Permit

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Hazardous Waste Bureau

Environmental Protection Division
Water Quality & RCRA (ENV-RCRA)
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Date: February 2, 2007
Refer To: ENV-RCRA: 07-024

Mr. Steve Pullen
Permit Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

SUBJECT: RESPONSE TO REQUEST FOR ADDITIONAL ELECTRONIC FILES OF PERMIT RENEWAL DOCUMENTS, LOS ALAMOS NATIONAL LABORATORY, EPA ID NM0890010515

Mr. Pullen:

The purpose of this letter is to submit additional electronic copies in a different format of Los Alamos National Laboratory permit renewal documents as requested by you during a phone conversation with Luciana Vigil-Holterman of my staff on January 31, 2007. The Adobe Acrobat (.pdf) files contained on the enclosed compact disc include the full content of the following documents, with one exception as described.

- "Los Alamos National Laboratory Technical Area 50 Part B Permit Renewal Application," Revision 3.0, August 2002, LA-UR-02-4739 (This document does not contain Figure 4-1. This figure is available hard copy only.)
- "Los Alamos National Laboratory General Part B Permit Renewal Application," Revision 2.0, August 2003, LA-UR-03-5923
- "Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Application," Revision 4.0, June 2003, LA-UR-03-3903
- "Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application," Revision 3.0, June 2003, LA-UR-03-3579
- "Los Alamos National Laboratory Technical Area 55 Part B Permit Application," Revision 2.0, September 2003, LA-UR-03-6303

16354

Electronic copies of Unclassified Controlled Nuclear Information (UCNI) defined by Section 148 of the Atomic Energy Act have not been included with this submittal. We appreciate the opportunity to contribute to your review. If you have questions, please contact Jack Ellvinger, at 667-0633.

Sincerely,

Dep. Grp. Ldr

for Anthony R. Grieggs
Group Leader
Water Quality & RCRA Group

ARG:LV/tag

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Department of Energy
National Nuclear Security Administration
Albuquerque Operations Office
Office of Los Alamos Site Operations
Los Alamos, New Mexico 87544

JUL 3 1 2002

Carl Will, RCRA Permits Program
Hazardous & Radioactive Materials Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Subject: Transmittal of the U.S. Department of Energy (DOE)/University of California (UC) Revised Permit Application for TA-50 Revision 3.0; and Closure Plan for Three Container Storage Units (CSUs) at TA-50; TA-50-1-59, TA-50-114, and TA-50-37

Dear Mr. Will:

The purpose of this letter is to transmit to you the DOE/UC Revision 3.0 of the TA-50 permit application and the closure plan for CSUs TA-50-1-59, TA-50-114, and TA-50-37. The requirement for submittal of these documents is twofold. Initially, DOE/UC had agreed to submit the application revision upon the completion of the NODIRSI process. It was also agreed to submit a closure plan for any units at T A-50 that would be closing prior to the publishing of the draft permit. This submittal fulfills that obligation.

Additionally, when your Bureau had issued a permit fee invoice for the T A-50 permit application it was appealed. Through the appeal process both the New Mexico Environment Department and DOE/UC entered into a settlement agreement. That agreement is dated July 5, 2002 and bears the number, HWB-01 04(P). The terms of the settlement agreement stipulate that DOE/UC must:

- Submit a revised application to the Department on or before August 1, 2002.
- Submit a nonrefundable permit fee for two container storage units for T A-50 in the amount of $72,000 at the time DOE/UC submit the revised TA-50 permit application.
- Submit a closure plan on or before July 31, 2002 for TA-50-1-59, TA-50-37, Rooms 112,115, 117 and 118andTA-50-114.

All three of these submittals are attached to this transmittal letter. A check for the review of the closure plan will be provided upon the receipt of an invoice to the DOE/UC by NMED at a later date as discussed in the settlement agreement.

AAM READER FILE COPY

If you have questions concerning this matter please feel free to contact either Gene Turner at (505) 667-5794 or Jack Ellvinger at (505) 667-0633.

Sincerely,

ORIGINAL SIGNED BY
E. DENNIS MARTINEZ

Ralph E. Erickson,
Director
Office of Los Alamos Site Operations

OFO:IGT-004

Enclosure

cc w/o enclosure:
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LA-UR-02-4739
August 2002

Los Alamos National Laboratory

Technical Area 50
Part B Permit Renewal Application

Revision 3.0

Prepared by:

Los Alamos National Laboratory
Solid Waste Regulatory Compliance (SWRC)
Los Alamos, New Mexico 87544

Los Alamos National Laboratory
Technical Area 50
Part B Permit Renewal Application

Revision 3.0

August 2002
LA-UR-02-4739

Prepared by:
Los Alamos National Laboratory
Solid Waste Regulatory Compliance (SWRC)
Los Alamos, New Mexico 87545

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LIST OF ATTACHMENTS

ATTACHMENT	TITLE
A	Facility Description
B	Waste Analysis Plan
C	Inspection Plan
D	Personnel Training Plan
E	Contingency Plan
F	Closure Plan
G	Container Management
H	Authorized Waste

LIST OF SUPPLEMENTS

SUPPLEMENT	TITLE
2-1	Transportainers
4-1	"TA-50 Solid Waste Management Unit Report," Los Alamos National Laboratory, Los Alamos, New Mexico, April 2002.

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
BWTU	Batch Waste Treatment Unit
CSU	container storage unit
CWA	Clean Water Act
D&D	decontamination and decommissioning
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
FRP	fiberglass-reinforced plywood
ft	foot/feet
gal.	gallon(s)
HRMB	Hazardous and Radioactive Materials Bureau
in.	inch(es)
LANL	Los Alamos National Laboratory
MDA	Material Disposal Area
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
RLW	radioactive liquid waste
RLWTF	Radioactive Liquid Waste Treatment Facility
SWB	standard waste box
SWMU	solid waste management unit
TA	Technical Area
WAC	waste acceptance criteria

1.0 INTRODUCTION

This revised "Los Alamos National Laboratory Technical Area 50 Part B Permit Renewal Application" is submitted to address the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00], specific to hazardous and mixed waste operations at Technical Area (TA) 50 at Los Alamos National Laboratory (LANL). Waste management units to be permitted include two container storage units located at TA-50, Building 69 (TA-50-69). This document serves as Revision 3.0 to the "Technical Area 50 Part B Permit Renewal Application," Revision 1.0, submitted to the New Mexico Environment Department (NMED) in January 1999 (LANL, 1999).

This document has been formatted to meet the permitting strategy outlined by the NMED Hazardous and Radioactive Materials Bureau (HRMB) in correspondence dated February 5, 1998 (NMED,1998). As presented in this correspondence, TA-specific permit applications, permit modification requests, and permit renewal documents will cover any details and/or requirements not addressed in the "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0 (LANL, 1998a) or most recent version, hereinafter referred to as the LANL General Part B. The LANL General Part B will serve in the operating permit as an "umbrella" document, covering the requirements of the New Mexico Hazardous Waste Act and implementing regulations, specifically 20.4.1 NMAC [6-14-00], common to all TAs. Together, information provided in this permit application and in the LANL General Part B will meet the applicable requirements specified in 20.4.1 NMAC, Subparts V and IX [6-14-00].

This permit renewal document addresses revisions agreed upon in the "Response to Request for Supplemental Information: Technical Adequacy Review, Resource Conservation and Recovery Act Permit Application; TA-50 Part B, December 2000, Revision 2.0; Los Alamos National Laboratory, U.S. Environmental Protection Agency ID No. NM0890010515," submitted to the NMED in November 2001 (LANL, 2001), and the "Response to Notice of Deficiency; TA-50 Part B Permit Application, Revision 2.0, March 4, 2002," submitted to the NMED in April 2002 (LANL, 2002a).

In accordance with HRMB's permitting strategy, LANL submitted the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0 (LANL, 1998b) or most recent version, hereinafter referred to as the LANL General Part A. The LANL General Part A consolidated information from previous site-wide and TA-specific Part A submittals into one comprehensive document, identifying all hazardous and mixed waste treatment, storage, and disposal facilities subject to 20.4.1 NMAC, Subparts V, VI, and IX [6-14-00] at LANL as of April 30, 1998. The LANL General Part A serves as a

companion document to the LANL General Part B and TA-specific permit applications, permit modification requests, and permit renewal documents, including this revised permit renewal application.

In the LANL General Part A, the LANL General Part B, and the revised permit renewal application, a unit to be permitted or an area within LANL may sometimes be referred to as a facility. The term "facility," as it appears in this context, is used only to denote building or area names and does not imply the regulatory meaning of "facility" as defined in 20.4.1 NMAC, Subpart I, 260.1 [6-14-00]. However, pursuant to 20.4.1 NMAC, Subpart I, 260.1 [6-14-00], the "LANL facility" as a whole does meet the regulatory definition of a facility.

Table 1-1 provides a list of regulatory references and the corresponding location in this permit application, as appropriate. Where applicable, regulatory citations in this document reference 20.4.1 NMAC, which adopts, with a few exceptions, all of the Code of Federal Regulations, Title 40, Parts 260 to 266, Part 268, Part 270, and Part 273.

Table 1-1

Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(b)(1)	General facility description	Attachment A
§270.14(b)(2)	Chemical and physical analyses of hazardous waste	Attachment B[a]
§270.14(b)(3)	Waste analysis plan	Attachments B[a]
§264.13(b)	Development and implementation of a written waste analysis plan	Attachments B[a]
§264.13(c)	Off-site waste analysis requirements	Attachments B[a]
§270.14(b)(4)	Security procedures and equipment	Attachment G
§270.14(b)(5)	General inspection schedule	Attachment C[a]
§264.174	Inspections/containers	Attachment C[a]
§264.193(i)	Tank system inspections pending provision of adequate secondary containment	NA
§264.195	Overfill control inspections	NA
§264.602	Miscellaneous units	NA
§264.1033	Process vent standards	NA
§264.1052	Equipment leak air emission standards	NA
§264.1053	Compressor standards	NA
§264.1058	Standards for pumps, valves, pressure relief devices, flanges, and connections	NA
264.1088	Subpart CC inspection air monitoring requirements	Attachment C, Attachment G
§270.14(b)(6)	Request for waiver from preparedness and prevention requirements of 264 Subpart C	NA
§270.14(b)(7)	Contingency Plan	Attachment E[a]
§270.14(b)(8)	Description of preparedness and prevention	Attachment G
§270.14(b)(8)(i)	Hazard prevention in unloading operations	Attachment G

See footnotes at end of table.

Table 1-1 (continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(b)(8)(ii)	Runoff prevention	2.0, Attachment G
§270.14(b)(8)(iii)	Contamination prevention of water supplies	Attachment G
§270.14(b)(8)(iv)	Mitigation of equipment failure and power outages	Attachment G
§270.14(b)(8)(v)	Prevention of undue exposure of personnel to hazardous waste	Attachment G
§270.14(b)(8)(vi)	Prevention of releases to the atmosphere	Attachment G
§270.14(b)(9)	Prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes	2.0, Attachment G
§264.17(c)	Documentation of compliance with 264.17 (general requirements for ignitable, reactive, or incompatible wastes)	2.0, Attachment G
§270.14(b)(10)	Traffic pattern, volume, and controls	Attachment A[a]
§270.14(b)(11)	Facility/unit location information	Attachment A
§270.14(b)(11)(i)	Seismic standard applicability [264.18(a)]	Attachment A
§270.14(b)(11)(ii)	Seismic standard requirements	Attachment A
§270.14(b)(11)(ii)(A)	No fault within 3,000 feet (ft) with displacement in Holocene time	Attachment A
§270.14(b)(11)(ii)(B)	If faults which have displacement in Holocene time are present within 3,000 ft, no faults pass within 200 ft of portions of the facility where treatment, storage, or disposal will be conducted	NA
§270.14(b)(11)(iii)	100-year floodplain standard	Attachment A[a]
§270.14(b)(11)(iv)	Facilities located within the 100-year floodplain	NA
§270.14(b)(11)(v)	Compliance schedule for 264.18(b)	NA
§270.14(b)(12)	Personnel training program	Attachment D[a]

See footnotes at end of table

Table 1-1 (continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(b)(13)	Closure and post-closure plans	Attachment F
§264, Subpart G	Closure and post-closure	Attachments F
§264.178	Closure/containers	Attachment F
§264.197	Closure and post-closure care/tanks	Attachment F
§264.601	Closure/miscellaneous units	Attachment F
§264.603	Requirements by the Secretary	Attachments F
§270.14(b)(14)	Post-closure notices (264.119)	Attachments F
§270.14(b)(15)	Closure cost estimate (264.142)	Attachments F
§270.14(b)(16)	Post-closure cost estimate (264.144)	Attachments F
§270.14(b)(17)	Liability insurance (264.147)	Attachments F
§270.14(b)(18)	Proof of financial coverage (264.149-150)	Attachments F
§270.14(b)(19)	Topographic map requirements	Attachment A[b]
§270.14(b)(19)(i)	Map scale and date	Attachment A[b]
§270.14(b)(19)(ii)	100-year floodplain area	Attachment A[b]
§270.14(b)(19)(iii)	Surface waters	Attachment A
§270.14(b)(19)(iv)	Surrounding land uses	Attachment A
§270.14(b)(19)(v)	Wind rose	Attachment A
§270.14(b)(19)(vi)	Map orientation	Attachment A[b]

See footnotes at end of table.

Table 1-1 (continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(b)(19)(vii)	Legal boundaries	Attachment A[b]
§270.14(b)(19)(viii)	Access control	Attachment A
§270.14(b)(19)(ix)	Wells	Attachment A
§270.14(b)(19)(x)	Buildings	Attachment A
§270.14(b)(19)(xi)	Drainage barriers or flood control	Attachment A
§270.14(b)(19)(xii)	Location of operational units	Attachment A
§270.14(b)(20)	Other federal laws	3.0[a]
§270.14(b)(20)(a)	Wild and Scenic Rivers Act	3.0[a]
§270.14(b)(20)(b)	National Historic Preservation Act	3.0[a]
§270.14(b)(20)(c)	Endangered Species Act	3.0[a]
§270.14(b)(20)(d)	Coastal Zone Management	3.0[a]
§270.14(b)(20)(e	Fish and Wildlife Coordination Act	3.0[a]
§270.14(b)(20)(f)	Executive Orders	3.0[a]
§270.14(b)(21)	Notice of extension approval for land disposal facilities	NA
§270.14(c)	Groundwater monitoring requirements	Attachment A[a]
§270.14(d)	Information requirements for solid waste management units (SWMU)	4.0
§270.14(d)(1)(i)	Location of SWMUs on topographic map	4.0
§270.14(d)(1)(ii)	Types of SWMUs	4.0
§270.14(d)(1)(iii)	Dimensions and descriptions of SWMUs	4.0
§270.14(d)(1)(iv)	Dates of SWMU operations	4.0

See footnotes at end of table.

Table 1-1 (continued)

Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(d)(1)(v)	Waste types managed at SWMUs	4.0
§270.14(d)(2)	Information on releases from SWMUs	4.0
§270.14(d)(3)	RCRA Facility Assessment sampling and analysis results	NA
§270.15	Information requirements for containers	Attachment G
§270.16	Information requirements for tank systems	NA
§270.23	Information requirements for miscellaneous units	NA

[a] Requirement or information is also addressed in the "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0, as appropriate, 1998a, Los Alamos National Laboratory, Los Alamos, New Mexico.

b Some of the topographic map requirements are addressed in the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0, 1998b, Los Alamos National Laboratory, Los Alamos, New Mexico.

NA = not applicable.

2.0 WASTE MANAGEMENT UNITS

The information provided in this section is submitted to address the applicable container storage requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, 20.4.1 NMAC, Subpart IX, 270.15, and 20.4.1 NMAC, Subpart V, Part 264, Subpart I, revised June 14, 2000 [6-14-00]. This section provides a general description of the Los Alamos National Laboratory (LANL) Technical Area (TA) 50 container storage units (CSU) and waste management practices. Detailed information on and figures of the TA-50 CSUs are provided in Attachment G of this permit renewal application. A summary of applicable regulatory references for container storage and the corresponding location where the requirement is addressed in this permit renewal application is located in Attachment G, Table G-1.

2.1 CONTAINER STORAGE

TA-50 is located at the northeast corner of the intersection of Pajarito Drive and Pecos Road, on the finger mesa bounded by Mortandad Canyon to the north and Two-Mile Canyon to the south. The CSUs at TA-50 include the TA-50-69, Indoor CSU and the TA-50-69, Outdoor CSU. The following provides descriptions of the locations and capacity, potential storage containers, and minimum aisle space requirements for the TA-50 CSUs.

2.1.1 Storage Capacity

The maximum storage capacity of the TA-50 CSUs is as follows:

- TA-50-69, Indoor CSU – 1,500 gallons (gal.)
- TA-50-69, Outdoor CSU – 30,000 gal.

General dimensions, containment features, and materials of construction for each CSU are provided in Attachment G of this permit renewal application to satisfy the requirements of 20.4.1 NMAC, Subpart IX, 270.15(a)(1) and (2) [6-14-00].

2.1.2 Storage Containers

Containers that will be used to store wastes at the TA-50 CSUs include, but are not limited to 5-, 30-, 55-, 83-, 85-, and 110-gal. steel and/or poly drums; standard fiberglass-reinforced plywood (FRP) boxes; steel standard waste boxes (SWBs); metal overpack boxes; steel B25 and B12 boxes; various small containers; and oversized, irregularly shaped FRP boxes. The following sections provide

descriptions of the storage containers considered acceptable for waste storage at the TA-50-69, Indoor and Outdoor CSUs.

2.1.2.1 55-Gallon Drums

The most common drum to be used for storage is the 55-gal. drum. The standard 55-gal. drum in use is constructed of 16-gauge steel, has an approximate 22-inch (in.) inner diameter, and a usable inside height of approximately 33 in. Standard 55-gal. drums meet the U.S. Department of Transportation (DOT) requirements.

2.1.2.2 Fiberglass-Reinforced Plywood Boxes

Standard-size FRP boxes used for storage measure 4 foot (ft) by 4 ft by 8 ft. The outer surface of the FRP boxes is coated with a 0.06- to 0.12-in.- (60- to 120-mil)- thick layer of epoxy-impregnated fiberglass. At times, nonstandard-size FRP boxes are designed and constructed to contain odd-shaped or oversized waste.

2.1.2.3 Standard Waste Boxes

Two different types of SWBs are used for storage at the TA-50 CSUs. One type is constructed of 14-gauge steel and has rounded ends. It measures 52 in. by 69 in. by 36 in., has continuous welds on all four sides and on the bottom, and has a lid with a closed-cell neoprene gasket that is secured in place with bolts. The second type of SWB is also constructed of 14-gauge steel, but is rectangular in shape. Its dimensions are 56 in. by 72 in. by 37 in. It has continuous welds on all four sides and on the bottom and a lid that is clamped and welded in place.

2.1.2.4 Overpacks

The metal overpack containers vary in size and have continuous welds both inside and outside on all four sides and on the bottom. The lid has a gasket made of closed-cell neoprene and can be strapped closed or clipped down. The metal overpacks are elevated by design with risers for ease of handling. B25 overpacks are constructed of 16-gauge welded carbon steel, are a standard size of 4 ft by 4 ft by 6 ft, and are elevated by design. All B25 overpacks have a rubber gasket with either a bolt-on, clipped-pinned, or hinged lid.

Overpacks are used when a container's integrity is suspect, or if cracks or leaks are observed. The 85-gal. drums are commonly used to overpack 55-gal. drums, and 110-gal. drums are used to overpack 85-gal. drums. The 85-gal. overpacks are constructed of 16-gauge steel, at a minimum. Universal sorbent is generally added to the interior of the overpack. The lid is secured to the overpack

with a 12-gauge bolt ring complete with a 5/8-in. closure bolt. Rounded-end SWBs are used to overpack drums of various sizes that contain mixed transuranic waste. Metal boxes are used as overpacks for FRP boxes.

2.1.3 Minimum Aisle Space and Storage Configuration

Waste containers at the TA-50 CSUs are arranged in rows with a minimum aisle space of 24 in. Storage configuration within a row depends upon the type of container, its size, and weight restrictions. Fifty-five gallon drums and SWBs are arranged in rows and may be stacked to a maximum of two high. The 85-gallon drums are not stacked. Large waste boxes are also stacked to a maximum of two high, unless size and width restrictions prohibit stacking due to safety concerns.

2.1.3.1 TA-50-69, Indoor CSU

Waste to be stored in the TA-50-69, Indoor CSU is positioned in an area away from any worker activity or traffic that is unrelated to the management of the waste itself. Adequate space is maintained around each storage pallet to allow for inspection of all containers. Due to volumes and placement of waste, aisle spacing is not an issue at this CSU. Solid waste stored in containers connected to the packaging/bagout module of the glovebox enclosure do not require aisle spacing. Incompatible wastes will not be stored inside the glovebox enclosure.

2.1.3.2 TA-50-69, Outdoor CSU

Drum containers at the TA-50-69, Outdoor CSU are stacked to a maximum of two high based upon size and weight. Adequate space is maintained between rows of containers. Container rows in the transportainers are typically oriented north/south and in one of two configurations. The first configuration stores containers on dollies in rows along both walls of the transportainer with a main aisle running down the center. Containers stored on dollies are rotated during routine inspections so that the entire drum can be inspected. The second configuration stores containers on pallets placed against one wall of the transportainer with a main aisle running along the opposite wall. Adequate space is maintained between each pallet and between the pallet and the transportainer wall to allow for visual inspection. To facilitate container movement, storage, and inspection, all drums and irregular containers holding wastes are stored on either pallets or dollies.

2.1.4 Authorized Waste Identification

The TA-50 CSUs will store containers of hazardous and mixed waste bearing the appropriate U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers presented in the LANL General Part A (LANL, 1998b). These wastes do not contain free liquids as defined by the Waste Isolation Pilot Plant Waste Acceptance Criteria, which include:

- Liquids that readily separate from the solid portion of a waste under ambient temperature and pressure; and
- Liquids that are not absorbed into a host material such that it could spill or drain from its container.

Additional information on the wastes to be stored at the TA-50 CSUs is provided in the waste analysis plan, Appendix B of the LANL General Part B (LANL, 1998a).

2.1.5 Condition of Containers [20.4.1 NMAC, Subpart V, 264.171, 264.173, and 264.174]

As required by 20.4.1 NMAC, Subpart V, 264.171 [6-14-00], any container that is not in good condition (e.g., severe rusting, apparent structural defects) will be overpacked, or the wastes will be transferred and repackaged in containers that are in good condition before being placed into storage. All containers will be kept closed during storage, in accordance with 20.4.1 NMAC, Subpart V, 264.173(a) [6-14-00], except when waste is added to or removed from the container or when a container's contents need to be repackaged. Containers will be handled and stored at all times in a manner that will not rupture a container nor cause it to leak, as required by 20.4.1 NMAC, Subpart V, 264.173(b) [6-14-00].

Any container of waste that shows signs of structural instability or leakage will be overpacked in a DOT-approved container, or the waste will be transferred into a container that is in good condition, as required by 20.4.1 NMAC, Subpart V, 264.171 [6-14-00]. When specified by DOT, liners will be used inside the waste container.

2.1.6 Compatibility of Waste with Containers

The container materials and liners will be selected to ensure that the ability of the container to contain the waste is not impaired as required by 20.4.1 NMAC, Subpart V, 264.172 [6-14-00]. Based on manufacturer's tolerance specifications, container material and liners used will not react with, and will be compatible with, the waste.

2.1.7 Management of Containers

Waste containers are kept closed during storage and staging, except when it is necessary to add or remove waste, as allowed by 20.4.1 NMAC, Subpart V, 264.173(a) [6-14-00]. Some mixed waste containers are vented and have carbon composite filters that allow gases (e.g., hydrogen), if any, to be released, but prevent the release of airborne particulates. Waste containers are closed or vented, handled, staged, and stored to prevent rupture, leakage, or spillage, as required by 20.4.1 NMAC, Subpart V, 264.173(b) [6-14-00]. Containers are managed at the TA-50 CSUs in accordance with written facility-specific procedures to minimize the potential for damage to or spillage from waste containers. All waste handlers at TA-50 are thoroughly trained in the safe use of waste container handling and transport equipment in accordance with Appendix C of the LANL General Part B. Because the TA-50 yard area is graded and paved, jarring of containers during transport is minimized. To protect the integrity of waste containers received at the TA-50 CSUs, only equipment designed for moving waste containers is used. Small waste containers may be handled manually or with dollies. Each TA-50 CSU is equipped with structures and equipment to facilitate safe loading, unloading, and movement of waste containers, as described in Attachment G of this permit renewal application.

2.1.7.1 Movement of Containers

All waste received at the TA-50 CSUs is manifested and transported from LANL waste generator or storage locations in accordance with applicable DOT regulations. LANL procedures establish vehicle and operator qualifications and provide specifications for loading and transporting waste. The loading and unloading of containers is also described in more detail in Section G.2.4.1. Waste received at TA-50 meets site-specific waste acceptance criteria (WAC) to ensure wastes and their containers are appropriate for storage in the various CSUs. The WAC is established to ensure wastes destined for TA-50 are identified as to form, packaged in DOT-approved containers appropriate for the waste, and markings and labels required by applicable EPA and DOT regulations are used. In addition, the WAC requires waste containers to be in good condition without signs of corrosion or structural defects.

2.1.7.2 Waste Container Labeling

All waste containers will be marked with a bar code identification number that corresponds to a number in LANLs waste management database. This database is composed of information supplied by the waste generator before storage by waste management personnel after the waste has been received. This information includes the name and location of the waste generator, waste characterization information, packaging, waste certification, receiving site, and storage location. All containers with hazardous or mixed waste will be labeled with a hazardous waste label that lists the appropriate EPA hazardous waste number(s). All containers are clearly marked to identify the contents and the date

each period of accumulation begins. In the event that a container is repackaged, repackaging personnel will ensure the new container is properly labeled. When waste containers are moved during storage, their waste package identification numbers (bar codes), origin and destination, and package changes (e.g., overpack volume, overpack dimensions) will be documented. The waste management database will then be updated to reflect any new information.

2.1.8 Containment Systems [20.4.1 NMAC, Subpart IX, 270.15(a)(1-5) and 270.15(b)(1-2)]

To demonstrate compliance with 20.4.1 NMAC, Subpart IX, 270.15(b)(1)[6-14-00], information documented in LANL waste management databases will be used to initially verify the absence of free liquids in containers. Containers that cannot be verified are characterized with real-time radiography (RTR) prior to being sent to the TA-50 CSUs. FRP boxes that hold glove boxes do not contain any free liquids. Free liquids discovered during past inspections and/or RTR are removed from the FRP boxes at TA-54, Area G, or elsewhere, before transport and storage at TA-50. FRP boxes that have poor structural integrity are overpacked in metal containers to facilitate safe transport and storage.

FRP boxes, SWBs, and steel B25 and B12 boxes are elevated by design. The pallets and/or devices used to elevate containers at the TA-50 CSUs are constructed of impervious, corrosion-resistant materials compatible with the wastes.

Elevated containers, pallets and/or devices (such as the glovebox in the TA-50-69 Indoor CSU) provide protection from potential contact with standing liquids that could be introduced through fire suppression activities. Together, these waste management practices and design features satisfy the requirements of 20.4.1 NMAC, Subpart IX, 270.15(b)(2) and 20.4.1 NMAC, Subpart V, 264.175(c) [6-14-00].

2.1.8.1 TA-50-69, Indoor CSU

This section describes containment systems specific to each room within the TA-50-69, Indoor CSU. Rooms 102 and 103 of TA-50-69 historically have been used to store contaminated glove boxes and other mixed wastes associated with the Waste Characterization, Reduction, and Repacking Facility operations. The total design capacity for these two rooms is 1,500 gal. and there is no physical barrier between them. A steel mezzanine added to the western third of the main process room is used for storage of materials and equipment. The mezzanine is not part of the CSU.

A large glove box enclosure is located inside the main process room for size reduction of radioactively contaminated metallic items. The glove box enclosure measures 15 ft wide, 30 ft long, and 10 ft high and is constructed of type 304 stainless steel with a high-polish finish. It was originally assembled in

four separate modules: Airlock, disassembly, cutting, and packaging/bagout. The modules are bolted together and seal welded. Although assembled as four modules, the structure is a single continuous volume, entirely self-contained, and meets all the requirements for containment of free liquids. The glove box enclosure was leak-tested before use. A floor drain is located near the glove box enclosure and is connected directly to the Radioactive Liquid Waste Treatment Facility (RLWTF). Waste containers are stored on pallets to prevent contact between the containers and any standing liquid. Collected liquids will be held in DOT-approved containers until they are sampled and analyzed in accordance with Appendix E of the LANL General Part B (LANL, 1998a). To facilitate container movement, storage, and inspection, all drums and irregular containers are stored on either wooden pallets or dollies.

The glove box enclosure is airtight and provides a containment system that meets the requirements of 20.4.1 NMAC, Subpart V, 264.175(b) [6-14-00]. Containers inside the glove box enclosure are elevated to prevent contact with potentially accumulated liquid. Any accumulated liquid in the glove box enclosure is removed as soon as possible after discovery to prevent overflow. Collected liquids are held in DOT-approved containers until they are sampled and analyzed in accordance with Appendix E of the LANL General Part B (LANL, 1998a). The design and operation of the pallets and glove box enclosure meet the requirements of 20.4.1 NMAC, Subpart V, 264.175(b) and 20.4.1 NMAC, Subpart IX, 270.15(a)(1) through (4) [6-14-00].

A floor drain is located in the eastern part of Room 103. The drain is plumbed directly to the RLWTF. Containers in Room 103 are stored on pallets that provide segregation of incompatible wastes in the event that a container is breached and prevent contact with potentially accumulated liquids. Any accumulated liquids in the room are removed as soon as possible after discovery. Collected liquids are held in DOT-approved containers until they are sampled and analyzed in accordance with Appendix E of the LANL General Part B (LANL, 1998a). Equipment that is located inside Room 103, but not associated with the CSU, includes a chemical decontamination fume hood, continuous feed welding system, and Heliarc welding system.

2.1.8.2 TA-50-69, Outdoor CSU

Capacity for the TA-50-69, Outdoor CSU is 30,000 gal. The waste to be stored in this CSU is expected to be solid waste; any liquids present would be residual liquids only. The TA-50-69, Outdoor CSU consists of transportainers and waste pallets stored on an asphalt pad. It does not have permanent secondary containment built into it.

Incompatible wastes stored at the Outdoor CSU are separated on pallets to keep the wastes segregated in the event that a container is breached.

2.1.9 Inspection Schedules and Procedures

The purpose of inspections is to identify leaking/breached containers, deterioration of containers, and/or loss of integrity of a containment system, as required by 20.4.1 NMAC, Subpart V, 264.174 [6-14-00]. The inspections will include checking the structural integrity of containers (e.g., for bulging or warping). Inspections will follow the Inspection Plan in Appendix C of the LANL General Part B (LANL, 1998a) and Attachment C of this permit renewal application.

2.1.10 Special Requirements for Ignitable, Reactive, and Incompatible Wastes [20.4.1 NMAC, Subpart V, 264.17 and 20.4.1 NMAC, Subpart IX, 270.15(c) and 270.15(d)]

To prevent accidental ignition or reaction of ignitable, reactive, or incompatible waste at the TA-50 CSUs, TA-50 personnel will manage hazardous and mixed waste using the precautions described in this section.

If containerized ignitable and/or reactive wastes (e.g., discarded materials contaminated with ignitable spent solvents, reactive metal debris) are stored at any of the CSUs, the containers will be located at least 50 ft from the facility property line at all times (refer to Map 2 of the General Part A (LANL 1998b). All ignitable and reactive wastes will be protected from sources of ignition or reaction, in accordance with 20.4.1 NMAC, Subpart V, 264.17(a) [6-14-00]. The following policies and controls are in place at TA-50, which minimize the possibility of accidental ignition:

- Most mechanical equipment operated within the areas is grounded to minimize the potential for sparking by dissipating static charges.
- Smoking is not allowed in or near the CSUs.
- "No Smoking" signs are conspicuously placed wherever there is a potential hazard from ignitable or reactive waste, as required by 20.4.1 NMAC, Subpart V, 264.17(a) [6-14-00].

Together, these measures meet the requirements of 20.4.1 NMAC, Subpart V, 264.17(a) and (b), and 264.176 [6-14-00].

Incompatible wastes, if any, will be segregated during storage. In addition, incompatible wastes will not be mixed and waste will not be placed in a container that previously held an incompatible waste as required by 20.4.1 NMAC, Subpart V, 264.177(a) and (b), and 20.4.1 NMAC, Subpart IX, 270.15(d) [6-14-00].

Pursuant to the requirements of 20.4.1 NMAC, Subpart V, 264.172 [6-14-00], only containers constructed of or lined with materials that will not react with and are otherwise compatible with the waste to be stored will be used for storage at the TA-50 CSUs.

Waste management database information and results of waste characterization activities provide documentation of compliance with the requirements for ignitable, reactive, or incompatible wastes, pursuant to 20.4.1 NMAC, Subpart V, 264.17(c) [6-14-00]. Wastes carrying the EPA Hazardous Waste Numbers F020, F021, F022, F023, F026, or F027 will not be stored in TA-50 CSUs; therefore, the requirements of 20.4.1 NMAC, Subpart V, 264.175(d) [6-14-00] are not applicable.

2.1.11 Closure

Closure will consist of partial closure of one or more of the CSUs at TA-50 while leaving the other hazardous and mixed waste units at LANL in service. Partial closure activities will, at a minimum, include removal of hazardous and/or mixed waste from the CSU to be closed and decontamination of any surfaces or equipment that has been contaminated by hazardous constituents. Closure will minimize the need for further maintenance, preclude the release of hazardous constituents to environmental media, and be protective of human health and the environment, in accordance with the closure performance standards specified in 20.4.1 NMAC, Subpart V, 264.111 [6-14-00]. Detailed closure procedures for the TA-50 CSUs are addressed in Attachment F of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC, Subpart V, 264.111 and 264.178 [6-14-00].

2.1.12 Control of Run-On and Runoff

Run-on into the TA-50-69, Indoor CSU from outdoors is not likely to occur. Positive surface drainage will direct potential run-on away from the building. Run-on into the TA-50-69, Outdoor CSU is prevented because the CSU is elevated by design. The Outdoor CSU is sloped sufficiently to prevent the accumulation of precipitation and drainage swales located in the vicinity divert storm water away from the CSU. One drainage swale is located just south of the CSU, between it and Material Disposal Area-C. A second drainage swale is located on the west side of the CSU between Pecos Drive and the TA-50 fence line. Figure A-11 in Attachment A of this permit renewal application shows the contours and surface drainage around the TA-50 CSUs. This information is provided to meet the requirements of 20.4.1 NMAC, Subpart IX, 270.14(b)(8)(ii) [6-14-00].

Supplement 2-1

TRANSPORTAINERS

TRANSPORTAINER INFORMATION

Maritime freight containers (transportainers) are routinely used at Los Alamos National Laboratory (LANL) to provide security and weather protection for temporary storage. LANL procures this type of equipment from a variety of vendors specializing in the reconditioning of used transportainers. Stringent federal transportation criteria govern the design and acceptance of transportainers for the specified intended use. Transportainers that no longer meet these specifications are commonly sold to suppliers who recondition them for resale. The following guidelines reflect specifications typical of reconditioned maritime freight containers designed to transport containerized, non-perishable cargo.

The exterior dimensions of the transportainers are typically 8 foot (ft) wide, 8.5 ft tall, and either 20 or 40 ft long. The sidewalls and roof of the transportainers are constructed of 14-gauge corrugated steel. The sidewalls are welded to 5 inch (in.)-channel beam supports. All joints and seams are continuously welded. The transportainers are equipped with four corner castings and lifting eyes to allow the transportainers to be stacked or hooked together. The corner posts and lifting eyes are 0.25-in. steel welded to corner castings. The floor has 0.125-in. steel-channel cross members. The joists are spaced 12 to 14 in. on center. Either a 1.125-in. or 1.25-in. hardwood decking is screwed into the joists. The decking is applied such that there are no visible gaps between planks. The transportainer door panels are of double-seam construction with double-sealing (two-flap) gaskets. For added security, the hinge pins are constructed of stainless steel and the locking handles are made of hardened steel. The door hardware bolts are welded so that they cannot be unbolted. Each transportainer is equipped with one-way side vents to equalize ambient pressure differentials inside the transportainer.

3.0 OTHER FEDERAL LAWS

A discussion of federal laws, as required by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart IX, 270.3 and 270.14(b)(20) revised June 14, 2000, is provided in Section 3.0 of the LANL General Part B (LANL, 1998a).

4.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

The information provided in this section is submitted to address the applicable solid waste management unit (SWMU) requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart IX, 270.14(d), revised June 14, 2000 [6-14-00]. This section provides descriptions of the SWMUs that have been identified at Technical Area (TA) 50. Information for these SWMUs was extracted from the "RFI Work Plan for Operable Unit 1147" (LANL, 1992) and the "TA-50 Solid Waste Management Unit Report", hereinafter referred to as the TA-50 SWMU Report (LANL, 2002b). The TA-50 SWMU Report is provided as Supplement 4-1.

Los Alamos National Laboratory (LANL) uses the definition of a SWMU as presented in the U.S. Environmental Protection Agency (EPA) "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to Resource Conservation and Recovery Act (RCRA) for LANL, EPA I.D. NM0890010515" (EPA, 1994), hereinafter referred to as Module VIII. This definition states that a SWMU is "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

4.1 SWMU DESCRIPTIONS [20.4.1 NMAC, Subpart IX, 270.14(d)(1)]

Several types of SWMUs are present at TA-50. These SWMUs include those identified for corrective actions in Module VIII, as modified following a Class III permit modification effective May 19, 1994; SWMUs that are active RCRA units; and SWMUs identified in the TA-50 SWMU Report. Brief unit and waste descriptions are provided in Tables 4-1 and 4-2. Figure 4-1 shows the locations of the SWMUs in TA-50.

4.1.1 SWMUs Identified for Corrective Action In Module VIII

4.1.1.1 Radioactive Liquid Waste Treatment Facility

SWMU No. 50-001(a) is identified as the Radioactive Liquid Waste Treatment Facility (RLWTF) and is located at TA-50, Building 1. The RLWTF is used to treat radioactive liquid waste (RLW) received from various TA's at LANL. The facilities at TA-50-1 consist of approximately 37,000-square feet of treatment equipment designed to remove radionuclides from RLW using neutralization, flocculation, clarification, and membrane filtration. After treatment the effluent from the RLWTF is monitored and discharged to a National Pollutant Discharge Elimination System (NPDES)-permitted Outfall 051 in Mortandad Canyon. Treatment sludges are stabilized and managed at TA-54.

4.1.1.2 Waste Lines and Manholes

SWMU No. 50-001(b) consists of the active underground drain line system through which RLW is transferred from the various TA's to the RLWTF. A manhole (TA-50-72) serves as the central collection area for most of the incoming RLW. There are three lines that feed into this manhole. The primary waste line for LANL was replaced in 1982 with a double contained polyethylene pipe and enters the manhole from the north side of Pecos Drive. The second line transfers low-level RLW from TA-50-73, which receives waste from TA-50-69 and TA-50-37 operations. This line consists of a 6-inch (in.) by 10-in. double contained polyethylene pipe that has leak monitor and vacuum testing capabilities. The third line transports low-level RLW from TA-55 to TA-50-72 through manholes TA-50-016 and TA-50-78. This line consists of an inner stainless steel pipe encased in a polyvinyl chloride (PVC) pipe and has leak-monitor and vacuum test capabilities. This SWMU also consists of the drain lines from TA-50-72 to the RLWTF and from TA-55 to the underground storage tanks at TA-55-66.

4.1.1.3 Underground Tanks

SWMU No. 50-002(a) consists of an underground, reinforced-concrete tank vault at TA-50, Building 2 that houses six flow-through process tanks, an equipment room, and waste-transfer lines associated with a RLWTF. The floor of the vault is 17 feet (ft) below ground and includes two raw-waste tanks (25,000 gallon [gal.] and 75,000 gal.), one low-level sludge tank (25, 000 gal.), and two effluent tanks (25,000 gal. each) for treated waste. The waste transfer lines include:

- Six cast-iron lines connecting TA-50-1 to the equipment room.
- Four steel lines added in 1984 to connect Room 61 to the Equipment room.
- Five cast iron lines from drains in TA-50-1 to the decontamination and decommissioning (D&D) tank in TA-50-2.
- One cast iron line from a sink in the vehicle decontamination facility to the D&D effluent line connecting 50-90 to one of the influent tanks.

4.1.1.4 Vaulted Underground Tanks for TA-50 Waste

SWMU No. 50-002(b)-00 is a consolidated SWMU that consists of former SWMU's 50-002(b) and (c). This SWMU includes two active waste tanks (TA-50-67 and TA-50-68) and their associated inlet and outlet lines housed in an underground vault (TA-50-66). The concrete vault measures 18-ft long, 16-ft wide, by 14 ft deep and is located approximately 30-ft west of the southwest corner of TA-50-1. The inlet lines consist of four stainless steel pipes encased in PVC. One of these lines is capped and serves as a backup. The second pipe transfers acidic RLW and the third transfers caustic RLW. The waste is transferred from the storage tanks through two double contained stainless steel lines to Room 60 at TA-50-1 for treatment. The tanks, piping, and vault were constructed exclusively to transfer/store caustic and acidic RLW received from TA-55.

4.1.1.5 Aboveground Storage Tank

SWMU No. 50-002(d) consists of a decommissioned aboveground storage tank (TA-50-5) that is located adjacent to the north wall of Room 60D at TA-50-1. The tank has a capacity of 5,000-gal. and was used to store nitric acid intended to recharge ion-exchange columns at the RLWTF. It was used to store nitric acid product only and was never used to store waste.

4.1.1.6 Container Storage Units

SWMU No. 50-003(a) and 50-007 consist of two CSUs that were used for hazardous and mixed waste storage and are scheduled for closure. SWMU No. 50-003(a) is located at the northwest corner of TA-50-1, Room 59. This CSU is used to store containers of cemented mixed waste sludge and is approximately 10 ft wide by 19 ft long. SWMU No. 50-007 is located at TA-50-37 and contains a CSU that includes Rooms 115, 117, and 118. Room 115 is located on the first floor of TA-50-37 and measures 10-ft wide by 21-ft long. Room 117 is located on the first floor in the eastern portion of TA-50-37 and measures 21-ft wide and 40-ft long. Room 118 is located on the first floor in the eastern portion of TA-50-37 and measures 31-ft wide and 40-ft long.

SWMU No. 50-008 consists of an active Indoor CSU located at TA-50, Building 69. The CSU consist of Rooms 102 and 103 and is used for hazardous and mixed waste storage. Room 102 is referred to as the main process room and is approximately 45-ft wide by 52-ft long. Room 103 is referred to as the unloading area and is approximately 18 ft wide by 19 ft long.

4.1.1.7 Historical Waste Lines and Underground Vault, RLWTF

The consolidated SWMU No. 50-004(a)-00 consists of former SWMU's 50-004(a), 50-004(b), and 50-004(c) and includes all historical waste lines and former components of the RLWTF at TA-50-1. This includes:

- Locations through which underground RLW and industrial waste lines were routed to the RLWTF from the LANL technical areas located along Pajarito Road.
- A decommissioned underground vault (TA-50-3) that housed three-stainless-steel lined concrete storage tanks, ranging in volume from 1,000 to 4,500 gal. and used to collect and store wastewater from the Omega reactor.
- Waste lines and manholes to the collection tank structure (TA-50-3) including waste line 49 from TA-35 and waste line 50 from TA-50-1.
- Thirteen industrial waste lines (44, 45, 45a, 46, 47, 48, 48a, 49, 54, 55, 56, 65, and 67) and three associated manholes (TA-50-6, 55, and 56) that discharged to the decommissioned underground vault.

4.1.1.8 Operational Releases/Outfalls

SWMU Nos. 50-006 (a, c, and d) consist of operational releases and outfalls located at TA-50. A portion of Upper Ten Site Canyon received two accidental releases of RLW as a result of a sump overflow at TA-50-2. This site is identified as SWMU No. 50-006(a). Airborne releases via stack emissions from the RLWTF and other treatment facilities at TA-50 have contaminated some soil in the area and are identified as SWMU No. 50-006(c). SWMU No. 50-006(d) consists of the RLWTF treated liquid effluent discharged into Mortandad Canyon. This active effluent discharge is subject to regulation under the Clean Water Act (CWA) and is permitted as NPDES Outfall 051. Parameters prescribed by the NPDES permit are sampled in accordance with that permit's requirements.

4.1.1.9 Incinerator

An incinerator complex was housed in TA-50-37 and is identified as SWMU No. 50-007. The incinerator complex was comprised of the incinerator, various waste-feed components, and two waste-feed tanks located in Rooms 112 and 115. The unit was used to treat solid and liquid wastes containing chlorinated and fluorinated hydrocarbons, carcinogenic materials, and TRU wastes. The incinerator unit, storage tanks, and associated CSU have undergone closure (Benchmark, 1998).

4.1.1.10 Material Disposal Area

Material Disposal Area (MDA) C is identified as SWMU No. 50-009 and consists of an 11.8-acre disposal site that comprises approximately one-half of TA-50. MDA C includes six pits that were used for the disposal of radioactive and hazardous waste (Pits 1 through 6), one unnumbered pit for disposal of chemical wastes, 107 disposal shafts, and one unnumbered shaft that was used for a single disposal of strontium-90. Pits 1 through 4 measure approximately 610 ft long, 40 ft wide, and 25 ft deep. Pit 5 is approximately 705 ft long, 110 ft wide, and 18 ft deep. Pit 6 is approximately 505 ft long, 100 ft wide, and 25 ft deep. The chemical pit measures approximately 180 ft long, 25 ft wide, and 12 ft deep. The disposal shafts vary in depth and diameter. Table 4-1 lists the various types of waste that

were disposed of at MDA C. Waste disposal at MDA C ceased by 1969, and the MDA C was officially decommissioned in 1974.

4.1.1.11 Decontamination Facility

SWMU No. 50-010 consists of an inactive vehicle decontamination area at TA-50-1, Room 34B, that is used to clean vehicles and radioactively contaminated large objects. The area was operated from 1963 through Ocotber 1999 and was enclosed in 1983. Liquid wastes generated during decontamination activities were transferred to TA-50-2 via the floor drain and waste line.

4.1.1.12 Septic System and Lift Stations

SWMU No. 50-011(a) is the location of a decommissioned septic system that was installed in 1964 at the south end of the RLWTF at TA-50-1. This septic system was comprised of a septic tank (TA-50-10), a manhole (TA-50-9), a sanitary distribution box (TA-50-11), and a seepage pit. The septic system was removed in 1983 except for the perforated pipe, which made up the seepage pit. These areas are currently located beneath an asphalt pad and Building 83. The septic system managed sanitary waste only.

SWMU No. 50-011(b) is composed of two active sanitary wastewater lift stations (TA-50-91 and 92) and approximately 400 ft of piping that transports sanitary wastewater from the RLWTF to the main line that serves the Solid Waste Sanitary Control Plant. The lift stations are located on the north and south sides of TA-50-1 and were installed as part of a utility upgrade in 1983.

4.1.2 SWMUs Not Identified for Corrective Action in Module VIII

4.1.2.1 Container Storage Units

The TA-50-69, Outdoor CSU has not been formerly evaluated relative to its status as a SWMU nor is it assigned a SWMU number. This CSU is located in the southwest corner of TA-50 and consists of an asphalt pad that is not lined or coated. The CSU is used for hazardous and mixed waste storage and is approximately 24 ft wide by 90 ft long, with an additional strip that is 12 ft wide by 90 ft long added to the southeast end.

The TA-50-114 CSU is identified at SWMU No. 50-003(d) and consists of a storage locker located south of the eastern wing of TA-50-1 and east of TA-50-1 Room 34 B. This CSU was used to store waste generated at the RLWTF and consists of a metal prefabricated building approximately 9 ft by 23 ft by 9 ft high, has three doors, and is anchored to a concrete pad. The CSU is divided into two separate lockers by a metal wall, and has a grated floor above a recessed area on which the waste containers are placed.

4.1.2.2 Batch Waste Treatment Unit

SWMU No. 50-005 consists of the Batch Waste Treatment Unit (BWTU) located in the basement of TA-50-1. The BWTU included a 500-gal. pressure vessel, filtering system, condenser, vacuum transfer lines, transfer pump, and associated transfer lines. The unit was permitted for hazardous waste treatment and closed in accordance with an NMED-approved closure plan (IT, 1994).

4.2 RELEASES [20.4.1 NMAC, Subpart IX, 270.14(d)(2)]

Some of the SWMUs listed in Table 4-1 have released, or are suspected to have released, hazardous waste or hazardous constituents. In 1990, LANL initiated drilling activities to test the integrity of the waste tanks comprising SWMU Nos. 50-002(a) and (b)-00. Cuttings from the boreholes revealed that some of the soil appeared wet and, based on field screening, were found to be radioactively contaminated.

SWMU No. 50-004(a)-00, a waste line in the vicinity of TA-50-37, has leaked. Radioactively contaminated soil discovered during waste line decommissioning activities was cleaned up to levels as low as reasonably achievable. Potential chemical contaminants were not analyzed at the time of decommissioning.

Accidental releases from the RLWTF have contaminated sections of Upper Ten Site Canyon [SWMU No. 50-006(a)] with radioactive and chemical wastes. Airborne contaminants released through stack emissions from the RLWTF, and other treatment facilities at TA-50 have contaminated soil at various locations within TA-50 [SWMU No. 50-006(c)]. Liquid effluent from the treatment plant, released prior to the issuance of a NPDES permit, has contaminated sections of Mortandad Canyon with a variety of chemical, radiological, and heavy metal wastes [SWMU No. 50-006(d)]. This active effluent discharge is subject to regulation under the CWA. Parameters prescribed by the NPDES permit are sampled in accordance with that permit's requirements.

4.3 CHARACTERIZATION OF RELEASES

Information regarding releases from SWMUs is contained in the "RFI Work Plan for Operable Unit 1147" (LANL, 1992). These descriptions include the material released and the nature of the release. However, because of the nature of the releases, the exact volume released is not always known. The timing of the releases can only be estimated by the period of operation and sampling events. Additional information on the SWMUs at TA-50 and any associated releases is provided in the revised TA-50 SWMU Report (LANL, 2002b) that is included as Supplement 4-1 of this permit renewal document.

4.4 CORRECTIVE ACTIONS [20.4.1 NMAC, Subpart V, 264.101(a)]

Pursuant to 20.4.1 NMAC, Subpart V, 264.101(a) [6-14-00], corrective actions are required for releases of hazardous waste or hazardous constituents. SWMUs identified in Section 4.1.1 and that are known or believed to have releases will be investigated in accordance with a schedule approved by NMED through LANL Environmental Restoration Project correction action activities. Corrective action, if necessary, will follow the RCRA Facility Investigation/Corrective Measures Study process.

Table 4-1

Solid Waste Management Units (SWMU) Identified for Corrective Action in Module VIII [a]

SWMU No.	Unit Type	Unit Description	Waste Description
50-001(a)	Radioactive Liquid Waste Treatment Facility (RLWTF)	The RLWTF is located at TA-50, Building 1 and designed to treat 250 gallons/minute of radioactive liquid waste (RLW) using neutralization, flocculation, clarification, and membrane filtration.	RLW, sludge, and potentially hazardous constituents
50-001(b)	Waste Lines and Manholes	Liquid waste transfer system.	RLW and potentially hazardous constituents
50-002(a)	Tank farm	A reinforced concrete vault that houses six flow-through process tanks, an equipment room, and associated waste transfer lines.	RLW, sludge, and potentially hazardous constituents
50-002(b)-00 [b]	Underground Storage Tanks	Two active waste tanks (TA-50-67 and TA-50-68) and their associated inlet and outlet lines housed in an underground vault located approximately 30 ft west of the southwest corner of TA-50-1.	RLW and potentially hazardous waste
50-002(d)	Aboveground Storage Tank	Decommissioned aboveground, 5000-gallon, stainless steel tank used for nitric acid storage.	Unused product storage only
50-003(a)	Container Storage Unit	An approximately 10- by 19-foot area located in TA-50-1, Room 59 along the northwest wall.	Mixed waste
50-004(a)-00 [c]	Historical Waste Lines and Underground Vault, RLWTF	All former components of the RLWTF at TA-50-1. Includes: • Decommissioned RLW and industrial waste lines routed tot he RLWTF from LANL TAs located along Pajarito Road. • Decommissioned underground concrete vault (TA-50-3) that housed three stainless-steel-lined concrete storage tanks (1,000 – 4,500 gallons) used to collect and store wastewater from the Omega Reactor. • 13 industrial waste lines that discharged to the decommissioned underground vault TA-50-3.	RLW and potentially hazardous constituents

Table 4-1 (continued)

Solid Waste Management Units (SWMU) Identified for Corrective Action in Module VIII [a]

SWMU No.	Unit Type	Unit Description	Waste Description
50-006(a)	Operational Release	Outfall area at the head of Ten Site Canyon impacted by two accidental operational releases due to a sump overflow at the RLWTF pump house.	RLW and potentially hazardous constituents
50-006(c)	Operational Release	Surface Soil contamination from historical stack emissions from operations at TA-50.	Soil contaminated with radioactive and potentially hazardous constituents
50-006(d)	Effluent Discharge	Drainline and NPDES-permitted Outfall 051 in Mortandad for treated wastewater from the RLWTF.	Soil contaminated with a variety of chemicals, radionuclides, and heavy metals
50-007	Incinerator and Container Storage Unit	An incinerator, various waste feed components, two waste feed tanks Container Storage Unit located in Rooms 115, 117, and 118 at TA-50-37.	Hazardous and mixed waste
50-008	Container Storage Unit	Container storage Unit located inside Rooms 102 and 103 at TA-50, Building 69 (TA-50-69).	Mixed waste
50-009	Material Disposal Area (MDA) C	An inactive MDA that covers 11.8-acres and consists of 7 pits and 108 shafts located on the north side of Pajarito Road at TA-50	Radioactive, mixed, hazardous, and solid waste
50-010	Decontamination Facility	An inactive vehicle decontamination area located in Room 34 B of the RLWTF at TA-50-1.	Radioactive and potentially hazardous waste
50-011(a)	Septic system	Decommissioned septic system located at the south end of the RLWTF at TA-50-1. The systems consisted of an influent line from TA-50-1, septic tank, manhole, a sanitary distribution system, and a seepage pit.	Sanitary waste

Table 4-1 (continued)

Solid Waste Management Units (SWMU) Identified for Corrective Action in Module VIII [a]

SWMU No.	Unit Type	Unit Description	Waste Description
50-011(b)	Lift Stations	Two active sanitary wastewater lift stations (TA-50-91 and TA-50-92) and approximately 400 feet of piping that transport sanitary wastewater from the RLWTF to the main line that serves the SWSC Plant.	Sanitary waste

a Information compiled from the LANL, 2002b, “TA-50 SWMU Report,” Los Alamos National Laboratory, Los Alamos, New Mexico; and LANL, 1992, "RFI Work Plan for Operable Unit 1147," Los Alamos National Laboratory, Los Alamos, New Mexico.
b Consolidated SWMU that consists of former SWMUs 50-002(b) and 50-002(c).
c Consolidated SWMU that consists of form SWMUs 50-004(a), 50-004(b), and 50-004(c).
d TBD = SWMU Number to be determined.

Table 4-2

Solid Waste Management Units (SWMU) Not Identified for Corrective Action in Module VIII [a]

SWMU No.	Unit Type	Unit Description	Waste Description
50-003(d)	Container Storage Unit	An approximately 9 ft by 23 ft by a 9 ft high CSU located east of TA-50-1, Room 34B at TA-50, Building 114.	Hazardous and mixed waste
50-005	Batch Waste Treatment Unit	Closed 500-gallon pressure vessel and associated processing components located at TA-50-1.	Hazardous waste
TBD [b]	Container Storage Unit	An approximately 24 ft wide by 90 ft long asphalt and concrete pad with a 12 ft wide by 90 ft long strip located in the southwest corner of TA-50, located outside TA-50-69.	Mixed waste

a Information compiled from the LANL, 2002b, “TA-50 SWMU Report,” Los Alamos National Laboratory, Los Alamos, New Mexico; LANL, 1992, "RFI Work Plan for Operable Unit 1147," Los Alamos National Laboratory, Los Alamos, New Mexico.
b TBD = SWMU Number to be determined.

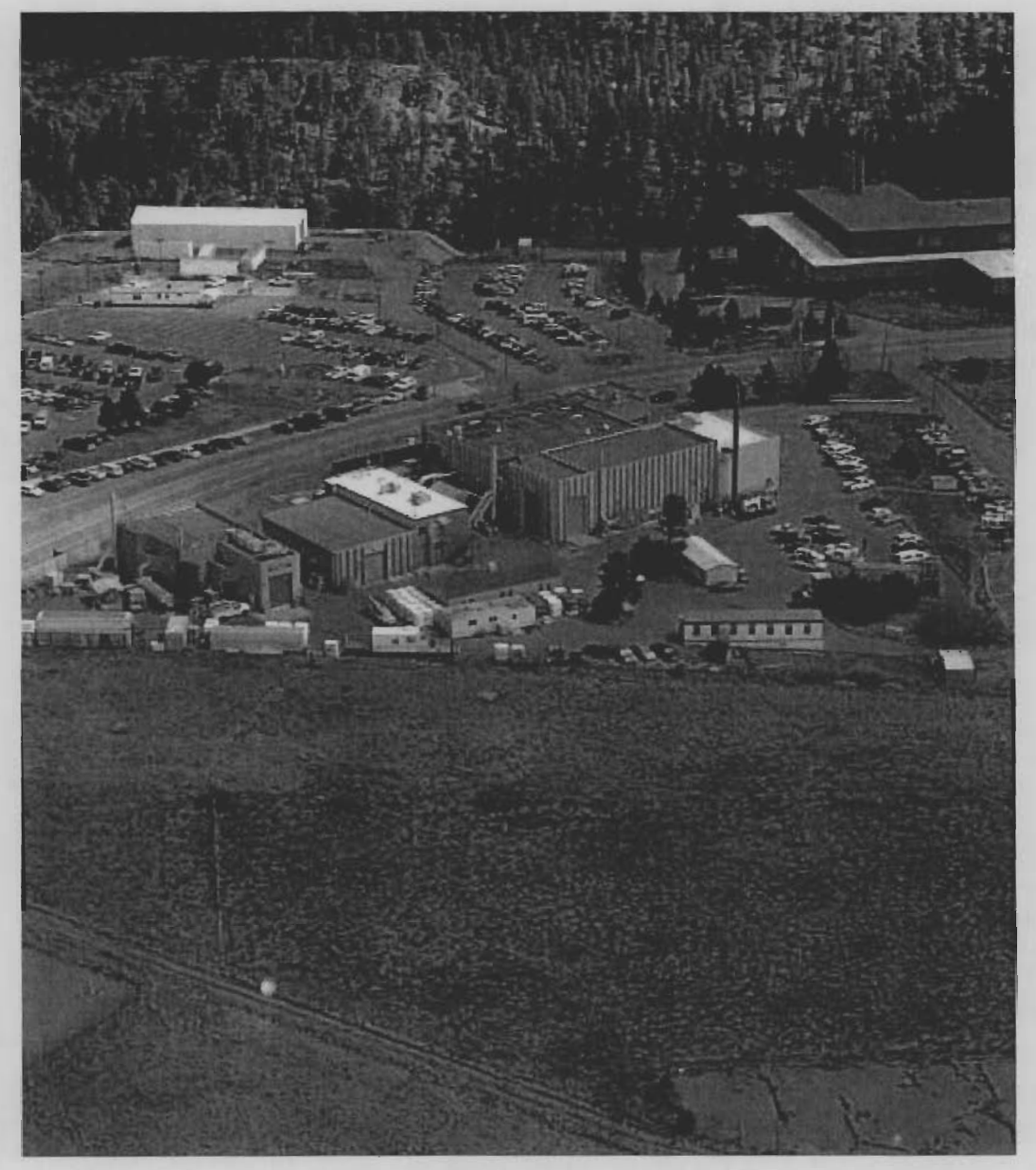
Supplement 4-1

"TA-50 Solid Waste Management Unit Report," Los Alamos National Laboratory, Los Alamos, New Mexico, April 2002.

TA-50, Waste Management Site

TA-50 is located near the center of the LANL complex. The site contains 33 waste management structures (including office trailers, tanks, storage sheds, and buildings). Waste management activities include treating radioactive liquid waste, reducing the size and volume of TRU wastes, and characterizing TRU wastes.

The facilities at TA-50 support LANL's waste management activities for several types of waste, including treatment and storage of solid and liquid, low-level radioactive waste, low-level mixed waste, TRU waste, and hazardous waste. The major facilities at TA-50 are the RLWTF; the WCRRF (50-69), formerly known as the Size Reduction Facility; and the RAMROD Facility.



TA-50 — Waste Management Site

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SWMU 50-001(a) — Waste treatment facility 50-1 — RCRA unit (active)

Administrative Authority	NMED	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1963-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	50-1	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 50-001(a) is an active radioactive liquid waste treatment plant (Building 50-1) that has operated continuously since its construction in 1963. Building 50-1 is designed to treat 250 gal./min of wastewater, primarily to remove TRU elements through neutralization, flocculation and clarification, pH control, ion exchange, and filtration. Building 50-1 treats only low-level liquid wastes from many TAs to remove target contaminants and then monitors and discharges treated effluent to NPDES-permitted Outfall 051 in Mortandad Canyon [SWMU 50-006(d)]. Treatment sludges subsequently are managed at TA-54, MDA G. Building 50-1 housed a container storage area in Room 59 [AOC 50-003(a)], and a second container storage area is located in a storage locker [structure 50-114, which was former AOC 50-003(d)]. A system of drainlines [SWMU 50-001(b)] and tanks [SWMUs 50-002(a) and 50-002(b)-00] is used to transfer, treat, and temporarily store the liquid waste and treatment sludge associated with Building 50-1. In July 1990, core samples collected from boreholes drilled through the floor around the pH adjustment tank or "grit chamber" indicated that the inlet line or the chamber leaked. Influent wastes subsequently were rerouted to flow directly into the pH adjustment tank in Building 50-2.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

This SWMU was proposed for NFA in an August 2000 permit modification request based on its active status and because the hazardous waste container storage areas within Building 50-1 are listed in Module VIII of LANL's Hazardous Waste Facility Permit. No additional RFI activities have been conducted at this SWMU.

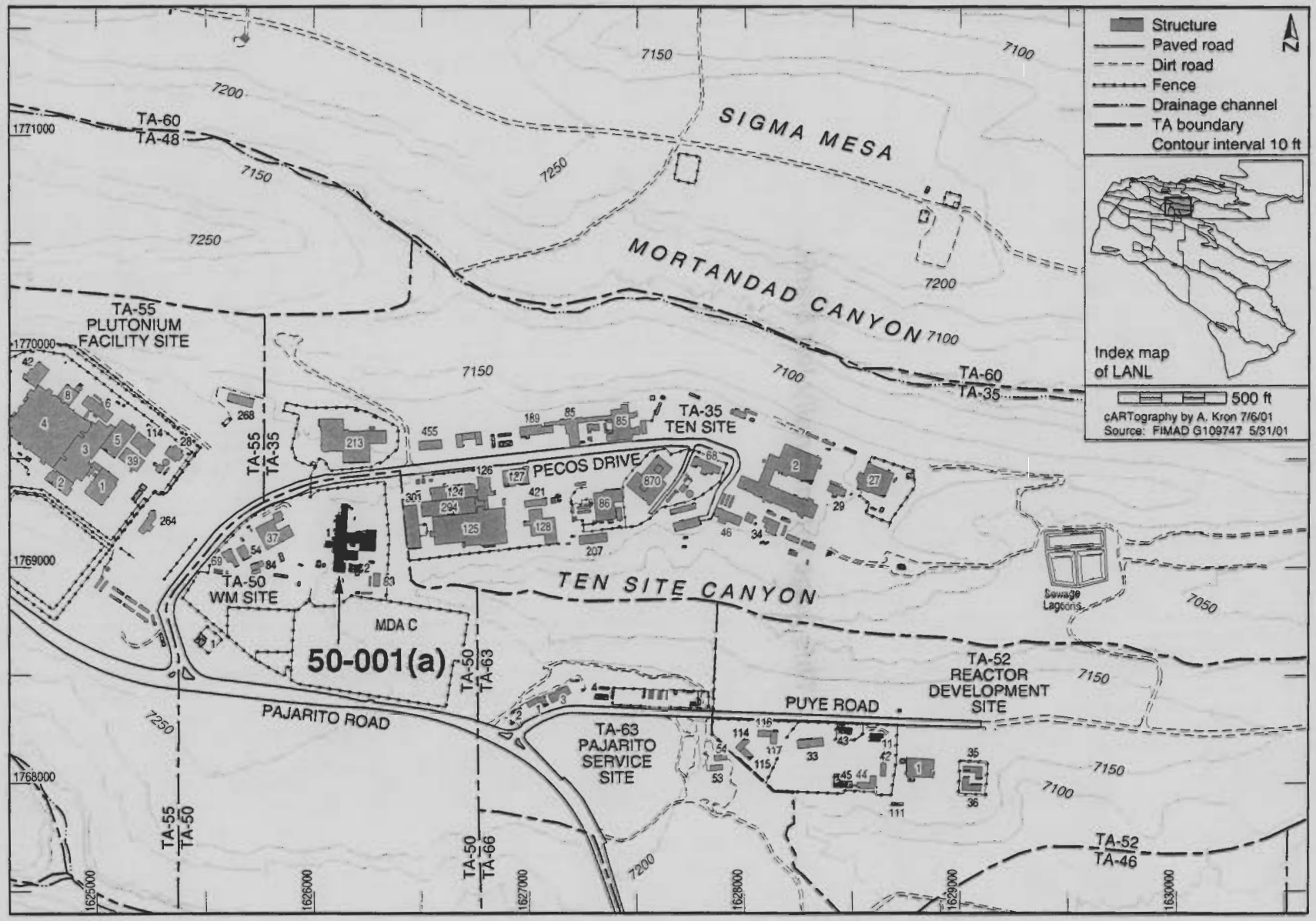
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Work Plan for Operable Unit 1147 — LA-UR Number: 92-0969

View of SWMU 50-001(a)


Structure
Paved road
Dirt road
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Drainage channel
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Contour interval 10 ft
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Index map of LANL
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cARTography by A. Kron 7/6/01
Source: FIMAD G109747 5/31/01
SIGMA MESA
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AOC 50-001(b) — Waste lines and manholes

Administrative Authority	DOE	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1963-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Various	**Other Remedial Action Conducted?**	No

Unit Description

AOC 50-001(b) is the active underground drainline system through which liquid waste is transferred to a radioactive liquid waste treatment facility (Building 50-1). A manhole (structure 50-72) is the central collection area for most incoming liquid waste. Three lines feed into structure 50-72. A major line connecting several TAs to this manhole was constructed in 1982 to replace an old line [SWMU 50-004(a)-00]. The new line is a double polyethylene pipe that enters structure 50-72 from the north side of Pecos Drive. Another waste line into structure 50-72, completed in 1982, transports low-level radioactive liquids from structure 50-73, which receives wastes from Building 50-69 (a volume reduction facility, AOC 50-008) and Building 50-37 (the incinerator complex, AOC 50-007). This line is a 6-in. polyethylene line encased in a 10-in. polyethylene line that has leak monitor and vacuum test capabilities. A third line, also installed in 1982, transports low-level radioactive waste from TA-55 to structure 50-72 through manholes 50-016 and 50-78. The line consists of an inner stainless steel pipe encased in a PVC pipe and has leak-monitor and vacuum test capabilities. All manholes that transport wastewater to Building 50-1 are monitored continuously. A single drainline carried all influent from structure 50-72 into the grit tank at Building 50-1 until a leak around the grit tank was detected in 1990. The line now bypasses the grit chamber and passes through the neutralization chamber before it connects to the Building 50-2 tank farm [SWMU 50-002(a)]. The line consists of an inner 8-in. schedule 40 stainless steel pipe and an outer 10-in. schedule 10 stainless steel pipe. Structure 50-7, another component of the influent waste system, is connected to the waste line from the tank truck unloading station (structure 50-77). Structure 50-7 has been out of service since the early 1990s.

Four other waste lines run from TA-55 to Building 50-1 through structure 50-106 to tanks in an underground vault (structure 50-66). Three of the lines are 1.5-in. stainless steel lines, each encased in 3-in. PVC. Two of the three lines carry caustic and acid wastes with high radioactivity; the third line is a spare that has never been used. The fourth line, which is for industrial waste, is a 2-in.-diameter stainless steel line encased in 3-in. PVC. The lines operate by gravity flow, and the end of each is continuously monitored at TA-55, at structure 50-57, and at structure 50-66 by a drip-tray and conductivity-probe system wired to a computer for continuous readout. The three nonindustrial waste lines were replaced in 1994; however, the new lines have not yet been put into service. Soil sampling was scheduled to determine if contaminants had leaked from the pipes. According to the 1990 SWMU report, there was some concern about contamination from the waste lines carrying TA-55 effluent because the original vacuum seals had lost their integrity; however, the drip pans have never collected fluid that indicated the inner lines were leaking. The area where the lines run into Building 50-1 and the area west and north of the tank farm (Building 50-2) were sampled in August 1990. Sample results showed no radionuclides above BVs.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

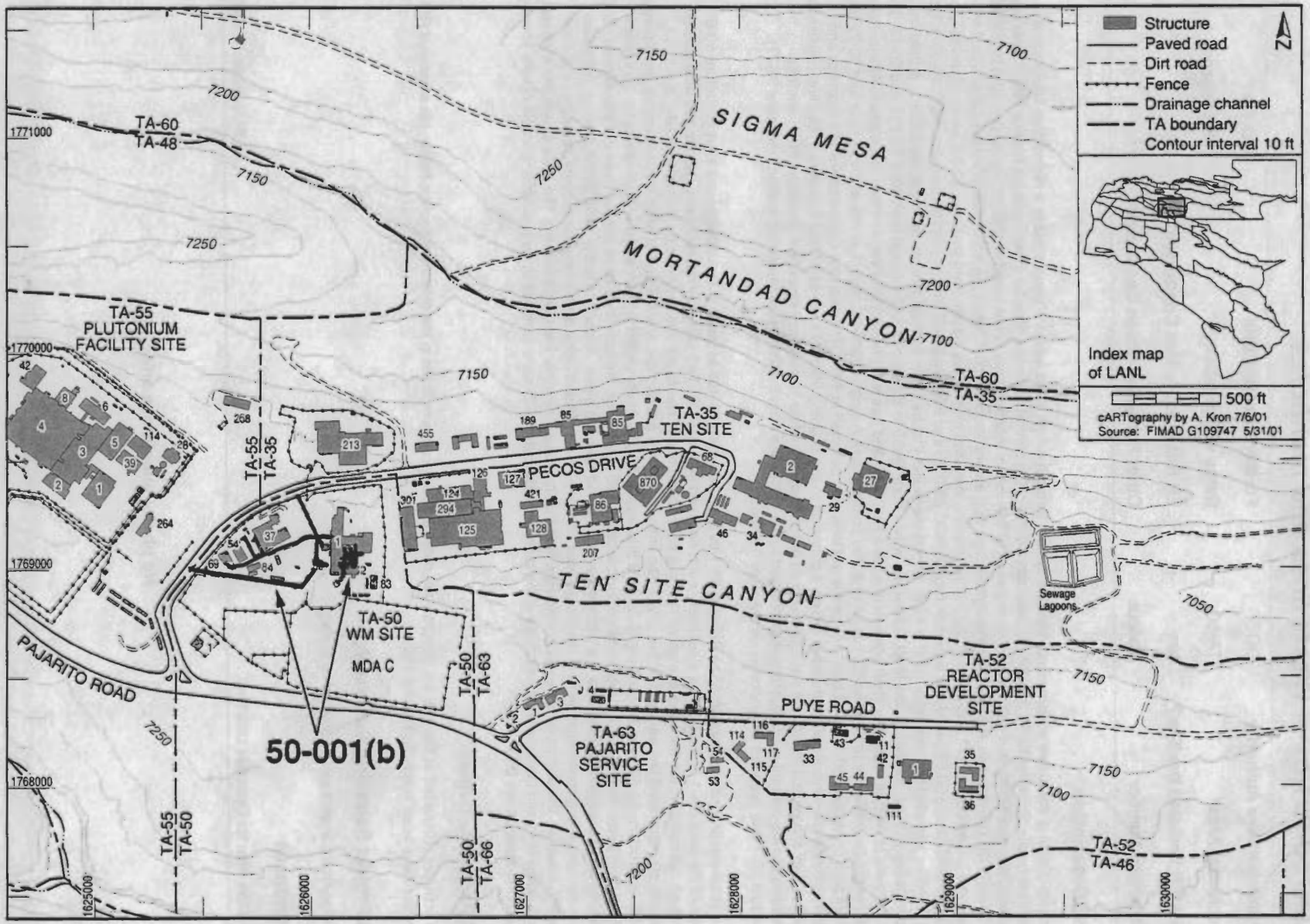
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Work Plan for Operable Unit 1147 — LA-UR Number: 92-0969

No photo; subsurface unit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SWMU 50-002(a) — Underground tanks

Administrative Authority	NMED	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1963-Present
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	50-2	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 50-002(a) consists of an underground, reinforced-concrete tank vault (Building 50-2) housing six flow-through process tanks, an equipment room, and waste-transfer lines associated with a radioactive liquid waste treatment facility (Building 50-1). The floor of the vault is 17 ft below ground. Holding tanks located within the vault (Building 50-2) include two incoming raw-waste tanks (25,000 gal. and 75,000 gal.); one 25,000-gal. low-level sludge tank; and two 25,000-gal. tanks used to store treated waste before discharge to NPDES-permitted Outfall 051 [SWMU 50-006(d)], which discharges to Mortandad Canyon. One of these tanks is used to store waste during D&D activities. Wastes are transported to the vault (Building 50-2) through the system of transfer lines. Waste-transfer lines include six cast-iron lines (including waste lines 55 and 67) connecting Building 50-1 to the equipment room in Building 50-2; four steel lines added in 1984 to connect Room 61 in Building 50-1 to the equipment room in Building 50-2; five cast-iron lines from drains in Building 50-1 to the D&D tank in Building 50-2; a cast-iron line from a sink in the vehicle-decontamination facility to the D&D tank in Building 50-2; an influent line connecting Building 50-2 to a 100,000-gal. emergency holding tank (structure 50-90); and an effluent line connecting structure 50-90 to one of the 25,000-gal. influent tanks in Building 50-2. Two unintended operational releases occurred from the overflow of a sump in Building 50-2, causing untreated wastewater to be discharged to waste lines 55 and 67 (the waste lines for treated effluent) and into the outfall area at the head of Ten Site Canyon [see SWMU 50-006(a)]. The releases occurred in July and September 1974. In February 1975, waste line 67 was plugged at its outfall. The integrity of the tank farm and the pipelines tied to Building 50-1 were checked in 1990, and no leaks were found. The 75,000-gal. influent tank and 25,000-gal. sludge tank were taken offline in June 2001 and are scheduled for decontamination in FY2002.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

One sample was collected at this SWMU in 1995; no additional RFI activities have been conducted at this site.

