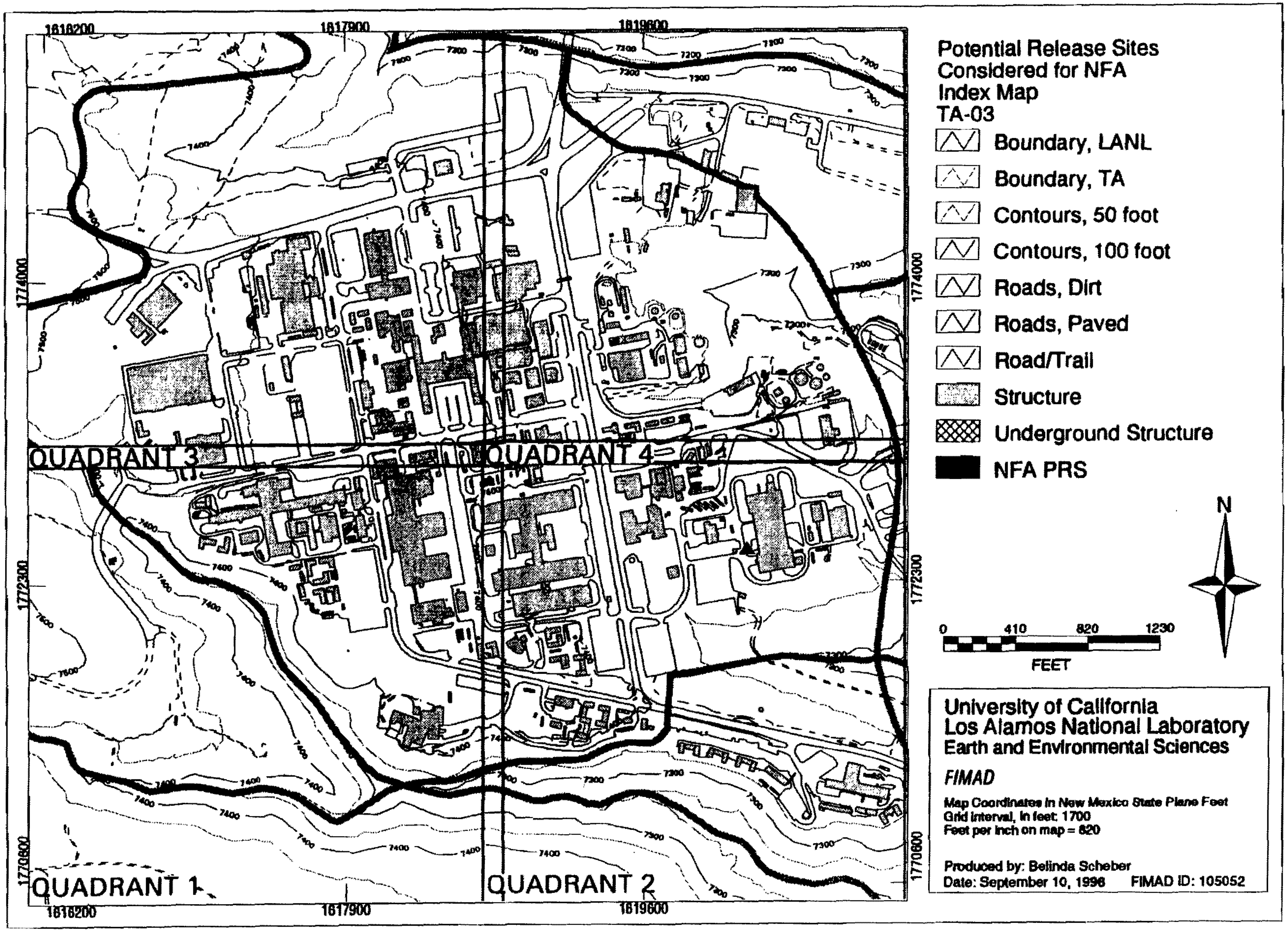
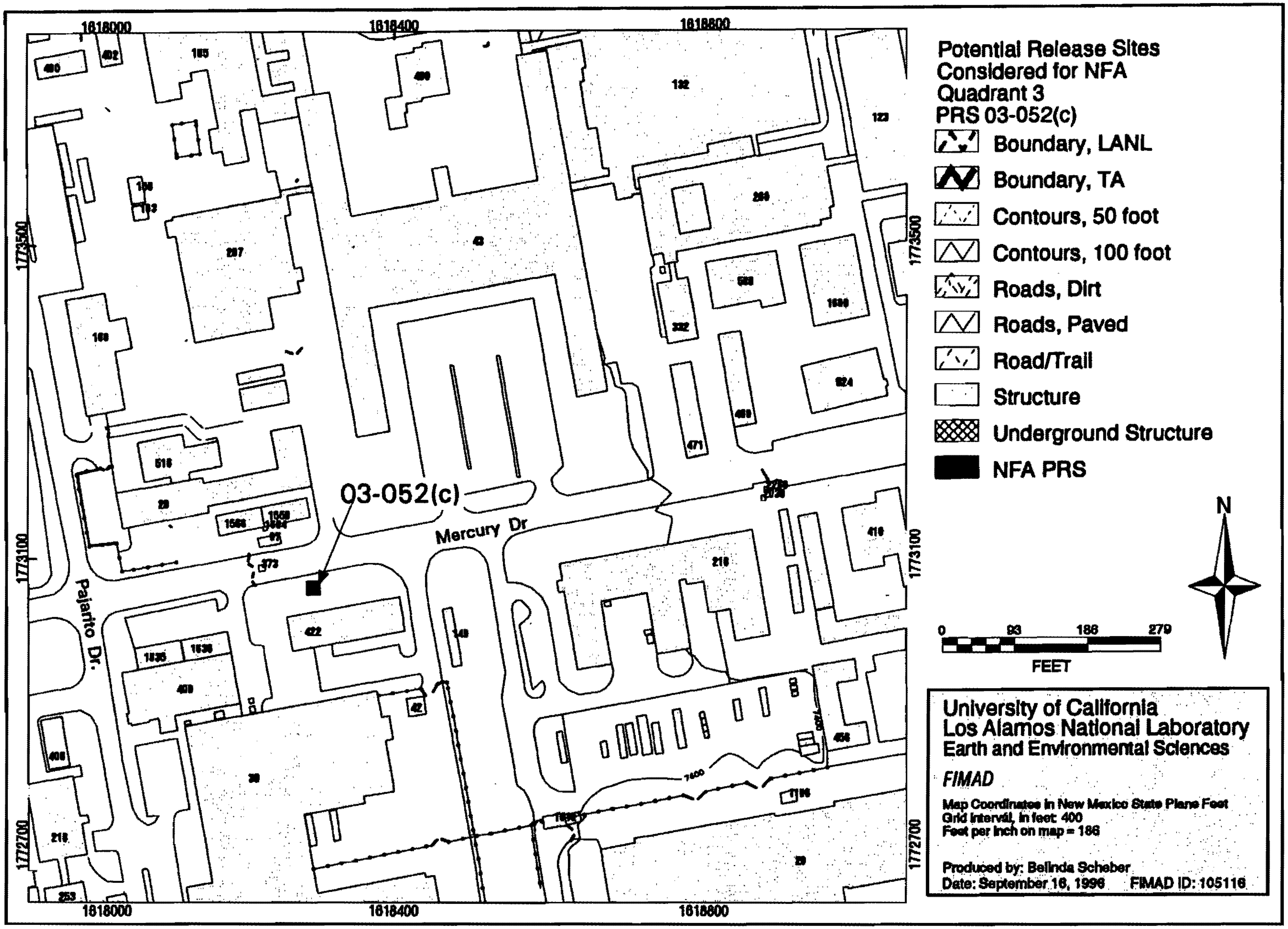



**Figure 1-2. Technical areas at Los Alamos National Laboratory.**




**Potential release sites considered for NFA, TA-03**
**INDEX MAP**




Potential release sites considered for NFA, TA-03, PRS 03-052(c)

Attachment A ~~J-000356~~

ON June 13, 1986, I received a phone call from Mr. Hugo Ojeida, who is the System Superintendent of the Tech Area-3 SM 22 power plant. The phone conversation between us concerned a toxic oil spill which he observed. On the same day, I went to the site and observed that the oil was coming from a storm drain situated on the southwest corner of the power plant ( see Figure #1 ). I then located the source of the oil spill with help of Jim Sitzberger (Road, Section Superintendent) and Manuel L 'Esperance (Grounds, General Supervisor) who in turn located thesource at Tech Area 3 SM 422. On that day, Mr. L 'Esperance did a close examination of the area where he noticed foot prints of oil leading to the storm drain and aroun the security hydralic bollards, which are situated by the front gate entrance near Tech Area 3 SM 97 (see Figure #1). On June 16, 1986 I again contacted Manuel L 'Esperance and Jim Sitzberger who informed me that it was their general consensus that the hydraulic oil found around the storm sewer (TA-3 SM 422) had orginated from the hydraulic bollards near the security entrance gate on Mercury road. The conversation went on further as they suggested that I contact Mr. Harry Clifford (Stationary equip, sec), who is in charge of all stationary equipment, and who has knowledge of hydraulic bollards. On June 17, 1986, and with the advice from Jim Sitzburger, I contacted Harry Clifford who is responsible of all stationary equipment in the repair and maintenance throughout the Tech Areas. Mr. Harry Clifford and I discussed the above mentioned problem of the storm sewers he had confirmed my suspicious that the hydraulic bollards were responsible for the oil spill. Mr Harry Clifford was concerned that this should not happen again recommended that I take to his crew concerning the incident.

On June 19,1986 I followed up on Harry Clifford invitation and met with the crew that deals with the repairs of the bollards. I received full cooperation when I requested a diagram and a explanation of what had occurred during the spill. I found out they first decided to disassemble the hydraulic bollard at Tech Area 3 SM 97. When dirt got clogged the oil flow in the hydraulic line. Subsequently the crew disassembled the unit,flushed it with water ,and used a siphon hose to remove the oil,and dirt , which was then siphoned into the storm sewer.

7-5591 → Mr. Hary Clifford suggested some time earlier that reprimands were needed to control the practice of dumping toxic waste down the storm sewers. Instead, I sug-
-2219 gested that stencilled warning labels should be placed on the storm sewers, which would make dumping oils less likely to happen. As a matter of fact, when I talked to the maintenance crew who actually dumped the oil, I posed the question would they have done what they did if the stencils were on and their response was a positive "no!". If the stencilled warning labels were in place, and if maintenance crews were caught in the act, then ample warning was given. In that case I think the reprimands would be justified.

I believe that if worning labels were in place, two benefits would come about:

1. It would protect the environment from any spills.
2. It would generate more work within the company. For example, there would be work in estimating the loaded rate for the various crafts in the development of a stencilled identification label.
   1) Drafting department would charge $200.00 for a total of eight hours needed to design the stencil.
   2) To convert the cardboard stencils to sheet metal would cost $40.00 an hour at the sheet metal department, or $160.00 for 4 hours.
   3) Painting the storm sewers would cost $58.00 an hour. Since there are approximately 500 storm sewers, this would be very profitable for the company.

## Attachment A

All the figures given above are just rough estimates, but increased revenues would be very profitable for the company and the environment. Another possible avenue of obtaining funds for a stencilled warning label on the storm sewers would result if the Area Coordinators could see the value of such a project in their areas ( see Figure # 3 ). Also to be noted is Figure # 4, this stencile could be painted on storm sewers or should read " do not dump oils / chemicals".

submitted by Robert Atencio

Robert Atencio

6/27/86

# Attachment A

Figure #1

Figure #1

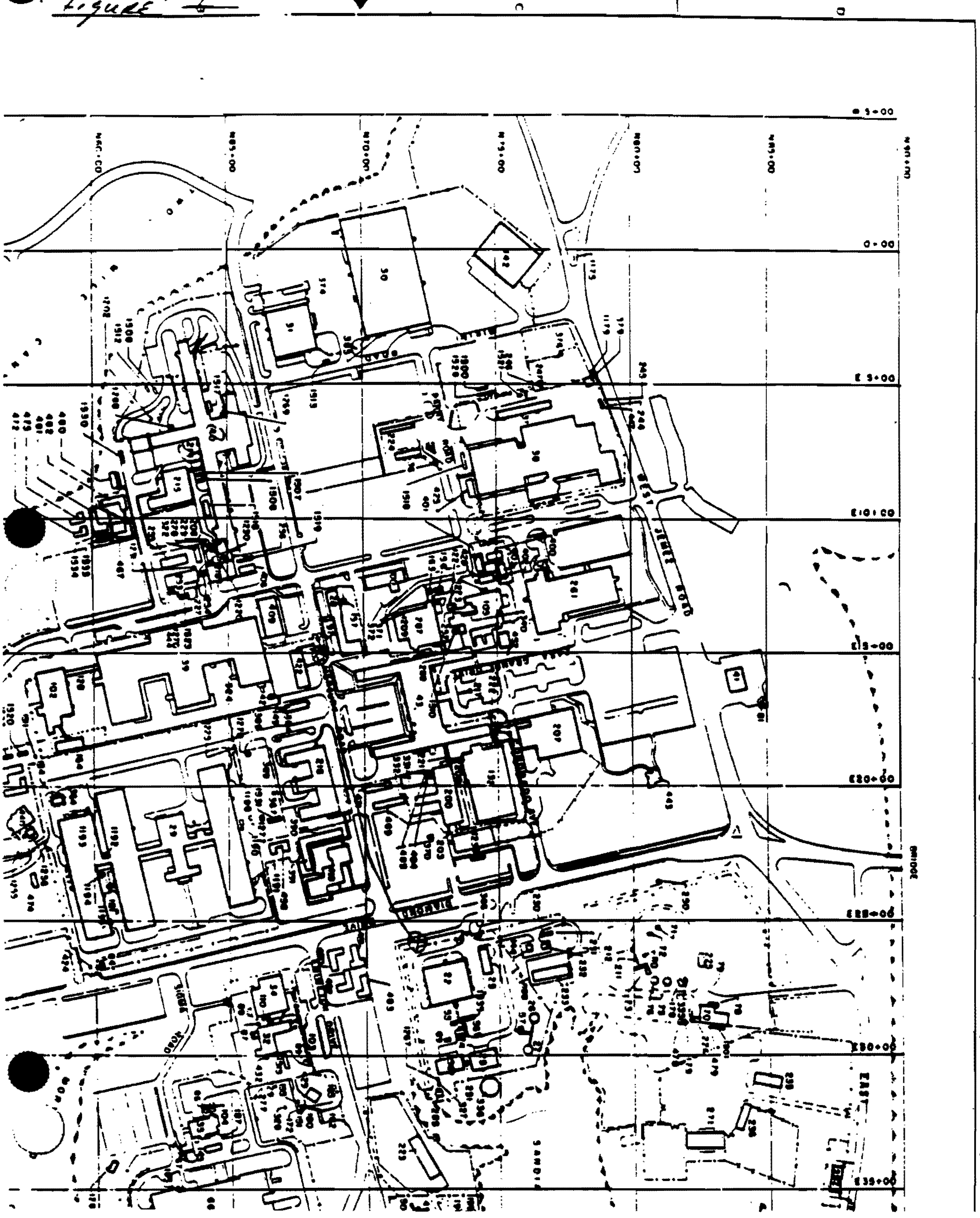
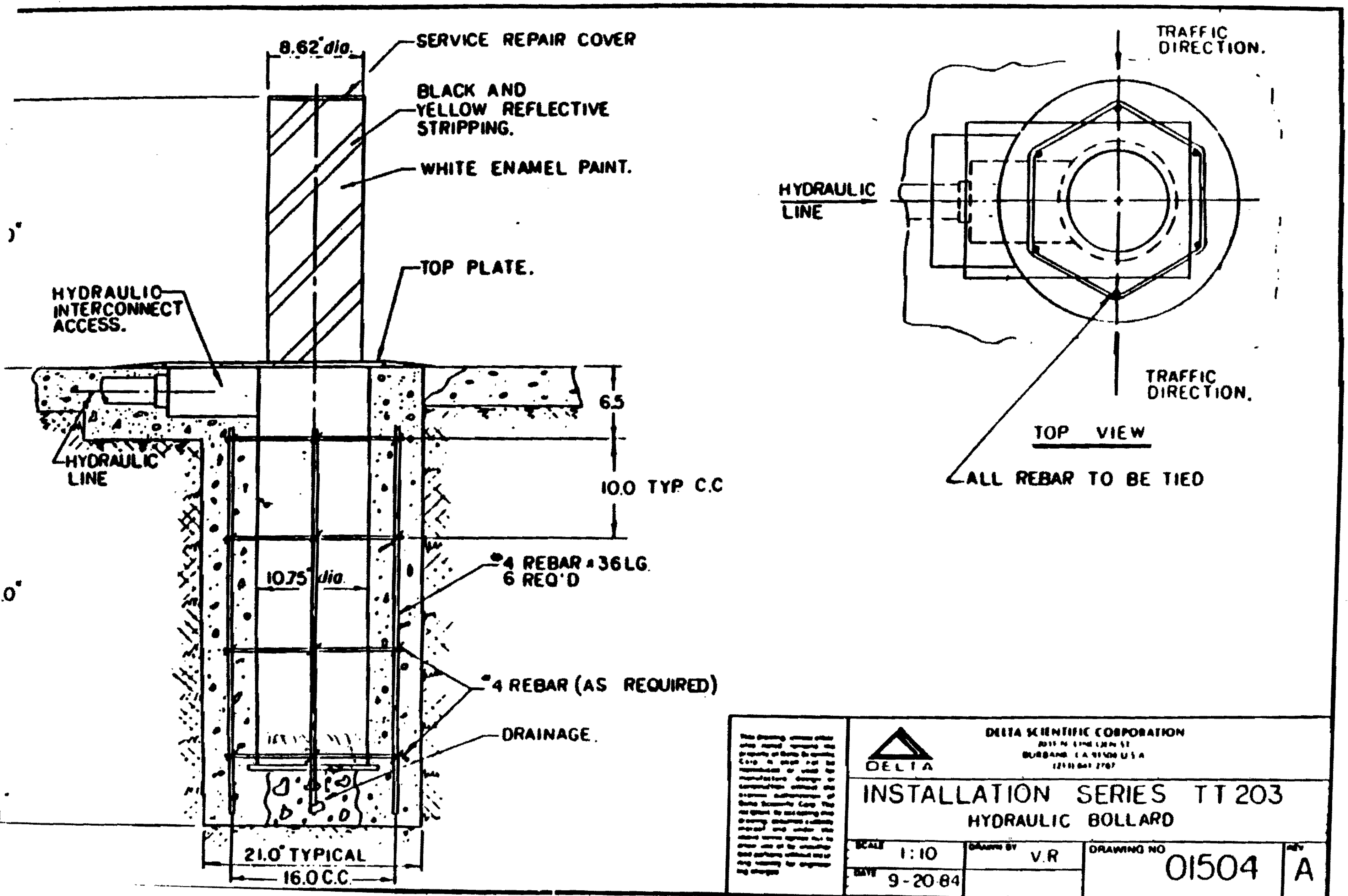


Figure #2

## Attachment A



SENT BY: 11-23-92 Attachment B 3-000834

ALO-LA-LANL-PHYSTECH-1991-1007

Final Report
(Submitted )
6-3-92

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OCCURRENCE REPORT

hysical and Technical Supt.

(Name of Facility)

Balance-of-Plant

(Facility Function Involved)

LOS ALAMOS NATIONAL LABORATORY

(Name of Laboratory, Site or Organization)

Name: Elliott, Alverton A.
Title: Occurrence Report Section Leader
Telephone No.: (505)665-0033 (FTS)855-0033

(Facility Manager/Designee)

Name: Gary Blauert
Title: JCI Utilities Superintendent
Telephone No.: (505)667-3657 (FTS)843-3657

(Originator)

1. OCCURRENCE REPORT NUMBER: ALO-LA-LANL-PHYSTECH-1991-1007

2. REPORT TYPE AND DATE:

| | Date | Time |
|---|---|---|
| [ ] Notification Report | 09/26/91 | 1641 (MTZ) |
| [ ] 10 Day Report | 10/09/91 | |
| [ ] 10 Day Update (latest) | 11/01/91 | |
| [X] Final Report | | |

3. OCCURRENCE CATEGORY :

[ ] Emergency
[X] Unusual
[ ] Off-Normal

4. DIVISION OR PROJECT :

ENG-DO

5. DOE PROGRAM OFFICE :

DP - Defense Programs

ALO-LA-LANL-PHYSTECH-1991-1007

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OCCURRENCE REPORT

Final Report
(Submitted )

. SYSTEM, BLDG., TA-3-22
OR EQUIPMENT:

7. UCNI? : No

8. PLANT AREA : TA-3

9. DATE AND TIME DISCOVERED :

09/25/91 1605

10. DATE AND TIME CATEGORIZED :

09/25/91 1804

11. DOE NOTIFICATION :

09/25/91 1922 Manny Comar DOE H

12. OTHER NOTIFICATIONS :

| | | | |
|---|---|---|---|
| 09/25/91 | 1855 | Anne Young | NMED |
| 09/25/91 | 1820 | Jerry Bellows | LAAO |
| 09/26/91 | 1657 | Mike Peck | LAAO |
| 09/26/91 | 1655 | Sig Hecker | LAB D |
| 09/26/91 | 0740 | Mildred Williams | EPA/N |

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13. SUBJECT OR TITLE OF OCCURRENCE :

Release of 100-200 gallons of fuel oil

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14. NATURE OF OCCURRENCE :

2) Environmental
   B. Hazardous Substances/Regulated Pollutants/Oil Releases

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15. DESCRIPTION OF OCCURRENCE :

An odor of natural gas was detected at 1515 hours. Analysis indicated that a fitting on a gas line needed to be replaced. The back-up fuel oil system was brought on line and pressurized. Johnson Controls, Inc. (JCI) personnel discovered an oil leak at 1605 from an underground line when JCI personnel noticed fuel oil was seeping from the ground. The spill was discovered on the south side of the plant. The storage tank with 160,000 gallon capacity is located above ground on the northeast side of the plant. Approximately 100 - 200 gallons are estimated to have been released into the ground, and some migrated into a storm sewer and then discharged into the adjacent canyon. There was no programmatic impact.

THE NAME APPEARING AS FACILITY MANAGER IN THIS REPORT IS AUTHORIZED TO ACT AS FACILITY MANAGER DESIGNEE FOR THE

ALO-LA-LANL-PHYSTECH-1991-1007 Final Report (Submitted )

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OCCURRENCE REPORT

PURPOSE OF DATA TRANSMITTAL ONLY. THE ACCOUNTABLE FACILITY MANAGER FOR RESOLUTION IS George Vavra, (505) 667-2300.

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16. OPERATING CONDITIONS OF FACILITY AT TIME OF OCCURRENCE :

Maintenance on gas line fitting.

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17. ACTIVITY CATEGORY :

Maintenance

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18. IMMEDIATE ACTIONS TAKEN AND RESULTS :

The fuel oil was shut off and the Johnson Controls, Inc. (JCI) Environmental group and the Environmental Protection group (EM-8) were notified. The spill was contained approximately 100 yards east of the leak in a small area of the canyon and the oil contaminated soil was removed from the site and all oil was removed from the water. The gas fitting was replaced within an hour. The New Mexico Environmental Department (NMED) was notified. The Environmental Protection Agency (EPA) was also notified, and they in turn notified the National Response Center (NRC).

This report has been reviewed by an Authorized Derivative Classifier (Alverton A. Elliott) on June 2, 1992, and determined to be unclassified.

19. DIRECT CAUSE :

1) Equipment/Material Problem
   A. Defective or Failed Part

20. CONTRIBUTING CAUSE(S) :

2) Procedure Problem
   A. Defective or Inadequate Procedure

21. ROOT CAUSE :

6) Management Problem
   A. Inadequate Administrative Control

22. DESCRIPTION OF CAUSE :

The Direct Cause has been identified as (1A) "Equipment/Material Problem, Defective or Failed Part" in that the fuel oil leak occurred when a break in the pipe occurred as the system was being pressurized in order to be used as a back-up fuel source for the steam plant. The 4" steel pipe is approximately 40 years old and the half inch diameter hole in the pipe was caused by corrosion. Corrective Action No. 4 will prevent recurrence of this causal factor in the long term. Corrective Action No. 3 will prevent recurrence in the short term.

The Contributing Cause has been identified as (2A) "Procedure Problem, Defective or Inadequate Procedure", in that a comprehensive preventative maintenance program/procedures for underground piping is lacking. Such a program would have assessed the condition of the pipe and probably prevented the occurrence. Furthermore, the back-up fuel oil system was not tested regularly. Switching over to fuel creates a puff of black smoke which violates air quality standards for opacity. Los Alamos National Laboratory (LANL) had requested permission from the NMED to regularly switch over to fuel oil in order to test reliability, train personnel, and to determine whether the air pollution problem could be mitigated. Corrective Action No. 2 will initiate prevention of a recurrence by monitoring the water flow for a period of one year. Corrective Action No. 5 is designed to prevent recurrence by completing annual leak tests on back-up fuel oil systems at all three steam plants.

The Root Cause has been identified as (6A) "Management Problem, Inadequate Administrative Control", because management did not properly assess the consequences of the lack of the comprehensive maintenance program in this area. Corrective Action No. 1 will formalize the spill containment plan. Corrective Action No. 5 will monitor the condition of the underground fuel on an annual basis.

23. EVALUATION : (By Facility Manager/Designee)

The occurrence had no effect on the operation of the plant. However, it brings to light the need to ensure we have adequate back-up systems for our utilities and the need to put together a comprehensive maintenance program for our piping systems to prevent another occurrence with sim''ar environmental impacts.

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24. IS FURTHER EVALUATION REQUIRED? : Yes [ ] No [X]

IF YES - BEFORE FURTHER OPERATION? : Yes [ ] No [X]

BY WHOM? :

BY WHEN? : --/--/--

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25. CORRECTIVE ACTIONS :
(* = Date added/revised since final report was signed off)

* 1) Oil Spill Containment Plan.
Write and implement an oil spill containment plan. All aspects of the containment plan will be implemented with the exception of monitoring the canyon water flow. (see corrective action item #2)

TARGET COMPLETION DATE: 09/25/91 COMPLETION DATE: 09/25/91

2) Ongoing Monitoring.
Ongoing monitoring of water flow in canyon for a period of one year.

Responsible Group/Division: JCI ENV

TARGET COMPLETION DATE: 11/01/92 COMPLETION DATE: 11/01/91

3) Temporary Replacement.
Install a temporary replacement fuel oil system.

Responsible Group/Division: JCI

TARGET COMPLETION DATE: 01/15/92 COMPLETION DATE: 12/23/91

4) Replacement of Fuel Oil System.
Design and install a permanent piping system to replace the fuel oil system.

Responsible Group/Division: JCI

TARGET COMPLETION DATE: 10/01/92 COMPLETION DATE: --/--/--

5) Annual Leak Testing.
Annual leak testing for the back-up fuel oil systems at all three steam plants will be conducted.

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Final Report
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Responsible Group/Division: JCI

TARGET COMPLETION DATE: 12/01/92 COMPLETION DATE: --/--/--

26. IMPACT ON ENVIRONMENT, SAFETY AND HEALTH :

Approximately 100 - 200 gallons of #2 diesel fuel were released to the environment. Rapid implementation of spill containment procedures by plant personnel minimized the impact of this spill. The oil was contained within a mall area of the canyon. Also, oil contaminated soil was removed from the site and all oil was removed from the water. Short term and long term environmental effects as a result of this release, if existant, are minimal.

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27. PROGRAMMATIC IMPACT :

Operation of the plant was not affected by this incident, but a back-up fuel supply is not available until the temporary line is installed. Clean-up costs were estimated at $84,080.

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28. IMPACT UPON CODES AND STANDARDS :

None

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29. FINAL EVALUATION AND LESSONS LEARNED :

Final Evaluation: Back-up fuel oil systems were installed at each of the three central steam plants at the Los Alamos National Laboratory. Although all underground fuel tanks at these facilities have been replaced with above ground tanks, the supply piping is still underground. Annual leak surveys of these lines will be instituted and scheduled to start in 1992.

Lessons Learned: This incident reinforces the need to perform periodic leak testing for underground fuel oil lines, particularly those which were installed without automatic leak detection devices.

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30. SIMILAR OCCURRENCE REPORT NUMBERS :

None

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31. DOE FACILITY REPRESENTATIVE INPUT :

Entered by: Date: --/--/--

Attachment C

3-000835

**Department of Energy**
Albuquerque Operations
Los Alamos Area Office
Los Alamos, New Mexico 87544

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Jim Piatt, Chief
Surface Water Quality Bureau
New Mexico Environment Department
P. O. Box 26110, 1190 St. Francis Dr.
Harold Runnels Building
Santa Fe, New Mexico 87502

Dear Mr. Piatt:

Enclosed is a notification concerning a recent discharge at Los Alamos National Laboratory (LANL) which has been verbally reported to the New Mexico Environment Department and U. S. Environmental Protection Agency (EPA). The notification concerns the discharge of 100-200 gallons of diesel fuel from a broken fuel line at the Tecnical Area-3 Power Plant which occurred on September 25, 1991.

We are providing the enclosed written notification at the request of Mr. Peter Monahan of your staff and to document that the U. S. Department of Energy and LANL are making every effort to mitigate and to prevent recurrence of this discharge.

If you need any additional information concerning the enclosed notification, please call Donald George of my staff at 665-5046 or Steven Rae of LANL's Environmental Protection Group at 665-1859.

Sincerely,

Jerry L. Bellows
Area Manager

LESH:2DG-022

Enclosure:

cc w/enclosure:
Diane Ratkey, EPA, Region 6, Dallas, Texas
John Themelis, EPD, AL
Allen Tiedman, ADO, LANL, MS-A120
Tom Gunderson, EM-DO, LANL, MS-K491
Ken Hargis, EM-8, LANL, MS-K490
Steve Rae, EM-8, LANL, MS-K490

Attachment C

## Notification of Discharge

**Los Alamos National Laboratory**
**NPDES Permit No. NM0028355**
**October 2, 1991**

1. **Location of Discharge**

Los Alamos National Laboratory
Technical Area (TA)-3, SM-22 (Power Plant)
Ephemeral Tributary to Sandia Canyon

2. **Nature of Discharge**

On September 25, 1991, at approximately 4:05 pm an underground diesel fuel transfer line broke during start-up of the TA-3 Power Plant's back-up fuel system. Diesel fuel oil #2 surfaced and was discharged across the ground and entered a storm water channel where it drained to a watercourse. The fuel line was shut off at approximately 4:20 pm on September 25, 1991, and the discharge ceased. The discharge occurred to a small drainage to Sandia Canyon which is an ephemeral tributary to the Rio Grande.

3. **Amount of Discharge**

The total discharge of diesel fuel oil #2 to the ephemeral watercourse was estimated to be 100-200 gallons.

4. **Discharge Discovery, Investigation and Notification**

The spill was discovered immediately by Johnson Control, Inc. (JCI), operators at the Power Plant. JCI notified the Laboratory's Emergency Management Office (EMO) of the diesel spill at approximately 4:45 pm on September 25, 1991. Ms. Ann Young of the New Mexico Environment Department (NMED) was notified of the diesel spill at 8:55 pm on September 25, 1991, by the Laboratory's Environmental Protection Group (EM-8). Ms. Mildred Williams of the U.S. Environmental Protection Agency (EPA), Region 6, was notified of the spill at 7:40 am on September 26, 1991. The National Response Center was notified of the spill at 11:00 am on September 26, 1991. Peter Monahan and Alex Puglesi from the NMED visited the site on September 26, 1991.

5. **Affected Area**

The 100 to 200 gallons of diesel discharged into the ephemeral watercourse and traveled downstream approximately 120 feet where it was contained.

## Attachment C

### 6. Mitigation of Affected Area

The diesel spill was contained in the watercourse within minutes using absorbent booms and pillows which are maintained in stock by JCI. Pools of diesel were removed using a wet/dry vacuum and absorbents. The removed oil and absorbents were placed in drums and will be properly disposed of. Contaminated soil will be removed, sampled and properly disposed of. Contaminated rocks not removed will be cleaned with low pressure water and any discharge associated with the clean-up will be contained and properly disposed of. NPDES outfalls located downstream were controlled by re-routing or discontinuing their discharges to ensure that the spill was not carried downstream. The ephemeral watercourse is being monitored to detect any releases of water upstream from the spill which could affect cleanup operations.

### 7. Corrective Actions

Pumps to the fuel transfer pipe were immediately turned off after discovery of the spill. The pipe line is presently being repaired. Start-up procedures require external monitoring of the Power Plant stack during this operation and is the reason the spill was discovered immediately. Start-up procedures will be modified to include the monitoring of the entire fuel supply system for leaks.

Investigation is on-going to determine the cause of the fuel line failure. Corrective actions required to prevent another occurrence are being initiated. Possible actions may include the installation of pressure gauges in the fuel line to detect leaks and replacement of the entire fuel supply system depending on its condition.

### 8. Names, Phone Numbers and Addresses of Persons in Charge

Jerry L. Bellows (Owner and Co-operator)
Area Manager
US Department of Energy
Los Alamos Area Office
Los Alamos, New Mexico 87544
(505) 667-5105

Allen J. Tiedman (Co-operator)
Associate Director for Operations
University of California
Los Alamos National Laboratory
Los Alamos, New Mexico 87545
(505) 667-9390

**Attachment D**

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

DATE September 27, 1991
IN REPLY REFER TO EM-8:91-349
MAIL STOP K490
TELEPHONE (505) 665-0452
(FTS) 855-0452

Mr. Robert Greuter
Johnson Controls World Services, Inc.
P. O. Box 50
UMDO, MS A199
Los Alamos, New Mexico 87544

THRU: KMH Ken Hargis, EM-8 Group Leader

Dear Mr. Greuter:

**SUBJECT: TA-3 SM-22 DIESEL SPILL ON 9/25/91**

On September 27, 1991, two members of the Surface Water Bureau of the New Mexico Environment Department (NMED) inspected the diesel spill and clean-up operations at the TA-3, SM-22 Power Plant. Overall the inspectors were satisfied with the spill response and clean-up operations. The inspectors requested the additional following actions be completed.

1. Water samples be collected below the affected area of the spill and analyzed for total petroleum hydrocarbons (TPH). If TPH can not be performed, volatile organic analyses (VOA) and semi-volatile analyses (SVOA) will be performed. JCI-ENV has been instructed to collect these samples and submit them to EM-9 for analyses. When analytical results are known EM-8 will submit the data to NMED.

2. Identify, sample, and stop the low volume discharge (about 1gpm) seen discharging from the corrugated metal pipe at Outfall 151 until spill clean-up is completed. The procedures mentioned above for sampling and analyses will be used.

   I understand you have identified the discharge as originating from the permitted NPDES Outfall 04A151 and that the water is from floor drains located in the power plant. These floor drains receive leaks from once-through cooling systems. I am requesting that the by-pass pipe for the outfall be locked out/tagged out and formal operating procedures be implemented and submitted to myself prior to any discharge from that pipe.

**Attachment D**



3. Information concerning the frequency of testing these fuel transfer lines and the last time they were tested or used prior to the spill.

Please submit to me the information requested above so it may be submitted to NMED as soon as possible.

Sincerely,

Roy A Bohn

Roy Bohn
Environmental Protection Group

RB:smm

Cy: K. Hargis, EM-8, MS K490
S. Rae, EM-8, MS K490
C. Richardson, ENG-8, MS M718
M. Brown, JCI/ENV, MS A199
CRM-4, MS A150
Circ. File

Attachment E

3-000832

State of New Mexico

# ENVIRONMENT DEPARTMENT

BRUCE KING
*GOVERNOR*

JUDITH M. ESPINOSA
*SECRETARY*

RON CURRY
*DEPUTY SECRETARY*

**CERTIFIED MAIL-RETURN RECEIPT REQUESTED**

June 10, 1992

Mr. Jerry L. Bellows
Area Manager
Department of Energy
Los Alamos Area Office
Los Alamos, NM 87544

Mr. Allen J. Tiedman
Associate Dir. of Support
University of California
P.O. Box 1663, MS A-120
Los Alamos, NM 87545

RE: Spill report pursuant to 1-203 A.3. and 1-203 A.6. of the New Mexico Water Quality Control Commission (WQCC) Regulations

Dear Sirs:

The Surface Water Quality Bureau of the New Mexico Environment Department (NMED), is in receipt of the spill reports submitted by DOE/UC-LANL. A list of the spill reports are as follows:

| Spill Date | Type of Release | Location | User Group |
|---|---|---|---|
| 8/29/91 | foam | TA-3 | WWTP |
| 9/10/91 | foam | TA-3 | WWTP |
| 10/26/91 | sewage overflow | TA-3 | WWTP |
| 12/18/91 | sewage overflow | TA-3 | WWTP |
| 2/11/92 | hydraulic fluid | TA-3 | Bldg. 2011 ACI |
| 8/1/91 | oily sheen | TA-3 | outfall 023 |
| 8/28/91 | foam | TA-3 | outfall 023 |
| 9/25/91 | diesel spill | TA-3 | Power Plant |
| 9/4/91 | white effluent | TA-3 | cooling tower 1837 |
| 10/10/91 | environmental tank effluent disposed in TA-18 lagoon | | |
| 1/27/92 | manhole overflow | TA-41 | Bldg. 50 |
| 2/9/92 | steam condensate | TA-21 | BLdg. 286 |
| 9/27/91 | treated effluent | TA-21 | outfall 050 |
| 2/27/92 | discharge from clean out | TA-60 | |

Each site was inspected on February 28, 1992. The corrective actions taken were satisfactory.

Spill reports are required by Section 1-203 of the New Mexico Water Quality Control Commission (WQCC) Regulations. The reports have been reviewed by technical staff of the NMED Surface Water Quality Bureau and they appear to be administratively complete. The NMED considers this letter as documentation for closing the files on these spills. NMED appreciates your voluntary cooperation in this matter.

**Attachment E**

If you have any questions regarding this matter do not hesitate to call Peter Monahan of my staff at 827-2794.

Sincerely,

Jim Piatt

Jim Piatt
Chief
Surface Water Quality Bureau

xc: NMED, Office of General Counsel
Courte Voorhees, NMED District II Office
Steve Rae, UC-LANL/HSE-8, MS K490

# 3-054(a)

# ATTACHMENTS

## SWMU 3-054(a) — Outfall (Decommissioned)

### 1.0 Introduction

SWMU 3-054(a) is located in former Operable Unit (OU) 1114 (Figure 1-1) within Technical Area (TA)-3 (Figure 1-2 and Index Map) at Los Alamos National Laboratory, Los Alamos, New Mexico.

### 1.1 Description

SWMU 3-054(a) [Map 3-054(a)] is a decommissioned outfall once associated with cooling tower TA-3-19. The outfall, operational since 1952 became inactive in 1966 when the cooling tower was removed and the outfall pipe was rerouted to the chilled water system in building TA-3-208. The effluent from this system is discharged in the same area, now designated NPDES outfall EPA03A025 [this NPDES outfall is SWMU 3-054(d); see the NFA proposal for SWMU 3-054(d) in this Request for Permit Modification]. The SWMU 3-054(a) outfall pipe could not be located; however, the discharge would have entered Twomile Canyon.

### 1.2 No Further Action Basis

SWMU 3-054(a) is recommended for NFA because the site has never been used for the management (i.e., generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes or constituents, or other CERCLA hazardous substances. There is no history of chromate use at cooling tower TA-3-19 (LANL 1993, 17-932) (Attachment A)

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-054(a) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

Outfall for a cooling tower TA-3-19 with no history of chromate use.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Memorandum, "Van de Graaf Site Visit SWMUs 3-054(a), 3-054(d), 3-055(a), and C-3-010," (LANL 1993, 17-932).

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

### 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-054(a) is recommended for NFA under Criterion 2.

## 5.0 References

Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, July 30, 1993. "Van De Graaff Site Visit SWMUs 3-054(a), 3-054(d), 3-055(a), and C-3-010," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1993, 17-932)

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, p 6-57. (LANL 1995, 1291)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

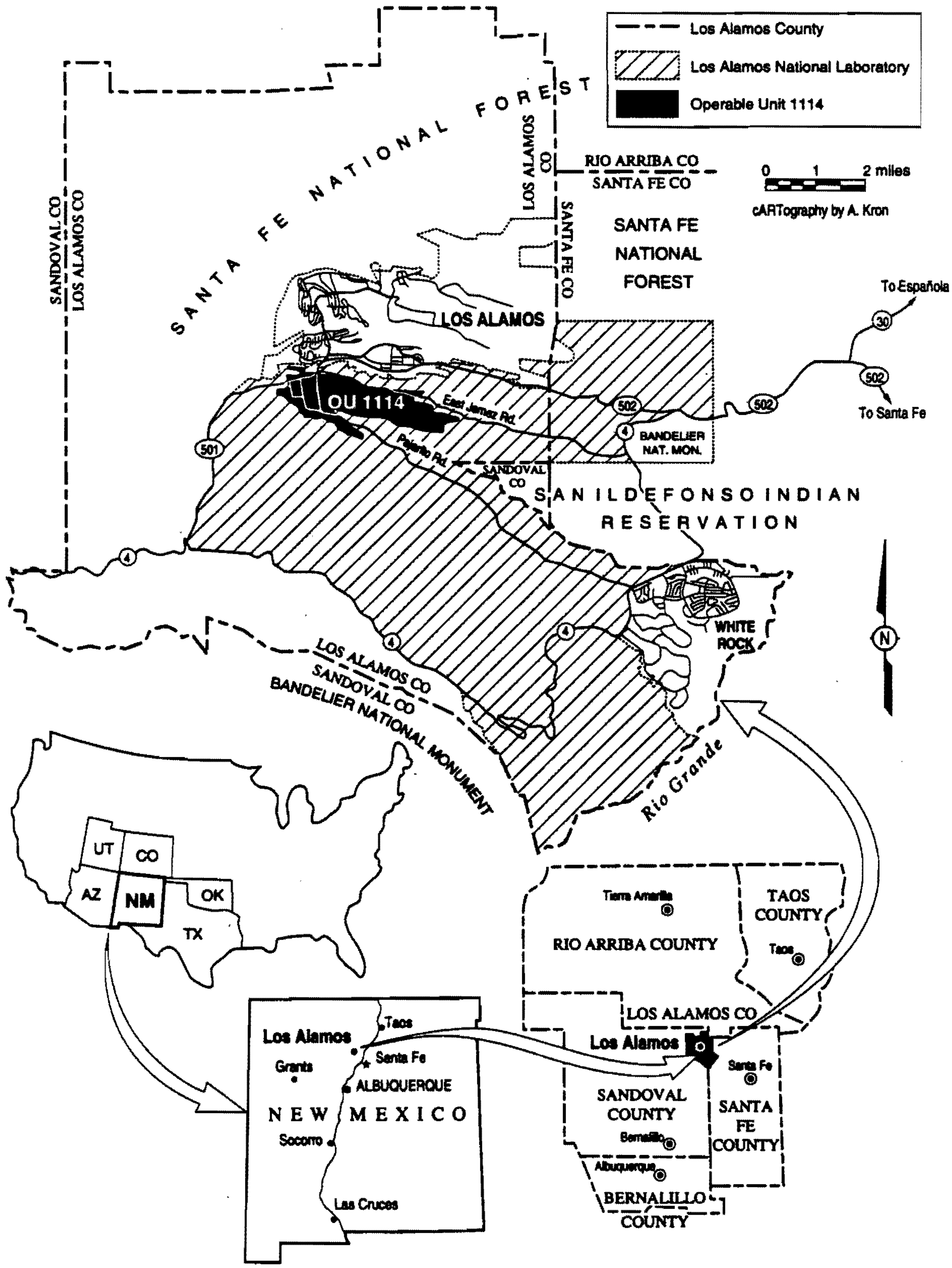



**Fig. 1-1. Location of Operable Unit 1114.**

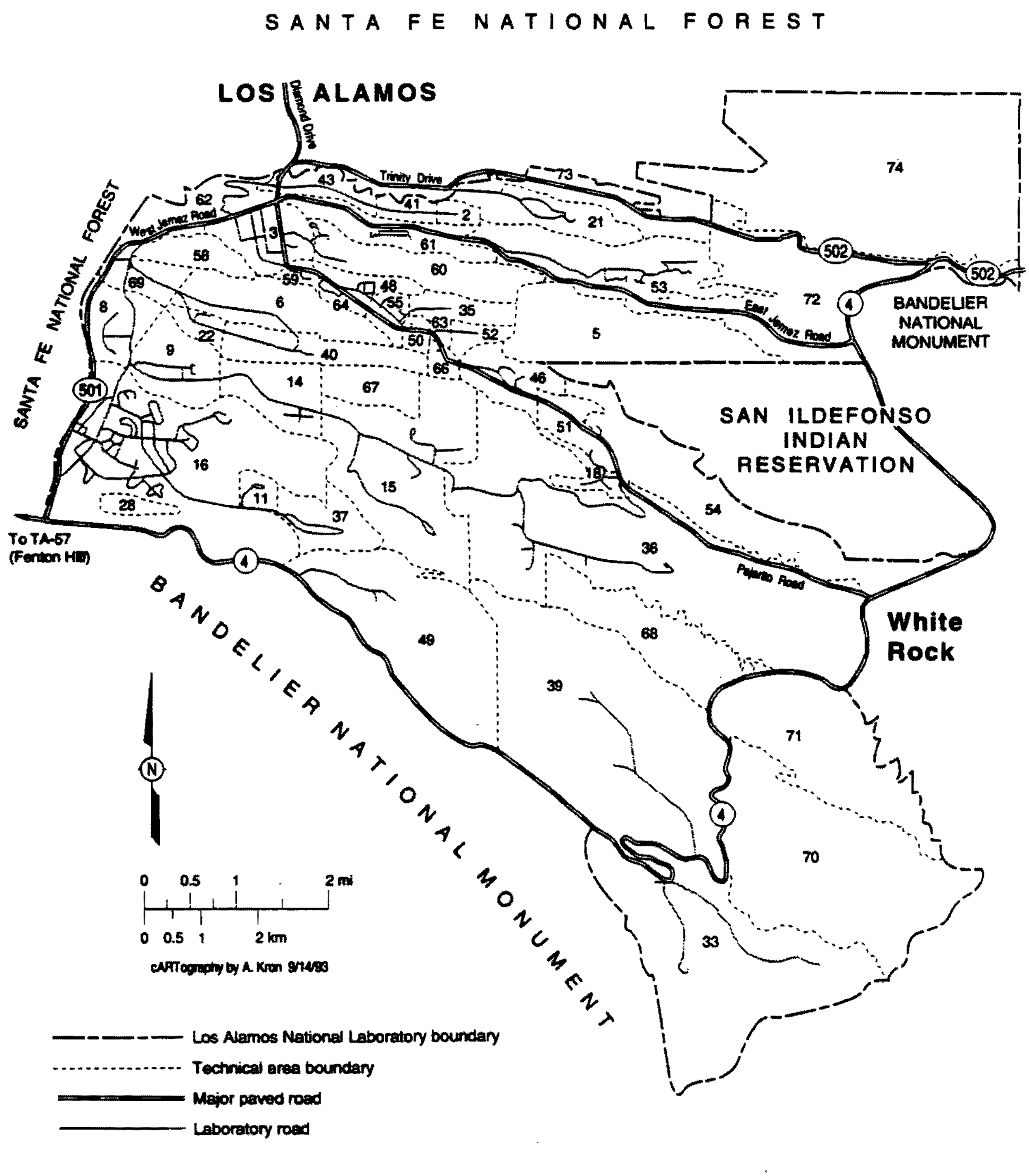
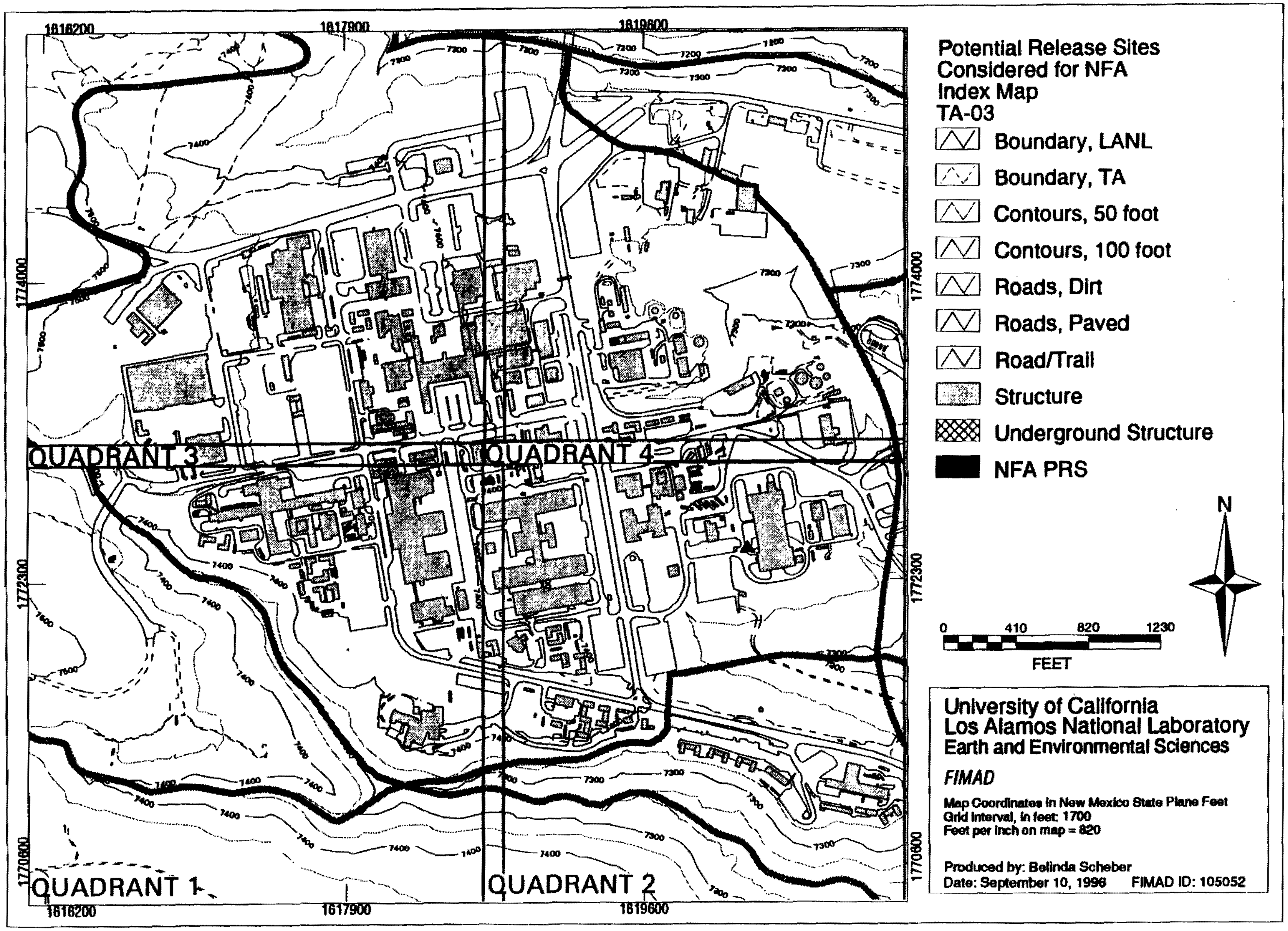
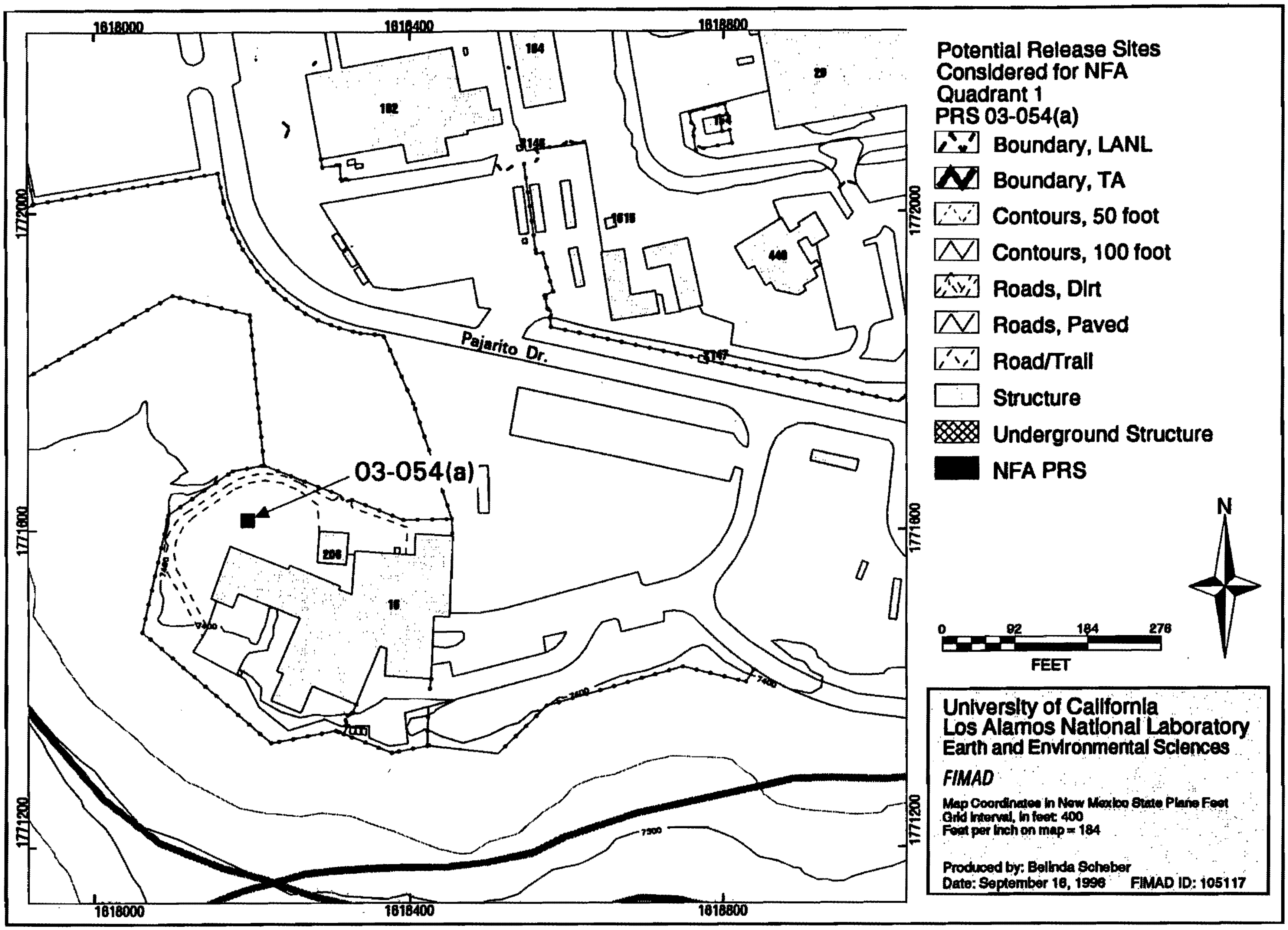



**Figure 1-2. Technical areas at Los Alamos National Laboratory.**




**Potential release sites considered for NFA, TA-03**
**INDEX MAP**




Potential release sites considered for NFA, TA-03, PRS 03-054(a)

# MEMORANDUM

ERM/GOLDER Los Alamos Project Team

**To:** Operable Unit 1114 File

**From:** Valerie Rhodes VR

**Date:** 30 July 1993

**Regarding:** VAN DE GRAAF SITE VISIT
SWMUS 3-054(A), 3-054(D), 3-055(A), AND AOC C-3-010

---

On 29 June and 16 July 1993, I met with Larry Rowton (Section Leader, P-9) to view and discuss the above referenced SWMUs located at the Van de Graaf Facility (TA-3-16). SWMUs 3-054(a), 3-054(d), and 3-055(a) are reported to be outfalls associated with the Van de Graaf Facility that discharge into Twomile Canyon while AOC C-3-010 is reported to be the remnant contamination from a cooling tower (associated with TA-3-19) that was decommissioned and removed. Information regarding these SWMUs and AOC from the site visits is outlined below:

<u>SWMU 3-054(a)</u>

Mr. Rowton was not familiar with the TA-3-19 cooling tower and associated outfall (SWMU 3-054(a)); both were decommissioned in 1966. A concrete slab whére TA-3-19 used to be located remains in place; there was no staining on or around the slab and the vegetation in the area was very healthy. After the cooling tower was removed, the outfall pipe was re-routed to the chilled water system in building 208. The effluent from this system is discharged in the same area; it is now designated NPDES No. EPA03A025 (See SWMU 3-054(d) below).

<u>SWMU 3-054(d)</u>

This outfall (NPDES No. EPA03A025) releases cooling tower discharge from TA-3-16 as well as the cooling system and the floor drains in equipment building TA-3-208. Chromates are/were not used in the cooling tower (re: Bill Radzinski, ENG-6). The chemicals to treat the hardwater in the cooling system include sodium bisulfide, potassium sulfide, and sodium hydroxide; these are pumped directly to the equipment from their original containers. Mr. Rowton reported that there had been no spills from either these chemicals or from oil, grease, or solvents to the floor drains; three the floor drains received only water from infrequent floor washdown. The floor in TA-3-208 was clean and free from staining.

SWMU 3-55(a)

An outfall pipe is located south of TA-3-16 on the edge of Twomile Canyon. Mr. Rowton did not know the origin of the pipe; however, drawing no. ENG-C31372 indicates that this pipe is an outfall for the roof drains. Mr. Rowton suggested that a dye test could be performed to verify this. Other drainages (that could be considered outfalls) in the vicinity of the Van de Graaf Facility carry storm water runoff from the streets, parking lots, and surrounding upgradient areas only.

AOC-C-010

There is no evidence (staining or stressed vegetation) on or near the concrete slab where the TA-3-19 cooling tower was once located; it is highly unlikely (re: Bill Radzinski, ENG-6) that chromates were used during cooling tower operation. Currently, several transformers occupy the concrete slab.

cc: Project File

# 3-054(d)

# ATTACHMENTS

## SWMU 3-054(d) — Outfall (Active)

### 1.0 Introduction

SWMU 3-054(d) is located in former Operable Unit (OU) 1114 (Figure 1-1) within Technical Area (TA)-3 (Figure 1-2 and Index Map) at Los Alamos National Laboratory, Los Alamos, New Mexico.

### 1.1 Description

SWMU 3-054(d) [Map 3-054(d)] is an active, permitted outfall (NPDES permit number EPA 03A025) that releases blow-down and effluent from the cooling tower located on the roof of TA-3-16 and wash water from three floor drains in the equipment room of TA-3-208. In the past, this outfall likely received cooling tower effluent and blow-down from TA-3-19 [see the NFA proposal for SWMU 3-054(a) in this Request for Permit Modification]. The equipment in TA-3-208 supports the cooling system that serves TA-3-16.

### 1.2 No Further Action Basis

SWMU 3-054(d) is recommended for NFA because the site has never been used for the management (i.e., generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes or constituents, or other CERCLA hazardous substances. Chemicals including sodium bisulfide, potassium sulfide, and sodium hydroxide were used to treat the hard water in the cooling system at TA-3-16. However, there is no history of chromate use at the TA-3-16 and TA-3-19 cooling towers (LANL 1993, 17-932) (Attachment A). In addition, the facility manager who has worked at TA-3-208 since 1979, reported that there had been no spills of chemicals, oil, grease, or solvents to the floor drains. He also reported that the only effluent that floor drains in TA-3-208 received was wash water from infrequent floor washdowns (LANL 1993, 17-932) (Attachment A).

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-054(d) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

Outfall for the cooling tower located on the roof of TA-3-16 and wash water from three floor drains in the equipment room of TA-3-208. In the past, this outfall likely received cooling tower effluent and blow-down from TA-3-19. Neither cooling tower has a history of chromate use.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Memorandum, "Van de Graaf Site Visit SWMUs 3-054(a), 3-054(d), 3-055(a), and C-3-010," (LANL 1993, 17-932).

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

### 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

## 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-054(d) is recommended for NFA under Criterion 2.

## 5.0 References


Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, p 6-57. (LANL 1995, 1291)

Los Alamos National Laboratory, July 30, 1993. "Van De Graaff Site Visit SWMUs 3-054(a), 3-054(d), 3-055(a), and C-3-010," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1993, 17-932)


## 6.0 Annexes

## 6.1 RFI Analytical Results

Section not applicable.

## 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

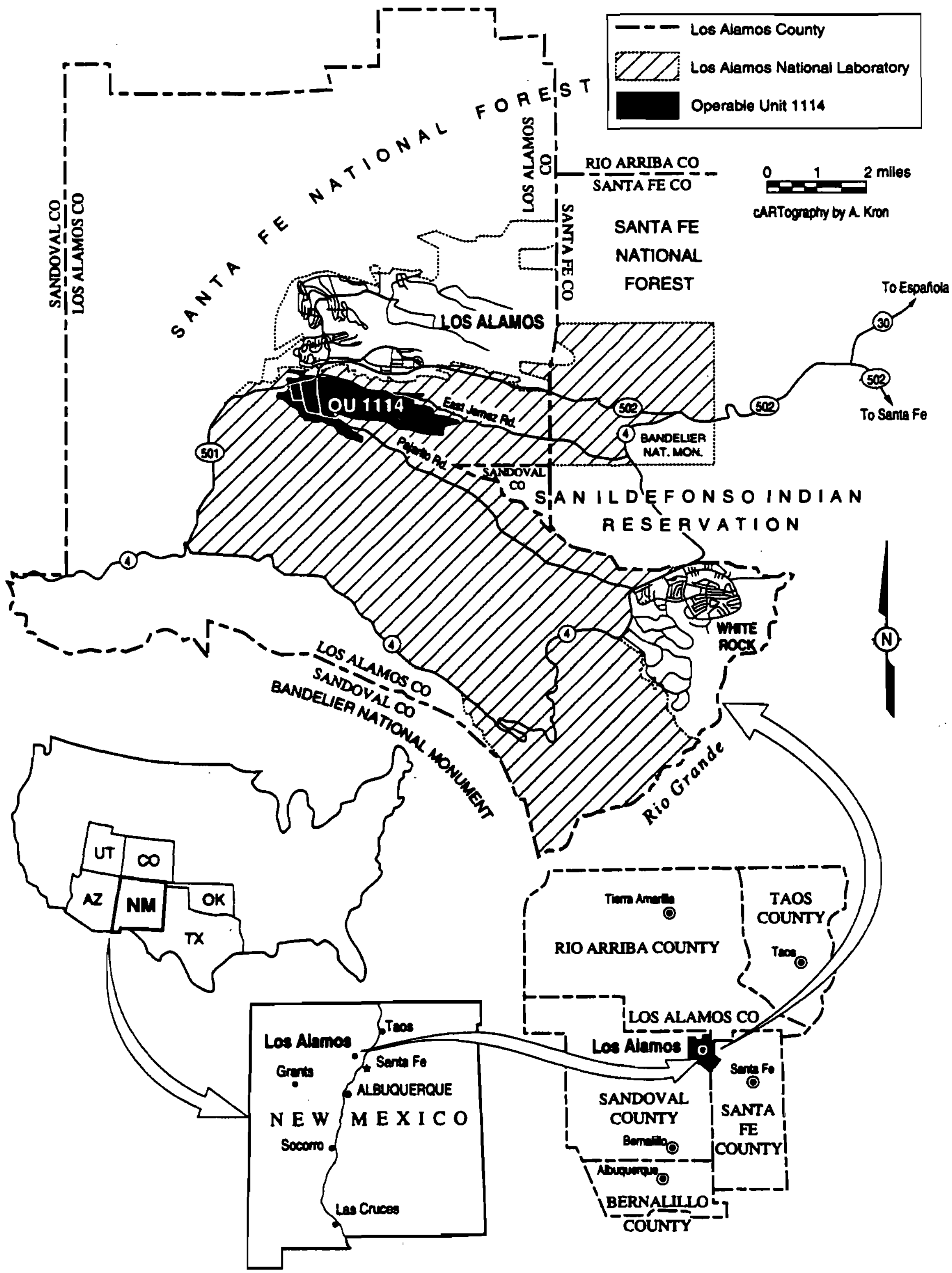



**Fig. 1-1. Location of Operable Unit 1114.**

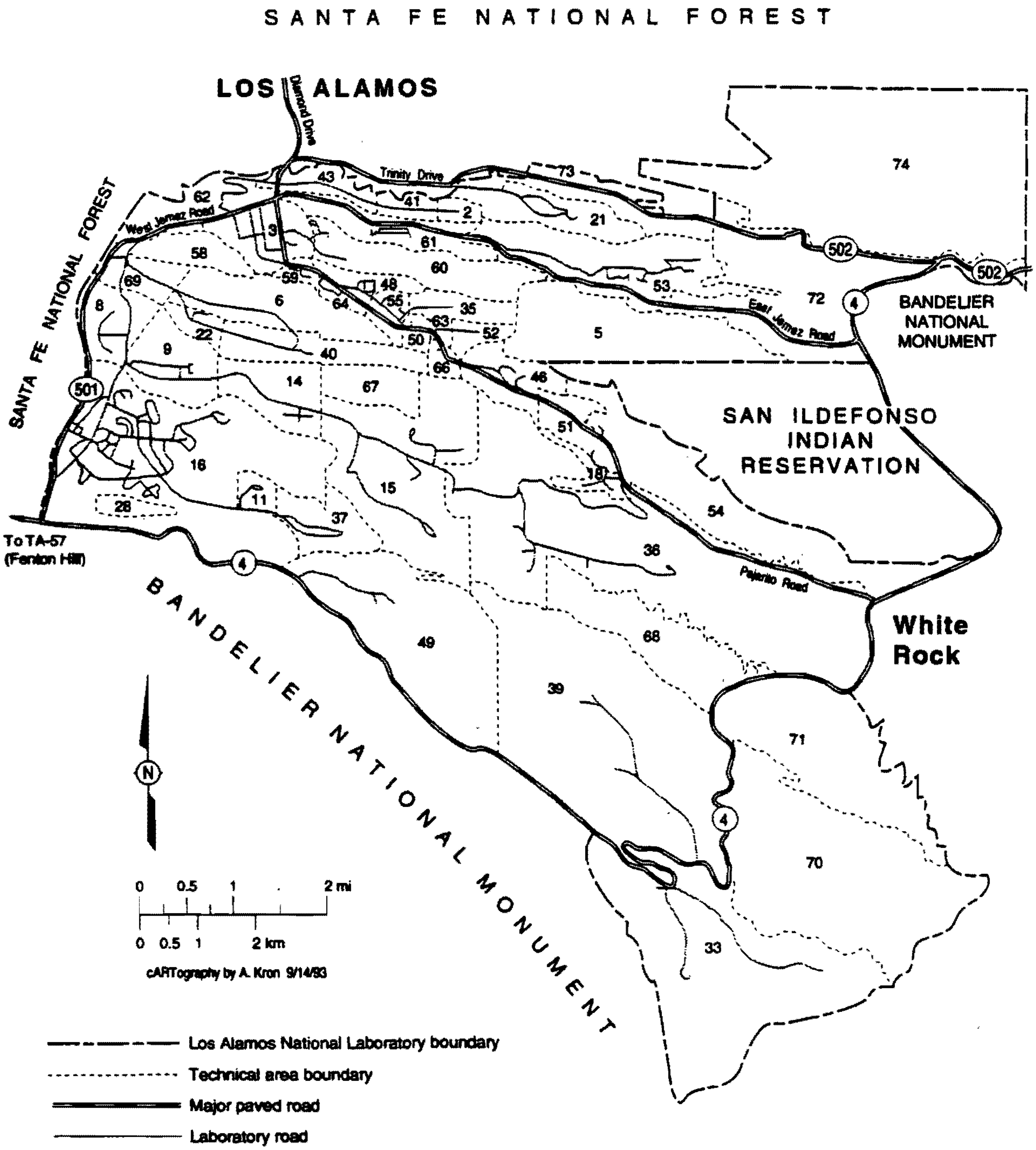
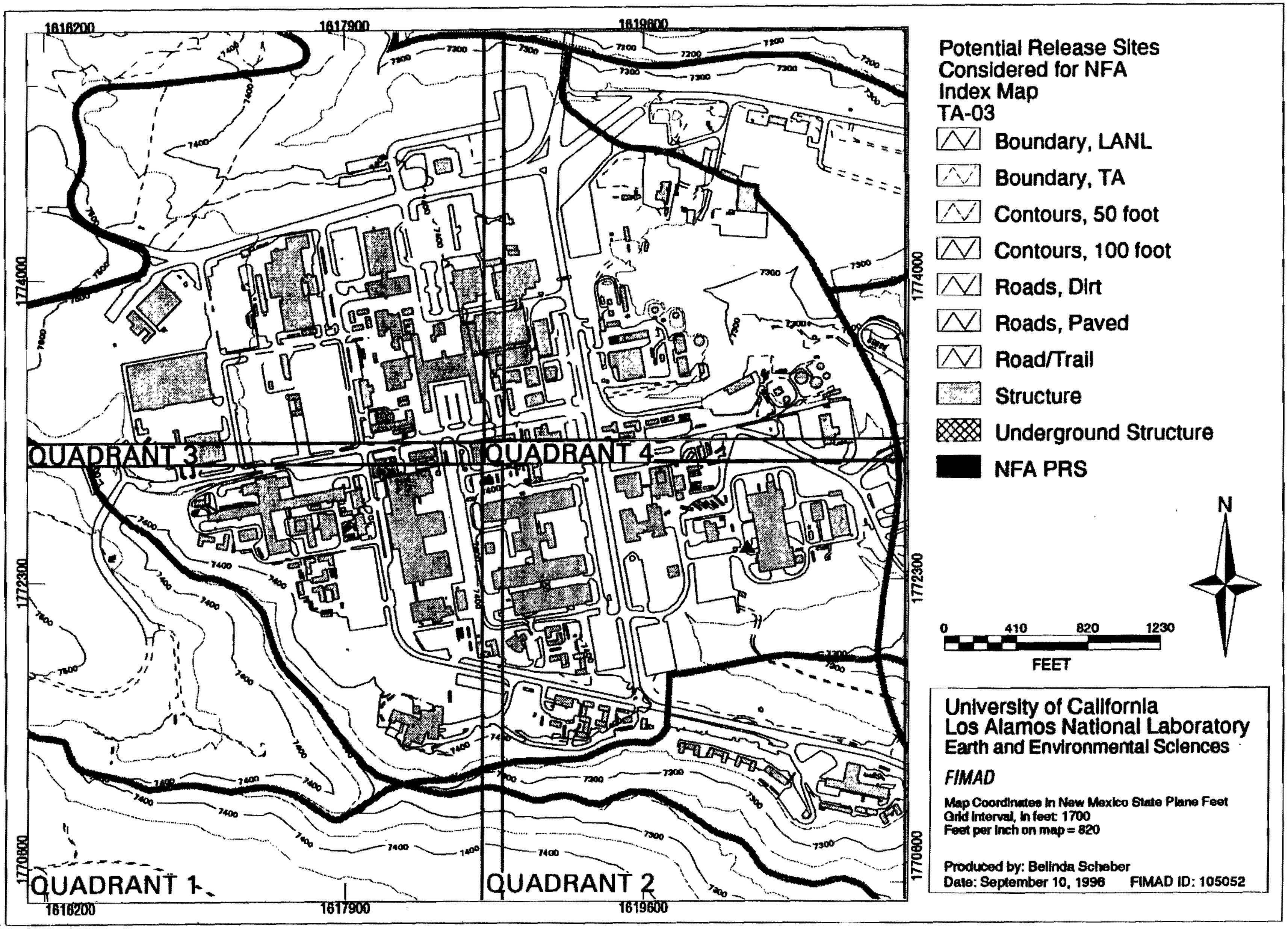
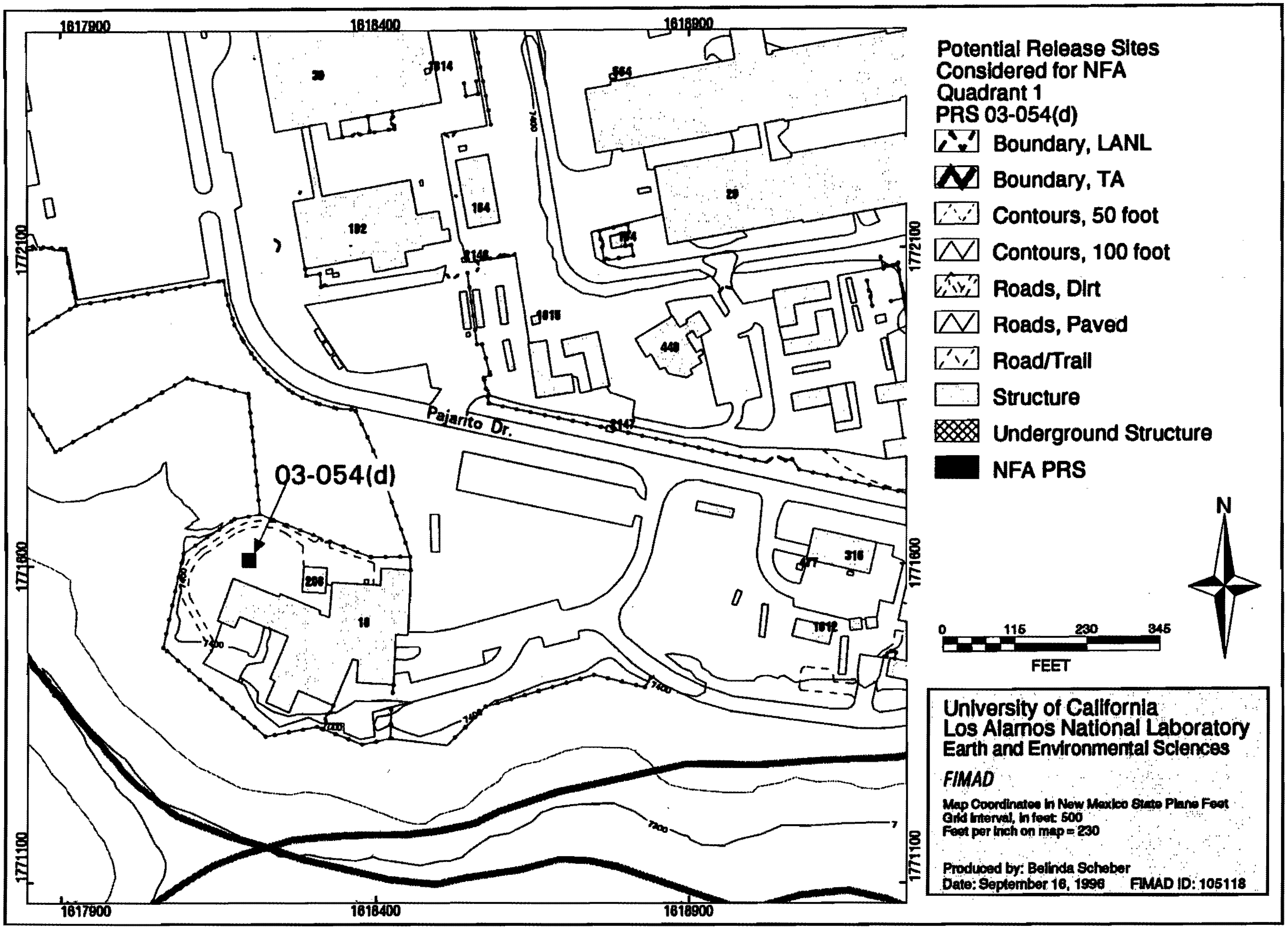



**Figure 1-2. Technical areas at Los Alamos National Laboratory.**




Potential release sites considered for NFA, TA-03
**INDEX MAP**




Potential release sites considered for NFA, TA-03, PRS 03-054(d)

# 3-055(a)

# ATTACHMENTS

## SWMU 3-055(a) — Outfall (Active)

### 1.0 Introduction

SWMU 3-055(a) is located in former Operable Unit (OU) 1114 (Figure 1-1) within Technical Area (TA)-3 (Figure 1-2 and Index Map) at Los Alamos National Laboratory, Los Alamos, New Mexico.

### 1.1 Description

SWMU 3-055(a) is an active outfall from roof and floor drains located approximately 50 ft south of the Van de Graaff Facility, TA-3-16. The outfall has been in operation since 1952. According to engineering drawings, the outfall pipe is a six- to eight- inch pipe with a filter screen that discharges to Twomile Canyon. The Wastewater Characterization Report indicates that the pipe collects water from roof drains and one floor drain in generator room 68 (LANL 1992, 17-861) (Attachment A). A visual survey revealed that there is no evidence of staining in the outfall area.

### 1.2 No Further Action Basis

SWMU 3-055(a) [Map 3-055(a)] is recommended for NFA because the site has never been used for the management (i.e., generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes or constituents, or other CERCLA hazardous substances. The outfall collects water only from roof drains and one floor drain (located in generator room 68) of the Van de Graaff Facility, TA-3-16. No RCRA constituents are located in the generator room; therefore, there is no source of contamination to this outfall.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-055(a) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

The outfall collects water from roof drains and one floor drain (located in generator room 68) of the Van de Graaff Facility, TA-3-16.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Report, "Wastewater Stream Characterization ...," (LANL 1992, 17-861).

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

### 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-055(a) is recommended for NFA under Criterion 2.

## 5.0 References


Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, p 6-10. (LANL 1995, 1291)

Los Alamos National Laboratory, July 1992. "Wastewater Stream Characterization for TA-3-16, 65, 130, 208, 316, 477, 550, 1228, 1229, 1522, 1538, 1612, 1730, 1731, 1734, 1762, 1898, 1944, 1945, 1946, 1949, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2062, 2130, 2143, and 2164," Santa Fe Engineering, LTD. Report under subcontract 9-X68-2874p-1, Santa Fe, New Mexico. (LANL 1992, 17-861)


## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

Attachment A 3-000932

# MEMORANDUM

ERM/GOLDER Los Alamos Project Team

**To:** Operable Unit 1114 File

**From:** Valerie Rhodes VR

**Date:** 30 July 1993

**Regarding:** **VAN DE GRAAF SITE VISIT**
**SWMUS 3-054(A), 3-054(D), 3-055(A), AND AOC C-3-010**

---

On 29 June and 16 July 1993, I met with Larry Rowton (Section Leader, P-9) to view and discuss the above referenced SWMUs located at the Van de Graaf Facility (TA-3-16). SWMUs 3-054(a), 3-054(d), and 3-055(a) are reported to be outfalls associated with the Van de Graaf Facility that discharge into Twomile Canyon while AOC C-3-010 is reported to be the remnant contamination from a cooling tower (associated with TA-3-19) that was decommissioned and removed. Information regarding these SWMUs and AOC from the site visits is outlined below:

<u>SWMU 3-054(a)</u>

Mr. Rowton was not familiar with the TA-3-19 cooling tower and associated outfall (SWMU 3-054(a)); both were decommissioned in 1966. A concrete slab where TA-3-19 used to be located remains in place; there was no staining on or around the slab and the vegetation in the area was very healthy. After the cooling tower was removed, the outfall pipe was re-routed to the chilled water system in building 208. The effluent from this system is discharged in the same area; it is now designated NPDES No. EPA03A025 (See SWMU 3-054(d) below).

<u>SWMU 3-054(d)</u>

This outfall (NPDES No. EPA03A025) releases cooling tower discharge from TA-3-16 as well as the cooling system and the floor drains in equipment building TA-3-208. Chromates are/were not used in the cooling tower (re: Bill Radzinski, ENG-6). The chemicals to treat the hardwater in the cooling system include sodium bisulfide, potassium sulfide, and sodium hydroxide; these are pumped directly to the equipment from their original containers. Mr. Rowton reported that there had been no spills from either these chemicals or from oil, grease, or solvents to the floor drains; three the floor drains received only water from infrequent floor washdown. The floor in TA-3-208 was clean and free from staining.

SWMU 3-55(a)

An outfall pipe is located south of TA-3-16 on the edge of Twomile Canyon. Mr. Rowton did not know the origin of the pipe; however, drawing no. ENG-C31372 indicates that this pipe is an outfall for the roof drains. Mr. Rowton suggested that a dye test could be performed to verify this. Other drainages (that could be considered outfalls) in the vicinity of the Van de Graaf Facility carry storm water runoff from the streets, parking lots, and surrounding upgradient areas only.

AOC-C-010

There is no evidence (staining or stressed vegetation) on or near the concrete slab where the TA-3-19 cooling tower was once located; it is highly unlikely (re: Bill Radzinski, ENG-6) that chromates were used during cooling tower operation. Currently, several transformers occupy the concrete slab.

cc: Project File

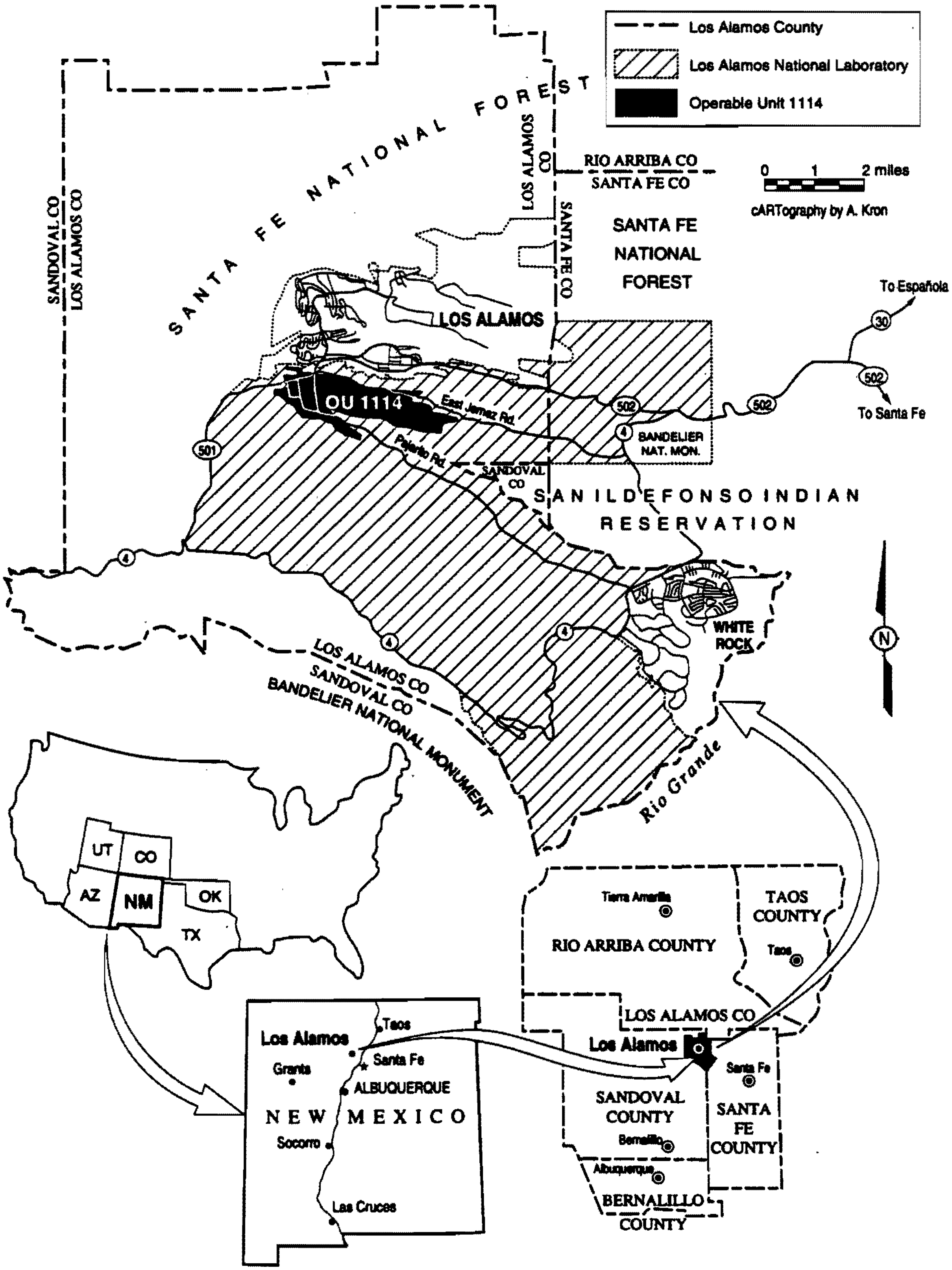



**Fig. 1-1. Location of Operable Unit 1114.**

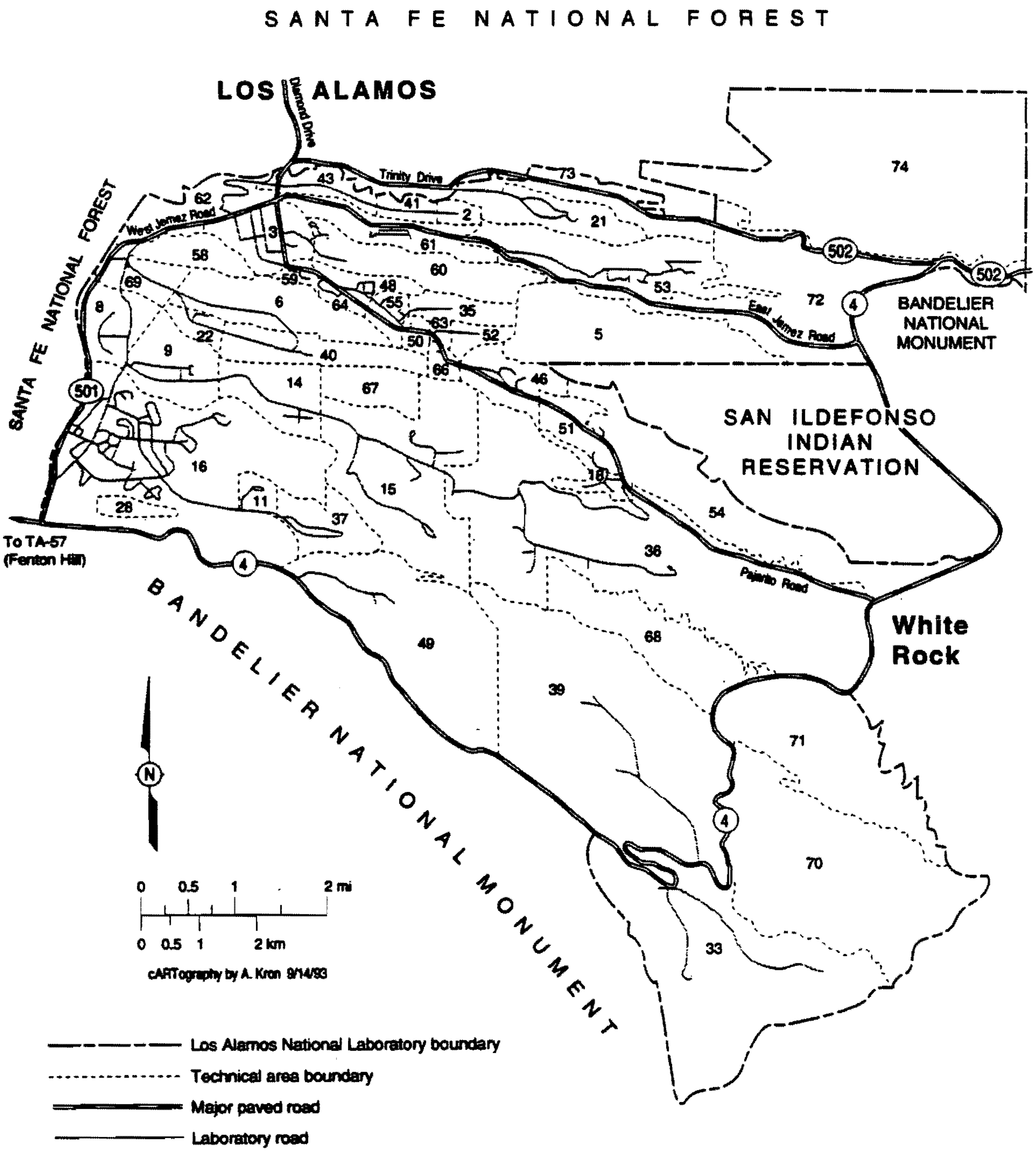
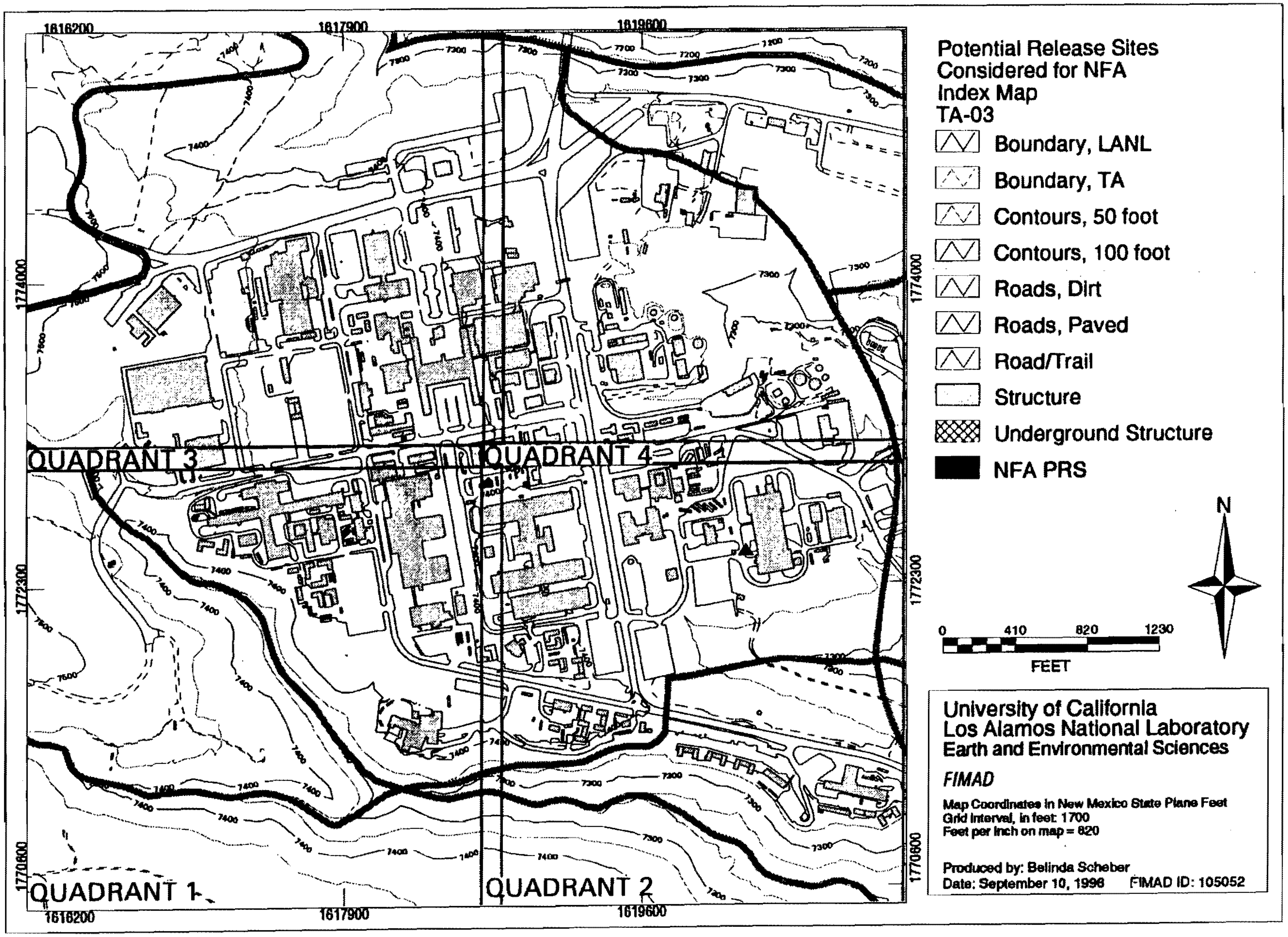
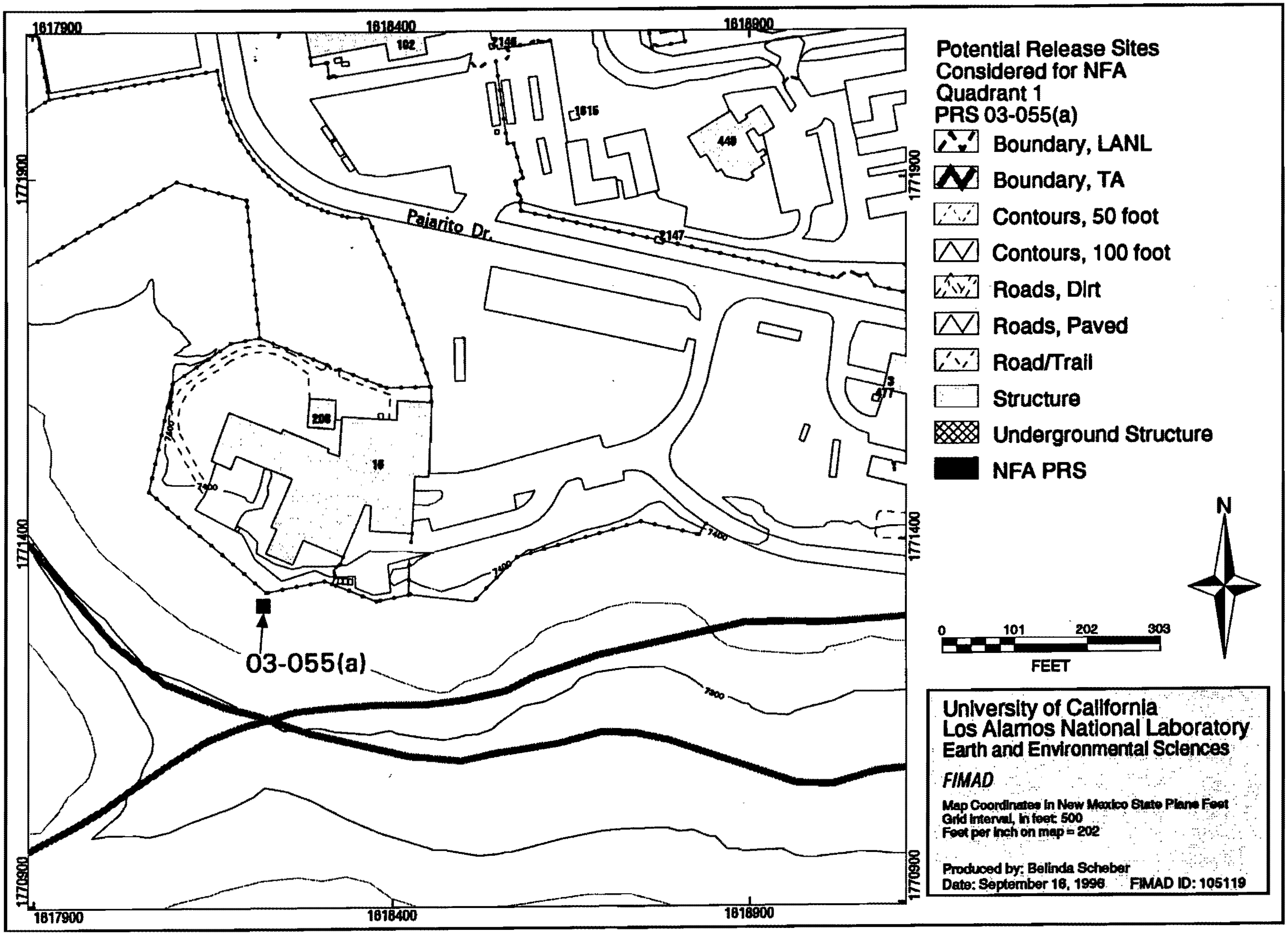



**Figure 1-2. Technical areas at Los Alamos National Laboratory.**




**Potential release sites considered for NFA, TA-03**
**INDEX MAP**




Potential release sites considered for NFA, TA-03, PRS 03-055(a)

# Attachment A

WASTEWATER STREAM
CHARACTERIZATION FOR
TA-3-16, 65, 130, 208, 316, 477, 550, 1228,
1229, 1522, 1538, 1612, 1730, 1731, 1734,
1762, 1898, 1944, 1945, 1946, 1949, 2003,
2004, 2005, 2006, 2007, 2008, 2009, 2010,
2062, 2130, 2143 and 2164

ENVIRONMENTAL STUDY

prepared for:
THE LOS ALAMOS NATIONAL LABORATORY
Los Alamos, New Mexico

under subcontract 9-XG8-2874P-1

by:
Santa Fe Engineering, Ltd.
1429 Second Street
Santa Fe, New Mexico 87501
(505) 988-7438

July, 1992

UPDATED ESH-8 COMMENTS FEBRUARY, 1994

Removal of water fountain 1WF2 located in control room 140 (controlled area) and replacing it with bottle water is also recommended. No permitting is required for this outfall and no EPA forms have been prepared.

4.3 Outfall 3-16-OPN-3

This outfall is from RLW facilities and flows to the Radioactive Waste Treatment Plant located at TA-50. Small amounts of Tritium compounds, Iodine 125 and Sulfur 35 are drained down various fixtures. No piping changes are recommended. No EPA forms were prepared.

4.4 Outfall 3-16-OPN-4

This outfall is from roof drains on the building and from one floor drain in the building. The discharge pipe drains to daylight into a tributary of Two Mile Canyon. Plugging of floor drain BFD10 in generator room 68 is recommended. No permitting is needed for this outfall and no EPA forms have been prepared.

4.5 Outfalls 3-16-OPN-5, 3-16-OPN-6, 3-16-OPN-7, 3-16-OPN-11, 3-16-OPN-12, 3-16-OPN-13, 3-16-OPN-14, 3-16-OPN-17, 3-16-OPN-18, 3-16-OPN-21, 3-16-OPN-22, 3-16-OPN-23, 3-16-OPN-24, 3-16-OPN-25, 3-16-OPN-33 and 3-16-OPN-34

These outfalls are fire water system drains which discharge to daylight next to the building. These outfalls should be covered by a Notice of Intent to Discharge (NOI). No piping changes are recommended. No EPA forms were prepared.

# 3-055(d)

# ATTACHMENTS

**SWMU 3-055(d) — Outfall**

## 1.0 Introduction

### 1.1 Description

SWMU 3-055(d) is described in the SWMU Report (LANL 1990, 0145) (Attachment A) as an outfall pipe directly north of TA-3-59, a large sanitary waste lift station west of the fire station (TA-3-41) The SWMU Report speculates that the pipe may have been an overflow from the sewage (i.e., sanitary waste) lift station. Field Unit 1 personnel were unable to locate the pipe during field investigation. Furthermore, sanitary waste lift stations have no associated outfall piping (LANL 1993, 17-898). (Attachment B).

### 1.2 No Further Action Basis

SWMU 3-055(d) is recommended for NFA because the site does not exist. No outfall pipe was found at the location identified in the SWMU Report.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-055(d) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

## 2.0 History

### 2.1 Historical Operations

Section not applicable.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL, November 1990. "Solid Waste Management Units Report," page 3-055.

Attachment B: LANL Memorandum, "Phone Conversation About SWMU 3-055(d)," (LANL 1993, 17-898).

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-055(d) is recommended for NFA under Criterion 1.

## 5.0 References

Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, July 27, 1993. "Phone Conversation About SWMU 3-055(d)," Memorandum Prepared by ERM (Environmental Resource Management) Under Contract 9-X52-F2078-1, Los Alamos, New Mexico. (LANL 1993, 17-898)

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, p 6-39. (LANL 1995, 1291)

Los Alamos National Laboratory, November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico, page 3-055. (LANL 1990, 0145)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

Section not applicable.

### 6.3 Other Survey/Investigation Data

Section not applicable.

## SUMMARY

LOCATION : TA-3
TYPE OF UNIT(s) : OUTFALL
UNIT USE : DISPOSAL
OPERATIONAL STATUS : ACTIVE/INACTIVE
PERIOD OF USE : ? - PRESENT
HAZARDOUS RELEASE : SUSPECTED
RADIOACTIVE RELEASE : SUSPECTED

MATERIALS MANAGED : SANITARY WASTE
SUSPECTED HAZARDOUS WASTE
SUSPECTED RADIOACTIVE WASTE

## UNIT INFORMATION

Several outfalls serve as points of release for liquids into the soil in TA-3. An outfall pipe [3-055(a)] is located south of TA-3-16 at the edge of Two Mile Canyon. The origin of the pipe is unknown, but it appears to have been inactive for some time. An outfall pipe [3-055(b)] is located west of TA-3-30. The outfall may be the discharge point for an emergency shower in TA-3-30. A battery charging and refilling operation was present in the northwest corner of the building from 1968-1975. A fume hood and emergency shower were installed for that operation, but have since been inactive. An outfall [3-055(c)] is located northeast of the fire station TA-3-41. The outfall is associated with floor drains in the fire station and discharges to a drainage area that trends toward Los Alamos Canyon. An outfall pipe [3-055(d)] is located directly north of TA-3-59. The origin of the pipe is not known, but it could be an overflow from the sewage lift station, TA-3-59. The outfall pipe was plugged with dirt and leaves and appeared to be inactive.

## WASTE INFORMATION

If the outfall into Two Mile Canyon was originally a discharge point from an acid waste line, the canyon could have received radionuclides, organics, and metals during its period of use. The outfall associated with TA-3-30 may have received acids and organics. The outfall north of TA-3-59 may have discharged sanitary waste.

## RELEASE INFORMATION

It is not known if hazardous releases have occurred from these units. During E.R. Program site surveys, stains were observed in the soil near the outfall into Two Mile Canyon. The outfall may be associated with an abandoned industrial waste line in the vicinity.

## SWMU CROSS-REFERENCE LIST

| SWMU NUMBER | CEARP IDENTIFICATION NUMBER(S) | RFA UNIT | E.R. RELEASE SITE INFO. | ASSOCIATED STRUCTURES |
|---|---|---|---|---|
| 3-055(a) | ** | | Tsk 21 : 1117 | SOUTH OF TA-3-16 |
| 3-055(b) | ** | | Tsk 21 : 1118 | TA-3-30 |
| 3-055(c) | ** | | Tsk 21 : 1119 | TA-3-41 |
| 3-055(d) | ** | | Tsk 21 : 1123 | NORTH OF TA-3-59 |

** No corresponding E. R. Program unit.

# MEMORANDUM

ERM/GOLDER Los Alamos Project Team

**To:** Operable Unit 1114 File

**From:** Valerie Rhodes VR

**Date:** 27 July 1993

**Regarding:** **PHONE CONVERSATION ABOUT SWMU 3-055(D)**

On 15 July 1993, I spoke with Mell Smithour (JCI) regarding the sanitary sewer lift station (TA-3-59) and associated outfall (SWMU 3-055(d)) located near the Fire Station (TA-3-41) on West Jemez Road. During recent field investigation the lift station was located (directly west of TA-3-41); however, there was no evidence of an associated outfall discharging into Los Alamos Canyon. Mr. Smithour confirmed that there is no outfall associated with the lift station. He added that the lift station was installed when the Fire Station (TA-3-41) was built (around 1952) and has served only that structure. Additionally, the sewer line from the lift station travels south (away from Los Alamos Canyon) to West Jemez Road, turns west to parallel the north side of West Jemez Road, and is routed under West Jemez Road; the sewer line then ties into the TA-3 waste water treatment plant. The lift station and accompanying sewer line route are shown on as-built drawing number R-8008, sheet NE-15.

cc: Project File

# 3-056(a)

# ATTACHMENTS

## SWMU 3-056(a) — Drum Storage Area (Active)

### 1.0 Introduction

SWMU 3-056(a) is located in former Operable Unit (OU) 1114 (Figure 1-1) within Technical Area (TA)-3 (Figure 1-2 and Index Map) at Los Alamos National Laboratory, Los Alamos, New Mexico.

### 1.1 Description

SWMU 3-056(a) [Map 3-056(a)] is an active used-oil accumulation facility built in 1986. The 12 x 45 ft structure is located approximately 15 ft north of TA-3-271, the Sample Management Facility (formerly the JCI salvage yard). The storage area has a concrete floor that slopes toward a sump and is surrounded on all sides by a concrete berm. The structure has a roof, but the sides are open. There have been no spills from the bermed area into the environment (Griggs 1992, 17-684) (Attachment A); nor could there be, because there are no drains.

### 1.2 No Further Action Basis

SWMU 3-056(a) is recommended for NFA because no release to the environment has occurred, nor is likely to occur in the future.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-056(a) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit via a Class 3 permit modification request (Attachment B, page 6).

### 2.0 History

### 2.1 Historical Operations

Used-oil accumulation area.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Memorandum, "Conversation with Mike Shepherd, JCI, concerning SWMU 3-056(a)," (Griggs 1992, 17-684).

Attachment B: US EPA, Letter from W. K. Honker to J. C. Vozella listing deficiencies for OU 1114, Work Plan.

### 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

## 3.4 Risk Evaluation

Based on evidence outlined in Sections 1.0 and 2.0, no unacceptable risk is presented by this site.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-056(a) is recommended for NFA under Criterion 3.

## 5.0 References

Griggs, E., August 4, 1992. "Conversation with Mike Shepherd, JCI, concerning SWMU 3-056(a)," Los Alamos National Laboratory Memorandum CLS-ER/ER-92:068 to File from Ed Griggs (CLS-DO), Los Alamos, New Mexico. (Griggs 1992, 17-684)

Environmental Protection Agency Region 6, October 29, 1993. "RFI Work Plan for OU 1114, Notice of Deficiency, Los Alamos National Laboratory," Los Alamos National Laboratory," letter to J. C. Vozella, Chief, Environment, Safety and Health Branch, Department of Energy, Los Alamos Area Office Laboratory, from W. K. Honker, Chief, RCRA Permits Branch (6H-P), Dallas, Texas.