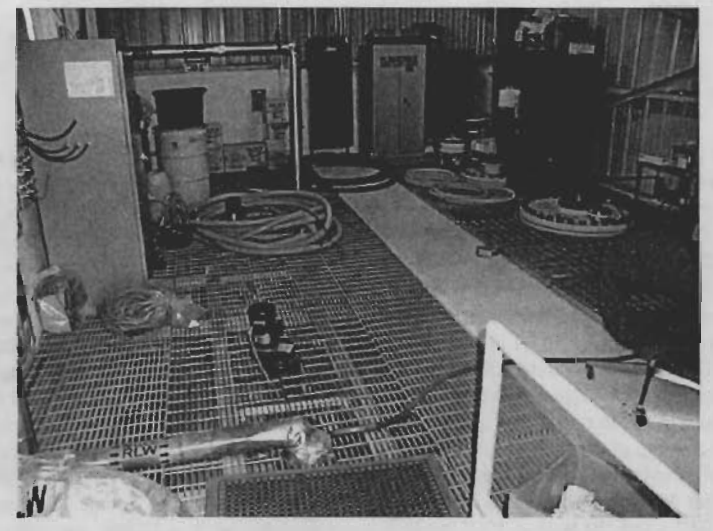
ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities that may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

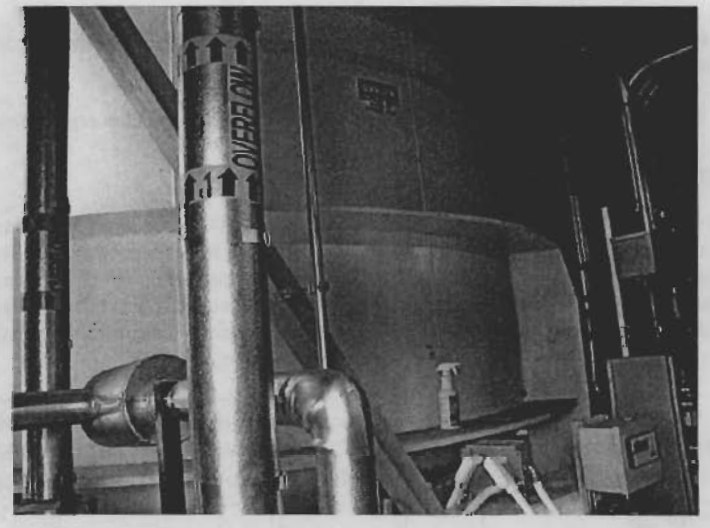
Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	17	0	1
PCBs	0	N/A	0
Radionuclides	3	1	1
SVOCs	0	N/A	0
VOCs	0	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

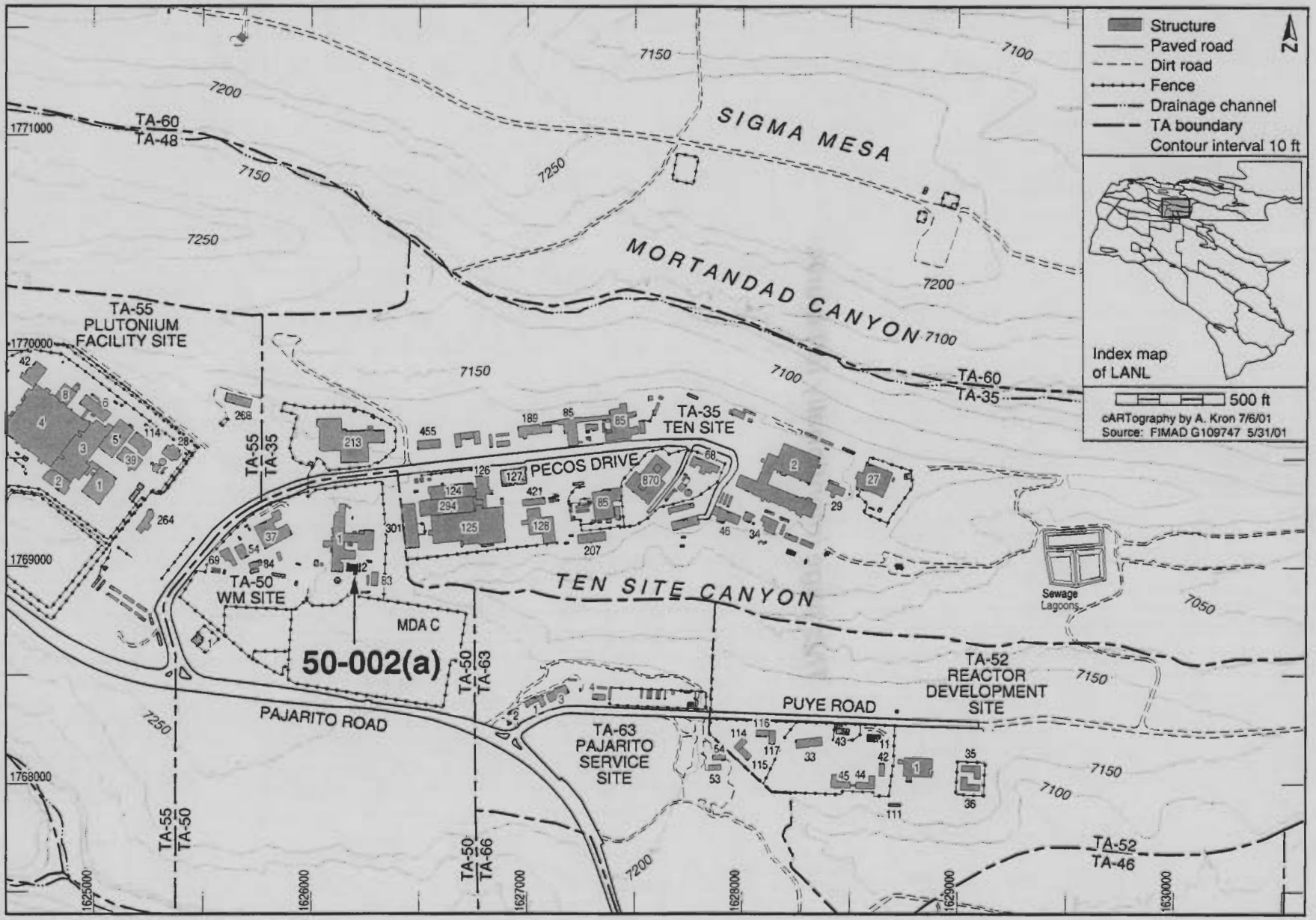
Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	1.4 mg/kg	0.39 mg/kg
Radionuclides	Tritium	2620 pCi/g	880 pCi/g



View of SWMU 50-002(a)



View of SWMU 50-002(a)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SWMU 50-002(b)-00 — Vaulted underground tanks for TA-55 wastes

Administrative Authority	NMED	**Former Operable Unit**	N/A
Technical Area	TA-50	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	50-67, 50-68	**Other Remedial Action Conducted?**	No

Unit Description

Consolidated SWMU 50-002(b)-00 consists of former SWMUs 50-002(b) and 50-002(c), two active waste tanks (structures 50-67 and 50-68) and their associated inlet and outlet lines housed in an underground, reinforced-concrete tank vault (structure 50-66) at the radioactive liquid waste treatment facility [Building 50-1, SWMU 50-001(a)]. The concrete vault measures 18 ft x 16 ft x 14 ft deep and is located about 30 ft from the southwest corner of Building 50-1. The tanks and vault were constructed exclusively to store radioactive caustic waste (structure 50-67) and acidic waste (structure 50-68) from TA-55, where TRU wastes are generated. TRU wastes are processed separately from other wastes. The inlet lines consist of four stainless steel pipes encased in PVC. One line is a capped backup. The second line carries radioactive acid waste to the acid waste tank. The third line carries radioactive caustic waste to the caustic tank. Wastes are transferred from the tanks through two double stainless steel lines to Room 60, Building 50-1. The operation is monitored for criticality hazards, and necessary adjustments are made before treatment; from 10 to 12 containers of treated TRU waste are generated annually. The fourth line carries radioactive liquid wastes to a manhole (structure 50-72) [see AOC 50-001(b)]. No documented releases are associated with SWMU 50-002(b)-00.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

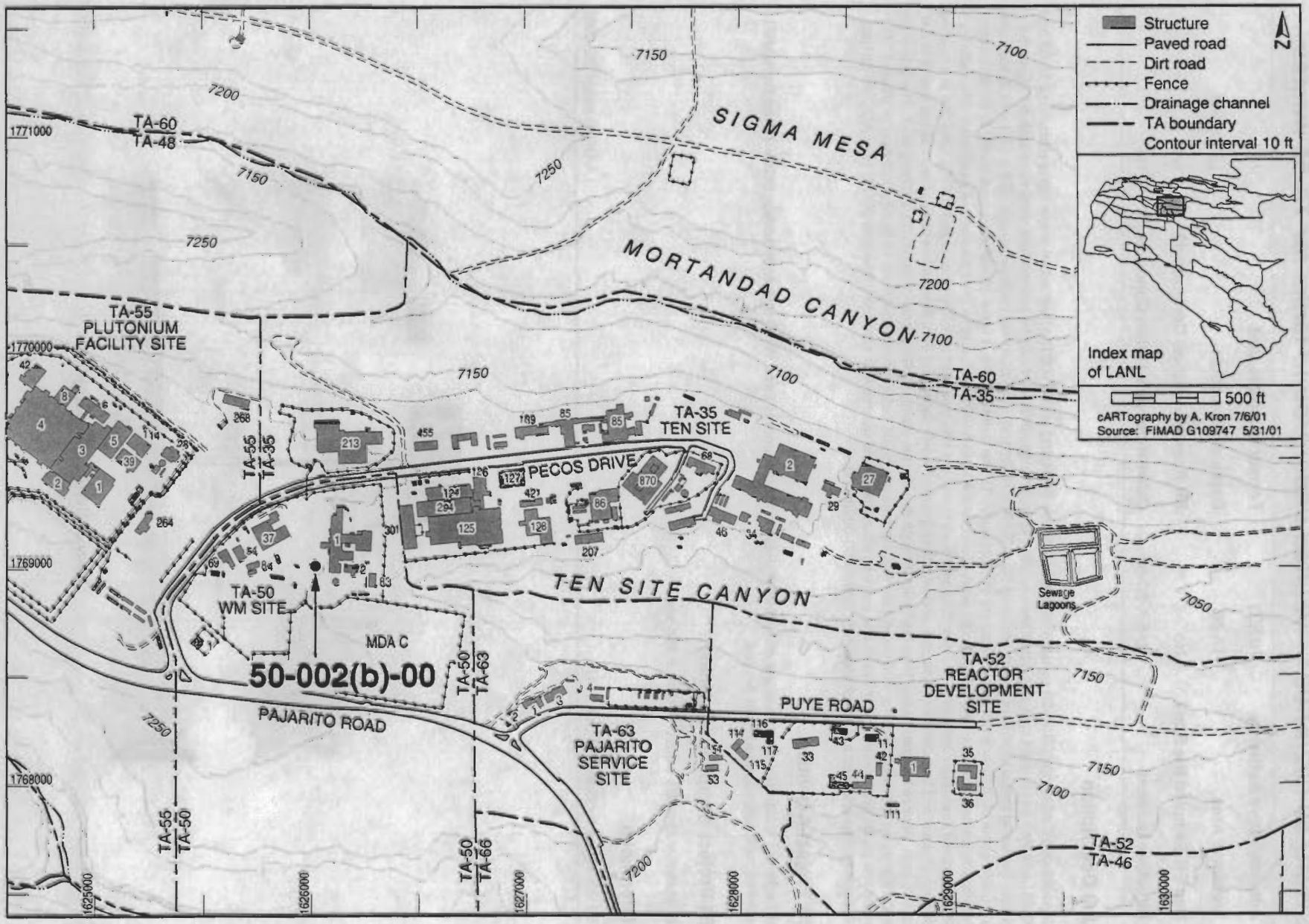
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Work Plan for Operable Unit 1147 — LA-UR Number: 92-0969

View of SWMU 50-002(b)-00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PAJARITO SERVICE SITE
PUYE ROAD
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REACTOR DEVELOPMENT SITE
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Sewage Lagoons
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AOC 50-002(d) — Aboveground storage tank

Administrative Authority	DOE	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1964-1996
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	50-5	**Other Remedial Action Conducted?**	Yes

Unit Description

AOC 50-002(d) is a decommissioned aboveground 5000-gal. stainless steel tank (structure 50-5) previously used for the storage of unused product (nitric acid). The storage tank was part of the ion-exchange column system, which was designed to remove any radioisotopes not removed by the clariflocculator system at the radioactive liquid waste treatment facility (Building 50-1). Because the clariflocculator system was successful in removing radioisotopes from wastewater to levels consistently below DOE limits, the ion-exchange column was rarely used and the tank was never filled to capacity. The tank (structure 50-5) is located adjacent to the north wall of Room 60D at Building 50-1 and replaced the original nitric acid tank in late 1964 after the original rubber-lined carbon steel tank reportedly leaked. The new tank (structure 50-5) is supported on concrete saddles that extend 5 ft below ground surface. A concrete sump filled with limestone chips (structure 50-12) was installed beneath the new tank. The tank was vented to the sump to neutralize any nitric acid vapors emitted when the tank was filled. Retaining walls and a concrete slab were installed in 1988 to contain any spillage. The tank was decommissioned (emptied, triple rinsed, and all piping disconnected) in 1996.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

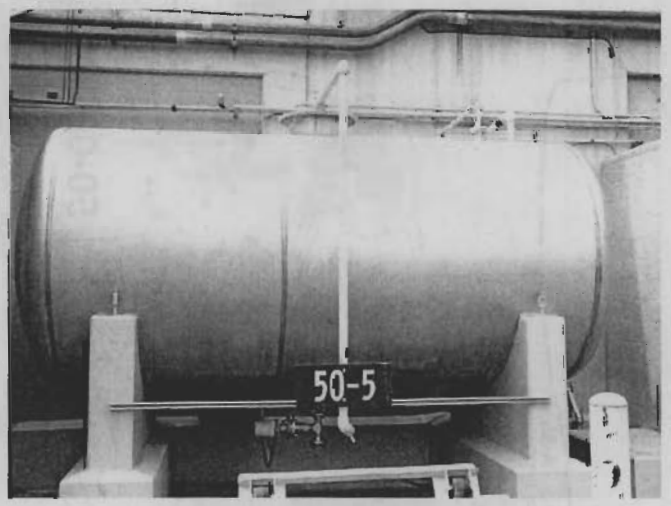
The original tank was replaced after a reported leak, and the new tank (structure 50-5) was managed in accordance with LANL's Spill Prevention Control and Countermeasures Plan. No documented releases have occurred from structure 50-5. AOC 50-002(d) was recommended for NFA in a 2000 RFI report.

ER Project Sampling Summary

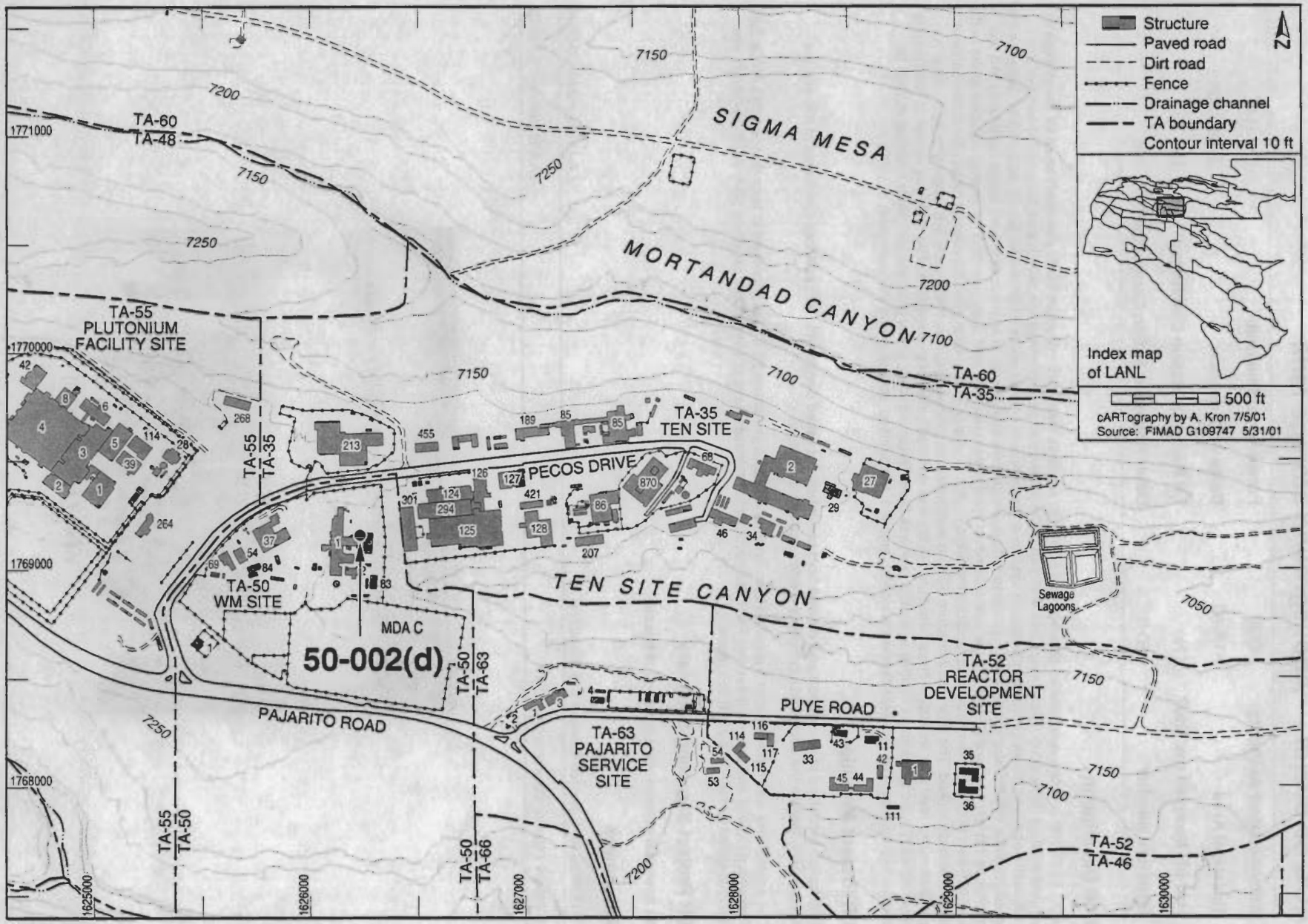
No analytical samples were collected at this site.

References

RFI Report for Potential Release Site 50-002(d)	LA-UR Number: 00-2514
RFI Work Plan for Operable Unit 1147	LA-UR Number: 92-0969



View of AOC 50-002(d)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AOC 50-003(a) — Container storage area

Administrative Authority	DOE	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

AOC 50-003(a) is a RCRA interim status mixed-waste container storage area located in Room 59 of the radioactive liquid waste treatment facility (Building 50-1). This unit will not be permitted, but will be closed. Room 59 was constructed with steel framing and insulated metal roofing and siding; the design capacity is the equivalent of twenty-seven 55-gal. containers of solid mixed low-level, mixed TRU, and hazardous waste. The area has been used to store containers of solid cemented mixed TRU sludge resulting from waste treatment activities in Room 60A; waste containing free liquids cannot be stored in Room 59. The cementation process is generator treatment being performed in a less-than-90-day storage area. Following cementation, containers of mixed TRU waste have been temporarily stored in Room 59 in accordance with the permit requirements. The waste containers are subsequently transported to other LANL RCRA-permitted mixed-waste management facilities for storage.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

AOC 50-003(a) is designed and operated in accordance with 20 NMAC 4.1 Subpart V and 40 CFR 264 Subpart B, C, and I requirements. Collectively, these requirements address the active management of the waste. AOC 50-003(a) was recommended for NFA in a 1999 RFI report.

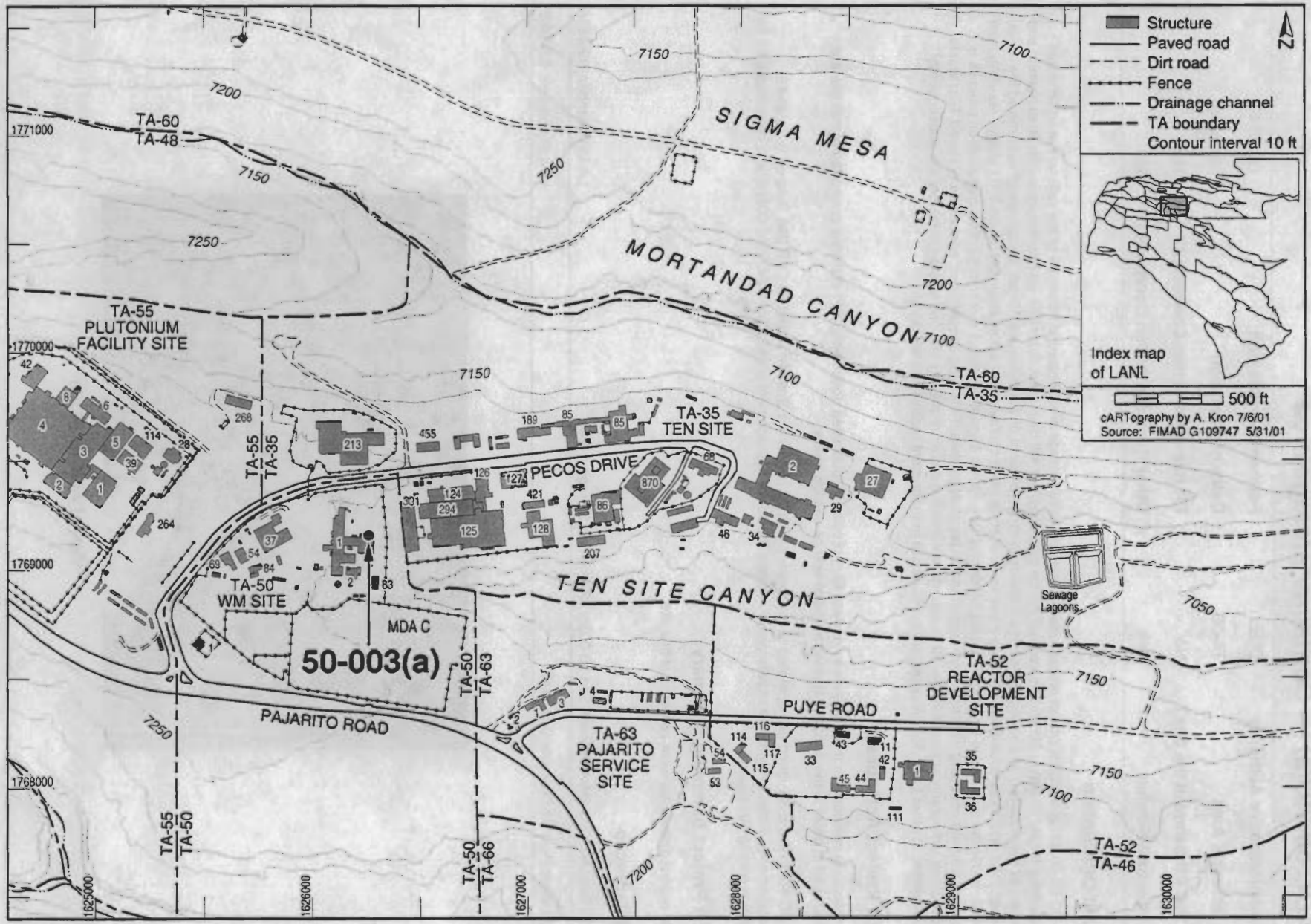
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Report for Potential Release Site 50-003(a) (Container Storage Area)	LA-UR Number: 99-4834
RFI Work Plan for Operable Unit 1147	LA-UR Number: 92-0969

View of AOC 50-003(a)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SWMU 50-004(a)-00 — Historical waste lines and underground vault, Radioactive Liquid Waste Treatment Facility

Administrative Authority	NMED	**Former Operable Unit**	N/A
Technical Area	TA-50	**Dates of Operation**	1963-1989
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	Various	**Other Remedial Action Conducted?**	Yes

Unit Description

Consolidated SWMU 50-004(a)-00 consists of former SWMUs 50-004(a), 50-004(b), and 50-004(c), all former components of the radioactive liquid waste treatment facility, Building 50-1.

Former SWMU 50-004(a) includes locations through which underground radioactive liquid waste and industrial waste lines were routed to the TA-50 radioactive liquid waste treatment facility from LANL technical areas located along Pajarito Road. The majority of these waste lines were decommissioned and removed in 1975; excavated soils were characterized for radioactive constituents and remediated to meet ALARA levels.

Former SWMU 50-004(b) is the location of a decommissioned underground vault (structure 50-3) that housed three stainless steel-lined concrete storage tanks, ranging in volume from 1000 to 4500 gal., used to collect and store wastewater from the Omega Reactor. Waste lines and manholes to the collection tank structure included waste line 49 from TA-35 and waste line 50 from Building 50-1. Waste line 49, the vault, and the tanks were removed in 1989. Soil sampled during decommissioning was screened for radionuclides and chemical constituents. No elevated concentrations were detected.

Former SWMU 50-004(c) consists of 13 industrial waste lines (44, 45, 45a, 46, 47, 48, 48a, 49, 54, 55, 56, 65, and 67) and three associated manholes (structures 50-6, -55, and -56) that discharged to the decommissioned underground vault (structure 50-3). All of the waste lines and manholes associated with former SWMU 50-004(b) were removed between 1981 and 1989, with the exception of waste line 56, which remains in service. Radionulcide contamination discovered during decommissioning of the waste lines and manholes was remediated to ALARA levels through removal of pipe and affected soil to approximately 19 ft below grade. Field screening for radionuclides confirmed that ALARA levels had been met; however, no samples were analyzed for hazardous constituents.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

In 1994, an RFI was conducted at former SWMUs 50-004(a) and 50-004(c), with the objective of filling data gaps identified in the RFI work plan and to determine the presence and/or absence of radionuclides and hazardous constituents from historical operational releases. The RFI at former SWMU 50-004(a) included the trench and manholes through which a 520-ft section of the original 6-in. VCP waste line passed. Part of the waste line was removed in 1975 to clear the area for construction of Building 50-37 (a new line, acid waste line 45, bypassed the Building 50-37 construction zone and replaced the decommissioned line until 1984, when the recently installed waste line also was removed). Five vertical boreholes located approximately 100 ft apart were advanced along the waste line trench to the contact between trench fill and trench bottom. Eleven samples, collected from the five locations, were field-screened for radionuclides and organic vapors. Radionuclide screening results were all at or near BVs and organic vapor results were below 1 ppm. The samples were subsequently submitted to an off-site laboratory for analysis for inorganic chemicals, organic chemicals, and radionuclides. Elevated levels of beryllium, plutonium-238, and plutonium-239 were detected at levels above BVs, but none of the detects exceeded SALs. At former SWMU 50-004(c), 67 samples were collected from depths up to approximately 14 ft in 29 locations. Samples were field-screened for radionuclides and organic vapors and submitted for off-site laboratory analysis for organic chemicals, inorganic chemicals, and radionuclides. Analytical results showed elevated levels of beryllium, copper, chromium, lead, mercury, calcium, potassium, nickel, zinc, plutonium-238, plutonium-239, and uranium-235. The human health risk assessment, documented in the RFI report, indicated that the contaminants identified above BVs were not considered COPCs when compared with risk-based SALs. An ecological screening assessment was not completed for either of the former SWMUs. Former SWMUs 50-004(a) and 50-004(c) were recommended for NFA in the RFI report, which is currently under review by the NMED. No additional RFI activities have been conducted at former SWMU 50-004(b).

Based on common operational history, waste streams, geographical proximity, contaminant transport mechanisms, and the investigation required to assess nature and extent of contamination, all three former SWMUs were consolidated during the FY2000 annual unit audit. Based on the current SAL screening, presented in table above, only arsenic exceeds SALs at a maximum detected value of 6.5 mg/kg.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities that may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	17	16	1
PCBs	0	N/A	0
Radionuclides	8	6	0
SVOCs	0	N/A	0
VOCs	3	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

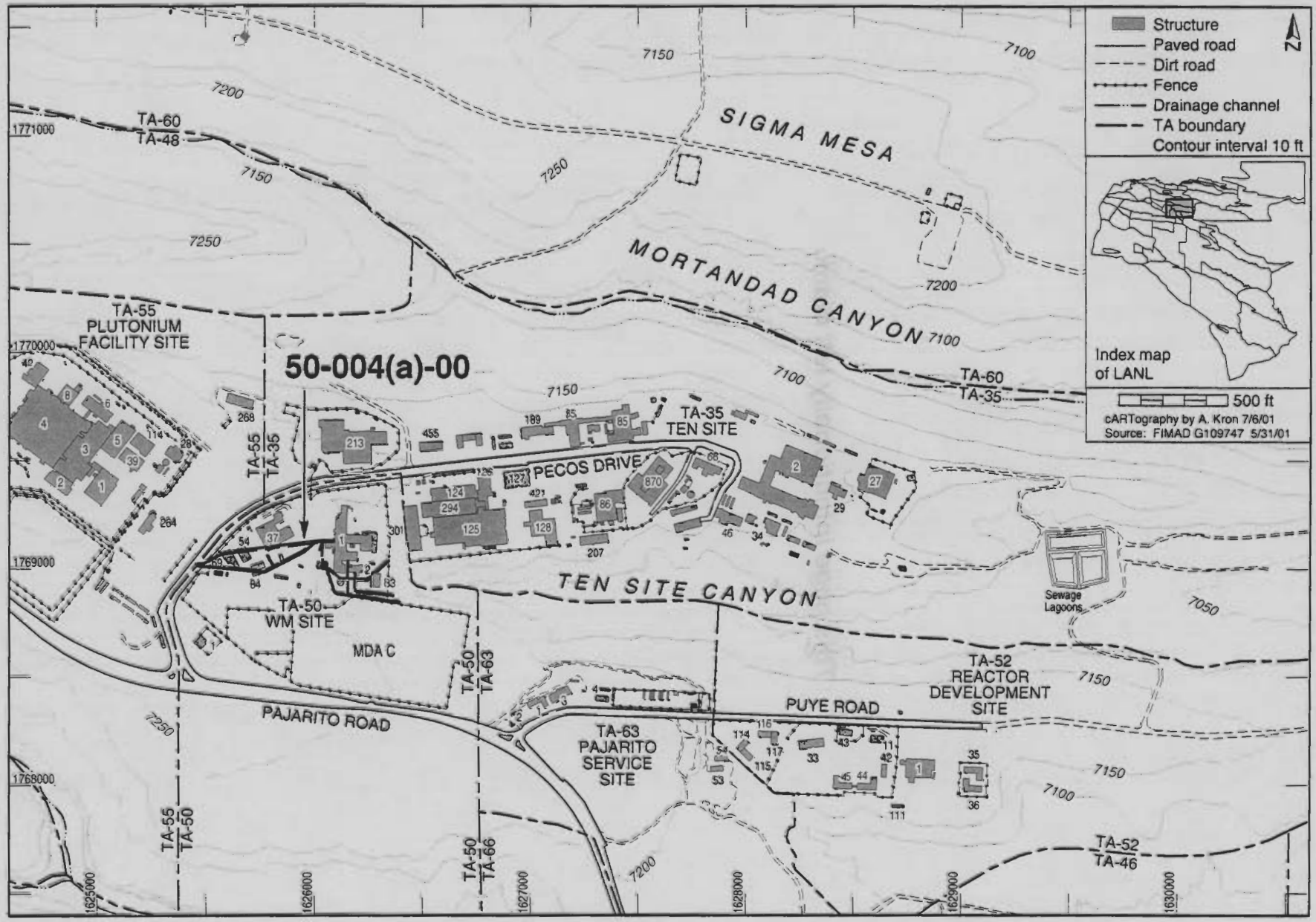
Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	6.5 mg/kg	0.39 mg/kg

References

RFI Report for Potential Release Sites at TA-50: 50-004(a), 50-004(c), 50-011(a) (Located in Former Operable Unit 1147) — LA-UR Number: 96-148

RFI Work Plan for Operable Unit 1147 — LA-UR Number: 92-0969

No photo; subsurface unit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SWMU 50-006(a) — Operational release

Administrative Authority	NMED	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1963-Present
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	Yes
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 50-006(a) is the outfall area at the head of Ten Site Canyon impacted by two accidental operational releases when a sump in a pumping station (Building 50-2) overflowed, causing untreated wastewater to be discharged to waste lines 55 and 67 (the waste lines for treated effluent). The releases occurred in July and September 1974. In February 1975, waste line 67 was plugged at its outfall. A soil sample collected from the outfall area when waste line 67 was plugged showed elevated levels of gross-alpha radioactivity. Analysis of additional soil samples collected below the waste line 67 outfall in September 1976 showed elevated levels of gross-alpha radioactivity extending 984 ft downgradient from the outfall. In 1981, both waste lines were completely removed. During the waste line removal operation, elevated levels of radionuclides, including plutonium-239, ruthenium-106, cesium-137, strontium-89, and yttrium-90, were detected. As a result, the outfall area was partially decontaminated by the removal of 70 cubic meters of contaminated soil [see description for SWMU 50-004(a)-00)]. The contaminated outfall area in Ten Site Canyon was subsequently marked with signs and tape.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted an RFI at SWMU 50-006(a) in 1993 to determine the nature and extent of radionuclide and hazardous chemical contamination in and around the Ten Site Canyon outfall area. Sample locations were sited below the former waste line outfalls, on both banks of the drainage channel, and in the canyon drainage channel at regular intervals over a distance of approximately 1300 ft downstream from the TA-50 boundary. Samples were field-screened for organic vapors and radioactivity. Elevated gross-alpha radiation was found at one screening sample location, resulting in the selection of additional sample locations upstream and downstream from the area with elevated gross-alpha radiation. A total of 134 samples were collected from 53 locations during the RFI. Samples were analyzed for inorganic chemicals, VOCs, SVOCs, PCBs/pesticides, and radionuclides. Analytical results showed concentrations of PAHs, lead, mercury, nickel, silver, thallium, PCBs, thorium-232, cesium-137, cobalt-60, plutonium-238, plutonium-239/240, and strontium-90 above their respective BVs and/or SALs. Samples collected from a hummock in the stream channel approximately 500 ft downgradient of the outfall area showed the highest levels of cesium-137, plutonium-238, plutonium-239/240, and strontium-90. Because the hummock could be dislodged in a rain event, the 1995 RFI report recommended an interim action to remove the contaminated sediment.

The ER Project implemented an interim action to remove the hummock in November 1996. Approximately 0.72 cubic yards of radioactively contaminated soil was excavated and removed from the location in the stream channel where the highest levels of radionuclides had been detected during the RFI. Ten confirmation samples were collected from the excavated area and analyzed for gross-alpha and -beta radioactivity. Results reported in the 1997 interim action report showed gross-alpha radiation levels ranging from 8.91 pCi/g to 23.5 pCi/g, and gross-beta levels ranging from 0.0 pCi/g to 23.8 pCi/g, indicating that the interim action cleanup levels had been met.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities that may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	12	11	1
PCBs	2	N/A	2
Radionuclides	10	10	6
SVOCs	16	N/A	4
VOCs	6	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

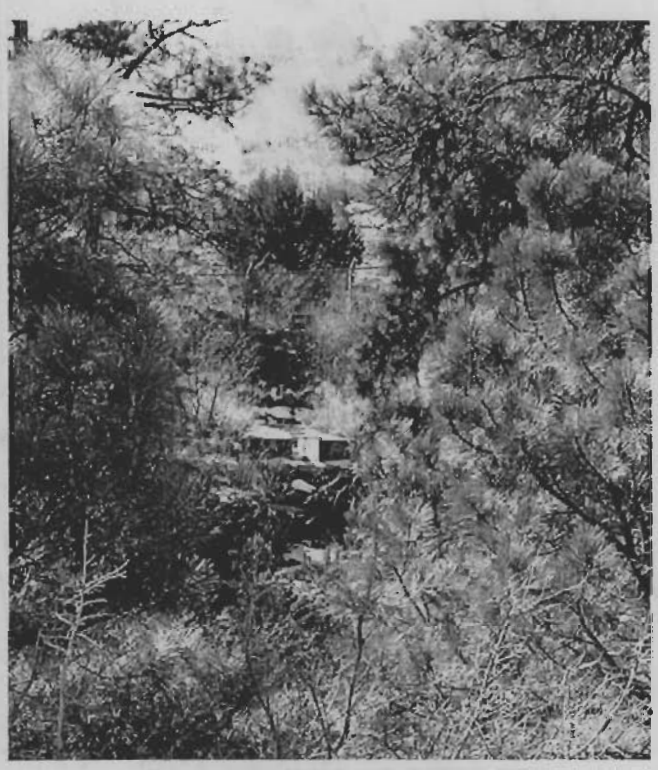
Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	4.6 mg/kg	0.39 mg/kg
PCBs	Aroclor-1254	6 mg/kg	0.22 mg/kg
	Aroclor-1260	1.25 mg/kg	0.22 mg/kg
Radionuclides	Americium-241	170.9 pCi/g	39 pCi/g
	Cesium-137	72.83 pCi/g	5.3 pCi/g
	Cobalt-60	1.2991 pCi/g	1.2 pCi/g
	Plutonium-238	5190 pCi/g	49 pCi/g
	Plutonium-239	453 pCi/g	44 pCi/g
	Strontium-90	57.7 pCi/g	5.7 pCi/g
SVOCs	Benzo(a)anthracene	1.1 mg/kg	0.62 mg/kg
	Benzo(a)pyrene	1.2 mg/kg	0.062 mg/kg
	Benzo(b)fluoranthene	1.5 mg/kg	0.62 mg/kg
	Indeno(1,2,3-cd)pyrene	0.66 mg/kg	0.62 mg/kg

References

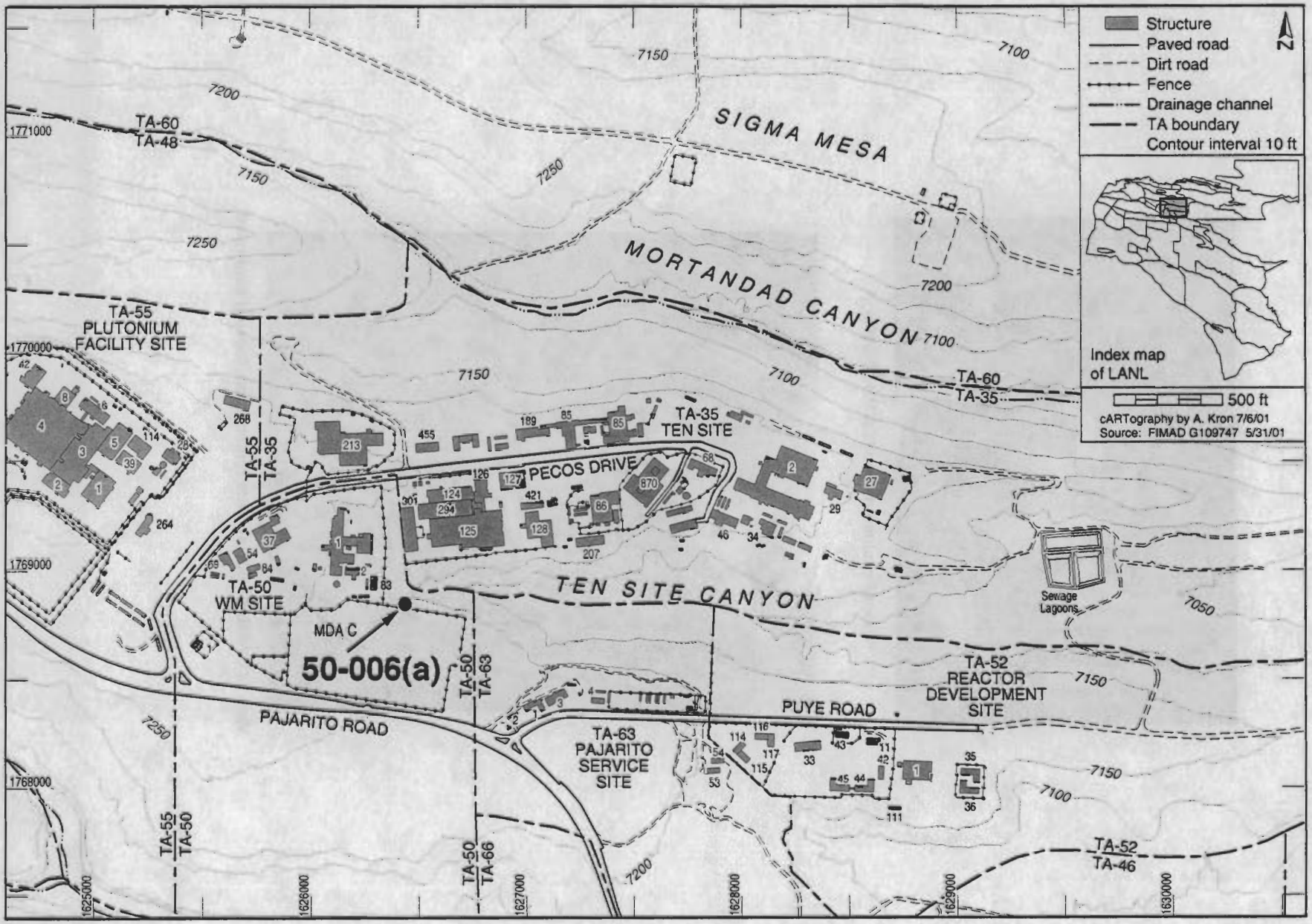
RFI Report for TA-50: PRSs 50-006(a), 50-006(c), 50-007, 50-008 — LA-UR Number: 95-2738

RFI Work Plan for Operable Unit 1147 — LA-UR Number: 92-0969

View of exclusion zone (SWMU 50-006(a))



View of SWMU 50-006(a), after remediation, looking southwest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SWMU 50-006(c) — Operational release

Administrative Authority	NMED	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1963-Present
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 50-006(c) refers to surface soil contamination from the deposition of radioactive contaminants (primarily plutonium and americium) from historical stack emissions from operations at TA-50. Emission sources included seven exhaust stacks that ventilated hoods for specific operations at the facility. A previous investigation showed slightly elevated plutonium levels in nearby soils. The only stack emission at TA-50 that has an Air Quality Permit is the Portable Flash Evaporation System. That permit is not held by LANL but by an independent firm called HydroChem Industrial Services; permit number: 2310-REV-1. Buildings 50-1, 50-37, and 50-69 are all monitored for radioactive emissions and resulting data are reported to EPA Region VI.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted an RFI at SWMU 50-006(c) in the summer of 1993 to confirm results from previous surface soil samples and to determine the nature and extent of any radionuclides and RCRA-listed chemicals for which data were lacking when the OU 1147 work plan was written. The RFI included AOCs 50-007 and 50-008, surface soil contamination from airborne releases from the incinerator complex (Building 50-37) and the volume reduction facility (Building 50-69), respectively. The one SWMU and two AOCs were investigated as an aggregate because their boundaries were indistinguishable. Samples were collected from surface soils from five unpaved areas around Buildings 50-1, 50-37, and 50-69. Sample locations were biased toward natural drainage channels, and soil samples were collected from a total of 51 locations. The samples were analyzed for inorganic and organic chemicals, PCBs, and radionuclides. Analytical results showed elevated concentrations of beryllium, cadmium, chromium, nickel, and silver near a pipe rack. Because the pipe rack was still in use at the time of the RFI, the RFI report recommended that the area be recharacterized when the pipe rack was removed. In addition, cobalt-60, radium-226, several PAHs, and PCBs (Aroclor 1254) were detected above their respective BVs and/or SALs. The RFI report indicated that these contaminants were not considered COPCs when compared with risk-based SALs and/or PRGs. An ecological screening assessment was not completed for the SWMU. The RFI report recommended NFA for SWMU 50-006(c).

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities that may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	12	8	4
PCBs	2	N/A	2
Radionuclides	7	4	1
SVOCs	14	N/A	5

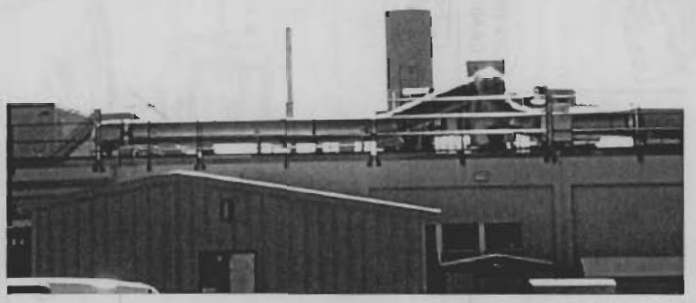
The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	12.3 mg/kg	0.39 mg/kg
	Cadmium	170 mg/kg	70 mg/kg
	Chromium (total)	810 mg/kg	210 mg/kg
	Silver	410 mg/kg	380 mg/kg
PCBs	Aroclor-1254	1 mg/kg	0.22 mg/kg
	Aroclor-1260	0.52 mg/kg	0.22 mg/kg
Radionuclides	Cobalt-60	1.5192 pCi/g	1.2 pCi/g
SVOCs	Benzo(a)anthracene	1.8 mg/kg	0.62 mg/kg
	Benzo(a)pyrene	2.4 mg/kg	0.062 mg/kg
	Benzo(b)fluoranthene	2.2 mg/kg	0.62 mg/kg
	Dibenz(a,h)anthracene	0.69 mg/kg	0.062 mg/kg
	Indeno(1,2,3-cd)pyrene	1.6 mg/kg	0.62 mg/kg

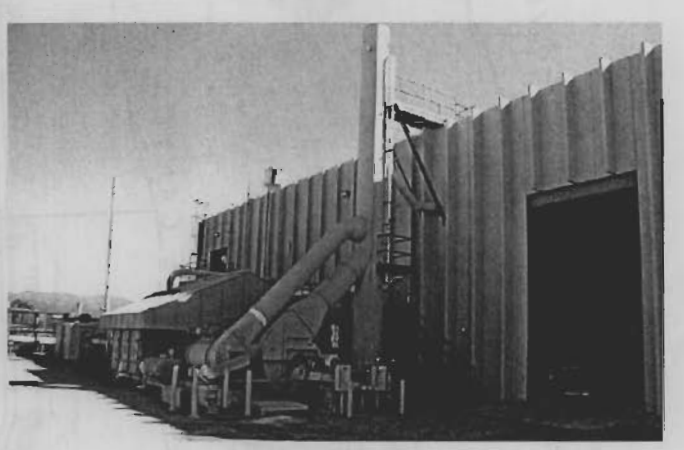
References

RFI Report for TA-50: PRSs 50-006(a), 50-006(c), 50-007, 50-008 — LA-UR Number: 95-2738

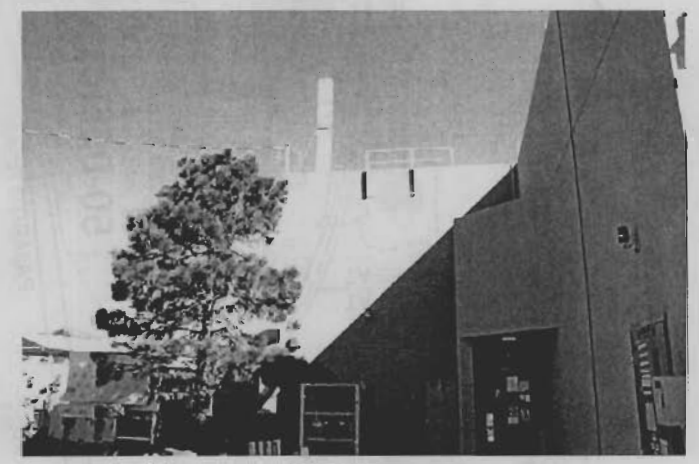
RFI Work Plan for Operable Unit 1147 — LA-UR Number: 92-0969



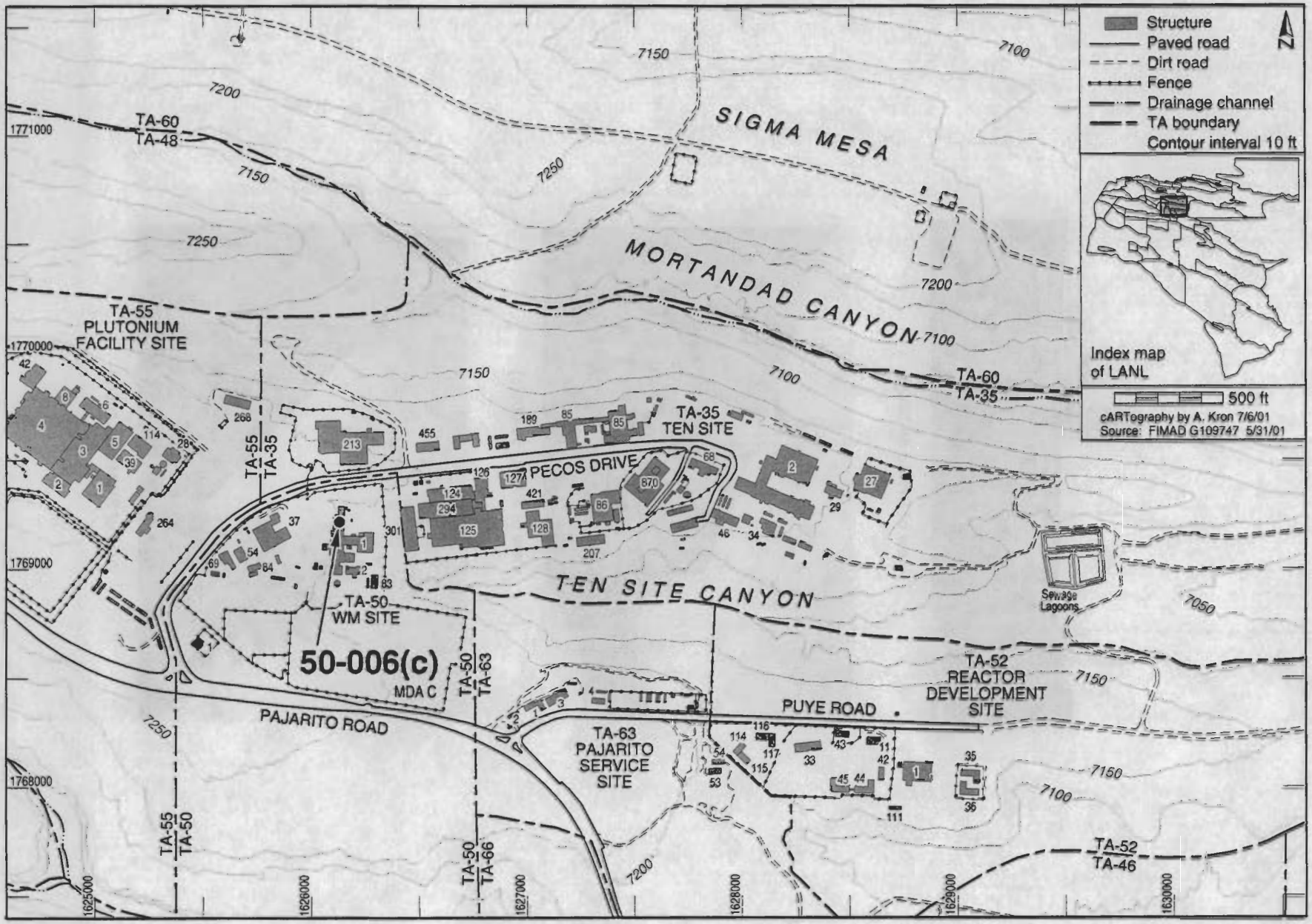
View of SWMU 50-006(c)



View of SWMU 50-006(c)



View of SWMU 50-006(c)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SWMU 50-006(d) — Effluent discharge

Administrative Authority	NMED	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1963-Present
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 50-006(d) consists of a drainline (structure 64) and NPDES-permitted Outfall 051 in Mortandad Canyon for treated wastewater from the radioactive liquid waste treatment facility (Building 50-1). Structure 64 is a 6-in.-diameter iron discharge pipe that was rerouted in 1983 to accommodate construction of the target fabrication facility (Building 35-213). In 1985, EPA Region VI issued an administrative order to DOE requiring modification of the outfall to mitigate ongoing stream bank erosion caused by the discharge pipe ending 25 ft short of the stream channel. DOE extended the pipe into the stream channel, and the order was subsequently closed by EPA in 1986.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

At the time the OU 1147 RFI work plan was prepared in 1992, 13 NPDES permit violations had been issued for Outfall 051 for exceedances of permit levels for iron and copper. The work plan stated that the nature and extent of contaminants in Mortandad Canyon would be addressed as part of the Canyons Focus Area investigations. No additional RFI activities have been conducted at SWMU 50-006(d).

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities that may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

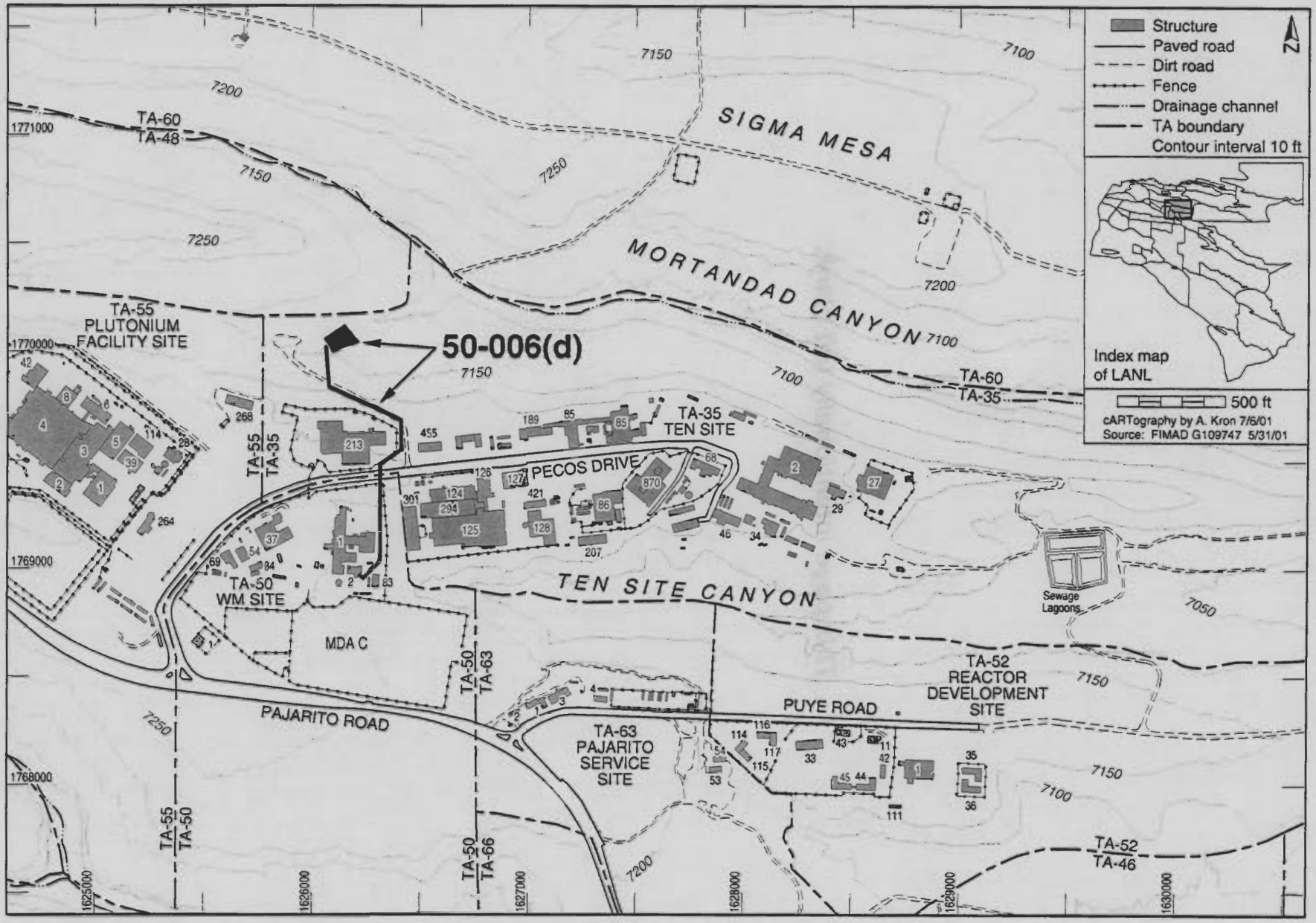
Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	12	8	1
PCBs	1	N/A	0
Radionuclides	12	12	5
SVOCs	3	N/A	0
VOCs	5	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	5.18 mg/kg	0.39 mg/kg
Radionuclides	Americium-241	71.003 pCi/g	39 pCi/g
	Cesium-137	203.02 pCi/g	5.3 pCi/g
	Cobalt-60	2.4397 pCi/g	1.2 pCi/g
	Plutonium-239	47.816 pCi/g	44 pCi/g
	Strontium-90	18.3 pCi/g	5.7 pCi/g

View of SWMU 50-006(d)

View of SWMU 50-006(d)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AOC 50-007 — Incinerator

Administrative Authority	DOE	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1975-1987
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	50-37	**Other Remedial Action Conducted?**	No

Unit Description

AOC 50-007 was an incinerator complex housed in Building 50-37. The complex was constructed in 1975 and consisted of the incinerator, various waste-feed components, and two waste-feed tanks. The incinerator was conceived as a research and development project to demonstrate the application of commercially available incineration technology for the safe treatment of TRU-containing wastes. The incinerator was located in Room 112, and the former solid and liquid waste-feed system was in Room 115. The liquid feed system preparation room was bermed and had no floor drains. The maximum waste inventory allowed in Room 115 was 600 gal. in two waste-feed tanks. The incinerator complex was equipped with an off-gas treatment unit, and the exhaust air system from the incinerator included two HEPA filters. Liquid effluent generated by the off-gas aqueous scrub system was filtered to remove solids before transfer to a double instrument-monitored pipeline to the radioactive liquid waste treatment facility (Building 50-1). Ash was stabilized in concrete. From 1978 to 1987, 23 test burns were successfully conducted for RCRA and TSCA wastes. EPA issued a permit for the incineration of PCBs in 1984, and NMED included the incinerator in LANL's 1989 Hazardous Waste Facility Permit. Actual waste streams incinerated at Building 50-37 after the permits were issued included radioactively contaminated PCBs and scintillation cocktails. Operation of the incinerator was discontinued in 1987 to allow for system upgrades. A previous investigation showed slightly elevated plutonium levels in nearby soils. The incinerator complex was removed and underwent RCRA closure in 1998. According to Part A of LANL's Hazardous Waste Facility Permit, Building 50-37 currently houses one container storage area consisting of rooms 112, 115, 117 and 118. This unit will not be permitted, but will be closed. It operated under RCRA interim status and staged waste undergoing characterization and verification.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

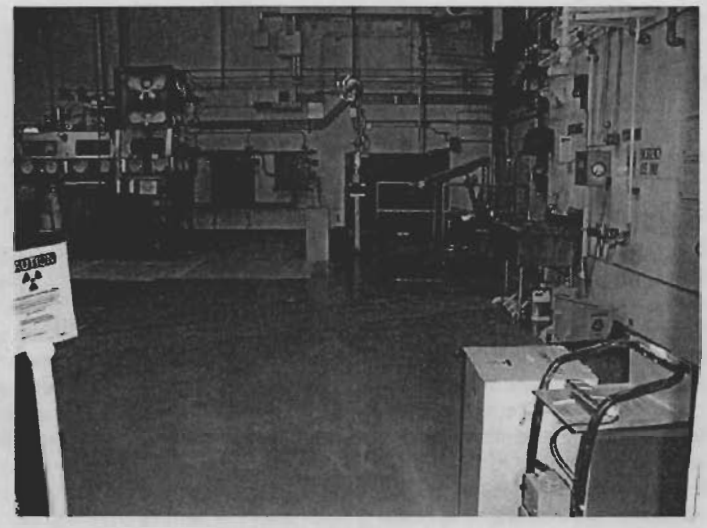
The ER Project conducted an RFI at AOC 50-007 in the summer of 1993 to confirm results from previous surface soil samples to determine the nature and extent of any radionuclides and RCRA-listed chemicals that were lacking data when the OU 1147 work plan was written. The RFI included SWMU 50-006(c) and AOC 50-008, surface soil contamination from airborne releases from Building 50-1 and the volume reduction facility (Building 50-69), respectively. The two AOCs and one SWMU were investigated as an aggregate because their boundaries were indistinguishable. Data collected during these activities are associated with SWMU 50-006(c). An ecological screening assessment was not completed for the AOC. The RFI report recommended NFA for AOC 50-007.

ER Project Sampling Summary

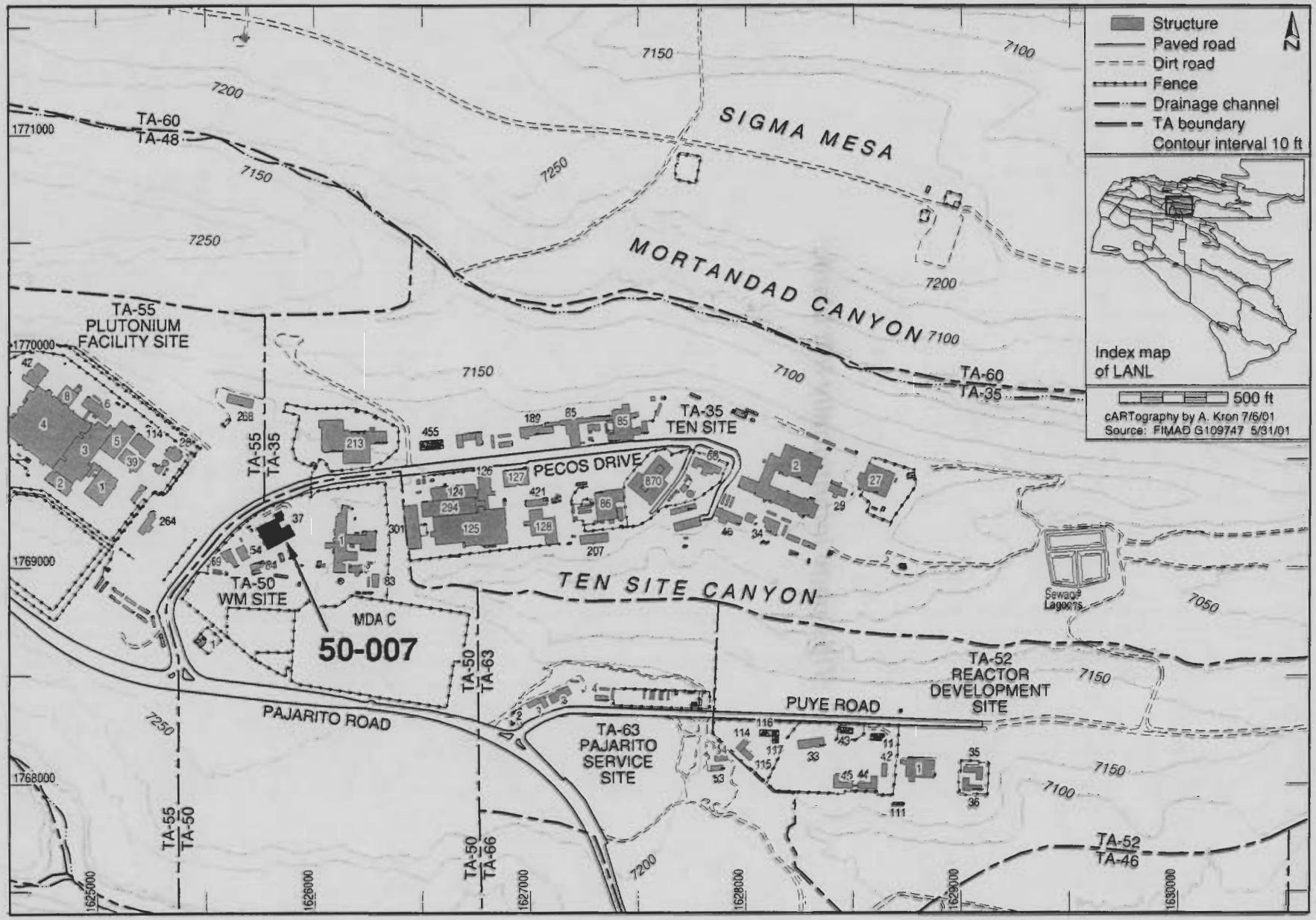
No analytical samples were collected at this site.

References

RFI Report for TA-50: PRSs 50-006(a), 50-006(c), 50-007, 50-008	LA-UR Number: 95-2738
RFI Work Plan for Operable Unit 1147	LA-UR Number: 92-0969



View of AOC 50-007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AOC 50-008 — Reduction site

Administrative Authority	DOE	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1982-1991
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	50-69	**Other Remedial Action Conducted?**	No

Unit Description

AOC 50-008 is the volume reduction facility (now called the waste characterization, reduction, and repackaging facility) located in Building 50-69. The facility was constructed in 1979 to size-reduce large TRU-contaminated metallic items (e.g., glove boxes, metal ducts, and plenums) and repackage them into standard-sized containers for ultimate disposal at WIPP. The facility was first used to size-reduce TRU waste in 1982. Previous swipe samples indicated that Building 50-69 may be moderately contaminated with radionuclides. No outfalls are associated with Building 50-69; all liquid wastes are processed at the radioactive liquid waste treatment facility (Building 50-1). Operations at Building 50-69 were stopped in 1991, while upgrades were made to allow for continued long-term operation. A previous investigation showed slightly elevated plutonium levels in nearby soils.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted an RFI at AOC 50-008 in the summer of 1993 to confirm results from previous surface soil samples and to determine the nature and extent of any radionuclides and RCRA-listed chemicals that were lacking data when the OU 1147 work plan was written. The RFI included SWMUs 50-006(c) and AOC 50-007, surface soil contamination from airborne releases from Building 50-1 and the incinerator complex (Building 50-37), respectively. The two AOCs and one SWMU were investigated as an aggregate because their boundaries were indistinguishable. Data collected during these activities are associated with SWMU 50-006(c). An ecological screening assessment was not completed for the AOC. The RFI report recommended NFA for AOC 50-008.

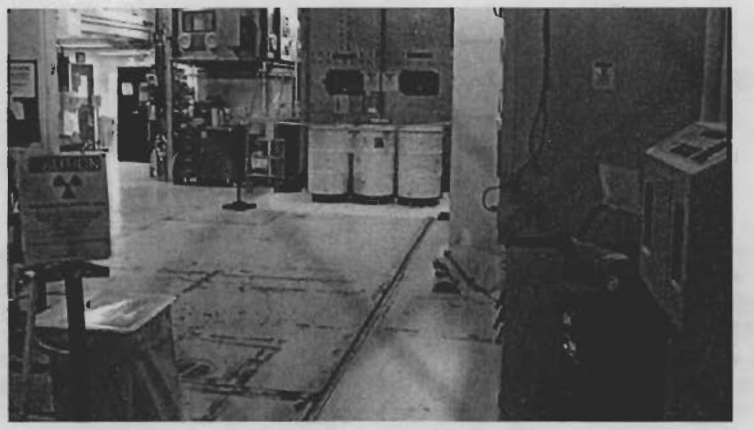
According to Part A of LANL's Hazardous Waste Facility Permit, the waste characterization, reduction, and repackaging facility (Building 50-69) currently houses one interim status mixed waste operation.

ER Project Sampling Summary

No analytical samples were collected at this site.

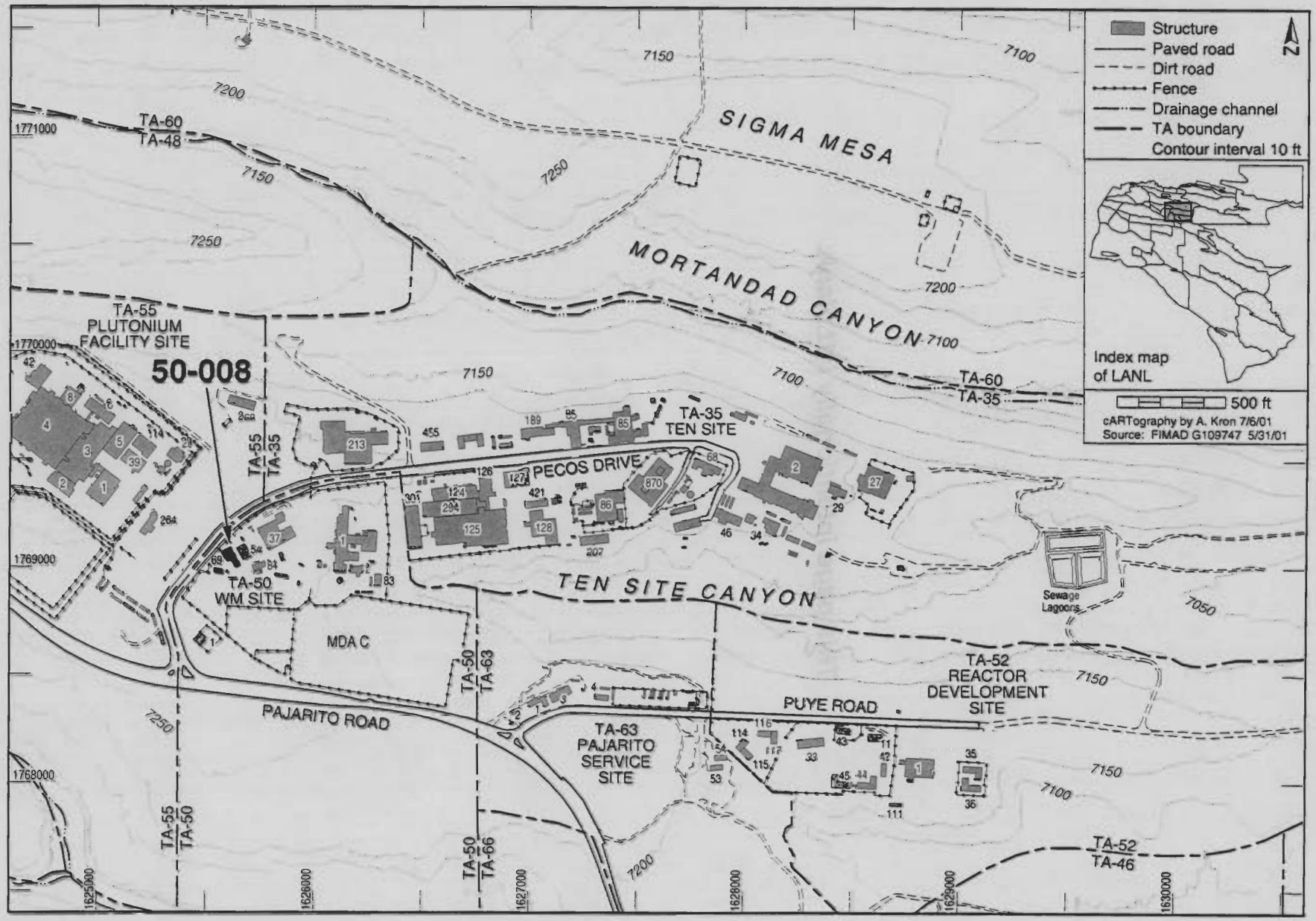
References

RFI Report for TA-50: PRSs 50-006(a), 50-006(c), 50-007, 50-008	LA-UR Number: 95-2738
RFI Work Plan for Operable Unit 1147	LA-UR Number: 92-0969



View of AOC 50-008

View of AOC 50-008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SWMU 50-009 — Material disposal area (MDA C)

Administrative Authority	NMED	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1948-1974
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 50-009 is inactive MDA C, established in May 1948 to replace MDA B (SWMU 21-015). MDA C covers 11.8 acres and consists of 7 pits, 107 shafts, and 1 unnumbered shaft that was used for a single strontium-90 disposal. Pits and shafts were used for burial of hazardous chemicals, uncontaminated classified materials, and radioactive materials. TRU waste also was buried in unknown quantities in the pits. The landfill was used until April 1974 but received waste only intermittently from 1968 to 1974. COPCs include inorganic chemicals, VOCs, SVOCs, and radionuclides. According to the OU 1147 work plan, most of the radioactivity at MDA C is associated with tritium.

Pits 1 through 5 are located in the eastern half of MDA C. Pits 1 through 4 are approximately 610 ft x 40 ft x 25 ft deep; pit 5 is 110 ft x 705 ft x 18 ft deep. Pit 1 operated from 1948 to 1951, pit 2 operated from 1950 to 1951, pit 3 operated from 1951 to 1953, pit 4 operated from 1951 to 1955, and pit 5 operated from 1953 to 1959. Pits 6 and 7 are located in the northwestern part of MDA C. Pit 6 is 100 ft x 505 ft x 25 ft deep and operated from 1956 to 1960. Pit 7, the chemical pit, is 25 ft x 180 ft x 12 ft deep and operated from 1960 to 1964. Pit 7's designation and use as a chemical disposal pit was spurred by several chemical fires, first at MDA B and later at MDA C. The pit was fenced off from the rest of MDA C and was used to bury chemicals, pyrophoric metals, natural uranium powders and hydrides, sealed vessels containing sodium-potassium alloy, compressed gases, and unspecified equipment. According to the OU 1147 work plan, some radioactively contaminated materials were disposed of in pit 7.

The shafts are grouped chronologically and were used to dispose of radioactively contaminated waste from TA-35 and elsewhere. Group 1 consisted of 12 shafts that were used from February through October 1959. Group 1 shafts are located between pits 4 and 5 and measure 2 ft in diameter x 10 ft deep. The shafts originally were numbered 1 through 12 and were renumbered 56 through 67 in 1962. Group 2 shafts, numbered 1 through 55, were used from November 1959 to May 1967. The shafts were located between pits 1 and 3 and are 2 ft in diameter x 15 ft deep. Group 3 shafts, numbered 68 through 107, are located along the western edge of pits 1 through 5 and were used from October 1962 to February 1966. Shafts 68 through 97 are unlined 2-ft-diameter shafts that vary in depth from 20 ft to 25 ft. Shafts 98 through 107 are lined with 12-in.-thick concrete and have an inner diameter of 1 ft. The strontium-90 shaft (no assigned number) was used in the 1950s or 1960s to bury a single strontium-90 source. This shaft is located a few feet from the south fence near the entrance gate at MDA C.

Water infiltration tests were performed at LANL, including MDA C, by the US Geological Survey from 1956 to 1961. In 1976, 1977, and 1980 to 1983, soil and vegetation sampling confirmed the presence of radionuclides in localized areas on the surface of MDA C. In 1984, as part of an interim action to cover the contaminated soil surface, a new soil cover was placed over most of MDA C. In 1985 and 1986, a field-instrument and soil-sampling effort took place at MDA C. Readings taken at 18 locations in 1985 were all near BVs. Tritium concentrations were at or below the average LANL BVs in about half the samples and above that level in the remaining samples. Samples from the north and east perimeter and the western third of the site exceeded BVs for tritium, whereas samples from the east-central portions of MDA C were consistently low in tritium. In many cases, tritium levels increased with sampling depth. In 1986, more samples were collected to confirm 1985 sample results.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

RFI activities were conducted at MDA C from 1993 through 1996. Surface soil sampling was conducted during the summer of 1993; a subsurface investigation was performed during parts of 1994, 1995, and early 1996.

Only one contaminant was found in surface soil samples at concentrations exceeding SALs. PCBs exceeded SALs in 4 out of 183 surface soil samples analyzed for pesticides/PCBs. Several inorganic chemicals and radionuclides were found to exceed BVs in surface soil samples. Out of 69 surface soil samples analyzed for inorganic chemicals, lead concentrations exceeded BVs in 6 and silver concentrations exceeded background in 2. In the 69 surface soil samples analyzed for radionuclides, several had exceedances of BVs for americium-241, plutonium-238 and -239, and uranium-235 and -238.

In subsurface samples, several inorganic chemicals were detected at concentrations greater than BVs. Each of the following inorganic analytes exceeded BVs in at least 2 of the 81 subsurface soil samples analyzed for inorganic chemicals: aluminum, antimony, barium, cadmium, calcium, chromium, cobalt, copper, cyanide, lead, magnesium, selenium, silver, and vanadium. The

following seven organic chemicals, including acetone, bis(2-ethylhexylphthalate, 1,1-dichloroethene, hexachlorobutadiene, 2-methylphenol, methylene chloride, and toluene were detected in isolated core samples out of the 70 samples analyzed for organic chemicals. Americium-241, cesium-137, cobalt-60, plutonium-238 and -239, strontium-90, and tritium were all measured above the minimum detectable activity in at least 1 of the 81 subsurface samples analyzed for radionuclides. Only isotopic uranium has a subsurface BV, and uranium-234, -235, and -238 all exceeded their respective BVs in at least one subsurface sample.

A data gap was identified by the ER Project after conducting 1995 RFI fieldwork at MDA C. The ER Project learned from work at TA-54 that VOCs do not adsorb to the tuff but are present in the pore gas. To complete the RFI, data were needed to determine whether there is a VOC vapor phase plume from the chemical pit (pit 7) at MDA C. The first of two vapor-monitoring boreholes was installed in FY2000 to collect pore-gas samples. The ER Project field-screens 10 sampling ports quarterly from this monitoring borehole; the deepest is 315 ft below ground surface. Based on field-screening data, two samples are collected quarterly for analysis by a fixed analytical laboratory. The second borehole was installed in June 2001 to provide a second reference point to delineate the plume. The pore-gas monitoring project is being conducted in parallel with similar characterization activities at MDAs G and L at TA-54, and results are reported in ER Project quarterly reports. The data will be used to complete the MDA C RFI, and the RFI results will feed into the corrective measures study for MDA C to determine if remedial action is required.

A geophysical investigation was conducted in 2001 to confirm the locations of the disposal pits and shafts at MDA C, as well as estimate the thickness of cover materials at the site. To achieve this objective, an integrated geophysical survey was performed using terrain conductivity, high-sensitivity metal detector, and digital ground-penetrating radar techniques. The results of this investigation indicate that the actual locations of disposal pits 1 through 4 are offset approximately 40 ft to the east relative to the historically reported locations of the pits. The thickness of cover materials at MDA C ranges from 0.0 ft to 8.76 ft.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities that may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

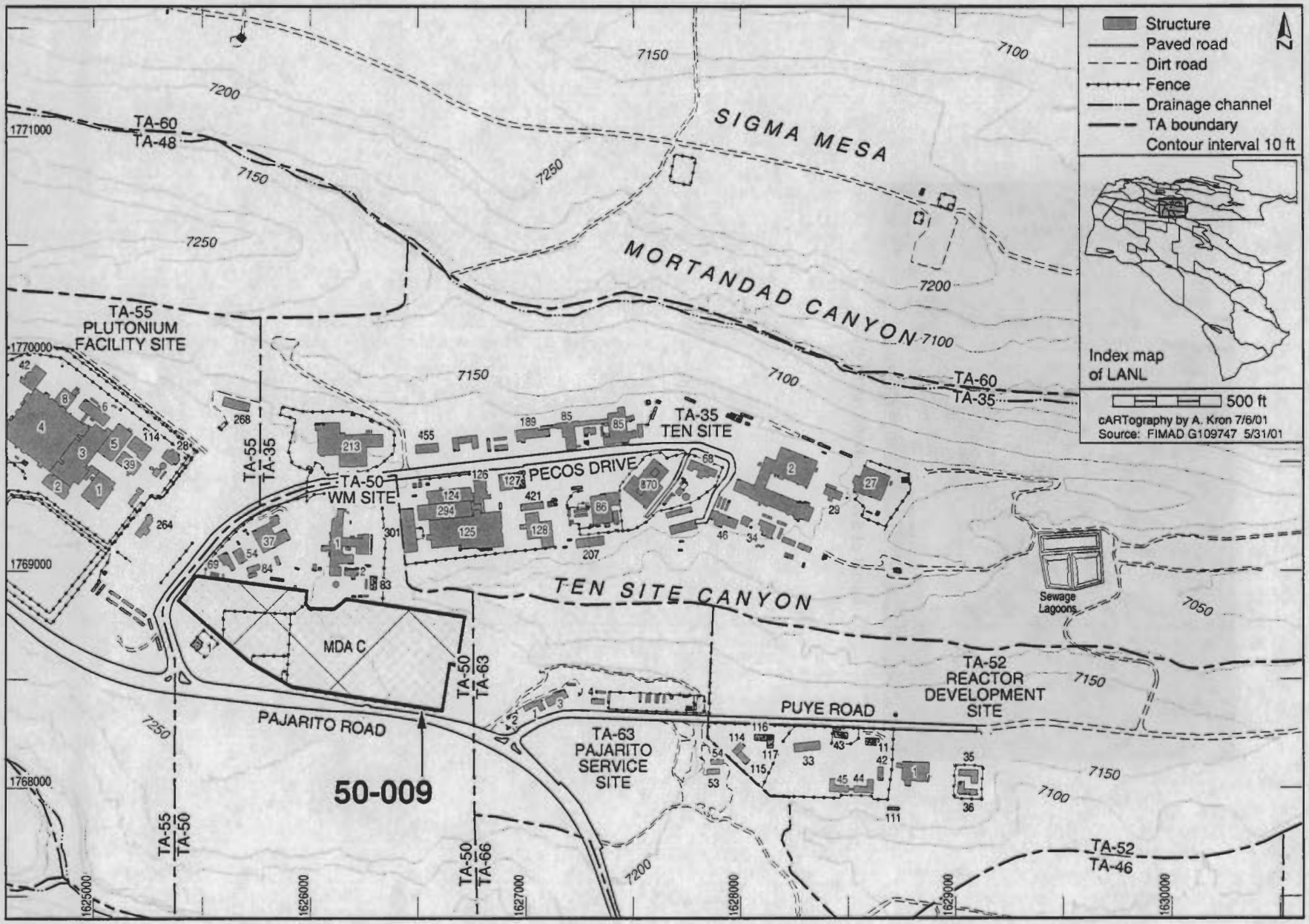
Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	23	19	2
PCBs	2	N/A	1
Pesticide/PCBs	0	N/A	0
Radionuclides	16	13	1
SVOCs	4	N/A	0
VOCs	4	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	8 mg/kg	0.39 mg/kg
	Thallium	12 mg/kg	6.1 mg/kg
PCBs	Aroclor-1254	1 mg/kg	0.22 mg/kg
Radionuclides	Tritium	1,660,000 pCi/g	880 pCi/g

References

Aerial of SWMU 50-009 (MDA C)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AOC 50-010 — Decontamination facility

Administrative Authority	DOE	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1963-1999
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

AOC 50-010 is an inactive vehicle decontamination area located in Room 34B of the radioactive liquid waste treatment facility (Building 50-1). The area was used to clean radioactive contamination from vehicles and large objects used to transport radioactive liquid waste to TA-50. Liquid wastes generated during decontamination activities were transferred to tanks at Building 50-2 through a floor drain and waste line. The decontamination bay was operated from 1963 through October 1999. It was enclosed in 1983. According to the OU 1147 work plan, there is no documented evidence of contaminant releases from this facility.

ER Project Activities

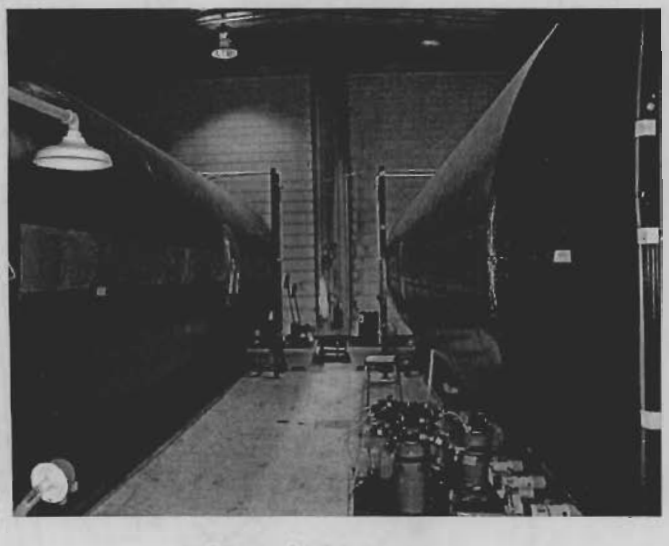
RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

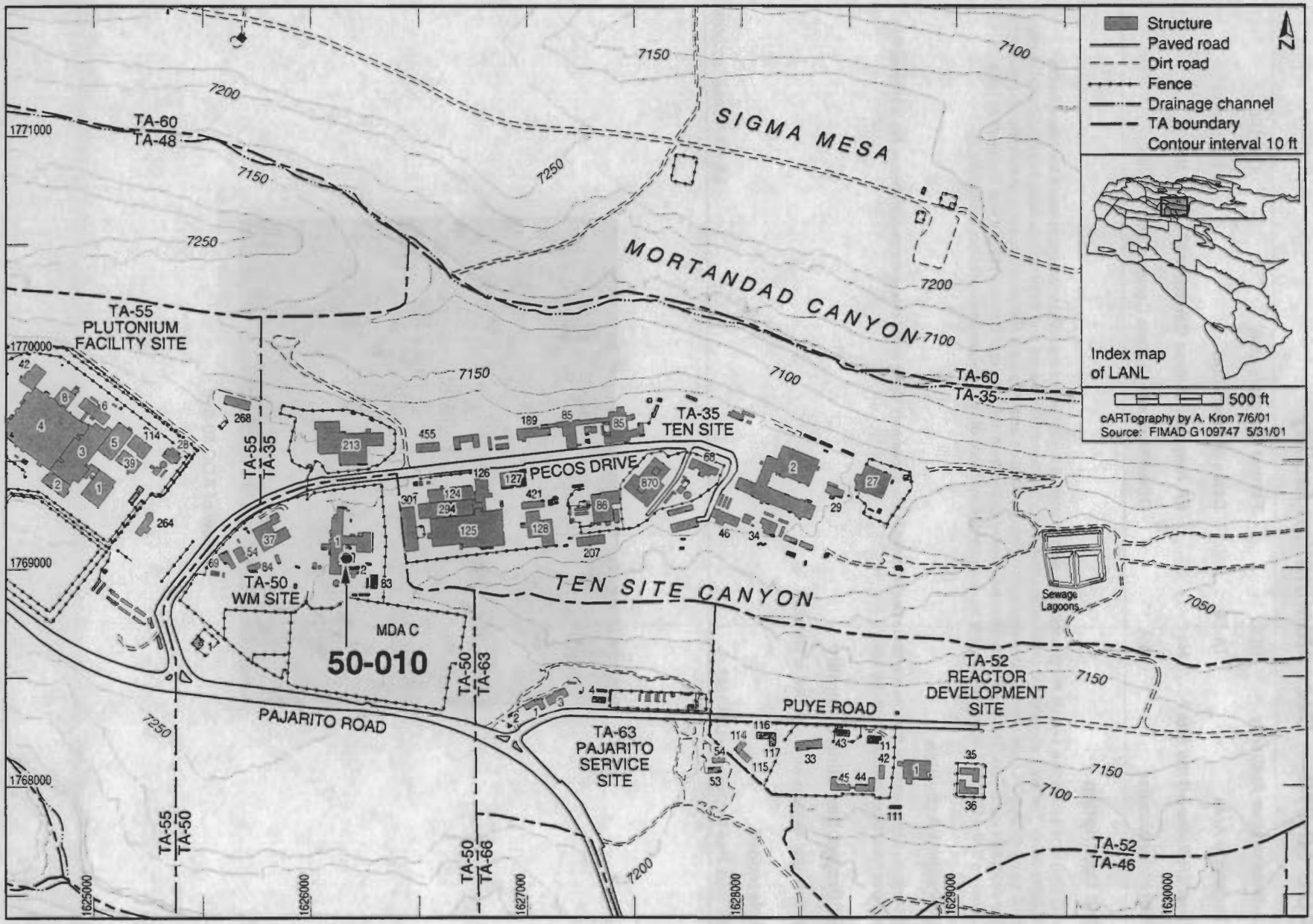
No analytical samples were collected at this site.