Los Alamos National Laboratory, July 1993. "RFI Work Plan for Operable Unit 1114," Los Alamos National Laboratory Report LA-UR-93-1000, Los Alamos, New Mexico; p 6-36. (LANL 1993, 1090)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

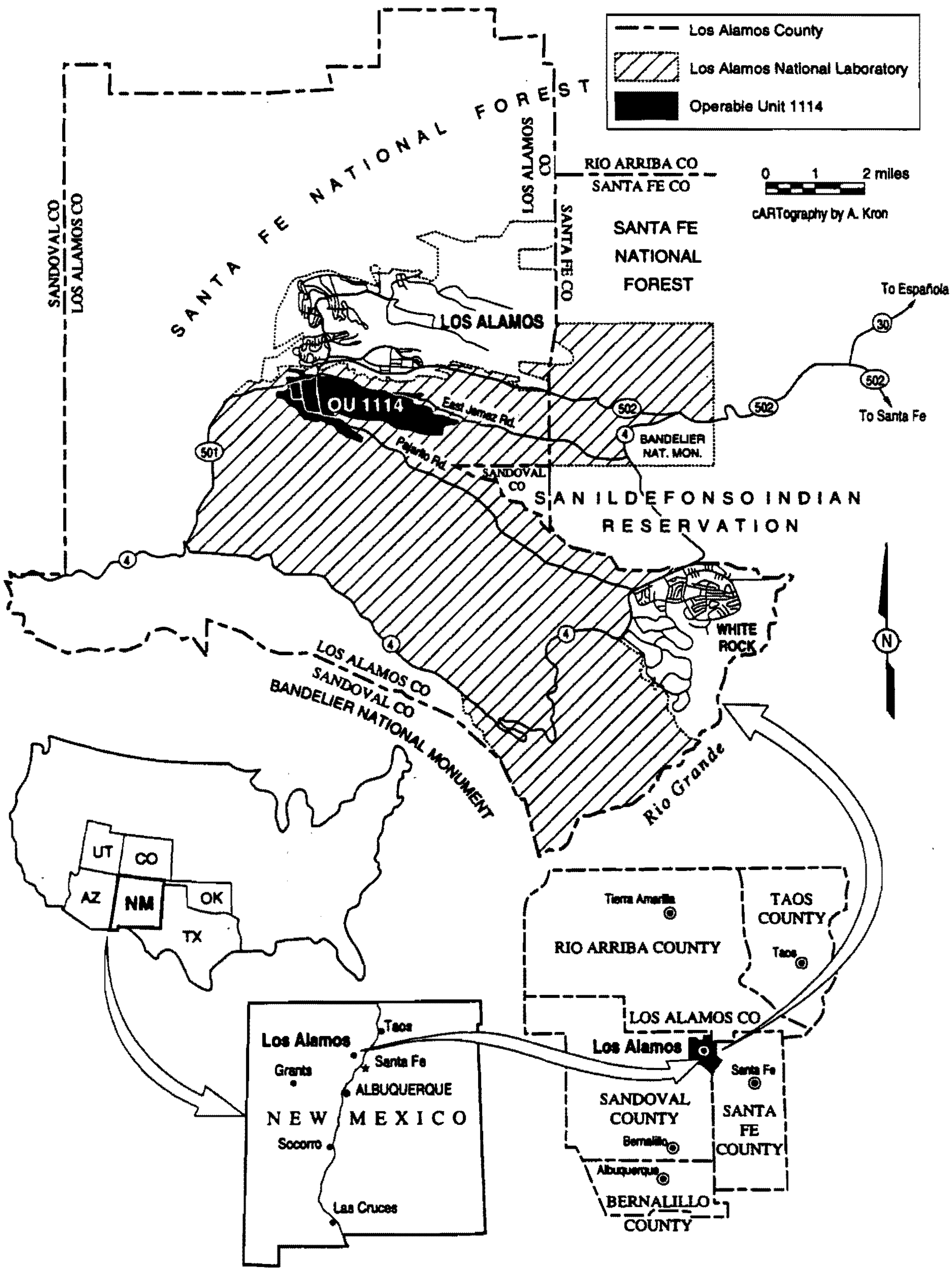



**Fig. 1-1. Location of Operable Unit 1114.**

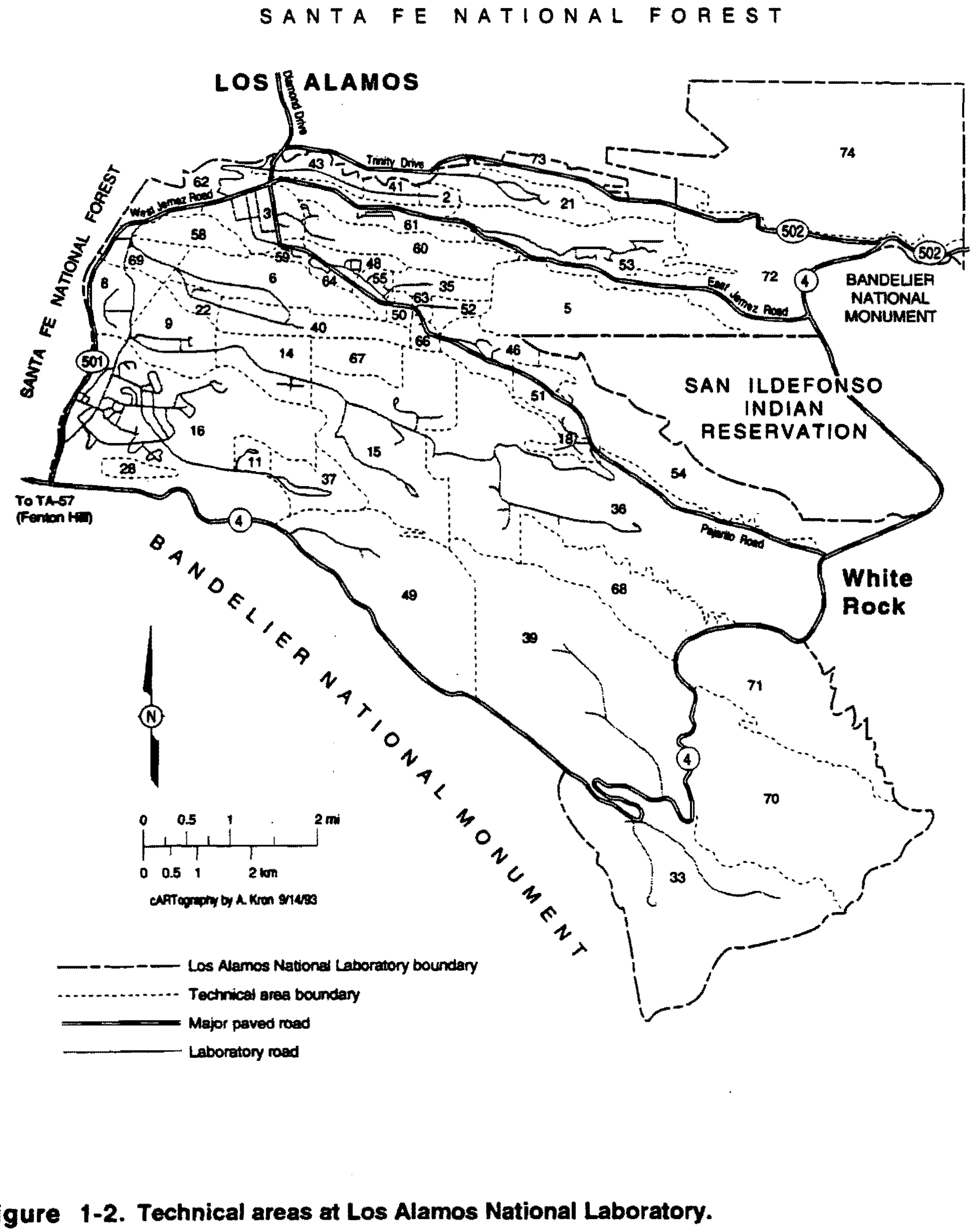
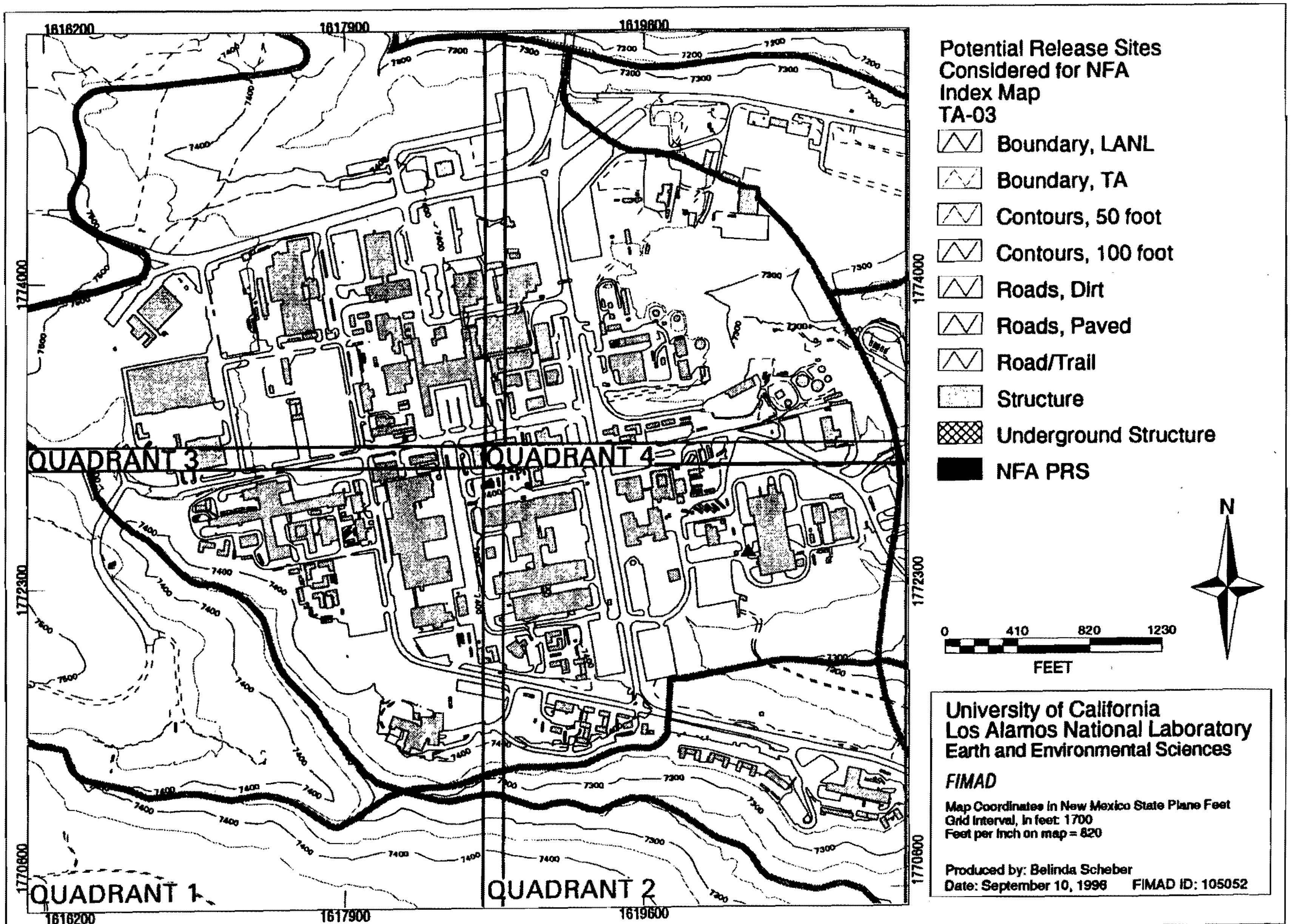
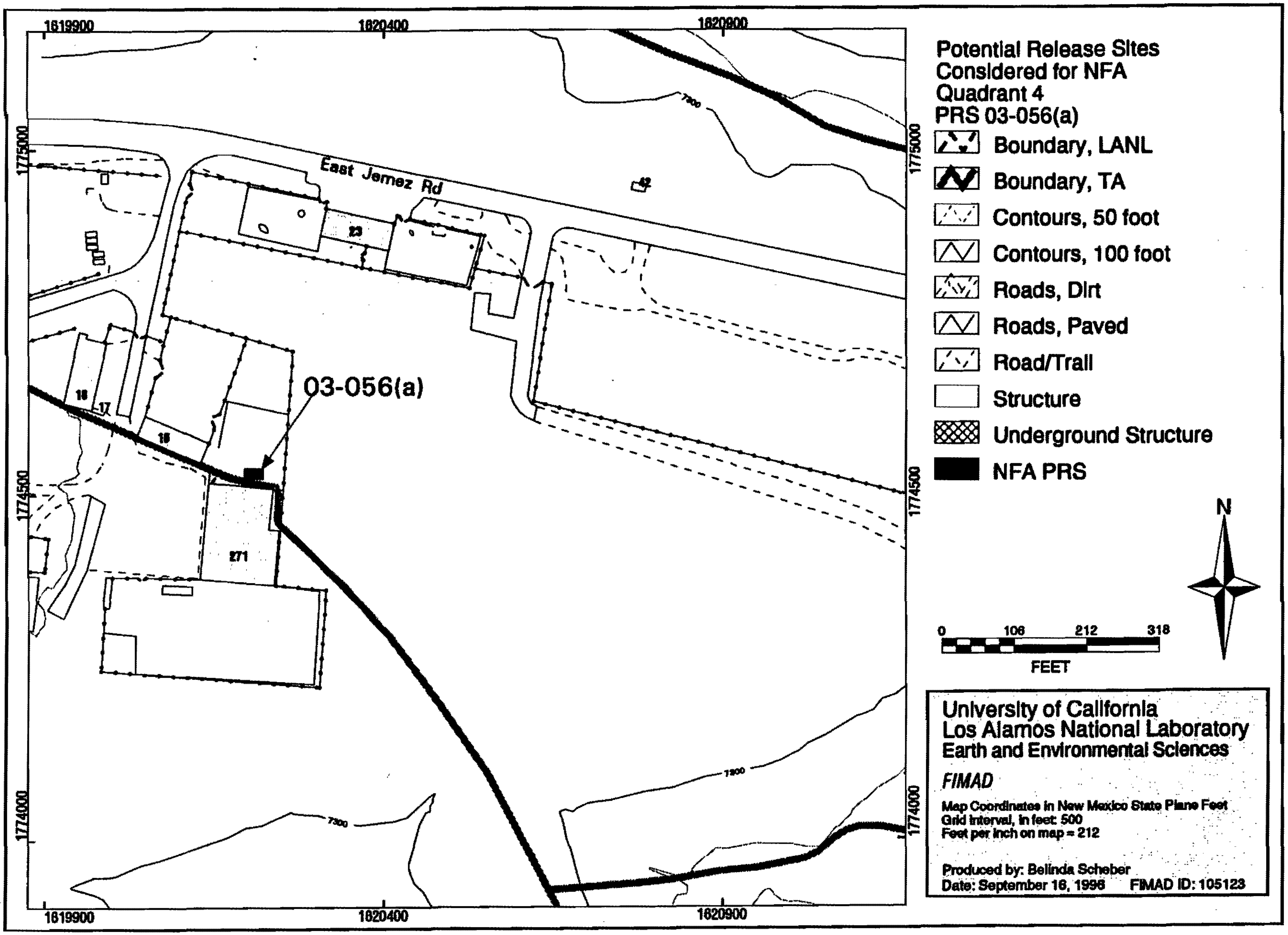



**Figure 1-2. Technical areas at Los Alamos National Laboratory.**




**Potential release sites considered for NFA, TA-03**
**INDEX MAP**




Potential release sites considered for NFA, TA-03, PRS 03-056(a)

Attachment A

~~3-000684~~

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

# memorandum

TO: File

DATE: August 4, 1992

FROM: Ed Griggs, CLS-DO EL

MAIL STOP/TELEPHONE: E525/7-5544

SYMBOL: CLS-ER/EG-92:068

SUBJECT: **CONVERSATION WITH MIKE SHEPHERD, JCI, CONCERNING SWMU 3-056(a)**

Ed Griggs and Jim Roberts visited this site 4/3/92 and talked with Mike Shepherd, JCI Supervisor, concerning the operation and any releases to the environment. Shepherd stated that there has never been any spillage from the bermed area into the environment. The site is a used oil storage facility was built near the north side of TA-3-271. It has a concrete floor which slopes towards a sump and is bermed on all sides. The structure is covered with a roof, but the sides are open.

Attachment B

OCT 2 9 1993

CERTIFIED LETTER: RETURN RECEIPT REQUESTED

Mr. Joseph C. Vozella, Chief
Environment, Safety and Health Branch
Department of Energy
Los Alamos Area Office
Los Alamos, New Mexico 87544

Re: RFI Work Plan for OU 1114
Notice of Deficiency
Los Alamos National Laboratory NM0890010515

Dear Mr. Vozella:

The Environmental Protection Agency (EPA) has reviewed the RCRA Facility Investigation for Operable Unit 1114 (OU 1114) and found it to be deficient. Enclosed is a list of deficiencies which you have thirty (30) days to respond to in full.

No deficiencies have been listed for the assumptions made in this work plan which EPA has already previously expressed disagreement, and which have been addressed by the Technical Assumptions Task Force (TATF). When approved the work plan should be implemented under the provisions that TATF has agreed to.

Should you have any questions, or need additional information, please contact Barbara Driscoll at (214) 655-7441.

Sincerely,

William K. Honker, P.E.
Chief
RCRA Permits Branch (6H-P)

Enclosure

cc: Benito Garcia, NMED
Al Tiedman, ADO, LANL, MS-A120

6H-PN:BDRISCOLL:BD:10/27/93:J:USER:SHARE:OU1114.NOD FILE:TECH

6H-PN NELEIGH
6H-P THOMAS

## Attachment B

### List of Deficiencies

**1. Executive Summary, p. ES-4 -** LANL makes the statement that "A CMS is not necessary for OU 1114; therefore, no cost estimates are required. It has not been determined yet whether or not a CMS will be needed at OU 1114; therefore, the above statement is inaccurate and should be removed from the work plan.

**2. Executive Summary -** The length of time required for the submittal of the final RFI Report is too long. LANL shall submit the final RFI report 6 months after receipt of data from the final RFI field work. LANL shall submit a schedule of the RFI with more detail. A sub-schedule for each SWMU aggregate, SWMU or AOC should be combined in a master schedule which encompasses the seven years proposed for the field activities.

**3. 2.2.1 Background Information, p. 2-6 -** LANL makes a conclusion that the facilities at TA-3 have never released significant amounts of hazardous constituents. This statement should be deleted. It is the goal of the RFI to determine the nature and extent of the releases. It is the goal of the CMS to determine if these releases are significant.

**4. 3.5.2.3 Perched Aquifers, p. 3-13 -** The statement is made that the main aquifer does not appear to be hydrologically connected to the overlying perched zones; therefore, the perched zones are not of concern as they are not drinking sources. Unless no interconnection between the perched and main aquifer can be demonstrated, the perched aquifers are potential sources of contamination to the aquifer. The perched zones are potential contamination sources to the surface water.

**5. 4.2.3 Active Sites, p. 4-10 -** EPA will make the final determination whether or not active sites are to be investigated, and if action will be deferred until later. The statement regarding whether or not active sites are to be investigated should be deleted from the work plan. Investigation activities can be performed even if the unit is active.

**6. 4.3.1 Potential Contaminants of Concern, p. 4-11 -** Initial sampling analysis will be for Appendix IX. Because the list of potential contaminants of concern (PCOC) were determined based only on archival data and the periods of operation for this Operable Unit are lengthy, it does not appear reasonable that a PCOC list can be determined for the entire Operable Unit. If LANL wishes to submit a list of PCOC for areas with recent operation and for which accurate records of hazardous constituents were maintained then EPA will consider a reduction in analysis (LANL appears to have done this in the specific sampling plans). A Target Analyte List (TAL) may be proposed based upon the results of initial Phase I analysis.

**7. 5.2.1.1 Description and History, p. 5-15 -** Why is AOC C-60-005 listed as an area of concern rather than as a SWMU? This unit meets the definition of a SWMU, due to the numerous spills, and presence of hazardous constituents. LANL shall redefine this unit as a SWMU within the work plan.

**8. 5.2.1.2.1 Nature and Extent of Contamination, p. 5-16 and Table 5-5 Range of VOC Analytical results at AOC C-60-005, p. 5-17 -** Text and the results in the Table 5-5 do not agree. Text indicates that carbon disulfide was found at concentrations of less than 0.1 ppm in samples from pad #2, while in Table 5-5, Pad #2, Sample #200, carbon disulfide is listed at 106 ppm. Please indicate the correct concentration of the sample.

**9. 5.2.3 Data Needs and Data Quality Objectives, p. 5-21 -** Text appears to indicate that four samples would nominally provide 80% confidence of detection; however, Table 5-7 indicates that only 1 sample will be sent for laboratory analysis. LANL shall submit the three samples with the highest field screening readings from SWMU 60-007(b), and the main drainage ditch TA-60-2 for laboratory analysis (total of 6 samples, plus QA/QC). Laboratory analysis shall consist of metals (TAL metals), and SVOCs (SW 8270). In addition, LANL shall include the provision in their work plan to take additional samples where contamination may be indicated to be deeper than 0-18 inches, and send these samples for the above mentioned laboratory analysis. At AOC C-60-005 the confirmatory samples should be collected from the areas of the highest field screening reading.

**10. 5.3.4.1.2 Sampling, p. 5-32 -** Text indicates that samples for SWMU 3-015 will be collected from the erosion channel leading from the outfall; however, Figure 5-6 makes it look like two of the samples may be collected outside of the channel. Samples should be collected from the erosion channel. All samples should be analyzed for metals (SW846 method 6010) and SVOCs. Samples should be analyzed for VOCs based on field screening.

**11. 5.5.4.1.2 Sampling, p. 5-55 -**

a. An additional sample needs to be collected at SWMU 3-012(b) within the actual channel area and analyzed for the same constituents as the other samples.

b. How will the locations of the five samples collected for SWMU 3-014(a,e) be determined? LANL shall include the rationale that will be utilized to determine the sampling locations for SWMU 3-014(a,e).

**12. 5.5.4.1.3 Laboratory Analyses, p. 5-58 -** All the samples collected at these SWMUs will be analyzed for metals using SW846 method 6010.

**13. 5.6.4.1.3 Laboratory Analysis, p. 5-66 -** LANL shall include analysis for the additional Subpart S metals.

**14. 5.7.1.2.1 Nature and Extent of Contamination, p. 5-71 -** The primary purpose of the RFI is to determine if a release has occurred. The presence of contaminants above screening action levels (SALs) will be used to determine whether a Corrective Measure Study (CMS) will be required by EPA. Therefore, LANL cannot make the determination to not analyze for a hazardous constituent based on the theory that the concentrations of that contaminant will not be above SALs. Delete all language associated with the theory that concentrations of contaminants will not be above screening action levels.

**15. 5.7.4.1.2 Sampling, p. 5-77 -**

**a.** Analysis for metals and SVOCs should be included for two additional locations in SWMU 60-007(a) (total of three locations undergoing CLP analysis). Two of these samples should be collected from the area where the majority of spills are located.

**b.** A total of three confirmatory samples should be analyzed from the areas that were supposedly remediated for metals, PCBs and TPH.

**16. 5.8.4.1.3 Laboratory Analysis, p.5-88 -** Samples from SWMU 60-004 (c) should by analyzed for metals using EPA method 6010 found in SW846.

**17. 5.8.4.1.2 Sampling, p. 5-88 -** What is the purpose of the six samples located outside the fence? If there are any drainage routes located near the pond then these might be preferentially sampled. Otherwise the samples should be located closer to the pond.

**18. 5.9.4.1.2 Sampling, p. 5-97 -** Additional samples should be collected in the other open areas of the drainage ditch closer to the original drain outlet from TA-3-38. In addition, samples should also be analyzed for metals (SW846, method 6010) and SVOCs.

**19. 5.10.1.2.1 Nature and Extent of Contamination, p. 5-102 -**

**a.** The action level for mercury in Subpart S is 20 ppm; therefore, LANL should revise their SAL to be the same and not higher (24 ppm).

**b.** In addition, the presence of solvents may not be ruled out based on a visual inspection. Any samples which are field screening for TPH and have results less than 100 ppm, should be analyzed for SVOCs and metals (SW846 method 6010).

**c.** All the samples collected in the 3-056(c) area for which a VCA is not conducted should be analyzed for VOCs and metals (SW 846 method 6010).

**d.** The three samples taken in the drainage channel at SWMU 61-001 should be analyzed for SVOCs and metals (SW 846 6010).

**Chapter 6, No Further Action Requests**

## Attachment B

**General Comment:** The statement is repeatedly made that some of the materials spilled are not target compound list (TCL) materials. It is important to note that the list of hazardous constituents (Appendix VIII) which are regulated under RCRA covers more than TCL materials; therefore, the material spilled may not be on the TCL, but may still be regulated by RCRA.

In addition, if new information becomes available for any site for which No Further Action (NFA) has been determined which indicates possible contamination then LANL will be required to investigate these areas.

**SWMU 61-002, p. 6-2** - SWMU 61-001 is not currently in Module VIII of the HSWA permit whereas, SWMU 61-002 (originally listed at 3-003(c)) is in the permit. It would have made more sense for LANL to have renumbered SWMU 61-001 to 61-002 in the work plan when LANL realized this was a duplicative SWMU. For this reason, NFA is not granted for SWMU 61-002 as it is still listed for investigation under the HSWA permit. LANL should note the duplication of the SWMU numbers in their next report.

EPA will not approve NFA for the following active units without concurrent approval from the New Mexico Environment Department:

**SWMU Number:**

| | | |
|---|---|---|
| 3-056(b) | 61-005 | 3-035(b) |
| 3-044(a) | 61-006 | 3-001(k) |

**SWMU 3-038 (a,b), p. 6-7** - Were any samples analyzed for hazardous constituents? This site cannot be deferred as it is not a site actively regulated under RCRA. Being located in an active area (traffic area) does not qualify as being an actively regulated site. It appears that action is appropriate for the portion of the waste line which has not been removed. LANL shall provide sampling plans for this area which will be implemented when road work makes it possible. In addition, the information presented is not sufficient for a NFA determination.

**SWMU 3-037, p. 6-11** - Additional information needs to be provided for this SWMU. It is unclear from the text what analysis was actually conducted in the 1991 sampling. If TCLP was the only analysis conducted then finding 5 ppm lead means the waste exhibits the characteristic of toxicity and is hazardous. TCLP was an inappropriate test to determine if the area had been impacted by waste management practices. In addition, it needs to be clarified if the collapsed waste line was addressed and remediated. Is this a regulated unit?

**SWMU 3-028, p. 6-12** - What is the period of operation for this SWMU? Has the SWMU always been covered by an NPDES permit? This information needs to be submitted for this unit.

**SWMU 3-010(a), p. 6-12** - EPA is awaiting confirmatory sampling prior to making a decision for this SWMU.

**SWMU 3-029, p. 6-13** - LANL's current actions at this SWMU under the citation issued by NMED are considered stabilization and not necessarily remediation. This SWMU should be investigated and a work plan submitted.

**SWMU 3-009(a), p. 6-16** - No dates of operation are given for this SWMU. Can LANL demonstrate that the fill at this area is only from construction debris?

**SWMU 3-009(d), p.6-18** - Further information needs to be provided about this SWMU. The origin of the material should be determined. How do you tell from a visual inspection that material is not TAL, TCL or radioactive?

**SWMU 60-002, p. 6-20** - LANL should ensure that these debris piles have been screened for potential radioactivity.

**SWMU 3-013(c), p. 6-25** - Some confirmatory sampling should occur to ensure that there has not been a release to the environment.

**SWMU 3-013(e), p. 6-27** - Ethylene glycol is listed in Appendix VIII as a hazardous constituent. In the future, LANL should clean-up these spills rather than allow them to drain to the storm drain.

**SWMUs 3-036(a,c,d,e), p. 6-30** - LANL shall provide documentation from the McVey report (McVey, 1989, 17-582) for EPA review. Also in the Rationale for Recommendation section on p. 6-31, what are the areas of offsite migration of hazardous substances that the Laboratory is planning to remediate?

**SWMU 3-026(d), p. 6-36** - LANL has just requested that this SWMU be added to the HSWA permit. An inspection of the tank and possibly sampling should occur. LANL should reevaluate why they requested this SWMU be added to the permit.

SWMUs which LANL requested be added to the HSWA permit in March 1993, for which NFA has been requested:

59-003
61-004(a,b,c)
3-013 (e,g)
3-020(b)

LANL may apply under a Class III permit modification for removal of the following SWMUs from the permit:

| | |
|---|---|
| 3-009(b) | 3-020(a) |
| 3-009(c) | 3-018 |
| 3-009(e) | 59-001 |
| 3-009(f) | 3-043(e) |
| 3-009(g) | 60-006(c) |
| 3-003(c) | 3-056(a) |

## Attachment B

| | |
|---|---|
| 3-012(a) | 3-039 (a) |
| 60-002 | |

The following SWMUs do not need to be added to the HSWA permit for investigation:

| | |
|---|---|
| 3-010(b) | 60-001(c) |
| 3-010(c) | 64-001 |
| 3-010(d) | 3-055(b) |
| 3-013(d) | 30-001 |
| 3-013(f) | 59-002 |
| 3-013(h) | 60-001(b) |
| 61-003 | 60-001(d) |
| 60-003 | 60-004(a) |
| 60-005(b) | 60-006(b) |
| 3-039(b-e) | |

# 3-056(m)

# ATTACHMENTS

## SWMU 3-056(m) — Drum Storage Area (Inactive)

### 1.0 Introduction

SWMU 3-056(m) is located in former Operable Unit (OU) 1114 (Figure 1-1) within Technical Area (TA)-3 (Figure 1-2 and Index Map) at Los Alamos National Laboratory, Los Alamos, New Mexico.

### 1.1 Description

SWMU 3-056(m) [Map 3-056(m)] is a former drum storage area located outside TA-3-322, a supply building southeast of the Physics Building, TA-3-40. The entire area is surrounded by concrete sidewalk and asphalt. According to the assistant building manager for TA-3-40, there was only one drum stored in the vicinity of TA-3-322. He stated that the area contained one open-topped drum and a pressed-board box on the northwest corner of the facility; both were used to collect general trash from the surrounding area. While it is unknown exactly how long the drums were located near TA-3-322, it has been estimated to be since the early 1970s. During a site reconnaissance visit, leakage noted from the drum was from rainwater that had collected in the open containers and drained through holes in the base of the drum. The containers were removed in 1989. (Griggs 1993, 17-866) (Attachment A).

### 1.2 No Further Action Basis

SWMU 3-056(m) is recommended for NFA because the site has never been used for the management (i.e., generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes or constituents, or other CERCLA hazardous substances. The drums at SWMU 3-056(m) consisted of only one drum containing general trash only.

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-056(m) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

One drum containing trash only.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Memorandum, "Drum Storage at TA-3-322, PRS 3-056(m)," (Griggs 1993, 17-866).

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

### 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-056(m) is recommended for NFA under Criterion 2.

## 5.0 References


Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Griggs, E., June 28, 1993. "Drum Storage at TA-3-322, PRS 3-056(m)," Los Alamos National Laboratory Memorandum CLS-ER/EG-93:079 to File from E. Griggs (CLS-DO), Los Alamos, New Mexico. (Griggs 1993, 17-866).

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, p 6-11. (LANL 1995, 1291)


## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

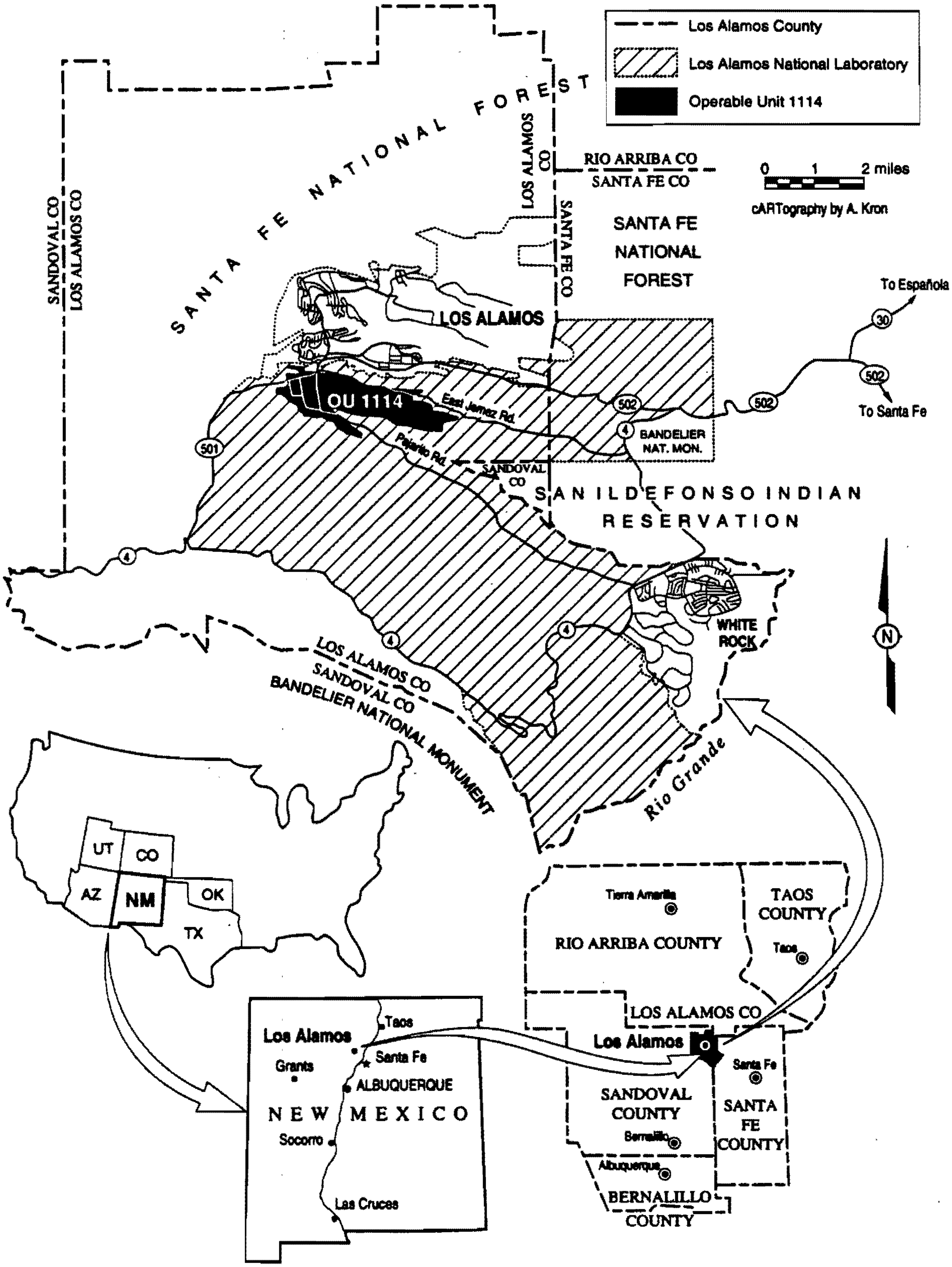



**Fig. 1-1. Location of Operable Unit 1114.**

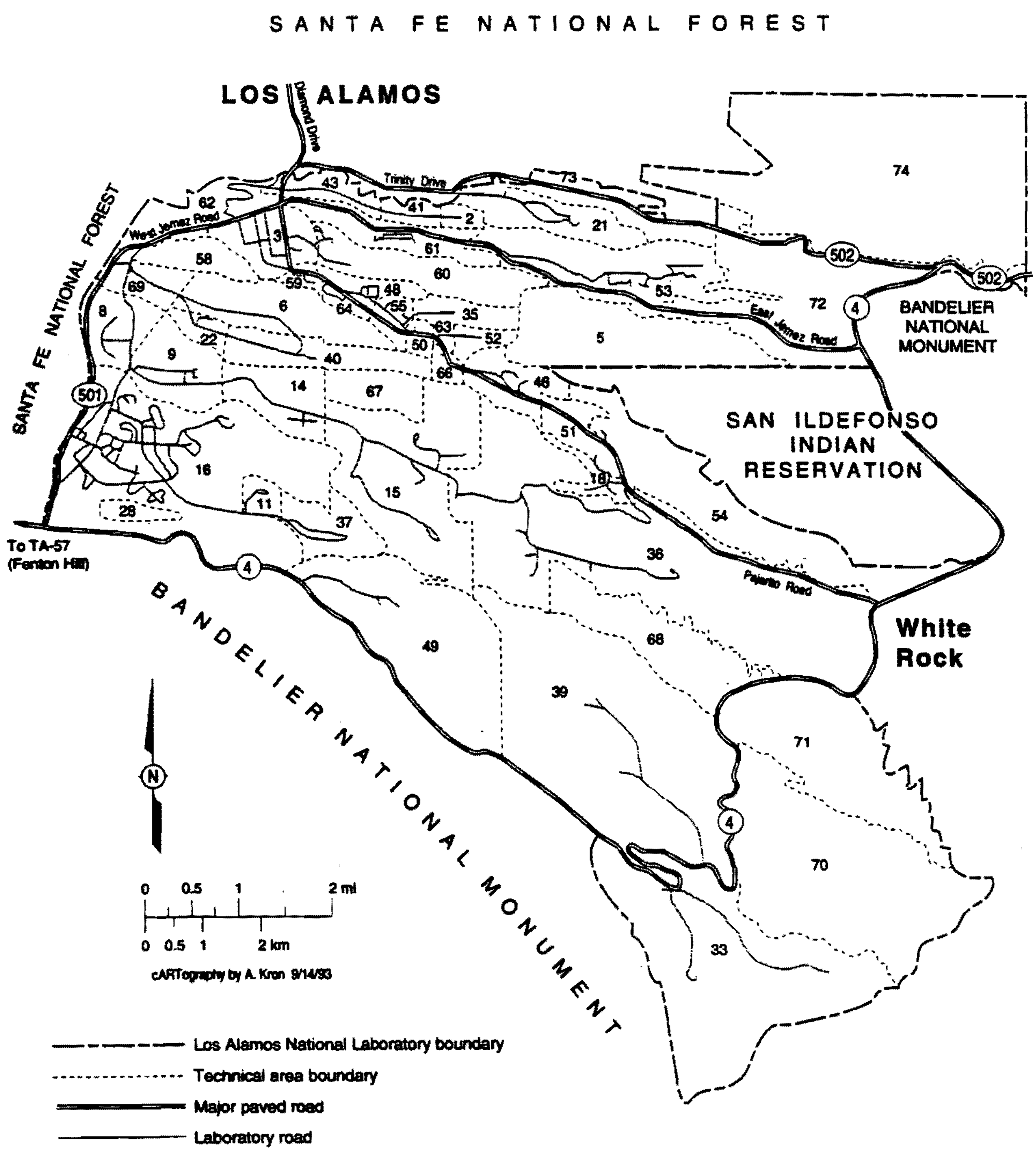
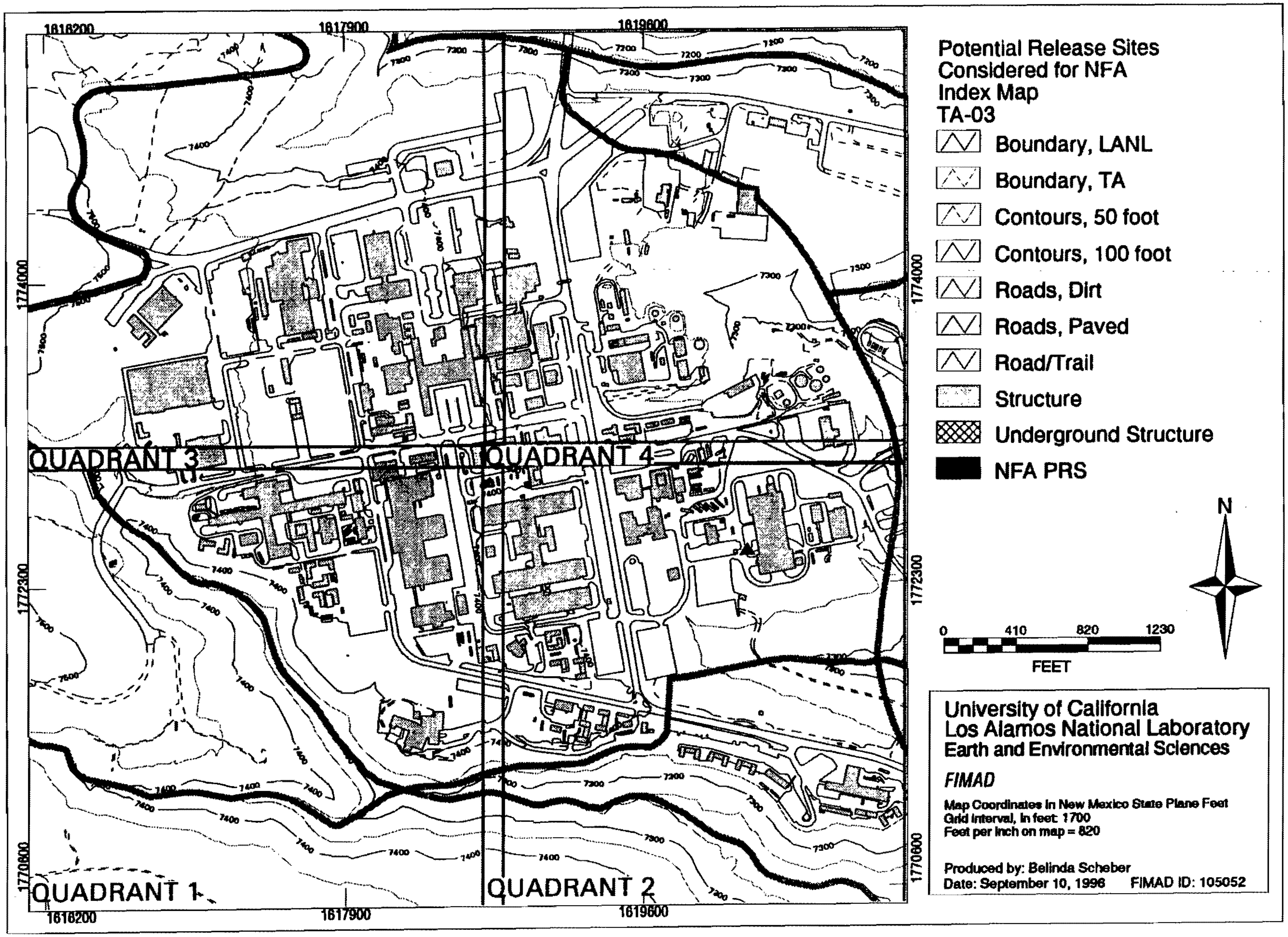
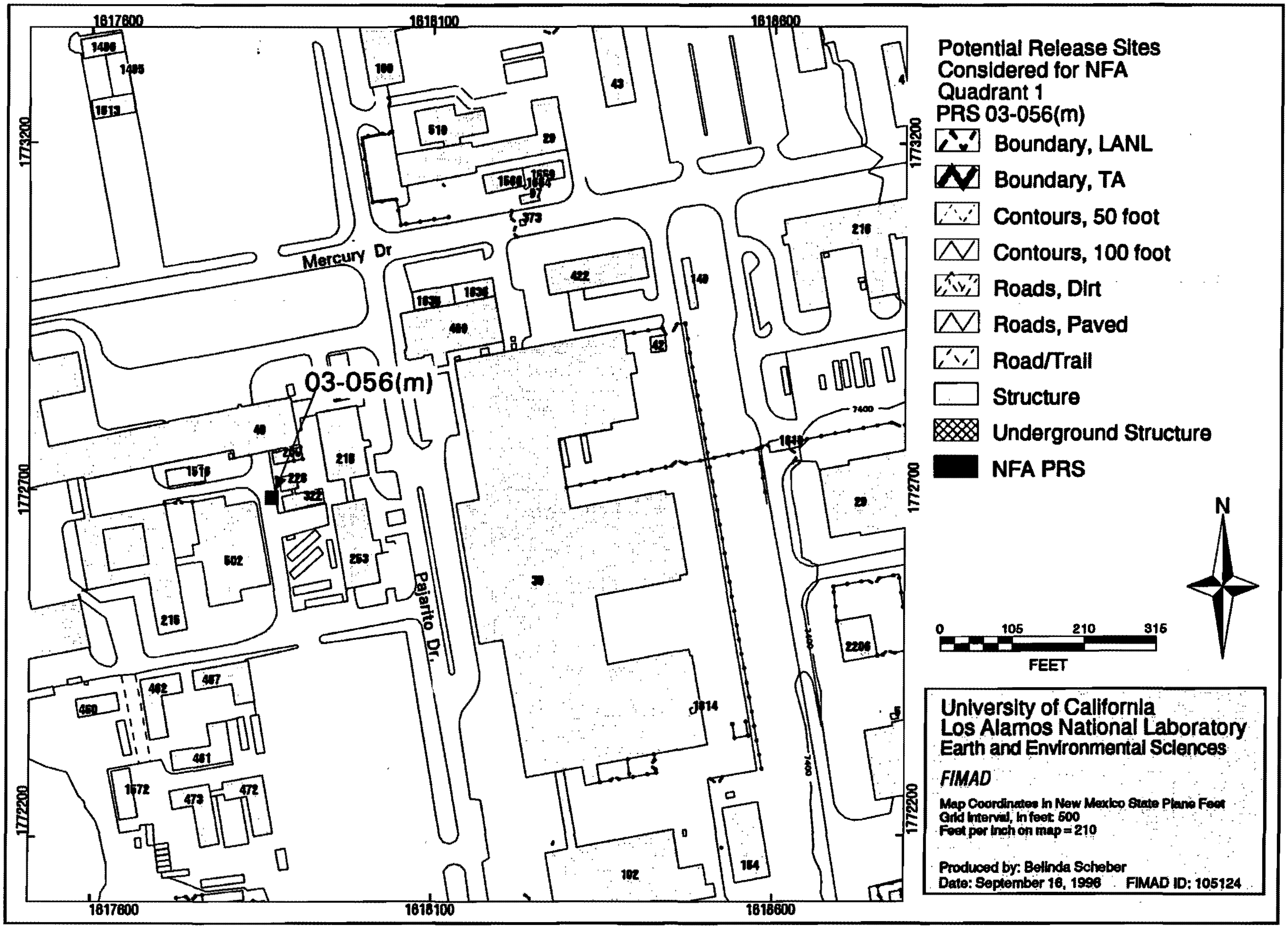



**Figure 1-2. Technical areas at Los Alamos National Laboratory.**




**Potential release sites considered for NFA, TA-03**
**INDEX MAP**




Potential release sites considered for NFA, TA-03, PRS 03-056(m)

# 3-056(n)

# ATTACHMENTS

## SWMU 3-056(n) — Drum Storage Area (Inactive)

### 1.0 Introduction

SWMU 3-056 (n) is located in former Operable Unit (OU) 1114 (Figure 1-1) within Technical Area (TA)-3 (Figure 1-2 and Index Map) at Los Alamos National Laboratory, Los Alamos, New Mexico.

### 1.1 Description

SWMU 3-056(n) [Map 3-056 (n)] was a temporary transfer storage area for lead waste located outside and southwest of TA-3-379, the Johnson's Controls (JCI) lead shop. Lead cuttings that were too small to be useful for making lead products were put into 55-gal. drums and placed outside the shop to be picked up for recycling. The drums were stored outside for only a few days before each pickup. They were kept dry and covered at all times. According to both the JCI shop supervisor and the shop foreman, using this outside transfer area was the practice of the JCI lead shop from the mid-1970s until March 1993 when the practice ended. Currently, lead waste cuttings are placed in double containment vessels which, until they are picked up for recycling, are kept in a LANL-approved less-than-90-day storage area located within the JCI lead shop. The JCI lead shop is totally surrounded by asphalt and has been since its construction in 1972. (Griggs 1993, 17-847). (Attachment A).

### 1.2 No Further Action Basis

SWMU 3-056(n) is recommended for NFA because no release to the environment occurred at the site, nor is likely to occur in the future. The drums at SWMU 3-056(n) contained solid lead waste and were kept dry and covered at all times. There is no historical record of release to the surrounding asphalt. The drum storage was well maintained and kept clean by the frequency of removal (Griggs 1993, 17-847) (Attachment A).

After reviewing the RFI Work Plan for OU 1114, the US Environmental Protection Agency concurred that SWMU 3-056(n) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Appendix A Attachment 1, page 3, note preceding Specific Comment 12) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

Temporary transfer storage area for lead waste cuttings.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL Memorandum, "Status of SWMU 3-056(n) at TA-3-379," (Griggs 1993, 17-847).

Appendix A Attachment 1: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for OU 1114, Work Plan Addendum 1.

### 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Based on evidence outlined in Sections 1.0 and 2.0, no unacceptable risk is presented by this site.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 3-056(n) is recommended for NFA under Criterion 3.

## 5.0 References


Environmental Protection Agency Region 6, November 1995. "Notice of Deficiency, Addendum 1 to Work Plan for Operable Unit (OU) 1114, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, New Mexico, Federal Facilities Section, Dallas, Texas.

Griggs, E., June 11, 1993. "Status of SWMU 3-056(n) at TA-3-379," Los Alamos National Laboratory Memorandum CLS-ER/EG-93:072 to File from E. Griggs (CLS-DO), Los Alamos, New Mexico. (Griggs 1993, 17-847)

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1114, Addendum 1," Los Alamos National Laboratory Report LA-UR-95-731, Los Alamos, New Mexico, p 6-49. (LANL 1995, 1291)


## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

Los Alamos

Attachment A

3-000866

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

# memorandum

TO: FILE

DATE: June 28, 1993

FROM: Ed Griggs, CLS-DO EG

MAIL STOP/TELEPHONE: E525/7-5544

SYMBOL: CLS-ER/EG-93:079

SUBJECT: **DRUM STORAGE AT TA-3-322, PRS 3-056(m)**

This SWMU site is an outside storage facility described as drum storage areas on the south and west sides and the northwest corner of the building. Some of the drums are noted to be leaking. leaks and spills have occurred at several of the facilities.

Currently occupied by EES-4 for the past 1 1/2 years. Occupied by SST-11 prior to that time.

Visit to site with Jeff Torrez, P-2, on 6/28/93. Torrez was aware of the site since he worked in the area during the reported drum storage. He stated that the only drum storage in the vicinity of TA-3-322 was an open-topped drum and pressboard box on the NW corner of the facility. Both units were used to collect general trash from the surrounding area. The noted leakage was from rainwater which collected in the open containers and drained through holes in their bases caused by deterioration and rusting. The containers were not product or waste storage for experimentation or from repair of hardware. Torrez said he thought the containers were removed in 1989.

Cy: Griggs ER File, E525

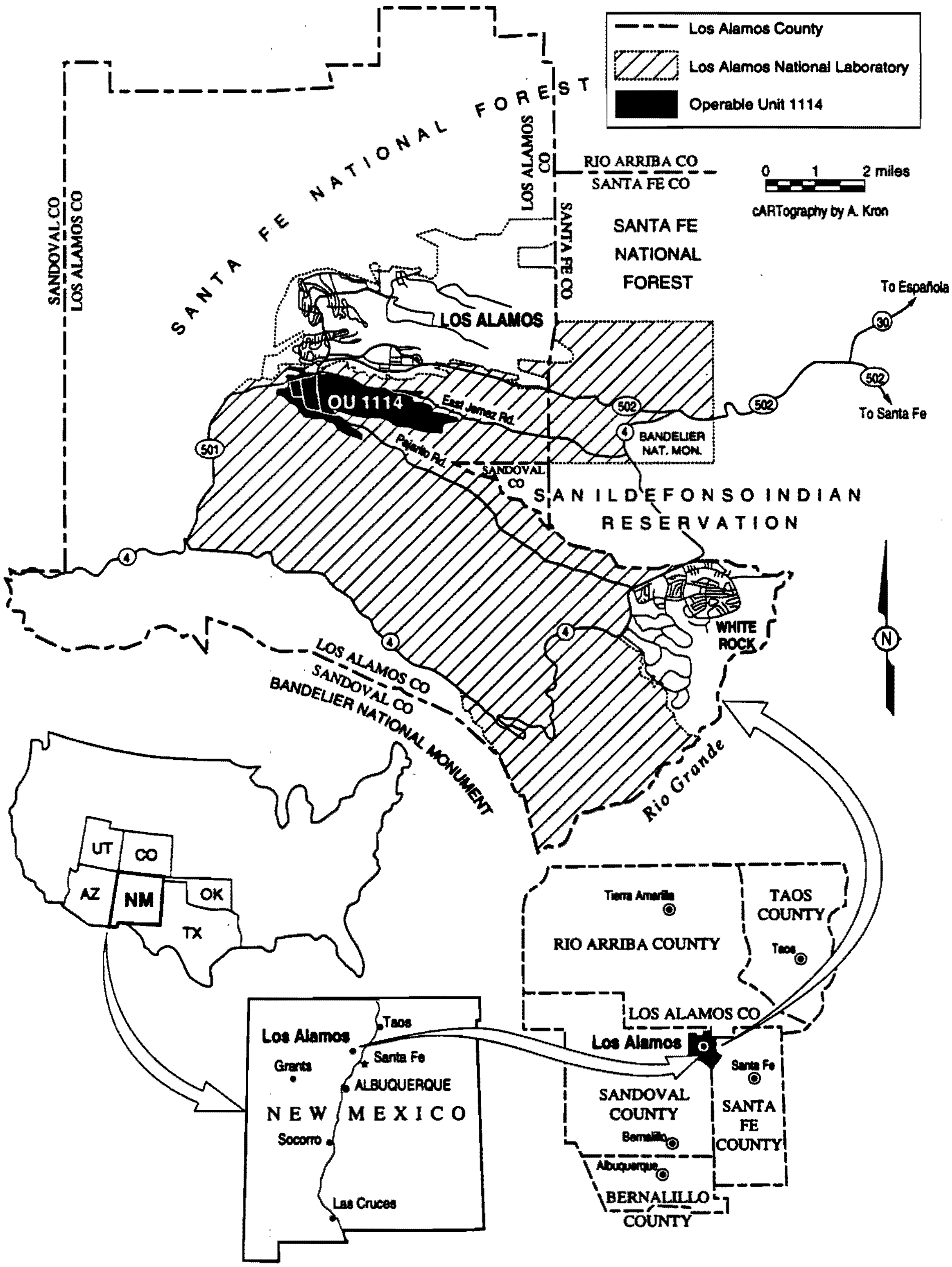



**Fig. 1-1. Location of Operable Unit 1114.**

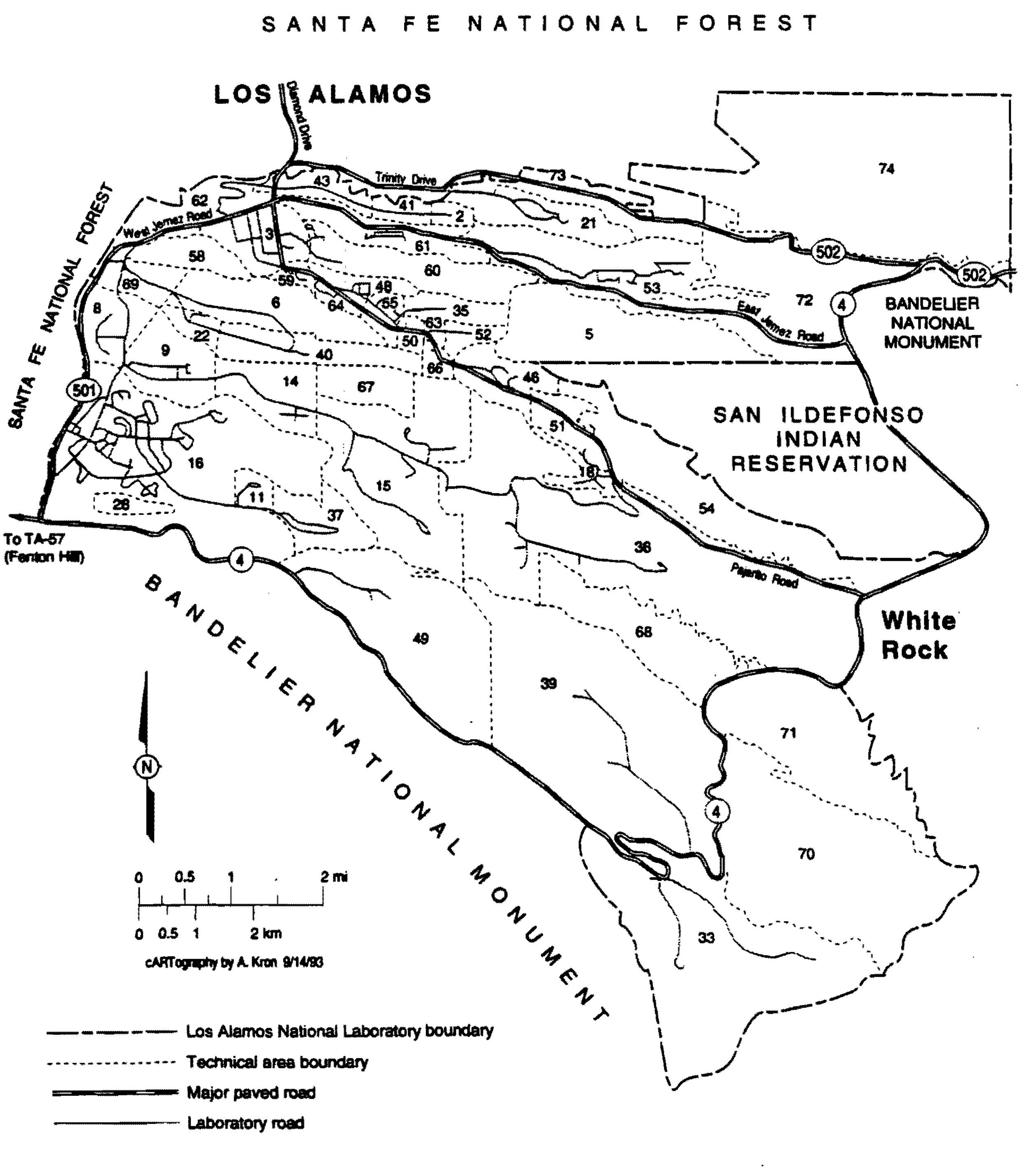
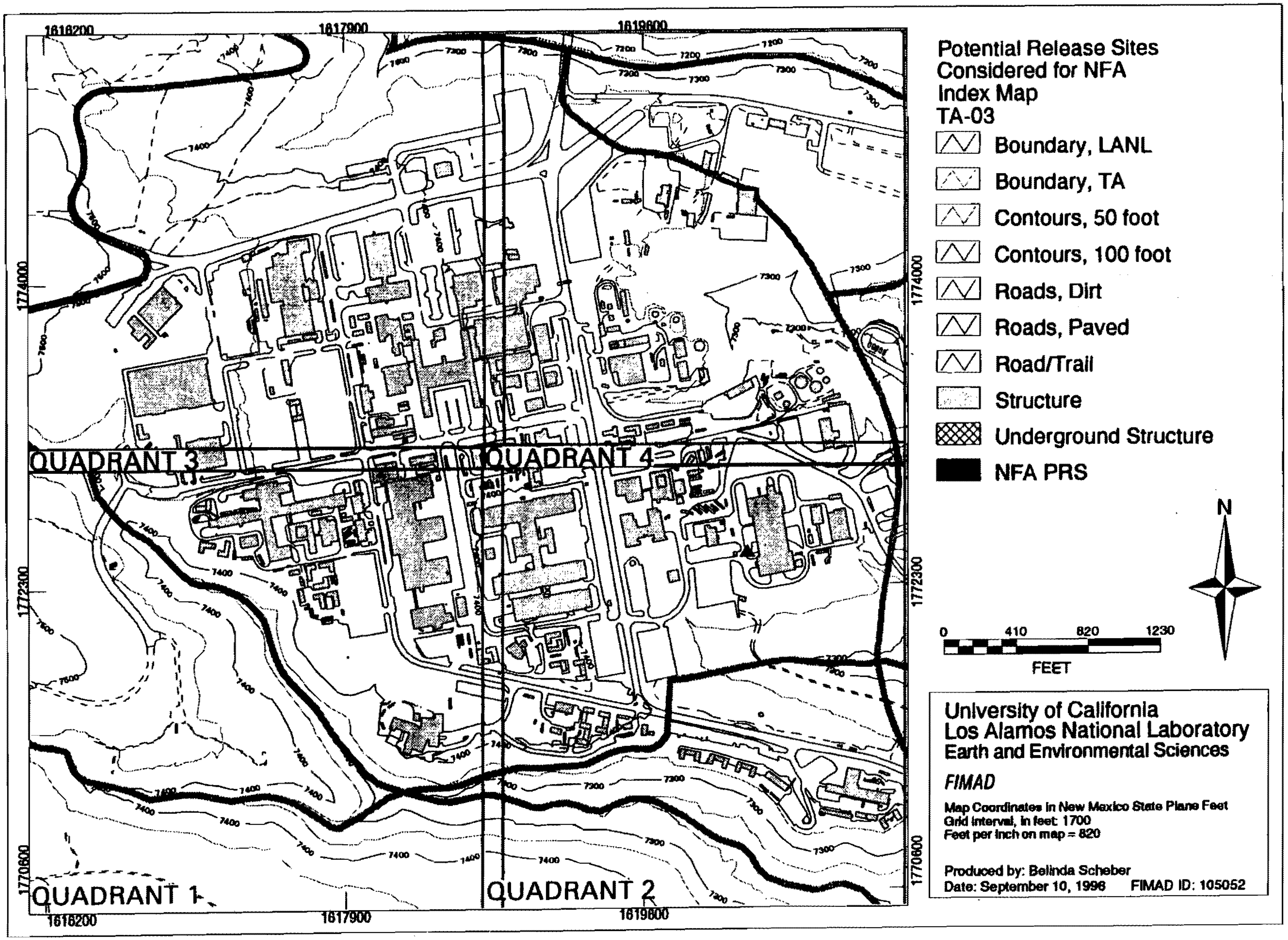
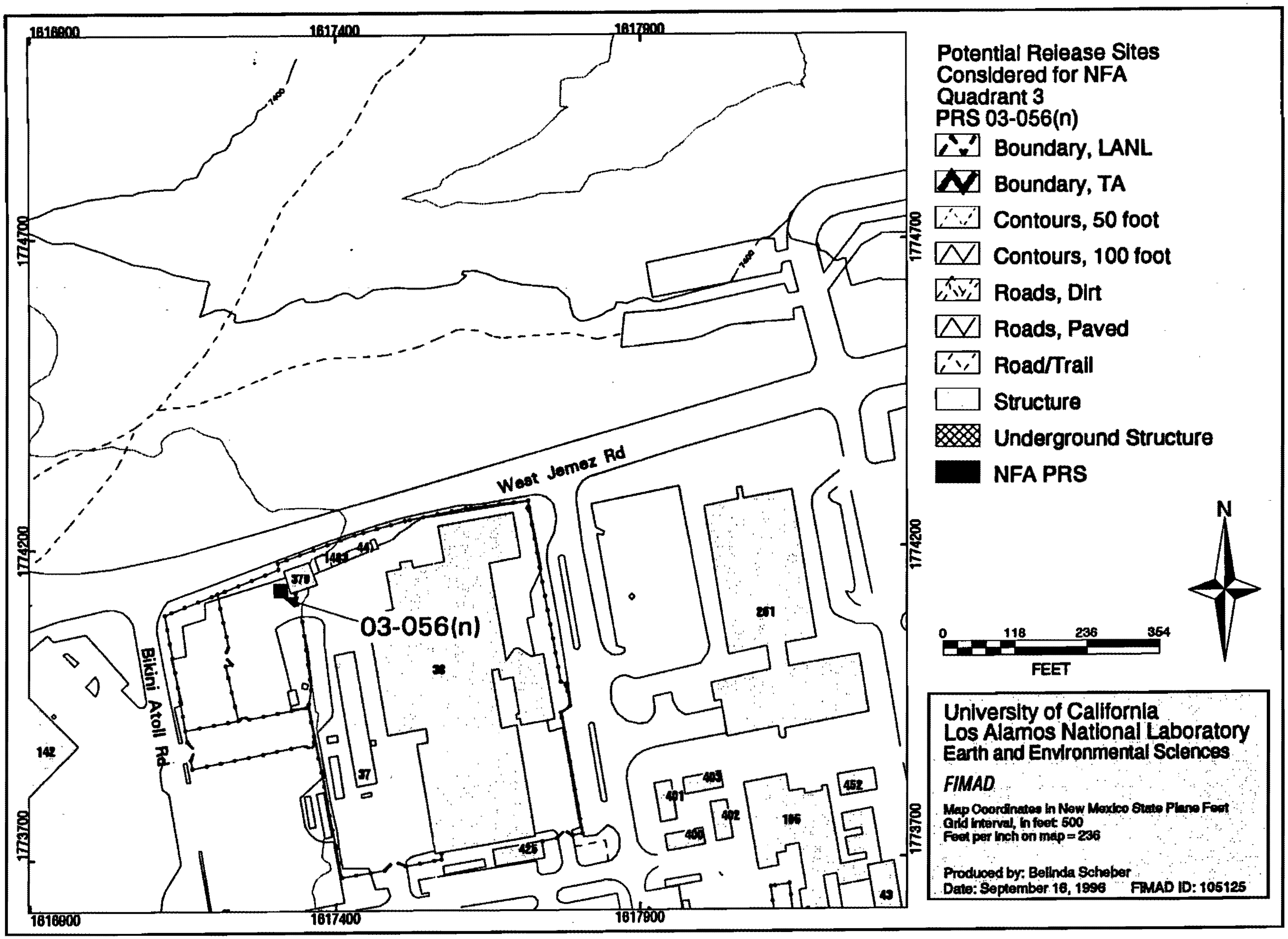



**Figure 1-2. Technical areas at Los Alamos National Laboratory.**




**Potential release sites considered for NFA, TA-03**
**INDEX MAP**




Potential release sites considered for NFA, TA-03, PRS 03-056(n)

# 7-003(c)

# ATTACHMENTS

**SWMU 7-003(c) — Clerical Error**

# 1.0 Introduction

## 1.1 Description

LANL submitted a request for a Class 3 Permit Modification to the HSWA Module of its RCRA Hazardous Waste Facility Permit in February 1993 (DOE 1993, Attachment A). Appendix II Table B of Attachment A listed SWMUs that were to be added to the Module. However, when the modified Module was being retyped, several discrepancies appeared in Table A of the Permit Modification. In compliance with a request made by Ms Barbara Driscoll of Region 6 of the EPA (DOE December 1993, Attachment B), LANL attempted to correct the discrepancies. During this revision a clerical error was made. SWMU 7-001(c), a detonation ground (firing site), was incorrectly typed as SWMU 7-003(c), a firing site (see DOE December 1993, Attachment B, Enclosure 2). This error was detected during the ensuing public comment period; however, this is the first attempt that LANL is making to correct that error.

To verify that SWMU 7-003(c) came into existence only as a clerical error, the SWMU Report (LANL 1990, 0145) was checked; SWMU 7-003(c) does not appear in that report. An email inquiry was made to the Field Project Leader responsible for TA-7. The Field Project Leader confirmed that SWMU 7-003(c) did not exist (LANL 1995, Attachment C).

## 1.2 No Further Action Basis

SWMU 7-003(c) is recommended for NFA because the SWMU does not exist. During revisions to a LANL request for a Class 3 Permit Modification to the HSWA Module of its RCRA Hazardous Waste Facility Permit in February 1993, a clerical typing error was made. There is no record of this SWMU in the SWMU Report (LANL 1990, 0145) and the Field Unit 5 Project Leader confirmed that the SWMU does not exist.

In light of this clerical error, we are requesting that SWMU 7-003(c) be removed from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit via a Class 1 permit modification.

# 2.0 History

## 2.1 Historical Operations

Section not applicable.

## 2.2 Previous Audits, Inspections, and Findings

Attachment A: US DOE, Letter from J. C. Vozella to W.K. Honker of EPA Region 6, February 1993.

Attachment B: US DOE, Letter from J. C. Vozella to W. Honker of EPA Region 6, December 1993.

Attachment C: LANL, Email Reply from Cheryl Rofer to Janet Harry.

# 3.0 Evaluation of Relevant Evidence

## 3.1 Unit Characteristics and Operating Practices

Section not applicable.

## 3.2 Results of Sampling/Surveys

Section not applicable.

## 3.3 Gaps in Information

Section not applicable.

## 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 7-003(c) is recommended for NFA under Criterion 1.

## 5.0 References


Department of Energy, February 16, 1993. Letter to W. K. Honker, Chief, RCRA Permits Branch, US EPA Region 6, Texas, from J. C. Vozella Department of Energy, Los Alamos Area Office, Los Alamos, New Mexico.

Department of Energy, December 15, 1993. Letter to W. Honker, Chief, RCRA Permits Branch, US EPA Region 6, Texas, from J.C. Vozella, Chief, Environment Safety and Health Branch, Department of Energy, Los Alamos Area Office, Los Alamos, New Mexico.

Los Alamos National Laboratory, February 12 1995. "PRSs 7-003 (c, d)," Email from C. Rofer to J. Harry, Los Alamos, New Mexico.

Los Alamos National Laboratory, November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico. (LANL 1990, 0145)


## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

Section not applicable.

### 6.3 Other Survey/Investigation Data

Section not applicable.

Attachment A

3-000847

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

# memorandum

TO: File

DATE: June 11, 1993

FROM: Ed Griggs, CLS-DO EG

MAIL STOP/TELEPHONE: E525/7-5544

SYMBOL: CLS-ER/EG-93:072

SUBJECT: **STATUS OF SWMU 3-056(n) AT TA-3-379**

The 1988 SWMU Report identified an outside drum storage area at TA-3-379, the JCI lead shop.

Ed Griggs visited the site with Mel Cave, JCI Shops Supervisor, and Keith Bingham, JCI Shops Foreman, on 6/11/93. Cave stated that an area just south of the west personnel entry door has been used until March, 1993, as a temporary transfer station for one or two drums containing lead waste destined for recycling. Consequently, the site referred to in the SWMU report no longer exists. Bingham verifed Cave's statement and added that as lead waste cuttings to small to be useful for making lead product items were generated inside the lead shop, they were put into in 55 gal metal drums and which were placed outside the building at the west-southwest corner for pickup and removal for recycling. The drums remained in residence for only a few days at a time. The drums contained solid lead waste and were kept dry and covered at all times.

The associated lead shop, TA-3-379, is totally surrounded with asphalt and has been since its construction. There is absolutely no evidence of lead waste on the surrounding asphalt. Lead product is stored internal to the structure and in covered shelves in a metal rack ~20 ft northwest from TA-3-379. Current operations require that the lead waste cuttings be placed in double containment vessels which are kept in a LANL-approved <90 storage site inside the building until picked up for recycling.

Cy: Griggs ER File

# 7-003(d)

# ATTACHMENTS

## SWMU 7-003(d) — Clerical Error

## 1.0 Introduction

### 1.1 Description

LANL submitted a request for a Class 3 Permit Modification to the HSWA Module of its RCRA Hazardous Waste Facility Permit in February 1993 (DOE 1993, Attachment A). Appendix II Table B of Attachment A listed SWMUs that were to be added to the Module. However, when the modified Module was being retyped, several discrepancies appeared in Table A of the Permit Modification. In compliance with a request made by Ms Barbara Driscoll of Region 6 of the EPA (DOE December 1993, Attachment B), LANL attempted to correct the discrepancies. During this revision a clerical error was made. SWMU 7-001(d), a detonation ground (firing site), was incorrectly typed as SWMU 7-003(d), a firing site (see DOE December 1993, Attachment B, Enclosure 2). This error was detected during the ensuing public comment period; however, this is the first attempt that LANL is making to correct that error.

To verify that SWMU 7-003(d) came into existence only as a clerical error, the SWMU Report (LANL 1990, 0145) was checked; SWMU 7-003(d) does not appear in that report. An email inquiry was made to the Field Project Leader responsible for TA-7. The Field Project Leader confirmed that SWMU 7-003(d) did not exist (LANL 1995, Attachment C).

### 1.2 No Further Action Basis

SWMU 7-003(d) is recommended for NFA because the SWMU does not exist. During revisions to a LANL request for a Class 3 Permit Modification to the HSWA Module of its RCRA Hazardous Waste Facility Permit in February 1993, a clerical typing error was made. There is no record of this SWMU in the SWMU Report (LANL 1990, 0145) and the Field Unit 5 Project Leader confirmed that the SWMU does not exist.

In light of this clerical error, we are requesting that SWMU 7-003(d) be removed from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit via a Class 1 permit modification.

## 2.0 History

### 2.1 Historical Operations

Section not applicable.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: US DOE, Letter from J. C. Vozella to W.K. Honker of EPA Region 6, February 1993.

Attachment B: US DOE, Letter from J. C. Vozella to W. Honker of EPA Region 6, December 1993.

Attachment C: LANL, Email Reply from Cheryl Rofer to Janet Harry.

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Section not applicable.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 7-003(d) is recommended for NFA under Criterion 1.

## 5.0 References

Department of Energy, February 16, 1993. Letter to W. K. Honker, Chief, RCRA Permits Branch, US EPA Region 6, Texas, from J. C. Vozella Department of Energy, Los Alamos Area Office, Los Alamos, New Mexico.

Department of Energy, December 15, 1993. Letter to W. Honker, Chief, RCRA Permits Branch, US EPA Region 6, Texas, from J.C. Vozella, Chief, Environment Safety and Health Branch, Department of Energy, Los Alamos Area Office, Los Alamos, New Mexico.

Los Alamos National Laboratory, February 12 1995. "PRSs 7-003 (c, d)," Email from C. Rofer to J. Harry, Los Alamos, New Mexico.

Los Alamos National Laboratory, November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico. (LANL 1990, 0145)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

Section not applicable.

### 6.3 Other Survey/Investigation Data

Section not applicable.

Attachment A

**Department of Energy**
Field Office, Albuquerque
Los Alamos Area Office
Los Alamos, New Mexico 87544

FEB 1 6 1993

William K. Honker, Chief
RCRA Permits Branch
Hazardous Waste Management Division
U. S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Dear Mr. Honker:

Pursuant to the Hazardous and Solid Waste Amendments (HSWA) of 1984 and follow-up to the information provided to you on November 20, 1992, the Department of Energy (DOE) is providing the enclosed information to revise Module VIII of the Los Alamos National Laboratory (LANL) hazardous waste permit. This action requests the following:

- Minor wording clarifications, and addition of boilerplate dispute resolution language to provide consistency with other permits in Region 6 (Appendix I);
- Addition of 483 Solid Waste Management Units (SWMUs) to the existing universe of 605 for a total of 1,088 SWMUs subject to investigation pursuant to 3004(u) and 3004(v) (Appendix II); and
- a staggered schedule for submitting RFI Workplans (Appendix III).

The information provided to you in November regarding the request for removal of sites identified in the permit and not found to be subject to 3004(u) or 3004(v) requires additional study and justification. DOE will provide you justification for removal of all duplicate sites and SWMUs subject to 3004(a) no later than March 19, 1993.

DOE and its operating contractor, Regents of the University of California, have jointly signed this permit modification request as the operator of the permitted facility. The Department has determined that dual signatures best reflect the actual apportionment of responsibility under which the Department's RCRA responsibilities are for policy, programmatic, funding and scheduling decisions, as well as general oversight, and the contractor's RCRA responsibilities are for day-to-day operations, including but not limited to, the following responsibilities: waste analyses and handling, monitoring, record keeping, reporting, and contingency planning. For

Attachment A



purposes of the certification required by 40 C.F.R. 270.11(d), the Department's and Regents of the University of California's representatives certify, to the best of their knowledge and belief, the truth, accuracy and completeness of the application for their respective areas of responsibility.

If you or your staff have any questions regarding this permit modification, please contact Steve Slaten of my staff at FTS 8-505-665-5050 to arrange a teleconference or meeting with DOE and LANL.

Sincerely,

Joseph C. Vozella

Joseph C. Vozella, Acting Chief
Environment, Safety and Health
Branch

LESH:3SS-007

Enclosure

cc w/o enclosure:
See page 3

**Attachment A**



Barbara Driscoll
RCRA Permits Branch
U. S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Bruce Swanton
Hazardous and Radioactive Materials Bureau
New Mexico Environmental Department
525 Camino de las Marquez
Santa Fe, New Mexico 87502

K. Bitner, ERPO, AL
A. Tiedman, ADO, LANL, MS-A120
J. Shipley, EE-AETO, LANL, MS-F641
T. Gunderson, EM-DO, LANL, MS-K491
C. Nylander, EM-DO, LANL, MS-K491
J. Corpion, EM-8, LANL, MS-K490
K. Hargis, EM-8, LANL, MS-K490
R. Vocke, EM-13, LANL, MS-M992

## Attachment A

## APPENDIX II, TABLE B - NEWLY-IDENTIFIED SWMUs SUBJECT TO HSWA

| Site Number | Solid Waste Management Unit Type |
|---|---|
| 06-003(f) | Detonation ground |
| 06-003(g) | Detonation ground |
| 06-007(g) | Abandoned building and appurtenances |
| 07-001(c) | Detonation ground |
| 07-001(d) | Detonation ground |
| 21-027(a) | Industrial or sanitary wastewater treatment |
| 21-027(b) | Industrial or sanitary wastewater treatment |
| 21-027(c) | Industrial or sanitary wastewater treatment |
| 21-027(d) | Industrial or sanitary wastewater treatment |
| 40-010 | Surface disposal site (i.e., landfill, impoundment, etc.) |
| 46-004(a2) | Industrial or sanitary wastewater treatment |
| 46-004(b2) | Industrial or sanitary wastewater treatment |
| 46-004(c2) | Industrial or sanitary wastewater treatment |
| 46-004(d2) | Soil contamination area |
| 46-004(p) | Surface disposal site (i.e., landfill, impoundment, etc.) |
| 46-004(q) | Industrial or sanitary wastewater treatment |
| 46-004(r) | Industrial or sanitary wastewater treatment |
| 46-004(s) | Industrial or sanitary wastewater treatment |
| 46-004(t) | Industrial or sanitary wastewater treatment |
| 46-004(u) | Industrial or sanitary wastewater treatment |
| 46-004(v) | Industrial or sanitary wastewater treatment |
| 46-004(w) | Industrial or sanitary wastewater treatment |
| 46-004(x) | Industrial or sanitary wastewater treatment |
| 46-004(y) | Industrial or sanitary wastewater treatment |
| 46-004(z) | Industrial or sanitary wastewater treatment |
| 46-006(f) | Container storage area |
| 61-004(c) | Septic tank |

TABLE A

Attachment A



**Technical Area 4**

4-001
4-002 (4)
4-003 (a-b)

**Technical Area 5**

5-001 (a-b)
5-002
5-003 (15)
5-004
5-005 (a-b)
5-006 (a-h)

**Technical Area 6**

6-001 (a-b)
6-002
6-003 (a) (18)
6-003 (c-g)
6-005
6-006
6-007 (a-g)

**Technical Area 7**

7-001 (a-d) (4)

**Technical Area 8**

8-002
8-003 (a-c)
8-004 (a-d)
8-005 (16)
8-006 (a-b)
8-007
8-009 (a-b)
8-009 (d-e)

**Technical Area 9**

9-001 (a-d)
9-002
9-003 (a-i) (43)
9-004 (a-o)
9-005 (a-h)
9-006
9-007
9-008 (a-b)
9-009
9-013

**Technical Area 10**

10-001 (a-d)
10-002 (a-b)
10-003 (a-h) (19)
10-004 (a-b)
10-005
10-006
10-007

**Technical Area 11**

11-001 (a-c)
11-002
11-004 (a-e)
11-005 (a-c) (22)
11-006 (a-d)
11-007
11-009
11-011 (a-d)

**Technical Area 12**

12-001 (a-b) (3)
12-002

**Technical Area 13**

13-001
13-002 (4)
13-003 (a)
13-004

**Technical Area 14**

14-002 (a-f)
14-003
14-004 (b)
14-005 (13)
14-006
14-007
14-009
14-010

(161)

Attachment B

# Department of Energy

Field Office, Albuquerque
Los Alamos Area Office
Los Alamos, New Mexico 87544

DEC 1 5 1993

Mr. William Honker, Chief
RCRA Permits Branch
Hazardous Waste Management Division
U. S. Environmental Protection
Agency
1445 Ross Avenue
Dallas, Texas 75202-2733

Dear Mr. Honker:

The Los Alamos National Laboratory (LANL) submitted a request for a Class 3 Permit Modification to the Hazardous and Solid Waste Amendments (HSWA) portion of its Resource Conservation and Recovery Act Hazardous Waste Permit in February 1993.

As a result of the modified permit being retyped, there appeared to be several discrepancies in Table A. Upon bringing these discrepancies to the attention of Ms. Barbara Driscoll of your staff, she requested that LANL correct the table within the time allowed during the public comment period. She also requested that we supply justification for the correction and that we attempt to make Table A reflect the most current knowledge of the Program as to which Potential Release Sites (PRSs) are Solid Waste Management Units (SWMUs) that should be in the Permit, and which PRSs LANL believes should be removed from the Permit. Enclosed please find a modified Table A which reflects what units LANL believes should be in the HSWA Permit. Also enclosed is a summarization and justification of PRSs that LANL now believes should not be included in the Permit (Enclosure 1).

We are also supplying to your office a list and brief description of PRSs that LANL now believes to be SWMUs that require incorporation into the Permit (Enclosure 2).

Attachment B

Mr. William Honker 2 DEC 15 1993

Should you have any questions, please feel free to contact Steve Slaten of my staff at (505) 665-5050.

Sincerely,

Joseph C. Vozella, Chief
Environment, Safety and Health Branch

LESH:9SS-014

Enclosures

cc w/enclosures:
K. Sisneros
NMED
1190 St. Francis Dr.
P. O. Box 26110
Santa Fe, NM 87502
T. Taylor, ES&H, LAAO
S. Slaten, ES&H, LAAO
K. Bitner, ERPO, AL

cc w/o enclosures:
R. Harris, EM-452, HQ
K. Schenck, Scientech, LAAO
J. Shipley, ERWM, LANL, MS-J591
R. Vocke, EM-13, LANL, MS-M992
RPF, LANL, MS-M707

Attachment B

Enclosure 2

PRS's added to Permit Modification.

| Site Number | Solid Waste Management Unit Type |
|---|---|
| 1-001(s) | Septic System |
| 1-001(t) | Septic System |
| 1-001(u) | Septic System |
| 1-006(c) | Drain lines and outfall |
| 1-006(d) | Drain lines and outfall |
| 1-006(h) | Drain lines and outfall |
| 1-006(n) | Drain lines and outfall |
| 1-006(o) | Drain lines and outfall |
| 1-007(a) | Soil Contamination area |
| 1-007(c) | Soil Contamination area |
| 1-007(d) | Soil Contamination area |
| 1-007(e) | Soil Contamination area |
| 1-007(j) | Soil Contamination area |
| 1-007(l) | Soil Contamination area |
| 6-003(f) | Firing Site |
| 6-003(g) | Firing Site and Building |
| 6-003(h) | Firing Site |
| 7-003(c) | Firing Site |
| 7-003(d) | Firing Site |
| 9-013 | Material Disposal Area |
| 10-003(f) | Disposal Pit |
| 10-003(j) | Tank |
| 10-003(k) | Tank |
| 10-003(l) | Tank |
| 10-003(m) | Waste Line |
| 10-003(n) | Leachfield |
| 10-003(o) | Leachfield |
| 10-003(d) | Firing Site |
| 18-001 (b) | Drain Lines |
| 18-001 (c) | Sump |
| 20-002(b) | Firing Site |
| 20-002(c) | Firing Site |
| 20-002(d) | Firing Site |
| 21-011(k) | Outfall |
| 21-027(a) | Ind. or San. waste water treat |
| 21-027(b) | Ind. or San. waste water treat |
| 21-027(c) | Ind. or San. waste water treat |

## Attachment B

Technical Area 4

4-001
4-002 (4)
4-003 (a-b)

Technical Area 5

5-001 (a-b)
5-002
5-003 (11)
5-004
5-005 (a-b)
5-006 (b, c, e, h)

Technical Area 6

6-001 (a-b)
6-002
6-003 (a)
6-003 (c-h) (19)
6-005
6-006
6-007 (a-g)

Technical Area 7

7-001 (a-d) (6)
7-003 (c-d)

Technical Area 8

8-002
8-003 (a-c)
8-004 (a-d)
8-005
8-006 (a-b) (15)
8-007
8-009 (a)
8-009 (d-e)

Technical Area 9

9-001 (a-d)
9-002
9-003 (a-i)
9-004 (a-o) (42)
9-005 (a-h)
9-006
9-007

Technical Area 9 Cont.

9-008 (b)
9-009
9-013

Technical Area 10

10-001 (a-d)
10-002 (a-b)
10-003 (a-o) (26)
10-004 (a-b)
10-005
10-006
10-007

Technical Area 11

11-001 (a-c)
11-002
11-004 (a-e)
11-005 (a-c) (22)
11-006 (a-d)
11-007
11-009
11-011 (a-d)

Technical Area 12

12-001 (a-b) (3)
12-002

Technical Area 13

13-001
13-002
13-003 (a) (4)
13-004

Technical Area 14

14-002 (a-f)
14-003
14-004 (b)
14-005
14-006 (13)
14-007
14-009
14-010

## Attachment C



Date: Sun, 12 Feb 1995 18:43:41 -0700
To: janeth@erl.lanl.gov (Janet Harry)
From: rofer@lanl.gov (Cheryl Rofer)
X-Sender: 073965@esslab.lanl.gov
Subject: Re: PRSs 7-003(c,d)

Janet -

There are no 7- numbers higher than 7-001. We have 7-001(c&d) but not 7-003(c&d).

Cheryl

>Cheryl-
>
>I am rechecking the HSWA Permit against the data base. PRSs 7-003 (c&d)
>are listed in the September 1994 permit. I do not have these in the data
>base. Going through my records it looks like they were added in the
>December 93 premit mod request. What can you tell me about these? Sorry to
>bother you, I thought we had resolved these.
>
>Thanks
>
>Janet Harry

**************************************************************
Cheryl K. Rofer — e-mail: rofer@lanl.gov
Geology and Geochemistry Group — phone: 505-667-2988
Los Alamos National Laboratory — fax: 505-665-3285
P.O. Box 1663, MS D462
Los Alamos, NM 87545
**************************************************************

# 18-001(c)

# ATTACHMENTS

## SWMU 18-001(c) — Sump

### 1.0 Introduction

SWMU 18-001(c) is located in former Operable Unit (OU) 1093 within Technical Area (TA)-18 at Los Alamos National Laboratory, Los Alamos, New Mexico (Figure 1-1). TA-18 is located in the central portion of the Laboratory (Figure 1-2).

### 1.1 Description

SWMU 18-001(c) [Map 18-001(c) and Figure 4-9], a sump located in the basement of building TA-18-30, collected groundwater from drains located outside the basement walls. Formerly, some sinks and floor drains within TA-18-30 drained to the sump. By the summer of 1994, all of these drains were diverted to the sanitary sewer line. The Laboratory Solid Waste Management Units (SWMU) Report (LANL 1990, 0145) (Attachment A) erroneously grouped the sump with the sanitary lagoons and sewer lines (Engineering Drawings ENG C-12697, Attachment B; ENG C-12711, Attachment C; and ENG C-12712, Attachment D). The sump discharges to an outfall (SWMU
18-012b) south of TA-18-30. This latter SWMU (not listed in the HSWA Module) was addressed in an RFI report submitted in October 1995. The potential contaminants of concern identified by a review of past operations at TA-18-30 are uranium, heavy metals, volatile organic chemicals (VOCs), and semivolatile organic chemicals (SVOCs).

### 1.2 No Further Action Basis

SWMU 18-001(c) is recommended for NFA because it has been characterized in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current or future land use.

Analysis results of groundwater samples indicated that three (3) metals, including uranium, were present at concentrations within the range of background. However, the maximum concentrations for uranium and lead were slightly above the upper tolerance limit (UTL) calculated for the main aquifer. This may, in part, be due to natural differences between the main and alluvial aquifers. The reported concentration of carbon disulfide was estimated at concentrations below the contract required quantitation limit (CRQL). This value is suspect, but the reported concentration is below the SAL. Therefore, no measured constituents were present above SALs (see Table in Section 3.2).

After reviewing the RFI Work Plan for OU 1093 Potential Release Site 18-001(c), the US Environmental Protection Agency concurred that SWMU 18-001(c) be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Attachment E, General Comment 1) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

Building TA-18-30 is an administrative building housing the control systems for remote nuclear criticality research areas. Historically, sinks and floor drains in offices and machine shops located in the building discharged to the sump. The drains have been removed or the discharges from them have been redirected to the sanitary sewer system.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL, November 1990. "Solid Waste Management Units Report," page 18-001.

Attachment B: LASL, Engineering Drawing ENG- C-12697.

Attachment C: LASL, Engineering Drawing ENG- C-12711.

Attachment D: LASL, Engineering Drawing ENG- C-12712.

Attachment E: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for RFI Report for Technical Areas 18 and 27.

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

SWMU 18-001(c) collects groundwater from drains located outside the basement walls of building TA-18-30.

### 3.2 Results of Sampling/Surveys

Two water samples were collected from SWMU 18-001(c) and analyzed for the potential contaminants of concern identified in Section 1.1. No sediment was present in the bottom of the sump.

The analytical data for the sump are presented in the table below. Very low concentrations of barium, lead, and uranium were detected in one or both samples. These concentrations are significantly below SALs. Barium and uranium concentrations are below the calculated UTL for main-aquifer groundwater. (No background data are currently available for the shallow aquifer.) The lead concentration in one sample was slightly above background.

**MEASURED CONCENTRATIONS OF POTENTIAL CONTAMINANTS OF CONCERN AT SWMU 18-001(c)**

| Sample Number | Sample Type | Metal µg/l | Radionuclide µg/l | SVOC µg/l | VOC µg/l | SAL µg/l | CRQL µg/l | Background µg/l |
|---|---|---|---|---|---|---|---|---|
| AAA5839 | Water | **71 Barium**<br>**2.0 Lead** | <br><br><br>**0.14 U (total)** | None Detected | <br><br>2.0 Carbon disulfide | 2000<br>50<br>5<br>20 (MCL) | 200<br>3<br>10<br>NA | 130<br>1.1<br><br>1.2 |
| AAA5840 | Water | 71 Barium<br>1.0 Lead | <br><br>0.123 U (total) | None Detected | | 2000<br>50<br>20 (MCL) | 200<br>3<br>NA | 130<br>1.1<br>1.2 |

Maximum concentrations in **boldface**. Shaded values: measured values above background UTLs.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Based on evidence outlined in Sections 1.0 and 3.0, no unacceptable risk is presented by this SWMU.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Section 3.0, SWMU 18-001(c) is recommended for NFA under Criterion 5.

## 5.0 References

Environmental Protection Agency Region 6, September 1995. "RFI Report Technical Areas 18 and 27, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of

Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, RCRA New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos Scientific Laboratory, "Utility Site Plan, Bldg. Nos. PL-30 & PL-31, Project TA-18," Drawing No. ENG C-12697 (May 15, 1950).

Los Alamos Scientific Laboratory, "Basement Plan, Bldg. No. PL-30, Project TA-18," Drawing No. ENG C-12711 (May 15, 1950).

Los Alamos Scientific Laboratory, "First Floor Plan, Bldg. No. PL-30, Project No. TA-18," Drawing No. ENG C-12711 (May 15, 1950).

Los Alamos National Laboratory, January 30, 1995. "RFI Report for Operable Unit 1093, Potential Release Sites 18-001a, b, c; 27-001, 27-003," Los Alamos National Laboratory Report LA-UR-95-0259, prepared by ICF Kaiser Engineers, Inc., Los Alamos, New Mexico, pp 4-25 through 4-27. (LANL 1995, 1337)

Los Alamos National Laboratory, November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico, page 18-001. (LANL 1990, 0145)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

Attachment A

**Department of Energy**
Field Office, Albuquerque
Los Alamos Area Office
Los Alamos, New Mexico 87544

FEB 1 6 1993

William K. Honker, Chief
RCRA Permits Branch
Hazardous Waste Management Division
U. S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Dear Mr. Honker:

Pursuant to the Hazardous and Solid Waste Amendments (HSWA) of 1984 and follow-up to the information provided to you on November 20, 1992, the Department of Energy (DOE) is providing the enclosed information to revise Module VIII of the Los Alamos National Laboratory (LANL) hazardous waste permit. This action requests the following:

- Minor wording clarifications, and addition of boilerplate dispute resolution language to provide consistency with other permits in Region 6 (Appendix I);
- Addition of 483 Solid Waste Management Units (SWMUs) to the existing universe of 605 for a total of 1,088 SWMUs subject to investigation pursuant to 3004(u) and 3004(v) (Appendix II); and
- a staggered schedule for submitting RFI Workplans (Appendix III).

The information provided to you in November regarding the request for removal of sites identified in the permit and not found to be subject to 3004(u) or 3004(v) requires additional study and justification. DOE will provide you justification for removal of all duplicate sites and SWMUs subject to 3004(a) no later than March 19, 1993.

DOE and its operating contractor, Regents of the University of California, have jointly signed this permit modification request as the operator of the permitted facility. The Department has determined that dual signatures best reflect the actual apportionment of responsibility under which the Department's RCRA responsibilities are for policy, programmatic, funding and scheduling decisions, as well as general oversight, and the contractor's RCRA responsibilities are for day-to-day operations, including but not limited to, the following responsibilities: waste analyses and handling, monitoring, record keeping, reporting, and contingency planning. For

Attachment A



purposes of the certification required by 40 C.F.R. 270.11(d), the Department's and Regents of the University of California's representatives certify, to the best of their knowledge and belief, the truth, accuracy and completeness of the application for their respective areas of responsibility.

If you or your staff have any questions regarding this permit modification, please contact Steve Slaten of my staff at FTS 8-505-665-5050 to arrange a teleconference or meeting with DOE and LANL.

Sincerely,

Joseph C. Vozella

Joseph C. Vozella, Acting Chief
Environment, Safety and Health
Branch

LESH:3SS-007

Enclosure

cc w/o enclosure:
See page 3

**Attachment A**



Barbara Driscoll
RCRA Permits Branch
U. S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Bruce Swanton
Hazardous and Radioactive Materials Bureau
New Mexico Environmental Department
525 Camino de las Marquez
Santa Fe, New Mexico 87502

K. Bitner, ERPO, AL
A. Tiedman, ADO, LANL, MS-A120
J. Shipley, EE-AETO, LANL, MS-F641
T. Gunderson, EM-DO, LANL, MS-K491
C. Nylander, EM-DO, LANL, MS-K491
J. Corpion, EM-8, LANL, MS-K490
K. Hargis, EM-8, LANL, MS-K490
R. Vocke, EM-13, LANL, MS-M992

Attachment A

## APPENDIX II, TABLE B - NEWLY-IDENTIFIED SWMUs SUBJECT TO HSWA

| Site Number | Solid Waste Management Unit Type |
|---|---|
| 06-003(f) | Detonation ground |
| 06-003(g) | Detonation ground |
| 06-007(g) | Abandoned building and appurtenances |
| 07-001(c) | Detonation ground |
| 07-001(d) | Detonation ground |
| 21-027(a) | Industrial or sanitary wastewater treatment |
| 21-027(b) | Industrial or sanitary wastewater treatment |
| 21-027(c) | Industrial or sanitary wastewater treatment |
| 21-027(d) | Industrial or sanitary wastewater treatment |
| 40-010 | Surface disposal site (i.e., landfill, impoundment, etc.) |
| 46-004(a2) | Industrial or sanitary wastewater treatment |
| 46-004(b2) | Industrial or sanitary wastewater treatment |
| 46-004(c2) | Industrial or sanitary wastewater treatment |
| 46-004(d2) | Soil contamination area |
| 46-004(p) | Surface disposal site (i.e., landfill, impoundment, etc.) |
| 46-004(q) | Industrial or sanitary wastewater treatment |
| 46-004(r) | Industrial or sanitary wastewater treatment |
| 46-004(s) | Industrial or sanitary wastewater treatment |
| 46-004(t) | Industrial or sanitary wastewater treatment |
| 46-004(u) | Industrial or sanitary wastewater treatment |
| 46-004(v) | Industrial or sanitary wastewater treatment |
| 46-004(w) | Industrial or sanitary wastewater treatment |
| 46-004(x) | Industrial or sanitary wastewater treatment |
| 46-004(y) | Industrial or sanitary wastewater treatment |
| 46-004(z) | Industrial or sanitary wastewater treatment |
| 46-006(f) | Container storage area |
| 61-004(c) | Septic tank |

Attachment A TABLE A



**Technical Area 4**

4-001
4-002 (4)
4-003 (a-b)

**Technical Area 5**

5-001 (a-b)
5-002
5-003 (15)
5-004
5-005 (a-b)
5-006 (a-h)

**Technical Area 6**

6-001 (a-b)
6-002
6-003 (a) (18)
6-003 (c-g)
6-005
6-006
6-007 (a-g)

**Technical Area 7**

7-001 (a-d) (4)

**Technical Area 8**

8-002
8-003 (a-c)
8-004 (a-d)
8-005 (16)
8-006 (a-b)
8-007
8-009 (a-b)
8-009 (d-e)

**Technical Area 9**

9-001 (a-d)
9-002
9-003 (a-i) (43)
9-004 (a-o)
9-005 (a-h)
9-006
9-007
9-008 (a-b)
9-009
9-013

**Technical Area 10**

10-001 (a-d)
10-002 (a-b)
10-003 (a-h) (19)
10-004 (a-b)
10-005
10-006
10-007

**Technical Area 11**

11-001 (a-c)
11-002
11-004 (a-e)
11-005 (a-c) (22)
11-006 (a-d)
11-007
11-009
11-011 (a-d)

**Technical Area 12**

12-001 (a-b) (3)
12-002

**Technical Area 13**

13-001
13-002 (4)
13-003 (a)
13-004

**Technical Area 14**

14-002 (a-f)
14-003
14-004 (b)
14-005 (13)
14-006
14-007
14-009
14-010

(161)

Attachment B

Department of Energy
Field Office, Albuquerque
Los Alamos Area Office
Los Alamos, New Mexico 87544

DEC 15 1993

Mr. William Honker, Chief
RCRA Permits Branch
Hazardous Waste Management Division
U. S. Environmental Protection
Agency
1445 Ross Avenue
Dallas, Texas 75202-2733

Dear Mr. Honker:

The Los Alamos National Laboratory (LANL) submitted a request for a Class 3 Permit Modification to the Hazardous and Solid Waste Amendments (HSWA) portion of its Resource Conservation and Recovery Act Hazardous Waste Permit in February 1993.

As a result of the modified permit being retyped, there appeared to be several discrepancies in Table A. Upon bringing these discrepancies to the attention of Ms. Barbara Driscoll of your staff, she requested that LANL correct the table within the time allowed during the public comment period. She also requested that we supply justification for the correction and that we attempt to make Table A reflect the most current knowledge of the Program as to which Potential Release Sites (PRSs) are Solid Waste Management Units (SWMUs) that should be in the Permit, and which PRSs LANL believes should be removed from the Permit. Enclosed please find a modified Table A which reflects what units LANL believes should be in the HSWA Permit. Also enclosed is a summarization and justification of PRSs that LANL now believes should not be included in the Permit (Enclosure 1).

We are also supplying to your office a list and brief description of PRSs that LANL now believes to be SWMUs that require incorporation into the Permit (Enclosure 2).

**Attachment B**



Should you have any questions, please feel free to contact Steve Slaten of my staff at (505) 665-5050.

Sincerely,

Joseph C. Vozella, Chief
Environment, Safety and Health
Branch

LESH:9SS-014

Enclosures

cc w/enclosures:
K. Sisneros
NMED
1190 St. Francis Dr.
P. O. Box 26110
Santa Fe, NM 87502
T. Taylor, ES&H, LAAO
S. Slaten, ES&H, LAAO
K. Bitner, ERPO, AL

cc w/o enclosures:
R. Harris, EM-452, HQ
K. Schenck, Scientech, LAAO
J. Shipley, ERWM, LANL, MS-J591
R. Vocke, EM-13, LANL, MS-M992
RPF, LANL, MS-M707

Attachment B

Enclosure 2

PRS's added to Permit Modification.

| Site Number | Solid Waste Management Unit Type |
| --- | --- |
| 1-001(s) | Septic System |
| 1-001(t) | Septic System |
| 1-001(u) | Septic System |
| 1-006(c) | Drain lines and outfall |
| 1-006(d) | Drain lines and outfall |
| 1-006(h) | Drain lines and outfall |
| 1-006(n) | Drain lines and outfall |
| 1-006(o) | Drain lines and outfall |
| 1-007(a) | Soil Contamination area |
| 1-007(c) | Soil Contamination area |
| 1-007(d) | Soil Contamination area |
| 1-007(e) | Soil Contamination area |
| 1-007(j) | Soil Contamination area |
| 1-007(l) | Soil Contamination area |
| 6-003(f) | Firing Site |
| 6-003(g) | Firing Site and Building |
| 6-003(h) | Firing Site |
| 7-003(c) | Firing Site |
| 7-003(d) | Firing Site |
| 9-013 | Material Disposal Area |
| 10-003(f) | Disposal Pit |
| 10-003(j) | Tank |
| 10-003(k) | Tank |
| 10-003(l) | Tank |
| 10-003(m) | Waste Line |
| 10-003(n) | Leachfield |
| 10-003(o) | Leachfield |
| 10-003(d) | Firing Site |
| 18-001 (b) | Drain Lines |
| 18-001 (c) | Sump |
| 20-002(b) | Firing Site |
| 20-002(c) | Firing Site |
| 20-002(d) | Firing Site |
| 21-011(k) | Outfall |
| 21-027(a) | Ind. or San. waste water treat |
| 21-027(b) | Ind. or San. waste water treat |
| 21-027(c) | Ind. or San. waste water treat |

# Attachment B

### Technical Area 4

- 4-001
- 4-002 (4)
- 4-003 (a-b)

### Technical Area 5

- 5-001 (a-b)
- 5-002
- 5-003 (11)
- 5-004
- 5-005 (a-b)
- 5-006 (b, c, e, h)

### Technical Area 6

- 6-001 (a-b)
- 6-002
- 6-003 (a)
- 6-003 (c-h) (19)
- 6-005
- 6-006
- 6-007 (a-g)

### Technical Area 7

- 7-001 (a-d) (6)
- 7-003 (c-d)

### Technical Area 8

- 8-002
- 8-003 (a-c)
- 8-004 (a-d)
- 8-005
- 8-006 (a-b) (15)
- 8-007
- 8-009 (a)
- 8-009 (d-e)

### Technical Area 9

- 9-001 (a-d)
- 9-002
- 9-003 (a-i)
- 9-004 (a-o) (42)
- 9-005 (a-h)
- 9-006
- 9-007

### Technical Area 9 Cont.

- 9-008 (b)
- 9-009
- 9-013

### Technical Area 10

- 10-001 (a-d)
- 10-002 (a-b)
- 10-003 (a-o) (26)
- 10-004 (a-b)
- 10-005
- 10-006
- 10-007

### Technical Area 11

- 11-001 (a-c)
- 11-002
- 11-004 (a-e)
- 11-005 (a-c) (22)
- 11-006 (a-d)
- 11-007
- 11-009
- 11-011 (a-d)

### Technical Area 12

- 12-001 (a-b) (3)
- 12-002

### Technical Area 13

- 13-001
- 13-002
- 13-003 (a) (4)
- 13-004

### Technical Area 14

- 14-002 (a-f)
- 14-003
- 14-004 (b)
- 14-005
- 14-006 (13)
- 14-007
- 14-009
- 14-010

## Attachment C



Date: Sun, 12 Feb 1995 18:43:41 -0700
To: janeth@erl.lanl.gov (Janet Harry)
From: rofer@lanl.gov (Cheryl Rofer)
X-Sender: 073965@esslab.lanl.gov
Subject: Re: PRSs 7-003(c.d)

Janet -

There are no 7- numbers higher than 7-001. We have 7-001(c&d) but not 7-003(c&d).