References

RFI Work Plan for Operable Unit 1147 — LA-UR Number: 92-0969



View of AOC 50-010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SWMU 50-011(a) — Septic system

Administrative Authority	NMED	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1964-1983
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	50-9, 50-10, 50-11	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 50-011(a) is the location of decommissioned septic system that was installed in 1964 at the south end of the radioactive liquid waste treatment facility (Building 50-1). The system consisted of an influent line from Building 50-1 that discharged to a manhole (structure 50-9) and then to a septic tank (structure 50-10). The effluent line from the tank tied to a distribution box (structure 50-11), which discharged to four parallel perforated pipes traversing a leach field. A 4-ft-diameter x 50-ft-deep shaft was drilled at the east end of the leach field in 1978 to address problems with standing water on the ground surface. A 4-in. perforated pipe was installed in the shaft, and the annulus was backfilled to within 4 ft of the ground surface (seepage pit). The outlets of the four parallel pipes were then tied into the 4-in. perforated pipe. The septic system, except for the perforated pipe (seepage pit), was removed in 1983. Currently, the former location of the leach field and the section of the effluent line between the former septic tank and the leach field are the only portions of the old system not covered by a storage building (Building 50-83). These areas are beneath an asphalt pad located between the pumping station (Building 50-2) and Building 50-83. The 50-ft-deep shaft is currently located beneath the southeast corner of Building 50-83. Previous investigations of the areas surrounding this SWMU were conducted in 1986, during decommissioning of the radioactive liquid waste line; excavated soils were characterized for radioactive constituents and remediated to meet ALARA levels.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted an RFI at SWMU 50-011(a) in 1994 to determine the presence of and define the nature and extent of any contamination from previous operational releases. The investigation involved the collection of seven soil samples from four 10-ft-deep vertical boreholes. The samples were analyzed for inorganic and organic chemicals, PCBs, and radionuclides. No elevated chemical concentrations were detected, and the RFI report recommended NFA for SWMU 50-011(a). In a May 1997 RSI, NMED approved the drilling of an additional borehole adjacent to the seepage pit to a depth of 60 ft.

In December 2001, geotechnical and waste characterization samples were collected from eight boreholes, including one adjacent to the seepage pit, to determine the feasibility of constructing a new pump house and influent storage tank vault at TA-50.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities that may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

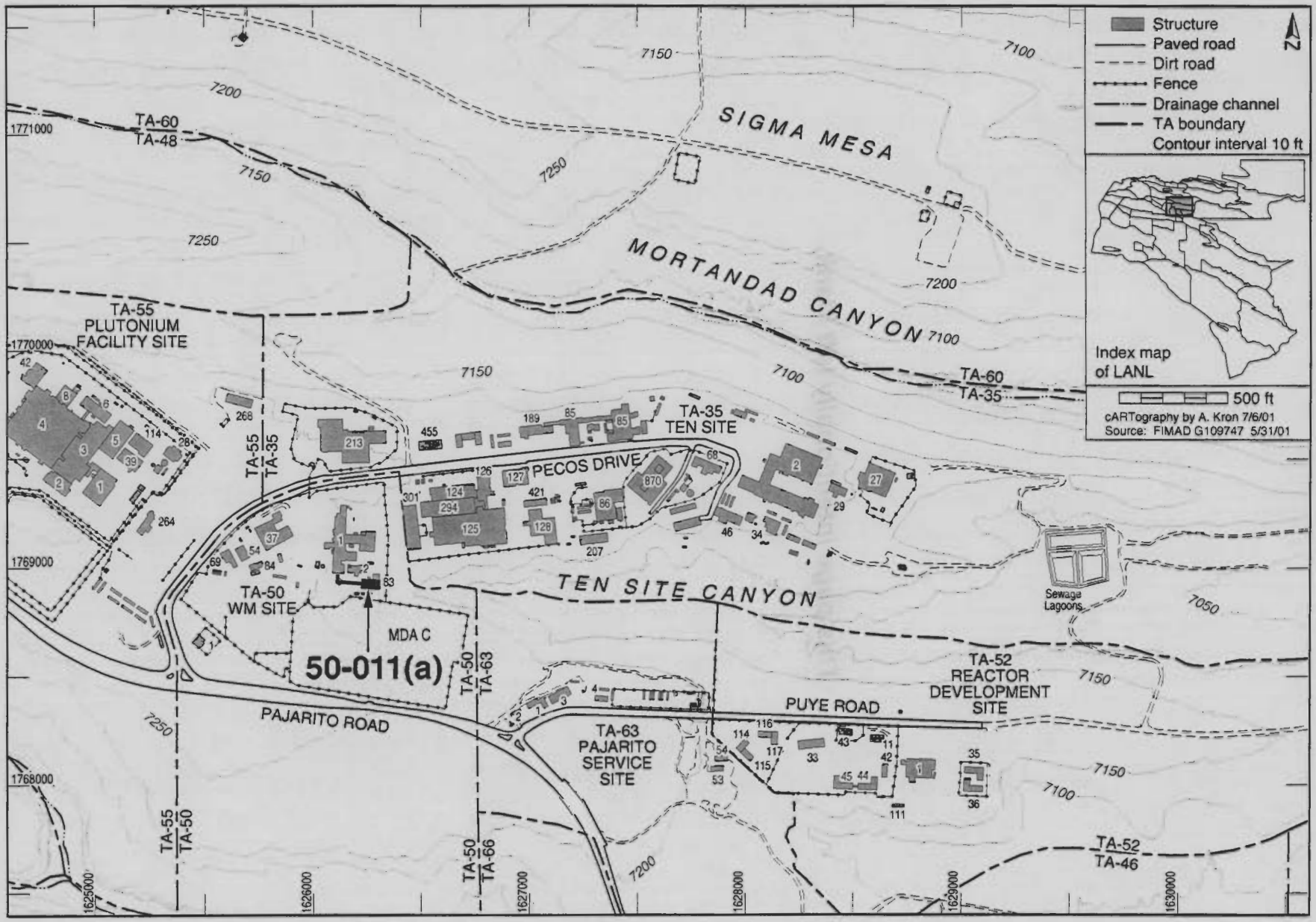
Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	6	0	0
PCBs	0	N/A	0
Radionuclides	5	3	0
SVOCs	0	N/A	0
VOCs	2	N/A	0

Data collected at this site indicate that there have been no constituents detected above SALs at this SWMU.

References

RFI Report for Potential Release Sites at TA-50: 50-004(a), 50-004(c), 50-011(a) (Located in Former Operable Unit 1147)	LA-UR Number: 96-148
RFI Work Plan for Operable Unit 1147	LA-UR Number: 92-0969

No photo; subsurface unit


Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map of LANL
500 ft
cARTography by A. Kron 7/6/01
Source: FIMAD G109747 5/31/01
SIGMA MESA
MORTANDAD CANYON
TEN SITE CANYON
TA-60
TA-48
TA-55
PLUTONIUM
FACILITY SITE
TA-35
TEN SITE
PECOS DRIVE
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MDA C
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PAJARITO ROAD
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SERVICE
SITE
PUYE ROAD
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REACTOR
DEVELOPMENT
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Sewage Lagoons
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AOC 50-011(b) — Lift stations

Administrative Authority	DOE	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1983-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	50-90, 50-91	**Other Remedial Action Conducted?**	No

Unit Description

AOC 50-011(b) is composed of two active sanitary wastewater lift stations (structures 50-91 and 50-92) and approximately 400 ft of piping that transport sanitary wastewater from the radioactive liquid waste treatment facility (Building 50-1) to the main line that serves the SWSC Plant. The lift stations are located on the north and south sides of Building 50-1. This sanitary wastewater system, AOC 50-011(b), was installed as part of a utility upgrade in 1983. At that time, the septic tank and drainfield [SWMU 50-011(a)] that had served Building 50-1 since 1963 were removed. One lift station serves the north end of Building 50-1, and a second lift station serves the south end of the building. This sanitary wastewater system is still active and is approximately 16 years old. The 400 ft of piping that runs between the lift stations and out to Pecos Drive was also installed in 1983. Effluent lines exit near the southwest and the northwest corners of Building 50-1 and drain to the lift stations. The wastewater is pumped through 4-in. laterals at each lift station to a 6-in. main on the west side of the building. The 6-in. main runs across Pecos Drive to a sanitary sewer manhole; then it joins the 5-in. gravity main to the SWSC Plant at TA-46.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

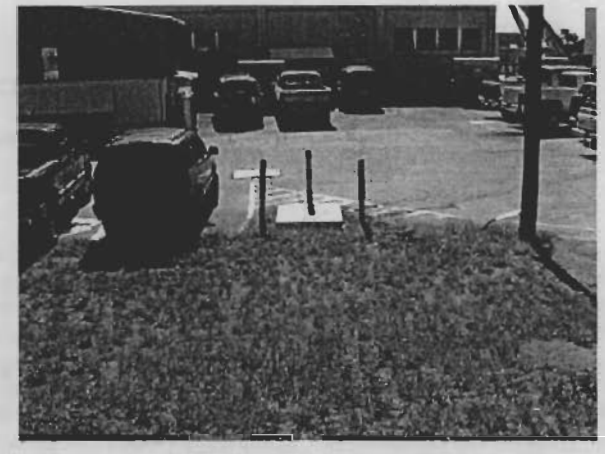
This AOC was recommended for NFA in a 1999 RFI report. The SWSC Plant, which is the ultimate repository for the sanitary waste handled by these lift stations, is operated in accordance with LANL's NPDES Permit, NM0028355, for Outfall 13S. To support the treatment and discharge standards specified by the NPDES Permit, the SWSC Plant requires detailed evaluation of all incoming waste streams, and all incoming wastes are required to meet the waste acceptance criteria specified for sanitary liquid waste (Chapter 19 of the LANL Waste Acceptance Criteria, Sanitary Liquid Waste, March 1999). Samples are collected from the SWSC Plant outfall on a regular basis to demonstrate the effectiveness of the program, as specified in the permit. The Water Quality and Hydrology Group at LANL (ESH-18) also periodically collects samples from this permitted outfall as a quality assurance and quality control measure. Collectively, these requirements comprise a program that addresses the active management and treatment of the sanitary wastewater generated at TA-50.

ER Project Sampling Summary

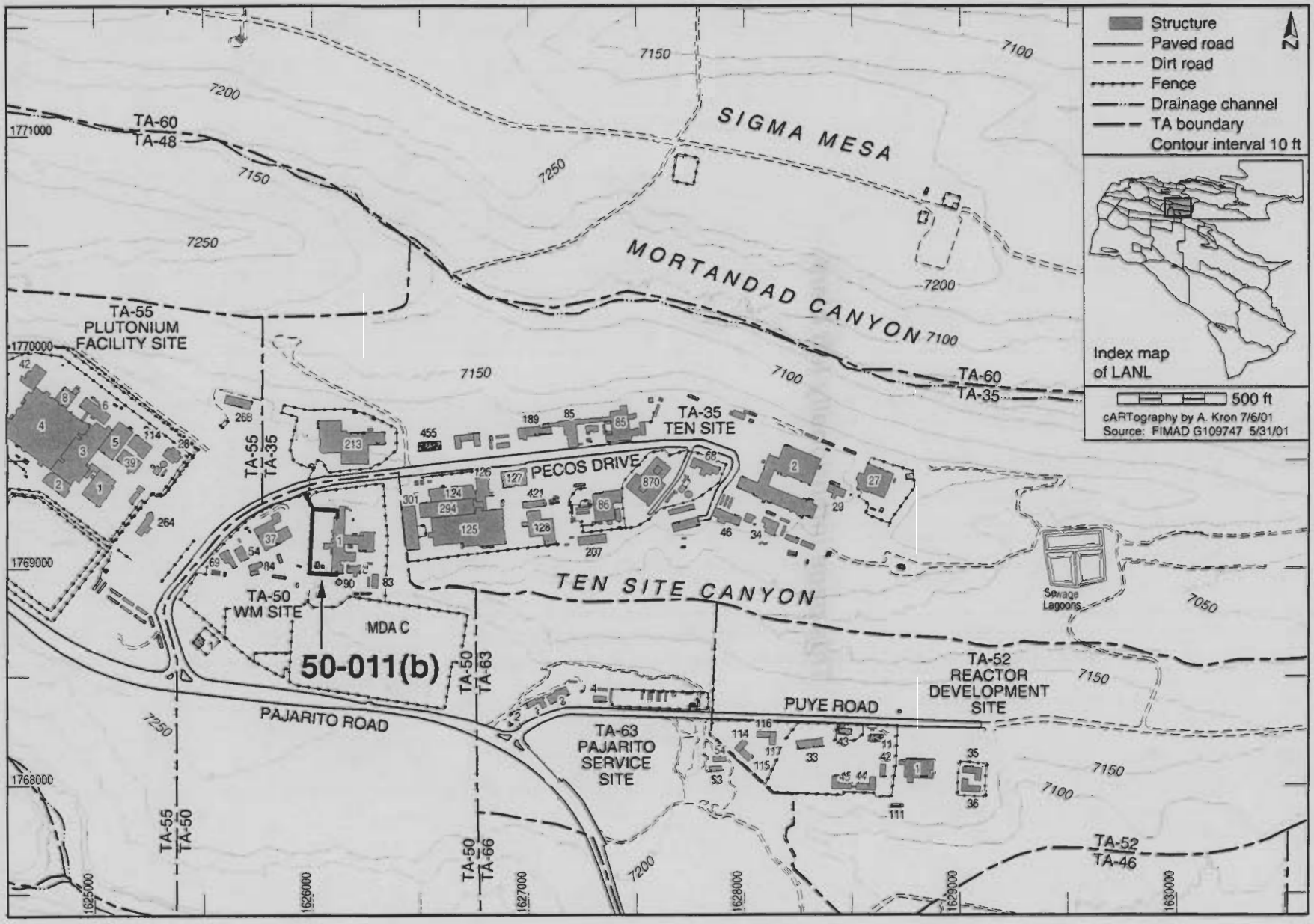
No analytical samples were collected at this site.

References

RFI Report for Potential Release Site 50-011(b) (Sanitary Sewage System)	LA-UR Number: 99-4968
RFI Work Plan for Operable Unit 1147	LA-UR Number: 92-0969



View of SWMU 50-011(b)


Structure
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TA boundary
Contour interval 10 ft
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Index map of LANL
500 ft
cARTography by A. Kron 7/6/01
Source: FIMAD G109747 5/31/01
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MORTANDAD CANYON
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AOC C-50-001 — Transformer - PCB only site

Administrative Authority	DOE	**Former Operable Unit**	OU 1147
Technical Area	TA-50	**Dates of Operation**	1963-1994
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

AOC C-50-001 is the former location of a PCB transformer that was installed when the radioactive liquid waste treatment facility (Building 50-1) was built in 1963. The site is a 20 ft x 10 ft concrete pad surrounded by asphalt and is located east of Building 50-1. According to the historical research conducted at this AOC, the concrete pad was expanded in recent years, and a containment system was installed along the inside edge of the pad. One documented release occurred from the transformer at AOC C-50-001. A minor seep from a valve was discovered in August 1989 during a routine daily inspection. The valve was cleaned, and metal epoxy was used to seal the valve. Oil staining was noted on the concrete pad after the PCB transformer was removed in 1994. A sample collected by ESH-19 confirmed the presence of PCBs. The staining remained within the perimeter boundary of the transformer pad. The pad subsequently was scraped clean and double washed/rinsed five times using an alkaline detergent, in accordance with EPA's PCB Spill Cleanup Policy (40 CFR 761). The cleaned area was encapsulated with polymeric paint/sealer before the replacement non-PCB transformer was positioned on the pad.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

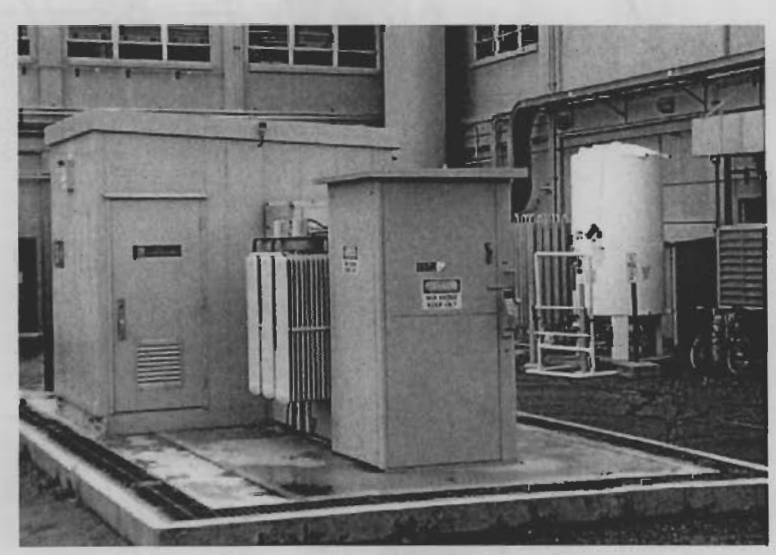
The June 2000 RFI report for AOC C-50-001 recommended NFA at this AOC because the site has been managed in accordance with 40 CFR 761 requirements and LANL's PCB management policy. Releases from AOC C-50-001 were cleaned up in accordance with regulatory requirements, and the PCB-containing transformer was replaced with a non-PCB transformer.

ER Project Sampling Summary

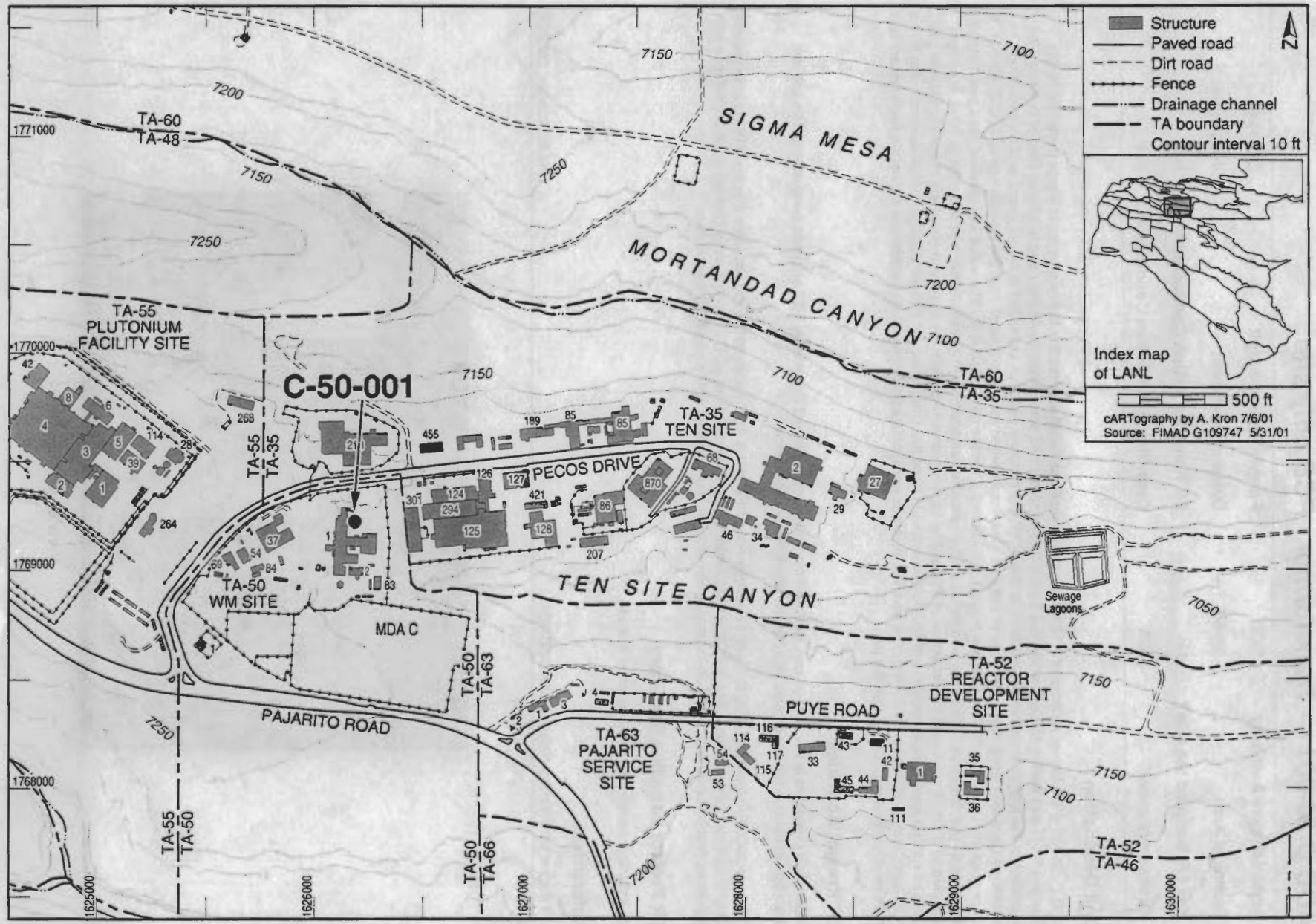
No analytical samples were collected at this site.

References

RFI Report for Potential Release Site C-50-001 LA-UR Number: 00-2515



View of AOC C-50-001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CERTIFICATION

I certify under penalty of law that this document 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 violations.

7-30-02

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
Operator

Date Signed

for:

7/31/02

Ralph E. Erickson
Director, Office of Los Alamos Site Operation
U.S. Department of Energy
Albuquerque Operations
Owner/Operator

Date Signed

6.0 REFERENCES

IT, 1994, "Closure Certification Report TA-50 Batch Waste Treatment Unit," IT Corporation, Albuquerque, New Mexico.

Benchmark, 1998, "Los Alamos National Laboratory Controlled-Air Incinerator RCRA Closure Certification Report," Benchmark Environmental Corporation, Albuquerque, New Mexico.

EPA, 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515." In Hazardous Waste Facility Permit. November 8, 1989. Permit No. NM 0890010515-1 issued to Los Alamos National Laboratory, Santa Fe, New Mexico, New Mexico Environmental Improvement Division.

LANL, 2002a, "Response to Notice of Deficiency; TA-50 Part B Permit Application, Revision 2.0, March 2002," LA-UR-02-2013, Los Alamos National Laboratory, Los Alamos, New Mexico, April 2002.

LANL, 2002b, "TA-50 Solid Waste Management Unit Report," Los Alamos National Laboratory, Los Alamos, New Mexico, April 2002.

LANL, 2001, "Response to Request for Supplemental Information: Technical Adequacy Review, Resource Conservation and Recovery Act Permit Application: TA-50 Part B, December 2000, Revision 2.0, Los Alamos National Laboratory, U.S. Environmental Protection Agency I.D. No. NM0890010515," LA-UR-01-6020, Los Alamos National Laboratory, Los Alamos, New Mexico, November 2001.

LANL, 1999, "Technical Area 50 Part B Permit Renewal Application," Revision 1.0, Los Alamos National Laboratory, Los Alamos, New Mexico, January 1999.

LANL, 1998a (or more recent version), "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

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LANL, 1992, "RFI Work Plan for Operable Unit 1147," Los Alamos, New Mexico, Los Alamos National Laboratory.

NMED, 1998, Dinwiddie, Robert S. (Stu), New Mexico Environment Department, Letter to T. Taylor and J. Brown, February 1998.

ATTACHMENT A

FACILITY DESCRIPTION

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
cm	centimeters
cm/hr	centimeters per hour
CSU	container storage unit
DOE	U.S. Department of Energy
ft	feet/foot
in.	inch(es)
km	kilometer
LANL	Los Alamos National Laboratory
RCRA	Resource Conservation and Recovery Act
TA	Technical Area
WCRRF	Waste Characterization, Reduction, and Repackaging Facility (TA-50-69)

ATTACHMENT A
FACILITY DESCRIPTION

The information provided in this section is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00]. The following subject areas are addressed:

- A general description of Technical Area (TA) 50 at Los Alamos National Laboratory (LANL) (20.4.1 NMAC, Subpart IX, 270.14(b)(1) [6-14-00])
- Site-specific traffic patterns, volume, and control (20.4.1 NMAC, Subpart IX, 270.14(b)(10) [6-14-00])
- Site-specific location information for compliance with seismic and floodplain standard requirements (20.4.1 NMAC, Subpart IX, 270.14(b)(11), and 20.4.1 NMAC, Subpart V, 264.18(a) and (b) [6-14-00])
- Site-specific topographic map requirements (20.4.1 NMAC, Subpart IX, 270.14(b)(19) [6-14-00])
- Site-specific groundwater monitoring and protection information (20.4.1 NMAC, Subpart IX, 270.14(c) and 20.4.1 NMAC, Subpart V, 264.90(a) [6-14-00])

A LANL-wide facility description addressing additional regulatory requirements is provided in Appendix A of the "Los Alamos National Laboratory General Part B Permit Application," (LANL 1998a), hereinafter referred to as the LANL General Part B.

A.1 TA-50 GENERAL DESCRIPTION [20.4.1 NMAC, Subpart IX, 270.14(b)(1)]

TA-50 is located at the northeast corner of the intersection of Pajarito Drive and Pecos Road, on the finger mesa bounded by Mortandad Canyon to the north and Two-Mile Canyon to the south. Mesa-top elevations at TA-50 range from approximately 7,250 to 7,280 feet (ft) above mean sea level. Figure A-1 depicts the TA-50 location within the LANL site boundary, and its location relative to other TAs. Figure A-2 depicts facilities, structures, and hazardous and mixed waste units within the TA-50 boundary. Nearby facilities are described in Section A.1.4 of this attachment. The nearest point of unrestricted public access to TA-50 outside the LANL site boundary is the Royal Crest Trailer Park 1,500 meters (3,770 ft) north of TA-50. The residential areas of Los Alamos and White Rock are within a 17-kilometer (km) (10-mile) radius of TA-50 and together have a population of approximately 18,200.

The waste management units addressed in this permit renewal application include two container storage units located at TA-50-69. Other waste management units have been identified in previous

Part A or Part B permit applications. These hazardous and/or mixed waste management units are identified in Table A-1.

Table A-1
Waste Management Unit Status at Technical Area 50

Waste Management Unit	Unit Type	Current Status
TA-50-1, Room 59	CSU	To Be Closed [a]
TA-50-37, Rooms 115, 117 and 118	CSU	To Be Closed [a]
TA-50-69, Indoor Area	CSU	Requesting Permit Renewal [b]
TA-50-69, Outdoor Area	CSU	Requesting Permit Renewal [b]
TA-50-114	CSU	To Be Closed [a]
TA-50-1, Rooms 35, 36, and 38/38A	CSU	Administratively Removed [c]
Solidification/Cementation Unit	Treatment	Administratively Removed [c]
Controlled Air Incinerator	Treatment	Closed [d]
Batch Waste Treatment Unit	Treatment	Closed [e]
TA-50-137	CSU	Administratively Removed [c]
TA-50-138	CSU	Administratively Removed [c]
TA-50-139/Storage Pads	CSU	Administratively Removed [c]
TA-50-140/Storage Pads	CSU	Administratively Removed [c]

[a] To be closed in accordance with New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart VI [6-14-00], requirements.
[b] Detailed descriptions provided in Attachment G of this permit renewal application.
[c] Waste management units that were proposed but never constructed and/or where waste was never stored, treated, or disposed.
[d] "Los Alamos National Laboratory controlled-Air Incinerator RCRA Closure Certification Report," Benchmark Environmental Corporation, Albuquerque, New Mexico, 1998.
[e] "Closure Certification Report TA-50 Batch Waste Treatment Unit," IT Corporation, Albuquerque, New Mexico, 1994.

CSU = container storage unit

Waste management units addresses in this permit renewal application include two container storage units (CSU) located in the southwest quadrant of TA-50 and identified as the TA-50-69, Indoor CSU and the TA-50-69, Outdoor CSU. Detailed descriptions of these CSUs are provided in Attachment G of this permit renewal application.

A.1.1 Meteorology and Hydrology

The climate and surface winds are described in the LANL General Part B.

A.1.2 Wells and Surface Waters [20.4.1 NMAC, Subpart IX, 270.14(b)(19)(iii) and (ix)]

The only hydrological characteristic specific to operations conducted at TA-50 is surface runoff in the small drainage off the mesa for brief periods during spring snowmelt and intense summer thunderstorms. Surface grading and other storm water controls prevent accumulation of storm water

and snowmelt (Appendix A, LANL General Part B). Summer storms on the Pajarito Plateau can generate high discharge rates and may reach a maximum discharge in less than two hours. High discharge rates can transport suspended and bed sediments down the canyons. Snow, however, melts slowly in the spring and runs off over a period of several weeks to several months at a low discharge rate. Stream flow is ephemeral in Cañada del Buey to the north and Pajarito Canyon to the south of Mesita del Buey, occurring primarily during snowmelt or thunderstorms. Situated on top of the mesa, TA-50 is not affected by stream flooding or runoff.

A.1.3 Surrounding Land Use [20.4.1 NMAC, Subpart IX, 270.14(b)(19)(iv)]

No industrial facilities, except for those within LANL, are near TA-50. The following buildings or facilities are located within the TA-50 boundary:

- Radioactive Liquid Waste Treatment Facility, TA-50-1
- TA-50-37
- Engineering Sciences and Applications Division, TA-50-54
- WCRRF, TA-50-69
- Portable office trailer, TA-50-84
- Portable office trailer, TA-50-196
- U.S. West relay facility, TA-50-184
- Material Disposal Area-C Landfill (inactive)

As depicted on Figure A-1, the TAs that border TA-50 include: TA-35, TA-40, TA-55, TA-63, and TA-66. TA-35, located northeast of TA-50, includes facilities that conduct nuclear safeguards research and development. TA-40, which is south and west of TA-50, is used in developing special detonators for the initiation of high-explosive systems. The facilities at TA-55, west of TA-50, conduct plutonium processing and metallurgy research. TA-66, southeast of TA-50, includes the Advanced Technology Assessment Center. The types of activities conducted, the separation distances, and administrative controls ensure that these nearby TAs do not affect the safety of operations conducted at TA-50.

A.2 TRAFFIC PATTERNS [20.4.1 NMAC, Subpart IX, 270.14(b)(10)]

General traffic pattern information, traffic volume, and traffic control signals for the LANL-wide facility are provided in Appendix A of the LANL General Part B (LANL, 1998a).

A.2.1 Routes of Travel

The primary traffic routes that may be used to transport hazardous and mixed waste to and from TA-50 include Pajarito Road, Pecos Drive, and Mesita del Buey Road as shown on Figure A-3. Lesser-used traffic routes include Diamond Drive and West Jemez Road (State Road 501). Containers received at TA-50, are also moved minimal distances on road surfaces within the TA.

A.2.2 Traffic Volumes and Control

The only local access road to TA-50 is Pajarito Road. Approximately 8,000 automobiles traverse Pajarito Road daily as stated in "Environmental Surveillance at Los Alamos During 1990" (LANL, 1992). The U.S. Department of Energy controls all of the area within the Laboratory site boundary and has the authority to completely restrict access. LANL routinely closes Pajarito Road for activities such as the transport of hazardous waste to and from TA-50.

During normal business hours, the traffic pattern consists of personal and government-owned passenger vehicles entering the area through the open western gate, going to a parking area, and parking. After normal business hours, access through this western gate is by badge-reader only. Throughout normal business hours, the eastern gate may remain open to receive deliveries. After normal business hours, this eastern gate is padlocked. Throughout the workday, the average flow of traffic is approximately 160 vehicles per day. Authorized government vehicles only are permitted on the road leading around the southern end of TA-50-1 and in the area to the southeast of TA-50-1. Figure A-4 depicts the gates and area discussed.

A.2.3 Traffic Control Signals

Traffic control signals within TA-50 include stop signs, posted speed limits, and other traffic and pedestrian control signs. The locations of existing signs at TA-50 are shown on Figure A-4

A.3 LOCATION INFORMATION [20.4.1 NMAC, Subpart IX, 270.14(b)(11)]

A.3.1 Geology

Geologic aspects (Longmire et. al., 1996) of interest at TA-50 include the following:

- Detailed stratigraphy of the upper units of the Bandelier Tuff, including contacts between units that may form barriers to migration or create paths to divert liquid or vapor movement.
- Joints in the Bandelier Tuff that may provide paths for liquid and vapor movement.
- Mineralogy of the geologic strata that may be important in the retardation of contaminant movement.
- Faulting that may provide zones of fracturing along which contaminant transport may be enhanced.
- Surface erosion that could potentially transport contaminants.

A.3.1.1 Seismology [20.4.1 NMAC, Subpart IX, 270.14(b)(11)(i) and (ii), and 20.4.1 NMAC, Subpart V, 264.18(a)]

TA-50 is located in Los Alamos, New Mexico; therefore, pursuant to 20.4.1 NMAC, Subpart IX, 270.14(b)(11)(i) [6-14-00], the seismic standard of 20.4.1 NMAC, Subpart V, 264.18(a) [6-14-00], is applicable.

A geologic field investigation, which consisted of exploratory trenching, was conducted within 3,000 ft of TA-50 during the fall of 1992 and summer of 1993. Based on trench stratigraphy, no evidence of Holocene faulting was observed (Woodward-Clyde Federal Services, 1995). Therefore, TA-50 is in compliance with the seismic standards of 20.4.1 NMAC, Subpart IX, 270.14(b)(11)(i) and (ii), and 20.4.1 NMAC, Subpart V, 264.18(a) [6-14-00]. Figure A-5 details regional surface faulting.

A.3.1.2 Stratigraphy

TA-50 is located in the central part of the Pajarito Plateau. A simplified stratigraphy of the TA-50 site, as well as estimated thickness of rock units, is shown on Figure A-6.

A.3.1.3 Soils

The soils on Mesita del Buey were derived from Bandelier Tuff bedrock and formed under a semiarid climate. Soils on the mesa top are mainly thin, well-drained, sandy loams. The subsoil is a reddish-brown clay, gravelly clay, or clay loam with depth to tuff bedrock about 20 to 50 centimeters (cm) (8 to 20 inches [in.]). These soils are classified in the Unified Soil Classification System as sandy loam, sandy loam-sandy clay, loam, clay loam-loam, and clay loam.

TA-50 is a Hackroy-Rock outcrop complex and Carjo loam. The Hackroy-Rock outcrop complex consists primarily of rock outcrop and Hackroy soils. The Hackroy soils typically range from a brown, sandy loam in the top 8 cm to a reddish-brown clay from 8 to 30 cm in depth. Permeability rates range from 5 to 15 centimeters per hour (cm/hr) in the top layers down to 0.15 to 0.50 cm/hr in the lower layers. The shrink-swell potential is low. Available water-holding capacity is 0.11 to 0.21 cm per cm (cm/cm), and the soil pH is 6.6 to 7.8. The Carjo soils typically range from a grayish-brown loam in the top 10 cm to a brown clay loam from 10 to 30 cm in depth. Permeability rates range from 1.5 to 5 cm/hr in the top layer, down to 0.15 to 5 cm/hr in the lower layers. The shrink-swell potential is low to moderate. Available water-holding capacity is 0.14 to 0.21 cm/cm, and the soil pH is 6.3 to 7.8 (Nyhan et al., 1978).

The slopes between TA-50 mesa top and canyon bottoms consists of steep rock outcrops and patches of shallow, undeveloped colluvial soils. The south-facing canyon walls of Pajarito Canyon are steep and have little or no soil material or vegetation, whereas the north-facing walls of Canada del Buey have areas of thin dark-colored soils. Native vegetation at TA-50 is mainly brome grass, false tarragon, blue grama, wormwood, Colorado piñon, and one-seed juniper.

A.3.1.4 Erosional Processes

Erosion of material on Mesita del Buey occurs primarily by shallow runoff on the relatively flat pans of the mesa, by deeper runoff in channels, and by rock fall and colluvial transport on the canyon walls. Wind erosion of disturbed soils also occurs. Mesita del Buey cliff-forming units are eroded primarily by lateral cliff retreat and not vertical erosion.

A.3.2 Floodplain Standard [20.4.1 NMAC, Subpart IX, 270.14(b)(11)(iii), 270.14(b)(19)(ii), and 20.4.1 NMAC, Subpart V, 264.18(b)]

The CSUs addressed in the TA-50 Part B are not located within the 100-year floodplain boundary. In accordance with 20.4.1 NMAC, Subpart IX, 270.14(b)(11)(iii) [6-14-00], additional floodplain information is provided in Appendix A of the LANL General Part B.

A.4 TOPOGRAPHIC MAPS [20.4.1 NMAC, Subpart IX, 270.14(b)(19)]

Topographic maps and figures are provided herein or referenced to meet the requirements of 20.4.1 NMAC, Subpart IX, and 270.14(b) (19) [6-14-00]. All maps clearly show the map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- LANL-wide 100-year floodplain maps are provided as Appendix C of the “Response to Request for Supplemental Information: Technical Adequacy Review, Resource Conservation and RCRA Permit Application; General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM 0890010515,” (LANL, 2001).
- A map showing surface waters, including intermittent streams, near TA-50 is included as Figure A-7.
- Surrounding land uses are shown on Figure A-1.
- Wind roses for TA-6, the TA directly to the west of TA-50, are shown on Figures A-8 and A-9.
- A map showing the legal boundaries of LANL (including TA-50) is provided as Map 1 in the “Los Alamos National Laboratory General Part A Permit Application,” Revision 0.0 (LANL, 1998b), hereinafter referred to as the LANL General Part A.
- Access control features at TA-50 (e.g., fences, gates) are shown on Figure A-10.

- A map showing supply wells, monitoring wells, test wells, springs, and surface-water sampling stations near TA-50 is included as Figure A-7.
- The locations of buildings, hazardous and/or mixed waste management units, and loading and unloading areas at TA-50 are shown on Figure A-7.
- A map showing National Pollutant Discharge Elimination System discharge structure locations is included in the LANL General Part A (LANL, 1998b).
- Storm, sanitary, and process sewer systems at LANL are shown on Map A-1 of the LANL General Part B (LANL, 1998a).
- Drainage control features (e.g., run-on/runoff) are shown on Figure A-11.
- Natural surface drainages are shown on a topographic map included herein as Figure A-7.
- Fire stations serving LANL and the County of Los Alamos are shown on Figure E-2 of Appendix E in the LANL General Part B (LANL, 1998a).
- The equipment cleanup area for LANL is located at TA-50-1. The location of TA-50-1 is shown on a map in the LANL General Part A (LANL, 1998b).

Contour lines on the topographic map are in intervals sufficient to detail natural drainage at LANL and in the vicinity of the waste management units at TA-50. As provided in 20.4.1 NMAC, Subpart IX, 270.14(b)(19) [6-14-00], LANL has submitted the maps to the New Mexico Environment Department at these scales and contour intervals due to the size of the waste management units, the extent of the LANL facility, and the topographic relief in the area.

A.5 GROUNDWATER MONITORING [20.4.1 NMAC, Subpart IX, 270.14(c) and 20.4.1 NMAC, Subpart V, 264.90(a)]

Groundwater monitoring and protection requirements specified in 20.4.1 NMAC, Subpart IX, 270.14(c) and 20.4.1 NMAC, Subpart V, 264.90(a) [6-14-00], apply only to owners and operators of surface impoundments, waste piles, land treatment units, and landfills. This document addresses CSUs, which are not regulated units subject to 20.4.1 NMAC, Subpart IX, 270.14(c) [6-14-00].

A.6 OTHER PERMIT ACTIVITIES

Other types of Resource Conservation and Recovery Act permits include, but are not limited to, the following:

- Permits by Rule
- Emergency Permits
- Hazardous Waste Incinerator Permits
- Permits for Land Treatment Demonstrations Using Field Test of Laboratory Analyses

- Interim Permits for Underground Injection Control Program Wells
- Research, Development, and Demonstration Permits
- Permits for Boilers and Industrial Furnaces Burning Hazardous Waste

Currently, none of these permit types are relevant for operations at TA-50.

A.7 REFERENCES

LANL, 2001, "Response to Request for Supplemental Information; Technical Adequacy Review, RCRA Permit Application; General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0, Los Alamos National Laboratory, EPA ID No. NM0890010515," Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998a, "Los Alamos National Laboratory General Part B Permit Application," Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998b, "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1992, "Environmental Surveillance at Los Alamos During 1990," Los Alamos National Laboratory, Los Alamos, New Mexico.

Longmire et. al., 1996, "Natural Background Geochemistry, Geomorphology, and Pedogenesis of Selected Soil Profiles and Bandelier Tuff," LA-12913-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Nyhan et al. (J. W. Nyhan, L. W. Hacker, T. E. Calhoun, and D. L. Young), 1978, "Soil Survey of Los Alamos County, New Mexico," LA-6779-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

Woodward-Clyde Federal Services, 1995, "Seismic Hazards Evaluation of the Los Alamos National Laboratory," Los Alamos, New Mexico.

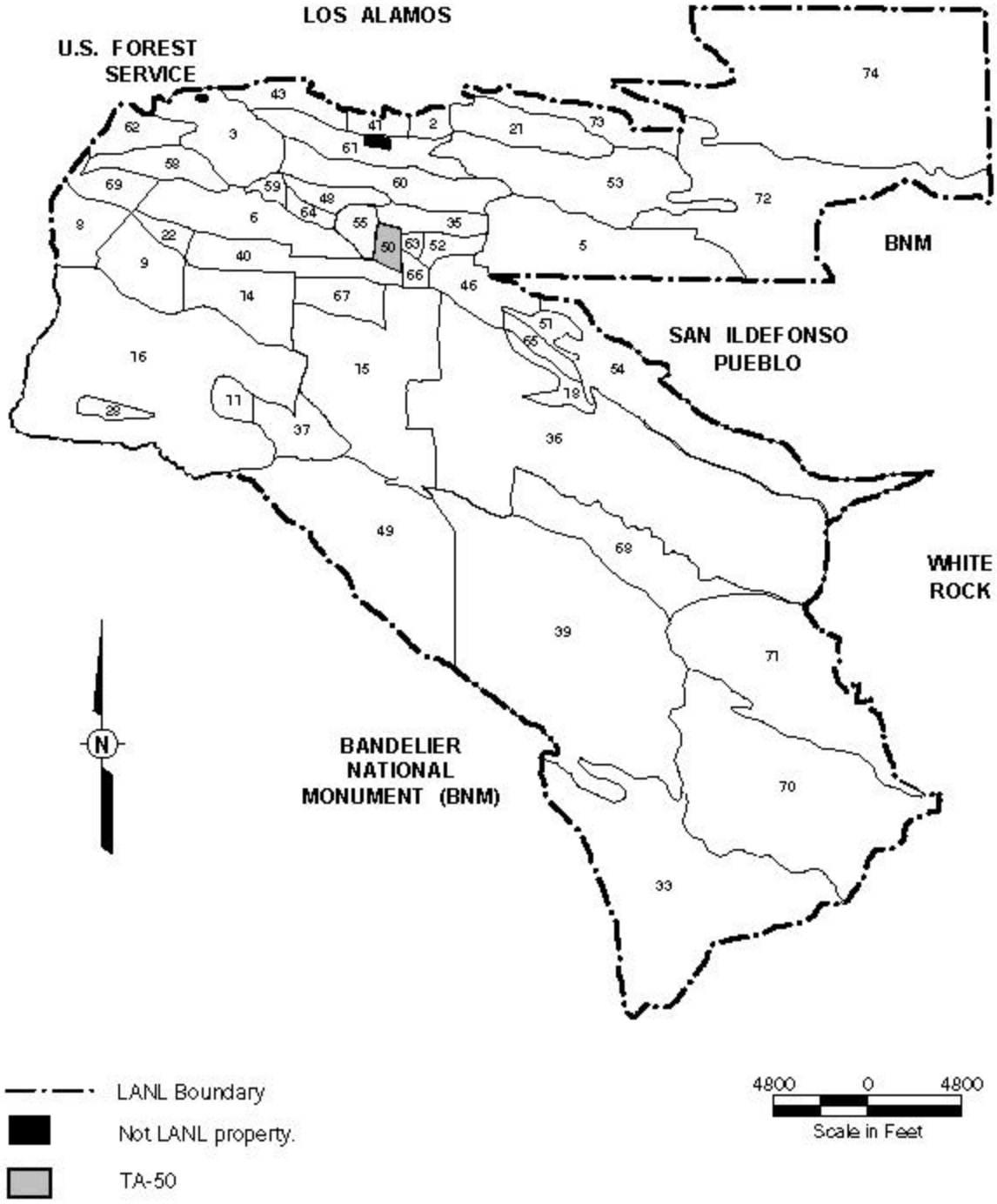


Figure A-1

Location Map of Technical Area (TA) 50 at Los Alamos National Laboratory (LANL)

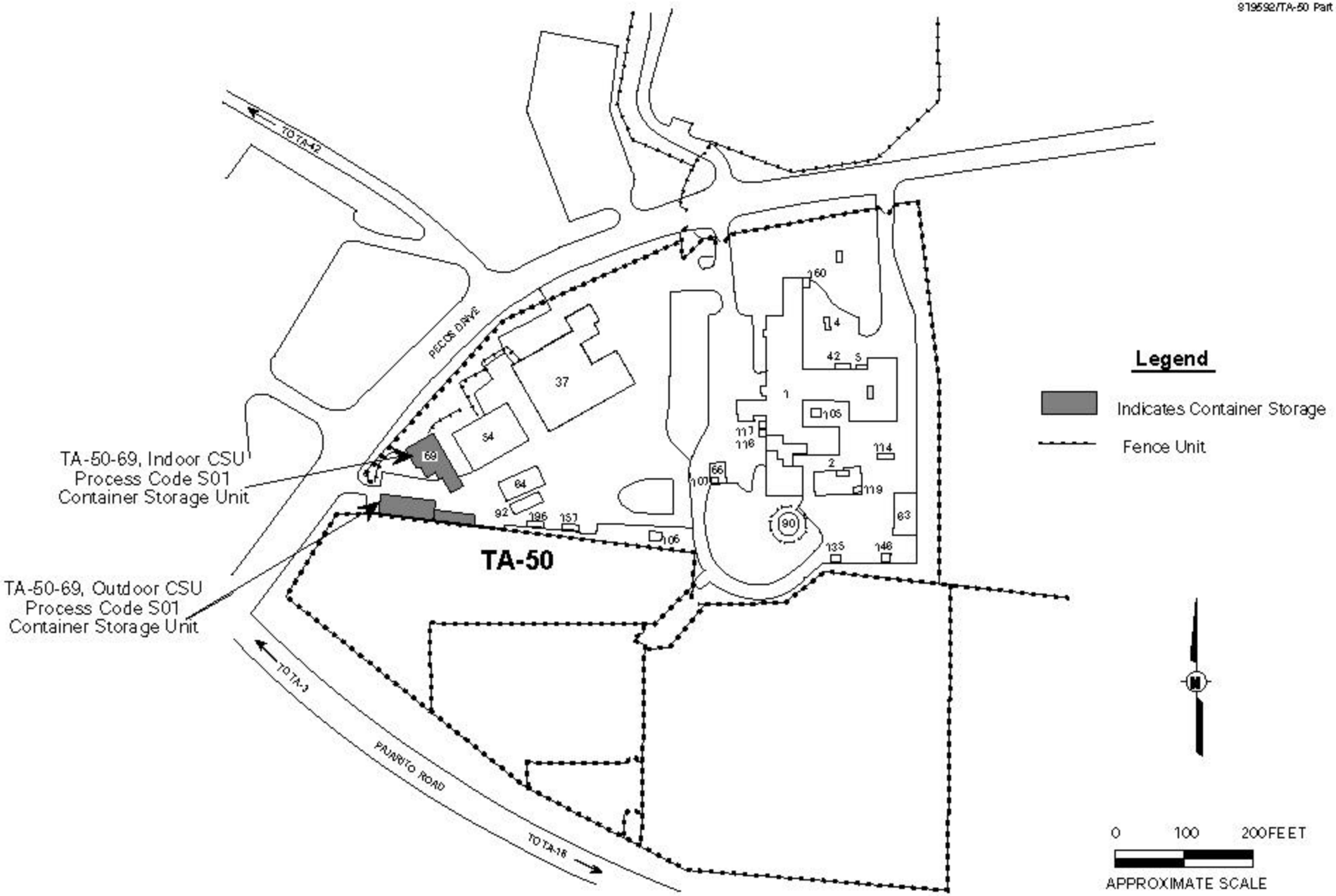


Figure A-2
Location of Container Storage Units (CSU) at Technical Area (TA) 50

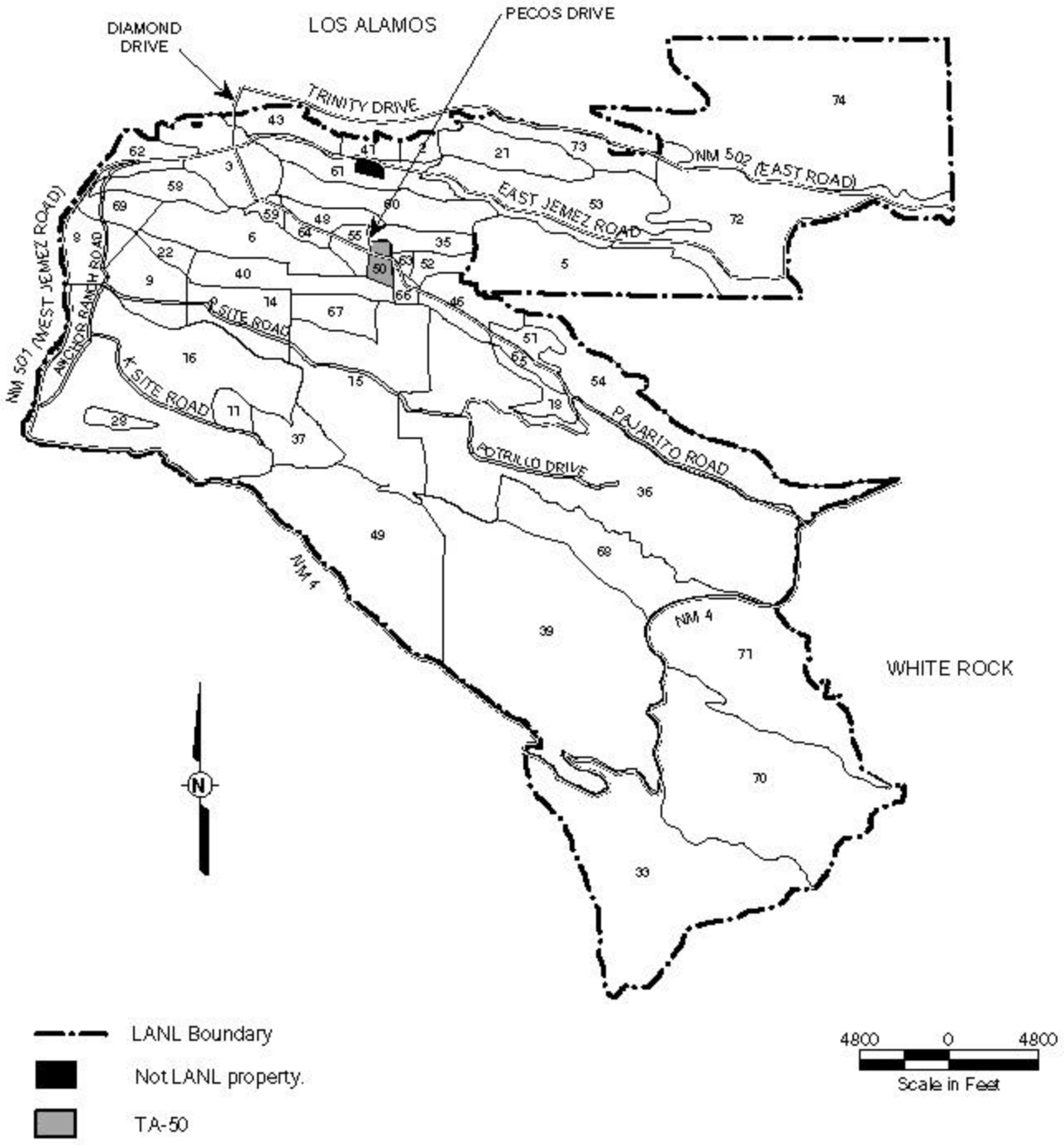


Figure A-3

Major Roads and Primary Traffic Routes at Los Alamos National Laboratory (LANL)

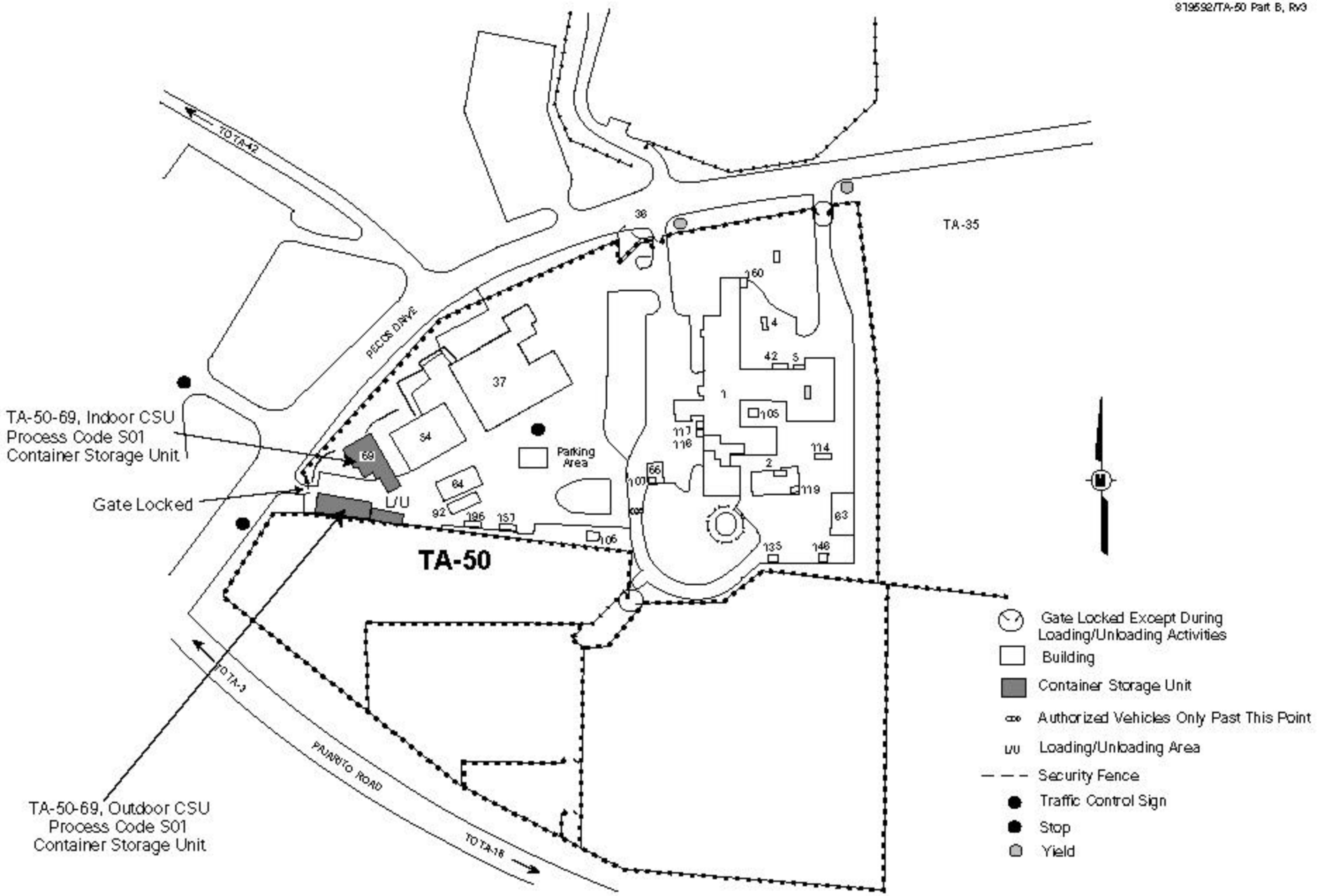


Figure A-4
Location Map of Access Roads and Traffic Control Signs
in the Vacinity of Technical Area (TA) 50

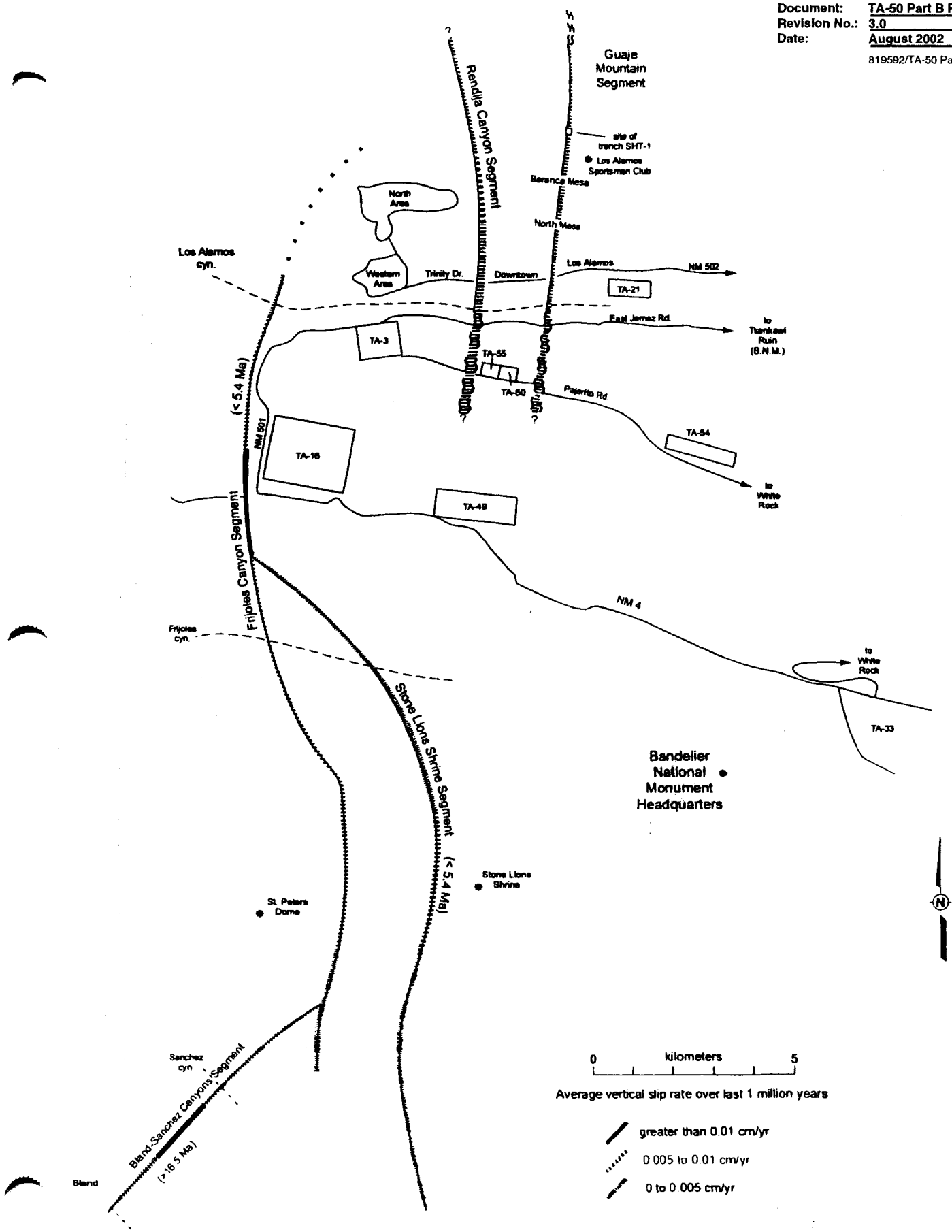


Figure A-5
Regional Surface Faulting

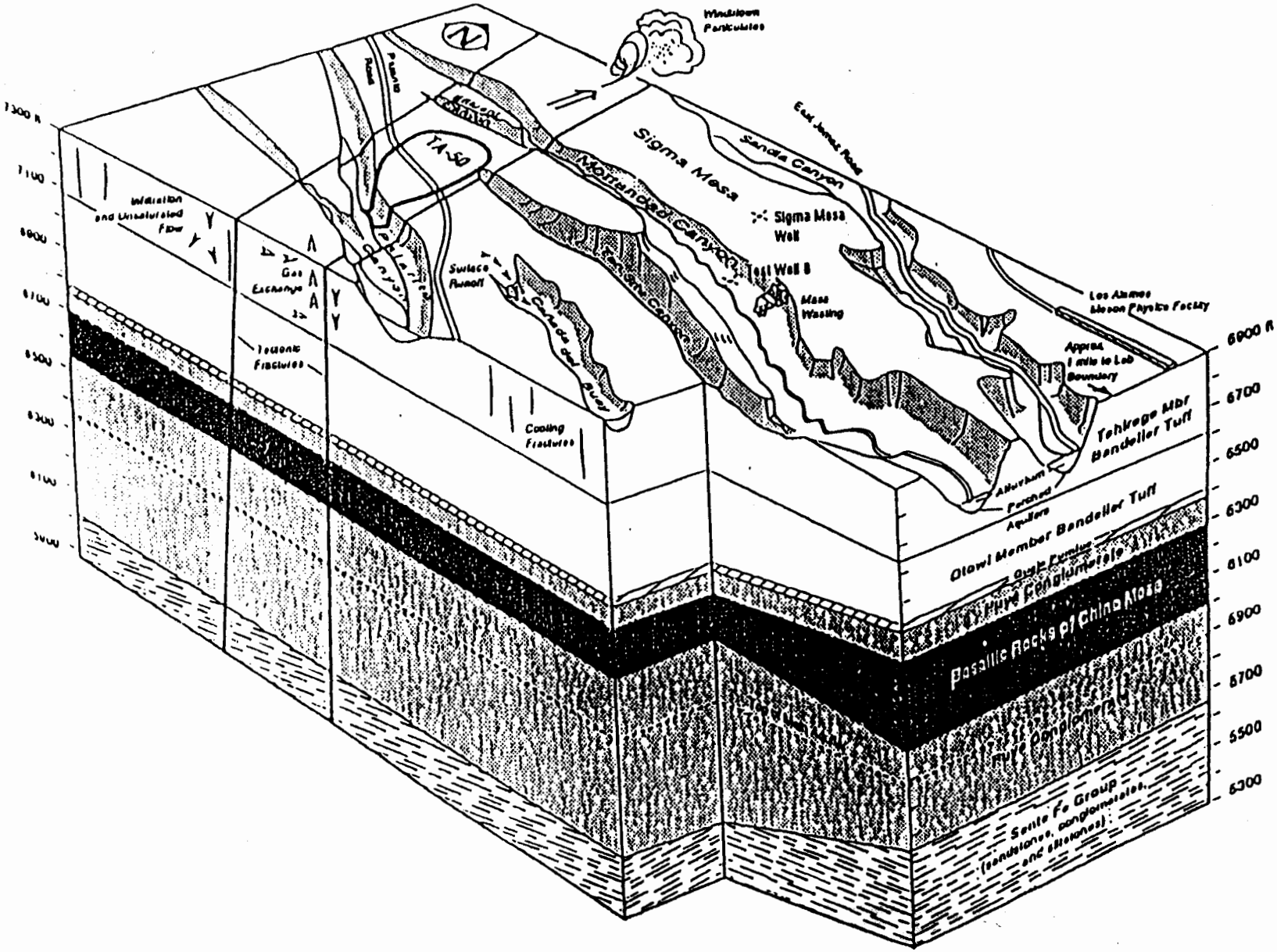
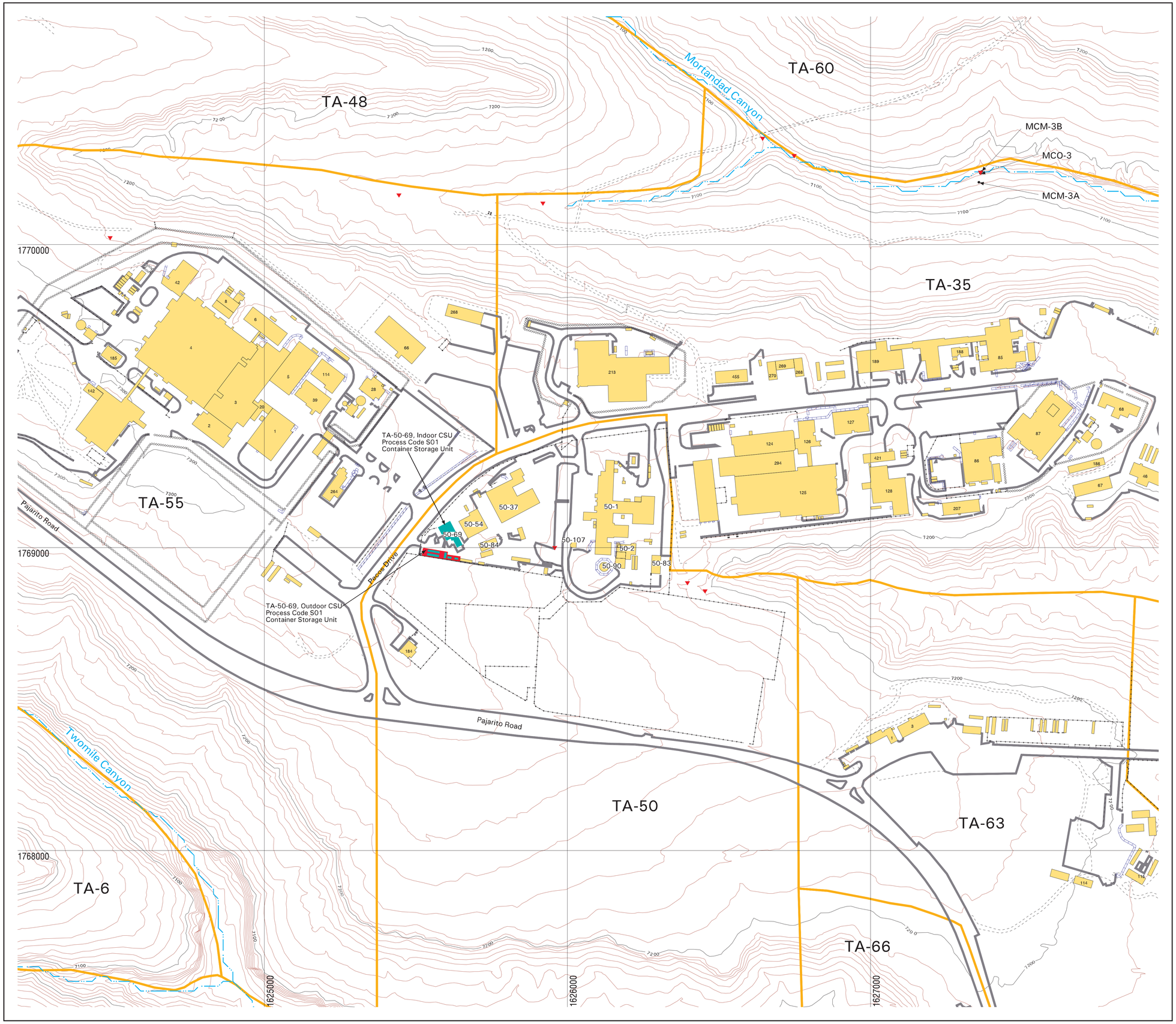


Figure A-6
Conceptual Block Diagram of the [illegible]igraphy of the TA-50 Site



LEGEND

- Boundary, TA
- Contour, 10 foot
- Contour, 100 foot
- Fence, Industrial
- Fence, Security
- Retaining Wall
- Road, Paved
- Road, Dirt
- Stream, Intermittent
- Stream, Perennial

- Structure
- RCRA-Regulated Waste Management Unit
- Structure Associated with a RCRA-Regulated Waste Management Unit

PERCHED ALLUVIAL MONITORING WELLS
(Old wells are pre-1990, new wells installed since 1990 according to EPA guidelines)

- New Dry Well
- Old Dry Well
- New Saturated Well
- Old Saturated Well

MAIN AQUIFER WELLS

- Water Supply Well
- Test Well

OTHER

- Abandoned/Plugged Well
- LAOR Well
- Other Monitoring Well

- Surface Water Sampling Station
- Spring

Figure A-7. Contour Map Showing the Locations of the RCRA-Regulated Waste Management Units at Technical Area (TA) 50

N

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 1000
Feet per inch on map = 150

SCALE 1:1800

0 46 92 138 184
METERS

0 150 300 450 600
FEET

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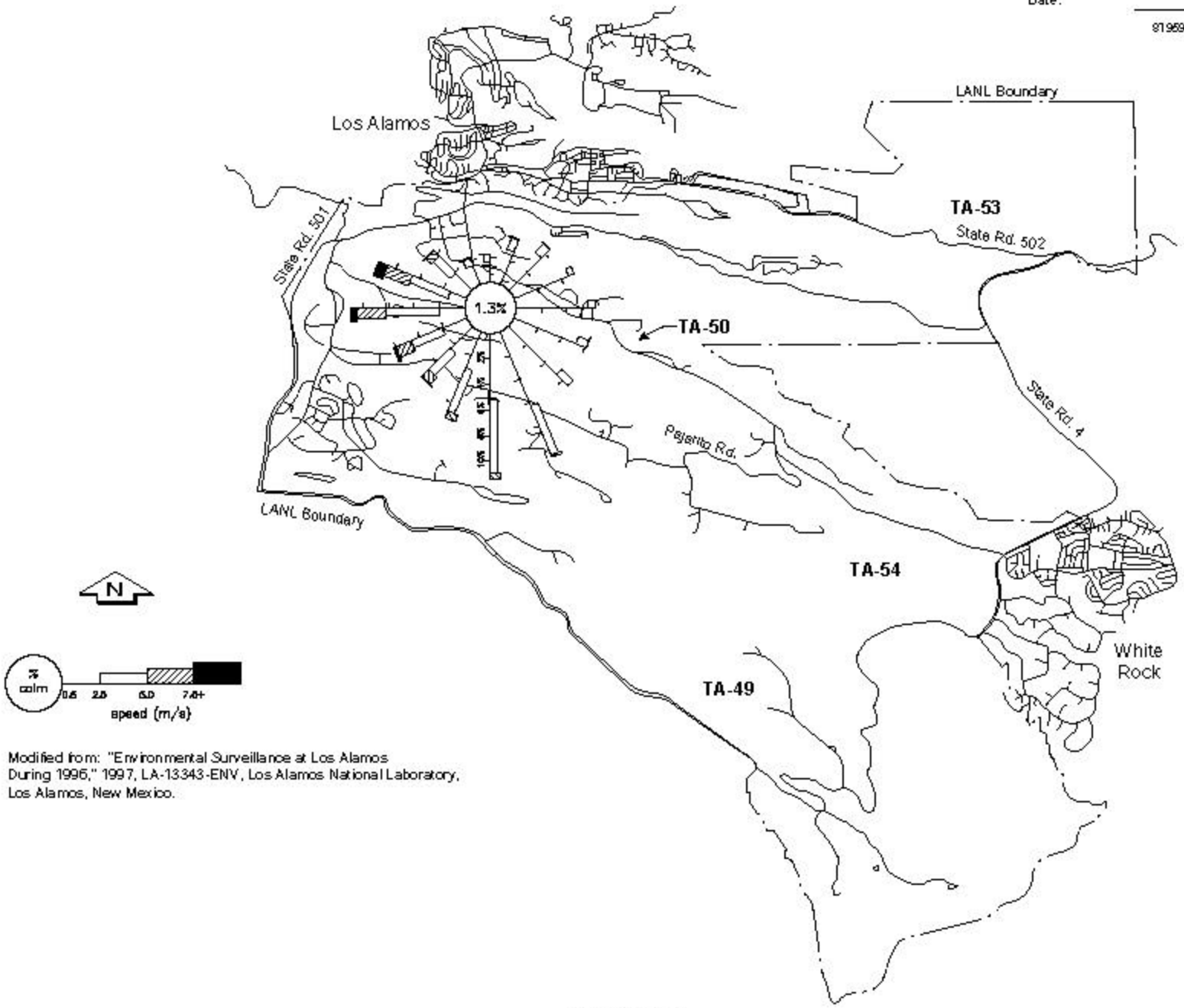
University of California
Los Alamos National Laboratory
Earth and Environmental Sciences Division

Cartography by: Marcia Jones
Date: July 24, 2002
GISLab Plot ID: G200314

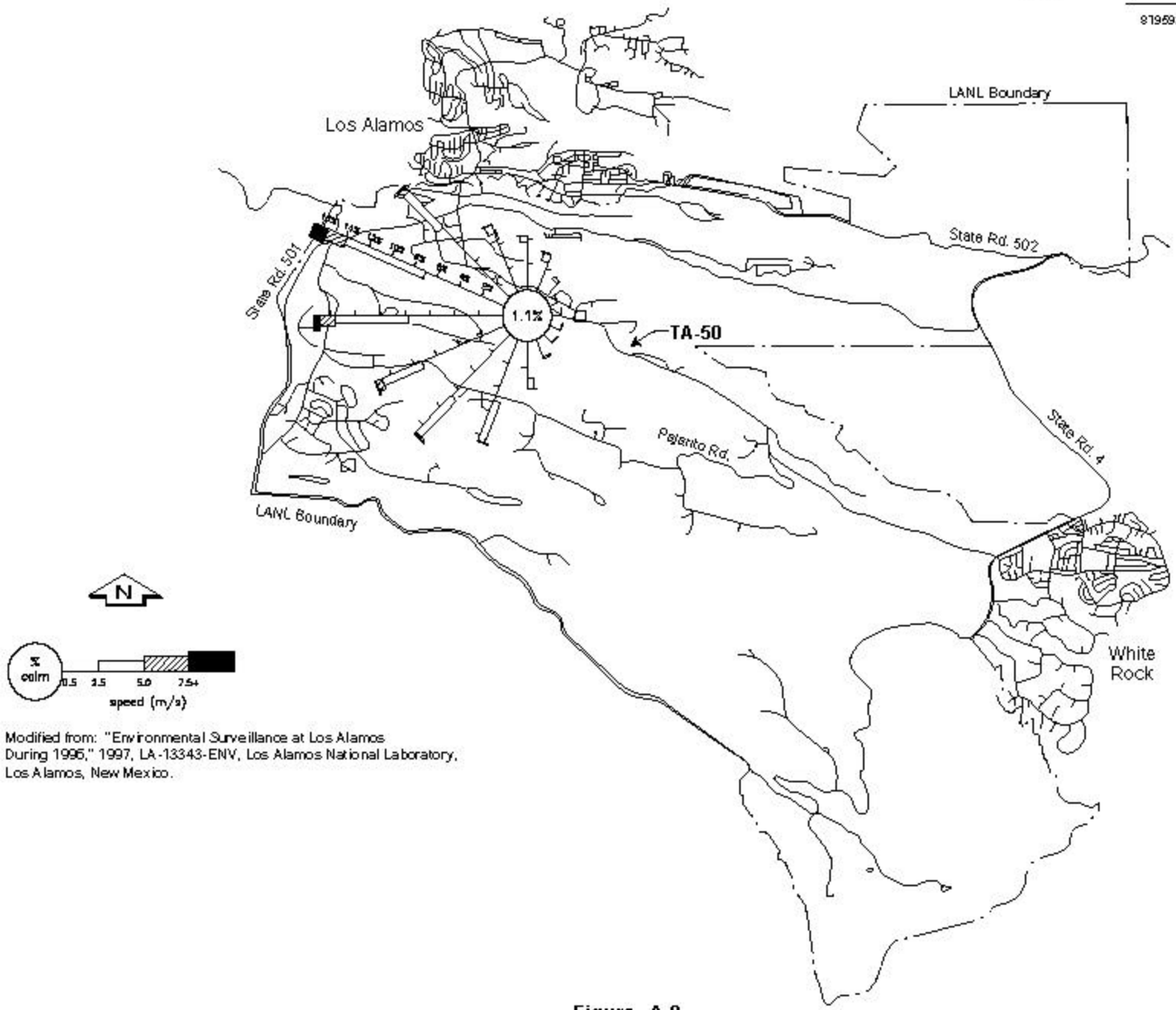
GISLab
Los Alamos National Laboratory



Modified from: "Environmental Surveillance at Los Alamos During 1996," 1997, LA-13343-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure A-8

Annual Wind Roses for Technical Area (TA) 6 at Los Alamos National Laboratory (LANL)—Day



Modified from: "Environmental Surveillance at Los Alamos During 1996," 1997, LA-13343-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure A-9

Annual Wind Roses for Technical Area (TA) 6 at Los Alamos National Laboratory (LANL)—Night

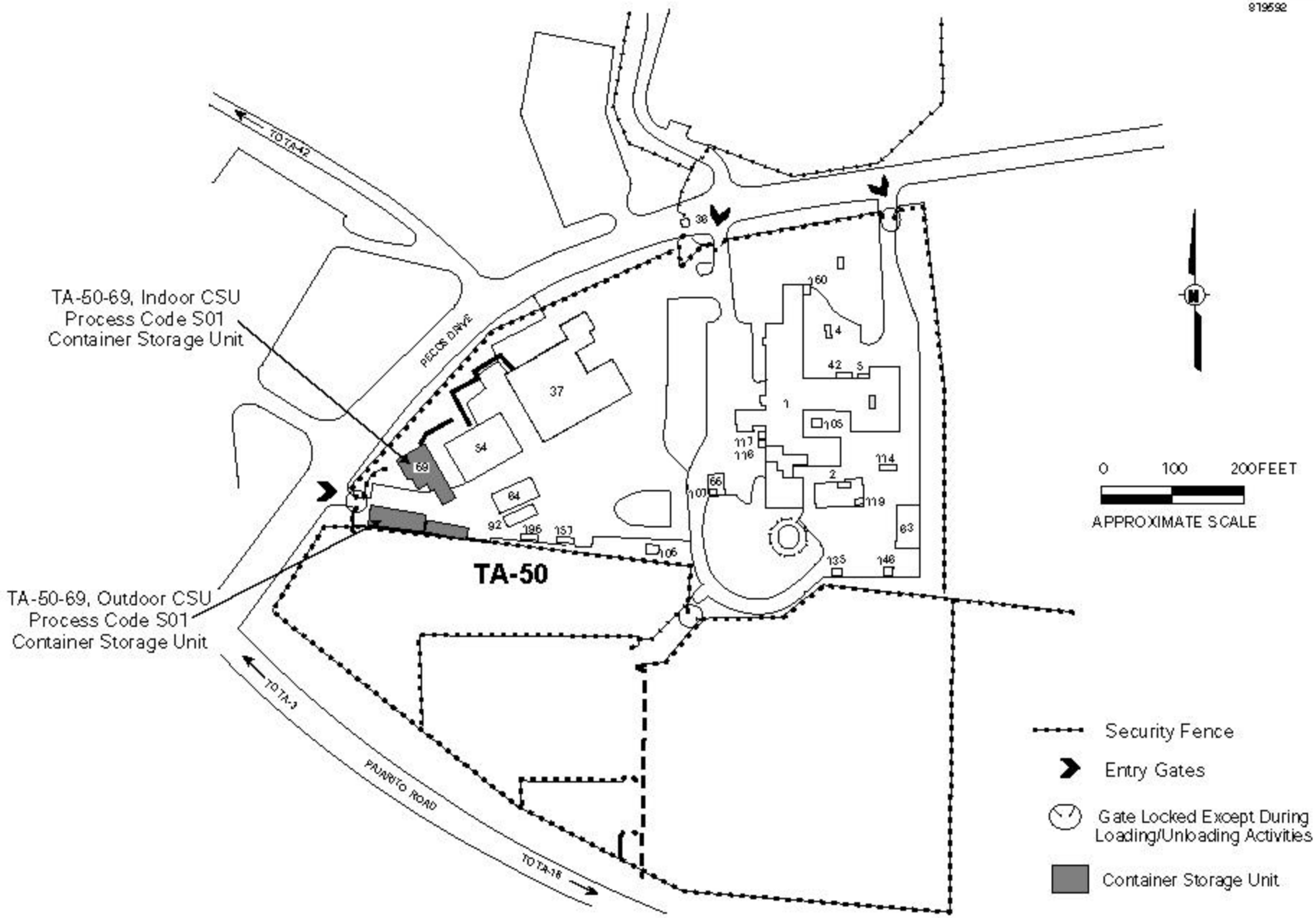
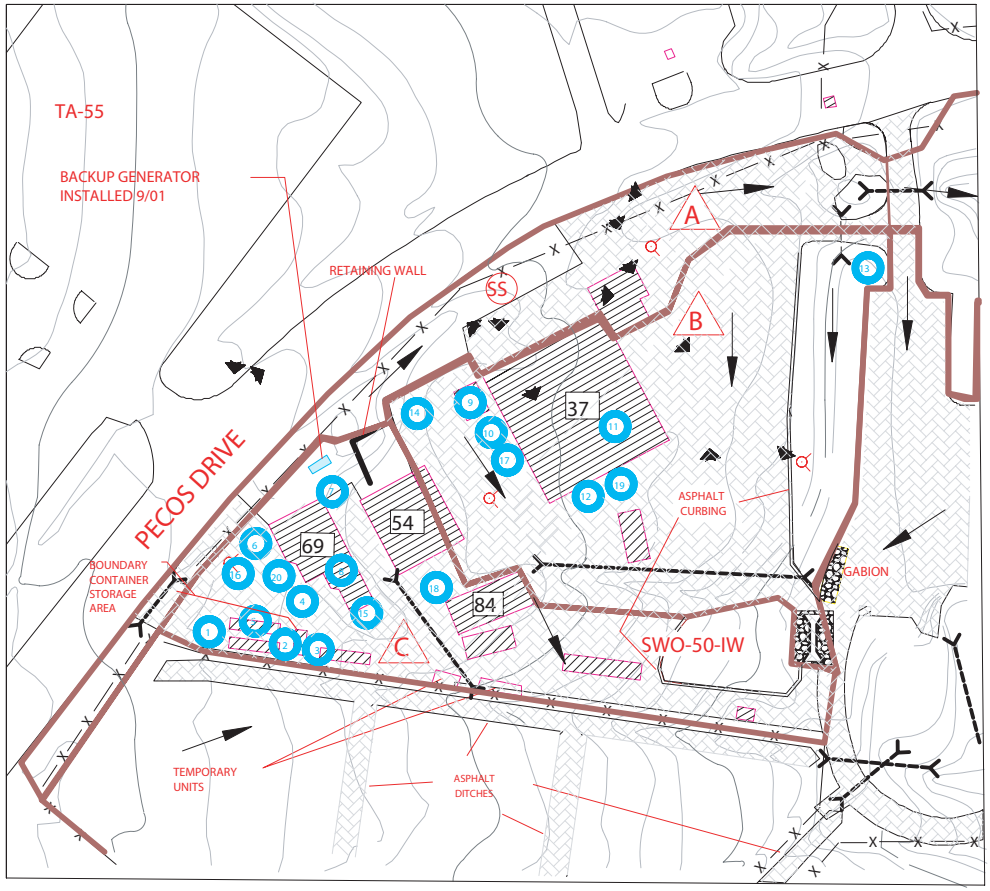


Figure A-10

Location Map Showing Security Fences, Entry Gates, and Entry Station at Technical Area (TA) 50



SYMBOLS LEGEND	
	DRAINAGE BOUNDARY
	DIRECTION OF STORM WATER FLOW
	DIRT ROAD
	ASPHALT COVERED SURFACE
	SOILS COVERED
	EXISTING BUILDING
	CULVERT
SS	SANITARY SEWER MANHOLE
	STORM WATER CATCH BASIN
	EXISTING FLUME
— x — x — x —	FENCE
	FIRE HYDRANT

Figure A-11

Drainage Control Features
at Technical Area (TA) 50

NO.	DATE		
2	12/01	Added Backup Generator	LA
	10/00	Added temporary units	LA

TA-50 RAMROD/ WCRCF
SWPP PLAN

SITE MAP

JCF

3/25/99

NO.	DATE	CLASS REV.	REVISIONS	DWN	DES	CHKD	SUB	APP

MERRICK
Engineers & Architects

600 Sixth Street, Los Alamos, New Mexico, 87544, USA
(505) 662-0606, Fax (505) 662-3851

0

DRAWN
DESIGN
CHECKED
DATE

SUBMITTED

APPROVED FOR RELEASE

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET

OF

CLASSIFICATION

REVIEWER

DATE

PROJECT ID

DRAWING NO.