Cheryl

>Cheryl-
>
>I am rechecking the HSWA Permit against the data base. PRSs 7-003 (c&d)
>are listed in the September 1994 permit. I do not have these in the data
>base. Going through my records it looks like they were added in the
>December 93 premit mod request. What can you tell me about these? Sorry to
>bother you. I thought we had resolved these.
>
>Thanks
>
>Janet Harry

**************************************************************
Cheryl K. Rofer — e-mail: rofer@lanl.gov
Geology and Geochemistry Group — phone: 505-667-2988
Los Alamos National Laboratory — fax: 505-665-3285
P.O. Box 1663, MS D462
Los Alamos, NM 87545
**************************************************************

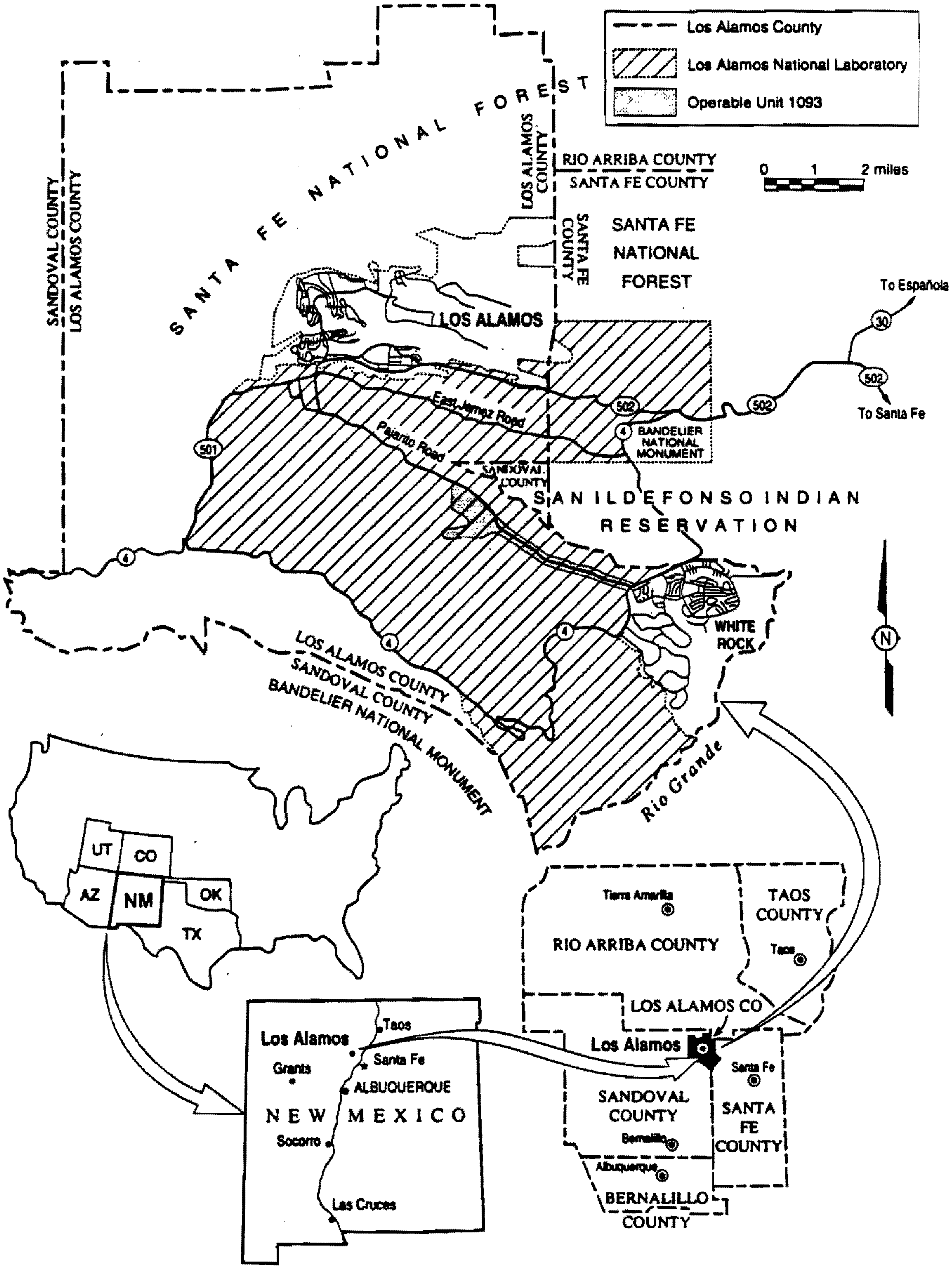



**Figure 1-1. Location of Operable Unit 1093**

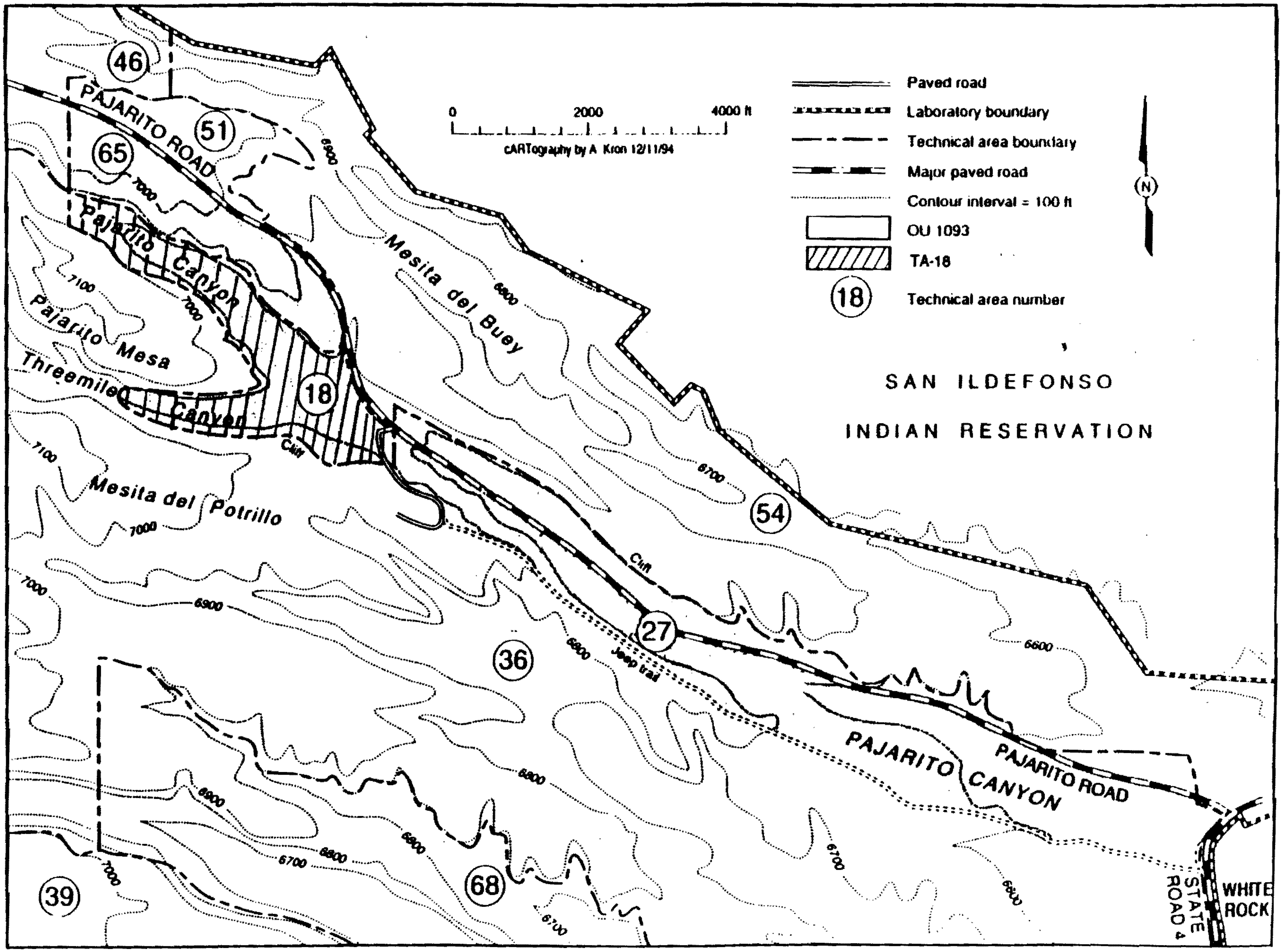
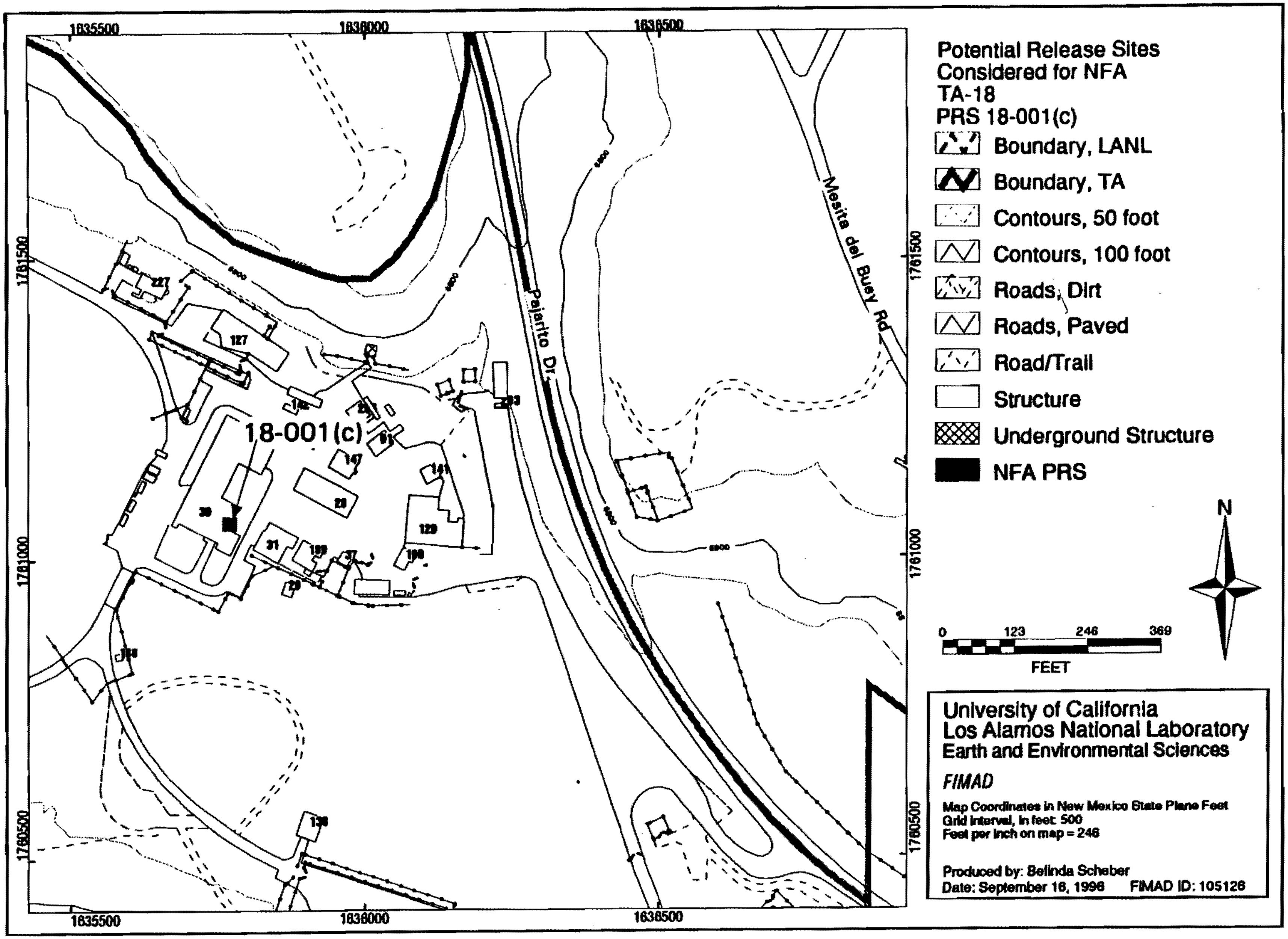



Figure 1-2. Technical areas, land formations, and major drainages at OU 1093.




Potential release sites considered for NFA, TA-18, PRS 18-001(c)

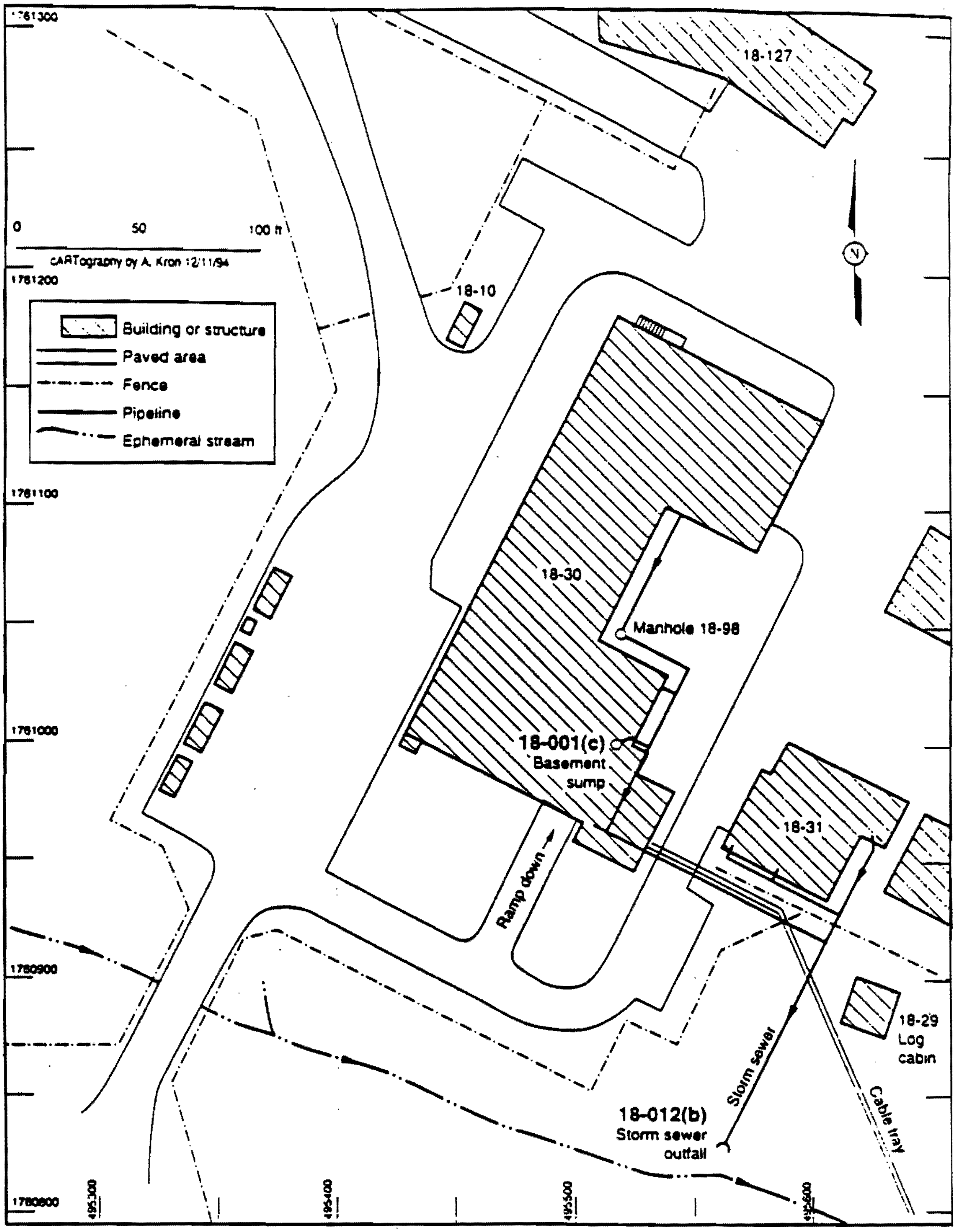



Figure 4-9. Location of site investigations for PRS 18-001(c)

# 18-007

# ATTACHMENTS

## SWMU 18-007 — Buried Armored Vehicle

### 1.0 Introduction

SWMU 18-007 is located in former Operable Unit (OU) 1093 within Technical Area (TA)-18 at Los Alamos National Laboratory, Los Alamos, New Mexico (Figure 1-1). TA-18 is located in the central portion of the Laboratory (Figure 1-2).

### 1.1 Description

SWMU 18-007 is a reputed armored vehicle supposedly buried west of Kiva 2, TA-18-32 (Figure 4-11). An unnamed employee interviewed for the 1987 Comprehensive Environmental Assessment and Response Program (CEARP) Report (DOE 1987, 0264) (Attachment A) "remembered burying a tank [armored vehicle] 1.25 miles up the [Threemile] canyon from Kiva 2 [west of TA-18-32] in 1949". In addition, the CEARP Report mentioned a memo (engineering file, date and signature not specified) indicating the possibility "of material buried beyond [west of] the old kiva at TA-18" (TA-18-23). However, in the archival search performed for TA-18, neither the interview notes nor the memo could be located.

The field investigator interviewed six former employees who had worked at TA-18, some of whom had been there in 1946; none could verify the tank burial (Attachment B). However, a seventh employee, formerly stationed here as a soldier during the Manhattan Project, claimed to have seen an M-3 tank (without its gun) next to a large excavation in Pajarito Canyon approximately 0.75 mi west of TA-18. Several hours later, he found both the tank and the excavation to be gone and concluded that the tank had been buried. (This individual may have been the one interviewed for the CEARP Report.) Later interviews with this employee failed to gain specific details such as location, date, participants, nature of potential hazards, etc.

### 1.2 No Further Action Basis

SWMU 18-007 is recommended for NFA because the site cannot be located.

The report of a buried tank seems to rest on the hearsay of a few Laboratory employees. No documentation to substantiate the claim and no discussion of a buried vehicle of any type were found in the archival search performed for TA-18. Nonetheless, an investigation was pursued based on the CEARP Report and the ambiguous, supposed eyewitness account from the interview with the former soldier. Furthermore, the US Army did, in fact, use M-3 tanks for site defense of the Laboratory during the Manhattan Project.

Despite the absence of corroborating evidence for a buried tank or indications of any hazards that might be associated with it, it was felt prudent to conduct an electromagnetic survey. It was determined that the depth of an excavation to just cover an M-3 tank would have been 8 ft, requiring depth to bedrock to be at least 10 ft. The excavation would have required a minimum area of 8 ft wide by 15 ft long, plus have an access ramp of at least 15 ft long (resulting in about 45 to 50 $yd^3$ of soil displacement). Such an excavation would have left visible traces and the tank (armored vehicle), if present, would easily be detected with magnetometry. Threemile Canyon was inspected and determined to be unsuitable for such a burial. The most reasonable location for such a burial, if one existed, is Pajarito Canyon, also west of TA-18. However, magnetometry revealed no large mass of metal in the area searched. Because of the lack of corroborative evidence for the tank burial, continuing the search in this extensive canyon would not be practical, nor can the expense of such an investigation be justified.

After reviewing the RFI Work Plan for OU 1093 Potential Release Site 18-007, the US Environmental Protection Agency concurred that SWMU 18-007 be proposed for removal from the HSWA portion of the Laboratory's Hazardous Waste Facility Permit (Attachment C, General Comment 1) via a Class 3 permit modification request.

## 2.0 History

### 2.1 Historical Operations

Section not applicable.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: DOE Report, November 1990. CEARP Report, page TA 18-7.

Attachment B: LANL Interview Log and 3 Personnel Interviews.

Attachment C: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for RFI Report for Technical Areas 18 and 27.

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

A geophysical survey (employing electromagnetic induction) was unable to locate the vehicle.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 and 2.0, SWMU 18-007 is recommended for NFA under Criterion 1.

## 5.0 References


US Department of Energy, October 1987. "Phase I: Installation Assessment, Los Alamos National Laboratory," Volumes 1 and 2, (draft), Comprehensive Environmental Assessment and Response Program, Albuquerque Operations Office, Albuquerque, New Mexico, page TA-18-7. (DOE 1987, 0264)

Environmental Protection Agency Region 6, September 1995. "RFI Report Technical Areas 18 and 27, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, RCRA New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, 1992. Interview Log; Personnel Interview, J.D. Orndoff; Personnel Interview, H.C. Paxton; Personnel Interview, K.J. Dunahugh; Los Alamos National Laboratory Documents, Los Alamos, New Mexico.

Los Alamos National Laboratory, January 30, 1995. "RFI Report for Operable Unit 1093, Potential Release Sites 18-001a, b, c; 27-001, 27-003," Los Alamos National Laboratory Report LA-UR-95-0259, prepared by ICF Kaiser Engineers, Inc., Los Alamos, New Mexico, pp 4-30 through 4-33. (LANL 1995, 1337)


## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

## 6.3 Other Survey/Investigation Data

Section not applicable.

Attachment A



## SUMMARY

LOCATION : TA-18
TYPE OF UNIT(s) : LAGOON
UNIT USE : TREATMENT/DISPOSAL
OPERATIONAL STATUS : ACTIVE
PERIOD OF USE : 1975 - PRESENT
HAZARDOUS RELEASE : SUSPECTED
RADIOACTIVE RELEASE : SUSPECTED

MATERIALS MANAGED : SOLID WASTE
SUSPECTED HAZARDOUS WASTE
SUSPECTED RADIOACTIVE WASTE

## UNIT INFORMATION

Two 60' x 120' lagoons [18-001(a)] are constructed of Gunite, are enclosed by an 8' chain link fence, and have 6' high earth berms. The lagoons are identified by structure number TA-18-162 and serve the sanitary system of TA-18, except kivas 1-3 (TA-18-23, -32, and -116), all of which are served by septic systems (see SWMU No. 18-003). There are an estimated 12,000 ft of sanitary sewer lines in TA-18 [18-001(b)] connecting most of the buildings to the lagoons. TA-18-30 is identified as having a sump with a gravity drain [18-001(c)] that empties into the sanitary sewer lines and lagoons.

## WASTE INFORMATION

The sump and gravity drain [18-001(c)] potentially contained uranium-235, beryllium, and photographic chemicals. The lagoons [18-001(a)] and sanitary sewer lines [18-001(b)] contain sanitary sewage, and possibly uranium-235, beryllium, and photographic chemicals from TA-18-30. The lagoons contain sanitary sewage and possibly photographic waste solutions, according to the RFA. At one time the lagoon received liquids pumped and transported by truck from septic tanks at other technical areas. The lagoons have been sampled and analyzed for volatile organics, semi-volatile organics (samples from the south lagoon) and EP toxic metals (samples from the north lagoon). The results of the analyses indicate all constituents are below detection limits.

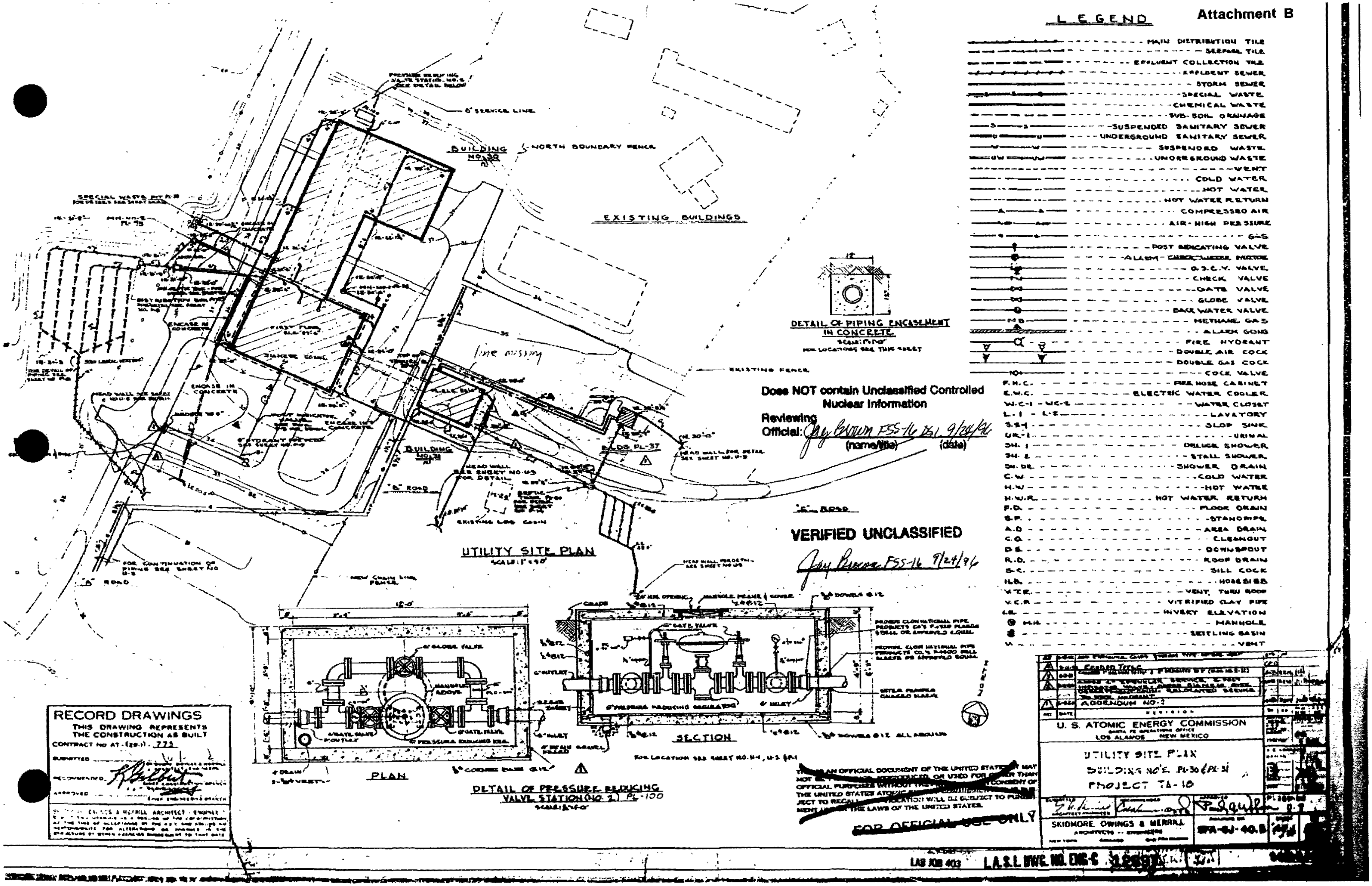
## RELEASE INFORMATION

The lagoons [18-001(a)] discharge to Pajarito Canyon via an NPDES outfall (serial no. 04S) (see Appendix A). Presently, there are no releases of hazardous wastes, although residues from past discharges may potentially be found at the discharge point.

## SWMU CROSS-REFERENCE LIST

| SWMU NUMBER | CEARP IDENTIFICATION NUMBER(S) | RFA UNIT | E.R. RELEASE SITE INFO. | ASSOCIATED STRUCTURES |
|---|---|---|---|---|
| 18-001(a) | TA18-4-CA/ST/0-A/I-HW/RW | 18.001<br>18.002 | Tsk 16 : 2 4 | TA-18-162 |
| 18-001(b) | TA18-4-CA/ST/0-A/I-HW/RW | | Tsk 16 : 3 | |
| 18-001(c) | TA18-4-CA/ST/0-A/I-HW/RW | | Tsk 18 : 54 | TA-18-30 |

Attachment B



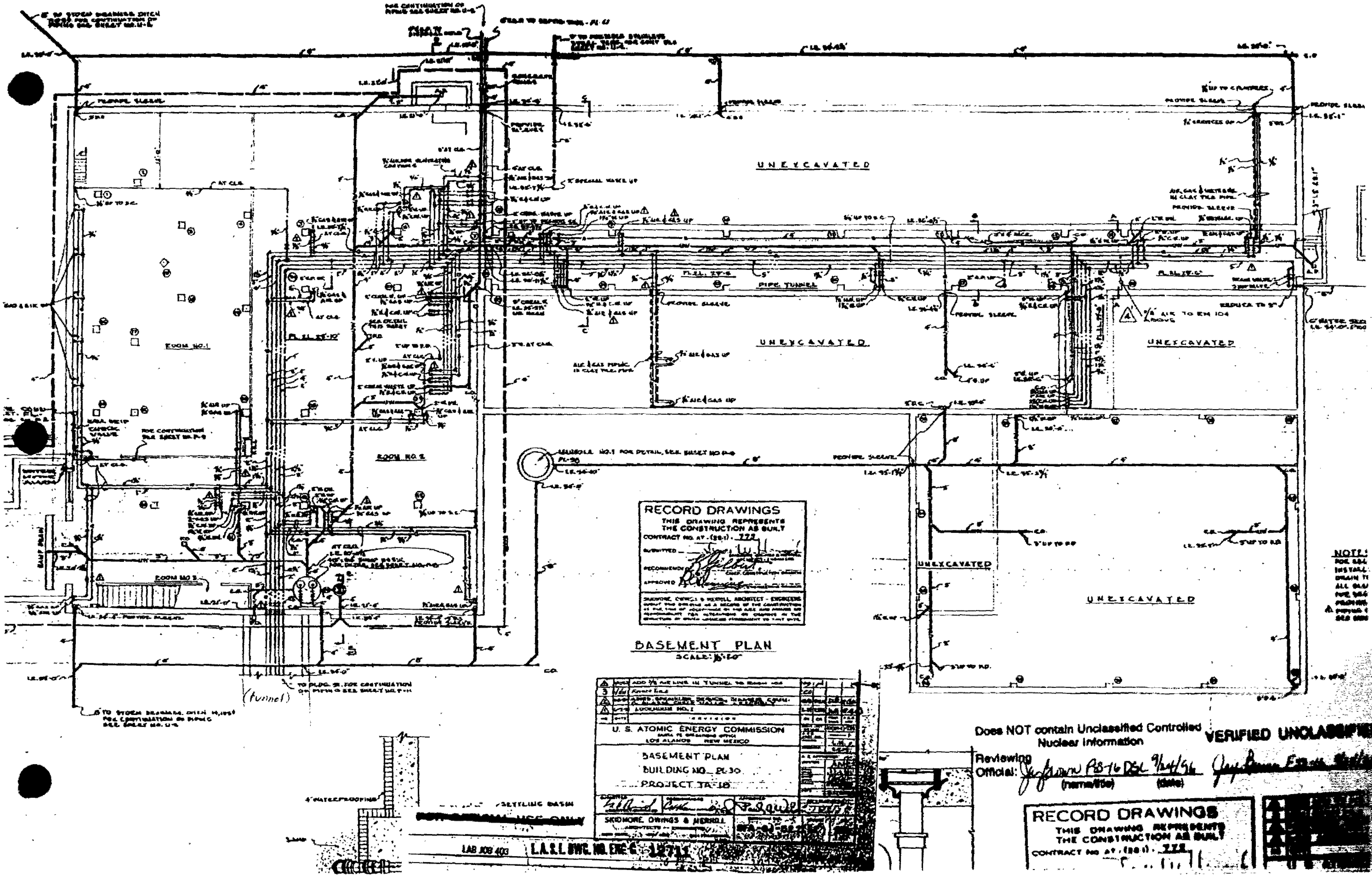

Does NOT contain Unclassified Controlled Nuclear Information

Reviewing Official: Jay Brown FSS-16 DSL 9/24/96
(name/title) (date)

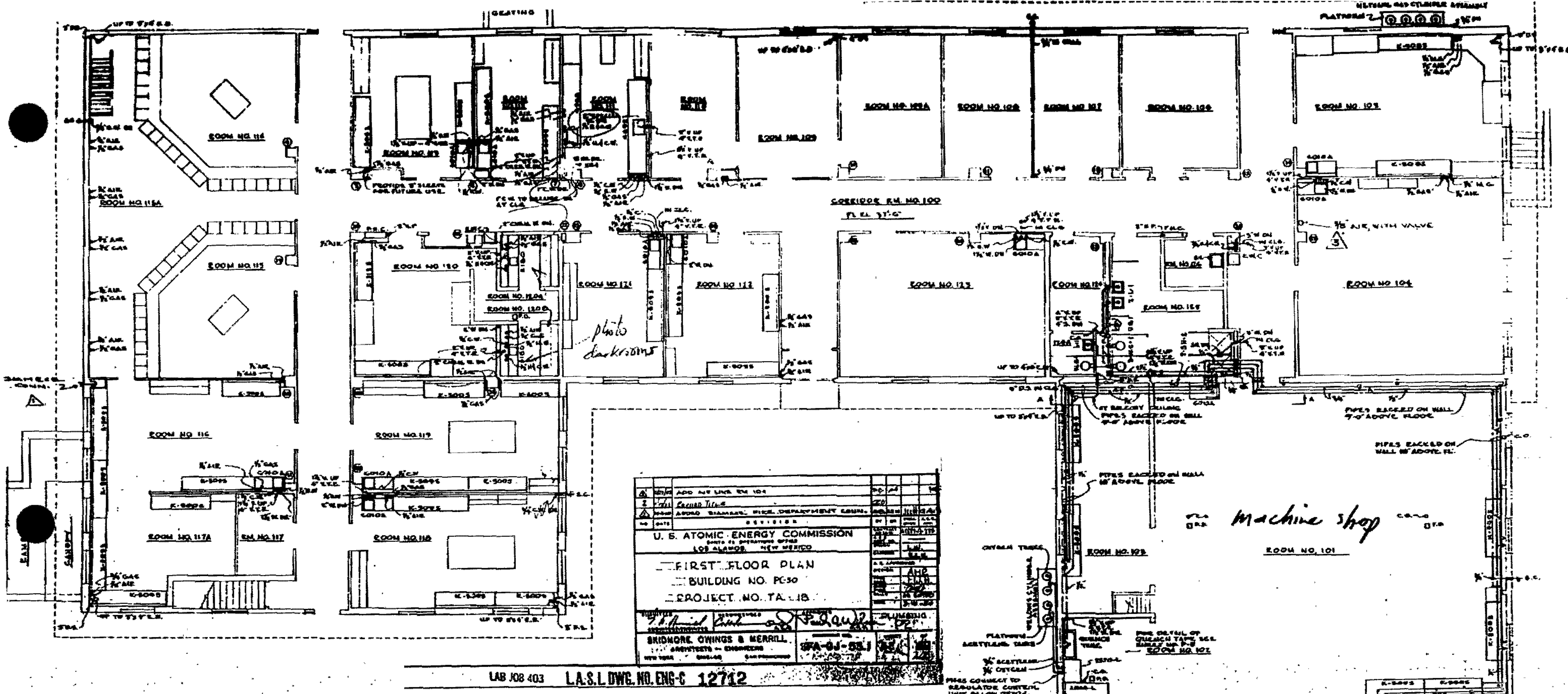
VERIFIED UNCLASSIFIED

Jay Brown FSS-16 9/24/96

~~FOR OFFICIAL USE ONLY~~

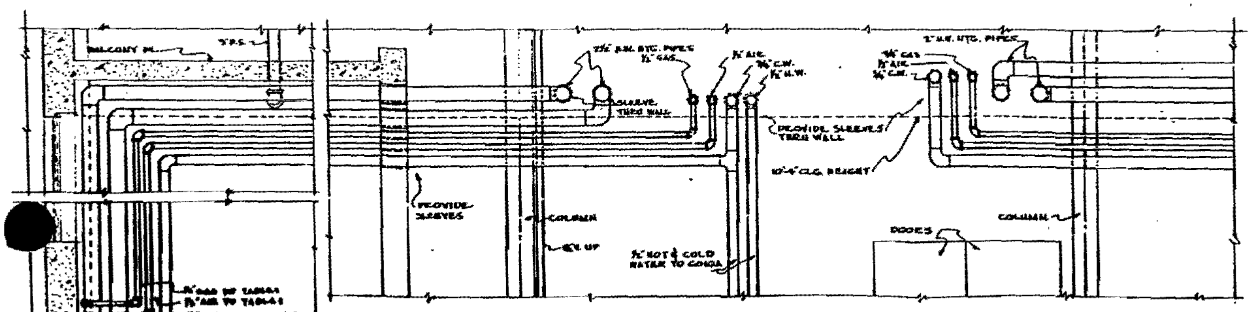


UNEXCAVATED
PIPE TUNNEL
ROOM NO. 1
ROOM NO. 2
ROOM NO. 3
(tunnel)
RECORD DRAWINGS
THIS DRAWING REPRESENTS THE CONSTRUCTION AS BUILT
CONTRACT NO. AT-(29-1)-772
BASEMENT PLAN
U. S. ATOMIC ENERGY COMMISSION
LOS ALAMOS NEW MEXICO
BASEMENT PLAN
BUILDING NO. PL-30
PROJECT TA-18
SKIDMORE, OWINGS & MERRILL
SETTLING BASIN
LAB JOB 403
L.A.S.L. DWG. NO. ENG-C
Does NOT contain Unclassified Controlled Nuclear Information
Reviewing Official:
(name/title)
(date)
VERIFIED UNCLASSIFIED
RECORD DRAWINGS
THIS DRAWING REPRESENTS THE CONSTRUCTION AS BUILT
CONTRACT NO. AT-(29-1)-772




FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"




SECTION A-A

SCALE: 1/4" = 1'-0"


Does NOT contain Unclassified Controlled Nuclear Information

Reviewing Official: Jay Brown FSS-16 DGL 9/24/96
(name/title) (date)

VERIFIED UNCLASSIFIED

Jay Brown FSS-16 9/24/96

Attachment D

RECORD DRAW

THIS DRAWING REPRESENTS THE CONSTRUCTION AS BUILT

CONTRACT NO. AT-(29-1)-775

SUBMITTED

RECOMMENDED

APPROVED

SKIDMORE, OWINGS & MERRILL, ARCHITECT - ENGINEERS SUBMIT THIS DRAWING AS A RECORD OF THE CONSTRUCTION AT THE TIME OF ACCEPTANCE BY THE A.E.C. AND ASSUME NO RESPONSIBILITY FOR ALTERATIONS OR CHANGES IN THE STRUCTURE BY OTHER AGENCIES SUBSEQUENT TO THAT DATE.

Attachment E

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

SEP 2 8 1995

Mr. Theodore J. Taylor
Program Manager
Department of Energy
Los Alamos National Laboratory
Los Alamos, NM 87544

Re: RFI Report Technical Areas 18 and 27
Los Alamos National Laboratory (NM 0890010515)

Dear Mr. Taylor:

The Environmental Protection Agency (EPA) has reviewed your RCRA Facility Investigation Report for Potential Release Sites in Technical Areas 18 and 27, and found it to be deficient. Enclosed is a list of deficiencies which you have 60 days to respond to.

Should you have any questions, please feel free to contact Ms. Barbara Driscoll at (214) 665-7441.

Sincerely,

for David W. Neleigh, Chief
RCRA New Mexico - Federal
Facilities Section

Enclosures

cc: Mr. Benito Garcia
New Mexico Environment Department
Mr. Jorg Jansen
Los Alamos National Laboratory, MS M992

## Attachment E

**List of Deficiencies**
**Los Alamos National Laboratory**
**Operable Unit 1093**
**Technical Areas 18 and 27**

**General Comments:**

1. EPA agrees that LANL may request a Class 3 permit modification for removal of the following units from the HSWA portion of the permit:

   27-003
   27-001
   18-007
   18-001(c)

2. 3.2.2 Soils, p. 3-4 - LANL should provide the locations and relevant information of any soil samples collected for the background database which were collected near the location of Technical Areas 18 and 27.

3. 3.6 Waste Criteria, p. 3-6 - Using the stated approach for TC screening levels is only acceptable for solid wastes/soils which contain no liquids.

4. 4.2.3 Evaluation of Results, p. 4-11 - EPA would prefer that the analytical results that are in question be included in the evaluation of results section for each SWMU, not in a different section several pages away.

5. Figure 4-8, p. 4-12 - Please include the sampling identification number for each sample point taken.

6. 4.4.3 Evaluation of Results, p. 4-30 - One electromagnetic anomaly was detected; however, LANL did not make a determination if material was actually buried at the location. LANL should have followed through to determine what the anomaly was whether or not LANL thought the anomaly was the actual guns they were looking for.

7. Appendix A - EPA will provide separate comments related to the background study. LANL should be aware that their approach used for calculating the upper tolerance limit was not acceptable to EPA.

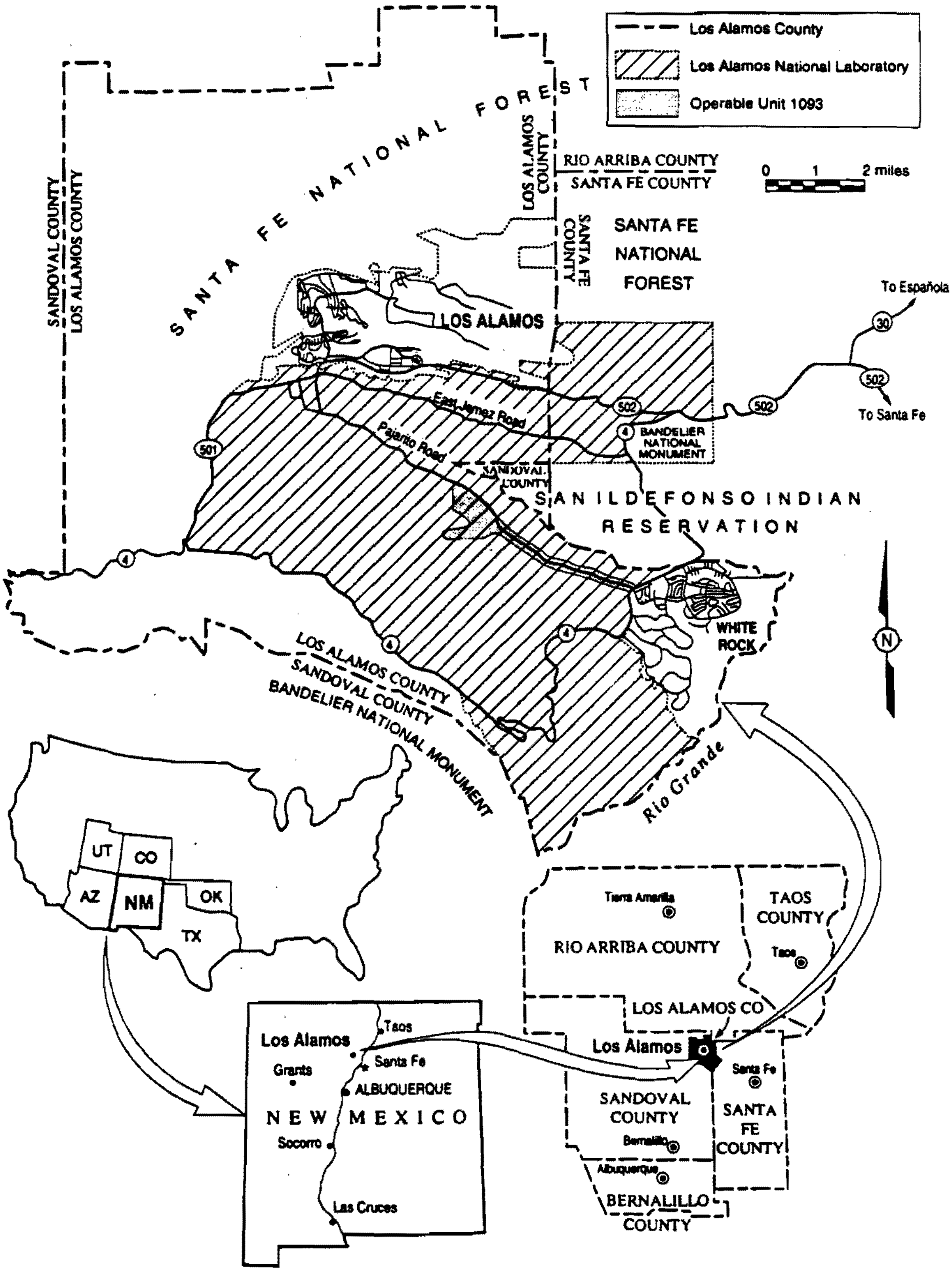



Figure 1-1. Location of Operable Unit 1093

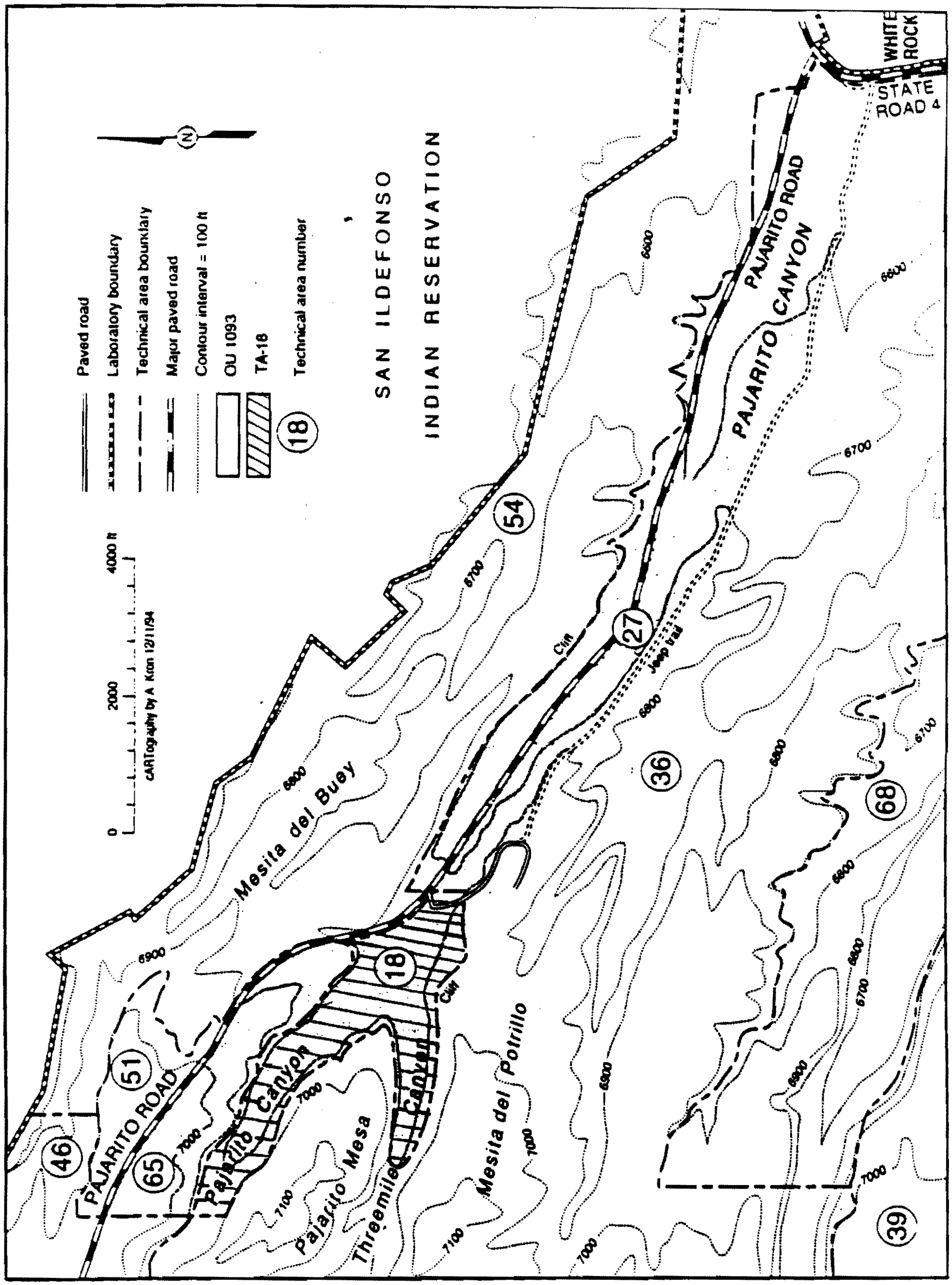



Figure 1-2. Technical areas, land formations, and major drainages at OU 1093.

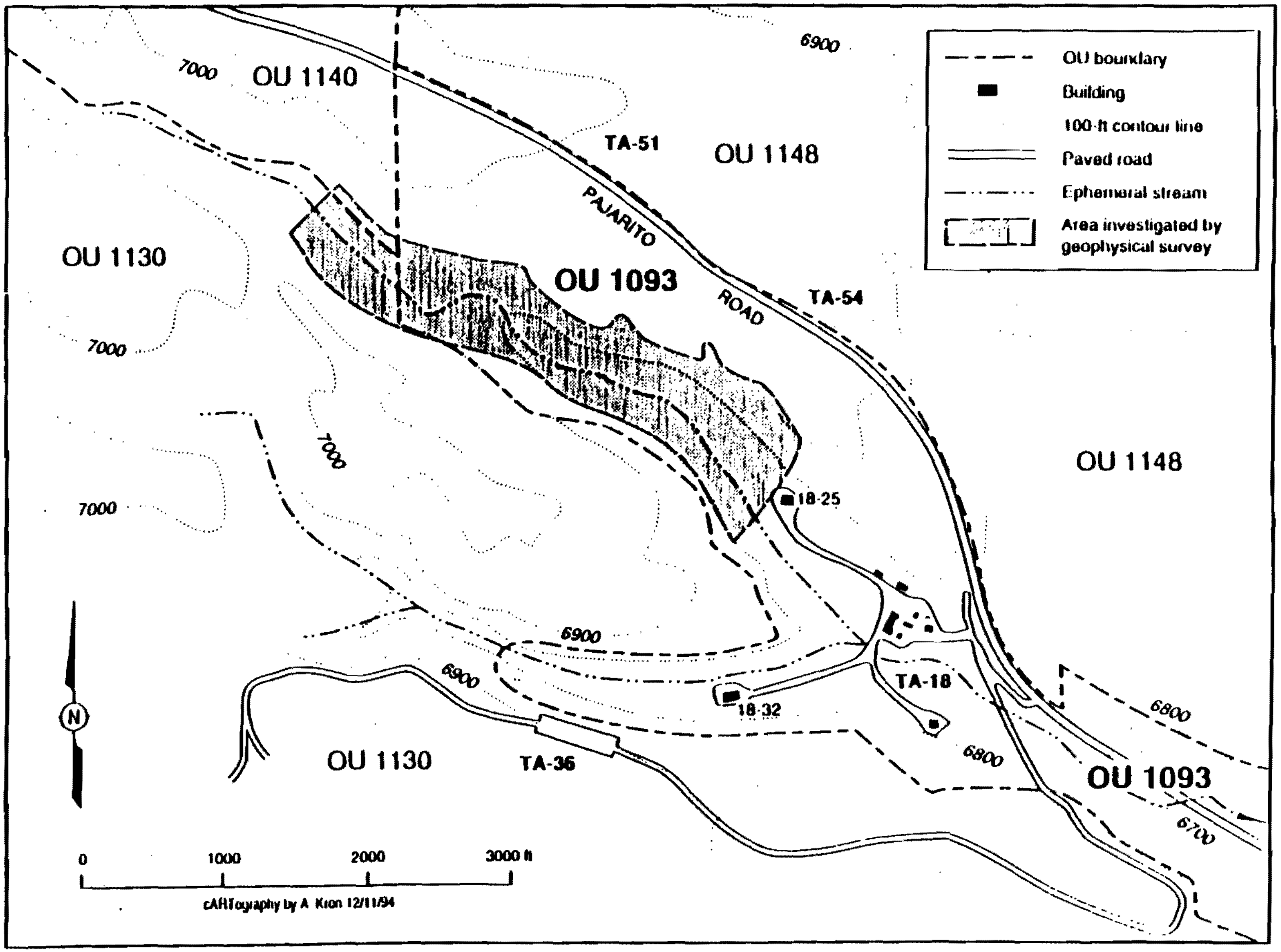



Figure 4-11. Location of site investigation for PRS 18-007.

# 27-001

# ATTACHMENTS

## SWMU 27-001 — Buried Naval Guns

### 1.0 Introduction

SWMU 27-001 is located in former Operable Unit (OU) 1093 within Technical Area (TA)-27 at Los Alamos National Laboratory, Los Alamos, New Mexico (Figure 1-1). TA-2 was located in the central portion of the Laboratory (Figure 1-2).

### 1.1 Description

In the 1990 SWMU Report (LANL 1990, 0145) (Attachment A), based on the 1987 Comprehensive Environmental Assessment and Response Program (CEARP) (DOE 1987, 0264) (Attachment B), SWMU 27-001 was described as a site in Pajarito Canyon at which 8-inch naval gun barrels, possibly with inert projectiles, reportedly had been buried circa 1946 when the Manhattan Project ended. This SWMU was included in the 1093 RFI Work Plan as SWMU 27-001. Archival research yielded only two accounts of the reputed burial of naval gun barrels. Each differed in reported location, though both indicated the area to be near Indian caves located east of TA-18, on the north side of Pajarito Canyon near the base of its cliffs. One document described the SWMU as a 200-yd-long trench located north of the area where Pajarito Creek crosses Pajarito Road and 1,400 ft east of TA-18. The second account suspected the gun burial location to be the flat area adjacent to and east of the road fill where Pajarito Road descends into the canyon. Other archival documents discussed various unsuccessful searches conducted in the canyon since 1964 (Russo 1964) (Attachment C) or gun barrels recovered from other Laboratory burial locales.

### 1.2 No Further Action Basis

SWMU 27-001 is recommended for NFA because the site cannot be located.

Three areas were investigated for the gun barrels: the two conjectured locations described in Section 1.1 and the land between them (Figure 4-10).

Initial work began in March 1992 with low sun-angle photography of the flat area near TA-18, when winter snows, by then melted, had flattened the grass to reveal surface undulations. Neither photos taken from the cliff top nor those taken on the ground revealed linear features indicative of a burial trench. Several aerial photographs (taken in 1958 and 1960) showed a linear patch of disturbed soil located next to the embankment of the existing road. However, aerial photos taken in 1949 and 1950, 3 to 4 years after the alleged time of burial, indicated no ground disturbance at this location (the photos do show major excavations for road gravel placed a few hundred yards to the east). If gun barrels were buried in this area during 1946, it is likely that the ground or vegetation disturbance would still be obvious in 1949. Therefore, photographic evidence indicates that no burial trench existed in the area under investigation.

The 8-10-ft-deep excavations for road gravel (dug between 1949 and 1962) (Russo 1964) (Attachment C) lie along the center of the canyon and now contain wetlands. The gravel excavations would have uncovered any gun burial trench, had one been located there. The shallow depth to bedrock (5-10 ft.) makes the presence a trench large enough to bury naval gun barrels unlikely. Thus this area was eliminated as a gun burial location.

Investigation of the third area, the strip of canyon along the base of the cliffs, began with a visual survey conducted by a botanist (from the Laboratory Environmental Protection Group) to determine if vegetation patterns indicated any disturbed soil. The vegetation pattern at the suspected location appeared to be linear; however, it could be attributed to ground disturbance by earthmoving equipment used in the adjacent gravel excavations. The visual survey was determined to be inconclusive.

Magnetometry was tried and proved ineffective because of the high magnetite content of the Bandelier tuff in Pajarito Canyon. Next, all accessible flat areas at the base of the cliffs from the suspected location 1,650 ft westward to the highway embankment were swept with a electromagnetic (EM) induction unit to detect buried objects (the EM system works especially well for metal objects). The system used was a Geonics EM31-DL ground conductivity meter capable of making readings to a depth of 15-18 ft under optimum conditions. East-west and north-south traverses were made at approximately 5-ft intervals. Several objects were detected. All but one were utilities buried in the proximity of the road. The non-utility detect was of limited lateral extent, measuring approximately 2 ft by 3 ft . Naval gun barrels typically measure 15-20 ft in length. If buried with the long axis of the gun perpendicular to the ground surface, the dimensions of the observed area would match those of naval gun barrels. However, this is highly unlikely because the alluvium is quite thin at that location (10-15 ft), and the gun barrels were reported to be buried in a lateral trench.

Since 1964, Pajarito Canyon has been investigated by the Laboratory for the existence of buried naval gun barrels without success. The two areas described in available accounts have been searched carefully. Large masses of steel such as naval gun barrels would have a markedly detectable EM signal, but none was detected in any of the areas surveyed. In the absence of definitive information about the location of the gun barrels, further investigation cannot be productively pursued, nor can the expense of such an investigation be justified. Therefore, no further action is proposed for SWMU 27-001.

After reviewing the RFI Work Plan for OU 1093 Potential Release Site 27-001, the US Environmental Protection Agency concurred that SWMU 27-001 be proposed for removal from the HSWA portion of the Laboratory's Hazardous Waste Facility Permit (Attachment D, General Comment 1; Attachment E, Response 6) via a Class 3 permit modification request.

## 2.0 History

### 2.1 Historical Operations

Section not applicable.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL, November 1990. "Solid Waste Management Units Report," page 27-001

Attachment B: DOE, November 1990. CEARP report, pp TA 27-1 and -2.

Attachment C: LASL Memorandum, September 1964, Russo 1964.

Attachment D: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for RFI Report for Technical Areas 18 and 27.

Attachment E: DOE, Letter from T. J. Taylor to B. Driscoll responding to deficiencies for RFI Report for Technical Areas 18 and 27.

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

See Section 1.2 for results of geophysical surveys.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0, SWMU 27-001 is recommended for NFA under Criterion 1.

## 5.0 References

Department of Energy, November 29, 1995. "Response to the Notice of Deficiency (NOD) for Potential Release Sites in Technical Areas 18 and 27," Letter to B. Driscoll, NM/Federal Facilities Section, EPA, Region 6, Dallas, Texas from T. J. Taylor, Program Manager, DOE Los Alamos Area Office, Los Alamos, New Mexico.

Department of Energy, October 1987. "Phase I: Installation Assessment, Los Alamos National Laboratory," Volumes 1 and 2, (draft), Comprehensive Environmental Assessment and Response Program, Albuquerque Operations Office, Albuquerque, New Mexico, page TA 27-1 and -2. (DOE 1987, 0264)

Environmental Protection Agency Region 6, September 1995. "RFI Report Technical Areas 18 and 27, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, RCRA New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, January 30, 1995. "RFI Report for Operable Unit 1093, Potential Release Sites 18-001a, b, c; 27-001, 27-003," Los Alamos National Laboratory Report LA-UR-95-0259, prepared by ICF Kaiser Engineers, Inc., Los Alamos, New Mexico, pp 4-27 through 4-30. (LANL 1995, 1337)

Los Alamos National Laboratory, November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico, page 27-001. (LANL 1990, 0145)

Russo, S.E., September 23, 1964. "Locations of Burial Areas in Pajarito Canyon and TA-8," Los Alamos Scientific Laboratory Memorandum to distribution from S. E. Russo (ENG-3), Los Alamos, New Mexico. (Russo 1964)

## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

TA18-7-UST-I-RW (Underground pipe)

Background--Building 168 housed the Kinglet reactor, which used a solution containing uranium. The solution was stored in an underground pipe. Although the solution is believed to have been removed, the pipe and associated pump running from the building northward toward the fence are still in place, according to 1987 CEARP field survey observations.

CERCLA Finding--Uncertain for FFSDIF, PA, and PSI.

Planned Future Action--The extent of residual environmental contamination in the area of the underground pipe will be determined during supplemental Phase I.

TA18-8-L-I-HW/RW (Possible burial site)

Background--An undated, unsigned memo in engineering file 1757 indicates the possibility of material buried beyond old kiva at TA-18. An employee remembers burying a tank about 1.25 miles up the canyon from Kiva 2 in 1949. The tank may have been contaminated with radionuclides and/or high explosives.

CERCLA Finding--Uncertain for FFSDIF, PA, and PSI.

Planned Future Action--The possible burial site will be investigated during supplemental Phase I.

TA18-9-UST-I-PP (Underground storage tank)

Background--The location and status of an abandoned underground fuel tank, TA-18-104, is not known. Engineering drawing R5112 notes it as being abandoned in 1966.

CERCLA Finding--Uncertain for FFSDIF, PA, and PSI.

Planned Future Action--The location and condition of the tank will be determined during supplemental Phase I.

TA18-10-CA-I-PP (PCBs/oil leak)

Background--In the spring of 1982, a transformer at TA-18-136 was found to be leaking oil contaminated with PCBs. Approximately 80 $m^3$ of contaminated soil was removed and disposed of at Area G (Emelity 1982).

There is no indication of residual environmental contamination of concern.

CERCLA Finding--Negative for FFSDIF, PA, and PSI.

Planned Future Action--No further action is warranted.

TA18-11-CA-I-HW/RW (Disposal)

Background--A 1963 report includes a map showing disposal apparently in or near the stream bed at TA-18. The report states, "Small quantities of wastes are discharged here occasionally."

INTERVIEW LOG **Attachment B**
PAGE 1 of 2

17. 3/12/92 Drafted memo to CRM102 group leaders re: access to records & archives. Brainstormed w/ York on cannon trench location. Reviewed index of photos at ER Reading Rm. Copied some aerial photos & TA-18 ground photos.

18. 3/13/92 Reviewed organizational history & History of Pajarito Site by Paxton to get list of groups & group leaders at TA 18 from 1945-present. Called C. Courtwright & left msg. Called ~~Marie~~ Bill Johnson of TA-18 but no answer.

19. 3/16/92 Wrote status memo to Gould on my work (see copy). Courtright returned my call. Interviewed him about TA 27, ~~mage~~ bazooka site, TA-18, & possible gun trench. (see notes). Compiled list of all photos & engr. dwgs. of TA 18 & 27 from ER Resources index.

20. 3/18/92 visited FIMAD for 100' grid TA 18 & 27 maps, visited overlooks above TA 18 & 27 (& bazooka site) for site photos. Took photos to 159 for developing. Visited ENG-7 for site maps & JCI to contact anyone w/ ZIA Co. archives. Got name of David McCloud 7-3757 (Comminic.)

21. 3/19/92 visited ENG-7 for more site info on TA-18. Tour of TA-18 on foot w/ Gould & EM8 biologists & archeologists. Found man who had seen hole M-3 Tank (w/o gun) was buried in 3/4 mi. W. of TA 18 in Pajarito Canyon. Tony Biebel (former Army man in Manh. Proj) 7-0184. Gould & I walked TA 27 area looking for remains of structures, debris, etc. but found little. Did locate old Pajarito Road roadbed (dirt) and one firing site on fenceline on north side of "new" Pajarito Road. Took photos of these.

22. 3/20/92 Took photos in low angle light at possible gun trench location next to TA-18 and TA-27/bazooka impact area from on top of Mesa del Buey. Found large shrapnel from TA 36 firing site 12 (Lower Slobbovia) on top of mesa near TA 54 fence. Also bazooka shrapnel above impact area. Picked up maps (all available revisions) of TA 18 & 27 from ENG 7. Updated FIMAD's digitized TA 27 map with aerial photo info, ground info, and old TA 27 site map grid coordinates. Located positions of all structures there. Only 1 firing site remains. (Check revisit to lagoon for any remains of control bldgs.)
(C)'s David McCloud referred me to [illegible]

# Attachment B



Lamar said all Zia Co. dwgs. had just been boxed & put into storage in basement of bldg 66 (TA 3) until LANL can microfilm them in approx. 1 yr. No catalog of records exists, so would be hard to locate particular ones. Keys to bldg. are available from Joe Mitchell. Dwgs. of Pajarito Rd. rerouting were Zia dwgs.

3/23/92 Toured TA 27 w/revised FIMAD map to relocate fence, plot bazooka area fences, verify firing site removals, locate any debris

3/24/92 Reviewed aerial photos at ER Reading Room, copy maps, reviewed ~~ENG~~ eng. dwgs. in TA 18 & 27 files there. Made list of ones needed from ENG-7 & photos from 15-9 files.

3/25/92 Took negs of aerial photos & my onsite TA 27 photos to 15-9. Updated my map files & TA 27 structure locations.

3/27/92 Completed ~~updating~~ marking TA 18 maps w/old & new structures. Reviewed negs. at 15-9 & ordered prints of useful site negs & aerial photos.

4/2/92 & 4/3 Enlarged old TA 18 site map & traced locations of former structures onto new FIMAD digital map. Vacation 4/6-10.

4/14, 4/15 - Labeled & noted objects seen in my photos of TA 27 & 18. Ordered larger scale maps of TA 18 from FIMAD. Willette asked me to be prepared to give short briefing on status of my activities perhaps Thurs.

4/16 - Wrote Progress Report for Gould. Meeting delayed until after my vacation 4/22-24

4/20 - Completed labeling TA 27 & TA 18 photos. Reviewed aerial photos

4/21 - Revised Progress Rpt. Reviewed & labeled aerial photos, returned negs. to ER Reading Rm.

4/27 - Revised Progress Rpt, set up interview w/Manny Diaz, ~~thin~~ pared list of potential interviewees, filing, labeled more photos & put in notebook

4/28 - Interviewed Manny Diaz. Wrote interview report. ~~Set up~~ called more interviewees. Wrote post interview report. Revised & copied Progress rpt.

4/29 - Progress report meeting w/team. Gave brief. Rewrote interview rpt.

4/30 - Wrote SWMU rpt. draft (TA 27). Picked up maps from FIMAD. Talked w/ potential interviewees in WX-5 (none useful). Reserved digital camera.

5/1 - Interviewed Gordon Hansen. Initial contact w/Brad Wilcox. Added to TA-18 map bldgs. seen on aerial photos. Labeled photos

5/4 - Toured TA 27 w/Brad Wilcox of EES-15. Visited M-8 Grp. Office for clearance to firing pit #1. Told Jim Straight (Grp. Ldr.) what we are doing & why.

ORNDOFF
PAGE 1 of 2

**Attachment B**

# Los Alamos
NATIONAL LABORATORY
# memorandum

***Mechanical and Electronic Engineering Division***
Technical Engineering Support Group

*To/MS:* OU 1093 Project File
*From/MS:* C. R. Mynard, MEE-4, MS G787
*Phone/FAX:* 7-7335/FAX 5-1976
*Symbol:* MEE4-92-117
*Date:* November 30, 1992

## SUBJECT: INTERVIEW OF J. D. ORNDOFF RE: TA-18 HISTORY; FOR OU1093 ENVIRONMENTAL REMEDIATION WORKPLAN

This memo-to-file records information pertinent to the environmental remediation activities being conducted by the Los Alamos National Laboratory as part of its RCRA Facility Investigation (RFI) project. The data herein are a synopsis from a personal interview conducted by C. Randall Mynard with John D. Orndoff on May 26, 1992. The information concerns facilities and past activities at TA-18 and may be referenced in the Workplan for Operable Unit (OU) 1093, or other documents releaseable to the public. Statements have not been independently verified, and opinions expressed are those of the interviewee, as paraphrased by the interviewer. Interviewer's comments are in brackets [ ].

Employee of: LANL (retired) Dates of service at TA-18: 11/46-7/77 Primary Work Area, Bldg(s): (all) Job Title(s): Staff member, Deputy Group Leader, Acting Group Leader. Duties/Dates: In charge of Rover Program and reactor experiments at TA-18, worked with experiment instrumentation and studied neutron physics.

1. Prior to 1946 explosive measurements for implosion studies were done at TA-18 by G Division . "G" stands for "Gadget", the code name of the atom bomb. Roger White may know about that work. Afterward M-2 used the site for critical assembly work.

2. The east-west part of building 18-1 [now gone] was used as an electronics assembly area. The south wing was used for radiation counting experiments. Louis Slotin was fatally injured there by a radiation accident, which also exposed Raemer Schreiber [and others]. The room later became a machine shop.

3. Building 18-30 had one serious contamination incident when radioactive polonium leaked, causing a two month shutdown for cleanup and to allow the radiation to decay to a safe level. Polonium's halflife is only 150 days.

4. Building 18-30 had a radiation counting room in the basement where metal foils, wires, and Project Rover fuel elements were checked for radioactivity. Care had to be taken when handling uranium fuel elements due to surface contamination, so rubber gloves were used.

5. Building 18-30 has a basement sump pump [to deal with the high water table]. The pump failed once, causing the basement to be flooded.

ORNDOFF
PAGE 2 OF 2

**Attachment B**

*Memo to File* *November 30, 1992*

6. The critical assembly programs used a lot of $^{235}U$, and $^{238}U$. In addition, many experiments were done with plutonium (coated with nickel) and $^{233}U$, which is highly radioactive. Uranium tends to oxidize and form a surface powder, but the dry climate reduces the problem.

7. The Rover Project involved criticality tests of reactor mockups representing cross sections of real reactors meant to power nuclear rockets. The mockups were experimental arrays of small hexagonal uranium fuel elements used to test various geometries at low power. Full-scale reactors based on these mockups, also tesed at TA-18, were later test-fired at the Nevada Test Site. These were then disassembled by remote control and the beryllium within shipped back to TA-18. Somewhat radioactive from induced gamma radiation, the beryllium was stored at TA-46 for later reuse in mockups at TA-18. Beryllium oxide, more hazardous than Be metal, was also used in some mockups. Its main hazard is from the dust generated by machining, an activity not conducted at TA-18.

8. Workers handled lots of beryllium metal at TA-18. Its surface can oxidize somewhat but that is not a problem in our dry climate. No special precautions were deemed necessary. The air was sampled once [date and location not stated] but BeO was not found to be a problem.

9. The short rail track northeast of Kiva 2 was used to roll uranium critical assemblies into and out of a storage shed, 18-128.

10. Building 18-168 was used for dynamic critical assemblies that used flowing solutions of uranium as fuel. A catch pan sat under the experiment. I never heard of any fuel spills there.

11. No "high level" contamination has occurred at TA-18 nor have any "hot" materials been buried there.

12. I have no knowledge of a military tank being buried in the canyon behind either Kiva 1 or 2.

The above information is accurate to the best of my knowledge and recollection, (signed):

John D. Orndoff Date 4/21/93

PAXTON
PAGE 1 OF 2

Attachment B

**Los Alamos**
NATIONAL LABORATORY
**memorandum**

*Mechanical and Electronic Engineering Division*
Technical Engineering Support Group

To/MS: OU 1093 Project File
From/MS: C. R. Mynard, MEE-4, MS G787
Phone/FAX: 7-7335/FAX 5-1976
Symbol: MEE4-92-118
Date: December 1, 1992

**SUBJECT: INTERVIEW OF H. C. PAXTON RE: TA-18 HISTORY; FOR OU1093 ENVIRONMENTAL REMEDIATION WORKPLAN**

This memo-to-file records information pertinent to the environmental remediation activities being conducted by the Los Alamos National Laboratory as part of its RCRA Facility Investigation (RFI) project. The data herein are a synopsis from a personal interview conducted by C. Randall Mynard with Hugh C. Paxton on August 6, 1992. The information concerns facilities and past activities at TA-18 and may be referenced in the Workplan for Operable Unit (OU) 1093, or other documents releaseable to the public. Statements have not been independently verified, and opinions expressed are those of the interviewee, as paraphrased by the interviewer. Interviewer's comments are in brackets [ ].

Employee of: LANL (retired) Dates of service at TA-18: 12/48-4/76 Primary Work Area, Bldg(s): mainly 18-1, 18-30. Job Title(s): Staff member, Group Leader. Duties/Dates: Group Leader of W-2, N-2, P-5 for 25 yrs (12/48-12/57, 1/59-12/74) Staff member in A-5 and R-5 under Grp Ldr Gordon Hansen 1/75-4/76.

1. Raemer Schreiber knows of the early history of TA-18. Ray Pederson, originally with H Division [H-1], was assigned to Pajarito Site to do radiation monitoring and take care of contamination. He later became a member of the group and has the radiation records plus a good memory, so is a good source of information. A book with some of the early history of the Manhattan Project is "Atomic Energy for Military Purposes" by H.D. Smyth, published by Princeton University Press in 1945.

2. I have no knowledge of any buried military tank behind Kiva 2 nor anything about the firing sites that used to be at TA-18. A Navy gun barrel was said to have been used at TA-18 for a non-criticality experiment, but not for "Little Boy" work. John Orndoff may know about it.

3. Building 18-1 was slightly contaminated by plutonium [oxide] powder when a shipping container containing a hemisphere with unsuspected corrosion was opened. It did not cause any widespread contamination and seemed insignificant at the time. I don't recall the date. The High Bay at 18-1 was used as a lab where hand [critical] assembly operations were done, until the Slotin accident there.

4. The contamination incident that Kenny Dunahugh speaks of in Building 18-1 may be the one that occurred in 18-30 when the polonium/beryllium source ruptured. It really spread around and was the only contamination incident that resulted in loss of workers' clothing.

**Attachment B**



5. Nonradioactive BeO blocks used for the "Water Boiler" reactor [at Omega Site, TA-41] were stored in Building 18-15, which was not used as a magazine after I was there. It was used only for storage, and no radioactive materials were stored there.

6. I don't remember the ["extra valuable materials"] drain in Kiva 1 ever being used, and am not sure what it was orignally for. Deuterium oxide was later used in the Kiva.

7. There were no spills of radioactive material in the vault [18-26] since only solid materials in containers were kept there, not liquids. Chunks of U-233 were stored there, since nobody wanted it or wanted it around. It becomes quite gamma-active [radioactive] with time. Ray Pederson knows about it.

8. Building 18-28 was used mainly for storage. Electrical work may have been done in the east end. The so-called "Contaminated Shop" was not used for contaminated work.

9. The machine shop in Building 30 was used to build things for the Kivas. No radioactive materials or beryllium were machined there, that being done elsewhere at the Lab.

10. The only radioactive materials used in 18-30 were sources and detectors and some tiny amounts of solid uranium. No liquid radioactive materials were ever used in the building so it is unlikely that any radioactive liquids were poured in the acid waste sink there. There should not have been any decontamination needed in the building. Check with John Orndoff to be sure.

11. The kivas would have had only minor contamination since the dry climate here inhibits oxidation [which rubs off]. Thus floor drains would likely have only negligible contamination. Rover fuel elements might have led to minor contamination in the kivas. Beryllium metal, not the oxide, was used in the Rover Program at TA-18.

12. Building 18-122 next to Kiva 2 once contained a small amount of Tuballoy [uranium] and thorium for one experiment.

13. 18-127 was the building housing a Cockcroft-Walton accelerator, used by a different group.

14. 18-129 was where Rover assemblies were prepared by another group for shipment to the Nevada Test Site. John Orndoff may know about it.

15. 18-141 was used by Rover assembly people, a different group. Orndoff may know about it.

16. Regarding solvent spills, there was not much concern about it then since there were only small amounts used at TA-18. There were no large spills.

The above information is accurate to the best of my knowledge and recollection, (signed):

Hugh Paxton Date March 15, 1993

DUNAHUGH
PAGE 1 OF 2

**Attachment B**

INTERVIEW SHEET, ER PROGRAM

Name *Kenneth J. Dunahugh* Date *5/26/92* Interviewer *C. R. Mynard*
Address ** [redacted]* Phone (W) *—* *** (H) [redacted]
Employee of *LASL N-2* Dates of service at site *Nov. 1947 - Jan 1979*
Tech Area *1, 18* Bldg(s) *18-1, Kivas 1 & 2, 18-30* Job Title(s) *machinist*
Duties/Dates *build critical assemblies & bomb mockups*

** Address & phone deleted for Privacy Act reasons. C. R. Mynard 9/6/96*

Indicate knowledge of possible SWMUs, location, dates, degree of certainty:

- Kenny was first at Los Alamos in the Army, machining HE at S-Site in the "Trinity Shop" for the "Fat Man" implosion bomb in 1945.
- He left the Army and was hired by LASL 1 Nov. 1947. Stayed 32 yrs.
- He worked first at TA-1 in "D" Shop, then went to Pajarito Lab at TA-18, working in the machine shop in the south wing of bldg. 18-1. Says that the first H-bomb was assembled there due to the 2-story high crane. (only place it could be assembled). Later Kiva 1 was used.
- Radioactive materials ("radiation stuff") were stored in the east-west wing of 18-1. A bomb device leaked some radioactive material in an office there, which contaminated the wing and some personnel. Manny Diaz was one of the first contaminated. Everyone had to leave their clothing there, including the secretary Marsalia Taylor (an "old maid" known as "Old Blue"). Lab coats were worn home that day (date not remembered). The building took a month to clean up & booties had to be worn there for a year. He doesn't know what the material was.
- Kenny helped fabricate the first remotely controlled critical assembly, "Lady Godiva".
- He thought that beryllium may have been machined in 18-1 but wasn't sure
- No knowledge of activities at TA-27, buried M-3 tank, or buried gun barrels.
- He was only one who could work in the Kivas for 1 year after Robert Keepin erroneously allowed a crew to stay 1½ hrs. vice 10 min. in a radiation area, using up their annual exposure quota.
- Most critical assembly work was eventually done in and around Kiva 2.

**Attachment B**

- Machine shavings were simply dumped in the trash (no special disposal methods were normally used).
- Al Sporner, who lives at *[redacted] north of *[redacted], ~~was~~ also worked in the machine shop at TA-18.
- says his memory is "going bad".
- Bob Wagner had small machine shop in 18-28. Lives now *[redacted].
  [still works at TA-18. Phone [redacted]]*

Note: Manny Diaz says Kenny is the oldest TA-18 "old timer" still around. (but Manny was at TA 18 earlier).

Attachment C

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

SEP 2 8 1995

Mr. Theodore J. Taylor
Program Manager
Department of Energy
Los Alamos National Laboratory
Los Alamos, NM 87544

Re: RFI Report Technical Areas 18 and 27
Los Alamos National Laboratory (NM 0890010515)

Dear Mr. Taylor:

The Environmental Protection Agency (EPA) has reviewed your RCRA Facility Investigation Report for Potential Release Sites in Technical Areas 18 and 27, and found it to be deficient. Enclosed is a list of deficiencies which you have 60 days to respond to.

Should you have any questions, please feel free to contact Ms. Barbara Driscoll at (214) 665-7441.

Sincerely,

for David W. Neleigh, Chief
RCRA New Mexico - Federal
Facilities Section

Enclosures

cc: Mr. Benito Garcia
New Mexico Environment Department
Mr. Jorg Jansen
Los Alamos National Laboratory, MS M992

# Attachment C

**List of Deficiencies**
**Los Alamos National Laboratory**
**Operable Unit 1093**
**Technical Areas 18 and 27**

**General Comments:**

1. EPA agrees that LANL may request a Class 3 permit modification for removal of the following units from the HSWA portion of the permit:

   27-003
   27-001
   18-007
   18-001(c)

2. 3.2.2 Soils, p. 3-4 - LANL should provide the locations and relevant information of any soil samples collected for the background database which were collected near the location of Technical Areas 18 and 27.

3. 3.6 Waste Criteria, p. 3-6 - Using the stated approach for TC screening levels is only acceptable for solid wastes/soils which contain no liquids.

4. 4.2.3 Evaluation of Results, p. 4-11 - EPA would prefer that the analytical results that are in question be included in the evaluation of results section for each SWMU, not in a different section several pages away.

5. Figure 4-8, p. 4-12 - Please include the sampling identification number for each sample point taken.

6. 4.4.3 Evaluation of Results, p. 4-30 - One electromagnetic anomaly was detected; however, LANL did not make a determination if material was actually buried at the location. LANL should have followed through to determine what the anomaly was whether or not LANL thought the anomaly was the actual guns they were looking for.

7. Appendix A - EPA will provide separate comments related to the background study. LANL should be aware that their approach used for calculating the upper tolerance limit was not acceptable to EPA.

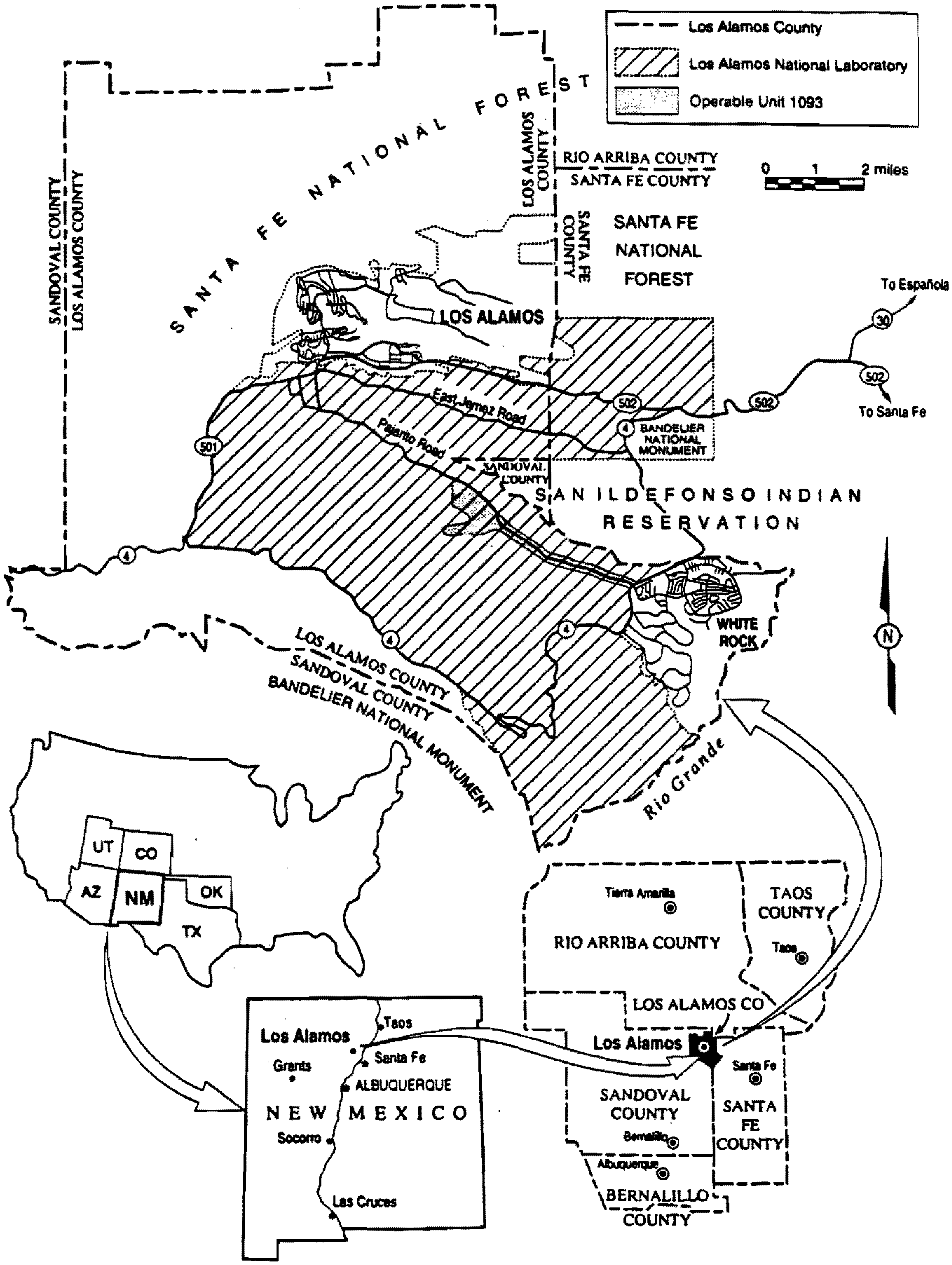



**Figure 1-1. Location of Operable Unit 1093**

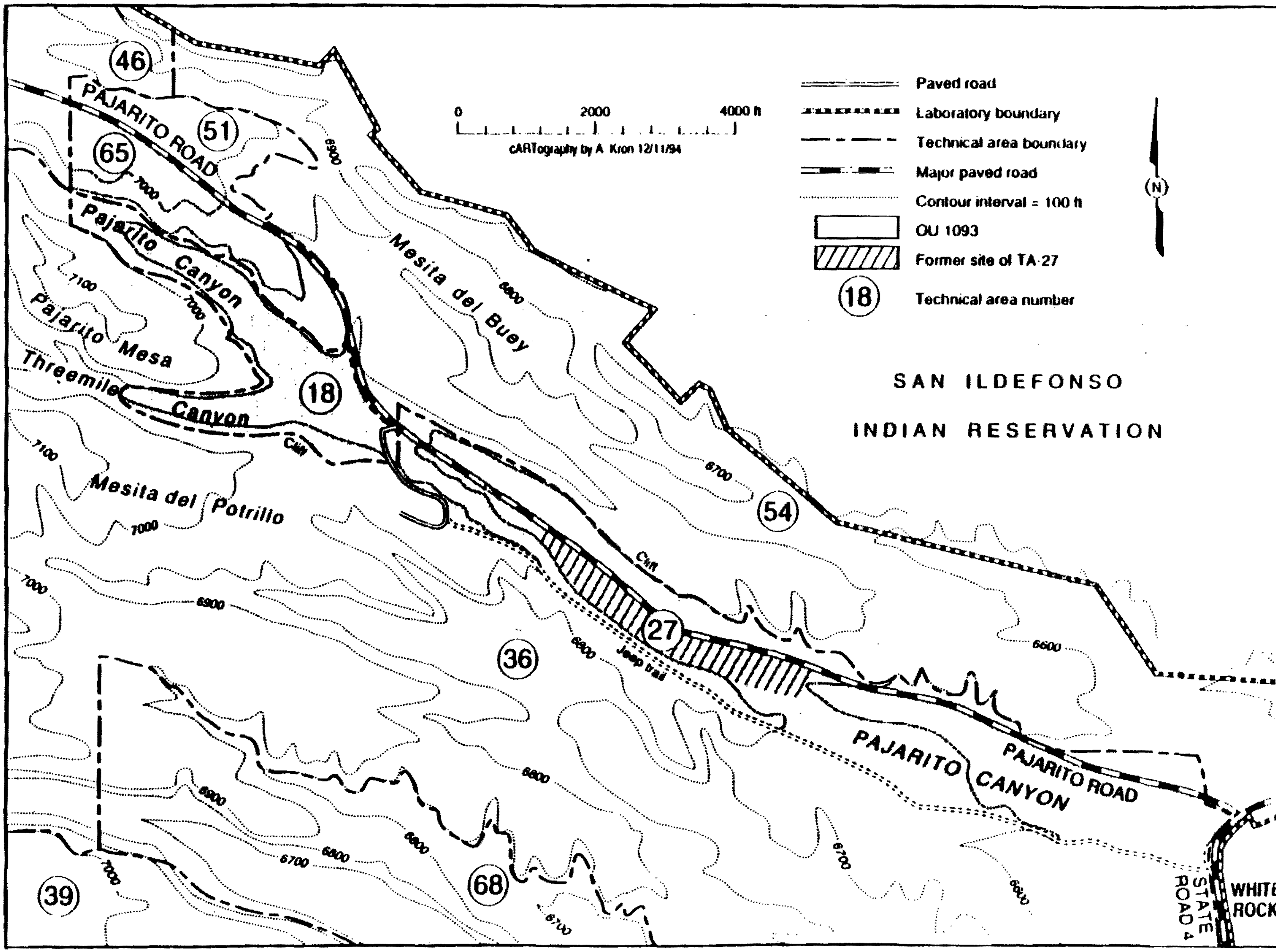



**Figure 1-2. Technical areas, land formations, and major drainages at OU 1093.**

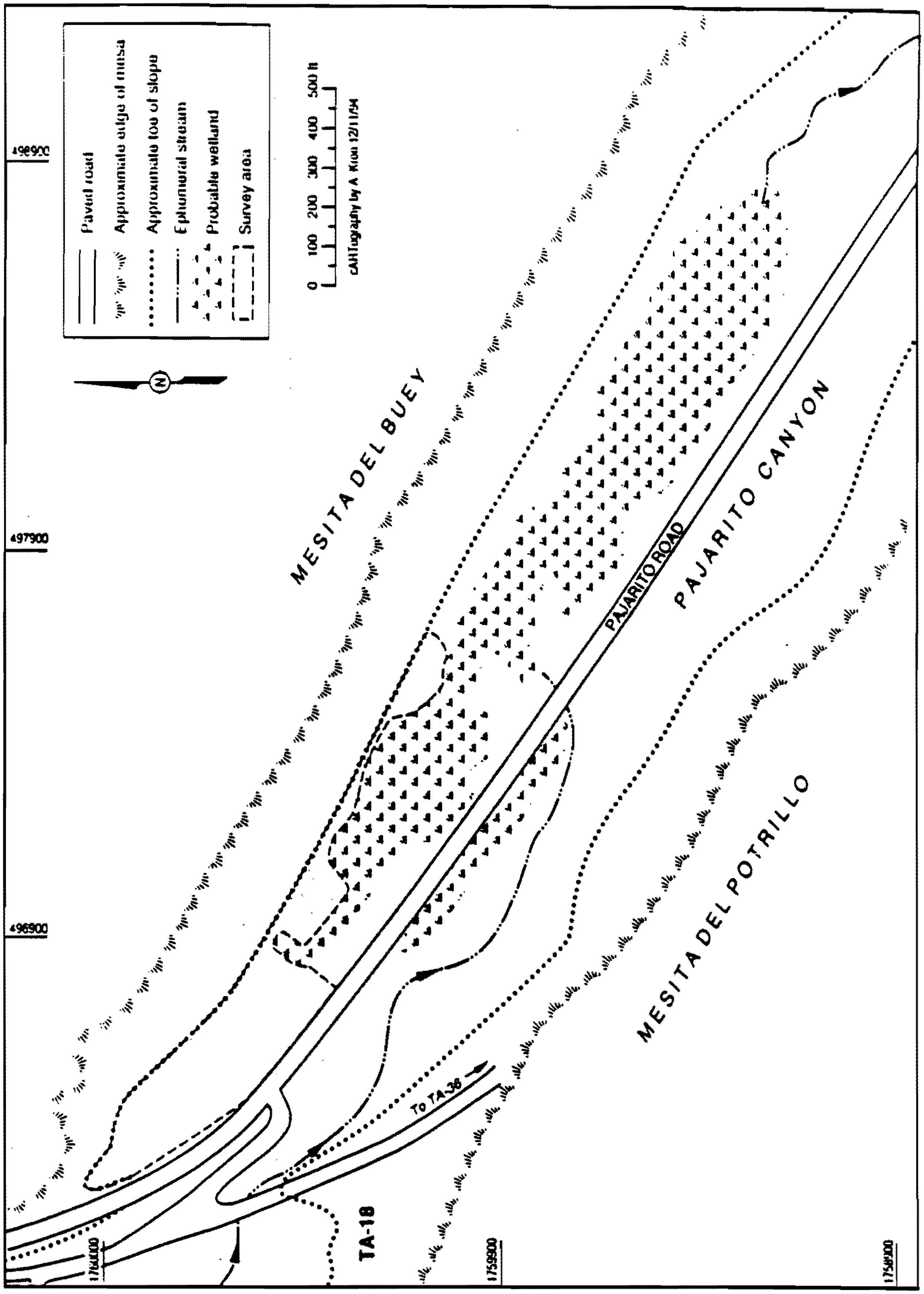



**Figure 4-10. Location of site investigations for PRS 27-001.**

# 27-003

# ATTACHMENTS

## SWMU 27-003 — Bazooka Impact Area

SWMU 27-003 is located in former Operable Unit (OU) 1093 within Technical Area (TA)-27 at Los Alamos National Laboratory, Los Alamos, New Mexico (Figure 1-1). TA-27 was located in the central portion of the Laboratory (Figure 1-2).

### 1.0 Introduction

### 1.1 Description

SWMU 27-003, the Bazooka Impact Area, is a target practice area that was used by the Army during 1947. Fenced and unused by the Laboratory since 1962, the area is located north of Pajarito Road in Pajarito Canyon, 0.25 mi east of the inactive TA-18 sewer lagoons (TA-18-162) and 1.25 mi east of TA-18 (Figure 4-1). Most of the SWMU lies on the steep slope of the north wall of the canyon, below the rim. However, the footprint of the impact area extends northward onto the top of Mesita del Buey within the TA-54 fence. The south side of the impact area extends downslope to the canyon floor, crosses an ephemeral stream, and ends near Pajarito Road. Firing was done from a point located south of the curve in the current road. The road dates from 1962, when it briefly allowed civilian access to unexploded ordnance (UXO) lying in the impact area.

Archival research retrieved numerous records on the history of the site, including an accident investigation report that contained archival photographs of the ordnance impact area. Comparison of these photographs with on-site inspections determined the location of the impact area to be within the one-half-mile-long fenced region north of Pajarito Road. This area, visible as a distinct light-colored patch of highly fragmented rock on the cliff slope, was the center of investigation. Ordnance fired at the cliff face consisted of many hundreds of bazooka rounds (2.36-in, rocket-propelled), typically with armor-piercing, shaped-charge warheads. (Four fragments appearing to have been from a former, one-time demolition shot were the only other type of ordnance found). The potential hazard of the ordnance was from possible unexploded warheads and fuses buried in the soil or slope talus and traces of undetonated high explosives (HE) in warhead subassemblies.

Superimposed on the Bazooka Impact Area are two fragment impact areas used for explosive testing conducted by the Laboratory. One of these is the result of firing pits in Pajarito Canyon used from 1946 to 1947. The second is the result of TA-36's "Lower Slobbovia" firing site, an operating test area beyond the mesa to the south of Pajarito Road, still active at the time of investigation. Occasional metal fragments from these tests were found in this SWMU. Because they were not related to UXO operations, these fragments were not always retrieved from the outer edges of the Bazooka Impact Area. However, ferrous fragments were always removed so that they would not interfere with the magnetic surveys. Some aluminum fragments, found to be slightly radioactive because of traces of depleted uranium explosively alloyed to them, were handled separately.

### 1.2 No Further Action Basis

SWMU 27-003 is recommended for NFA because it has been characterized and remediated in accordance with current applicable state and federal regulations, and the available data indicated that contaminants pose an acceptable level of risk under current or future land use.

The nature of the UXO hazard prompted a departure from the original intent of the site work plan, which was to conduct a Phase I site investigation with remediation to follow. The large quantity of ordnance debris present (based on initial visual survey) and its wide pattern of dispersion indicated the impracticality of marking and mapping each fragment rather than simply removing it when found. Discussions with explosive ordnance disposal (EOD) personnel from Environmental Hazards Specialists International, Inc. (EHSI), clearly indicated that immediate disposal of UXO upon its discovery, a standard practice in ordnance-clearing operations, would eliminate hazard to survey personnel. The EHSI personnel were contracted to search for and clear any unexploded bazooka rounds and to recover all ordnance debris from this SWMU. Therefore, in this instance, Phase I included site remediation.

Visual survey was used to determine the extent of the search area, indicated in Figures 4-1 and 4-2. Site investigation involved visual search and the use of two types of metal detectors to locate surface and subsurface metallic objects to a depth of up to 18 in. Sequential magnetic sweeps were conducted in 10-foot-wide adjoining lanes, oriented parallel to the cliff. When possible, rocks and talus on the cliffs were moved to check for buried ordnance material underneath. Vertical surfaces on the cliff were checked visually and magnetically by personnel rappelling from the mesa top. Cracks and ravines were also carefully checked. Sweeps were continued in the canyon bottom southward toward Pajarito Road until no further ordnance fragments were found, indicating the uprange limit of the fragment footprint. Sweep operations continued downrange from the impact area within the TA-54 fence on the mesa top. Minor amounts of debris were recovered from the downrange sweep, indicating that the mesa top had not been significantly affected or had been previously cleared by Army EOD teams during the period from 1965 (McAndrew, 1965) (Attachment A) to some undetermined date in the 1980s (personal interview, no attachment).

Between October 4 and November 2, 1993, 3,200 pieces of ordnance debris were removed, including 646 tail assemblies. Photographs of typical material removed are presented in Figures 4-3 and 4-4. All detected ferrous metal was removed from the area. Eight (8) live bazooka rounds and 6 unexploded booster assemblies (i.e., fuses) were located under loose sand and gravel on the upper slopes of the north canyon wall (Figure 4-2). These pieces of UXO were detonated in place (Figure 4-4).

The 3,200 pieces of ordnance debris (consisting of fragments, expended rocket motors, and a few warhead subassemblies) that were removed from the site were screened for radioactivity by radiological control technicians from the Laboratory Health Physics Operations Group. A small number of slightly radioactive (30 dpm beta/gamma) aluminum fragments from Laboratory explosive testing unrelated to this SWMU were found. These were disposed of at TA-54, Area G. The remainder of the debris was sent to the TA-16 interim-status, open-burning unit to destroy any residual HE.

The EHSI team spent one day doing quality assurance sweeps and was confident that no significant ordnance debris remains in the search area.

The geographic pattern of recovered material indicates that the extent of SWMU 27-003 has been adequately defined. All detectable ordnance material within the SWMU has been removed, although it is possible that further searching might uncover metal fragments located outside the boundaries of the SWMU. Soil samples were collected from the base of the slope, below the area where the bulk of the ordnance debris was located. Analytical results for HE analysis indicated no contamination above detection limits. The measured concentrations of the three target metals (barium, copper, and lead) were below background concentrations with one exception. The maximum measured concentration for copper (17.5 mg/kg) was slightly above the background UTL (15.7 mg/kg), and substantially greater than the measured concentrations of the other four samples. Whether the elevated concentration is the result of copper introduced by bazooka firing or simply an aberrant natural concentration is conjectural. In either event, that maximum value is significantly less than the SAL for copper (3000 mg/kg). Because, no residual contamination related to use of the Bazooka Impact Area was detected, no unacceptable risk is presented by this SWMU.

It is the opinion of the investigating team that continued limitation of access to the area (fences and explosive hazard signs surrounding the SWMU) because of explosive hazards is no longer required based on the cleanup performed in the fall of 1993. The fence that extends along the side of Pajarito Road, installed in 1993 as part of the DOE-mandated property fencing, should be adequate for limiting access. In addition, the area is Laboratory property and public access is constrained by trespass law.

All detectable ordnance material within SWMU 27-003 has been removed; therefore, it is no longer a safety hazard from unexploded ordnance. In addition, no residual contamination related to the use of the Bazooka Impact Area was detected. Therefore, no further action is proposed for SWMU 27-003.

After reviewing the RFI Work Plan for OU 1093 Potential Release Site 27-003, the US Environmental Protection Agency concurred that SWMU 27-003 be proposed for removal from the HSWA portion of the Laboratory's Hazardous Waste Facility Permit (Attachment B, General Comment 1) via a Class 3 permit modification request.

## 2.0 History

### 2.1 Historical Operations

Bazooka target practice by the Army in 1947 and explosive testing conducted by the Laboratory during 1946 to 1947.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: Memorandum, May 12, 1965, McAndrew 1965.

Attachment B: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing deficiencies for RFI Report for Technical Areas 18 and 27.

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

In the Summer of 1994, surface soil sampling was conducted to check for the presence of residual materials which may have resulted from the firing of large quantities of ordnance. The sampling sites are shown in Figure 4-2. Samples were analyzed for metals and HE. Specific metals of concern are barium (commonly occurring in explosives), copper and lead (present in the bazooka shell).

**MEASURED CONCENTRATIONS OF POTENTIAL CONTAMINANTS OF CONCERN AT SWMU 27-003**

| Sample Location | Sample Number | Sample Type | Units | Metals | High Explosives | SALs | CRQLs | Background |
|---|---|---|---|---|---|---|---|---|
| 27-003 (5 Samples) | AAB4194 | Sediment | mg/kg<br>mg/kg<br>mg/kg | 30.7 Barium<br>4.1 Copper<br>10.9 Lead | None Detected | 5600<br>3000<br>400 | 40<br>5<br>0.6 | 1140<br>15.7<br>39 |
| | AAB5195 | Sediment | mg/kg<br>mg/kg<br>mg/kg | 30.2 Barium<br>3.6 Copper<br>9.4 Lead | None Detected | 5600<br>3000<br>400 | 40<br>5<br>0.6 | 1140<br>15.7<br>39 |
| | AAB5196 | Sediment | mg/kg<br>mg/kg<br>mg/kg | **37.0 Barium**<br>**17.5 Copper**<br>**11.8 Lead** | None Detected | 5600<br>3000<br>400 | 40<br>5<br>0.6 | 1140<br>15.7<br>39 |
| | AAB5198 | Sediment | mg/kg<br>mg/kg<br>mg/kg | 33.8 Barium<br>3.2 Copper<br>8.3 Lead | None Detected | 5600<br>3000<br>400 | 40<br>5<br>0.6 | 1140<br>15.7<br>39 |
| | AAB5199 | Sediment | mg/kg<br>mg/kg<br>mg/kg | 29.8 Barium<br>4.2 Copper<br>8.0 Lead | None Detected | 5600<br>3000<br>400 | 40<br>5<br>0.6 | 1140<br>15.7<br>39 |

Maximum concentrations in **boldface**. Shaded values: measured values above background UTLs

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

Based on evidence outlined in Sections 1.0 and 3.0, no unacceptable risk is presented by this SWMU.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0, SWMU 27-003 is recommended for NFA under Criterion 5.

## 5.0 References


May 12, 1965. "Resurvey of Munitions Impact Areas and Ordnance Re-orientation, Los Alamos Schools, May 4, 5, 6 and 7, 1965," memorandum to E. E. Wingfield, Chief, Administrative Branch from E. G. McAndrew, Safety Engineer, Administrative Branch.

Environmental Protection Agency Region 6, September 1995. "RFI Report Technical Areas 18 and 27, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, RCRA New Mexico, Federal Facilities Section, Dallas, Texas.

Los Alamos National Laboratory, January 30, 1995. "RFI Report for Operable Unit 1093, Potential Release Sites 18-001a, b, c; 27-001, 27-003," Los Alamos National Laboratory Report LA-UR-95-0259, prepared by ICF Kaiser Engineers, Inc., Los Alamos, New Mexico, pp 4-1 through 4-7. (LANL 1995, 1337)


## 6.0 Annexes

### 6.1 RFI Analytical Results

Section not applicable.

### 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

Attachment A

27-001 GAMMA SITE TRENCH 10/31/90

## SUMMARY

LOCATION : TA-27
TYPE OF UNIT(s) : LANDFILL
UNIT USE : DISPOSAL
OPERATIONAL STATUS : INACTIVE
PERIOD OF USE : EST. 1945
HAZARDOUS RELEASE : UNKNOWN
RADIOACTIVE RELEASE : UNKNOWN

MATERIALS MANAGED : SUSPECTED RADIOACTIVE WASTE
SUSPECTED HAZARDOUS WASTE

## UNIT INFORMATION

Around 1945, a trench is believed to have been dug near the base of the south-facing cliff at TA-27, downcanyon from TA-18. It was used to dispose of experimental pieces. The physical condition of the land makes establishing the exact location of the unit difficult. Results from a recent geophysical survey have been archived and were not reviewed.

## WASTE INFORMATION

The buried items are believed to have been guns and gun barrels, and possibly gun assemblies which may have been contaminated with radionuclides. It is possible that, in addition, live ammunition may have been placed in the trench.

## RELEASE INFORMATION

No information is available to document the existence of radioactive or hazardous waste releases from this unit.

## NOTES

The location of this SWMU is within the current boundaries of TA-36.

## SWMU CROSS-REFERENCE LIST

| SWMU NUMBER | CEARP IDENTIFICATION NUMBER(S) | RFA UNIT | E.R. RELEASE SITE INFO. | ASSOCIATED STRUCTURES |
|---|---|---|---|---|
| 27-001 | TA27-1-L-I-HW/RW | 27.001<br>18.076 | Tsk 16 : 9 | |

# TA-27 - GAMMA SITE

## CURRENT OPERATIONS

TA-27, Gamma Site, is no longer being used.

## POTENTIAL CERCLA/RCRA SITES

During the war years, a plutonium gun assembly program at Gamma Site was abandoned in favor of the uranium gun assembly. Some of the guns used in the tests for the plutonium assembly were deformed because of the intense pressure involved during experiments, and some were returned to the Naval Gun Factory (Hawkins 1983:95). Others may have been buried, together with their ammunition, at this site in Pajarito Canyon or somewhere else within the confines of "Project Y," as Los Alamos was known during the war. The burial was necessary to ensure the project's secrecy. Other guns, possibly contaminated with radioactivity, were buried with their ammunition in a trench in Pajarito Canyon in 1945.

A firing area that was part of TA-18 from 1944-45, when it was called "Far Point," was improved and included in Gamma Site. Larger shots were fired here than at other sites, and they contained uranium or thorium and beryllium. One calibration shot went low order in 1946 and scattered high-explosive Composition B for a considerable distance up and down the canyon. The area was subsequently closed and several surface sweeps were made in an attempt to clean the canyon up. Five firing pits existed at the site; they have been monitored over the years. The control building was moderately contaminated. Some of the area has been opened for use and some is still fenced off.

The following table presents what is known about potential CERCLA/RCRA sites at this location. Phase I investigations have not been concluded. Information obtained during supplemental Phase I investigations will be documented in the CEARP Phase IIA Monitoring Plan for TA-27. CEARP findings are based on a negative, positive, or uncertain finding for FFSDIF, PA, and PSI, for potential CERCLA/RCRA sites. The HRS/MHRS Migration Mode Scores for TA-27 is 14.3 (Appendix B).

# Attachment B

## FIGURES (NOT INCLUDED)

Figure TA-27-1: Location and Site Plan for TA-27 - Gamma Site, along Pajarito Road east of Pajarito Site (1956)

## REFERENCES

Buckland, Carl. 1960. "Disposition of TA-27-1 and TA-27-2," Los Alamos Scientific Laboratory memorandum to Clarence W. Courtright.

Employee Interviews. 1985. Interview conducted with current or former Los Alamos National Laboratory employees during CEARP Phase I; in the CEARP files at Los Alamos National Laboratory.

Hawkins, D. 1983. "Toward Trinity," *Project Y: The Los Alamos Story*, Part I, Tomash Publishers, Los Angeles/San Francisco, CA.

LASL. 1959. "Vacated Los Alamos Scientific Laboratory Structures," Los Alamos Scientific Laboratory document, October 1959.

Attachment C

LOS ALAMOS SCIENTIFIC LABORATORY
UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87544
TELEPHONE:

# OFFICE MEMORANDUM

TO : Distribution  DATE: September 23, 1964

FROM : Engineering Department

SUBJECT: LOCATIONS OF BURIAL AREAS IN PAJARITO CANYON AND TA-8

SYMBOL : ENG-3

On the morning of September 17, 1964, Harold A. Hidy and Ben P. Williams accompanied Harry Allen, SP-DO, to Pajarito Canyon and TA-8 where they were shown the approximate locations of burial areas known to have been used for disposal of objects, near the end of World War II.

(1). Pajarito Canyon. From the point on Pajarito Road where the stream crosses under the road, being approximately 2,000 feet southeast of TA-18, Hidy and Williams were shown twin pine trees, near the canyon wall on the north side of the canyon floor, said to mark the approximate southeast limits of a narrow strip about two hundred yards long, within which some navy gun barrels, some old ammunition, and probably natural uranium, were buried in a trench cut by a bulldozer, to a probable depth of ten to twelve feet. The canyon floor in this vicinity had been extensively excavated from approximately 1949 through 1962 by road contractors and The Zia Company, to obtain road base course materials. The amount of cover removed from this burial area as a result of producing base course material would be difficult to ascertain, as well as the exact location. The general locality of this burial is indicated on the attached map, Exhibit "A".

Designated "Area Q" BPW 4/12/65

(2). In an area south of Building AW-1, TA-8, near the top of the access road around the west end of the building, as shown on the attached map, Exhibit "B", were buried several navy gun barrels, at least one gun mount, and perhaps some additional sections of gun barrels. According to Harlow Russ, W-3 Alternate Group Leader, (in a telephone conversation with Harry Allen, 9/17/64), one gun mount was recovered in 1947, used for some experiments, and is now at TA-33.

Mr. Allen stated that he might recall names of other people familiar with these disposal areas, if it should be considered necessary to ascertain their exact locations; particularly the burial containing the ammunition. He thought R. J. Van Gemert, SP-DO, might possibly have some idea as to the exact locations.

9/23

| | | |
|---|---|---|
| 2 | RUSSO | |
| 1 | SIZER | JKS 9/24 |
| 3 | WILLIAMS | BPW 9/25 |
| 2 | HIDY | |
| 1 | BYERS | 9/24 |
| 2 | BARTHELL | LB 9/24 |
| 8 | MINNICK | |
| X | ~~[illegible]~~ | |
| | MONTOYA | |
| 8 | FILE | 1757 |

Info, History, additions to Waste Pit set of dwgs, future surveys needed, etc

From ENG-7 microfilm (Lab Job file 1757.)

Attachment C



The above information was relayed to R. W. Drake, GMX-DO, especially with regard to the burial of ammunition in Pajarito Canyon. R. W. Drake said he would talk with Harry Allen and R. J. Van Gemert, and determine what additional information might be available from them, and then contact C. A. Burch, H-3, to obtain his evaluation of the desirability of accurately locating the materiel, for the purpose of fencing the location; the inherent risks involved in digging into the old ammunition must be taken into consideration with regard to its disposition. R. W. Drake will relay any information he receives to ENG-3, for the purpose of keeping Record Drawings and Maps up to date.

S. E. Russo

S. E. Russo
Records and Land Surveys

SER/rm

Attach: Maps

Distribution: (w/attach)
Harry Allen, SP-DO
R. J. Van Gemert, SP-DO
R. W. Drake, GMX-DO
Roy Reider, H-3
C. A. Burch, H-3
Harlow Russ, W-3
Lab Job 1757
ENG-DO
ENG-4

Attachment D

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

SEP 2 8 1995

Mr. Theodore J. Taylor
Program Manager
Department of Energy
Los Alamos National Laboratory
Los Alamos, NM 87544

Re: RFI Report Technical Areas 18 and 27
Los Alamos National Laboratory (NM 0890010515)

Dear Mr. Taylor:

The Environmental Protection Agency (EPA) has reviewed your RCRA Facility Investigation Report for Potential Release Sites in Technical Areas 18 and 27, and found it to be deficient. Enclosed is a list of deficiencies which you have 60 days to respond to.

Should you have any questions, please feel free to contact Ms. Barbara Driscoll et (214) 665-7441.

Sincerely,

for David W. Neleigh, Chief
RCRA New Mexico - Federal
Facilities Section

Enclosures

cc: Mr. Benito Garcia
New Mexico Environment Department
Mr. Jorg Jansen
Los Alamos National Laboratory, MS M992

Attachment D

**List of Deficiencies**
**Los Alamos National Laboratory**
**Operable Unit 1093**
**Technical Areas 18 and 27**

**General Comments:**

1. EPA agrees that LANL may request a Class 3 permit modification for removal of the following units from the HSWA portion of the permit:

   27-003
   27-001
   18-007
   18-001(c)

2. **3.2.2 Soils, p. 3-4** - LANL should provide the locations and relevant information of any soil samples collected for the background database which were collected near the location of Technical Areas 18 and 27.

3. **3.6 Waste Criteria, p. 3-6** - Using the stated approach for TC screening levels is only acceptable for solid wastes/soils which contain no liquids.

4. **4.2.3 Evaluation of Results, p. 4-11** - EPA would prefer that the analytical results that are in question be included in the evaluation of results section for each SWMU, not in a different section several pages away.

5. **Figure 4-8, p. 4-12** - Please include the sampling identification number for each sample point taken.

6. **4.4.3 Evaluation of Results, p. 4-30** - One electromagnetic anomaly was detected; however, LANL did not make a determination if material was actually buried at the location. LANL should have followed through to determine what the anomaly was whether or not LANL thought the anomaly was the actual guns they were looking for.

7. **Appendix A** - EPA will provide separate comments related to the background study. LANL should be aware that their approach used for calculating the upper tolerance limit was not acceptable to EPA.

Attachment E

# Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

*University of California*
Environmental Restoration, MS M992
Los Alamos, New Mexico 87545
505-665-4557
FAX 505-665-4747

*U. S. Department of Energy*
Los Alamos Area Office, MS A316
Los Alamos, New Mexico 87544
505-665-7203
FAX 505-665-4504

*Date:* **November 29, 1995**
*Refer to:* EM/ER:95-642

Ms. Barbara Driscoll
NM/Federal Facilities Section
Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

**SUBJECT: RESPONSE TO THE NOTICE OF DEFICIENCY (NOD) FOR POTENTIAL RELEASE SITES IN TECHNICAL AREAS 18 AND 27**

Dear Barbara:

Enclosed is the Los Alamos National Laboratory's response to the Environmental Protection Agency's NOD on the Resource Conservation and Recovery Act facility investigation report for potential release sites in Technical Areas 18 and 27 (former operable unit 1093). A certification form signed by the appropriate officials is also enclosed. This response is due to your office on December 1, 1995.

Please contact Gene Gould at 505-667-0402 or Everett Trollinger at 505-667-5801 if you have any questions about the response to this NOD.

Sincerely,

Jorg Jansen, Project Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

JJ/TT/bp

Environmental Restoration

Enclosures: OU 1093 NOD Responses

Cy (w/enc.):
B. Garcia, NMED-HRMB
D. Griswold, ERD, AL, MS A906
G. Gould, ESA-DE, MS G787
J. Harry, EM/ER, MS M992
B. Hoditschek, NMED-HRMB
R. Kern, NMED-HRMB
E. Merrill, EM-453, DOE-HQ
T. Taylor, LAAO, MS A316
E. Trollinger, LAAO, MS A316
N. Weber, Bureau Chief, NMED-AIP
J. White, ESH-19, MS K498
S. Yanicak, NMED-AIP
EM/ER File, MS M992
RPF, MS M707

Cy (w/o enc.):
T. Baca, EM, MS J591
T. Glatzmaier, DDEES/ER, MS M992
D. McInroy, EM/ER, MS M992
G. Rael, ERD, AL, MS A906
W. Spurgeon, EM-453, DOE-HQ
J. Vozella, LAAO, MS A316

## Attachment E

## CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title: Response To The Notice Of Deficiency For Potential Release Sites In Technical Areas 18 And 27

Name: ______________________ Date: 11-21-95

Jorg Jansen, Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

or

Tom Baca, Program Director
Environmental Management
Los Alamos National Laboratory

Name: ______________________ Date: 11/29/95

Joseph Vozella,
Acting Assistant Area Manager of
Environment Projects
Environment, Safety, and Health Branch
DOE-Los Alamos Area Office

or

Theodore J. Taylor
Program Manager
Environment Restoration Program
DOE-Los Alamos Area Office

# Attachment E

## RESPONSE TO NOTICE OF DEFICIENCY
## RFI REPORT FOR OU 1093, TECHNICAL AREAS 18 AND 27
## SEPTEMBER 28, 1995

1. *EPA agrees that LANL may request a Class 3 permit modification for removal of the following units from the HSWA portion of the permit:*
   *27-003*
   *27-001*
   *18-007*
   *18-001(c)*

**Response:**

LANL will request a Class 3 permit modification, scheduled for March 1996, on the listed PRSs.

2. **Section 3.2.3 Soils, p. 3-4.** *LANL should provide the locations and relevant information of any soil samples collected for the background database which were collected near the location of Technical Areas 18 and 27.*

**Response:**

Soil samples used to evaluate background concentrations were all collected at sites around the perimeter of LANL. None of these locations are near TA-18 or -27.

**Proposed Text Changes:**

None required.

3. **Section 3.6 Waste Criteria, p 3-6.** *Using the stated approach for TC screening levels is only acceptable for solid wastes/soils which contain no liquids.*

**Response:**

LANL agrees with the comment and only uses the TC screening levels to evaluate solid waste or soils.

**Proposed Text Changes:**

Section 3.6. Nonradiologic waste criteria are the possible presence of hazardous waste constituents, and RCRA toxicity characteristic (TC) screening levels **(for solid wastes that contain no liquids). Toxic characteristic limits are used for liquid wastes.**

4. **Section 4.2.3 Evaluation of Results, p. 4-21.** *EPA would prefer that the analytical results that are in question be included in the evaluation of results section for each SWMU, not in a different section several pages away.*

**Response:**

LANL agrees with the comment and will adhere to this format in future RFI reports.

**Proposed Text Changes:**

None required.

5. **Figure 4-8, p. 4-12.** *Please include the sampling identification number for each sample point taken.*

**Response:**

LANL accepts the comment and has revised the figure to include sample numbers. However, in the process of indicating the sample numbers associated with each sampling location, it was realized that the data presented in the report for the wetland sites were actually those from an upstream wetland location instead of from the outfall location. As a result, the data (for the wetland samples) in Table 4-2 of the report need to be amended and the text revised. Concentrations of potential contaminants were in the same range as for the data presented in the report and some were lower. No conclusions presented in the report changed as a result of this error. The text has been revised to reflect the correct data for the sampling locations at the outfall.

**Proposed Text Changes:**

See revised Figure 4-8.

See amended Table 4-2, presenting data for sampling sites at Wetland 7.

Section 4.2.3.1 Comparison With Background. Revise third paragraph as follows:

Concentrations of metals in samples from the outfall area were generally below the background UTL, with the exception of lead (above the UTL for ~~two~~ **three** water samples). This could easily be the result of natural differences between surface water in the wetlands and groundwater in the main aquifer, which was used as a basis for the UTL. Total uranium concentrations were above the UTL in ~~three~~ **all five** sediment samples. This could be the result of releases from the lagoons, from historical releases at a nearby abandoned firing site (which will be addressed in a subsequent report), or from natural differences between uranium concentrations in wetland samples and soil samples. ~~Concentrations of plutonium isotopes were above the UTL in several sediment samples. Plutonium is not a potential contaminant for the nearby abandoned firing site. However, as with uranium, the concentrations above the UTL could have resulted from releases from the lagoons, or from naturally elevated values. Thorium-230 does not occur naturally, and its presence may be attributable to the former firing site mentioned above. Thorium was not a potential contaminant for this PRS.~~

Section 4.2.3.2 Comparison with SALs. Revise third paragraph as follows:

Reported concentrations of PCOCs in the outfall area were below established SALs. ~~with the exception of $^{232}$Th. However, the SAL for $^{232}$Th is within the range of background concentrations, and the measured concentration is below the background UTL.~~

6. **Section 4.4.3 Evaluation of Results, p. 4-30.** *One electromagnetic anomaly was detected; however, LANL did not make a determination if material was actually buried at the location. LANL should have followed through to determine what the anomaly was whether or not LANL thought the anomaly was the actual guns they were looking for.*

**Response:**

As indicated in the text, the observed magnetic anomaly was too small to be indicative of the presence of the buried guns. LANL elected not to expend the funds required to excavate the site to determine if something else was buried at the location of the anomaly.

**Proposed Text Changes:**

None required.

7. **Appendix A** - *EPA will provide separate comments related to the background study. LANL should be aware that their approach used for calculating the upper tolerance limit was not acceptable to EPA.*

**Response:**

LANL is aware of EPA's concerns and has revised the approach to calculating the upper tolerance level.

**Proposed Text Changes:**

None required.

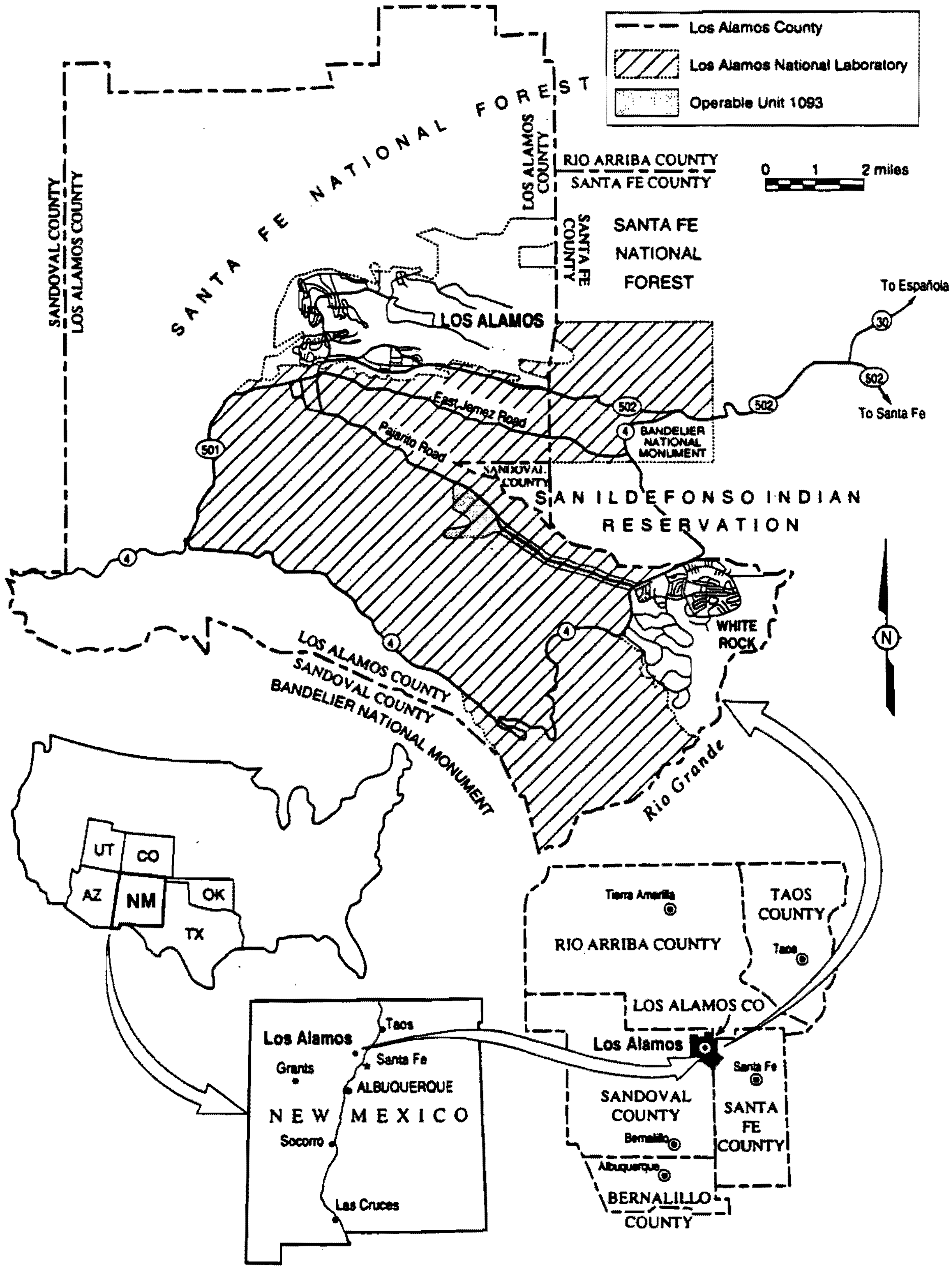



**Figure 1-1. Location of Operable Unit 1093**

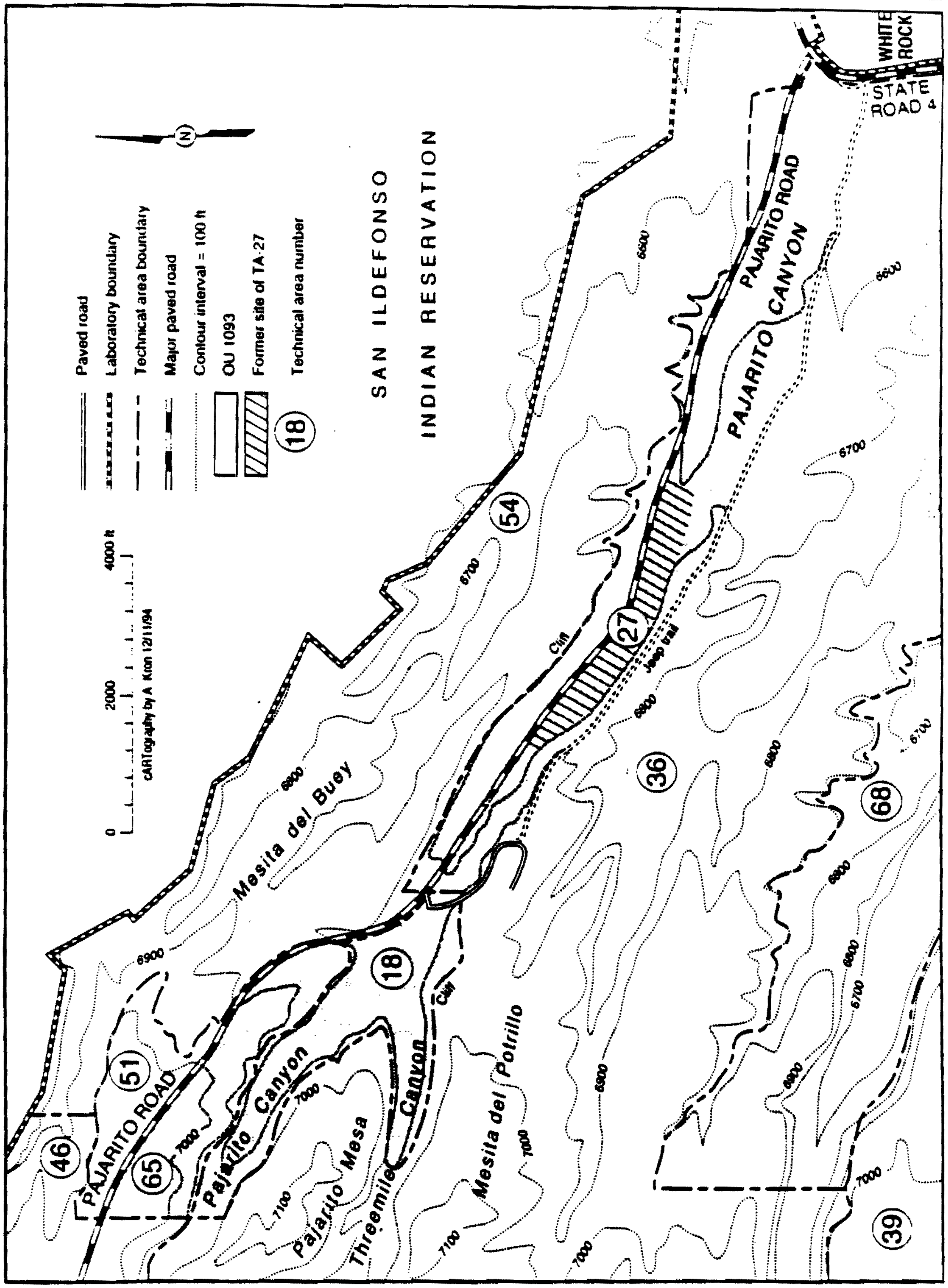



Figure 1-2. Technical areas, land formations, and major drainages at OU 1093.

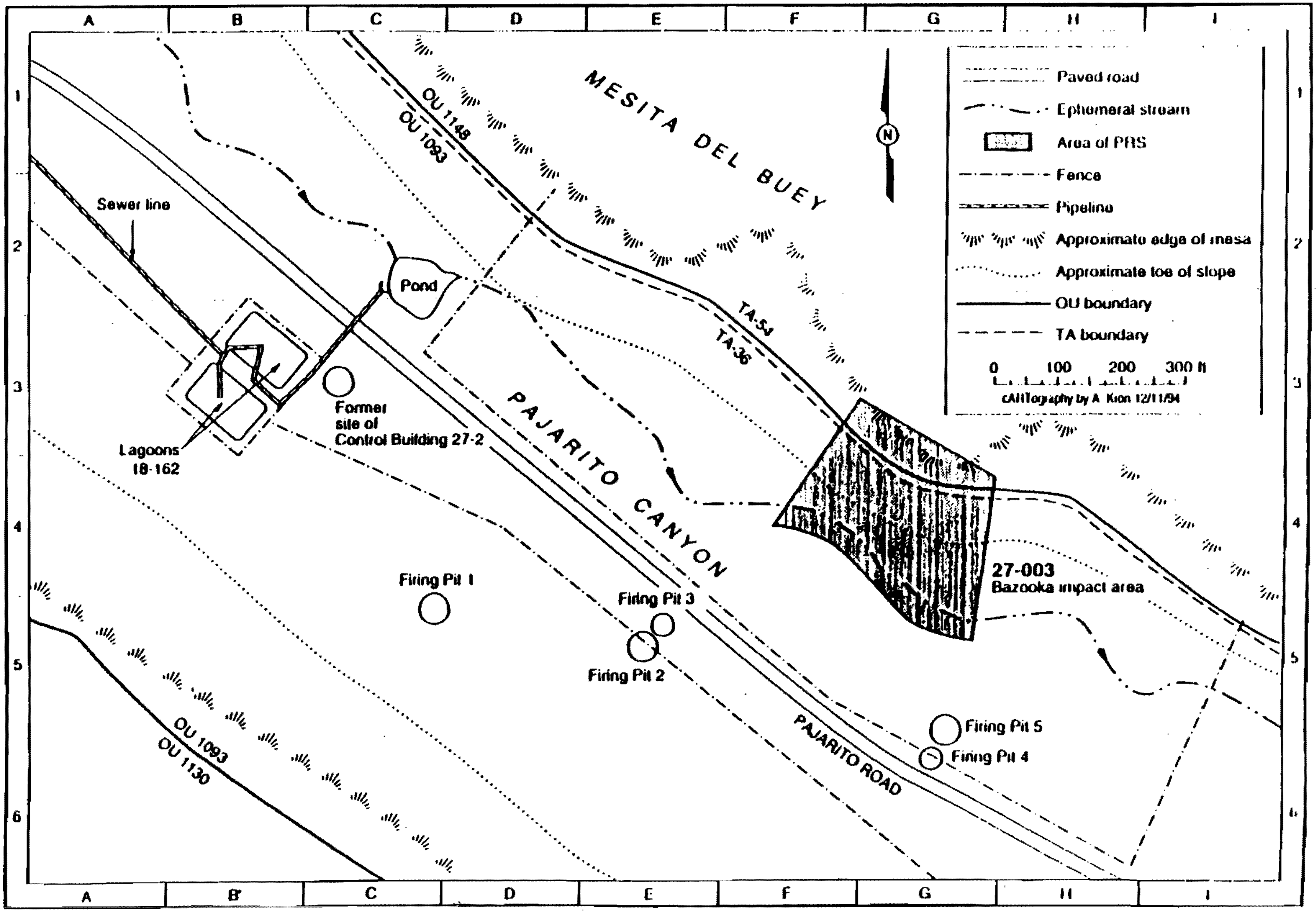



**Figure 4-1. Location of PRS 27-003.**

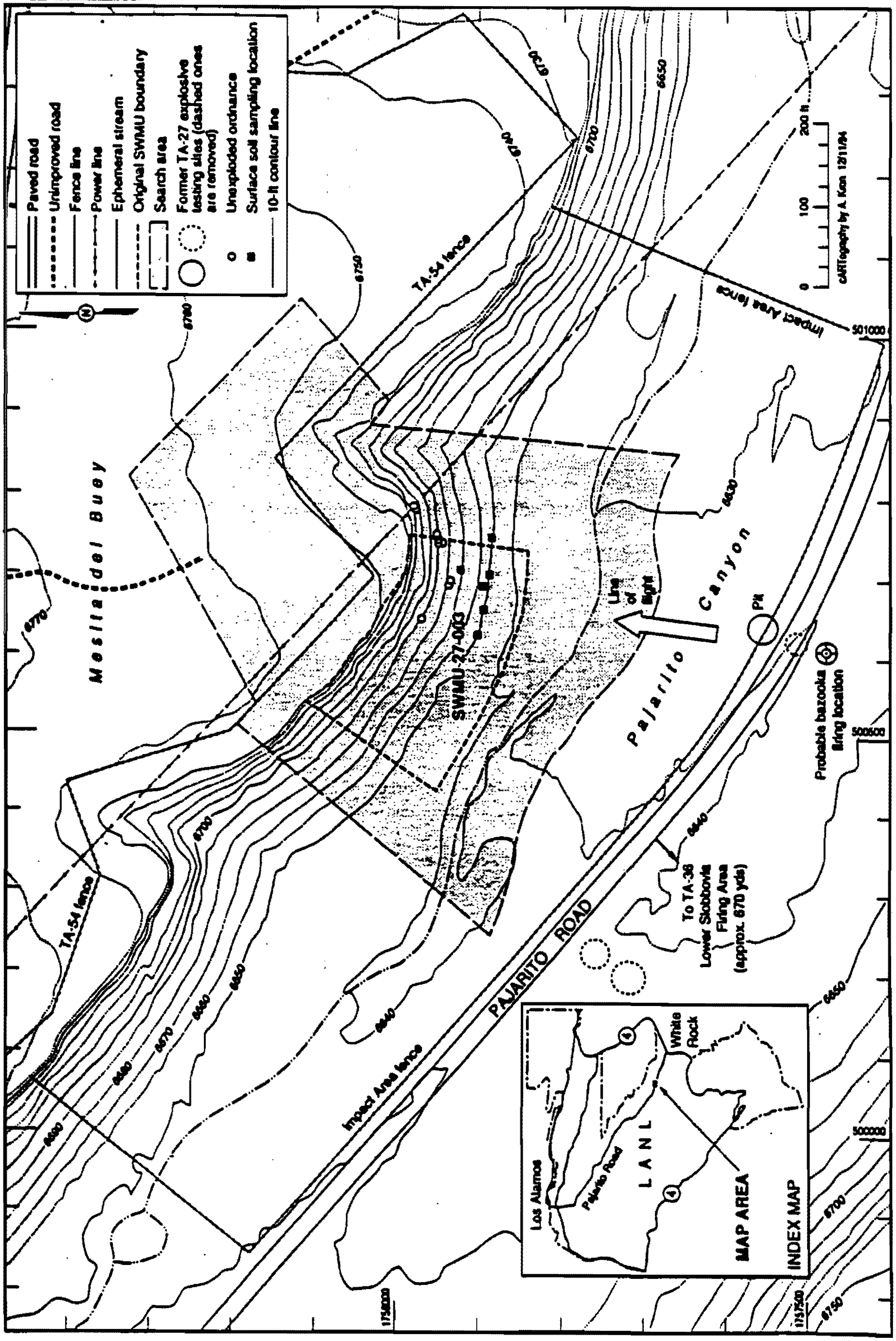
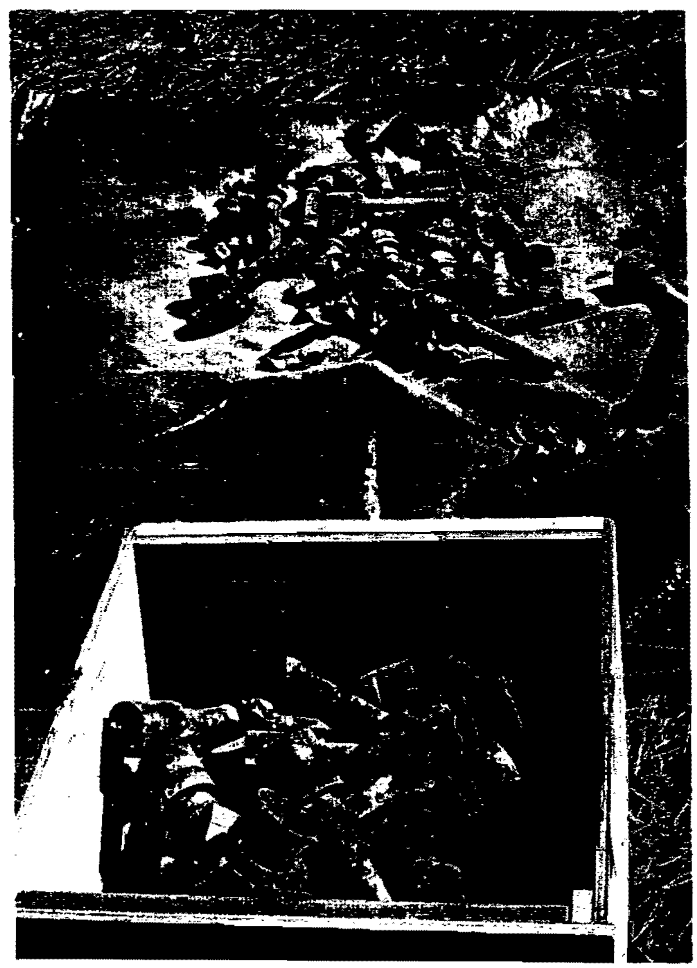


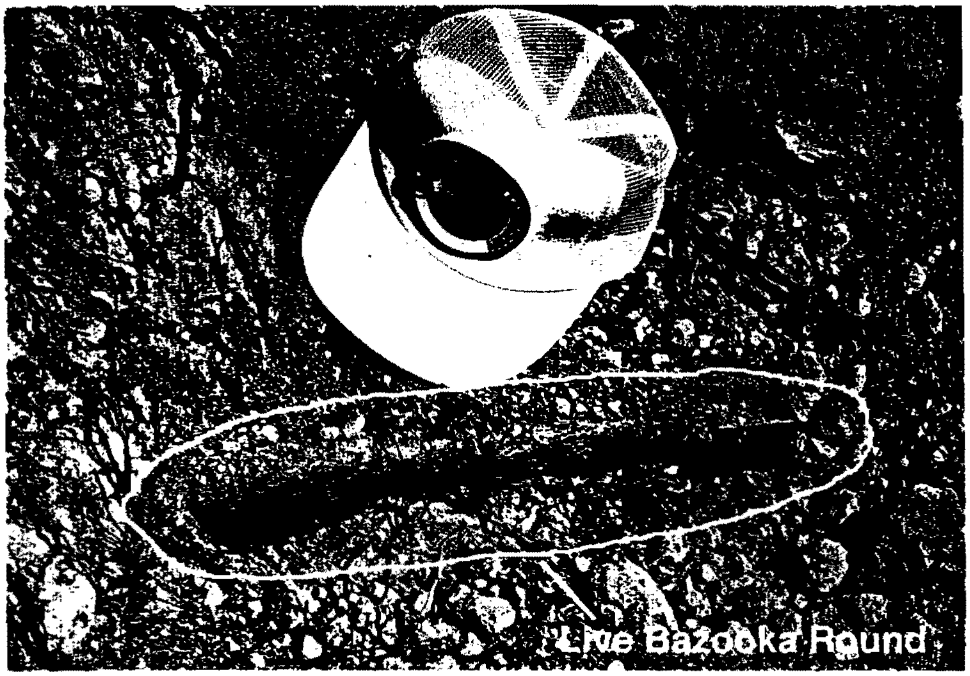

Figure 4-2. Location of field investigations at Bazooka Impact Area.

Bazooka subassemblies (top to bottom)
Rocket motor with fins
Nose cap
Copper slug from shaped charge
Nose cap
HE container from warhead
Rocket motor



(Right) Rocket motors and tailfins from PRS 27-003.

**Figure 4-3. Ordnance debris removed from Bazooka Impact Area.**




Live bazooka round located by UXO team.

Explosive destruction of live bazooka rounds.

**Figure 4-4. Remediation of explosive hazards at Bazooka Impact Area.**

# 36-002

# ATTACHMENTS

## SWMU 36-002 — Sump

### 1.0 Introduction

SWMU 36-002 is located in former Operable Unit (OU) 1130 within Technical Area (TA)-36 at Los Alamos National Laboratory, Los Alamos, New Mexico (Figure 1-1). TA-36 is located in the central portion of the Laboratory (Figure 1-2).

### 1.1 Description

SWMU 36-002 (Figures 1-3, 1-4, and Map 3-002) is a sump located south of Potrillo Drive approximately 655 ft west of the security checkpoint at the entrance to TA-36. The sump was constructed by excavating a pit, 4 ft in diameter by 8 ft deep, within the native soil and tuff. A corrugated metal culvert was placed vertically in the pit. The pit was then filled with pieces of coarse rock (3-in.-diameter) to a depth of 8 ft and covered with a 5-foot-diameter metal covering. The sump served sinks in the Controlled Environment Building, TA-36-48.

### 1.2 No Further Action Basis

SWMU 36-002 is recommended for NFA because it has been characterized in accordance with current applicable state and federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current or future land use.

The results of the Phase I investigation indicated that no chemicals of potential concern harmful to human health were present in SWMU 36-002, the fill material, or the surrounding soils. On June 2, 1995, after a complete review and validation of the analytical data, the excavated material was returned to the sump area, and best effort was made to restore the area to its original condition. The corrugated metal culvert, metal cover, and broken inlet port were removed and disposed of properly.

After reviewing the RFI Work Plan for OU 1130 Potential Release Site 36-002, the US Environmental Protection Agency concurred that SWMU 36-002 be proposed for removal from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit (Attachment A, indicated by an arrow; Attachment B, Response 2) via a Class 3 permit modification request.

### 2.0 History

### 2.1 Historical Operations

Building TA-36-48 was used for shot assembly and temperature-controlled experiments. Depleted uranium was cut, lapped, and polished in the building, and the chemical-resistant sink in the building might possibly have been used to discard acetone, alcohol, HMX (explosive powder), and nitromethane.

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: US EPA, Letter from D. W. Neleigh to T. J. Taylor listing comments for RFI Report for Technical Area 36.

Attachment B: DOE, Letter from T. J. Taylor to B. Driscoll responding to deficiencies for RFI Report for Technical Area 36.

### 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

### 3.2 Results of Sampling/Surveys

Soil samples were taken from beneath the sump starting at 5.5 ft below ground surface and ending at 9.5 ft below surface. The samples were analyzed for volatile organic compounds

(VOCs), semi-volatile organic compounds, high explosives (HE), radionuclides, and metals. Results were compared with health-based screening action levels (SALs) and known background levels of contaminants.

Field screening for VOCs and HE was conducted on all sample material collected. The photoionization detector/flame ionization detector was used to detect VOCs and combustible gases, and the HE spot test was used to screen for the presence of explosives. Portable field instruments were used to screen for alpha-, beta-, and gamma-emitters, and filter swipes were used to screen for radioactivity. All field screening had negative results, that is, the contaminants for which the various instruments were screening were not detected.

Analytical results (see Section 6.1) for concentrations of aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium (total), copper, iron, lead, magnesium, manganese, nickel, potassium, uranium, vanadium, and zinc were below background levels. The highest value of mercury was detected at a concentration at 0.76 ppm in Sample AAB1806. No measured concentrations of PAHs, VOCs, or SVOCs were identified in the analytical results. One HE compound (2,4,6-trinitrotoluene) was detected at a concentration of 0.15 mg/kg in Sample AAB1806.

Sampling and quality assurance results were assessed. Trace amounts of mercury and 2,4,6-trinitrotoluene were found to be present, but comparison of these amounts with backgrounds and/or SALs indicated that the concentrations were no threat to human health or to the environment.

### 3.3 Gaps in Information

Section not applicable.

### 3.4 Risk Evaluation

When analytical results for inorganic constituents were compared with background UTL concentrations, aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium (total), copper, iron, lead, magnesium, manganese, nickel, potassium, uranium, vanadium, and zinc were found to be below background, and on that basis, were eliminated as chemicals of potential concern. The remaining inorganic chemical (mercury) was above background and on that basis was compared with its SAL.

No measured concentrations of PAHs, VOCs, or SVOCs were detected at the sump. One HE compound (2,4,6-trinitrotoluene) was detected for which background concentration data were not available. As a result, this compound was compared with its SAL.

Mercury and 2,4,6-trinitrotoluene had measured concentrations below their respective SALs and on that basis were submitted for a multiple constituent evaluation.

The multiple constituent evaluation showed mercury and 2,4,6-trinitrotoluene in the noncarcinogenic category, with a normalized sum of 0.03. Because this sum was less than 1, exposures to a combination of 0.78 mg/kg of mercury and 0.15 mg/kg 2,4,6-trinitrotoluene are unlikely to produce adverse health effects. Therefore, these analytes were eliminated as contaminants of potential concern. Evaluations for radionuclide and carcinogenic effects were not conducted, because no analytes in these categories were present.

**MULTIPLE CONSTITUENT EVALUATION FOR NONCARCINOGENIC EFFECTS**

| Analyte | Maximum Soil Concentration Mg/Kg | Soil SAL Mg/Kg | Concentration Normalized to SAL Value |
|---|---|---|---|
| Mercury | 0.78 | 24 | 0.03 |
| 2,4,6-Trinitrotoluene | 0.15 | 40 | 0.004 |
| Total | | | 0.03 |

The screening assessment results showed that no human health chemicals of concern (COCs) were identified in the sump. Because no COCs were identified within the sump, subsequent sampling of the areas below and adjacent to the sump to determine migration did not occur.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Sections 1.0 - 3.0, SWMU 36-002 is recommended for NFA under Criterion 5.

## 5.0 References


Department of Energy, December 12, 1995. "Response to the Notice of Deficiency (NOD) for Potential Release Sites in Technical Area 36," Letter to B. Driscoll, NM/Federal Facilities Section, EPA, Region 6, Dallas, Texas from T. J. Taylor, Program Manager, DOE Los Alamos Area Office, Los Alamos, New Mexico.

Environmental Protection Agency Region 6, November 1995. "RFI Report for SWMU 36-002, Los Alamos National Laboratory," letter to T. J. Taylor, Program Manager, Department of Energy, Los Alamos National Laboratory, from D. W. Neleigh, Chief, RCRA New Mexico, Federal Facilities Section, , Dallas, Texas.

Los Alamos National Laboratory, July, 1995. "RFI Report for Operable Unit 1130, Potential Release Sites 36-002," Los Alamos National Laboratory Report LA-UR-95-2390, prepared by ICF Kaiser Engineers, Inc., Los Alamos, New Mexico. (LANL 1995,1338)


## 6.0 Annexes

### 6.1 RFI Analytical Results

## 6.2 Site Map

### 6.3 Other Survey/Investigation Data

Section not applicable.

From microfilm roll
GAMF 1697

Vrescile
File
(Mac)

Attachment A

E. E. Wingfield, Chief,
Administrative Branch

May 12, 1965

E. G. McAndrew, Safety Engineer,
Administrative Branch

RESURVEY OF MUNITIONS IMPACT AREAS AND ORDNANCE RE-ORIENTATION - LOS ALAMOS SCHOOLS - MAY 4, 5, 6 AND 7, 1965

LR:EGM

The semi-annual resurvey of all known munitions impact areas was conducted on May 4, 5, 6 and 7, 1965, together with a re-education of school children in the recognition of ordnance items, blasting caps and dynamite.

Three ordnance experts from the 133rd Ordnance Detachment (ED), U. S. Army, Fort Bliss, Texas, assisted in both of the above activities. The 133rd personnel assigned were:

SP-6 Guy Riga
SP-5 Jackie Howard
SP-4 Richard McGiffin

Student assemblies were held at the following schools:

May 4, 1965 - Canyon, Central, Pueblo and Barranca

May 5, 1965 - High School, Aspen and Pinon

At the High School assembly, in addition to the ordnance recognition program, E. G. McAndrew delivered a half-hour presentation emphasizing the hazards of amateur rocketry stressing the dangers of formulating missile fuel and the perils and tragedies resulting from unsupervised chemical experiments.

May 6, 1965 - Mountain, Pajarito, Cumbres, and Mesa

Adm. Br.
McAndrew:cra
5-12-65

(continued)

1697 181-6

An estimated 4,184 students attended the assemblies. The program included a talk by the Army personnel, the showing of a film, "Blasting Caps - Danger" (American Institute of Explosive Manufacturers) and the display and explanation of two exhibits: one of Army ordnance items and one of blasting caps and dynamite. The blasting cap exhibit was given to Pinon School for permanent display.

As a follow-up of the program, a 50 caliber machine gun shell was picked up at 1207 7th Street (primer unfired). A mine detector sweep of a reported burial of a 60 mm shell at 2292-B 48th Street with negative results, an investigation of a reported balsting cap in a canyon (unfounded), and a telephone inquiry was made to a parent relative to a shell at home.

The garden area at 227 El Conejo (where practice mortar shell was found April 17, 1965) was swept with a mine detector. Pieces of cans, nails and pipes were found, but no ordnance items were detected.

The resurvey of the impact ranges resulted in the removal of 6 tail assemblies of expended bazookas at the Pajarito Canyon impact site, the removal of two tail assembly shrouds at Barranca and the removal of piece of shrapnel from an exploded 60 mm mortar at Rendija Canyon Site.

Fences and signs at Pajarito, Rendija and cliff north of Rendija were examined and determined to be intact and legible.

The fence at Barranca Site was found to have been damaged by a fallen tree at the top of the Canyon rim in the rear of 117 El Corto, (a work request for repair has been issued).

Sandia Canyon and Pajarito Canyon were swept for the purpose of detecting hidden caches of ordnance with no success. Both the Army detecting set mine, portable, metallic, Model P-153, and an "Electronic Witch" M-Scope (Fisher Instrument Co.) were used with negative results. Clarence Courtright, LASL, H-3, assisted in the Sandia search.

(continued)

Attachment A



A detector search was made of a reported cistern burial site on Barranca Mesa where metal from wartime experiments was buried. The cistern was located but the mine detector readings were negative. Digging out the dirt fill is being considered. The assistance of James E. Greenwood, SD-1, LASL, Henry Filip, N-1, wartime LASL employees, who had personal knowledge of the cistern location and contents was secured, together with the assistance of Clarence Courtright, H-3.

1697 : 1810

Attachment B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

SEP 28 1995

Mr. Theodore J. Taylor
Program Manager
Department of Energy
Los Alamos National Laboratory
Los Alamos, NM 87544

Re: RFI Report Technical Areas 18 and 27
Los Alamos National Laboratory (NM 0890010515)

Dear Mr. Taylor:

The Environmental Protection Agency (EPA) has reviewed your RCRA Facility Investigation Report for Potential Release Sites in Technical Areas 18 and 27, and found it to be deficient. Enclosed is a list of deficiencies which you have 60 days to respond to.

Should you have any questions, please feel free to contact Ms. Barbara Driscoll at (214) 665-7441.

Sincerely,

for David W. Neleigh, Chief
RCRA New Mexico - Federal
Facilities Section

Enclosures

cc: Mr. Benito Garcia
New Mexico Environment Department
Mr. Jorg Jansen
Los Alamos National Laboratory, MS M992

Attachment B

**List of Deficiencies**
**Los Alamos National Laboratory**
**Operable Unit 1093**
**Technical Areas 18 and 27**

**General Comments:**

1. EPA agrees that LANL may request a Class 3 permit modification for removal of the following units from the HSWA portion of the permit:

   27-003
   27-001
   18-007
   18-001(c)

2. **3.2.2 Soils, p. 3-4** - LANL should provide the locations and relevant information of any soil samples collected for the background database which were collected near the location of Technical Areas 18 and 27.

3. **3.6 Waste Criteria, p. 3-6** - Using the stated approach for TC screening levels is only acceptable for solid wastes/soils which contain no liquids.

4. **4.2.3 Evaluation of Results, p. 4-11** - EPA would prefer that the analytical results that are in question be included in the evaluation of results section for each SWMU, not in a different section several pages away.

5. **Figure 4-8, p. 4-12** - Please include the sampling identification number for each sample point taken.

6. **4.4.3 Evaluation of Results, p. 4-30** - One electromagnetic anomaly was detected; however, LANL did not make a determination if material was actually buried at the location. LANL should have followed through to determine what the anomaly was whether or not LANL thought the anomaly was the actual guns they were looking for.

7. **Appendix A** - EPA will provide separate comments related to the background study. LANL should be aware that their approach used for calculating the upper tolerance limit was not acceptable to EPA.

| PRS | Sample Number | Sample Type | Units | Metals | Radionuclides | SVOCs | VOCs | High Explosives | SALs | Control Required Quantifaction Limit | Background |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 36-002 | AAB1801 | Soil | mg/kg | 6140 Aluminum(J) | | ND | ND | ND | ~ | 40 | 58900 |
| Sump | | | mg/kg | 1.1 Arsenic | | | | | ~ | 2 | 11.1 |
| | | | mg/kg | 84.3 Barium | | | | | 5600 | 40 | 1140 |
| | | | mg/kg | 0.55 Beryllium(J) | | | | | NC | 1 | 3.31 |
| | | | mg/kg | 0.7 Cadmium | | | | | 80 | 1 | 2.7 |
| (5 samples) | | | mg/kg | 59.0 Calcium | | | | | ~ | 1000 | 54400 |
| | | | mg/kg | 11.8 Chromium | | | | | 400 | 10 | 51.1 |
| | | | mg/kg | 10.6 Copper | | | | | 3000 | 5 | 15.7 |
| | | | mg/kg | 7500 Iron | | | | | ~ | 20 | 35600 |
| | | | mg/kg | 30.4 Lead | | | | | 400 | 0.6 | 39 |
| | | | mg/kg | 1200 Magnesium | | | | | ~ | 1000 | 16100 |
| | | | mg/kg | 317 Manganese | | | | | 11000 | 3 | 1030 |
| | | | mg/kg | 0.38 Mercury* | | | | | 24 | 0.04 | 0.1 |
| | | | mg/kg | 4.4 Nickel | | | | | 1600 | 8 | 26.7 |
| | | | mg/kg | 1110 Potassium | | | | | ~ | 1000 | 6180 |
| | | | mg/kg | 10.8 Vanadium | | | | | 560 | 10 | 66 |
| | | | mg/kg | 1160 Zinc | | | | | 24000 | 4 | 101 |
| | | | mg/kg | | 0.14 U (Total) | | | | 160 | N/A | 2.09 |
| 36-002 | AAB1802 | Soil | mg/kg | 3940 Aluminum (J) | | ND | ND | ND | ~ | 40 | 58900 |
| (continued) | | | mg/kg | 1.3 Arsenic | | | | | ~ | 2 | 11.1 |
| | | | mg/kg | 6.6 Barium | | | | | 5600 | 40 | 1140 |
| | | | mg/kg | 0.64 Beryllium(J) | | | | | NC | 1 | 3.31 |
| | | | mg/kg | 1570 Calcium | | | | | ~ | 1000 | 54400 |
| | | | mg/kg | 3.7 Chromium | | | | | 400 | 10 | 51.1 |
| | | | mg/kg | 4.8 Copper | | | | | 3000 | 5 | 15.7 |
| | | | mg/kg | 4910 Iron | | | | | ~ | 20 | 35600 |
| | | | mg/kg | 7.6 Lead | | | | | 400 | 0.6 | 39 |
| | | | mg/kg | 1030 Magnesium | | | | | ~ | 1000 | 16100 |
| | | | mg/kg | 274 Manganese | | | | | 11000 | 3 | 1030 |
| | | | mg/kg | 0.1 Mercury | | | | | 24 | 0.04 | 0.1 |
| | | | mg/kg | 940 Potassium | | | | | ~ | 1000 | 6180 |
| | | | mg/kg | 8 Vanadium | | | | | 560 | 10 | 66 |
| | | | mg/kg | 129 Zinc | | | | | 24000 | 4 | 101 |
| | | | mg/kg | | 0.11 U (Total) | | | | 160 | NA | 2.09 |

Maximum concentrations in **boldface**
*Values at or above background UTL
(J) = Estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable, ~ = Not Avail
ND = None Detected
TNT= 2,4,6-Trinitrotoluene





Analytical Results

| PRS | Sample Number | Sample Type | Units | Metals | Radionuclides | SVOCs | VOCs | High Explosives | SALs | Control Required Quantification Limit | Background |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 36-002 | AAB 1803 | Soil | mg/kg | 2210 Aluminum(J) | | ND | ND | ND | ~ | 40 | 58900 |
| (continued) | | | mg/kg | 60.8 Barium | | | | | 5600 | 40 | 1140 |
| | | | mg/kg | 0.54 Beryllium(J) | | | | | NC | 1 | 3.31 |
| | | | mg/kg | 1450 Calcium | | | | | ~ | 1000 | 54400 |
| | | | mg/kg | 7.4 Chromium | | | | | 400 | 10 | 51.1 |
| | | | mg/kg | 7.6 Copper | | | | | 3000 | 5 | 15.7 |
| | | | mg/kg | 3300 Iron | | | | | ~ | 20 | 35600 |
| | | | mg/kg | **31.7 Lead** | | | | | 400 | 0.6 | 39 |
| | | | mg/kg | 721 Magnesium | | | | | ~ | 1000 | 16100 |
| | | | mg/kg | **184 Manganese** | | | | | 11000 | 3 | 1030 |
| | | | mg/kg | 0.48 Mercury* | | | | | 24 | 0.04 | 0.1 |
| | | | mg/kg | **606 Potassium** | | | | | ~ | 1000 | 6180 |
| | | | mg/kg | **8.6 Vanadium** | | | | | 560 | 10 | 66 |
| | | | mg/kg | 177 Zinc | | | | | 24000 | 4 | 101 |
| | | | mg/kg | | 0.1 U (Total) | | | | 160 | NA | 2.09 |
| 36-002 | AAB1805 | Soil | mg/kg | 3270 Aluminum(J) | | ND | ND | ND | ~ | 40 | 58900 |
| (continued) | | | mg/kg | 30.4 Barium | | | | | 5600 | 40 | 1140 |
| | | | mg/kg | 1270 Calcium | | | | | ~ | 1000 | 54400 |
| | | | mg/kg | 4.9 Chromium | | | | | 400 | 10 | 51.1 |
| | | | mg/kg | **5320 Iron** | | | | | ~ | 20 | 35600 |
| | | | mg/kg | 2.6 Lead | | | | | 400 | 0.6 | 39 |
| | | | mg/kg | **976 Magnesium** | | | | | ~ | 1000 | 16100 |
| | | | mg/kg | 129 Manganese | | | | | 11000 | 3 | 1030 |
| | | | mg/kg | 0.27 Mercury* | | | | | 24 | 0.04 | 0.1 |
| | | | mg/kg | 5.6 Vanadium | | | | | 560 | 10 | 66 |
| | | | mg/kg | 66.2 Zinc | | | | | 24000 | 4 | 101 |
| | | | mg/kg | | 0.1 U (Total) | | | | 160 | NA | 2.09 |
| 36-002 | AAB1806 | Soil | mg/kg | **3300 Aluminum** | | ND | ND | ND | ~ | 40 | 58900 |
| (continued) | | | mg/kg | 44.4 Barium | | | | | 5600 | 40 | 1140 |
| | | | mg/kg | **1890 Calcium** | | | | | ~ | 1000 | 54400 |
| | | | mg/kg | 7.2 Chromium | | | | | 400 | 10 | 51.1 |
| | | | mg/kg | 5.1 Copper | | | | | 3000 | 5 | 15.7 |
| | | | mg/kg | 4190 Iron | | | | | ~ | 20 | 35600 |
| | | | mg/kg | 8.4 Lead | | | | | 400 | 0.6 | 39 |
| | | | mg/kg | 712 Magnesium | | | | | ~ | 1000 | 16100 |
| | | | mg/kg | 171 Manganese | | | | | 11000 | 3 | 1030 |
| | | | mg/kg | **0.76 Mercury*** | | | | | 24 | 0.04 | 0.1 |
| | | | mg/kg | 540 Potassium | | | | | ~ | 1000 | 6180 |
| | | | mg/kg | 5.9 Vanadium | | | | | 560 | 10 | 66 |
| | | | mg/kg | 127 Zinc | | | | | 24000 | 4 | 101 |
| | | | mg/kg | | 0.1 U (Total) | | | | 160 | NA | 2.09 |
| | | | mg/kg | | | | | 0.15 TNT | 40 | ~ | ~ |

Maximum concentrations in **boldface**
*Values at or above background UTL
(J) = Estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable; ~ = Not Avail
ND = None Detected
TNT= 2,4,6-Trinitrotoluene

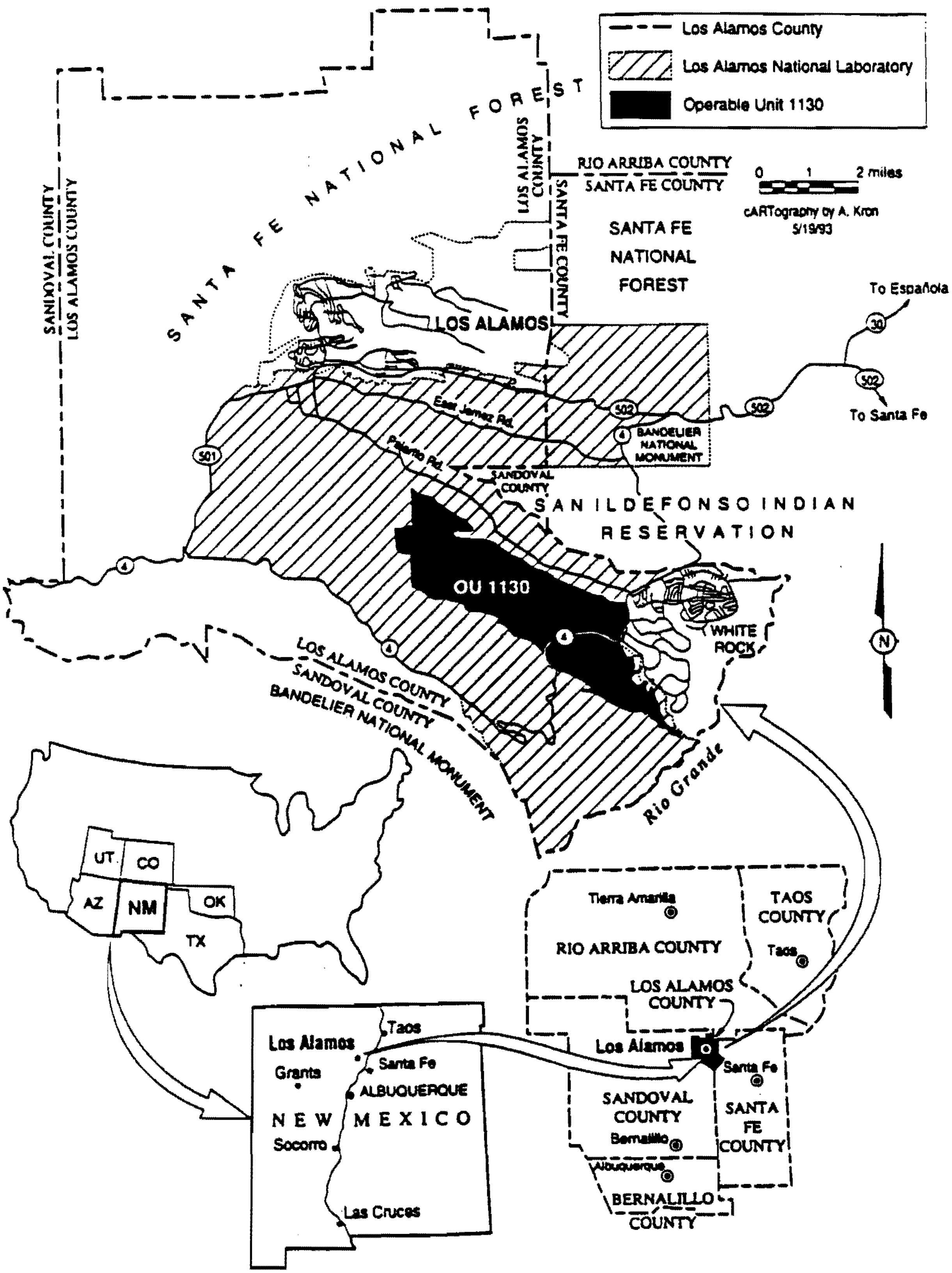



**Figure 1-1. Location map of formerly designated OU 1130 within Los Alamos National Laboratory, Los Alamos County, New Mexico**

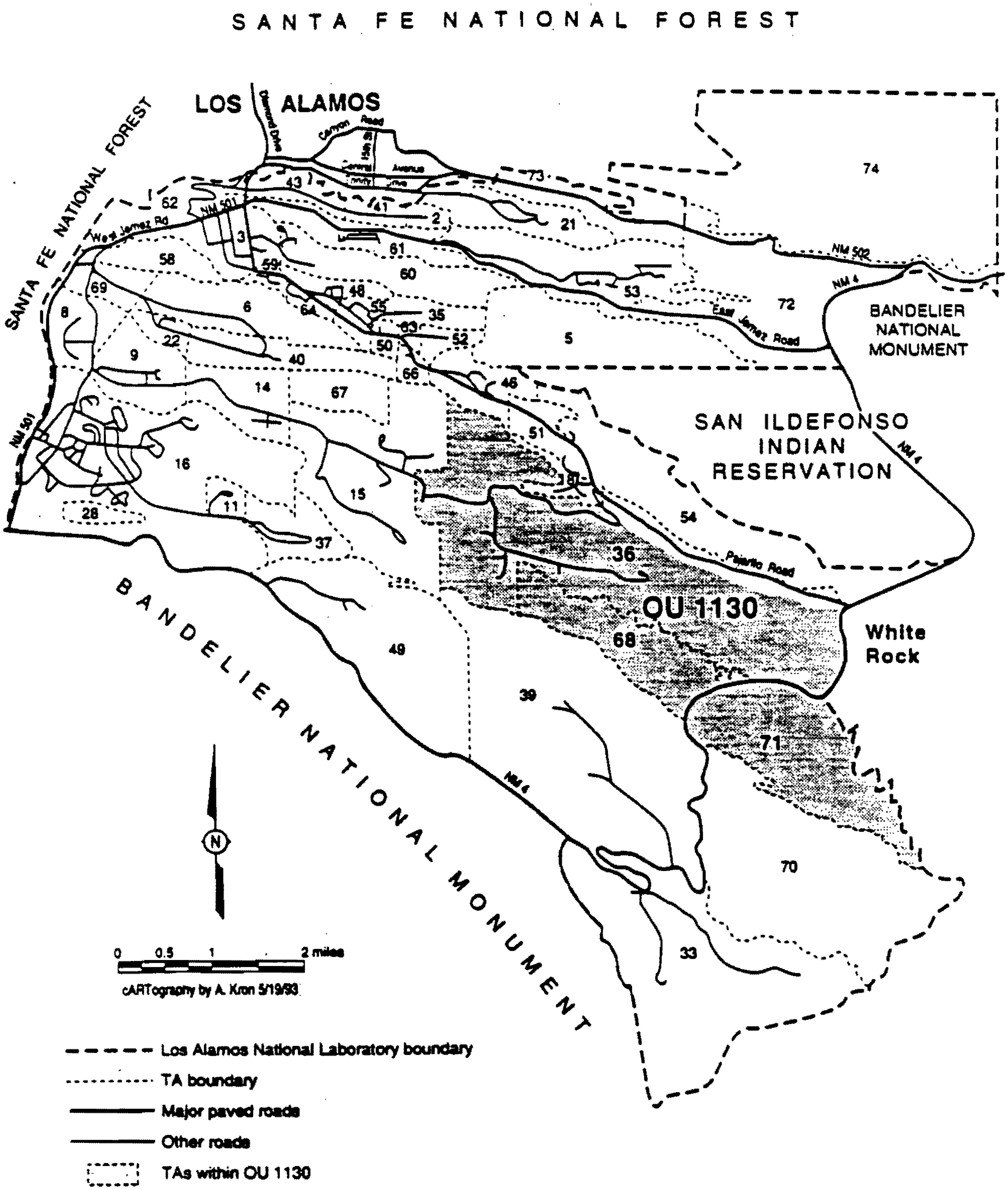



Figure 1-2. Location of formerly designated OU 1130 with respect to Laboratory TAs and surrounding landholdings

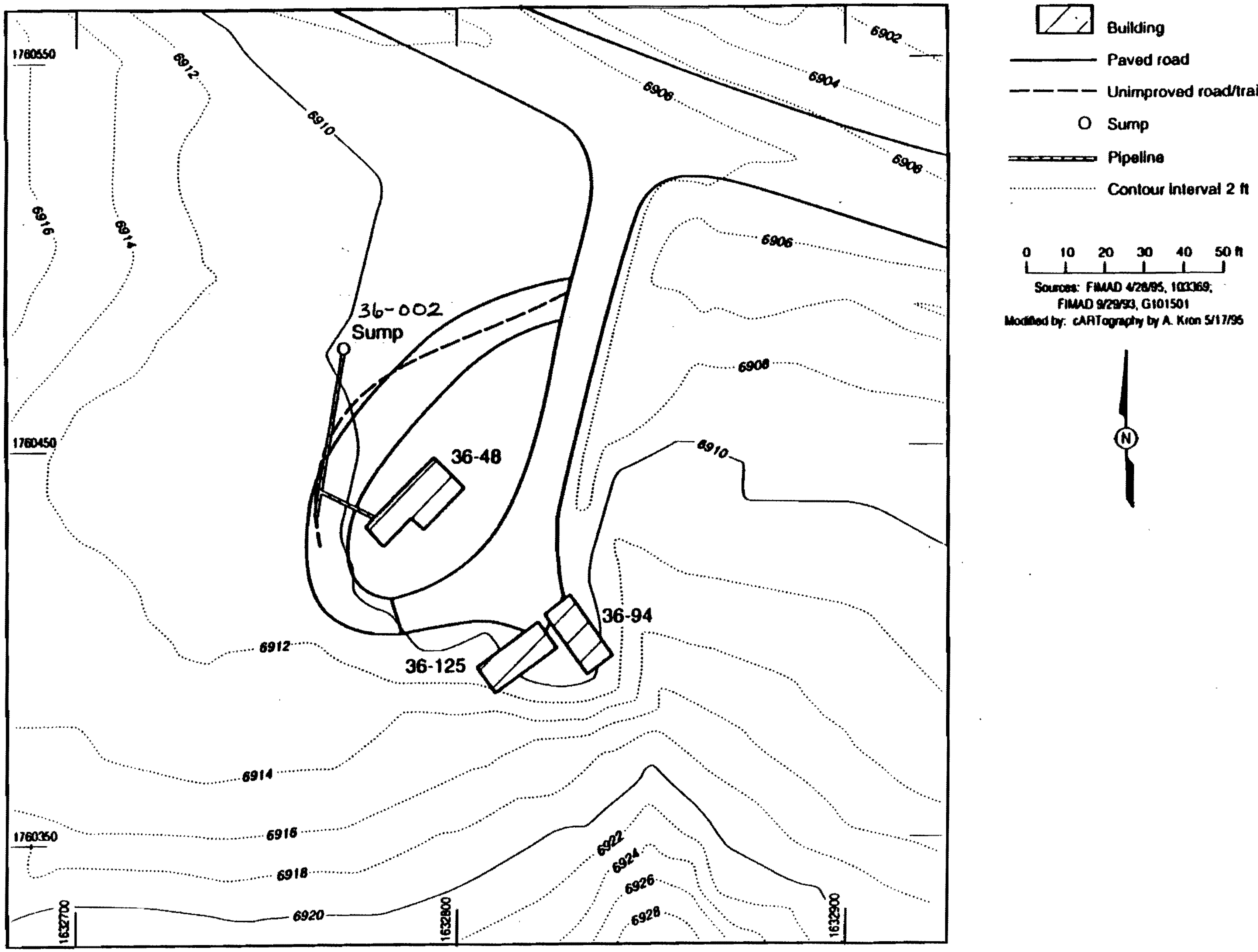



**Figure 1-3. Location of TA-36-48 and sump**

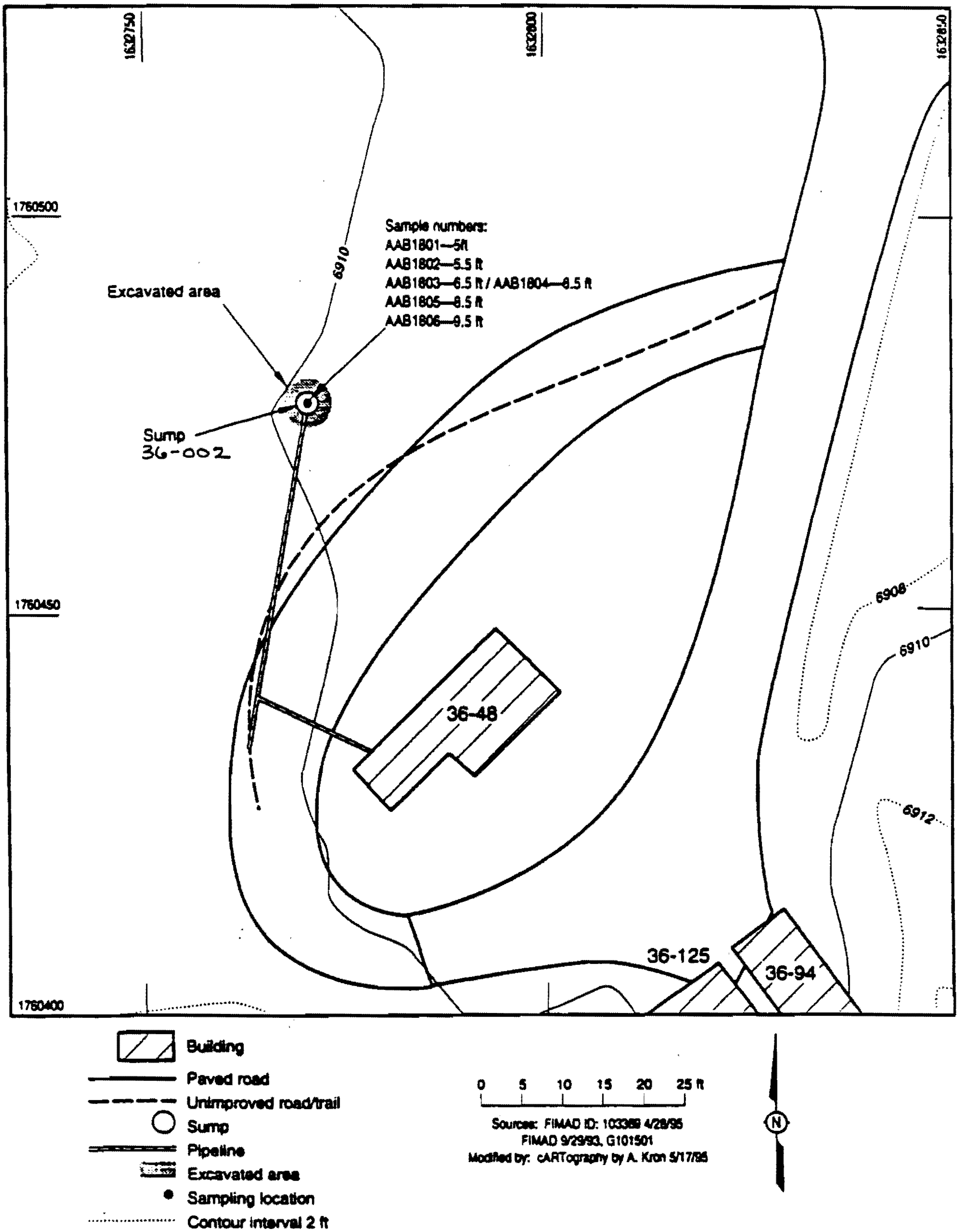



**Figure 1-4. Sump with sample location and identifiers**

# 52-002(e)

# ATTACHMENTS

## SWMU 52-002(e) — Septic Tank and Seepage Pit (Active)

## 1.0 Introduction

### 1.1 Description

In the SWMU Report (LANL 1990, 0145) (Attachment A), SWMU 52-002(e) is described as an active 1,000-gallon septic tank, TA 52-49, and its associated seepage pit, TA 52-50. The septic tank/seepage pit were located in the western portion of Technical Area 52 (LANL ENG R 5129) (Attachment B). In May of 1989, the western portion of TA-52 was reassigned as TA-63; septic tank TA-52-49 and its associated seepage pit, TA-52-50, were consequently reassigned as structures TA-63-12 and TA-63-13 (LANL ENG R AB191) (Attachment C). The Structure Number Log maintained by LANL's Facility Engineering Department recorded that structures TA-52-49 and TA-52-50 were renumbered as TA-63-12 and TA-63-13 (Attachment D).

The SWMU Report, however, failed to consider the reassignment of the western portion of TA-52. It not only included the reassigned area as a portion of TA-52 (as described above and as shown in Attachment A), but it also included that same area under its new designation of TA-63. As a component of TA-63, the 1,000-gallon septic tank and its associated seepage pit, TA-63-12, was assigned a second SWMU number, 63-001(a) (LANL 1990, 0145) (Attachment E). Thus, the septic tank/seepage pit received two different SWMU numbers, 52-002(e) and 63-001(a). The Field Unit opted to retain the number 63-001(a) for investigating the SWMU.

### 1.2 No Further Action Basis

SWMU 52-002(e) is recommended for NFA because it is a duplicate SWMU and has been investigated as SWMU 63-001(a) in the RFI Work Plan for OU 1129 (LANL 1992, 1129, pp. 3-134 and 3-135, 7-134 through 7-138). Copies of the SWMU Report descriptions of both SWMUs (Attachments A and E) and Engineering Records (Attachments B, C and D) have been included for verification of the error.

The US Environmental Protection Agency reviewed and approved the RFI Work Plan for OU 1129 (Attachment F). In light of that approval and the presentation made above, we are requesting that SWMU 52-002(e) be removed from the HSWA Module of the Laboratory's Hazardous Waste Facility Permit via a Class 3 permit modification.

## 2.0 History

### 2.1 Historical Operations

Active Septic System

### 2.2 Previous Audits, Inspections, and Findings

Attachment A: LANL, November 1990. "Solid Waste Management Units Report," page 52-002.

Attachment B: LANL, Engineering Drawing ENG R 5129.

Attachment C: LANL, Engineering Drawing ENG R AB191.

Attachment D: LANL, Engineering Structure Number Log.

Attachment E: LANL, November 1990. "Solid Waste Management Units Report," page 63-001.

Attachment F: US EPA, Letter from A.M. Davis. to J. C. Vozella approving OU 1129 RFI Work Plan.

## 3.0 Evaluation of Relevant Evidence

### 3.1 Unit Characteristics and Operating Practices

Section not applicable.

## 3.2 Results of Sampling/Surveys

Section not applicable.

## 3.3 Gaps In Information

Section not applicable

## 3.4 Risk Evaluation

Section not applicable.

## 4.0 Rationale for No Further Action Decision

Based on evidence outlined in Section 1.0, SWMU 52-002(e) is recommended for NFA under Criterion 1.

## 5.0 References

Environmental Protection Agency Region 6, November 1993. "RFI Work Plan for OU 1129, Approval, Los Alamos National Laboratory," letter to J. C. Vozella, Acting Chief, Environment, Safety and Health Branch, Department of Energy, Los Alamos Area Office, from A.M. Davis, Director, Hazardous Waste Management Division (6H), Dallas, Texas.

Los Alamos National Laboratory, "Structure Number Log," Facillity Engineering Department, Los Alamos, New Mexico.

Los Alamos National Laboratory, July 1995. "RFI Work Plan for Operable Unit 1129, ," Los Alamos National Laboratory Report LA-UR-92-800, Los Alamos, New Mexico. pp 3-115, 3-134, 3-135, 7-134, 7-138

Los Alamos National Laboratory, November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico, p 52-002 and 63-001. (LANL 1990, 0145)

Los Alamos National Laboratory, "Solid Waste Management Units (SWMUs) in TA-52," Drawing No. ENG R 5129, (September 28, 1983).

Los Alamos National Laboratory, "Sanitary Sewer System, TA-63," Drawing No. ENG R AB191, (March 30, 1994).

## 6.0 Annexes

## 6.1 RFI Analytical Results

Section not applicable.

## 6.2 Site Map

Section not applicable.

## 6.3 Other Survey/Investigation Data

Section not applicable.

Attachment A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

NOV 07 1995

CERTIFIED MAIL: RETURN RECEIPT REQUESTED

Mr. Theodore J. Taylor
Program Manager
Department of Energy
Los Alamos Area Office
Los Alamos, NM 87544

Re: RFI Report for SWMU 36-002
Los Alamos National Laboratory (NM0890010515)

Dear Mr. Taylor:

The Environmental Protection Agency (EPA) has reviewed the RFI Report dated July 14, 1995, for Technical Area 36, solid waste management unit 36-002. Enclosed are several comments concerning the quality of the report and the sampling and analysis conducted at this site. Los Alamos National Laboratory (LANL) needs to respond to the concerns issued in comment number two within thirty days of receipt of this letter. [LANL may request a Class 3 permit modification for this unit.]

Should you have any questions, please feel free to contact Ms. Barbara Driscoll at (214) 665-7441.

Sincerely,

David Neleigh, Chief
New Mexico and Federal
Facilities Section

Enclosure

cc: Mr. Benito Garcia
New Mexico Environment Department
Mr. Jorg Jansen
Los Alamos National Laboratory, MS M992

Attachment A

**Comments**
**RFI Report Technical Area 36**
**Los Alamos National Laboratory**

1. Figure 1-4 : The figure for the sump should fill this entire page which would allow for clearly indicating where sample locations were taken. A cross-sectionally view should also be provided indicating the depth of samples.

2. EPA has not approved the HE analytical method used for this site, USTHAMA LW12. EPA SW-846 Method 8330 is the approved method, and has gone through rigorous peer review, use and testing by multiple laboratories to be approved. LANL should be using this method for all HE analysis for which the method is appropriate, unless there was a form of HE used at the site such as PETN for which the method does not apply. Use of other than the approved methods for analysis may result in resampling and analysis. LANL needs to provide an explanation for using this alternative method without prior EPA approval.

3. EPA is not commenting on the UTL, human health risk or ecological risk assessments described in this report. These comments have already been provided in numerous documents, and the approaches used in this report are not approved.

Attachment B

# Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

*University of California*
Environmental Restoration, MS M992
Los Alamos, New Mexico 87545
505-665-4557
FAX 505-665-4747

*U. S. Department of Energy*
Los Alamos Area Office, MS A316
Los Alamos, New Mexico 87544
505-665-7203
FAX 505-665-4504

*Date:* December 12, 1995
*Refer to:* EM/ER:95-693

Ms. Barbara Driscoll
NM/Federal Facilities Section
Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

**SUBJECT: RESPONSE TO THE NOTICE OF DEFICIENCY (NOD) FOR POTENTIAL RELEASE SITES IN TECHNICAL AREA 36**

Dear Barbara:

Enclosed is the Los Alamos National Laboratory's response to the Environmental Protection Agency's NOD on the Resource Conservation and Recovery Act Facility Investigation report for potential release site in Technical Area 36 (former operable unit 1130). A certification form signed by the appropriate officials is also enclosed. This response is due to your office on December 13, 1995.

Please contact Gene Gould at 505-667-0402 or Everett Trollinger at 505-667-5801 if you have any questions about the response to this NOD.

Sincerely,

Jorg Jansen, Project Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

JJ/TT/am

Environmental Restoration

Enclosures: OU 1130 NOD Responses

Cy (w/enc.):
B. Garcia, NMED-HRMB
D. Griswold, ERD, AL, MS A906
G. Gould, ESA-DE, MS G787
J. Harry, EM/ER, MS M992
B. Hoditschek, NMED-HRMB
R. Kern, NMED-HRMB
E. Merrill, EM-453, DOE-HQ
T. Taylor, LAAO, MS A316
E. Trollinger, LAAO, MS A316
N. Weber, Bureau Chief, NMED-AIP
J. White, ESH-19, MS K498
S. Yanicak, NMED-AIP
EM/ER File, MS M992
RPF, MS M707

Cy (w/o enc.):
T. Baca, EM, MS J591
T. Glatzmaier, DDEES/ER, MS M992
D. McInroy, EM/ER, MS M992
G. Rael, ERD, AL, MS A906
W. Spurgeon, EM-453, DOE-HQ
J. Vozella, LAAO, MS A316

## Attachment B

## CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title: Response To The Notice Of Deficiency For Potential Release SiteIn Technical Area 36

Name: ______________________ Date: 12/11/95

Jorg Jansen, Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

or

Tom Baca, Program Director
Environmental Management
Los Alamos National Laboratory

Name: ______________________ Date: 12/12/95

Joseph Vozella,
Acting Assistant Area Manager of
Environment Projects
Environment, Safety, and Health Branch
DOE-Los Alamos Area Office

or

Theodore J. Taylor
Program Manager
Environment Restoration Program
DOE-Los Alamos Area Office

**Attachment B**

**Response to Notice of Deficiency dated 11/7/95 from US Environmental Protection Agency**

**RFI Report For PRS 36-002**

1. Figure 1-4 has been revised to show more detail from the top and side view. See revised Figure 1-4.

2. This RFI mistakenly reported that the US Army Toxic and Hazardous Material Agency (USATHAMA) method was used for analyzing the high explosives samples. In fact, data package results indicate that EPA SW-846 Method 8330 was used for the analyses. Field Unit 2 personnel are aware that the USATHAMA is not approved by EPA and will specificy the use of EPA SW-846 Method 8330 in the future for analyzing the high explosives samples.

3. LANL's Environmental Restoration Project will programmatically address the EPA's concerns and issues regarding the conduct of human health and environment risk assessments based on the EPA risk assessment meeting held at LANL in September of this year.

## Attachment B

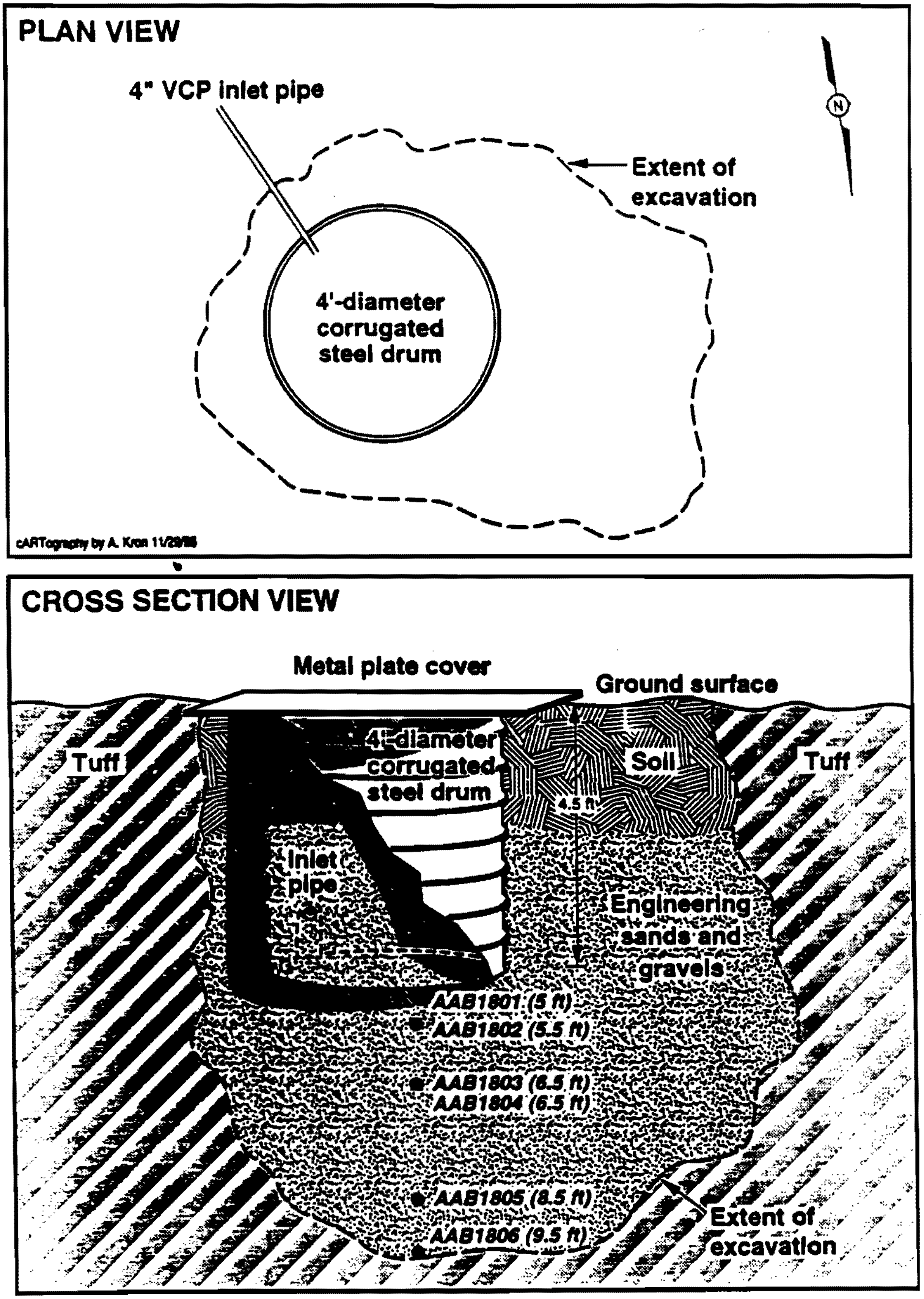



Figure 1-4. Sampling details for SWMU 36-002.

# APPENDIX A

# ATTACHMENT 1

# Attachments Common to Several HSWA Units

## Attachment A



### SUMMARY

| | |
|---|---|
| LOCATION | : TA-52 |
| TYPE OF UNIT(s) | : SEPTIC SYSTEM |
| UNIT USE | : TREATMENT/DISPOSAL |
| OPERATIONAL STATUS | : ACTIVE |
| PERIOD OF USE | : SEE BELOW |
| HAZARDOUS RELEASE | : NONE |
| RADIOACTIVE RELEASE | : NONE |

MATERIALS MANAGED : SANITARY WASTE
SUSPECTED HAZARDOUS WASTE

### UNIT INFORMATION

Several active septic systems are present at TA-52:

| SWMU NO. | STRUCTURE NO. | PERIOD OF USE | CAPACITY | OVERFLOW | ASSOCIATED STRUCTURE |
|---|---|---|---|---|---|
| 52-002(a) | TA-52-3 | 1963 - present | 2,580 gal. | leach field/ drainline | Distribution Box TA-52-4 |
| 52-002(b) | TA-52-34(a) | 1983 - present | 2,000 gal. | seepage pit | Tanks TA-52-97 and -98 |
| | TA-52-34(b) | 1983 - present | 2,000 gal. | seepage pit | Seepage pit received effluent from TA-52-34(a) and (b) |
| 52-002(b) | TA-52-97 | ? - present | 2,500 gal. | unknown | TA-52-34 |
| 52-002(b) | TA-52-98 | ? - present | 1,000 gal. | unknown | TA-52-34 |
| 52-002(c) | TA-52-46 | 1984 - ? | 500 gal. | unknown | |
| 52-002(d) | TA-52-47 | 1984 - ? | 500 gal. | unknown | |
| 52-002(e) | TA-52-49 | est. 1984 - present | 1,000 gal. | seepage pit | Seepage Pit TA-52-50 |
| 52-002(f) | TA-52-99 | ? - present | 2,500 gal. | seepage pit | |
| 52-002(g) | TA-52-95 | ? - present | 3,000 gal. | holding tank | |

The overflow from tank TA-52-3 goes to a leach field located 230 ft north of TA-52-1. The field may be saturated, and the tank is routinely pumped. The 1987 EID "Registration of an Unpermitted Individual Liquid Waste System" indicates that a 300-ft long drainline has replaced the leach field. The EID Registration Number is LA-54. The seepage pit for both TA-52-34 tanks is not working (it may be overloaded) so that the TA-52-34 tanks are routinely pumped, and the tanks that discharge into TA-52-34 (TA-52-97 and -98) are occasionally pumped. Tanks TA-52-34(a) and (b) have EID Registration Numbers LA-57 and LA-58. Tanks TA-52-97 and -98 have EID Registration Numbers LA-55 and LA-56. Septic systems TA-52-46 and -47 are believed to be actively serving the TA-52 transportables. Septic tank TA-52-49 and seepage pit TA-52-50 serve maintenance shop TA-0-155. Sanitary septic system TA-52-97 is thought to serve TA-52-45, a transportable office building. It is frequently pumped and also believed to discharge into septic system TA-52-34. TA-52-98 is reportedly serving transportable office building TA-52-44. Septic tank system TA-52-99 served transportables TA-52-35 and -36. Septic system TA-52-99 has EID Registration Number LA-59. The 1988 ER Program radiation screening measurements taken in the general area of TA-52-3, -97, -98, and -99 were found to be at background levels. Engineering records indicated the placement of tanks TA-52-46 and -47, however, further information as to their locations is not available.

### WASTE INFORMATION

The tanks presently handle only sanitary waste and the laboratory staff believe that it is unlikely the tanks (and associated seepage pits) have ever received radioactive material. Tanks TA-52-3 and -49, distribution box TA-52-4, and seepage pit TA-52-50 may be suspect for solvents and chemicals discharged in previous years from the UHTREX building, TA-52-1.

### RELEASE INFORMATION

It is unknown whether hazardous releases have occurred from these septic systems.

### NOTES

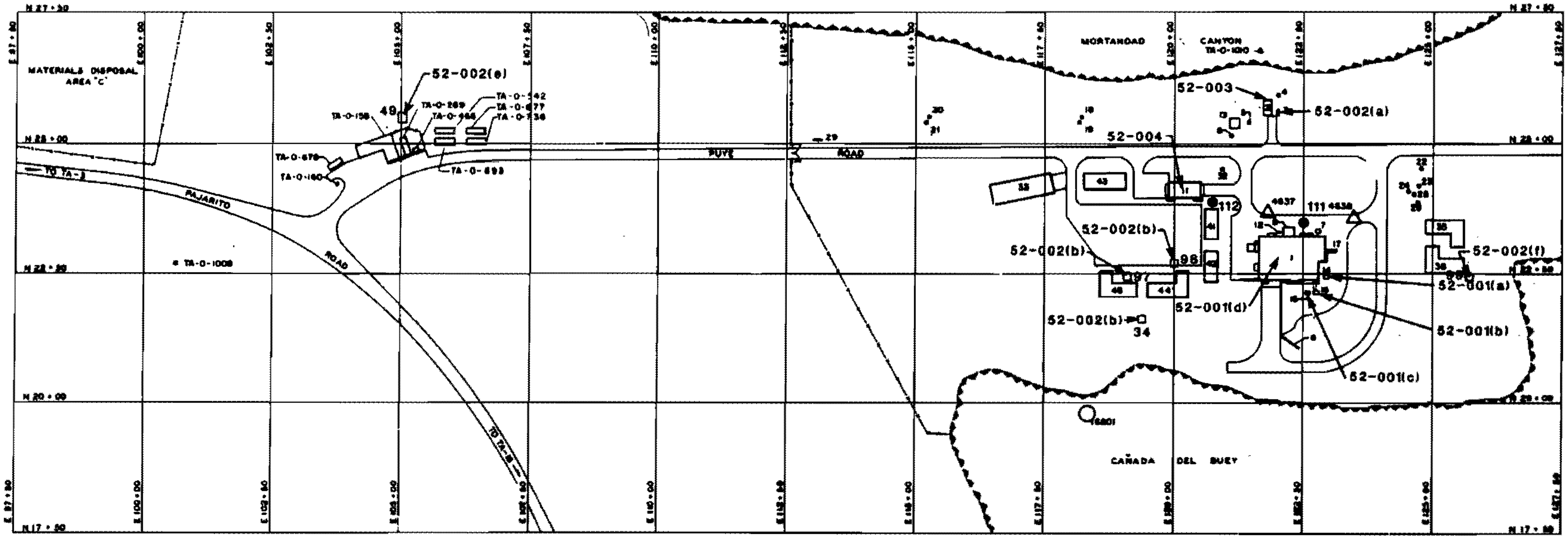
The TA-52-3 septic system includes TA-53-4 distribution box, which was formerly 52-002(b). The tank and distribution box are combined as a single unit, 52-002(a). Septic system TA-52-34 consists of 4 septic tanks [TA-52-34(a), (b), TA-52-97, and TA-52-98], a seepage pit, and an outfall. All of these have been combined into one unit: 52-002(b). Septic tank TA-52-154 is now in TA-63; see 63-001(b).

(continued)

## SWMU CROSS-REFERENCE LIST

| SWMU NUMBER | CEARP IDENTIFICATION NUMBER(S) | RFA UNIT | E.R. RELEASE SITE INFO. | ASSOCIATED STRUCTURES |
|---|---|---|---|---|
| 52-002(a) | TA52-2-CA/S/UST/ST-I/A-HW/RW | ? 52.002 | Tsk 7 : 136 | TA-52-3, -4 |
| 52-002(b) | TA52-2-CA/S/UST/ST-I/A-HW/RW | | Tsk 7 : 144 138 139 | TA-52-34, -97, -98 |
| 52-002(c) | TA52-2-CA/S/UST/ST-I/A-HW/RW | | Tsk 7 : 141 | TA-52-46 |
| 52-002(d) | TA52-2-CA/S/UST/ST-I/A-HW/RW | | Tsk 7 : 142 | TA-52-47 |
| 52-002(e) | TA52-2-CA/S/UST/ST-I/A-HW/RW | | Tsk 7 : 143 | TA-52-49, -50 |
| 52-002(f) | TA52-2-CA/S/UST/ST-I/A-HW/RW | | Tsk 7 : 140 | TA-52-99 |
| 52-002(g) | ** | | | TA-52-95 |
| | | | | TA-0-462 |

? Indicates uncertainty with RFA Unit correlation.
** No corresponding E. R. Program unit.




LEGEND: ARCHY SITE STATUS

△ EXCAVATED

○ UNEXCAVATED

FIGURE 52-1

SOLID WASTE MANAGEMENT UNITS (SWMUs) IN TA-52

REV.1 04/03/90

1" = 100'

GRAPHIC SCALE

## EXPLANATION

52-001 SWMU LOCATION

010 LOCATION OF OUTFALL INDICATING ASSOCIATED PIPING AND NPDES SERIAL NUMBERS (SEE APPENDIX A)

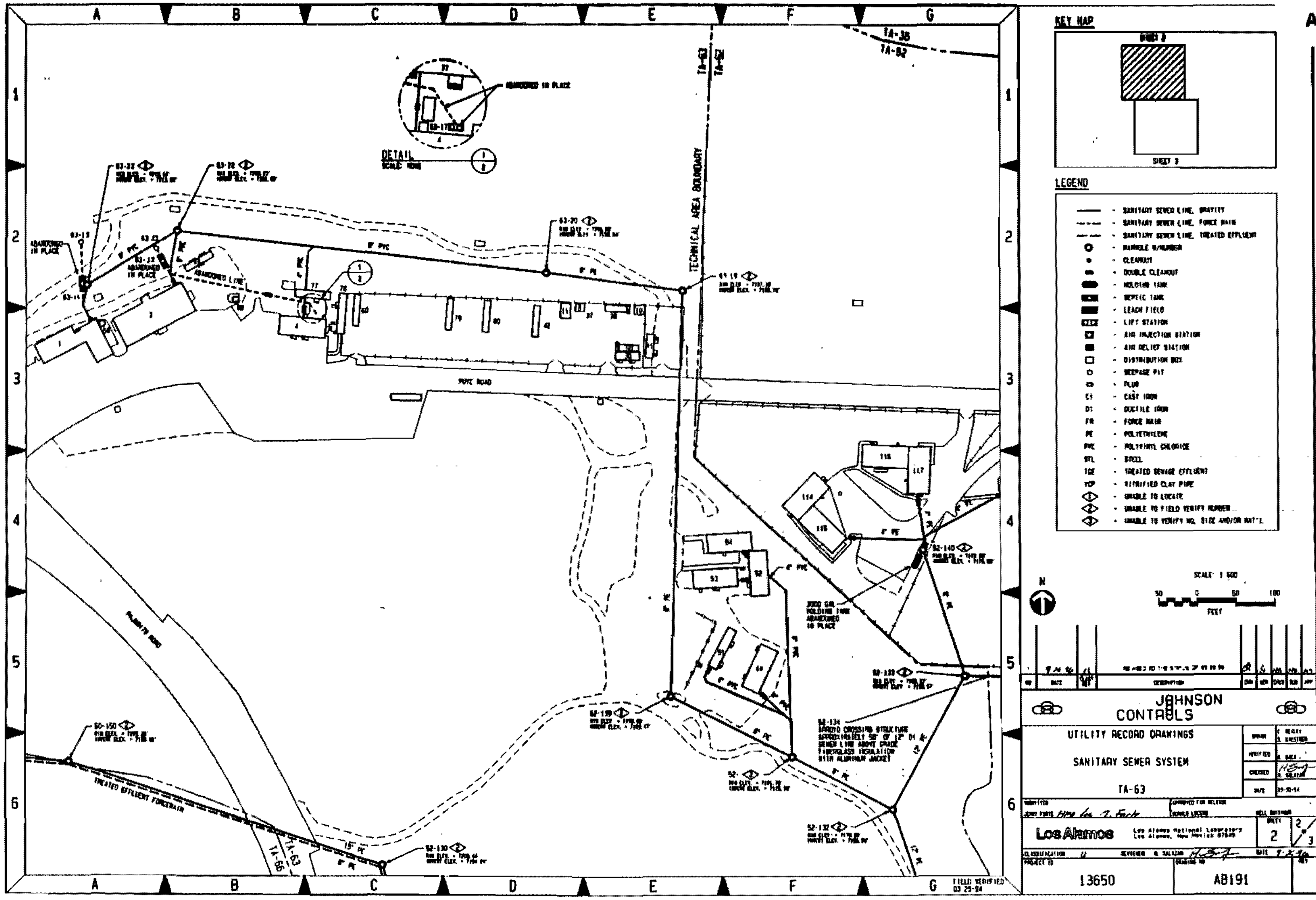
**NOTES**

Location of NPDES outfall number 112 is approximate.

UNCLASSIFIED

UNIVERSITY OF CALIFORNIA
Los Alamos
FACILITIES ENGINEERING DIVISION
STRUCTURE LOCATION PLAN
TA-52 REACTOR DEVELOPMENT

Attachment C



Attachme[illegible]D

| TRUCTURE NUMBER | BUILDING DESIGNATION | COMMON USAGE | COST CODE | REMARKS |
| --- | --- | --- | --- | --- |
| 1-52-43 | RD-43 | Manuetaw Leased | Q-00 2-2-80 | Formerly HLK-1187 |
| 9-52-44 | RD-44 | Manuetaw Leased | Q-6 8-9-82 | Formerly HLK-1205 |
| 9-52-45 | RD-45 | Manuetaw Leased | Q-6 9-14-82 | Formerly HLK-1206 |
| 9-52-46 | RD-46 | Septic Tank | Zia 1-4-84 | 500 gallon septic tanks to serve Manuetaw |
| 9-52-47 | RD-47 | Septic Tank | Zia 1-4-84 | 500 gallon septic tank to serve Manuetaw |
| (1)-52-48 | RD-48 | Zia Craft Shop | Zia 4-2-84 | 40 x 100' Bldg. Entrance to TA-52 Cancel w/o 905928 Renumbered TA-63-3 4-17-89 |
| TA-52-49 | RD-49 | Septic Tank Cancel | Zia 4-2-84 | north 35' of RD-48. TA-0-54 Renumbered TA-63-12 5/23/89 |

Attachment D

| RUCTURE UMBER | BUILDING DESIGNATION | COMMON USAGE | COST CODE | REMARKS |
|---|---|---|---|---|
| ~~2-50~~ | RD-50 | Surplus Camper [illegible] | [illegible] 4-2-84 | north of RD-49 Renumbered TA-63-13 5-23-87 |
| 52-51 | RD-51 | Transformer Station | [illegible] 4-2-84 | north ~~east~~ west corner TA-52-48 Cancel Renumbered TA-63-27 1/8/91 [illegible] |
| 52-52 | RD-52 | Transportable Ofc | [illegible] | L 9 7730-52 Cancel B. Turner - L shaped (3360 sq ft [illegible] Intersection of Pajarito Road + [illegible] (Frank [illegible] rep) |
| 1-52-53 | RD-53 | Guard Station | 6-18-84 | Don Dunklin adjacent to RD-51 + RD-52 Cancel - same as TA-52-105 |
| 1-52-54 | RD-54 | — | 12-13-84 | - Get info later - Richard [illegible] |
| 52-55 | RD-55 | — | 12-13-84 | Same as above |
| [illegible] | RD- | | [illegible] | Same as above |

63-001 **SEPTIC SYSTEMS** 11/01/90

## SUMMARY

| | |
|---|---|
| LOCATION | : TA-63 |
| TYPE OF UNIT(s) | : SEPTIC SYSTEM |
| UNIT USE | : TREATMENT/DISPOSAL |
| OPERATIONAL STATUS | : ACTIVE |
| PERIOD OF USE | : 1965 - PRESENT |
| HAZARDOUS RELEASE | : UNKNOWN |
| RADIOACTIVE RELEASE | : NONE |

MATERIALS MANAGED : SANITARY WASTE
SUSPECTED HAZARDOUS WASTE

## UNIT INFORMATION

Two active septic systems are listed on the LANL 12/89 Active Septic Tank Systems database. The first system [63-001(a)] consists of a 1000-gallon septic tank (TA-63-12), a seepage pit, and connecting drainlines. It is not known when this system was constructed. It serves approximately 20 to 30 people. The second system [63-001(b)] consists of a 920-gallon septic tank (TA-63-14, formerly TA-52-154), a seepage pit (formerly TA-0-462), and connecting drainlines. It was constructed in 1965 and has been active to the present. This septic system is registered as an Unpermitted Individual Liquid Waste System with EID registration number LA-09. This system serves building TA-63-1, an office building with 30 to 40 people. This building was previously used as a maintenance shop.

## WASTE INFORMATION

Both systems currently handle sanitary waste. The TA-63-14 system may be suspect for solvent and chemicals discharged in previous years from the maintenance shop.

## RELEASE INFORMATION

It is unknown whether there have been hazardous releases from these units.

## SWMU CROSS-REFERENCE LIST

| SWMU NUMBER | CEARP IDENTIFICATION NUMBER(S) | RFA UNIT | E.R. RELEASE SITE INFO. | ASSOCIATED STRUCTURES |
|---|---|---|---|---|
| 63-001(a) | ** | | | TA-63-12 |
| 63-001(b) | TA52-2-CA/S/UST/ST-I/A-HW/RW | | Tsk 7 : 145 | TA-63-14 |

** No corresponding E. R. Program unit.

**Attachment F**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

NOV 3 1993

**CERTIFIED LETTER: RETURN RECEIPT REQUESTED**

NOV 10 8 15 AM '93

Mr. Joseph C. Vozella, Acting Chief
Environment, Safety and Health Branch
Department of Energy
Los Alamos Area Office
Los Alamos, New Mexico 87544

Re: RFI Work Plan for OU 1129, Approval
Los Alamos National Laboratory
NM0890010515

Dear Mr. Vozella:

The Environmental Protection Agency (EPA) hereby approves with the enclosed modification your Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1129 with the exception of Appendix E. The approved work plan consists of the RFI work plan dated May 20, 1992, the revised Notice of Deficiency (NOD) Response dated October 18, 1993, and the attached modification. An NOD for the revised RFI Work Plan for Appendix E will be issued separately by EPA.

You shall immediately initiate the implementation of this approved RFI work plan. If you have any questions, please contact Barbara Driscoll of my staff at (214) 655-7441.

Sincerely yours,

Allyn M Davis

Allyn M. Davis, Director
Hazardous Waste Management Division (6H)

Enclosure

cc: Kathleen Sisneros, NMED
Al Tiedman, LANL, MS-A120

## Attachment F

**MODIFICATION**

1. The NOD Response dated October 18, 1993, incorrectly indicates that a Corrective Measure Study (CMS) is recommended when the 95% upper-confidence limit (UCL) on the arithmetic mean concentration of an individual site contaminant exceeds the screening action level (SAL) for that contaminant. A CMS will be recommended when the concentration of a hazardous constituent exceeds the screening action level. EPA does not use the mean concentration but rather the maximum concentration to determine the need for a CMS.
The revised work plan pages have been changed to reflect this.

Attachment 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

NOV 0 1 1995

Recv'd 11/9/9

**CERTIFIED MAIL: RETURN RECEIPT REQUESTED**

Mr. Theodore J. Taylor
Program Manager
Department of Energy
Los Alamos National Laboratory
Los Alamos, NM 87544

**RE: Notice of Deficiency, Addendum 1 To Work Plan For Operable Unit (OU) 1114, Los Alamos National Laboratory (NM0890010515)**

Dear Mr. Taylor:

The Environmental Protection Agency has reviewed the RCRA Facility Investigation Workplan, Addendum 1, for OU 1114, dated July 18, 1995, and have found the Report to be deficient. Los Alamos National Laboratory has 60 days from the receipt of this letter to address the enclosed list of deficiencies.

If you have any questions or need additional information, please contact Ms. Barbara Driscoll at (214) 665-7441 or Mr. Richard Mayer at (214) 665-7442.

Sincerely yours,

David W. Neleigh, Chief
New Mexico - Federal
Facilities Section

Enclosure

cc: Mr. Benito Garcia
New Mexico Environment Department
Mr. Jorg Jansen
Los Alamos National Laboratory, MS M992

# Attachment 1

**List of Deficiencies**
**Operable Unit 1114 Addendum 1**
**Los Alamos National Laboratory**

**General Comments:**

1. LANL did not include a schedule in the RFI workplan. The schedule should include a timeframe of the activities to be performed and the date that the RFI report will be submitted to EPA.

2. LANL must ensure that all soil borings are logged with the appropriate soil descriptions and that all olfactory or visual contamination be identified in the log. Also, the boring logs should also indicate the PID/FID readings at various locations vertically in the boring.

3. In some PRS discussions in Chapter 6 of the workplan, LANL states that a particular PRS has never handled/received hazardous waste, therefore, no further action on this PRS is recommended. This is not correct. If a PRS never received RCRA hazardous constituents, then a no further action recommendation would be correct.

4. For each SWMU or PRS, a second soil sampling interval will be taken approximately 2 feet below the surface soil sample. If this sampling interval is contaminated, then LANL must continue to define the vertical extent of soil contamination. Also, LANL should have a contingency in their soil sampling plan that allows for continued sampling of contaminated zones.

**Specific Comments:**

1. **5.13.3 Sample Locations and Methods, p. 5-13-5** - LANL shall take one sample closer to the outfall. Also, LANL shall explain why sediment/soil samples in sediment catchment basin number two were taken near the exiting pipe. It appears to EPA that at least one soil/sediment sample should be taken at the start of catchment basin number two.

2. **5.14.3 Sample Locations and Methods, p. 5-14-5** - It appears that LANL is compositing samples by homogenizing the three biased samples collected prior to laboratory analysis. LANL should submit the samples individually. In addition, LANL should be collecting samples at deeper intervals than one-foot interval below the fill-soil interface. Two additional samples should be collected and submitted for analysis at the five-foot depth below the fill-soil interface.

3. **5.16.2 Investigation Approach and Objectives, p. 5-16-5 -** LANL shall sample and conduct analysis for trichloroethane and trichloroethene, as the concentration of these constituents was high enough to be detected in the outfall/cattails area or the area before the willows. LANL shall revise the workplan.

4. **5.16.3 Sample Locations and Methods, p. 5-16-7 -** EPA feels that there should be two vertical soil sampling intervals at the outfall area (See General Comment #4). LANL shall revise the work plan accordingly.

5. **5.17.3 Sample Locations, p.5-17-4 -**

   a. LANL shall submit all samples for fixed laboratory analysis of metals and SVOCs. LANL needs to submit 20% of the VOC samples collected for fixed laboratory analysis. Use of an XRF is appropriate for biasing screening locations and for supplemental use after the types of hazardous constituents are known at a site. In addition, XRF data is generally not acceptable for a risk assessment.

   b. If contamination is found at the 12-24 inch depth than LANL shall continue to sample on 2 foot intervals up to 10 feet and then on 5 foot intervals until the extent of contamination is delineated vertically.

6. **5.19.4.2 SWMU 3-059, p. 5-19-8 -** How are the asphalt samples being taken?

7. **5.19.4.3 SWMU 3-003(n), p. 5-19-9 -** LANL shall explain why the soil samples are not being analyzed for SVOCs.

8. **5.19.4.2 SWMU 3-059, p. 5-19-8 -** What is LANL's logic in taking samples from the asphalt? Is the asphalt going to be removed?

9. **5.20.2 Investigation and Approach , p. 5-20-4 -** LANL shall include SVOCs since they have not documented that the oils do not contain SVOCs.

10. **5.21.3 Sample Locations and Methods, p. 5-21-7, second paragraph -** What does LANL mean by the samples will be collected and homogenized prior to submittal for analysis? Are these samples being composited? This is not appropriate, and the samples should be submitted individually for analysis.

## Attachment 1



11. **5.24.2 Investigation Summary, p. 5-24-2** - LANL shall indicate the date and the report that SWMU 3-053 will be found in. Also, please include a map or figure in the revised workplan locating the SWMU. Also, since this investigation work was not approved by EPA, there is possibility that additional sampling may be required if not deemed acceptable.

    This comment also pertains to the following SWMUs, and the requested information indicated above should also be provided for these SWMUs:

    3-052(f)
    3-042
    3-045(b) and (c)

    Attachment 1a provides the list of TA-3 SWMUs in this request for permit modification.

<u>Chapter 6: PRSs Recommended for No Further Action:</u> EPA agrees with no further action for the PRSs contained in this Chapter except for the PRSs commented on below; the PCB Transformer and Capacitor PRSs; and, the VCA PRSs.

12. **Page 6-17; Heading:** This heading is not correct. Asphalt emulsion does contain hazardous constituents.

13. **Page 6-4; SWMU 3-011:** Please describe what a carboy is in the revised report.

14. **Page 6-11; Rationale for Recommendation, SWMU 3-056(l):** EPA disagrees with LANL in the statement that beryllium is not hazardous constituent. How long was this SWMU in operation?

15. **Page 6-17; C-3-022:** Is the gravity feed line considered a SWMU?

16. **Page 6-18: SWMU 3-043(a):** EPA disagrees with the no further action decision. Just because there is no record of a release does not mean that a release has or is occurring.

17. **Page 6-18; SWMU 3-043(b):** Please include the soil sampling analytical results in the revised workplan.

18. **Page 6-19; SWMU 3-043(f) & 3-036(c):** Please include the soil sampling analytical results in the revised workplan.

19. **Page 6-19; SWMU 3-043(g) & 3-036(d):** Please include the soil sampling analytical results in the revised workplan.

20. **Page 6-19; SWMU 3-043(d,h) & 3-036(a):** Please include the soil sampling analytical results in the revised workplan.

21. **Page 6-23; Rationale for Recommendation:** LANL's justification for no further action is incorrect when stating that the sheds were never used for the storage of hazardous constituents. The appropriate justification is that the sheds held small quantities of substances that contained hazardous constituents but that there were no releases to the environment.

22. **Page 6-23; SWMU 3-029:** Is the landfill comprised of several pits? Please provide a map showing all the pits. EPA is also concerned with the possible vertical migration of constituents from these pits since they received tar and liquid wastes and have not been removed. Please clarify the outfall.

23. **Page 6-25; SWMU 3-045(g):** Please include a map of this SWMU in the revised workplan. EPA disagrees with no further action on this SWMU since soil sampling has never been performed.

24. **Page 6-26; C-3-016:** It appears to EPA that this unit needs to be re-designed so that contamination is prevented. Currently it appears that LANL is continuing to contaminate the soils/area around this unit. EPA believes that some initial soil sampling needs to be done to determine the extent of soil contamination. EPA disagrees with no further action.

25. **Page 6-27: SWMU 3-036:** Please provide a map of this SWMU which includes the metal catch basin.

26. **Page 6-38; SWMU 3-008(a):** Is LANL saying that this SWMU is located in another location. The explanation and reasoning for no further action on this SWMU is weak, and additional information needs to be provided.

27. **Page 6-39; SWMU 3-055(c):** Please include the sampling results in the revised workplan.

28. **Page 6-42; Rationale for Recommendation:** LANL states that the flow through all industrial lines can be measured and leaks anywhere in the lines can be detected. Please explain this further in the revised workplan.

29. **Page 6-42; SWMU 3-025(c):** EPA has required the investigation of oil/water separators at all Air Force Bases in the Region. LANL will not be exempted either. EPA disagrees with the NFA.

30. **Page 6-43; Rationale for Recommendations:** Please clarify whether this water contains hazardous constituents from the cooling towers.

31. **Page 6-44; SWMU 3-034(b):** Is this sump located inside or outside of the building?

32. **Page 6-45; SWMU 3-038(d):** LANL should provide the results of the removal of the industrial waste line.

33. **Page 6-45; SWMU 3-041:** Was the unit checked to ensure that it had never been used?

34. **Page 6-46; SWMU 3-047(g):** Does the concrete have significant cracks or does it have expansion joints?

35. **Page 6-48; SWMU 3-056(d):** How long has the storage area been asphalted? Also, did the lubricating oil contain any hazardous constituents?

36. **Page 6-54; SWMU 3-027:** Do the sumps have cracks?

37. **Page 6-56; SWMU 3-047(i):** LANL shall provide the period of usage for this SWMU.

38. **General Comment:** LANL mentions several cooling towers that were used in the 50's and 60's that had no history of chromate use. Please explain indicate how this information was determined?

39. **Page 6-59; Rationale for Recommendation:** Did the UST program approve this closure. LANL shall provide the soil sampling results.

40. **Page 6-61; SWMU 3-046:** Is the concrete containment cover the whole area underneath the tank?

41. **Pages 6-63 through 6-71; PCB Transformers and Capacitors:** Has EPA approved of the PCB soil removals and floor cleanups? EPA will give this information to the Region 6 PCB coordinator, Lou Roberts, to see if remediation was acceptable.

42. **Page 6-71; SWMU 3-054(c):** Include the two sampling reports along with locations sampled in the revised RFI workplan.

43. **Page 6-72; SWMU 3-038(c):** Please include a map or drawing showing the layout of drain pipe. How far did the drain pipe extend from the building to the industrial wasteline? EPA disagrees that this unit was covered by EPA regulations over its active life because the unit begin operating in the 1960's. Furthermore, the regulation that LANL quoted was promulgated in 1974. LANL states that the unit ceased operations in the early 1970's, which is before the regulation was effective.

## Attachment 1



44. **Page 6-80: Voluntary Corrective Action/Expedited Cleanup:** EPA will not approve a NFA decision on a VCA until the final results are reviewed and found acceptable.

## ATTACHMENT 1a

### HSWA Units Recommended for No Further Action in OU 1114 RFI Work Plan Addendum 1

| | |
|---|---|
| SWMU 3-002(a) | Container Storage Area |
| SWMU 3-002(d) | Container Storage Area |
| SWMU 3-009(i) | Surface Disposal Site |
| SWMU 3-009(j) | Surface Disposal Site |
| SWMU 3-019 | Septic Tank |
| SWMU 3-024 | Tank and/or Associated Equipment |
| SWMU 3-025(a) | Tank and/or Associated Equipment |
| SWMU 3-026(b) | Sumps (Active) |
| SWMU 3-031 | Tank and/or Associated Equipment |
| SWMU 3-032 | Tank and/or Associated Equipment |
| SWMU 3-043(c) | Tank and/or Associated Equipment |
| SWMU 3-044 (a) | Container Storage Area |
| SWMU 3-045(a) | NPDES Permitted Outfall (Inactive) |
| SWMU 3-045(d) | Storage Tank (Above Ground) |
| SWMU 3-045(e) | Outfall (Inactive) |
| SWMU 3-045(f) | Outfall (Inactive) |
| SWMU 3-045(h) | NPDES Permitted Outfall (Active) |
| SWMU 3-045(i) | Outfall (Active) |
| SWMU 3-049(c) | Outfall (Active) |
| SWMU 3-049(d) | Outfall (Active) |
| SWMU 3-049(e) | Outfall (Inactive) |
| SWMU 3-050(a) | Potential Soil Contamination . . . |
| SWMU 3-050(d) | Potential Soil Contamination . . . |
| SWMU 3-050(e) | Filter Unit (Inactive) |
| SWMU 3-050(f) | Potential Soil Contamination . . . |
| SWMU 3-050(g) | Potential Soil Contamination . . . |
| SWMU 3-052(c) | One Time Release |
| SWMU 3-054(a) | Outfall (Decommissioned) |
| SWMU 3-054(d) | Outfall (Active) |
| SWMU 3-055(a) | Outfall (Active) |
| SWMU 3-055(d) | Outfall |
| SWMU 3-056(a) | Drum Storage Area (Active) |
| SWMU 3-056(m) | Drum Storage Area (Inactive) |
| SWMU 3-056(n) | Drum Storage Area (Inactive) |

# APPENDIX A

# ATTACHMENT 2

3-001008

Attachment 2

# MEMORANDUM

ERM/GOLDER Los Alamos Project Team

**To:** Operable Unit 1114 Paper History File

**From:** Michelle Y. Morgenstern *mym*

**Date:** January 25, 1994

**Regarding: AVAILABLE RADIOACTIVE AIR EMISSIONS REPORTS CONCERNING SWMUS 3-050 A THROUGH G**

---

Attached are copies of the available historical radioactive air emissions reports from 1967 through 1991 (excluding 1969) obtained from Janet Smith of ESH-15, LANL report LA-12586-PR (*Radioactive Air Emissions, 1992 Summary*) obtained from Larry Hoffman of ESH-15, and the unplanned releases published in the annual Environemntal Surveillance Reports at Los Alamos since 1970.

cc: OU 1114 Project File 17020

**Attachment 2**

to: Margo Buksa

from: Keith Jacobson, KWJ 1-13-94 ESH-8 K490 699-1404

RE: Unplanned Releases from TA-3 Area

The following data was taken from yearly Environmental Surveillance Reports published by our group since 1970. They include airborne radioactive releases from TA-3 area only.