REV.

V1.1 DRAWING: TA-50 TA-51 TA-55 SWPP.DWG

ATTACHMENT B

WASTE ANALYSIS PLAN

ATTACHMENT B
WASTE ANALYSIS PLAN

Waste analysis requirements are specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart IX, 270.14(b)(2) revised June 14, 2000 [6-14-00], and 20.4.1 NMAC, Subpart V, 264.13, and 268.7 [6-14-00]. The only waste management operation at TA-50 addressed in this permit renewal application is container storage. Waste analysis requirements for all container storage units at Los Alamos National Laboratory are described in the facility-wide Waste Analysis Plan in Appendix B of the “Los Alamos National Laboratory General Part B Permit Application”, (LANL, 1998).

ATTACHMENT C

INSPECTION PLAN

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C.1 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART CC REQUIREMENTS C-1
C.2 REFERENCES C-2

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CSU	container storage unit
gal.	gallon(s)
LANL	Los Alamos National Laboratory
m^3	Cubic meter(s)
TA	Technical Area

ATTACHMENT C
INSPECTION PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart IX, 270.14(b)(5), and 20.4.1 NMAC, Subpart V, 264.15, "General Inspection Requirements," revised June 14, 2000 [6-14-00], inspection requirements for all hazardous and/or mixed waste management units at Los Alamos National Laboratory (LANL) are addressed in Appendix C of the "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0, (LANL, 1998), hereinafter referred to as the LANL General Part B. This attachment presents additional inspection requirements applicable to the container storage units (CSU) at Technical Area (TA) 50, Building 69 (TA-50-69). Inspections will be conducted often enough to identify problems in time to correct them before they harm human health or the environment.

C.1 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART CC REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart CC]

The hazardous wastes stored in containers at the TA-50 CSUs are subject to 20.4.1 NMAC, Subpart V, 264, Subpart CC [6-14-00], "Air Emission Standards for Tanks, Surface Impoundment and Containers." Subpart CC standards for containers require that containers be covered so that there are no detectable emissions. The standards are met by placement of waste in DOT-compliant containers and are not applicable to containers of radioactive mixed waste. These standards are also not applicable to containers of waste with less than 500 parts per million by weight average volatile organics concentration, containers of less than a 0.1 cubic meters (m^3) (approximately 26 gallons [gal.]) capacity, and containers that have received waste before December 6, 1996.

Containers of hazardous waste that are less than or equal to 0.46 m^3 (approximately 119-gal.) capacity and meet U.S. Department of Transportation specifications under 49 Code of Federal Regulations, Part 178 will be closed while they are in storage so that there are no detectable emissions. All other containers subject to 20.4.1 NMAC, Subpart 264, Subpart CC [6-14-00] requirements will be inspected and monitored, as required at 20.4.1 NMAC, Subpart V, 264.1088(b) [6-14-00].

C.2 REFERENCES

LANL, 1998, ”Los Alamos National Laboratory General Part B Permit Application”, Los Alamos, New Mexico, Los Alamos National Laboratory.

ATTACHMENT D

PERSONNEL TRAINING PLAN

ATTACHMENT D
PERSONNEL TRAINING PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart IX, 270.14(b)(12), and 20.4.1 NMAC, Subpart V, 264.16, “Personnel Training,” revised June 14, 2002 [6-14-00], training requirements for treatment, storage, and disposal facility workers who work at Technical Area 50 are addressed in Appendix D of the “Los Alamos National Laboratory General Part B Permit Application,” Revision 1.0 (LANL, 1998).

ATTACHMENT E

CONTINGENCY PLAN

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CONTINGENCY PLAN E-1

LIST OF TABLES

TABLE NO.	TITLE
E-1	Emergency Equipment

LIST OF FIGURES

FIGURE NO.	TITLE
E-1	Evacuation Routes and Muster Areas at Technical Area (TA) 50
E-2	TA-50-69, Indoor Container Storage Unit Emergency Equipment

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CSU	container storage unit
LANL	Los Alamos National Laboratory
TA	Technical Area

ATTACHMENT E
CONTINGENCY PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart V, Part 264, Subpart D, "Contingency Plan and Emergency Procedures," and 20.4.1 NMAC, Subpart IX, 270.14(b)(7), revised June 14, 2000, contingency measures applicable to the hazardous and mixed waste container storage units (CSU) at Technical Area (TA) 50 are provided in Appendix E of the "Los Alamos National Laboratory General Part B," hereinafter referred to as the General Part B (LANL, 1998).

Figure E-1 shows evacuation routes and muster areas that may be used in the event of an emergency. In addition, lists of emergency equipment currently available for use at TA-50 CSUs are included as Table E-1. A list of emergency equipment (including spill equipment) available from the Hazardous Materials Response Group is presented in Table E-2 of Appendix E in the LANL General Part B (LANL, 1998). Evacuation routes, muster area locations, and emergency equipment are subject to change.

Hazardous and mixed waste spills are managed by type and severity of the incident. If a hazardous/mixed waste spill occurs, the Incident Command evaluates the type and severity of the spill and determines if assistance from LANL's Emergency Management Response Group is required. If not, the spill is managed internally by TA-50 personnel.

Table E-1

Emergency Equipment

FIRE CONTROL EQUIPMENT:

- **FIRE EXTINGUISHERS**

  Description of General Capabilities

  The fire extinguishers are portable, manually operated units and may be used by any employee in case of fire. They consist of Class A, B, and C units of approximately 9 to 15 pounds capacity used in wet chemical laboratory applications.

  Locations

  2 fire extinguishers are located in TA-50-69, Indoor Container Storage Unit (CSU) (Room—102)

  1 fire extinguisher is located within 20 feet (ft) of the TA-50-69, Outdoor CSU

- **FIRE ALARM PULL BOXES CONNECTED TO THE CENTRAL ALARM STATION**

  Description of General Capabilities

  Fire alarms may be activated by any employee in the event of fire to notify the Central Alarm Station. Upon activation, fire alarm horns and strobes provide audible and visual signals for personnel notification. The fire alarm is a pulsing sound. The evacuation alarm is a wailing sound that can be heard throughout TA-50-69, Indoor CSU and at the TA-50-69, Outdoor CSU.

  Locations

  Two fire alarm pull stations are located in the TA-50-69, Indoor CSU. One is just inside the south door of Room 102 and the other is inside the east door of TA-50-69. Personnel working at the TA-50-69, Outdoor CSU may use the pull stations at TA-50-69 in the event of a fire.

- **AUTOMATIC FIRE SUPPRESSION SYSTEM**

  Description of General Capabilities

  A wet-pipe automatic sprinkler system that is hydraulically designed for ordinary hazard Group II coverage is in place throughout TA-50-69. This system is activated at 100°C (212°F). The glovebox cutting and disassembly modules are equipped with an automatic water deluge sprinkler system. One sprinkler head is mounted on the west wall of the cutting module and one sprinkler head is mounted on the east wall of the disassembly module. Additionally, a manually operated carbon dioxide (CO_2) system is in place inside the cutting enclosure which allows an operator to apply CO_2 to minor flare-ups that can originate on the waste item being cut up with the plasma-torch. The CO_2 system cannot over pressurize the enclosure.

Table E-1 (continued)

Emergency Equipment
Technical Area (TA) 50, Building 69 (TA-50-69) Indoor and Outdoor Container Storage Units

FIRE CONTROL EQUIPMENT (continued):

Locations
Throughout TA-50-69, as described above.

- **FIRE HYDRANT**

  Description of General Capabilities
  Fire hydrants provide water for fire fighting. All fire hydrants are supplied by an 8-inch (in.) water line connected to the 12-in. water main on Pecos Drive.

  Location
  A fire hydrant is located approximately 55 ft west of TA-50-69.

SPILL CONTROL EQIUPMENT:

- **CURBING AND DRAINS**

  The main process room (Room 102) and unloading area (Room 103) at TA-50-69 provide secondary containment by use of curbs or floor drains. The storage capacity plus curbed area storage would be adequate to contain water generated during fire fighting.

- **SPILL CENTERS**

  Description of General Capabilities
  The spill centers contain at a minimum personnel protective equipment (i.e., gloves), and sorbents (i.e., pillows and pigs). The Emergency Management and Response Group provides additional spill control and clean up equipment as needed.

  Spill Center Location
  2 - TA-50-69, Indoor CSU (Room 102)
  2 - TA-50-69, Outdoor CSU

COMMUNICATION EQUIPMENT:

Description of General Capabilities
Telephones with public address (PA) capabilities for internal and external communication are available for use by any employee. Fire and evacuation alarms are activated in the event of a fire or in case an evacuation is required. The fire alarm is a double slow whoop sound. The evacuation alarm is a high-pitched wailing sound. The PA system can be heard at the TA-50-69, Outdoor CSU. When working at the CSUs, personnel will have immediate access to emergency communication equipment either directly or through visual or voice contact with another employee.

Table E-1 (continued)

Emergency Equipment
Technical Area (TA) 50, Building 69 (TA-50-69) Indoor and Outdoor Container Storage Units

COMMUNICATION EQUIPMENT (continued):

Location of Communication Equipment
Four telephones, three with PA capabilities, are located in TA-50-69. One is located outside Room 104 near the door. Personnel working at the TA-50-69, Outdoor CSU have access to the phone outside Room 104, will carry cellular phones, or will have immediate access to communication equipment through visual or voice contact with another employee.

DECONTAMINATION EQUIPMENT:

- **SAFETY SHOWERS**

  Description of General Capabilities
  Safety showers are available to personnel who receive a chemical splash to the skin.

  Location of Safety Showers
  Safety showers are located in TA-50-69, Room 102 and Room 103. One standard shower is located adjacent to the change room in TA-50-69.

- **EYEWASHES**

  Description of General Capabilities
  Eyewashes are available to personnel who receive a chemical splash to the eye(s). Specific MSDSs for the chemicals being managed are available to personnel working with hazardous or mixed waste to determine if the application of water is indicated for decontamination.

  Location of Eyewashes and Material Safety Data Sheets
  An eyewash is located in the TA-50-69, Indoor CSU (Room 102). The safety shower and eyewash in TA-50-69 are available to personnel working at the TA-50-69, Outdoor CSU.

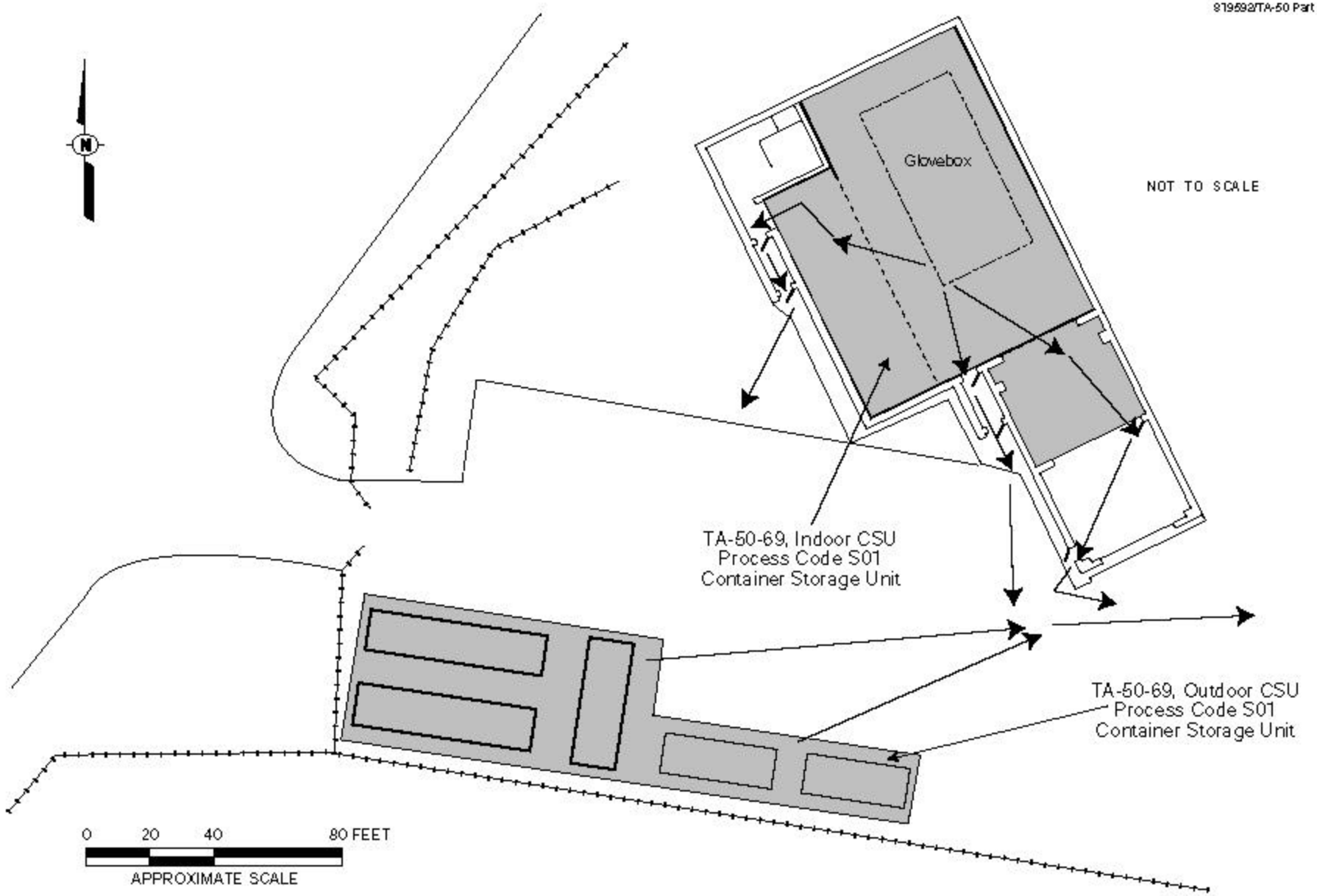

Figure E-1
Evacuation Routes and Muster Areas at Technical Area (TA) 50

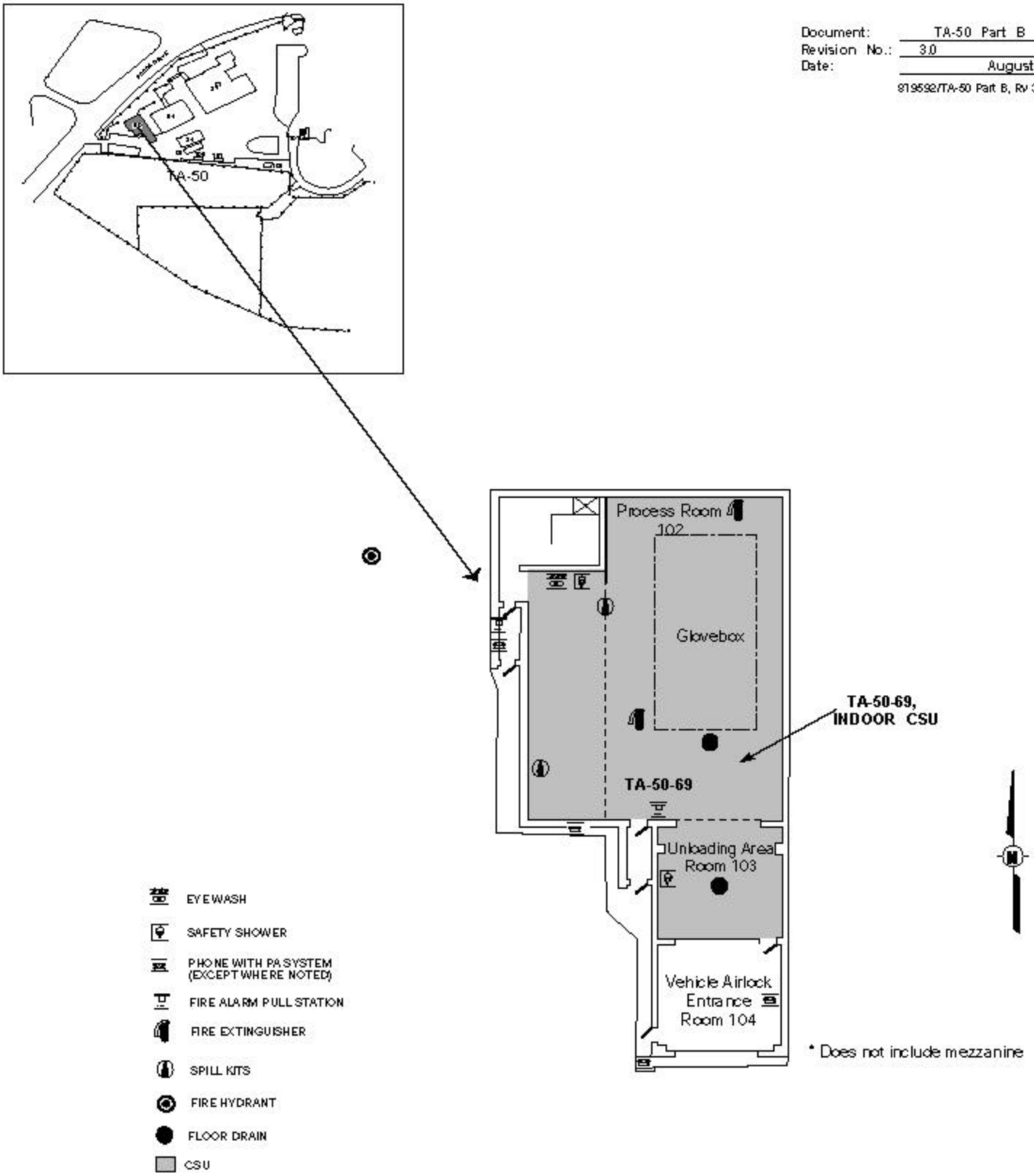

Figure E-2
TA-50-69, Indoor Container Storage Unit (CSU) Emergency Equipment

ATTACHMENT F

CLOSURE PLAN

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
COPC	contaminants of potential concern
CSU	container storage unit
D&D	Decontamination and Development
DOE	U.S. Department of Energy
ft	feet/foot
HSR-1	Health Physics Operations Group
HAR-5	Industrial Hygiene and Safety Group
LANL	Los Alamos National Laboratory
NMED	New Mexico Environment Department
OLASO	Office of Los Alamos Site Operation
PPE	Personal Protective Equipment
QA/QC	quality assurance/quality control
R&D	research and development
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SW-846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
SWRC	Solid Waste Regulatory Compliance
TA	technical area

ATTACHMENT F
CLOSURE PLAN

The information provided in this closure plan is submitted to address the applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart IX, 270.14(b)(13), and 20.4.1 NMAC, Subpart V, Part 264, Subpart G [6-14-00], which is inclusive of 264.178. This closure plan describes the activities necessary to clean close the container storage units (CSU) located at Los Alamos National Laboratory (LANL) Technical Area (TA) 50. Closure activities will minimize the need for further maintenance, preclude the release of hazardous constituents to environmental media, and be protective of human health, in accordance with the closure performance standards specified in 20.4.1 NMAC, Subpart 264.111 [6-14-00].

The CSUs addressed in this closure plan include the TA-50, Building 69 (TA-50-69), Indoor CSU and the TA-50-69, Outdoor CSU. The CSUs provide storage for hazardous and mixed wastes and are shown on Figure F-1.

Until closure is complete and has been certified in accordance with 20.4.1 NMAC, Subpart V, 264.115 [6-14-00], as discussed in Section F.1.6, a copy of the approved closure plan and any approved revisions will be on file at LANL's Solid Waste Regulatory Compliance (SWRC) and at the U. S. Department of Energy (DOE) Office of Los Alamos Site Operation (OLASO).

F.1 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC, Subpart IX, 270.14(b)(13), and 20.4.1 NMAC, Subpart V, Part 264, Subpart G, which is inclusive of 20.4.1 NMAC, Subpart 264.178.

F.1.1 Closure Performance Standard [20.4.1 NMAC, Subpart V, 264.111]

The CSUs addressed in this closure plan will be closed in a manner that:

- Minimizes the need for further maintenance,
- Controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground, or surface waters, or to the atmosphere, and
- Complies with the closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G [6-14-00], including, but not limited to the requirements of 20.4.1 NMAC, Subpart V,

264.178, 264.197, 264.228, 264.258, 264.280, 264.310, 264.351, 264.601 through 264.603, and 264.1102.

This will be accomplished by removal of waste from each TA-50 CSU and decontamination, if necessary, of all surfaces and equipment that may have come into contact with wastes. The surfaces and equipment will either be sampled and determined to be below applicable standards or will be removed or decontaminated to meet the applicable standards which are inclusive of the closure performance standard; 20.4.1 NMAC, Subpart V, Part 264, Subpart G; and 20.4.1 NMAC, Subpart V, 264.178. All waste may be either subsequently reclaimed, recycled, or disposed of as appropriate after closure activities are completed. Decontamination activities will ensure the removal of hazardous waste residues from the TA-50 CSUs to establish cleanup levels.

F.1.2 Partial and Final Closure Activities [20.1.4 NMAC, Subpart V, 264.112 (b) and (d)]

This closure plan has been written for partial closure rather than final closure of the entire LANL facility. Partial closure will consist of closing one or more of the CSUs at TA-50 while leaving the other regulated hazardous/mixed waste units at LANL in service. Partial closure (hereinafter referred to as closure) will be deemed complete when clean closure of a unit has been verified; all surfaces and/or equipment have been decontaminated, if necessary; and closure certification has been submitted to and approved by the New Mexico Environment Department (NMED). Final closure will occur when LANL's remaining regulated hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each unit, including all previous partial clean closures as well as land-based units that have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED and the NMED has approved the final closure.

F.1.3 General Closure Schedule [20.1.4 NMAC, Subpart V, 264.112 (b)(6), 264.112(e) and 264.113]

Written notification will be provided to the NMED 45 days before the start of closure activities at any TA-50 CSU. However, pursuant to 20.4.1 NMAC, Subpart V, 264.112(e) [6-14-00], removing hazardous wastes and decontaminating or dismantling equipment in accordance with an approved closure plan may be conducted at any time before or after notification of closure. Closure activities will begin according to the requirements of 20.4.1 NMAC, Subpart V, 264.112(d)(2) [6-14-00]. Treatment, removal, or disposal of any hazardous waste will begin prior to the initiation of removal and/or decontamination of equipment and facilities in accordance with the approved closure plan, as required by 20.4.1 NMAC, Subpart V, 264.113(a) [6-14-00], within 90 days after final receipt of waste at the TA-50 CSU to be closed. This timeframe will be met as long as facilities are available for storage, treatment, or disposal of these wastes. In the event that closure activities cannot begin within 90 days,

LANL will notify the Secretary of the NMED in accordance with the extension requirements in 20.4.1 NMAC, Subpart V, 264.113(a) [6-14-00]. Closure activities and reporting requirements will then be completed within 180 days of the receipt of the final volume of waste at the CSU to be closed. Closure will be conducted in accordance with the schedule presented in Table F-1 of this closure plan. In the event that closure is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC, Subpart V, 264.113(b) [6-14-00]. In addition, the demonstrations in 20.4.1 NMAC, Subpart V, 264.113(a)(1) and (b)(1) [6-14-00], will be made in accordance with 20.4.1 NMAC, Subpart V, 264.113(c) [6-14-00].

F.1.4 Amendment of the Closure Plan [20.4.1 NMAC, Subpart V, 264.112(c)]

In accordance with 20.4.1 NMAC, Subpart V, 264.112(c) [6-14-00], LANL will submit a written notification of request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan.
- There is a change in the expected year of closure.
- Unexpected events occur during closure that require modification of the approved closure plan.

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

F.1.5 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.1.4 NMAC, Subpart V, 264.140(c)]

In accordance with 20.4.1 NMAC, Subpart V, 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for closure actions.

F.1.6 Closure Certification [20.1.4 NMAC, Subpart V, 264.115]

Within 60 days after completion of closure activities at any TA-50 CSU or final closure of the facility, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC, Subpart V, 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC, Subpart V, 264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both DOE/OLASO and SWRC.

F.1.7 Security

Because of the ongoing nature of operations at LANL, site security at the TA-50 CSUs will be maintained by the DOE or another authorized federal agency for as long as necessary to prohibit public access. The security fence at TA-50 will be maintained to ensure that public access is prevented.

F.1.8 Closure Reports

Upon completion of the closure activities at a TA-50 CSU, a closure report will be prepared and, upon request, provided to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section F.1.6 of this closure plan
- Any significant variance from the approved activities and the reason for the variance
- A summary of all sampling results, showing:
    - Sample identification
    - Sampling location
    - Datum reported
    - Detection limit for each datum
    - A measure of analytical precision (e.g., uncertainty, range, variance)
    - Identification of analytical procedure
    - Identification of analytical laboratory
- A quality assurance (QA)/quality control (QC) statement on analytical data validation and decontamination verification
- The location of the file of supporting documentation, including:
    - Field logbooks
    - Laboratory sample analysis reports

- QA/QC documentation
- Chain-of-custody forms

- Storage or disposal location of regulated hazardous/mixed waste resulting from closure activities
- A certification of accuracy of the report.

F.2 DESCRIPTION OF THE TA-50 CSUs

F.2.1 TA-50-69, Indoor CSU

The TA-50-69, Indoor CSU consists of Rooms 102 and 103. Room 102, the main process room, measures approximately 45 feet (ft) wide and 52-ft long. The long dimension is oriented northwest-southwest. Room 103, the unloading area, measures approximately 18-ft wide and 19-ft long and is located adjacent to and southeast of Room 102. A 12-ft by 20-ft roll-up vehicle access door is located at the southernmost end of Room 103, separating the unloading area (Room 103) from the vehicle airlock entrance (Room 104).

F.2.2 TA-50-69, Outdoor CSU

The TA-50-69, Outdoor CSU is located in the southwest corner of TA-50 and consists of an asphalt and concrete pad that is not lined or coated, and measures 24-ft wide and 90-ft long, with an additional strip 12-ft wide and 90-ft long added to the southwest end. The asphalt and concrete pad is approximately 4-in. thick. The long dimension of this CSU is oriented east-southeast. The pad slopes gently (approximately 1 to 5 percent) from west to east and up to 2.5 percent toward the centerline. Transportainers and other weather protective structures within the TA-50-69, Outdoor CSU provide optional weather protection for containers of various sizes. Painted lines are used to visually delineate the CSU boundary.

F.2.3 Estimate of Maximum Waste In Storage

The maximum total inventory of waste that may be in storage at any time in the TA-50 CSUs is estimated as follows:

- TA-50-69, Indoor CSU – 1,500 gallons
- TA-50-69, Outdoor CSU – 30,000 gallons

F.2.4 Description of Waste in Storage

The TA-50 CSUs are used to store containers of solid hazardous and mixed waste. The hazardous waste is generated during research and development (R&D) activities, processing and recovery

operations, decontamination and decommissioning (D&D) projects, and environmental remediation/restoration activities conducted at various TAs throughout LANL. A waste is considered hazardous if it meets the definition of a solid waste described in 20.34.1 NMAC, Subpart II, 261.2 [6-14-00]; is not exempt from regulation as a hazardous waste under 20.4.1 NMAC, Subpart II, 261.2 [6-14-00]; and exhibits any of the characteristics of hazardous waste identified in 20.4.1 NMAC, Subpart II, Subpart C, or is listed in 20.4.1 NMAC, Subpart II, Subpart D [6-14-00]. Mixed wastes currently stored at TA-50 are generated during R&D activities, processing and recovery operations, D&D projects, and general facility operations. The mixed wastes are classified as such because Resource Conservation and Recovery Act (RCRA)-characteristic or -listed wastes are or may be present, along with radioactive components. Information on the hazardous components of all waste stored at the TA-50 CSUs is provided in the "Los Alamos National Laboratory General Part A Permit Application, " Revision 0.0 (LANL, 1998a) and Attachment H of this permit renewal application.

F.2.5 Removal of Waste

Prior to initiation of closure activities, all wastes will be removed from the CSU to undergo closure. Containers may be removed from each location with forklifts. Small containers may be handled manually or with dollies. Containers will be placed onto flatbed trucks or trailers for transport. Appropriate shipping papers will accompany the wastes during transport. Containers holding hazardous or mixed wastes will be moved to an approved on-site storage unit or permitted off-site treatment, storage, or disposal facility.

F.3 CLOSURE PROCEDURES [20.4.1 NMAC, Subpart V, 264.112]

To the extent possible, all contaminated surfaces and equipment (if present) at the TA-50 CSUs will be removed and decontaminated to meet applicable standards determined at the time of closure. Surfaces and equipment that cannot be decontaminated will be containerized and managed in compliance with applicable regulations. All waste may be subsequently reclaimed, recycled, or disposed of as appropriate after closure activities are completed. Decontamination of the CSU surfaces and/or equipment will undergo verification via sampling and analysis. All sampling conducted during closure activities will be done as generally discussed in this closure plan and as outlined in the CSU-specific sampling and analysis plan (SAP) (see Section F.4) to be provided at the time of closure. Sampling and analysis will be done in accordance with appropriate QA/QC procedures as required by the individual analytical technique or the authority for the relevant standard methods. Closure will be conducted in accordance with the general schedule presented in Table F-1, as amended by the TA-50 CSU-specific SAP to be submitted prior to the actual closure.

F.3.1 Preliminary Closure Activities

F.3.1.1 Safety Precautions

Job hazards associated with closure activities will be identified, controls developed, and workers briefed before closure activities are conducted, in accordance with LANL safety procedures. Personnel involved in closure activities will wear appropriate personal protective equipment (PPE), specified by the Health Physics Operations Group (HSR-1) and Industrial Hygiene and Safety Group (HSR-5), and will follow good hygiene practices to protect themselves from exposure to hazardous and/or mixed waste. The level of PPE that will be required will depend upon the levels of radiological and/or chemical contamination that are detected, if any. If HSR-1 and HSR-5 surveys do not indicate detectable contamination levels, minimum PPE requirements will consist of coveralls, steel-toed shoes, and safety glasses or face shields. If an overhead danger is present, a hard hat will be worn. All workers involved in closure activities will be required to have appropriate training as described in Appendix D of the "Los Alamos National Laboratory General Part B Permit Application" hereinafter referred to as the LANL General Part B (LANL, 1998b). Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

F.3.2. Background Determination

Before any decontamination activity begins, background levels for potential hazardous waste constituents will be determined. Decontamination and verification sampling procedures may involve wash water sampling, swipe sampling, soil sampling, or other methods developed by the time of closure. A minimum of two background samples will be obtained from clean water, cleaning equipment, and detergent solutions, as they are applicable to the closure. Background samples will be obtained for the material to be decontaminated and/or for any sampling materials used in swipe sampling analysis used to verify closure. Appropriate background soil sample concentrations derived from soil studies developed under the LANL corrective action or other programs will be used to determine soil hazardous constituent background levels, if applicable. Details of appropriate background levels and/or necessary samples and collection techniques will be included in the TA-50 CSU-specific SAP as discussed in Section F.4 of this closure plan.

F.3.2.1 Structural Assessment

Before decontamination activities begin, the base or secondary containment of each CSU will be inspected for any cracks or conditions that could potentially lead to loss of wash water containment. Preventive maintenance inspections are conducted routinely (i.e., weekly) at each CSU. If any defects, deterioration, damage, or hazards affecting containment have developed after the most recent preventive maintenance inspection was conducted, appropriate remedial actions (including sampling, repairs, maintenance, or replacement) will be completed before decontamination activities begin. The

base surface will be evaluated for cracks/gaps that could potentially lead to a loss of decontamination wash water. If a crack or gap is present, a swipe sample or a representative sample of the media will be taken (e.g., asphalt or concrete) to determine the presence of contamination. The sample will be analyzed for hazardous contaminants of potential concern (COPC) determined through review of the chemical properties of the waste stored during the operating history of the CSU. If contamination is detected, the surface flaw will be decontaminated prior to repairing the crack/gap. Complete or partial removal (e.g., scabbling) of the material may be performed until contamination is no longer detected. If partial removal is successful in eliminating the contamination, it will be assumed that the remaining material, including underlying soil, is clean.

F.3.3 TA-50-69, Indoor CSU

Prior to decontamination of the main surfaces at the TA-50-69, Indoor CSU, any portable equipment (if present) to be removed from the area will be wiped down with a wash water solution for decontamination. The equipment may include items such as pallets and miscellaneous waste management equipment (i.e., drum dolly, glovebox). The CSU walls and floors will then be wiped down with mops, cloths, and/or other absorbent materials to remove hazardous constituents. This will minimize the amount of liquid waste generated as a result of decontamination activities. A portable berm will be used to collect excess wash water and provide containment, as necessary during the decontamination process. The used wash water will be allowed to accumulate within the portable berm area and will then be transferred to a container where it will be sampled to determine an appropriate location for disposal.

There are no recessed areas (i.e., sumps) located at the TA-50-69, Indoor CSU. There are, however, two drains connected directly to the piping that feeds to the Radioactive Liquid Waste Treatment Facility. These drains are located in Rooms 102 and 103 and will be covered prior to the commencement of decontamination activities.

When decontamination of the CSU is complete, verification will be conducted as indicated in Section F.4. If analysis from the verification indicate that hazardous constituents are present, the decontamination and verification will be repeated until the surface or equipment (if present) has been decontaminated or the decision is made to manage it as contaminated waste. Upon determination that it is contaminated waste, the surface, or equipment may be removed, transported, and stored at other hazardous waste CSUs to facilitate the closure process.

F.3.4 Decontamination of the TA-50-69, Outdoor CSU

Closure activities at the TA-50-69, Outdoor CSU will include:

- Decontamination, recycling, and/or disposal of transportainers and/or portable equipment.
- Decontamination or removal of portions of the storage pad underlying this CSU (as indicated by the operating record).
- Sampling of surrounding soils to determine presence and/or extent of contamination (as indicated in the operating record).
- Disposal of soils and/or waste materials generated during decontamination.

F.3.4.1 Pallet Decontamination

Pallets and other portable equipment used at the TA-50-69, Outdoor CSU will be removed or decontaminated to meet applicable standards at the time of closure. Pallets and equipment that cannot be decontaminated will be containerized and managed in compliance with applicable regulations. All waste may be subsequently reclaimed, recycled, or disposed of as appropriate after closure activities are completed. If decontaminated, the pallets and other portable equipment will be wiped down with a wash water solution. This will minimize the amount of liquid waste generated as a result of decontamination activities. A portable berm will be used to collect excess wash water and provide containment, as necessary during the decontamination process. The used wash water will be allowed to accumulate within the portable berm area and will then be transferred to a container where it will be sampled to determine an appropriate location for disposal.

After the decontamination is completed, several discrete verification samples will be taken as discussed in Section F.4. If this verification sampling and analysis indicates that hazardous constituents are present, the decontamination and verification will be repeated until the pallet or equipment (if present) has been decontaminated or the decision is made to manage it as contaminated waste. Upon determination that it is contaminated waste, the pallet or equipment may be removed, transported, and stored at other hazardous waste CSUs to facilitate the closure process.

F.3.4.2 Transportainer Decontamination

Normal operations at the TA-50-69, Outdoor CSU will not expose outer surfaces of transportainers to waste contamination. Therefore, unless there is evidence of accidental outer surface contamination by spillage of regulated wastes either on the outside, or leakage from interior spills, the outer surfaces will not be sampled for contamination. If outer surfaces of a transportainer(s) are found to be contaminated with hazardous constituents, those surfaces will be decontaminated following the procedures described for transportainer interior surfaces.

If necessary, the inside of the transportainers will be pressure washed or wiped down and rinsed with wash water. A portable berm will be used to collect excess wash water and provide containment, as necessary during the decontamination process. The used wash water will be allowed to accumulate within the portable berm area and will then be transferred to a container where it will be sampled to determine an appropriate disposal path.

After the decontamination is completed, several discrete verification samples will be taken as discussed in Section F.4. If this verification sampling and analysis indicates that hazardous constituents are present, the decontamination and verification will be repeated until the transportainer has been decontaminated or the decision is made to manage it as contaminated waste. Upon determination that it is contaminated waste, the transportainer may be removed, transported, and stored at other hazardous waste CSUs to facilitate the closure process.

F.3.4.3 Storage Pad Decontamination

Operational records (e.g., inspection findings, occurrence reports), visual inspection, and analytical data (if necessary) will be used to determine if the asphaltic concrete pad at the TA-50-69, Outdoor CSU is contaminated by hazardous constituents from waste management operations at the unit. Those areas suspected of being contaminated will either be removed from the pad, or washed with a wash water solution. Removal, containerization, and disposal of contaminated asphalt is likely to be the option of choice.

A portable berm will be used to collect excess wash water and provide containment, as necessary during the decontamination process. The used wash water will be allowed to accumulate within the portable berm area and will then be transferred to a container where it will be sampled to determine an appropriate location for disposal.

After the decontamination is completed, several discrete verification samples will be taken as discussed in Section F.4. If this verification sampling and analysis indicates that hazardous constituents are present, the decontamination and verification will be repeated until the pad has been decontaminated or the decision is made to manage it appropriately as contaminated waste.

Used washwater samples may exhibit anomalously high levels of organic compounds due to leaching of the asphalt during washdown. If this is the case, record reviews (e.g. manufacturer's specifications, Material Safety Data Sheets) and additional analyses may be performed to determine if leaching of organics from the asphalt contributed to the organic compound concentration in the used washwater. If this additional evaluation confirms the asphalt as the source of contamination, baseline concentrations

for clean washwater will be adjusted accordingly. If decontamination verification cannot be demonstrated, the container storage pad may be evaluated using an alternative demonstration of decontamination. If all alternative demonstrations fail, the container storage pad will be removed.

Record reviews and visual inspection of soils along the margins of the TA-50-69, Outdoor CSU will be used to identify areas where soil contamination from waste management activities could have occurred. Soil sampling will be conducted in any suspected contaminated areas and in those areas where the asphalted concrete pad has been removed due to contamination with hazardous constituents. Before closure activities begin, soil samples will be collected from appropriate areas and analyzed to serve as background samples. A statistically representative number of soil samples will be collected from contaminated area(s) to a 6-inch (in.) depth. Samples will be equally spaced to ensure representative sampling of the contaminated area(s). If contamination resulting from container storage activities is discovered, the contaminated soils will be either remediated in place, or removed for proper disposal.

F.3.4.4 Soil Sampling and Decontamination

Soil removal at the TA-50-69, Outdoor CSU may be conducted to meet the closure performance standards. Examples include the detection of contamination that has migrated beyond the asphalt pads to the surrounding soil, and cases in which operating records indicate that a release of hazardous waste from storage structures to the surrounding soil has occurred. If records indicate that no release of hazardous waste to soils has occurred, soil sampling will not be conducted.

If collection of soil samples is necessary to demonstrate decontamination, background soil samples will be collected and analyzed for the COPCs identified in the operating record to provide a baseline for decontamination verification. Sampling locations to determine the extent of contamination will be based upon a biased random sampling approach, including historical evidence of releases, or visual staining, and any other information that indicates a potential contamination pathway. The number of samples, locations, depths, and sampling methods will be determined before closure and included in the TA-50 CSU-specific closure SAP, as discussed in Section F.4. Results from sampling will be compared to the background samples and/or baseline concentration levels included in the closure SAP. If analysis shows that the soil at the storage area is contaminated, soil sampling results that are above the background/baseline levels will be used to identify the extent of soil contamination. Contaminated soils will be removed in layers and sampling conducted following removal of each layer. This procedure will be used to minimize the amount of soil removed.

F.3.5 Decontamination Equipment

Prior to use, all reusable sampling equipment used during decontamination in closure activities will be

cleaned and rinsed, as described in the closure SAP. Sampling equipment rinsate blanks will be collected and analyzed in accordance with the QA/QC procedures described in the closure SAP. Reusable decontamination equipment, including protective clothing and tools, used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash water solution (the closure SAP will include a discussion of wash water solutions). Residue and disposable decontamination equipment as well as reusable decontamination equipment that cannot be decontaminated will be containerized and managed appropriately at an approved on-site facility, depending on the regulated constituents present.

F.4 DECONTAMINATION VERIFICATION

Sufficient sampling and analysis will be conducted to demonstrate that hazardous waste residue is not present at the CSU after closure. Wash water sampling, swipe sampling, or other appropriate sampling and analysis methodologies may be used to verify decontamination. The verification sampling method will be determined at the time of development of the TA-50 CSU-specific closure SAP and will be based on factors such as COPCs and materials of construction for the storage structure. The SAP will establish the minimum number of verification samples based on the total surface area of the CSU. Using a biased random sampling approach, items, structures, and/or surfaces will be sampled for verification of decontamination. Sample bias will include known or likely areas of contamination, low areas, sumps, and known spill locations, as determined to be appropriate on a case-by-case basis.

For wash water-based decontamination verifications, samples of clean wash water solution squeezed from mops, sponges, and/or other absorbent materials prior to use will be collected for a baseline comparison. The samples will be analyzed for the COPCs, as presented in the TA-50 CSU specific SAP. Analytical procedures will conform to methods found in the most current version of “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods” (*SW-846*) (U.S. Environmental Protection Agency, 1986).

Used wash down solutions will be analyzed for the same parameters. Wash down solutions will be considered contaminated if the used wash water solution shows a significant increase (i.e., determined using statistical methods defined in *SW-846*) in the analytical parameters over the clean wash water solution. If additional decontamination is deemed necessary, the verification procedure will be repeated.

Swipe sampling may be used on a case-by-case basis to determine verification of decontamination at the TA-50 CSUs. Background for swipe samples will be determined by submitting an unused swipe and

solvent sample for analysis of the CSU COPCs. Swipe samples will be analyzed using approved methods, which will be included in the closure SAP.

If other sampling methodologies have been developed at the time of closure for the TA-50 CSU, their use to determine decontamination will be addressed in the closure SAP.

For any sampling methodology, decontamination will be verified if the collected samples meet any of the decontamination criteria listed in Section F.3.6 of this closure plan. If the verification sampling indicates contamination higher than the approved values, additional sampling will be performed to establish the boundaries of contamination for large structures. After establishing the boundaries of contamination, the decontamination process will be repeated within those boundaries, using portable berms or other appropriate material to limit the potential for run-off from the affected area. An additional round of verification sampling will be performed for all of the areas previously determined to be contaminated. After each decontamination event and verification iteration, a decision will be made to repeat the process or remove contaminated materials and dispose of them properly.

F.5 DECONTAMINATION VERIFICATION CRITERIA

Successful decontamination is defined as one of the following criteria:

- No detectable hazardous waste or hazardous constituents from container storage activities are found in the final sample.
- Detectable hazardous waste or hazardous constituents from container storage activities in the final sample are removed to statistically significant levels based on baseline concentrations in the clean wash water.
- Detectable hazardous waste or hazardous constituents from container storage activities in the final sample are at or below levels agreed upon with the NMED.
- Detectable hazardous waste or hazardous constituent concentrations from container storage activities do not significantly decrease after several wash downs. In such an event, hazardous constituents that pose an acceptable risk will be allowed to remain, as mutually agreed upon with the NMED.

An alternative demonstration of decontamination may be proposed and justified at the time of unit closure, as circumstances indicate. The Secretary, NMED, will evaluate the proposed alternative in accordance with the standards and guidance then in effect and, if approved, incorporate the alternative into this closure plan.

F.6 SAMPLING AND ANALYSIS PLAN [20.4.1 NMAC 264.112(b)(4)]

Sampling and analytical procedures will be performed during the decontamination and verification activities associated with the partial closure of the TA-50 CSUs covered by this plan. These

procedures will use standard approved methods (e.g., SW-846), as appropriate, for making closure decontamination verification determinations. However, the TA-50 CSUs are not anticipated to undergo closure for a relatively long time, and it is probable that sampling and analytical methods will be revised and improved before closure. In order to alleviate the need for future closure plan and permit modifications until actual closure activities are scheduled, LANL will submit TA-50 CSU-specific closure SAPs to the NMED at the time of closure notification for review and approval.

The TA-50 CSU-specific closure SAPs will contain a detailed discussion of the available CSU information and proposed clean closure methodology to assure the closure performance standards are met. These closure SAPs for the TA-50 CSUs will, at a minimum, include:

- A detailed discussion of site characteristics.
- The CSU operational history, to include descriptions of known spills, releases, and/or evidence of potential problems (e.g., visual stains).
- Chemical properties of the waste stored at the CSU.
- Determination of applicable COPCs.
- A detailed hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures for decontamination methods for equipment, structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the specific CSU.
- Methods for sampling and analysis of contaminated media.
- Removal procedures for contaminated media, if necessary.
- Sampling methods for decontamination media and hazardous waste determination. The discussion will include the rationale for using wash water samples, swipe samples, soil samples, and/or other sampling methodology.
- Sampling methods for decontamination verification procedures. The discussion will include the statistical or judgmental basis for determining the number of verification samples needed and the constituents to be analyzed for.
- Sampling equipment decontamination and disposition procedures.
- Sample handling and documentation procedures.
- Analytical methods and the rationale for their determination.

- Disposition of removed waste, decontamination media, or contaminated soils. This discussion will identify on- or off-site hazardous waste management facilities used for final disposition and the types of wastes shipped.

- Decontamination criteria.

- Statistical basis for verification of decontamination, if applicable. The discussion will include information on determination of statistical increases in analytical parameters and numerical values for significant increases.

- Risk assessment procedures to be used, if necessary.

- Field and laboratory QA/QC procedures.

- Schedule of closure activities, including decontamination, sampling, analysis, potential removal of soils, and final report submittal.

- Identification of contact person or office.

F.7 REFERENCES

EPA, 1986 (and all approved updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

LANL, 1998a, "Los Alamos National Laboratory General Part A Permit Application," Los Alamos, New Mexico, Los Alamos National Laboratory.

LANL, 1998b, "Los Alamos National Laboratory General Part B Permit Application," Los Alamos, New Mexico, Los Alamos National Laboratory.

Table F-1
Schedule for TA-50 Closure Activities

Activity	Maximum Time Required [a]
Submit CSU-specific Closure/Sampling and Analysis Plan	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Collect background samples (if applicable)	-5 Days
Final receipt of waste	Day 0
Begin closure activities (i.e., removal of wastes)	Day 5
Decontaminate surfaces and/or equipment	Day 10
Perform verification sampling of the surfaces and/or equipment	Day 20
Evaluate analytical data	Day 50
Perform additional decontamination (if necessary)	Day 55
Perform additional verification sampling (if necessary)	Day 60
Evaluate analytical data	Day 75
Perform asphalt decontamination and verification sampling	Day 80
Evaluate analytical data	Day 95
Perform soil sampling (if necessary)	Day 100
Evaluate analytical data	Day 120
Perform final clean up (i.e., removal of decontaminated equipment and decontamination waste)	Day 140
Verify decontamination	Day 150
Submit final report to NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously and/or may not require the maximum time listed. Extensions to this schedule may be requested, as needed.

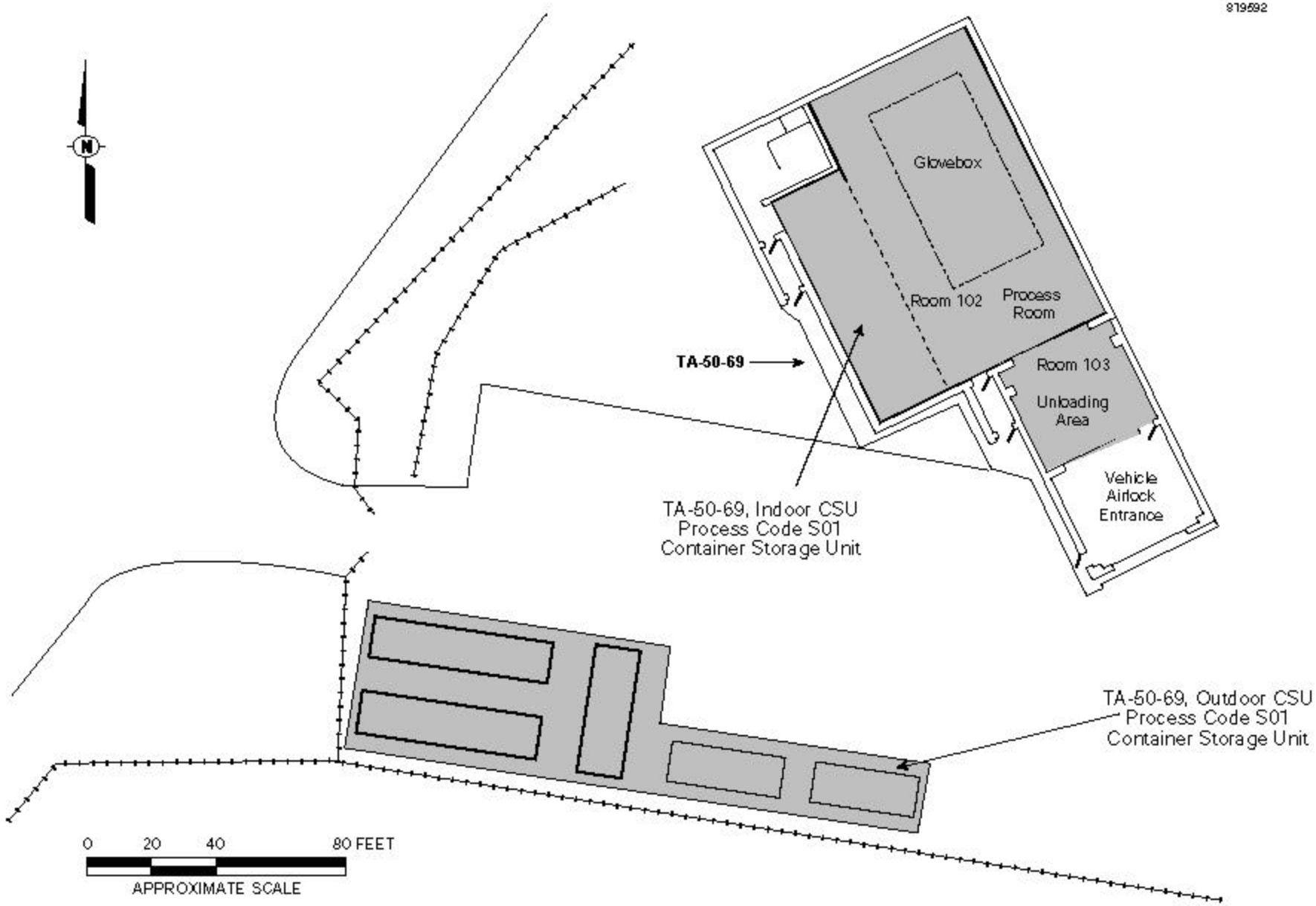

Figure F-1
Location Map Technical Area (TA) 50, Building 69, Container Storage Units

ATTACHMENT G

CONTAINER MANAGEMENT

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FIGURE NO.	TITLE
G-1	Technical Area (TA) 50, Building 69, Container Storage Units

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CAM	continuous air monitor
CSU	container storage unit
FRP	fiberglass-reinforced plywood
ft	feet/foot
LANL	Los Alamos National Laboratory
m^3	cubic meters
MDA	Material Disposal Area
ppmw	parts per million by weight
TA	Technical Area
TRU	transuranic
WCRRF	Waste Characterization, Reduction, and Repackaging Facility

ATTACHMENT G
CONTAINER MANAGEMENT

The information provided in this attachment is submitted to address the applicable container storage requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart IX, 270.15, and 20.4.1 NMAC, Subpart V, Part 264, Subpart I , revised June 14, 2000 [6-14-00]. This attachment provides an overview of current facility operations and waste management practices for the Technical Area (TA) 50 container storage units at Los Alamos National Laboratory (LANL) and complements the information provided in Section 2.0 of this permit renewal application. It includes detailed descriptions of the TA-50 container storage units (CSUs) and the waste management practices associated with them. Table G-1 summarizes applicable regulatory references for container storage and the corresponding location where the requirements are addressed in this permit renewal application.

G.1 CONTAINER STORAGE

TA-50 is located at the northeast corner of the intersection of Pajarito Drive and Pecos Road, on the finger mesa bounded by Mortandad Canyon to the north and Two-Mile Canyon to the south. TA-50-69 is located in the southwest quadrant of TA-50 and was constructed in 1979 to house the Waste Characterization, Reduction, and Repackaging Facility (WCRRF) (formerly the Size Reduction Facility). The primary purpose of WCRRF was to size reduce large metallic items (e.g., glove boxes and other process equipment) that were transuric (TRU)-contaminated and repackage them into standard-sized containers capable for transportation and disposal at the Waste Isolation Pilot Plant. The facility was first used to size reduce mixed TRU waste in 1982. The original function of the WCRRF has since been expanded to include other activities related to hazardous and mixed waste management including waste characterization and experimental process demonstration support.

TA-50-69 is a single-story building constructed in two phases. The original structure (45 feet (ft) by 52 ft) was built in 1979, to house the main process room (Room 102) and personnel change rooms. An unloading area (Room 103) and a vehicle airlock entrance (Room 104) were added to the building in 1986. The dimensions of the 1986 addition are 20 ft by 36 ft. The longest dimension of the building is now 88 ft, and the building is oriented northwest-southeast. A mezzanine was also added in 1986 over the western third of the main process room. The exterior walls of TA-50-69 are load-bearing and constructed of structural steel framing with a plastic veneer finish on polystyrene insulation and gypsum wallboard. The interior walls are similarly constructed. The epoxy-painted floor of the building is a reinforced concrete slab on compacted fill. The CSUs at TA-50 include the TA-50-69, Indoor CSU

and the TA-50-69, Outdoor CSU.

G.1.1 TA-50-69, Indoor CSU

The TA-50-69, Indoor CSU consists of Rooms 102 and 103 as shown in Figure G-1. Room 102, the main process room, measures approximately 45 ft wide and 52 ft long. The long dimension is oriented northwest-southeast. Room 103, the unloading area, measures approximately 18 ft wide and 19 ft long and is located adjacent to and southeast of Room 102. A 12-ft by 20-ft roll-up vehicle access door is located at the southernmost end of Room 103, separating the unloading area (Room 103) from the vehicle airlock entrance (Room 104). This design allows for unobstructed transport of oversized fiberglass-reinforced plywood (FRP) boxes from outside the facility, through the vehicle airlock entrance, into the unloading area, and into the glove box cutting enclosure.

G.1.2 TA-50-69, Outdoor CSU

The TA-50-69, Outdoor CSU was constructed before 1980, and was first used to store mixed waste in 1982. It is located in the southwest corner of TA-50. The TA-50-69, Outdoor CSU (Figure G-1) asphalt pad is not lined or coated, and measures 24 ft wide and 90 ft long, with an additional strip 12 ft wide and 90 ft long added to the southeast end. The asphalt pad is approximately 4 in. thick. The long dimension of this CSU is oriented east-southeast. The pad slopes gently (approximately 1 to 5 percent) from west to east and up to 2.5 percent toward the centerline. Transportainers and other weather protective structures (i.e., containers covered with tarps, containers inside SWBs) within the TA-50-69, Outdoor CSU provide weather protection for containers of various sizes. Supplement 2-1 of this permit renewal application provides detailed information regarding standard transportainers. Painted lines are used to visually delineate the TA-50-69, Outdoor CSU boundary.

G.2 GENERAL FACILITY OPERATIONS AND WASTE MANAGEMENT PRACTICES

The following provides an overview of current facility operations and waste management practices that are applicable to the TA-50 CSUs. This overview includes a discussion of container handling and inspection; security and access control; preparedness and prevention; hazards prevention; special requirements for ignitable, reactive, or incompatible waste; and air emission standards for containers. This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Specific waste management practices and procedures detailed herein may be subject to change as a result of LANL safety and waste management policy changes.

G.2.1 Container Handling and Inspection

Handling and inspection requirements for containers stored within the TA-50 CSU are presented in Sections 2.1.5 and 2.1.7, respectively, of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC, Subpart V, 264.171, 264.173, and 264.174 [6-14-00].

G.2.2 Security and Access

Security at TA-50 is predominantly maintained with artificial barriers. These barriers prevent the unknowing entry and minimize the possibility for unauthorized entry of persons or livestock into the area and, thus, satisfy the requirements of 20.4.1 NMAC, Subpart V, 264.14(a) and (b)(2) [6-14-00]. An 8-ft high chain-link security fence surrounds the entire perimeter of TA-50. Bilingual (i.e., English and Spanish) warning signs are posted on the fences at approximately 50- to 75-ft intervals. In accordance with the requirements of 20.4.1 NMAC, Subpart V, 264.14(c) [6-14-00], warning signs are also posted at the entrances to each area that will manage hazardous and mixed waste and are visible from any approach to these areas. The legends on the posted signs indicate “Danger?Hazardous Waste Storage Area” and “Unauthorized Persons Keep Out.” The signs are legible from a distance of 25 ft. Additionally, signs will be posted at the entrance to each hazardous and mixed waste management area to address requirements associated with entering and working in the area.

There are four entry gates into TA-50. Two entry gates are located north of TA-50-1. During normal business hours, the easternmost of these two gates may remain open to receive deliveries. After normal business hours, this gate is padlocked. The westernmost of these two gates is the main access gate and remains open during normal business hours for personal and government-owned passenger vehicles. After normal business hours, access through this gate is by badge-reader only. A fire access and shipping gate is located west of TA-50-69 and is routinely kept closed and locked. When this gate is opened for shipments of materials or waste, facility personnel are present in the yard west of TA-50-69 to limit egress by unauthorized persons. A fourth gate to the south of TA-50-1 is locked except when authorized access is necessary. TA-50 is patrolled by Protection Technology Los Alamos security personnel during non-operational hours to ensure that unauthorized entry has not occurred. In accordance with 20.4.1 NMAC, Subpart IX, 270.14(b)(19)(viii) [6-14-00], the locations of the security fences and entry gates at TA-50 are shown on Figure A-10.

TA-50-69 is always locked and access is gained by a badge reader. Doors to the building and transportainers are locked. Keys to these doors are distributed to designated personnel only. Building access also limits access to the Indoor CSU. Access to the TA-50-69, Outdoor CSU is controlled by a chain around the CSU and a posted sign that indicates “Authorized Personnel Only.”

G.2.3 Preparedness and Prevention

The following sections present how waste management operations at TA-50 comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. Additional information on the communication and alarm equipment available at LANL is presented in Appendix E of the "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0 (LANL, 1998), hereinafter referred to as the LANL General Part B. A list of the emergency equipment available for use at the TA-50 CSUs is provided as Table E-1 of Attachment E of this document and in Table E-2 of the LANL General Part B.

G.2.3.1 Required Equipment [20.4.1 NMAC, Subpart V, 264.32]

All personnel involved in waste management activities at the TA-50 CSUs have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another individual in accordance with 20.4.1 NMAC, Subpart V, 264.34 [6-14-00]. In the event of an emergency, this communication equipment will allow personnel to contact the operating group management, the Emergency Management and Response Office, and/or the Central Alarm Station operator.

TA-50-69 is equipped with an audible alarm system to alert personnel to evacuate the area. The alarm system may be activated by one of the fire alarm pull stations located throughout the building. TA-50-69 also has a public address system for announcing fires or evacuations and telephones with paging capabilities. Paging telephones are used to page on-site personnel and may be used in the event of an emergency to communicate the location and nature of hazardous conditions to personnel in the area. The alarm system is interrupted when the paging telephone system is activated to allow personnel to hear the announcement. Personnel can also use these phones to summon assistance from local emergency response teams in case of emergency. Personnel may carry pagers, two-way radios, and/or cellular telephones so they can contact or be contacted by on-site and LANL emergency support personnel at all times.

TA-50-69 is equipped with fire extinguishers and fire suppression systems. Depending on the size of a fire and the fuel source, fire extinguishers may be used by on-site personnel. However, LANL policy encourages immediate evacuation of the area and notification of appropriate emergency personnel. The fire alarm control panel continuously monitors all fire suppression and detection systems and transmits signals to the Los Alamos County Fire Department through LANL central alarm system.

A fire hydrant installed according to National Fire Protection Association standards is located approximately 55 ft west of TA-50-69. Water is supplied to the fire hydrant by a municipal water system

through 8 inch pipes at an adequate volume and pressure (i.e., 200 gallons per minute and 90 pounds per square inch static pressure) to supply a water hose in the event of a fire.

TA-50-69 has an automatic wet-pipe sprinkler system in the main building and in the large glove box enclosure. The sprinkler system is heat-activated at 100°C (212°F). The TA-50-69, Outdoor CSU transportainers and weather protective structures are not equipped with automatic sprinkler systems, but are provided with a fire extinguisher located within 20-ft of the CSU. Personnel may use the fire alarm pull station at TA-50-69 in the event of a fire at both the Indoor and Outdoor CSUs.

Two spill centers are located in TA-50-69 in Room 102. They contain spill control equipment, personal protective equipment, and sorbents. Trained personnel may use this equipment to mitigate small containable spills when they are certain their actions will not put themselves or others at risk. EM&R provides additional spill control equipment and assistance upon request and depending on the size and severity of the spill. Personnel decontamination equipment available includes safety showers and eye wash stations located at TA-50-69. Material safety data sheets located at all operations areas provide useful exposure information.

G.2.3.2 Testing and Maintenance of Equipment [20.4.1 NMAC, Subpart V, 264.33]

The communication, alarm systems, fire protection, spill control, and decontamination equipment described above are tested and/or maintained according to the inspection schedule provided in Appendix C of the LANL General Part B (LANL, 1998). The frequency of inspection is adequate to ensure proper operation in the event of an emergency. Repair and replacement of emergency equipment is performed as required.

G.2.3.3 Access to Communications or Alarm System

Whenever waste is being handled at the TA-50 CSUs, all personnel involved have immediate access to internal alarms or telephones either directly or through visual or voice contact with another individual. In the event of an emergency, communication equipment allows personnel to contact the operating group management, the Emergency Management and Response Office, and/or the Central Alarm Station operator. In addition to the communications and alarm systems described in Section G.2.3.1, on-site personnel may carry pagers so that they can be contacted on-site and LANL emergency support personnel at all times.

G.2.3.4 Aisle Space and Storage Configuration

Information on aisle space and storage configurations for the TA-50 CSUs is presented in Section 2.1.3 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC, Subpart V, 264.35 [6-14-00].

G.2.3.5 Support Agreements with Outside Agencies

LANL maintains support agreements and contracts with outside agencies for emergency response assistance. Information regarding these contracts and support agreements is provided in Section 2.1.2.4 of the LANL General Part B (LANL, 1998).

G.2.4 Hazards Prevention [20.4.1 NMAC, Subpart IX, 270.14(b)(8) and 20.4.1 NMAC, Subpart V, Part 264 Subpart C]

In accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart C and 20.4.1 NMAC, Subpart IX, 270.14(b)(8) [6-14-00], the TA-50 CSUs addressed in this TA-50 Part B are designed and operated to minimize the possibility of fire, explosion, or unplanned releases of hazardous constituents to any environmental medium. The following sections describe the general preventive procedures, structures, and equipment at the TA-50 CSUs to meet these requirements. Adherence to the procedures and proper use of the structures and equipment will help to prevent hazards and exposure to personnel and releases to the environment.

G.2.4.1 Preventing Hazards in Unloading

TA-50 personnel will use proper handling equipment, appropriate to a container's size and weight, to help prevent hazards while moving containers within the CSUs. Flatbed trucks or trailers will be used to transport containers to TA-50-69 for storage and processing. A forklift will be used to move containers at the TA-50-69, Outdoor CSU, from outside the building into the TA-50-69 airlock, and then within the TA-50-69, Indoor CSU. FRP boxes and palletized drums will be handled with a forklift equipped with tines. Individual drums of waste will be manipulated with a drum-grapple attachment on the forklift. Small containers may be handled manually or with a dolly. Inside TA-50-69, two cranes are available to move heavy objects. Load limits are restricted to the rated capacity of these cranes for safe operation. All damaged containers (e.g., severely corroded drums) will be repaired or overpacked, or the wastes repackaged in new containers before being staged at the CSUs.

Waste management personnel at TA-50 do not perform loading/unloading operations during precipitation events. The waste stored in the TA-50 CSUs is Waste Isolation Pilot Plant-certifiable and does not contain free liquids; therefore, if a drum is opened and the contents spilled, it is easily contained. In the case of spills, on-site personnel follow site procedures, emergency response plans,

and implement the LANL Contingency Plan, if necessary. Because the waste does not contain free liquids, secondary containment and temporary berms are not necessary during loading/unloading operations.

G.2.4.2 Runoff and Runon Controls [20.4.1 NMAC, Subpart V, 264.31 and 264.175(b); and 20.4.1 NMAC, Subpart IX, 270.15(a)(4) and (5)]

Runoff from the TA-50 CSUs to other areas or to the environment will be prevented. Engineered surfaces/structures or secondary containment pallets/devices are provided for potential liquid-bearing containers. All secondary containment systems are sufficient to contain at least 10 percent of the volume of potential liquid-bearing containers or the volume of the largest container, whichever is greater, in accordance with the requirements of 20.4.1 NMAC, Subpart V, 264.175(b)(3) [6-14-00].

As a practice at TA-50, runoff and erosion controls are designed to guide surface water away from waste management activities and into the natural drainages. Storm water feeds into Mortandad Canyon and is managed according to the Clean Water Act. Liquids that may accumulate in the self-containment pallets as a result of leaks or spills will be collected into a container using a portable pump and/or sorbents, depending on the volume of accumulated liquid. Accumulated liquids will be removed as soon as possible and sampled in accordance with Appendix E of the LANL General Part B (LANL, 1998).

G.2.4.2.1 TA-50-69, Indoor CSU

Run-on into the TA-50-69, Indoor CSU from outdoors is not likely to occur due to positive surface drainage that directs potential run-on away from the building. Figure A-11 (Attachment A) provides the contours and surface drainage around TA-50. The northern and eastern portions of TA-50 drain mainly to an unlined channel on the boundary between TA-50 and TA-35 (east of TA-50), although some flow diverges into a shallow channel running southward between TA-50-37 and TA-50-1.

To meet the requirements of 20.4.1 NMAC, Subpart IX, 270.15(a)(5) [6-14-00], any liquids that may accumulate within the self-containment pallets or devices, trenches and pits, or glove box enclosure will be removed as soon as possible to prevent overflow. The accumulated liquid will be sampled and analyzed. Depending upon the volume of the accumulated liquid, a high-efficiency particulate air vacuum, portable pump, universal sorbents, and/or other methods suitable for retrieval will be used to remove the liquid. Accumulated liquids are removed as soon as possible. The collected liquids and/or sorbents will be transferred to compatible containers, which will be stored temporarily at the respective CSU pending sample analysis, which will dictate how the wastes will be managed. Should a spill occur during waste handling activities, the spill and/or residual material will be sampled and managed in accordance with Appendix E of the LANL General Part B (LANL, 1998).

G.2.4.2.2 TA-50-69, Outdoor CSU

Run-on into the TA-50-69, Outdoor CSU is prevented because the CSU is elevated by design. The TA-50-69, Outdoor CSU is sloped sufficiently to prevent the accumulation of precipitation. In addition, drainage swales located in the vicinity, divert storm water away from the pad. One drainage swale is located just south of the CSU, between it and the material disposal area (MDA)-C. A second drainage swale is located on the west side of the CSU between Pecos Drive and the TA-50 fence line. Inspections of TA-50 waste management facilities, areas that may be prone to soil erosion, and drainage control structures are conducted as described in the "Storm Water Pollution Prevention Plan for Technical Area 50 Waste Treatment Facilities" (LANL, 1993). Together, the containment design and operations meet the requirements of 20.4.1 NMAC, Subpart V, 264.175(b), and 20.4.1 NMAC, Subpart IX, 270.15(a)(4) [6-14-00].

G.2.4.3 Preventing Water Supply Contamination [20.4.1 NMAC, Subpart V, 264.31]

It is not anticipated that there will be any impact to groundwater or other water supplies as a result of waste-handling operations at TA-50 CSUs. The TA-50-69, Indoor CSU is located inside a building. Any material spilled during waste management activities are immediately remediated pursuant to Appendix E of the LANL General Part B (LANL, 1998). All water supply lines at TA-50 are under pressure and are equipped with backflow prevention devices to prevent contamination of these lines during emergencies. Therefore, no impact to water supplies is expected. The depth to groundwater at TA-50 is approximately 1,000 ft (Purtymun and Johansen, 1974). Geologic units underlying TA-54 (located 4 miles east of TA-50) include layers of unsaturated volcanic tuff and ash, the moisture content of which ranges from 0.2 to 2.0 percent by weight (IT Corporation, 1987).

G.2.4.4 Mitigating Effects of Power Outages [20.4.1 NMAC, Subpart IX, 270.14(b)(8)]

Electrical power is supplied to TA-50-69 by a 13.4-kilovolt overhead distribution line through an underground conduit to an on-site substation that provides distribution to the building. Supplied power is used to operate continuous air monitors (CAMs) and other electrical equipment in the buildings. Additionally, an uninterruptible power source has been installed to operate the CAMs in the event of a power outage. In the event of a power failure, operations would cease and personnel would exit the affected building. Operations at the CSUs will be discontinued temporarily if electrical power is not restored quickly. A power failure or equipment failure would not affect containment within the TA-50 CSUs.

G.2.4.5 Preventing Undue Exposure [20.4.1 NMAC, Subpart V, 264.32]

To prevent undue exposure of personnel to hazardous or mixed waste, personal protective equipment appropriate for the waste being handled is worn by all on-site personnel at TA-50 involved in waste management activities at any of the waste management units. Workers involved in waste handling at TA-50 are required to wear protective work uniforms and steel-toed /composite-toed shoes, as appropriate. Hard hats and gloves may also be worn while equipment is being operated and when containers are being loaded or unloaded.

G.2.4.6 Air Emission Standards [20.4.1 NMAC, Subpart V, 264.31 and 264.179]

Releases to the atmosphere are not anticipated from any of the TA-50 CSUs. Containers are kept closed during handling and storage except when, upon inspection, it is determined that containers need to be overpacked or the contents repackaged in new containers or when it is necessary to add or remove waste. Inspections are conducted to ensure the integrity of all stored containers. In the event of an unexpected release, all personnel working within or near the area would be notified immediately to evacuate.

G.2.5 Ignitable, Reactive, or Incompatible Waste [20.4.1 NMAC, Subpart IX, 270.14(b)(9) and 270.15(c) and (d); and 20.4.1 NMAC, Subpart V, 264.17, 264.176, and 264.177]

Special requirements for ignitable, reactive, or incompatible waste at the TA-50 CSUs is presented in Section 2.1.8 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC, Subpart V, 264.17(a), 264.176, and 264.177(a)(b)(c); and 20.4.1 NMAC, Subpart IX, 270.14(b)(9) and 270.15(d) [6-14-00].

G.2.6 Air Emission Standards for Containers [20.4.1 NMAC, Subpart V, Part 264, Subpart CC]

This section addresses potential applicability of 20.4.1 NMAC, Subpart V, Part 264, Subpart CC [6-14-00], "Air Emission Standards for Tanks, Surface Impoundments, and Containers" to containers at TA-50, based on applicability criteria specified in 20.4.1 NMAC, Subpart V, 264.1080 [6-14-00]. Subpart CC standards require that the containers be covered or controlled so that there are no detectable emissions. The standards are met by placement of waste in DOT-compliant containers and are not applicable to containers of radioactive mixed waste. The standards are also not applicable to containers of hazardous waste with less than 500 parts per million by weight (ppmw) volatile organics, containers that have received waste prior to the effective date of regulation (December 6, 1996), or containers of less than 0.1 cubic meters (m^3) (approximately 26 gallon) capacity.

Containers of less than 0.46 m^3 (approximately 119 gallon) capacity and that meet DOT specifications under the Code of Federal Regulations, Title 49, Part 178, will be kept closed during storage pursuant to 20.4.1 NMAC, Subpart V, 264.1086(b)(1)(ii) [6-14-00]. Containers undergoing waste characterization activities may be open for access for the purposes described in 20.4.1 NMAC, Subpart V, 264.1086(c) [6-14-00]. Containers of greater than 0.46 m^3 capacity that contain waste with greater than 500 ppmw volatile organics or those that are greater than 0.1 m^3 capacity, do not meet U.S. Department of Energy specifications, and contain wastes of greater than 500 ppmw volatile organics will be subject to a visual inspection and monitoring program as required by 20.4.1 NMAC, Subpart V, 264.1088(b) [6-14-00].

G.3 REFERENCES

IT Corporation, 1987, "Hydrogeologic Assessment of Technical Area 54, Areas G and L," Los Alamos National Laboratory, Docket No. NMHWA 001007, IT Corporation, Albuquerque, New Mexico.

LANL, 1993, "Storm Water Pollution Prevention Plan for Technical Area 50 Waste Treatment Facilities," Los Alamos, New Mexico, Los Alamos National Laboratory.

LANL, 1998, "Los Alamos National Laboratory General Part B Permit Application," Los Alamos, New Mexico, Los Alamos National Laboratory.

Purtymun and Johansen, 1974, "General Geohydrology of the Pajarito Plateau," New Mexico Geological Society Guidebook, 25th Field Conference, Central Northern New Mexico.

Table G-1

Use and Management of Containers
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.15	Specific information requirements for containers:	G.0
§270.15(a)	A description of the containment system to demonstrate compliance with §264.175 including at a minimum:	G.2
§270.15(a)(1)	Basic design parameters, dimensions, and materials of construction	G.1
§270.15(a)(2)	How the design promotes drainage or how containers are kept from contact with standing liquids in the containment system	G.2
§270.15(a)(3)	Capacity of the containment system relative to the number and volume of containers to be stored	G.2
§270.15(a)(4)	Provisions for preventing or managing run-on	G.2
§270.15(a)(5)	How accumulated liquids can be analyzed and removed to prevent overflow	G.2
§270.15(b)	For storage areas that store containers holding wastes that do not contain free liquids, a demonstration of compliance with §264.175(c) including:	G.2
§270.15(b)(1)	Test procedures and results or other documentation or information to show that the wastes do not contain free liquids	G.2
§270.15(b)(2)	A description of how the storage area is designed or operated to drain and remove liquids or how containers are kept from contact with standing liquids	G.2
§270.15(c)	Sketches, drawings, or data demonstrating compliance with §264.176 (location of buffer zone and containers holding ignitable or reactive wastes) and §264.177(c) (location of incompatible wastes), where applicable	1.0
§270.15(d)	Where incompatible wastes are stored or otherwise managed in containers, a description of the procedures used to ensure compliance with §264.177(a) and (b) and §264.17(b) and (c)	G.3
§270.15(e)	Information on air emission control equipment as required in §270.27	G.4
§270.27(a)	Specific information requirements for air emission controls	G.4
§270.27(a)(2)	Identification of each container area subject to the requirements of §264, Subpart CC and certification by the owner or operator that the requirements are met	G.4

Table G-1 (Continued)

Use and Management of Containers
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.27(a)(3)	Documentation that each enclosure used to control air emissions from containers are in accordance with the requirements of §264.1086(b)(2)(I) includes information prepared by the owner or operator or manufacturer or vendor describing the enclosure design and certification that the enclosure meets the specifications listed in §265.1087(b)(2)(ii)	NA[a]
§270.27(a)(5)	Documentation for each closed-vent system and control device installed in accordance with the requirements of §264.1087 that includes design and performance information as specified in §270.24 (c) and (d)	NA
§270.27(a)(6)	An emission monitoring plan for both Method 21 and control device monitoring methods. The plan must include:	NA
§270.27(a)(7)	Implementation schedule	NA

[a] NA= not applicable

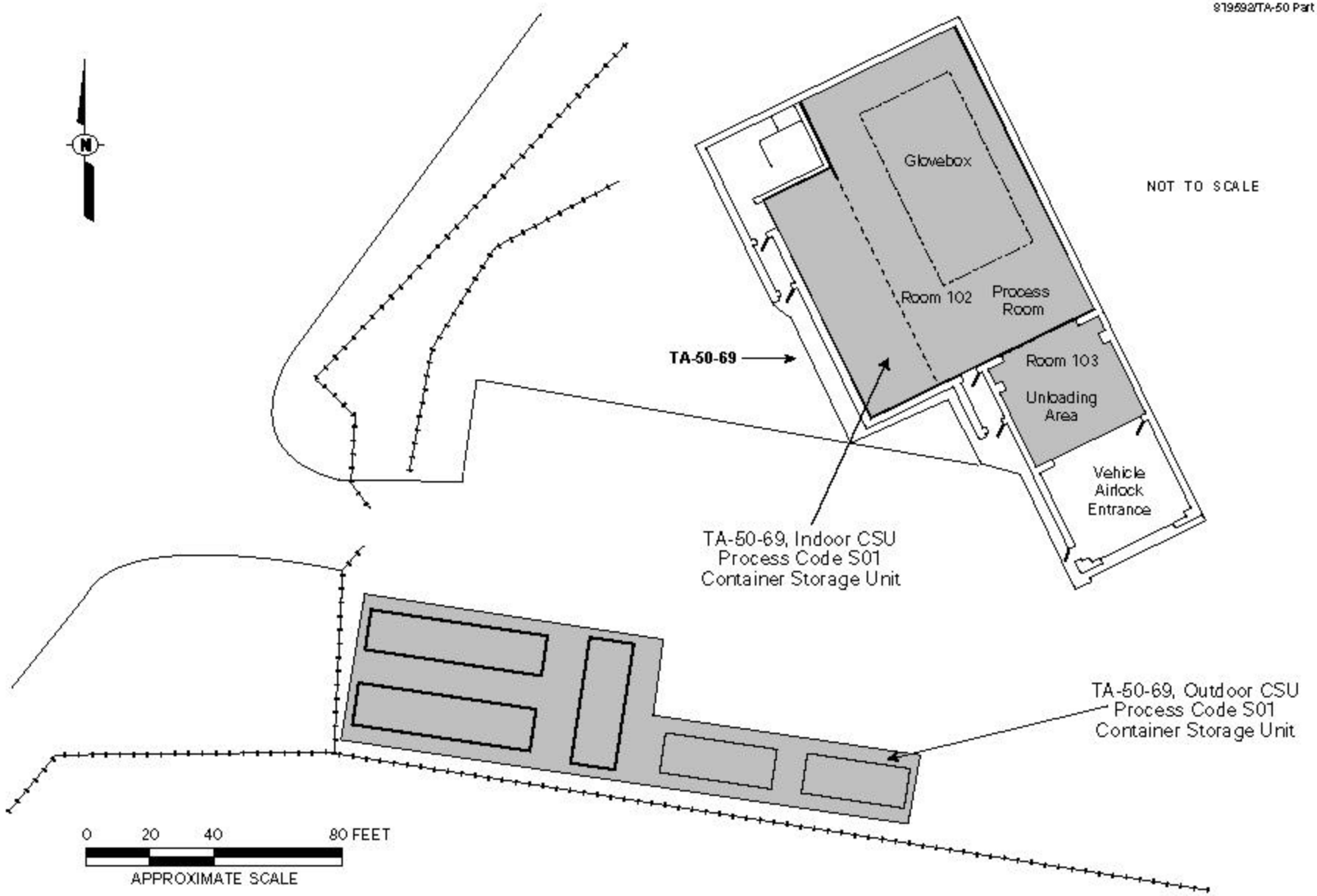

Figure G-1
Technical Area (TA) 50, Building 69, Container Storage Units

ATTACHMENT H

AUTHORIZED WASTE

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
			Technical Area 50				
1	D001	69,696	P	S01			
2	D002	52,734	P	S01			
3	D003	3,444	P	S01			
4	D004	7,531	P	S01			
5	D005	7,740	P	S01			
6	D006	535,451	P	S01			
7	D007	567,226	P	S01			
8	D008	1,405,439	P	S01			
9	D009	75,666	P	S01			
10	D010	8,922	P	S01			
11	D011	31,255	P	S01			
12	D016	44	P	S01			
13	D017	66	P	S01			
14	D018	5,535	P	S01			
15	D019	4261	P	S01			
16	D020	100	P	S01			
17	D021	1,918	P	S01			
18	D022	4,354	P	S01			
19	D023	100	P	S01			
20	D024	100	P	S01			
21	D025	100	P	S01			
22	D026	518	P	S01			
23	D027	972	P	S01			
24	D028	216,183	P	S01			
25	D029	215,184	P	S01			
26	D030	5,491	P	S01			
27	D031	293	P	S01			
28	D032	3135	P	S01			
29	D033	2,222	P	S01			
30	D034	1,228	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
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XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter code)			D. PROCESSES (2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
31	D035	1,792	P	S01			
32	D036	549	P	S01			
33	D037	761	P	S01			
34	D038	1,594	P	S01			
35	D039	1,675	P	S01			
36	D040	3,942	P	S01			
37	D041	293	P	S01			
38	D042	1182	P	S01			
39	D043	655	P	S01			
40	F001	442,263	P	S01			
41	F002	147,347	P	S01			
42	F003	50,980	P	S01			
43	F004	2,817	P	S01			
44	F005	334,821	P	S01			
45	F006	100	P	S01			
46	F007	100	P	S01			
47	F008	100	P	S01			
48	F009	165	P	S01			
49	F027	165	P	S01			
50	F028	100	P	S01			
51	K044	100	P	S01			
52	K045	100	P	S01			
53	K047	100	P	S01			
54	P001	100	P	S01			
55	P002	100	P	S01			
56	P003	293	P	S01			
57	P004	100	P	S01			
58	P005	100	P	S01			
59	P006	143	P	S01			
60	P007	100	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
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XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
61	P008	100	P	S01			
62	P009	100	P	S01			
63	P010	100	P	S01			
64	P011	143	P	S01			
65	P012	293	P	S01			
66	P013	100	P	S01			
67	P014	100	P	S01			
68	P015	293	P	S01			
69	P016	100	P	S01			
70	P017	100	P	S01			
71	P018	100	P	S01			
72	P020	100	P	S01			
73	P021	100	P	S01			
74	P022	100	P	S01			
75	P023	100	P	S01			
76	P024	100	P	S01			
77	P026	100	P	S01			
78	P027	100	P	S01			
79	P028	100	P	S01			
80	P029	293	P	S01			
81	P030	485	P	S01			
82	P031	485	P	S01			
83	P033	143	P	S01			
84	P034	100	P	S01			
85	P036	100	P	S01			
86	P037	100	P	S01			
87	P038	227	P	S01			
88	P039	100	P	S01			
89	P040	100	P	S01			
90	P041	100	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter code)			D. PROCESSES (2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
91	P042	100	P	S01			
92	P043	143	P	S01			
93	P044	100	P	S01			
94	P045	100	P	S01			
95	P046	100	P	S01			
96	P047	100	P	S01			
97	P048	143	P	S01			
98	P049	100	P	S01			
99	P050	100	P	S01			
100	P051	100	P	S01			
101	P054	100	P	S01			
102	P056	2,674	P	S01			
103	P057	100	P	S01			
104	P058	100	P	S01			
105	P059	100	P	S01			
106	P060	100	P	S01			
107	P062	100	P	S01			
108	P063	293	P	S01			
109	P064	100	P	S01			
110	P065	100	P	S01			
111	P066	100	P	S01			
112	P067	100	P	S01			
113	P068	293	P	S01			
114	P069	100	P	S01			
115	P070	100	P	S01			
116	P071	100	P	S01			
117	P072	100	P	S01			
118	P073	293	P	S01			
119	P074	100	P	S01			
120	P075	100	P	S01			

EPA I.D. Number *(Enter from Page 1)* N M 0 8 9 0 0 1 0 5 1 5

Secondary ID Number *(Enter from Page 1)*

XIV. Description of Hazardous Wastes ***(Continued; use additional sheets as necessary)***

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter code)			D. PROCESSES (2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
121	P076	403	P	S01			
122	P077	100	P	S01			
123	P078	425	P	S01			
124	P081	100	P	S01			
125	P082	100	P	S01			
126	P084	100	P	S01			
127	P085	100	P	S01			
128	P087	100	P	S01			
129	P088	100	P	S01			
130	P089	100	P	S01			
131	P092	143	P	S01			
132	P093	100	P	S01			
133	P094	100	P	S01			
134	P095	293	P	S01			
135	P096	293	P	S01			
136	P097	100	P	S01			
137	P098	293	P	S01			
138	P099	100	P	S01			
139	P101	100	P	S01			
140	P102	100	P	S01			
141	P103	100	P	S01			
142	P104	143	P	S01			
143	P105	143	P	S01			
144	P106	293	P	S01			
145	P107	100	P	S01			
146	P108	100	P	S01			
147	P109	100	P	S01			
148	P110	100	P	S01			
149	P111	100	P	S01			
150	P112	143	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
151	P113	293	P	S01			
152	P114	100	P	S01			
153	P115	100	P	S01			
154	P116	100	P	S01			
155	P118	100	P	S01			
156	P119	143	P	S01			
157	P120	293	P	S01			
158	P121	100	P	S01			
159	P122	100	P	S01			
160	P123	100	P	S01			
161	U001	293	P	S01			
162	U002	954	P	S01			
163	U003	485	P	S01			
164	U004	100	P	S01			
165	U005	100	P	S01			
166	U006	100	P	S01			
167	U007	143	P	S01			
168	U008	143	P	S01			
169	U009	143	P	S01			
170	U010	100	P	S01			
171	U011	100	P	S01			
172	U012	293	P	S01			
173	U014	100	P	S01			
174	U015	100	P	S01			
175	U016	100	P	S01			
176	U017	100	P	S01			
177	U018	143	P	S01			
178	U019	470	P	S01			
179	U020	100	P	S01			
180	U021	100	P	S01			

EPA I.D. Number *(Enter from Page 1)* | **Secondary ID Number** *(Enter from Page 1)*

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XIV. Description of Hazardous Wastes ***(Continued; use additional sheets as necessary)***

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
181	U022	293	P	S01			
182	U023	100	P	S01			
183	U024	100	P	S01			
184	U025	100	P	S01			
185	U026	100	P	S01			
186	U027	100	P	S01			
187	U028	100	P	S01			
188	U029	293	P	S01			
189	U030	100	P	S01			
190	U031	293	P	S01			
191	U032	100	P	S01			
192	U033	143	P	S01			
193	U034	100	P	S01			
194	U035	100	P	S01			
195	U036	100	P	S01			
196	U037	143	P	S01			
197	U038	100	P	S01			
198	U039	100	P	S01			
199	U041	143	P	S01			
200	U042	100	P	S01			
201	U043	100	P	S01			
202	U044	293	P	S01			
203	U045	293	P	S01			
204	U046	100	P	S01			
205	U047	100	P	S01			
206	U048	100	P	S01			
207	U049	100	P	S01			
208	U050	100	P	S01			
209	U051	100	P	S01			
210	U052	293	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
211	U053	100	P	S01			
212	U055	143	P	S01			
213	U056	293	P	S01			
214	U057	293	P	S01			
215	U058	100	P	S01			
216	U059	100	P	S01			
217	U060	100	P	S01			
218	U061	100	P	S01			
219	U062	100	P	S01			
220	U063	100	P	S01			
221	U064	100	P	S01			
222	U066	100	P	S01			
223	U067	143	P	S01			
224	U068	143	P	S01			
225	U069	100	P	S01			
226	U070	165	P	S01			
227	U071	100	P	S01			
228	U072	100	P	S01			
229	U073	100	P	S01			
230	U074	100	P	S01			
231	U075	381	P	S01			
232	U076	100	P	S01			
233	U077	293	P	S01			
234	U078	100	P	S01			
235	U079	100	P	S01			
236	U080	4,129	P	S01			
237	U081	100	P	S01			
238	U082	100	P	S01			
239	U083	100	P	S01			
240	U084	100	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
241	U085	143	P	S01			
242	U086	100	P	S01			
243	U087	100	P	S01			
244	U088	100	P	S01			
245	U089	100	P	S01			
246	U090	100	P	S01			
247	U091	518	P	S01			
248	U092	143	P	S01			
249	U093	100	P	S01			
250	U094	100	P	S01			
251	U095	100	P	S01			
252	U096	100	P	S01			
253	U097	100	P	S01			
254	U098	100	P	S01			
255	U099	100	P	S01			
256	U101	100	P	S01			
257	U102	100	P	S01			
258	U103	143	P	S01			
259	U105	100	P	S01			
260	U106	100	P	S01			
261	U107	100	P	S01			
262	U108	293	P	S01			
263	U109	143	P	S01			
264	U110	100	P	S01			
265	U111	100	P	S01			
266	U112	293	P	S01			
267	U113	100	P	S01			
268	U114	100	P	S01			
269	U115	293	P	S01			
270	U116	100	P	S01			

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N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
271	U117	293	P	S01			
272	U118	100	P	S01			
273	U119	100	P	S01			
274	U120	100	P	S01			
275	U121	293	P	S01			
276	U122	778	P	S01			
277	U123	293	P	S01			
278	U124	143	P	S01			
279	U125	100	P	S01			
280	U126	100	P	S01			
281	U127	100	P	S01			
282	U128	100	P	S01			
283	U129	100	P	S01			
284	U130	100	P	S01			
285	U131	293	P	S01			
286	U132	100	P	S01			
287	U133	293	P	S01			
288	U134	667	P	S01			
289	U135	447	P	S01			
290	U136	143	P	S01			
291	U137	100	P	S01			
292	U138	100	P	S01			
293	U139	100	P	S01			
294	U140	293	P	S01			
295	U141	100	P	S01			
296	U142	100	P	S01			
297	U143	100	P	S01			
298	U144	293	P	S01			
299	U145	293	P	S01			
300	U146	100	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
301	U147	100	P	S01			
302	U148	100	P	S01			
303	U149	100	P	S01			
304	U150	100	P	S01			
305	U151	884	P	S01			
306	U152	100	P	S01			
307	U153	143	P	S01			
308	U154	359	P	S01			
309	U155	100	P	S01			
310	U156	100	P	S01			
311	U157	100	P	S01			
312	U158	100	P	S01			
313	U159	315	P	S01			
314	U160	293	P	S01			
315	U161	470	P	S01			
316	U162	143	P	S01			
317	U163	143	P	S01			
318	U164	100	P	S01			
319	U165	293	P	S01			
320	U166	100	P	S01			
321	U167	143	P	S01			
322	U168	143	P	S01			
323	U169	293	P	S01			
324	U170	143	P	S01			
325	U171	100	P	S01			
326	U172	100	P	S01			
327	U173	100	P	S01			
328	U174	100	P	S01			
329	U176	100	P	S01			
330	U177	100	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter code)			D. PROCESSES (2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
331	U178	100	P	S01			
332	U179	100	P	S01			
333	U180	100	P	S01			
334	U181	100	P	S01			
335	U182	100	P	S01			
336	U183	100	P	S01			
337	U184	100	P	S01			
338	U185	100	P	S01			
339	U186	100	P	S01			
340	U187	100	P	S01			
341	U188	293	P	S01			
342	U189	100	P	S01			
343	U190	293	P	S01			
344	U191	100	P	S01			
345	U192	100	P	S01			
346	U193	100	P	S01			
347	U194	100	P	S01			
348	U196	293	P	S01			
349	U197	100	P	S01			
350	U200	100	P	S01			
351	U201	100	P	S01			
352	U202	100	P	S01			
353	U203	100	P	S01			
354	U204	293	P	S01			
355	U205	100	P	S01			
356	U206	100	P	S01			
357	U207	100	P	S01			
358	U208	100	P	S01			
359	U209	100	P	S01			
360	U210	513	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
361	U211	359	P	S01			
362	U212	100	P	S01			
363	U213	293	P	S01			
364	U214	100	P	S01			
365	U215	100	P	S01			
366	U216	293	P	S01			
367	U217	100	P	S01			
368	U218	293	P	S01			
369	U219	293	P	S01			
370	U220	491	P	S01			
371	U221	100	P	S01			
372	U222	100	P	S01			
373	U223	143	P	S01			
374	U225	293	P	S01			
375	U226	6,594	P	S01			
376	U227	293	P	S01			
377	U228	1,219	P	S01			
378	U230	100	P	S01			
379	U231	100	P	S01			
380	U232	100	P	S01			
381	U233	100	P	S01			
382	U234	100	P	S01			
383	U235	100	P	S01			
384	U236	100	P	S01			
385	U237	100	P	S01			
386	U238	100	P	S01			
387	U239	646	P	S01			
388	U240	143	P	S01			
389	U242	100	P	S01			
390	U243	100	P	S01			

EPA I.D. Number *(Enter from Page 1)*	Secondary ID Number *(Enter from Page 1)*
N M 0 8 9 0 0 1 0 5 1 5	

XIV. Description of Hazardous Wastes *(Continued; use additional sheets as necessary)*

Line Number	A. EPA Hazardous Waste No. (Enter code)	B. Estimated Annual Quantity Of Waste	C. Unit of Measure (Enter code)	D. PROCESSES			
				(1) PROCESS CODES (Enter code)			(2) PROCESS DESCRIPTION (If a code is not entered in D[1])
Technical Area 50 (Continued)							
391	U244	100	P	S01			
392	U246	231	P	S01			
393	U247	100	P	S01			
394	U248	100	P	S01			
395	U249	100	P	S01			
396	U326	100	P	S01			
397	U353	100	P	S01			
398	U359	100	P	S01			

Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

AUG 2003
NMED Hazardous Waste Bureau

AUG 2 2 2003

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Sandra Martin, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Dear Ms. Martin:

Subject: Resource Conservation and Recovery Act (RCRA) Part B Permit Renewal Application Submittal - Los Alamos National Laboratory (LANL), EPA ID No. NM 890010515

The purpose of this letter is to submit and request approval for the most recent versions of the RCRA permit applications supporting the renewal of the LANL hazardous waste facility permit. The original RCRA Hazardous Waste Facility Permit was issued to the U.S. Department of Energy (DOE) and the University of California (UC) by the New Mexico Environmental Improvement Division on November 8, 1989.

The permit applications included in this submittal have been revised to incorporate the text and information indicated in DOE/UC's responses to nine requests for information received from the Hazardous Waste Bureau (HWB) since the original applications were submitted for the permit renewal. These revisions of the applications were modified to include additional information regarding various waste management programs or procedures that have changed since the last responses.

This submittal contains three revised permit applications. These include the LANL General Part B, Technical Area 16, and Technical Area 54. As discussed during our meeting on August 21, 2003 the application for Technical Area 55 will be submitted in mid-September 2003. The enclosed applications have been prepared separately to reflect the permit guidance received from HWB in March 1998 regarding the required format. The documents are:

- Los Alamos National Laboratory General Part B Permit Renewal Application, Revision 2.0, LA-UR-03-5923
- Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Application, Revision 4.0, LA-UR-03-3903
- Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application, Revision 3.0, LA-UR-03-3579

In addition, this submittal contains three supporting documents designed to aid final review of the applications in the form of crosswalks or change tables. These documents were discussed with Mr. Carl Will, HWB, on March 10, 2003. The documents are intended to provide a way of referencing the comments received in the HWB's requests for information and the sections of the permit applications affected by subsequent text changes or additions as described in DOE/UC's responses. Additional copies of the relevant requests for information are included with the crosswalk documents to assist in reviewing the detailed responses. These copies do not contain the appendices and attachments included with the original submittals in the interest of brevity and since the full submittals are already available at HWB. The crosswalks are each specific for the included revised permit renewal applications (General, TA-16, TA-54).

The enclosure for this letter contains a list of the changes that have been incorporated in the General Part B permit application since the last DOE/UC response to a request for information. The changes reflect new information regarding LANL waste management procedures developed since that time and text edits to address issues of concern to DOE/UC.

If you should have any questions or comments concerning this permit renewal submittal, please contact Gene Turner, DOE, of my staff at (505) 667-5794 or Jack Ellvinger, UC, at (505) 667-0633.

Sincerely,

for Ralph E. Erickson
Manager

OFO:1GT-020

Enclosure

cc w/enclosure:
Carl Will
Permits Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Laurie King (6PD-N)
New Mexico/Federal Facilities Section
Environmental Protection Agency – Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

cc w/o enclosure:
B. Osheim, OC, LASO
G. Turner, OFO, LASO
J. Holt, ADO, LANL, MS-A104
B. Ramsey, RRES-DO, LANL, MS-A150
T. Stanford, FWO-SWO, LANL, MS-K492
E. Louderbough, LC-GL, LANL, MS-A187
J. Ellvinger, RRES-SWRC, LANL, MS-K490
G. Bacigalupa, RRES-SWRC, LANL, MS-K490

Isolation Pilot Plant (WIPP) Waste Acceptance Criteria and Hazardous Waste Facility Permit. The waste stream descriptions and some procedures have recently undergone changes associated with the approval of a new report, the "Acceptable Knowledge Information Summary for LANL Transuranic Waste Streams." As a result, the waste stream descriptions included in Section B.1.2.3, "Mixed Transuranic Waste" of the WAP, have been modified with the replacement of waste matrix codes by summary category groups for the general waste delineation scheme. As described in the section, waste matrix codes have been retained as a more specific waste identification system. LANL TRU Waste Stream ID numbers have been applied to the MTRU waste stream descriptions rather than the TRUCON codes previously used. Table B-4 has been modified to illustrate the new waste stream identifiers and their relationship with past and present LANL MTRU waste stream categories. Tables B-5 and B-11 have also been modified as appropriate. In addition, Section B.3.2 "Mixed Transuranic Waste Characterization," has been edited to reference WIPP documentation and LANL procedures derived from those documents to simplify the waste characterization discussion and to alleviate the need for extensive permit modifications as the MTRU waste characterization program develops. These changes affect Section B.3.2.1, "LANL TRU Waste Certification Plan;" Section B.3.2.1.1, "Acceptable Knowledge;" Section B.3.2.1.3, "Visual Examination;" Section B.3.2.1.4, "Headspace Gas Sampling;" and Section B.3.2.1.5, "Solid Waste Sampling and Analysis."

- A general category of change involves edits throughout the WAP to emphasize the actions taken at permitted treatment or storage units to verify waste contents prior to acceptance at the unit. An explanatory paragraph has been added to the introduction of the WAP to address this issue.

- Section B.2.2, "Criteria and Rationale for Parameter Selection," was edited to improve the path of the discussion. The edit involved rearranging the paragraph order presented in previous versions of the WAP.

- Section B.3.1.3, "Verification Frequencies," was edited to include waste verification procedures for the open burn/open detonation units at TA-16 and for wastes managed at TA-55.

- Section B.5.3, "Procedures to Ensure Compliance with LDR Requirements," has been significantly edited to provide a comprehensive approach to Land Disposal Restrictions waste characterization requirements. This was done upon the suggestion of Steve Pullen, NMED Hazardous Waste Bureau (HWB), in a telephone conversation on October 31, 2002 and in discussions during the April 2003 facility inspection at TA-54.

documents can be arranged on site at LANL, as necessary. Therefore, LANL has not included new supplements with Revision 2.0 of the General Part B.

- Section E.1.1, "Emergency Management and Response Office," has been modified to include contact information for a Primary and Alternate Emergency Coordinator as directed by Mr. Carl Will, NMED HWB, in a telephone conversation on April 30, 2003. In addition, LANL maintains a 24-hour emergency telephone number to contact an on-call Duty Emergency Manager.

Additional General Part B Permit Renewal Application Modifications

The purpose of this attachment is to provide a list of modifications or additions to the "Los Alamos National Laboratory General Part B Permit Renewal Application," Revision 2.0, (General Part B) that reflect changes to Los Alamos National Laboratory (LANL) waste management programs or policy decisions that have occurred since the last Notice of Deficiency (NOD) was received from the New Mexico Environment Department (NMED) in May 2002. As such, they represent additional changes to Revision 1.0 of the application that were not presented or proposed in previous responses to NMED Requests for Supplemental Information (RSI) or NODs.

The following discussion includes a list of relatively significant changes. The items have been grouped by section of the General Part B. Other minor changes to the General Part B are editorial in nature or update group or organizational name changes and are not presented herein.

Section 1.0, Introduction

- As presented in the Introduction to the General Part B, the purpose of this permit renewal application is to support the permitting of existing or future operating hazardous waste management units at LANL. LANL is seeking permitted status for active storage and treatment units only. The application does not request permitted status for disposal operations. Previous versions of the General Part B did not make this distinction clearly, particularly when providing discussions of the applicability of general Resource Conservation and Recovery Act (RCRA) waste management conditions. This revision of the document has been modified throughout to emphasize this distinction.

- Paragraph 2 of the Introduction has been added to describe the intended use of supplemental documentation contained throughout this permit renewal application. Much of these data, references to groups and organizations, references to documents, and other material was included for informational purposes only. Other examples of these types of information have also been submitted to the NMED in the course of providing responses to agency requests for information since 2000. In many cases, this information is not intended, nor required by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14, to be incorporated into the renewed permit as enforceable conditions. The paragraph has been added to illustrate that consent for such actions was not implied by LANL's submittal of such material.

Section 2.0, Facility Operations and Unit Designs

- Two off-site waste management facilities have been added to Table 2-2 for return of treatment-derived waste or waste residuals from LANL-generated wastes. The basis for the permit requirement illustrated in Table 2-2 is further discussed in

LA-UR-03-5923
August 2003

Los Alamos National Laboratory
General Part B Permit Renewal Application

Revision 2.0

Prepared by:

Los Alamos National Laboratory
Risk Reduction and Environmental Stewardship Division
Solid Waste Regulatory Compliance Group (RRES-SWRC)
Los Alamos, New Mexico 87545

Los Alamos National Laboratory
General Part B Permit Renewal Application

Revision 2.0

LA-UR-03-5923
August 2003

Prepared by:
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Los Alamos, New Mexico 87545

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F	General Closure Plan
G	General Post-Closure Plan

LIST OF SUPPLEMENTS

SUPPLEMENT	TITLE
1	Off-Site Waste Information
2	2003 Traffic Study Data
3	"Mapping 100-Year Floodplain Boundaries Following the Cerro Grande Wildfire"

LIST OF TABLES

TABLE NO.	TITLE
1-1	Regulatory References and Corresponding Permit Renewal Application Location
2-1	List of Off-Site Waste Management Facilities That May Return Treatment-Derived Waste or Waste Residuals to the Los Alamos National Laboratory
2-2	List of Off-Site Waste Management Facilities That May Send Waste to Los Alamos National Laboratory

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
HRMB	Hazardous and Radioactive Materials Bureau
IWP	Installation Work Plan
LANL	Los Alamos National Laboratory
MOU	memorandum of understanding
NMED	New Mexico Environment Department
PRS	potential release site
TA	technical area
T&E	threatened and endangered
USC	*United States Code*
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

This “Los Alamos National Laboratory General Part B Permit Renewal Application” is submitted to address the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00], requirements that apply to hazardous and mixed waste treatment and storage facility operations at Los Alamos National Laboratory (LANL). This document serves as Revision 2.0 to previous applications submitted to the New Mexico Environment Department (NMED) in August 1996 (Revision 0.0; LANL, 1996) and January 1999 (Revision 1.0; LANL, 1998a). It includes revisions presented in Responses to Supplemental Information submitted to the NMED in June 2000 (LANL, 2000a) and November 2001 (LANL, 2001), and in a Response to a Notice of Deficiency submitted to the NMED in August 2002 (LANL, 2002a). Revision 1.0 and this revision of the application were prepared to be consistent with the permitting strategy outlined by the NMED Hazardous and Radioactive Materials Bureau (HRMB) in correspondence dated February 5, 1998.

This permit renewal application also contains data, references to groups or organizations and contractors, references to documents, and other material provided to NMED for informational purposes only. Groups, organizations, and contractors, if changed, will be replaced and/or supplemented with functionally equivalent services required to assume the same duties and responsibilities described in this application. The above information is not intended to be incorporated into the renewed permit as an enforceable permit requirement, and its submittal should not be construed by NMED as the basis for the facility to consent to the imposition of permit conditions and/or requirements that are unnecessarily restrictive, go beyond the regulatory requirements of the Resource Conservation and Recovery Act, and/or reduce the ability of the facility to implement improved waste management practices.

As presented in the 1998 correspondence, certain portions of the LANL General Part B will serve in the operating permit as "umbrella" documents, covering the requirements of the New Mexico Hazardous Waste Act and implementing regulations, specifically, 20.4.1 NMAC [6-14-00], common to all treatment and storage units. Other applicable 20.4.1 NMAC Part B requirements would be addressed in technical area (TA)-specific permit applications, permit modification requests, or permit renewal applications. Together, information provided in this application and in the TA-specific documents will meet the applicable Part B requirements specified in 20.4.1 NMAC, Subparts V and IX [6-14-00].

In accordance with HRMB's 1998 permitting strategy, LANL submitted the “Los Alamos National Laboratory General Part A Permit Application” (Revision 0.0) in April 1998 (LANL, 1998b). That Part A consolidated information from previous site-wide and TA-specific Part A submittals into one comprehensive document, identifying all hazardous and mixed waste treatment, storage, and disposal facilities at LANL subject to 20.4.1 NMAC, Subparts V, VI, and IX [6-14-00], at that time. The Part A was subsequently revised and submitted to the NMED in November 1999 (Revision 1.0; LANL, 1999), July 2000 (Revision 2.0; LANL, 2000b), and August 2002 (Revision 3.0; LANL, 2002b). The most recent version of that document, hereinafter referred to as the LANL General Part A, serves as a companion document to the LANL General Part B and TA-specific permit applications, permit modification requests, and permit renewal applications.

In the LANL General Part A, the LANL General Part B, and TA-specific permit applications, a unit to be permitted may sometimes be referred to as a "facility" (e.g., the Radioassay and Nondestructive Testing Facility). The term "facility," as it appears in this context, is used only to denote building names and does not imply the regulatory meaning of "facility" as defined in 20.4.1 NMAC § 260.10 [6-14-00]. However, pursuant to 20.4.1 NMAC § 260.10 [6-14-00], the LANL facility as a whole does meet the regulatory definition of a facility.

Table 1-1 provides a list of regulatory references and the corresponding section location in this document, as appropriate. Where applicable, regulatory citations in this document reference 20.4.1 NMAC, which adopts, with a few exceptions, all of the Code of Federal Regulations, Title 40, Parts 260 to 266, Part 268, and Part 270.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(1)	General facility description	Appendix A
§270.14(b)(2)	Chemical and physical analyses	Appendix B
§270.14(b)(3)	Waste analysis plan	Appendix B
§264.13(b)	Development and implementation of waste analysis plan	Appendix B
§264.13(c)	Off-site waste analysis requirements	Appendix B
§270.14(b)(4)	Security procedures and equipment	2.0[b]
§270.14(b)(5)	General inspection requirements	Appendix C
§264.174	Container inspections	Appendix C
§264.193(i)	Tank inspections	Appendix C
§264.195	Overfill control inspections	Appendix C
§264.226	Surface impoundments monitoring and inspection	NA
§264.254	Waste pile monitoring and inspection	NA
§264.273	Land treatment design and operating requirements	NA
§264.303	Landfill monitoring and inspection	NA
§264.347	Incinerator monitoring and inspection	NA
§264.602	Miscellaneous units	Appendix C
§264.1033	Process vent standards	Appendix C
§264.1052	Equipment leak air emission standards	Appendix C
§264.1053	Compressor standards	Appendix C
§264.1058	Standards for pumps, valves, pressure relief devices, flanges and connections	Appendix C
§264.1088	Subpart CC inspection and monitoring requirements	Appendix C
§270.14(b)(6)	Request for waiver from preparedness and prevention requirements of 264 Subpart C	NA
§270.14(b)(7)	Contingency plan requirements under 264 Subpart D	Appendix E
§264.227	Surface impoundment emergency repairs; contingency plans	NA
§270.14(b)(8)	Preparedness and prevention	2.0[b]
§270.14(b)(8)(i)	Prevention of hazards in unloading operations (ramps and special forklifts)	NA[b]
§270.14(b)(8)(ii)	Runoff prevention with berms, trenches, and dikes	NA[b]
§270.14(b)(8)(iii)	Prevention of contamination of water supplies	NA[b]
§270.14(b)(8)(iv)	Mitigation effects of equipment failure and power outages	NA[b]

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(8)(v)	Prevention of undue exposure of personnel by use of personal protective equipment	NA[b]
§270.14(b)(8)(vi)	Prevention of release to the atmosphere	NA[b]
§270.14(b)(9)	Prevention of accidental ignition or reaction	2.0[b]
§264.17(c)	Documentation of compliance with 264.17 (general requirements for ignitable, reactive, or incompatible wastes)	NA[b]
§270.14(b)(10)	Traffic pattern, volume, and controls	Appendix A
	Identification of turn lanes	Appendix A
	Identification of traffic/stacking lanes	Appendix A
	Description of road surface	Appendix A
	Description of road load bearing capacity	Appendix A
	Identification of type and number of traffic controls	Appendix A
§270.14(b)(11)	Facility/unit location information	Appendix A
§270.14(b)(11)(i)	Seismic standard applicability [264.18(a)]	NA[b]
§270.14(b)(11)(ii)	Seismic standard requirements	NA[b]
§270.14(b)(11)(ii)(A)	No fault within 3,000 feet (ft) with displacement in Holocene time	NA[b]
§270.14(b)(11)(ii)(A)(1)	Published geological studies	NA[b]
§270.14(b)(11)(ii)(A)(2)	Aerial reconnaissance of a five-mile radius from the facility	NA[b]
§270.14(b)(11)(ii)(A)(3)	Analysis of aerial photographs covering 3,000-ft radius from the facility/unit	NA[b]
§270.14(b)(11)(ii)(A)(4)	Reconnaissance based on walking portions of the area within 3,000 ft of the facility	NA[b]
§270.14(b)(11)(ii)(B)	If faults which have displacement in Holocene time are present within 3,000 ft, no faults pass within 200 ft of portions of the facility where treatment, storage, or disposal will be conducted	NA[b]
§270.14(b)(11)(iii)	100-year floodplain standard	Appendix A[b]
§270.14(b)(11)(iv)	If facility is within 100-year floodplain	Appendix A[b]
§270.14(b)(11)(iv)(A)	Engineering analyses of hydrostatic forces expected in a 100-year flood	NA[b]
§270.14(b)(11)(iv)(B)	Structural engineering studies for flood protection to prevent washout	NA[b]
§270.14(b)(11)(iv)(C)	Detailed description of procedures to remove hazardous waste to safety before flood reaches the waste	NA[b]
§270.14(b)(11)(iv)(C)(1)	Timing of removal	NA[b]

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(11)(iv)(C)(2)	Location to be moved to	NA[b]
§270.14(b)(11)(iv)(C)(3)	Dedicated equipment and personnel to ensure removal	NA[b]
§270.14(b)(11)(iv)(C)(4)	Potential for accidental discharge during movement	NA[b]
§270.14(b)(11)(v)	Plan to show how the facility will be brought into compliance with 264.18(b)	NA[b]
§270.14(b)(12)	Personnel training program	Appendix D
§270.14(b)(13)	Closure and post-closure plans	Appendices F & G
§264.112	Amendment of closure plan	Appendix F
§264.118	Post-closure plan; amendment of plan	Appendices F[b] & G[b]
§264.178	Closure/containers	Appendix F[b]
§264.197	Closure/tanks	Appendix F[b]
§264.228	Closure/post-closure/surface impoundments	NA
§264.258	Closure/post-closure/waste piles	NA
§264.280	Closure/post-closure/land treatment	NA
§264.310	Closure/post-closure/landfills	Appendices F[b] & G[b]
§264.351	Closure/incinerators	NA
§264.601	Miscellaneous units	Appendix F[b]
§264.603	Post-closure care	Appendix G[b]
§270.14(b)(14)	Post-closure notices (264.119)	Appendices F & G
§270.14(b)(15)	Closure cost estimate (264.142)	Appendix F
	Financial assurance (264.143)	Appendix F
§270.14(b)(16)	Post-closure cost estimate (264.144)	Appendix G
	Post-closure care financial assurance (264.145)	Appendix G
§270.14(b)(17)	Liability insurance (264.147)	Appendices F & G
§270.14(b)(18)	Proof of financial coverage (264.149-150)	Appendices F & G
§270.14(b)(19)	Topographic map requirements	Appendix A[c]
§270.14(b)(19)(i)	Map scale and date	Appendix A[c]
§270.14(b)(19)(ii)	100-year floodplain	Appendix A
§270.14(b)(19)(iii)	Surface waters	Appendix A[c]
§270.14(b)(19)(iv)	Land use	Appendix A

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(19)(v)	Wind rose	Appendix A
§270.14(b)(19)(vi)	Map orientation	Appendix A[c]
§270.14(b)(19)(vii)	Legal boundaries	Appendix A[c]
§270.14(b)(19)(viii)	Access controls	NA[b]
§270.14(b)(19)(ix)	Wells	Appendix A[c]
§270.14(b)(19)(x)	Buildings	Appendix A[c]
	Treatment, storage, and disposal (TSD) operations	Appendix A[c]
	Run-on/run-off control systems	NA[b]
	Storm sewer systems	Appendix A
	Sanitary sewer systems	Appendix A
	Process sewer systems	Appendix A
	Loading/unloading areas	NA[b]
	Fire control facilities	Appendix E
§270.14(b)(19)(xi)	Drainage barriers	NA[b]
§270.14(b)(19)(xii)	Location of operational units	Appendix A[c]
§270.14(b)(20)	Other federal laws	3.0
	Wild and Scenic Rivers Act	3.0
	National Historic Preservation Act	3.0
	Endangered Species Act	3.0
	Costal Zone Management	3.0
	Fish and Wildlife Coordination Act	3.0
	Executive Orders	3.0
§270.14(b)(21)	Notice of extension approval for land disposal facilities	NA
§270.14(c)	Groundwater monitoring requirements	Appendix A
§270.14(c)(1)	Groundwater monitoring under 265.90 through 265.94	NA
§270.14(c)(2)	Identification of uppermost aquifer, groundwater flow rate and direction	Appendix A
§270.14(c)(3)	A topographic map required under 270.14(b)(19) that identifies proposed point of compliance	Appendix A
	Proposed location of groundwater monitoring wells under 264.97.	Appendix A
§270.14(c)(4)	Description of plume of contamination that has entered groundwater	NA
§270.14(c)(4)(i)	Extent of plume indicated on topographic map	NA

Refer to footnotes at end of table.

Table 1-1 (Continued)

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(c)(4)(ii)	Identification of constituents and concentration for Appendix IX of 264	NA
§270.14(c)(5)	Detailed plan and an engineering report describing proposed groundwater monitoring program under 264.97	NA
§270.14(c)(6)	No releases detected in groundwater (264.98)	Appendix A
§270.14(c)(6)(i)	List of proposed indicator parameters	NA
§270.14(c)(6)(ii)	Proposed groundwater monitoring system	NA
§270.14(c)(6)(iii)	Background values for each proposed monitoring parameter	NA
§270.14(c)(6)(iv)	Description of proposed sampling, analyses and statistical comparisons to be used	NA
§270.14(c)(7)	Release detected at point of compliance requires corrective action under 264.100	NA
§270.14(d)	Information requirements for solid waste management units (SWMU)	4.0[b]
§270.14(d)(1)(i)	Location of SWMUs on topographic map	NA[b]
§270.14(d)(1)(ii)	Types of SWMUs	NA[b]
§270.14(d)(1)(iii)	Dimensions and descriptions of SWMUs	NA[b]
§270.14(d)(1)(iv)	Dates of operation	NA[b]
§270.14(d)(1)(v)	Waste types managed at SWMU	NA[b]
§270.14(d)(2)	Information on releases from SWMUs	NA[b]
§270.15	Containers	NA[b]
§270.16	Tank systems	NA[b]
§270.16(a)	Written assessment and certification	NA[b]
§270.16(b)	Capacity/dimensions	NA[b]
§270.16(c)	Systems and controls	NA[b]
§270.16(d)	Piping and process flow	NA[b]
§270.16(e)	External corrosion protection	NA[b]
§270.16(f)	Installation	NA[b]
§270.16(g)	Secondary containment system	NA[b]
§270.16(h)	Request for variance from secondary containment	NA[b]
§270.16(i)	Spill prevention	NA[b]
§270.16(j)	Ignitable, reactive, or incompatible wastes	2.0[b]

[a] NA = not applicable
[b] Special requirements or information is addressed in technical area-specific permit applications, permit modification requests, or permit renewal applications, as appropriate.
[c] Some of the topographic map requirements are addressed in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application."

Refer to footnotes at end of table.

2.0 FACILITY OPERATIONS AND UNIT DESIGNS

This section presents an overview of the general facility operations for hazardous and mixed waste management units at Los Alamos National Laboratory (LANL). Facility operations and unit designs for individual waste management units at LANL are presented in technical area (TA)-specific permit applications, permit modification requests, or permit renewal applications. Together, this information addresses the applicable Part B information requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart IX, Part 270, and 20.4.1 NMAC, Subpart V, Part 264, revised June 14, 2000 [6-14-00].

In accordance with 20.4.1 NMAC § 264.31, the waste management units at LANL are designed, constructed, maintained, and operated to minimize the possibility of fire, explosion, or unplanned releases of hazardous waste or hazardous waste constituents to any environmental medium that could potentially harm human health or the environment. Detailed information on the procedures to prevent hazards at the specific units is provided in TA-specific permit applications, permit modification requests, or permit renewal applications for the following subject areas:

- Security procedures and equipment [20.4.1 NMAC § 270.14(b)(4) and 20.4.1 NMAC § 264.14];
- Access control [20.4.1 NMAC § 270.14(b)(19)(viii)];
- Preparedness and prevention requirements [20.4.1 NMAC § 270.14(b)(8) and 20.4.1 NMAC, Subpart V, Part 264, Subpart C];
- Procedures, structures, and equipment for preventing hazards [20.4.1 NMAC § 270.14(b)(8)];
- General waste management practices for ignitable, reactive, and incompatible waste [20.4.1 NMAC § 270.14(b)(9) and 20.4.1 NMAC § 264.17].

The general information provided below is applicable to hazardous and mixed waste management units at LANL that are included in TA-specific permit applications, permit modification requests, or permit renewal applications.

2.1 GENERAL FACILITY OPERATIONS

The following is an overview of the general facility operations applicable to hazardous and/or mixed waste management units addressed in TA-specific permit applications, permit modification requests, or permit renewal applications. This overview includes a discussion of security and access control; preparedness and prevention; and precautions taken when managing incompatible, ignitable, or reactive wastes. This information is submitted to partially fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264. The facility standards in Subparts I through X of 20.4.1 NMAC, Subpart V, Part 264, will be addressed as applicable to waste management units included in TA-specific permit applications, permit modification requests, and permit renewal applications.

2.1.1 Security Procedures and Equipment/Access Control [20.4.1 NMAC §§ 270.14(b)(4) and (b)(19)(viii); 20.4.1 NMAC § 264.14]

Information on security procedures and equipment and on access control is provided in TA-specific permit applications, permit modification requests, or permit renewal applications.

2.1.2 Preparedness and Prevention Requirements

Detailed information on how operations at LANL's waste management units comply with the preparedness and prevention requirements of 20.4.1 NMAC § 270.14(b)(8), and 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00], is provided in TA-specific permit applications, permit modification requests, or permit renewal applications. Communication and alarm equipment available at LANL is presented in Appendix E of this document. A summary list of the emergency equipment available for use at each waste management unit is addressed in Attachment E of TA-specific permit applications, permit modification requests, or permit renewal applications.

2.1.2.1 Required Equipment [20.4.1 NMAC § 264.32]

Information on required equipment for each waste management unit is provided in TA-specific permit applications, permit modification requests, or permit renewal applications. The required equipment includes internal communications or alarm systems; devices to summon emergency assistance; fire control, spill control, and decontamination equipment; and adequate water volume and pressure for fire suppression equipment.

2.1.2.2 Testing and Maintenance of Equipment [20.4.1 NMAC § 264.33]

Communications and alarm systems and fire protection, spill control, and decontamination equipment are inspected and/or tested according to the inspection schedule detailed in Appendix C of this document and/or Attachment C of TA-specific permit applications, permit modification requests, or permit renewal applications. The frequency of inspection is adequate to assure proper operation in the event of an emergency. Maintenance, repair, and replacement of emergency equipment are performed as needed.

2.1.2.3 Access to Communications or Alarm System [20.4.1 NMAC § 264.34]

Whenever waste is being handled at any of the waste management units, all personnel involved have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another individual. In the event of an emergency, this communication equipment allows personnel to contact the operating group management, the Emergency Management and Response Office, and/or the Central Alarm Station operator (refer to Appendix E). In addition to the communications and alarm systems described in TA-specific permit applications, permit modification requests, or permit renewal applications, on-site personnel may carry pagers, two-way radios, and/or cellular telephones so that they can contact or be contacted by on-site and LANL emergency support personnel at all times.

2.1.2.4 Support Agreements with Outside Agencies [20.4.1 NMAC § 264.37(a)]

The U.S. Department of Energy maintains support agreements in the form of contracts and memoranda of understanding (MOU) with various outside response agencies (e.g., Los Alamos County Fire Department, Los Alamos County Police Department, and Los Alamos Medical Center) for emergency response assistance at LANL. In addition, LANL maintains contracts with additional response groups for security and scene access (i.e., Protection Technology Los Alamos) and maintenance support (i.e., KBR-Shaw-LATA) during emergency response. The contracts/MOUs generally provide for the training of fire department and emergency response personnel so that they are familiar with the layout of the facility, the properties of hazardous waste handled at the facility, associated hazards, and possible evacuation routes; summarize the agreement for local police assistance; and allow for the training of medical personnel regarding the care and treatment of patients contaminated with radioactive materials. Support agreements are discussed briefly in the Contingency Plan (Appendix E of this document). Responsibilities of internal and external emergency response groups and agencies are discussed in Appendix E.

2.1.3 Hazards Prevention [20.4.1 NMAC § 270.14(b)(8)]

Information on general procedures, equipment, and structures used to prevent hazards at or in the vicinity of the waste management units is provided in TA-specific permit applications, permit modification requests, or permit renewal applications.

2.1.4 Prevention of Accidental Ignition or Reaction of Ignitable, Reactive, or Incompatible Waste [20.4.1 NMAC §§ 270.14(b)(9), 270.15(c) and (d), 270.16(j); 20.4.1 NMAC §§ 264.17, 264.176, 264.177, 264.198, and 264.199]

This section provides a description of the precautions used to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes at LANL.

Ignitable or reactive wastes are or will be protected from sources of ignition or reaction. Policies and features are in place that minimize the possibility of accidental ignition. Ignitable or reactive waste is separated and protected from welding activities, hot surfaces, frictional heat, and sources of sparks. Smoking is not allowed within any waste management area. "No Smoking" signs are conspicuously placed wherever there is a potential hazard from ignitable or reactive waste, as required by 20.4.1 NMAC § 264.17(a). Together, these measures meet the requirements of 20.4.1 NMAC §§ 264.17(a) and (b).

Waste management unit-specific information on prevention of accidental ignition or reaction of ignitable, reactive, or incompatible waste is provided in TA-specific permit applications, permit modification requests, and permit renewal applications.

2.1.5 Off-Site Wastes

Wastes from off-site sources may be accepted on a limited basis at LANL. "Off-site source" refers to wastes other than those generated by LANL or its contractor(s) operating on the permitted facility. Off-site wastes that may be accepted for storage or treatment include wastes generated by LANL or its contractor(s) at TA-57 (the Fenton Hill site) and wastes generated by LANL or its contractor(s) through investigation or remediation of potential release sites (PRS) located off the permitted facility. As required by Module VIII, LANL prepares an Installation Work Plan (IWP) that includes a listing of all PRSs. Investigation and remediation wastes generated at PRSs listed in the IWP and located in TA-0, TA-1, TA-10, TA-31, TA-32, TA-45, and TA-73 would constitute off-site wastes. All investigation and remediation activities generating off-site wastes must be conducted in accordance with approved investigation or remediation plans, with the exception of Voluntary Corrective Actions, which may be implemented without prior approval. LANL will notify the New

Mexico Environment Department (NMED) prior to conducting investigation or remediation activities in accordance with the notification requirements contained in Module VIII. All wastes generated during investigation and remediation at off-site PRSs and accepted for storage or treatment must be properly manifested.

Wastes or contaminated residuals of wastes associated with off-site treatment of those waste streams originally generated by LANL and subsequently managed or treated by off-site facilities may be accepted for storage or treatment if all such waste is properly characterized and manifested (Table 2-1). Wastes may also be received from the off-site facilities listed in Table 2-2 for characterization, storage, treatment, and transport to other off-site facilities, if all such waste is properly characterized and manifested. If it is determined that LANL will receive hazardous or mixed waste from an off-site source other than those listed in Tables 2-1 and 2-2, a permit modification will be requested in accordance with 20.4.1 NMAC § 270.42.

2.2 AIR EMISSION STANDARDS FOR PROCESS VENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart AA]

Air emissions standards for process vents are addressed, as appropriate, in TA-specific permit applications, permit modification requests, or permit renewal applications, pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart AA.

2.3 AIR EMISSION STANDARDS FOR EQUIPMENT LEAKS [20.4.1 NMAC, Subpart V, Part 264, Subpart BB]

Air emissions standards for equipment leaks are addressed, as appropriate, in TA-specific permit applications, permit modification requests, or permit renewal applications, pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart BB.

2.4 AIR EMISSION STANDARDS FOR TANKS, SURFACE IMPOUNDMENTS, AND CONTAINERS [20.4.1 NMAC, Subpart V, Part 264, Subpart CC]

Air emissions standards for tanks, surface impoundments, and containers are addressed, as appropriate, in TA-specific permit applications, permit modification requests, or permit renewal applications, pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart CC.

2.5 CONTAINMENT BUILDINGS [20.4.1 NMAC, Subpart V, Part 264, Subpart DD]

Containment buildings are addressed, as appropriate, in TA-specific permit applications, permit modification requests, or permit renewal applications, pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart DD.

2.6 RECORDKEEPING REQUIREMENTS

Recordkeeping requirements applicable to LANL hazardous and/or mixed waste management units consist of the biennial report, unmanifested waste report, and additional reports. These reports are discussed in the following sections.

2.6.1 Biennial Report [20.4.1 NMAC § 264.75]

LANL will prepare and submit a biennial report to the NMED by March 1 of each even-numbered year. The biennial report will be submitted to the NMED on U. S. Environmental Protection Agency (EPA) Form 8700-13B. The report will cover facility activities during the previous calendar year and will include:

- The EPA identification number, name, and address of the facility;
- The calendar years covered by the report;
- A description and the quantity of each hazardous waste the facility received during the year;
- The method of treatment, storage, or disposal for each hazardous waste;
- For generators who treat, store, or dispose of hazardous waste on site, a description of the efforts undertaken during the year to reduce the volume and toxicity of waste generated;
- For generators who treat, store, or dispose of hazardous waste on site, a description of the changes in volume and toxicity of waste actually achieved during the year in comparison to previous years to the extent such information is available for the years prior to 1984; and
- The certification signed by LANL and U.S. Department of Energy, National Nuclear Security Administration representatives.

2.6.2 Unmanifested Waste Report [20.4.1 NMAC § 264.76]

Waste from off-site sources may be accepted on a limited basis at LANL provided that such waste is properly characterized and manifested and meets the requirements listed in Section 2.1.5.

If LANL accepts any wastes for treatment or storage from an off-site facility without an accompanying manifest, or without an accompanying shipping paper as described in 20.4.1 NMAC § 264.76, LANL will prepare and submit an Unmanifested Waste Report (EPA Form 870013B) to the NMED within fifteen days after receiving the waste. The report will include the following:

- The EPA identification number, name, and address of the facility;
- The date the facility received the waste;
- A description and the quantity of each unmanifested hazardous waste a facility received;
- The method of treatment, storage, or disposal for each hazardous waste;
- The certification signed by LANL or an authorized representative; and
- A brief explanation of why the waste was unmanifested, if known.

2.6.3 Additional Reports [20.4.1 NMAC § 264.77]

In accordance with the requirements of 20.4.1 NMAC § 264.77, LANL will also report the following to the NMED:

- Releases and unanticipated fires and explosions that require implementation of the contingency plan, as specified in 20.4.1 NMAC § 264.56(j);
- Facility closures, as specified in 20.4.1 NMAC § 264.115; and
- As otherwise required by 20.4.1 NMAC, Subpart V, Part 264, Subparts F, BB, and CC.

2.7 LAND DISPOSAL RESTRICTIONS

Currently, no exemption from or extension to Land Disposal Restrictions has been requested by LANL. In the future, if LANL requires such an extension, it will be requested under 20.4.1 NMAC § 268.5 [6-14-00], as necessary. Similarly, a petition to allow land disposal of a waste prohibited under 20.4.1 NMAC, Subpart VIII, Part 268, Subpart C [6-14-00], would be requested under 20.4.1 NMAC § 268.6 [6-14-00], if needed.

Table 2-1

List of Off-Site Waste Management Facilities That May Return Treatment-Derived Waste or Waste Residuals to the Los Alamos National Laboratory

Off-Site Facility	EPA Identification Number
Argonne National Laboratory, Argonne, IL	IL38900089
Catholic University, Washington, D.C.	DCD980204879
Consolidated Incineration Facility, Savannah River Site, S.C.	SC1890008989
Diversified Scientific Services, Inc., Kingston, TN	TND982109142
Envirocare, Clive, UT	UTI982598898
Waste Experimental Reduction Facility, Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID	ID4890008952
M4 Environmental Management, Inc., Oak Ridge, TN	RD&D Permit
Nuclear Fuel Services, Erwin, TN	TND003095635
Nuclear Sources & Services, Inc., Houston, TX	TXD982560294
Toxic Substances Control Act Incinerator, Oak Ridge National Laboratory, Oak Ridge, TN	TN0890090004
International Technology Corporation, Technology Center, Knoxville, TN	TND000770479
International Technology Corporation, Biotech Applications Center, Knoxville, TN	TND987782521
International Technology Corporation, Environmental Technology Development Center, Oak Ridge, TN	TND981933120
Perma-Fix, Albuquerque, NM	NM0000182121
Perma-Fix, Gainesville, FL	FLG980711071
EG&G Mound Applied Technologies, Miamisburg, OH	OH6890008984
Waste Control Specialists, Andrews, TX	TXD988088464
Colorado Minerals Research Institute, Golden, CO	COD17944308
Allied Technology Group, Richland, WA	WAR000010355
East Tennessee Waste Treatment Center, Oak Ridge, TN	TNR000005397
Materials and Energy Corporation, Oak Ridge, TN	TNR000005397
Clean Harbors Environmental Service Corporation, Aragonite, UT	UTD381552177
Superior Special Services, Inc., Phoenix, AZ	AZ000033960
Clean Harbors Grassy Mountain, Grassy Mountain, UT	UTD991301748
Onyx Environmental Services, Henderson, CO	COD980591184

Table 2-2

List of Off-Site Waste Management Facilities That May Send Waste to Los Alamos National Laboratory

Off-Site Facility	EPA Identification Number
Sandia National Laboratories/New Mexico, Albuquerque, NM	NM5890110518

3.0 OTHER FEDERAL LAWS

The following federal laws are required under the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), §§ 270.3 and 270.14(b)(20), revised June 14, 2000 [6-14-00], to be given consideration when applying for a hazardous waste facility permit. When any of these laws is applicable, its procedures must be followed:

1. *The Wild and Scenic Rivers Act (16 United States Code [USC] 1273 et seq.)*. This act provides for a national wild and scenic rivers system and prohibits construction of any waterway that would have a direct adverse effect on the values for which a wild and scenic river was established.

2. *The National Historic Preservation Act of 1966 (16 USC 470 et seq.)*. This act establishes a program for the preservation of historic properties throughout the country. The act has provisions that require mitigation of adverse effects to registered properties.

3. *The Endangered Species Act of 1973 (16 USC 1531)*. This act provides for the conservation of endangered and threatened species of fish, wildlife, and plants. The act prohibits any action that would jeopardize the continued existence of any endangered or threatened species or adversely affect its critical habitat.

4. *The Coastal Zone Management Act of 1972 (16 USC 1451 et seq.)*. This act establishes national policy for the management, use, protection, and development of land and water resources of the nation's coastal zones. Section 307(c) of the act and implementing regulations prohibit the U.S. Environmental Protection Agency from issuing a permit for activity affecting coastal zone land or water without the certification from the applicant that the activity is in compliance with the state Coastal Zone Management Program.

5. *The Fish and Wildlife Coordination Act of 1934, as amended (16 USC 661 et seq.)*. This act promotes the conservation of wildlife, fish, and game and integrates this conservation with water resource projects. Certain provisions of the act require that permits proposing or authorizing the impoundment, diversion, or other control or modification of any body of water be considered by the appropriate state agency for impacts to wildlife resources.

Because Los Alamos National Laboratory (LANL) has ongoing programs in support of the National Historic Preservation Act, the Endangered Species Act, and the Fish and Wildlife Coordination Act, consideration was given to these federal laws.

The National Historic Preservation Act is administered by the Advisory Council on Historic Preservation, appointed by the President, and the New Mexico State Historic Preservation Office. Section 106 of the Act requires the U.S. Department of Energy (DOE) to consider the effects of its actions on historic properties, and provide the Council with a reasonable opportunity to comment on those actions and the manner in which DOE takes historic properties into account in their decisions.

DOE accomplishes this through consultation with the State Historic Preservation Office whenever a project may potentially impact a historic property. LANL may prepare a Historic Building Survey Report assessing the eligibility of a historic building dating from the Manhattan Project and early Cold War periods (1943 to 1956) for the National Register of Historic Places and evaluating the impacts of the proposed actions. The consultation process was formalized in April 2000 through a Programmatic Agreement between DOE, the Council, and the State.

For any undertaking on DOE land that may directly or indirectly impact threatened and endangered (T&E) species or their habitat, DOE must consult with the U.S. Fish and Wildlife Service (USFWS), as provided under Section 7 of the Endangered Species Act. Similarly, DOE must consult with the USFWS for projects that would impound, divert, or otherwise control or modify a body of water, as required by the Fish and Wildlife Coordination Act. For Endangered Species Act compliance, LANL may prepare a Biological Assessment to document the presence of T&E species and to evaluate the impacts of a project on a listed species or its habitat. DOE will then request in writing that the USFWS concurs with DOE's findings in the Biological Assessment. In recent years, DOE and LANL have streamlined the consultation process by preparing a T&E Species Habitat Management Plan. This plan fulfills the provisions of the Endangered Species Act that require federal agencies to carry out programs for the conservation of T&E species and their habitat. The USFWS approved this plan in February 1999.

Provisions in the Wild and Scenic Rivers Act and the Coastal Zone Management Act are not applicable to LANL's activities.

Consideration will be given to Executive Orders, issued by the President, that are relevant to waste management activities at LANL. When any of these Orders is applicable, its provisions will be followed. Requirements for Executive Orders are reserved in 20.4.1 NMAC § 270.3(f) [6-14-00].

4.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 270.14(d), revised June 14, 2000, information on solid waste management units in the vicinity of the hazardous and mixed waste management units at Los Alamos National Laboratory is presented in Section 4.0 of technical area-specific permit applications, permit modification requests, or permit renewal applications.

5.0 CERTIFICATION

I certify under penalty of law that this document 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
University of California
Operator

8/22/03
Date Signed

for Ralph E. Erickson
Manager, Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy
Owner/Operator

8/22/03
Date Signed

6.0 REFERENCES

LANL, 2002a, “Response to Notice of Deficiency: General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; RCRA Permit Applications; Los Alamos National Laboratory, EPA ID # NM0890010515,” LA-UR-02-5013, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002b, “Los Alamos National Laboratory General Part A Permit Application,” Revision 3.0, LA-UR-02-5273, August 2002, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2001, “Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application; General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM0890010515,” LA-UR-01-6054, Los Alamos National Laboratory, Los Alamos, New Mexico.

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APPENDIX A

FACILITY DESCRIPTION

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
µg/L	microgram(s) per liter
AASHTO	American Association of State Highway and Transportation Officials
amsl	above mean sea level
cm/yr	centimeters per year
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ft	feet/foot
GPP	Groundwater Protection Program
HE	high explosives
IC	ion chromatography
LANL	Los Alamos National Laboratory
LC/MS/MS	liquid chromatography/mass spectrometry/mass spectrometry
mg/L	milligrams per liter
m/s	meters per second
m/yr	meter(s) per year
NMED	New Mexico Environment Department
pCi/L	picocuries per liter
ppb	parts per billion
R&D	research and development
RLWTF	Radioactive Liquid Waste Treatment Facility
RRES	Risk Reduction and Environmental Stewardship Division
TA	technical area

APPENDIX A
FACILITY DESCRIPTION

The information provided in this appendix is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00]. The following subject areas are addressed in this appendix or are referenced to technical area (TA)-specific permit applications, permit modification requests, or permit renewal applications:

- A general description of the Los Alamos National Laboratory (LANL) facility [20.4.1 NMAC § 270.14(b)(1)];
- Traffic patterns, volume, and control [20.4.1 NMAC § 270.14(b)(10)];
- Facility location information for compliance with the seismic standard and floodplain requirements [20.4.1 NMAC §§ 270.14(b)(11) and 270.14(b)(19)(ii), and 20.4.1 NMAC § 264.18(a) and (b)];
- Topographic map requirements [20.4.1 NMAC § 270.14(b)(19)];
- Groundwater [20.4.1 NMAC § 270.14(c) and 20.4.1 NMAC § 264.90(a)].

A.1 GENERAL DESCRIPTION [20.4.1 NMAC § 270.14(b)(1)]

LANL is located in Los Alamos County, an incorporated county, in north-central New Mexico, approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. The regional location of LANL is shown on Figure A-1. LANL is divided into TAs, as shown on Figure A-2. LANL, which occupies an area of 40 square miles, and the associated residential and commercial areas of Los Alamos County, which occupy an area of approximately 109 square miles, are situated on the Pajarito Plateau. The plateau consists of a series of finger-like mesas separated by deep east-west trending canyons. Ephemeral, interrupted, or intermittent streams lie at the bottoms of all the canyons. The mesa tops range in elevation from approximately 7,800 feet (ft) above mean sea level (amsl) at the flank of the Jemez Mountains, located to the west of Los Alamos, to about 6,200 ft amsl at their eastern extent, where they terminate above the Rio Grande.

LANL's central mission is the reduction of global nuclear danger supported by research that also contributes to conventional defense, civilian, and industrial needs. This includes programs in nuclear, medium energy, and space physics; hydrodynamics; conventional explosives; chemistry; metallurgy; radiochemistry; space nuclear systems; controlled thermonuclear fusion; laser research;

environmental technology; geothermal, solar, and fossil energy research; nuclear safeguards; biomedicine; health and biotechnology; and industrial partnerships. LANL is owned by the U.S. Department of Energy (DOE) and is operated jointly by the DOE National Nuclear Security Administration and the University of California. The facility mailing address is P.O. Box 1663, Los Alamos, New Mexico, 87545.

LANL is an existing treatment and storage facility. This General Part B Permit Renewal Application and other TA-specific permit applications, permit modification requests, or permit renewal applications are submitted for treatment and storage units that are current or proposed "active" operating units. LANL does not seek an operating permit for any disposal units.

Hazardous waste is generated at LANL primarily from research and development (R&D) activities, general facility operations, environmental restoration (ER) activities, and decontamination and decommissioning (D&D) projects. Mixed low-level waste is generated mainly from R&D activities, processing and recovery operations, general facility operations, D&D projects, and ER activities. Mixed transuranic waste is generated primarily from R&D activities, processing and recovery operations, and D&D projects. High explosives (HE)-contaminated waste is generated mainly from R&D activities, ER activities, wastewater treatment processes, and building maintenance and modification activities. Brief descriptions of specific hazardous and mixed waste management units at LANL are presented in Attachment A of TA-specific permit applications, permit modification requests, or permit renewal applications. Waste generated from R&D activities, processing and recovery operations, and ER activities may be received from off-site facilities, as described in Supplement 1 of this General Part B Permit Renewal Application.

A.2 TRAFFIC PATTERNS [20.4.1 NMAC § 270.14(b)(10)]

The traffic pattern information presented below is general in nature. More detailed information is addressed in TA-specific permit applications, permit modification requests, or permit renewal applications.

A.2.1 General

The rugged topography of alternating mesas and canyons present at LANL limits traffic circulation to only a few major arterial roads. Approximately 85 miles of paved roads are present within LANL (Pan Am World Services Inc., 1986). The major roads are shown on Map 1 in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application," hereinafter

referred to as the LANL General Part A. There are approximately 19 miles of highway, 22 miles of TA access roads, and 44 miles of roads in LANL's TAs.

The main access route to LANL is State Road 502; the majority of traffic to LANL approaches from the east on State Road 502 and East Jemez Road. Alternate access routes are available from the south and west on State Roads 4 and 501 (West Jemez Road).

The pattern of east-west trending canyons at LANL prohibits north-south automobile travel in nearly all portions of LANL, with the exception of Diamond Drive and part of West Jemez Road. Los Alamos Canyon is spanned at Diamond Drive by an 820-ft-long steel-arch bridge that was completed in 1951 and improved in 1993. This bridge provides the main access between LANL facilities located on either side of Los Alamos Canyon.

Approximately 10,000 people are currently employed at LANL (including full-time, part-time, and casual LANL personnel and subcontractors). Roughly 4,000 people commute to LANL daily from communities outside Los Alamos County.

A.2.2 Waste Collection Areas

Hazardous and mixed waste is generated at TAs throughout LANL. Small quantities of waste are generally accumulated in containers at less-than-90-day storage areas or satellite accumulation areas and then packed in containers, such as drums, boxes, or crates, for transport to storage or treatment areas, as necessary. Bulk liquid waste is contained primarily in drums or tanks. Because hazardous and mixed waste may be generated throughout LANL, waste transport may occur on nearly all roads within LANL. Off-site wastes may be received at LANL on a limited basis.

A.2.3 Routes of Travel

Information addressing unit-specific travel routes is presented in Attachment A of TA-specific permit applications, permit modification requests, or permit renewal applications.

A.2.4 Traffic Volumes

According to a traffic study conducted in early 2003, the peak traffic periods are between 6:00 and 8:00 a.m. and 4:00 and 6:00 p.m. Monday through Thursday, and between 6:00 and 8:00 a.m. and 3:00 and 5:00 p.m. Friday (Digital Traffic Systems, 2003). The 2003 traffic study was conducted at 10 locations throughout Los Alamos County. The data collection locations are shown on a figure in

Supplement 2 of this document. A data summary and the data from the cited study are also presented in Supplement 2. Based on the study, the daily average number of vehicles is greatest on Monday through Friday near the intersection of Diamond Drive and Trinity Drive (Site 2 in the study), with 25,820 vehicles. The smallest daily average number of vehicles on Monday through Friday is 1,539 near the intersection of West Jemez Road and State Road 4.

Additional traffic volume information is provided in Attachment A of TA-specific permit applications, permit modification requests, or permit renewal applications.

A.2.5 Traffic Control Signals

Site-wide traffic flow at LANL is controlled by traffic lights, stop signs, and yield signs. Traffic lights are in place at all major intersections. Traffic signs are used at "T" intersections throughout LANL. Access to high security TAs is controlled by security guards or special access gates. Only personnel having appropriate security clearance and identification or escorted visitors are allowed access to the high security TAs. Vehicles and personnel entering these TAs are subject to periodic search by security personnel.

Unit-specific information addressing traffic control signals is presented in Attachment A of TA-specific permit applications, permit modification requests, or permit renewal applications.

A.2.6 Road Load-Bearing Capacity

Roads at LANL carrying the greatest traffic volumes include Diamond Drive, Pajarito Road, and East and West Jemez Roads. These roads are typically constructed with an 8-inch-thick base overlain with a 5-inch-thick asphaltic-concrete surface, and were designed and built in conformance with American Association of State Highway and Transportation Officials (AASHTO) specification HS-20 (AASHTO, 1996). This specification is intended to accommodate truck loading capacities of 32,000 pounds per axle. Roads within TAs are generally two-lane roads with asphaltic-concrete surfaces. These roads are typically constructed with a 6-inch-thick base overlain with a 3-inch-thick asphaltic-concrete surface. These roads were also designed and constructed to meet AASHTO specification HS-20.

A.3 LOCATION INFORMATION

A.3.1 Seismic Standard [20.4.1 NMAC § 270.14(b)(11)]

LANL is an "existing" facility that met the requirements for interim status under Section 74-4-9 of the New Mexico Hazardous Waste Act and Section 3005(e) of the Resource Conservation and Recovery Act. The U.S. Environmental Protection Agency (EPA) specifically exempted "existing" facilities operating under interim status from the requirement under 20.4.1 NMAC § 270.14(b)(11) to submit a Part B permit application that demonstrates compliance with the seismic standards under 20.4.1 NMAC § 264.18(a) [see *46 FR 2802* and *46 FR 2813* (January 12, 1981)].

A.3.2 Floodplain Standard [20.4.1 NMAC §§ 270.14(b)(11)(iii through v) and 270.14(b)(19)(ii); 20.4.1 NMAC § 264.18(b)]

As required in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (EPA, 1994), LANL mapped all 100-year floodplain boundaries within the LANL complex. A report was published documenting the floodplain mapping procedures (McLin, 1992). These maps were revised after the Cerro Grande Fire, and a new report was generated (McLin et al., 2001). The new maps and new report were provided to the New Mexico Environment Department (NMED) as Appendices B and C in the November 2001 Response to a Request for Supplemental Information (LANL, 2001). As shown on the new maps, no hazardous waste management units to be permitted are located within the 100-year floodplain at LANL. The new report is included as Supplement 3 in this document.

A.4 TOPOGRAPHIC MAPS [20.4.1 NMAC § 270.14(b)(19)]

Due to the size of LANL, several maps and figures are provided or referenced to meet the requirements of 20.4.1 NMAC § 270.14(b)(19) [6-14-00]. All maps clearly show the map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- LANL-wide 100-year floodplain maps were provided as Appendix C of the "Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application: General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM0890010515" (LANL, 2001).
- A map showing surface waters, including intermittent streams, and flow direction is included in the LANL General Part A.
- Surrounding land uses are shown on Map 1 in the LANL General Part A.
- Wind roses for LANL are shown on Figures A-3 and A-4 of this appendix.

- Access control features (e.g., fences, gates) are shown on a figure(s) in TA-specific permit applications, permit modification requests, or permit renewal applications.
- Buildings and structures are shown on maps in the LANL General Part A and on figures in TA-specific permit applications, permit modification requests, or permit renewal applications.
- The locations of the hazardous and/or mixed waste management units at LANL are shown on maps in the LANL General Part A and on figures in TA-specific permit applications, permit modification requests, or permit renewal applications.
- A map showing National Pollutant Discharge Elimination System discharge structure locations is included in the LANL General Part A.
- Storm, sanitary, and process sewer systems at LANL are shown on Map A-1 of this appendix.
- A map showing the boundaries of LANL is provided as Map A-2 in this appendix.
- Drainage control features (e.g., run-on/runoff) are shown on a figure(s) in TA-specific permit applications, permit modification requests, or permit renewal applications.
- Fire stations serving LANL and the County of Los Alamos are shown on Figure E-2 of Appendix E.
- An equipment cleanup area for LANL is located at TA-50-1. The location of TA-50-1 is shown on Figure 50-1 in the LANL General Part A.

Contour lines on all topographic maps are in intervals sufficient to detail natural drainage at LANL and in the vicinity of the waste management units. As provided in 20.4.1 NMAC § 270.14(b)(19) [6-14-00], LANL has submitted the maps at these scales and contour intervals due to the size of the waste management units, the extent of the LANL facility, and the topographic relief in the area.

A.5 GROUNDWATER [20.4.1 NMAC § 270.14(c) and 20.4.1 NMAC § 264.90(a)]

The following information is provided to meet the requirements of 20.4.1 NMAC § 270.14(c) [6-14-00] for regulated units subject to corrective action.

In the Los Alamos area, groundwater occurs in three modes: (1) water in shallow alluvium and underlying tuff in some of the larger canyons, (2) intermediate perched zone groundwater (a perched groundwater body above a less permeable layer and separated from the underlying aquifer by an unsaturated zone), and (3) the regional aquifer of the Los Alamos area.

A.5.1 Alluvial Groundwater Occurrence

Infiltration of surface water flow (caused by effluent discharges, spring discharge, or stormwater runoff) maintains shallow groundwater in the alluvium of some canyons. Alluvial groundwater is unconfined and is perched on underlying Bandelier Tuff, Cerros del Rio basalts, or Puye Formation.

In wet canyon bottoms, infiltration of surface water maintains shallow groundwater in the alluvium. Wet canyons generally have large surface water flow, head in the Jemez Mountains, or receive effluent discharges. Groundwater levels are typically highest in the late spring due to snowmelt runoff and in mid-to-late summer due to thunderstorms. Groundwater levels and extent of saturation decrease during the winter and early summer when runoff is at a minimum. Dry canyons have little surface water flow. In these canyons, groundwater may occur seasonally in the alluvium. Dry canyons are generally those that head in the eastern portion of the Pajarito Plateau.

Alluvium that is as much as 100 ft thick has been deposited in the canyons of the Pajarito Plateau by intermittent and ephemeral stream flows. Alluvium in canyons that head in the Jemez Mountains is generally composed of sands, gravels, pebbles, cobbles, and boulders derived from the Tschicoma Formation and Bandelier Tuff on the flank of the mountains. Alluvium in canyons that head on the Pajarito Plateau is relatively fine-grained and consists of clays, silts, sands, and gravels derived from the Bandelier Tuff. In Mortandad Canyon east of Test Well 8, the alluvium has two distinct lithologic zones: the upper zone is a coarse-grained pebbly sand; the lower zone is a brown sandy silty clay, which rests unconformably on the Bandelier Tuff (Baltz et al., 1963, p. 31).

Ephemeral runoff in some canyons infiltrates the alluvium until downward movement is impeded by the less permeable underlying strata. The impeded downward movement results in a buildup of shallow alluvial groundwater. In some cases, relatively thin zones of shallow groundwater can also be contained in the weathered tuff or some other geologic unit immediately underlying the alluvium. The horizontal and vertical extent of the alluvial groundwater is limited by depletion via evapotranspiration and movement into the underlying rocks (Purtymun et al., 1977). The limited saturated thickness and extent of the alluvial groundwater within the Laboratory boundaries make it inadequate as a significant source of potable and industrial water supply to LANL .

A.5.1.1 Alluvial Groundwater Flux

Lateral flow of the alluvial groundwaters is down canyon and in an easterly direction. Purtymun (1974) used observed travel times through the alluvial groundwater of Mortandad Canyon of a pulse of tritium released from TA-50 to infer the large-scale permeability of the alluvium. Based on this study, the velocity of alluvial groundwater flow ranges from about 60 ft per day in the upper reach to about 7 ft per day in the lower reach of the canyon (Purtymun, 1974). Purtymun (1974) determined field-scale hydraulic conductivity values to several zones of different texture within the alluvium, which were identified during a study by Baltz et al. (1963). Chloride and tritium tracer

measurements were used to estimate the hydraulic conductivities. The upper zone has a hydraulic conductivity of 1.6×10^{-3} meters per second (m/s) between MCO-5 and MCO-6. The lower zone has a hydraulic conductivity of 5.8×10^{-4} m/s between MCO-6 and MCO-7.5, and 8.8×10^{-5} m/s between MCO-7.5 and MCO-8.

A.5.1.2 Alluvial Groundwater Quality

Water quality of the alluvial groundwater reflects the composition of storm runoff, snowmelt, and effluent discharges, where present. In canyons affected by effluents, the alluvial groundwater and sediments contain the majority of adsorbing contaminants (such as plutonium). Mobile solutes (such as tritium, HE compounds, and anions) migrate with moving groundwater, and are present in recharge. Contaminated alluvial groundwater occurs in Acid/Pueblo, DP/Los Alamos, and Mortandad canyons, and in Cañon de Valle, and potentially in other canyons where full investigations have not yet been conducted. In Acid/Pueblo, DP/Los Alamos, and Mortandad canyons, the contamination resulted from discharges from radioactive liquid waste treatment facilities (and untreated discharges in Acid/Pueblo Canyon). The groundwater and sediments are contaminated with residual radionuclides, including cesium-137, strontium-90, plutonium isotopes, and americium-241. In Mortandad Canyon, samples collected from alluvial shallow groundwater monitoring wells (Wells MCO-3 through MCO-6) in Mortandad Canyon in December 1999 contained perchlorate concentrations ranging from 80 to 220 parts per billion (ppb). Other components of the discharges included fluoride and nitrate. Cañon de Valle contains residues from past discharges of HE wastewater.

A permeable reactive barrier was installed in Mortandad Canyon in 2002 to remove from alluvial aquifer water radionuclide and chemical contaminants resulting from legacy discharges to the canyon. Alluvial water that encounters the barrier is scrubbed of radionuclides (such as strontium-90, americium-241, and plutonium and uranium isotopes) as well as chemicals (such as perchlorate, nitrate, and heavy metals). To assess the effectiveness of the barrier, samples of water and materials inside the barrier's treatment box and water upstream and downstream of the barrier will be collected for analyses.

A.5.2 Intermediate Perched Groundwater Occurrence

The areas where intermediate perched zone groundwater has been encountered in wells are shown in Table A-1. Intermediate perched zones occur beneath major canyons, particularly in wet canyons that receive effluent discharges, have large surface water flow, or head in the Jemez

Mountains. These intermediate perched zones occur in the Guaje Pumice Bed at the base of the Bandelier Tuff, the underlying Cerros del Rio basalts, and the Puye Formation. The location of intermediate perched zones is determined by presence of sufficient recharge, permeability variations of the rocks (reflecting lithologic variations), and geologic structure. Intermediate perched zones may be confined or unconfined. Intermediate perched zones beneath canyons do not generally extend laterally beneath the mesas.

Within drier mesas (generally in the eastern portion of the Laboratory), water can occur in the Bandelier Tuff under unsaturated conditions. Relatively little water (~1 millimeter/year) moves downward beneath the mesa tops under natural conditions due to low rainfall, high evaporation, and efficient water use by vegetation. Atmospheric evaporation extends within mesas, drying out the mesa interior and decreasing downward flow. Moisture content of the tuff varies with recharge rate and with texture of the lithologic units (Nylander et al., 2001). Generally, at depths of below 10 ft, the moisture content of the tuff varies from about 4 to 6% on the mesas. In the eastern portion of the Laboratory (e.g., in Los Alamos Canyon), perching layers are found within the interbedded Cerros del Rio Basalt and the Puye Formation sediments, where they underlie the more permeable Guaje Pumice Bed (Table A-1).

For wet mesas (generally along the western portion of the Laboratory), water occurs in the Bandelier Tuff primarily under unsaturated conditions. At the mesa top Well R-25 at TA-16, relatively low moisture contents in the Tshirege Member of the Bandelier Tuff range from 2% to 5%. The moisture content increases through the lower units of this member to about 21% in the top of the Cerro Toledo interval. Moisture content in the upper portion of the Otowi Member is about 7%, and increases at depth to approximately 20%. Groundwater also occurs as transient zones of saturation and in perennial saturated ribbons of limited spatial extent, which feed springs on the mesa sides. The saturated zones are localized by fractures and by permeability changes related to lithologic variations within the Bandelier Tuff. Higher rainfall and increased welding and jointing of the tuff lead to greater recharge rates for wet mesas than observed in drier mesas. In addition to spring discharge at mesa sides, saturated and unsaturated flow through mesas result in recharge to the underlying intermediate perched zones or the regional aquifer. In the western portion of the Laboratory, groundwater occurs as a thick (300-ft) intermediate perched zone within the lower Bandelier Tuff and the Puye Formation, approximately 700 ft below the mesa top.

Mesa top recharge under disturbed surface conditions is higher than under natural conditions. Increased recharge occurs when the soil is compacted, when vegetation is disturbed, or when more water is added to the hydrologic system by features such as pavement or effluent discharge. Fractures within mesas could provide preferential pathways for contaminants, especially in regions of high infiltration and in rocks of low matrix permeability. Fracture flow is less likely to occur when the rock matrix is porous and permeable, because water is drawn out of the fractures.

Characterization over the past decade has significantly improved the understanding of the hydrogeologic setting at LANL, including intermediate perched zone groundwater. The vertical and lateral extent of the perched zones, the nature and extent of the perching units, and the potential for migration of perched groundwater to the regional aquifer continue to be investigated. Drilling of alluvial wells and regional aquifer wells that intersect intermediate perched groundwater has provided sufficient information thus far that indicates that neither alluvial nor perched saturated water exist to any significant vertical extent. From the data and information generated thus far, LANL believes that upon completion of the Hydrogeologic Workplan, anticipated in calendar year 2004, sufficient information will have been generated through well installation and modeling to create a technically-based conceptual model of the alluvial and perched water zones. Such information will help fulfill the objectives and purpose of site-wide characterization under the Hydrogeologic Workplan.

Upon completion of the Hydrogeologic Workplan, it is anticipated that additional hydrogeologic characterization will be performed as part of Investigation Work Plans for canyons and aggregate areas. Information obtained during these investigations will be used to continue improving the conceptual model of the alluvial and perched water zones.

A.5.2.1 Intermediate Perched Groundwater Flux

Lateral movement of intermediate perched groundwater may occur if the dip of the perching horizon and the canyon orientation do not coincide. Most recharge for west side perched intermediate groundwater originates as underflow of groundwater from the Jemez Mountains, with some contribution from recharge through mesas and canyon bottoms. Discharge from the intermediate perched zones occurs at springs or results in recharge to the underlying regional aquifer. Studies have shown that the intermediate perched zone groundwater in Pueblo Canyon is hydrologically connected to the stream in Pueblo Canyon (Abrahams and Purtymun, 1966). This perched zone water discharges at the base of the basalt at Basalt Spring, located on San Ildefonso Pueblo land

east of LANL in lower Los Alamos Canyon. It has been estimated that the rate of movement of the perched groundwater in this vicinity is about 60 ft per day, or about 6 months from recharge to discharge (Purtymun, 1975).

The direction and flux of water through the unsaturated zone have been examined in two studies. Rogers and Gallaher (1995) tabulated Bandelier Tuff core hydraulic properties from several boreholes at LANL to estimate recharge rates beneath the Pajarito Plateau. Rogers et al. (1996) used hydraulic properties from seven boreholes that had sufficient data to evaluate movement of water in the vadose zone. The seven boreholes were from mesa top and canyon bottom locations, which represent two of the distinct hydrologic regimes on the Pajarito Plateau. Most head gradients determined for the boreholes were approximately unity, thus implying that flow is nearly steady state. One exception was found for boreholes at TA-54, Area G, where gradient reversals at depths of about 100 ft suggest that evaporative drying may be occurring.

Infiltration rates for liquid water at the seven locations were approximated by Rogers et al. (1996), who used vertical head gradients and unsaturated hydraulic conductivity estimates in their calculations. As such, the apparent fluxes beneath mesa top locations range from approximately 0.06 centimeters per year (cm/yr) beneath Area G to 245 cm/yr directly beneath the TA-53 surface impoundments when they were operational. It is believed that high precipitation or surface disturbances (e.g., man-made ponds) lead to higher fluxes beneath some mesas. Beneath Cañada del Buey and Potrillo Canyon, two typically dry canyons, the apparent canyon-bottom infiltration rates range from 0.4 to 8.3 cm/yr. Beneath Mortandad Canyon, the canyon-bottom infiltration rates range from 1 to 10 cm/yr. More recent data from wet canyons have been interpreted to provide more comprehensive estimates. For Well R-15 in Mortandad Canyon, moisture profile measurements yield infiltration rate estimates on the order of 50 cm/yr. In Los Alamos Canyon, similar estimation techniques in canyon well LADP-3 were estimated to be consistent with infiltration rates of about 10 to 60 cm/yr. Such values are large enough that contaminants are predicted to travel through at least 100 meters of Bandelier Tuff during the time of Laboratory operations. This result is consistent with the observations of relatively deep penetration of contaminants such as perchlorate ion in R-15.

A.5.2.2 Intermediate Perched Groundwater Quality

Water quality within intermediate perched zones reflects that of the recharge water, including effluent discharges and native groundwater. Flow within intermediate perched zones could

transport contaminants away from their surface source. Measurements of tritium in intermediate perched zone groundwater indicate that recharge to those depths has occurred during the last several decades. Observations made at four locations in Pueblo and Los Alamos canyons show that levels of tritium in the perched zone are high enough to be attributed to recharge of surface water contaminated by effluent or other releases from LANL operations. In a test well in Pueblo Canyon (TW-2A), tritium has been observed at concentrations between 2,000 and 3,000 picocuries per liter (pCi/L). Beginning in 1991, low-detection-limit tritium measurements have shown tritium levels of about 150 pCi/L in samples from a test well located in lower Pueblo Canyon near its confluence with Los Alamos Canyon (TW-1A), and in Basalt Spring, which is located in Los Alamos Canyon just downstream from its confluence with Pueblo Canyon. Measurements at these three locations are consistent with LANL's previous understanding that the intermediate perched zone groundwater in Pueblo Canyon has been affected by effluents discharged into the canyon. In the middle reach of Los Alamos Canyon, about one mile down gradient of TA-2, tritium was detected in the intermediate perched zone at well LADP-3 (Broxton and Eller, 1995). Perched groundwater was encountered at a depth of about 320 to 330 ft at this well, and water samples contained about 6,000 pCi/L of tritium.

In June 2001, characterization well MCOBT-4.4 was installed at the confluence of Mortandad and Ten Site canyons. Mortandad Canyon received effluent discharged from LANL's former wastewater treatment plant at TA-35 from 1951 to 1963 and from LANL's Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50 from 1963 to present. Tritium, fluoride, nitrate plus nitrate (as N), and perchlorate were detected in the perched groundwater samples collected from MCOBT-4.4. The nitrate and perchlorate concentrations exceeded the EPA primary standard for nitrate (10 milligrams per liter [mg/L]) and the draft provisional risk-based level for perchlorate (1 microgram per liter [µg/L]). Additional characterization sampling is being conducted at this well to evaluate contaminant concentrations in the perched zone (Broxton et al., 2002a). Results to date show that perchlorate concentrations range from 140 to 180 µg/L (ppb) at depths of 492 to 524 ft (Longmire, 2003).

A.5.3 Regional Aquifer Groundwater Occurrence

The regional aquifer of the Los Alamos area is the only aquifer known to be capable of providing the Los Alamos County community and Laboratory water supply (Purtymun, 1984). The surface of the regional aquifer rises westward from the Rio Grande within the Santa Fe Group into the lower part of the Puye Formation beneath the central and western parts of the Pajarito Plateau. The depth to the regional aquifer below the mesa tops (and adjacent canyons) ranges from about 600 ft at the

eastern margin of the plateau (or near the surface at the Rio Grande) to about 1,200 ft along the western margin (or 900 ft below the deepest canyons). According to Purtymun (1984), the regional aquifer exhibits artesian conditions in the eastern part along the Rio Grande. Throughout the plateau, continuously recorded water level measurements collected in test wells since the Fall of 1992 indicate that the regional aquifer responds to barometric and earth tide effects in a manner typical of confined aquifers.