1992

Attachment 2

**Unplanned Releases - Airborne Radionuclide Releases.**

Thorium Release at TA-3, Sigma Facility. Measurements taken from July 31 to August 7 showed the release of 9.9 uCi of $^{232}Th$ in secular equilibrium with progeny. The resulting dose to members of the public were estimated using the meteorological conditions during the time of the release (EPA, 1990). The maximum effective dose equivalent to the nearest off-site location was calculated to be $3.4 \times 10^{-3}$ mrem. The dose to LANL's Maximum Exposed Individual location (East Gate) was $3.5 \times 10^{-4}$ mrem.

Airborne Tritium Release at TA-53, LAMPF. On September 18, 1992, 20 Ci elemental tritium gas was released from TA-53, 1 % was assumed to be subsequently oxidized to tritiated water (Brown 1990). Potential doses were calculated using an atmospheric dispersion model that included wind speed and direction characteristics at the time of the release (LLNL, 1990). The maximum effective dose equivalent to the nearest off-site location was calculated to be 0.08 mrem, which is 0.8 % of the EPA's 10 mrem/yr radiation limit from the air pathway.

Airborne Tritium Release at TA-53, LAMPF. On September 24, 1992, 20 Ci elemental tritium gas was released from TA-53, 1 % was assumed to be subsequently oxidized to tritiated water (Brown 1990). Potential doses were calculated using an atmospheric dispersion model that included wind speed and direction characteristics at the time of the release (LLNL, 1990). The maximum effective dose equivalent to the nearest off-site location was calculated to be 0.04 mrem, which is 0.4 % of the EPA's 10 mrem/yr radiation limit from the air pathway.

Above Normal Release Rates at TA-48, Radiochemistry Site. During the period of October 29 to November 20, higher than average release rates were noted for stack FE-40. The activation products $^{72}As$ (0.6 mCi), $^{73}As$ (1.4 mCi), $^{74}As$ (1.1 mCi), $^{75}Se$ (1.8 mCi), and $^{68}Ge/^{68}Ga$ (0.6 mCi) were released during the three week time period. Potential doses were calculated using an atmospheric dispersion model that included wind speed and direction characteristics during the release (EPA, 1990). The maximum effective dose equivalent to the nearest off-site location was calculated to be $8.7 \times 10^{-5}$ mrem. The dose to LANL's Maximum Exposed Individual location (East Gate) was $1.1 \times 10^{-5}$ mrem.

Above Normal Release Rates at TA-3, Sigma Facility. During the period of October 30 to November 6, higher than average release rates were noted for stack FE-26. Approximately 0.6 uCi of $^{238}U$ was released during this time period. Potential doses were calculated using an atmospheric dispersion model that included wind speed and direction characteristics during the release (EPA, 1990). The maximum effective dose equivalent to the nearest off-site location was calculated to be $6.5 \times 10^{-5}$ mrem. The dose to LANL's Maximum Exposed Individual location (East Gate) was $2.3 \times 10^{-6}$ mrem.

off site for disposal: 25,306 kg (55,673 lb) liquid PCB oil that included some 50-499 ppm PCB oil; 4,502 kg (9,904 lb) contaminated debris; 3,114 kg (6,851 lb) contaminated water; 64,621 kg (142,166 lb) from 39 transformers: and 6,622 kg (14,568 lb) from capacitors. In addition, 31,496 kg (69,291 lb) of PCB-contaminated soil, debris, and equipment were disposed of at TA-54, Area G. Of the 31 PCB transformers being retrofilled within the last two years, 11 were reclassified to non–PCB status at the end of 1991, and most of the rest were reclassified to PCB-contaminated status. The DOE Tiger Teams audited and inspected the Laboratory's PCB program in 1991. No audits or inspections of the Laboratory's PCB activities were conducted by the EPA or NMED in 1991.

C. Unplanned Releases

1. Airborne Radionuclide Releases.

On February 1, 1991, 2,800 Ci of elemental tritium were released at TA-41. Less than 0.1% of the tritium was present as tritiated water. The effective dose equivalent (50-yr dose commitment) to a member of the public was calculated to be 0.03 mrem. This dose occurred 7 km east of TA-41, where Los Alamos Canyon reaches State Road 4. The dose estimate conservatively assumed that 1% of the tritium was oxidized before reaching the receptor location. The dose is 0.03% of DOE's public dose limit (PDL) of 100 mrem/yr from all pathways and 0.3% of the EPA's 10 mrem/yr limit for the air pathway.

On March 28, 1991, 0.40 Ci of tritiated water vapor were released from TA-21 as tritium oxide. The effective dose equivalent to a member of the public was calculated to be 0.01 mrem. The dose is 0.01% of DOE's PDL from all pathways and 0.1% of the EPA's limit for the air pathway.

On April 17, 1991, 0.1550 Ci of tritiated water vapor were released from TA-3-16. A slow leak was discovered at the Van de Graaff accelerator. The effective dose equivalent to a member of the public was calculated to be 0.006 mrem. The dose is 0.006% of DOE's PDL and 0.06% of the EPA limit.

2. Airborne Nonradiological Releases.

No unplanned airborne nonradiological releases were reported during 1991.

3. Radioactive Liquid Releases.

On January 2, 1991, a discharge was discovered at TA-54, Area G. A plumbing joint on an eye wash/safety shower located inside Building 33 froze and burst sometime between December 21, 1990, and January 1, 1991, when the Laboratory was closed for the winter holidays. The amount of discharge was estimated to be 18,000 gal. Analyses were conducted on the frozen water and soil; gross alpha, beta, and gamma were found to be within background levels. Samples analyzed for tritium averaged 0.29 μCi/L, approximately 15% of the DOE Derived Concentration Guide for off-site tritium releases (2.0 μCi/L). Removal of the frozen water below Building 33 was not required because of the slow rate of melting during which the water either evaporates or enters the subsurface rather than producing a definitive runoff into Cañada del Buey.

On February 21, 1991, 0.2 μCi of plutonium and americium were released at TA-50 from a leaking pipe near the Size Reduction Facility. The spill was confined to a small area. The leak was repaired, and the spill was cleaned up to applicable standards.

4. Nonradioactive Liquid Releases.

On September 25, 1991, an underground diesel fuel transfer line broke during start-up of the TA-3 power plant's backup fuel system. Approximately 100-200 gal. of diesel fuel oil surfaced and was discharged across the ground to a storm water channel, where it drained into a tributary to Sandia Canyon. The discharge was immediately reported to EPA and NMED. Corrective actions included immediate shutdown of the fuel line. The diesel spill was contained in the water course within minutes using absorbent booms and pillows. Pools of diesel fuel and water were removed using a wet/dry vacuum and absorbents. The contaminated soil was sampled, removed, and disposed of at the Los Alamos County landfill.

During 1991, 56 other releases of nonradioactive liquids occurred at the Laboratory and were reported to the EPA and NMED. Each of these discharges was minor in nature and was contained on Laboratory property. None was found to be of any threat to health or to the environment. Sampling and clean-up were completed. Over 60% of these unplanned releases were either potable water or steam condensate originating from the Laboratory's utility system.

1987



### E. Water, Soil, and Sediment Monitoring

Liquid effluents containing low levels of radioactivity were routinely released from one waste treatment plant and one sanitary sewage lagoon system. Concentrations at all discharge points were well below the DOE's concentration guides for on-site areas. The dominant change was an increase in tritium discharge from TA-50's radioactive liquid-waste treatment facility due to increased concentrations in the released waters (Table 3).

Surface and ground waters are monitored to detect potential dispersion of radionuclides from Laboratory operations. Only the surface and shallow ground waters in on-site liquid effluent release areas contained radioactivity in concentrations that are above natural terrestrial and worldwide fallout levels. These concentrations are minute fractions (<0.1%) of DOE's guides for on-site areas. These on-site waters are not a source of industrial, agricultural, or municipal water supplies. The radiochemical quality of water from regional, perimeter, and on-site areas that have received no direct discharge showed no significant effects from Laboratory releases.

The potable water supply met all applicable EPA radiochemical and chemical standards. Lack of a hydrologic connection to the deep aquifer was confirmed by lack of radioactive or chemical contamination in municipal water supply sources.

Measurements of radioactivity in samples of soils and sediments provide data on less direct pathways of exposure. These measurements are useful for understanding hydrological transport of radioactivity in intermittent stream channels near low-level radioactive waste management areas. On-site areas within Pueblo, Los Alamos, and Mortandad canyons all had concentrations of radioactivity on sediments at levels slightly higher than attributable to natural terrestrial sources or worldwide fallout. The low levels of cesium, plutonium, and strontium in Mortandad Canyon are due to liquid effluents from a waste treatment plant. No above-background radioactivity on sediments or in water has been measured in locations beyond the Laboratory boundary in Mortandad Canyon. However, small amounts of radioactivity on sediments in Pueblo Canyon (from pre-1964 effluents) and Los Alamos Canyon (from 1952 to current treated effluents) have been transported to the Rio Grande. Theoretical estimates, confirmed by measurements, show the incremental effect on Rio Grande sediments is insignificant when compared with background concentrations in soils and sediments.

Environmental monitoring is done at 1 active and 11 inactive waste management areas at the Laboratory. The general public is excluded from these controlled-access sites. Surface run-off has transported some low-level contamination from the active disposal area and several of the inactive areas into controlled-access canyons. Leachate extracts (following EPA guidelines) from the surface contamination indicate the presence of no constituents in excess of EPA criteria for hazardous waste determination.

### F. Foodstuffs Monitoring

Most fruit, vegetable, fish, bee, and honey samples from regional and perimeter locations showed no radioactivity distinguishable from that attributable to natural sources or worldwide fallout. Some produce samples from on-site locations had slightly elevated tritium concentrations at levels $\leq$2% of DOE's guides for tritium in water (there are no concentration guides for produce).

### G. Unplanned Releases

During 1987, there were two unplanned releases of radioactive or hazardous materials. Both involved release of tritium. The quantities of tritium released were small and resulted in radiation doses that were fractions of the Radiation Protection Standard.

**1. March 18 Tritium Release at the Van de Graaff Facility at TA-3.** On March 18, 1987, 375 Ci of tritium (as elemental tritium gas) were released from the Van de Graaff facility at TA-3. Air samples collected from four downwind air samplers were within normal ranges for tritium at these locations. All measured concentrations were <0.1% of the DOE's Derived Concentration Guide for tritium in off-site areas. Calculations from meteorological modeling estimated a dose to the maximum exposed individual of 0.003 mrem to the lung, <0.1% of the EPA's air emission standard of 75 mrem/yr (any organ) to a member of the public.

**2. December 11-12 Tritium Release at TA-33.** Approximately 165 Ci of elemental tritium gas were inadvertently released from TA-33 on December 11-12, 1987. Air samples were collected at five downwind locations. All measured air concentrations were found to

1982

involved. On the basis of these results. the affected soil from the areas along both sides of the road north of TA-48 were removed (down to bedrock) up to the edge of Mortandad Canyon and replaced with clean soil. Radiological surveys of the exposed bedrock found no residual contamination. Soil samples taken after the area was restored registered background levels of gross alpha and gross beta activity.

b. **Tritium Release at the Van de Graaff Facility.** On March 24. 1982. about 10 Ci of tritium leaked from a pump in the Van de Graaff Facility (TA-3) and into a room. setting off room air tritium monitors. Approximately 80% of this tritium was released directly from this room between 10:30 and 11:30 a.m.; the remainder was released through a 10-m high vent at 4:00 p.m. The tritium was believed to be almost entirely in gaseous form as HT.

Radiological doses to the public resulting from the release were estimated using meteorological modeling and tritium air sampling results. Samples from five air samplers from the Laboratory's routine air sampling network were analyzed for tritium. These samples were of tritiated water vapor (HTO), not of gaseous tritium (HT).

The maximum dose. which occurred approximately 50 m downwind of the morning release point, was 0.4 mrem to the whole body, or 0.08% of the Radiation Protection Standard for members of the public (500 mrem/yr for whole body radiation). The highest dose occurring offsite (on West Jemez Road) was 0.003 mrem to the whole body, 0.006% of the Radiation Protection Standard. These doses were estimated using meteorological modeling.

The dose associated with the highest measured tritium in air concentration (at Station 5. Arkansas Avenue) was 0.0044 mrem. or 0.0009% of the Radiation Protection Standard. Since this station was farthest from the release point of any station sampled and since meteorological analysis indicated this station was out of the zone principally affected by the release, it is probably due to the commonly observed fluctuations of tritium in air concentrations. All other doses calculated from measured tritium in air concentrations were lower than 0.0044 mrem.

c. **Cooling Water Release at Omega Site.** On October 26. 1982, a release of about 1100 ℓ of secondary cooling water occurred from the nuclear research reactor at Omega Site (TA-2). The released cooling water contained activation products that generally have short half-lives (an hour or less) and tritium (half-life is 12.3 yr).

The release occurred over about a 30-min period at a rate of about 40 ℓpm and was into Los Alamos Canyon, which is a tributary to the Rio Grande. Stream flow at the reactor site was estimated at 750 ℓpm at the time of the release. Consequently, the released cooling water was diluted about 20 to 1. Stream flow in Los Alamos Canyon did not reach State Road 4 (SR-4 is the Laboratory boundary; see Fig. 1). The Rio Grande lies about 6.4 km east of SR-4.

A total of 25 surface water. shallow ground water in the alluvium, and sediment samples were collected for analysis (gross alpha, gross beta, gamma, and tritium) upstream and downstream from Omega Site on October 27 and November 4, 1982. No radioactivity in any of the samples was at concentrations that could be attributed to the secondary cooling water release.

treated at TA-50. A total of $1.7 \times 10^7$ ℓ of effluent was discharged from the TA-53 sanitary lagoons containing 0.021 Ci of $^{22}$Na, 0.86 Ci of $^{7}$Be, and 15 Ci of $^{3}$H. The source of the radioactivity was activated water from beam stop cooling systems. None of the concentrations were at concentrations higher than about 0.9% of CGs for water in controlled areas. Samples of water, sediments, and transpirate from trees adjacent to the discharge from the lagoons have been collected this year and the results of this sampling program are discussed in Section IV.C.9.

Releases from the larger plant (TA-50) are discharged into a normally dry stream channel (Mortandad Canyon) in which surface flow has not passed beyond the Laboratory boundary since before the plant began operation. Discharges from the smaller plant (TA-21) are into DP Canyon, a tributary of Los Alamos Canyon where runoff does at times flow past the boundary and transports some residual activity adsorbed on sediments. Effluent from the LAMPF lagoons sinks into alluvium within the Laboratory boundary.

### 7. Unplanned Releases

On May 4, 1979, up to 0.31 g (3000 Ci) of tritium (probably as tritium gas and oxide) were released to the environment from an accidental overheating of a stainless steel pot containing uranium tritide at the Cryogenics Building (SM-34). Had the release been all tritium oxide (HTO) it would have been measured by the air sampling network, however, it was not detected. To estimate upper bound doses from the release, standard diffusion models were used and the entire release was conservatively assumed to be HTO. This estimate gives a maximum boundary dose (near the Omega Bridge) of 0.27 mrem which is 0.05% of the annual dose limit to members of the public. Since we were not able to measure in the atmosphere the release, it is likely that actual doses would probably be 10 to 100 times lower than those calculated. Although Royal Crest Mobile Home Park, the nearest offsite location, was not downwind from the release, the HTO concentration at the Park was somewhat higher (16 pCi/m$^3$) than perimeter (average 2.9 pCi/m$^3$, maximum 5.3 pCi/m$^3$) and regional (average 3.6 pCi/m$^3$, maximum 8 pCi/m$^3$) stations for this period, but was well within expected values for this station (1978 average 16 pCi/m$^3$, maximum 67 pCi/m$^3$).

On Oct. 31, 1979, a small amount of activated soil was released as airborne emissions from the Omega West Reactor Facility located in Los Alamos Canyon. A soil sample stuck in a sample irradiation port at the reactor. During attempts to remove the stuck sample, the sample container broke spreading activated soil throughout the sample handling room. Some of this activity (principally $^{152m}$Eu, $^{116m}$In, $^{140}$La, and $^{24}$Na) escaped to the environment through an unfiltered air exhaust in the room. Samples were collected from five routine air monitoring stations (TA-53, TA-21, Gulf Station, Royal Crest, and 48th Street) near Los Alamos Canyon and at two background locations (Well PM-1 and Espanola). None of the samples had detectable activity. Detection limits for these short-lived isotopes (maximum half life was 40 h) were between 100 and 10 000 times below the uncontrolled area CGs (which apply to continuous exposure) for those isotopes.

## B. Chemical Constituents

### 1. Chemical Quality of Surface and Ground Waters

**Chemical analyses of surface and ground waters from regional, perimeter, and onsite noneffluent release areas varied slightly from previous years; however, these variations in concentrations were within the normal range of seasonal fluctuations. The chemical quality of water from the municipal supply for the Laboratory and community meets the standards set by the EPA and New Mexico Environmental Improvement Division. Analyses from onsite effluent release areas indicated that some constituents were higher than in naturally-occurring waters; however, these waters are not a source of municipal, industrial, or agricultural supply.**

1976

## XIII. UNPLANNED RELEASE

On the morning of July 15, 1976, approximately 2.27 g, or about 22 000 Ci, of tritium gas ($^3H_2$) were inadvertently released to the environment from the roof vents of the Cryogenics Building (SM-34) at TA-3. The release was caused by operational error resulting in exhausting a supply tank of tritium gas while air was being evacuated from the tritium-handling system. The escaping gas was diluted and moved to the southwest by a moderately unstable 4-m/s (8 mph) northeast wind. Part of the gas was drawn into the building air intake, which increased tritium concentrations in the building to the extent that the building was evacuated. Ninety-two potentially exposed people submitted urine samples for tritium assay. Analyses showed no personnel received any detectable exposure from the release. These findings supported the expectation that the release was in the form of elemental gas ($^3H_2$) and no significant oxidation to tritiated water (HTO) had occurred. Tritiated water vapor has a higher potential for exposure than tritium gas. Tritium gas in the atmosphere undergoes oxidation at a rate of <1% a day.

The nearest point at which a member of the public could have been exposed was 100 m downwind on Diamond Drive, an on-site, ERDA-controlled road normally open for public use. Tritium oxide (HTO) measurements were made on moisture distilled from silica gel cartridges collected from routine air net sampling stations on the afternoon of July 15. They showed no significant difference between upwind and downwind stations and indicated no overall deviation from expected values for the 2-wk integration period. Vegetation samples (grass, pine needles, weeds) collected on July 16 at seven of nine downwind vegetation sample locations indicated no significant difference in tritiated water concentrations compared to four upwind vegetation sampling locations. One of the slightly elevated locations was near the Van de Graaff accelerator where small quantities of tritium and tritiated water vapor have been released for a number of years. Thus, activity in these samples was attributed to Van de Graaff operations. Elevated activity (36 pCi/mℓ vs an average of 8.4 pCi/mℓ at the upwind stations) at the other station (near the entrance to TA-16) is not believed to be caused by this release because the nearby air sampling station did not indicate elevated concentrations of tritium oxide. (The CG for tritium in drinking water in uncontrolled areas is 3000 pCi/mℓ.) Thus, there was no apparent exposure to either Laboratory personnel or the general public as a result of the release. No decontamination operations were necessary because of the gaseous nature of the release.

## XIV. RADIOLOGICAL SURVEY AND DECONTAMINATION OF A FORMER TECHNICAL AREA

A major portion of the resources of the environmental surveillance program during 1976 was devoted to support of field operations at the site of the former Main Technical Area (TA-1) at Los Alamos (approximate location N95 E57, Fig. 3). Technical Area One was located on land around Ashley Pond, which is now owned partly by the County and partly by private interests. The original Laboratory facilities were constructed and used from 1943 through 1965. Work carried on in the facilities resulted in varying degrees of radioactive contamination of some buildings, the waste handling system, and land. Beginning in the 1950s, research work was gradually moved from TA-1, which was immediately adjacent to the townsite, to new areas south of Los Alamos Canyon. When vacated, the obsolete TA-1 facilities were decontaminated and demolished. Major operations to remove structures began in 1954 and continued intermittently through 1965. In 1966 the land occupied by TA-1 was turned over to Los Alamos County or sold to private interests because it was sited in a central area useful to the future

Attachment 2

# *Plutonium Air Emissions*

# PLUTONIUM AIR EMISSIONS

Plutonium, as measured in Laboratory air emissions, includes several isotopes of plutonium ($^{238}$Pu, $^{239}$Pu, $^{240}$Pu, and $^{241}$Pu) and a decay product of plutonium ($^{241}$Am). The activity of plutonium emissions from all Laboratory stacks combined totaled approximately 12 μCi in 1992. As shown in Table III, more than half of these emissions were from one stack at TA-48.

Throughout this section, plutonium activities are reported in microcuries, μCi (1 million μCi equal 1 Ci).

***Table III.*** **Plutonium Emissions in 1992**

| Facility | Stack Number | Activity of Emitted Plutonium (μCi) |
|---|---|---|
| TA-3-29 | FE-14 | 0.53 |
| | FE-15 | 0.08 |
| | FE-17 | <MDA[a] |
| | FE-18 | <MDA[a] |
| | FE-19 | 0.50 |
| | FE-21 | 0.091 |
| | FE-28 | 0.76 |
| | FE-29 | 0.28 |
| | FE-30 | 0.008 |
| | FE-31 | 0.033 |
| | FE-32 | <MDA[a] |
| | FE-33 | <MDA[a] |
| | FE-34 | 0.009 |
| | FE-35 | <MDA[a] |
| | FE-37 | <MDA[a] |
| | FE-44 | 0.20 |
| | FE-45 | 0.14 |
| | FE-46 | 0.10 |
| TA-21-4 | FE-1 | 0.006 |
| TA-21-5 | FE-7 | 0.022 |
| TA-21-150 | FE-1 | 0.158 |
| TA-21-257 | FE-4 | 0.1 |
| TA-21-313 | FE-1 | <MDA[a] |
| | FE-2 | 0.46 |
| TA-21-314 | FE-1 | 0.04 |
| | FE-7 | 0.074 |
| TA-21-315 | FE-1 | <MDA[a] |
| TA-21-324 | FE-1 | 0.012 |
| TA-35-7 | FE-2 | 0.31 |
| | FE-7 | 0.043 |
| | FE-8 | 0.007 |
| TA-41-1 | FE-4 | <MDA[a] |
| TA-48-1 | FE-15 | 6.5 |
| | FE-45 | 0.12 |
| | FE-46 | 0.11 |
| | FE-51 | 0.002 |
| | FE-54 | <MDA[a] |
| | FE-60 | 0.003 |
| TA-50-1 | FE-1 | 0.30 |
| | FE-2 | 0.15 |
| | FE-3 | 0.053 |
| | FE-6 | 0.011 |
| | FE-17 | <MDA[a] |
| | FE-25 | 0.009 |
| | FE-27 | <MDA[a] |
| TA-50-37 | FE-1 | 0.011 |
| TA-50-66 | FE-1 | 0.003 |
| TA-50-69 | FE-1 | 0.018 |
| | FE-2 | <MDA[a] |
| | FE-3 | 0.001 |
| TA-54-2 | FE-1 | 0.002 |
| | FE-2 | 0.008 |
| TA-55-4 | FE-15 | 0.05 |
| | FE-16 | 1.1 |
| Total (rounded) | | 12 |

[a]MDA is minimum detectable activity

## *T ˋ Plutonium Air Emissions*

..issions of plutonium from TA-3 stacks peaked in the 7th and 8th reporting period of 1992, as shown in Figure 22.

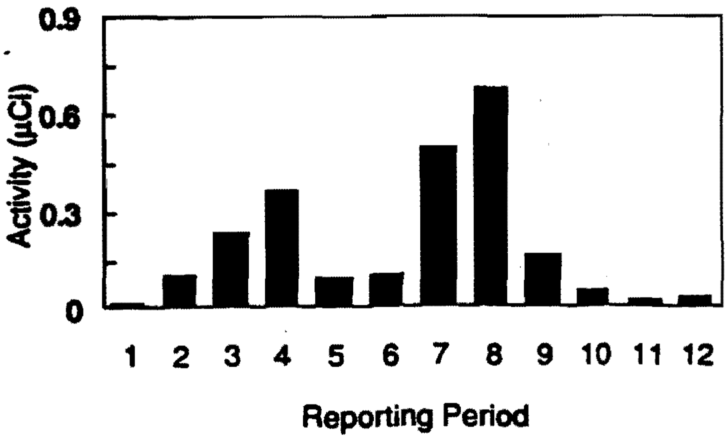



***Figure 22.*** **Plutonium Emissions at TA-3 for Each Reporting Period of 1992**

In 1992, plutonium emissions from TA-3 stacks decreased, as shown in Figure 23. During the 1990—1992 pe...d, the activity of plutonium emitted from TA-3 stacks ... ..atest in 1991 (31 µCi).

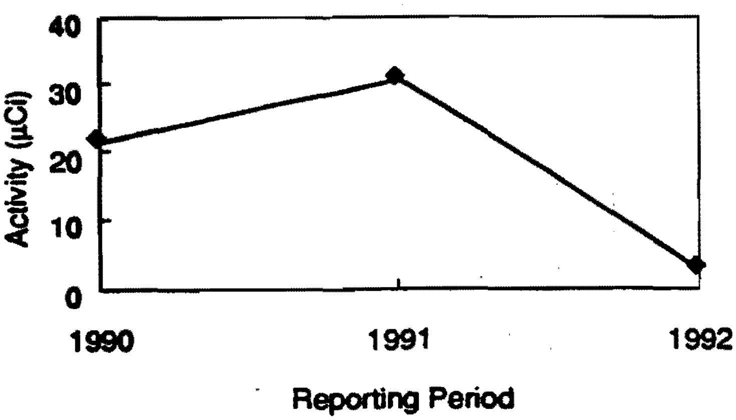



***Figure 23.*** **Plutonium Emissions at TA-3 in 1990—1992**

## *TA-21 Plutonium Air Emissions*

During 1992, several TA-21 buildings were scheduled for decontamination and decommissioning. The details of TA-21 plutonium air emissions for 1992 are provided in Figure 24.

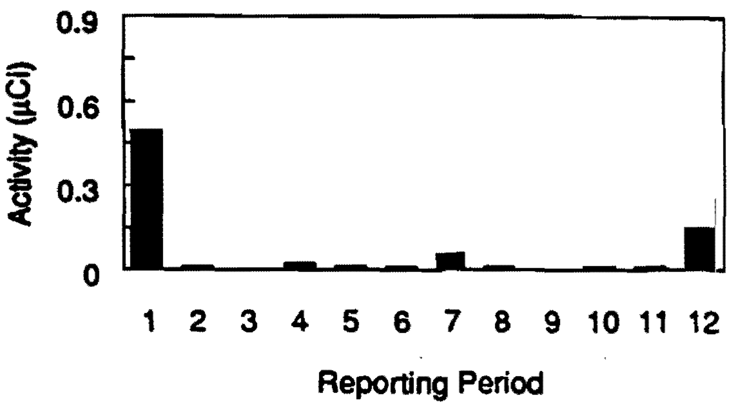



***Figure 24.*** **Plutonium Emissions at TA-21 for Each Reporting Period of 1992**

The trend in plutonium emissions from TA-21 stacks over the past three years is shown in Figure 25. During the 1990—1992 period, the activity of plutonium emitted from TA-21 stacks was greatest in 1990 (1.0 µCi).

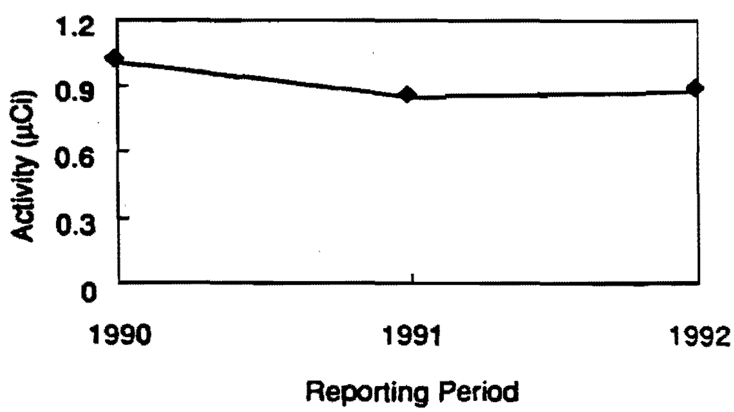



***Figure 25.*** **Plutonium Emissions at TA-21 in 1990—1992**

### *TA-35 Plutonium Air Emissions*

1992 emissions of plutonium from TA-35 stacks are displayed by reporting period in Figure 26, and the total TA-35 plutonium air emissions for 1990—1992 are shown in Figure 27. Note that 1992 emissions were decreased from previous years. During the 1990—1992 period, the activity of plutonium emitted from TA-35 stacks was greatest in 1991 (1.2 μCi).

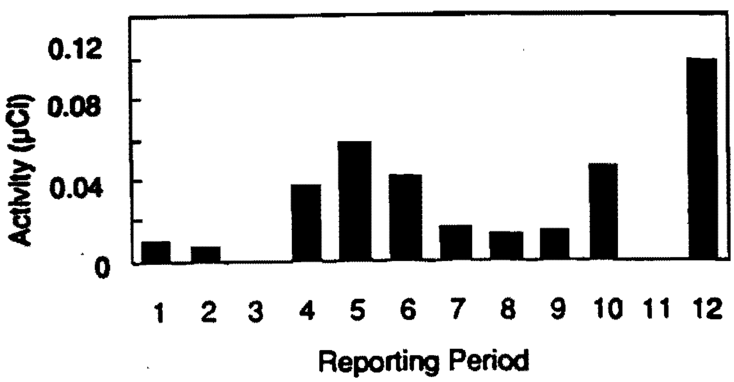



***Figure 26.*** **Plutonium Emissions at TA-35 for Each Reporting Period of 1992**

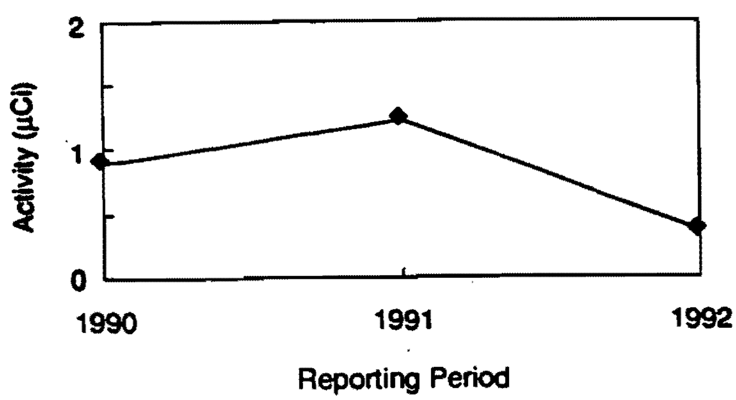



***Figure 27.*** **Plutonium Emissions at TA-35 in 1990—1992**

### *TA-48 Plutonium Air Emissions*

In 1992, the greatest activity of plutonium from TA-48 stacks was emitted in the 12th period. This is displayed in Figure 28.

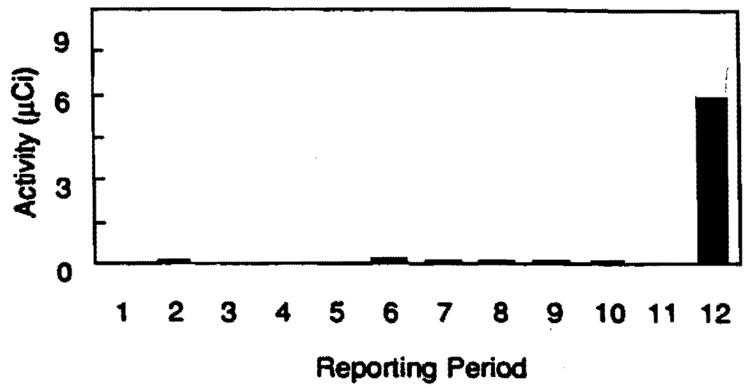



***Figure 28.*** **Plutonium Emissions at TA-48 for Each Reporting Period of 1992**

Mainly because of the increase in plutonium emissions during the 12th period of 1992, the total 1992 plutonium emission (6.7 μCi) from TA-48 stacks was increased over 1990 and 1991 emissions. This increase is shown in Figure 29.

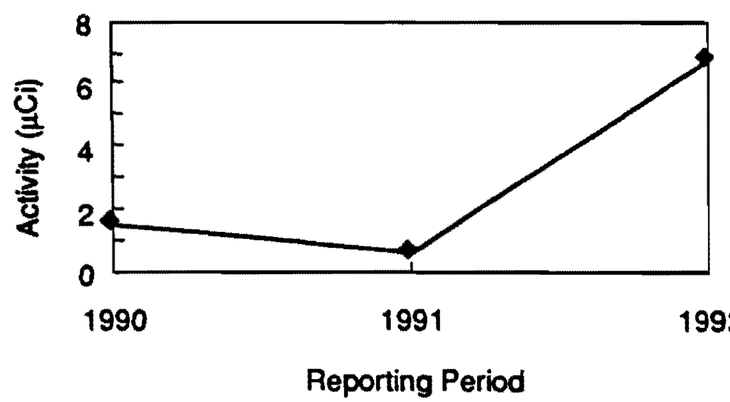



***Figure 29.*** **Plutonium Emissions at TA-48 in 1990—1992**

### *50 Plutonium Air Emissions*

Emissions of plutonium from TA-50 stacks are shown in Figure 30 for each reporting period of 1992. These emissions peaked in the 7th reporting period.

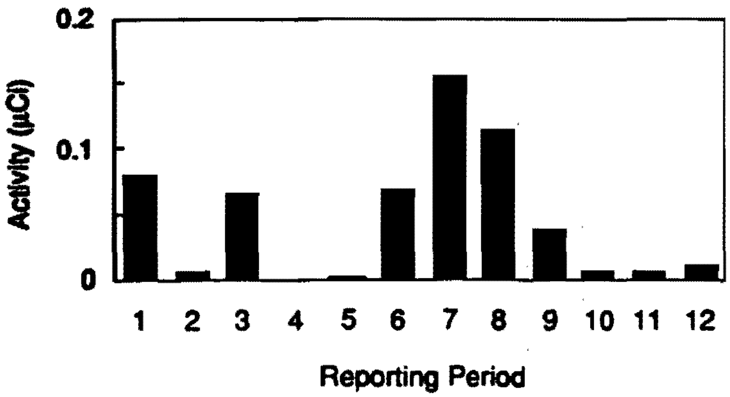



***Figure 30.*** **Plutonium Emissions at TA-50 for Each Reporting Period of 1992**

1992 plutonium emissions from TA-50 stacks were decreased from 1991 emissions. The trend for the three years from 1990—1992 is shown in Figure 31. During this period, the activity of plutonium emitted from TA-50 stacks was greatest in 1991 (1.4 µCi).

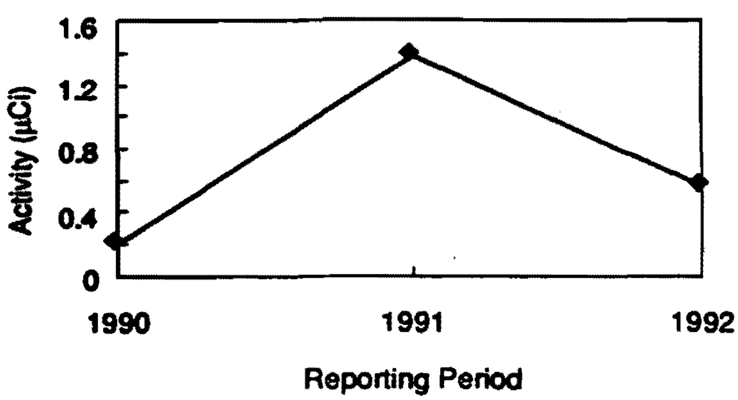



***Figure 31.*** **Plutonium Emissions at TA-50 in 1990—1992**

### *TA-54 Plutonium Air Emissions*

For each reporting period of 1992, plutonium emissions from TA-54 stacks are shown in Figure 32. These emissions have decreased every year since 1990, as displayed in Figure 33.

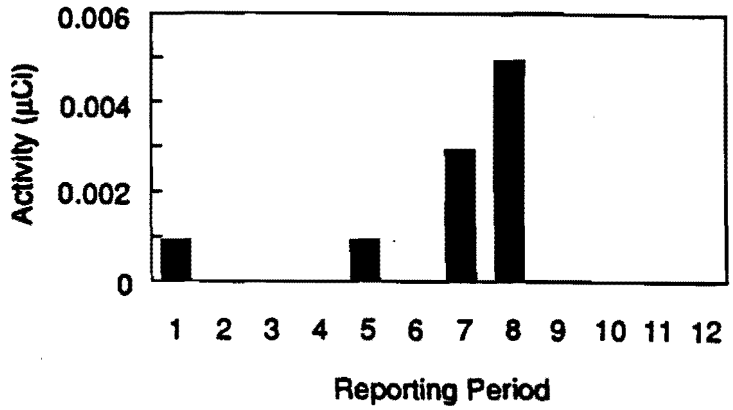



***Figure 32.*** **Plutonium Emissions at TA-54 for Each Reporting Period of 1992**

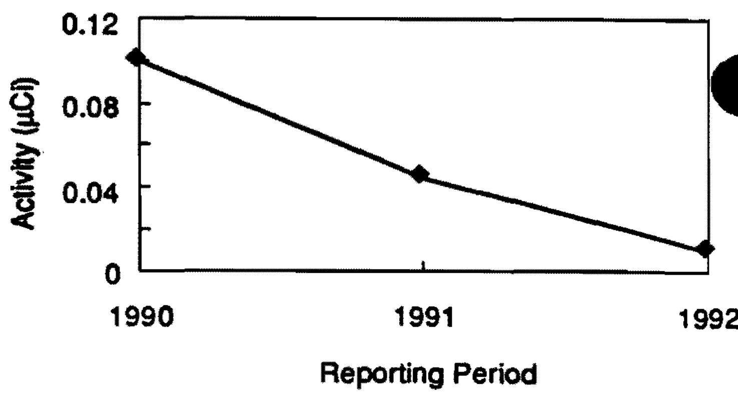



***Figure 33.*** **Plutonium Emissions at TA-54 in 1990—1992**

## *TA-55 Plutonium Air Emissions*

Plutonium emissions from TA-55 stacks for each reporting period of 1992 are shown in Figure 34; the trend for the past three years is shown in Figure 35. During the 1990—1992 period, the activity of plutonium emitted from TA-55 stacks was greatest in 1991 (2.0 μCi).

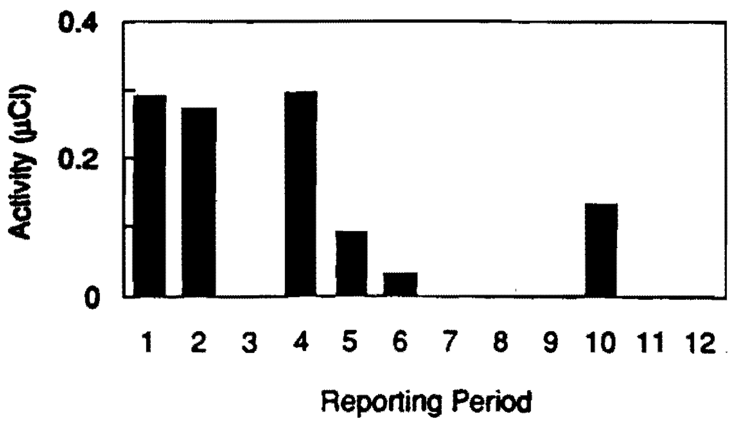



***Figure 34.*** **Plutonium Emissions at TA-55 for Each Reporting Period of 1992**

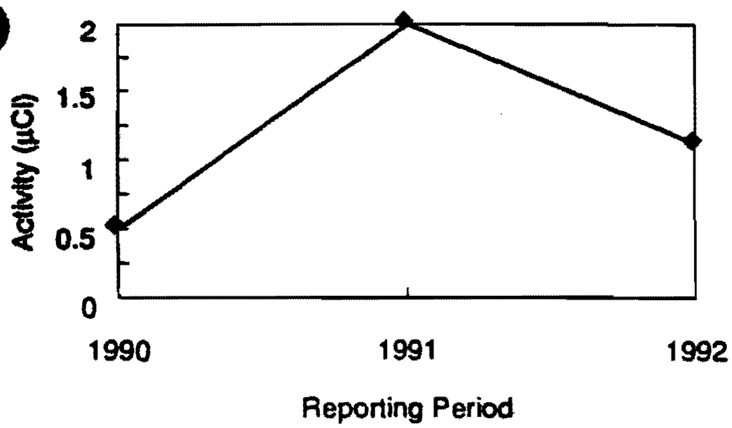



***Figure 35.*** **Plutonium Emissions at TA-55 in 1990—1992**

# *Uranium Air Emissions*

# Uranium Air Emissions

Several isotopes of uranium and various uranium decay products are emitted into the air by Laboratory stacks. In general, these radionuclides are reported as total uranium emissions or are reported as one of two isotopes, $^{235}U$ or $^{238}U$. From a particular building, the activities at that building determine which isotope is reported. For example, at TA-3, Buildings 29 and 35, only $^{235}U$ is reported; at Buildings 66, 102, and 141 at TA-3, only $^{238}U$ is reported.

In 1992, the reported $^{235}U$ activity emitted from Laboratory stacks was approximately 190 µCi; as shown in Table IV, more than half of this came from one stack at TA-3, Building 29. The reported $^{238}U$ activity emitted from Laboratory stacks in 1992 was approximately 60 µCi, mostly from a stack at TA-3, Building 66.

Throughout this section, uranium activities are reported in microcuries, µCi (1 million µCi equal 1 Ci).

*Table IV.* **Uranium Emissions in 1992**

| | | Activity of Emitted Uranium (µCi) | |
|---|---|---|---|
| **Facility** | **Stack Number** | $^{235}U$ | $^{238}U$ |
| TA-3-29 | FE-20 | 0.13 | NA[a] |
| | FE-22 | 0.24 | NA[a] |
| | FE-23 | 110 | NA[a] |
| | FE-24 | 26 | NA[a] |
| | FE-26 | 0.32 | NA[a] |
| | FE-27 | 0.30 | NA[a] |
| TA-3-35 | FE-1 | 0.14 | NA[a] |
| TA-3-66 | FE-8 | NA[a] | 2.8 |
| | FE-9 | NA[a] | 1.2 |
| | FE-10 | 1.3 | NA[a] |
| | FE-13 | NA[a] | 42 |
| | FE-24 | NA[a] | 9.4 |
| | FE-25 | NA[a] | 0.12 |
| | FE-26 | NA[a] | 1.2 |
| TA-3-102 | FE-18 | NA[a] | 1.9 |
| | FE-25 | NA[a] | 0.008 |
| TA-3-141 | FE-6 | NA[a] | 0.017 |
| | FE-9 | NA[a] | 0.32 |
| | FE-10 | NA[a] | 0.063 |
| TA-21-3 | FE-6 | 42 | NA[a] |
| TA-21-4 | FE-3 | 9.7 | NA[a] |
| TA-48-1 | FE-4 | 0.42 | NA[a] |
| | FE-40 | NA[a] | <MDA[b] |
| Total (rounded) | | 190 | 60 |

[a]NA is not analyzed
[b]MDA is minimum detectable activity

### TA-3 Uranium Air Emissions

At TA-3 in 1992, air emissions of $^{235}U$ peaked in the 3rd reporting period and emissions of $^{238}U$ peaked in the 8th reporting period. These results are shown in Figure 36.

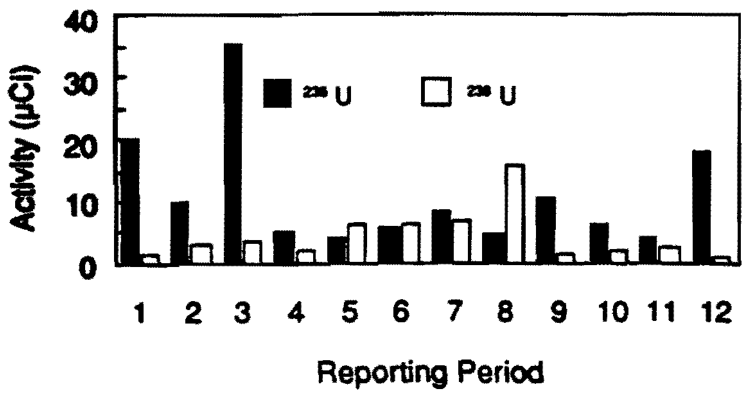



***Figure 36.*** **Uranium Emissions at TA-3 for Each Reporting Period of 1992**

In 1990, uranium activity was not broken out by isotope; thus only 1991 and 1992 data for TA-3 uranium air emissions can be compared. In 1992, these emissions were decreased from the previous year, as displayed in Figure During the 1990—1992 period, the activity of total uranium emitted from TA-3 stacks was greatest in 1991 (approximately 240 µCi).

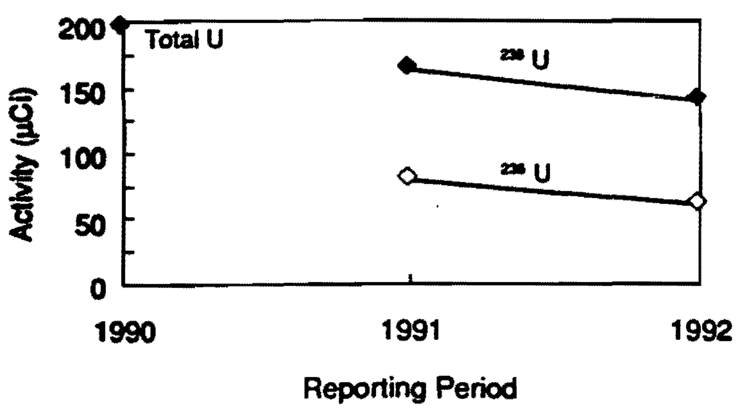



***Figure 37.*** **Uranium Emissions at TA-3 in 1990—1992**

### TA-21 Uranium Air Emissions

The only reported uranium isotope emitted from TA-21 stacks in 1992 was $^{235}U$, which is detailed by reporting period in Figure 38.

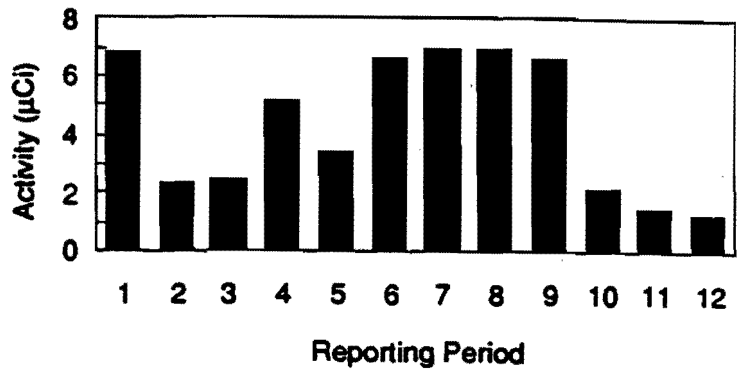



***Figure 38.*** **$^{235}U$ Emissions at TA-21 for Each Reporting Period of 1992**

In 1990, uranium emissions from TA-21 stacks were reported as total uranium; for 1991 and 1992, however, the isotope was specified as $^{235}U$. The uranium air emissions trend for these years is shown in Figure 39. During the 1990—1992 period, the reported activity of $^{235}U$ emitted from TA-21 stacks was greatest in 1991 (92 µCi).

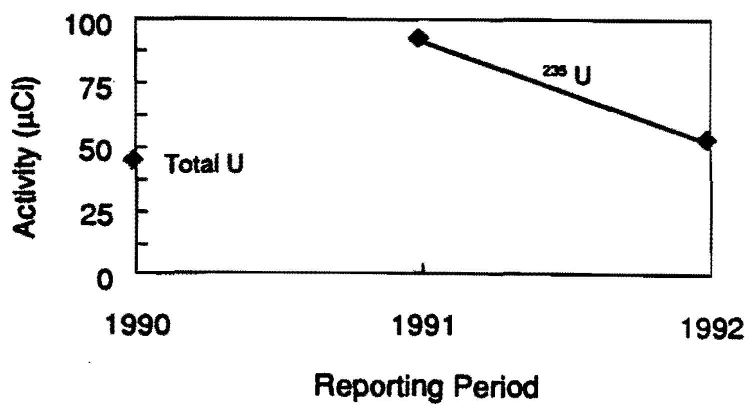



***Figure 39.*** **Uranium Emissions at TA-21 in 1990—1992**

## *TA-48 Uranium Air Emissions*

Only small amounts of $^{235}U$ were reported for TA-48 stacks in 1992 (Figure 40); this is true also of the two years previous (Figure 41). In 1990, these emissions were not broken down by isotope but were reported as total uranium activity. During the 1990—1992 period, the reported activity of $^{235}U$ emitted from TA-48 stacks was greatest in 1992 (0.42 µCi).

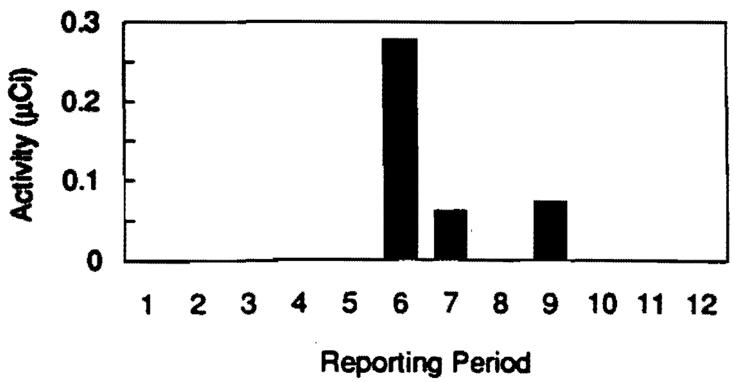



***Figure 40.*** **Uranium Emissions at TA-48 for Each Reporting Period of 1992**

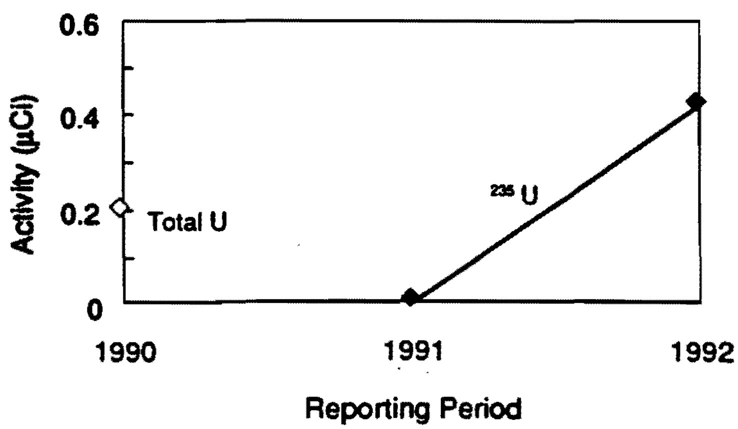



***Figure 41.*** **Uranium Emissions at TA-48 in 1990—1992**

# *Mixed Fission Product Air Emissions*

# Mixed Fission Product Air Emissions

In 1992, mixed fission products, which are formed when a heavy element breaks into two or more lighter elements, were emitted from facilities at four technical areas. As shown in Table V, most of these fission products were emitted from one stack at TA-48, which is the radiochemistry site where the nuclear properties of radioactive materials are studied using analytical and physical chemistry.

Throughout this section, mixed fission product activities are reported in microcuries, μCi (1 million μCi equal 1 Ci).

***Table V.* Mixed Fission Product Emissions in 1992**

| Facility | Stack Number | Activity of Emitted Mixed Fission Products (μCi) |
|---|---|---|
| TA-3-29 | FE-44 | 5.4 |
| | FE-45 | 1.5 |
| | FE-46 | 1.5 |
| TA-21-4 | FE-1 | 0.024 |
| TA-48-1 | FE-4 | 19 |
| | FE-15 | 23 |
| | FE-40 | 2600 |
| | FE-45 | 62 |
| | FE-46 | 48 |
| | FE-51 | 0.092 |
| | FE-54 | 0.90 |
| | FE-60 | 1.1 |
| TA-50-1 | FE-1 | 1.3 |
| | FE-2 | 2.2 |
| | FE-3 | 0.019 |
| | FE-6 | 0.007 |
| | FE-17 | <MDA[a] |
| | FE-25 | 0.005 |
| | FE-27 | 0.031 |
| TA-50-37 | FE-1 | 0.02 |
| TA-50-66 | FE-1 | 0.001 |
| Total (rounded) | | 2800 |

[a]MDA is minimum detectable activity

### *TA-3 Mixed Fission Product Air Emissions*

In 1992, emissions of mixed fission products from TA-3 stacks were greatest during the 4th and 5th reporting periods. This is displayed in Figure 42.

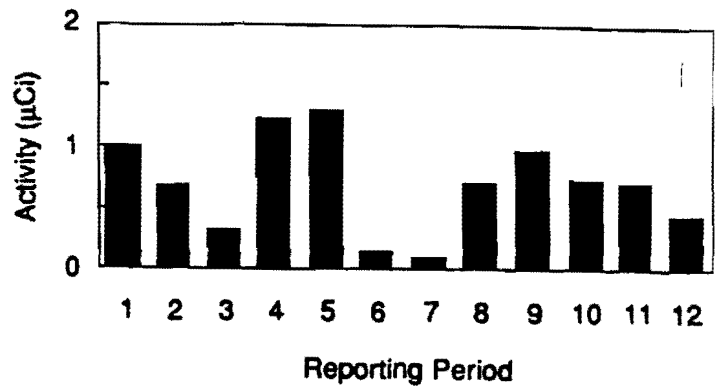



***Figure 42.* Mixed Fission Product Emissions at TA-3 for Each Reporting Period of 1992**

For the period from 1990—1992, mixed fission products emitted from TA-3 stacks decreased steadily. This trend is shown in Figure 43. During this period, the activity of mixed fission products emitted from TA-3 stacks was greatest in 1990 (39 μCi).

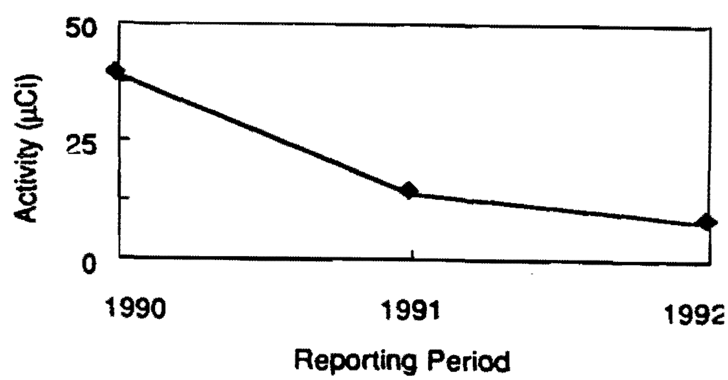



***Figure 43.* Mixed Fission Product Emissions at TA-3 in 1990—1992**

## *21 Mixed Fission Product Air Emissions*

Mixed fission products emitted from TA-21 stacks are detailed by 1992 reporting period in Figure 44. For the past three years, these emissions have decreased, as displayed in Figure 45.

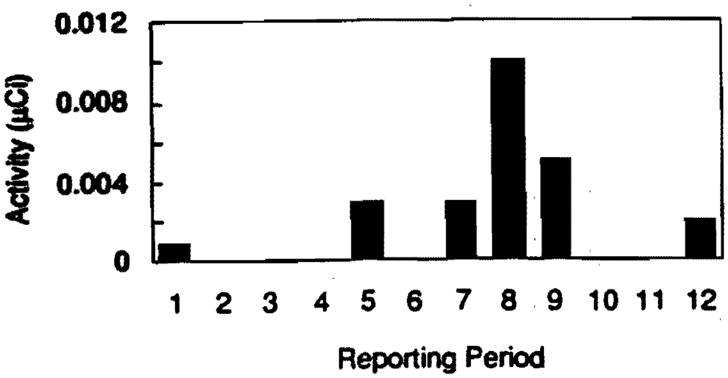



***Figure 44.*** **Mixed Fission Product Emissions at TA-21 for Each Reporting Period of 1992**

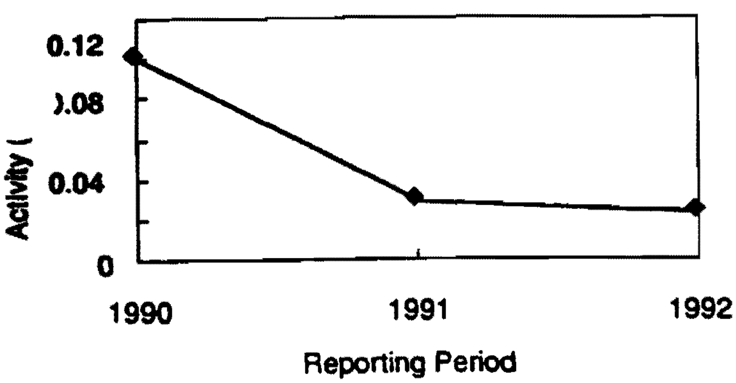



***Figure 45.*** **Mixed Fission Product Emissions at TA-21 in 1990—1992**

## *TA-48 Mixed Fission Product Air Emissions*

Air emissions of mixed fission products at TA-48 varied in 1992 but were increased in the 11th and 12th reporting periods. This is shown in Figure 46.

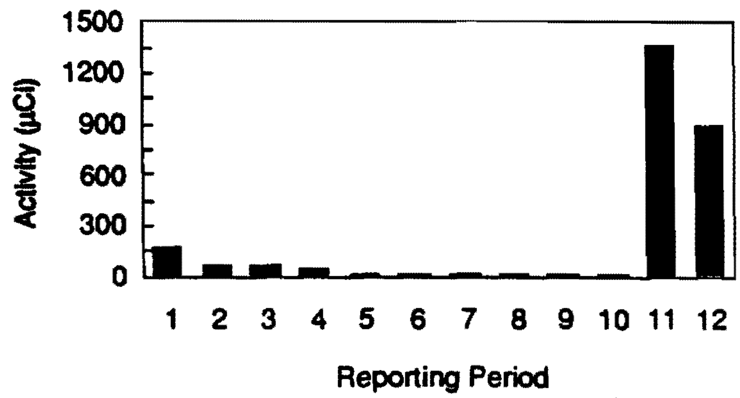



***Figure 46.*** **Mixed Fission Product Emissions at TA-48 for Each Reporting Period of 1992**

In 1992, mixed fission products emitted from TA-48 stacks (approximately 2700 µCi) were increased over the previous two years (Figure 47). This was due in part to the 11th and 12th reporting period increases previously noted.

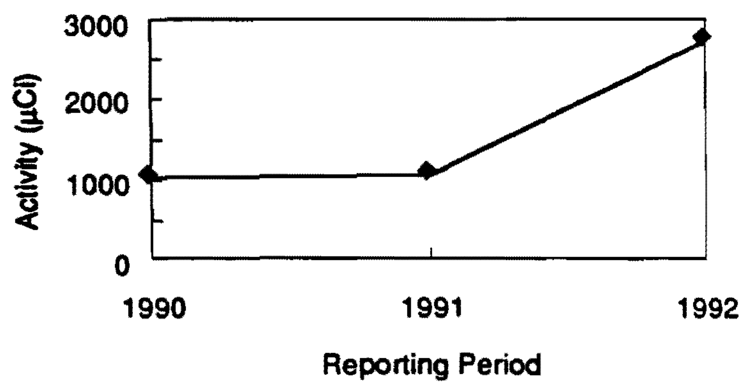



***Figure 47.*** **Mixed Fission Product Emissions at TA-48 in 1990—1992**

## TA-50 Mixed Fission Product Air Emissions

Emissions from TA-50 stacks of mixed fission products are shown for each 1992 reporting period in Figure 48.

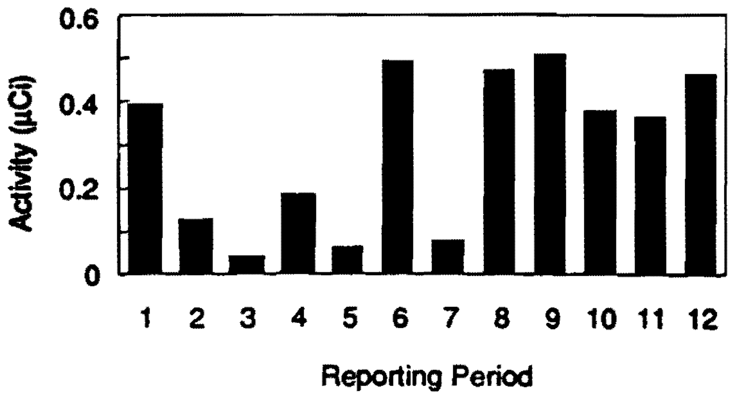



***Figure 48.*** **Mixed Fission Product Emissions at TA-50 for Each Reporting Period of 1992**

For the three years from 1990—1992, mixed fission products emitted from TA-50 stacks did not change much, as shown in Figure 49. During this period, the activity of total mixed fission products emitted from TA-50 stacks was greatest in 1990 (3.9 µCi)

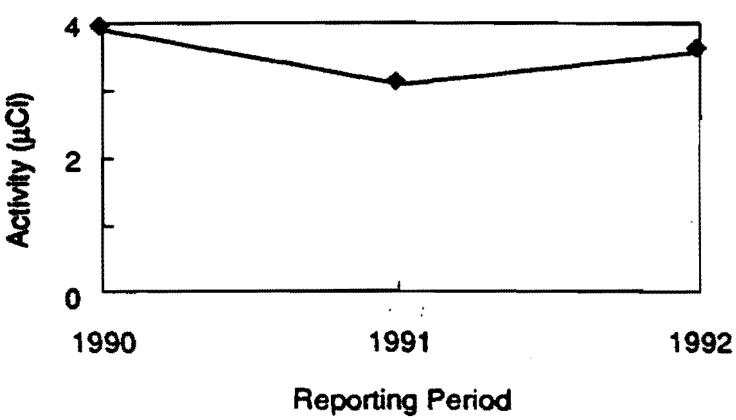



***Figure 49.*** **Mixed Fission Product Emissions at TA-50 in 1990—1992**

Part 2.a. CY 73 Airborne Plutonium Releases

| ce | Nuclides | Release Data: Gross Volume ($M^3$) | Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) | Pu-238 & 239 | 6.09 2.19 x $10^8$ | 43.0 ~~17~~ x $10^{-14}$ | 37.2 |
| TA-3-29 Wg. 2(N) | Pu-238 & 239 | 6.10 ~~6.33~~ x $10^8$ | 41.0 ~~198~~ x $10^{-14}$ | 1253 |
| TA-3-29 Wg. 3(S) | Pu-238 & 239 | 6.91 ~~7.49~~ x $10^8$ | 48.3 ~~62~~ x $10^{-14}$ | 464 |
| TA-3-29 Wg. 5(S) | Pu-238 & 239 | 6.08 x $10^8$ | 228 x $10^{-14}$ | 1386 |
| TA-3-29 Wg. 5(N) | Pu-239 | 3.29 x $10^8$ | 2 x $10^{-14}$ | 6.6 |
| TA-3-29 Wg. 7(S) | Pu-238 & 239 | 5.57 x $10^8$ | 561 x $10^{-14}$ | 3124 |
| TA-3-29 Wg. 7(N) | Pu-238 & 239 | 1.07 x $10^8$ | 554 x $10^{-14}$ | 593 |
| TA-3-29 Wg. 9 | Pu-239 | 26.4 x $10^8$ | 16 x $10^{-14}$ | 422 |
| TA-21-2 (E) | Pu-239 | 2.54 x $10^8$ | 0.54 x $10^{-14}$ | 1.4 |
| TA-21-2 (W) | Pu-239 | 4.29 x $10^8$ | 0.63 x $10^{-14}$ | 2.7 |
| TA-21-3 (E) | Pu-238 & 239 | 2.01 x $10^8$ | 0.54 x $10^{-14}$ | 1.1 |
| -3 (W) | Pu-238 & 239 | 3.91 x $10^8$ | 0.14 x $10^{-14}$ | 0.5 |
| TA-21-4 | Pu-238 | 3.00 x $10^8$ | 0.54 x $10^{-14}$ | 1.6 |
| TA-21-4 Hot Cell | Pu-239 | 0.58 x $10^8$ | 0.23 x $10^{-14}$ | 0.1 |
| TA-21-5 (E) | Pu-239 | 3.68 x $10^8$ | 0.18 x $10^{-14}$ | 0.7 |
| TA-21-5 (W) | Pu-239 | 3.98 x $10^8$ | 0.32 x $10^{-14}$ | 1.3 |
| TA-21-5 (SR) | Pu-239 | 0.14 x $10^8$ | 1.7 x $10^{-14}$ | 0.2 |
| TA-21-5 (530) | Pu-239 | 0.16 x $10^8$ | 0.09 x $10^{-14}$ | 0.01 |
| TA-21-5 (530 Hood) | Pu-239 | 0.03 x $10^8$ | 0.04 x $10^{-14}$ | <0.01 |
| TA-21-12 (#1) | Pu-239 | 0.86 x $10^8$ | 27.0 x $10^{-14}$ | 23.2 |
| TA-21-12 (#2) | Pu-239 | 0.86 x $10^8$ | 25.0 x $10^{-14}$ | 21.5 |
| TA-21-12 (#3) | Pu-239 | 0.86 x $10^8$ | 16.0 x $10^{-14}$ | 13.8 |
| TA-21-12 (#4) | Pu-239 | 2.15 x $10^8$ | 610 x $10^{-14}$ | 1312 |
| -150 | Pu-238 & 239 | 2.81 x $10^8$ | 0.77 x $10^{-14}$ | 2.2 |
| TA-21-324 | Pu-238 & 239 | 2.10 x $10^8$ | 0.54 x $10^{-14}$ | 1.1 |

## AIRBORNE EFFLUENT RELEASE SUMMARY

CY 74

CONTENTS

Part 1. Total Release Summary by Nuclides

| Nuclide(s) | '79 Total Activity Released (Ci) | '73 |
|---|---|---|
| Pu-238 & 239 | .000794 | .008696 |
| U-233, 235, & 238 | .000804 | .001505 |
| Mixed Fission Products | .001374 | .013840 |
| H-3 | 7317 | 5207 |
| Ar-41 | 312 | 273 |
| I-131 | .004734 | .004229 |
| P-32 | .000074 | — |

2.a. CY 74 Airborne Plutonium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) | Pu-238 & 239 | 6.09 E+8 | 0.43 E-14 | 2.6 |
| TA-3-29 Wg. 2(N) | Pu-238 & 239 | 6.10 E+8 | 0.41 E-14 | 2.5 |
| TA-3-29 Wg. 3(S) | Pu-238 & 239 | 6.91 E+8 | 48.30 E-14 | 333 |
| TA-3-29 Wg. 5(S) | Pu-238 & 239 | 4.14 E+8 | 31.00 E-14 | 128 |
| TA-3-29 Wg. 5(N) | Pu-238 & 239 | 6.38 E+8 | 8.80 E-14 | 56 |
| TA-3-29 Wg. 7(S) | Pu-238 & 239 | 2.97 E+8 | 42.10 E-14 | 125 |
| TA-3-29 Wg. 7(N) | Pu-238 & 239 | 6.21 E+8 | 13.00 E-14 | 81 |
| TA-3-29 Wg. 9 | Pu-239 | 26.3 E+8 | 0.66 E-14 | 17 |
| TA-21-2 (E) | Pu-239 | 2.53 E+8 | 0.15 E-14 | 0.4 |
| TA-21-2 (W) | Pu-239 | 4.28 E+8 | 0.24 E-14 | 1.0 |
| -3 (E) | Pu-238 & 239 | 2.00 E+8 | 0.27 E-14 | 0.5 |
| TA-21-3 (W) | Pu-238 & 239 | 3.91 E+8 | 0.07 E-14 | 0.3 |
| TA-21-4 | Pu-238 | 3.00 E+8 | 0.19 E-14 | 0.6 |
| TA-21-4 Hot Cell | Pu-239 | 0.58 E+8 | 0.29 E-14 | 0.2 |
| TA-21-5 (E) | Pu-239 | 3.68 E+8 | 0.09 E-14 | 0.3 |
| TA-21-5 (W) | Pu-239 | 3.98 E+8 | 0.10 E-14 | 0.4 |
| TA-21-5 (SR) | Pu-239 | 0.14 E+8 | 1.40 E-14 | 0.2 |
| TA-21-5 (530) | Pu-239 | 0.16 E+8 | 0.96 E-14 | 0.2 |
| TA-21-5 (530 Hood) | Pu-239 | 0.03 E+8 | 0.07 E-14 | <0.01 |
| TA-21-150 | Pu-238 & 239 | 2.81 E+8 | 0.33 E-14 | 0.9 |
| TA-21-324 | Pu-238 & 239 | 2.10 E+8 | 0.31 E-14 | 0.7 |
| TA-35-7 (SE) | Pu-239 | 1.3 E+8 | 0.52 E-14 | 0.7 |
| 35-7 (NE.C.) | Pu-239 | 1.4 E+8 | 4.20 E-14 | 5.9 |
| -35-7 (NE) | Pu-239 | 0.50 E+8 | 2.60 E-14 | 1.3 |

Part 2.b. CY 74 Plutonium Releases Greater than $7 \times 10^{-14}$ μCi/ml at Stack

| Location | Nuclides | Ave. Conc. (μCi/ml) | '74 Release (μCi) |
|---|---|---|---|
| TA-3-29 Wg. 3(S) | Pu-238 & 239 | 48.3 E-14 | 333 |
| *TA-3-29 Wg. 7(S) | Pu-238 & 239 | 42.1 E-14 | 125 |
| *TA-3-29 Wg. 5(S) | Pu-238 & 239 | 31.0 E-14 | 128 |
| *TA-3-29 Wg. 7(N) | Pu-238 & 239 | 13.0 E-14 | 81 |
| *TA-3-29 Wg. 5(N) | Pu-238 & 239 | 8.8 E-14 | 56 |

*Upgraded to double HEPA filtration during '74.

## Part 3. CY 74 Airborne Uranium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Release Data: Ave. Conc. (µCi/ml) | Release Data: Total Activity (µCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 3(N) | U-235 & 238 | 5.92 E+8 | 7.2 E-14 | 42.6 |
| TA-3-29 Wg. 4(S) | U-235 & 238 | 4.96 E+8 | 12.0 E-14 | 59.5 |
| TA-3-29 Wg. 4(N) | U-235 & 238 | 6.56 E+8 | 1.80 E-14 | 11.8 |
| TA-3-35 (W) | U-235 | 2.5 E+8 | 0.48 E-14 | 1.2 |
| TA-3-66 (NW) | U-238 | 5.9 E+8 | 2.5 E-14 | 14.8 |
| TA-3-66 (NE) | U-235 & 238 | 6.0 E+8 | 1.3 E-14 | 7.8 |
| TA-3-66 (SE) | U-235 | 7.8 E+8 | 0.37 E-14 | 2.9 |
| TA-3-66 (N) | U-238 | 5.2 E+8 | 8.5 E-14 | 44.2 |
| TA-3-66 (NW Corner) | U-238 | 0.16 E+8 | 11.0 E-14 | 1.8 |
| TA-3-66 (WC) | U-235 & 238 | 3.95 E+8 | 0.61 E-14 | 2.4 |
| [illegible]-102 | U-235 & 238 | 2.4 E+8 | 3.7 E-14 | 8.9 |
| [illegible]-141 (N) | U-238 | 1.3 E+8 | 0.52 E-14 | 0.7 |
| TA-3-141 (NW) | U-238 | 2.7 E+8 | 0.76 E-14 | 2.1 |
| TA-3-141 (SW) | U-238 | 4.4 E+8 | 0.38 E-14 | 1.7 |
| TA-21-3 (S) | U-235 | 2.4 E+8 | 233.0 E-14 | 559. |
| TA-21-3 (Incin.) | U-235 | 0.1 E+8 | 21.4 E-14 | 2.1 |
| TA-21-4 (S) | U-235 | 2.8 E+8 | 13.4 E-14 | 37.5 |
| TA-21-155 (NE) | U-235 | 0.57 E+8 | 1.5 E-14 | 0.9 |
| TA-21-155 (NW) | U-235 | 0.58 E+8 | 0.19 E-14 | 0.1 |
| TA-21-155 (SE) | U-235 | 0.75 E+8 | 0.14 E-14 | 0.1 |
| TA-21-155 (SW) | U-235 | 0.57 E+8 | 0.35 E-14 | 0.2 |
| TA-46-31 (N) | U-238 | 0.006 E+8 | <0.01 E-14 | <0.01 |
| TA-46-31 (S) | U-238 | 0.080 E+8 | 3.70 E-14 | 0.3 |
| [illegible]6-31 (SW) | U-235 | 0.08 E+8 | 1.20 E-14 | 0.1 |

## Part 4. CY 74 Airborne Mixed Fission Product Releases

| Source | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|
| TA-3-29 (Wg. 9) | 26.3 E+8 | 0.13 E-12 | 342 |
| TA-21-4 (Hot Cell) | 0.58 E+8 | 0.05 E-12 | 2.9 |
| TA-48-1 (S) | 8.8 E+8 | 0.09 E-12 | 79.2 |
| TA-48-1 (N) | 7.2 E+8 | 0.77 E-12 | 554 |
| TA-48-1 (Hot Cell) | 0.79 E+8 | 0.05 E-12 | 3.9 |
| TA-48-1 (Core Wg.) | 6.6 E+8 | 0.46 E-12 | 304 |
| TA-48-1 (Alpha Wg.) | 0.09 E+8 | 0.01 E-12 | 0.1 |
| TA-50-1 (NE) | 3.1 E+8 | 0.11 E-12 | 34.1 |
| TA-50-1 (SE) | 6.5 E+8 | 0.08 E-12 | 52.0 |
| TA-50-1 (S) | 0.54 E+8 | 0.04 E-12 | 2.2 |
| | | TOTAL RELEASED | 1374 µCi |

## Part 5. CY 74 Airborne Tritium Releases

| Source | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|
| TA-9-21 (E) | 0.24 E+8 | 0.054 E-6 | 1.3 E+6 |
| TA-21-5 (SR) | no discharge in '74 | 0 | 0 |
| TA-33-86 | 0.87 E+8 | 68 E-6 | 5916 E+6 |
| TA-35-2(S) | 1.4 E+8 | 10 E-6 | 1400 E+6 |
| | | TOTAL RELEASED | 7317 µCi E+6 |

Part 6. CY 74 Miscellaneous Releases

| Source | Nuclides | Release Data<br>Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Released ($\mu Ci$) |
|---|---|---|---|---|
| TA-2-9 Omega | Ar-41 | 0.12 E+8 | 26.00 E-6 | 312 E+6 |
| TA-3-29 (Wg. 9) | I-131 | 26.3 E+8 | 1.80 E-12 | 4734 |
| TA-43-1 (FE-9) | P-32 | 1.78 E+8 | 6.70 E-14 | 11.9 |
| TA-43-1 (FE-10) | P-32 | 1.95 E+8 | 4.90 E-14 | 9.6 |
| TA-43-1 (FE-11) | P-32 | 2.59 E+8 | 7.60 E-14 | 19.7 |
| TA-43-1 (FE-12) | P-32 | 2.63 E+8 | 8.60 E-14 | 22.6 |
| TA-43-1 (FE-14 & 16) | P-32 | 1.89 E+8 | 5.50 E-14 | 10.4 |
| TA-43-1 (FE-24) | P-32 | 0.05 E+8 | 2.20 E-14 | 0.1 |
| TA-53-1 (D Wing) | MAP | 2.19 E+8 | <0.01 E-14 | <0.01 |

ATTACHMENT I

LASL FACILITY RADIOACTIVE

AIRBORNE EFFLUENT RELEASE SUMMARY

FOR CY 75

Prepared By: William F. [signature]

Date: February 12, 1976

Part 1. Total Release Summary by Nuclides for CY75

| Nuclide(s) | Total Activity Released (Ci) |
|---|---|
| Pu-238 & 239 | .000246 |
| U-233, 235, & 238 | .000919 |
| Mixed Fission Products | .000950 |
| H-3 | 6200 |
| Ar-41 | 237 |
| I-131 | .001358 |
| P-32 | .000049 |
| Th-234 | .006562 |

## Part 2.a. CY 75 Airborne Plutonium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Release Data: Ave. Conc. (μCi/ml) | Release Data: Total Activity (μCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) | Pu-238 & 239 | 3.43 E+8 | 0.14 E-14 | 0.48 |
| TA-3-29 Wg. 2(N) | Pu-238 & 239 | 8.57 E+8 | 0.01 E-14 | 0.09 |
| TA-3-29 Wg. 3(S) FL 9 | Pu-238 & 239 | 6.46 E+8 | 31.93 E-14 | 206 |
| TA-3-29 Wg. 5(S) | Pu-238 & 239 | 8.27 E+8 | 0.05 E-14 | 0.41 |
| TA-3-29 Wg. 5(N) | Pu-238 & 239 | 4.16 E+8 | 0.01 E-14 | 0.04 |
| TA-3-29 Wg. 7(S) | Pu-238 & 239 | 4.38 E+8 | 0.19 E-14 | 0.83 |
| TA-3-29 Wg. 7(N) | Pu-238 & 239 | 4.28 E+8 | 0.03 E-14 | 0.13 |
| TA-3-29 Wg. 9 | Pu-239 | 26.26 E+8 | 0.10 E-14 | 2.63 |
| TA-3-29 Wg. 2 FE-17 | Pu-238 & 239 | 0.33 E+8 | 0 | 0.00 |
| TA-3-29 Wg. 2 FE-18 | Pu-238 & 239 | 0.64 E+8 | 0.01 E-14 | 0.01 |
| 29 Wg. 3 FE-21 | Pu-238 & 239 | 0.48 E+8 | 0.46 E-14 | 0.22 |
| TA-3-29 Wg. 3 FE-30 | Pu-238 & 239 | 0.66 E+8 | 0 | 0.00 |
| TA-3-29 Wg. 5 FE-31 | Pu-238 & 239 | 0.64 E+8 | 0.02 E-14 | 0.01 |
| TA-3-29 Wg. 7 FE-34 | Pu-238 & 239 | 0.64 E+8 | 0 | 0.00 |
| TA-3-29 Wg. 7 FE-35 | Pu-238 & 239 | 0.65 E+8 | 0.01 E-14 | 0.01 |
| TA-21-2 (E) | Pu-239 | 2.78 E+8 | 0.09 E-14 | 0.25 |
| TA-21-2 (W) | Pu-239 | 3.87 E+8 | 0.07 E-14 | 0.27 |
| TA-21-3 (E) | Pu-238 & 239 | 1.82 E+8 | 0.10 E-14 | 0.18 |
| TA-21-3 (W) | Pu-238 & 239 | 3.34 E+8 | 0.15 E-14 | 0.50 |
| TA-21-4 | Pu-238 | 2.66 E+8 | 1.06 E-14 | 2.82 |
| TA-21-4 Hot Cell | Pu-239 | 0.48 E+8 | 0.16 E-14 | 0.08 |
| TA-21-5 (E) | Pu-239 | 3.74 E+8 | 0.10 E-14 | 0.37 |
| TA-21-5 (W) | Pu-239 | 3.53 E+8 | 0.09 E-14 | 0.32 |
| 21-5 (SR) | Pu-239 | 0.16 E+8 | 3.13 E-14 | 0.50 |

Part 2.b. CY 75 Plutonium Releases Greater than 7 x $10^{-14}$ $\mu Ci/ml$ at Stack

| Location | Nuclides | Ave. Conc. ($\mu Ci/ml$) | '75 Release ($\mu Ci$) | |
|---|---|---|---|---|
| TA-3-29 Wg. 3(S) | Pu-238 & 239 | 31.9 E-14 | 209 | 206 |

Part 3. CY 75 Airborne Uranium Releases

| Source | Nuclides | Release Data Volume (M$^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|---|
| TA-3-29 Wg. 3(N) | U-235 & 238 | 5.94 E+8 | 3.10 E-14 | 18.4 |
| TA-3-29 Wg. 4(S) | U-235 & 238 | 4.61 E+8 | 5.99 E-14 | 27.6 |
| TA-3-29 Wg. 4(N) | U-235 & 238 | 6.22 E+8 | 1.80 E-14 | 11.2 |
| TA-3-29 Wg. 3 FE-22 | U-238 & 235 | 0.39 E+8 | 0.36 E-14 | 0.14 |
| TA-3-29 Wg. 4 FE-26 | U-238 & 235 | 0.49 E+8 | 0.08 E-14 | 0.04 |
| TA-3-29 Wg. 4 FE-27 | U-238 & 235 | 0.37 E+8 | 0.23 E-14 | 0.09 |
| TA-3-35 (W) | U-235 | 2.42 E+8 | 2.01 E-14 | 4.9 |
| TA-3-66 (NW) | U-238 | 3.98 E+8 | 2.95 E-14 | 11.7 |
| TA-3-66 (NE) | U-235 & 238 | 5.67 E+8 | 0.11 E-14 | 0.62 |
| TA-3-66 (SE) | U-235 | 8.01 E+8 | 0.14 E-14 | 1.12 |
| TA-3-66 (N) | U-238 | 5.06 E+8 | 21.6 E-14 | 109 |
| TA-3-66 (NW Corner) | U-238 | 0.12 E+8 | 5.95 E-14 | 0.71 |
| TA-3-66 (WC) | U-238 | 0.34 E+8 | 3.21 E-14 | 1.09 |
| TA-3-102 | U-235 & 238 | 1.62 E+8 | 3.08 E-14 | 4.10 |
| TA-3-141 (N) | U-238 | 2.05 E+8 | 0.02 E-14 | 0.04 |
| TA-3-141 (NW) | U-238 | 2.76 E+8 | 0.90 E-14 | 2.48 |
| TA-3-141 (SW) | U-238 | 4.44 E+8 | 0.17 E-14 | 0.75 |
| TA-21-3 (S) | U-235 | 2.15 E+8 | 301.0 E-14 | 647 |
| TA-21-3 (Incin.) | U-235 | 0.09 E+8 | 19.7 E-14 | 1.77 |
| TA-21-4 (S) | U-235 | 2.99 E+8 | 14.4 E-14 | 43 |
| TA-21-155 (NE) | U-235 | 0.57 E+8 | 3.60 E-14 | 2.05 |
| TA-21-155 (NW) | U-235 | 0.44 E+8 | 34.6 E-14 | 15.2 |
| TA-21-155 (SE) | U-235 | 0.46 E+8 | 25.9 E-14 | 11.9 |
| TA-21-155 (SW) | U-235 | 0.59 E+8 | 0.50 E-14 | 0.29 |

Part 4. CY 75 Airborne Mixed Fission Product Releases

| Source | Release Data<br>Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|
| TA-3-29 (Wg. 9) | 26.3 E+8 | 0.07 E-12 | 184 |
| TA-21-4 (Hot Cell) | 0.48 E+8 | 0.03 E-12 | 1.44 |
| TA-48-1 (S) | 8.9 E+8 | 0.09 E-12 | 80.1 |
| TA-48-1 (N) | 7.4 E+8 | 0.45 E-12 | 333 |
| TA-48-1 (Hot Cell) | 0.71 E+8 | 0.01 E-12 | 0.71 |
| TA-48-1 (Core Wg.) | 7.0 E+8 | 0.44 E-12 | 308 |
| TA-48-1 (Alpha Wg.) | 0.22 E+8 | 0.01 E-12 | 0.22 |
| TA-50-1 (NE) | 3.7 E+8 | 0.05 E-12 | 18.5 |
| TA-50-1 (SE) | 5.7 E+8 | 0.04 E-12 | 22.8 |
| TA-50-1 (S) | 0.44 E+8 | 0.02 E-12 | 0.88 |
| | | TOTAL RELEASED | 950 μCi |

Part 5. CY 75 Airborne Tritium Releases

| Source | Release Data<br>Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|
| TA-3-216 | unknown | unknown | 22 E+6 |
| TA-9-21 (E) | 0.24 E+9 | 0 | 0 |
| TA-21-5 (SR) | 0.11 E+8 | 0 | 0 |
| TA-21-209 | 2.14 E+8 | 1.43 E-6 | 306 E+6 |
| TA-33-86 | 0.94 E+8 | 37 E-6 | 3478 E+6 |
| TA-35-2 (S) | 1.33 E+8 | 18 E-6 | 2394 E+6 |
| | | TOTAL RELEASED | 6200 E+6 μCi |

Part 5. CY 75 Miscellaneous Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Released ($\mu Ci$) |
|---|---|---|---|---|
| TA-2-3 Omega | Ar-41 | 0.13 E+8 | 18.23 E-6 | 237 E+6 |
| TA-3-29 (Wg. 9) | I-131 | 26.26 E+8 | 51.70 E-14 | 1358 |
| TA-43-1 (FE-9) | P-32 | 1.77 E+8 | 4.52 E-14 | 8.0 |
| TA-43-1 (FE-10) | P-32 | 1.47 E+8 | 3.29 E-14 | 4.84 |
| TA-43-1 (FE-11) | P-32 | 2.61 E+8 | 5.64 E-14 | 14.7 |
| TA-43-1 (FE-12) | P-32 | 2.58 E+8 | 5.90 E-14 | 15.2 |
| TA-43-1 (FE-14, 16 & 17) | P-32 | 1.82 E+8 | 3.48 E-14 | 6.3 |
| TA-43-1 (FE-24) | P-32 | 0.04 E+8 | 1.14 E-14 | 0.05 |
| TA-53-1 (D Wing) | MAP | 1.67 E+3 | 3.30 E-14 | < 0.01 |
| TA-3-66 (FE-13) | Th-234 | 2.27 E+8 | 2.88 E-11 | 6538 |
| TA-3-66 (FE-26 & 27) | Th-234 | 4.21 E+6 | 5.78 E-12 | 24.3 |

Part 1. Total Release Summary by Nuclides for CY76

| ide(s) | Total Activity Released (Ci) |
|---|---|
| Pu-238 & 239 | .000068 |
| U-233, 235, & 238 | .001346 |
| Mixed Fission Products | .001674 |
| H-3 | ~~4941~~ *3401 |
| Ar-41 | 339 |
| I-131 | .000300 |
| P-32 | .000073 |
| Th-234 | .002531 |

* Does not include 22,000 Ci accidentally released at TA-3-34 on 7-15-76.

~~Jerry~~ Allen
This is the 1976 stack release summary. Cy sent to H-8 Tom G. 1/28/77. for use in Envir. Sur. Report.
AWW
1/30/77

Part 2.a. CY 76 Airborne Plutonium Releases

| ce | Nuclides | Release Data Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) | Pu-238 & 239 | 3.516 E+8 | 1.820 E-16 | 0.064 |
| TA-3-29 Wg. 2(N) | Pu-238 & 239 | 8.592 E+8 | 5.575 E-16 | 0.479 |
| TA-3-29 Wg. 3(S) | Pu-238 & 239 | 6.678 E+8 | 4.188 E-14 | 27.970 ? release |
| TA-3-29 Wg. 5(S) | Pu-238 & 239 | 8.403 E+8 | 1.598 E-15 | 1.343 |
| TA-3-29 Wg. 5(N) | Pu-238 & 239 | 4.173 E+8 | 1.222 E-16 | 0.051 |
| TA-3-29 Wg. 7(S) | Pu-238 & 239 | 4.287 E+8 | 4.992 E-16 | 0.214 |
| TA-3-29 Wg. 7(N) | Pu-238 & 239 | 4.730 E+8 | 2.114 E-16 | 0.100 |
| TA-3-29 Wg. 9 | Pu-239 | 2.677 E+9 | 3.043 E-15 | 8.147 |
| TA-3-29 Wg. 2 FE-17 | Pu-238 & 239 | 1.066 E+8 | 3.752 E-15 | 0.400 |
| TA-3-29 Wg. 2 FE-18 | Pu-238 & 239 | 2.108 E+8 | 3.321 E-16 | 0.070 |
| TA-3-29 Wg. 3 FE-21 | Pu-238 & 239 | 1.577 E+8 | 1.357 E-15 | 0.214 |
| 3-29 Wg. 3 FE-30 | Pu-238 & 239 | 2.055 E+8 | 4.818 E-16 | 0.099 |
| TA-3-29 Wg. 5 FE-31 | Pu-238 & 239 | 2.020 E+8 | 3.564 E-16 | 0.072 |
| TA-3-29 Wg. 7 FE-34 | Pu-238 & 239 | 2.073 E+8 | 5.403 E-16 | 0.112 |
| TA-3-29 Wg. 7 FE-35 | Pu-238 & 239 | 2.097 E+8 | 7.439 E-16 | 0.156 |
| TA-21-2 (E) | Pu-239 | 3.074 E+8 | 2.557 E-15 | 0.786 |
| TA-21-2 (W) | Pu-239 | 3.392 E+8 | 2.603 E-15 | 0.883 |
| TA-21-3 (E) | Pu-238 & 239 | 1.617 E+8 | 4.923 E-15 | 0.796 |
| TA-21-3 (W) | Pu-238 & 239 | 2.690 E+8 | 2.093 E-14 | 5.630 |
| TA-21-4 | Pu-233 | 2.279 E+8 | 1.957 E-15 | 0.446 |
| TA-21-4 Hot Cell | Pu-239 | 3.790 E+7 | 4.723 E-15 | 0.179 |
| TA-21-5 (E) | Pu-239 | 3.816 E+8 | 1.698 E-15 | 0.648 |
| TA-21-5 (W) | Pu-239 | 3.008 E+8 | 1.705 E-15 | 0.513 |
| TA-21-5 (SR) | Pu-239 | 1.815 E+7 | 1.063 E-14 | 0.193 |

Part 3. CY 76 Airborne Uranium Releases

| Source | Nuclides | Release Data Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|---|
| TA-3-29 Wg. 3(N) | U-235 & 238 | 5.737 E+8 | 2.336 E-14 | 13.399 |
| TA-3-29 Wg. 4(S) | U-235 & 238 | 4.518 E+8 | 3.292 E-14 | 14.873 |
| TA-3-29 Wg. 4(N) | U-235 & 238 | 6.294 E+8 | 1.532 E-14 | 9.645 |
| TA-3-29 Wg. 3 FE-22 | U-238 & 235 | 1.293 E+8 | 8.778 E-15 | 1.135 |
| TA-3-29 Wg. 4 FE-26 | U-238 & 235 | 1.617 E+8 | 8.782 E-16 | 0.142 |
| TA-3-29 Wg. 4 FE-27 | U-238 & 235 | 1.225 E+8 | 6.678 E-15 | 0.818 |
| TA-3-35 (W) | U-235 | 2.398 E+8 | 7.920 E-14 | 18.992 |
| TA-3-66 (NW) | U-238 | 2.332 E+8 | 5.138 E-14 | 11.981 |
| TA-3-66 (NE) | U-235 & 238 | 5.433 E+8 | 9.709 E-15 | 5.275 |
| TA-3-66 (SE) | U-235 | 7.990 E+8 | 8.512 E-15 | 6.801 |
| TA-3-66 (N) | U-238 | 5.009 E+8 | 5.370 E-13 | 269 |
| TA-3-66 (NW Corner) | U-238 | 9.288 E+6 | 1.787 E-14 | 0.166 |
| TA-3-66 (WC) | U-238 | 2.981 E+7 | 4.495 E-14 | 1.340 |
| TA-3-102 | U-235 & 238 | 9.023 E+7 | 3.897 E-14 | 3.516 |
| TA-3-141 (N) | U-238 | 2.107 E+8 | 1.448 E-15 | 0.305 |
| TA-3-141 (NW) | U-238 | 2.809 E+8 | 1.449 E-14 | 4.069 |
| TA-3-141 (SW) | U-238 | 4.479 E+8 | 3.503 E-15 | 1.569 |
| TA-21-3 (S) | U-235 | 2.828 E+8 | 2.560 E-12 | 724 |
| TA-21-3 (Incin.) | U-235 | 8.838 E+6 | 2.565 E-13 | 2.267 |
| TA-21-4 (S) | U-235 | 3.180 E+8 | 4.465 E-13 | 142 |
| TA-21-155 (NE) | U-235 | 3.591 E+7 | 2.662 E-14 | 0.956 |
| TA-21-155 (NW) | U-235 | 2.822 E+7 | 3.260 E-15 | 0.092 |
| TA-21-155 (SE) | U-235 | 3.419 E+7 | 1.974 E-14 | 0.675 |
| TA-21-155 (SW) | U-235 | 6.095 E+7 | 4.512 E-15 | 0.275 |

## Part 4. CY 76 Airborne Mixed Fission Product Releases

| Source | Gross Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|
| | Release Data | | |
| TA-3-29 (Wg. 9) | 2.667 E+9 | 1.550 E-13 | 415 |
| TA-21-4 (Hot Cell) | 3.790 E+7 | 1.451 E-14 | 0.550 |
| TA-48-1 (S) | 8.997 E+8 | 1.656 E-13 | 149 |
| TA-48-1 (N) | 7.818 E+8 | 2.008 E-13 | 157 |
| TA-48-1 (Hot Cell) | 5.989 E+7 | 2.557 E-13 | 15.315 |
| TA-48-1 (Core Wg.) | 7.394 E+8 | 1.225 E-12 | 906 |
| TA-48-1 (Alpha Wg.) | 3.723 E+7 | 7.252 E-15 | 0.270 |
| TA-48-1 (NE) | 1.080 E+8 | 2.951 E-14 | 3.187 |
| TA-50-1 (NE) | 3.564 E+8 | 1.917 E-14 | 6.833 |
| TA-50-1 (SE) | 6.360 E+8 | 3.145 E-14 | 20 |
| TA-50-1 (S) | 4.717 E+7 | 1.376 E-14 | 0.649 |
| | | TOTAL RELEASED | 1674 uCi |

## Part 5. CY 76 Airborne Tritium Releases

| Source | Gross Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) | C o/o |
|---|---|---|---|---|
| | Release Data | | | |
| TA-3-16<br>TA-3-34 | unknown | unknown | 0 | 22, |
| TA-9-21 (E) | 2.400 E+7 | 5.384 E-6 | 1.292 E+8 | 12c |
| TA-21-5 (SR) | 1.444 E+7 | 1.423 E-8 | 2.054 E+5 | |
| TA-21-209 | 2.107 E+8 | 4.499 E-7 | 9.480 E+7 | 94 |
| TA-33-86 | 9.319 E+7 | 1.448 E-5 | 1.349 E+9 | 134 |
| TA-35-2 (S) | 1.193 E+8 | 1.389 E-5 | 1.657 E+9 | 16: |
| TA-53 (N) | 2.447 E+6 | 6.992 E-~~4~~5 | 1.711 E+~~0~~8 | 17 |
| | | TOTAL RELEASED | 4.941 E+9 | 25, |

Part 5. CY 76 Miscellaneous Releases

| rce | Nuclides | Release Data Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Released ($\mu Ci$) |
|---|---|---|---|---|
| TA-2-9 Omega | Ar-41 | 1.325 E+7 | 2.560 E-5 | 3.392 E+8 |
| TA-3-29 (Wg. 9) | I-131 | 2.677 E+9 | 1.121 E-13 | 300 |
| TA-43-1 (FE-9) | P-32 | 1.789 E+8 | 6.623 E-14 | 11.849 |
| TA-43-1 (FE-10) | P-32 | 1.084 E+8 | 4.556 E-14 | 4.939 |
| TA-43-1 (FE-11) | P-32 | 2.690 E+8 | 6.276 E-14 | 16.883 |
| TA-43-1 (FE-12) | P-32 | 2.597 E+8 | 4.943 E-14 | 12.836 |
| TA-43-1 (FE-14, 16 & 17) | P-32 | 1.802 E+8 | 1.487 E-13 | 26.800 |
| TA-43-1 (FE-24) | P-32 | 2.531 E+6 | 7.546 E-14 | 0.191 |
| TA-53-1 (D Wing) | MAP | unknown | 0 | 0.000 |
| TA-3-66 (FE-13) | Th-234 | 5.009 E+8 | 4.893 E-12 | 2451 |
| TA-3-66 (FE-26 & 27) | Th-234 | 9.288 E+6 | 8.613 E-12 | 80 |
| TA-53 (FE-3) | C-11, N-13, O-15 | 2.158 E+8 | 2.729 E-5 | 5.890 E+9 |

# AIRBORNE EFFLUENT RELEASE SUMMARY

CY 77

CONTENTS

Part 1. Total Release Summary by Nuclides for CY 77

| Nuclide(s) | Total Activity Released (Ci) |
|---|---|
| Pu-238 & 239 | .000127 |
| U-233, 235 & 238 | .000709 |
| Mixed Fission Products | .002762 |
| H-3 | 38,561 |
| Ar-41 | 315 |
| I-131 | .000088 |
| P-32 | .000304 |
| Th-234 | .005193 |
| Mixed Activation Products | 47,650 |

Part 2.a. CY 77 Airborne Plutonium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) FE-15 | Pu-238 & 239 | 3.614 E+8 | 3.345 E-15 | 1.209 |
| TA-3-29 Wg. 2(N) FE-14 | Pu-238 & 239 | 6.851 E+8 | 2.157 E-15 | 1.478 |
| TA-3-29 Wg. 3(S) FE-19 | Pu-238 & 239 | 6.552 E+8 | 2.069 E-14 | 13.558 |
| TA-3-29 Wg. 5(S) FE-28 | Pu-238 & 239 | 8.021 E+8 | 9.809 E-15 | 7.868 |
| TA-3-29 Wg. 5(N) FE-29 | Pu-238 & 239 | 3.458 E+8 | 6.738 E-16 | 0.233 |
| TA-3-29 Wg. 7(S) FE-33 | Pu-238 & 239 | 2.522 E+8 | 4.084 E-16 | 0.103 |
| TA-3-20 Wg. 7(N) FE-32 | Pu-238 & 239 | 8.138 E+8 | 1.222 E-15 | 0.913 |
| TA-3-29 Wg. 9 | Pu-239 | 2.626 E+9 | 2.426 E-15 | 6.370 |
| TA-3-29 Wg. 2 FE-17 | Pu-238 & 239 | 7.683 E+7 | 4.295 E-16 | 0.033 |
| TA-3-29 Wg. 2 FE-18 | Pu-238 & 239 | 1.833 E+8 | 8.783 E-16 | 0.161 |
| TA-3-29 Wg. 3 FE-21 | Pu-238 & 239 | 1.547 E+8 | 6.193 E-15 | 0.958 |
| TA-3-29 Wg. 5 FE-30 | Pu-238 & 239 | 7.774 E+7 | 1.544 E-15 | 0.120 |
| TA-3-29 Wg. 5 FE-31 | Pu-238 & 239 | 9.165 E+7 | 1.506 E-15 | 0.138 |
| TA-3-29 Wg. 7 FE-34 | Pu-238 & 239 | 1.716 E+8 | 1.439 E-15 | 0.247 |
| TA-3-29 Wg. 7 FE-35 | Pu-238 & 239 | 1.469 E+8 | 4.561 E-16 | 0.067 |
| TA-21-2 (E) | Pu-239 | 3.016 E+8 | 5.182 E-15 | 1.563 |
| TA-21-2 (W) | Pu-239 | 3.328 E+8 | 2.530 E-15 | 0.842 |
| TA-21-3 (E) | Pu-238 & 239 | 1.586 E+8 | 3.657 E-15 | 0.580 |
| TA-21-3 (W) | Pu-238 & 239 | 2.639 E+8 | 1.789 E-15 | 0.472 |
| TA-21-4 | Pu-238 | 2.236 E+8 | 1.185 E-15 | 0.265 |
| TA-21-4 Hot Cell | Pu-239 | 3.718 E+7 | 5.820 E-14 | 2.164 |
| TA-21-5 (E) | Pu-239 | 3.744 E+8 | 1.619 E-15 | 0.606 |
| TA-21-5 (W) | Pu-239 | 2.951 E+8 | 4.673 E-15 | 1.379 |
| -21-5 (SR) | Pu-239 | 1.781 E+7 | 1.084 E-14 | 0.193 |

Part 2.a. CY 77 Airborne Plutonium Releases - Continued

| Source | Nuclides | Release Data Gross Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|---|
| TA-21-5 (530) | Pu-239 | 4.524 E+7 | 2.073 E-14 | 0.938 |
| TA-21-5 (530 Hood) | Pu-239 | 2.119 E+7 | 1.350 E-14 | 0.286 |
| TA-21-150 | Pu-238 & 239 | 2.808 E+8 | 1.859 E-15 | 0.522 |
| TA-21-324 | Pu-238 & 239 | 1.911 E+8 | 9.524 E-16 | 0.182 |
| TA-35-7 (SE) FE-7 | Pu-239 | 5.018 E+7 | 2.451 E-15 | 0.123 |
| TA-35-7 (NE.C.) FE-3 | Pu-239 | 1.898 E+8 | 1.338 E-15 | 0.254 |
| TA-35-7 (NE) FE-6 | Pu-239 | 5.629 E+7 | 4.175 E-15 | 0.235 |
| TA-35-7 (SE.C.) FE-8 | Pu-239 | 4.186 E+7 | 1.959 E-15 | 0.082 |
| TA-35-7 (S) FE-2 | Pu-239 | 1.252 E+8 | 9.984 E-16 | 0.125 |
| TA-43-1 (FE-9) | Pu-238 & 239 | 1.755 E+8 | 2.439 E-15 | 0.428 |
| TA-43-1 (FE-10) | Pu-239 | 1.063 E+8 | 2.286 E-15 | 0.243 |
| .-43-1 (FE-11) | Pu-239 | 2.639 E+8 | 1.641 E-15 | 0.433 |
| TA-43-1 (FE-12) | Pu-239 | 2.548 E+8 | 1.617 E-15 | 0.412 |
| TA-43-1 (FE-14, 16, 17) | Pu-239 | 1.768 E+8 | 1.773 E-14 | 3.134 |
| TA-43-1 (FE-24) | Pu-239 | 2.483 E+6 | 1.611 E-15 | 0.004 |
| TA-48-1 (FE-54) | Pu-239 | 1.147 E+8 | 2.790 E-16 | 0.032 |
| TA-48-1 (Core) FE-45, 46 | Pu-239 | 7.254 E+8 | 1.148 E-14 | 8.328 |
| TA-48-1 (Alpha) FE-51 | Pu-239 | 3.653 E+7 | 5.749 E-16 | 0.021 |
| TA-50-1 (NE) FE-1 | Pu-239 | 3.497 E+8 | 1.233 E-14 | 4.312 |
| TA-50-1 (SE) FE-2 | Pu-239 | 6.240 E+8 | 2.130 E-15 | 1.329 |
| TA-50-1 (S) FE-3 | Pu-239 | 4.628 E+7 | 1.383 E-12 | 64. |
| TA-54 (Main Stack) | Pu-239 | 2.484 E+5 | 1.208 E-14 | 0.003 |
| | | | Total Released | 127 $\mu$Ci |

## Part 3. CY 77 Airborne Uranium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 3(N) FE-20 | U-235 & 238 | 5.269 E+8 | 2.136 E-14 | 11.255 |
| TA-3-29 Wg. 4(S) FE-24 | U-235 & 238 | 4.433 E+8 | 1.612 E-14 | 7.148 |
| TA-3-29 Wg. 4(N) FE-23 | U-235 & 238 | 6.175 E+8 | 2.497 E-14 | 15.422 |
| TA-3-29 Wg. 3 FE-22 | U-235 & 238 | 1.269 E+8 | 6.998 E-15 | 0.888 |
| TA-3-29 Wg. 4 FE-26 | U-235 & 238 | 1.586 E+8 | 2.560 E-15 | 0.406 |
| TA-3-29 Wg. 4 FE-27 | U-235 & 238 | 1.201 E+8 | 2.573 E-15 | 0.309 |
| TA-3-35 (W) FE-1 & FE-2 | U-235 | 2.353 E+8 | 1.005 E-14 | 2.364 |
| TA-3-66 (NW) FE-7 & FE-8 | U-238 | 2.288 E+8 | 1.538 E-14 | 3.520 |
| TA-3-66 (NE) FE-9 | U-235 & 238 | 5.330 E+8 | 3.375 E-15 | 1.799 |
| TA-3-66 (SE) FE-1 & FE-10 | U-235 | 7.839 E+8 | 4.960 E-15 | 3.888 |
| TA-3-66 (N) FE-13 | U-238 | 4.914 E+8 | 5.698 E-13 | 280. |
| 3-66 (NW corner) | U-238 | 9.113 E+6 | 1.942 E-14 | 0.177 |
| TA-3-66 (WC) FE-24 | U-238 | 2.925 E+7 | 1.412 E-14 | 0.413 |
| TA-3-102 FE-20 | U-235 & 238 | 8.853 E+7 | 3.764 E-14 | 3.332 |
| TA-3-141 (N) FE-6 | U-235 & 238 | 2.067 E+8 | 1.151 E-15 | 0.238 |
| TA-3-141 (NW) FE-9 | U-235 & 238 | 2.756 E+8 | 1.956 E-14 | 5.390 |
| TA-3-141 (SW) FE-10 | U-235 & 238 | 4.394 E+8 | 2.176 E-15 | 0.956 |
| TA-21-3 (S) | U-235 | 2.951 E+8 | 8.946 E-13 | 264. |
| TA-21-3 (Incin.) | U-235 | 8.671 E+6 | 4.867 E-13 | 4.220 |
| TA-21-4 (S) | U-235 | 3.120 E+8 | 1.548 E-13 | 48.288 |
| TA-21-155 (NE) | U-235 | 1.084 E+7 | 7.657 E-15 | 0.083 |
| TA-21-155 (NW) | U-235 | 8.520 E+6 | 3.521 E-16 | 0.003 |
| TA-21-155 (SE) | U-235 | 1.032 E+7 | 1.938 E-16 | 0.002 |
| 21-155 (SW) | U-235 | 1.840 E+7 | 1.087 E-15 | 0.020 |

Part 3. CY 77 Airborne Uranium Releases - Continued

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|---|
| TA-46-31 (N) FE-41 | U-238 | 3.648 E+5 | 0.000 | 0.000 |
| TA-46-31 (S) FE-25 | U-238 | 2.676 E+6 | 1.121 E-15 | 0.003 |
| TA-46-31 (SW) FE-26 | U-235 | 5.096 E+6 | 1.962 E-16 | 0.001 |
| TA-46-31 (W) FE-44 | U-238 | 1.368 E+5 | 0.000 | 0.000 |
| TA-48-1 (S) FE-11, 12, 13 | U-235 | 8.827 E+8 | 3.687 E-14 | 32.547 |
| TA-48-1 (Hot Cell) | U-235 | 5.876 E+7 | 8.713 E-15 | 0.512 |
| TA-48-1 (N) FE-15, 16 | U-235 | 7.670 E+8 | 2.885 E-14 | 22.130 |
| | | | Total Released | 709 $\mu Ci$ |

Part 4. CY 77 Airborne Mizec 'ssion Product Releases

| ırce | Release Data Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|
| TA-3-29 (Wg. 9) | 2.626 E+9 | 1.832 E-13 | 481. |
| TA-21-4 (Hot Cell) | 3.718 E+7 | 8.765 E-14 | 3.259 |
| TA-48-1 (S) FE-11, 12, 13 | 8.827 E+8 | 6.423 E-13 | 567. |
| TA-48-1 (N) FE-15, 16 | 7.670 E+8 | 3.272 E-13 | 251. |
| TA-48-1 (Hot Cell) | 5.876 E+7 | 9.871 E-13 | 58. |
| TA-48-1 (Core Wg.) FE-45, 46 | 7.254 E+8 | 1.806 E-12 | 1310. |
| TA-48-1 (Alpha Wg.) FE-51 | 3.653 E+7 | 4.640 E-14 | 1.695 |
| TA-48-1 (NE) FE-54 | 1.147 E-8 | 3.552 E-14 | 4.074 |
| TA-50-1 (NE) FE-1 | 3.497 E+8 | 9.054 E-14 | 31.661 |
| -50-1 (SE) FE-2 | 6.240 E+8 | 6.904 E-14 | 43.084 |
| TA-50-1 (S) FE-3 | 4.628 E+7 | 2.390 E-13 | 11.063 |
| | | Total Released | 2762 μCi |

Part 5. CY 77 Airborne Tritium Releases

| Source | Release Data Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|
| TA-3-16 | 4.453 E+6 | 8.983 E-5 | 4.000 E+8 |
| TA-3-34 (FE-52) | 2.227 E+7 | 0.000 | 0.000 |
| TA-9-21 (E) | 2.400 E+7 | 1.083 E-7 | 2.600 E+6 |
| TA-21-5 (SR) | 1.781 E+7 | 1.860 E-7 | 3.312 E+6 |
| TA-21-209 (FE-10) | 2.067 E+8 | 6.289 E-7 | 1.300 E+8 |
| TA-33-86 (FE-6) | 1.060 E+8 | 3.486 E-4 | 3.695 E+10 |
| TA-35-2 (S) (FE-11) | 1.104 E+8 | 7.116 E-6 | 7.856 E+8 |
| TA-53 (N) | 2.650 E+6 | 8.928 E-5 | 2.366 E+8 |
| 53 (S) (FE-4) | 1.713 E+6 | 3.094 E-5 | 5.300 E+7 |
| | | Total Released | 3.856 E+10 |

## Part 6. CY 77 Miscellaneous Releases

| | | Release Data | | |
|---|---|---|---|---|
| **Source** | Nuclides | Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi) |
| TA-2-9 Omega | Ar-41 | 1.300 E+7 | 2.421 E-5 | 3.147 E+8 |
| TA-3-29 (Wg. 9) | I-131 | 2.629 E+9 | 3.347 E-14 | 88. |
| TA-43-1 (FE-9) | P-32 | 1.755 E+8 | 2.339 E-13 | 41.045 |
| TA-43-1 (FE-10) | P-32 | 1.063 E+8 | 2.396 E-13 | 25.471 |
| TA-43-1 (FE-11) | P-32 | 2.639 E+8 | 3.107 E-13 | 82. |
| TA-43-1 (FE-12) | P-32 | 2.548 E+8 | 2.374 E-13 | 60.490 |
| TA-43-1 (FE-14, 16 & 17) | P-32 | 1.768 E+8 | 5.373 E-13 | 95. |
| TA-43-1 (FE-24) | P-32 | 2.483 E+6 | 1.418 E-13 | 0.352 |
| TA-53-1 (D Wing) | $Be^7$ | 1.992 E+8 | 2.510 E-17 | 0.005 |
| TA-53 (FE-3) | C-11, N-13 O-15, Ar-41* | 1.528 E+8 | 3.118 E-4 | 4.765 E+10 |
| TA-3-66 (FE-13) | Th-234 | 4.914 E+8 | 1.017 E-11 | 4998. |
| TA-3-66 (FE-26 & 27) | Th-234 | 9.113 E+6 | 2.140 E-11 | 195. |
| TA-53 (FE-3) | $Be^7$ | 1.694 E+8 | 1.836 E-15 | 0.311 |
| TA-53 (FE-16) | $Be^7$ | 1.992 E+8 | 2.510 E-17 | 0.005 |

*O-15 122 sec half-life - $\sim$67% of total activity

C-11 20.4 min half-life - $\sim$29% of total activity

N-13 $\sim$10 min half-life - $\sim$3% of total activity

Ar-41 1.8 hr half-life - $\sim$1% of total activity

(December 30, 1978 thru December 29, 1978)

| NUCLIDE(S) | 1st. Quarter (1) | 2nd. (2) | 3rd. (3) | 4th. (4) | | Total Activity (Cu |
|---|---|---|---|---|---|---|
| Pu-238 & 239 | .000039 | .000018 | .000011 | .000043 | | .00 |
| U-235 & 238 | .000138 | .000120 | .000116 | .000152 | | .0005 .0( |
| Mixed Fission Products | .000348 | .000668 | .000172 | .000426 | | .00 |
| H-3 | 1037 | 1319 | 1865 | 14,410 | | 18 |
| Ar-41 | 57 | 50 | 53 | 79 | | 2 |
| I-131 | .000007 | .000013 | .000021 | .000040 | | .00 |
| P-32 | .000035 | .000035 | .000009 | .000006 | | .00 |
| Th-234 | .000821 | .000433 | .000423 | .000221 | | .00 |
| Mixed Activation Products | 16,420 | 7690 | 42,190 | 10,206 * | | 76 |

* thru Nov. 1978

# AIRBORNE EFFLUENT RELEASE SUMMARY

CY 77

CONTENTS

Part 1. Total Release Summary by Nuclides for CY 77

| Nuclide(s) | Total Activity Released (Ci) |
|---|---|
| Pu-238 & 239 | .000127 |
| U-233, 235 & 238 | .000709 |
| Mixed Fission Products | .002762 |
| H-3 | 38,561 |
| Ar-41 | 315 |
| I-131 | .000088 |
| P-32 | .000304 |
| Th-234 | .005193 |
| Mixed Activation Products | 47,650 |

## Part 2.a. CY 77 Airborne Plutonium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) FE-15 | Pu-238 & 239 | 3.614 E+8 | 3.345 E-15 | 1.209 |
| TA-3-29 Wg. 2(N) FE-14 | Pu-238 & 239 | 6.851 E+8 | 2.157 E-15 | 1.478 |
| TA-3-29 Wg. 3(S) FE-19 | Pu-238 & 239 | 6.552 E+8 | 2.069 E-14 | 13.558 |
| TA-3-29 Wg. 5(S) FE-28 | Pu-238 & 239 | 8.021 E+8 | 9.809 E-15 | 7.868 |
| TA-3-29 Wg. 5(N) FE-29 | Pu-238 & 239 | 3.458 E+8 | 6.738 E-16 | 0.233 |
| TA-3-29 Wg. 7(S) FE-33 | Pu-238 & 239 | 2.522 E+8 | 4.084 E-16 | 0.103 |
| TA-3-20 Wg. 7(N) FE-32 | Pu-238 & 239 | 8.138 E+8 | 1.222 E-15 | 0.913 |
| TA-3-29 Wg. 9 | Pu-239 | 2.626 E+9 | 2.426 E-15 | 6.370 |
| TA-3-29 Wg. 2 FE-17 | Pu-238 & 239 | 7.683 E+7 | 4.295 E-16 | 0.033 |
| TA-3-29 Wg. 2 FE-18 | Pu-238 & 239 | 1.833 E+8 | 8.783 E-16 | 0.161 |
| TA-3-29 Wg. 3 FE-21 | Pu-238 & 239 | 1.547 E+8 | 6.193 E-15 | 0.958 |
| TA-3-29 Wg. 5 FE-30 | Pu-238 & 239 | 7.774 E+7 | 1.544 E-15 | 0.120 |
| TA-3-29 Wg. 5 FE-31 | Pu-238 & 239 | 9.165 E+7 | 1.506 E-15 | 0.138 |
| TA-3-29 Wg. 7 FE-34 | Pu-238 & 239 | 1.716 E+8 | 1.439 E-15 | 0.247 |
| TA-3-29 Wg. 7 FE-35 | Pu-238 & 239 | 1.469 E+8 | 4.561 E-16 | 0.067 |
| TA-21-2 (E) | Pu-239 | 3.016 E+8 | 5.182 E-15 | 1.563 |
| TA-21-2 (W) | Pu-239 | 3.328 E+8 | 2.530 E-15 | 0.842 |
| TA-21-3 (E) | Pu-238 & 239 | 1.586 E+8 | 3.657 E-15 | 0.580 |
| TA-21-3 (W) | Pu-238 & 239 | 2.639 E+8 | 1.789 E-15 | 0.472 |
| TA-21-4 | Pu-238 | 2.236 E+8 | 1.185 E-15 | 0.265 |
| TA-21-4 Hot Cell | Pu-239 | 3.718 E+7 | 5.820 E-14 | 2.164 |
| TA-21-5 (E) | Pu-239 | 3.744 E+8 | 1.619 E-15 | 0.606 |
| TA-21-5 (W) | Pu-239 | 2.951 E+8 | 4.673 E-15 | 1.379 |
| .-21-5 (SR) | Pu-239 | 1.781 E+7 | 1.084 E-14 | 0.193 |

Part 3. CY 77 Airborne Uranium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi |
|---|---|---|---|---|
| TA-3-29 Wg. 3(N) FE-20 | U-235 & 238 | 5.269 E+8 | 2.136 E-14 | 11.255 |
| TA-3-29 Wg. 4(S) FE-24 | U-235 & 238 | 4.433 E+8 | 1.612 E-14 | 7.148 |
| TA-3-29 Wg. 4(N) FE-23 | U-235 & 238 | 6.175 E+8 | 2.497 E-14 | 15.422 |
| TA-3-29 Wg. 3 FE-22 | U-235 & 238 | 1.269 E+8 | 6.998 E-15 | 0.888 |
| TA-3-29 Wg. 4 FE-26 | U-235 & 238 | 1.586 E+8 | 2.560 E-15 | 0.406 |
| TA-3-29 Wg. 4 FE-27 | U-235 & 238 | 1.201 E+8 | 2.573 E-15 | 0.309 |
| TA-3-35 (W) FE-1 & FE-2 | U-235 | 2.353 E+8 | 1.005 E-14 | 2.364 |
| TA-3-66 (NW) FE-7 & FE-8 | U-238 | 2.288 E+8 | 1.538 E-14 | 3.520 |
| TA-3-66 (NE) FE-9 | U-235 & 238 | 5.330 E+8 | 3.375 E-15 | 1.799 |
| TA-3-66 (SE) FE-1 & FE-10 | U-235 | 7.839 E+8 | 4.960 E-15 | 3.888 |
| TA-3-66 (N) FE-13 | U-238 | 4.914 E+8 | 5.698 E-13 | 280. |
| A-3-66 (NW corner) | U-238 | 9.113 E+6 | 1.942 E-14 | 0.177 |
| TA-3-66 (WC) FE-24 | U-238 | 2.925 E+7 | 1.412 E-14 | 0.413 |
| TA-3-102 FE-20 | U-235 & 238 | 8.853 E+7 | 3.764 E-14 | 3.332 |
| TA-3-141 (N) FE-6 | U-235 & 238 | 2.067 E+8 | 1.151 E-15 | 0.238 |
| TA-3-141 (NW) FE-9 | U-235 & 238 | 2.756 E+8 | 1.956 E-14 | 5.390 |
| TA-3-141 (SW) FE-10 | U-235 & 238 | 4.394 E+8 | 2.176 E-15 | 0.956 |
| TA-21-3 (S) | U-235 | 2.951 E+8 | 8.946 E-13 | 264. |
| TA-21-3 (Incin.) | U-235 | 8.671 E+6 | 4.867 E-13 | 4.220 |
| TA-21-4 (S) | U-235 | 3.120 E+8 | 1.548 E-13 | 48.288 |
| TA-21-155 (NE) | U-235 | 1.084 E+7 | 7.657 E-15 | 0.083 |
| TA-21-155 (NW) | U-235 | 8.520 E+6 | 3.521 E-16 | 0.003 |
| TA-21-155 (SE) | U-235 | 1.032 E+7 | 1.938 E-16 | 0.002 |
| A-21-155 (SW) | U-235 | 1.840 E+7 | 1.087 E-15 | 0.020 |

## Part 4. CY 77 Airborne Mized :ssion Product Releases

| Source | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi) |
|---|---|---|---|
| TA-3-29 (Wg. 9) | 2.626 E+9 | 1.832 E-13 | 481. |
| TA-21-4 (Hot Cell) | 3.718 E+7 | 8.765 E-14 | 3.259 |
| TA-48-1 (S) FE-11, 12, 13 | 8.827 E+8 | 6.423 E-13 | 567. |
| TA-48-1 (N) FE-15, 16 | 7.670 E+8 | 3.272 E-13 | 251. |
| TA-48-1 (Hot Cell) | 5.876 E+7 | 9.871 E-13 | 58. |
| TA-48-1 (Core Wg.) FE-45, 46 | 7.254 E+8 | 1.806 E-12 | 1310. |
| TA-48-1 (Alpha Wg.) FE-51 | 3.653 E+7 | 4.640 E-14 | 1.695 |
| TA-48-1 (NE) FE-54 | 1.147 E-8 | 3.552 E-14 | 4.074 |
| TA-50-1 (NE) FE-1 | 3.497 E+8 | 9.054 E-14 | 31.661 |
| TA-50-1 (SE) FE-2 | 6.240 E+8 | 6.904 E-14 | 43.084 |
| TA-50-1 (S) FE-3 | 4.628 E+7 | 2.390 E-13 | 11.063 |
| | | Total Released | 2762 μCi |

## Part 5. CY 77 Airborne Tritium Releases

| Source | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi) |
|---|---|---|---|
| TA-3-16 | 4.453 E+6 | 8.983 E-5 | 4.000 E+8 |
| TA-3-34 (FE-52) | 2.227 E+7 | 0.000 | 0.000 |
| TA-9-21 (E) | 2.400 E+7 | 1.083 E-7 | 2.600 E+6 |
| TA-21-5 (SR) | 1.781 E+7 | 1.860 E-7 | 3.312 E+6 |
| TA-21-209 (FE-10) | 2.067 E+8 | 6.289 E-7 | 1.300 E+8 |
| TA-33-86 (FE-6) | 1.060 E+8 | 3.486 E-4 | 3.695 E+10 |
| TA-35-2 (S) (FE-11) | 1.104 E+8 | 7.116 E-6 | 7.856 E+8 |
| TA-53 (N) | 2.650 E+6 | 8.928 E-5 | 2.366 E+8 |
| 53 (S) (FE-4) | 1.713 E+6 | 3.094 E-5 | 5.300 E+7 |
| | | Total Released | 3.856 E+10 |

Part 6. CY 77 Miscellaneous Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|---|
| TA-2-9 Omega | Ar-41 | 1.300 E+7 | 2.421 E-5 | 3.147 E+8 |
| TA-3-29 (Wg. 9) | I-131 | 2.629 E+9 | 3.347 E-14 | 88. |
| TA-43-1 (FE-9) | P-32 | 1.755 E+8 | 2.339 E-13 | 41.045 |
| TA-43-1 (FE-10) | P-32 | 1.063 E+8 | 2.396 E-13 | 25.471 |
| TA-43-1 (FE-11) | P-32 | 2.639 E+8 | 3.107 E-13 | 82. |
| TA-43-1 (FE-12) | P-32 | 2.548 E+8 | 2.374 E-13 | 60.490 |
| TA-43-1 (FE-14, 16 & 17) | P-32 | 1.768 E+8 | 5.373 E-13 | 95. |
| TA-43-1 (FE-24) | P-32 | 2.483 E+6 | 1.418 E-13 | 0.352 |
| TA-53-1 (D Wing) | $Be^7$ | 1.992 E+8 | 2.510 E-17 | 0.005 |
| TA-53 (FE-3) | C-11, N-13 O-15, Ar-41* | 1.528 E+8 | 3.118 E-4 | 4.765 E+1 |
| TA-3-66 (FE-13) | Th-234 | 4.914 E+8 | 1.017 E-11 | 4998. |
| .A-3-66 (FE-26 & 27) | Th-234 | 9.113 E+6 | 2.140 E-11 | 195. |
| TA-53 (FE-3) | $Be^7$ | 1.694 E+8 | 1.836 E-15 | 0.311 |
| TA-53 (FE-16) | $Be^7$ | 1.992 E+8 | 2.510 E-17 | 0.005 |

*O-15 122 sec half-life - ∿67% of total activity
C-11 20.4 min half-life - ∿29% of total activity
N-13 ∿10 min half-life - ∿3% of total activity
Ar-41 1.8 hr half-life - ∿1% of total activity

UNIVERSITY OF CALIFORNIA
LOS ALAMOS, NEW MEXICO 87545

# OFFICE MEMORANDUM

TO : James DeField, Section Leader
H-5 Engineering Section

DATE: April 11, 1979

FROM : Ronald G. Stafford, H-1 Section Leader RGS

SUBJECT : CMR BUILDING FE-19 EFFICIENCY TESTS

SYMBOL : H-1-PF-79-54

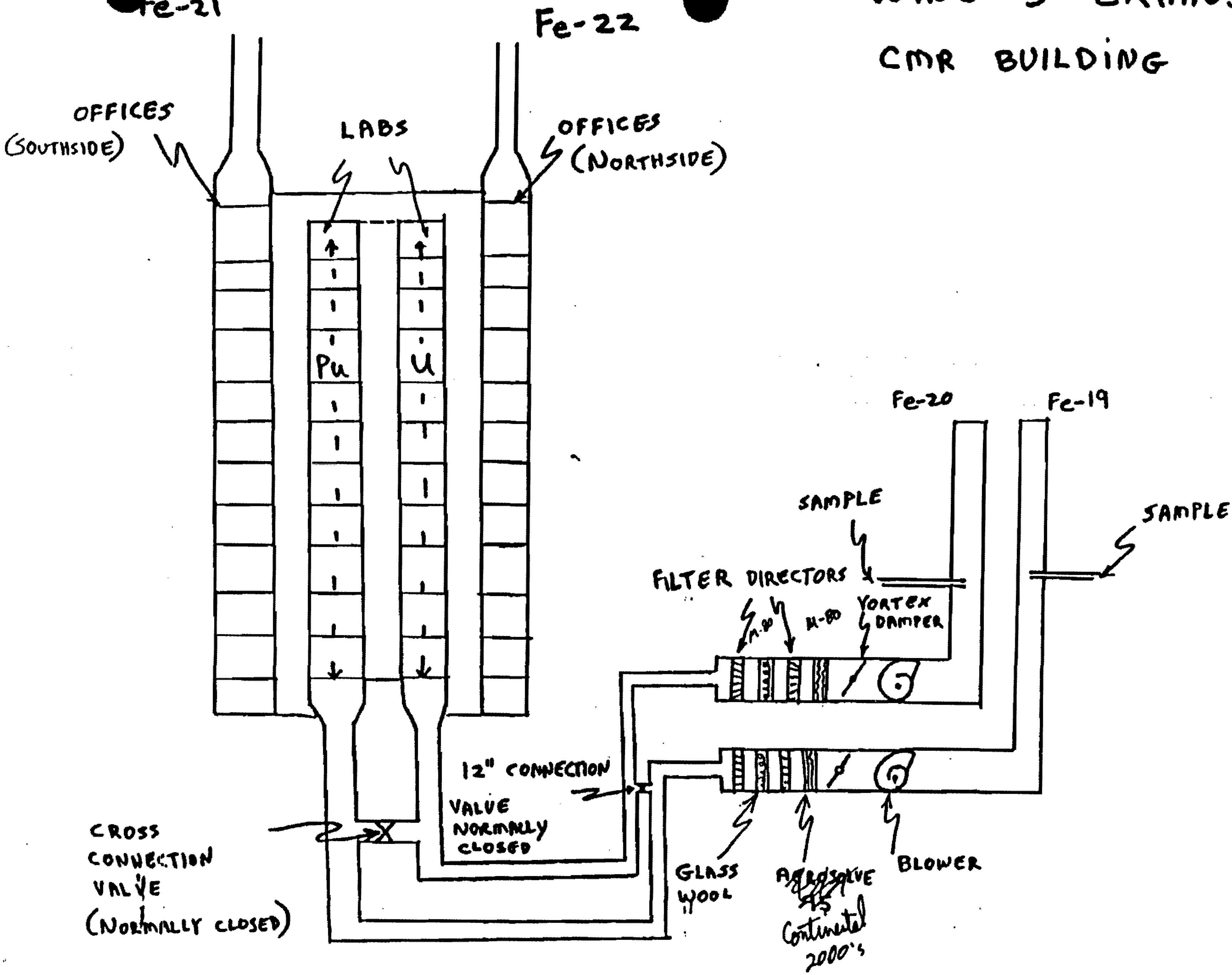
MAIL STOP: 503

In early February, 1979 it was brought to my attention that at least two of the M-80 prefilters and two bag filters had torn in FE-19 filter plenum serving the south side of Wing 3 of the CMR Building. The entire bank of prefilters and bag filters were changed on March 5. After the job was complete Mr. Robert Geoffrion and I independently asked Mr. Meliton Garcia, H-5, to DOP test this plenum to determine the efficiency of the system. We were both informed by Mr. Garcia that H-5 would only DOP test HEPA filter systems and, therefore, would not supply us with FE-19 efficiency information. Since the filter change on March 5 our stack sampling data on FE-19 stack has made us aware of either low bank efficiency or a possible filter bank by-pass. I am, therefore, again requesting that H-5 DOP test this system. This information will be valuable to H-1 to make recommendations to either upgrade the system or correct any deficiencies.

RGS/mr

cc: H-1 PF Files

# WING 3 EXHAUST
## CMR BUILDING



# OFFICE MEMORANDUM

TO : Jerome E. Dummer, H-1 Group Leader DATE: March 26, 1979

: John C. Gallimore, H-1 Assistant Group Leader

FROM : Ronald G. Stafford, H-1 Section Leader

SUBJECT : CMR BUILDING FE-19 STACK RELEASE (MARCH 5, 1979)

SYMBOL : H-1-PF-79-49

MAIL STOP: 503

In early February it was brought to my attention that the January 19 to January 26 stack release from Wing 3, south, stack FE-19 was 91 µCi. This was greater than the total release from this stack in 1978. Mr. Geoffrion and I examined the filters through the sight glass in plenum FE-19 and it appeared that two of the bag filters had torn leaving substantial holes in the filter bank. These filters were installed in 1976. We immediately requested through Marion Davis, ENG-4, that an "X Urgent" work order be initiated to install new filters in this bank. We also requested that the M-80 prefilters be replaced at the same time. An "SOP for Changing Radioactively Contaminated Filters or Media In The CMR Building Filter Plenums" (attachment 1) had been prepared and reviewed in December 1978 and was to be used as the guide for this job.

A preoperational meeting was held at the CMR Building on March 2, 1979 to discuss safety requirements associated with the filter change. The following individuals were present at this meeting: Robert Geoffrion, Al Cucchiara, H-1, Robert F. Weeks, Tom Moore, H-5, Marion Davis, ENG-4, and Keith Dalrymple, Zia.

Mr. Geoffrion suggested in this meeting that consideration be given to reversing the flow through the plenum and exhausting this reverse flow through the Wing 3 north (FE-20) process exhaust plenum. H-5, ENG-4 and Zia felt that this was unnecessary and would lead to difficulties in installing the bag filters against a reverse flow. Mr. Geoffrion recalled that this reverse flow concept had not been used in the 1976 filter change, however, Mr. Gallimore felt that it was. Vince Hall, ENG-4, suggested that the blower speed be reduced and the plenum dampers be vortexed such that the entire exhaust out the stack be from one plenum door opening. This could be accomplished by opening the by-pass damper from FE-19 to FE-20 duct and putting FE-20 fan on high speed. This should have resulted in all south half process exhaust being diverted and filtered through FE-20. Mr. Hall and Mr. Cucchiara later calculated that the stack exhaust flow through FE-19 in this configuration would be 733 ft$^3$/minute.

The filter change was done on March 5, 1979 between 9:30 am to 3:30 pm (6 hours).

On Monday March 19 I was informed by William Romero, H-1, that we had a high stack discharge from stack FE-19 during the 168 hour sampling period between March 2 and March 9. Calculation from the HPAL indicated that the average effluent over this period was $3.68 \times 10^{-11}$ µCi/ml or 1197 µCi total released over this period. On March 20 I requested that Dennis Vasilik, H-1, count the filter and determine the total activity and isotopic content collected on the FE-19 stack filter. He reported that .0495 µCi of weapons grade Pu-239 had been collected on the filter.

The HPAL calculations were, as usual, based on a stack flow rate of 48,345 $ft^3$/min and did not account for the reduced flow rate during the filter change of 733 $ft^3$/min on March 5 for 6 hours. It is my feeling that the majority of the activity collected on this stack air sample filter resulted from the filter change since the total FE-19 stack discharge from January 26, 1979 to February 23, 1979 was 13.99 µCi and no significant CMB-1 operational changes had occurred. In addition, the FE-19 stack release between March 9 and March 16 was 0.97 µCi after the filter change.

If we assume that the total activity collected on the FE-19 stack sampling filter between March 2 and March 9 was a result of the filter change the following calculation could be used.

0.0495 µCi collected on FE-19 stack sample filter.

Stack sample flow rate of 2.0 $ft^3$/min.

Stack flow rate for 6 hour period was 733 $ft^3$/min.

$$\frac{X\ \mu Ci\ \text{discharged}}{733\ ft^3/min} = \frac{0.0495\ \mu Ci\ \text{collected}}{2\ ft^3/min}$$

$$X = 18.14\ \mu Ci\ \text{discharged.}$$

Since it is impossible to quanitate the actual release over the entire period, specifically the 6 hour filter change vs. the remaining 162 hour sampling period I am recommending that the following be done to report the FE-19 stack discharge between March 2 and March 9. We should assume that the majority of the release occurred during the filter change (18.14 µCi). Since the January 26 to February 23 (4 sampling periods) discharge was 13.99 µCi we estimate that 3.5 µCi average was released per sampling period. By adding these two we have a total of 21.64 µCi discharged. I feel this is a conservative approach and over estimates the stack discharge.

If this is approved we can estimate the effluent concentration by the following relationship:

$$\frac{18.14\ \mu Ci + (3.5\ \mu Ci)\ \frac{18\ hr}{168\ hr}}{(753\ ft^3/min)(360\ min)\ \frac{2.832X10^{4}ml}{ft^3} + (48{,}345\ ft^3/min)(1080\ min)\ \frac{2.832X10^{4}ml}{ft^3}}$$

$$= \frac{18.515}{7.47X10^{9} + 1.48X10^{12}} = \frac{18.515}{1.49X10^{12}} = 1.24X10^{-11}\ \mu Ci/ml.$$

$$\frac{1.24X10^{-11}\ \mu Ci/ml}{\text{Soluable Pu-239 MPC for uncontrolled area}} = \frac{1.24x10^{-11}\ \mu Ci/ml}{6.0X10^{-14}\ \mu Ci/ml} =$$ 206 times the u controlled area for a 24 hour p

From this information it is not necessary to look at the dispersion dilution equation, however, it is a useful exercise for general information from this stack release point. We have requested that John Ahlquist, H-8, perform the necessary calculations to give us concentration at the site boundry (Pajarito Road).

Several things, in hindsight, are apparent which could lead to a better controlled filter change operation at the CMR Building. Therefore, I am recommending that the following items be required at this facility and any deviation be approved by the H-1 and Operating Group Office responsible for the ventilation system in question.

1. All filter changes require that the air flow be diverted from the system being changed to the other system in the same wing.

2. The blower be completely shut down on the system being changed.

3. Stack air sampling filters be changed for the filter change operation.

4. The Health Physics Analysis Laboratory personnel be notified of the down time associated with the filter change.

RGS/mr

cc: A. Valentine, H-1 MS-401
G. Waterbury, CMB-1 MS-740
D. Vasilik, H-1 MS-749
R. Geoffrion, H-1 MS-749
A. Cucchiara, H-1 MS-503
H-1 PF Files

# AIRBORNE EFFLUENT RELEASE SUMMARY

## CY 78

CONTENTS

Part 1. Total Release Summary by Nuclides for CY 78

| Nuclide(s) | Total Activity Released (Ci) |
|---|---|
| Pu-238 & 239 | .000112 |
| U-233, 235 & 238 | .000527 |
| Mixed Fission Products | .001613 |
| H-3 | 18,630 |
| Ar-41 | 239 (+ [illegible]) = 589 Ci |
| I-131 | .000081 |
| P-32 | .000085 |
| Th-234 | .001900 |
| Mixed Activation Products | 116,800 − 350 Ci Ar-41 |

Part 2.a. CY 78 Airborne Plutonium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) FE-15 | Pu-238 & 239 | 3.614 E+8 | 1.107 E-16 | 0.040 |
| TA-3-29 Wg. 2(N) FE-14 | Pu-238 & 239 | 6.851 E+8 | 6.422 E-17 | 0.044 |
| TA-3-29 Wg. 3(S) FE-19 | Pu-238 & 239 | 6.552 E+8 | 7.834 E-14 | 51.327 |
| TA-3-29 Wg. 5(S) FE-28 | Pu-238 & 239 | 8.021 E+8 | 0 | 0 |
| TA-3-29 Wg. 5(N) FE-29 | Pu-238 & 239 | 3.458 E+8 | 3.759 E-17 | 0.013 |
| TA-3-29 Wg. 7(S) FE-33 | Pu-238 & 239 | 2.522 E+8 | 7.891 E-16 | 0.199 |
| TA-3-29 Wg. 7(N) FE-32 | Pu-238 & 239 | 8.138 E+8 | 7.250 E-17 | 0.059 |
| TA-3-29 Wg. 9 | Pu-239 | 2.626 E+9 | 1.939 E-15 | 5.092 |
| TA-3-29 Wg. 2 FE-17 | Pu-238 & 239 | 7.683 E+7 | 3.905 E-17 | 0.003 |
| TA-3-29 Wg. 2 FE-18 | Pu-238 & 239 | 1.833 E+8 | 4.910 E-17 | 0.009 |
| T 29 Wg. 3 FE-21 | Pu-238 & 239 | 1.547 E+8 | 9.418 E-15 | 1.457 |
| 3-29 Wg. 5 FE-30 | Pu-238 & 239 | 7.774 E+7 | 1.286 E-17 | 0.001 |
| TA-3-29 Wg. 5 FE-31 | Pu-238 & 239 | 9.165 E+7 | 4.583 E-16 | 0.042 |
| TA-3-29 Wg. 7 FE-34 | Pu-238 & 239 | 1.716 E+8 | 2.914 E-17 | 0.005 |
| TA-3-29 Wg. 7 FE-35 | Pu-238 & 239 | 1.469 E+8 | 7.488 E-17 | 0.011 |
| TA-21-2 (E) FE-2 | Pu-239 | 3.016 E+8 | 2.447 E-15 | 0.738 |
| TA-21-2 (W) FE-1 | Pu-239 | 3.328 E+8 | 7.550 E-14 | 25.127 |
| TA-21-3 (E) FE-2 | Pu-238 & 239 | 1.586 E+8 | 3.127 E-15 | 0.496 |
| TA-21-3 (W) FE-1 | Pu-238 & 239 | 2.639 E+8 | 3.187 E-15 | 0.841 |
| TA-21-4 (W) FE-2 | Pu-238 | 2.236 E+8 | 1.905 E-15 | 0.426 |
| TA-21-4 (Hot Cell) FE-1 | Pu-239 | 2.964 E+7 | 1.889 E-15 | 0.056 |
| TA-21-5 (E) FE-2 | Pu-239 | 3.744 E+8 | 8.494 E-16 | 0.318 |
| TA-21-5 (W) FE-2 | Pu-239 | 2.951 E+8 | 2.684 E-15 | 0.792 |
| 1-5 (SR) FE-5, FE-6 | Pu-239 | 1.370 E+7 | 1.606 E-15 | 0.022 |
| TA-21-257 (Pug Mill) | Am-241 | 7.040 E+7 | 4.830 E-16 | 0.034 |

Part 3. CY 78 Airborne Uranium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 3(N) FE-20 | U-235 & 238 | 5.629 E+8 | 2.803 E-15 | 1.578 |
| TA-3-29 Wg. 4(S) FE-24 | U-235 & 238 | 4.433 E+8 | 9.156 E-15 | 4.059 |
| TA-3-29 Wg. 4(N) FE-23 | U-235 & 238 | 6.175 E+8 | 5.200 E-15 | 3.211 |
| TA-3-29 Wg. 3 FE-22 | U-235 & 238 | 1.269 E+8 | 1.087 E-15 | 0.138 |
| TA-3-29 Wg. 4 FE-26 | U-235 & 238 | 1.586 E+8 | 1.066 E-15 | 0.169 |
| TA-3-29 Wg. 4 FE-27 | U-235 & 238 | 1.201 E+8 | 5.745 E-16 | 0.069 |
| TA-3-35 (W) FE-1 & FE-2 | U-235 | 2.353 E+8 | 4.037 E-15 | 0.950 |
| TA-3-66 (NW) FE-8 | U-238 | 2.288 E+8 | 1.763 E-14 | 4.033 |
| TA-3-66 (NE) FE-9 | U-238 | 5.330 E+8 | 2.084 E-15 | 1.111 |
| TA-3-66 (SE) FE-10 | U-235 | 2.249 E+8 | 1.025 E-14 | 2.305 |
| TA-3-66 (N) FE-13 | U-238 | 4.914 E+8 | 3.109 E-13 | 153. |
| 3-66 (NW corner) FE-26 | U-238 | 5.824 E+6 | 8.929 E-15 | 0.052 |
| TA-3-66 (WC) FE-24 | U-238 | 2.925 E+7 | 4.633 E-14 | 1.364 |
| TA-3-102 FE-20 | U-235 & 238 | 8.853 E+7 | 2.946 E-14 | 2.608 |
| TA-3-141 (N) FE-6 | U-235 & 238 | 2.067 E+8 | 8.128 E-16 | 0.168 |
| TA-3-141 (NW) FE-9 | U-235 & 238 | 2.756 E+8 | 3.259 E-14 | 8.981 |
| TA-3-141 (SW) FE-10 | U-235 & 238 | 4.394 E+8 | 2.237 E-15 | 0.983 |
| TA-21-3 (S) FE-1 | U-235 | 2.951 E+8 | 8.669 E-13 | 256. |
| TA-21-3 (Incin.) FE-1 | U-235 | 8.671 E+6 | 1.129 E-13 | 0.979 |
| TA-21-4 (S) FE-1 | U-235 | 3.120 E+8 | 1.552 E-13 | 48.415 |
| TA-54 (Rm. Exhaust). FE-2 | U-238 | 7.950 E+6 | 0.000 | 0.000 |
| TA-46-31 FE-43 | U-238 | 1.240 E+7 | 2.044 E-12 | 25.344 |
| TA-48-1 (S) FE-11, 12, 13 | U-235 | 8.827 E+8 | 3.592 E-15 | 3.171 |

| Source | Release Data<br>Gross Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|
| -29 (Wg. 9) | 2.626 E+9 | 1.533 E-13 | 403. |
| TA-21-4 (Hot Cell) FE-1 | 2.964 E+7 | 3.465 E-14 | 1.027 |
| TA-48-1 (S) FE-11, 12, 13 | 8.827 E+8 | 1.992 E-13 | 176. |
| TA-48-1 (N) FE-15, 16 | 7.670 E+8 | 2.241 E-13 | 172. |
| TA-48-1 (Hot Cell) | 5.876 E+7 | 2.639 E-13 | 15.505 |
| TA-48-1 (Core Wg.) FE-45, 46 | 7.254 E+8 | 1.106 E-12 | 802 |
| TA-48-1 (Alpha Wg.) FE-51 | 3.653 E+7 | 1.872 E-14 | 0.684 |
| TA-48-1 (NE) FE-54 | 1.147 E-8 | 2.107 E-14 | 2.417 |
| TA-50-1 (NE) FE-1 | 3.497 E+8 | 5.541 E-14 | 19.378 |
| TA-50-1 (SE) FE-2 | 6.240 E+8 | 2.966 E-14 | 18.508 |
| TA-50-1 (S) FE-3 | 2.136 E+7 | 9.513 E-14 | 2.032 |
| | | Total Released | 1613 $\mu$Ci |

Table 5. CY 78 Airborne Tritium Releases

| Source | Release Data<br>Gross Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|
| TA-3-16 | 4.446 E+6 | 2.245 E-5 | 9.980 E+7 |
| TA-3-34 (FE-52) | 2.227 E+7 | 0.000 | 0.000 |
| TA-9-21 (E) | 2.400 E+7 | 1.083 E-7 | 2.600 E+6 |
| TA-21-5 (SR) | 2.740 E+6 | 4.745 E-8 | 1.300 E+5 |
| TA-21-209 (FE-10) | 2.067 E+8 | 3.458 E-7 | 7.147 E+7 |
| TA-33-86 (FE-16) | 1.082 E+8 | 1.644 E-4 | 1.778 E+10 |
| TA-35-2 (S) (FE-11) | 1.285 E+8 | 5.259 E-6 | 6.757 E+8 |
| | | Total Released | 1.863 E+10 |

## Part 6. CY 78 Miscellaneous Releases

| Source | Nuclides | Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|---|
| | | Release Data | | |
| TA-2-9 Omega | Ar-41 | 1.300 E+7 | 1.840 E-5 | 2.392 E+8 |
| TA-3-29 (Wg. 9) | I-131 | 2.626 E+9 | 3.084 E-14 | 81. |
| TA-43-1 (FE-9) | P-32 | 1.755 E+8 | 4.991 E-14 | 8.760 |
| TA-43-1 (FE-10) | P-32 | 1.063 E+8 | 8.676 E-14 | 9.223 |
| TA-43-1 (FE-11) | P-32 | 2.639 E+8 | 7.942 E-14 | 20.958 |
| TA-43-1 (FE-12) | P-32 | 2.548 E+8 | 5.505 E-14 | 14.026 |
| TA-43-1 (FE-14, 16) | P-32 | 1.768 E+8 | 1.831 E-13 | 32.374 |
| TA-43-1 (FE-24) | P-32 | 2.483 E+6 | 1.812 E-14 | 0.045 |
| TA-53 (FE-3) | C-11, N-13 O-15, Ar-41* | 2.087 E+8 | 5.597 E-4 | 1.168 E+11 |
| TA-3-66 (FE-13) | Th-234 | 4.914 E+8 | 3.862 E-12 | 1898. |
| TA-[illegible] 66 (FE-26) | Th-234 | 5.824 E+6 | 4.236 E-13 | 2.467 |
| [illegible] (FE-3) | Be 7 | 2.158 E+8 | 8.851 E-16 | 0.191 |
| TA-53 (FE-16) | Be 7 | 2.158 E+8 | 0.000 | 0.000 |

*O-15 122 sec half-life - ~67% of total activity

C-11 20.4 min half-life - ~29% of total activity

N-13 ~10 min half-life - ~3% of total activity

Ar-41 1.8 hr half-life - ~1% of total activity

ATTACHMENT I

LASL FACILITY RADIOACTIVE

AIRBORNE EFFLUENT RELEASE SUMMARY

FOR CY 79

Prepared By: William F. Romero, H-1

Date: 1-18-80

Part 1. Total Release Summary by Nuclides for CY 79

| Nuclide(s) | Total Activity Released (Ci) |
|---|---|
| Pu-238 & 239 | .001085 |
| U-233, 235 & 238 | .000933 |
| Mixed Fission Products | .001555 |
| H-3 | 15,030 |
| Ar-41 | 351 |
| I-131 | .000158 |
| P-32 | .000018 |
| Th-232 | .000000 |
| Th-234 | .001604 |
| Mixed Activation Products | 119,200 |
| Am-241 | .000000 |
| Be-7 | .000002 |

Part 2.a. CY 79 Airborne Plutonium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μ |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) FE-15 | Pu-238 & 239 | 3.026 E+8 | 2.743 E-16 | 0.083 |
| TA-3-29 Wg. 2(N) FE-14 | Pu-238 & 239 | 7.427 E+8 | 2.424 E-16 | 0.180 |
| TA-3-29 Wg. 3(S) FE-19 | Pu-238 & 239 | 7.128 E+8 | 1.287 E-12 | 917 |
| TA-3-29 Wg. 5(S) FE-28 | Pu-238 & 239 | 8.837 E+8 | 6.744 E-16 | 0.596 |
| TA-3-29 Wg. 5(N) FE-29 | Pu-238 & 239 | 1.694 E+8 | 2.952 E-16 | 0.050 |
| TA-3-29 Wg. 7(S) FE-33 | Pu-238 & 239 | 3.038 E+8 | 1.086 E-16 | 0.033 |
| TA-3-29 Wg. 7(N) FE-32 | Pu-238 & 239 | 7.730 E+8 | 1.501 E-16 | 0.116 |
| TA-3-29 Wg. 9 FE-44,45,46 | Pu-239 | 1.498 E+9 | 3.134 E-15 | 4.695 |
| TA-3-29 Wg. 2 FE-17 | Pu-238 & 239 | 1.763 E+8 | 2.269 E-17 | 0.004 |
| TA-3-29 Wg. 2 FE-18 | Pu-238 & 239 | 1.713 E+8 | 1.506 E-15 | 0.258 |
| TA-3-29 Wg. 3(N) FE-20 | Pu-239 | 4.530 E+7 | 3.160 E-12 | 143* |
| TA-3-29 Wg. 3 FE-21 | Pu-238 & 239 | 1.619 E+8 | 8.079 E-15 | 1.308 |
| TA-3-29 Wg. 5 FE-30 | Pu-238 & 239 | 1.079 E+8 | 1.946 E-16 | 0.021 |
| TA-3-29 Wg. 5 FE-31 | Pu-238 & 239 | 1.010 E+8 | 4.455 E-16 | 0.045 |
| TA-3-29 Wg. 7 FE-34 | Pu-238 & 239 | 1.488 E+8 | 0 | 0 |
| TA-3-29 Wg. 7 FE-35 | Pu-238 & 239 | 1.673 E+8 | 1.315 E-16 | 0.022 |
| TA-21-2 (E) FE-2 | Pu-239 | 2.032 E+8 | 1.535 E-15 | 0.312 |
| TA-21-2 (W) FE-1 | Pu-239 | 2.212 E+8 | 1.944 E-15 | 0.430 |
| TA-21-3 (E) FE-2 | Pu-238 & 239 | 2.080 E+8 | 2.370 E-15 | 0.493 |
| TA-21-3 (W) FE-1 | Pu-238 & 239 | 2.855 E+8 | 4.739 E-15 | 1.353 |
| TA-21-4 (W) FE-2 | Pu-238 | 2.152 E+8 | 1.078 E-15 | 0.232 |
| TA-21-4 (Hot Cell) FE-1 | Pu-239 | 2.952 E+7 | 1.118 E-15 | 0.033 |
| TA-21-5 (E) FE-2 | Pu-239 | 3.864 E+8 | 8.618 E-16 | 0.333 |
| TA-21-5 (W) FE-2 | Pu-239 | 3.359 E+8 | 1.307 E-15 | 0.439 |

*Due to filter change in FE-19 on 3-5-79.

Part 3. CY 79 Airborne Uranium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (µCi/ml | Total Activity (µCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 3 (N) FE-20 | U-235 & 238 | 5.869 E+8 | 2.802 E-15 | 1.222 |
| TA-3-29 Wg. 4 (S) FE-24 | U-235 & 238 | 3.845 E+8 | 1.011 E-14 | 3.889 |
| TA-3-29 Wg. 4 (N) FE-23 | U-235 & 238 | 4.795 E+8 | 3.739 E-14 | 17.929 |
| TA-3-29 Wg. 3 FE-22 | U-235 & 238 | 1.502 E+8 | 3.142 E-15 | 0.472 |
| TA-3-29 Wg. 4 FE-26 | U-235 & 238 | 1.706 E+8 | 8.148 E-16 | 0.139 |
| TA-3-29 Wg. 4 FE-27 | U-235 & 238 | 1.304 E+8 | 1.189 E-15 | 0.155 |
| TA-3-35 (W) FE-1 & FE-2 | U-235 | 2.365 E+8 | 2.142 E-14 | 5.067 |
| TA-3-35 FE-3 | U-235 | 6.470 E+4 | 1.236 E-14 | 0.008 |
| TA-3-66 (NW) FE-8 | U-238 | 2.240 E+8 | 4.703 E-14 | 10.534 |
| TA-3-66 (NE) FE-9 | U-238 | 7.646 E+8 | 4.328 E-15 | 3.309 |
| TA-3-66 (SE) FE-10 | U-235 | 1.781 E+8 | 2.083 E-14 | 3.709 |
| .A-3-66 (N) FE-13 | U-238 | 5.010 E+8 | 4.152 E-13 | 208. |
| TA-3-66 (NW corner) FE-26 | U-238 | 1.230 E+7 | 3.455 E-14 | 0.425 |
| TA-3-102 FE-20 | U-235 & 238 | 7.137 E+7 | 2.243 E-14 | 1.601 |
| TA-3-141 (N) FE-6 | U-235 & 238 | 1.431 E+8 | 1.586 E-15 | 0.227 |
| TA-3-414 (NW) FE-9 | U-235 & 238 | 4.092 E+8 | 8.905 E-15 | 3.644 |
| TA-3-141 (SW) FE-10 | U-235 & 238 | 2.558 E+8 | 2.123 E-15 | 0.543 |
| TA-18 FE-1 | U-235 | 3.387 E+6 | 1.167 E-12 | 3.951 |
| TA-21-3 (S) FE-1 | U-235 | 2.567 E+8 | 1.589 E-12 | 408. |
| TA-21-3 (Incin.) FE-1 | U-235 | 4.603 E+6 | 1.577 E-13 | 0.726 |
| TA-21-4 (S) FE-1 | U-235 | 3.972 E+8 | 6.193 E-13 | 246. |
| TA-46-31 FE-43 | U-238 | 2.015 E+7 | 1.125 E-13 | 2.266 |
| TA-48-1 (S) FE-11, 12, 13 | U-235 | 8.407 E+8 | 2.212 E-16 | 0.186 |

## Part 4. CY 79 Airborne Mixed Fission Product Releases

| Source | Release Data: Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µ |
|---|---|---|---|
| TA-3-29 (Wg. 9) FE-44, 45, 46 | 1.498 E+9 | 3.151 E-13 | 472. |
| TA-21-4 (Hot Cell) FE-1 | 2.952 E+7 | 1.585 E-14 | 0.468 |
| TA-48-1 (S) FE-11, 12, 13 | 8.407 E+8 | 1.665 E-13 | 140. |
| TA-48-1 (N) FE-15, 16 | 7.982 E+8 | 5.003 E-14 | 39.933 |
| TA-48-1 (Hot Cell | 4.184 E+7 | 2.721 E-13 | 11.386 |
| TA-48-1 (Core Wg.) FE-45, 46 | 7.830 E+8 | 1.124 E-12 | 880. |
| TA-48-1 (Alpha Wg.) FE-51 | 2.249 E+7 | 1.303 E-14 | 0.293 |
| TA-48-1 (NE) FE-54 | 9.282 E+7 | 5.139 E-15 | 0.477 |
| TA-50-1 (NE) FE-1 | 3.497 E+8 | 6.949 E-15 | 2.430 |
| TA-50-1 (SE) FE-2 | 6.240 E+8 | 1.240 E-14 | 7.739 |
| TA-50-1 (S) FE-3 | 2.492 E+7 | 1.344 E-14 | 0.335 |
| .A-50-1 FE-4 | 3.296 E+7 | 2.245 E-15 | 0.07 |
| TA-50-1 FE-18 | 1.519 E+7 | 1.514 E-15 | 0.023 |
| | | Total Released | 1555 µCi |

## Part 5. CY 79 Airborne Tritium Releases

| Source | Release Data: Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µCi) |
|---|---|---|---|
| TA-3-16 | 4.446 E+6 | 3.034 E-6 | 1.349 E+7 |
| TA-3-34 (FE-52) | 2.223 E+7 | 1.350 E-4 | 3.002 E+9 |
| TA-9-21 (E) | 2.400 E+7 | 2.083 E-7 | 5.000 E+6 |
| TA-21-209 (FE-10) | 2.067 E+8 | 4.592 E-7 | 9.491 E+7 |
| TA-33-86 (FE-6) | 1.081 E+8 | 9.685 E-5 | 1.047 E+10 |
| TA-35-2 (S) (FE-11) | 5.566 E+7 | 2.336 E-5 | 1.300 E+9 |
| .A-41 FE-4 | 1.950 E+8 | 7.338 E-7 | 1.431 |
| | | Total Released | 1.503 E+ |

Part 6. CY 79 Miscellaneous Release

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Release Data: Ave. Conc. (µCi/ml) | Release Data: Total Activity (µCi) |
|---|---|---|---|---|
| TA-2-9 Omega | Ar-41 | 1.300 E+7 | 2.698 E-5 | 3.508 E+8 |
| TA-3-29 (Wg. 9) | I-131 | 3.784 E+8 | 4.175 E-13 | 158. |
| TA-21-257 (Pug Mill) | Am-241 | 3.256 E+7 | 5.835 E-16 | 0.019 |
| TA-43-1 (FE-9) | P-32 | 1.815 E+8 | 1.288 E-14 | 2.338 |
| TA-43-1 (FE-10) | P-32 | 2.158 E+8 | 5.556 E-15 | 1.199 |
| TA-43-1 (FE-11) | P-32 | 2.675 E+8 | 1.498 E-14 | 4.006 |
| TA-43-1 (FE-12) | P-32 | 2.416 E+8 | 1.245 E-14 | 3.009 |
| TA-43-1 (FE-14, 16) | P-32 | 1.203 E+8 | 5.284 E-14 | 6.357 |
| TA-43-1 (FE-24) | P-32 | 3.515 E+6 | 2.774 E-13 | 0.975 |
| TA-53 (FE-3) | C-11, N-13 O-15, AR-41* | 2.461 E+8 | 4.844 E-4 | 1.192 E+11 |
| TA-3-66 FE-24 | Th-232 | 3.765 E+7 | 1.716 E-14 | 0.646 |
| TA-3-66 (FE-13) | Th-234 | 5.010 E+8 | 3.142 E-12 | 1574. |
| TA-3-66 (FE-26) | Th-234 | 1.230 E+7 | 2.441 E-12 | 30.025 |
| TA-53 (FE-3) | $Be^7$ | 2.461 E+8 | 1.047 E-14 | 2.576 |
| TA-53 (FE-16) | $Be^7$ | 2.158 E+8 | 4.634 E-18 | 0.001 |

*O-15 122 sec half-life - ∿73% of total activity

C-11 20.4 min half-life - ∿18% of total activity

N-13 10 min half-life - ∿ 4% of total activity

Ar-41 1.8 hr half-life - ∿ 0.3% of total activity

Unkn. 10 sec apparent half-life - ∿ 4.7% of total activity

ATTACHMENT I

LASL FACILITY RADIOACTIVE

AIRBORNE EFFLUENT RELEASE SUMMARY

FOR CY 80

Prepared by: William F. Romero, H-1

Date: January 26, 1981

# AIRBORNE EFFLUENT RELEASE SUMMARY

CY 80

CONTENTS

## Part 1. Total Release Summary by Nuclides for CY 80

| Nuclide(s) | Total Activity Released (Ci) |
| --- | --- |
| Pu-238 & 239 | .000747 |
| U-233, 235 & 238 | .000791 |
| Mixed Fission Products | .002191 |
| H-3 | 7,515 |
| Ar-41 | 513 |
| I-131 | .000094 |
| P-32 | .000004 |
| Th-232 | .000000 |
| Th-234 | .000567 |
| Mixed Activation Products | 146,011 |
| Am-241 | .000000 |
| Be-7 | .012192 |
| H-3 "oxide" | 5 |
| Hg-203 | .000047 |

'art 2.a. CY 80 Airborne Plutonium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 2(S) FE-15 | Pu-238 & 239 | 3.033 E+8 | 0 | 0 |
| TA-3-29 Wg. 2(N) FE-14 | Pu-238 & 239 | 7.475 E+8 | 0 | 0 |
| TA-3-29 Wg. 3(S) FE-19 | Pu-238 & 239 | 6.804 E+8 | 1.086 E-12 | 739 |
| TA-3-29 Wg. 5(S) FE-28 | Pu-238 & 239 | 5.687 E+8 | 1.493 E-15 | 0.849 |
| TA-3-29 Wg. 5(N) FE-29 | Pu-238 & 239 | 4.429 E+8 | 1.084 E-16 | 0.048 |
| TA-3-29 Wg. 7(S) FE-33 | Pu-238 & 239 | 2.903 E+8 | 6.200 E-16 | 0.180 |
| TA-3-29 Wg. 7(N) FE-32 | Pu-238 & 239 | 7.744 E+8 | 0 | 0 |
| TA-3-29 Wg. 9 FE-44,45,46 | Pu-239 | 1.404 E+9 | 2.849 E-16 | 0.400 |
| TA-3-29 Wg. 2 FE-17 | Pu-238 & 239 | 1.822 E+8 | 0 | 0 |
| TA-3-29 Wg. 2 FE-18 | Pu-238 & 239 | 1.863 E+8 | 0 | 0 |
| TA-3-29 Wg. 3 FE-21 | Pu-238 & 239 | 1.593 E+8 | 4.011 E-15 | 0.639 |
| -29 Wg. 5 FE-30 | Pu-238 & 239 | 1.050 E+8 | 0 | 0 |
| TA-3-29 Wg. 5 FE-31 | Pu-238 & 239 | 1.288 E+8 | 3.106 E-16 | 0.040 |
| TA-3-29 Wg. 7 FE-34 | Pu-238 & 239 | 1.538 E+8 | 6.520 E-17 | 0.010 |
| TA-3-29 Wg. 7 FE-35 | Pu-238 & 239 | 1.684 E+8 | 3.860 E-16 | 0.065 |
| TA-21-2 (E) FE-2 | Pu-239 | 1.950 E+8 | 6.051 E-16 | 0.118 |
| TA-21-2 (W) FE-1 | Pu-239 | 2.119 E+8 | 2.643 E-16 | 0.056 |
| TA-21-3 (E) FE-2 | Pu-238 & 239 | 2.145 E+8 | 4.103 E-16 | 0.088 |
| TA-21-3 (W) FE-1 | Pu-238 & 239 | 2.873 E+8 | 1.392 E-15 | 0.400 |
| TA-21-4 (W) FE-2 | Pu-238 & 239 | 2.145 E+8 | 8.951 E-16 | 0.192 |
| TA-21-4 (Hot Cell) FE-1 | Pu-239 | 2.951 E+7 | 1.423 E-15 | 0.042 |
| TA-21-5 (E) FE-2 | Pu-239 | 1.788 E+8 | 5.593 E-16 | 0.100 |
| TA-21-5 (W) FE-2 | Pu-239 | 3.393 E+8 | 4.156 E-16 | 0.141 |
| TA-21-5 (530) FE-1 | Pu-239 | 5.172 E+7 | 3.480 E-16 | 0.018 |
| -21-150 FE-1 | Pu-238 & 239 | 1.314 E+8 | 3.813 E-15 | 0.501 |

## Part 3. CY 80 Airborne Uranium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|---|
| TA-3-29 Wg. 3 (N) FE-20 | U-235 & 238 | 5.829 E+8 | 8.521 E-15 | 4.967 |
| TA-3-29 Wg. 4 (S) FE-24 | U-235 & 238 | 4.186 E+8 | 4.993 E-14 | 2.090 |
| TA-3-29 Wg. 4 (N) FE-23 | U-235 & 238 | 5.054 E+8 | 3.576 E-14 | 18.075 |
| TA-3-29 Wg. 3 FE-22 | U-235 & 238 | 5.677 E+8 | 3.417 E-16 | 0.194 |
| TA-3-29 Wg. 4 FE-26 | U-235 & 238 | 1.868 E+8 | 9.368 E-16 | 0.175 |
| TA-3-29 Wg. 4 FE-27 | U-235 & 238 | 1.308 E+8 | 8.945 E-16 | 0.117 |
| TA-3-35 (W) FE-1 & FE-2 | U-235 | 2.366 E+8 | 9.658 E-15 | 2.285 |
| TA-3-66 (NW) FE-8 | U-238 | 2.236 E+8 | 1.943 E-14 | 4.344 |
| TA-3-66 (NE) FE-9 | U-238 | 7.839 E+8 | 3.183 E-15 | 2.495 |
| TA-3-66 (SE) FE-10 | U-235 | 1.742 E+8 | 3.318 E-15 | 0.578 |
| TA-3-66 (N) FE-13 | U-238 | 5.018 E+8 | 2.290 E-14 | 115 |
| -3-66 (NW corner) FE-26 | U-238 | 1.284 E+7 | 2.983 E-14 | 0.383 |
| -3-102 FE-20 | U-235 & 238 | 6.994 E+7 | 2.758 E-14 | 1.929 |
| TA-3-141 (N) FE-6 | U-235 & 238 | 1.378 E+8 | 4.717 E-16 | 0.065 |
| TA-3-414 (NW) FE-9 | U-235 & 238 | 4.420 E+8 | 5.258 E-15 | 2.324 |
| TA-3-141 (SW) FE-10 | U-235 & 238 | 2.405 E+8 | 8.690 E-16 | 0.209 |
| TA-21-3 (S) FE-1 | U-235 | 2.535 E+8 | 1.923 E-12 | 487 |
| TA-21-3 (Incin.) FE-1 | U-235 | 4.264 E+6 | 6.027 E-14 | 0.257 |
| TA-21-4 (S) FE-1 | U-235 | 4.043 E+8 | 3.610 E-13 | 146 |
| TA-46-31 FE-43 | U-238 | 2.015 E+7 | 7.365 E-14 | 1.484 |
| TA-48-1 (S) FE-11,12,13 | U-235 | 8.372 E+8 | 7.788 E-16 | 0.652 |
| TA-48-1 (Hot Cell) | U-235 | 4.043 E+7 | 3.463 E-16 | 0.014 |

Total Released 791 ($\mu$Ci)

## Part 4. CY 80 Airborne Mixed Fission Product Releases

| Source | Release Data<br>Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µCi) |
|---|---|---|---|
| TA-3-29 (Wg. 9) FE-44, 45, 46 | 1.404 E+9 | 3.020 E-13 | 424 |
| TA-21-4 (Hot Cell) FE-1 | 2.951 E+7 | 1.417 E-13 | 4.183 |
| TA-48-1 (S) FE-11, 12, 13 | 8.372 E+8 | 3.131 E-13 | 262 |
| TA-48-1 (N) FE-15, 16 | 8.008 E+8 | 5.596 E-14 | 44.813 |
| TA-48-1 (Hot Cell) | 4.043 E+7 | 9.275 E-12 | 375 |
| TA-48-1 (Core Wg.) FE-45, 46 | 7.878 E+8 | 1.360 E-12 | 1071 |
| TA-48-1 (Alpha Wg.) FE-51 | 2.132 E+7 | 6.895 E-14 | 1.470 |
| TA-48-1 (NE) FE-54 | 9.100 E+7 | 4.407 E-15 | 0.401 |
| TA-50-1 (NE) FE-1 | 3.497 E+8 | 1.632 E-14 | 5.708 |
| TA-50-1 (SE) FE-2 | 6.240 E+8 | 2.929 E-15 | 1.828 |
| TA-50-1 (S) FE-3 | 4.628 E+7 | 3.889 E-15 | 0.180 |
| TA-50-1 FE-4 | 5.356 E+7 | 4.388 E-15 | 0.235 |
| [illegible]0-1 FE-18 | 2.821 E+7 | 1.074 E-14 | 0.303 |
| | | Total Released | 2191 (µCi) |

## Part 5. CY 80 Airborne Tritium Releases

| Source | Release Data<br>Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µCi) |
|---|---|---|---|
| TA-3-16 | 4.446 E+6 | 1.023 E-6 | 4.550 E+6 |
| TA-3-34 (FE-52) | 2.223 E+7 | 0 | 0 |
| TA-9-21 (E) | 3.711 E+7 | 1.347 E-7 | 5.000 E+6 |
| TA-21-209 (FE-10) | 2.067 E+8 | 5.148 E-7 | 1.064 E+8 |
| TA-33-86 (FE-6) | 1.082 E+8 | 6.437 E-5 | 6.965 E+9 |
| TA-35-2 (FE H-1) | 2.661 E+7 | 9.395 E-7 | 2.500 E+7 |
| TA-41 (FE-4) | 2.990 E+8 | 1.383 E-6 | 4.136 E+8 |
| | | Total Released | 7.520 E+9 |

Part 6. CY 80 Miscellaneous Release

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu Ci/ml$) | Total Activity ($\mu Ci$) |
|---|---|---|---|---|
| TA-2-9 Omega | Ar-41 | 1.300 E+7 | 3.944 E-5 | 5.127 E+8 |
| TA-3-29 (Wg. 9) | I-131 | 5.439 E+8 | 1.728 E-13 | 94 |
| TA-3-66 (FE-24) | Th-232 | 3.835 E+7 | 4.329 E-15 | 0.166 |
| TA-3-66 (FE-13) | Th-234 | 5.018 E+8 | 1.060 E-12 | 532 |
| TA-3-66 (FE-26) | Th-234 | 1.284 E+7 | 2.657 E-12 | 34.122 |
| TA-21-257 (Pug Mill) | Am-241 | 3.287 E+7 | 1.855 E-15 | 0.061 |
| TA-43-1 (FE-9) | P-32 | 2.172 E+8 | 1.715 E-14 | 3.724 |
| TA-53 (FE-3) | C-11, N-13 O-15, Ar-41* | 2.600 E+8 | 5.616 E-4 | 1.460 E+11 |
| TA-53 (FE-3) | $Be^7$ | 2.600 E+8 | 4.689 E-11 | 1.219 E+4 |
| TA-53 (FE-3) | Hg-203 | 4.000 E+7 | 1.167 E-12 | 46.660 |
| TA-53 (FE-16) | $Be^7$ | 2.158 E+8 | 6.716 E-14 | 14.493 |

*O-15 122 sec half-life - ∿56.7% of total activity

C-11 20.4 min half-life - ∿36% of total activity

N-13 10 min half-life - ∿7% of total activity

Ar-41 1.8 hr half-life - ∿0.3% of total activity

# AIRBORNE EFFLUENT RELEASE SUMMARY

CY 81

CONTENTS

Part 1. Total Release Summary by Nuclides for CY 81

| Nuclide(s) | | Total Activity Released (Ci) | | 1982 |
|---|---|---|---|---|
| Pu-238 & 239 | | .000057 | = 57 μCi | 77 |
| U-233, 235, & 238 | | .001274 | = 1,274 " | 944 |
| Mixed Fission Products | | .001567 | = 1,567 " | 1,180 |
| H-3 | | 7,225 | = $7.2 \times 10^{9}$ μCi | 15.9 × |
| Ar-41 | | 301 = | $3.01 \times 10^{8}$ μCi | 3.42 × |
| I-131 | | .000044 | = 44 μCi | 78 |
| P-32 | 1984 found error | .000020 | = 20 μCi | 5 |
| Gaseous Mixed Activation Products | $t_{count}$ × 1.39 | 353,640 | = $3.5 \times 10^{11}$ μCi | 2.5 |
| Am-241 (0.029 μCi were released) | | .000000 | | .035 |
| Be-7 | 491,000 | .014726 = $1.4 \times 10^{-2}$ Ci = $1.4 \times 10^{4}$ μCi | | 03 |

Part 2.a. CY 81 Airborne Plutonium Releases

| Source | Nuclides | Release Data | | |
|---|---|---|---|---|
| | | Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µCi) |
| TA-3-29 Wg. 2(S) FE-15 | Pu-238 & 239 | 5.689 E+8 | 5.449 E-17 | 0.031 |
| TA-3-29 Wg. 2(N) FE-14 | Pu-238 & 239 | 3.423 E+8 | 2.337 E-16 | 0.080 |
| TA-3-29 Wg. 3(S) FE-19 | Pu-238 & 239 | 7.030 E+8 | 4.751 E-14 | 33.399 |
| TA-3-29 Wg. 5(S) FE-28 | Pu-238 & 239 | 3.769 E+8 | 9.680 E-16 | 0.365 |
| TA-3-29 Wg. 5(N) FE-29 | Pu-238 & 239 | 6.674 E+8 | 0 | 0 |
| TA-3-29 Wg. 7(S) FE-33 | Pu-238 & 239 | 4.303 E+8 | 5.345 E-17 | 0.023 |
| TA-3-29 Wg. 7(N) FE-32 | Pu-238 & 239 | 6.469 E+8 | 8.348 E-17 | 0.054 |
| TA-3-29 Wg. 9 FE-44,45,46 | Pu-239 | 1.285 E+9 | 5.354 E-16 | 0.688 |
| TA-3-29 Wg. 2 FE-17 | Pu-238 & 239 | 1.645 E+8 | 4.863 E-17 | 0.008 |
| TA-3-29 Wg. 2 FE-18 | Pu-238 & 239 | 1.782 E+8 | 1.571 E-16 | 0.028 |
| TA-3-29 Wg. 3 FE-21 | Pu-238 & 239 | 1.529 E+8 | 3.190 E-14 | 4.878 |
| -3-29 Wg. 5 FE-30 | Pu-238 & 239 | 9.305 E+7 | 0 | 0 |
| TA-3-29 Wg. 5 FE-31 | Pu-238 & 239 | 1.394 E+8 | 1.363 E-16 | 0.019 |
| TA-3-29 Wg. 7 FE-34 | Pu-238 & 239 | 2.090 E+8 | 0 | 0 |
| TA-3-29 Wg. 7 FE-35 | Pu-238 & 239 | 1.174 E+8 | 6.814 E-17 | 0.008 |
| TA-21-2 (E) FE-2 | Pu-239 | 1.960 E+8 | 1.700 E-14 | 3.331 |
| TA-21-2 (W) FE-1 | Pu-239 | 2.120 E+8 | 1.180 E-14 | 2.495 |
| TA-21-3 (E) FE-2 | Pu-238 & 239 | 1.980 E+8 | 5.350 E-15 | 1.059 |
| TA-21-3 (W) FE-1 | Pu-238 & 239 | 2.920 E+8 | 1.540 E-15 | 0.450 |
| TA-21-4 (W) FE-2 | Pu-238 & 239 | 2.114 E+8 | 1.440 E-14 | 3.053 |
| TA-21-4 (Hot Cell) FE-1 | Pu-239 | 2.987 E+7 | 2.280 E-15 | 0.068 |
| TA-21-5 (W) FE-2 | Pu-239 | 3.393 E+8 | 2.611 E-15 | 0.886 |
| TA-21-150 FE-1 | Pu-238 & 239 | 2.148 E+8 | 4.620 E-15 | 1.008 |
| TA-21-324 FE-1, FE-2 | Pu-238 & 239 | 2.106 E+8 | 1.200 E-15 | 0.253 |
| -21-257 FE-4 | Pu-239 | 2.565 E+7 | 1.940 E-14 | 0.499 |

Part 2.a. CY 81 Airborne Plutonium Releases - Continued

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (μCi/ml) | Total Activity (μCi) |
|---|---|---|---|---|
| TA-35-7 (SE) FE-7 | Pu-239 | 5.312 E+7 | 2.146 E-15 | 0.114 |
| TA-35-7 (SE.C) FE-8 | Pu-239 | 2.951 E+7 | 2.710 E-16 | 0.008 |
| TA-35-7 (S) FE-2 | Pu-239 | 2.535 E+7 | 5.996 E-16 | 0.152 |
| TA-43-1 (FE-9) | Pu-238 & 239 | 2.574 E+8 | 1.049 E-16 | 0.027 |
| TA-43-1 (FE-10) | Pu-239 | 2.249 E+8 | 1.690 E-16 | 0.038 |
| TA-43-1 (FE-11) | Pu-239 | 2.678 E+8 | 1.606 E-16 | 0.043 |
| TA-43-1 (FE-12) | Pu-239 | 2.990 E+8 | 1.104 E-16 | 0.033 |
| TA-43-1 (FE-14, 16) | Pu-239 | 1.741 E+8 | 1.304 E-15 | 0.227 |
| TA-43-1 (FE-24) | Pu-239 | 3.172 E+6 | 0 | 0 |
| TA-48-1 (N) FE-15, 16 | Pu-239 | 8.008 E+8 | 1.613 E-15 | 1.292 |
| TA-48-1 (FE-18) | Pu-239 | 2.392 E+6 | 0 | 0 |
| -48-1 (FE-54) | Pu-239 | 9.100 E+7 | 6.593 E-17 | 0.006 |
| TA-48-1 (Core) FE-45, 46 | Pu-239 | 7.792 E+8 | 2.695 E-17 | 0.021 |
| TA-48-1 (Alpha) FE-51 | Pu-239 | 2.132 E+7 | 0 | 0 |
| TA-50-1 (NE) FE-1 | Pu-239 | 3.497 E+8 | 1.052 E-15 | 0.368 |
| TA-50-1 (SE) FE-2 | Pu-239 | 6.240 E+8 | 1.558 E-15 | 0.972 |
| TA-50-1 (S) FE-3 | Pu-239 | 4.665 E+7 | 1.319 E-15 | 0.061 |
| TA-50-1 FE-4 | Pu-239 | 5.370 E+7 | 4.935 E-15 | 0.265 |
| TA-50-1 FE-18 | Pu-239 | 2.821 E+7 | 1.418 E-16 | 0.004 |
| TA-50-37 TDF | Pu-239 | 2.145 E+8 | 5.641 E-16 | 0.121 |
| TA-54 (Main Stack) | Pu-239 | 5.005 E+6 | 1.998 E-16 | 0.001 |
| TA-54 (Rm. Exhaust) FE-2 | Pu-239 | 2.327 E+7 | 3.868 E-16 | 0.009 |
| TA-55 (North Stack) | Pu-239 | 2.483 E+8 | 1.932 E-16 | 0.048 |
| TA-55 (South Stack) | Pu-239 | 3.202 E+8 | 1.530 E-16 | 0.049 |
| | | | Total Released | 56.542 (μ |

Part 3. CY 81 Airborne Uranium Releases

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µCi) |
|---|---|---|---|---|
| TA-3-29 Wg. 3 (N) FE-20 | U-235 & 238 | 5.296 E+8 | 4.366 E-14 | 23.124 |
| TA-3-29 Wg. 4 (S) FE-24 | U-235 & 238 | 3.975 E+8 | 8.180 E-15 | 3.253 |
| TA-3-29 Wg. 4 (N) FE-23 | U-235 & 238 | 5.406 E+8 | 4.560 E-14 | 24.650 |
| TA-3-29 Wg. 3 FE-22 | U-235 & 238 | 9.087 E+8 | 5.491 E-16 | 0.499 |
| TA-3-29 Wg. 4 FE-26 | U-235 & 238 | 1.676 E+8 | 4.654 E-16 | 0.078 |
| TA-3-29 Wg. 4 FE-27 | U-235 & 238 | 1.305 E+8 | 7.969 E-16 | 0.104 |
| TA-3-35 (W) FE-1 & FE-2 | U-235 | 2.240 E+8 | 4.692 E-15 | 1.051 |
| TA-3-66 (NW) FE-8 | U-238 | 2.236 E+8 | 2.236 E-14 | 5.000 |
| TA-3-66 (NE) FE-9 | U-238 | 4.444 E+8 | 6.033 E-15 | 4.729 |
| TA-3-66 (SE) FE-10 | U-235 | 1.742 E+8 | 4.334 E-15 | 0.754 |
| TA-3-66 (N) FE-13 | U-238 | 5.018 E+8 | 3.383 E-13 | 170 |
| -3-66 (NW corner) FE-26 | U-238 | 1.284 E+7 | 5.070 E-14 | 0.651 |
| TA-3-102 FE-29 | U-235 & 238 | 7.045 E+7 | 1.307 E-14 | 0.921 |
| TA-3-141 (N) FE-6 | U-235 & 238 | 1.378 E+8 | 5.080 E-17 | 0.007 |
| TA-3-141 (NW) FE-9 | U-235 & 238 | 4.444 E+8 | 3.166 E-15 | 1.407 |
| TA-3-141 (SW) FE-10 | U-235 & 238 | 2.460 E+8 | 4.590 E-16 | 0.113 |
| TA-21-3 (S) FE-1 | U-235 | 2.520 E+8 | 2.610 E-12 | 658 |
| TA-21-3 (Incin.) FE-1 | U-235 | 4.264 E+6 | 7.750 E-13 | 0.329 |
| TA-21-4 (S) FE-1 | U-235 | 4.029 E+8 | 9.010 E-13 | 363 |
| TA-46-31 FE-43 | U-238 | 2.134 E+7 | 6.467 E-13 | 13.806 |
| TA-48-1 (S) FE-11,12,13 | U-235 | 8.016 E+8 | 2.819 E-15 | 2.260 |
| TA-48-1 (Hot Cell) | U-235 | 3.907 E+7 | 1.280 E-15 | 0.050 |

Total Released 1,274 (µCi)

Part 4. CY 81 Airborne Mixed Fission Product Releases

| Source | Gross Volume ($M^3$) | Ave. Conc. (µCi/ml) | Total Activity (µCi) |
|---|---|---|---|
| | Release Data | | |
| TA-3-29 (Wg. 9) FE-44, 45, 46 | 1.403 E+9 | 1.229 E-13 | 172 |
| TA-21-4 (Hot Cell) FE-1 | 2.951 E+7 | 9.500 E-14 | 2.802 |
| TA-48-1 (S) FE-11, 12, 13 | 8.385 E+8 | 3.292 E-13 | 276 |
| TA-48-1 (N) FE-15, 16 | 8.008 E+8 | 2.048 E-14 | 164 |
| TA-48-1 (Hot Cell) | 3.097 E+7 | 7.397 E-12 | 289 |
| TA-48-1 (Core Wg.) FE-45, 46 | 7.792 E+8 | 8.137 E-13 | 634 |
| TA-48-1 (Alpha Wg.) FE-51 | 2.132 E+7 | 1.674 E-13 | 3.570 |
| TA-48-1 (NE) FE-54 | 9.100 E+7 | 1.543 E-14 | 1.404 |
| TA-50-1 (NE) FE-1 | 3.497 E+8 | 4.947 E-14 | 17.300 |
| TA-50-1 (SE) FE-2 | 6.240 E+8 | 8.013 E-15 | 5.000 |
| TA-50-1 (S) FE-3 | 4.665 E+7 | 5.595 E-15 | 0.261 |
| -50-1 FE-4 | 5.370 E+7 | 9.516 E-15 | 0.511 |
| TA-50-1 FE-18 | 2.821 E+7 | 8.259 E-15 | 0.233 |
| TA-50-37 TDF FE-1 | 9.900 E+7 | 8.596 E-15 | 0.851 |

Total Released 1567 (µCi)

## Part 6. CY 81 Miscellaneous Release

| Source | Nuclides | Release Data: Gross Volume ($M^3$) | Ave. Conc. ($\mu$Ci/ml) | Total Activity ($\mu$Ci) |
|---|---|---|---|---|
| TA-2-9 Omega | AR-41 | 3.007 E+8 | 2.313 E-5 | 3.007 E+8 |
| TA-3-29 (Wg. 9) | I-131 | 1.911 E+8 | 2.300 E-13 | 44 |
| TA-21-257 (Pug Mill) | Am-241 | 3.287 E+7 | 8.810 E-15 | 0.029 |
| TA-43-1 (FE-9) | P-32 | 2.574 E+8 | 7.821 E-14 | 20.154 |
| TA-53 (FE-3) | C-11, N-13 O-15, Ar-41* | 2.600 E+8 | 1.359 E-3 | 3.534 E+11 |
| TA-53 (FE-3) | $Be^7$ | 2.600 E+8 | 5.658 E-11 | 1.471 E+4 |
| TA-53 (FE-16) | $Be^7$ | 2.158 E+8 | 0 | 0 |

*O-15 122 sec half-life - ∿56.7% of total activity

C-11 20.4 min half-life - ∿36% of total activity

N-13 10 min half-life - ∿7% of total activity

Ar-41 1.8 hr half-life - ∿0.3% of total activity

56.7
43
0.3
100.0

ATTACHMENT II

1981 CONTROL CODES AND REFERENCE LOCATION IDENT. DOE FORM F-5821.1 (Rev. 11-80)

Narrative Description

| | |
|---|---|
| ALDEA - 009 - 001 | TA-2-9, Omega Stack |
| ALDE7 - 016 - 001 | TA-3-16, Van De Graaff |
| *ALDE7 - 016 - 002 | FE-H-1, TA-3-16, Van De Graaff |
| ALDE8 - 034 - 001 | FE-52, TA-3-34, Cryogenics |
| ALDE9 - 054 - 001 | FE-1, TA-54, Main Stack |
| ALDE9 - 054 - 002 | FE-2, TA-54, Room Air Exhaust |
| ALDE10 - 055 - 001 | FE-15, TA-55, North Stack |
| ALDE10 - 055 - 002 | FE-16, TA-55, South Stack |
| ALDEB - 029 - 001 | FE-15, TA-3-29, South Stack, Wing 2 |
| ALDEB - 029 - 002 | FE-14, TA-3-29, North Stack, Wing 2 |
| ALDEB - 029 - 003 | FE-19, TA-3-29, South Stack, Wing 3 |
| ALDEB - 029 - 004 | FE-20, TA-3-29, North Stack, Wing 3 |
| ALDEB - 029 - 005 | FE-24, TA-3-29, South Stack, Wing 4 |
| ALDEB - 029 - 006 | FE-23, TA-3-29, North Stack, Wing 4 |
| ALDEB - 029 - 007 | FE-28, TA-3-29, South Stack, Wing 5 |
| ALDEB - 029 - 008 | FE-29, TA-3-29, North Stack, Wing 5 |
| ALDEB - 029 - 009 | FE-33, TA-3-29, South Stack, Wing 7 |
| ALDEB - 029 - 010 | FE-32, TA-3-29, North Stack, Wing 7 |
| ALDEB - 029 - 011 | FE-44, 45, 46, TA-3-29, Wing 9 Stack |
| ALDEB - 029 - 012 | FE-17, TA-3-29, South Offices, Wg. 2, Room Air |
| ALDEB - 029 - 013 | FE-18, TA-3-29, North Offices, Wg. 2, Room Air |
| ALDEB - 029 - 01 | FE-21, TA-3-29, South Offices, Wg. 3, Room Air |
| ALDEB - 029 - 015 | FE-22, TA-3-29, North Offices, Wg. 3, Room Air |

| | |
|---|---|
| ALDEB - 029 - 016 | FE-26, TA-3-29, North Offices, Wg. 4, Room Air |
| ALDEB - 029 - 017 | FE-27, TA-3-29, South Offices, Wg. 4, Room Air |
| ALDEB - 029 - 018 | FE-30, TA-3-29, North Offices, Wg. 5, Room Air |
| ALDEB - 029 - 019 | FE-31, TA-3-29, South Offices, Wg. 5, Room Air |
| ALDEB - 029 - 020 | FE-34, TA-3-29, South Offices, Wg. 7, Room Air |
| ALDEB - 029 - 021 | FE-35, TA-3-29, North Offices, Wg. 7, Room Air |
| ALDE2 - 035 - 001 | FE-1 & FE-2, TA-3-35, West Stack |
| ALDE3 - 066 - 001 | FE-8, TA-3-66, NW Stack |
| ALDE3 - 066 - 002 | FE-9, TA-3-66, NE Stack |
| ALDE3 - 066 - 003 | FE-10, TA-3-66, SE Stack |
| ALDE3 - 066 - 004 | FE-13, TA-3-66, North Stack |
| ALDE3 - 066 - 005 | FE-24, TA-3-66, West Central Stack |
| ALDE3 - 066 - 006 | FE-26, TA-3-66, NW Corner Stack |
| ALDE4 - 102 - 001 | FE-20, TA-3-102, Main Stack |
| ALDE5 - 141 - 001 | FE-6, TA-3-141, North Stack |
| ALDE5 - 141 - 002 | FE-9, TA-3-141, NW Stack |
| ALDE5 - 141 - 003 | FE-10, TA-3-141, SW Stack |
| ALDED - 021 - 001 | TA-9-21, East Stack |
| ALDE6 - 002 - 001 | FE-2, TA-21, Bldg. 2, East Stack, Rm. Air |
| ALDE6 - 002 - 002 | FE-1, TA-21, Bldg. 2, West Stack, Rm. Air |
| ALDE6 - 003 - 001 | FE-2, TA-21, Bldg. 3, East Stack, Rm. Air |
| ALDE6 - 003 - 002 | FE-1, TA-21, Bldg. 3, West Stack, Rm. Air |
| ALDE6 - 003 - 003 | FE-1, TA-21, Bldg. 3, Main Stack |
| ALDE6 - 003 - 004 | FE-1, TA-21, Bldg. 3, Incinerator Stack |
| ALDE6 - 004 - 001 | (W) FE-2, TA-21, Bldg. 4, Room Air Stack |
| ALDE6 - 004 - 002 | FE-1, TA-21, Bldg. 4, Hot Cell Stack |
| ALDE6 - 004 - 003 | FE-1, TA-21, Bldg. 4, South Stack |

LOS ALAMOS

AIRBORNE EFFLUENT RELEASE SUMMARY

CY 82

CONTENTS

## PART 1. TOTAL LOS ALAMOS AIRBORNE RELEASE FOR CY 82.

SUMMARY OF ACTIVITY DISCHARGED

| | | | |
|---|---|---|---|
| PU | = | 1.10 E+02 | MICROCURIES |
| U-235 | = | 1.17 E+03 | MICROCURIES |
| U-238 | = | 1.97 E+02 | MICROCURIES |
| AM-241 | = | 3.50 E-02 | MICROCURIES |
| MFP | = | 1.18 E+03 | MICROCURIES |
| G/MAP | = | 2.51 E+11 | MICROCURIES |
| P/VAP | = | 1.82 E+08 | MICROCURIES |
| I-131 | = | 7.85 E+02 | MICROCURIES |
| AR-41 | = | 3.42 E+06 | MICROCURIES |
| H-3 | = | 1.59 E+10 | MICROCURIES |
| >. H-3/V | = | ~~2.64~~ E+05 | MICROCURIES (2/24/83 change update for late Dvorak dat 2.72 E+05 |
| P-32 | = | 4.77 | MICROCURIES |

FOOTNOTES FOR ABOVE TABLES:

G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS;C-11,N-13,O-15,AND AR-41

P/VAP DENOTES PARTICULATE AND/OR VAPOR ACTIVATION PRODUCTS. MAIN CONTAMINAN ARE Hg-195 FOR VAPOR AND Au-182 FOR PARTICULATE.

MFP DENOTES MIXED FISSION PRODUCTS

H-3/V DENOTES TRITIATED WATER VAPOR.

PART 2. CY 1982 LOS ALAMOS AIRBORNE PLUTONIUM RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA-3-29 | FE-14 | .0377 3.77 E-02 | 2.66 E+14 | 1.41 E-16 | PU |
| | FE-15 | 10.8 1.08 E+01 | 6.46 E+14 | 1.67 E-14 | PU |
| | FE-17 | .0362 3.62 E-02 | 1.57 E+14 | 2.31 E-16 | PU |
| | FE-18 | 3.62 E-02 | 1.80 E+14 | 2.01 E-16 | PU |
| | FE-19 | 57.7 5.77 E+01 | 7.39 E+14 | 7.81 E-14 | PU |
| | FE-21 | 3.05 E-01 | 1.63 E+14 | 1.87 E-15 | PU |
| | FE-28 | 7.10 E-02 | 3.50 E+14 | 2.03 E-16 | PU |
| | FE-29 | 6.69 E-01 | 8.92 E+14 | 7.50 E-16 | PU |
| | FE-30 | 2.32 E-02 | 1.06 E+14 | 2.17 E-16 | PU |
| | FE-31 | 2.01 E-01 | 3.17 E+14 | 6.35 E-16 | PU |
| | FE-32 | 3.77 E-02 | 3.56 E+14 | 1.06 E-16 | PU |
| | FE-33 | 4.07 E-01 | 7.85 E+14 | 5.19 E-16 | PU |
| | FE-34 | 2.61 E-02 | 1.46 E+14 | 1.78 E-16 | PU |
| | FE-35 | 7.83 E-02 | 9.56 E+13 | 8.19 E-16 | PU |
| | FE-44,-45,-46 | 3.95 | 1.43 E+15 | 2.76 E-15 | PU |
| TA21: | 2E,FE-2 | 2.26 E-01 | 1.95 E+14 | 1.16 E-15 | PU |
| | 2W,FE-1 | 3.52 E-01 | 2.12 E+14 | 1.66 E-15 | PU |
| | 3E,FE-2 | 4.90 E-01 | 2.18 E+14 | 2.24 E-15 | PU |
| | 3W,FE-1 | 2.15 | 2.93 E+14 | 7.36 E-15 | PU |
| | 4W,FE-2 | 1.10 E+01 | 2.10 E+14 | 5.24 E-14 | PU |
| | 4-HC,FE-1 | 9.42 E-02 | 2.95 E+13 | 3.19 E-15 | PU |
| | 5W,FE-2 | 4.65 E-01 | 3.39 E+14 | 1.37 E-15 | PU |
| | 150,FE-1 | 3.82 E-01 | 2.22 E+14 | 1.72 E-15 | PU |
| | 257,FE-4 | 1.65 E-01 | 2.59 E+13 | 6.38 E-15 | PU |
| | 324,FE-1 | 5.13 E-01 | 2.14 E+14 | 2.39 E-15 | PU |
| TA-35-7: | FE-2 | 7.78 E-01 | 2.43 E+14 | 3.19 E-15 | PU |
| | FE-7 | 4.93 E-01 | 5.01 E+13 | 9.83 E-15 | PU |
| | FE-8 | 2.75 E-02 | 2.89 E+13 | 9.53 E-16 | PU |
| TA-43-1: | FE-9 | 1.79 E-01 | 2.32 E+14 | 7.73 E-16 | PU |
| | FE-10 | 3.94 E-01 | 2.03 E+14 | 1.94 E-15 | PU |
| | FE-11 | 3.24 E-01 | 2.42 E+14 | 1.34 E-15 | PU |
| | FE-12 | 1.85 E-01 | 2.76 E+14 | 6.70 E-16 | PU |
| | FE-14,-16 | 3.04 E-01 | 1.69 E+14 | 1.80 E-15 | PU |
| | FE-24 | 0.00 | 2.86 E+12 | 0.00 | PU |
| TA-48-1: | FE15,16 | 9.44 | 8.16 E+14 | 1.16 E-14 | PU |
| | FE-18 | 0.00 | 2.43 E+12 | 0.00 | PU |
| | FE-45,46 | 4.62 E-01 | 8.02 E+14 | 5.76 E-16 | PU |
| | FE-51 | 7.25 E-03 | 2.18 E+13 | 3.32 E-16 | PU |
| | FE-54 | 3.91 E-02 | 9.05 E+13 | 4.33 E-16 | PU |
| TA-50: | FE-1 | 1.10 | 3.56 E+14 | 3.09 E-15 | PU |
| | FE-2 | 1.81 | 6.15 E+14 | 2.94 E-15 | PU |
| | FE-3 | 2.79 E-01 | 4.54 E+13 | 6.16 E-15 | PU |
| | FE-4 | 3.98 E-01 | 5.34 E+13 | 7.46 E-15 | PU |
| | FE-18 | 2.88 | 2.82 E+13 | 1.02 E-13 | PU |
| TA50-37: | FE-1 | 6.96 E-02 | 2.14 E+14 | 3.24 E-16 | PU |
| TA50-69: | FE-1 | 2.90 E-03 | 4.85 E+12 | 5.98 E-16 | PU |
| | FE-3 | 0.00 | 1.27 E+13 | 0.00 | PU |
| TA54:M/S | FE-1 | 1.45 E-03 | 5.10 E+12 | 2.84 E-16 | PU |
| | RM EXH. FE-2 | 1.88 E-02 | 2.37 E+13 | 7.95 E-16 | |
| TA55:N/S | FE-15 | 3.30 E-01 | 2.48 E+14 | 1.33 E-15 | |
| | S/S FE-16 | 2.26 | 3.26 E+14 | 6.95 E-15 | PU |

TOTAL RELEASED 110 µCi

## PART 3. CY 82 LOS ALAMOS URANIUM RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPA ISOTOPE |
|---|---|---|---|---|---|
| TA-3-29, | FE-20 | 1.64 | 3.78 E+14 | 4.34 E-15 | U-235 |
| | FE-22 | 6.42 E-01 | 1.71 E+14 | 3.75 E-15 | U-235 |
| | FE-23 | 1.12 E+02 | 5.94 E+14 | 1.90 E-13 | U-235 |
| | FE-24 | 5.54 | 2.97 E+14 | 1.86 F-14 | U-235 |
| | FE-26 | 3.37 E-01 | 1.30 E+14 | 2.59 E-15 | U-235 |
| | FE-27 | 3.34 E-01 | 1.25 E+14 | 2.67 E-15 | U-235 |
| TA-3-35, | FE-1,-2 | 1.89 | 2.41 E+14 | 7.84 E-15 | U-235 |
| TA-3-66, | FE-10 | 1.94 | 1.72 E+14 | 1.12 E-14 | U-235 |
| TA-21: | 3-MAIN,FE-1 | 1.20 E+02 | 2.58 E+14 | 4.67 E-13 | U-235 |
| | 3-INCI,FE-1 | 1.82 | 4.26 E+12 | 4.27 E-13 | U-235 |
| | 4-MAIN,FE-1 | 9.21 E+02 | 4.13 E+14 | 2.23 E-12 | U-235 |
| TA-48-1: | FE11,12,13 | 7.30 | 8.53 E+14 | 8.55 E-15 | U-235 |
| | FE-38,40 | 2.46 E-02 | 4.06 E+13 | 6.06 E-16 | U-235 |
| | SUB TOTAL | 1.17E+03 µCi | | | |
| TA-3-66, | FE-8 | 5.89 | 2.85 E+14 | 2.06 E-14 | U-238 |
| | FE-9 | 5.66 | 7.30 E+14 | 7.77 E-15 | U-238 |
| | FE-13 | 1.71 E+02 | 5.05 E+14 | 3.38 E-13 | U-238 |
| | FE-24 | 1.99 | 3.86 E+13 | 5.16 F-14 | U-238 |
| | FE-26 | 1.73 | 1.29 E+13 | 1.34 E-13 | U-238 |
| TA-3-102, | FE-20 | 3.66 | 6.99 E+13 | 5.24 E-14 | U-238 |
| TA-3-141, | FE-6 | 2.53 E-01 | 1.36 E+14 | 1.86 E-15 | U-238 |
| | FE-9 | 5.45 | 4.49 E+14 | 1.21 F-14 | U-238 |
| | FE-10 | 1.05 | 2.44 E+14 | 4.32 E-15 | U-238 |
| TA-46: | FE-43 | 2.03 | 1.80 E+13 | 1.13 E-13 | U-238 |
| DTR> | SUB TOTAL | 1.99E+02 µCi | | | |
| | U GRAND TOTAL | 1.37E+03 µCi | | | |

## PART 4. CY 82 LOS ALAMOS AIRBORNE MIXED FISSION PRODUCT RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRIN ISO |
|---|---|---|---|---|---|
| TA-3-29: | FE-44,-45,-46 | 7.63 E+01 | 1.43 E+15 | 5.33 E-14 | MF |
| TA-21: | 4-HC,FE-1 | 4.35 E-01 | 3.01 E+13 | 1.45 E-14 | MF |
| TA-48-1: | FE11,12,13 | 1.63 E+02 | 7.93 E+14 | 2.05 E-13 | MF |
| | FE15,16 | 9.24 E+01 | 8.16 E+14 | 1.13 E-13 | MF |
| | FE-18 | 4.37 E-02 | 2.44 E+12 | 1.79 E-14 | MF |
| | FE-38,40 | 1.02 E+02 | 4.06 E+13 | 2.51 E-12 | MF |
| | FE-45,46 | 7.35 E+02 | 8.02 E+14 | 9.16 E-13 | MF |
| | FE-51 | 4.42 E-01 | 2.18 E+13 | 2.07 E-14 | MF |
| | FE-54 | 1.28 | 9.05 E+13 | 1.42 E-14 | MF |
| TA-50: | FE-1 | 6.68 | 3.56 E+14 | 1.88 E-14 | [illegible] |
| | FE-2 | 4.38 | 6.15 E+14 | 7.12 E-15 | MF |
| | FE-3 | 2.27 E-01 | 4.54 E+13 | 5.00 E-15 | MF |
| | FE-4 | 2.57 E-01 | 5.34 E+13 | 4.83 E-15 | MF |
| | FE-18 | 3.71 E-01 | 2.82 E+13 | 1.32 E-14 | MF |
| TA-50-37: | FE-1 | 2.54 | 2.28 E+14 | 1.11 E-14 | MF |

TOTAL RELEASE 1.18E+03 µCi

## PART 5. CY 82 LOS ALAMOS AIRBORNE TRITIUM RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINC ISOT |
|---|---|---|---|---|
| TA-3-16 FE-H1 | 2.14 E+08 | 2.27 E+13 | 9.40 E-06 | H- |
| FE-H2 | 1.72 E+09 | 1.53 E+13 | 1.13 E-04 | H- |
| TA-3-34, FE-52 | 4.21 E+06 | 2.22 E+13 | 1.90 E-07 | H- |
| TA-21-209-DPE,FE-10 | 1.69 E+08 | 1.96 E+14 | 8.61 E-07 | H- |
| TA-33-86 | 1.36 E+10 | 1.08 E+14 | 1.27 E-04 | H- |
| TA-35-2:FE-H-1 | 0.00 | 4.94 E+13 | 0.00 | H- |
| TA-41-4 | 1.30 E+08 | 1.07 E+14 | 1.21 E-06 | H- |
| TA-55:S/S FE-16 | 1.87 E+07 | 2.95 E+14 | 6.34 E-08 | H- |
| TA-53:WNR FE-2 | 4.93 ~~4.64~~ E+04 | 1.72 E+14 | 2.69 E-10 | H- |
| MAIN S. FE-3 | 2.23 ~~2.17~~ E+05 | 2.28 E+14 | 9.54 E-10 | H- |

'87

TOTAL RELEASE 1.59 E+10 µCi

## PART 6. CY 82 MISCELLANEOUS LOS ALAMOS AIRBORNE RELEASE

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA-2-9, OMEGA | 3.42 E+08 | 1.32 E+13 | 2.59 E-05 | Ar-41* |
| TA-3-29, Wing 9 | 7.85 E+02 | 1.28 E+15 | 6.11 E-13 | I-131 |
| TA-21-257 (Pug Mill) | 3.50 E-02 | 3.35 E+13 | 1.04 E-15 | Am-241 |
| TA-43-1 (FE-9) | 4.77 | 2.37 E+14 | 2.01 E-14 | P-32 |
| TA-53 WNR (FE-2) | 4.40 E+07 | 1.72 E+14 | 2.55 E-07 | G/MAP** |
| TA-53 (FE-3) | 2.51 E+11 | 2.28 E+14 | 1.10 E-03 | G/MAP** |
| TA-53 WNR (FE-2) | 6.24 E+01 | 1.72 E+14 | 3.61 E-13 | P/VAP*** |
| TA-53 (FE-3) | 1.82 E+08 | 2.28 E+14 | 8.01 E-07 | P/VAP*** |

*A LARGER SOURCE OF Ar-41 (9.54 E+08 μCi) IS THE G/MAP AT TA-53 FE-3.
**G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS WITH THE FOLLOWING PRINCIPAL CONSTITUENTS O-15, 70.4%; C-11, 14.6%; N-13, 3.9% AND Ar-41, 0.38%.
***P/VAP DENOTES PARTICULATE OR VAPOR ACTIVATION PRODUCTS (THE MAIN PARTICULATE CONSTITUENT IS 1.31 E+07 μCi OF Au-192 AND THE MAIN VAPOR CONSTITUENT IS 1.49 E+08 μCi OF Hg-195.

1982 CONTROL AND REFERENCE LOCATION IDENT. DOE FORM F-5821.1 (Rev. 1-31-83)

| H-1 Data Base No. | DOE I.D. No | Narrative Description | Nuclide |
|---|---|---|---|
| 001 | ALDEA-009-001 | TA-2-9, Omega Stack | Ar-41 |
| 002 | ALDE7-016-002 | TA-3-16, Van De Graaff, FE-H-1 | H-3 |
| 003 | ALDE7-016-001 | TA-3-16, Van De Graaff, FE-H-2 | H-3 |
| 004 | ALDEB-029-002 | TA-3-29, North Stack, Wing 2, FE-14 | Pu |
| 005 | ALDEB-029-001 | TA-3-29, South Stack, Wing 2, FE-15 | Pu |
| 006 | ALDEB-029-012 | TA-3-29, South Offices, Wg. 2, Room Air, FE-17 | Pu |
| 007 | ALDEB-029-013 | TA-3-29, North Offices, Wg. 2, Room Air, FE-18 | Pu |
| 008 | ALDEB-029-003 | TA-3-29, South Stack, Wing 3, FE-19 | Pu |
| 009 | ALDEB-029-004 | TA-3-29, North Stack, Wing 3, FE-20 | U-235 |
| 010 | ALDEB-029-014 | TA-3-29, South Offices, Wg. 3, Room Air, FE-21 | Pu |
| 011 | ALDEB-029-015 | TA-3-29, North Offices, Wg. 3, Room Air, FE-22 | U-235 |
| 012 | ALDEB-029-006 | TA-3-29, North Stack, Wing 4, FE-23 | U-235 |
| 013 | ALDEB-029-005 | TA-3-29, South Stack, Wing 4, FE-24 | U-235 |
| 014 | ALDEB-029-016 | TA-3-29, North Offices, Wg. 4, Room Air, FE-26 | U-235 |
| 015 | ALDEB-029-017 | TA-3-29, South Offices, Wg. 4, Room Air, FE-27 | U-235 |
| 016 | ALDEB-029-007 | TA-3-29, South Stack, Wing 5, FE-28 | Pu |
| 017 | ALDEB-029-008 | TA-3-29, North Stack, Wing 5, FE-29 | Pu |
| 018 | ALDEB-029-018 | TA-3-29, North Offices, Wg. 5, Room Air, FE-30 | Pu |
| 019 | ALDEB-029-019 | TA-3-29, South Offices, Wg. 5, Room Air, FE-31 | Pu |
| 020 | ALDEB-029-010 | TA-3-29, North Stack, Wing 7, FE-32 | Pu |
| 021 | ALDEB-029-009 | TA-3-29, South Stack, Wing 7, FE-33 | Pu |
| 022 | ALDEB-029-020 | TA-3-29, South Offices, Wg. 7, Room Air, FE-34 | Pu |
| 023 | ALDEB-029-021 | TA-3-29, North Offices, Wg. 7, Room Air, FE-35 | Pu |
| 024 | ALDEB-029-011 | TA-3-29, Wing 9 Stack, FE-44, 45, 46 | Pu |
| 025 | " " " | " " " | MFP |
| 026 | " " " | " " " | I-131 |
| 027 | ALDE8-034-001 | TA-3-34, Cryogenics, FE-52 | H-3 |
| 028 | ALDE2-035-001 | TA-3-35, West Stack, FE-1 α FE-2 | U-235 |
| 029 | ALDE3-066-001 | TA-3-66, NW Stack, FE-8 | U-235 |
| 030 | ALDE3-066-002 | TA-3-66, NE Stack, FE-9 | U-235 |
| 031 | ALDE3-066-003 | TA-3-66, SE Stack, FE-10 | U-235 |
| 032 | ALDE3-066-004 | TA-3-66, North Stack, FE-13 | U-238 |
| 033 | ALDE3-066-005 | TA-3-66, West Central Stack, FE-24 | U-238 |
| 034 | ALDE3-066-006 | TA-3-66, NW Corner Stack, FE-26 | U-238 |
| 035 | ALDE4-102-001 | TA-3-102, Main Stack, FE-20 | U-238 |
| 036 | ALDE5-141-001 | TA-3-141, North Stack, FE-6 | U-238 |
| 037 | ALDE5-141-002 | TA-3-141, NW Stack, FE-9 | U-238 |
| 038 | ALDE5-141-003 | TA-3-141, SW Stack, FE-10 | U-238 |
| 039 | ALDE6-002-001 | TA-21-2, East Stack, Rm. Air, FE-2 | Pu |
| 040 | ALDE6-002-002 | TA-21-2, West Stack, Rm. Air, FE-1 | Pu |

LOS ALAMOS

AIRBORNE EFFLUENT RELEASE SUMMARY

CY 83

CONTENTS

## PART 1. CY 83 TOTAL LOS ALAMOS AIRBORNE RELEASES

SUMMARY OF ACTIVITY DISCHARGED BY ISOTOPE

| | | | | |
|---|---|---|---|---|
| PU | = | 1.11 E+02 | MICROCURIES | |
| U-235 | = | 7.50 E+02 | MICROCURIES | |
| U-238 | = | 1.35 E+02 | MICROCURIES | |
| AM-241 | = | 1.10 E-01 | MICROCURIES | |
| MFP | = | 1.58 E+03 | MICROCURIES | (Includes 734 μCi from an irradiation |
| G/MAP | = | 4.61 E+11 | MICROCURIES | experiment at TA-2 OWR) |
| P/VAP | = | 2.64 E+09 | MICROCURIES | |
| I-131 | = | 8.30 E+01 | MICROCURIES | |
| AR-41 | = | 4.18 E+08 | MICROCURIES | |
| H-3 | = | 7.90 E+09 | MICROCURIES | |
| H-3/V | = | 1.24 E+07 | MICROCURIES | |
| P-32 | = | 2.66 | MICROCURIES | |

FOOTNOTES FOR ABOVE TABLES:
G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS;C-11,N-13,O-15,AND AR-41.
P/VAP DENOTES PARTICULATE AND/OR VAPOR ACTIVATION PRODUCTS. SEE ATTACHMENT FOR SPECIFIC NUCLIDE INFORMATION
MFP DENOTES MIXED FISSION PRODUCTS
H-3/V DENOTES TRITIATED WATER VAPOR.
PIP>

PART 2. CY 83 LOS ALAMOS AIRBORNE PLUTONIUM RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA-3-29 | FE-14 | 6.40 E-02 | 2.46 E+14 | 2.60 E-16 | PU |
| | FE-15 | 4.24 E-01 | 6.73 E+14 | 6.29 E-16 | PU |
| | FE-17 | 2.98 E-01 | 1.36 E+14 | 2.18 E-15 | PU |
| | FE-18 | 1.01 E-01 | 1.59 E+14 | 6.32 E-16 | PU |
| | FE-19 | 8.20 E+01 | 7.15 E+14 | 1.15 E-13 | PU |
| | FE-21 | 7.77 E-01 | 1.36 E+14 | 5.70 E-15 | PU |
| | FE-28 | 4.87 E-01 | 3.28 E+14 | 1.48 E-15 | PU |
| | FE-29 | 2.04 | 8.70 E+14 | 2.35 E-15 | PU |
| | FE-30 | 7.00 E-02 | 9.92 E+13 | 7.05 E-16 | PU |
| | FE-31 | 1.84 E-01 | 1.27 E+14 | 1.44 E-15 | PU |
| | FE-32 | 8.42 E-01 | 3.24 E+14 | 2.59 E-15 | PU |
| | FE-33 | 6.45 E-01 | 7.25 E+14 | 8.89 E-16 | PU |
| | FE-34 | 7.70 E-02 | 1.61 E+14 | 4.77 E-16 | PU |
| | FE-35 | 6.30 E-02 | 9.67 E+13 | 6.51 E-16 | PU |
| | FE-44,-45,-46 | 4.53 E-01 | 1.40 E+15 | 3.23 E-16 | PU |
| TA21: | 2E,FE-2 | 3.83 E-01 | 1.83 E+14 | 2.09 E-15 | PU |
| | 2W,FE-1 | 3.95 E-01 | 1.85 E+14 | 2.13 E-15 | PU |
| | 3E,FE-2 | 2.49 | 2.14 E+14 | 1.16 E-14 | PU |
| | 3W,FE-1 | 2.17 | 2.78 E+14 | 7.82 E-15 | PU |
| | 4W,FE-2 | 1.52 | 2.15 E+14 | 7.07 E-15 | PU |
| | 4-HC,FE-1 | 1.93 E-01 | 2.96 E+13 | 6.52 E-15 | PU |
| | 5W,FE-2 | 7.26 E-01 | 3.09 E+14 | 2.35 E-15 | PU |
| | 150,FE-1 | 1.32 E-01 | 2.14 E+14 | 6.14 E-16 | PU |
| | 257,FE-4 | 2.06 E-01 | 2.50 E+13 | 8.21 E-15 | PU |
| | 324,FE-1 | 1.70 | 2.11 E+14 | 8.08 E-15 | PU |
| TA-35-7: | FE-2 | 7.17 E-01 | 2.51 E+14 | 2.85 E-15 | PU |
| | FE-7 | 1.94 E-01 | 7.10 E+13 | 2.73 E-15 | PU |
| | FE-8 | 1.50 E-02 | 2.92 E+13 | 5.13 E-16 | PU |
| TA-43-1: | FE-9 | 2.74 E-01 | 2.10 E+14 | 1.30 E-15 | PU |
| | FE-10 | 2.49 | 2.15 E+14 | 1.16 E-14 | PU |
| | FE-11 3.331 | 1.29 E-01 | 2.57 E+14 | 5.02 E-16 | PU |
| | FE-12 | 2.69 E-01 | 2.86 E+14 | 9.39 E-16 | PU |
| | FE-14,-16 | 1.69 E-01 | 1.70 E+14 | 9.91 E-16 | PU |
| | FE-24 | 0.00 | 2.98 E+12 | 0.00 | PU |
| TA-48-1: | FE15,16 | 2.74 | 8.03 E+14 | 3.41 E-15 | PU |
| | FE-18 | 0.00 | 2.39 E+12 | 0.00 | PU |
| | FE-45,46 3.3 | 4.85 E-01 | 7.89 E+14 | 6.14 E-16 | PU |
| | FE-51 | 3.40 E-02 | 2.14 E+13 | 1.58 E-15 | PU |
| | FE-54 | 3.90 E-02 | 9.12 E+13 | 4.27 E-16 | PU |
| TA-50: | FE-1 | 2.36 | 3.50 E+14 | 6.74 E-15 | PU |
| | FE-2 | 2.12 | 6.25 E+14 | 3.39 E-15 | PU |
| | FE-3 | 9.20 E-02 | 4.64 E+13 | 1.98 E-15 | PU |
| | FE-4 | 1.48 E-01 | 5.35 E+13 | 2.76 E-15 | PU |
| | FE-17 | 1.59 E-01 | 2.83 E+13 | 5.62 E-15 | PU |
| | FE-27 | 6.40 E-02 | 6.37 E+13 | 1.00 E-15 | PU |
| TA50-37: | FE-1 | 1.50 E-02 | 2.14 E+14 | 6.98 E-17 | PU |
| TA50-69: | FE-1 | 1.10 E-02 | 1.48 E+13 | 7.39 E-16 | PU |
| | FE-3 | 5.77 E-01 | 1.48 E+13 | 3.88 E-14 | PU |
| TA54: | RM EXH FE-1 | 0.00 | 1.89 E+13 | 0.00 | PU |
| | PROCESS FE-2 | 2.00 E-03 | 8.95 E+12 | 2.23 E-16 | PU |
| TA55: | N/S FE-15 | 1.52 E-01 | 2.48 E+14 | 6.12 E-16 | PU |
| | S/S FE-16 | 9.20 E-01 | 3.21 E+14 | 2.86 E-15 | PU |

GRAND TOTAL RELEASED 111 μCi

PART 3. CY 83 LOS ALAMOS URANIUM RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA-3-29 | FE-20 | 1.93 | 5.40 E+14 | 3.59 E-15 | U-235 |
| | FE-22 | 4.50 E-01 | 1.21 E+14 | 3.72 E-15 | U-235 |
| | FE-23 | 1.29 E+01 | 4.39 E+14 | 2.96 E-14 | U-235 |
| | FE-24 | 7.30 | 4.21 E+14 | 1.73 E-14 | U-235 |
| | FE-26 | 5.49 E-01 | 1.21 E+14 | 4.51 E-15 | U-235 |
| | FE-27 | 2.14 E-01 | 2.61 E+14 | 8.17 E-16 | U-235 |
| TA-3-35, | FE-1,-2 | 3.93 | 2.37 E+14 | 1.66 E-14 | U-235 |
| TA-3-66 | FE-10 | 1.82 E+01 | 1.74 E+14 | 1.05 E-13 | U-235 |
| TA-21 | 3-MAIN, FE-1 | 5.46 E+02 | 2.54 E+14 | 2.15 E-12 | U-235 |
| | 3-INCI, FE-1 | 1.15 | 4.27 E+12 | 2.69 E-13 | U-235 |
| | 4-MAIN, FE-1 | 1.59 E+02 | 4.06 E+14 | 3.92 E-13 | U-235 |
| TA-48-1: | FE11,12,13 | 5.04 E-01 | 1.52 E+15 | 3.30 E-16 | U-235 |
| | FE-38,40 | 7.00 E-03 | 4.06 E+13 | 1.72 E-16 | U-235 |

23.3

23.3+18.6 = 41.9

18.6

706

0.5

SUB TOTAL 7.50 E+02 µCi

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA-3-66, | FE-8 | 6.38 | 2.24 E+14 | 2.85 E-14 | U-238 |
| | FE-9 | 1.18 E+01 | 7.86 E+14 | 1.51 E-14 | U-238 |
| | FE-13 | 9.64 E+01 | 5.03 E+14 | 1.91 E-13 | U-238 |
| | FE-24 | 3.06 | 3.76 E+13 | 8.14 E-14 | U-238 |
| | FE-26 | 6.63 E-01 | 1.28 E+13 | 5.16 E-14 | U-238 |
| TA-3-102, | FE-20 | 7.95 | 6.60 E+13 | 1.20 E-13 | U-238 |
| TA-3-141, | FE-6 | 3.30 E-01 | 1.38 E+14 | 2.39 E-15 | U-238 |
| | FE-9 | 8.27 | 4.43 E+14 | 1.87 E-14 | U-238 |
| | FE-10 | 8.45 E-01 | 2.41 E+14 | 3.50 E-15 | U-238 |
| TA-46: | FE-43 | 3.60 E-02 | 2.00 E+13 | 1.80 E-15 | U-238 |

118.3

7.95

9.445

238 135.7

235 41.9

177.6

118.3

7.95

9.445

SUB TOTAL 1.35 E+02 µCi

U GRAND TOTAL 8.85 E+02 µCi

## PART 4. CY 83 LOS ALAMOS AIRBORNE MIXED FISSION PRODUCT RELEASES BY FACILITY

| | STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA3-29 | FE-44,-45,-46 | 1.71 E+01 | 1.40 E+15 | 1.22 E-14 | MFP |
| TA21 | 4-HC,FE-1 | 7.94 E-01 | 2.96 E+13 | 2.68 E-14 | MFP |
| TA48-1 | FE11,12,13 | 3.13 E+01 | 1.52 E+15 | 2.06 E-14 | MFP |
| | FE15,16 | 1.85 E+02 | 8.03 E+14 | 2.31 E-13 | MFP |
| | FE-18 | 4.70 E-02 | 2.39 E+12 | 1.96 E-14 | MFP |
| | FE-38,40 815.9 | 7.15 E+01 | 3.75 E+13 | 1.91 E-12 | MFP |
| | FE-45,46 | 5.26 E+02 | 7.89 E+14 | 6.67 E-13 | MFP |
| | FE-51 | 3.70 E-01 | 2.14 E+13 | 1.72 E-14 | MFP |
| | FE-54 | 1.73 | 9.12 E+13 | 1.90 E-14 | MFP |
| TA50: | FE-1 | 3.56 | 3.50 E+14 | 1.02 E-14 | MFP |
| | FE-2 | 4.53 | 6.25 E+14 | 7.24 E-15 | MFP |
| | FE-3 | 1.93 E-01 | 4.64 E+13 | 4.16 E-15 | MFP |
| | FE-4 | 1.69 E-01 | 5.25 E+13 | 3.22 E-15 | MFP |
| | FE-6 | 1.90 E-02 | 4.56 E+11 | 4.16 E-14 | MFP |
| | FE-17 | 6.40 E-02 | 2.83 E+13 | 2.26 E-15 | MFP |
| TA50-37: | FE-1 | 5.45 E-01 | 2.14 E+14 | 2.54 E-15 | MFP |

**TOTAL NORMAL RELEASE** 8.43 E+02 µCi

**TA-2 RELEASE** 7.34 E+03 µCi (one time irradiation experiment at TA-2 OWR resulted in this additional release)

**AND TOTAL** 1.58 E+03 µCi

## PART 5. CY 83 LOS ALAMOS AIRBORNE TRITIUM RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA-3-16 FE-14 | 4.11 E+08 | 2.90 E+13 | 1.42 E-05 | H-3 |
| FE-16 | 1.84 E+09 | 9.42 E+12 | 1.96 E-04 | H-3 |
| TA-3-34, FE-52 | 2.56 E+07 | 2.26 E+13 | 1.13 E-06 | H-3 |
| TA21: 209-DPE,FE-10 | 1.80 E+08 | 2.00 E+14 | 9.00 E-07 | H-3 |
| TA-33-86 | 4.41 E+09 | 1.10 E+14 | 4.00 E-05 | H-3 |
| TA-35-2:FE-H-1 | 6.00 E+06 | 4.84 E+13 | 1.24 E-07 | H-3 |
| TA-41-4 | 9.74 E+08 | 1.60 E+14 | 6.09 E-06 | H-3 |
| TA35 S/S FE-16 | 4.42 E+07 | 2.42 E+14 | 1.82 E-07 | H-3 |

**TOTAL RELEASE** 7.90 E+09 µCi

## PART 6. CY 83 MISCELLANEOUS LOS ALAMOS AIRBORNE RELEASE

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA-2-9, OMEGA | 4.18 E+08 | 1.30 E+13 | 3.21 E-05 | Ar-41* |
| TA-3-29, Wing 9 | 8.30 E+01 | 1.26 E+15 | 6.55 E-14 | I-131 |
| TA-21-257 (Pug Mill Discontinued after Oct. 7, 1983) | 9.50 E-02 | 2.76 E+13 | 3.43 E-15 | Am-241 |
| TA-43-1 (FE-9) | 2.66 | 2.31 E+14 | 1.15 E-14 | P-32 |
| TA-53 WNR (FE-2) | 1.11 E+08 | 1.84 E+14 | 6.07 E-07 | G/MAP** |
| TA-53 (FE-3) | ~~4.61 E+11~~ | 2.64 E+14 | 1.74 E-03 | G/MAP** |
| TA-53 WNR (FE-2) | 1.46 E+03 | 1.84 E+14 | 7.93 E-12 | P/VAP*** |
| TA-53 (FE-3) | 2.64 E+09 | 2.64 E+14 | 1.00 E-05 | P/VAP*** |

*A LARGER SOURCE OF Ar-41 (1.84 E+09 μCi) IS THE G/MAP AT TA-53 FE-3.
**G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS WITH THE FOLLOWING PRINCIPAL CONSTITUENTS O-15, 76.6%; O-14, 2.3%; C-11, 16.4%; N-13, 4.3% AND Ar-41, 0.4%.
***P/VAP DENOTES PARTICULATE OR VAPOR ACTIVATION PRODUCTS (THE MAIN PARTICULATE CONSTITUENT IS 1.68 E+09 μCi OF Au-192 AND THE MAIN VAPOR CONSTITUENT IS 7.63 E+08 μCi OF Hg-195.