Twelve deep water-supply wells in three well fields currently produce water for LANL and the communities of Los Alamos and White Rock. The well fields include the off-site Guaje well field and the on-site Pajarito and Otowi well fields. The Guaje well field is located northeast of LANL and contains five production wells. The five production wells in the Pajarito well field are located in Sandia and Pajarito canyons and on mesa tops between these canyons. The Otowi well field is located in Los Alamos and Pueblo canyons, and consists of two production wells. Production of potable municipal water supplies from these three well fields from 1998 through 2001 ranged from approximately 1.32 billion gallons in 1999 to 1.51 billion gallons in 2000 (Koch and Rogers, 2003). Yields from individual production wells ranged from about 375 to 1,479 gallons per minute from 1998 through 2001 (Koch and Rogers, 2003). The long-term trends in water levels reflect a plateau-wide decline in regional aquifer water levels in response to municipal water production. The average annual decline is gradual and has ranged from 0.7 to 2 ft per year for production wells (Koch and Rogers, 2003).

A.5.3.1 Regional Aquifer Groundwater Flux

The Rio Grande is the main discharge area for the regional aquifer. The largest component of recharge occurs as underflow of groundwater from the Sierra de los Valles, to the west of the Pajarito Plateau. Recharge also occurs by leakage from wet mesas, from alluvial groundwater in canyon bottoms on the Pajarito Plateau, and from intermediate perched groundwater. Local recharge on the Pajarito Plateau is important because it provides potential pathways for contaminants that originate from effluent discharges (Nylander et al., 2001).

Recharge due to infiltration and percolation of alluvial groundwater can be a source of recharge to underlying intermediate perched zones and to the regional aquifer, usually by unsaturated flow. Recharge from alluvial groundwater by unsaturated flow accounts for important volumes of recharge and relatively rapid rates of groundwater flow (reaching the regional aquifer in decades or less). In some cases, recharge might occur by saturated flow. Faults, fractures, joints, surge beds,

and higher permeability geologic units that underlie saturated alluvium (such as the Guaje Pumice Bed, Cerro Toledo Interval, Cerros del Rio basalts, and Puye Formation) could provide pathways for downward movement of water and contaminants. Moisture content of the Bandelier Tuff below wet canyons is approximately 6% to saturation. In Mortandad Canyon, a wet canyon due to effluent discharges, the moisture content in the Otowi Member is about 20% at Well R-15. Moisture content in the underlying Cerros del Rio Basalt ranges from 0.5 to 14.6% (LANL, 2000a). Additional information on Los Alamos groundwater and vadose zone characteristics will be published in groundwater annual status reports, drill hole or characterization well completion reports, and other technical reports.

Isotope and age-dating measurements have been made in an effort to better understand the nature of recharge to the regional aquifer. Samples from test wells and water-supply wells that penetrate the regional aquifer were analyzed for carbon-14 and low-level tritium to allow tentative estimates of the age of the water in the regional aquifer at various locations. The interpretation of the carbon-14 data indicates that the minimum age of water in the regional aquifer varies. Under the western portion of the plateau, the minimum age is about 1,000 years. As the water moves eastward, the age increases. Near the Rio Grande, the age of water is about 30,000 years (Rogers et al., 1996). It is important to recognize that, because the samples were collected from water drawn from screened intervals of 600 to 3,100 ft, these ages are composite water ages. Nonetheless, these ages are consistent with easterly flow, with younger water recharging at the plateau's western boundary and flowing towards the east.

Groundwater samples from the regional aquifer near Los Alamos appear to show the presence of some recent (within the last 40 years) recharge. Samples from five locations detected tritium in several measurements by extremely low-detection-limit analytical methods (Environmental Protection Group, 1995, 1994). These locations include TW-1 in Pueblo Canyon near the confluence with Los Alamos Canyon, TW-3 in Los Alamos Canyon, old observation and water-supply wells LA-1A and LA-2 in Los Alamos Canyon near its confluence with the Rio Grande, TW-8 in Mortandad Canyon, and in wells and springs at San Ildefonso Pueblo (Environmental Protection Group, 1995; Blake et al., 1995). The tritium levels measured range from less than a percent to less than a hundredth of a percent of current drinking water standards. In addition, these levels are less than the levels that could be detected by EPA-specified analytical methods normally used to determine compliance with drinking water regulations. Additionally, samples from water-supply well Otowi-1 collected during 2000 detected perchlorate (see Section A.5.3.2) that documents recent

recharge to the regional aquifer.

The regional hydraulic gradient is generally to the east, with a slight southerly component in some areas. As shown in Table A-2, the gradient is fairly steep in the western portion of the plateau within the Puye Formation, less steep in the central portions, then steepening again to the east as the groundwater approaches the Rio Grande. Locally, gradients may depart from these larger scale estimates; uncertainty due to local variations at scales less than R-well spacing is probably larger than uncertainty due to measurement error. Permeability data (provided in Table A-3) show that considerable variation in permeability is present in the aquifer. Assuming average aquifer properties measured in wells in the central portion of the plateau, LANL estimates a typical groundwater velocity to be 33 meters per year [m/yr] (see Table A-4). This is in good agreement with previous estimates (Purtymun, 1995). Any such estimate has inherent uncertainties due to the difficulty in estimating the effective porosity of the medium. By choosing a value on the low end of the range typically assumed for sedimentary rocks, it is thought that the groundwater velocity estimate is a maximum bound.

A.5.3.2 Regional Aquifer Groundwater Quality

Continued testing of water-supply wells, test wells, and springs in 2001 confirm the overall quality of the regional aquifer (LANL, 2002). Trace levels of tritium are present in the regional aquifer in a few areas where past liquid waste discharges occurred, notably beneath Los Alamos, Pueblo, and Mortandad canyons. The highest tritium level found in a regional aquifer test well (Test Well-1), near water-supply well Otowi-1, was about 1/50 of the drinking water standard of 20,000 pCi/L (LANL, 2002). Tritium continued to be found in water-supply well Otowi-1, located in Pueblo Canyon, in 2001 at a level that is 1/500 the drinking water standard. Except for above-background tritium in water-supply well Otowi-1, no other radionuclides other than naturally-occurring uranium were found in Los Alamos County, San Ildefonso Pueblo, or Santa Fe water-supply wells (LANL, 2002). Nitrate concentration in Test Well-1 remained elevated; however, in 2001, the concentration was only about half the drinking water standard of 10 mg/L, and nitrate was higher than background in water-supply well Otowi 1 (LANL, 2002).

The EPA named perchlorate as a contaminant of concern after studies linked the chemical to thyroid disorders and other potential health problems. Perchlorate is a non-radioactive chemical compound used in a variety of industrial processes. At LANL, perchlorate is a byproduct of the perchloric acid used in nuclear chemistry research. Low-level concentrations (2 to 3 ppb) of

perchlorate were detected in late June 2000 in water samples collected from the Otowi-1 water-supply well located in lower Pueblo Canyon (LANL, 2000b). Independent analytical laboratories corroborated LANL's analytical results, and in four separate samples collected between June 21, 2000, and July 6, 2000, perchlorate concentrations in the Otowi-1 well ranged from 2 to 3.5 ppb. In 2001, perchlorate was detected in samples collected from the Otowi-1 well at concentrations of 1.7 and 5.85 µg/L (ppb); these concentrations were dependant on analytical method (LANL, 2002). Ion chromatography (IC) and liquid chromatography/mass spectrometry/mass spectrometry (LC/MS/MS) were used to analyze samples collected from Otowi-1. These two methods have different detection limits; the LC/MS/MS method has a lower detection limit than the IC method.

EPA has not yet established a drinking water standard for perchlorate, but has recommended safe drinking water levels ranging from 4 to 18 ppb. The State of California, in response to EPA studies, lowered its perchlorate standard from 18 to 4 ppb. An action level or regulatory standards have not been established by the State of New Mexico. In 1998, the EPA added perchlorate to the Safe Drinking Water Act's Contaminant Candidate List for consideration for possible regulation; however, a finalized toxicity assessment and technical guidance development must be completed before a federal drinking water regulation for perchlorate would be promulgated.

LANL began testing for perchlorate in December 1997 after the California Department of Health Services identified perchlorate as a contaminant of concern. A possible source for the contamination could be legacy waste that was discharged into Acid Canyon from LANL's TA-45 treatment plant, which operated from 1943 to 1964. The plant was decommissioned in 1966 and 1967. Prior to the June 2000 detection, perchlorate had not been detected in any water-supply wells. Since 1997, LANL has submitted samples to external laboratories that utilize the most current industry-recognized minimum detection limits for perchlorate. Since 1999, LANL has sampled and analyzed (internally) four drinking water wells and several shallow and intermediate groundwater monitoring wells using the minimum detection limit of 4 ppb. Historical industry detection limits prior to 1997 were 100 ppb.

LANL personnel have successfully demonstrated the effectiveness of a new ion-exchange system installed in March 2002 at the TA-50 RLWTF, which discharges treated effluent to Mortandad Canyon. Since the installation of this special ion-exchange resin system, perchlorate concentrations in the discharged effluent have been reduced to below the EPA's approved testing method detection limit of 4 ppb. Between January 2000 and April 2001, before the new ion-

exchange system was installed, monthly composite samples of effluent discharged from the RLWTF showed concentrations that ranged between 3 and 950 ppb. The modifications to the treatment operations have significantly decreased perchlorate concentrations in water discharged from the treatment facility.

Regulated units (i.e., surface impoundments, waste piles, land treatment units, and landfills, as provided by 20.4.1 NMAC § 264.90(a)(2) [6-14-00]) will meet the requirements specified in 20.4.1 NMAC §§ 260.90-100 [6-14-00], as appropriate. Currently, the regulated units at LANL include the Area G landfills (Pit 29 and Shaft 124), the Area H landfill (Shaft 9), and the Area L landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D). Areas G, H, and L are located at TA-54. Interim status groundwater monitoring data for the regulated units at LANL were not obtained as part of a groundwater monitoring program, as required by 20.4.1 NMAC §270.14(c)(1), because LANL had submitted groundwater monitoring waiver demonstrations, in accordance with 20.4.1 NMAC § 265.90(c). These waiver requests were subsequently denied, and NMED requested that LANL develop the Hydrogeologic Workplan, which would address the requirements of 20.4.1 NMAC §§ 264.91 through 264.100 for regulated units and 20.4.1 NMAC § 264.101 for solid waste management units that have been determined to have had a release. The Hydrogeologic Workplan is being used to characterize the site-wide hydrogeologic setting at the facility. The data collected will help in the identification of the regional aquifer and any hydraulically-interconnected aquifers beneath the facility property, including groundwater flow direction and rate, and the basis for such identification, as required by 20.4.1 NMAC § 270.14(c)(2). It will also be used to establish a technical basis for siting potential future monitoring wells. The groundwater wells constructed pursuant to the Hydrogeologic Workplan may be used to monitor groundwater, and, if necessary, the well characterization and groundwater monitoring data collected will be used as inputs to determine points of compliance, as required by 20.4.1 NMAC § 264.95, as well as potential future locations of groundwater monitoring wells.

As required in 20.4.1 NMAC § 270.14(c)(3), topographic maps of the hazardous waste management areas at TA-54 are included in the LANL General Part A and in the “Los Alamos National Laboratory Technical Area 54 Permit Renewal Application,” Revision 3.0 (LANL, 2003). These maps also show the property boundary (if allowed by map scale) and the locations of R wells installed at the time the maps were generated. The “point of compliance,” as defined under 20.4.1 NMAC § 264.95, and the groundwater flow direction and rate will be added to these maps in General Part A revisions, as appropriate, when this information is developed and refined,

respectively. There is currently no known groundwater contamination from the regulated units at TA-54; therefore, a description of any plume of contamination that has entered the groundwater, as required by 20.4.1 NMAC § 270.14(c)(4), is not provided herein. LANL is currently developing a facility-wide groundwater monitoring plan which will, among other topics, discuss relevant and appropriate groundwater monitoring provisions for LANL's regulated units and solid waste management units, as required by 20.4.1 NMAC § 270.14(c)(5) through (8).

A.5.4 Groundwater Characterization

To date, numerous characterization wells have been drilled, as required by the Hydrogeologic Workplan (LANL, 1998). The installed wells include Wells R-5, R-7, R-8, R-9, and R-9i (Los Alamos/Pueblo Canyon), R-12 (Sandia Canyon), R-13 and R-15 (Mortandad Canyon), R- 14 (Ten Site Canyon), R-16 (Overlook Park in White Rock), R-19 (mesa top above Threemile and Potrillo canyons), R-21 and R-22 (on Mesita del Buey between Pajarito Canyon and Cañada del Buey), R-20, R-23, and R-32 (Pajarito Canyon), R-25 (south rim of Cañon de Valle), and R-31 (Ancho Canyon). The following provides brief descriptions of each of the characterization wells. Additional information will continue to be provided to the NMED Hazardous Waste Bureau via well summary reports, well completion reports, monitoring reports, and other technical reports.

- Well R-5 is located in lower Pueblo Canyon between the Los Alamos County Sewage Treatment Plant and water-supply well Otowi-1. Drilling activities started in April 2001, and well installation was completed in May 2001. The total depth of Well R-5 is 902 ft. The regional aquifer was reached at a depth of 685 ft. The well was completed with four screened intervals at depths of 326-331 ft, 373-389 ft, 677-720 ft, and 859-864 ft. Based on the analytical results from screening samples collected from the borehole during drilling, it appears that contamination from Laboratory discharges is not present in the regional aquifer at this well site. Additional information for Well R-5 is presented in the "Characterization Well R-5 Completion Report" (Risk Reduction and Environmental Stewardship Division [RRES] Groundwater Protection Program [GPP], 2003a).

- Well R-7 is located in upper Los Alamos Canyon. Drilling activities began in February 2000, and well construction and development were completed in February 2001. The well was drilled to a total depth of 1,097 ft. The regional aquifer was reached at a depth of 903 ft. The R-7 well was completed with three screened intervals: two associated with perched saturation at depths of 363-379 ft and 730-746 ft; and one straddling the regional water table at 895-937 ft. No

contaminants above background were detected in samples collected from the borehole during drilling. Additional information for Well R-7 is published in the “Characterization Well R-7 Completion Report” (Stone et al., 2002).

- Well R-8 is located in Los Alamos Canyon, downstream of the confluence with DP Canyon. Drilling activities began in September 2001, and well construction and development were completed in February 2002. The R-8 well was drilled to a total depth of 1,022 ft. The regional aquifer was reached at a depth of 709 ft. The well was completed with two screened intervals at depths of 705-756 ft and 821-828 ft. Based on the analytical results from screening samples collected from the borehole during drilling, tritium is present at a slightly elevated level above background. Additional information for Well R-8 is presented in the “Characterization Well R-8 Completion Report” (RRES GPP, 2003b).

- Well R-9 is located in Los Alamos Canyon at the eastern boundary of LANL. During the drilling of the well to a total depth of 771 ft, five perched water zones were encountered. The regional aquifer was reached at a depth of 688 ft. Tritium levels were highest (347 pCi/L) in the uppermost perched zone and lowest (14 pCi/L) in the regional aquifer. These levels are far below the levels of health concern (20,000 pCi/L), but do indicate the movement of some water from the land surface to the groundwater zones within the past 40 or so years. Additional information for Well R-9 is published in the "Characterization Well R-9 Completion Report" (Broxton et al., 2001a).

- Well R-9i was completed in March 2000 near the eastern LANL boundary in Los Alamos Canyon to a depth of 322 ft with two screened intervals in the upper saturated zones identified in Well R-9. Additional information for Well R-9i is published in the "Characterization Well R-9i Completion Report" (Broxton et al., 2001b).

- Well R-12 is located in Sandia Canyon at the eastern boundary of LANL. This well was drilled to a total depth of 886 ft. An intermediate-depth perched groundwater zone was encountered at a depth of 424 ft, and the regional aquifer was reached at a depth of 805 ft. The perched groundwater at the 424-ft depth was found to contain nitrate, ammonia, chloride, and tritium (208.1 pCi/L). The presence of some recent recharge water is indicated at this regional aquifer location by tritium levels of 46.9 pCi/L; nitrogen isotopes present indicate a sewage influence.

Additional information for Well R-12 is published in the "Characterization Well R-12 Completion Report" (Broxton et al., 2001c).

- Well R-13 is located in Mortandad Canyon. Drilling activities began in August 2001, and well construction, development, and site completion were finished in February 2002. The borehole was drilled to a total depth of 1,133 ft, and the well was installed to a total depth of 1,029.4 ft. No perched water was encountered; the regional aquifer was reached at a depth of 834 ft. The well was completed with one screened interval in the regional aquifer at a depth of 958-1,019 ft. Based on the analytical results from water samples collected from the borehole during drilling, it appears that contamination from Laboratory discharges is not present in the regional aquifer at this well site. Additional information is presented in the “Characterization Well R-13 Completion Report” (RRES GPP, 2003c).

- Well R-14 is located in Ten Site Canyon, east of the former radioactive liquid waste treatment and septic facilities at TA-35. Preparation and drilling activities began in May 2002, and well construction, development, and site completion were finished in February 2003. The well was drilled to a total depth of 1,327 ft. No perched water zones were encountered; the regional aquifer was reached at a depth of 1,182 ft. The well was completed with two screened intervals in the regional aquifer at depths of 1,201-1,233 ft and 1,286-1,293 ft. Two water samples were collected from the screened intervals in the regional aquifer during well development activities. Based on the analytical results for these samples, it appears that contamination from Laboratory discharges is not present in the regional aquifer at this well site. Additional information is presented in the “Characterization Well R-14 Completion Report” (RRES GPP, 2003d).

- Well R-15 is located in Mortandad Canyon about 1.5 miles east of the RLWTF at TA-50. Both hollow stem auger and air rotary/casing advance methods were used in drilling this well. A definable intermediate perched zone was encountered at a depth of 646 ft, and the regional aquifer was reached at a depth of 964 ft. The total depth of Well R-15 is 1,107 ft. The deep perched zone contained tritium at concentrations of 3,770 ± 850 pCi/L; these levels indicate infiltration of Laboratory-derived contaminants at this location, but the levels are well below federal drinking water standards. The tritium concentration in the regional aquifer at Well R-15 is less than detection. A perchlorate concentration of 12 ppb was detected in the perched

water zone at Well R-15 in December 1999 (LANL, 2000c). Additional information for Well R-15 is published in the "Characterization Well R-15 Completion Report" (Longmire et al., 2001a).

- Well R-16 is located just south of Cañada del Buey near Overlook Park in White Rock, and immediately upstream from the sanitary sewage treatment plant. Preparation and drilling activities began in July 2002, and well construction and development were completed in December 2002. The well was drilled to a total depth of 1,287 ft, and the zone of regional groundwater saturation was encountered at a depth of 642 ft. The well was completed with four screened intervals at depths of 641-649 ft, 863-871 ft, 1,015-1,022 ft, and 1,237-1,245 ft. Three water samples were collected after well development, one each from the lower three screened intervals. Based on analytical results for these three samples, contamination from Laboratory discharges does not appear to be present in the regional aquifer at this well site. Additional information is presented in the “Characterization Well R-16 Completion Report (RRES GPP, 2003e).

- Well R-19 was completed near TA-36 on the mesa above Threemile and Potrillo canyons to a depth of 1,902 ft with seven screens: two in the perched zone; and five in the regional aquifer. Additional information for Well R-19 is published in the "Characterization Well R-19 Completion Report" (Broxton et al., 2001d).

- Well R-20 is located in Pajarito Canyon, just east of TA-18 on the south side of Pajarito Road. Preparation and drilling activities began in July 2002, and well construction, development, and site completion activities were finished in March 2003. The borehole was drilled to a total depth of 1,365 ft. No perched zones were encountered during drilling, and the regional aquifer was reached at a depth of 873 ft. The well was completed with three screened intervals in the regional aquifer at depths of 905-912 ft, 1,147-1,155 ft, and 1,329-1,336 ft. Two regional aquifer water samples were collected from the developed well. Although strontium-90 was detected near the minimum detection activity level, the absence of tritium suggests that the waters have not been impacted by Laboratory releases. Additional information is presented in the “Characterization Well R-20 Completion Report” (RRES GPP, 2003f).

- Well R-21 is located in Cañada del Buey north of TA-54. This well was installed between October 2002 and February 2003. It was advanced to a depth of 995 ft. No perched water zones were encountered during borehole advancement, and the static water level of the

regional aquifer was determined to be at a depth of approximately 804 ft. Based on the analytical results for screening samples collected from the single well screen, which extends from 889 ft to 907 ft below ground surface, potential contaminants of concern were not detected. Additional information for this well is published in the “Characterization Well R-21 Completion Report” (Kleinfelder, Inc., 2003).

- Well R-22 was drilled on Mesita del Buey east of TA-54, Area G, to a depth of 1,489 ft. Drilling activities began in August 2000, and well construction and development were completed in November 2000. The regional aquifer was reached at a depth of 883 ft; no perched intermediate groundwater was encountered in Well R-22. The well was completed with five screened intervals in the regional zone of saturation at depths of 872-914 ft, 947-989 ft, 1,272-1,279 ft, 1,378-1,385 ft, and 1,447-1,452 ft. Samples collected from the borehole during drilling contained tritium at concentrations above background. Additional information for Well R-22 is published in the "Characterization Well R-22 Completion Report" (Ball et al., 2002).

- Well R-23 is located in Pajarito Canyon, just west of the intersection of State Road 4 and Pajarito Road and on the south side of Pajarito Road. Preparation and drilling activities began in July 2002, and well construction, development, and site completion activities were finished in March 2003. The borehole was drilled to a total depth of 935 ft. A possible perched zone was encountered at a depth of 470 ft, and the regional aquifer was reached at a depth of 829 ft. The well was completed with one screened interval in the regional aquifer at a depth of 816-873 ft. Based on the analytical screening results of the regional groundwater samples collected, contamination from Laboratory discharges does not appear to be present in the regional aquifer at this well site. Additional information is presented in the “Characterization Well R-23 Completion Report” (RRES GPP, 2003g).

- Well R-25 is located on a mesa top at TA-16 along the south rim of Cañon de Valle near the western boundary of LANL. The total depth of Well R-25 is 1,942 ft, and the regional aquifer was reached at a depth of 1,286 ft. Well R-25 was completed with nine screened intervals: three in the upper zone of saturation; one in the intervening alternating wet/dry zone; and five in the regional zone of saturation. Contaminants detected in borehole samples included HE compounds and their associated degradation products. Subsequently, quarterly sampling has detected solvent compounds. Additional information for Well R-25 is published in the "Characterization Well R-25 Completion Report" (Broxton et al., 2002b).

- Well R-31 is located at TA-39 in the north fork of Ancho Canyon near the southern boundary of LANL. This well was drilled to a total depth of 1,103 ft. The regional zone of saturation was encountered between 521 and 537 ft; no intermediate perched zones were encountered in this well. Additional information for Well R-31 is published in the "Characterization Well R-31 Completion Report" (Vaniman et al., 2002).

- Well R-32 is located in Pajarito Canyon, within TA-36 and south of TA-54, on the north side of Pajarito Road. Preparation and drilling activities began in July 2002, and well construction, development, and site completion activities were finished in March 2003. This well was drilled to a total depth of 1,008 ft. Perched groundwater was encountered in the alluvium at a depth of 22 ft. No other perched zones were identified. The regional aquifer was reached at a composite depth of 783 ft. The well was completed with three screened intervals in the regional aquifer at depths of 867-875 ft, 932-935 ft, and 973-981 ft. Based on analytical results for water samples collected at each screened interval, contamination from Laboratory discharges does not appear to be present in the regional aquifer at this well site. Additional information is presented in the “Characterization Well R-32 Completion Report” (RRES GPP, 2003h).

The following provides brief descriptions of wells that were installed for further investigation of contaminants in groundwater:

- CdV-R-15-3 was completed at TA-15 on the mesa above Cañon de Valle in June 2000 with six screened intervals: three in the upper perched zone and three in the regional zone of saturation. The three perched zone screens are dry. Additional information for Well CdV-R-15-3 is published in the "Well CdV-R-15-3 Completion Report" (Kopp et al., 2002).

- MCOBT-4.4 in Mortandad Canyon was drilled to a total depth of 767 ft in June 2001. The borehole was plugged up to a depth of 725 ft and a single completion well was installed.

- MCOBT-8.5 in Mortandad Canyon was drilled to a total depth of 740 ft in June 2001. The borehole was plugged up to a depth of 670 ft in order to install a well in Cerros del Rio basalt. However, after several days of monitoring, the borehole did not yield water and MCOBT-8.5 was plugged back to the surface.

A.6 OTHER PERMIT ACTIVITIES

Other types of Resource Conservation and Recovery Act permits will be addressed in TA-specific permit applications, permit modification requests, or permit renewal applications.

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Table A-1
Occurrences of Intermediate-Depth Perched Groundwater

Well	Perched Water Level Depth (ft)	Unit Containing Perched Saturation	Data Source
Pueblo Canyon			
TW-2A	120	Puye Formation	Purtymun, 1995
O-1	183	Puye Formation	Purtymun, 1995
TW-1A	180	Cerros del Rio Basalt	Purtymun, 1995
R-5	375	Cerros del Rio Basalt	Longmire, 2001b
Los Alamos Canyon			
H-19	(20-ft interval)	Guaje Pumice Bed	LANL, 1995
R-7	378	Guaje Pumice Bed/Puye Formation	Longmire, 2001b
LAO(A)	295	Guaje Pumice Bed	LANL, 1995
LADP-3	325	Guaje Pumice Bed	LANL, 1995
O-4	253	Puye Formation	Purtymun, 1995
R-9	137	Cerros del Rio Basalt	Broxton et al., 2000
R-9	264	Cerros del Rio Basalt	Broxton et al., 2000
R-9	524	Cerros del Rio Basalt	Broxton et al., 2000
Sandia Canyon			
R-12	424	Cerros del Rio Basalt	Broxton et al., 2000
PM-1	450	Cerros del Rio Basalt	Purtymun, 1995
Mortandad Canyon			
MCM-51	55	Tsankawi/Cerro Toledo	LANL, 1997
MCM-5.9	105	Tsankawi/Cerro Toledo	LANL, 1997
R-15	646	Cerros del Rio Basalt	Longmire et al., 2000
Pajarito Canyon			
SHB-4	145	Cerro Toledo interval	LANL, 1998
R-19	909	Puye Formation	Longmire, 2001b
54-1016	592	Cerros del Rio basalt	LANL, 1998
Cañon de Valle			
R-25	747	Otowi Member	Nylander et al., 2001
Ancho Canyon			
R-31	440	Cerros del Rio basalt	Marin, 2000

Table A-2

Estimated West-East Hydraulic Gradients

Pair of Wells				West-East Distance (m)	Gradient (m/m)
Upgradient Well	Water level (m)	Downgradient Well	Water level (m)		
R25	1836	CDV15-3	1833	2189	-0.02884
CDV15-3	1833	R19	1795	4710	-0.02149
DT-10	1805	R22	1747	5195	-0.01121
R15	1785	R12	1738	3684	-0.01283

Table A-3

Permeability Data for Rocks in the Regional Aquifer

Stratigraphic Unit	Well	Permeability (log m^2)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (m/yr)
Tsf	O-1	-12.64	0.63	70.11
	LA-6	-12.36	1.22	135.76
	LA-5	-12.84	0.4	44.51
	LA-4	-12.56	0.44	48.96
	LA-3	-12.8	0.44	48.96
	LA-2	-12.77	0.47	52.30
	LA-1B	-12.35	1.25	139.10
	G-4	-12.26	1.51	168.03
	G-3	-12.59	0.71	79.01
	G-2	-12.36	1.22	135.76
	G-1A	-12.36	1.22	135.76
	G-1	-12.47	0.94	104.60
Tsfuv	DT-9	-11.23	16.35	1819.44
	O-4	-11.84	4.02	447.35
	PM-4	-11.94	3.22	358.32
Tpf	TW-8	-11.92	3.35	372.79
	R-15	-12.14	2.01	223.67
	R-15	-11.92	3.32	369.45
	R-19	-11.2	17.5	1947.41
	R-19	-11.15	19.6	2181.10
	CDV-R-15	-13.05	0.25	27.82
	CDV-R-15	-13.44	0.1	11.13
	R-9[a]	-15.22	.002	0.18
	R-12[a]	-17.8	4.E-6	.0005
	R-12[a]	-15.01	.003	0.30
Tpt	TW-3	-11.24	16.08	1789.39
	TW-2	-10.93	32.39	3604.38
	TW-1	-12.71	0.54	60.09

Stratigraphic Unit	Well	Permeability (log m^2)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (m/yr)
Tb	PM-5	-12.59	0.71	79.01
	G-5	-12.38	1.17	130.20
	DT-10	-11.27	14.87	
	R-31	-12.41	1.07	119.07
	R-31	-12.82	0.42	46.74
	R-31	-11.88	3.62	402.84
	R-31	-14.49	0.01	1.11
	R-31	-14.6	0.01	1.11
	R-9i	-10.87	37.07	4125.17
	R-9i	-12.55	0.78	86.80
	R-9[a]	-14.9	.003	0.30
	R-12[a]	-18.4	1.1E-6	.00012
Tt	TW-4	-12.04	2.55	283.77
Average[b]		-12.30	1.38	153.25

[a] Derived from core measurements
[b] Excluding core measurements

Table A-4

Groundwater Velocity Estimate

Gradient (m/m)	Hydraulic Conductivity (m/yr)	Porosity	Calculated Velocity (m/yr)
.019[a]	176 m/yr[b]	0.1[c]	33

[a] Average of gradients shown in Table A-2
[b] Geometric average of data shown in Table A-3, excluding LA well field (due to its lower permeability)
[c] At low end of range typically reported for sedimentary rocks (0.1 – 0.3)

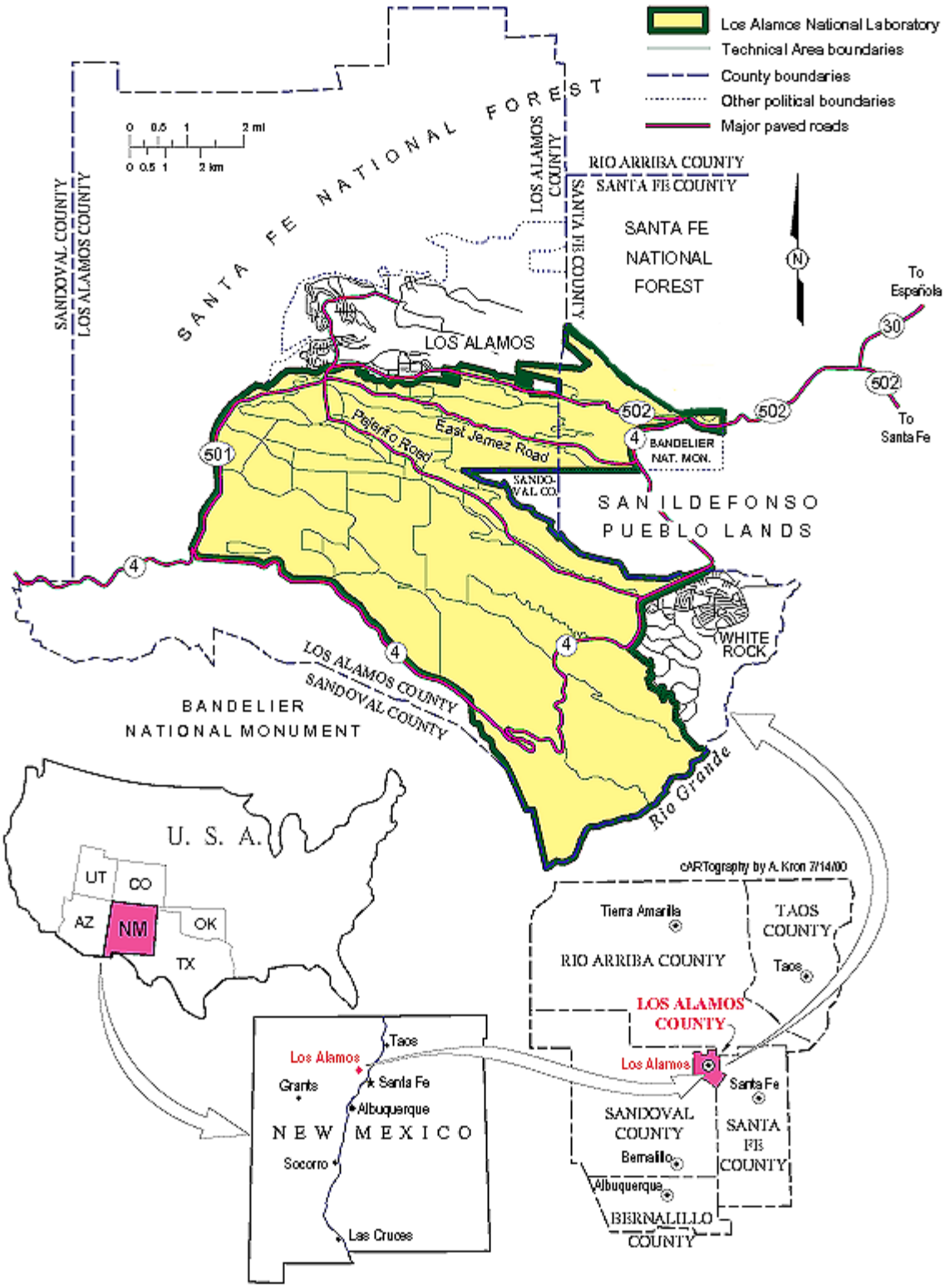

Figure A-1

Regional Location Map of Los Alamos National Laboratory and Surrounding Land Use

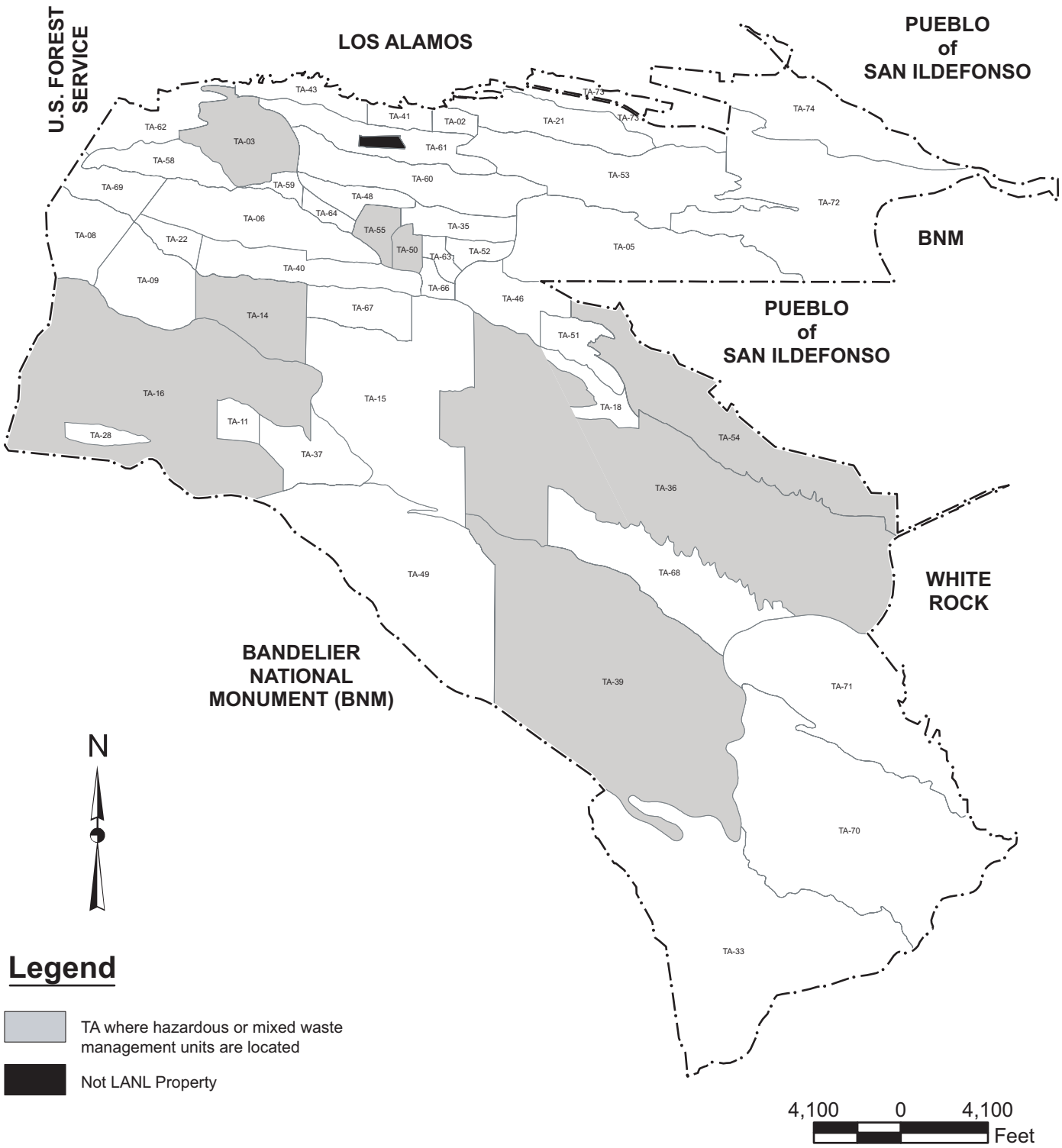

Figure A-2
Location Map of Los Alamos National Laboratory (LANL) Technical Areas (TA)

State Plane Coordinate System New Mexico Central Zone North American Datum 1983 (ft)

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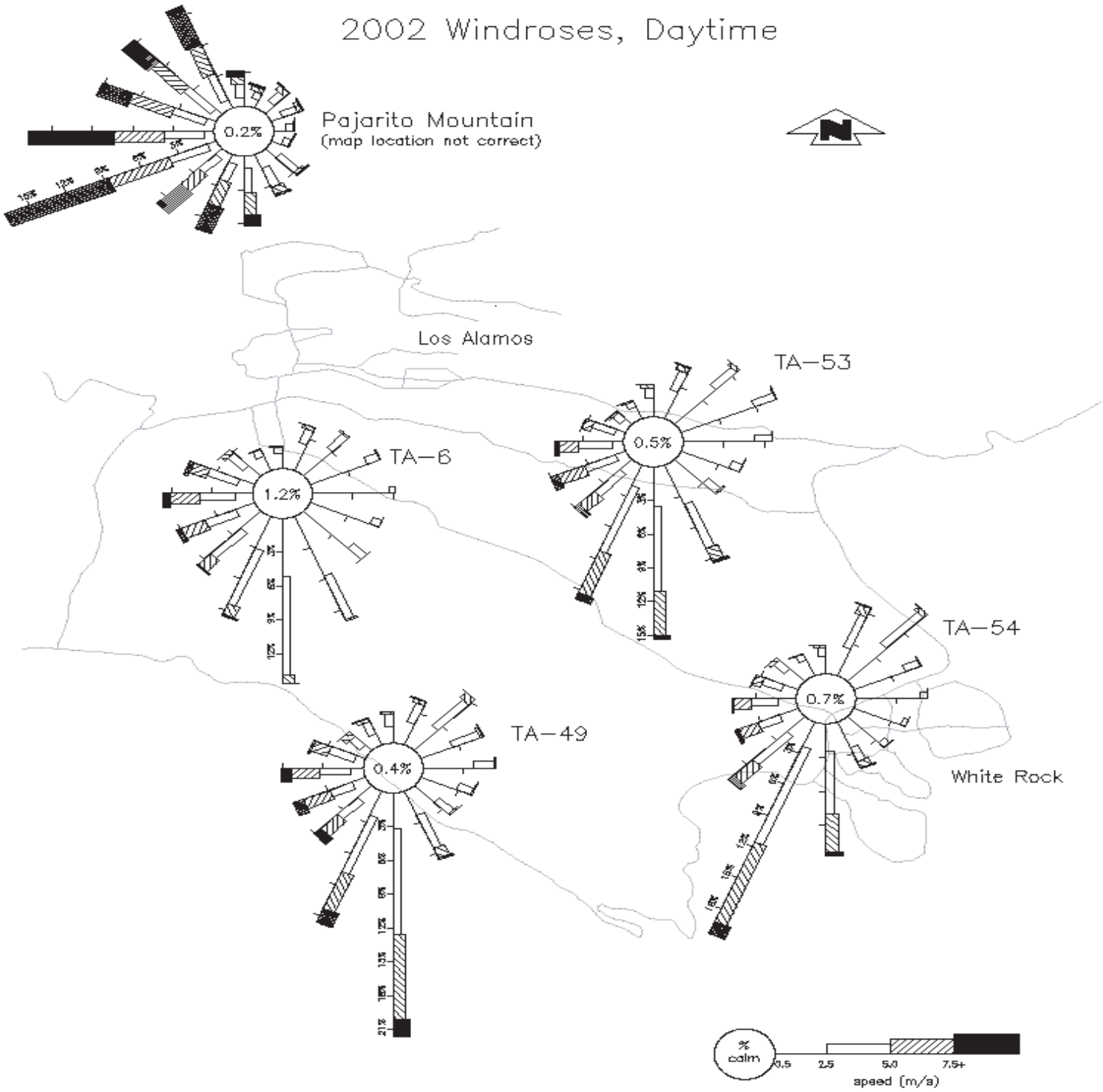
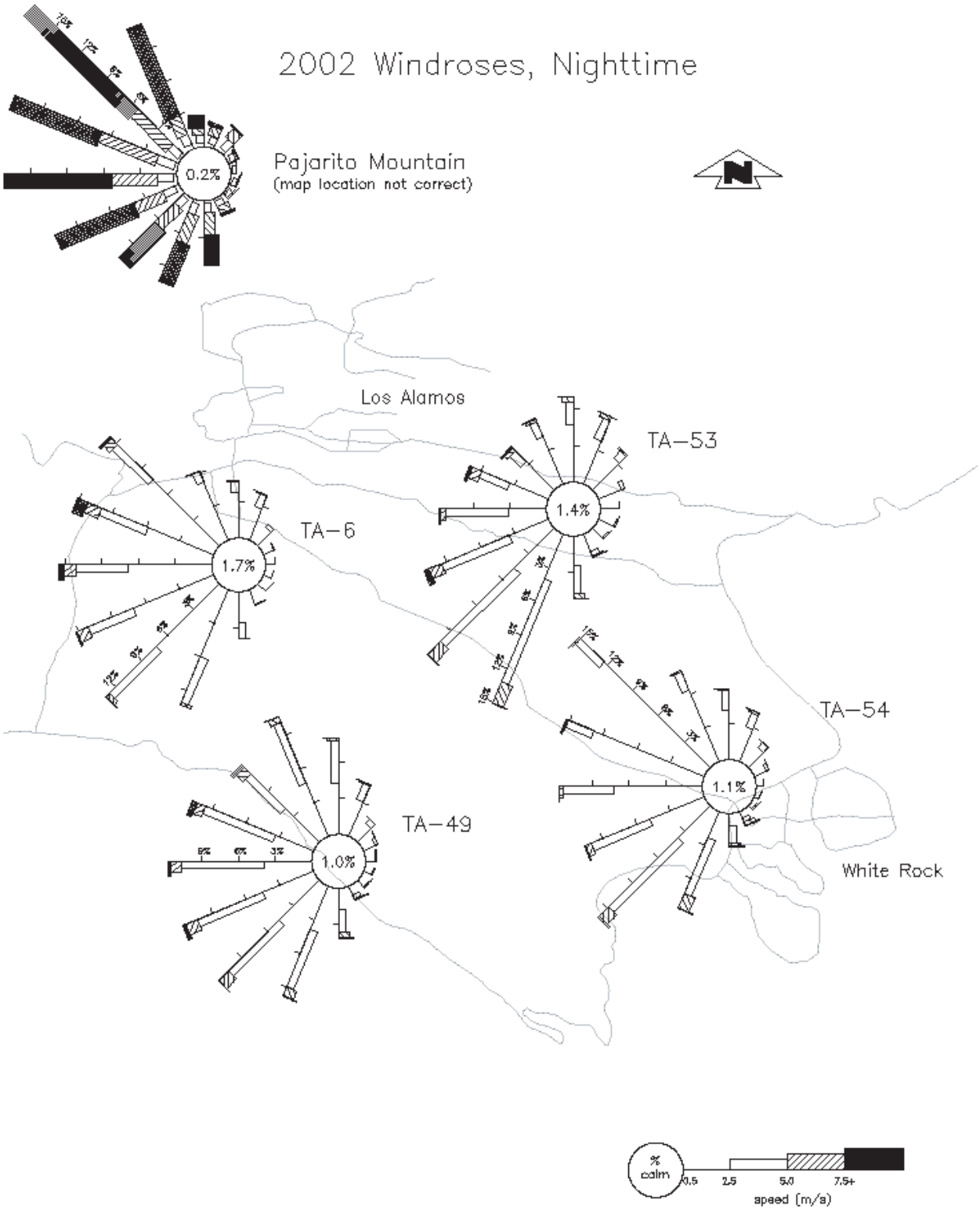


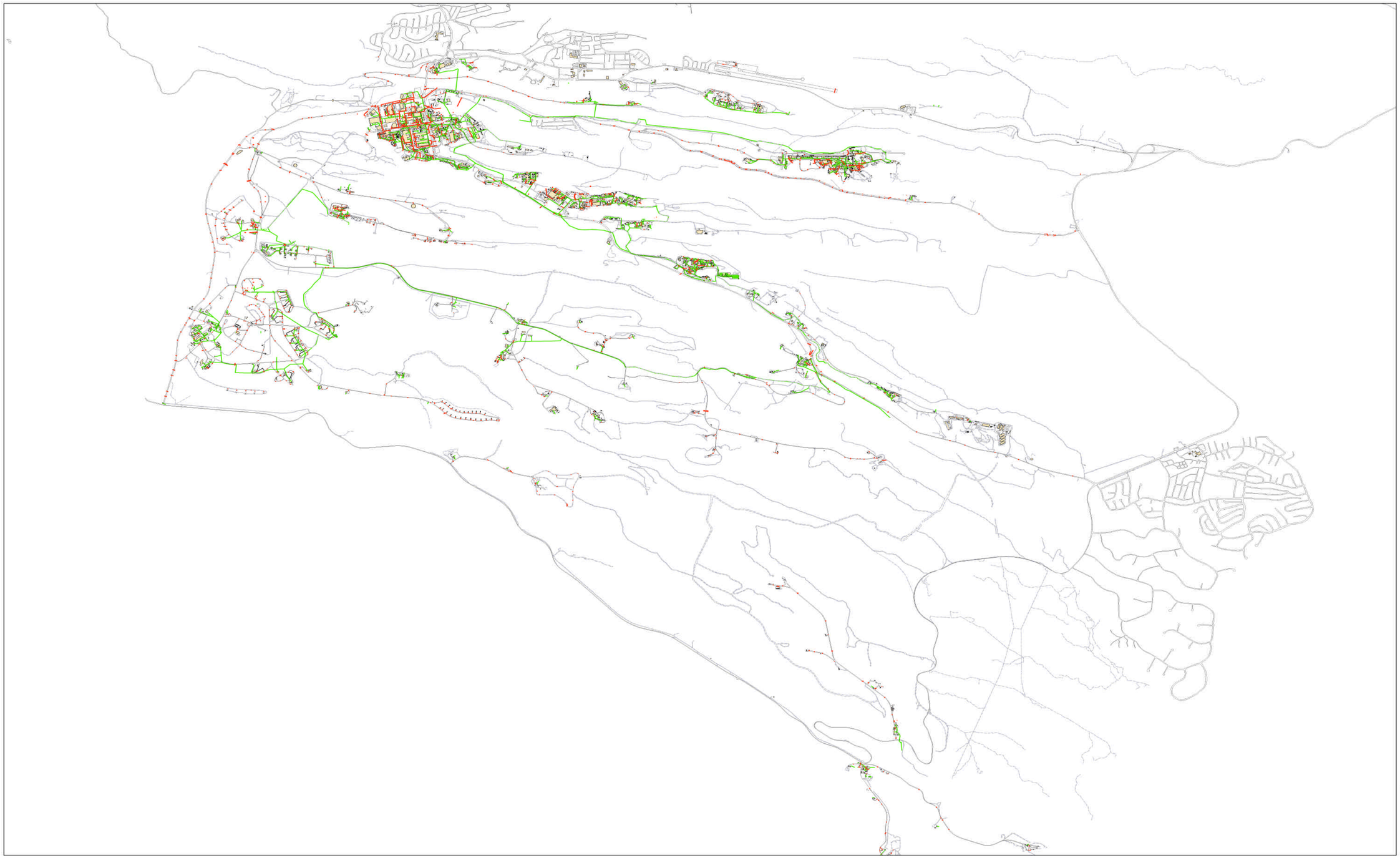
Wind rose information obtained from Weather Machine at weather.lanl.gov.

Figure A-3
Annual Wind Roses for Los Alamos Laboratory (LANL)--Day



Wind rose information obtained from Weather Machine at weather.lanl.gov.

Figure A-4
Annual Wind Roses for Los Alamos National Laboratory (LANL)--Night



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Legend

- PAVED ROADS
- DIRT ROADS
- SANITARY SEWER LINE
- STORM DRAINS
- STRUCTURES

N
W E
S

MAP A-1

Los Alamos National Laboratory Sanitary Sewer and Storm Drain Systems

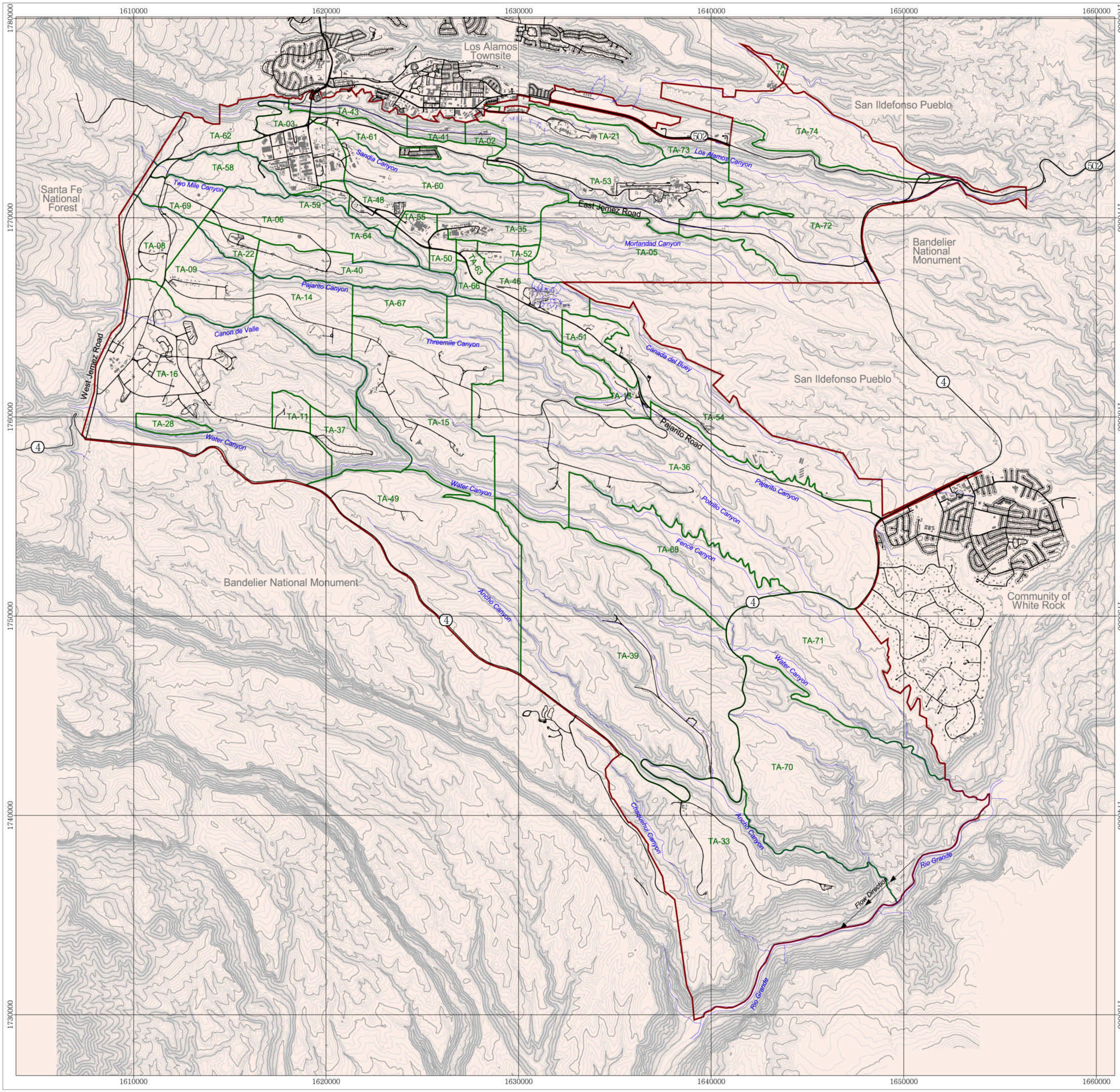
1" = 2000' ft

2,000 1,000 0 2,000 4,000 Feet

U03045
MARCH 31, 2003

MAP A-2

Los Alamos National Laboratory Boundaries



LEGEND

- Boundaries, LANL
- Boundaries, Technical Area
- Contours, 100 ft
- Contours, 20 ft
- Drainages
- Roads, paved
- Buildings

N
W E
S

1:30000

0.5 0 0.5 1 Miles

0.7 0 0.7 1.4 Kilometers

Mapped from State Plane Coordinates, New Mexico Central Zone. 1983 North American Datum. Units in Feet. Displayed with a New Mexico State Plane Grid.

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Data Sources:
Boundaries developed by RRES-OEIM/PM-1 using best available information (2003).
Roads and buildings acquired from the Asbuilt Program (9/99).
Contours and drainages acquired from EES-10, GIS Lab (1999).

RRES

Los Alamos NATIONAL LABORATORY

Prepared by : RRES-OEIM-GIS
Date: April 4, 2003
Map Reference #: 03-0024-01

APPENDIX B

WASTE ANALYSIS PLAN

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LIST OF ATTACHMENTS

ATTACHMENT	TITLE
B-1	Waste Management Units at Los Alamos National Laboratory

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
AK	acceptable knowledge
ALARA	as low as reasonably achievable
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
FFCO	Federal Facilities Compliance Order
FR	*Federal Register*
FWO-SWO	Facilities and Waste Operations-Solid Waste Operations Group
HE	high explosives
HEPA	high-efficiency particulate air
LANL	Los Alamos National Laboratory
LDR	land disposal restrictions
LIG	Laboratory Implementation Guidance
LIR	Laboratory Implementation Requirement
MLLW	mixed low-level waste(s)
MTRUW	mixed transuranic waste(s)
NCR	non-conformance report
NMED	New Mexico Environment Department
OB	open burning
OD	open detonation
ppmw	parts per million by weight
QA	quality assurance

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

QAPjP	"Los Alamos National Laboratory Transuranic Waste Quality Assurance Project Plan"
QC	quality control
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RTL	regulatory threshold limit
RTR	real-time radiography
SOP	standard operating procedure
SVOC	semivolatile organic compound
STP	Site Treatment Plan
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
TA	technical area
TC	toxicity characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TRU	transuranic
TSDF	treatment, storage, and disposal facility
UHC	underlying hazardous constituents
VOC	volatile organic compound
WAC	waste acceptance criteria
WAP	waste analysis plan
WCSF	Waste Characterization Strategy Form
WIPP	Waste Isolation Pilot Plant
WIPP WAC	"Waste Acceptance Criteria for the Waste Isolation Pilot Plant"
WMC	Waste Matrix Code(s)

APPENDIX B
WASTE ANALYSIS PLAN

This Waste Analysis Plan (WAP) presents information on and describes the sampling and characterization procedures used to determine the chemical and physical nature of hazardous waste, the hazardous component of mixed low-level waste (MLLW), the hazardous component of mixed transuranic waste (MTRUW), and high explosives (HE) and HE-contaminated waste stored and treated at Los Alamos National Laboratory (LANL). It has been prepared to meet the requirements set forth in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 264.13, revised June 14, 2000 [6-14-00]. The waste analysis information contained in this WAP is used for characterization of wastes managed in containers and tanks, and to support treatment by open burning (OB), open detonation (OD), and cementation processes. Additional waste analysis requirements are specified in 20.4.1 NMAC § 270.14(b), and 20.4.1 NMAC § 268.7 [6-14-00]. The content of this WAP follows the guidance provided in "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual" (U.S. Environmental Protection Agency [EPA], 1994). It is organized as follows:

Section B.1 Facility Description: Includes a general description of LANL; general descriptions of the waste streams stored and treated and the activities that generate waste; and a reference to an attachment listing the waste management units at LANL.

Section B.2 Waste Analysis Parameters: Includes a discussion of the proposed analytical parameters and methods used by LANL and the criteria/rationale for the parameter selection.

Section B.3 Characterization Procedures: Includes the characterization approach (e.g., acceptable knowledge, sampling and analysis) for each waste classification stored and treated at LANL.

Section B.4 Off-Site Waste: Includes a discussion of procedures in place for acceptance of waste from off-site facilities.

Section B.5 Special Procedural Requirements: Includes a discussion of the procedures in place for ignitable, reactive, and incompatible wastes; procedures to ensure compliance with land disposal restrictions (LDR); and procedures to ensure compliance with Subpart CC requirements.

Section B.6 References.

Table B-1 summarizes applicable regulatory requirements and the corresponding location where the requirement is addressed in this appendix.

Throughout this document, generator waste characterization is described as the preliminary source of information at LANL determining the identification and subsequent management of the waste. Generator waste characterization requirements are addressed in 20.4.1 NMAC, Subpart III, Part 262, and the information included in this permit renewal application is not intended to result in hazardous waste facility permit conditions being applied to the waste-generation process or the procedures covered by that regulation. The information presented is intended to discuss how the waste characterization data are reviewed and used by LANL waste management units and organizations in compliance with the 20.4.1 NMAC, Subpart V, Part 264, and 20.4.1 NMAC, Subpart VIII, Part 268, regulatory requirements.

B.1 FACILITY DESCRIPTION [20.4.1 NMAC § 270.14(b)(1)]

LANL is located in Los Alamos County in north-central New Mexico. It is approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. LANL and the associated residential and commercial areas of Los Alamos County are situated on the Pajarito Plateau. A detailed description of the LANL facility is included in Appendix A of this General Part B Permit Renewal Application.

LANL's central mission is the reduction of global nuclear danger supported by research that also contributes to conventional defense, civilian, and industrial needs. This includes programs in nuclear, medium energy, and space physics; hydrodynamics; conventional explosives; chemistry; metallurgy; radiochemistry; space nuclear systems; controlled thermonuclear fusion; laser research; environmental technology; geothermal, solar, and fossil energy research; nuclear safeguards; biomedicine, health, and biotechnology; and industrial partnerships. LANL is owned by the U.S. Department of Energy (DOE) and is operated jointly by DOE and the University of California.

B.1.1 Facility Waste-Generating Processes and Activities

Wastes are generated at LANL primarily from research and development (R&D) activities, processing and recovery operations, decontamination and decommissioning (D&D) projects, and environmental restoration (ER) activities. Wastes generated from these types of processes and activities may also be received from off-site facilities, as described in Supplement 1 of this General Part B Permit Renewal Application. Tables B-2 through B-7 present information on hazardous

wastes, MLLW, MTRUW, HE wastes, and HE-contaminated wastes potentially generated at LANL. Wastes generated at off-site facilities that may be received at LANL are described in Table B-8. These tables include brief waste descriptions, waste-generating process or activity, the characterization basis for waste designation, potential EPA Hazardous Waste Number(s), the hazardous constituent(s) listed in Appendix VIII of 20.4.1 NMAC, Subpart V, and/or the characteristic(s) defined at 20.4.1 NMAC, Subpart V, Part 264, Subpart C, that make the waste hazardous, and the regulatory limits, as appropriate. These tables are provided for information purposes only.

B.1.2 Stored Waste

Hazardous waste, MLLW, and MTRUW are stored at various container storage units throughout LANL. The following sections contain general descriptions of these wastes and the processes that generate them.

B.1.2.1 Hazardous Waste

The criteria for establishing a waste as a hazardous waste are provided in 20.4.1 NMAC, Subpart II [6-14-00]. A waste is considered hazardous if it meets the definition of a solid waste described in 20.4.1 NMAC § 261.2 [6-14-00]; is not exempted from regulation as a hazardous waste under 20.4.1 NMAC § 261.4 [6-14-00]; and exhibits any of the characteristics of hazardous waste identified in 20.4.1 NMAC, Subpart II, Part 261, Subpart C, or is listed in 20.4.1 NMAC, Subpart II, Part 261, Subpart D [6-14-00].

Hazardous wastes are generated at LANL primarily from R&D activities, general facility operations, D&D projects, and ER activities. These waste streams include spent solvents, contaminated solid wastes, paint and related wastes, photographic and photocopier wastes, corrosive liquids, solid metals and metallic compounds, contaminated noncorrosive aqueous and nonaqueous solutions and sludges, mercury wastes, used batteries and battery fluids, unused off-specification commercial chemical products, gas cylinder waste, ER soils and sludges, ER aqueous liquids, and ER debris. Hazardous waste streams may be of uniform physical composition (i.e., homogeneous) or of dissimilar/diverse composition (i.e., heterogeneous). Homogeneous waste is defined as waste that contains only one material or substance or waste that has its components mixed so that consistent samples can be drawn throughout. Homogeneous waste streams can be either solids or liquids. Heterogeneous waste is defined as waste that contains multiple components that are separate because of density or specific gravity, are located in different places within the mixture, or are

discrete and different articles. Heterogeneous wastes (e.g., debris) do not lend themselves to representative sampling and analysis. Descriptions of these routinely handled hazardous waste streams and their waste-generating processes are provided below and summarized in Table B-2.

Spent Solvents

This waste stream consists of spent solvents and spent solvent mixtures that may contain organic or inorganic compounds, heavy metals, oils, and other contaminants. Waste-generating activities include R&D, laser research, organic and inorganic chemistry research, cleaning, and degreasing.

Contaminated Solid Wastes

Contaminated solid wastes (i.e., wastes of a solid physical form) include mixtures of rags, spill cleanup materials, Kimwipes™, gloves, filters, plastic and paper products, and personal protective equipment. This waste stream may also consist of disposable equipment contaminated with organic or inorganic compounds, heavy metals, oils, and other contaminants. Waste-generating activities include machining operations, chemistry research, D&D projects, metal finishing operations, and general maintenance operations.

Paint and Related Wastes

Paint and paint-related wastes consist of excess paint, paint strippers/thinners, and sludges of paints and thinners. Possible contaminants include heavy metals used as paint pigments and solvents contained in thinners and lacquers. Waste-generating activities include painting and finishing operations and general facility maintenance.

Photographic and Photocopier Wastes

Photographic wastes include spent or excess film developers, fixer solutions, and bleach solutions that may be contaminated with heavy metals. Photocopier wastes include kerosene-based toners and dispersants. This waste stream is generated from photographic film processing and photocopier operations.

Corrosive Liquid Wastes

These wastes consist of acidic or alkaline solutions that may contain organics, inorganics, metals, oils, and other contaminants. Waste-generating activities include analytical chemistry research, electro-etching, and electro-polishing.

Solid Metals and Metallic Compounds

This waste stream consists of metal chips and turnings from machining and cutting operations. It also consists of metal powders; metal salts; metal sheets; reactive metals used in synthesis reactions; solders from electronic manufacturing, repair, and brazing operations; and grinding operations. Other solid metals and metallic compounds include lead shot, bricks, plate, and shielding.

Contaminated Noncorrosive Aqueous and Nonaqueous Solutions and Sludges

This waste stream consists of noncorrosive aqueous and nonaqueous solutions and sludges that are contaminated with hazardous wastes or hazardous residues. Waste-generating activities include vacuum pump maintenance, analytical spectrometry, equipment cleaning and maintenance, vehicle maintenance, synthesis reactions, metal-polishing operations, and chemical research.

Mercury Wastes

Mercury wastes include free elemental mercury, mercuric compounds, articles and instruments containing mercury, fluorescent light fixtures, and gels containing mercuric compounds. Waste-generating activities include lamp replacement, chemical research, mercury spill cleanup, and equipment cleaning and maintenance.

Used Batteries and Battery Fluids

This waste stream consists of used batteries and battery fluids that contain heavy metals such as cadmium, lead, mercury, and silver. Waste-generating activities include routine equipment maintenance.

Unused/Off-specification Commercial Chemical Products

This waste stream consists of discarded solid and liquid chemical reagents that are off-specification, unused, or outdated. This waste stream also includes spill residues and containers containing original product residues that are unused.

Gas Cylinder Waste

This waste stream consists of pressurized gas cylinders, including aerosol cans, which may contain regulated hazardous metals, organic compounds, or exhibit the hazardous characteristics of ignitability, corrosivity, and reactivity.

ER Soils and Sludges

This waste stream consists of environmental media and sludges generated through ER activities, including site decommissioning, site characterization, and site remediation. Waste-generating activities include septic tank and detention basin closure, removal actions, and other remedial actions and site closures.

ER Aqueous Liquids

This waste stream consists of liquids generated during ER activities, including decontamination of remedial equipment, drilling fluids and well development fluids, septic tank liquids, and contaminated stormwater runoff.

ER Debris

This waste stream consists of debris (such as concrete, vitrified clay pipe, steel baffles, and building materials) generated through ER activities, including site decommissioning, site characterization, and site remediation. Waste-generating activities include septic tank and detention basin closure, removal actions, and other remedial actions and site closures.

B.1.2.2 Mixed Low-Level Waste

Low-level waste is defined in DOE Order 435.1, “Radioactive Waste Management” (DOE, 1999), as “Radioactive waste that is not classified as high-level waste, spent nuclear fuel, transuranic waste, by-product material [as defined in Section 11(e)(2) of the *Atomic Energy Act,* as amended], or naturally occurring radioactive material”. MLLW is any waste that has both a hazardous waste component and a low-level waste component, as defined above. For MLLW, this WAP addresses only the hazardous component.

MLLW is generated at LANL primarily from R&D activities, processing and recovery operations, D&D projects, and ER activities. MLLW streams may be homogeneous or heterogeneous, as defined in Section B.1.2.1. Descriptions of the MLLW and their waste-generating processes are provided below and summarized in Table B-3. These descriptions are extracted primarily from

LANL's “Report for the Characterization Review of Low-Level Mixed Waste” (LANL, 1995a) and “Federal Facilities Compliance Order Site Treatment Plan Background Volume” (LANL, 1995b).

Soils with Heavy Metals

Soil waste contaminated with heavy metals is generated during D&D and ER activities at various locations throughout LANL. This waste consists of soils contaminated with varying concentrations of lead or other heavy metals.

Environmental Restoration Soils

This waste consists of soils contaminated with heavy metals and organic compounds. They are generated by ER activities, such as the remediation of release sites and D&D activities.

Inorganic Solid Oxidizers

Discarded reagent powders and crystalline materials comprise this waste stream. Most of these items are in the original manufacturer's containers, some of which may be hydrated. Many of these containers are unopened but are suspected to have radioactive surface contamination. Waste-generating activities include D&D of research laboratories and R&D.

Lead Waste

Lead waste consists of contaminated and activated lead shielding used as radiation shielding, inseparable lead, lead blankets, and lead requiring sorting. It is generated primarily from radioisotope experiments and other reactor, accelerator, laser, and x-ray activities. The lead may be in the form of sheets, pigs, bricks, shot, shavings, slag, dross, and other shapes. Radioactive contamination on the surface of the lead may be removable and the lead can then be recycled or reused.

Noncombustible Debris

Noncombustible debris consists of discarded hazardous and contaminated scrap metals that are generated by maintenance, D&D of research laboratories or equipment, R&D, and ER activities. Additionally, discarded bricks and glass are generated through dismantling of LANL buildings, including plating shops and machine sheds. The waste may be considered hazardous due to the metal content or by virtue of contamination during use.

Combustible Debris

Maintenance, D&D, R&D, and ER activities generate rags and combustible debris with heavy metals and/or organics, some of which contain residual liquids. Examples include solvents and lubricants that are used in metal-cutting operations. Much of this waste is generated during the processing of lead and barium, resulting in heavy metal contamination.

Organic-Contaminated Noncombustible Solids

This waste stream includes absorbed oils, laboratory trash, and discarded equipment. Absorbed oil waste is comprised of drums containing vermiculite or other inorganic sorbents used to absorb oil from spills and routine maintenance operations. Some of the oil originates from vacuum pumps and may be contaminated by mercury, lead, or cadmium.

Laboratory trash consists of noncombustible solid materials with residual solvent contamination. The laboratory debris includes reagent bottles, broken glassware, and disposable lab ware. Large quantities of chemicals are not placed in this trash; however, residual liquids or powders may have remained on some of the discarded material.

Discarded equipment with heavy metals and solvents primarily includes equipment and broken glassware that may have contained residual solvents.

Organic-Contaminated Combustible Solids

This waste stream consists of waste similar to combustible debris waste, along with rags, cardboard, protective clothing, and paint-stripper trash. This waste stream is potentially contaminated with methyl ethyl ketone and other solvents. Waste-generating activities include maintenance, D&D, and ER activities.

Water-Reactive Wastes

Water-reactive wastes consist of reactive metal debris generated through the cleanup of HE firing-site debris and from machining and disassembly of test components. This waste stream includes calcium, lithium hydride, lithium metal, and magnesium.

Mercury Wastes

The mercury-contaminated instruments and equipment waste stream consists of discarded or broken equipment containing liquid mercury. The instruments and equipment include broken thermometers, vacuum tubes, vacuum pumps with residual mercury, activated or contaminated fluorescent light bulbs, and mercury absorbed into a paper or solid matrix. Most of this waste is generated by cleanup operations and could not effectively be recycled or separated from its containing vessel.

Unused Solid Reagent Chemical Wastes

Many different types of discardable off-specification unused solid reagent chemical wastes are generated at LANL by R&D programs. Most of these items are in their original containers.

Spent Solvents and Contaminated Solvent Mixtures

This waste stream is comprised of spent solvents and spent solvent mixtures that contain organic or inorganic compounds, heavy metals, oils, and/or other contaminants. Waste-generating activities include a wide variety of maintenance, cleaning and degreasing, R&D, and processing operations, such as extraction, bench-scale experimental inorganic chemistry, environmental analysis, and radiochemistry.

Corrosive Liquid Wastes

This waste stream consists of acidic or alkaline solutions that contain organics, inorganics, metals, oils, and/or other contaminants. Waste-generating activities include radiochemistry research, plutonium processing, and analytical chemistry.

Aqueous and Nonaqueous Liquids Contaminated with Heavy Metals and/or Organics

This waste stream consists of aqueous and nonaqueous solutions that contain heavy metals and/or organics. Waste-generating activities include metal-polishing operations, radiochemistry research, and ER activities.

Oil Wastes

Oil wastes at LANL are generated during equipment maintenance operations. Possible contaminants in this waste stream include heavy metals and solvents.

Unused Liquid Reagent Chemical Wastes

Many different types of discarded off-specification unused liquid reagent chemical wastes are generated at LANL by R&D programs. Most of these items are in their original containers.

Gas Cylinder Waste

This waste stream consists of pressurized gas cylinders, including aerosol cans, which contain regulated hazardous metals, organic compounds, or exhibit the hazardous characteristics of ignitability, corrosivity, and reactivity.

B.1.2.3 Mixed Transuranic Waste

Transuranic (TRU) waste is defined in DOE Order 435.1, "Radioactive Waste Management" (DOE, 1999), as follows: "Radioactive waste containing more than 100 nanocuries (3700 becquerels) per gram of waste, with half-lives greater than 20 years." Transuranic isotopes are those with atomic numbers greater than 92. MTRUW contains both a hazardous waste component and a TRU waste component. For MTRUW, this WAP addresses only the hazardous component. The system of MTRUW stream descriptions presented below is consistent with the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit. This information may be superceded by any changes to the "Waste Acceptance Criteria for the Waste Isolation Pilot Plant" (WIPP WAC).

MTRUW is generated at LANL primarily from R&D activities, processing and recovery operations, and D&D projects. Limited quantities of MTRUW from off-site facilities will be accepted at LANL for additional characterization and management. MTRUW streams at LANL include four broad categories that can be described by a Summary Category Group, which is further subdivided into Waste Matrix Codes. Summary Category Groups are used to define waste characterization groupings for the "Federal Facility Compliance Order (Los Alamos National Laboratory)" (New Mexico Environment Department [NMED], 1995) requirements and are based on the physical and chemical forms of the waste. Complete descriptions of the Summary Category Groups are available in "DOE Waste Treatability Groups Guidance" (DOE, 1995). The Summary Category Groups that are applicable to the MTRUW stored and, in some cases, treated at LANL are listed below.

- *Summary Category Group S3000, Homogeneous Solids*: defined as solid waste materials, excluding soil/gravel, that do not meet the EPA LDR criteria for classification as debris.

- *Summary Category Group S4000, Soil/Gravel*: defined as solid waste materials that are at least 50 percent by volume soil/gravel.

- *Summary Category Group S5000, Debris*: defined as a heterogeneous waste stream that is at least 50 percent by volume solid materials exceeding a 2.36-inch particle size that is intended for disposal and is a manufactured object, plant or animal matter, or natural geologic material. Particle sizes smaller than 2.36 inches in size may be considered debris if the debris is a manufactured object and if it is not a particle of S3000 or S4000 material.

- *Summary Category Group L1000, Aqueous Liquids/Slurries*: defined as aqueous liquids and slurries that meet the EPA LDR criteria for wastewaters (i.e., <1 percent total suspended solids).

Summary Category Groups are applied to MTRUW streams as a general categorization scheme to distinguish between waste types. More specific waste identification systems (i.e., Waste Matrix Codes [WMC] and LANL TRU Waste Stream ID numbers) are used for supplementary purposes as part of waste management operations at LANL. The WMCs that are applicable to the solid MTRUW stored at LANL are:

- *WMC S3100, Inorganic Homogeneous Solid Waste*: includes mixed inorganic homogeneous waste (cemented inorganics, organics on vermiculite, non-cemented, salts, and cemented organics).

- *WMC S5300, Organic Debris Waste*: consists of mixed combustible debris waste (plastic, cellulosics, and rubber).

- *WMC S5400, Heterogeneous Debris Waste*: includes mixed heterogeneous debris waste (varying amounts of combustible and noncombustible debris, with a small amount of homogeneous waste present).

Solid MTRUW is assigned a WMC and is further identified with a LANL TRU Waste Stream ID number. Using the WMC, waste streams are further delineated based on the following prioritized criteria: waste-generating process (to the degree to which waste has been segregated by process); Summary Category Group (i.e., homogeneous or debris waste); waste matrix; and hazardous chemical content (i.e., organics and/or inorganics). The following are general MTRUW stream descriptions:

- Homogeneous Inorganic, Cemented: includes solidified aqueous or homogeneous inorganic solids, solidified inorganic process solids, leached process residues, evaporator bottoms/salts, and/or cement paste.

- Homogeneous Inorganic, Cemented Organics: major portion of the waste is cement (i.e., inorganic) containing a minor portion of cemented solidified organic process solids.

- Homogeneous Inorganic, Non-cemented: includes solid (non-cemented) inorganic waste, ash, dewatered aqueous sludge, and/or chemical treatment sludge.

- Homogeneous Inorganic, Salts: includes pyrochemical, nitrate, and/or chloride salts; hydroxide cake; and/or other salt waste.

- Homogeneous Inorganic, Vermiculite: includes vermiculite-absorbed hydrocarbon oil, vermiculite-absorbed silicon-based liquid, and solidified (non-cemented) organic waste.

- Soil: includes all radioactive-contaminated soil.

- Combustible debris: includes greater than 50% by volume combustible decontamination waste, cellulosics, plastics, rubber, laboratory trash, building debris, hot cell waste, and/or other combustibles.

- Heterogeneous debris: includes greater than 50% by volume noncombustible waste, metal scrap, glass, metal waste, metal crucibles and dies, precious metals, filter media and residue, beryllium-contaminated debris, ion-exchange resins, irradiation sources, firing point sources, leaded rubber, graphite waste, high-efficiency particulate air (HEPA) filter waste, skull and oxide, slag and porcelain, and/or other noncombustible waste.

The WMCs correspond to other historical and current waste identification systems used at LANL. Table B-4 lists the MTRUW streams stored at LANL by their Summary Category Group, WMC, and general matrix description, and provides a cross-reference between past and present waste identification systems.

LANL TRU Waste Stream ID numbers are applied to the MTRUW streams described above. LANL TRU Waste Stream ID numbers are assigned the prefix "LA-", followed by a unique identifier that further delineates the waste stream. The following paragraphs provide examples of the delineated waste streams for the MTRUW stored and, in some cases, treated at LANL. MTRUW information is summarized in Table B-5.

LA-TA-55-19: Mixed Combustible Debris Waste

This waste stream consists of mixed combustible debris waste generated by plutonium recovery, R&D processes, and facility and equipment operations and maintenance. The debris waste includes paper, rags, plastic, rubber, wood-based HEPA filters, and other plastic-based and cellulose-based items.

LA-TA-55-30: Mixed Heterogeneous Debris Waste

This waste stream consists of mixed heterogeneous debris waste generated by plutonium recovery, R&D processes, and facility and equipment operations and maintenance. The waste includes plutonium-contaminated noncombustible and combustible debris waste.

LA-MIN01-CIN: Mixed Inorganic Homogeneous Waste, Cemented Inorganics

This waste stream consists of mixed inorganic homogeneous waste generated by plutonium recovery, R&D processes, facility and equipment operations and maintenance, and liquid waste treatment operations. The waste includes cemented sludge, solidified aqueous waste, and solidified inorganic process solids.

LA-MIN02-V: Mixed Inorganic Homogeneous Waste, Organics on Vermiculite

This waste stream consists of mixed inorganic homogeneous waste generated by plutonium recovery, R&D processes, and facility and equipment operations and maintenance. The waste is comprised of organic liquids (oils and solvents) adsorbed on vermiculite.

LA-MIN03-NC: Mixed Inorganic Homogeneous Waste, Non-cemented

This waste stream consists of mixed inorganic homogeneous waste generated by plutonium recovery, R&D processes, and liquid waste treatment operations. It consists of vacuum filter cake solid waste.

LA-MIN04-S: Mixed Inorganic Homogeneous Waste, Salts

This waste stream consists of mixed inorganic homogeneous waste generated by plutonium recovery, R&D processes, and facility and equipment operations and maintenance. It is comprised of non-cemented inorganic process solids (salts).

LA-MIN05-COR: Mixed Inorganic Homogeneous Waste, Cemented Organics

This waste stream consists of mixed inorganic homogeneous solidified (cemented) organic process solids and emulsified solvents and oils generated by plutonium recovery, R&D processes, and facility and equipment operations and maintenance.

LA-MHD02-238: Mixed Heterogeneous Debris Waste, Pu-238

This waste stream consists of mixed heterogeneous debris waste generated by Pu-238 processing operations (primarily heat-source fabrication) and facility and equipment operations and maintenance. The waste includes Pu-238 contaminated noncombustible and combustible debris waste.

LA-MIN06-C238: Mixed Inorganic Homogeneous Waste, Cemented Inorganics, Pu-238

This waste stream consists of mixed inorganic homogeneous waste comprised of solidified (cemented) inorganic process solids. This waste stream is generated by Pu-238 processing operations (primarily heat-source fabrication) and facility and equipment operations and maintenance.

LA-MHD03-DD: Mixed Heterogeneous Debris Waste, D&D

This waste stream consists of mixed heterogeneous debris waste generated from facility and equipment D&D, including associated sectioning, size reduction, and packaging operations. The waste is comprised of plutonium-contaminated noncombustible and combustible debris waste.

LA-MHD05-ITRI: Mixed Heterogeneous Debris Waste, ITRI

This waste stream consists of mixed heterogeneous debris generated between 1975 and 1984 by the Inhalation Toxicology Research Institute, which is currently operated by Lovelace at the Kirtland Air Force Base, New Mexico. The waste is comprised of laboratory waste that may contain rags, tools, and biological waste contaminated with Pu-239.

LA-MHD07-SNL: Mixed Heterogeneous Debris Waste, Sandia National Laboratory

This waste stream consists of mixed heterogeneous debris waste generated by Sandia National Laboratories. This waste stream may contain lead (D008).

LA-MHD04-RH: Mixed Heterogeneous Debris Waste, Remote-Handled

This waste stream consists of mixed remote-handled heterogeneous debris waste generated by hot cell operations. This waste is comprised of combustible and noncombustible waste.

Sandia National Laboratories/New Mexico - Generated Waste

MTRUW managed at Sandia National Laboratories/New Mexico will be received and stored at LANL for waste certification purposes prior to subsequent reshipment for final disposition. The waste stream consists of combustible and noncombustible debris and may include metals, cellulosics, rubber, plastics, organic matrices, and inorganic materials (see Table B-8).

B.1.3 Treated Wastes

MTRUW, HE waste, and HE-contaminated waste are treated at various waste management units throughout LANL. MTRUW is treated by cementation to stabilize the waste for storage and to meet the WIPP WAC. The HE waste and HE-contaminated waste are treated by OB or OD to remove its reactive characteristic.

B.1.3.1 Treated Mixed TRU Wastes

MTRUW that require treatment are generated primarily from R&D and processing and recovery operations. Treatment of MTRUW at LANL may consist of immobilization/solidification by cementation to form a noncorrosive solid matrix. Additional specific information on the cementation treatment process is provided in Section B.3.2.3 of this WAP.

B.1.3.2 HE Waste and HE-Contaminated Waste Treated by Open Burning

HE waste and HE-contaminated waste are treated by OB at LANL to remove the hazardous characteristic of reactivity. HE waste generally consists of discrete pieces or volumes of HE, whereas HE-contaminated waste consists of solid or liquid wastes that have been contaminated with HE material. An explosive material is defined as any compound or mechanical mixture that detonates or deflagrates when subjected to heat, impact, friction, shock, or other suitable initiation stimulus. Therefore, HE waste and HE-contaminated waste meet the definition of reactive provided in 20.4.1 NMAC § 261.23 [6-14-00], because they are capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement.

HE waste and HE-contaminated waste are generated at LANL primarily from HE-processing operations, such as machining and pressing; R&D activities, including pilot-scale HE production; D&D; and ER activities. Table B-6 provides a summary of available information on HE waste and HE-contaminated waste treated by OB. These waste streams include homogeneous and heterogeneous wastes as defined in Section B.1.2.1 and are described in the following paragraphs.