1983 CONTROL AND REFERENCE LOCATION IDENT. DOE FORM F-5821.1 (Rev. 2-24-84

| HSE-1 I.D. | DOE I.D. | Narrative Description | Nuclide |
|---|---|---|---|
| 001 | ALDEA-009-001 | TA2-9, Omega Stack | AR-41 |
| 002 | ALDE7-016-002 | TA3-16, Van De Graaff, FE-14 | H-3 |
| 003 | ALDE7-016-001 | TA3-16, Van De Graaf, FE-16 | H-3 |
| 004 | ALDEB-029-002 | TA3-29, North Stack, Wing 2, FE-14 | Pu |
| 005 | ALDEB-029-001 | TA3-29, South Stack, Wing 2, FE-15 | Pu |
| 006 | ALDEB-029-012 | TA3-29, South Offices, Wg. 2, Room Air, FE-17 | Pu |
| 007 | ALDEB-029-013 | TA3-29, North Offices, Wg. 2, Room Air, FE-18 | Pu |
| 008 | ALDEB-029-003 | TA3-29, South Stack, Wing 3, FE-19 | Pu |
| 009 | ALDEB-029-004 | TA3-29, North Stack, Wing 3, FE-20 | U-235 |
| 010 | ALDEB-029-014 | TA3-29, South Offices, Wg. 3, Room Air, FE-21 | Pu |
| 011 | ALDEB-029-015 | TA3-29, North Offices, Wg. 3, Room Air, FE-22 | U-235 |
| 012 | ALDEB-029-006 | TA3-29, North Stack, Wing 4, FE-23 | U-235 |
| 013 | ALDEB-029-005 | TA3-29, South Stack, Wing 4, FE-24 | U-235 |
| 014 | ALDEB-029-016 | TA3-29, North Offices, Wg. 4, Room Air, FE-26 | U-235 |
| 015 | ALDEB-029-017 | TA3-29, South Offices, Wg. 4, Room Air, FE-27 | U-235 |
| 016 | ALDEB-029-007 | TA3-29, South Stack, Wing 5, FE-28 | Pu |
| 017 | ALDEB-029-008 | TA3-29, North Stack, Wing 5, FE-29 | Pu |
| 018 | ALDEB-029-018 | TA3-29, North Offices, Wg. 5, Room Air, FE-30 | Pu |
| 019 | ALDEB-029-019 | TA3-29, South Offices, Wg. 5, Room Air, FE-31 | Pu |
| 020 | ALDEB-029-010 | TA3-29, North Stack, Wing 7, FE-32 | Pu |
| 021 | ALDEB-029-009 | TA3-29, South Stack, Wing 7, FE-33 | Pu |
| 022 | ALDEB-029-020 | TA3-29, South Offices, Wg. 7, Room Air, FE-34 | Pu |
| 023 | ALDEB-029-021 | TA3-29, North Offices, Wg. 7, Room Air, FE-35 | Pu |
| 024 | ALDEB-029-011 | TA3-29, Wing 9 Stack, FE-44, 45, 46 | Pu |
| 025 | ALDEB-029-011 | TA3-29, Wing 9 Stack, FE-44, 45, 46 | MFP |
| 026 | ALDEB-029-011 | TA3-29, Wing 9 Stack, FE-44, 45, 46 | I-131 |
| 027 | ALDE8-034-001 | TA3-34, Cryogenics, FE-52 | H-3 |
| 028 | ALDE2-035-001 | TA3-35, West Stack, FE-1 FE-2 | U-235 |
| 029 | ALDE3-066-001 | TA3-66, NW Stack, FE-8 | U-235 |
| 030 | ALDE3-066-002 | TA3-66, NE Stack, FE-9 | U-235 |
| 031 | ALDE3-066-003 | TA3-66, SE Stack, FE-10 | U-235 |
| 032 | ALDE3-066-004 | TA3-66, North Stack, FE-13 | U-238 |
| 033 | ALDE3-066-005 | TA3-66, West Central Stack, FE-24 | U-238 |
| 034 | ALDE3-066-006 | TA3-66, NW Corner Stack, FE-26 | U-238 |
| 035 | ALDE4-102-001 | TA3-102, Main Stack, FE-20 | U-238 |
| 036 | ALDE5-141-001 | TA3-141, North Stack, FE-6 | U-238 |
| 037 | ALDE5-141-002 | TA3-141, NW Stack, FE-9 | U-238 |
| 038 | ALDE5-141-003 | TA3-141, SW Stack, FE-10 | U-238 |
| 039 | ALDE6-002-001 | TA21-2, East Stack, Rm. Air, FE-2 | Pu |
| 040 | ALDE6-003-001 | TA21-3, East Stack, Rm. Air, FE-2 | Pu |

# LOS ALAMOS

## AIRBORNE EFFLUENT RELEASE SUMMARY

## CY 84

CONTENTS

## PART 1. CY 84 TOTAL LOS ALAMOS AIRBORNE RELEASES

SUMMARY OF ACTIVITY DISCHARGED BY ISOTOPE

| | | | |
|---|---|---|---|
| PU | = | 1.37 E+02 | MICROCURIES |
| U-235 | = | 1.06 E+03 | MICROCURIES |
| U-238 | = | 1.30 E+02 | MICROCURIES |
| MFP | = | 1.61 E+03 | MICROCURIES |
| G/MAP | = | 7.34 E+11 | MICROCURIES |
| P/VAP | = | 2.50 E+09 | MICROCURIES |
| I-131 | = | 7.30 E+01 | MICROCURIES |
| AR-41 | = | 3.35 E+08 | MICROCURIES |
| H-3 | = | 1.48 E+10 | MICROCURIES |
| P-32 | = | 3.29 E+01 | MICROCURIES |

NOTES:

1. G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS;C-11,N-13,0-15, 0-14, AND AR-41.

2. P/VAP DENOTES PARTICULATE AND/OR VAPOR ACTIVATION PRODUCTS.

3. MFP DENOTES MIXED FISSION PRODUCTS.

4. PU VALUES CONTAIN INDETERMINANT TRACE OF AM-241 A DECAY PRODUCT OF PU-241.

PART 2. CY 84 LOS ALAMOS AIRBORNE PLUTONIUM RELEASES BY FACILITY

| STACK LOCATION & ID | % | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPA ISOTOPE |
|---|---|---|---|---|---|
| TA3-29 FE-14 | 0.22 | 5.92 E-01 | 2.36 E+14 | 2.50 E-15 | PU |
| TA3-29 FE-15 | 0.02 | 5.10 E-02 | 6.72 E+14 | 7.59 E-17 | PU |
| TA3-29 FE-17 | 0.002 | 5.00 E-03 | 1.28 E+14 | 3.88 E-17 | PU |
| TA3-29 FE-18 | 0.032 | 8.30 E-02 | 1.48 E+14 | 5.59 E-16 | PU |
| TA3-29 FE-19 | 40.6 | 1.08 E+02 | 6.87 E+14 | 1.57 E-13 | PU |
| TA3-29 FE-21 | 0.090 | 2.37 E-01 | 1.39 E+14 | 1.70 E-15 | PU |
| TA3-29 FE-28 | 0.590 | 1.56 | 3.87 E+14 | 4.05 E-15 | PU |
| TA3-29 FE-29 | 1.10 | 2.91 | 8.30 E+14 | 3.51 E-15 | PU |
| TA3-29 FE-30 | 0.027 | 7.10 E-02 | 9.10 E+13 | 7.80 E-16 | PU |
| TA3-29 FE-31 | 0.057 | 1.51 E-01 | 1.39 E+14 | 1.08 E-15 | PU |
| TA3-29 FE-32 | 0.037 | 9.80 E-02 | 3.14 E+14 | 3.12 E-16 | PU |
| TA3-29 FE-33 | 0.092 | 2.43 E-01 | 7.41 E+14 | 3.28 E-16 | PU |
| TA3-29 FE-34 | 0.027 | 7.10 E-02 | 1.48 E+14 | 4.78 E-16 | PU |
| TA3-29 FE-35 | 0.052 | 1.38 E-01 | 9.10 E+13 | 1.52 E-15 | PU |
| TA3-29 FE-44,-45,-46 | 0.23 | 6.15 E-01 | 1.40 E+15 | 4.38 E-16 | PU |
| TA21-313(2E),FE-1 | 1.03 | 9.19 E-01 | 1.95 E+14 | 4.71 E-15 | PU |
| TA21-314(3E),FE-1 | 4.77 | 4.24 | 2.14 E+14 | 1.98 E-14 | PU |
| TA21-313(3W),F-2 | 1.63 | 1.45 | 2.87 E+14 | 5.07 E-15 | PU |
| TA21-314(4W),FE-7 | 2.89 | 2.57 | 2.14 E+14 | 1.20 E-14 | PU |
| TA21-4(HC),FE-1 | 0.18 | 1.53 E-01 | 2.95 E+13 | 5.18 E-15 | PU |
| TA21-315(5W),FE-1 | 3.45 | 3.07 | 3.39 E+14 | 9.06 E-15 | PU |
| TA21 150,FE-1 | 0.24 | 2.11 E-01 | 2.18 E+14 | 9.66 E-16 | PU |
| TA21 257,FE-4 | 0.57 | 5.03 E-01 | 2.52 E+13 | 1.99 E-14 | PU |
| TA21 324,FE-1 | 4.75 | 4.22 | 2.10 E+14 | 2.01 E-14 | PU |
| TA35-7: FE-2 | 0.12 | 3.13 E-01 | 2.48 E+14 | 1.26 E-15 | PU |
| TA35-7 FE-7 | 0.037 | 9.70 E-02 | 5.11 E+13 | 1.90 E-15 | PU |
| TA35-7 FE-8 | 0.003 | 7.00 E-03 | 2.93 E+13 | 2.39 E-16 | PU |
| TA43-1: FE-9 | ~~[illegible]~~ | 4.63 E-01 8.0 | 2.57 E+14 | 1.80 E-15 | PU |
| TA43 FE-10 | ~~[illegible]~~ | 9.70 E-02 1.68 | 2.24 E+14 | 4.31 E-16 | PU |
| TA43 FE-12 | ~~[illegible]~~ | 1.59 E-01 2.75 | 2.68 E+14 | 5.93 E-16 | PU |
| TA43 FE-34 | ~~[illegible]~~ | 3.28 E-01 5.66 | 2.98 E+14 | 1.10 E-15 | PU |
| TA48 FE15 | 1.12 | 1.99 | 7.93 E+14 | 2.51 E-15 | PU |
| TA48 FE-18 | 0.002 | 2.00 E-03 | 2.39 E+12 | 8.36 E-16 | PU |
| TA48 FE-45,46 | 0.31 | 5.47 E-01 | 7.87 E+14 | 6.95 E-16 | PU |
| TA48 FE-51 | 0.002 | 3.00 E-03 | 2.14 E+13 | 1.40 E-16 | PU |
| TA48 FE-54 | 0.006 | 1.00 E-02 | 9.10 E+13 | 1.10 E-16 | PU |
| TA50: FE-1 | 0.58 | 1.36 | 3.49 E+14 | 3.89 E-15 | PU |
| TA50 FE-2 | 0.69 | 1.62 | 6.24 E+14 | 2.61 E-15 | PU |
| TA50 FE-3 | 0.011 | 2.50 E-02 | 4.62 E+13 | 5.40 E-16 | PU |
| TA50 FE-25 | 0.11 | 2.40 E-02 | 5.34 E+13 | 4.49 E-16 | PU |
| TA50 FE-6 | -0- | 0.00 | 1.51 E+11 | 0.00 | PU |
| TA50 FE-17 | 0.082 | 1.93 E-01 | 2.82 E+13 | 6.84 E-15 | PU |
| TA50 FE-27 | 0.19 | 4.26 E-01 | 1.50 E+14 | 2.82 E-15 | PU |
| TA50-37: FE-1 | -0- | 0.00 | 2.14 E+14 | 0.00 | PU |
| TA50-69: FE-1 | 0.005 | 1.00 E-02 | 1.48 E+13 | 6.74 E-16 | PU |
| TA50-69 FE-3 | 0.004 | 9.00 E-03 | 1.48 E+13 | 6.06 E-16 | PU |
| TA54: RM EXH FE-1 | 0.006 | 2.30 E-02 | 1.25 E+13 | 1.83 E-15 | PU |
| TA54: PROCESS FE-2 | -0- | 0.00 | 5.66 E+12 | 0.00 | PU |
| TA55:N/S FE-15 | 0.20 | 4.48 E-01 | 2.48 E+14 | 1.81 E-15 | PU |
| TA55 S/S FE-16 | 0.26 | 5.88 E-01 | 3.20 E+14 | 1.83 E-15 | PU |

TOTAL PU RELEASED: 137 µCi

## PART 3. CY 84 LOS ALAMOS AIRBORNE URANIUM RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIP ISOTOPE |
|---|---|---|---|---|---|
| TA3-29 FE-20 | 0.16 | 3.83 | 5.48 E+14 | 6.99 E-15 | U-235 |
| TA3-29 FE-22 | 0.014 | 3.44 E-01 | 9.10 E+13 | 3.78 E-15 | U-235 |
| TA3-29 FE-23 | 1.94 | 4.79 E+01 | 2.83 E+14 | 1.69 E-13 | U-235 |
| TA3-29 FE-24 | 0.83 | 2.04 E+01 | 5.42 E+14 | 3.78 E-14 | U-235 |
| TA3-29 FE-26 | 0.007 | 1.56 E-01 | 1.13 E+14 | 1.37 E-15 | U-235 |
| TA3-29 FE-27 | 0.009 | 2.04 E-01 | 1.27 E+14 | 1.60 E-15 | U-235 |
| TA3-35 FE-1,-2 | 0.18 | 4.39 | 3.05 E+14 | 1.44 E-14 | U-235 |
| TA3-66 FE-10 | 0.25 | 5.96 | 2.29 E+14 | 2.60 E-14 | U-235 |
| TA21-3(MAIN),FE-6 | 116 | 9.50 E+02 | 2.53 E+14 | 3.75 E-12 | U-235 |
| TA21-3(PROCESS),FE-1 | 0.12 | 9.79 E-01 | 4.26 E+12 | 2.30 E-13 | U-235 |
| TA21-4(MAIN),FE-3 | 4.79 | 3.94 E+01 | 4.05 E+14 | 9.73 E-14 | U-235 |
| TA48-1: FE11 | | 1.32 | 9.45 E+14 | 1.41 E-15 | U-235 |
| TA48 FE-40 | | 1.50 E-02 | 4.63 E+13 | 3.23 E-16 | U-235 |

TOTAL U-235 RELEASED: 1,060 µCi

| | | | | | |
|---|---|---|---|---|---|
| TA3-66 FE-8 | 0.25 | 6.10 | 2.19 E+14 | 2.78 E-14 | U-23 |
| TA3-66 FE-9 | 3.76 | 9.27 E+01 | 7.38 E+14 | 1.26 E-13 | U-23 |
| TA3-66 FE-13 | 1.04 | 2.55 E+01 | 4.92 E+14 | 5.19 E-14 | U-23 |
| TA3-66 FE-24 | 0.016 | 3.92 E-01 | 3.76 E+13 | 1.04 E-14 | U-23 |
| TA3-66 FE-26 | 0.047 | 1.15 | 1.25 E+13 | 9.13 E-14 | U-23 |
| TA3-102,FE-20 | 0.094 | 2.32 | 6.99 E+13 | 3.32 E-14 | U-23 |
| TA3-141,FE-6 | 0.015 | 3.48 E-01 | 1.37 E+14 | 2.53 E-15 | U-23 |
| TA3-141,FE-9 | 0.081 | 2.00 | 4.42 E+14 | 4.53 E-15 | U-23 |
| TA3-141,FE-10 | 0.024 | 5.91 E-01 | 2.40 E+14 | 2.45 E-15 | U-23 |
| TA46: FE-41 | 0.001 | 5.10 E-02 | 1.97 E+13 | 2.58 E-15 | U-23 |

TOTAL U-238 RELEASED: 130 µCi

GRAND TOTAL U RELEASED: 1,190 µCi

## PART 4. CY 84 LOS ALAMOS AIRBORNE MIXED FISSION PRODUCT [illegible]

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-44,-45,-46 | 4.15 E+01 | 1.40 E+15 | 2.96 E-14 | MFP |
| TA21-4(HC),FE-1 | 3.14 E-01 | 2.95 E+13 | 1.06 E-14 | MFP |
| TA48-1: FE11 | 1.42 E+02 | 9.45 E+14 | 1.51 E-13 | MFP |
| TA48 FE15 | 4.36 E+01 | 7.93 E+14 | 5.50 E-14 | MFP |
| TA48 FE-18 | 9.50 E-02 | 2.39 E+12 | 3.97 E-14 | MFP |
| TA48 FE-40 | 2.58 E+02 | 4.63 E+13 | 5.57 E-12 | MFP |
| TA48 FE-45,46 | 1.12 E+03 | 7.87 E+14 | 1.42 E-12 | MFP |
| TA48 FE-51 | 7.33 E-01 | 2.14 E+13 | 3.42 E-14 | MFP |
| TA48 FE-54 | 1.59 | 9.10 E+13 | 1.75 E-14 | MFP |
| TA50: FE-1 | 3.62 | 3.49 E+14 | 1.04 E-14 | MFP |
| TA50 FE-2 | 4.27 | 6.24 E+14 | 6.85 E-15 | MFP |
| TA50 FE-3 | 3.40 E-02 | 4.62 E+13 | 7.35 E-16 | MFP |
| TA50 FE-25 | 1.95 E-01 | 5.34 E+13 | 3.65 E-15 | MFP |
| TA50 FE-6 | 0.00 | 1.51 E+11 | 0.00 | MFP |
| TA50 FE-17 | 3.40 E-02 | 2.82 E+13 | 1.21 E-15 | MFP |
| TA50 FE-27 | 6.12 E-01 | 1.50 E+14 | 4.06 E-15 | MFP |
| TA50-37: FE-1 | 1.35 E-01 | 2.14 E+14 | 6.29 E-16 | MFP |

TOTAL MFP RELEASED: 1,610 µCi

## PART 5. CY 84 LOS ALAMOS AIRBORNE TRITIUM RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPA ISOTOPE |
|---|---|---|---|---|---|
| TA3-16 FE-14 | 8.12 E+08 | 6.6 | 2.51 E+13 | 3.23 E-05 | H-3 |
| TA3-16 FE-16 | 9.65 E+08 | 7.9 | 8.45 E+12 | 1.14 E-04 | H-3 |
| TA3-34 FE-26 | 1.57 E+07 | 0.13 | 1.74 E+13 | 9.02 E-07 | H-3 |
| TA21-209(DPE), FE-1,-1 | 8.02 E+08 | 23.8 | 1.96 E+14 | 4.09 E-06 | H-3 |
| TA21-155N(TSTA),FE-5 | 4.40 E+05 | 0.02 | 7.06 E+13 | 6.23 E-09 | H-3 |
| TA33-86 FE-6,-11 | 7.11 E+09 | 43.4 | 1.08 E+14 | 6.57 E-05 | H-3 |
| TA35-2:FE-H1 | 7.83 E+07 | 0.91 | 9.58 E+12 | 8.17 E-06 | H-3 |
| TA35-TSL213 FE1 | 0.00 | -0- | 3.15 E+13 | 0.00 | H-3 |
| TA35-TSL213 FE5 | 1.28 E+08 | 1.50 | 1.89 E+14 | 6.75 E-07 | H-3 |
| TA41-4, FE-17 | 4.78 E+09 | 172 | 1.81 E+14 | 2.63 E-05 | H-3 |
| TA53 WNR FE-2 | 6.05 E+04 | | 1.93 E+14 | 3.13 E-10 | H-3 |
| TA53 MAIN S. FE-3 | 2.69 E+07 | | 2.17 E+14 | 1.24 E-07 | H-3 |
| TA55 S/S FE-16 | 1.52 E+08 | | 3.20 E+14 | 4.75 E-07 | H-3 |

TOTAL H-3 RELEASED: 1.48 E+10 µCi

NOTE: TA35-2: FE-H1 WAS DECOMMISSIONED IN 1984.
TA21-155N(TSTA), FE-5 BECAME OPERATIONAL IN 1984.
TA35-TSL-213 FE-1 and FE-5 BECAME OPERATIONAL IN 1984.

## PART 6. CY 84 MISCELLANEOUS LOS ALAMOS AIRBORNE RELEASE

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED % | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA2-9, OMEGA | 3.35 E+08 31.9 | 1.30 E+13 | 2.57 E-05 | Ar-41 |
| TA3-29, Wing 9 | 7.30 E+01 0.004 | 1.40 E+15 | 5.20 E-14 | I-131 |
| TA43, FE-9 | 2.26 0.0004 | 2.57 E+14 | 8.80 E-15 | P-32 |
| TA43, FE-10 | 1.20 | 2.24 E+14 | 5.36 E-15 | P-32 |
| TA43, FE-12 | 2.10 E+01 | 2.68 E+14 | 7.84 E-14 | P-32 |
| TA43, FE-34 | 8.48 | 2.98 E+14 | 2.84 E-14 | P-32 |
| Ttl P-32 0.006 TA53, WNR (FE-2) | 1.18 E+08 | 1.93 E+14 | 6.14 E-07 | G/MAP |
| TA53, (FE-3) | 7.34 E+11 | 2.17 E+14 | 3.38 E-03 | G/MAP |
| TA53 WNR (FE-2) | 5.52 E+03 | 1.93 E+14 | 2.85 E-11 | P/VAP |
| TA53 (FE-3) | 2.50 E+09 | 2.17 E+14 | 1.16 E-05 | P/VAP |

NOTES:

1. A LARGER SOURCE OF Ar-41 (3.08 E+09 μCi) IS THE G/MAP AT TA-53 FE-3.

2. G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS WITH THE FOLLOWING PRINCIPAL CONSTITUENTS O-15, 71.8%; O-14, 2.1%; C-11, 16.0%; N-13, 4.2% AND Ar-41, 0.42%.

3. P/VAP DENOTES PARTICULATE OR VAPOR ACTIVATION PRODUCTS (THE MAIN PARTICULATE CONSTITUENT IS 9.55 E+08 μCi OF Au-192 AND THE MAIN VAPOR CONSTITUENT IS 1.21 E+09 μCi OF Hg-195. THIRTY SIX DISTINCT NUCLIDES WERE IDENTIFIED.

4. PU RELEASES INCLUDE AN INDETERMINATE TRACE OF AM-241 A DECAY PRODUCT OF PU-241. OPERATIONS AT THE PUG MILL AT TA21 WERE THE PRINCIPAL SOURCE OF AM-241 RELEASES AND HAVE BEEN DISCONTINUED.

1984 CONTROL AND REFERENCE LOCATION IDENT. DOE FORM F-5821.1 (Rev. 2-24-84)

| HSE-1 I.D. | DOE I.D. | Narrative Description | Nuclide |
|---|---|---|---|
| 001 | ALDEA-009-001 | TA2-9, Omega Stack | AR-41 |
| 002 | ALDE7-016-002 | TA3-16, Van De Graaf, FE-14 | H-3 |
| 003 | ALDE7-016-001 | TA3-16, Van De Graaf, FE-16 | H-3 |
| 004 | ALDEB-029-002 | TA3-29, North Stack, Wing 2, FE-14 | Pu |
| 005 | ALDEB-029-001 | TA3-29, South Stack, Wing 2, FE-15 | Pu |
| 006 | ALDEB-029-012 | TA3-29, South Offices, Wg. 2, Room Air, FE-17 | Pu |
| 007 | ALDEB-029-013 | TA3-29, North Offices, Wg. 2, Room Air, FE-18 | Pu |
| 008 | ALDEB-029-003 | TA3-29, South Stack, Wing 3, FE-19 | Pu |
| 009 | ALDEB-029-004 | TA3-29, North Stack, Wing 3, FE-20 | U-235 |
| 010 | ALDEB-029-014 | TA3-29, South Offices, Wg. 3, Room Air, FE-21 | Pu |
| 011 | ALDEB-029-015 | TA3-29, North Offices, Wg. 3, Room Air, FE-22 | U-235 |
| 012 | ALDEB-029-006 | TA3-29, North Stack, Wing 4, FE-23 | U-235 |
| 013 | ALDEB-029-005 | TA3-29, South Stack, Wing 4, FE-24 | U-235 |
| 014 | ALDEB-029-016 | TA3-29, North Offices, Wg. 4, Room Air, FE-26 | U-235 |
| 015 | ALDEB-029-017 | TA3-29, South Offices, Wg. 4, Room Air, FE-27 | U-235 |
| 016 | ALDEB-029-007 | TA3-29, South Stack, Wing 5, FE-28 | Pu |
| 017 | ALDEB-029-008 | TA3-29, North Stack, Wing 5, FE-29 | Pu |
| 018 | ALDEB-029-018 | TA3-29, North Offices, Wg. 5, Room Air, FE-30 | Pu |
| 019 | ALDEB-029-019 | TA3-29, South Offices, Wg. 5, Room Air, FE-31 | Pu |
| 020 | ALDEB-029-010 | TA3-29, North Stack, Wing 7, FE-32 | Pu |
| 021 | ALDEB-029-009 | TA3-29, South Stack, Wing 7, FE-33 | Pu |
| 022 | ALDEB-029-020 | TA3-29, South Offices, Wg. 7, Room Air, FE-34 | Pu |
| 023 | ALDEB-029-021 | TA3-29, North Offices, Wg. 7, Room Air, FE-35 | Pu |
| 024 | ALDEB-029-011 | TA3-29, Wing 9 Stack, FE-44, 45, 46 | Pu |
| 025 | ALDEB-029-011 | TA3-29, Wing 9 Stack, FE-44, 45, 46 | MFP |
| 026 | ALDEB-029-011 | TA3-29, Wing 9 Stack, FE-44, 45, 46 | I-131 |
| 027 | ALDE8-034-001 | TA3-34, Cryogenics, FE-26 | H-3 |
| 028 | ALDE2-035-001 | TA3-35, West Stack, FE-1, FE-2 | U-235 |
| 029 | ALDE3-066-001 | TA3-66, NW Stack, FE-8 | U-235 |
| 030 | ALDE3-066-002 | TA3-66, NE Stack, FE-9 | U-235 |
| 031 | ALDE3-066-003 | TA3-66, SE Stack, FE-10 | U-235 |
| 032 | ALDE3-066-004 | TA3-66, North Stack, FE-13 | U-238 |
| 033 | ALDE3-066-005 | TA3-66, West Central Stack, FE-24 | U-238 |
| 034 | ALDE3-066-006 | TA3-66, NW Corner Stack, FE-26 | U-238 |
| 035 | ALDE4-102-001 | TA3-102, Main Stack, FE-20 | U-238 |
| 036 | ALDE5-141-001 | TA3-141, North Stack, FE-6 | U-23[illegible] |
| 037 | ALDE5-141-002 | TA3-141, NW Stack, FE-9 | U-238 |
| 038 | ALDE5-141-003 | TA3-141, SW Stack, FE-10 | U-238 |
| 039 | ALDE6-002-001 | TA21-313(2E) East Stack, Rm. Air, FE-1 | Pu |
| 040 | ALDE6-003-001 | TA21-314(3E) East Stack, Rm. Air, FE-1 | Pu |

LOS ALAMOS

AIRBORNE EFFLUENT RELEASE SUMMARY

CY85

CONTENTS

## PART 1. CY85 TOTAL LOS ALAMOS AIRBORNE RELEASES BY NUCLIDE

SUMMARY OF ACTIVITY DISCHARGED

| | | |
|---|---|---|
| PU | = 2.11 E+02 | MICROCURIES (1) |
| U-235 | = 6.03 E+02 | MICROCURIES |
| U-238 | = 1.24 E+02 | MICROCURIES |
| MFP | = 1.24 E+03 | MICROCURIES (2) |
| G/MAP | = 1.27 E+11 | MICROCURIES (3) |
| P/VAP | = 2.12 E+05 | MICROCURIES (4) |
| I-131 | = 1.46 E+02 | MICROCURIES |
| Ar-41 | = 3.90 E+08 | MICROCURIES (5) |
| H-3 | = 8.85 E+09 | MICROCURIES |
| P-32 | = 5.30 E+01 | MICROCURIES |

NOTES:

(1). PU VALUES CONTAIN INDETERMINANT TRACES OF AM-241, A DECAY PRODUCT OF PU-241.

(2). MFP DENOTES MIXED FISSION PRODUCTS.

(3). G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS; N-16, C-10, O-14, O-15, N-13, C-11, AND AR-41. PERCENTAGES ARE IN PART 6.

(4). P/VAP DENOTES PARTICULATE AND/OR VAPOR ACTIVATION PRODUCTS.

(5). AR-41 VALUE DOES NOT CONTAIN THE AR-41 INCLUDED IN G/MAP.

CY85

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPA ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-14 | 2.99 E-01 | 2.42 E+14 | 1.23 E-15 | PU |
| TA3-29 FE-15 | 5.20 E-01 | 6.93 E+14 | 7.49 E-16 | PU |
| TA3-29 FE-17 | 2.70 E-02 | 1.32 E+14 | 2.04 E-16 | PU |
| TA3-29 FE-18 | 1.37 E-01 | 1.52 E+14 | 9.00 E-16 | PU |
| TA3-29 FE-19 | 1.80 E+02 | 7.04 E+14 | 2.56 E-13 | PU |
| TA3-29 FE-21 | 2.62 | 1.42 E+14 | 1.84 E-14 | PU |
| TA3-29 FE-28 | 7.25 | 4.87 E+14 | 1.49 E-14 | PU |
| TA3-29 FE-29 | 5.24 E-01 | 7.79 E+14 | 6.73 E-16 | PU |
| TA3-29 FE-30 | 4.50 E-02 | 9.33 E+13 | 4.82 E-16 | PU |
| TA3-29 FE-31 | 2.16 E-01 | 1.42 E+14 | 1.51 E-15 | PU |
| TA3-29 FE-32 | 1.03 E-01 | 3.22 E+14 | 3.20 E-16 | PU |
| TA3-29 FE-33 | 1.76 E-01 | 7.59 E+14 | 2.32 E-16 | PU |
| TA3-29 FE-34 | 9.00 E-02 | 1.52 E+14 | 5.91 E-16 | PU |
| TA3-29 FE-35 | 2.18 E-01 | 9.32 E+13 | 2.34 E-15 | PU |
| TA3-29 FE-44,45,46 | 2.65 | 1.43 E+15 | 1.85 E-15 | PU |
| TA21-313(2E),FE-1 | 3.05 E-01 | 1.95 E+14 | 1.56 E-15 | PU |
| TA21-314(3E),FE-1 | 8.65 E-01 | 2.14 E+14 | 4.03 E-15 | PU |
| TA21-313(3W),FE-2 | 5.91 E-01 | 2.87 E+14 | 2.05 E-15 | PU |
| TA21-314(4W),FE-7 | 4.09 E-01 | 2.12 E+14 | 1.92 E-15 | PU |
| TA21-4(HC),FE-1 | 3.05 E-01 | 2.95 E+13 | 1.03 E-14 | PU |
| TA21-315(5W),FE-1 | 1.23 | 3.39 E+14 | 3.64 E-15 | PU |
| TA21-150,FE-1 | 6.03 | 2.14 E+14 | 2.82 E-14 | PU |
| TA21-257,FE-4 | 2.71 E-01 | 2.57 E+13 | 1.05 E-14 | PU |
| TA21-324,FE-1 | 5.62 E-01 | 2.10 E+14 | 2.67 E-15 | P |
| TA35-7 FE-2 | 4.97 E-01 | 2.50 E+14 | 1.99 E-15 | P |
| TA35-7 FE-7 | 5.60 E-02 | 5.14 E+13 | 1.09 E-15 | PU |
| TA35-7 FE-8 | 8.00 E-03 | 2.90 E+13 | 2.75 E-16 | PU |
| TA43 FE-9 | 5.02 E-01 | 2.57 E+14 | 1.95 E-15 | PU |
| TA43 FE-10 | 6.16 E-01 | 2.24 E+14 | 2.74 E-15 | PU |
| TA43 FE-12 | 2.68 E-01 | 2.68 E+14 | 10.00 E-16 | PU |
| TA43 FE-34 | 4.18 E-01 | 2.98 E+14 | 1.40 E-15 | PU |
| TA48 FE-15 | 1.61 | 7.89 E+14 | 2.05 E-15 | PU |
| TA48 FE-18 | 4.00 E-03 | 2.39 E+12 | 1.67 E-15 | PU |
| TA48 FE-45,46 | 4.09 E-01 | 7.87 E+14 | 5.19 E-16 | PU |
| TA48 FE-51 | 2.00 E-03 | 2.14 E+13 | 9.33 E-17 | PU |
| TA48 FE-54 | 4.20 E-02 | 9.10 E+13 | 4.62 E-16 | PU |
| TA50 FE-1 | 1.04 | 3.58 E+14 | 2.93 E-15 | PU |
| TA50 FE-2 | 4.24 E-01 | 6.39 E+14 | 6.63 E-16 | PU |
| TA50 FE-3 | 4.70 E-02 | 4.74 E+13 | 9.91 E-16 | PU |
| TA50 FE-25 | 6.50 E-02 | 5.37 E+13 | 1.21 E-15 | PU |
| TA50 FE-6 | 1.00 E-03 | 8.10 E+11 | 1.23 E-15 | PU |
| TA50 FE-17 | 1.23 E-01 | 2.83 E+13 | 4.34 E-15 | PU |
| TA50 FE-27 | 1.49 E-01 | 1.54 E+14 | 9.64 E-16 | PU |
| TA50-37 FE-1 | 1.39 E-01 | 2.17 E+14 | 6.40 E-16 | PU |
| TA50-69 FE-1 | 7.00 E-03 | 1.45 E+13 | 4.81 E-16 | PU |
| TA50-69 FE-3 | 2.20 E-02 | 1.45 E+13 | 1.51 E-15 | PU |
| TA54 RM EXH FE-1 | 6.00 E-03 | 4.39 E+12 | 1.36 E-15 | PU |
| TA54 PROCESS FE-2 | 0.00 | 3.49 E+11 | 0.00 | PU |
| TA55 N/S FE-15 | 1.07 | 2.37 E+14 | 4.51 E-15 | P |

TOTAL PU RELEASED: 211 MICROCURIES

PART 3. CY85 LOS ALAMOS AIRBORNE URANIUM RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML. | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-20 | 1.37 | 5.61 E+14 | 2.44 E-15 | U-235 |
| TA3-29 FE-22 | 4.28 E-01 | 9.32 E+13 | 4.59 E-15 | U-235 |
| TA3-29 FE-23 | 1.81 E+02 | 2.94 E+14 | 6.17 E-13 | U-235 |
| TA3-29 FE-24 | 3.08 E+01 | 5.61 E+14 | 5.50 E-14 | U-235 |
| TA3-29 FE-26 | 3.81 E-01 | 1.20 E+14 | 3.16 E-15 | U-235 |
| TA3-29 FE-27 | 3.59 E-01 | 1.32 E+14 | 2.72 E-15 | U-235 |
| TA3-35 FE-1,2 | 1.46 | 2.42 E+14 | 6.07 E-15 | U-235 |
| TA3-66 FE-10 | 3.55 | 1.72 E+14 | 2.06 E-14 | U-235 |
| TA21-3(MAIN),FE-6 | 3.09 E+02 | 2.53 E+14 | 1.22 E-12 | U-235 |
| TA21-3(PROCESS),FE-1 | 7.86 E-02 | 1.14 E+12 | 6.85 E-14 | U-235 |
| TA21-4(MAIN),FE-3 | 7.28 E+01 | 3.17 E+14 | 2.30 E-13 | U-235 |
| TA48 FE-11 | 1.88 | 9.98 E+14 | 1.88 E-15 | U-235 |
| TA48 FE-40 | 3.40 E-02 | 4.92 E+13 | 6.90 E-16 | U-235 |

TOTAL U-235 RELEASED: 603 MICROCURIES

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML. | PRINCIP ISOTOP |
|---|---|---|---|---|
| TA3-66 FE-8 | 4.44 | 2.31 E+14 | 1.92 E-14 | U-238 |
| TA3-66 FE-9 | 4.63 E+01 | 7.83 E+14 | 5.92 E-14 | U-238 |
| TA3-66 FE-13 | 6.66 E+01 | 5.10 E+14 | 1.31 E-13 | U-238 |
| TA3-66 FE-24 | 5.60 E-02 | 3.84 E+13 | 1.46 E-15 | U-238 |
| TA3-66 FE-26 | 1.16 | 1.31 E+13 | 8.85 E-14 | U-238 |
| TA3-102,FE-20 | 2.11 | 6.99 E+13 | 3.02 E-14 | U-238 |
| TA3-141,FE-6 | 2.91 E-01 | 1.28 E+14 | 2.26 E-15 | U-238 |
| TA3-141,FE-9 | 3.22 | 4.52 E+14 | 7.11 E-15 | U-238 |
| TA3-141,FE-10 | 6.40 E-01 | 2.46 E+14 | 2.59 E-15 | U-238 |
| TA46 FE-41 | 2.80 E-02 | 2.09 E+13 | 1.34 E-15 | U-238 |

TOTAL U-238 RELEASED: 124 MICROCURIES

GRAND TOTAL U RELEASED: 727 MICROCURIES

## PART 4. CY85 LOS ALAMOS AIRBORNE MIXED FISSION PRODUCT RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIP ISOTOP |
|---|---|---|---|---|
| TA3-29 FE-44,45,46 | 3.47 E+01 | 1.43 E+15 | 2.42 E-14 | MFP |
| TA21-4(HC),FE-1 | 3.61 E-01 | 2.95 E+13 | 1.22 E-14 | MFP |
| TA48 FE-11 | 1.24 E+02 | 9.98 E+14 | 1.25 E-13 | MFP |
| TA48 FE-15 | 5.90 E+01 | 7.89 E+14 | 7.48 E-14 | MFP |
| TA48 FE-18 | 1.70 E-01 | 2.39 E+12 | 7.11 E-14 | MFP |
| TA48 FE-40 | 4.84 E+02 | 4.92 E+13 | 9.82 E-12 | MFP |
| TA48 FE-45,46 | 5.36 E+02 | 7.87 E+14 | 6.81 E-13 | MFP |
| TA48 FE-51 | 3.20 E-01 | 2.14 E+13 | 1.49 E-14 | MFP |
| TA48 FE-54 | 2.97 | 9.10 E+13 | 3.26 E-14 | MFP |
| TA50 FE-1 | 4.27 | 3.58 E+14 | 1.19 E-14 | MFP |
| TA50 FE-2 | 3.52 | 6.39 E+14 | 5.51 E-15 | MFP |
| TA50 FE-3 | 7.20 E-02 | 4.74 E+13 | 1.52 E-15 | MFP |
| TA50 FE-25 | 9.10 E-02 | 5.37 E+13 | 1.69 E-15 | MFP |
| TA50 FE-6 | 0.00 | 8.10 E+11 | 0.00 | MFP |
| TA50 FE-17 | 3.50 E-02 | 2.83 E+13 | 1.23 E-15 | MFP |
| TA50 FE-27 | 3.23 E-01 | 1.54 E+14 | 2.09 E-15 | MFP |
| TA50-37 FE-1 | 1.75 E-01 | 2.17 E+14 | 8.06 E-16 | MFP |

TOTAL MFP RELEASED: 1,240 MICROCURIES

## PART 5. CY85 LOS ALAMOS AIRBORNE TRITIUM RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIP ISOTOP |
|---|---|---|---|---|
| TA3-16 FE-14 | 6.69 E+08 | 1.83 E+13 | 3.65 E-05 | H-3 |
| TA3-16 FE-16 | 1.45 E+09 | 7.86 E+12 | 1.85 E-04 | H-3 |
| TA3-34 FE-26 | 2.04 E+05 | 1.04 E+13 | 1.95 E-08 | H-3 |
| TA21-209,FE-1,10,12 | 3.63 E+08 | 3.19 E+14 | 1.14 E-06 | H-3 |
| TA21-155N(TSTA),FE-5 | 3.59 E+06 | 1.22 E+14 | 2.94 E-08 | H-3 |
| TA33-86 FE-6,11 | 4.87 E+09 | 1.08 E+14 | 4.51 E-05 | H-3 |
| TA35-TSL213,FE-1 | 0.00 | 7.57 E+13 | 0.00 | H-3 |
| TA35-TSL213,FE-5 | 5.28 E+06 | 3.25 E+14 | 1.62 E-08 | H-3 |
| TA41-4 FE-17 | 1.27 E+09 | 2.29 E+14 | 5.56 E-06 | H-3 |
| TA53 WNR FE-2 | 2.52 E+04 | 1.93 E+14 | 1.30 E-10 | H-3 |
| TA53 MAIN ST FE-3 | 6.93 E+06 | 2.42 E+14 | 2.86 E-08 | H-3 |

TOTAL H-3 RELEASED: 8,850 CURIES

## PART 6. CY85 MISCELLANEOUS LOS ALAMOS AIRBORNE RELEASE

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA2-9, OMEGA | 3.90 E+08 | 1.31 E+13 | 2.97 E-05 | Ar-41(1) |
| TA3-29, Wing 9 | 1.46 E+02 | 1.43 E+15 | 1.02 E-13 | I-131 |
| TA43, Fe-9, 10, 12, 34 | 5.30 E+01 | 1.05 E+15 | 5.07 E-14 | P-32 |
| TA53, WNR (FE-2) | 7.94 E+07 | 1.93 E+14 | 4.11 E-07 | G/MAP(2) |
| TA53, (FE-3) | 1.26 E+11 | 2.42 E+14 | 5.23 E-04 | G/MAP(2) |
| TA53, (FE-2) | 2.24 E+03 | 1.93 E+14 | 1.16 E-11 | P/VAP(3) |
| TA53 (FE-3) | 2.10 E+05 | 2.42 E+14 | 8.68 E-10 | P/VAP(3) |

NOTES:

(1). DOES NOT INCLUDE 5.08 E+08 MICROCURIES OF Ar-41 PRESENT IN G/MAP.

(2). G/MAP DENOTES GASEOUS MIXED ACTIVIATION PRODUCTS WITH THE FOLLOWING CONSTITUENTS: N-16, 0.9%; C-10, 2.0%; O-14, 1.2%; O-15, 35.6%; N-13, 21.7%; C-11, 38.2%; AND Ar-41, 0.4%.

(3). P/VAP DENOTES PARTICULATE OR VAPOR ACTIVATION PRODUCTS (THE MAIN PARTICULATE CONSTITUENT IS 6.58 E+04 µCi OF OS-183 AND THE MAIN VAPOR CONSTITUENT IS 3.15 E+04 µCi OF Br-82. THIRTY EIGHT DISTINCT NUCLIDES WERE IDENTIFIED.

# LOS ALAMOS

# AIRBORNE EFFLUENT RELEASE SUMMARY

CY86

CONTENTS

## PART 1. CY86 TOTAL LOS ALAMOS AIRBORNE RELEASES BY NUCLIDE

SUMMARY OF ACTIVITY DISCHARGED

| | | | |
|---|---|---|---|
| PU | = 2.07 E+02 | MICROCURIES | (1) |
| U-235 | = 7.05 E+02 | MICROCURIES | |
| U-238 | = 1.39 E+02 | MICROCURIES | |
| MFP | = 2.57 E+03 | MICROCURIES | (2) |
| G/MAP | = 1.12 E+11 | MICROCURIES | (3) |
| P/VAP | = 1.15 E+05 | MICROCURIES | (4) |
| I-131 | = 3.80 E+01 | MICROCURIES | |
| Ar-41 | = 2.76 E+08 | MICROCURIES | (5) |
| H-3 | = 1.07 E+10 | MICROCURIES | (6) |
| H-3/V | = 7.46 E+06 | MICROCURIES | (6) |
| P-32 | = 6.99 E+01 | MICROCURIES | |
| MSP | = 2.56 E-01 | MICROCURIES | (7) |

NOTES:

(1). PU VALUES CONTAIN INDETERMINANT TRACES OF AM-241, A DECAY PRODUCT OF PU-241.

(2). MFP DENOTES MIXED FISSION PRODUCTS.

(3). G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS; N-16, C-10, O-14, O-15 N-13, C-11, AND AR-41. PERCENTAGES ARE IN PART 6.

(4). P/VAP DENOTES PARTICULATE AND/OR VAPOR ACTIVATION PRODUCTS (SEE PART VII).

(5). AR-41 VALUE IS FOR OMEGA WEST REACTOR ONLY AND DOES NOT CONTAIN THE AR-41 INCLUDED IN G/MAP.

(6). H-3 DENOTES ELEMENTAL FORM TRITIUM GAS AND H-3/V DENOTES TRITIUM VAPOR IN THE HTO FORM

(7). MSP DENOTES MIXED SPALLATION PRODUCTS.

PART 2. CY86 LOS ALAMOS AIRBORNE PLUTONIUM RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-14 | 0.00E+00 | 2.40E+14 | 0.00E+00 | PU |
| TA3-29 FE-15 | 0.00E+00 | 6.81E+14 | 0.00E+00 | PU |
| TA3-29 FE-17 | 1.20E-02 | 1.31E+14 | 9.18E-17 | PU |
| TA3-29 FE-18 | 3.30E-02 | 1.51E+14 | 2.19E-16 | PU |
| TA3-29 FE-19 | 1.86E+02 | 6.97E+14 | 2.67E-13 | PU |
| TA3-29 FE-21 | 3.44E-01 | 1.41E+14 | 2.44E-15 | PU |
| TA3-29 FE-28 | 6.73E+00 | 4.91E+14 | 1.37E-14 | PU |
| TA3-29 FE-29 | 4.34E-01 | 7.86E+14 | 5.53E-16 | PU |
| TA3-29 FE-30 | 1.00E-02 | 9.23E+13 | 1.08E-16 | PU |
| TA3-29 FE-31 | 5.00E-02 | 1.41E+14 | 3.54E-16 | PU |
| TA3-29 FE-32 | 2.70E-02 | 3.19E+14 | 8.47E-17 | PU |
| TA3-29 FE-33 | 1.94E-01 | 7.52E+14 | 2.58E-16 | PU |
| TA3-29 FE-34 | 9.40E-02 | 1.51E+14 | 6.25E-16 | PU |
| TA3-29 FE-35 | 3.30E-02 | 9.23E+13 | 3.58E-16 | PU |
| TA3-29 FE-44,45,46 | 3.19E-01 | 1.42E+15 | 2.25E-16 | PU |
| TA21-150,FE-1 | 4.81E-01 | 2.21E+14 | 2.17E-15 | PU |
| TA21-257,FE-4 | 7.00E-02 | 2.54E+13 | 2.75E-15 | PU |
| TA21-313(2E),FE-1 | 2.10E-02 | 1.98E+14 | 1.06E-16 | PU |
| TA21-313(3W),FE-2 | 9.95E-01 | 2.92E+14 | 3.41E-15 | PU |
| TA21-314(3E),FE-1 | 1.07E-01 | 2.17E+14 | 4.92E-16 | PU |
| TA21-314(4W),FE-7 | 3.78E-01 | 2.03E+14 | 1.87E-15 | PU |
| TA21-315(5W),FE-1 | 1.99E-01 | 3.44E+14 | 5.79E-16 | PU |
| TA21-324,FE-1 | 1.22E+00 | 2.13E+14 | 5.74E-15 | PU |
| TA21-4(HC),FE-1 | 1.00E-01 | 2.99E+13 | 3.34E-15 | PU |
| TA35-7 FE-2 | 2.93E-01 | 2.57E+14 | 1.14E-15 | PU |
| TA35-7 FE-7 | 7.00E-02 | 5.28E+13 | 1.33E-15 | PU |
| TA35-7 FE-8 | 0.00E+00 | 2.99E+13 | 0.00E+00 | PU |
| TA43 FE-9 | 4.43E-01 | 2.61E+14 | 1.70E-15 | PU |
| TA43 FE-10 | 3.31E-01 | 2.28E+14 | 1.45E-15 | PU |
| TA43 FE-12 | 2.05E+00 | 2.72E+14 | 7.53E-15 | PU |
| TA43 FE-34 | 9.00E-02 | 3.03E+14 | 2.97E-16 | PU |
| TA48 FE-15 | 1.67E+00 | 8.00E+14 | 2.09E-15 | PU |
| TA48 FE-18 | 1.00E-03 | 2.43E+12 | 4.12E-16 | PU |
| TA48 FE-45,46 | 4.63E-01 | 7.98E+14 | 5.80E-16 | PU |
| TA48 FE-51 | 0.00E+00 | 2.17E+13 | 0.00E+00 | PU |
| TA48 FE-54 | 1.72E-01 | 9.23E+13 | 1.87E-15 | PU |
| TA48 FE-60 | 5.43E-01 | 9.90E+12 | 5.49E-14 | PU |
| TA50 FE-1 | 1.53E-01 | 3.48E+14 | 4.40E-16 | PU |
| TA50 FE-2 | 2.47E+00 | 6.39E+14 | 3.87E-15 | PU |
| TA50 FE-3 | 7.00E-02 | 4.69E+13 | 1.49E-15 | PU |
| TA50 FE-6 | 1.10E-02 | 6.57E+10 | 1.67E-13 | PU |
| TA50 FE-17 | 9.40E-02 | 2.86E+13 | 3.29E-15 | PU |
| TA50 FE-25 | 3.10E-02 | 5.42E+13 | 5.72E-16 | PU |
| TA50 FE-27 | 2.00E-02 | 1.53E+14 | 1.31E-16 | PU |
| TA50-37 FE-1 | 1.70E-02 | 1.88E+14 | 9.03E-17 | PU |
| TA50-69 FE-1 | 1.20E-02 | 1.35E+13 | 8.86E-16 | PU |
| TA50-69 FE-3 | 1.00E-03 | 1.35E+13 | 7.39E-17 | PU |
| TA54 RM EXH FE-1 | 1.00E-03 | 6.10E+12 | 1.64E-16 | PU |
| TA54 PROCESS FE-2 | 1.64E-01 | 5.34E+12 | 3.07E-14 | PU |
| TA55 N/S FE-15 | 4.90E-02 | 1.94E+14 | 2.52E-16 | PU |
| TA55 S/S FE-16 | 1.85E-01 | 2.42E+14 | 7.63E-16 | PU |

TOTAL PU RELEASED: 207.33 MICROCURIES

## PART 3. CY86 LOS ALAMOS AIRBORNE URANIUM RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-20 | 3.72E-01 | 5.56E+14 | 6.69E-16 | U-235 |
| TA3-29 FE-22 | 2.02E-01 | 9.23E+13 | 2.19E-15 | U-235 |
| TA3-29 FE-23 | 4.65E+02 | 2.97E+14 | 1.57E-12 | U-235 |
| TA3-29 FE-24 | 2.26E+01 | 5.56E+14 | 4.07E-14 | U-235 |
| TA3-29 FE-26 | 4.57E-01 | 1.19E+14 | 3.84E-15 | U-235 |
| TA3-29 FE-27 | 6.38E-01 | 1.31E+14 | 4.88E-15 | U-235 |
| TA3-35 FE-1,2 | 1.42E-01 | 2.35E+14 | 6.04E-16 | U-235 |
| TA3-66 FE-10 | 2.18E+00 | 1.42E+14 | 1.53E-14 | U-235 |
| TA21-3(MAIN),FE-6 | 1.14E+02 | 2.57E+14 | 4.43E-13 | U-235 |
| TA21-4(MAIN),FE-3 | 9.83E+01 | 3.15E+14 | 3.12E-13 | U-235 |
| TA48 FE-11 | 6.11E-01 | 1.01E+15 | 6.04E-16 | U-235 |
| TA48 FE-40 | 0.00E+00 | 4.92E+13 | 0.00E+00 | U-235 |

TOTAL U-235 RELEASED: 704.64 MICROCURIEES

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-66 FE-8 | 1.50E+01 | 2.40E+14 | 6.23E-14 | U-238 |
| TA3-66 FE-9 | 2.98E+01 | 6.80E+14 | 4.39E-14 | U-238 |
| TA3-66 FE-13 | 8.56E+01 | 4.88E+14 | 1.75E-13 | U-238 |
| TA3-66 FE-24 | 2.20E-02 | 3.36E+13 | 6.55E-16 | U-238 |
| TA3-66 FE-26 | 3.28E+00 | 1.30E+13 | 2.52E-13 | U-238 |
| TA3-102,FE-20 | 1.24E+00 | 7.09E+13 | 1.75E-14 | U-238 |
| TA3-141,FE-6 | 1.80E-02 | 5.30E+12 | 3.40E-15 | U-238 |
| TA3-141,FE-9 | 3.75E+00 | 4.48E+14 | 8.36E-15 | U-238 |
| TA3-141,FE-10 | 6.38E-01 | 2.44E+14 | 2.61E-15 | U-238 |
| TA46 FE-41 | 4.00E-03 | 1.35E+13 | 2.96E-16 | U-238 |

TOTAL U-238 RELEASED: 139.35 MICROCURIES

## PART 4. CY86 LOS ALAMOS AIRBORNE MIXED FISSION PRODUCT RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA3-29 | FE-44,45,46 | 4.79E+01 | 1.42E+15 | 3.37E-14 | MFP |
| TA21-4(HC),FE-1 | | 3.24E-01 | 2.99E+13 | 1.08E-14 | MFP |
| TA48 | FE-11 | 1.41E+02 | 1.01E+15 | 1.39E-13 | MFP |
| TA48 | FE-15 | 2.32E+02 | 8.00E+14 | 2.90E-13 | MFP |
| TA48 | FE-18 | 4.91E-01 | 2.43E+12 | 2.03E-13 | MFP |
| TA48 | FE-40 | 1.50E+03 | 4.92E+13 | 3.04E-11 | MFP |
| TA48 | FE-45,46 | 6.28E+02 | 7.98E+14 | 7.87E-13 | MFP |
| TA48 | FE-51 | 6.66E-01 | 2.17E+13 | 3.07E-14 | MFP |
| TA48 | FE-54 | 2.34E+00 | 9.23E+13 | 2.54E-14 | MFP |
| TA50 | FE-1 | 7.60E+00 | 3.48E+14 | 2.19E-14 | MFP |
| TA50 | FE-2 | 9.21E+00 | 6.33E+14 | 1.46E-14 | MFP |
| TA50 | FE-3 | 2.32E-01 | 4.69E+13 | 4.95E-15 | MFP |
| TA50 | FE-6 | 3.00E-03 | 1.72E+10 | 1.74E-13 | MFP |
| TA50 | FE-17 | 1.07E-01 | 2.86E+13 | 3.74E-15 | MFP |
| TA50 | FE-25 | 2.72E-01 | 4.90E+13 | 5.55E-15 | MFP |
| TA50 | FE-27 | 8.42E-01 | 1.53E+14 | 5.51E-15 | MFP |
| TA50-37 | FE-1 | 1.88E+00 | 1.88E+14 | 1.00E-14 | MFP |

TOTAL MFP RELEASED: 2571.25 MICROCURIES

## PART 5. CY86 LOS ALAMOS AIRBORNE TRITIUM RELEASES BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-16 FE-14 | 6.39E+08 | 1.83E+13 | 3.49E-05 | H-3(GAS) |
| TA3-16 FE-16 | 5.89E+08 | 7.86E+12 | 7.49E-05 | H-3(GAS) |
| TA3-40 FE-25 | 1.69E+04 | 2.50E+11 | 6.75E-08 | H-3(GAS) |
| TA21-155N(TSTA),FE-5 | 1.04E+07* | 1.25E+14 | 8.36E-08 | H-3(GAS&HTO) |
| TA21-209,FE-1,10,12 | 4.38E+08 | 3.33E+14 | 1.32E-06 | H-3(GAS) |
| TA33-86 FE-6,11 | 6.66E+09 | 1.10E+14 | 6.05E-05 | H-3(GAS) |
| TA35-TSL213,FE-1 | 0.00E+00 | 7.26E+13 | 0.00E+00 | H-3(GAS) |
| TA35-TSL213,FE-5 | 4.76E+07 | 3.02E+14 | 1.58E-07 | H-3(GAS) |
| TA41-4 FE-17 | 1.32E+09 | 3.94E+14 | 3.36E-06 | H-3(GAS) |
| TA53 WNR FE-2 | 2.95E+04 | 1.68E+14 | 1.76E-10 | H-3(HTO) |
| TA53 MAIN ST FE-3 | 6.07E+06 | 1.95E+14 | 3.12E-08 | H-3(HTO) |
| TA55 S/S FE-16 | 1.01E+09 | 2.41E+14 | 4.17E-06 | H-3(GAS) |

*1.36E+06(HTO)

TOTAL H-3 RELEASED: 10721.00 CURIES

## PART 6. CY86 MISCELLANEOUS LOS ALAMOS AIRBORNE RELEASE

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA2-9, OMEGA | 2.76 E+08 | 1.31 E+13 | 2.10 E-05 | Ar-41(1) |
| TA3-29, Wing 9 | 3.80 E+01 | 1.42 E+15 | 2.67 E-14 | I-131 |
| TA43, (Fe-9 + 10 + 12 + 34) | 6.99 E+01 | 1.06 E+15 | 6.57 E-14 | P-32 |
| TA48, Fe-60 | 2.56 E-01 | 2.39 E+12 | 1.07 E-13 | MSP (Cu-67) (2) |
| TA53, WNR (FE-2) | 2.07 E+08 | 1.65 E+14 | 1.26 E-06 | G/MAP(3) |
| TA53, (FE-3) | 1.12 E+11 | 1.95 E+14 | 5.74 E-04 | G/MAP(3) |
| TA53, WNR (FE-2) | 5.09 E+00 | 1.55 E+14 | 3.29 E-11 | P/VAP(4) |
| TA53 (FE-3) | 1.15 E+05 | 1.95 E+14 | 5.89 E-10 | P/VAP(4) |

NOTES:

(1). NOTE THAT G/MAP AT 0.3% Ar-41 IS ANOTHER SOURCE OF APPROXIMATELY 3.3 E+08 MICROCURIES.

(2). MSP DENOTES MIXED SPALLATION PRODUCTS FROM LAMPF TARGETS.

(3). G/MAP DENOTES GASEOUS MIXED ACTIVIATION PRODUCTS WITH THE FOLLOWING CONSTITUENTS: N-16, 3.0%; C-10, 0.6%: 0-14, 0.5%; 0-15, 42.0%; N-13, 18.6%; C-11, 35.0%; AND Ar-41, 0.3%.

(4). P/VAP DENOTES PARTICULATE OR VAPOR ACTIVATION PRODUCTS (THE MAIN PARTICULATE CONSTITUENT IS 8.88 E+03 MICRO Ci OF Be-7 AND THE MAIN VAPOR CONSTITUENT IS 6.86 E+04 MICRO Ci OF Os-183. TWENTY THREE DISTINCT NUCLIDES WERE IDENTIFIED (SEE PART 7).

DATE: 27-Jan-1987
PREPARED BY:
F. GUEVARA

# LOS ALAMOS NATIONAL LABORATORY
## STACK DISCHARGE REPORT

FOR THE PERIOD FROM: 27-DEC-85 TO: 29-DEC-86

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA2-9 | OWR | 2.76E+08 | 1.31E+13 | 2.10E-05 | AR-41 |
| TA3-16 | FE-14 | 6.39E+08 | 1.83E+13 | 3.49E-05 | H-3 |
| TA3-16 | FE-16 | 5.89E+08 | 7.86E+12 | 7.49E-05 | H-3 |
| TA3-29 | FE-14 | 0.00E+00 | 2.40E+14 | 0.00E+00 | PU |
| TA3-29 | FE-15 | 0.00E+00 | 6.81E+14 | 0.00E+00 | PU |
| TA3-29 | FE-17 | 1.20E-02 | 1.31E+14 | 9.18E-17 | PU |
| TA3-29 | FE-18 | 3.30E-02 | 1.51E+14 | 2.19E-16 | PU |
| TA3-29 | FE-19 | 1.86E+02 | 6.97E+14 | 2.67E-13 | PU |
| TA3-29 | FE-20 | 3.72E-01 | 5.56E+14 | 6.69E-16 | U-235 |
| TA3-29 | FE-21 | 3.44E-01 | 1.41E+14 | 2.44E-15 | PU |
| TA3-29 | FE-22 | 2.02E-01 | 9.23E+13 | 2.19E-15 | U-235 |
| TA3-29 | FE-23 | 4.65E+02 | 2.97E+14 | 1.57E-12 | U-235 |
| TA3-29 | FE-24 | 2.26E+01 | 5.56E+14 | 4.07E-14 | U-235 |
| TA3-29 | FE-26 | 4.57E-01 | 1.19E+14 | 3.84E-15 | U-235 |
| TA3-29 | FE-27 | 6.38E-01 | 1.31E+14 | 4.88E-15 | U-235 |
| TA3-29 | FE-28 | 6.73E+00 | 4.91E+14 | 1.37E-14 | PU |
| TA3-29 | FE-29 | 4.34E-01 | 7.86E+14 | 5.53E-16 | PU |
| TA3-29 | FE-30 | 1.00E-02 | 9.23E+13 | 1.08E-16 | PU |
| TA3-29 | FE-31 | 5.00E-02 | 1.41E+14 | 3.54E-16 | PU |
| TA3-29 | FE-32 | 2.70E-02 | 3.19E+14 | 8.47E-17 | PU |
| TA3-29 | FE-33 | 1.94E-01 | 7.52E+14 | 2.58E-16 | PU |
| TA3-29 | FE-34 | 9.40E-02 | 1.51E+14 | 6.25E-16 | PU |
| TA3-29 | FE-35 | 3.30E-02 | 9.23E+13 | 3.58E-16 | PU |
| TA3-29 | FE-44,45,46 | 3.19E-01 | 1.42E+15 | 2.25E-16 | PU |
| TA3-29 | FE-44,45,46 | 4.79E+01 | 1.42E+15 | 3.37E-14 | MFP |
| TA3-29 | FE-44,45,46 | 3.80E+01 | 1.42E+15 | 2.67E-14 | I-131 |
| TA3-35 | FE-1,2 | 1.42E-01 | 2.35E+14 | 6.04E-16 | U-235 |
| TA3-40 | FE-25 | 1.69E+04 | 2.50E+11 | 6.75E-08 | H-3 |
| TA3-66 | FE-8 | 1.50E+01 | 2.40E+14 | 6.23E-14 | U-238 |
| TA3-66 | FE-9 | 2.98E+01 | 6.80E+14 | 4.39E-14 | U-238 |
| TA3-66 | FE-10 | 2.18E+00 | 1.42E+14 | 1.53E-14 | U-235 |
| TA3-66 | FE-13 | 8.56E+01 | 4.88E+14 | 1.75E-13 | U-238 |
| TA3-66 | FE-24 | 2.20E-02 | 3.36E+13 | 6.55E-16 | U-238 |
| TA3-66 | FE-26 | 3.23E+00 | 1.30E+13 | 2.52E-13 | U-238 |
| TA3-102, | FE-20 | 1.24E+00 | 7.09E+13 | 1.75E-14 | U-238 |

LOS ALAMOS
AIRBORNE EFFLUENT RELEASE SUMMARY
CY87

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## PART 1. CY87 TOTAL LOS ALAMOS AIRBORNE RELEASES BY NUCLIDE

SUMMARY OF ACTIVITY DISCHARGED

| | | |
|---|---|---|
| PU | = 7.28 E+01 | MICROCURIES (1) |
| U-235 | = 9.66 E+02 | MICROCURIES |
| U-238 | = 1.10 E+02 | MICROCURIES |
| MFP | = 1.29 E+03 | MICROCURIES (2) |
| G/MAP | = 1.50 E+11 | MICROCURIES (3) |
| P/VAP | = 2.2 E+05 | MICROCURIES (4) |
| Ar-41 | = 2.32 E+08 | MICROCURIES (5) |
| H-3 | = 3.14 E+09 | MICROCURIES (6) |
| H-3/V | = 2.97 E+07 | MICROCURIES (6) |
| P-32 | = 4.84 E+01 | MICROCURIES |

NOTES:

(1) PU VALUES CONTAIN INDETERMINANT TRACES OF AM-241, A DECAY PRODUCT OF PU-241.

(2) MFP DENOTES MIXED FISSION PRODUCTS.

(3) G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS; N-16, C-10, 0-14, 0-15, N-13, C-11, AND AR-41. PERCENTAGES ARE IN PART 6.

(4) P/VAP DENOTES PARTICULATE AND/OR VAPOR ACTIVATION PRODUCTS (SEE PART VII).

(5) AR-41 VALUE IS FOR OMEGA WEST REACTOR ONLY AND DOES NOT CONTAIN THE AR-41 INCLUDED IN G/MAP.

(6) H-3 DENOTES ELEMENTAL FORM TRITIUM GAS AND H-3/V DENOTES TRITIUM VAPOR IN THE HTO FORM

PART 2. CY 87 LOS ALAMOS AIRBORNE PLUTONIUM RELEASE BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-14 | 1.02E-01 | 2.00E+14 | 5.09E-16 | PU |
| TA3-29 FE-15 | 1.32E-01 | 6.93E+14 | 1.90E-16 | PU |
| TA3-29 FE-17 | 0.00E+00 | 1.20E+14 | 0.00E+00 | PU |
| TA3-29 FE-18 | 2.20E-02 | 1.39E+14 | 1.58E-16 | PU |
| TA3-29 FE-19 | 5.54E+01 | 6.77E+14 | 8.18E-14 | PU |
| TA3-29 FE-21 | 2.69E-01 | 1.19E+14 | 2.27E-15 | PU |
| TA3-29 FE-28 | 6.64E+00 | 5.08E+14 | 1.31E-14 | PU |
| TA3-29 FE-29 | 1.32E+00 | 6.79E+14 | 1.95E-15 | PU |
| TA3-29 FE-30 | 3.70E-02 | 7.48E+13 | 4.95E-16 | PU |
| TA3-29 FE-31 | 1.94E-01 | 1.06E+14 | 1.83E-15 | PU |
| TA3-29 FE-32 | 3.20E-02 | 3.43E+14 | 9.34E-17 | PU |
| TA3-29 FE-33 | 2.41E-01 | 5.95E+14 | 4.05E-16 | PU |
| TA3-29 FE-34 | 1.00E-01 | 9.35E+13 | 1.07E-15 | PU |
| TA3-29 FE-35 | 3.70E-02 | 7.39E+13 | 5.01E-16 | PU |
| TA3-29 FE-44,45,46 | 3.25E-01 | 1.43E+15 | 2.27E-16 | PU |
| TA21-150,FE-1 | 1.12E-01 | 2.11E+14 | 5.31E-16 | PU |
| TA21-257,FE-4 | 3.10E-02 | 2.37E+13 | 1.31E-15 | PU |
| TA21-313(2E),FE-1 | 9.30E-02 | 1.29E+14 | 7.23E-16 | PU |
| TA21-313(3W),FE-2 | 3.07E-01 | 2.86E+14 | 1.07E-15 | PU |
| TA21-314(3E),FE-1 | 2.01E-01 | 1.79E+14 | 1.12E-15 | PU |
| TA21-314(4W),FE-7 | 1.91E-01 | 2.06E+14 | 9.27E-16 | PU |
| TA21-315(5W),FE-1 | 1.48E-01 | 2.52E+14 | 5.88E-16 | PU |
| TA21-324,FE-1 | 3.80E-02 | 1.45E+14 | 2.63E-16 | PU |
| TA21-4(HC),FE-1 | 3.12E-01 | 2.76E+13 | 1.13E-14 | PU |
| TA35-7 FE-2 | 5.82E-01 | 2.06E+14 | 2.82E-15 | PU |
| TA35-7 FE-7 | 4.30E-02 | 4.52E+13 | 9.51E-16 | PU |
| TA35-7 FE-8 | 1.10E-02 | 2.38E+13 | 4.62E-16 | PU |
| TA43 FE-9 | 1.67E-01 | 2.21E+14 | 7.56E-16 | PU |
| TA43 FE-10 | 8.40E-02 | 2.33E+14 | 3.61E-16 | PU |
| TA43 FE-12 | 7.50E-02 | 2.78E+14 | 2.70E-16 | PU |
| TA43 FE-34 | 1.80E-01 | 2.52E+14 | 7.15E-16 | PU |
| TA48 FE-15 | 5.35E-01 | 8.09E+14 | 6.62E-16 | PU |
| TA48 FE-18 | 7.00E-03 | 2.45E+12 | 2.86E-15 | PU |
| TA48 FE-45,46 | 4.10E-02 | 8.07E+14 | 5.08E-17 | PU |
| TA48 FE-51 | 4.00E-03 | 2.20E+13 | 1.82E-16 | PU |
| TA48 FE-54 | 1.60E-02 | 9.33E+13 | 1.72E-16 | PU |
| TA48 FE-60 | 1.20E-02 | 2.55E+13 | 4.71E-16 | PU |
| TA50 FE-1 | 2.70E-01 | 3.14E+14 | 8.59E-16 | PU |
| TA50 FE-2 | 2.39E-01 | 6.56E+14 | 3.65E-16 | PU |
| TA50 FE-3 | 3.62E+00 | 4.74E+13 | 7.64E-14 | PU |
| TA50 FE-6 | 0.00E+00 | 3.62E+11 | 0.00E+00 | PU |
| TA50 FE-17 | 6.60E-02 | 1.73E+13 | 3.82E-15 | PU |
| TA50 FE-25 | 9.30E-02 | 4.10E+13 | 2.27E-15 | PU |
| TA50 FE-27 | 8.30E-02 | 1.50E+14 | 5.53E-16 | PU |
| TA50-37 FE-1 | 0.00E+00 | 2.13E+14 | 0.00E+00 | PU |
| TA50-69 FE-1 | 8.50E-02 | 1.52E+13 | 5.59E-15 | PU |
| TA50-69 FE-2 | 2.50E-02 | 3.80E+13 | 6.58E-16 | PU |
| TA50-69 FE-3 | 2.80E-02 | 1.52E+13 | 1.84E-15 | PU |
| TA54 RM EXH FE-1 | 1.00E-03 | 5.13E+12 | 1.95E-16 | PU |
| TA54 PROCESS FE-2 | 2.50E-02 | 9.41E+12 | 2.66E-15 | PU |
| TA55 N/S FE-15 | 3.90E-02 | 1.66E+14 | 2.36E-16 | PU |
| TA55 S/S FE-16 | 2.06E-01 | 2.01E+14 | 1.02E-15 | PU |

TOTAL PU RELEASED: 72.82 MICROCURIES

PART 3. CY87 LOS ALAMOS AIRBORNE URANIUM RELEASE BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-20 | 8.71E-01 | 4.85E+14 | 1.80E-15 | U-235 |
| TA3-29 FE-22 | 1.84E-01 | 7.07E+13 | 2.60E-15 | U-235 |
| TA3-29 FE-23 | 7.21E+02 | 4.06E+14 | 1.78E-12 | U-235 |
| TA3-29 FE-24 | 2.98E+01 | 4.63E+14 | 6.42E-14 | U-235 |
| TA3-29 FE-26 | 7.32E-01 | 1.14E+14 | 6.43E-15 | U-235 |
| TA3-29 FE-27 | 9.87E-01 | 1.17E+14 | 8.43E-15 | U-235 |
| TA3-35 FE-1,2 | 1.99E-01 | 2.31E+14 | 8.61E-16 | U-235 |
| TA3-66 FE-10 | 4.20E+00 | 1.33E+14 | 3.15E-14 | U-235 |
| TA21-3(MAIN),FE-6 | 7.13E+01 | 2.27E+14 | 3.14E-13 | U-235 |
| TA21-4(MAIN),FE-3 | 1.36E+02 | 3.14E+14 | 4.31E-13 | U-235 |
| TA48 FE-11 | 1.54E+00 | 1.02E+15 | 1.50E-15 | U-235 |
| TA48 FE-40 | 3.60E-02 | 4.93E+13 | 7.30E-16 | U-235 |

TOTAL U-235 RELEASED: 965.68 MICROCURIES

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-66 FE-8 | 7.92E+00 | 2.59E+14 | 3.06E-14 | U-238 |
| TA3-66 FE-9 | 1.80E+00 | 6.91E+14 | 2.61E-15 | U-238 |
| TA3-66 FE-13 | 8.44E+01 | 5.05E+14 | 1.67E-13 | U-238 |
| TA3-66 FE-24 | 1.25E+00 | 3.33E+13 | 3.74E-14 | U-238 |
| TA3-66 FE-26 | 1.72E+00 | 1.35E+13 | 1.28E-13 | U-238 |
| TA3-102,FE-20 | 1.94E+00 | 6.29E+13 | 3.08E-14 | U-238 |
| TA3-102,FE-25 | 5.90E-02 | 8.34E+12 | 7.08E-15 | U-238 |
| TA3-141,FE-6 | 1.57E-01 | 1.06E+14 | 1.48E-15 | U-238 |
| TA3-141,FE-9 | 2.86E+00 | 3.76E+14 | 7.59E-15 | U-238 |
| TA3-141,FE-10 | 7.76E+00 | 2.71E+14 | 2.87E-14 | U-238 |

TOTAL U-238 RELEASED: 109.86 MICROCURIES

PART 4. CY87 LOS ALAMOS AIRBORNE MIXED FISSION PRODUCT RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA3-29 | FE-44,45,46 | 2.16E+01 | 1.43E+15 | 1.50E-14 | MFP |
| TA21-4(HC),FE-1 | | 1.88E-01 | 2.76E+13 | 6.82E-15 | MFP |
| TA48 | FE-11 | 1.28E+02 | 1.02E+15 | 1.25E-13 | MFP |
| TA48 | FE-15 | 3.38E+01 | 7.44E+14 | 4.54E-14 | MFP |
| TA48 | FE-18 | 3.50E-01 | 2.45E+12 | 1.43E-13 | MFP |
| TA48 | FE-40 | 7.04E+02 | 4.93E+13 | 1.43E-11 | MFP |
| TA48 | FE-45,46 | 3.76E+02 | 8.07E+14 | 4.65E-13 | MFP |
| TA48 | FE-51 | 4.44E-01 | 2.20E+13 | 2.02E-14 | MFP |
| TA48 | FE-54 | 1.57E+00 | 9.33E+13 | 1.68E-14 | MFP |
| TA48 | FE-60 | 1.13E+00 | 2.63E+13 | 4.29E-14 | MFP |
| TA50 | FE-1 | 7.90E+00 | 3.14E+14 | 2.51E-14 | MFP |
| TA50 | FE-2 | 9.50E+00 | 6.56E+14 | 1.45E-14 | MFP |
| TA50 | FE-3 | 6.67E-01 | 7.95E+13 | 8.39E-15 | MFP |
| TA50 | FE-6 | 4.21E-01 | 3.62E+11 | 1.16E-12 | MFP |
| TA50 | FE-17 | 1.26E-01 | 1.73E+13 | 7.29E-15 | MFP |
| TA50 | FE-25 | 3.17E-01 | 4.10E+13 | 7.74E-15 | MFP |
| TA50 | FE-27 | 1.12E+00 | 1.50E+14 | 7.47E-15 | MFP |
| TA50-37 | FE-1 | 1.58E+00 | 2.13E+14 | 7.39E-15 | MFP |

TOTAL MFP RELEASED: 1288.46 MICROCURIES

LOS ALAMOS
AIRBORNE EFFLUENT RELEASE SUMMARY
CY88

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PART 1. CY88 TOTAL LOS ALAMOS AIRBORNE RELEASES BY NUCLIDE

SUMMARY OF ACTIVITY DISCHARGED

| | | | |
|---|---|---|---|
| PU | = | 7.24 E+01 | MICROCURIES (1) |
| U-235 | = | 5.05 E+02 | MICROCURIES |
| U-238 | = | 5.32 E+01 | MICROCURIES |
| MFP | = | 1.16 E+03 | MICROCURIES (2) |
| G/MAP | = | 1.22 E+11 | MICROCURIES (3) |
| P/VAP | = | 1.24 E+05 | MICROCURIES (4) |
| Ar-41 | = | 2.64 E+08 | MICROCURIES (5) |
| H-3 | = | 1.10 E+10 | MICROCURIES (6) |
| H-3/V | = | 3.78 E+07 | MICROCURIES (6) |
| P-32 | = | 5.72 E+01 | MICROCURIES |

NOTES:

(1) PU VALUES CONTAIN INDETERMINANT TRACES OF AM-241, A DECAY PRODUCT OF PU-241.

(2) MFP DENOTES MIXED FISSION PRODUCTS.

(3) G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS; N-16, C-10, 0-14, 0-15, N-13, C-11, AND AR-41. PERCENTAGES ARE IN PART 6.

(4) P/VAP DENOTES PARTICULATE AND/OR VAPOR ACTIVATION PRODUCTS (SEE PART VII).

(5) AR-41 VALUE IS FOR OMEGA WEST REACTOR ONLY AND DOES NOT CONTAIN THE AR-41 INCLUDED IN G/MAP.

(6) H-3 DENOTES ELEMENTAL FORM TRITIUM GAS AND H-3/V DENOTES TRITIUM VAPOR IN THE HTO FORM.

PART 2. CY88 LOS ALAMOS AIRBORNE PLUTONIUM RELEASE BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-14 | 8.80E-02 | 1.76E+14 | 5.00E-16 | PU |
| TA3-29 FE-15 | 2.13E-01 | 7.99E+14 | 2.67E-16 | PU |
| TA3-29 FE-17 | 1.00E-02 | 1.03E+14 | 9.69E-17 | PU |
| TA3-29 FE-18 | 2.50E-02 | 1.43E+14 | 1.75E-16 | PU |
| TA3-29 FE-19 | 3.17E+01 | 6.30E+14 | 5.03E-14 | PU |
| TA3-29 FE-21 | 1.61E-01 | 7.71E+13 | 2.09E-15 | PU |
| TA3-29 FE-28 | 1.66E+01 | 5.13E+14 | 3.24E-14 | PU |
| TA3-29 FE-29 | 1.70E+00 | 6.83E+14 | 2.50E-15 | PU |
| TA3-29 FE-30 | 2.10E-02 | 4.97E+13 | 4.23E-16 | PU |
| TA3-29 FE-31 | 6.80E-02 | 5.91E+13 | 1.15E-15 | PU |
| TA3-29 FE-32 | 2.10E-01 | 6.12E+14 | 3.43E-16 | PU |
| TA3-29 FE-33 | 4.59E-01 | 5.85E+14 | 7.85E-16 | PU |
| TA3-29 FE-34 | 1.80E-02 | 2.92E+13 | 6.16E-16 | PU |
| TA3-29 FE-35 | 1.32E-01 | 8.49E+13 | 1.56E-15 | PU |
| TA3-29 FE-44,45,46 | 4.65E-01 | 1.38E+15 | 3.38E-16 | PU |
| TA3-29 VFE-48 | 0.00E+00 | 6.08E+12 | 0.00E+00 | PU |
| TA21-150,FE-1 | 7.10E-02 | 1.65E+14 | 4.30E-16 | PU |
| TA21-257,FE-4 | 6.80E-02 | 2.03E+13 | 3.35E-15 | PU |
| TA21-313(3W),FE-2 | 7.80E-02 | 2.90E+14 | 2.69E-16 | PU |
| TA21-314(3E),FE-1 | 1.52E-01 | 1.27E+14 | 1.20E-15 | PU |
| TA21-314(4W),FE-7 | 5.10E-02 | 2.09E+14 | 2.44E-16 | PU |
| TA21-315(5W),FE-1 | 2.70E-02 | 1.26E+14 | 2.15E-16 | PU |
| TA21-324,FE-1 | 2.14E-01 | 9.05E+13 | 2.36E-15 | PU |
| TA21-4(HC),FE-1 | 5.20E-02 | 2.42E+13 | 2.15E-15 | PU |
| TA35-7 FE-2 | 1.07E-01 | 1.26E+14 | 8.50E-16 | PU |
| TA35-7 FE-7 | 6.30E-02 | 3.24E+13 | 1.95E-15 | PU |
| TA35-7 FE-8 | 2.00E-03 | 1.43E+13 | 1.40E-16 | PU |
| TA43 FE-9 | 2.50E-01 | 1.66E+14 | 1.51E-15 | PU |
| TA43 FE-10 | 5.25E-01 | 2.86E+14 | 1.84E-15 | PU |
| TA43 FE-12 | 4.91E-01 | 3.03E+14 | 1.62E-15 | PU |
| TA43 FE-34 | 1.94E-01 | 1.69E+14 | 1.15E-15 | PU |
| TA48 FE-15 | 4.43E-01 | 4.78E+14 | 9.26E-16 | PU |
| TA48 FE-18 | 1.00E-03 | 1.08E+12 | 9.28E-16 | PU |
| TA48 FE-45,46 | 2.63E-01 | 7.73E+14 | 3.41E-16 | PU |
| TA48 FE-51 | 1.00E-03 | 1.59E+13 | 6.29E-17 | PU |
| TA48 FE-54 | 1.10E-02 | 1.12E+14 | 9.79E-17 | PU |
| TA48 FE-60 | 5.00E-03 | 2.80E+13 | 1.79E-16 | PU |
| TA50 FE-1 | 1.46E-01 | 2.54E+14 | 5.76E-16 | PU |
| TA50 FE-2 | 9.46E-01 | 6.60E+14 | 1.43E-15 | PU |
| TA50 FE-3 | 1.30E-02 | 3.61E+13 | 3.60E-16 | PU |
| TA50 FE-6 | 3.00E-03 | 2.01E+13 | 1.49E-16 | PU |
| TA50 FE-17 | 1.00E-03 | 1.05E+13 | 9.50E-17 | PU |
| TA50 FE-25 | 3.00E-03 | 2.18E+13 | 1.38E-16 | PU |
| TA50 FE-27 | 1.30E-02 | 1.41E+14 | 9.23E-17 | PU |

PART 2. CY88 LOS ALAMOS AIRBORNE PLUTONIUM RELEASE BY FACILITY - CONTINUED

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA50-37 FE-1 | 2.30E-02 | 1.36E+14 | 1.69E-16 | PU |
| TA50-66 FE-1 | 1.00E-03 | 1.30E+12 | 7.69E-16 | PU |
| TA50-69 FE-1 | 9.20E-02 | 8.76E+12 | 1.05E-14 | PU |
| TA50-69 FE-2 | 7.97E-01 | 5.01E+13 | 1.59E-14 | PU |
| TA50-69 FE-3 | 8.00E-03 | 1.38E+13 | 5.80E-16 | PU |
| TA54 RM EXH FE-1 | 3.00E-03 | 1.07E+13 | 2.80E-16 | PU |
| TA54 PROCESS FE-2 | 1.10E-02 | 7.11E+12 | 1.55E-15 | PU |
| TA55 N/S FE-15 | 2.30E-01 | 1.65E+14 | 1.40E-15 | PU |
| TA55 S/S FE-16 | 1.51E+01 | 2.13E+14 | 7.09E-14 | PU |

TOTAL PU RELEASED: 72.34 MICROCURIES

PART 3. CY88 LOS ALAMOS AIRBORNE URANIUM RELEASE BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-20 | 8.41E-01 | 3.77E+14 | 2.23E-15 | U-235 |
| TA3-29 FE-22 | 1.01E-01 | 4.07E+13 | 2.48E-15 | U-235 |
| TA3-29 FE-23 | 4.25E+02 | 5.34E+14 | 7.96E-13 | U-235 |
| TA3-29 FE-24 | 1.83E+01 | 3.29E+14 | 5.57E-14 | U-235 |
| TA3-29 FE-26 | 3.63E-01 | 1.01E+14 | 3.59E-15 | U-235 |
| TA3-29 FE-27 | 3.53E-01 | 9.59E+13 | 3.68E-15 | U-235 |
| TA3-35 FE-1,2 | 2.04E-01 | 1.92E+14 | 1.06E-15 | U-235 |
| TA3-66 FE-10 | 1.11E+00 | 1.11E+14 | 9.99E-15 | U-235 |
| TA21-3(MAIN),FE-6 | 4.65E+01 | 1.30E+14 | 3.57E-13 | U-235 |
| TA21-4(MAIN),FE-3 | 1.23E+01 | 1.78E+14 | 6.92E-14 | U-235 |
| TA48 FE-11 | 1.91E-01 | 4.51E+14 | 4.23E-16 | U-235 |
| TA48 FE-40 | 2.90E-02 | 1.13E+14 | 2.56E-16 | U-235 |

TOTAL U-235 RELEASED: 505.32 MICROCURIES

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-66 FE-8 | 6.12E+00 | 2.57E+14 | 2.38E-14 | U-238 |
| TA3-66 FE-9 | 5.54E-01 | 3.68E+14 | 1.51E-15 | U-238 |
| TA3-66 FE-13 | 3.95E+01 | 4.71E+14 | 8.38E-14 | U-238 |
| TA3-66 FE-24 | 2.13E+00 | 4.18E+13 | 5.08E-14 | U-238 |
| TA3-66 FE-26 | 1.68E+00 | 1.64E+13 | 1.03E-13 | U-238 |
| TA3-102,FE-20 | 1.92E+00 | 5.17E+13 | 3.72E-14 | U-238 |
| TA3-102,FE-25 | 1.40E-02 | 1.24E+13 | 1.13E-15 | U-238 |
| TA3-141,FE-6 | 1.40E-01 | 1.58E+14 | 8.84E-16 | U-238 |
| TA3-141,FE-9 | 1.02E+00 | 2.34E+14 | 4.37E-15 | U-238 |
| TA3-141,FE-10 | 1.70E-01 | 2.51E+14 | 6.78E-16 | U-238 |

TOTAL U-238 RELEASED: 53.21 MICROCURIES

PART 4. CY88 LOS ALAMOS AIRBORNE MIXED FISSION PRODUCT RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA3-29 | FE-44,45,46 | 2.97E+01 | 1.38E+15 | 2.16E-14 | MFP |
| TA21-4(HC),FE-1 | | 1.54E-01 | 2.42E+13 | 6.36E-15 | MFP |
| TA48 | FE-11 | 3.55E+01 | 4.51E+14 | 7.86E-14 | MFP |
| TA48 | FE-15 | 4.48E+01 | 4.78E+14 | 9.37E-14 | MFP |
| TA48 | FE-18 | 7.10E-02 | 1.08E+12 | 6.59E-14 | MFP |
| TA48 | FE-40 | 8.51E+02 | 1.13E+14 | 7.50E-12 | MFP |
| TA48 | FE-45,46 | 1.76E+02 | 7.73E+14 | 2.27E-13 | MFP |
| TA48 | FE-51 | 5.14E-01 | 1.59E+13 | 3.24E-14 | MFP |
| TA48 | FE-54 | 2.86E+00 | 1.12E+14 | 2.54E-14 | MFP |
| TA48 | FE-60 | 1.23E+00 | 2.80E+13 | 4.39E-14 | MFP |
| TA50 | FE-1 | 3.98E+00 | 2.54E+14 | 1.57E-14 | MFP |
| TA50 | FE-2 | 7.37E+00 | 6.60E+14 | 1.12E-14 | MFP |
| TA50 | FE-3 | 4.60E-01 | 3.43E+13 | 1.34E-14 | MFP |
| TA50 | FE-6 | 2.42E-01 | 2.01E+13 | 1.20E-14 | MFP |
| TA50 | FE-17 | 6.80E-02 | 1.05E+13 | 6.46E-15 | MFP |
| TA50 | FE-25 | 1.30E-01 | 2.18E+13 | 5.96E-15 | MFP |
| TA50 | FE-27 | 7.82E-01 | 1.41E+14 | 5.55E-15 | MFP |
| TA50-37 | FE-1 | 7.59E-01 | 1.36E+14 | 5.57E-15 | MFP |
| TA50-66 | FE-1 | 2.20E-02 | 1.30E+12 | 1.69E-14 | MFP |

TOTAL MFP RELEASED: 1154.85 MICROCURIES

DATE: 3-Mar-1989
PREPARED BY: R. MILLER

LOS ALAMOS NATIONAL LABORATORY
STACK DISCHARGE REPORT
FOR THE PERIOD FROM: 31-DEC-87 TO: 30-DEC-88

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA2-9 | OWR | 2.64E+08 | 1.07E+13 | 2.46E-05 | AR-41 |
| TA3-16 | FE-14 | 1.29E+07 | 1.26E+13 | 1.03E-06 | H-3(GAS) |
| TA3-16 | FE-16 | 3.77E+08 | 3.71E+12 | 1.01E-04 | H-3(GAS) |
| TA3-29 | FE-14 | 8.80E-02 | 1.76E+14 | 5.00E-16 | PU |
| TA3-29 | FE-15 | 2.13E-01 | 7.99E+14 | 2.67E-16 | PU |
| TA3-29 | FE-17 | 1.00E-02 | 1.03E+14 | 9.69E-17 | PU |
| TA3-29 | FE-18 | 2.50E-02 | 1.43E+14 | 1.75E-16 | PU |
| TA3-29 | FE-19 | 3.17E+01 | 6.30E+14 | 5.03E-14 | PU |
| TA3-29 | FE-20 | 8.41E-01 | 3.77E+14 | 2.23E-15 | U-235 |
| TA3-29 | FE-21 | 1.61E-01 | 7.71E+13 | 2.09E-15 | PU |
| TA3-29 | FE-22 | 1.01E-01 | 4.07E+13 | 2.48E-15 | U-235 |
| TA3-29 | FE-23 | 4.25E+02 | 5.34E+14 | 7.96E-13 | U-235 |
| TA3-29 | FE-24 | 1.83E+01 | 3.29E+14 | 5.57E-14 | U-235 |
| TA3-29 | FE-26 | 3.63E-01 | 1.01E+14 | 3.59E-15 | U-235 |
| TA3-29 | FE-27 | 3.53E-01 | 9.59E+13 | 3.68E-15 | U-235 |
| TA3-29 | FE-28 | 1.66E+01 | 5.13E+14 | 3.24E-14 | PU |
| TA3-29 | FE-29 | 1.70E+00 | 6.83E+14 | 2.50E-15 | PU |
| TA3-29 | FE-30 | 2.10E-02 | 4.97E+13 | 4.23E-16 | PU |
| TA3-29 | FE-31 | 6.80E-02 | 5.91E+13 | 1.15E-15 | PU |
| TA3-29 | FE-32 | 2.10E-01 | 6.12E+14 | 3.43E-16 | PU |
| TA3-29 | FE-33 | 4.59E-01 | 5.85E+14 | 7.85E-16 | PU |
| TA3-29 | FE-34 | 1.80E-02 | 2.92E+13 | 6.16E-16 | PU |
| TA3-29 | FE-35 | 1.32E-01 | 8.49E+13 | 1.56E-15 | PU |
| TA3-29 | FE-44,45,46 | 4.65E-01 | 1.38E+15 | 3.38E-16 | PU |
| TA3-29 | FE-44,45,46 | 2.97E+01 | 1.38E+15 | 2.16E-14 | MFP |
| TA3-29 | VFE-48 | 0.00E+00 | 6.08E+12 | 0.00E+00 | PU |
| TA3-35 | FE-1,2 | 2.04E-01 | 1.92E+14 | 1.06E-15 | U-235 |
| TA3-40 | FE-25 | 2.91E+04 | 3.81E+11 | 7.64E-08 | H-3(GAS) |
| TA3-66 | FE-8 | 6.12E+00 | 2.57E+14 | 2.38E-14 | U-238 |
| TA3-66 | FE-9 | 5.54E-01 | 3.68E+14 | 1.51E-15 | U-238 |
| TA3-66 | FE-10 | 1.11E+00 | 1.11E+14 | 9.99E-15 | U-235 |
| TA3-66 | FE-13 | 3.95E+01 | 4.71E+14 | 8.38E-14 | U-238 |
| TA3-66 | FE-24 | 2.13E+00 | 4.18E+13 | 5.08E-14 | U-238 |
| TA3-66 | FE-26 | 1.68E+00 | 1.64E+13 | 1.03E-13 | U-238 |
| TA3-102, | FE-20 | 1.92E+00 | 5.17E+13 | 3.72E-14 | U-238 |

ATTACHMENT II

1988 CONTROL AND REFERENCE LOCATION IDENT. DOE FORM F-5821.1

| HSE-1 I.D. | DOE I.D | Narrative Description | Nuclide |
|---|---|---|---|
| 001 | ALDEA-009-001 | TA2-9, Omega Stack | Ar-41 |
| 003 | ALDE7-016-002 | TA3-16, Van de Graaf, FE-14 | H-3 |
| 004 | ALDE7-016-001 | TA3-16, Van de Graaf, FE-16 | H-3 |
| 005 | ALDEB-029-002 | TA3-29, North Stack, Wg. 2, FE-14 | Pu |
| 006 | ALDEB-029-001 | TA3-29, South Stack, Wg. 2, FE-15 | Pu |
| 007 | ALDEB-029-012 | TA3-29, South Offices, Wg. 2, Rm. Air, FE-17 | Pu |
| 008 | ALDEB-029-013 | TA3-29, North Offices, Wg. 2, Rm. Air, FE-18 | Pu |
| 009 | ALDEB-029-003 | TA3-29, South Stack, Wg. 3, FE-19 | Pu |
| 010 | ALDEB-029-004 | TA3-29, North Stack, Wg. 3, FE-20 | U-235 |
| 011 | ALDEB-029-014 | TA3-29, South Offices, Wg. 3, Rm. Air, FE-21 | Pu |
| 012 | ALDEB-029-015 | TA3-29, North Offices, Wg. 3, Rm. Air, FE-22 | U-235 |
| 013 | ALDEB-029-006 | TA3-29, North Stack, Wg. 4, FE-23 | U-235 |
| 014 | ALDEB-029-005 | TA3-29, South Stack, Wg. 4, FE-24 | U-235 |
| 015 | ALDEB-029-016 | TA3-29, North Offices, Wg. 4, Rm. Air, FE-26 | U-235 |
| 016 | ALDEB-029-017 | TA3-29, South Offices, Wg. 4, Rm. Air, FE-27 | U-235 |
| 017 | ALDEB-029-007 | TA3-29, South Stack, Wg. 5, FE-28 | Pu |
| 018 | ALDEB-029-008 | TA3-29, North Stack, Wg. 5, FE-29 | Pu |
| 019 | ALDEB-029-018 | TA3-29, North Offices, Wg. 5, Rm. Air, FE-30 | Pu |
| 020 | ALDEB-029-019 | TA3-29, South Offices, Wg. 5, Rm. Air, FE-31 | Pu |
| 021 | ALDEB-029-010 | TA3-29, North Stack, Wg. 7, FE-32 | Pu |
| 022 | ALDEB-029-009 | TA3-29, South Stack, Wg. 7, FE-33 | Pu |
| 023 | ALDEB-029-020 | TA3-29, South Offices, Wg. 7, Rm. Air, FE-34 | Pu |
| 024 | ALDEB-029-021 | TA3-29, North Offices, Wg. 7, Rm. Air, FE-35 | Pu |
| 025.1 | ALDEB-029-011 | TA3-29, Wg. 9 Stack, FE-44, 45, 46 | Pu |
| 025.2 | ALDEB-029-011 | TA3-29, Wg. 9 Stack, FE-44, 45, 46 | MFP |
| 026 | ALDEB-029-022 | TA3-29, Vault Stack, VFE-48 | Pu |
| 027 | ALDE2-035-001 | TA3-35, West Stack, FE-1, 2 | U-235 |
| 028 | ALDE3-040-007 | TA3-40, Phy. Bldg. Calib. Lab. FE-25 | H-3 |
| 029 | ALDE3-066-001 | TA3-66, NW Stack, FE-8 | U-238 |
| 030 | ALDE3-066-002 | TA3-66, NE Stack, FE-9 | U-238 |
| 031 | ALDE3-066-003 | TA3-66, SE Stack, FE-10 | U-235 |
| 032 | ALDE3-066-004 | TA3-66, North Stack, FE-13 | U-238 |
| 033 | ALDE3-066-005 | TA3-66, West Central Stack, FE-24 | U-238 |
| 034 | ALDE3-066-006 | TA3-66, NW Corner Stack, FE-26 | U-238 |
| 035 | ALDE4-102-001 | TA3-102, Main Stack, FE-20 | U-238 |
| 035.1 | ALDE4-102-002 | TA3-102, FE-25 | U-238 |
| 036 | ALDE5-141-001 | TA3-141, North Stack, FE-6 | U-238 |
| 037 | ALDE5-141-002 | TA3-141, NW Stack, FE-9 | U-238 |
| 038 | ALDE5-141-003 | TA3-141, SW Stack, FE-10 | U-238 |

ATTACHMENT I

LOS ALAMOS FACILITIES RADIOACTIVE
AIRBORNE EFFLUENT RELEASE SUMMARY
FOR CY89

Prepared by: Ross Miller, HSE-1
Date: February 27, 1990

LOS ALAMOS
AIRBORNE EFFLUENT RELEASE SUMMARY
CY89

CONTENTS

## PART 1. CY89 TOTAL LOS ALAMOS AIRBORNE RELEASES BY NUCLIDE

SUMMARY OF ACTIVITY DISCHARGED

| | | | |
|---|---|---|---|
| PU | = | 4.53 E+01 | MICROCURIES (1) |
| U-235 | = | 3.64 E+02 | MICROCURIES |
| U-238 | = | 2.94 E+01 | MICROCURIES |
| MFP | = | 4.35 E+05 | MICROCURIES (2) |
| G/MAP | = | 1.57 E+11 | MICROCURIES (3) |
| P/VAP | = | 1.12 E+05 | MICROCURIES (4) |
| Ar-41 | = | 2.23 E+08 | MICROCURIES (5) |
| H-3 | = | 1.43 E+10 | MICROCURIES (6) |
| H-3/V | = | 4.24 E+07 | MICROCURIES (6) |
| P-32 | = | 1.76 E+01 | MICROCURIES |

NOTES:

(1) PU VALUES CONTAIN INDETERMINANT TRACES OF AM-241, A DECAY PRODUCT OF PU-241.

(2) MFP DENOTES MIXED FISSION PRODUCTS.

(3) G/MAP DENOTES GASEOUS MIXED ACTIVATION PRODUCTS; N-16, C-10, 0-14, 0-15, N-13, C-11, AND AR-41. PERCENTAGES ARE IN PART 6.

(4) P/VAP DENOTES PARTICULATE AND/OR VAPOR ACTIVATION PRODUCTS (SEE PART VII).

(5) AR-41 VALUE IS FOR OMEGA WEST REACTOR ONLY AND DOES NOT CONTAIN THE AR-41 INCLUDED IN G/MAP.

(6) H-3 DENOTES ELEMENTAL FORM TRITIUM GAS AND H-3/V DENOTES TRITIUM VAPOR IN THE HTO FORM.