HE-Contaminated Water

This waste stream consists of HE-contaminated water that may contain trace solvents and/or regulated hazardous metals. It is generated primarily by laboratory analysis; HE processing; ER, R&D, and D&D activities; drilling activities; and maintenance activities.

HE-Contaminated Solvent Waste

This waste stream consists of HE-contaminated solvents. It is generated primarily by laboratory analysis; R&D, ER, and D&D activities; HE production; spills; and the dissolving of HE and polymers.

HE-Contaminated Used Oil

This waste stream consists of HE-contaminated used oil, which is generated primarily from hydraulic presses and lubrication systems associated with HE-processing operations and ER and D&D activities.

Solid and Scrap HE

This waste stream consists of off-specification or obsolete HE. It is generated primarily from HE processing; testing operations; disposition of weapons; and from ER, R&D, and D&D activities.

HE-Contaminated Commercial Chemical Products

HE-contaminated commercial chemical products may be generated at various technical areas (TA) throughout LANL that manage HE. This waste generally consists of spilled commercial chemical products contaminated with HE.

Wet HE

This waste stream consists of wet HE-machining chips, ER and D&D wastes, sludges, spent activated carbon, filters, and filter solids that result primarily from the filtration of HE wastewater; ER, R&D, and D&D activities; and HE processing.

HE-Contaminated Solid Waste

This waste stream may include HE-contaminated rags, paper, glassware, tools, and other waste. These wastes may also be contaminated with solvents or oil. This waste stream is generated primarily from HE-processing activities; laboratory use; and ER, D&D, R&D, and drilling activities.

HE-Contaminated Equipment

This waste stream consists of HE-contaminated equipment, which includes discarded, noncombustible equipment and material from HE-processing areas; D&D, R&D, and ER activities; and laboratory use. This waste stream is typically recycled after treatment.

HE-Contaminated Liquid Acids, Bases, and/or Inorganic Salt Solutions

This waste stream consists of liquid acids, bases, and/or inorganic salts. It may include materials used as titrants, solvents, cleaning fluids, and/or materials from hydrolysis research.

B.1.3.3 HE Waste and HE-Contaminated Waste Treated by Open Detonation

The HE waste and HE-contaminated waste treated by OD typically consist of off-specification explosive wastes, scrap explosive waste, and other HE-contaminated solid wastes (e.g., rags, glass, wood). These wastes are characteristic for reactivity, as defined in Section B.1.3.2. OD treatment of these wastes involves an explosion that chemically transforms the HE component of the waste faster than the speed of sound.

Table B-7 provides a summary of available information on HE waste and HE-contaminated waste that is treated by OD. These waste streams include homogeneous and heterogeneous wastes and are described briefly below.

HE-Contaminated Solid Waste

This waste stream may include HE-contaminated rags, paper, glassware, tools, and other waste. These wastes may also be contaminated with solvents or oil. This waste stream is generated primarily from HE-processing activities; laboratory use; and ER, D&D, R&D, and drilling activities.

Solid and Scrap HE

This waste stream consists of off-specification or obsolete HE. It is generated primarily from HE processing; testing operations; disposition of weapons; and from ER, R&D, and D&D activities.

B.1.4 Description of Waste Management Units

The waste management units used for storage and treatment of wastes addressed in this WAP are located within numerous TAs at LANL. These units are listed in Attachment B-1, which is provided for information purposes only. Detailed information on the waste management units is provided in the TA-specific permit applications, permit modification requests, or permit renewal documents.

B.2 WASTE ANALYSIS PARAMETERS [20.4.1 NMAC § 264.13(a)(1)]

Detailed chemical and physical characterization will be performed on hazardous wastes, the hazardous component of MLLW, the hazardous component of MTRUW, HE wastes, and HE-contaminated wastes for management purposes, as required by 20.4.1 NMAC § 264.13. Waste analysis parameters will be selected to ensure that the waste characterization documentation will contain the information necessary to properly manage the waste in accordance with Resource Conservation and Recovery Act (RCRA) general facility standards in 20.4.1 NMAC, Subpart V, Part 264, and LDR requirements in 20.4.1 NMAC, Subpart VIII, Part 268.

B.2.1 Proposed Analytical Parameters and Methods [20.4.1 NMAC § 264.13(b)(1), and 20.4.1 NMAC § 270.14(b)(2)]

Analytical parameters and characterization methods that will be used for hazardous wastes, MLLW, MTRUW, and HE and HE-contaminated wastes generated at LANL are summarized in Tables B-9 through B-12. The parameters listed below will be used, as necessary, to determine the RCRA regulatory status of the wastes listed in Section B.1.

- Acceptable Knowledge (AK)
- Sampling and analysis to determine the presence and concentrations of:
  - RCRA-regulated metals
  - RCRA-regulated volatile organic compounds (VOC)
  - RCRA-regulated semivolatile organic compounds (SVOC)
- MTRUW characterization sampling methods
  - Headspace gas sampling to determine the presence of VOCs in container headspace
  - Physical waste form characterization through real-time radiography (RTR) and/or visual examination to verify the absence of prohibited items (e.g., liquids and sealed >4 liter containers).
- Flash point characterization

- pH characterization
- Reactivity characterization
- Additional characterization data

B.2.2 Criteria and Rationale for Parameter Selection [20.4.1 NMAC § 264.13(b)(1)]

Parameter selection for waste characterization is based on the physical form of the waste (e.g., debris) and on knowledge of the process generating the waste. To determine whether a solid waste is hazardous, LANL uses AK (which includes process knowledge), supplemented by sampling and analysis, if necessary, as described in Sections B.3.1.1 and B.3.1.2. The analytical parameters selected to confirm knowledge-based waste characterization for hazardous waste, MLLW, and MTRUW, and the rationale for the selected parameters are identified in Tables B-9, B-10, and B-11, respectively. MTRUW characterization incorporates characterization procedures from the WIPP permit (NMED, 2003) requirements, which are based on knowledge of raw materials and physical/chemical processes of waste-generating activities and by verification methods. Additional characterization procedures will be implemented as needed to meet the requirements of the WIPP permit or other LANL waste management conditions. Parameters for HE waste and HE-contaminated waste are selected to characterize the hazardous and explosive components of the waste and are based on knowledge of raw materials and physical/chemical processes of waste-generating activities. The rationale for HE waste and HE-contaminated waste parameter selection is identified in Table B-12.

Appendix III of 20.4.1 NMAC, Subpart II, Part 261, provides references which list approved analytical methods used to determine the concentrations of hazardous constituents in the liquid and solid fractions and extracts of waste samples. All the methods are fully described in the most recent version of *SW-846*. These and other approved methods will be used , as necessary, to determine whether a waste stream is hazardous. Samples will not be analyzed for all listed hazardous constituents, only those that are most likely to be present based on the source of the waste stream.

Detailed instructions for conducting Toxicity Characteristic Leaching Procedure (TCLP) waste analysis are found in the most recent version of “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods” *(SW-846)* and are incorporated by reference into 20.4.1 NMAC,

Subpart II, Part 261, Appendices II and III. Also listed in the most recent version of *SW-846* is the appropriate analytical method for each hazardous constituent required to determine if the waste contains a contaminant in excess of the maximum contaminant concentration regulated under 20.4.1 NMAC, Subpart II, Part 261. TCLP is a method for leaching hazardous constituents from the solid portion of the waste and is used only if the solids constitute more than 0.5% of the waste by weight. The laboratory can also forego extraction if: 1) total analysis of the waste shows the concentrations of the analytes are so low, an extract of the waste could not contain analytes at concentrations above the regulatory limits; or 2) analysis of any liquid portion of the waste contains such high concentrations of hazardous constituents that, even accounting for dilution, the entire sample would be hazardous.

Many RCRA hazardous wastes are restricted from land disposal under the Hazardous and Solid Waste Amendments unless they are treated first to substantially diminish their toxicity and reduce the likelihood that hazardous constituents will migrate from the disposal site. As required in 20.4.1 NMAC, Subpart VIII, Part 268, each waste shipment must be accompanied by a notification stating whether the restricted waste meets specific LDR treatment standards promulgated for hazardous constituents, or is otherwise exempt. In most cases, the notification can be completed after laboratory analysis of the waste. If an LDR notification is based solely on knowledge of the waste, the supporting documentation will be kept on record, in accordance with 20.4.1 NMAC § 268.7.

B.3 CHARACTERIZATION PROCEDURES [20.4.1 NMAC §§ 264.13(a)(1) and 264.13(b)(2), and 20.4.1 NMAC § 270.14(b)(2)]

Throughout LANL, it is required that characterization of wastes be considered before a waste-generating process will begin. The preliminary characterization of waste begins prior to actual generation (at the point of concept and design of a process or system), which in turn allows the generator to determine whether AK, sampling and analysis, or a combination of the two will be required prior to actual waste characterization for transport to the TA-54 storage facility.

The approach to characterization of hazardous wastes, MLLW, MTRUW, HE wastes, and HE-contaminated wastes is based on the chemical, physical, and radiological nature of the waste stream. Characterization procedures require that information for the waste stream be provided on waste characterization documentation, accompanied by sampling and analysis data or AK documentation. The waste characterization documentation is submitted to Facilities and Waste Operations-Solid Waste Operations (FWO-SWO) personnel for review, classification, and approval

prior to acceptance at TA-54. This characterization is accomplished by using AK and/or sampling and analysis, which are described in the following sections.

Trained personnel review the waste characterization documentation for adequacy and waste acceptance criteria (WAC) acceptability. Training for use of waste characterization documentation is included in a facility waste documentation course. This training provides step-by-step instructions on how to complete forms for characterizing wastes. If the documentation is incomplete or does not contain sufficient information to adequately characterize or classify the waste, the documentation is returned to the generator for additional information. Examples of further documentation that may be requested include more detailed process knowledge and description or additional/new analytical data to meet WAC requirements for the off-site treatment, storage, or disposal facility (TSDF).

Waste characterization documentation allows waste classification and assignment of EPA Hazardous Waste Numbers, as needed; preparation of LDR documentation; and proper management of the waste. Once the waste characterization documentation is reviewed, classified, and approved, the generator is notified and paperwork is prepared for shipping. The shipping documentation is submitted to FWO-SWO personnel and reviewed against the waste characterization documentation and Department of Transportation regulations. If approved by FWO-SWO personnel, the waste shipment is scheduled for transport to the appropriate TSDF. If the shipping documentation is inadequate or does not correspond with the characterization documentation, the shipping documentation is returned to the generator for corrections.

Upon receipt and prior to accepting the waste containers for storage at TA-54, waste shipments are inspected to ensure that the shipping documentation and the waste characterization documentation have the proper approvals in addition to ensuring that compliance with the WAC and all federal and state regulations are met. At TA-54, both the waste characterization documentation and the shipping documentation become part of the operating record upon receipt of the waste. These records will be made available within a reasonable timeframe to the NMED, upon request.

Reevaluation of initial characterization information is performed to verify the accuracy of the initial waste characterization, to ensure that applicable treatment standards have been met, when there is a change in a waste-generating process, when the generator requests a review, or when analytical results indicate a change in a waste stream. Waste streams are reevaluated annually to verify that

they have not changed. This annual reevaluation will be accomplished through review and recertification of applicable waste characterization documentation, and the documented reevaluation will be maintained in the facility operating record. Any information that indicates a change in the process that generates the waste and/or affects the waste will require the waste to be recharacterized.

B.3.1 Hazardous and Mixed Low-Level Waste Characterization

Characterization procedures for hazardous waste and MLLW are selected based on the physical nature of the waste stream (e.g., homogeneous or heterogeneous waste). Homogeneous solid waste will be characterized for the presence of hazardous components of the waste (i.e., VOCs, SVOCs, and metals) on the basis of AK and, if necessary, sampling and analysis. Heterogeneous solid waste is typically characterized on the basis of AK for the following reasons: (1) the physical, chemical, and/or radiological nature of the waste makes it difficult to obtain representative samples; (2) the lack of appropriate sampling methodology; and (3) for MLLW, safety concerns associated with unnecessary exposure to the radioactive component of the waste (i.e., as low as reasonably achievable [ALARA] concerns). In the event AK is used to characterize the waste, characterization documents are reviewed with the help of subject matter experts, when necessary, to achieve the most comprehensive characterization available before waste is approved for transport to TA-54.

Chemicals of an unknown nature are handled on a case-by-case basis. The individual waste is initially characterized by knowledge of the operations and activities that were performed in the specific area in which the waste was generated. This information is used to restrict the choices of initial waste analysis to a smaller population of chemicals and is not the sole basis of waste characterization. In the event that RCRA hazardous wastes are present in the initial waste analysis, more definitive AK is obtained, including, as appropriate, further analysis for sufficient and complete waste characterization prior to waste acceptance at TA-54.

For purposes of managing unknown wastes, a small volume is defined at LANL as one liquid gallon (approximately four liters) or less. The rationale for the small volume designation is that this is the minimum quantity of sample needed to test if the waste is hazardous. At and below this limit, the sample may be consumed in the analytical procedure. Small volumes of unknown wastes are typically analyzed for pH, flash point, and reactivity. This allows the material to be categorized for further management.

Volumes greater than one gallon (four liters) of a single unknown waste allow a more detailed analytical scheme. These wastes are tested for ignitability, corrosivity, reactivity, toxicity characteristics, and/or any other parameters indicated by the initial data gathered on the material. Sufficient detail must be reported to allow the assignment of the proper EPA Hazardous Waste Number(s) to the waste. Characterization methods used are provided in Tables B-9 and B-10.

Information regarding the presence of free liquids in containers of hazardous waste and MLLW is obtained through generator waste-characterization knowledge, visual examinations, and/or the Paint Filter Liquids Test.

HE waste and HE-contaminated waste at LANL are treated by OB or OD to remove the characteristic of reactivity. They are considered, by definition, to be reactive because they meet the RCRA requirement of being "capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement." Regulations do not specify a particular test method for reactivity of HE waste and HE-contaminated waste, so the determination of whether a waste is HE-contaminated is made based on the properties of the chemicals known or suspected to be in the waste and/or field screening or laboratory analysis. Wastes that contain concentrated HE are characterized by process knowledge, as described in Section B.3.1.1.1. Wastes that may contain HE in lower concentrations are characterized by both process knowledge and/or the following techniques to determine whether HE in lower concentrations is detonable/explosive:

- If it is unknown whether HE is present, a screening method, such as the DX-2 Spot Test or DeTech, may be used.
- If heterogeneous waste contains visible HE, it is considered reactive.
- If heterogeneous waste came into direct contact with HE and all of the surfaces cannot be tested or visually examined (e.g., debris or equipment), it is assumed that there is a reactive amount of HE associated with it.
- HE concentrations may be directly measured in homogeneous materials (e.g., soil or water). This is usually done using the appropriate analytical method from the most recent version of *SW-846* Method 8300 series. Parameters such as the concentration of HE, its sensitivity, and the media in which it occurs are used to determine whether the waste is likely to be reactive or not.

Characterization methods for HE and HE-contaminated wastes are summarized in Table B-13.

OB and OD completely remove the reactive characteristic from HE-contaminated wastes. These wastes, however, may also exhibit RCRA toxicity characteristics or contain listed wastes. In some cases, OB and OD are effective in removing these other characteristics (e.g., 2,4-dinitrotoluene and solvents). This is not the case when it comes to HE contaminated with RCRA metals. Untreated HE-contaminated wastes do not usually contain metals in high enough concentrations to be considered hazardous. Once the waste has been treated by OB, however, the metals are concentrated in the residue ash/debris. The treatment process may also oxidize parent metals, making them more soluble, which can cause the residue to fail the TCLP. Sampling and analysis for ash generated by OB are summarized in Table B-14.

B.3.1.1 Acceptable Knowledge [20.4.1 NMAC §§ 264.13(a)(2) and 264.13(b)(5), and 20.4.1 NMAC § 270.14(b)(2)]

The physical, chemical, and radiological nature of some waste forms (e.g., heterogeneous) makes collection of representative samples for characterization difficult. This difficulty arises from several factors, some of which include: waste streams that contain disparate elements; disparate elements may need to be segregated into similar forms; large objects which cannot fit within standard size sample containers; and laboratories which do not have the capability to sample large objects (EPA, 1992). Other difficulties arise from health and safety risks to personnel due to potential exposure to radioactive material (i.e., ALARA concerns) or explosive material.

Acceptable knowledge is a method used to characterize the waste streams utilizing process knowledge and additional waste analysis data. According to EPA guidance, *acceptable knowledge* is broadly defined to include process knowledge, additional characterization data, and/or facility records of analysis (EPA, 1994A). Consistent with the 1994 guidance, EPA defined "acceptable knowledge" as it applies to TRU waste destined for WIPP as "any information about the process used to generate the waste, material inputs to the process, and the time period during which the waste was generated . . ." [Code of Federal Regulations, Title 40 (40 CFR), § 194.254(c)(3)]. EPA recognizes AK as an "integral part" of the system for controls for waste characterization of certain types of DOE waste (see *67 FR 51930, 51942* [August 9, 2002]).

Process knowledge is described in 20.4.1 NMAC § 264.13(a)(2) [6-14-00], as data developed under 20.4.1 NMAC, Subpart II, Part 261, and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes. EPA described *process knowledge* as knowledge of waste characteristics derived from information generated contemporaneously with the waste on the materials or processes used to generate the waste. This information may include administrative, procurement, and quality control documentation associated with the generating process, or past sampling or analytical data. Usually, the major elements of process knowledge include information about the process used to generate the waste, material inputs to the process, and the time period during which the waste was generated (see *67 FR 51934*).

Additional characterization data includes data obtained from chemical or physical analysis or review that is not subject to RCRA protocols, such as the most recent version of *SW-846* and other

approved methods, or through testing of similar or surrogate waste streams. These data can be used to determine if wastes are RCRA-regulated and to determine LDR status.

Facility records of analysis consist of waste analysis and/or physical characterization performed prior to the effective date of RCRA regulations. These analytical results must be accurate and applicable to the specified waste and should be supplemented with other existing information (e.g., published data).

For characterization, the following examples from EPA guidance (EPA, 1994A) are appropriate for the use of AK:

- Hazardous components in wastes from specific processes are well documented, such as with F-listed and K-listed wastes.
- Wastes are discarded unused commercial chemical products, reagents, or chemicals of known physical and chemical properties.
- Health and safety risks to personnel would not justify sampling and analysis (e.g., radioactive mixed waste).
- Physical nature of the waste does not lend itself to taking a laboratory sample.

Waste characterization documentation based solely on AK is reviewed by appropriate personnel, with the aid of subject matter experts if necessary, to determine if one or more of the above criteria have been met. The criteria must be provided or available for review to ensure that a valid and accurate RCRA hazardous waste characterization can be made before acceptance at TA-54. While AK documentation will be maintained at the generator's location for at least three years as required by 20.4.1 NMAC § 262.40, it must be in a format so that waste management personnel and/or subject matter experts can obtain copies or review the documentation at the generator's site. The latter would be the case with classified or sensitive AK documentation that cannot be sent to TA-54 due to security requirements. A traceable identifier (i.e., process or AK document number or alphanumeric designation) is assigned by the generator on the waste characterization documentation, and must be referenced in such a way that generators can access the information at their site for as long as required by RCRA regulation.

B.3.1.1.1 Process Knowledge

For characterization, process knowledge consists of one or more of the following:

- Detailed information on a waste stream obtained from existing published or documented waste analysis data;

- Studies conducted on hazardous wastes generated by processes similar to that which generated the waste; and

- Knowledge of the materials and operations that generated the waste and that demonstrates the potential for hazardous components in the waste. For example, metals present in debris waste are often associated with specific materials (e.g., lead in leaded rubber or lead shielding).

Waste generators obtain, assemble, and prepare the process knowledge documentation for each waste stream. There are many sources of applicable documentation at LANL that are acceptable to substantiate process knowledge for a specific waste stream. Examples of documentation that are acceptable include, but are not limited to, the following:

- Process design documents (e.g., Title II Design).

- Preliminary and final safety analysis reports, unreviewed safety question determinations, and technical safety requirements.

- Standard operating procedures and detailed operating procedures, which can include a list of the raw materials or reagents, a description of the process/experiment that uses the materials, and a description of the wastes generated and how the wastes are handled.

- Waste packaging logs.

- Test plans or research project reports that describe the reagents and other raw materials used in an experiment.

- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements).

- Information from site personnel (e.g., documented interviews).

- Standard industry practice documents (e.g., vendor information).

- Industry reports on a similar process when there is a clear connection between the LANL process/experiment and the industry's similar process/experiment.

- Previous analytical data relevant to the waste stream, including results from fingerprint analyses, spot checks, or routine waste verification sampling.

- Analytical data from studies of common industry processes that are similar to LANL processes. These data can be used to identify the chemical composition in a specific “similar” process waste stream and to determine the regulatory status of the waste.

- Material Safety Data Sheets, product labels, and other product package information.
- Sampling and analysis data from comparable waste streams.
- Documented visual inspections to confirm or identify the physical characteristics and packaging of a waste.
- Laboratory notebooks that detail the research processes and raw materials used in an experiment.
- ER site characterization data, waste characterization data, waste characterization strategy documentation, and RCRA Facility Investigation documentation.

B.3.1.1.2 Additional Characterization Data

Additional characterization data used for AK include information for the waste stream provided by the generator. These data may be qualitative in nature, not subject to an approved quality control program, or performed on a similar waste stream. This information can be the result of a recent analysis of the waste, a well-documented historical analysis of the waste, and/or the analysis of a surrogate waste stream. For example, data from the analysis of nonradioactive leaded-rubber glove waste may be used to evaluate the characteristics of similar radioactive leaded-rubber glove waste. Sampling nonradioactive inputs or outputs from processes may also provide data that are useful for characterizing a similar mixed waste stream.

B.3.1.2 Sampling and Analysis [20.4.1 NMAC §§ 264.13(a)(3), 264.13(b)(2), (3), and (4), and 20.4.1 NMAC § 270.14(b)(2)]

This section discusses proposed sampling and analytical procedures and frequency of sampling applicable to hazardous waste and the hazardous component of MLLW. The approach described for characterizing these waste types is based on the radiological, physical, chemical, and hazardous properties of the waste. If necessary for waste characterization purposes, chemical data will be obtained, as needed, through solid and liquid waste sampling techniques.

For waste streams that can be representatively sampled (i.e., homogeneous), sampling and analysis is performed when a waste lacks sufficient process information to adequately characterize the waste based on AK. A representative sample of the waste is collected and handled by means that preserve its original physical form and composition and prevent contamination or changes in concentration of the constituents to be analyzed. Analytical methods for the determination of RCRA-regulated metals, VOCs, and SVOCs are conducted to meet certain technical performance

criteria and to be consistent with regulatory guidelines. Personnel involved in sampling and analysis comply with LANL-specific protocol consistent with the most recent version of *SW-846* (EPA, 1986) and/or other approved methods.

Many analytical laboratories provide sample containers and specify required minimum volumes for individual waste types or physical states. The most important determinants of sampling method and volume are the physical state of the waste (liquid, solid, sludge), the waste container (drum, tank), accessibility, waste variability, and safety concerns. Detailed sampling recommendations and guidance are provided in the most recent version of *SW-846*, Chapter 9. For solids, 500 grams in a glass container is usually adequate. Liquid sample volumes vary from one liter to approximately eight liters, depending on the number of analysis parameters and solids content. Sample jars for samples to be analyzed for VOCs must be completely filled to minimize volatilization of contaminants from the liquid into the headspace.

Sampling is performed with a device appropriate for the waste being sampled. Sampling devices include, but are not limited to, weighted bottles, bailers, or composite liquid waste samplers for sampling liquids in drums, pits, or tanks. Augers, triers, scoops, shovels, and similar types of devices are useful for sampling solid wastes in containers or other locations.

The aim of the sampling method is to obtain a sample or samples representative of the waste stream. Sampling personnel must use an understanding of the waste-generating and -handling processes to ensure samples are representative. Some wastes separate into distinct layers with time, and representative samples must include aliquots from each layer. In some cases, it may be important to use a statistical or random sampling scheme that provides for the collection of representative samples.

A number of criteria must be considered in determining how many samples are required, how locations are selected, and how frequently sampling should be repeated. If a highly uniform waste stream is generated from a single process location, one sample collected annually is sufficient. However, if a single waste stream is a mixture of materials generated in several locations under varying conditions through time, more samples will be required, and composite sampling may be appropriate. At a minimum, the sampling must be repeated if the waste-generating process changes in a material way, or if inspection of the waste reveals it has changed.

Appendix I of 20.4.1 NMAC, Subpart II, Part 261, lists specific guidance documents that detail sampling protocols for different waste types. Waste samples collected in accordance with these protocols are considered representative by EPA. The protocols include standards developed by the American Society for Testing and Materials (ASTM) and portions of the most recent version of *SW-846*.

B.3.1.2.1 Solid Waste Analysis [20.4.1 NMAC § 264.13(b)(3)]

If necessary for waste characterization purposes, solid homogeneous waste streams are sampled and analyzed for total metal content, VOCs, and SVOCs. The sampling protocol for solid hazardous waste and MLLW is based on sampling methods approved by EPA for solid waste and soil sampling in the most recent version of *SW-846*, as well as other approved methods. These methods are designed to ensure that representative waste samples are collected consistently and transferred to the responsible laboratory in a manner that maintains sample integrity.

If necessary for waste characterization purposes, homogeneous waste streams will be sampled and analyzed for the toxicity characteristic (TC) contaminants listed in 20.4.1 NMAC § 261.24 [6-14-00]. Analysis for total concentration of TC contaminants will be performed on samples in a screening step, as described in Section 1.2 of Method 1311 (TCLP). If total concentrations are used in the waste characterization process, analytical data will be compared to the TC regulatory levels expressed as total values. These total values will be considered the regulatory threshold limit (RTL) values for the determination of whether a particular waste exhibits a TC. RTL values are obtained by calculating the weight/weight concentration (in the solid) of a TC contaminant that would give the regulatory weight/volume concentration in the TCLP extract. If the total concentrations are less than the RTL value, the waste does not exhibit the toxicity characteristic and the TCLP does not need to be completed for the screened TC contaminants.

B.3.1.2.2 Liquid Waste Analysis

Liquid wastes generated at LANL consist of aqueous solutions, slurries, and organic liquids. If necessary for waste characterization purposes, these wastes will be sampled and analyzed for total metal content, VOCs, and SVOCs. In accordance with Method 1311 (TCLP), liquid wastes (i.e., those wastes that contain less than 0.5 percent dry solids) do not require extraction. The liquid waste, after filtration, is defined as the TCLP extract. Liquid waste, therefore, is characterized by

filtering the waste, measuring total contaminant concentrations in the resulting filtrate, and comparing these concentrations to the TC regulatory levels in 20.4.1 NMAC § 261.24 [6-14-00].

Wastes that contain both a liquid and a solid phase are characterized using total analytical data for the solid phase to determine toxicity characteristics. This is accomplished by comparison with the TC regulatory levels for each phase in a manner consistent with the discussion in Section B.3.1.2.1. The following formula (EPA, 1994b) will be used to calculate the maximum theoretical leachate concentrations for the combined phases:

$$\frac{[A \times B] + [C \times D]}{B + [20 \text{ liters/kilogram} \times D]} = M$$

Where,

A = concentration of the analyte in the liquid portion of the sample (milligrams/liter)
B = volume of the liquid portion of the sample (liter)
C = concentration of the analyte in the solid portion of the sample (milligrams/kilogram)
D = weight of the solid portion of the sample (kilogram)
M = maximum theoretical leachate concentration (milligrams/liter).

B.3.1.2.3 Sample Handling, Preservation, and Storage

Table B-15 presents requirements specified in the most recent version of *SW-846* regarding sample containers, preservation techniques, and holding times associated with sample collection. Adherence to these requirements will ensure that sampling and analysis meet quality objectives for data. In the event the specified criteria are not met, another sample will be collected and submitted for analysis.

B.3.1.2.4 Analytical Laboratory Selection and Analytical Methods [20.4.1 NMAC § 264.13(b)(2)]

Analytical laboratories at LANL and/or approved subcontractor laboratories will perform the detailed qualitative and quantitative chemical analyses specified in Tables B-16 and B-17 of this WAP. These laboratories must have:

- A documented comprehensive quality assurance (QA)/quality control (QC) program
- Technical analytical expertise

- A document control/records management plan
- The capability to perform data reduction, validation, and reporting.

The selection and development of analytical testing methods for LANL waste streams were based on the following considerations:

- The physical form of the waste
- Analytes of interest
- Required detection limits (e.g., regulatory thresholds)
- Information requirements (e.g., verify compliance with LDR treatment standards, waste classification).

Collectively, these factors contributed to the selection of the analytical methods specified in Tables B-16 and B-17. Qualified analytical laboratories at LANL and/or approved subcontractor laboratories that meet the above criteria will be used for the required analyses.

B.3.1.3 Verification Frequencies [20.4.1 NMAC §§ 264.13(a)(3) and 264.13(b)(4)]

Verification frequencies vary by the types of waste received at each LANL treatment or storage facility. As the primary storage and shipping facility at LANL, TA-54 manages the widest variety of waste streams. A limited number of HE waste streams, primarily debris, are managed at the OB/OD units.

The waste verification process at TA-54 applies to waste received at that facility and designated for storage and/or off-site treatment and/or disposal. Personnel involved in verification activities are trained and qualified for the activities they perform.

Waste may be identified as part of the verification program at TA-54 through any of the following:

- Random selection, with a bias toward AK waste streams,
- Past performance of the waste generators, including previous non-conformances, and
- Incomplete or suspect documentation.

Once the waste stream has been designated for verification, waste verification personnel are notified of its pending arrival at TA-54. Waste streams needing verification are sampled in

accordance with approved EPA and ASTM protocols. Some waste streams may only require a visual verification of the container's contents.

If the characterization for the waste stream is found to be inconsistent with the documentation, a non-conformance report (NCR) is issued. The NCR program is used both to trigger further verification of waste and as enforceable criteria for the TA-54 waste verification program. Depending on the severity of the discrepancy, the waste generator or waste-generating facility may be subject to increased verification review under the program, and the waste may not be accepted for management at TA-54.

The verification program for wastes treated at the OB/OD units is different because debris and HE are the predominant types of waste treated and because there are a limited number of waste streams. Due to the difficulty in analyzing debris, information on the waste-generating process becomes the primary source of information. Verification for debris occurs in two stages. The debris is first visually inspected before treatment to ensure that the received waste matches the description on the waste characterization documentation. Then, any residues separated from the debris before or after treatment are analyzed each time a new waste stream is treated. If analysis of the residues finds constituents not identified on the waste characterization documentation for the incoming waste, treatment facility personnel contact the waste generator and conduct a thorough review of the process generating the waste. Based on the review, the generator may be requested to modify the waste characterization documentation. Solid and scrap HE and wet HE are not usually sampled because the formulations are closely controlled and well known, and HE waste is dangerous to transport off site for analysis. In addition to the transportation considerations, HE is by definition "energetic" and may react adversely to dissolution with acids, extraction with solvents, and sample size reduction techniques used in standard laboratory analytical procedures.

For other HE waste streams, initial chemical analysis by the generator is required. Analysis is also required if the waste-generating process changes. Additional analytical testing from generators may be requested based upon the following criteria:

- The complexity of the waste-generating process,
- Constituents identified during testing of residues were not included on original waste characterization documentation,

- Incomplete or suspect documentation, and/or
- Past performance of the waste generators.

The frequency of sampling OB/OD treatment residues is, at a minimum, each time a new waste stream is treated. Treatment residues may be sampled more frequently, considering the above criteria.

For wastes managed at the TA-55 hazardous and mixed waste management units, the waste may be verified through the TA-54 waste verification process. Wastes treated by cementation at TA-55 are subject to institutional controls, which assure that the waste composition is constant. Because this waste-generating process does not change, subsequent review through the TA-54 waste verification process is sufficient.

B.3.2 Mixed Transuranic Waste Characterization

Characterization of the hazardous component of MTRUW stored and treated at LANL and destined for disposal at WIPP is performed in accordance with the procedures described in the WIPP Hazardous Waste Facility Permit. The following summarizes these requirements, as presented in the "Los Alamos National Laboratory Transuranic Waste Quality Assurance Project Plan" (QAPjP) (LANL, 2003). MTRUW not destined for WIPP is characterized as described in Section B.3.2.2 of this WAP.

Initial characterization of both homogeneous and heterogeneous MTRUW is based primarily on AK. Additional characterization to meet WIPP certification procedures will be implemented at appropriate LANL or other facilities to meet requirements of the WIPP WAP permit conditions. Pursuant to WIPP certification and WIPP WAP requirements, further characterization of homogeneous waste will be accomplished through statistically-based sampling and analysis, headspace gas sampling, RTR, and visual examination. Further characterization of heterogeneous waste will be implemented at appropriate LANL or other facilities using AK, headspace gas sampling, RTR, and visual examination. MTRUW not destined for WIPP but stored at LANL is characterized using the routine procedures used for hazardous waste and MLLW, as discussed in Section B.3.2.2.

The MTRUW streams described in Section B.1.2.3 are categorized by Summary Category Groups based on the physical and chemical form of the waste. Homogeneous waste streams in the solid

process residue (Summary Category Group S3000), soil/gravel (Summary Category Group S4000), or aqueous liquids/slurries (Summary Category Group L1000) categories may contain RCRA-regulated VOCs, SVOCs, and metals and will be characterized using AK and/or sampling and analysis. Debris waste streams (Summary Category Group S5000) consist of heterogeneous materials and, as such, it is difficult to obtain representative samples of these wastes. Therefore, debris waste will be characterized for the presence of hazardous components using AK based on examination of the original materials and operations from which the waste was generated, followed by RTR, visual examination, and headspace gas sampling.

MTRUW destined for storage at Area G must meet the following WAC for free liquids: 1) no more than two liters of liquid in a 55-gallon drum; 2) no more than eight liters of liquid in a standard waste box; and 3) no more than one inch of liquid in the bottom of any container. Compliance with this requirement is verified through RTR and/or visual examination.

The QAPjP referenced above addresses MTRUW characterization procedures to be utilized after the waste is stored at LANL. These procedures were developed primarily to meet the off-site WAC. LANL's use of these procedures is designed to allow appropriate waste characterization information obtained for storage to serve as a basis for or to supplement future characterization needs without a duplication of effort. Because the QAPjP and other WIPP permit-derived documents addressing MTRUW characterization are subject to change as new information is provided, developed, or approved, and because LANL is not subject to their requirements in LANL's operating permit for storage, but rather utilizes them as waste management guidelines, this WAP will not be modified as ongoing changes to the referenced documents occur.

LANL has prepared a records inventory and disposition schedule for all waste characterization data and related QA/QC records for MTRUW to be shipped to WIPP. These documents will be designated as Lifetime Records or Non-Permanent Records as defined by the schedule and Table B-7 of the WIPP permit. Lifetime Records will be maintained for the life of the LANL MTRUW characterization program plus six years and then offered to WIPP or the appropriate Federal Records Center for permanent archival. Non-Permanent Records will be maintained for 10 years after the date of record generation and then disposed of according to the schedule.

B.3.2.1 LANL TRU Waste Certification Plan

The LANL TRU Waste Certification Plan (LANL, 2002) incorporates the certification requirements of the "Waste Acceptance Criteria for the Waste Isolation Pilot Plant" (WIPP WAC) (DOE, 2002a or most recent version) for MTRUW that will be sent to that site. It establishes the programmatic framework and requirements within which waste generators operate to ensure that their wastes can be certified as meeting the sampling, characterization, and packaging requirements of the WIPP WAC. These include LANL site-specific documents and procedures by which the waste stream analytical data and other AK information are evaluated. Once this documentation has been prepared, it is subject to review and approval by certification program personnel. Waste generators also participate in external audits, as required by the QAPjP and the LANL TRU Waste Certification Plan, to verify the characterization and certification process. If the requirements of the WIPP WAC and the "TRUPACT-II Authorized Methods for Payload Control" (DOE, 2002b) are met, the waste will be certified and transported to WIPP.

B.3.2.1.1 Acceptable Knowledge

AK characterization procedures for MTRUW stored at LANL prior to certification for WIPP acceptance are the same as those described in Section B.3.1.1. The QAPjP (LANL, 2003) describes how LANL ensures compliance with the WIPP requirements associated with the compilation, confirmation, and administrative controls of AK information. LANL-specific procedures consistent with the WIPP WAP are used to implement AK as part of the LANL TRU waste certification program for WIPP to ensure the AK information is compiled in an auditable record, the facility and MTRUW management operations are described and correlated to specific waste stream information, prohibited wastes are identified and segregated, discrepancies in AK are resolved, and the appropriate EPA Hazardous Waste Numbers are assigned.

B.3.2.1.2 Real-Time Radiography [20.4.1 NMAC § 264.13(b)(2), and 20.4.1 NMAC § 270.14(b)(2)]

RTR is a nondestructive, qualitative, and semiquantitative assay technique that involves x-ray scanning of waste containers to identify and verify, using appropriate equipment and qualified operators, the physical form(s) of waste container contents. RTR will be used to verify the absence of free liquids and prohibited items and that the physical form requirements of the WIPP WAC are met. At the same time, RTR will verify the waste classification (i.e., Summary Category Group) and waste form determined using AK. All MTRUW containers will be analyzed by RTR, and the results

for each waste container will be documented. An RTR data form will be used to document the types and quantities of material types observed in each container.

A radiography system routinely consists of an x-ray producing device, an imaging system, an enclosure for radiation protection, a waste container-handling system, an audio/video recording system, and an operator control and data acquisition station. Operating parameters such as the intensity of the x-ray can be varied for optimum viewing of the interior of the waste container. The imaging system typically utilizes an image intensifier, television camera, and remotely-located television screen. Instrument configurations will vary depending on manufacturer and site usage.

During operation of the system, the waste container is scanned while the operator views and permanently records the image from the television screen on audio/videotape. The radiography data form is also used to document the materials present and other information about the containerized waste, as required by the WIPP permit.

The radiography image produced is examined for evidence of liquid materials by jogging the container or repetitively moving the container-handling system and searching for evidence of wave motion in addition to observing the container contents for suspect waste items. The container contents are also observed for items that confirm the waste classification of the container. Conditions that limit or interfere with this determination are noted.

Operator training and experience are important considerations for assuring the quality of the radiography data. Only properly trained personnel are allowed to operate radiography equipment. Standardized training requirements for radiography operators are based upon existing industry standard training requirements. Radiography operators receive formal and on-the-job training in project requirements, system operations and standards, safe operating practices, application techniques, specific waste-generating practices, packaging configurations, parameter estimation, and identification of prohibited items. Operators must be trained and tested before they are qualified for RTR operation, and must requalify at least every two years. LANL operating and training requirements for RTR analysis of MTRUW are based on Attachment B1, “Waste Characterization Sampling Methods,” Section B1-3, “Radiography” (NMED, 2003).

B.3.2.1.3 Visual Examination [20.4.1 NMAC § 264.13(b)(2), and 20.4.1 NMAC §270.14(b)(2)]

The contents of select MTRUW containers will be visually examined to confirm RTR results, or visual examination may be used in lieu of RTR. Visual examination will also verify aspects of AK amenable to visual confirmation. For example, the visual examination will verify the physical characteristics of a waste and the associated Summary Category Group (i.e., Summary Category Group S3000, S4000, or S5000). In addition, visual examination will verify the presence of certain hazardous constituents, such as lead in lead bricks or lead-lined gloves. These types of visual confirmations will either verify or refute the overall AK used to characterize the waste stream.

The contents of each container undergoing visual examination will be recorded on audio/videotape and a description of the observed items must be provided on a visual examination data form. Visual examination procedure operators receive formal and on-the-job training in project requirements, safe operating practices, specific waste-generating practices, packaging configurations, waste parameter estimation, and identification of prohibited items. Operators must be trained and qualify for visual examination procedures and must requalify at least every two years. LANL operating and training requirements for visual examination of MTRUW are based on Attachment B1, “Waste Characterization Sampling Methods,” Section B1-3b(3), “Visual Examination” (NMED, 2003).

The hypergeometric distribution is a statistical means of estimating the probability of determining the true number of miscertified containers in the overall population of waste containers by selecting a number of containers for visual examination using a previously determined or observed miscertification rate and a set confidence factor. The basis for the determination of the number of appropriate containers to be visually examined and a description of the hypergeometric distribution used is available in the WIPP permit, Attachment B2, “Statistical Methods Used in Sampling and Analysis,” Section B2-1, “Approach for Statistically Selecting Waste Containers for Visual Examination” (NMED, 2003). The following table is an example of how the number of MTRUW containers to be randomly selected for visual examination will be determined. The selection process will be updated as necessary to maintain consistency with revisions of the WIPP permit.

Number of Waste Containers Requiring Visual Examination:

Annual Number of Waste Containers Undergoing Characterization	Number of Waste Containers Requiring Visual Examination					
50	22	22	22	22	29	29
100	15	24	24	33	33	41
200	15	26	26	35	44	52
300	15	26	26	35	44	53
400	15	26	26	36	45	54
500	15	26	26	36	45	63
Percent of Waste Containers Miscertified to WIPP WAC by Radiography in Previous Year	1 percent	2 percent	3 percent	4 percent	5 percent	6 percent

LANL uses the miscertification rate observed at LANL in the previous year to determine the appropriate number of containers for visual examination.

B.3.2.1.4 Headspace Gas Sampling [20.4.1 NMAC §§ 264.13(b)(2) and (3), and 20.4.1 NMAC § 270.14(b)(2)]

Headspace gas sampling and analysis is a qualitative screening technique used to confirm the presence of certain regulated hazardous constituents. This method of characterization includes sampling and analysis of headspace gas from the container headspace. In order to meet the characterization requirements in the WIPP permit, the headspace of all containers in storage will be sampled and analyzed as the containers are characterized for shipment to WIPP. Headspace gas sampling will not be relied upon to prove the absence of a hazardous constituent in a waste.

The precision, accuracy, and representativeness of headspace gas samples will be evaluated for adherence to the QAPjP QA objectives through analysis of field QC samples and adherence to QC practices. Sampling and analysis methods for the determination of VOCs in the headspace of MTRUW containers must meet the requirements in the WIPP WAP.

B.3.2.1.5 Solid Waste Sampling and Analysis

The following describes the methods for collecting samples of MTRUW classified as homogeneous solids or soils. Sampling protocol is based on requirements in the WIPP WAP. These sampling methods are similar to those approved by EPA for solid waste and soil sampling in the most recent version of *SW-846*; in “Standard Practice for Thin-Walled Tube Sampling of Soils” (ASTM, 1983); and in “Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds” (ASTM,

1991). These methods are designed to ensure that representative waste samples are consistently collected and transferred to the responsible laboratory in a manner that maintains sample integrity.

The MTRUW classified as homogeneous solids or soils is packaged as a monolith in waste containers or in smaller containers within the outermost waste container. For waste containers selected for sampling that contain multiple small containers, one of the small containers will be randomly selected for sampling. Waste parameters for which homogeneous solids or soils are analyzed are listed in Table B-18.

To accomplish sampling of these wastes, the techniques described below have been developed for sample collection. The methods used to collect samples from the monolithic waste containers or smaller containers must be such that the samples are representative of the waste from which they are taken. For containers of monolithic homogeneous solids or soils, a sample must be collected as a core that is representative of the waste along the entire depth of the waste in the container.

Sample Core Collection

Coring tools must be used to collect cores of homogeneous solids or soils from waste containers in a manner that minimizes disturbance to the core. A rotational coring tool (i.e., a tool that is rotated longitudinally), similar to a drill bit, must be used to cut, lift the waste cuttings, and collect a core sample from containers of waste. For homogeneous solids or soils that are relatively soft, nonrotational coring tools will be used in lieu of a rotational coring tool. Requirements for coring tools are presented in the WIPP WAP.

Statistical Approach for Selection of Homogeneous Waste Containers

A statistical approach will be used to select homogeneous waste containers for solid waste sampling and analysis of solid process residue and soil waste streams. This approach relies on the premise that the waste containers have been separated into waste streams on the basis of AK and, thus, represent populations that contain similar waste. The specific method for calculating the number of drums for sampling is found in the WIPP permit. Waste containers within each waste stream and sample locations within each container will be randomly selected to ensure that the analytical results provide an unbiased estimate of the true mean contaminant concentration for each waste stream.

B.3.2.2 Non-WIPP Mixed TRU Waste Characterization

MTRUW may be generated, re-characterized, or accepted at LANL that is not currently destined for characterization and shipment to WIPP and subject to the WIPP certification requirements. Examples of this type of waste stream are MTRUW that is not generated by defense programs and items that are not compliant with the WIPP WAC.

Characterization procedures for these types of wastes will consist of the same procedures as those described for hazardous waste and MLLW in Section B.3.1 of this plan. These wastes will be characterized using AK and/or sampling and analysis on the same basis as discussed in Section B.3. AK for these wastes can also include additional AK verification procedures for MTRUW, as discussed in Section B.3.2.1, depending on the waste type.

Characteristic MTRUW that is not currently destined for disposition at WIPP will be required to complete characterization for underlying hazardous constituents (UHC) as discussed in Section B.5.3.

B.3.2.3 Characterization Procedures for Treatment of Mixed TRU Wastes

This section presents waste analysis information specific to treatment in the cementation unit at TA-55. It addresses only the hazardous component of mixed waste treated in the cementation unit.

The cementation unit is a Subpart X miscellaneous unit pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart X [6-14-00], and is used to treat liquid and solid mixed wastes by stabilization in cement to form a noncorrosive solid matrix. The cementation unit is located in Glovebox GB-454 along the west wall of TA-55, Building 4 (TA-55-4), in Room 401, and consists of a pH adjustment column, vacuum trap, two motor-driven mixers, four impellers, associated support structures, a glovebox, and piping.

The cementation unit treats homogeneous liquid and solid mixed waste generated primarily from R&D and processing and recovery operations at TA-55 and at the Chemistry and Metallurgy Research Building at TA-3. The liquid wastes (Summary Category Group L1000) generally consist of evaporator bottoms solutions and laboratory solutions that may exhibit the hazardous characteristics of corrosivity and toxicity for metals (including arsenic, barium, cadmium, chromium, lead, mercury, and silver), as defined in 20.4.1 NMAC §§ 261.22 and 261.24 [6-14-00], respectively.

The homogeneous solid process wastes (Summary Category Group S3000) generally consist of process residue from the evaporator, process leached solids, filter cake, and other miscellaneous solids. This waste stream typically exhibits the hazardous characteristics of toxic metals. These waste streams will be mixed with cement in 55-gallon drums and allowed to cure into a noncorrosive solid matrix. Table B-19 provides a description of the waste streams associated with the cementation unit and identifies their potentially applicable EPA Hazardous Waste Numbers. The resulting cemented waste is identified by Summary Category Group S3000 and typically carries the Waste Matrix Code S3100. A general description of the Summary Category Groups and WMCs is provided in Section B.1.2.3.

B.3.2.3.1 Characterization Procedures for Waste to Be Treated by Cementation

Chemical and physical characterization is performed prior to treatment of MTRUW, in accordance with 20.4.1 NMAC § 264.13 [6-14-00]. Documented AK, as described in Section B.3.1.1, is used to determine whether the waste stream is regulated as a hazardous waste. Process knowledge and/or chemical analytical data will be utilized to adequately characterize the MTRUW prior to cementation. If process information is not sufficient, the wastes to be treated by cementation may be periodically sampled and analyzed for pH and for TC metals listed in 20.4.1 NMAC § 261.24 [6-14-00] to establish a baseline, as appropriate. Based on documented AK, these wastes do not contain VOCs or SVOCs. Parameters and analytical methods for specific hazardous constituents are presented in Table B-18.

To ensure that proper procedures and considerations for sample collection and preservation, QA/QC, and occupational safety and health are followed, personnel involved in sampling and analysis of MTRUW at TA-55 will comply with the LANL-specific protocol consistent with the most recent version of *SW-846*. For purposes of collecting a representative sample of MTRUW, the sample will be collected and handled in a manner that preserves its original physical form and composition and prevents contamination or changes in concentration of the parameters to be analyzed. Specific information relative to sampling, parameters, and analytical methods is outlined in Tables B-11 and B-18. Reevaluation frequency is addressed in Section B.3.

B.3.2.3.2 Characterization Procedures for Waste Treated by Cementation

The treated cemented waste will be shipped to WIPP for disposal. Therefore, the treated waste will be characterized in accordance with the LANL QAPjP (LANL, 2003), which incorporates the characterization requirements of the WIPP WAP for waste to be shipped to WIPP. QAPjP

characterization procedures for the treated wastes also meet the RCRA waste analysis requirements of 20.4.1 NMAC § 264.13(a) [6-14-00].

B.3.2.4 Sample Handling, Preservation, and Storage

Table B-15 presents the most recent *SW-846* requirements regarding sample containers, preservation techniques, and holding times associated with sample collection. Sampling personnel adhere to these requirements to ensure that sampling and analysis meet quality objectives for data.

B.3.2.5 Analytical Laboratory Selection and Analytical Methods

Analytical laboratory selection and methods for the purpose of certifying MTRUW for transportation to WIPP must be certified to the requirements of the WIPP WAP. For wastes to be stored at LANL, analytical laboratories at LANL and/or approved subcontractor laboratories will perform the detailed qualitative and quantitative chemical analyses specified in Table B-18 of this WAP. These laboratories must have:

- The capability of handling TRU waste
- A documented comprehensive QA/QC program
- Technical analytical expertise
- A document control/records management plan
- The capability to perform data reduction, validation, and reporting.

The selection and development of analytical testing methods for LANL MTRUW streams were based on the following considerations:

- The physical form of the waste
- Analytes of interest
- Information requirements (e.g., verify compliance with LDR treatment standards, waste classification).

Collectively, these factors contributed to the selection of the analytical methods specified in Table B-18. Qualified analytical laboratories at LANL and/or approved subcontractor laboratories that meet the above criteria will be used for the required analytes.

B.3.3 Remediation Waste Characterization

Remediation waste is defined in 20.4.1 NMAC § 260.10 as all solid and hazardous waste, and all media and debris, which contain listed hazardous wastes or which themselves exhibit a hazardous waste characteristic, that are managed for the purposes of implementing corrective action requirements. At LANL, ER Project remediation wastes are generated from a wide variety of activities, including, but not limited to, site investigations, corrective actions (e.g., interim actions, interim measures, voluntary corrective actions, voluntary corrective measures, and corrective measures study/corrective measures implementation), drilling projects, closures, and D&D activities. These remediation wastes consist primarily of contaminated soil and structural debris. Investigation-derived waste, a subset of remediation wastes, may include small amounts of samples, personal protective equipment, contaminated sampling supplies, plastic, environmental media (e.g., drill cuttings and/or core material, well development and purge waters), and decontamination fluids.

The Laboratory's ER Project has developed two standard operating procedures (SOP) to fully address characterization of remediation waste, which form the basis for the information provided in this WAP. The SOPs are subject to change and the following discussion is provided for information purposes only. The SOPs are "Management of Environmental Restoration Project Waste," ER-SOP-01.06 (LANL, 2001a), which describes the process for managing ER Project waste generated during corrective action, and "Waste Characterization," ER-SOP-01.10 (LANL, 2001b), which describes the development of a strategy for characterizing wastes generated during specific corrective action-related activities implemented by the ER Project. These SOPs provide specific, mandatory, and uniform procedures for managing and characterizing remediation waste and incorporate, by reference, the most current version of Laboratory Implementation Requirements (LIR) and Laboratory Implementation Guidance (LIG) associated with waste management.

ER-SOP-01.06 provides definitions and references for all types and categories of waste, corresponding waste documentation, waste management personnel, and applicable ER Project policies. The SOP describes training requirements for any ER Project personnel managing waste, and references ER-SOP-01.10 for the completion of a Waste Characterization Strategy Form (WCSF).

ER-SOP-01.10 identifies the steps involved in waste identification and characterization as delineated by Laboratory requirements, and provides instructions for completing a WCSF. A WCSF

must be completed by ER Project personnel and subsequently reviewed and approved by appropriate personnel prior ER Project waste generation. The WCSF process for ER Project remediation waste is used in conjunction with current LIRs and LIGs associated with waste characterization and management, and with the Laboratory's current WAC document.

Completion of a WCSF includes the following steps:

- Identify potential wastes to be generated by the proposed activity through reviewing historical site information, including previously developed ER Project data and reports regarding the project site.
- Determine whether the existing data and/or documentation for the waste stream fulfill the criteria for AK specified in LIG 404-00-02, "Acceptable Knowledge Guidance."
- If the existing data do not fulfill the AK criteria specified in the LIG, develop a waste analysis suite and select test methods appropriate to identify and quantify potential contaminants. If the existing data are partially useful, develop a sampling and analysis strategy that will complete the characterization for the waste stream. If the existing data provide no useful information, develop a sampling and analysis strategy that will identify and quantify all potential constituents of concern in the waste stream.
- Identify preliminary classifications of wastes to be generated. Classifications include, but are not limited to, radioactive (including low-level and mixed low-level), RCRA solid or hazardous, polychlorinated biphenyl, and special. Wastes may be combinations of these classifications.
- List the anticipated amount of waste, by classification, to be generated as part of the ER Project activity.
- List packaging requirements.

The WCSF for a specific ER Project site or activity is amended when a new waste type or classification not previously identified on the form is to be generated or there are changes in planned field activities. Once approved, the amendment becomes part of the original WCSF. The WCSF, with instructions on its completion, is included in ER-SOP-01.10.

The information provided in a WCSF is used to aid the classification of waste generated by an ER Project activity. Waste characterization documentation is prepared for each type of waste generated and is used to document the actual characterization of a specific waste stream described in the WCSF.

B.4 OFF-SITE WASTE ACCEPTANCE PROCEDURES [20.4.1 NMAC §§ 264.13(a)(3)(ii)

and (a)(4); 264.13(b)(5); and 264.13(c)]

This section discusses general waste acceptance procedures that will be used when hazardous or mixed waste is accepted from off-site waste-generating facilities. These procedures will be used to meet the requirements of 20.4.1 NMAC §§ 264.13(a)(3)(ii), 264.13(a)(4), 264.13(b)(5), and 264.13(c) [6-14-00]. Table 2-2 of this General Part B Permit Renewal Application lists off-site waste-generating facilities that may send waste to LANL. Specific descriptions of the waste streams to be received by LANL from these facilities and the appropriate waste characterization documentation and acceptance procedures are included in Supplement 1 of this General Part B Permit Renewal Application. The basis for characterization of waste streams to be accepted by LANL is generator documentation of the waste. For off-site waste, all of LANL's routine waste characterization documentation will, at a minimum, be collected from the generator and reviewed for completeness and accuracy by LANL in accordance with standard procedures. Off-site preshipment inspection of the waste will be used to examine the waste and its documentation, if the information provided by the generator is insufficient to meet LANL WAC.

Uniform Hazardous Waste Manifests and LDR Notification Forms, as applicable, will be prepared for each shipment of off-site hazardous or mixed waste to LANL and verified by LANL waste management personnel. Upon receipt at LANL, waste shipments will be physically examined for correct documentation, presence and correctness/completeness of waste container identification and labeling, and conformance with LANL container types and waste compatibility for storage and segregation, as appropriate. If discrepancies are found, nonconformance procedures will be followed to resolve the discrepancy. Acceptable options for resolution will include shipment of the waste back to the off-site generation facility, or temporary storage pending further analysis or characterization.

If TA-54 accepts hazardous waste from an off-site facility, each shipment is inspected and analyzed as necessary to determine that it matches the waste identified on the waste manifest. These requirements are reiterated under LDR.

Additional waste characterization activities in support of WIPP certification will generally be the purpose of MTRUW shipments to LANL from off site, and discrepancies may become apparent as part of characterization, as described in Section B.3.2. Resolution of such discrepancies will be

performed in accordance with the procedures contained in each analytical method in conformance with the WIPP permit.

B.5 SPECIAL PROCEDURAL REQUIREMENTS [20.4.1 NMAC § 264.13(b)(6)]

Waste management requirements specific to ignitable, reactive, and incompatible waste, as well as for compliance with LDR and Subpart CC regulations, are described below.

B.5.1 Procedures for Ignitable, Reactive, and Incompatible Wastes to be Stored

Pursuant to 20.4.1 NMAC § 264.17 [6-14-00], specific waste management procedures for ignitable, reactive, and incompatible wastes to be stored are described as follows. These waste management methods vary depending on the physical form and type of waste managed. To ensure that these wastes are managed safely and properly, their characteristics are identified and documented as described in Section B.3, they are labeled appropriately, and the waste types are physically segregated within each container storage unit. Wastes are segregated and stored, as appropriate, by their physical characteristics (i.e., liquids or solids) and according to the following compatibility groups: (1) flammables/ignitables; (2) oxidizers; (3) corrosive acids; (4) reactive with water; (5) corrosive bases; (6) other reactives; and (7) other wastes.

B.5.2 Procedures for Ignitable, Reactive, and Incompatible Wastes to be Treated

Waste management procedures for ignitable, reactive, and incompatible wastes to be treated will be followed pursuant to 20.4.1 NMAC § 264.17 [6-14-00]. LANL personnel will take the necessary precautions to prevent accidental ignition or reaction of wastes to be treated by OB or OD. LANL relies on SOPs, hazard control plans, and other formal procedures for specific safety and handling associated with the treatment of HE waste and HE-contaminated waste. This includes, but is not limited to, the segregation of these wastes according to compatibility groups and by the physical nature of the waste (i.e., liquids and solids).

The treatment of these wastes by OB or OD is an appropriate treatment method under RCRA. It is necessary to mitigate the ignitable and/or reactive hazards associated with HE waste and HE-contaminated waste and is the preferred waste management practice for health and safety concerns.

The cementation unit will not treat ignitable, reactive, or incompatible mixed waste.

B.5.3 Procedures to Ensure Compliance with LDR Requirements [20.4.1 §§ 268.7(a) and 268.7(b)(3), (4), and (5)]

The LDR contained in 20.4.1 NMAC, Subpart VIII, Part 268, identify hazardous wastes restricted from land disposal; define those circumstances under which an otherwise prohibited waste may continue to be placed on or in a land treatment, storage, or disposal unit; specify treatment standards; and describe testing, tracking, and recordkeeping requirements for generators and TSDFs. This section describes the approach used by LANL treatment and storage facilities to comply with LDR requirements.

The characterization documentation for all waste streams to be treated or stored on-site are reviewed as described in Section B.3. The documentation is evaluated:

- To ensure that appropriate EPA Hazardous Waste Numbers and UHCs exceeding treatment standards are identified and that the wastes are accompanied by generator notifications/certifications, if required by 20.4.1 NMAC § 268.7(a).
- To determine whether the waste is exempt or excluded, already meets the treatment standards, or must be treated on site, off site, or both to meet all treatment standards.
- To identify the appropriate TSDF to which the waste will next be sent.

LANL maintains the waste characterization data and other records, as specified in Section B.3.

If waste is to be treated on site to meet the LDR requirements, the treatment unit must comply with the testing and reporting requirements of 20.4.1 NMAC § 268.7(b). After treating the waste, the treated waste/residue is evaluated to determine whether all treatment standards have been met. The treatment standards are defined in 20.4.1 NMAC §§ 268.40, 268.45, 268.48, or 268.49, depending on the type of waste treated. Residues from wastes with concentration-based treatment standards are analyzed by the appropriate methods described in Section B.3.1.2 to assure that the waste meets applicable treatment standards. For wastes or contaminated soil with treatment standards expressed by the waste extract, the TCLP procedures described in Sections B.3.1.2.1 or B.3.1.2.2 will be used.

The treatment facility prepares the certifications appropriate to excluded debris treated to 20.4.1 NMAC § 268.45 alternative standards, soil treated to 20.4.1 NMAC § 268.49 standards, characteristic wastes for which all characteristics have been treated and all Universal Treatment

Standards have been met, characteristic wastes for which all characteristics have been treated but not all treatment standards are achieved, and/or other special certifications required for materials such as soil. New waste characterization documentation, incorporating the treatment facility paperwork requirements of 20.4.1 NMAC § 268.7(b) or the generator paperwork requirements of 20.4.1 NMAC § 268.7(a) if the residue is considered a newly-generated waste or is being shipped to another TSDF, is prepared for the treated waste/residue, as appropriate. The certifications/notifications and waste characterization documentation are used to determine where the waste will be sent for further treatment, storage, or disposal. The appropriate 20.4.1 NMAC § 268.7(a) notifications are prepared before sending any waste subject to LDR to an off-site TSDF. Most receiving facilities have their own WAC requirements, specifying how the LDR information will be submitted. The receiving facilities usually require that analytical data be provided before the waste is shipped to ensure the waste meets their WAC. Waste may be sent to TA-54 or other LANL storage units after treatment or directly off-site from the treatment facility.

For wastes received from off-site, LANL will require an LDR notification that addresses all LDR requirements applicable to the specific waste type. If off-site wastes are treated at LANL, LANL will comply with the requirements of 20.4.1 NMAC §268.7(b), as discussed above.

As a permitted storage facility, LANL must comply with the 20.4.1 NMAC, Subpart VIII, Part 268, Subpart E, prohibitions on storage. Generally, wastes subject to LDR can be stored no longer than one year. However, the LDR provide relief from the storage prohibition for wastes that have received a variance or waiver from treatment or have no practical disposal alternative. Other rulemaking may also exempt waste from LDR. For example, MTRUW destined for WIPP is not be subject to LDR under the Federal Facilities Compliance Order (FFCO) and the WIPP Land Withdrawal Act. The 1992 Federal Facility Compliance Act (Pub.L. 102-386, 106 Stat. 1505) exempts LANL's mixed waste from the storage prohibitions under 20.4.1 NMAC, Subpart VIII, Part 268, so long as LANL is in compliance with a state-issued order and Site Treatment Plan (STP). NMED issued LANL an FFCO and approved an STP setting forth schedules for LDR compliance. LANL is in compliance with its FFCO and STP and, therefore, the storage prohibition under 20.4.1 NMAC, Subpart VIII, Part 268, does not apply to mixed waste covered by the FFCO.

B.5.4 Procedures to Ensure Compliance with Subpart CC Requirements [40 CFR § 264.1082]

LANL waste streams described in this document may be subject to 40 CFR, Part 264, Subpart CC, "Air Emission Standards for Tanks, Surface Impoundments, and Containers," based on applicability criteria specified in 40 CFR § 264.1080. For wastes that are not eligible for exemption under 40 CFR §264.1080(b), LANL will address the applicable Subpart CC characterization requirements. LANL requires that Subpart CC requirements be evaluated as part of the waste characterization process. Generator information is used to determine whether the concentration of VOCs in a waste stream at the point of generation is less than 500 parts per million by weight (ppmw), or is equal to or greater than 500 ppmw. The generator documents this determination for that waste stream. AK or process knowledge will be used to make this determination; however, if sampling and analysis is needed, it will be performed in accordance with the approved methods listed in Tables B-16, B-17, and B-18.

The characterization documentation for VOCs will be reviewed prior to acceptance of the waste at TA-54, as discussed in Section B.3. If process knowledge is insufficient, sampling and analysis of the waste will be required, in accordance with 20.4.1 NMAC §§ 265.1084(a)(2) through 265.1084(a)(4). Any hazardous waste that is newly-generated through the treatment or re-characterization of mixed waste will be characterized for the volatile organic content.

B.6 REFERENCES

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NMED, 1995, "Federal Facility Compliance Order (Los Alamos National Laboratory)," New Mexico Environment Department, Santa Fe, New Mexico.

Table B-1

Regulatory References and Corresponding Waste Analysis Plan Location

Regulatory Citation(s)	Description of Requirement	Location in the Waste Analysis Plan
§264.13	General waste analysis	Throughout document
§264.13(a)(1)	A detailed chemical and physical analysis of a representative sample of the waste prior to treatment, storage, or disposal of the waste	B.2, B.3
§264.13(a)(2)	Analysis may include data developed under Part 261 and existing published or documented data on the hazardous waste or on hazardous waste generated from similar processes	B.3.1, B.3.2, B.3.3
§264.13(a)(3)	Analysis must be repeated as necessary to ensure that it is accurate and up to date	B.3.1, B.3.2, B.3.3
§264.13(a)(3)(i)	Analysis repeated when owner/operator has reason to believe that the process or operation generating the hazardous wastes, or nonhazardous wastes if applicable under § 264.113(d), has changed	B.3.1, B.3.2, B.3.3
§264.13(a)(3)(ii)	For off-site facilities, analysis repeated when the results of the inspection required in § 264.13(a)(4) indicate that the hazardous waste received at the facility does not match the waste designated on the accompanying manifest or shipping paper	B.4
§264.13(a)(4)	Owner/operator of an off-site facility must inspect and, if necessary, analyze each hazardous waste received to determine whether it matches the identity of the waste specified on the accompanying manifest or shipping paper	B.4
§264.13(b)	Development and implementation of waste analysis plan	Entire document
§264.13(b)(1)	Parameters for which each hazardous waste, or non-hazardous waste if applicable under § 264.113(d), will be analyzed and the rationale for selection of the parameters	B.2, Tables B-9, B-10, B-11, and B-12
§264.13(b)(2)	Test methods which will be used for the proposed parameters	B.3, Tables B-13, B-14, B-16, B-17, and B-18
§264.13(b)(3)	Sampling method which will be used to obtain a representative sample of the waste to be analyzed	B.3
§264.13(b)(3)(i)	Sampling methods described in Appendix I of Part 261	B.3.1, B.3.2, B.3.3
§264.13(b)(3)(ii)	An equivalent sampling method	B.3.1, B.3.2, B.3.3
§264.13(b)(4)	Frequency with which the initial analysis of the waste will be reviewed or repeated to ensure that the analysis is accurate and up to date	B.3.1, B.3.2, B.3.3

Table B-1 (Continued)

Regulatory References and Corresponding Waste Analysis Plan Location

Regulatory Citation(s)	Description of Requirement	Location in the Waste Analysis Plan
§264.13(b)(5)	For off-site facilities, the waste analyses that hazardous waste generators have agreed to supply	B.4
§264.13(b)(6)	Where applicable, the methods to meet additional waste analysis requirements for specific waste management methods as specified in § 264.17 (ignitable, reactive, or incompatible), § 264.314 (bulk and containerized liquids), § 264.341 (waste analysis for incinerators), § 264.1034(d) (Subpart AA), § 264.1063(d) (Subpart BB), § 264.1083 (Subpart CC), and § 268.7 (Land Disposal Restrictions)	B.5
§264.13(b)(7)	The procedures and schedules for surface impoundments exempted from land disposal restrictions under § 268.4(a)	NA
§264.13(b)(7)(i)	Sampling of impoundment contents	NA
§264.13(b)(7)(ii)	Analysis of test data	NA
§264.13(b)(7)(iii)	Annual removal of residues which are not delisted under § 260.22 or which exhibit a characteristic of hazardous waste and either:	NA
§264.13(b)(7)(iii)(A)	Do not meet applicable treatment standards of Part 268, Subpart D; or	NA
§264.13(b)(7)(iii)(B)	Where no treatment standards have been established;	NA
§264.13(b)(7)(iii)(B)(1)	Such residues are prohibited from land disposal under § 268.32 or the Resource Conservation and Recovery Act § 3004(d); or	NA
§264.13(b)(7)(iii)(B)(2)	Such residues are prohibited from land disposal under § 268.33(f)	NA
§264.13(b)(8)	For owner/operator seeking an exemption to the air emission standards of Subpart CC in accordance with § 264.1082	B.5.4
§264.13(b)(8)(i)	If direct measurement is used for the waste determination, the procedures and schedules for waste sampling and analysis and the results of the analysis of test data to verify the exemption	B.5.4
§264.13(b)(8)(ii)	If knowledge of the waste is used for the waste determination, any information prepared by the facility owner/operator or by the generator of the hazardous waste if the waste is received from off-site, that is used as the basis for knowledge of the waste	B.5.4
§264.13(c)	For off-site facilities, the procedures which will be used to inspect and, if necessary, analyze each movement of hazardous waste received at the facility to ensure that it matches the identity of the waste designated on the accompanying manifest or shipping paper	B.4

Table B-1 (Continued)

Regulatory References and Corresponding Waste Analysis Plan Location

Regulatory Citation(s)	Description of Requirement	Location in the Waste Analysis Plan
§264.13(c)(1)	The procedures to determine the identity of each movement of waste managed at the facility	B.4
§264.13(c)(2)	The sampling method which will be used to obtain a representative sample of the waste to be identified, if the identification method includes sampling	B.4
§264.13(c)(3)	The procedures for an off-site landfill receiving containerized hazardous wastes to determine whether a hazardous waste generator or treater has added a biodegradable sorbent to the waste in the container	NA

[a] NA = not applicable

Table B-2
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Spent Solvents	Research and development (R&D) activities; laser research; organic and inorganic chemistry research (e.g., solvent extractions, liquid chromatography solvents, polymer synthesis, and distillations); cleaning; and degreasing operations	Acceptable Knowledge[d] Sampling and Analysis	D001	Ignitability	NA[e]	Acetone, Acetonitrile, Antimony, Benzene, Cadmium, Cyanides (Total), 1,2-Dichloroethane, 1,4-Dioxane, Ethyl ether, Methanol, Methylene chloride, Toluene, Trichloroethylene, Triethylamine
			D002	Corrosivity	NA[e]	
			D003	Reactivity	NA[e]	
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			D018	Benzene	0.5	
			D019	Carbon tetrachloride	0.5	
			D021	Chlorobenzene	100.0	
			D022	Chloroform	6.0	
			D026	Cresol	200.0[h]	
			D027	1,4-Dichlorobenzene	7.5	
			D028	1,2-Dichloroethane	0.5	
			D029	1,1-Dichloroethylene	0.7	
			D030	2,4-Dinitrotoluene	0.13	
			D032	Hexachlorobenzene	0.13	
			D034	Hexachloroethane	3.0	
			D035	Methyl ethyl ketone	200.0	
			D036	Nitrobenzene	2.0	
			D037	Pentrachlorophenol	100.0	
			D038	Pyridine	5.0	
			D040	Trichloroethylene	0.5	
			D041	2,4,5-Trichlorophenol	400.0	
			D042	2,4,6-Trichlorophenol	2.0	
			D043	Vinyl chloride	0.2	
			F001	Spent halogenated solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F004	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	
			U213	Tetrahydrofuran	NA[e]	

Table B-2 (Continued)
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Contaminated Solid Wastes	Machining operations, chemistry research, decontamination and decommissioning projects, metal finishing operations, HE wastewater filtration, and general maintenance operations	Acceptable Knowledge[d] Sampling and Analysis	D001	Ignitability	NA[e]	Barium, Beryllium, Cadmium, Carbon disulfide, Chloroform, Chromium (Total), Ethel ether, Lead, Mercury-all others, Methanol, Methyl ethyl ketone, Methylene chloride, Nickel, Phenol, p,p'-DDT, Selenium, Silver, Thallium, Trichloroethylene
			D003	Reactivity	NA[e]	
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			D018	Benzene	0.5	
			D019	Carbon tetrachloride	0.5	
			D021	Chlorobenzene	100.0	
			D022	Chloroform	6.0	
			D023	o-Cresol	200.0[h]	
			D024	m-Cresol	200.0[h]	
			D025	p-Cresol	200.0[h]	
			D026	Cresol	200.0[h]	
			D027	1,4-Dichlorobenzene	7.5	
			D028	1,2-Dichloroethane	0.5	
			D029	1,1-Dichloroethylene	0.7	
			D030	2,4-Dinitrotoluene	0.13	
			D031	Heptachlor (and its epoxide)	0.008	
			D032	Hexachlorobenzene	0.13	
			D033	Hexachlorobutadiene	0.5	
			D034	Hexachloroethane	3.0	
			D035	Methyl ethyl ketone	200.0	
			D036	Nitrobenzene	2.0	
			D037	Pentrachlorophenol	100.0	
			D038	Pyridine	5.0[f]	
			D039	Tetrachloroethylene	0.7	
			D040	Trichloroethylene	0.5	
			D041	2,4,5-Trichlorophenol	400.0	
			D042	2,4,6-Trichlorophenol	2.0	
			D043	Vinyl chloride	0.2	
			F001	Spent halogented solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F004	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	
			K045	Spent carbon	NA[e]	

Refer to footnotes at end of table.

Table B-2 (Continued)
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Paint and Related Wastes	Painting and finishing operations, and general facility maintenance	Acceptable Knowledge[d] Sampling and Analysis	D001 D005 D006 D007 D008 D009 D011 D036 F003 F005	Ignitability Barium Cadmium Chromium Lead Mercury Silver Nitrobenzene Spent non-halogenated solvents Spent non-halogenated solvents	NA[e] 100.0 1.0 5.0 5.0 0.2 5.0 2.0 NA[e] NA[e]	Lead, Methyl ethyl ketone
Photographic and Photocopier Wastes	Photographic film processing and photocopier operations	Acceptable Knowledge[d] Sampling and Analysis	D001 D002 D006 D007 D008 D011	Ignitability Corrosivity Cadmium Chromium Lead Silver	NA[e] NA[e] 1.0 5.0 5.0 5.0	Silver

Refer to footnotes at end of table.

Table B-2 (Continued)
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Corrosive Liquid Wastes	Analytical chemistry research, electro-etching, and electro-polishing	Acceptable Knowledge[d] Sampling and Analysis	D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D011 D018 D022 D038 F002 F003 F005 P023	Ignitability Corrosivity Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Benzene Chloroform Pyridine Spent halogenated solvents Spent non-halogenated solvents Spent non-halogenated solvents Chloroacetaldehyde	NA[e] NA[e] NA[e] 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 0.5 6.0 5.0 NA[e] NA[e] NA[e] NA[e]	Acetone, Arsenic, Barium, Cadmium, Chromium (Total), Cyanides (Total), 2,4-Dinitrophenol, Fluoride, Isobutyl alcohol, Lead, Mercury-all others, Methanol, Nickel, o-Nitrophenol, Selenium, Silver, Sulfide, Thallium, Triethylamine, Zinc
Solid Metals and Metallic Compounds	Machining and cutting operations; synthesis reactions; solder from electronic manufacturing, repair, and brazing operations; and grinding operations	Acceptable Knowledge[d] Sampling and Analysis	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	NA[e] NA[e] 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0	Arsenic, Lead, Nickel, Silver

Refer to footnotes at end of table.

Table B-2 (Continued)
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Contaminated Noncorrosive Aqueous and Nonaqueous Solutions and Sludges	Vacuum pump maintenance, analytical spectrometry, equipment cleaning and maintenance, vehicle maintenance, synthesis reactions, metal-polishing operations, and chemical research	Acceptable Knowledge[d] Sampling and Analysis	D001	Ignitability	NA[e]	Acetone, Acetonitrile, Antimony, Arsenic, Barium, Benzene, Cadmium, Carbon tetrachloride, Chromium (Total), Chrysene, p-Cresol, m-Dichlorobenzene, 1,2-Dichloroethane, 4,6-Dinitro-o-cresol, 1,4-Dioxane, Fluorene, Indeno(1,2,3-c,d) pyrene, Lead, Mercury-all others, Methanol, Methyl ethyl ketone, Methylene chloride, Naphthalene, p-Nitrophenol, Pyridine, Selenium, Silver, Tetrachloroethylene, Toluene, Trichloroethylene, 2,4,6-Trichlorophenol, Zinc
			D002	Corrosivity	NA[e]	
			D003	Reactivity	NA[e]	
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			D018	Benzene	0.5	
			D019	Carbon tetrachloride	0.5	
			D021	Chlorobenzene	100.0	
			D022	Chloroform	6.0	
			D023	o-Cresol	200.0[h]	
			D024	m-Cresol	200.0[h]	
			D025	p-Cresol	200.0[h]	
			D026	Cresol	200.0[h]	
			D027	1,4-Dichlorobenzene	7.5	
			D028	1,2-Dichloroethane	0.5	
			D029	1,1-Dichloroethylene	0.7	
			D030	2,4-Dinitrotoluene	0.13[f]	
			D032	Hexachlorobenzene	0.13[f]	
			D033	Hexachlorobutadiene	0.5	
			D034	Hexachloroethane	3.0	
			D035	Methyl ethyl ketone	200.0	
			D036	Nitrobenzene	2.0	
			D037	Pentrachlorophenol	100.0	
			D038	Pyridine	5.0	
			D039	Tetrachloroethylene	0.7	
			D040	Trichloroethylene	0.5	
			D041	2,4,5-Trichlorophenol	400.0	
			D042	2,4,6-Trichlorophenol	2.0	
			D043	Vinyl chloride	0.2	
			F001	Spent halogenated solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F004	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	

Refer to footnotes at end of table.

Table B-2 (Continued)
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Mercury Wastes	Lamp replacement, chemical research, mercury spill cleanup, and equipment cleaning and maintenance	Acceptable Knowledge[d] Sampling and Analysis	D003 D008 D009 D011 U151	Reactivity Lead Mercury Silver Mercury	NA[e] 5.0 0.2 5.0 NA[e]	Barium, Chromium (Total), Mercury-all others, Thallium, Zinc
Used Batteries and Battery Fluids	Equipment maintenance	Acceptable Knowledge[d]	D002 D003 D006 D007 D008 D009 D011 D038	Corrosivity Reactivity Cadmium Chromium Lead Mercury Silver Pyridine	NA[e] NA[e] 1.0 5.0 5.0 0.2 5.0 5.0[f]	Cadmium, Lead, Pyridine, Silver
Unused/Off-specification Commercial Chemical Products	R&D, spill residues, and general facility operations	Acceptable Knowledge[d] Sampling and Analysis	D001 D002 D003 D004 through D043 All P- and U-listed EPA Hazardous Waste Numbers[g]	Ignitability Corrosivity Reactivity Toxicity characteristic wastes Discarded commercial chemical products and off-specification species	NA[e] NA[e] NA[e] -[c] NA[e]	Acetonitrile, Barium, Cadmium, Chromium (Total), Lead, Mercury-all others, Nickel, Selenium, Silver, Toluene

Refer to footnotes at end of table.

Table B-2 (Continued)
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Gas Cylinder Waste	R&D and general facility operations	Acceptable Knowledge[d]	D001	Ignitability	NA[e]	
			D002	Corrosivity	NA[e]	
			D003	Reactivity	NA[e]	
			Potential D-coded EPA Hazardous Waste Numbers	Toxicity characteristic wastes	-[c]	
			Potential P-and U-listed EPA Hazardous Waste Numbers[g]	Discarded commercial chemical products and off-specification species	NA[e]	
Environmental Restoration (ER) Soils and Sludges	Site decommissioning, site characterization, and site remediation; includes septic tank and detention basin closure, removal actions, and other remedial actions and site closures	Acceptable Knowledge[d] Sampling and Analysis	D001	Ignitability	NA[e]	Barium, Cadmium, Lead
			D003	Reactivity	NA[e]	
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			D018	Benzene	0.5	
			D022	Chloroform	6.0	
			D030	2,4-Dinitrotoluene	0.13[f]	
			D032	Hexachlorobenzene	0.13[f]	
			D033	Hexachlorobutadiene	0.5	
			D034	Hexachloroethane	3.0	
			D036	Nitrobenzene	2.0	
			D039	Tetrachloroethylene	0.7	
			D040	Trichloroethylene	0.5	
			D042	2,4,6-Trichlorophenol	2.0	
			F001	Spent halogenated solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	

Refer to footnotes at end of table.

Table B-2 (Continued)
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
ER Aqueous Liquids	Decontamination of remedial equipment, drilling fluids and well development fluids, septic tank liquids, and contaminated storm water runoff	Acceptable Knowledge[d] Sampling and Analysis	D001	Ignitability	NA[e]	
			D002	Corrosivity	NA[e]	
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			D038	Pyridine	5.0	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	
ER Debris	Site decommissioning, site characterization, and site remediation; includes septic tank and detention basin closure, removal actions, and other remedial actions and site closures	Acceptable Knowledge[d]	D001	Ignitability	NA[e]	Barium, Lead
			D003	Reactivity	NA[e]	
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			D018	Benzene	0.5	
			D022	Chloroform	6.0	
			D030	2,4-Dinitrotoluene	0.13[f]	
			D032	Hexachlorobenzene	0.13[f]	
			D033	Hexachlorobutadiene	0.5	
			D034	Hexachloroethane	3.0	
			D036	Nitrobenzene	2.0	
			D039	Tetrachloroethylene	0.7	
			D040	Trichloroethylene	0.5	
			D042	2,4,6-Trichlorophenol	2.0	

Refer to footnotes at end of table.

Table B-2 (Continued)
Descriptions of Hazardous Waste Stored at LANL

Waste Description[a]	Waste-Generating Process[a]	Basis for Characterization[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
ER Debris (continued)			F001	Spent halogenated solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	

a Denotes information from the Los Alamos National Laboratory waste characterization documentation database.
b U.S. Environmental Protection Agency.
c A solid waste exhibits the characteristics of toxicity if, using the Toxicity Characteristic Leaching Procedure, Test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1986), the extract from a representative sample of the waste contains any of the contaminants listed (D004-D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart II, Part 261, Subpart C [6-14-00].
d Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994. "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.
e Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic wastes and F-, P-, and U-listed wastes.
f The quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level (20.4.1 NMAC, Subpart II, 261.24, Table 1) [6-14-00].
g Refers to the P- and U-listed wastes found in the "Los Alamos National Laboratory General Part A Permit Application," Revision 3.0, 2002, Los Alamos National Laboratory, Los Alamos, New Mexico.
h If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 milligrams per liter.

Note: Fluoride, sulfide, vanadium, and zinc are not "underlying hazardous constituents" in characteristic wastes, according to the definition in § 268.2(i). Selenium is not an underlying hazardous constituent as defined at § 268.2(i) because its Universal Treatment Standard level is greater than its Toxicity Characteristic level, thus a treated selenium waste would always be characteristically hazardous, unless it is treated to below its characteristic level.

Refer to footnotes at end of table.