PART 2. CY89 LOS ALAMOS AIRBORNE PLUTONIUM RELEASE BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-14 | 3.40E-02 | 1.75E+14 | 1.94E-16 | PU |
| TA3-29 FE-15 | 1.34E-01 | 7.68E+14 | 1.75E-16 | PU |
| TA3-29 FE-17 | 2.80E-02 | 9.92E+13 | 2.82E-16 | PU |
| TA3-29 FE-18 | 1.30E-02 | 1.40E+14 | 9.29E-17 | PU |
| TA3-29 FE-19 | 2.13E+01 | 6.06E+14 | 3.52E-14 | PU |
| TA3-29 FE-21 | 9.80E-02 | 7.41E+13 | 1.32E-15 | PU |
| TA3-29 FE-28 | 3.15E+00 | 4.83E+14 | 6.52E-15 | PU |
| TA3-29 FE-29 | 5.46E+00 | 6.43E+14 | 8.49E-15 | PU |
| TA3-29 FE-30 | 9.00E-03 | 4.68E+13 | 1.92E-16 | PU |
| TA3-29 FE-31 | 3.30E-02 | 5.68E+13 | 5.81E-16 | PU |
| TA3-29 FE-32 | 8.26E+00 | 5.89E+14 | 1.40E-14 | PU |
| TA3-29 FE-33 | 6.00E-02 | 5.62E+14 | 1.07E-16 | PU |
| TA3-29 FE-34 | 4.00E-03 | 2.81E+13 | 1.42E-16 | PU |
| TA3-29 FE-35 | 6.00E-03 | 1.40E+14 | 4.27E-17 | PU |
| TA3-29 FE-44,45,46 | 4.98E-01 | 1.32E+15 | 3.77E-16 | PU |
| TA3-29 VFE-48 | 0.00E+00 | 3.05E+13 | 0.00E+00 | PU |
| TA21-150,FE-1 | 5.50E-02 | 1.53E+14 | 3.61E-16 | PU |
| TA21-257,FE-4 | 5.30E-02 | 1.83E+13 | 2.90E-15 | PU |
| TA21-313(3W),FE-2 | 4.25E-01 | 2.68E+14 | 1.59E-15 | PU |
| TA21-314(3E),FE-1 | 1.94E-01 | 1.17E+14 | 1.66E-15 | PU |
| TA21-314(4W),FE-7 | 1.40E-01 | 1.93E+14 | 7.26E-16 | PU |
| TA21-315(5W),FE-1 | 4.53E-01 | 1.16E+14 | 3.90E-15 | PU |
| TA21-324,FE-1 | 2.60E-02 | 8.38E+13 | 3.11E-16 | PU |
| TA21-4(HC),FE-1 | 4.30E-02 | 2.24E+13 | 1.92E-15 | PU |
| TA35-7 FE-2 | 5.67E-01 | 1.21E+14 | 4.68E-15 | PU |
| TA35-7 FE-7 | 1.02E-01 | 3.11E+13 | 3.28E-15 | PU |
| TA35-7 FE-8 | 1.10E-02 | 1.37E+13 | 8.01E-16 | PU |
| TA48 FE-15 | 1.25E+00 | 4.60E+14 | 2.71E-15 | PU |
| TA48 FE-45,46 | 2.30E-01 | 7.67E+14 | 3.00E-16 | PU |
| TA48 FE-51 | 1.00E-03 | 1.53E+13 | 6.55E-17 | PU |
| TA48 FE-54 | 6.00E-03 | 1.08E+14 | 5.55E-17 | PU |
| TA48 FE-60 | 5.00E-03 | 1.83E+13 | 2.74E-16 | PU |
| TA50 FE-1 | 1.37E-01 | 2.44E+14 | 5.62E-16 | PU |
| TA50 FE-2 | 1.71E-01 | 6.35E+14 | 2.69E-16 | PU |
| TA50 FE-3 | 5.00E-02 | 3.15E+13 | 1.59E-16 | PU |
| TA50 FE-6 | 4.00E-03 | 1.97E+13 | 2.03E-16 | PU |
| TA50 FE-17 | 1.00E-03 | 8.10E+12 | 1.23E-16 | PU |
| TA50 FE-25 | 9.00E-03 | 2.14E+13 | 4.21E-16 | PU |
| TA50 FE-27 | 0.00E+00 | 1.35E+14 | 0.00E+00 | PU |
| TA50-37 FE-1 | 7.10E-02 | 1.29E+14 | 5.52E-16 | PU |
| TA50-66 FE-1 | 0.00E+00 | 1.23E+12 | 0.00E+00 | PU |
| TA50-69 FE-1 | 4.00E-03 | 8.42E+12 | 4.75E-16 | PU |
| TA50-69 FE-2 | 2.00E-03 | 4.91E+13 | 4.07E-17 | PU |
| TA50-69 FE-3 | 1.00E-02 | 1.33E+13 | 7.54E-16 | PU |
| TA54 RM EXH FE-1 | 1.00E-02 | 9.93E+12 | 1.01E-15 | PU |
| TA54 PROCESS FE-2 | 1.20E-02 | 5.11E+12 | 2.35E-15 | PU |
| TA55 N/S FE-15 | 1.54E+00 | 1.59E+14 | 9.71E-15 | PU |
| TA55 S/S FE-16 | 6.75E-01 | 1.93E+14 | 3.50E-15 | PU |

TOTAL PU RELEASED: 45.34 MICROCURIES

PART 3. CY89 LOS ALAMOS AIRBORNE URANIUM RELEASE BY FACILITY

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-29 FE-20 | 1.55E-01 | 3.63E+14 | 4.27E-16 | U-235 |
| TA3-29 FE-22 | 3.21E-01 | 3.91E+13 | 8.21E-15 | U-235 |
| TA3-29 FE-23 | 3.26E+02 | 5.14E+14 | 6.35E-13 | U-235 |
| TA3-29 FE-24 | 6.09E+00 | 3.10E+14 | 1.97E-14 | U-235 |
| TA3-29 FE-26 | 2.85E-01 | 9.92E+13 | 2.87E-15 | U-235 |
| TA3-29 FE-27 | 7.38E-01 | 9.22E+13 | 8.00E-15 | U-235 |
| TA3-35 FE-1,2 | 1.02E-01 | 1.85E+14 | 5.51E-16 | U-235 |
| TA3-66 FE-10 | 1.45E+00 | 1.07E+14 | 1.36E-14 | U-235 |
| TA21-3(MAIN),FE-6 | 2.06E+01 | 1.20E+14 | 1.72E-13 | U-235 |
| TA21-4(MAIN),FE-3 | 8.33E+00 | 1.64E+14 | 5.07E-14 | U-235 |
| TA48 FE-11 | 2.02E-01 | 4.34E+14 | 4.66E-16 | U-235 |
| TA48 FE-40 | 6.80E-02 | 8.76E+14 | 7.76E-16 | U-235 |

TOTAL U-235 RELEASED: 364.36 MICROCURIES

| STACK LOCATION & ID | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|
| TA3-66 FE-8 | 4.98E+00 | 2.47E+14 | 2.01E-14 | U-238 |
| TA3-66 FE-9 | 9.40E-02 | 3.54E+14 | 2.66E-16 | U-238 |
| TA3-66 FE-13 | 2.06E+01 | 4.62E+14 | 4.44E-14 | U-238 |
| TA3-66 FE-24 | 5.58E-01 | 4.02E+13 | 1.39E-14 | U-238 |
| TA3-66 FE-26 | 1.91E+00 | 1.57E+13 | 1.21E-13 | U-238 |
| TA3-102,FE-20 | 7.65E-01 | 4.97E+13 | 1.54E-14 | U-238 |
| TA3-102,FE-25 | 1.30E-02 | 1.19E+13 | 1.09E-15 | U-238 |
| TA3-141,FE-6 | 5.00E-02 | 1.52E+14 | 3.28E-16 | U-238 |
| TA3-141,FE-9 | 3.91E-01 | 2.25E+14 | 1.74E-15 | U-238 |
| TA3-141,FE-10 | 4.50E-02 | 2.41E+14 | 1.87E-16 | U-238 |

TOTAL U-238 RELEASED: 29.44 MICROCURIES

PART 4. CY89 LOS ALAMOS AIRBORNE MIXED FISSION PRODUCT RELEASES BY FACILITY

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA3-29 | FE-44,45,46 | 3.82E+01 | 1.32E+15 | 2.89E-14 | MFP |
| TA21-4(HC),FE-1 | | 3.10E-02 | 2.24E+13 | 1.39E-15 | MFP |
| TA48 | FE-11 | 3.13E+02 | 4.34E+14 | 7.21E-13 | MFP |
| TA48 | FE-15 | 2.24E+01 | 4.60E+14 | 4.86E-14 | MFP |
| TA48 | FE-40 | 4.35E+05 | 9.42E+13 | 4.62E-09 | MFP |
| TA48 | FE-45,46 | 1.02E+02 | 7.67E+14 | 1.32E-13 | MFP |
| TA48 | FE-51 | 5.30E-02 | 1.53E+13 | 3.47E-15 | MFP |
| TA48 | FE-54 | 5.61E-01 | 1.08E+14 | 5.19E-15 | MFP |
| TA48 | FE-60 | 2.69E+00 | 1.83E+13 | 1.47E-13 | MFP |
| TA50 | FE-1 | 2.20E+00 | 2.44E+14 | 9.00E-15 | MFP |
| TA50 | FE-2 | 6.93E+00 | 6.35E+14 | 1.09E-14 | MFP |
| TA50 | FE-3 | 1.50E-02 | 3.15E+13 | 4.76E-16 | MFP |
| TA50 | FE-6 | 1.50E-02 | 1.97E+13 | 7.60E-16 | MFP |
| TA50 | FE-17 | 1.00E-02 | 8.10E+12 | 1.23E-15 | MFP |
| TA50 | FE-25 | 3.20E-02 | 2.14E+13 | 1.50E-15 | MFP |
| TA50 | FE-27 | 8.40E-02 | 1.35E+14 | 6.21E-16 | MFP |
| TA50-37 | FE-1 | 4.89E-01 | 1.29E+14 | 3.80E-15 | MFP |
| TA50-66 | FE-1 | 6.00E-03 | 1.23E+12 | 4.86E-15 | MFP |

TOTAL MFP RELEASED: 0.44 CURIES

Part 9. CY89 LISTING OF LOS ALAMOS RELEASES BY STACK

FOR THE PERIOD FROM: 6-JAN-89 TO: 22-DEC-89

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA2-9 | OWR | 2.23E+08 | 1.13E+13 | 1.97E-05 | AR-41 |
| TA3-16 | FE-14 | 3.40E+06 | 1.26E+13 | 2.69E-07 | H-3(GAS) |
| TA3-16 | FE-16 | 2.87E+08 | 3.73E+12 | 7.71E-05 | H-3(GAS) |
| TA3-29 | FE-14 | 3.40E-02 | 1.75E+14 | 1.94E-16 | PU |
| TA3-29 | FE-15 | 1.34E-01 | 7.68E+14 | 1.75E-16 | PU |
| TA3-29 | FE-17 | 2.08E-02 | 9.92E+13 | 2.82E-16 | PU |
| TA3-29 | FE-18 | 1.30E-02 | 1.40E+14 | 9.29E-17 | PU |
| TA3-29 | FE-19 | 2.13E+01 | 6.06E+14 | 3.52E-14 | PU |
| TA3-29 | FE-20 | 1.55E-01 | 3.63E+14 | 4.27E-16 | U-235 |
| TA3-29 | FE-21 | 9.80E-02 | 7.41E+13 | 1.32E-15 | PU |
| TA3-29 | FE-22 | 3.21E-01 | 3.91E+13 | 8.21E-15 | U-235 |
| TA3-29 | FE-23 | 3.26E+02 | 5.14E+14 | 6.35E-13 | U-235 |
| TA3-29 | FE-24 | 6.09E+00 | 3.10E+14 | 1.97E-14 | U-235 |
| TA3-29 | FE-26 | 2.85E-01 | 9.92E+14 | 2.87E-15 | U-235 |
| TA3-29 | FE-27 | 7.38E-01 | 9.22E+13 | 8.00E-15 | U-235 |
| TA3-29 | FE-28 | 3.15E+01 | 4.83E+14 | 6.52E-15 | PU |
| TA3-29 | FE-29 | 5.46E+00 | 6.43E+14 | 8.49E-15 | PU |
| TA3-29 | FE-30 | 9.00E-03 | 4.68E+13 | 1.92E-16 | PU |
| TA3-29 | FE-31 | 3.30E-02 | 5.68E+13 | 5.81E-16 | PU |
| TA3-29 | FE-32 | 8.26E+00 | 5.89E+14 | 1.40E-14 | PU |
| TA3-29 | FE-33 | 6.00E-02 | 5.62E+14 | 1.07E-16 | PU |
| TA3-29 | FE-34 | 4.00E-03 | 2.81E+13 | 1.42E-16 | PU |
| TA3-29 | FE-35 | 6.00E-03 | 1.40E+14 | 4.27E-17 | PU |
| TA3-29 | FE-44,45,46 | 4.98E-01 | 1.32E+15 | 3.77E-16 | PU |
| TA3-29 | FE-44,45,46 | 3.82E+01 | 1.32E+15 | 2.89E-14 | MFP |
| TA3-29 | VFE-48 | 0.00E+00 | 3.05E+13 | 0.00E+00 | PU |
| TA3-35 | FE-1,2 | 1.02E-01 | 1.85E+14 | 5.51E-16 | U-235 |
| TA3-40 | FE-25 | 2.65E+05 | 1.55E+13 | 1.71E-08 | H-3(GAS) |
| TA3-66 | FE-8 | 4.98E+00 | 2.47E+14 | 2.01E-14 | U-238 |
| TA3-66 | FE-9 | 9.40E-02 | 3.54E+14 | 2.66E-16 | U-238 |
| TA3-66 | FE-10 | 1.45E+00 | 1.07E+14 | 1.36E-14 | U-235 |
| TA3-66 | FE-13 | 2.06E+01 | 4.62E+14 | 4.46E-14 | U-238 |
| TA3-66 | FE-24 | 5.58E-01 | 4.02E+13 | 1.39E-14 | U-238 |
| TA3-66 | FE-26 | 1.91E+00 | 1.57E+13 | 1.21E-13 | U-238 |
| TA3-102, | FE-20 | 7.65E-01 | 4.97E+13 | 1.54E-14 | U-238 |

ATTACHMENT II

1989 CONTROL AND REFERENCE LOCATION IDENT. DOE FORM F-5821.1

| HSE-1 I.D. | DOE I.D | Narrative Description | Nuclide |
|---|---|---|---|
| 001 | ALDEA-009-001 | TA2-9, Omega Stack | Ar-41 |
| 003 | ALDE7-016-002 | TA3-16, Van de Graaf, FE-14 | H-3 |
| 004 | ALDE7-016-001 | TA3-16, Van de Graaf, FE-16 | H-3 |
| 005 | ALDEB-029-002 | TA3-29, North Stack, Wg. 2, FE-14 | Pu |
| 006 | ALDEB-029-001 | TA3-29, South Stack, Wg. 2, FE-15 | Pu |
| 007 | ALDEB-029-012 | TA3-29, South Offices, Wg. 2, Rm. Air, FE-17 | Pu |
| 008 | ALDEB-029-013 | TA3-29, North Offices, Wg. 2, Rm. Air, FE-18 | Pu |
| 009 | ALDEB-029-003 | TA3-29, South Stack, Wg. 3, FE-19 | Pu |
| 010 | ALDEB-029-004 | TA3-29, North Stack, Wg. 3, FE-20 | U-235 |
| 011 | ALDEB-029-014 | TA3-29, South Offices, Wg. 3, Rm. Air, FE-21 | Pu |
| 012 | ALDEB-029-015 | TA3-29, North Offices, Wg. 3, Rm. Air, FE-22 | U-235 |
| 013 | ALDEB-029-006 | TA3-29, North Stack, Wg. 4, FE-23 | U-235 |
| 014 | ALDEB-029-005 | TA3-29, South Stack, Wg. 4, FE-24 | U-235 |
| 015 | ALDEB-029-016 | TA3-29, North Offices, Wg. 4, Rm. Air, FE-26 | U-235 |
| 016 | ALDEB-029-017 | TA3-29, South Offices, Wg. 4, Rm. Air, FE-27 | U-235 |
| 017 | ALDEB-029-007 | TA3-29, South Stack, Wg. 5, FE-28 | Pu |
| 018 | ALDEB-029-008 | TA3-29, North Stack, Wg. 5, FE-29 | Pu |
| 019 | ALDEB-029-018 | TA3-29, North Offices, Wg. 5, Rm. Air, FE-30 | Pu |
| 020 | ALDEB-029-019 | TA3-29, South Offices, Wg. 5, Rm. Air, FE-31 | Pu |
| 021 | ALDEB-029-010 | TA3-29, North Stack, Wg. 7, FE-32 | Pu |
| 022 | ALDEB-029-009 | TA3-29, South Stack, Wg. 7, FE-33 | Pu |
| 023 | ALDEB-029-020 | TA3-29, South Offices, Wg. 7, Rm. Air, FE-34 | Pu |
| 024 | ALDEB-029-021 | TA3-29, North Offices, Wg. 7, Rm. Air, FE-35 | Pu |
| 025.1 | ALDEB-029-011 | TA3-29, Wg. 9 Stack, FE-44, 45, 46 | Pu |
| 025.2 | ALDEB-029-011 | TA3-29, Wg. 9 Stack, FE-44, 45, 46 | MFP |
| 026 | ALDEB-029-022 | TA3-29, Vault Stack, VFE-48 | Pu |
| 027 | ALDE2-035-001 | TA3-35, West Stack, FE-1, 2 | U-235 |
| 028 | ALDE3-040-007 | TA3-40, Phy. Bldg. Calib. Lab. FE-25 | H-3 |
| 029 | ALDE3-066-001 | TA3-66, NW Stack, FE-8 | U-238 |
| 030 | ALDE3-066-002 | TA3-66, NE Stack, FE-9 | U-238 |
| 031 | ALDE3-066-003 | TA3-66, SE Stack, FE-10 | U-235 |
| 032 | ALDE3-066-004 | TA3-66, North Stack, FE-13 | U-238 |
| 033 | ALDE3-066-005 | TA3-66, West Central Stack, FE-24 | U-238 |
| 034 | ALDE3-066-006 | TA3-66, NW Corner Stack, FE-26 | U-238 |
| 035 | ALDE4-102-001 | TA3-102, Main Stack, FE-20 | U-238 |
| 035.1 | ALDE4-102-002 | TA3-102, FE-25 | U-238 |
| 036 | ALDE5-141-001 | TA3-141, North Stack, FE-6 | U-238 |
| 037 | ALDE5-141-002 | TA3-141, NW Stack, FE-9 | U-238 |
| 038 | ALDE5-141-003 | TA3-141, SW Stack, FE-10 | U-238 |

LOS ALAMOS
AIRBORNE EFFLUENT RELEASE SUMMARY
CY90

CONTENTS

PART 9. CY90 LISTING OF LOS ALAMOS RELEASES BY STACK

FOR THE PERIOD FROM: 22-DEC-89 TO: 21-DEC-90

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | AVERAGE MICROCURIES PER ML | PRINCIPAL ISOTOPE |
|---|---|---|---|---|---|
| TA2-9 | OWR | 1.63E+08 | 7.55E+12 | 2.16E-05 | AR-41 |
| TA3-16 | FE-14 | 2.18E+07 | 1.95E+13 | 1.12E-06 | H-3(GAS) |
| TA3-16 | FE-16 | 4.74E+08 | 7.49E+12 | 6.33E-05 | H-3(GAS) |
| TA3-29 | FE-14 | 0.00E+00 | 1.55E+14 | 0.00E+00 | PU |
| TA3-29 | FE-15 | 0.00E+00 | 7.96E+14 | 0.00E+00 | PU |
| TA3-29 | FE-17 | 7.00E-03 | 1.14E+14 | 6.14E-17 | PU |
| TA3-29 | FE-18 | 0.00E+00 | 1.43E+14 | 0.00E+00 | PU |
| TA3-29 | FE-19 | 1.97E+01 | 7.46E+14 | 2.65E-14 | PU |
| TA3-29 | FE-20 | 0.00E+00 | 5.20E+14 | 0.00E+00 | U-235 |
| TA3-29 | FE-21 | 1.30E-02 | 9.63E+13 | 1.35E-16 | PU |
| TA3-29 | FE-22 | 3.80E-02 | 4.64E+13 | 8.19E-16 | U-235 |
| TA3-29 | FE-23 | 1.39E+02 | 6.12E+14 | 2.27E-13 | U-235 |
| TA3-29 | FE-24 | 5.28E+00 | 4.14E+14 | 1.28E-14 | U-235 |
| TA3-29 | FE-26 | 1.27E-01 | 1.04E+14 | 1.22E-15 | U-235 |
| TA3-29 | FE-27 | 2.64E-01 | 9.16E+13 | 2.88E-15 | U-235 |
| TA3-29 | FE-28 | 4.08E-01 | 6.15E+14 | 6.63E-16 | PU |
| TA3-29 | FE-29 | 6.29E-01 | 6.19E+14 | 1.02E-15 | PU |
| TA3-29 | FE-30 | 1.00E-02 | 5.19E+13 | 1.93E-16 | PU |
| TA3-29 | FE-31 | 2.30E-02 | 8.57E+13 | 2.68E-16 | PU |
| TA3-29 | FE-32 | 1.62E-01 | 5.94E+14 | 3.06E-16 | PU |
| TA3-29 | FE-33 | 0.00E+00 | 7.20E+14 | 0.00E+00 | PU |
| TA3-29 | FE-34 | 0.00E+00 | 8.66E+13 | 0.00E+00 | PU |
| TA3-29 | FE-35 | 3.30E-02 | 8.88E+13 | 3.72E-16 | PU |
| TA3-29 | FE-44,45,46 | 5.64E-01 | 1.59E+15 | 3.55E-16 | PU |
| TA3-29 | FE-44,45,46 | 3.89E+01 | 1.59E+15 | 2.44E-14 | MFP |
| TA3-29 | FE-43 | 5.00E-03 | 1.40E+13 | 3.57E-16 | PU |
| TA3-35 | FE-1,2 | 5.10E-02 | 1.69E+14 | 3.02E-16 | U-235 |
| TA3-40 | FE-25 | 8.18E+04 | 8.33E+12 | 9.82E-09 | H-3(GAS) |
| TA3-66 | FE-8 | 3.93E+00 | 2.48E+14 | 1.59E-14 | U-238 |
| TA3-66 | FE-9 | 2.54E-01 | 4.40E+14 | 5.77E-16 | U-238 |
| TA3-66 | FE-10 | 3.43E-01 | 7.65E+13 | 4.48E-15 | U-235 |
| TA3-66 | FE-13 | 4.03E+01 | 4.66E+14 | 8.65E-14 | U-238 |
| TA3-66 | FE-24 | 1.58E+00 | 4.02E+13 | 3.93E-14 | U-238 |
| TA3-66 | FE-26 | 3.85E+00 | 5.75E+13 | 6.69E-14 | U-238 |
| TA3-102 | FE-20 | 7.93E-01 | 8.13E+13 | 9.75E-15 | U-238 |

# LOS ALAMOS NATIONAL LABORATORY
# RADIOACTIVE AIR EMISSIONS REPORT
# SUMMARY FOR 1991


Prepared by
J. Margo Clark, HS-12

Assisted by
Terry Vergamini, HS-1
Kevin Smale, HS-12


March 4, 1992

# LOS ALAMOS NATIONAL LABORATORY RADIOACTIVE AIR EMISSIONS REPORT SUMMARY FOR 1991

This CY91 annual report consists of twelve reporting periods as follows:

Period 1: Dec. 21, 1990 to Feb. 1, 1991
Period 2: Feb. 1, 1991 to Mar. 1, 1991
Period 3: March 1, 1991 to March 29, 1991
Period 4: March 29, 1991 to May 3, 1991
Period 5: May 3, 1991 to May 31, 1991
Period 6: May 31, 1991 to June 28, 1991
Period 7: June 28, 1991 to Aug. 2, 1991
Period 8: Aug. 2, 1991 to Aug. 30, 1991
Period 9: Aug. 30, 1991 to October 4, 1991
Period 10: Oct.4, 1991 to Nov. 1, 1991
Period 11: Nov. 1, 1991 to Nov. 27, 1991
Period 12: Nov. 27, 1991 to Dec. 20, 1991

LOS ALAMOS NATIONAL LABORATORY
AIRBORNE EFFLUENT RELEASE SUMMARY
CY91

CONTENTS

## PART 1. CY91 TOTAL LOS ALAMOS AIRBORNE RELEASES BY NUCLIDE

SUMMARY OF ACTIVITY DISCHARGED

| ISOTOPE | TOTAL MICROCURIES DISCHARGED | |
|---|---|---|
| AR-41 | 4.60E+08 | (1) |
| CU-67 | 0.00E+00 | (7) |
| G/MAP | 5.72E+10 | (2) |
| H-3(GAS) | 4.68E+09 | (3) |
| H-3(HTO) | 3.73E+07 | (3) |
| MFP | 1.10E+03 | (4) |
| P-32 | 1.70E+01 | |
| P/VAP | 3.55E+04 | (5) |
| PU | 3.69E+01 | (6) |
| U-235 | 2.56E+02 | |
| U-238 | 7.98E+01 | |

Notes:

1) This value is comprised of 2.03E+08 microcuries from Omega West reacto and 2.57E+08 microcuries from G/MAP (LAMPF) (SEE FOOTNOTE 5 BELOW).

2) G/MAP denotes gaseous mixed activation products; N-16 (1.79%), C-10 (4.5%), O-14 (2.04%), O-15 (59.56%), N-13 (14.89%), C-11 (16.77%), and Ar-41 (0.45%).
Note, another significant source of AR-41 exists in G/MAP. Since AR-4 is difficult to measure because of its comparatively longer half-life, it is estimated at 0.45% of G/MAP, which is 2.57E+08 microcuries.

3) H-3 denotes the elemental form of tritium gas and H-3(HTO) denotes tritium vapor in the HTO form.

4) MFP denotes mixed fission products.

5) P/VAP denotes particulate and/or vapor activation products. The main particulate constituent is 1.95E+04 microcuries of Be-7, and the main vapor constituent is 6.01E+03 microcuries of Br-82 and 2.00E+03 microcuries of Br-76 respectively. Nineteen distinct nuclides were identified (SEE PART 7).

6) Pu values contain indeterminate traces of Am-241, decay product of Pu-241.

7) A zero in activity field denotes a value less than lower limit of detectability.

PART 4. CY91 LOS ALAMOS AIRBORNE RELEASES BY FACILITY AND ISOTOPE

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL M OF AIR DISCHARGED | ISOTOPE |
|---|---|---|---|---|
| TA-21-150 | FE-1 | 7.10E-02 | 2.82E+14 | PU |
| TA-21-257 | FE-4 | 1.47E-01 | 2.36E+13 | PU |
| TA-21-313 | FE-2 | 5.30E-02 | 4.10E+14 | PU |
| TA-21-314 | FE-1 | 2.22E-01 | 2.12E+14 | PU |
| TA-21-314 | FE-7 | 8.10E-02 | 3.04E+14 | PU |
| TA-21-315 | FE-1 | 3.60E-02 | 4.51E+14 | PU |
| TA-21-324 | FE-1,2 | 6.00E-03 | 9.50E+13 | PU |
| TA-21-4 | FE-1 | 1.09E-02 | 2.24E+13 | PU |
| TA-21-5 | FE-7 | 2.18E-01 | 2.78E+14 | PU |
| TA-3-29 | FE-14 | 0.00E+00 | 2.24E+14 | PU |
| TA-3-29 | FE-15 | 1.81E-01 | 8.06E+14 | PU |
| TA-3-29 | FE-17 | 0.00E+00 | 1.12E+14 | PU |
| TA-3-29 | FE-18 | 0.00E+00 | 2.25E+14 | PU |
| TA-3-29 | FE-19 | 1.72E+01 | 7.84E+14 | PU * |
| TA-3-29 | FE-21 | 1.28E-01 | 1.08E+14 | PU |
| TA-3-29 | FE-28 | 2.43E+00 | 6.26E+14 | PU |
| TA-3-29 | FE-29 | 9.11E+00 | 7.63E+14 | PU |
| TA-3-29 | FE-30 | 1.10E-02 | 6.18E+13 | PU |
| TA-3-29 | FE-31 | 3.00E-02 | 8.17E+13 | PU |
| TA-3-29 | FE-32 | 3.60E-01 | 5.93E+14 | PU |
| TA-3-29 | FE-33 | 9.43E-01 | 7.58E+14 | PU |

* See footnote #11

PART ~~4.~~ CY91 LOS ALAMOS AIRBORNE RELEASES BY FACILITY AND ISOTOPE

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | ISOTOPE |
|---|---|---|---|---|
| TA-3-29 | FE-34 | 1.00E-02 | 1.46E+14 | PU |
| TA-3-29 | FE-35 | 2.50E-02 | 8.60E+13 | PU |
| TA-3-29 | FE-44 | 1.87E-01 | 5.31E+14 | PU |
| TA-3-29 | FE-45 | 1.33E-01 | 5.83E+14 | PU |
| TA-3-29 | FE-46 | 4.91E-02 | 6.87E+14 | PU |
| TA-3-29 | FE-48 | 3.10E-03 | 1.56E+13 | PU |
| TA-35-7 | FE-2 | 7.60E-01 | 1.74E+14 | PU |
| TA-35-7 | FE-7 | 4.63E-01 | 9.30E+13 | PU |
| TA-35-7 | FE-8 | 0.00E+00 | 4.86E+13 | PU |
| TA-48-1 | FE-15 | 4.72E-01 | 7.48E+14 | PU |
| TA-48-1 | FE-45,46 | 1.11E-01 | 6.85E+14 | PU |
| TA-48-1 | FE-51 | 0.00E+00 | 2.05E+13 | PU |
| TA-48-1 | FE-54 | 0.00E+00 | 9.24E+13 | PU |
| TA-48-1 | FE-60 | 3.00E-03 | 5.04E+13 | PU |
| TA-50-1 | FE-1 | 0.00E+00 | 2.80E+14 | PU |
| TA-50-1 | FE-17 | 5.00E-03 | 3.86E+13 | PU |
| TA-50-1 | FE-2 | 1.36E+00 | 6.71E+14 | PU |
| TA-50-1 | FE-25 | 0.00E+00 | 8.17E+13 | PU |
| TA-50-1 | FE-27 | 0.00E+00 | 2.08E+14 | PU |
| TA-50-1 | FE-3 | 1.00E-02 | 6.05E+13 | PU |
| TA-50-1 | FE-6 | 5.00E-03 | 3.81E+13 | PU |

PART 5. CY91 LOS ALAMOS AIRBORNE RELEASES BY FACILITY AND ISOTOPE

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | ISOTOPE |
|---|---|---|---|---|
| TA-21-3 | FE-6 | 7.27E+01 | 2.56E+14 | U-235 |
| TA-21-4 | FE-3 | 1.93E+01 | 2.94E+14 | U-235 |
| TA-3-29 | FE-20 | 2.09E-01 | 5.00E+14 | U-235 |
| TA-3-29 | FE-22 | 2.60E-01 | 1.23E+14 | U-235 |
| TA-3-29 | FE-23 | 1.58E+02 | 6.34E+14 | U-235 |
| TA-3-29 | FE-24 | 4.48E+00 | 4.29E+14 | U-235 |
| TA-3-29 | FE-26 | 1.96E-01 | 1.02E+14 | U-235 |
| TA-3-29 | FE-27 | 2.80E-01 | 9.91E+13 | U-235 |
| TA-3-35 | FE-1,2 | 1.35E-01 | 1.59E+14 | U-235 |
| TA-3-66 | FE-10 | 6.93E-01 | 1.00E+14 | U-235 |
| TA-48-1 | FE-11 | 0.00E+00 | 8.21E+14 | U-235 |
| TA-48-RC1 | FE-40 | 0.00E+00 | 1.08E+14 | U-235 |

TOTAL MICROCURIES RELEASED: 2.56E+02

## PART 8. CY91 LISTING OF LOS ALAMOS RELEASES BY STACK

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | ISOTOPE | PERCENT DATA CAPTURED |
|---|---|---|---|---|---|
| TA-3-16 | FE-14 | 6.01E+06 | 1.93E+13 | H-3(GAS) | 100.00 |
| TA-3-16 | FE-16 | 1.99E+08 | 8.22E+12 | H-3(GAS) | 100.00 |
| TA-3-29 | FE-14 | 0.00E+00 | 2.24E+14 | PU | 100.00 |
| TA-3-29 | FE-15 | 1.81E-01 | 8.06E+14 | PU | 100.00 |
| TA-3-29 | FE-17 | 0.00E+00 | 1.12E+14 | PU | 100.00 |
| TA-3-29 | FE-18 | 0.00E+00 | 2.25E+14 | PU | 100.00 |
| TA-3-29 | FE-19 | 1.72E+01 | 7.84E+14 | PU | 100.00 |
| TA-3-29 | FE-20 | 2.09E-01 | 5.00E+14 | U-235 | 98.08 |
| [illegible]3-29 | FE-21 | 1.28E-01 | 1.08E+14 | PU | 100.00 |
| [illegible]-29 | FE-22 | 2.60E-01 | 1.23E+14 | U-235 | 100.00 |
| TA-3-29 | FE-23 | 1.58E+02 | 6.34E+14 | U-235 | 100.00 |
| TA-3-29 | FE-24 | 4.48E+00 | 4.29E+14 | U-235 | 100.00 |
| TA-3-29 | FE-26 | 1.96E-01 | 1.02E+14 | U-235 | 100.00 |
| TA-3-29 | FE-27 | 2.80E-01 | 9.91E+13 | U-235 | 100.00 |
| TA-3-29 | FE-28 | 2.43E+00 | 6.26E+14 | PU | 94.23 |
| TA-3-29 | FE-29 | 9.11E+00 | 7.63E+14 | PU | 98.08 |
| TA-3-29 | FE-30 | 1.10E-02 | 6.18E+13 | PU | 94.23 |
| TA-3-29 | FE-31 | 3.00E-02 | 8.17E+13 | PU | 94.23 |
| TA-3-29 | FE-32 | 3.60E-01 | 5.93E+14 | PU | 100.00 |
| TA-3-29 | FE-33 | 9.43E-01 | 7.58E+14 | PU | 100.00 |
| TA-3-29 | FE-34 | 1.00E-02 | 1.46E+14 | PU | 100.00 |

## PART 8. CY91 LISTING OF LOS ALAMOS RELEASES BY STACK

| STACK LOCATION & ID | | TOTAL MICROCURIES DISCHARGED | TOTAL ML OF AIR DISCHARGED | ISOTOPE | PERCENT DATA CAPTURED |
|---|---|---|---|---|---|
| TA-3-29 | FE-35 | 2.50E-02 | 8.60E+13 | PU | 100.00 |
| TA-3-29 | FE-44 | 3.97E+00 | 5.31E+14 | MFP | 98.08 |
| TA-3-29 | FE-44 | 1.87E-01 | 5.31E+14 | PU | 98.08 |
| TA-3-29 | FE-45 | 6.70E+00 | 5.83E+14 | MFP | 100.00 |
| TA-3-29 | FE-45 | 1.33E-01 | 5.83E+14 | PU | 100.00 |
| TA-3-29 | FE-46 | 3.43E+00 | 6.87E+14 | MFP | 100.00 |
| TA-3-29 | FE-46 | 4.91E-02 | 6.87E+14 | PU | 100.00 |
| TA-3-29 | FE-48 | 3.10E-03 | 1.56E+13 | PU | 98.08 |
| [illegible]3-35 | FE-1,2 | 1.35E-01 | 1.59E+14 | U-235 | 100.00 |
| [illegible]-40 | FE-25 | 5.85E+04 | 1.24E+13 | H-3(GAS) | 100.00 |
| TA-3-66 | FE-10 | 6.93E-01 | 1.00E+14 | U-235 | 100.00 |
| TA-3-66 | FE-13 | 4.67E+01 | 4.67E+14 | U-238 | 100.00 |
| TA-3-66 | FE-24 | 2.57E+01 | 4.13E+13 | U-238 | 100.00 |
| TA-3-66 | FE-26,27 | 1.41E-01 | 1.90E+12 | U-238 | 100.00 |
| TA-3-66 | FE-8 | 2.66E+00 | 2.54E+14 | U-238 | 100.00 |
| TA-3-66 | FE-9 | 1.20E+00 | 4.81E+14 | U-238 | 100.00 |
| TA-33-86 | FE-6,11 | 2.54E+08 | 1.18E+14 | H-3(GAS) | 100.00 |
| TA-35-213 | FE-1 | 0.00E+00 | 6.39E+13 | H-3(GAS) | 100.00 |
| TA-35-213 | FE-5 | 4.30E+00 | 3.78E+14 | H-3(GAS) | 100.00 |
| TA-35-7 | FE-2 | 7.60E-01 | 1.74E+14 | PU | 100.00 |
| [illegible]35-7 | FE-7 | 4.63E-01 | 9.30E+13 | PU | 100.00 |

# APPENDIX A

# ATTACHMENT 3

3-001028

Attachment 3

# MEMORANDUM

ERM/GOLDER Los Alamos Project Team

**To:** Operable Unit 1114 Project File

**From:** Michelle Y. Morgenstern *mym*

**Date:** February 9, 1994

**Regarding:** **RADIOACTIVE AIR EMISSIONS FROM TA-3 SM-16, 29, 34, 35, 40, AND 102**

cc: Bart Vanden Plas
OU 1114 Project File 17020

The attached tables contain the *available* radioactive air emissions data from various buildings in TA-3. These tables have been prepared with data from the following sources:

- Historical information of radioactive air emissions from 1967 through 1991 (except 1969) is provided by ESH-15 (Morgenstern 1994, 3-001008). Some of the historical information for 1969 radioactive air emissions could not be found, therefore, the amount of radioactivity is intentionally left blank.

- The only set of available data dated back to 1953 was obtained from table 1 in the memo written by R.G. Stafford to J.E. Dummer (Stafford 1980, 3-000969). The gross alpha activities from CMR building wing 2, 5, and 7 are used to represent the plutonium activities since only plutonium work was conducted in these wings. Data from 1953 through 1972 are used for the CMR building radioactive air emissions table.

- The 1963 and 1969 radioactive air emissions data of TA-3-35 as well as the 1969 radioactive air emission data of TA-3-102 are retrieved from the Central Records and Archive Facility (Morgenstern 1994, 3-001027).

- The information on the unplanned releases of radioactive air from 1970 through 1993 is obtained from the *Environmental Surveillance at Los Alamos* provided by ESH-8 (Morgenstern 1994, 3-001008). Other unplanned release information was obtained from memoranda retrieved from the Central Records and Archive Facility.

- The 1992 radioactive air emissions information is obtained from LANL report LA-12586-PR *Radioactive Air Emissions, 1992 Summary* (Morgenstern 1994, 3-001008).

No report on TA-3-39 radioactive air emissions data is found, therefore, it is not included here. Mr. Carl Buckland, former section leader at H division, indicated in a telephone interview that *no* radioactive work was ever conducted at TA-3-39. Therefore, radioactive air emissions was never monitored during his tenure at LANL from 1945 through 1992. The radioactive air emission data for 1993 is not available from ESH-15, thus, not included in this report either.

It is not understood nor documented in any of the LANL reports if the historical information on radioactive air emissions include the radioactivities as a result of the unplanned releases. The amount of information from the historical data is limited. Therefore, the total radioactivities are calculated by adding data from historical information and the unplanned releases.

In order to be consistent with the CAP88-PC results performed by ESH-15, the stack emission data from six buildings in TA-3 are consolidated as one point source stack emission data, and they are summarized below:

| Tritium | $^{238+239}Pu$ | $^{235+238}U$ | MFP | $^{131}I$ |
|---|---|---|---|---|
| 53,000 Ci | 0.081 Ci | 0.004 Ci | 0.0032 Ci | 0.008 Ci |

**Table 1. Radioactive Air Emissions at TA-3-16 Van de Graaff**

| Year | Tritium (Ci) |
|---|---|
| 1962 | 60[a] |
| 1963 | 20[a] |
| 1967 | None Reported |
| 1968 | None Reported |
| 1969 | |
| 1970 | None Reported |
| 1971 | None Reported |
| 1972 | None Reported |
| 1973 | None Reported |
| 1974 | None Reported |
| 1975 | None Reported |
| 1976 | 0 |
| 1977 | 400 |
| 1978 | 100 |
| 1979 | 13 |
| 1980 | 4.6 |
| 1981 | 900 |
| 1982 | 1,900 / 10[a] |
| 1983 | 2,300 |
| 1984 | 1,800 |
| 1985 | 2,100 |
| 1986 | 1,200 |
| 1987 | 850 / 380[a] |
| 1988 | 390 |
| 1989 | 290 |
| 1990 | 500 |
| 1991 | 210 / 0.16[a] |
| 1992 | 120 |

Total Radioactivity = 14, 000 Ci of Tritium
No. of years with data = 19 years

[a] The latter number indicate the data from the unplanned releases.

Table 2. Radioactive Air Emissions at TA-3-29 the CMR Building

| Year | $^{238+239}$Pu (µCi)* | $^{235+238}$U (µCi)* | MFP[b] (µCi)* | $^{131}$I (µCi)* | Tritium (Ci) |
|---|---|---|---|---|---|
| 1953 | 24 | Not Available | Not Available | Not Available | Not Available |
| 1954 | 1,100 | Not Available | Not Available | Not Available | Not Available |
| 1955 | 1,800 | Not Available | Not Available | Not Available | Not Available |
| 1956 | 1,900 | Not Available | Not Available | Not Available | Not Available |
| 1957 | 800 | Not Available | Not Available | Not Available | Not Available |
| 1958 | 2,800 | Not Available | Not Available | Not Available | Not Available |
| 1959 | 600 | Not Available | Not Available | Not Available | Not Available |
| 1960 | 1,700 | Not Available | Not Available | Not Available | Not Available |
| 1961 | 1,200 | Not Available | Not Available | Not Available | Not Available |
| 1962 | 720 | Not Available | Not Available | Not Available | Not Available |
| 1963 | 550 | Not Available | Not Available | Not Available | Not Available |
| 1964 | 560 | Not Available | Not Available | Not Available | Not Available |
| 1965 | 1,400 | Not Available | Not Available | Not Available | Not Available |
| 1966 | 800 | Not Available | Not Available | Not Available | Not Available |
| 1967 | 3,700 | None Reported | None Reported | None Reported | 650[a] |
| 1968 | 5,500 | None Reported | None Reported | None Reported | 10,000[a] |
| 1969 | 10,000 | | | | |
| 1970 | 13,000 | None Reported | None Reported | None Reported | None Reported |
| 1971 | 14,000 | None Reported | None Reported | None Reported | None Reported |
| 1972 | 7,700 | None Reported | None Reported | None Reported | None Reported |
| 1973 | 7,300 | None Reported | None Reported | None Reported | None Reported |
| 1974 | 720 | 110 | 340 | 4,700 | None Reported |
| 1975 | 210 | 57 | 180 | 1,400 | None Reported |
| 1976 | 39 | 40 | 420 | 300 | None Reported |
| 1977 | 33 | 35 | 480 | 88 | None Reported |
| 1978 | 58 | 9.2 | 400 | 81 | None Reported |
| 1979 | 1,100 | 24 | 470 | 160 | None Reported |
| 1980 | 740 | 26 | 420 | 94 | None Reported |
| 1981 | 40 | 52 | 170 | 44 | None Reported |
| 1982 | 74 | 120 | 76 | 790 | None Reported |
| 1983 | 89 | 23 | 17 | 83 | None Reported |
| 1984 | 110 | 73 | 42 | 73 | None Reported |
| 1985 | 190 | 210 | 35 | 150 | None Reported |
| 1986 | 190 | 490 | 48 | 38 | None Reported |
| 1987 | 65 | 750 | 22 | None Reported | None Reported |
| 1988 | 52 | 440 | 30 | None Reported | None Reported |
| 1989 | 39 | 330 | 38 | None Reported | None Reported |
| 1990 | 22 | 140 | 39 | None Reported | None Reported |

* Please note units are in µCi.

[a] The latter number indicate the data from the unplanned releases.

[b] MFP denotes Mixed Fission Products. $^{90}$Sr ($t_{1/2}$ = 28.8 y) and $^{90}$Y ($t_{1/2}$ = 64 h) are the major radionuclides of concern.

**Table 2. Radioactive Air Emissions at TA-3-29 the CMR Building (Continued)**

| Year | $^{238+239}$Pu (μCi)* | $^{235+238}$U (μCi)* | MFP[b] (μCi)* | $^{131}$I (μCi)* | Tritium (Ci) |
|---|---|---|---|---|---|
| 1991 | 31 | 160 | 14 | None Reported | None Reported |
| 1992 | 2.7 | 140 | 8.4 | None Reported | None Reported |

Total Radioactivities = 81, 000 μCi of $^{238+239}$Pu; 3,200 μCi of $^{235+238}$U; 3,200 μCi of MFP; 8,000 μCi of $^{131}$I; 11,000 Ci of $^{3}$H
No. of years with data = 40 years for $^{238+239}$Pu; 19 years for $^{235+238}$U; 19 years for MFP; 13 years for $^{131}$I; 2 years of $^{3}$H

* **Please note units are in μCi.**

[a] The latter number indicate the data from the unplanned releases.

[b] MFP denotes Mixed Fission Products. $^{90}$Sr ($t_{1/2}$ = 28.8 y) and $^{90}$Y ($t_{1/2}$ = 64 h) are the major radionuclides of concern.

# Attachment 3



**Table 3. Radioactive Air Emissions at TA-3-34 the Cryogenic building**

| Year | Tritium (Ci) |
|---|---|
| 1967 | None Reported |
| 1968 | None Reported |
| 1969 | |
| 1970 | None Reported |
| 1971 | None Reported |
| 1972 | None Reported |
| 1973 | None Reported |
| 1974 | None Reported |
| 1975 | None Reported |
| 1976 | 0 / 22,000[a] |
| 1977 | 0 |
| 1978 | 0 |
| 1979 | 3,002 / 3,000[a] |
| 1980 | 0 |
| 1981 | 3.9 |
| 1982 | 4.2 |
| 1983 | 26 |
| 1984 | 16 |
| 1985 | 0.20 |
| 1986 | None Reported |
| 1987 | None Reported |
| 1988 | None Reported |
| 1989 | None Reported |
| 1990 | None Reported |
| 1992 | None Reported |
| 1992 | None Reported |

Total Radioactivity = 28, 000 Ci of Tritium
No. of years with data = 10 years

[a] The latter number indicate the data from the unplanned releases.

**Table 4. Radioactive Air Emissions at TA-3-35 the Press Building**

| Year | $^{235}U$ (µCi)* |
|---|---|
| 1963 | 38 |
| 1967 | 11 |
| 1968 | 16 |
| 1969 | 51 |
| 1970 | 50 |
| 1971 | 23 |
| 1972 | 27 |
| 1973 | None Reported |
| 1974 | None Reported |
| 1975 | 4.9 |
| 1976 | 19 |
| 1977 | 2.4 |
| 1978 | 0.95 |
| 1979 | 5.1 |
| 1980 | 2.3 |
| 1981 | 1.1 |
| 1982 | 1.9 |
| 1983 | 3.9 |
| 1984 | 4.4 |
| 1985 | 1.5 |
| 1986 | 0.14 |
| 1987 | 0.20 |
| 1988 | 0.20 |
| 1989 | 0.10 |
| 1990 | 0.051 |
| 1991 | 0.14 |
| 1992 | 0.14 |

Total Radioactivity = 260 µCi of $^{235}U$
No. of years with data = 24 years

* Please note units are in µCi.

Table 5. Radioactive Air Emissions at TA-3-40 the Physics Building

| Year | Tritium (Ci) |
|---|---|
| 1967 | None Reported |
| 1968 | None Reported |
| 1969 | |
| 1970 | None Reported |
| 1971 | None Reported |
| 1972 | None Reported |
| 1973 | None Reported |
| 1974 | None Reported |
| 1975 | None Reported |
| 1976 | None Reported |
| 1977 | None Reported |
| 1978 | None Reported |
| 1979 | None Reported |
| 1980 | None Reported |
| 1981 | None Reported |
| 1982 | None Reported |
| 1983 | None Reported |
| 1984 | None Reported |
| 1985 | None Reported |
| 1986 | 0.017 |
| 1987 | 0.049 |
| 1988 | 0.029 |
| 1989 | 0.27 |
| 1990 | 0.082 |
| 1991 | 0.059 |
| 1992 | 0.16 |

Total Radioactivity = 0.67 Ci of Tritium
No. of years with data = 7 years

Table 6. Radioactive Air Emissions at TA-3-102 the Special Material Machining Shop

| Year | $^{235+238}U$ (μCi)* |
|---|---|
| 1967 | 9.5 |
| 1968 | 26 |
| 1969 | 32 |
| 1970 | 18 |
| 1971 | 380 |
| 1972 | 62 |
| 1973 | None Reported |
| 1974 | 8.9 |
| 1975 | 4.1 |
| 1976 | 3.5 |
| 1977 | 3.3 |
| 1978 | 2.6 |
| 1979 | 1.6 |
| 1980 | 1.9 |
| 1981 | 0.92 |
| 1982 | 3.7 |
| 1983 | 8.0 |
| 1984 | 2.3 |
| 1985 | 2.1 |
| 1986 | 1.2 |
| 1987 | 2.0 |
| 1988 | 1.9 |
| 1989 | 0.78 |
| 1990 | 0.91 |
| 1991 | 1.5 |
| 1992 | 1.9 |

Total Radioactivity = 580 μCi of $^{235+238}U$
No. of years with data = 24 years

* Please note units are in μCi.

# APPENDIX A

# ATTACHMENT 4

Attachment 4

# code of federal regulations

## Protection of Environment

# 40

PARTS 61 TO 71

**Revised as of July 1, 1995**

**CONTAINING**
**A CODIFICATION OF DOCUMENTS**
**OF GENERAL APPLICABILITY**
**AND FUTURE EFFECT**

**AS OF JULY 1, 1995**

***With Ancillaries***

Published by
the Office of the Federal Register
National Archives and Records
Administration

as a Special Edition of
the Federal Register

# Attachment 4



**§61.71 Recordkeeping.**

(a) The owner or operator of any source to which this subpart applies shall retain the following information at the source and make it available for inspection to the Administrator for a minimum of 3 years:

(1) A record of the leaks detected by the vinyl chloride monitoring system, as required by §61.65(b)(8), including the concentrations of vinyl chloride measured, analyzed, and recorded by the vinyl chloride detector, the location of each measurement and the date and approximate time of each measurement.

(2) A record of the leaks detected during routine monitoring with the portable hydrocarbon detector and the action taken to repair the leaks, as required by §61.65(b)(8), including a brief statement explaining the location and cause of each leak detected with the portable hydrocarbon detector, the date and time of the leak, and any action taken to eliminate that leak.

(3) A record of emissions measured in accordance with §61.68.

(4) A daily operating record for each polyvinyl chloride reactor, including pressures and temperatures.

[41 FR 46594, Oct. 21, 1976, as amended at 42 FR 29007, June 7, 1977; 51 FR 34914, Sept. 30, 1986]

## Subpart G—[Reserved]

## Subpart H—National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities

SOURCE: 54 FR 51695, Dec. 15, 1989, unless otherwise noted.

**§61.90 Designation of facilities.**

The provisions of this subpart apply to operations at any facility owned or operated by the Department of Energy that emits any radionuclide other than radon-222 and radon-220 into the air, except that this subpart does not apply to disposal at facilities subject to 40 CFR part 191, subpart B or 40 CFR part 192.

**§61.91 Definitions.**

As used in this subpart, all terms not defined here have the meaning given them in the Clean Air Act or 40 CFR part 61, subpart A. The following terms shall have the following specific meanings:

(a) *Effective dose equivalent* means the sum of the products of absorbed dose and appropriate factors to account for differences in biological effectiveness due to the quality of radiation and its distribution in the body of reference man. The unit of the effective dose equivalent is the rem. For purposes of this subpart, doses caused by radon-222 and its respective decay products formed after the radon is released from the facility are not included. The method for calculating effective dose equivalent and the definition of reference man are outlined in the International Commission on Radiological Protection's Publication No. 26.

(b) *Facility* means all buildings, structures and operations on one contiguous site.

(c) *Radionuclide* means a type of atom which spontaneously undergoes radioactive decay.

(d) *Residence* means any home, house, apartment building, or other place of dwelling which is occupied during any portion of the relevant year.

**§61.92 Standard.**

Emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.

**§61.93 Emission monitoring and test procedures.**

(a) To determine compliance with the standard, radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated using EPA approved sampling procedures, computer models CAP-88 or AIRDOS-PC, or other procedures for which EPA has granted prior approval. DOE facilities for which the maximally exposed individual lives within 3 kilometers of all sources of emissions in the facility, may use EPA's COMPLY model and associated

# Attachment 4



procedures for determining dose for purposes of compliance.

(b) Radionuclide emission rates from point sources (stacks or vents) shall be measured in accordance with the following requirements or other procedures for which EPA has granted prior approval:

(1) Effluent flow rate measurements shall be made using the following methods:

(i) Reference Method 2 of appendix A to part 60 shall be used to determine velocity and volumetric flow rates for stacks and large vents.

(ii) Reference Method 2A of appendix A to part 60 shall be used to measure flow rates through pipes and small vents.

(iii) The frequency of the flow rate measurements shall depend upon the variability of the effluent flow rate. For variable flow rates, continuous or frequent flow rate measurements shall be made. For relatively constant flow rates only periodic measurements are necessary.

(2) Radionuclides shall be directly monitored or extracted, collected and measured using the following methods:

(i) Reference Method 1 of appendix A part 60 shall be used to select monitoring or sampling sites.

(ii) The effluent stream shall be directly monitored continuously with an in-line detector or representative samples of the effluent stream shall be withdrawn continuously from the sampling site following the guidance presented in ANSIN13.1-1969 "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities" (including the guidance presented in appendix A of ANSIN13.1) (incorporated by reference—see §61.18). The requirements for continuous sampling are applicable to batch processes when the unit is in operation. Periodic sampling (grab samples) may be used only with EPA's prior approval. Such approval may be granted in cases where continuous sampling is not practical and radionuclide emission rates are relatively constant. In such cases, grab samples shall be collected with sufficient frequency so as to provide a representative sample of the emissions.

(iii) Radionuclides shall be collected and measured using procedures based on the principles of measurement described in appendix B, Method 114. Use of methods based on principles of measurement different from those described in appendix B, Method 114 must have prior approval from the Administrator. EPA reserves the right to approve measurement procedures.

(iv) A quality assurance program shall be conducted that meets the performance requirements described in appendix B, Method 114.

(3) When it is impractical to measure the effluent flow rate at an existing source in accordance with the requirements of paragraph (b)(1) of this section or to monitor or sample an effluent stream at an existing source in accordance with the site selection and sample extraction requirements of paragraph (b)(2) of this section, the facility owner or operator may use alternative effluent flow rate measurement procedures or site selection and sample extraction procedures provided that:

(i) It can be shown that the requirements of paragraph (b) (1) or (2) of this section are impractical for the effluent stream.

(ii) The alternative procedure will not significantly underestimate the emissions.

(iii) The alternative procedure is fully documented.

(iv) The owner or operator has received prior approval from EPA.

(4)(i) Radionuclide emission measurements in conformance with the requirements of paragraph (b) of this section shall be made at all release points which have a potential to discharge radionuclides into the air in quantities which could cause an effective dose equivalent in excess of 1% of the standard. All radionuclides which could contribute greater than 10% of the potential effective dose equivalent for a release point shall be measured. With prior EPA approval, DOE may determine these emissions through alternative procedures. For other release points which have a potential to release radionuclides into the air, periodic confirmatory measurements shall be made to verify the low emissions.

(ii) To determine whether a release point is subject to the emission measurement requirements of paragraph (b) of this section, it is necessary to evalu-

# Attachment 4



ate the potential for radionuclide emissions for that release point. In evaluating the potential of a release point to discharge radionuclides into the air for the purposes of this section, the estimated radionuclide release rates shall be based on the discharge of the effluent stream that would result if all pollution control equipment did not exist, but the facilities operations were otherwise normal.

(5) Environmental measurements of radionuclide air concentrations at critical receptor locations may be used as an alternative to air dispersion calculations in demonstrating compliance with the standard if the owner or operator meets the following criteria:

(i) The air at the point of measurement shall be continuously sampled for collection of radionuclides.

(ii) Those radionuclides released from the facility, which are the major contributors to the effective dose equivalent must be collected and measured as part of the environmental measurement program.

(iii) Radionuclide concentrations which would cause an effective dose equivalent of 10% of the standard shall be readily detectable and distinguishable from background.

(iv) Net measured radionuclide concentrations shall be compared to the concentration levels in Table 2 of appendix E to determine compliance with the standard. In the case of multiple radionuclides being released from a facility, compliance shall be demonstrated if the value for all radionuclides is less than the concentration level in Table 2, and the sum of the fractions that result when each measured concentration value is divided by the value in Table 2 for each radionuclide is less than 1.

(v) A quality assurance program shall be conducted that meets the performance requirements described in appendix B, Method 114.

(vi) Use of environmental measurements to demonstrate compliance with the standard is subject to prior approval of EPA. Applications for approval shall include a detailed description of the sampling and analytical methodology and show how the above criteria will be met.

**§61.94 Compliance and reporting.**

(a) Compliance with this standard shall be determined by calculating the highest effective dose equivalent to any member of the public at any offsite point where there is a residence, school, business or office. The owners or operators of each facility shall submit an annual report to both EPA headquarters and the appropriate regional office by June 30 which includes the results of the monitoring as recorded in DOE's Effluent Information System and the dose calculations required by §61.93(a) for the previous calendar year.

(b) In addition to the requirements of paragraph (a) of this section, an annual report shall include the following information:

(1) The name and location of the facility.

(2) A list of the radioactive materials used at the facility.

(3) A description of the handling and processing that the radioactive materials undergo at the facility.

(4) A list of the stacks or vents or other points where radioactive materials are released to the atmosphere.

(5) A description of the effluent controls that are used on each stack, vent, or other release point and an estimate of the efficiency of each control device.

(6) Distances from the points of release to the nearest residence, school, business or office and the nearest farms producing vegetables, milk, and meat.

(7) The values used for all other user-supplied input parameters for the computer models (e.g., meteorological data) and the source of these data.

(8) A brief description of all construction and modifications which were completed in the calendar year for which the report is prepared, but for which the requirement to apply for approval to construct or modify was waived under §61.96 and associated documentation developed by DOE to support the waiver. EPA reserves the right to require that DOE send to EPA all the information that normally would be required in an application to construct or modify, following receipt of the description and supporting documentation.

(9) Each report shall be signed and dated by a corporate officer or public

# APPENDIX A

# ATTACHMENT 5

Attachment 5

**MEMORANDUM**

**TO:** OU 1114 TECHNICAL TEAM

**FROM:** KIRBY HUESKE

**SUBJECT:** AIR EMISSION SWMUs

**DATE:** DECEMBER 22, 1993

In order to develop a defensible rationale for not sampling soil near the CRM, Cryogenics, Press, Mechanical Shops, Physics, and Van de Graaff buildings that may have been contaminated by emissions from associated stacks, the analysis described below was conducted to estimate the total emission that would have been necessary to cause a deposition rate sufficient to exceed soil SALs.

Several assumptions were made to arrive at predicted soil concentrations. It was assumed that all emissions were released in one year and remain in the top 15 cm of soil. This is conservative since portion of the released radionuclides may have decayed to a certain extent in the past forty years and since this approach does not account for naturally migration and attenuation. Additionally, because little information is known about release incidents and exact meteorologic conditions at the time of release, average wind directions and speeds have been used for the nearest meteorology station (TA-6). CAP88PC uses a gaussian plume model that has conservative assumptions inherent to the program, which errs on the side of overestimating deposition rates.

CAP88PC was run several times using TA-6 meteorological data, Los Alamos population data, and various total emission rates (0.1, 1.0, 10.0, and 100.0 Ci/yr) for the radionuclides expected to have been released. Among other things like dose equivalents, the model predicts deposition rates. Deposition rates in pC/m$^2$-sec were converted to pCi/g of soil using the following equation:

$$(\text{pCi/m}^2\text{-sec})(31{,}536{,}000\ \text{sec/yr})(\text{m}^2/10^4\text{cm}^2)(1/15\text{cm})(1\text{cm}^3/1.8\text{g}).$$

Residential soil SALs were compared to estimated soil concentrations although the SWMUs are on laboratory property and it is unlikely that this land will ever be used for residential purposes. It should be noted that the nearest public receptor is over 2 km away from the site whereas the area of highest deposition and soil concentration is 250m ESE of the site. I think that the conclusions made from this analysis, even without an precise quantified history of past emissions, adequately protects human health with or without soil sampling since actual soil concentrations directly impacted from the air emissions are very likely to be several orders of magnitude less than the predicted concentrations due to the conservative assumptions used in this approach.

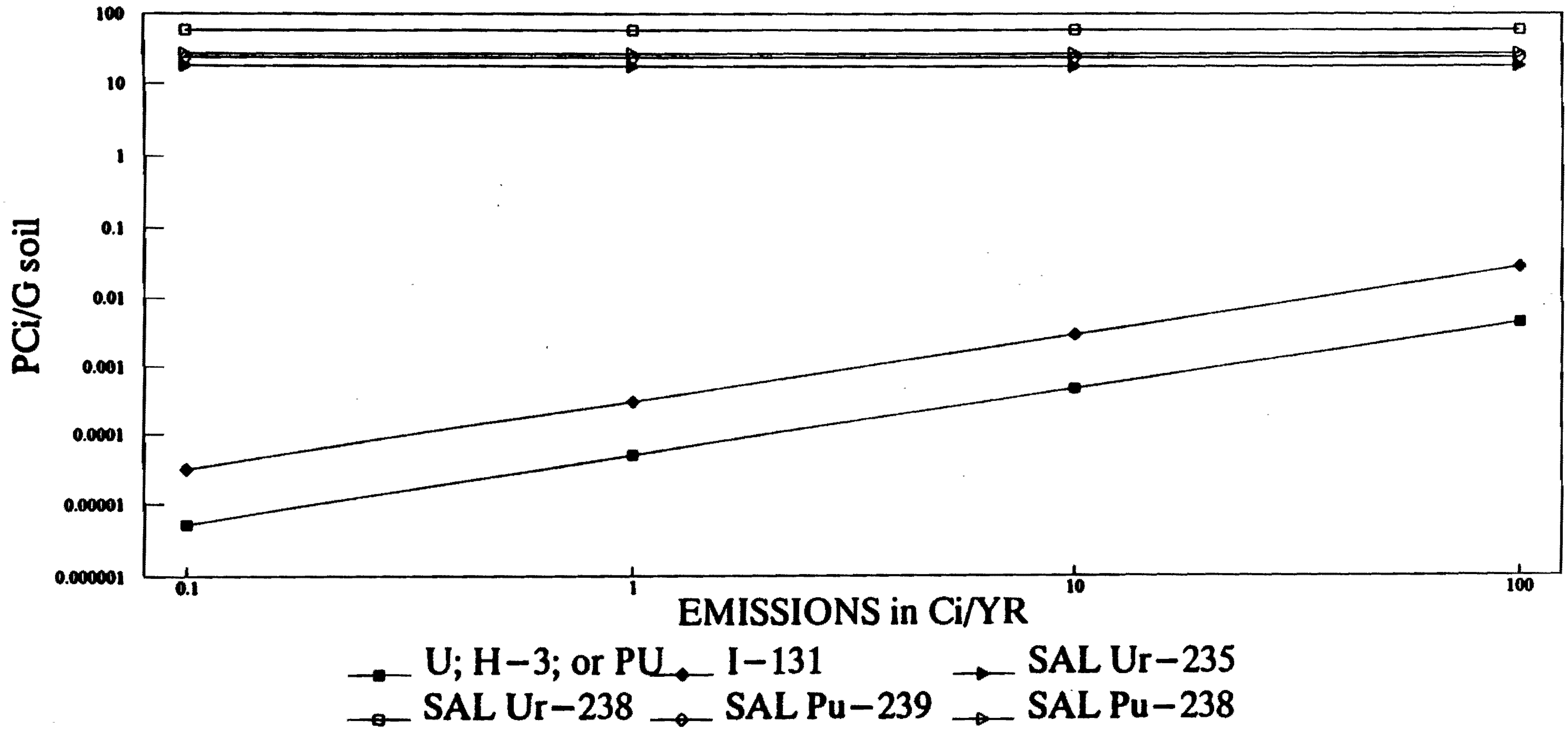


Figure 1. Comparison of Emissions to Soil Concentrations with SALs Provided

# APPENDIX A

# ATTACHMENT 6

Attachment 6 3-000259

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

# memorandum

TO: Robert Gonzales, EM-13, MS K481

DATE: August 12, 1991

THRU: Ron Conrad, EM-8, MS K490 *RC*

MAIL STOP/TELEPHONE: K490/7-0815

FROM: Phil Fresquez, EM-8 *PF*

SYMBOL: EM-8:91-52

SUBJECT: **RESULTS OF AN ENVIRONMENTAL RESTORATION INTERIM ACTION (ERIA) WASTE SURVEY AT THE VAN DE GRAAFF UNDERGROUND STORAGE TANK REMOVAL PROJECT AT TA-3**

As you recall, on June 25, 1991, we met with a group of people headed by Mr. Richard Roybal of Johnson Controls World Services Inc. (JCI) at the Van de Graaff facility (TA-3-16) to discuss the removal of an underground gasoline tank by the 1st of July. At that time, Mr. Chuck Richards of the Industrial Hygiene Group (HS-5) determined that there were no significant health hazards associated with the project as a result of Solid Waste Management Unit (SWMU) 3-050(g) (surface contamination from stack emissions). Mr. Dave McInroy of the Environmental Protection Group (EM-8), however, suggested that the soil be segregated and sampled for radiological and heavy metal waste constituents to determine the ultimate disposal site. We were also asked by Mr. Jerome Gonzales (JCI) to collect soil samples from four 55-gallon barrels located on the east side of building TA-3-16. The barrels were labeled "U.W.G.W. Excavation Dirt."

Therefore, on July 3, 1991, we collected one asphalt and two soil samples from three piles of material that had been segregated from the surface portion of the excavated hole. The contents of the barrels located on the east side of the building were also sampled. Sample materials were screened by EM-8 for gross alpha, beta and gamma radioactivity before they were submitted to the Health and Environmental Chemistry Group (EM-9) for the analysis of Toxicity Characteristic Leaching Procedure (TCLP) metals (Ag, As, Ba, Cd, Cr, Hg, Pb and Se).

Gross alpha, beta and gamma radioactivity were at background levels. Similarly, all samples (asphalt, soil surface and soil collected from the four barrels) had TCLP metals below Environmental Protection Agency (EPA) guidelines. These metals in the top surface materials (asphalt and soil) ranged from <10 to 14 ppb for Ag, from <0.01 to 0.02 ppm for As, from

## Attachment 6



<0.4 to 0.7 ppm for Ba, <0.01 ppm for Cd, <0.01 ppm for Cr, <0.02 ppb for Hg, <0.05 ppm for Pb, and <0.02 ppm for Se. Metals in the four barrels were all below detection limits; i.e., <10 ppb for Ag, <0.02 ppm for As, <0.7 ppm for Ba, <0.01 ppm for Cd, <0.01 ppm for Cr, <0.02 ppb for Hg, <0.05 ppm for Pb, and <0.02 ppm for Se.

PF:RC/gr

Cy: Keith Dowler, CLS-1, MS J585
Tom Gunderson, EM-DO, MS K491
Dave McInroy, EM-8, MS K490
Richard Romero, EM-8, MS K490
Larry Maassen, EM-13, MS K481
Ted Norris, EM-13, MS K481
Lars Soholt, EM-13, MS K481
Robert Vocke, EM-13, MS K481
Susan Rector, HS-5, MS K486
ER Records Management, MS M707
Richard Roybal, JCI/CAID, MS A199
Jerome Gonzales, JCI, MS A199
Circ. File
CRM-4, MS A150

# APPENDIX A

# ATTACHMENT 7

3-001026

**Attachment 7**

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

# memorandum

TO: Ed Griggs, CLS-DO, MS E525 — DATE: October 22, 1992

THRU: Ron Conrad, EM-8, MS K490 RC — MAIL STOP/TELEPHONE: K490/7-0815

FROM: Phil Fresquez, EM-8 — SYMBOL: EM-8:92-3234

SUBJECT: **COLLECTION OF SOIL SAMPLES AT SWMU 3-010(a)**

$^{3}H$, $^{238}Pu$, $^{239,240}Pu$ < SALs

On August 26, 1992, the Environmental Protection Group (EM-8) collected two soil and three sediment samples from Solid Waste Management Unit (SWMU) 3-010 located directly behind building TA-3-30. Two (soil) samples, collected at the 0 to 3-inch-depth, were located (sample #1) at the top of the slope within an obvious mercury (Hg) contaminated area (i.e., the Hg was visible on the soil surface) two feet away from the western edge of the TA-3 fence line, and (sample #2) approximately 27 feet down gradient of the first sampling point (Figure 1). The other three (sediment) samples were collected at the sediment/tuff interface along the length of a drainage channel down (stream) of the Hg contaminated area; sample #5 was located in the drainage channel directly below the Hg site, and samples #3 and #4 were located in the drainage channel approximately 31 and 63 feet down (stream) from sample location #5, respectively.

All soil/sediment samples were screened for gross alpha, beta and gamma activity before they were submitted under full chain-of-custody documentation to the Environmental Chemistry Group (EM-9). Sample #1, where visible signs of Hg were evident, was submitted for analysis of total Hg and Be, TCLP metals, total U, Pu-238, Pu-239,240, H-3, volatile organic compounds (VOC), total petroleum hydrocarbons (TPH) and polychlorinated biphenyls (PCB's). All other soil/sediment samples were submitted for metal and radiochemical analysis only. All locations of the sample points were surveyed and fixed to FIMAD maps.

Enclosed you will find all of the data. Gross alpha and beta activity for all soil/sediment samples measured <3 pCi/g and <17 pCi/g, respectively. Four soil/sediment samples measured <1.30 pCi/g for gross gamma activity, and one soil sample (sample #2) measured 5.65 pCi/g.

## Attachment 7



Total Hg levels (as measured with an x-ray fluorescence instrument) measured approximately 13,500 ppm in soil sample #1. Results from EM-9 show total Hg levels in soil samples #1 and #2 at >2000 and 1.7 ppm, respectively. Total Hg levels in the drainage channel measured 1.9 (sample #5), 0.05 (sample #3), and 0.002 ppm (sample #4). Levels of total Be and uranium in all soil/sediment samples were at background levels.

TCLP metals, Ba, Cd, Cr, Pb and Hg, in all soil/sediment samples were below EPA action levels; the highest Hg level was detected in sample #1 at 23.1 ppb. EPA action levels for Hg is 0.2 ppm.

Total petroleum hydrocarbon levels in sample #1 measured 37,000 ppm. No PCB's were measured above detection limits. Two VOC's, acetone (36 ppb) and 1,1,1-trichloroethane (160 ppb), were detected at ppb levels; these levels are far below EPA action levels, however.

Soil samples collected from the hillside (samples #1 and #2), and one sediment sample (#5) had concentrations of H-3, Pu-238, Pu-239,240 above upper limit background levels. Sample #2, for example, contained 189 pCi/mL of H-3, 0.28 pCi/g of Pu-238 and 1.55 pCi/g of Pu-239,240. Upper limit background levels (mean + 2S.D.) for H-3 is 7.2 pCi/mL, for Pu-238 it is 0.005 pCi/g and for Pu-239,240 it is 0.025 pCi/g. The other two sediment samples (#3 and #4) collected in the drainage channel did not contain radiological contaminants above upper limit background concentrations.

<SALS

PF:RC/gr

Enc. a/s

Cy: C. Martell, CLS-1, w/enc., MS E525
M. Saladen, EM-8, w/enc., MS K490
D. McInroy, EM-13, w/enc., MS M992
RM Records Processing Facility, w/enc., MS M707
Circ. File, w/o enc.

■ APPENDIX B

# Requested Modifications to Tables A, B, and C of the LANL HSWA Module

**Note:**
This appendix contains the requested modifications to Tables A, B, and C of the LANL HSWA Module. This appendix also includes requested modifications included in the permit modification requests submitted in March 1995 and September 1995. The date of each permit request is listed next to the SWMU proposed for deletion or addition. The requested deletions to the tables are indicated by using strike-through text. The bolded text indicates new text. The number to the side of each listing for a technical area denotes the number of SWMUs for that area. The number at the end of each page denotes the total number of SWMUs on that page.

## REQUESTED MODIFICATIONS TO TABLE A

SWMU Number

Technical Area 0

0-001
0-003
~~0-005~~ Mar. 1995
0-011 (a)
0-011 (c-e) ~~(21)~~
0-012 **(20)** Mar. 1995
0-016
0-017
0-018 (a)
0-019
0-028 (a-b)
0-030 (a-b)
0-030 (g)
0-030 (l-m)
0-033
0-039

Technical Area 1

~~1-001 (a-e)~~ Mar. 1995
**1-001 (a-g)** Mar. 1995
**1-001 (m)** Mar. 1995
**1-001 (o)** Mar. 1995
1-001 (s-u)
1-002
1-003 (a) ~~(36)~~
1-003 (d-e) **(30)** Mar. 1995
1-006 (a-d)
1-006 (h)
1-006 (n-o)
1-007 (a-e)
1-007 (j)
1-007 (l)

Technical Area 2

2-005
2-006 (a-b) **(9)**
2-007
2-008 (a-b)
2-009 (a-c)

Technical Area 3

~~3-001 (a-e)~~ Sept. 1995
~~3-001 (k)~~ Sept. 1995
~~3-002 (b-e)~~ Sept. 1995
**3-002(c)** Sept. 1995
~~3-003 (a-e)~~ Sept. 1995
**3-003(a-b)** Sept. 1995
~~3-009 (a-h)~~ Mar. 1995
~~3-009 (a)~~ Sept. 1995
~~3-009 (d)~~ Sept. 1995
~~3-009 (h)~~ Sept. 1995
3-010 (a)
~~3-012 (a-b)~~ Mar. 1995
**3-012 (b)** Mar. 1995
3-013 (a)
3-014 (a-u)
3-015 ~~(61)~~
~~3-018~~ Mar. 1995 ~~(51)~~ Mar. 1995
~~3-020 (a)~~ Mar. 1995 ~~(40)~~ Sept. 1995
3-026 (d) **(38)** Sept. 1996
3-028
3-033
~~3-035 (a-b)~~ Sept. 1995
3-036 (a)
3-036 (c-d)
3-037
3-038 (a-b)
~~3-039 (a)~~ Mar. 1995
~~3-043 (e)~~ Mar. 1995
~~3-044 (a)~~ Sept. 1996
~~3-056 (a)~~ Sept. 1996
3-056 (c)

Technical Area 4

4-001
4-002 **(4)**
4-003 (a-b)

Technical Area 5

5-001 (a-b)
5-002
5-003 **(11)**
5-004
5-005 (a-b)
5-006 (b,c,e,h)

~~(142)~~
~~(125)~~ Mar. 1995
~~(114)~~ Sept. 1995
**Total SWMUs (p. B-1)** **(112)** Sept. 1996

## REQUESTED MODIFICATIONS TO TABLE A (cont.)

Technical Area 6

6-001 (a-b)
6-002
6-003 (a) (19)
6-003 (c-h)
6-005
6-006
6-007 (a-g)

Technical Area 7

7-001 (a-d) ~~(6)~~
~~7-003 (c-d)~~ Sept. 1996 (4) Sept. 1996

Technical Area 8

8-002
~~8-003 (a-e)~~ Mar. 1995
**8-003 (a)** Mar. 1995
8-004 (a-d) Mar. 1995
8-005 Mar. 1995 ~~(16)~~
~~8-006 (a-b)~~ Mar. 1995 **(12)** Mar. 1995
**8-006 (a)** Mar. 1995
~~8-007~~ Mar. 1995
8-009 (a)
8-009 (d-e)
C-8-010

Technical Area 9

9-001 (a-d)
9-002
~~9-003 (a-i)~~ Mar. 1995
**9-003 (a)** Mar. 1995
**9-003 (b)** Mar. 1995
**9-003 (d)** Mar. 1995
**9-003 (e)** Mar. 1995
**9-003 (g-l)** Mar. 1995
9-004 (a-o)
~~9-005 (a-h)~~ Mar. 1995 ~~(43)~~
**9-005 (a)** Mar. 1995 **(34)** Mar. 1995
**9-005 (d)** Mar. 1995
9-006
~~9-007~~ Mar. 1995
9-008 (b)
9-009
9-013
C-9-001

Technical Area 10

10-001 (a-d)
10-002 (a-b)
10-003 (a-o) ~~(26)~~
10-004 (a-b) **(25)** Mar. 1995
10-005
~~10-006~~ Mar. 1995
10-007

Technical Area 11

11-001 (a-c)
11-002
11-004 (a-e)
11-005 (a-c) ~~(22)~~
11-006 (a-d) **(20)** Mar. 1995
~~11-007~~ Mar. 1995
11-009
~~11-011 (a-d)~~ Mar. 1995
**11-011 (a)** Mar. 1995
**11-011 (b)** Mar. 1995
**11-011 (d)** Mar. 1995

Technical Area 12

12-001 (a-b) ~~(3)~~
~~12-002~~ Mar. 1995 **(2)** Mar. 1995

Technical Area 13

13-001
13-002 (4)
13-003 (a)
13-004

Technical Area 14

14-002 (a-f)
14-003
~~14-004 (b)~~ Sept. 1995
14-005 ~~(13)~~
14-006 **(12)** Sept. 1995
14-007
14-009
14-010

~~(152)~~
~~(135)~~ Mar. 1995
~~(134)~~ Sept. 1995
**Total SWMUs (p. B-2)** **(132)** Sept. 1996

## REQUESTED MODIFICATIONS TO TABLE A (cont.)

Technical Area 15

15-002
15-003
15-004 (a-c)
15-004 (f-g)
~~15-004 (i)~~ Mar. 1995
15-006 (a-d) ~~(45)~~
~~15-007 (a-d)~~ Sept. 1995 ~~(44)~~ Mar. 1995
**15-007(a-c)** Sept. 1995 **(39)** Sept. 1995
15-008 (a-d)
~~15-009 (a-e)~~ Sept. 1995
**15-009(a)** Sept. 1995
~~15-009 (e-k)~~ Sept. 1995
**15-009(e-g)** Sept. 1995
**15-009(i-k)** Sept. 1995
15-010 (a-c)
15-011 (a-c)
15-012 (a-b)
15-014 (a-b)
~~15-014 (i-m)~~ Sept. 1995
**15-014(l-l)** Sept. 1995

Technical Area 16

16-001 (a-e)
16-003 (a-o)
16-004 (a-f)
16-005 (g)
~~16-005 (i)~~ Sept. 1995
~~16-005 (n-o)~~ Mar. 1995
**16-005 (n)** Mar. 1995
~~16-006 (a-f)~~ Mar. 1995
**16-006 (a)** Mar. 1995
**16-006 (c-e)** Mar. 1995
16-007 (a) ~~(105)~~
16-008 (a) ~~(91)~~ Mar. 1995
16-009 (a) **(74)** Sept. 1995
~~16-010 (a-n)~~ Mar. 1995
**16-010 (a-f)** Mar. 1995
**16-010 (h-n)** Mar. 1995
~~16-012 (a-z)~~ Mar. 1995
~~16-012 (a-e)~~ Sept. 1995
~~16-012 (e-h)~~ Sept. 1995
~~16-012 (k)~~ Sept. 1995
~~16-012 (o)~~ Sept. 1995
~~16-012 (q)~~ Sept. 1995
~~16-012 (r)~~ Sept. 1995
~~16-012 (s)~~ Sept. 1995
~~16-012 (v)~~ Sept. 1995
~~16-012 (w)~~ Sept. 1995
~~16-012 (y)~~ Sept. 1995
~~16-012 (z)~~ Sept. 1995
16-013
16-016 (a-c)
16-018
16-019
16-020
16-021 (a)
16-021 (c)
16-026 (b-e)
16-026 (h2)
16-026 (j2)
16-026 (v)
16-029 (a-g)
16-030 (h)
16-035
16-036

Technical Area 18

~~18-001 (a-e)~~ Sept. 1996
**18-001(a-b)** Sept. 1996
18-002 (a-b)
18-003 (a-h) ~~(19)~~
18-004 (a-b) **(17)** Sept. 1996
18-005 (a)
~~18-007~~ Sept. 1996
18-012 (a-b)

Technical Area 19

19-001
19-002 **(3)**
19-003

Technical Area 20

20-001 (a-c)
20-002 (a-d) **(9)**
20-003 (a)
20-005

~~(181)~~
~~(166)~~ Mar. 1995
~~(144)~~ Sept. 1995
**Total SWMUs (p. B-3)** **(142)** Sept. 1996

## REQUESTED MODIFICATIONS TO TABLE A (cont.)

Technical Area 21

21-002 (a)
21-003
21-004 (b-c)
21-005
21-006 (a-e)
21-007
21-010 (a-h) ~~(83)~~
21-011 (a-g) ~~(82)~~ Mar. 1995
21-011 (i-k) (75) Sept. 1995
~~21-012 (a-b)~~ Mar. 1995
**21-012 (b)** Mar. 1995
21-013 (a-e)
21-014
21-015
21-016 (a-c)
21-017 (a-c)
21-018 (a-b)
21-021
21-022 (a-j)
21-023 (a-d)
~~21-024 (a-e)~~ Sept. 1995
**21-024(a-l)** Sept. 1995
**21-024(l)** Sept. 1995
21-026 (a-b)
~~21-027 (a-d)~~ Sept. 1995
**21-027(a)** Sept. 1995
**21-027(c)** Sept. 1995
21-029

Technical Area 22

22-010 (a)
22-010 (b)
~~22-011~~ Mar. 1995
22-012
22-014 (a-b) ~~(12)~~
22-015 (a-e) (11) Mar. 1995
22-016

Technical Area 26

26-001
26-002 (a-b) (4)
26-003

Technical Area 27

~~27-001~~ Sept. 1996
27-002 (3)
~~27-003~~ Sept. 1996 (1) Sept. 1996

Technical Area 31

31-001 (1)

Technical Area 32

32-001
32-002 (a-b) (3)

Technical Area 33

33-001 (a-e)
33-002 (a-e)
33-003 (a-b)
~~33-004 (a-k)~~ Mar. 1995
~~33-004 (a-d)~~ Sept. 1995
**33-004(a-c)** Sept. 1995
~~33-004 (g-k)~~ Sept. 1995
**33-004(l-k)** Sept. 1995
33-004 (m)
33-005 (a-c)
33-006 (a-b) ~~(52)~~
33-007 (a-c) ~~(50)~~ Mar. 1995
33-008 (a-b) (44) Sept. 1995
33-009
33-010 (a-d)
~~33-010 (f-h)~~ Sept. 1995
**33-010(g-h)** Sept. 1995
33-011 (a)
~~33-011 (c-e)~~ Sept. 1995
**33-011(c-d)** Sept. 1995
~~33-012 (a)~~ Sept. 1995
33-013
33-014
33-015
33-016
33-017

**Total SWMUs (p. B-4)** ~~(158)~~ ~~(154)~~ Mar. 1995 ~~(141)~~ Sept. 1995 (139) Sept. 1996

## REQUESTED MODIFICATIONS TO TABLE A (cont.)

Technical Area 35
~~35-002~~ Mar. 1995
~~35-003 (a-q)~~ Mar. 1995
**35-003 (a-h)** Mar. 1995
**35-003 (j-o)** Mar. 1995
**35-003 (q)** Mar. 1995
35-004 (a-b)
~~35-004 (e)~~ Mar. 1995
35-004 (g-h)
~~35-006~~ Mar. 1995
35-008
35-009 (a-e)
35-010 (a-d)
~~35-011 (a)~~ Mar. 1995
~~35-013 (a-d)~~ Mar. 1995 ~~(54)~~
35-014 (a-b) **(44)** Mar. 1995
35-014 (e)
35-014 (g)
35-015 (a-b)
35-016 (a)
35-016 (c-d)
35-016 (i)
35-016 (k)
35-016 (m)
35-016 (o-q)

Technical Area 36
36-001
~~36-002~~ Sept. 1996
~~36-003 (a-e)~~ Mar. 1995 ~~(9)~~
**36-003(a)** Mar. 1995 ~~(8)~~ Mar. 1995
**36-003(b)** Mar. 1995 (7) Sept. 1996
36-004 (d)
36-005
36-006
C-36-003

Technical Area 39
39-001 (a-b)
39-002 (a)
~~39-003~~ Mar. 1995 ~~(14)~~
39-004 (a-e) **(12)** Mar. 1995
39-005
~~39-006 (a-b)~~ Mar. 1995
**39-006(a)** Mar. 1995
39-007 (a)
39-008

Technical Area 40
~~40-001 (a-e)~~ Mar. 1995
**40-001 (b)** Mar. 1995
**40-001 (c)** Mar. 1995
40-003 (a)
40-004 ~~(11)~~
40-005 **(10)** Mar. 1995
40-006 (a-c)
40-009
40-010

Technical Area 41
41-001 **(4)**
41-002 (a-c)

Technical Area 42
42-001 (a-c)
42-002 (b) **(5)**
42-003

Technical Area 43
43-001 (a) **(2)**
43-002

Technical Area 45
45-001
45-002 **(4)**
45-003
45-004

Technical Area 46
46-002
46-003 (a-h)
~~46-004 (a-h)~~ Mar. 1995
**46-004 (b-h)**
46-004 (a2-d2)
46-004 (m)
46-004 (p-z)
46-005 ~~(51)~~
46-006 (a-d) **(49)** Mar. 1995
46-006 (f-g)
46-007
~~46-008 (a-g)~~ Mar. 1995
**46-008 (a)** Mar. 1995
**46-008 (b)** Mar. 1995
**46-008 (d-g)** Mar. 1995
46-009 (a-b)
46-010 (d)

~~(154)~~
~~(138)~~ Mar. 1995
**Total SWMUs (p. B-5)** **(137)** Sept. 1996

## REQUESTED MODIFICATIONS TO TABLE A (cont.)

Technical Area 48

48-002 (a-b)
48-003
~~48-004 (a-e)~~ Mar. 1995 ~~(13)~~
48-005 (10) Mar. 1995
48-007 (a-d)
48-007 (f)
48-010

Technical Area 49

49-001 (a-g)
49-003 (11)
49-004
49-005 (a)
49-006

Technical Area 50

50-001 (a)
50-002 (a-c)
50-004 (a-c) (12)
50-006 (a)
50-006 (c-d)
50-009
50-011 (a)

Technical Area 52

~~52-001 (a-d)~~ Mar. 1995
~~52-002 (a-f)~~ Mar. 1995 ~~(10)~~
**52-002 (a)** ~~(2)~~ Mar. 1995
~~52-002 (e)~~ Sept. 1996 (1) Sept. 1996

Technical Area 53

53-001 (a-b)
53-002 (a-b)
53-005 ~~(12)~~
53-006 (b-f) (11) Sept. 1995
~~53-007 (a-b)~~ Sept. 1995
**53-007(a)** Sept. 1995

Technical Area 54

54-001 (a)
~~54-001 (e)~~ Mar. 1995
54-004 (excluding Shaft No. 9)
54-005
54-006
~~54-007 (a-e)~~ Mar. 1995 ~~(20)~~
**54-007 (a)** Mar. 1995 **(16)** Mar. 1995
**54-007 (c)** Mar. 1995
54-012 (b)
~~54-013 (a-b)~~ Mar. 1995
**54-013 (b)** Mar. 1995
54-014 (b-d)
~~54-015 (h)~~ Mar. 1995
54-015 (k)
54-017
54-018
54-019
54-020

Technical Area 55

~~55-008~~ Mar. 1995 ~~(2)~~
~~55-009~~ Mar. 1995 (0) Mar. 1995

Technical Area 59

~~59-001~~ Mar. 1995 ~~(1)~~
(0) Mar. 1995

Technical Area 60

~~60-002~~ Mar. 1995
60-005 (a) ~~(5)~~
60-006 (a) (4) Mar. 1995
60-007 (a-b)

Technical Area 61

61-002
~~61-004(a)~~ Mar. 1995 ~~(5)~~
61-005 ~~(4)~~ Mar. 1995
61-006 (3) Sept. 1995
~~61-007~~ Sept. 1995

Technical Area 63

63-001(a-b) (2)

Technical Area 69

69-001 (1)

~~(94)~~
~~(74)~~ Mar. 1995
~~(72)~~ Sept. 1995
**Total SWMUs (p. B-6)** (71) Sept. 1996

## REQUESTED MODIFICATIONS TO TABLE A (cont.)

Technical Area 73

73-001 (a-d)
73-002
73-004 (a-d) (11)
73-005
73-006

~~(11)~~

**Total SWMUs in Table A**
= ~~802~~
~~803~~ Mar. 1995
~~754~~ Sept. 1995
**744** Sept. 1996

## REQUESTED MODIFICATIONS TO TABLE B - PRIORITY SWMUS

| SWMU No. | | SWMU No. | |
|---|---|---|---|
| ~~0-005~~ | Mar. 1995 | 16-018 | |
| ~~1-001 (a-n)~~ | Mar. 1995 | 16-019 | |
| **1-001 (a-g)** | Mar. 1995 | 16-020 | |
| **1-001 (o)** | Mar. 1995 | 16-021 (a) | |
| 1-002 | | 18-001 (a) | |
| 1-003 (a) | | 18-003 (a-h) | |
| 2-005 | | 21-006 (a-e) | |
| 2-008 (a) | | 21-010 (a-h) | |
| 3-010 (a) | | 21-011 (a-i) | |
| ~~3-012 (a-b)~~ | Mar. 1995 | ~~21-012 (a)~~ | Mar. 1995 |
| **3-012 (b)** | Mar. 1995 | 21-014 | |
| 3-013 (a) | | 21-015 | |
| 3-015 | | 21-016 (a) | |
| ~~3-020 (a)~~ | Mar. 1995 | 21-017(a-c) | |
| 5-005 (a) | | 21-018 (a-b) | |
| 6-007 (a) | | 22-015 (c) | |
| ~~8-003 (a-e)~~ | Mar. 1995 | 33-002 (a-c) | |
| **8-003(a)** | Mar. 1995 | 33-017 | |
| ~~8-007~~ | Mar. 1995 | ~~35-003 (a-q)~~ | Mar. 1995 |
| 9-008 (b) | | **35-003 (a-h)** | Mar. 1995 |
| 9-009 | | **35-003 (j-o)** | Mar. 1995 |
| 9-013 | | **35-003 (q)** | Mar. 1995 |
| 10-003 (a-f) | | ~~35-006~~ | Mar. 1995 |
| ~~10-006~~ | Mar. 1995 | 35-010 (a-d) | |
| 11-004 (a-e) | | ~~36-003 (a-e)~~ | Mar. 1995 |
| 11-005 (a-b) | | **36-003 (a)** | Mar. 1995 |
| 11-006 (a) | | **36-003 (b)** | Mar. 1995 |
| 13-004 | | 39-001 (a-b) | |
| 15-002 | | 41-001 | |
| 15-006 (a-d) | | 46-002 | |
| ~~15-007 (a-d)~~ | Sept. 1995 | 46-006 (a-d) | |
| **15-007(a-c)** | Sept. 1995 | 46-007 | |
| 15-008 (a-d) | | 49-001 (a) | |
| ~~15-009 (a-b)~~ | Sept. 1995 | 50-006 (a) | |
| **15-009(a)** | Sept. 1995 | 50-006 (c-d) | |
| 15-012 (a-g) | | 50-009 | |
| 16-001 (b-e) | | 54-004 (except Shaft No. 9) | |
| ~~16-005 (n-o)~~ | Mar. 1995 | 54-005 | |
| **16-005 (n)** | Mar. 1995 | ~~54-015 (h)~~ | Mar. 1995 |
| 16-006 (a) | | 60-005 (a) | |
| ~~16-006 (c-f)~~ | Mar. 1995 | 73-001 (a) | |
| **16-006 (c-e)** | Mar. 1995 | | |
| 16-007 | | ~~**179 SWMUs**~~ | |
| 16-008 (b) | | ~~159~~ | Mar. 1995 |
| 16-016 | | **(157)** | Sept. 1995 |

As RFI work progresses, EPA may identify more SWMUs to be added to the list to be addressed in the installation workplans.

## REQUESTED MODIFICATIONS TO TABLE C

**RFI Work Plan due July 7, 1994:**

Technical Area 16

| | |
|---|---|
| ~~16-005 (a-f)~~ | Sept. 1995 |
| **16-005(a)** | Sept. 1995 |
| **16-005(c-e)** | Sept. 1995 |
| 16-005 (h) | |
| 16-005 (j-m) | |
| ~~16-006 (g-i)~~ | Sept. 1995 |
| **16-006(g-h)** | Sept. 1995 |
| 16-015 (a,b) | |
| 16-017 | |
| 16-024(e) | |
| 16-025 (a) | |
| 16-025 (b-b2) | |
| ~~16-025 (c-c2)~~ | Sept. 1995 |
| **16-025(c2)** | Sept. 1995 |
| 16-025 (d-f) | |
| ~~16-025 (g-g2)~~ | Sept. 1995 |
| **16-025(g)** | Sept. 1995 |
| 16-025 (h-z) | |
| ~~16-026 (i2)~~ | Sept. 1995 |
| 16-026 (m-q) | |
| 16-026 (s) | |
| 16-026 (w) | |
| 16-028 (a) | |
| 16-029 (a2-h2) | |
| 16-029 (k-z) | |
| 16-031 (c-d) | |
| ~~16-031 (g)~~ | Sept. 1995 |
| 16-032 (a) | |
| ~~16-032 (c-e)~~ | Sept. 1995 |
| **16-032(c)** | Sept. 1995 |
| ~~16-034 (a-g)~~ | Sept. 1995 |
| **16-034(a-f)** | Sept. 1995 |
| 16-034 (l-p) | |
| C-16-025 | |
| C-16-026 | |

**Total SWMUs = ~~101~~**
**(91)** Sept. 1995

**RFI Work Plan due July 7, 1995:**

Technical Area 16

16-016 (d-e)
16-016 (g)
16-025 (a2)
16-025 (d2)
16-025 (e2)
16-025 (f2)
16-025 (h2)
16-026 (a-a2)
16-026 (b2)
16-026 (c2)
16-026 (d2)
16-026 (e2)
16-026 (f-f2)
16-026 (g-g2)
16-026 (h-j)
16-026 (k-k2)
16-026 (l)
16-026 (r)
16-026 (t-u)
16-026 (x-z)
16-028 (b-e)
16-029 (h-j)
16-030 (a-c)
16-030 (e-f)
16-031 (a-b)
16-031 (e-f)
16-031 (h)
16-034 (h-k)

**Total SWMUs = 51**

**RFI Work Plan due May 21, 1995:**

Operable Unit 1114

| | |
|---|---|
| ~~3-002(a)~~ | Sept. 1996 |
| ~~3-002(d)~~ | Sept. 1996 |
| ~~3-009(i)~~ | Sept. 1996 |
| ~~3-009(j)~~ | Sept. 1996 |
| 3-011 | |
| ~~3-019~~ | Sept. 1996 |
| 3-021 | |
| ~~3-024~~ | Sept. 1996 |
| ~~3-025(a-b)~~ | Sept. 1996 |
| **3-025(b)** | Sept. 1996 |
| ~~3-026(b-c)~~ | Sept. 1996 |
| **3-026(c)** | Sept. 1996 |
| 3-029 | |
| ~~3-031~~ | Sept. 1996 |
| ~~3-032~~ | Sept. 1996 |
| 3-034(a-b) | |
| ~~3-043(e)~~ | Sept. 1996 |
| ~~3-045(a-i)~~ | Sept. 1996 |
| **3-045(b,c,g)** | Sept. 1996 |
| 3-046 | |
| ~~3-049(a-c)~~ | Sept. 1996 |
| **3-049(a-b)** | |
| ~~3-050(a)~~ | Sept. 1996 |
| ~~3-050(d-g)~~ | Sept. 1996 |
| 3-052(a) | |
| ~~3-052(e)~~ | Sept. 1996 |
| 3-052(e-f) | |
| ~~3-054(a-e)~~ | Sept. 1996 |
| **3-054(b,c,e)** | |
| ~~3-055(a)~~ | Sept. 1996 |
| ~~3-055(c-d)~~ | Sept. 1996 |
| **3-055(c)** | |
| 3-056(d) | |
| ~~3-056(l-n)~~ | Sept. 1996 |
| **3-056(l)** | |
| 3-059 | |

**Total SWMUs = ~~55~~**
**(23)** Sept. 1996

■ **APPENDIX C**

# Proposed Tables A, B, and C of the LANL HSWA Module

**Note:**
This appendix contains the proposed Tables A, B, and C for the LANL HSWA Module. This appendix also contains proposed new text requested in the permit modification submitted March 1995 and September 1995. The bolded text indicates the proposed new text. The number to the side of each listing for a technical area denotes the number of PRSs for that area. The number at the end of each page denotes the total number of PRSs on that page.

## PROPOSED TABLE A

SWMU Number

Technical Area 0
0-001
0-003
0-011 (a)
0-011 (c-e)
0-012 **(20)**
0-016
0-017
0-018 (a)
0-019
0-028 (a-b)
0-030 (a-b)
0-030 (g)
0-030 (l-m)
0-033
0-039

Technical Area 1
**1-001 (a-g)** Mar. 1995
**1-001 (m)** Mar. 1995
**1-001 (o)** Mar. 1995
1-001 (s-u)
1-002
1-003 (a)
1-003 (d-e) **(30)**
1-006 (a-d)
1-006 (h)
1-006 (n-o)
1-007 (a-e)
1-007 (j)
1-007 (l)

Technical Area 2
2-005
2-006 (a-b) **(9)**
2-007
2-008 (a-b)
2-009 (a-c)

Technical Area 3
**3-002(c)** Sept. 1995
**3-003(a-b)** Sept. 1995
3-010 (a)
**3-012 (b)** Mar. 1995
3-013 (a)
3-014 (a-u)
3-015
3-026 (d)
3-028
3-033
3-036 (a) **(38)**
3-036 (c-d)
3-037
3-038 (a-b)
3-056 (c)

Technical Area 4
4-001
4-002 **(4)**
4-003 (a-b)

Technical Area 5
5-001 (a-b)
5-002
5-003 **(11)**
5-004
5-005 (a-b)
5-006 (b,c,e,h)

Technical Area 6
6-001 (a-b)
6-002
6-003 (a) **(19)**
6-003 (c-h)
6-005
6-006
6-007 (a-g)

**(131)**

**PROPOSED TABLE A (cont.)**

Technical Area 7

7-001 (a-d) **(4)**

Technical Area 8

8-002
**8-003 (a)** Mar. 1995
8-004 (a-d)
8-005 **(12)**
**8-006 (a)** Mar. 1995
8-009 (a)
8-009 (d-e)
C-8-010

Technical Area 9

9-001 (a-d)
9-002
**9-003 (a)** Mar. 1995 **(34)**
**9-003 (b)** Mar. 1995
**9-003 (d)** Mar. 1995
**9-003 (e)** Mar. 1995
**9-003 (g-l)** Mar. 1995
9-004 (a-o)
**9-005 (a)** Mar. 1995
**9-005 (d)** Mar. 1995
9-006
9-008 (b)
9-009
9-013
C-9-001

Technical Area 10

10-001 (a-d)
10-002 (a-b)
10-003 (a-o)
10-004 (a-b) **(25)**
10-005
10-007

Technical Area 11

11-001 (a-c)
11-002
11-004 (a-e)
11-005 (a-c)
11-006 (a-d) **(20)**
11-009
**11-011 (a)** Mar. 1995
**11-011 (b)** Mar. 1995
**11-011 (d)** Mar. 1995

Technical Area 12

12-001(a-b) **(2)**

Technical Area 13

13-001
13-002 **(4)**
13-003 (a)
13-004

Technical Area 14

14-002 (a-f)
14-003
14-005 **(12)**
14-006
14-007
14-009
14-010

Technical Area 15

15-002
15-003
15-004 (a-c)
15-004 (f-g)
15-006 (a-d) **(39)**
**15-007(a-c)** Sept. 1995
15-008 (a-d)
**15-009(a)** Sept. 1995
**15-009(e-g)** Sept. 1995
**15-009(i-k)** Sept. 1995
15-010 (a-c)
15-011 (a-c)
15-012 (a-b)
15-014 (a-b)
**15-014(i-l)** Sept. 1995

**(152)**

## PROPOSED TABLE A (cont.)

Technical Area 16
16-001 (a-e)
16-003 (a-o)
16-004 (a-f)
16-005 (g)
**16-005 (n)** Mar. 1995
**16-006 (a)** Mar. 1995
**16-006 (c-e)** Mar. 1995
16-007 (a)
16-008 (a) **(74)**
16-009 (a)
**16-010 (a-f)** Mar. 1995
**16-010 (h-n)** Mar. 1995
16-013
16-016 (a-c)
16-018
16-019
16-020
16-021 (a)
16-021 (c)
16-026 (b-e)
16-026 (h2)
16-026 (j2)
16-026 (v)
16-029 (a-g)
16-030 (h)
16-035
16-036

Technical Area 18
**18-001 (a-b)** Sept. 1996
18-002 (a-b)
18-003 (a-h) **(17)**
18-004 (a-b)
18-005 (a)
18-012 (a-b)

Technical Area 19
19-001
19-002 **(3)**
19-003

Technical Area 20
20-001 (a-c)
20-002 (a-d) **(9)**
20-003 (a)
20-005

Technical Area 21
21-002 (a)
21-003
21-004 (b-c)
21-005
21-006 (a-e)
21-007
21-010 (a-h)
21-011 (a-g) **(75)**
21-011 (i-k)
**21-012 (b)** Mar. 1995
21-013 (a-e)
21-014
21-015
21-016 (a-c)
21-017 (a-c)
21-018 (a-b)
21-021
21-022 (a-j)
21-023 (a-d)
**21-024 (a-l)** Sept. 1995
**21-024(l)** Sept. 1995
21-026 (a-b)
**21-027 (a)** Sept. 1995
**21-027(c)** Sept. 1995
21-029

Technical Area 22
22-010 (a)
22-010 (b)
22-012
22-014 (a-b) **(11)**
22-015 (a-e)
22-016

Technical Area 26
26-001
26-002 (a-b) **(4)**
26-003

**(193)**

## PROPOSED TABLE A (cont.)

Technical Area 27

27-002 (1)

Technical Area 31

31-001 (1)

Technical Area 32

32-001
32-002 (a-b) (3)

Technical Area 33

33-001 (a-e)
33-002 (a-e)
33-003 (a-b)
**33-004 (a-c)** Sept. 1995
**33-004 (i-k)** Sept. 1995
33-004 (m)
33-005 (a-c)
33-006 (a-b)
33-007 (a-c) (44)
33-008 (a-b)
33-009
33-010 (a-d)
**33-010 (g-h)** Sept. 1995
33-011 (a)
**33-011 (c-d)** Sept. 1995
33-013
33-014
33-015
33-016
33-017

Technical Area 35

**35-003 (a-h)** Mar. 1995
**35-003 (j-o)** Mar. 1995
**35-003 (q)** Mar. 1995
35-004 (a-b)
35-004 (g-h)
35-008
35-009 (a-e)
35-010 (a-d)
35-014 (a-b) (44)
35-014 (e)
35-014 (g)
35-015 (a-b)
35-016 (a)
35-016 (c-d)
35-016 (i)
35-016 (k)
35-016 (m)
35-016 (o-q)

Technical Area 36

36-001
**36-003 (a)** Mar. 1995 (7)
**36-003 (b)** Mar. 1995
36-004 (d)
36-005
36-006
C-36-003

Technical Area 39

39-001 (a-b)
39-002 (a)
39-004 (a-e) (12)
39-005
**39-006(a)** Mar. 1995
39-007 (a)
39-008

Technical Area 40

**40-001 (b)** Mar. 1995
**40-001 (c)** Mar. 1995
40-003 (a)
40-004
40-005 (10)
40-006 (a-c)
40-009
40-010

Technical Area 41

41-001 (4)
41-002 (a-c)

Technical Area 42

42-001 (a-c)
42-002 (b) (5)
42-003

(131)

## PROPOSED TABLE A (cont.)

Technical Area 43
43-001 (a) (2)
43-002

Technical Area 45
45-001
45-002 (4)
45-003
45-004

Technical Area 46
46-002
46-003 (a-h)
**46-004 (b-h)** Mar. 1995
46-004 (a2-d2)
46-004 (m)
46-004 (p-z)
46-005
46-006 (a-d) (49)
46-006 (f-g)
46-007
**46-008 (a)** Mar. 1995
**46-008 (b)** Mar. 1995
**46-008 (d-g)** Mar. 1995
46-009 (a-b)
46-010 (d)

Technical Area 48
48-002 (a-b)
48-003
48-005 (10)
48-007 (a-d)
48-007 (f)
48-010

Technical Area 49
49-001 (a-g)
49-003 (11)
49-004
49-005 (a)
49-006

Technical Area 50
50-001 (a)
50-002 (a-c)
50-004 (a-c) (12)
50-006 (a)
50-006 (c-d)
50-009
50-011 (a)

Technical Area 52
52-002 (a) (1)

Technical Area 53
53-001 (a-b)
53-002 (a-b)
53-005 (11)
53-006 (b-f)
**53-007 (a)** Sept. 1996

Technical Area 54
54-001 (a)
54-004 (excluding Shaft No. 9)
54-005
54-006
**54-007 (a)** Mar. 1995 (16)
**54-007 (c)** Mar. 1995
54-012 (b)
**54-013 (b)** Mar. 1995
54-014 (b-d)
54-015 (k)
54-017
54-018
54-019
54-020

Technical Area 60
60-005 (a)
60-006 (a) (4)
60-007 (a-b)

Technical Area 61
61-002
61-005 (3)
61-006

(123)

PROPOSED TABLE A (cont.)

Technical Area 63
63-001(a-b) (2)

Technical Area 69
69-001 (1)

Technical Area 73
73-001 (a-d)
73-002
73-004 (a-d) (11)
73-005
73-006

(14)

**Total SWMUs in Table A = 744**

## PROPOSED TABLE B - PRIORITY SWMUs

SWMU No.

**1-001 (a-g)** Mar. 1995
**1-001 (o)** Mar. 1995
1-002
1-003 (a)
2-005
2-008 (a)
3-010 (a)
**3-012 (b)** Mar. 1995
3-013 (a)
3-015
5-005 (a)
6-007 (a)
**8-003(a)** Mar. 1995
9-008 (b)
9-009
9-013
10-003 (a-f)
11-004 (a-e)
11-005 (a-b)
11-006 (a)
13-004
15-002
15-006 (a-d)
**15-007 (a-c)** Sept. 1995
15-008 (a-d)
**15-009 (a)** Sept. 1995
15-012 (a-g)
16-001 (b-e)
**16-005 (n)** Mar. 1995
16-006 (a)
**16-006 (c-e)** Mar. 1995
16-007
16-008 (b)
16-016
16-018

SWMU No.

16-019
16-020
16-021 (a)
18-001 (a)
18-003 (a-h)
21-006 (a-e)
21-010 (a-h)
21-011 (a-i)
21-014
21-015
21-016 (a)
21-017(a-c)
21-018 (a-b)
22-015 (c)
33-002 (a-c)
33-017
**35-003 (a-h)** Mar. 1995
**35-003 (j-o)** Mar. 1995
**35-003 (q)** Mar. 1995
35-010 (a-d)
**36-003 (a)** Mar. 1995
**36-003 (b)** Mar. 1995
39-001 (a-b)
41-001
46-002
46-006 (a-d)
46-007
49-001 (a)
50-006 (a)
50-006 (c-d)
50-009
54-004 (except Shaft No. 9)
54-005
60-005 (a)
73-001 (a)

**157** SWMUs

As RFI work progresses, EPA may identify more SWMUs to be added to the list to be addressed in the installation workplans.

## PROPOSED TABLE C

**RFI Work Plan due July 7, 1994:**

Technical Area 16

**16-005 (a)** Sept. 1995
**16-005 (c-e)** Sept. 1995
16-005 (h)
16-005 (j-m)
**16-006 (g-h)** Sept. 1995
16-015 (a,b)
16-017
16-024(e)
16-025 (a)
16-025 (b-b2)
**16-025 (c2)** Sept. 1995
16-025 (d-f)
**16-025 (g)** Sept. 1995
16-025 (h-z)
16-026 (m-q)
16-026 (s)
16-026 (w)
16-028 (a)
16-029 (a2-h2)
16-029 (k-z)
16-031 (c-d)
16-032 (a)
**16-032 (c)** Sept. 1995
**16-034 (a-f)** Sept. 1995
16-034 (l-p)
C-16-025
C-16-026

**Total SWMUs = 91**

**RFI Work Plan due July 7, 1995:**

Technical Area 16

16-016 (d-e)
16-016 (g)
16-025 (a2)
16-025 (d2)
16-025 (e2)
16-025 (f2)
16-025 (h2)
16-026 (a-a2)
16-026 (b2)
16-026 (c2)
16-026 (d2)
16-026 (e2)
16-026 (f-f2)
16-026 (g-g2)
16-026 (h-j)
16-026 (k-k2)
16-026 (l)
16-026 (r)
16-026 (t-u)
16-026 (x-z)
16-028 (b-e)
16-029 (h-j)
16-030 (a-c)
16-030 (e-f)
16-031 (a-b)
16-031 (e-f)
16-031 (h)
16-034 (h-k)

**Total SWMUs = 51**

**RFI Work Plan due May 21, 1995:**

Operable Unit 1114

3-011
3-021
**3-025 (b)** Sept. 1996
**3-026 (c)** Sept. 1996
3-029
3-034 (a-b)
**3-045 (b,c,g)** Sept. 1996
3-046
**3-049(a-b)** Sept. 1996
3-052 (a)
3-052 (e-f)
**3-054 (b,c,e)** Sept. 1996
**3-055 (c)** Sept. 1996
3-056 (d)
**3-056 (l)** Sept. 1996
3-059

**Total SWMUs = 23**