Table B-3

Descriptions of Mixed Low-Level Waste Stored at LANL

Waste Description[a]	Waste Generating Activity[a]	Basis for Hazardous Waste Designation[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Solid Wastes						
Soils with Heavy Metals	Decontamination and decommissioning (D&D) and Environmental Restoration (ER) activities	Acceptable Knowledge[d] and Preliminary Analysis[e]	D004 D005 D006 D007 D008 D009 D010 D011	Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0	Arsenic, Barium, Chromium (Total), Mercury-all others, Selenium, Vanadium, Zinc
Environmental Restoration Soils	Remediation of release sites and D&D activities	Acceptable Knowledge[d] Sampling and Analysis	D005 D006 D007 D008 D009 D028 D029 F001 F002 F004 F005	Barium Cadmium Chromium Lead Mercury 1,2-Dichloroethane 1,1-Dichloroethylene Spent halogenated solvents Spent halogenated solvents Spent non-halogenated solvents Spent non-halogenated solvents	100.0 1.0 5.0 5.0 0.2 0.5 0.7 NA[e] NA[e] NA[e] NA[e]	Chromium (Total), Lead
Inorganic Solid Oxidizers	D&D of research laboratories and research and development (R&D)	Acceptable Knowledge[d]	D001 D003 D005	Ignitability Reactivity Barium	NA[e] NA[e] 100.0	
Lead Waste	Radioisotope experiments and other reactor, accelerator, laser, and x-ray activities	Acceptable Knowledge[d]	D002 D003 D007 D008 D009	Corrosivity Reactivity Chromium Lead Mercury	NA[e] NA[e] 5.0 5.0 0.2	Lead
Noncombustible Debris	Maintenance, D&D, R&D, and ER activities	Acceptable Knowledge[d]	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011 F002 F005	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Spent halogenated solvents Spent non-halogenated solvents	NA[e] NA[e] 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 NA[e] NA[e]	Arsenic, Cadmium, Chromium (Total), Lead, Mercury-all others

Table B-3 (Continued)

Descriptions of Mixed Low-Level Waste Stored at LANL

Waste Description[a]	Waste Generating Activity[a]	Basis for Hazardous Waste Designation[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Solid Wastes (Continued)						
Combustible Debris	Maintenance, R&D, D&D, and ER activities	Acceptable Knowledge[d]	D001	Ignitability	NA[e]	Lead, Mercury-all others, Nickel, Zinc
			D003	Reactivity	NA[e]	
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			F001	Spent halogenated solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	
Organic-Contaminated Noncombustible Solids	Vacuum pump maintenance, R&D, D&D, and ER activities	Acceptable Knowledge[d]	D001	Ignitability	NA[e]	Methoxychlor, Methyl ethyl ketone
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			D018	Benzene	0.5	
			D027	1,4-Dichlorobenzene	7.5	
			D030	2,4-Dinitrotoluene	0.13[f]	
			D032	Hexachlorobenzene	0.13[f]	
			D033	Hexachlorobutadiene	0.5	
			D034	Hexachloroethane	3.0	
			D035	Methyl ethyl ketone	200.0	
			D037	Pentrachlorophenol	100.0	
			D038	Pyridine	5.0[f]	
			D041	2,4,5-Trichlorophenol	400.0	
			D042	2,4,6-Trichlorophenol	2.0	
			F001	Spent halogenated solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F004	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	

Table B-3 (Continued)

Descriptions of Mixed Low-Level Waste Stored at LANL

Waste Description[a]	Waste Generating Activity[a]	Basis for Hazardous Waste Designation[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Solid Wastes (Continued)						
Organic-Contaminated Combustible Solids	Maintenance, D&D, and ER activities	Acceptable Knowledge[d]	D001 D003 D007 D008 D009 D030 D035 F001 F002 F003 F005	Ignitability Reactivity Chromium Lead Mercury 2,4-Dinitrotoluene Methyl ethyl ketone Spent halogenated solvents Spent halogenated solvents Spent non-halogenated solvents Spent non-halogenated solvents	NA[e] NA[e] 5.0 5.0 0.2 0.13[f] 200.0 NA[e] NA[e] NA[e] NA[e]	
Water-Reactive Wastes	Cleanup of HE firing-site debris, machining and disassembly of test components	Acceptable Knowledge[d]	D001 D003 D005 F002	Ignitability Reactivity Barium Spent halogenated solvents	NA[e] NA[e] 100.0 NA[e]	
Mercury Wastes	Cleanup operations	Acceptable Knowledge[d]	D005 D007 D008 D009 F001	Barium Chromium Lead Mercury Spent halogenated solvents	100.0 5.0 5.0 0.2 NA[e]	Mercury-all others
Unused Solid Reagent Chemical Wastes	R&D activities	Acceptable Knowledge[d]	D001 D002 D003 All P- and U-listed EPA Hazardous Waste Numbers[h]	Ignitability Corrosivity Reactivity Discarded commercial chemical products and off-specification species	NA[e] NA[e] NA[e] NA[e]	

Table B-3 (Continued)

Descriptions of Mixed Low-Level Waste Stored at LANL

Waste Description[a]	Waste Generating Activity[a]	Basis for Hazardous Waste Designation[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Liquid Wastes						
Spent Solvents and Contaminated Solvent Mixtures	Maintenance, cleaning, and degreasing activities: R&D; processing operations, such as extraction, bench-scale experimental inorganic chemistry, environmental analysis, radiochemistry	Acceptable Knowledge[d]	D001	Ignitability	NA[e]	Tribromomethane (Bromoform)
			D002	Corrosivity	NA[e]	
			D004	Arsenic	5.0	
			D005	Barium	100.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D011	Silver	5.0	
			D018	Benzene	0.5	
			D019	Carbon tetrachloride	0.5	
			D021	Chlorobenzene	100.0	
			D022	Chloroform	6.0	
			D027	1,4-Dichlorobenzene	7.5	
			D028	1,2-Dichloroethane	0.5	
			D030	2,4-Dinitrotoluene	0.13[f]	
			D032	Hexachlorobenzene	0.13[f]	
			D033	Hexachlorobutadiene	0.5	
			D034	Hexachloroethane	3.0	
			D036	Nitrobenzene	2.0	
			D042	2,4,6-Trichlorophenol	2.0	
			D043	Vinyl chloride	0.2	
			F001	Spent halogenated solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	

Table B-3 (Continued)

Descriptions of Mixed Low-Level Waste Stored at LANL

Waste Description[a]	Waste Generating Activity[a]	Basis for Hazardous Waste Designation[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Liquid Wastes (Continued)						
Corrosive Liquid Wastes	Radiochemistry research, plutonium-processing operations, and analytical chemistry	Acceptable Knowledge[d]	D001 D002 D004 D006 D007 D008 D009 D010 D011 D036 D043 F001 F002 F005	Ignitability Corrosivity Arsenic Cadmium Chromium Lead Mercury Selenium Silver Nitrobenzene Vinyl chloride Spent halogenated solvents Spent halogenated solvents Spent non-halogenated solvents	NA[e] NA[e] 5.0 1.0 5.0 5.0 0.2 1.0 5.0 2.0 0.2 NA[e] NA[e] NA[e]	Arsenic, Barium, Bromodichloromethane, Chromium (Total), Lead, Nickel, Silver
Aqueous and Nonaqueous Liquids Contaminated with Heavy Metals and/or Organics	ER activities, metal-polishing operations, and radiochemistry research	Acceptable Knowledge[d] Sampling and Analysis[i]	D001 D003 D004 D005 D006 D007 D008 D009 D010 D011 D018 D019 D021 D022 D023 D024 F002 F005	Ignitability Reactivity Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver Benzene Carbon tetrachloride Chlorobenzene Chloroform o-Cresol m-Cresol Spent halogenated solvents Spent non-halogenated solvents	NA[e] NA[e] 5.0 100.0 1.0 5.0 5.0 0.2 1.0 5.0 0.5 0.5 100.0 6.0 200.0[g] 200.0[g] NA[e] NA[e]	Chromium (Total), 1,2-Dichloroethane, Selenium

Table B-3 (Continued)

Descriptions of Mixed Low-Level Waste Stored at LANL

Waste Description[a]	Waste Generating Activity[a]	Basis for Hazardous Waste Designation[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Liquid Wastes (Continued)						
Oil Wastes	Equipment maintenance operations	Acceptable Knowledge[d]	D004	Arsenic	5.0	Diethylphthalate, Di-n-butyl phthalate, Hexachlorobenzene, Hexachlorocyclopentadiene, Nitrobenzene, Thallium, 2,4,5-Trichlorophenol, Silver
			D005	Barium	100.0	
			D006	Cadmium	1.0	
			D007	Chromium	5.0	
			D008	Lead	5.0	
			D009	Mercury	0.2	
			D010	Selenium	1.0	
			D018	Benzene	0.5	
			D019	Carbon tetrachloride	0.5	
			D027	1,4-Dichlorobenzene	7.5	
			D028	1,2-Dichloroethane	0.5	
			D030	2,4-Dinitrotoluene	0.13[f]	
			D032	Hexachlorobenzene	0.13[f]	
			D033	Hexachlorobutadiene	0.5	
			D034	Hexachloroethane	3.0	
			D036	Nitrobenzene	2.0	
			D037	Pentrachlorophenol	100.0	
			D038	Pyridine	5.0[f]	
			D041	2,4,5-Trichlorophenol	400.0	
			D042	2,4,6-Trichlorophenol	2.0	
			D043	Vinyl chloride	0.2	
			F001	Spent halogenated solvents	NA[e]	
			F002	Spent halogenated solvents	NA[e]	
			F003	Spent non-halogenated solvents	NA[e]	
			F005	Spent non-halogenated solvents	NA[e]	
Unused Liquid Reagent Chemical Wastes	R&D activities	Acceptable Knowledge[d]	D001	Ignitability	NA[e]	
			D002	Corrosivity	NA[e]	
			D035	Methyl ethyl ketone	200.0	
			All P- and U-listed EPA Hazardous Waste Numbers[h]	Discarded commercial chemical products and off-specification species	NA[e]	

Table B-3 (Continued)

Descriptions of Mixed Low-Level Waste Stored at LANL

Waste Description[a]	Waste Generating Activity[a]	Basis for Hazardous Waste Designation[a]	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents
Gas Cylinder Waste						
Gas Cylinder Waste	R&D and general facility operations	Acceptable Knowledge[d]	D001 D002 D003 Potential D-coded EPA Hazardous Waste Numbers	Ignitability Corrosivity Reactivity Toxicity characteristic wastes	NA[e] NA[e] NA[e] -[c]	
			Potential P- and U-listed EPA Hazardous Waste Numbers[i]	Discarded commercial chemical products and off-specification species	NA[e]	

[a] Denotes information from the Los Alamos National Laboratory waste characterization documentation database.
[b] U.S. Environmental Protection Agency.
[c] A solid waste exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, Test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1986), the extract from a representative sample of the waste contains any of the contaminants listed (D004-D043) at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart II, Part 261, Subpart C [6-14-00].
[d] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.
[e] Not applicable: Refers to the absence of regulatory limits for ignitable, corrosive, and reactive characteristic wastes and F-, P-, and U-listed wastes.
[f] The quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level (20.4.1 NMAC, Subpart II, 261.24, Table 1 [6-14-00]).
[g] If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 milligrams per liter.
[h] Refers to the P- and U-listed wastes found in the "Los Alamos National Laboratory General Part A Permit Application," Revision 3.0, 2002, Los Alamos National Laboratory, Los Alamos, New Mexico.

Note: Fluoride, sulfide, vanadium, and zinc are not "underlying hazardous constituents" in characteristic wastes, according to the definition in § 268.2(i). Selenium is not an underlying hazardous constituent as defined at § 268.2(i) because its Universal Treatment Standard level is greater than its Toxicity Characteristic level, thus a treated selenium waste would always be characteristically hazardous, unless it is treated to below its characteristic level.

Table B-4

LANL MTRUW Stream Waste Matrix Codes Correlated with LANL Waste Identification Systems

Summary Category Group	Waste Matrix Code	Waste Stream Description	RSWD Code[a]		IDC[b]		TRUCON Code[c]	
S3000 - Homogeneous	S3100	Homogeneous Inorganic, Cemented	A-25 A-26 A-76	Leached Process Residues Evaporator Bottoms/Salts Cement Paste	002 006	Cemented Aqueous Waste Solidified Inorganic and Organic Process Solids	LA111 LA114	Solidified Aqueous or Homogeneous Inorganic Solids Solidified Inorganic Process Solids
	S3100	Homogeneous Inorganic, Cemented Organics					LA126	Solidified Organic Process Solids
	S3100	Homogeneous Inorganic, Non-cemented	A-75	Chemical Treatment Sludge	003	Stabilized Aqueous Waste (dewatered sludge)	LA122 LA130	Solid Inorganic Waste Ash
	S3100	Homogeneous Inorganic, Salts	A-27 A-28 A-29	Nitrate Salts Chloride Salts Hydroxide Cake		Salt Waste	LA124	Pyrochemical Salt Waste
	S3100	Homogeneous Inorganic, Vermiculite	A-20 A-21	Hydrocarbon Oil – Liquid (Absorbed) Silicon-Based - Liquid (Absorbed)			LA112	Solidified Organic Waste
S4000 – Soil/Gravel	S4100	Soil	A-90	Radioactively-Contaminated Soil				

Table B-4 (Continued)

LANL MTRUW Stream Waste Matrix Codes Correlated with LANL Waste Identification Systems

Summary Category Group	Waste Matrix Code	Waste Stream Description	RSWD Code[a]		IDC[b]		TRUCON Code[c]	
S5000 - Debris	S5300	Combustible Debris	A-14	Combustible Decon Waste	004	Combustible Waste	LA116	Combustible Debris
			A-15	Cellulosics				
			A-16	Plastics				
			A-17	Rubber Materials				
			A-18	Combustible Lab Trash				
			A-35	Combustible Building Debris				
			A-40	Combustible Hot-Cell Waste				
			A-60	Other Combustibles				
	S5400	Heterogeneous Debris	A-10	Graphite Solids	001	Metal Scrap and Incidental Combustibles	LA115	Graphite Waste
			A-19	Combined Combustible/Non-Combustible Lab Trash	005	Combined Noncombustible / Combustible Waste	LA117	Metal Waste
			A-30	PN Equipment	005LG	Glass Waste	LA118	Glass Waste
			A-31	Non-PN Equipment	005LM	Metal Waste	LA119	HEPA Filter Waste
			A-36	Noncombustible Building Debris	005P1	Leaded Rubber and Metal Waste	LA123	Leaded Rubber and Metal Waste

Table B-4 (Continued)

LANL MTRUW Stream Waste Matrix Codes Correlated with LANL Waste Identification Systems

Summary Category Group	Waste Matrix Code	Waste Stream Description	RSWD Code[a]		IDC[b]		TRUCON Code[c]	
			A-41	Noncombustible Hot-Cell Waste	005P2G	Graphite Waste	LA125	Mixed Combustible / Noncombustible Waste
			A-46	Skull and Oxide				
			A-47	Slag and Porcelain				
			A-50	Metal Crucibles, Scrap, Dies				
			A-51	Precious Metals				
			A-52	Scrap Metal				
			A-55	Filter Media				
			A-56	Filter Media Residue				
			A-61	Other Noncombustibles				
			A-72	Beryllium Contaminated Debris				
			A-74	Ion Exchange Resin				
			A-80	Irradiation Sources				
			A-85	Firing Point Residues				
			A-95	Glass				

[a] RSWD = Radioactive Solid Waste Disposal [codes]
[b] IDC = Item Description Code
[c] TRUCON = TRUPACT-II Content [codes]

Table B-5

Descriptions of Mixed Transuranic Waste Stored at LANL[a]

Summary Category Group	Waste Matrix Code	Waste Stream Description	Waste-Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents[f]
S3000 - Homogeneous	S3100	Homogeneous Inorganic, Cemented	Plutonium processing operations	Acceptable Knowledge[d]	D002	Corrosive	NA[e]	
					D003	Reactive	NA[e]	
					D004	Arsenic	5.0	
					D005	Barium hydroxide	100.0	
		Homogeneous Inorganic, Cemented Organics	Plutonium processing operations	Acceptable Knowledge[d]	D006	Cadmium	1.0	
					D007	Chromium	5.0	
					D008	Lead	5.0	
					D009	Mercury	0.2	
		Homogeneous Inorganic, Non-cemented	Plutonium processing operations	Acceptable Knowledge[d]	D010	Selenium	1.0	
					D011	Silver	5.0	
					D018	Benzene	0.5	
					D019	Carbon tetrachloride	0.5	
		Homogeneous Inorganic, Salts	Plutonium processing operations	Acceptable Knowledge[d]	D021	Chlorobenzene	100.0	
					D022	Chloroform	6.0	
					D035	Methyl ethyl ketone	200.0	
					D038	Pyridine	5.0[g]	
					D039	Tetrachloroethylene	0.7	
					D040	Trichloroethylene	0.5	
					F001	Spent halogenated solvents	NA[e]	
					F002	Spent halogenated solvents	NA[e]	
					F003	Spent non-halogenated solvents	NA[e]	
					F005	Spent non-halogenated solvents	NA[e]	

Table B-5 (Continued)

Descriptions of Mixed Transuranic Waste Stored at LANL[a]

Summary Category Group	Waste Matrix Code	Waste Stream Description	Waste-Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents[f]
S3000 - Homogeneous	S3100	Homogeneous Inorganic, Vermiculite	Plutonium processing operations	Acceptable Knowledge[d]	D002	Corrosive	NA[e]	
					D004	Arsenic	5.0	
					D005	Barium hydroxide	100.0	
					D006	Cadmium	1.0	
					D007	Chromium	5.0	
					D008	Lead	5.0	
					D009	Mercury	0.2	
					D010	Selenium	1.0	
					D011	Silver	5.0	
					D018	Benzene	0.5	
					D019	Carbon tetrachloride	0.5	
					D021	Chlorobenzene	100.0	
					D022	Chloroform	6.0	
					D027	1,4-Dichlorobenzene	7.5	
					D028	1,2-Dichloroethane	0.5	
					D030	2,4-Dinitrotoluene	0.13[g]	
					D032	Hexachlorobenzene	0.13[g]	
					D033	Hexachlorobutadiene	0.5	
					D034	Hexachloroethane	3.0	
					D035	Methyl ethyl ketone	200.0	
					D036	Nitrobenzene	2.0	
					D037	Pentachlorophenol	100.0	
					D038	Pyridine	5.0[g]	
					D039	Tetrachloroethylene	0.7	
					D040	Trichloroethylene	0.5	
					D042	2,4,6-Trichlorophenol	2.0	
					D043	Vinyl Chloride	0.2	
					F001	Spent halogenated solvents	NA[e]	
					F002	Spent halogenated solvents	NA[e]	
					F003	Spent non-halogenated solvents	NA[e]	
					F005	Spent non-halogenated solvents	NA[e]	

Table B-5 (Continued)

Descriptions of Mixed Transuranic Waste Stored at LANL[a]

Summary Category Group	Waste Matrix Code	Waste Stream Description	Waste-Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents[f]
S4000 – Soil/ Gravel	S4100	Soil	D&D	Acceptable Knowledge[d]	D004	Arsenic	5.0	D004
					D005	Barium hydroxide	100.0	D005
					D006	Cadmium	1.0	D006
					D007	Chromium	5.0	D007
					D008	Lead	5.0	D008
					D009	Mercury	0.2	D009
					D010	Selenium	1.0	D010
					D011	Silver	5.0	D011
					D018	Benzene	0.5	D018
					D019	Carbon tetrachloride	0.5	D019
					D021	Chlorobenzene	100.0	D021
					D022	Chloroform	6.0	D022
					D035	Methyl ethyl ketone	200.0	D035
					D038	Pyridine	5.0[g]	D038
					D039	Tetrachloroethylene	0.7	D039
					D040	Trichloroethylene	0.5	D040
					F001	Spent halogenated solvents	NA[e]	F001
					F002	Spent halogenated solvents	NA[e]	F002
					F003	Spent non-halogenated solvents	NA[e]	F003
					F005	Spent non-halogenated solvents	NA[e]	F005

Table B-5 (Continued)

Descriptions of Mixed Transuranic Waste Stored at LANL[a]

Summary Category Group	Waste Matrix Code	Waste Stream Description	Waste-Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Waste Constituents and/or Characteristics	Regulatory Limits[c] (milligrams per liter)	Potential Underlying Hazardous Constituents[f]
S5000 - Debris	S5300	Combustible Debris	Plutonium processing operations	Acceptable Knowledge[d]	D003	Reactive	NA[e]	
					D004	Arsenic	5.0	
					D005	Barium hydroxide	100.0	
					D006	Cadmium	1.0	
					D007	Chromium	5.0	
					D008	Lead	5.0	
					D009	Mercury	0.2	
					D010	Selenium	1.0	
					D011	Silver	5.0	
					D018	Benzene	0.5	
					D019	Carbon tetrachloride	0.5	
					D021	Chlorobenzene	100.0	
					D022	Chloroform	6.0	
					D035	Methyl ethyl ketone	200.0	
					D038	Pyridine	5.0[g]	
					D039	Tetrachloroethylene	0.7	
					D040	Trichloroethylene	0.5	
					D043	Vinyl Chloride	0.2	
					F001	Spent halogenated solvents	NA[e]	
					F002	Spent halogenated solvents	NA[e]	
					F003	Spent non-halogenated solvents	NA[e]	
					F004	Spent non-halogenated solvents	NA[e]	
					F005	Spent non-halogenated solvents	NA[e]	
					U080	Methylene Chloride	NA[e]	
	S5400	Heterogeneous Debris	Plutonium processing operations; D&D	Acceptable Knowledge[d]				

Table B-5 (Continued)

Descriptions of Mixed Transuranic Waste Stored at LANL[a]

[a] This table is based on information from the *Acceptable Knowledge Information Summary for Los Alamos National Laboratory Transuranic Waste Streams* (AKIS), (TWCP-AK-2.1-019, R.0) (LA-UR-03-4870); and from waste characterization documentation information maintained by the Facility and Waste Operations Division. Waste with EPA Hazardous Waste Numbers that are not included in the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit will not be transported to WIPP.

[b] U.S. Environmental Protection Agency.

[c] A solid waste exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, Test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1986), the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart C [6-14-00].

[d] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

[e] Not Applicable.

[f] Potential underlying hazardous constituents (UHC) have been included, where the information is available. UHC characterization for the purpose of Land Disposal Restrictions will not apply for mixed transuranic waste to be disposed of at WIPP.

[g] Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.

Note: Fluoride, sulfide, vanadium, and zinc are not "underlying hazardous constituents" in characteristic wastes, according to the definition in § 268.2(i). Selenium is not an underlying hazardous constituent as defined at § 268.2(i) because its Universal Treatment Standard level is greater than its Toxicity Characteristic level, thus a treated selenium waste would always be characteristically hazardous, unless it is treated to below its characteristic level.

Table B-6

Descriptions of High Explosives (HE) Waste and HE-Contaminated Waste Treated by Open Burning at LANL

Waste Description	Waste Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
HE-Contaminated Water	Laboratory analysis; HE processing; maintenance, Environmental Restoration (ER), decontamination and decommissioning (D&D), research and development (R&D), and drilling activities	Acceptable Knowledge[c]	D003	Reactivity	NA[d]
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D011	Silver	5.0
			D018	Benzene	0.5
			D022	Chloroform	6.0
			D028	1,2-Dichloroethane	0.5
			D029	1,1-Dichloroethylene	0.7
			D030	2,4-Dinitrotoluene	0.13
			D035	Methyl ethyl ketone	200.0
			D036	Nitrobenzene	2.0
			D038	Pyridine	5.0
			D040	Trichloroethylene	0.5
			F001	Spent halogenated solvents	NA[d]
			F002	Spent halogenated solvents	NA[d]
			F004	Spent nonhalogenated solvents	NA[d]
			F005	Spent nonhalogenated solvents	NA[d]
HE-Contaminated Oil/Solvent Waste	Laboratory analysis; dissolving HE and polymers; HE production; spills; and ER, D&D, and R&D activities	Acceptable Knowledge[c]	D001	Ignitability	NA[d]
			D002	Corrosivity	NA[d]
			D003	Reactivity	NA[d]
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D011	Silver	5.0
			D018	Benzene	0.5
			D022	Chloroform	6.0
			D028	1,2-Dichloroethane	0.5
			D029	1,1-Dichloroethylene	0.7
			D030	2,4-Dinitrotoluene	0.13
			D035	Methyl ethyl ketone	200.0
			D036	Nitrobenzene	2.0

Refer to footnotes at end of table.

Table B-6 (Continued)

Descriptions of High Explosives (HE) Waste and HE-Contaminated Waste Treated by Open Burning at LANL

Waste Description	Waste Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
HE-Contaminated Oil/Solvent Waste (Continued)			D038	Pyridine	5.0
			D040	Trichloroethylene	0.5
			F001	Spent halogenated solvents	NA[d]
			F002	Spent halogenated solvents	NA[d]
			F003	Spent nonhalogenated solvents	NA[d]
			F004	Spent nonhalogenated solvents	NA[d]
			F005	Spent nonhalogenated solvents	NA[d]
Solid and Scrap HE	HE-processing; R&D, ER, and D&D activities; testing operations; disposition of weapons	Acceptable Knowledge[c]	D001	Ignitability	NA[d]
			D003	Reactivity	NA[d]
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D018	Benzene	0.5
			D030	2,4-Dinitrotoluene	0.13
HE-Contaminated Commercial Chemical Products	Spilled commercial chemical products contaminated with HE	Acceptable Knowledge[c]	D001	Ignitability	NA[d]
			D003	Reactivity	NA[d]
			U022	Acetone	NA[d]
			U019	Benzene	NA[d]
			U044	Chloroform	NA[d]
			U112	Ethyl acetate	NA[d]
			U154	Methanol	NA[d]
			U159	Methyl ethyl ketone	NA[d]
			U196	Pyridine	NA[d]
			U169	Nitrobenzene	NA[d]
			U220	Toluene	NA[d]
			U239	Xylene	NA[d]

Refer to footnotes at end of table.

Table B-6 (Continued)

Descriptions of High Explosives (HE) Waste and HE-Contaminated Waste Treated by Open Burning at LANL

Waste Description	Waste Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
Wet HE	Filtration of HE wastewater; ER, R&D, and D&D activities; HE processing	Acceptable Knowledge[c]	D001	Ignitability	NA[d]
			D003	Reactivity	NA[d]
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D011	Silver	5.0
			D018	Benzene	0.5
			D022	Chloroform	6.0
			D028	1,2-Dichloroethane	0.5
			D029	1,1-Dichloroethylene	0.7
			D030	2,4-Dinitrotoluene	0.13
			D035	Methyl ethyl ketone	200.0
			D036	Nitrobenzene	2.0
			D038	Pyridine	5.0
			D040	Trichloroethylene	0.5
			F001	Spent halogenated solvents	NA[d]
			F002	Spent halogenated solvents	NA[d]
			F003	Spent nonhalogenated solvents	NA[d]
			F004	Spent nonhalogenated solvents	NA[d]
			F005	Spent nonhalogenated solvents	NA[d]
			K044	Wastewater sludges	NA[d]
			K045	Spent carbon	NA[d]

Refer to footnotes at end of table.

Table B-6 (Continued)

Descriptions of High Explosives (HE) Waste and HE-Contaminated Waste Treated by Open Burning at LANL

Waste Description	Waste Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
HE-Contaminated Solid Waste	HE processing activities; D&D, ER, R&D, and drilling activities; and laboratory use	Acceptable Knowledge[c]	D001	Ignitability	NA[d]
			D002	Corrosivity	NA[d]
			D003	Reactivity	NA[d]
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D011	Silver	5.0
			D018	Benzene	0.5
			D022	Chloroform	6.0
			D028	1,2-Dichloroethane	0.5
			D029	1,1-Dichloroethylene	0.7
			D030	2,4-Dinitrotoluene	0.13
			D035	Methyl ethyl ketone	200.0
			D036	Nitrobenzene	2.0
			D038	Pyridine	5.0
			D040	Trichloroethylene	0.5
			F001	Spent halogenated solvents	NA[d]
			F002	Spent halogenated solvents	NA[d]
			F003	Spent nonhalogenated solvents	NA[d]
			F004	Spent nonhalogenated solvents	NA[d]
			F005	Spent nonhalogenated solvents	NA[d]
HE-Contaminated Equipment	HE processing; D&D, R&D, and ER activities; and laboratory use	Acceptable Knowledge[c]	D003	Reactivity	NA[d]
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D011	Silver	5.0
			D030	2,4-Dinitrotoluene	0.13

Refer to footnotes at end of table.

Table B-6 (Continued)

Descriptions of High Explosives (HE) Waste and HE-Contaminated Waste Treated by Open Burning at LANL

Waste Description	Waste Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
HE-Contaminated Liquid Acids, Bases, and/or Inorganic Salt Solutions	Materials used as titrants, solvents, and cleaning fluids and/or material from hydrolysis research	Acceptable Knowledge[c]	D002	Corrosivity	NA[d]
			D003	Reactivity	NA[d]
			D018	Benzene	0.5
			D022	Chloroform	6.0
			D030	2,4-Dinitrotoluene	0.13
			D035	Methyl ethyl ketone	200.0
			D036	Nitrobenzene	2.0
			D038	Pyridine	5.0
			F001	Spent halogenated solvents	NA[d]
			F002	Spent halogenated solvents	NA[d]
			F003	Spent nonhalogenated solvents	NA[d]
			F004	Spent nonhalogenated solvents	NA[d]
			F005	Spent nonhalogenated solvents	NA[d]

[a] U.S. Environmental Protection Agency. Note that these constituents will likely be present only in trace amounts.

[b] A solid waste exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, Test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1986), the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart C [6-14-00]. These constituents are included if they are likely to be present; however, they are not expected to exceed the toxicity characteristic limits on a routine basis.

[c] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

[d] Not applicable: refers to the absence of regulatory limits for ignitable, corrosive, reactive wastes, and F-, K-, and U-listed wastes. The amount of F-listed waste is expected to be trace in all waste streams, with the exception of the HE-contaminated spent solvent waste, which is expected to be 30 percent or more (by volume) solvent.

Table B-7

Descriptions of High Explosives (HE) Waste and HE-Contaminated Waste Treated by Open Detonation at LANL

Waste Description	Waste Generating Activity	Basis for Hazardous Waste Designation	Potential EPA[a] Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste	Regulatory Limits[b] (milligrams per liter)
HE-Contaminated Solid Waste	HE processing activities; D&D, ER, R&D, and drilling activities; and laboratory use	Acceptable Knowledge[c]	D001	Ignitability	NA[d]
			D002	Corrosivity	NA[d]
			D003	Reactivity	NA[d]
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D009	Mercury	0.2
			D011	Silver	5.0
			D018	Benzene	0.5
			D022	Chloroform	6.0
			D028	1,2-Dichloroethane	0.5
			D029	1,1-Dichloroethylene	0.7
			D030	2,4-Dinitrotoluene	0.13
			D035	Methyl ethyl ketone	200.0
			D036	Nitrobenzene	2.0
			D038	Pyridine	5.0
			D040	Trichloroethylene	0.5
			F001	Spent halogenated solvents	NA[d]
			F002	Spent halogenated solvents	NA[d]
			F003	Spent nonhalogenated solvents	NA[d]
			F004	Spent nonhalogenated solvents	NA[d]
			F005	Spent nonhalogenated solvents	NA[d]
Solid and Scrap HE	HE-processing; R&D, ER, and D&D activities; testing operations; disposition of weapons	Acceptable Knowledge[c]	D001	Ignitability	NA[d]
			D003	Reactivity	NA[d]
			D005	Barium	100.0
			D006	Cadmium	1.0
			D007	Chromium	5.0
			D008	Lead	5.0
			D018	Benzene	0.5
			D030	2,4-Dinitrotoluene	0.13

Table B-7 (Continued)

Descriptions of High Explosives (HE) Waste and HE-Contaminated Waste Treated by Open Detonation at LANL

[a] U.S. Environmental Protection Agency. Note that these constituents will likely be present only in trace amounts.

[b] A solid waste exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, Test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1986), the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, Part 261, Subpart C [6-14-00]. These constituents are included if they are likely to be present; however, they are not expected to exceed the toxicity characteristic limits on a routine basis.

[c] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

[d] Not applicable: refers to the absence of regulatory limits for ignitable, corrosive, reactive wastes, and F-, K-, and U-listed wastes.

Table B-8

Descriptions of Waste Generated at Off-Site Facilities That May Be Received at LANL

Off-Site Waste Generating Facility	Waste Description	Waste-Generating Activity	Basis for Hazardous Waste Designation	Potential EPA Hazardous Waste Numbers	Potential Hazardous Constituents and/or Characteristics in the Waste
Sandia National Laboratories/New Mexico, Albuquerque, NM	Potential mixed transuranic waste: Combustible and noncombustible debris including metals, cellulosics, rubber, plastics, organic matrices, and inorganic materials.	To be determined	To be determined	To be determined	To be determined

Table B-9
Parameters, Characterization Methods, and Rationale for Parameter Selection for Hazardous Waste

Waste Description[a]	Parameters[b]	Characterization Methods	Rationale
Spent Solvents	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA[c]-regulated metals – Volatile organic compounds (VOC) – Semivolatile organic compounds (SVOC)	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine concentration of F-listed solvents
Contaminated Solid Wastes	– RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, reactivity, and toxicity – Determine concentration of F-listed solvents
Paint and Related Wastes	– Flash point (for liquid waste) – RCRA[c]-regulated metals – VOCs	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability and toxicity – Determine concentration of F-listed solvents
Photographic and Photocopier Wastes	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA[c]-regulated metals	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, corrosivity, and toxicity
Corrosive Liquid Wastes	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
Solid Metals and Metallic Compounds	– RCRA[c]-regulated metals	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, reactivity, and toxicity
Contaminated Noncorrosive Aqueous and Nonaqueous Solutions and Sludges	– Flash point – RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, reactivity, and toxicity – Determine concentration of F-listed solvents
Mercury Wastes	– RCRA[c]-regulated metal	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characterisitc for toxicity – Determine the presence of a U-listed unused commercial chemical product
Used Batteries and Battery Fluids	– pH (for liquid waste) – RCRA[c]-regulated metals	– Acceptable Knowledge[d]	– Determine characteristic for corrosivity and toxicity
Unused/Off-specification Commercial Chemical Products	– Flash point (for liquid waste) – pH (for liquid waste) – RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine presence of P-listed or U-listed unused commercial chemical products
Gas Cylinder Waste	– RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d]	– Determine characterisitic for ignitability, corrosivity, and reactivity – Determine presence of D-coded and U- and P-listed wastes
Environmental Restoration (ER) Soils and Sludges	– RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d]	– Determine characteristic for ignitability, reactivity, and toxicity – Determine concentration of F-listed solvents

Refer to footnotes at end of table.

Table B-9 (Continued)

Parameters, Characterization Methods, and Rationale for Parameter Selection for Hazardous Waste

Waste Description[a]	Parameters[b]	Characterization Methods	Rationale
ER Aqueous Liquids	– pH – RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d]	– Determine characteristic for ignitability, corrosivity, reactivity, and toxicity – Determine concentration of F-listed solvents
ER Debris	– RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d]	– Determine characteristic for ignitability, reactivity, and toxicity – Determine concentration of F-listed solvents

[a] Information contained in this column is from the Los Alamos National Laboratory waste characterization documentation database.
[b] Parameter selection is based on acceptable knowledge for each waste stream. Additional parameters may be selected for each waste stream as necessary.
[c] Resource Conservation and Recovery Act. Use of the term "RCRA-regulated metals" refers to hazardous waste as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24 [6-14-00].
[d] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-10

Parameters, Characterization Methods, and Rationale for Parameter Selection for Mixed Low-Level Waste

Waste Description[a]	Parameter[b]	Characterization Method	Rationale
Solid Wastes			
Soils with Heavy Metals	– RCRA-regulated metals[c]	– Acceptable Knowledge[d] – Sample and analyze randomly selected drums in waste stream	– Determine toxicity characteristic
Environmental Restoration Soils	– RCRA-regulated metals[c] – Volatile organic compounds (VOC)	– Acceptable Knowledge[d] – Sample and analyze randomly selected drums in waste stream	– Determine presence of F-listed solvents – Determine toxicity characteristic
Inorganic Solid Oxidizers	– RCRA-regulated metals[c]	– Acceptable Knowledge[d] – Sample and analyze randomly selected drums in waste stream	– Determine toxicity characteristic – Determine characteristic for ignitability and reactivity
Lead Waste	– RCRA-regulated metals[c]	– Acceptable Knowledge[d]	– Determine characteristic for reactivity – Determine toxicity characteristic
Noncombustible Debris	– RCRA-regulated metals[c]	– Acceptable Knowledge[d]	– Determine toxicity characteristic – Determine characteristic for ignitability and reactivity
Combustible Debris	– RCRA-regulated metals[c] – VOCs	– Acceptable Knowledge[d]	– Determine toxicity characteristic – Determine presence of F-listed solvents – Determine characteristic for ignitability and reactivity
Organic-Contaminated Noncombustible Solids	– RCRA-regulated metals[c] – VOCs	– Acceptable Knowledge[d]	– Determine toxicity characteristic – Determine presence of F-listed solvents
Organic-Contaminated Combustible Solids	– RCRA-regulated metals[c] – VOCs	– Acceptable Knowledge[d]	– Determine characteristic for ignitability and reactivity – Determine toxicity characteristic – Determine presence of F-listed solvents
Water-Reactive Wastes	– RCRA-regulated metals[c] – VOCs	– Acceptable Knowledge[d] – Sample and analyze randomly selected drums in waste stream	– Determine toxicity characteristic – Determine characteristic for ignitability and reactivity – Determine presence of F-listed solvents

Refer to footnotes at end of table.

Table B-10 (Continued)

Parameters, Characterization Methods, and Rationale for Parameter Selection for Mixed Low-Level Waste

Waste Description[a]	Parameter[b]	Characterization Method	Rationale
Solid Wastes (Continued)			
Mercury Wastes	– RCRA-regulated metals[c] – VOCs	– Acceptable Knowledge[d] – Sample and analyze randomly selected drums in waste stream	– Determine toxicity characteristic – Determine presence of F-listed solvents
Unused Solid Reagent Chemical Wastes	– RCRA-regulated metals[c]	– Acceptable Knowledge[d]	– Determine characteristic for ignitability and corrosivity – Determine the presence of P- and U-listed unused commercial chemical product
Liquid Wastes			
Spent Solvents and Contaminated Solvent Mixtures	– Flash point – pH – RCRA-regulated metals[c] – VOCs – Semivolatile organic compounds (SVOC)	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
Corrosive Liquid Wastes	– Flash point – pH – RCRA-regulated metals[c] – SVOCs	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability, corrosivity, and toxicity – Determine concentration of F-listed solvents
Aqueous and Nonaqueous Liquids Contaminated with Heavy Metals and/or Organics	– Flash point – RCRA-regulated metals[c] – VOCs – SVOCs	– Acceptable Knowledge[d] – Sampling and Analysis	– Determine characteristic for ignitability and toxicity – Determine concentration of F-listed solvents
Oil Wastes	– RCRA-regulated metals[c] – VOCs – SVOCs	– Acceptable Knowledge[d] – Sampling and analysis	– Determine characteristic for toxicity – Determine concentration of F-listed solvents
Unused Liquid Reagent Chemical Wastes	– Flash point – pH	– Acceptable Knowledge[d]	– Determine characteristic for ignitability and corrosivity – Determine the presence of P- and U-listed unused commercial chemical product
Gas Wastes			
Gas Cylinder Waste	– RCRA[c]-regulated metals – VOCs – SVOCs	– Acceptable Knowledge[d]	– Determine characteristic for ignitability, corrosivity, and reactivity – Determine presence of D-coded and P- and U-listed waste

[a] Information contained in this column is extracted primarily from Los Alamos National Laboratory, 1995, "LANL's Federal Facility Compliance Order Site Treatment Plan Background Volume," Los Alamos National Laboratory, Los Alamos, New Mexico.
[b] Parameter selection is based on acceptable knowledge for each waste stream. Additional parameters may be selected for each waste stream as necessary.
[c] Resource Conservation and Recovery Act. Use of the term "RCRA-regulated metals" refers to hazardous waste as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24 [6-14-00].
[d] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-11

Parameters, Characterization Methods, and Rationale for Parameter Selection for Mixed Transuranic Waste

Summary Category Group/Description[a]	Waste Description	Parameters	Characterization Methods	Rationale
		Storage		
S3000-Homogeneous Solids	– Solidified aqueous waste (e.g., concreted/cemented aqueous waste)	– Free liquids in waste matrix – Physical form of the waste	– Visual examination – Real-time radiography (RTR) – Acceptable Knowledge[b]	– Verify physical waste form – No free liquids allowed
	– Solidified aqueous waste (e.g., dewatered sludge and chemical treatment sludge) – Solidified inorganic/organic process solids and liquids	– Resource Conservation and Recovery Act (RCRA)-regulated metals	– Sample and analyze statistically selected number of drums in waste stream – Acceptable Knowledge[b]	– Determine toxicity characteristic – Determine concentration of metals
	– Homogeneous inorganic solids – Glass/noncombustible waste – Uncemented inorganics – Absorbed organics on vermiculite	– Volatile organic compounds (VOC) in container headspace gas	– Gas chromatography / mass spectrometry (GC/MS) – Fourier transform infrared spectrometry – Gas chromatography / Flame ionization detector – Acceptable Knowledge[b]	Qualitative screening to confirm the presence of VOCs
S4000-Soils/Gravels	– Contaminated soil	– Free liquids in waste matrix – Physical form of the waste	– Visual examination – RTR – Acceptable Knowledge[b]	– Verify physical waste form – No free liquids allowed
		– RCRA-regulated metals	– Sample and analyze statistically selected number of drums in waste stream – Acceptable Knowledge[b]	– Determine toxicity characteristic – Determine concentration of metals
		– VOCs in container headspace gas	– GC/MS – Fourier transform infrared spectrometry – Gas chromatography / Flame ionization detector	Qualitative screening to confirm the presence of VOCs
S5000-Debris Waste	– Mixed metal scrap and incidental combustibles – Combustible waste – Graphite waste – Metal waste – Glass waste	– Free liquids – Physical form of the waste – VOCs in container headspace gas – VOCs and semivolatile organic compounds	– Visual examination – RTR – Acceptable Knowledge[b]	– Verify physical waste form – No free liquids allowed – Determine compliance with land disposal restrictions (LDR) treatment standards, if applicable
	– Leaded-rubber and metal waste – High-efficiency particulate air filters – Noncombustible waste – Mixed combustible / noncombustible waste	– RCRA-regulated metals	– Gas chromatography / mass spectrometry – Fourier transform infrared spectrometry – Gas chromatography / Flame ionization detector – Acceptable Knowledge[b]	– Qualitative screening to confirm the presence of VOC – Determine compliance with LDR treatment standards, if applicable

Refer to footnotes at end of table.

Table B-11 (Continued)

Parameters, Characterization Methods, and Rationale for Parameter Selection for Mixed Transuranic Waste

Summary Category Group/Description [a]	Waste Description	Parameters	Characterization Methods	Rationale
		Treatment		
L1000–Aqueous Liquids/Slurries	Evaporator bottoms solutions, aqueous waste, and laboratory solutions	– RCRA-regulated metals and corrosivity	– Acceptable Knowledge[b] – Sampling and Analysis	– Determine toxicity characteristics – Determine concentration of metals
S3000-Homogeneous Solids	Inorganic process solids and cemented inorganic process solids	– RCRA-regulated metals	– Acceptable Knowledge[b] – Sampling and Analysis	– Determine concentration of metals

[a] Information in this column is based on information from the *Acceptable Knowledge Information Summary for Los Alamos National Laboratory Transuranic Waste Streams* (AKIS), TWCP-AK-2.1-019, R.0, LA-UR-03-4870, Los Alamos National Laboratory, Los Alamos, New Mexico.

[b] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-12

Parameters, Characterization Methods, and Rationale for Parameter Selection for High Explosives (HE) Waste and HE-Contaminated Waste

Waste Description	Parameter[a]	Characterization Method	Rationale
HE-Contaminated Water	– Ignitability – Reactivity – Toxicity – Solvents from non-specific sources	– Acceptable Knowledge[b] – Field screening – Sampling and analysis	– Determine characteristic for ignitability and reactivity – Determine toxicity characteristic (metals and organics) – Determine the presence of F-listed solvents
HE-Contaminated Oil/Solvent Waste	– Corrosivity – Ignitability – Reactivity – Toxicity – Solvents from non-specific sources	– Acceptable Knowledge[b] – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and reactivity – Determine toxicity characteristic (organics) – Determine the presence of F-listed solvents
Solid and Scrap HE	– Ignitability – Reactivity – Toxicity	– Acceptable Knowledge[b]	– Determine characteristic for ignitability and reactivity – Determine toxicity characteristic (barium and dinitrotoluene)
HE-Contaminated Commercial Chemical Products	– Ignitability – Reactivity – Spill residues from commercial products	– Acceptable Knowledge[b]	– Determine characteristic for ignitability and reactivity – Determine the presence of U-listed wastes
Wet HE	– Ignitability – Reactivity – Toxicity – Solvents from non-specific sources – Specific source wastes (K wastes)	– Acceptable Knowledge[b]	– Determine characteristic for ignitability and reactivity – Determine toxicity characteristic (organics and metals) – Determine the presence of F- and K- listed solvents

Refer to footnotes at end of table.

Table B-12 (Continued)

Parameters, Characterization Methods, and Rationale for Parameter Selection for High Explosives (HE) Waste and HE-Contaminated Waste

Waste Description	Parameter[a]	Characterization Method	Rationale
HE-Contaminated Solid Waste	– Ignitability – Corrosivity – Reactivity – Toxicity – Solvents from non-specific sources	– Acceptable Knowledge[b] – Field screening – Sampling and analysis	– Determine characteristic for ignitability, corrosivity, and reactivity – Determine toxicity characteristic (organics and metals) – Determine the presence of F-listed solvents
HE-Contaminated Equipment	– Reactivity – Toxicity	– Acceptable Knowledge[b] – Field screening – Sampling and analysis	– Determine characteristic for reactivity – Determine toxicity characteristic (dinitrotoluene and metals)
HE-Contaminated Liquid Acids, Bases, and/or Inorganic Salt Solutions	– Corrosivity – Reactivity – Toxicity – Solvents from non-specific sources	– Acceptable Knowledge[b] – Field screening – Sampling and analysis	– Determine characteristic for corrosivity and reactivity – Determine toxicity characteristic (organics) – Determine the presence of F-listed solvents

[a] Parameter selection is based on process knowledge for each waste stream. Additional parameters may be selected for each waste stream as necessary.

[b] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-13

Summary of Characterization Methods for High Explosives (HE) Waste and HE-Contaminated Waste

Parameters	Method Numbers	Test Method	Rationale
HE in the Waste	SW-846 (Appropriate analytical method from the Method 8300 series)[a]	High Performance Liquid Chromatography or Acceptable Knowledge[b]	Determine HE concentrations directly in homogeneous materials or by process information.
		DX-2 Spot Test, DeTech, or other screening methods	Determine if HE is present in the waste stream.
		Acceptable Knowledge[b]	If all surfaces of heterogeneous waste cannot be directly tested or visually examined (e.g., debris or equipment) and the waste object was potentially contaminated with HE during its use.

[a] U.S. Environmental Protection Agency, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.

[b] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-14

Summary of Characterization Methods for Ash Generated by Open Burning[a]

Parameters	Method Numbers	Test Method	Rationale
Metals: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010B, 7060A, 7061A)[b] (1311, 6010B, 7080A, 7081) [b] (1311, 6010B, 7130, 7131A) [b] (1311, 6010B, 7190, 7191) [b] (1311, 6010B, 7420, 7421[d]) [b] (1311, 6010B, 7470A, 7471A)[b] (1311, 6010B, 7740, 7741A, 7742)[b] (1311, 6010B, 7760A, 7761) [b] or equivalent methods[c]	Total and/or toxicity characteristic leaching procedure (TCLP) Inductively-coupled plasma atomic emission spectroscopy Atomic absorption Manual cold vapor technique Acceptable Knowledge[d]	Determine total and/or TCLP metals concentrations in samples of solid process residues
Volatile Organic Compounds	SW-846 (8260B)	Total VOC analysis by gas chromotography/mass spectrometry (GC/MS) Acceptable Knowledge[d]	Determine total VOC concentrations for comparison with Universal Treatment Standards (UTS
Semivolatile Organic Compounds	SW-846 (8270C)	Total SVOC analysis by GC/MS Acceptable Knowledge[d]	Determine total SVOC concentrations for comparison with UTS

[a] Ash generated by open burning is characterized for all TCLP metals.
[b] U.S. Environmental Protection Agency (EPA), 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C..
[c] Equivalent methods, subject to EPA approval, may be substituted.
[d] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, “Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual,” *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-15

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

Analyte Class and Sample Type	Container	Preservative	Holding Time
Volatile Organics			
Concentrated Waste Samples:	Method 5035: 40-milliliter (mL) vials with stirring bar. Method 5021: See method. Methods 5031 & 5032: 125-mL WM[c]-G[d]. Use Teflon-lined lids for all procedures.	Cool to 4º degrees Celsius (ºC)[e]	14 days
Aqueous Samples:			
No Residual Chlorine Present	Methods 5030, 5031, & 5032: 2 x 40-mL vials with Teflon-lined septum caps.	Cool to 4ºC and adjust pH[f] to less than 2 with H_2SO_4, HCl, or solid $NaHSO_4$	14 days
Residual Chlorine Present	Methods 5030, 5031, & 5032: 2 x 40-mL vials with Teflon-lined septum caps.	Collect sample in a 125-mL container which has been pre-preserved with 4 drops of 10% sodium thiosulfate solution. Gently swirl to mix sample and transfer to a 40-mL volatile organic analysis (VOA) vial. Cool to 4ºC and adjust pH to less than 2 with H_2SO_4, HCl, or solid $NaHSO_4$	14 days
Acrolein and Acrylonitrile	Methods 5030, 5031, & 5032: 2 x 40-mL vials with Teflon-lined septum caps.	Adjust to pH of 4-5. Cool to 4ºC	14 days
Soil/Sediments and Sludges:	Method 5035: 40-mL vials with stirring bar. Method 5021: See method. Methods 5031 & 5032: 125-mL WM[c]-G[d]. Use Teflon-lined lids for all procedures.	See the individual method	14 days

Refer to footnotes at end of table.

Table B-15 (Continued)

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

Analyte Class and Sample Type	Container	Preservative	Holding Time
Semivolatile Organics/Organochlorine Pesticides and Herbicides			
Concentrated Waste Samples:	125 mL WM[c]-G[d] with Teflon-lined lid	None	Samples must be extracted within 14 days and analyzed within 40 days following extraction.
Soil/Sediments and Sludges:	250 mL WM[c]-G[d] with Teflon-lined lid	Cool to 4ºC	Samples must be extracted within 14 days and analyzed within 40 days following extraction.
Liquid Samples:			
No Residual Chlorine Present	1-gallon (gal.), 2 x 0.5 gal., or 4 x 1 liter (L) AG[g] container with Teflon[ϑ]-lined lid	Cool to 4ºC	Samples must be extracted within 7 days and extracts analyzed within 40 days following extraction
Residual Chlorine Present	1-gal., 2 x 0.5 gal., or 4 x 1-L AG[g] with Teflon[ϑ]-lined lid	Add 3-mL 10% sodium thiosulfate solution per gallon (or 0.008%). Addition of sodium thiosulfate solution to sample container may be performed in the laboratory prior to field use. Cool to 4ºC.	Samples must be extracted within 7 days and extracts analyzed within 40 days following extraction
Metals			
Aqueous Samples:			
Metals (except hexavalent chromium and mercury)	1-L P[h] or G[d]	Add nitric acid to adjust pH to less than 2.	180 days
Hexavalent chromium	500-mL P[h] or G[d]	Cool to 4ºC	24 hours
Mercury	500-mL P[h] or G[d]	Add nitric acid to adjust pH to less than 2.	28 days
Soil/Sediments and Sludges:			
Metals (except hexavalent chromium and mercury)	500-mL WM[c]-P[h] or G[d]	Cool to 4ºC	180 days
Hexavalent chromium	500-mL WM[c]-P[h] or G[d]	Cool to 4ºC	Not established - analyze as soon as possible.
Mercury	500-mL WM[c]-P[h] or G[d]	Cool to 4ºC	28 days

Refer to footnotes at end of table.

Table B-15 (Continued)

Recommended Sample Containers[a], Preservation Techniques, and Holding Times[b]

[a] Smaller sample containers may be required due to health and safety concerns associated with potential radiation exposure, transportation requirements, and waste management considerations.
[b] Information primarily from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846,* U.S. Environmental Protection Agency, 1986 and all approved updates.
[c] WM = Wide-mouth
[d] G - Glass
[e] Adjust to pH of less than 2 with sulfuric acid, hydrochloric acid, or solid sodium bisulfate.
[f] A term used to describe the hydrogen-ion activity of a system.
[g] AG = Amber glass
[h] P = Polyethylene

Table B-16

Summary of Characterization Methods for Hazardous Waste

Parameter	Method Numbers	Test Methods	Rationale
Volatile organic compounds (VOC) in waste matrix: Spent halogenated solvents Spent nonhalogenated solvents	ASTM Method D4547-91[a] U.S. EPA/540/4-91/001[b] SW-846 (1311, 8260B, 8275A)[c] or equivalent methods[d] Methods included in 20.4.1 NMAC §§ 265.1084(a)(2), (a)(3), and (a)(4)	Total and/or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromotography/mass spectrometry (GC/MS) Semivolatile organic compound (SVOC) analysis by thermal extraction/gas chromatography/mass spectrometry (TE/GC/MS) Acceptable Knowledge[f]	Determine total and/or TCLP and SVOC/VOC concentration in samples of solids or liquids
SVOCs in waste:	SW-846 (1311 and 8270C)[c] or equivalent methods[d]	Total or TCLP SVOC analysis by GC/MS Acceptable Knowledge[f]	Determine total and/or TCLP and SVOC concentration in samples of solids or liquids
Resource Conservation and Recovery Act-regulated metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010B, 7060A, 7061A)[c] (1311, 6010B, 7080A, 7081)[c] (1311, 6010B, 7130, 7131A)[c] (1311, 6010B, 7190, 7191)[c] (1311, 6010B, 7420, 7421)[c] (1311, 6010B, 7470A, 7471A, 7472)[c] (1311, 6010B, 7740, 7741A, 7742)[c] (1311, 6010B, 7760A, 7761)[c] or equivalent methods[d]	Total and/or TCLP Inductively-coupled plasma atomic emission spectroscopy Atomic absorption Manual cold vapor atomic absorption Anodic stripping voltammetry Acceptable Knowledge[f]	Determine total and/or TCLP concentration in samples of solids or liquids
Reactive Sulfide	SW-846, Test Method to Determine Hydrogen Sulfide Released from Wastes[e] SW-846 (9030B, 9031, 9034)[c] or equivalent methods[d]	Colorimetric, titrametric, or spectrophotometric measurement of hydrogen sulfide released from waste following reflux distillation under acidic conditions	Determine concentration of reactive sulfides
Ignitability (Flash Point)	SW-846 (1010, 1020A, 1030)[c] or equivalent methods[d]	Pensky-Martens closed cup Setaflash closed cup Ignitability of solids	Determine ignitablity
pH (Corrosivity)	SW-846 (9040B, 9041A, 9045C)[c] or equivalent methods[d]	pH electrometric measurement pH paper Soil and waste pH	Determine corrosivity

Refer to footnotes at end of table.

Table B-16 (Continued)

Summary of Characterization Methods for Hazardous Waste

[a] American Society for Testing and Materials, 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," ASTM D4547-91, *Annual Book of ASTM Standards*, Philadelphia, Pennsylvania, American Society for Testing and Materials.

[b] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," EPA 154014-91001, Office of Research and Development.

[c] U.S. Environmental Protection Agency, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.

[d] Equivalent methods subject to EPA approval may be substituted.

[e] *SW-846*, Section 7.3.4.2 contains specialized methods to determine if a sulfide-containing waste exhibits the reactivity characteristic.

[f] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-17

Summary of Characterization Methods for Mixed Low-Level Waste

Parameter	Method Numbers	Test Method	Rationale
Solid Wastes			
Volatile organic compounds (VOC) in waste matrix: Spent halogenated solvents Spent nonhalogenated solvents	ASTM Method D4547-91[a] U.S. EPA/540/4-91/001[b] SW-846 (1311, 8260B, 8275A)[c] or equivalent methods[d] Methods included in 20.4.1 NMAC §§ 265.1084(a)(2), (a)(3), and (a)(4)	Total and/or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromotography/mass spectrometry (GC/MS) Semivolatile organic compounds (SVOC) analysis by thermal extraction/gas chromatography/mass spectrometry (TE/GC/MS) Acceptable Knowledge[e]	Determine total and/or TCLP and VOC concentration in samples of solid process residues and soils
SVOCs in waste:	SW-846 (1311 and 8270C)[c] or equivalent methods[d]	Total and/or TCLP SVOC analysis by GC/MS Acceptable Knowledge[e]	Determine total and/or TCLP and SVOC concentration in samples of solid process residues and soils
Resource Conservation and Recovery Act (RCRA)-regulated metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010B, 7060A, 7061A)[c] (1311, 6010B, 7080A, 7081)[c] (1311, 6010B, 7130, 7131A)[c] (1311, 6010B, 7190, 7191)[c] (1311, 6010B, 7420, 7421)[c] (1311, 6010B, 7470A, 7471A, 7472)[c] (1311, 6010B, 7740, 7741A, 7742)[c] (1311, 6010B, 7760A, 7761)[c] or equivalent methods[d]	Total and/or TCLP Inductively-coupled plasma atomic emission spectroscopy Atomic absorption Manual cold vapor atomic absorption Acceptable Knowledge[e]	Determine total and/or TCLP concentration in samples of solid process residues and soils
Liquid Wastes			
VOCs in waste matrix: Spent halogenated solvents Spent nonhalogenated solvents	ASTM Method D4547-91[a] EPA/540/4-91/001[b] SW-846 (1311 and 8260B)[c] or equivalent methods[d]	Total and/or TCLP VOC analysis by GC/MS Acceptable Knowledge[e]	Determine total and/or TCLP and VOC concentration in samples of liquid
SVOCs in waste:	SW-846 (1311 and 8270B)[c] or equivalent methods[d]	Total and/or TCLP SVOC analysis by GC/MS Acceptable Knowledge[e]	Determine total and/or TCLP and SVOC concentration in samples of liquid
RCRA-regulated metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010B, 7060A, 7061A)[c] (1311, 6010B, 7080A, 7081)[c] (1311, 6010B, 7130, 7131A)[c] (1311, 6010B, 7190, 7191)[c] (1311, 6010B, 7420, 7421)[c] (1311, 6010B, 7470A, 7471A, 7472)[c] (1311, 6010B, 7740, 7741A, 7742)[c] (1311, 6010B, 7760A, 7761)[c] or equivalent methods[d]	Total and/or TCLP Inductively-coupled plasma atomic emission spectroscopy Atomic absorption Manual cold vapor atomic absorption Anodic stripping voltammetry Acceptable Knowledge[e]	Determine total and/or TCLP concentration in samples of liquid

Refer footnotes at end of table.

Table B-17 (Continued)

Summary of Characterization Methods for Mixed Low-Level Waste

Parameter	Method Numbers	Test Method	Rationale
Liquid Wastes (Continued)			
Ignitability (Flash Point)	SW-846 (1010, 1020A, 1030)[c] or equivalent methods[d]	Pensky-Martens closed cup Setaflash closed cup Acceptable Knowledge[e]	Determine ignitability
pH (Corrosivity)	SW-846 (9040B, 9041A, 9045C)[c] or equivalent methods[d]	pH electrometric Measurement pH paper Soil and waste pH Acceptable Knowledge[e]	Determine corrosivity

[a] American Society for Testing and Materials, 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," ASTM D4547-91, *Annual Book of ASTM Standards*, Philadelphia, Pennsylvania, American Society for Testing and Materials.
[b] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," EPA 154014-91991, Office of Research and Development.
[c] U.S. Environmental Protection Agency, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
[d] Equivalent methods, subject to EPA approval, may be substituted.
[e] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-18

Summary of Characterization Methods for Mixed Transuranic Waste

Parameter	Method Numbers	Test Methods	Rationale
	Storage		
Physical Waste Form (Free liquids in waste matrix)		Waste inspection procedures Real-time radiography Visual examination Acceptable Knowledge[e]	Verify waste container contents
Volatile organic compounds (VOC) in waste matrix: Spent halogenated solvents Spent nonhalogenated solvents	ASTM Method D4547-91[a] U.S. EPA/540/4-91/001[b] SW-846 (1311, 8260B, 8275A)[c] or equivalent methods[d] Methods included in 20.4.1 NMAC §§ 265.1084(a)(2), (a)(3), and (a)(4)	Total and/or toxicity characteristic leaching procedure (TCLP) VOCs in container headspace gas VOC analysis by gas chromatography/mass spectrometry (GC/MS) Semivolatile organic compound (SVOC) analysis by thermal extraction/gas chromatography/mass spectrometry (TE/GC/MS) Acceptable Knowledge[e]	Determine the presence or absence of VOCs in samples
SVOCs in waste	SW-846 (1311 and 8270C)[c] or equivalent methods[d]	Total and/or TCLP SVOC analysis by GC/MS Acceptable Knowledge[e]	Determine the presence or absence of SVOCs in samples
Resource Conservation and Recovery Act (RCRA)-regulated metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Selenium Silver	SW-846 (1311, 6010B, 7060A, 7061A)[c] (1311, 6010B, 7080A, 7081)[c] (1311, 6010B, 7130, 7131A)[c] (1311, 6010B, 7190, 7191)[c] (1311, 6010B, 7420, 7421)[c] (1311, 6010B, 7470A, 7471A, 7472)[c] (1311, 6010B, 7740, 7741A, 7742)[c] (1311, 6010B, 7760A, 7761) or equivalent methods[d]	Total and/or TCLP Inductively-coupled plasma atomic emission spectroscopy Atomic absorption Manual cold vapor atomic absorption Anodic stripping voltammetry Acceptable Knowledge[e]	Determine total and/or TCLP concentration in samples
Ignitability	SW-846 (1010, 1020A, 1030)[c] or equivalent methods[d]	Pensky-Martens closed cup Setaflash closed cup Ignitabililty of Solids Acceptable Knowledge[e]	Determine ignitability
pH (Corrosivity)	SW-846 (9040B, 9041A, 9045C) or equivalent methods[d]	pH electrometric measurement Acceptable Knowledge[e]	Determine corrosivity

Refer to footnotes at end of table.

Table B-18 (Continued)

Summary of Characterization Methods for Mixed Transuranic Waste

Parameter	Method Numbers	Test Methods	Rationale
	Treatment		
RCRA-regulated metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Silver	SW-846 (1311, 6010B, 7060A, 7061A)[c] (1311, 6010B, 7080A, 7081)[c] (1311, 6010B, 7130, 7131A)[c] (1311, 6010B, 7190, 7191)[c] (1311, 6010B, 7420, 7421)[c] (1311, 6010B, 7470A, 7471A, 7472)[c] (1311, 6010B, 7760A, 7761)[c] or equivalent methods[d]	Total and/or TCLP Inductively-coupled plasma atomic emission spectroscopy Atomic absorption Manual cold vapor atomic absorption Acceptable Knowledge[e]	Determine total and/or TCLP metals concentration in samples
pH (Corrosivity)	SW-846 (9040B, 9041A, 9045C) or equivalent methods[d]	pH electrometric measurement Acceptable Knowledge[e]	Determine corrosivity

[a] American Society for Testing and Materials, 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," ASTM D4547-91, *Annual Book of ASTM Standards*, Philadelphia, Pennsylvania, American Society for Testing and Materials.
[b] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," EPA 154014-91001, Office of Research and Development.
[c] U.S. Environmental Protection Agency, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
[d] Equivalent methods, subject to EPA approval, may be substituted.
[e] Acceptable knowledge is broadly defined as process knowledge, additional characterization data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

Table B-19

Description of Cementation Waste Streams at Technical Area 55

Summary Category Group	Waste Description	Waste-Generating Activity	Basis for Hazardous Waste Designation	Potential EPA Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[a] (milligrams per liter)
L1000 – Aqueous Liquids/Slurries	Evaporator bottoms solutions, aqueous waste, and laboratory solutions	Process residue from evaporator bottoms and other discardable solutions.	Acceptable Knowledge[b]	D002	Nitric acid	NA
				D004	Arsenic	5.0
				D005	Barium hydroxide	100.0
				D006	Cadmium	1.0
				D007	Chromium	5.0
				D008	Lead	5.0
				D009	Mercury	0.2
				D011	Silver	5.0
S3000 – Homogenous Solids	Inorganic process solids and cemented inorganic process solids	Process residue from evaporator bottoms and other discardable solutions; process-leached solids, ash, filter cakes, salts, metal oxides, and fines generated as a result of plutonium-processing	Acceptable Knowledge[b]	D004	Arsenic	5.0
				D006	Cadmium	1.0
				D007	Chromium	5.0
				D008	Lead	5.0
				D009	Mercury	0.2

[a] A solid waste exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, Test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *EPA-SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C., the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised June 14, 2000.

[b] Acceptable knowledge is broadly defined as process knowledge, supplemental waste analysis data, and/or facility records of analysis, U.S. Environmental Protection Agency, 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

EPA = U.S. Environmental Protection Agency
NA = Not applicable

Attachment B-1

Waste Management Units at
Los Alamos National Laboratory

Attachment B-1

Waste Management Units at Los Alamos National Laboratory[a]

Unit Location	Unit Type	Waste Types Managed[b]
TA-3-29, Rooms 9010, 9020, 9030	Storage - container	Hazardous Waste (HW), Mixed Low-Level Waste (MLLW), Mixed Transuranic Waste (MTRUW)
TA-14, Burn Cage	Treatment - Open Burning (OB)	High Explosives (HE) and HE-Contaminated Waste
TA-14, Detonation Unit	Treatment - Open Detonation (OD)	HE and HE-Contaminated Waste
TA-16-388	Treatment - OB	HE and HE-Contaminated Waste
TA-16-399	Treatment - OB	HE and HE-Contaminated Waste
TA-36-8	Treatment - OD	HE and HE-Contaminated Waste
TA-39-6	Treatment - OD	HE and HE-Contaminated Waste
TA-39-57	Treatment - OD	HE and HE-Contaminated Waste
TA-50-69, Indoor Area	Storage - Container	HW, MLLW, MTRUW
TA-50-69, Outdoor Area	Storage - Container	HW, MLLW, MTRUW
TA-54, Area L, Aboveground Container Storage Unit (CSU)	Storage - Container	HW, MLLW, MTRUW
TA-54, Area L, Storage Shafts CSU (Shafts 36 & 37)	Storage – Container	MLLW
TA-54, Area G, Storage Domes 229, 230, 231, and 232 and Pad 9	Storage – Container	HW, MLLW, MTRUW
TA-54, Area G, TA-54-412, Storage Dome 226, and Pad 1	Storage – Container	HW, MLLW, MTRUW
TA-54, Area G, Storage Dome 48 and Pad 3	Storage – Container	HW, MLLW, MTRUW
TA-54, Area G, Pad 10 (former Pads 2 and 4) and Transuranic Waste Characterization Facilities	Storage – Container	HW, MLLW, MTRUW
TA-54, Area G, Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7	Storage – Container	HW, MLLW, MTRUW
TA-54, Area G, Storage Domes 153 and 283 and Pad 6	Storage – Container	HW, MLLW, MTRUW
TA-54, Area G, Storage Shed 8	Storage – Container	HW, MLLW, MTRUW
TA-54, Area G,TA-54-33	Storage – Container	HW, MLLW, MTRUW
TA-54, Area G, Storage Dome 375 and Pad 11	Storage – Container	HW, MLLW, MTRUW

Attachment B-1 (Continued)

Waste Management Units at Los Alamos National Laboratory[a]

Unit Location	Unit Type	Waste Types Managed[b]
TA-54 West, Indoor CSU	Storage – Container	MLLW, MTRUW
TA-54 West, Outdoor CSU	Storage – Container	MLLW, MTRUW
TA-55-4, B40	Storage - Container	HW, MLLW, MTRUW
TA-55-4, K13	Storage – Container	HW, MLLW, MTRUW
TA-55-4, B05	Storage – Container	HW, MLLW, MTRUW
TA-55-4, B45	Storage – Container	HW, MLLW, MTRUW
TA-55-4, Vault	Storage – Container	HW, MLLW, MTRUW
TA-55-185	Storage - Container	HW, MLLW, MTRUW
TA-55, Storage Pad	Storage - Container	HW, MLLW, MTRUW
TA-55-4, 401	Storage - Tanks	MTRUW
TA-55-4, 401	Treatment – Cementation	MTRUW
TA-55-4, 401	Treatment – Vitrification	MLLW, MTRUW

[a] Waste management units active or proposed as of June 2003 that will be permitted or renewed.
[b] Waste types managed or planned to be managed as of June 2003.

APPENDIX C

INSPECTION PLAN

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C-1	Hazardous and Mixed Waste Facility Inspection Record Form

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
AR	Action Required
CSU	container storage unit
IRF	Inspection Record Form
LANL	Los Alamos National Laboratory
NA	Not Applicable
TA	technical area

APPENDIX C
INSPECTION PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 264.15, revised June 14, 2000 [6-14-00], this appendix presents inspection requirements applicable to all currently existing hazardous or mixed waste management units at Los Alamos National Laboratory (LANL) that are included in technical area (TA)-specific permit applications, permit modification requests, or permit renewal applications. Pursuant to 20.4.1 NMAC § 264.15(a) [6-14-00], inspection schedules for the units have been developed to identify equipment malfunctions and deterioration, operator errors, and discharges that might cause or lead to a release of hazardous or mixed waste and pose a threat to human health and the environment. As specified in 20.4.1 NMAC § 270.14(b)(5) [6-14-00], this inspection plan, which presents general inspection schedules, is being submitted with this permit renewal application. Inspections will be conducted often enough to identify problems in time to correct them before they harm human health or the environment. Inspection schedules or methods may differ at certain waste management units based upon worker safety issues or the nature of the safety and emergency equipment. In these cases, the specific inspection schedules or methods are or will be included in Attachment C of TA-specific permit applications, permit modification requests, or permit renewal applications.

C.1 GENERAL INSPECTION SCHEDULES AND REQUIREMENTS [20.4.1 NMAC § 270.14(b)(5) and 20.4.1 NMAC § 264.15(b) and (c)]

In accordance with the requirements of 20.4.1 NMAC § 270.14(b)(5), and 20.4.1 NMAC § 264.15(b)(1) [6-14-00], a written inspection schedule has been developed at LANL. This schedule will be followed for the inspection of monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment that are important to preventing, detecting, and responding to environmental or human health hazards. Inspections may be conducted at any time during the applicable day or week, as specified in the inspection schedule. A copy of this inspection plan, which includes inspection schedules, will be maintained by LANL's Solid Waste Regulatory Compliance Group and by the site operator (i.e., the division or operating group that is responsible for or manages the unit), as required in 20.4.1 NMAC § 264.15(b)(2) [6-14-00].

Inspection schedules outlining the items to be addressed on LANL's Hazardous and Mixed Waste Facility Inspection Record Form (IRF) and inspection frequencies for the unit types addressed in TA-specific permit applications, permit modification requests, or permit renewal applications are

provided in Sections C.2 through C.9. The IRF and instructions for its completion are provided for informational purposes only as Figure C-1 of this appendix; the form may be supplemented, changed, or otherwise replaced with an equivalent form. Pursuant to 20.4.1 NMAC § 264.15(b)(3) [6-14-00], the IRF lists the types of problems to be looked for during an inspection. The activities discussed below are addressed according to the specified regulatory requirements as well as to existing LANL inspection requirements for hazardous and mixed waste management units.

C.1.1 Inspection Records [20.4.1 NMAC § 264.15(d)]

Inspection training is provided through LANL's Performance Surety Division's ES&H Training Group. The division or operating group is responsible for ensuring that training is repeated, as necessary. After training, personnel assigned from the division or operating group that is responsible for or manages the unit will conduct inspections and record the information on IRFs or equivalent forms. The division or operating group responsible for or managing the unit will retain the inspection records for a minimum of three years from the date of inspection. During that timeframe, the inspection records will be available for review in the event that the New Mexico Environment Department or the U.S. Environmental Protection Agency inspects the facility for compliance with inspection requirements.

If necessary, LANL may modify the IRF or develop a form equivalent to it. Because the IRF is a comprehensive form, not all sections of the form apply to all units. The IRF encompasses 20.4.1 NMAC, Subpart V, Part 264 [6-14-00], requirements for permitted hazardous and mixed waste management units, and additional requirements directed by LANL policy. Instructions included with the IRF provide specific guidance for each inspection item listed.

The IRF or equivalent form will be completed according to the daily and/or weekly schedules provided in Sections C.2 through C.9. Inspections will be conducted and recorded in Parts I and II of the IRF for each working day or week that waste is opened, moved, received, stored, treated, or removed, as appropriate. Other records, such as a memo to file, may be used to document a condition of "No Use" at a unit.

For every item requiring inspection, a response indicating the condition of each item must be entered in the column under the appropriate day of the week. Responses may include "OK," "NA" (Not Applicable), or "AR" (Action Required). If the response is AR, the action required must be noted in Part II of the IRF. If more than one AR is listed, ARs should be numbered. All ARs must

be identified and noted, even if corrected immediately by the inspector. If inspection results indicate that corrective measures are warranted, any and all actions taken (along with time, date, and other pertinent information) will be recorded in Part II of the IRF and the AR noted on all subsequent IRFs until corrective measures are completed. Only after corrective measures have been completed and recorded on an IRF can an OK be entered in the "Condition" column on the IRF.

C.1.2 Inspection Frequency [20.4.1 NMAC § 264.15(b)(4)]

Inspection frequencies relevant to the unit types at LANL are presented in Sections C.2 through C.9 of this appendix and/or in Attachment C of TA-specific permit applications, permit modification requests, or permit renewal applications. Inspection frequencies may be increased at LANL's discretion when it determines that increased frequency may further assist in the detection or prevention of environmental hazards.

C.1.3 Actions Resulting From Inspections [20.4.1 NMAC § 264.15(c)]

If any defects, deterioration, operator errors, discharges, or potential hazards are discovered during an inspection, appropriate corrective measures (e.g., transfer of waste from a defective container to an appropriate container in good condition, repair or replacement of nonfunctioning equipment and/or systems, or removal of any accumulated liquids) will be completed on a schedule which ensures that the problem does not lead to an environmental or human health hazard. Any action taken in response to an inspection will be noted on the IRF or IRF documentation.

If a hazardous condition is imminent or has already occurred, an assessment of the condition will be made immediately, followed by appropriate remedial action. The condition will be assessed by the division or operating group that is responsible for or manages the unit. If this assessment indicates that human health or the environment may be adversely affected, the contingency plan (Appendix E of this document) may be implemented. The contingency plan discusses the appropriate responses to emergency situations. Evacuation determinations will be made as outlined in Table E-4 of the contingency plan. In the event the contingency plan is implemented, any sampling, decontamination, and verification will be conducted as specified in that plan. If the condition is such that the contingency plan is not implemented, remedial action will be defined and documented by the division or operating group that is responsible for or manages the unit.

C.2 INSPECTION SCHEDULE AND REQUIREMENTS FOR CONTAINER STORAGE UNITS [20.4.1 NMAC §§ 264.15(b) and 264.174]

Container storage units (CSU) are inspected according to the schedule provided below and/or in TA-specific permit applications, permit modification requests, or permit renewal applications. Inspection frequencies are adequate based on the deterioration rates of equipment/systems and the probability of harm to human health or the environment if failure of the equipment/systems occurs, or any operator error goes undetected between inspections.

C.2.1 On Day(s) of Waste Handling

Inspections will be conducted every day of or the day after waste handling, with special attention placed on areas subject to spills, such as loading and unloading areas. Waste handling includes when waste is received at, moved or opened within, treated at, or removed from a CSU. For inspections of CSUs, the following items will be addressed, as appropriate:

- General information (Items 1-6)
- Secondary containment structures
- Run on/off control
- Covers/lids of containers
- Labels
- Accumulation start date
- Compatibility
- Structural integrity of containers
- (Un)loading area
- Presence and condition of shaft cover

C.2.2 Weekly

Weekly inspections of CSUs will be conducted every week that waste remains in storage. These weekly inspections will address the following items, as appropriate:

- General information (Items 1-6)
- Communications equipment
- Warning signs
- Security
- Work surfaces/floors
- Spill/fire equipment
- Eyewashes/safety showers
- Wind sock
- Secondary containment structures
- Run on/off control
- Covers/lids of containers

- Labels
- Accumulation start date
- Compatibility
- Structural integrity of containers
- (Un)loading area
- Aisle space/stacking
- Pallets/raised containers
- Presence and condition of shaft cover

C.3 INSPECTION SCHEDULE AND REQUIREMENTS FOR TANK SYSTEMS [20.4.1 NMAC §§ 264.15(b), 264.193(i), and 264.195]

Resource Conservation and Recovery Act-regulated tank systems are inspected according to the schedule provided below and/or in TA-specific permit applications, permit modification requests, or permit renewal applications. The inspection frequency is adequate based on the deterioration rate of equipment/systems and the probability of adverse impact to human health or the environment if failure of the equipment/systems or any operator error goes undetected between inspections.

C.3.1 Daily (During Operation)

Tank systems (including ancillary equipment) will be inspected at least once each operating day. An operating day includes when waste is added to or emptied from a tank, or when tank treatment is conducted. Tank systems will be inspected for the items listed below, as appropriate:

- General information (Items 1-6)
- Secondary containment structures
- Labels
- Structural integrity of tanks and ancillary equipment
- (Un)loading areas
- Aboveground portions of tank systems to detect corrosion or releases of waste and to detect any possible malfunctions to overfill/spill control equipment, tank monitoring and leak detection systems, and data from these systems
- Proper operating condition of treatment tank (if applicable)

C.3.2 Weekly

Weekly inspection requirements for tank systems include the following items, as appropriate:

- General information (Items 1-6)
- Communications equipment
- Warning signs
- Security
- Work surfaces/floors
- Spill/fire equipment
- Eyewashes/safety showers
- Wind sock, if applicable
- Secondary containment structures
- Run on/off controls, if applicable
- Labels
- Accumulation start date, if appropriate
- Structural integrity of tanks and ancillary equipment
- (Un)loading areas
- Aboveground portions of tank systems to detect corrosion or releases of waste, overfill/spill control equipment, tank monitoring and leak detection systems, and data from these systems
- Proper operating condition of treatment tank (if applicable)

C.3.3 Annually

In accordance with 20.4.1 NMAC § 264.193(i) [6-14-00], an annual assessment of the overall condition of a tank system that does not have secondary containment will be performed by an independent, qualified registered professional engineer. The assessment procedure must be adequate to detect obvious cracks, leaks, and corrosion or erosion that may lead to cracks and leaks. Stored waste must be removed from the tank, if necessary, to allow the condition of all internal tank surfaces to be assessed. The frequency of these assessments must be based on the material of construction of the tank and its ancillary equipment, the age of the system, the type of corrosion or erosion protection used, the rate of corrosion or erosion observed during the previous inspection, and the characteristics of the waste being stored or treated.

C.4 INSPECTION SCHEDULE AND REQUIREMENTS FOR OPEN BURNING/OPEN DETONATION UNITS [20.4.1 NMAC §§ 264.15(b) and 264.602]

Open burning/open detonation units are inspected according to the schedule provided below. Inspection frequencies are adequate based on the deterioration rates of equipment/systems and the probability of harm to human health or the environment if failure of the equipment/systems occurs, or any operator error goes undetected between inspections.

C.4.1 On Day of Treatment

Inspections will be conducted every day of operation (i.e., every day that open burning/open detonation occurs). For inspections conducted on the day of treatment at open burning/open detonation units, the following items will be addressed, as appropriate:

- General information (Items 1-6)
- Secondary containment structures (if applicable)
- Detonation pad run on/off control (if applicable)
- (Un)loading area

C.4.2 Weekly

Weekly inspections of open burning/open detonation units will be conducted if no treatment will occur during that week or when waste is present on the treatment unit and awaiting treatment. Weekly inspections will address the following items, as appropriate:

- General information (Items 1-6)
- Communications equipment
- Warning signs
- Security
- Work surfaces
- Spill/fire equipment
- Eyewashes/safety showers
- Wind sock (if applicable)
- Secondary containment structures (if applicable)
- Detonation pad run on/off control (if applicable)
- Open burning units covered when not in use
- (Un)loading area

C.5 INSPECTION SCHEDULE AND REQUIREMENTS FOR CEMENTATION UNITS [20.4.1 NMAC §§ 264.15(b) and 264.602]

Cementation units will be inspected according to the schedule provided below and/or in TA-specific permit applications, permit modification requests, or permit renewal applications. The inspection frequency is adequate based on the deterioration rate of equipment/systems and the probability of harm to human health or the environment if failure of the equipment/systems or any operator error goes undetected between inspections.

C.5.1 Daily (During Operation)

Cementation units for treatment by solidification will be inspected each operating day (i.e., when waste is treated in the unit). For the daily inspection of the cementation unit, the following items will be addressed, as appropriate.

- General information (Items 1-6)
- Warning signs
- Work surfaces/floors
- Secondary containment structures
- Covers/lids of containers
- Labels
- (Un)loading area
- Structural integrity of cementation unit

C.5.2 Weekly

Weekly inspections of cementation units will be conducted if no treatment will occur during that week. Weekly inspections will address the following items, as appropriate:

- General information (Items 1-6)
- Communications equipment
- Warning signs
- Security
- Work surfaces/floors
- Spill/fire equipment
- Eyewashes/safety showers
- Secondary containment structures
- Covers/lids of containers
- Labels
- (Un)loading area
- Structural integrity of cementation unit

C.6 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART AA REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart AA]

Inspection and monitoring requirements for units subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart AA [6-14-00], are addressed, if applicable, in Attachment C of TA-specific permit applications, permit modification requests, or permit renewal applications.

C.7 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART BB REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart BB]

Inspection and monitoring requirements for units subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart BB [6-14-00], are addressed, if applicable, in Attachment C of TA-specific permit applications, permit modification requests, or permit renewal applications.

C.8 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART CC REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart CC]

Inspection and monitoring requirements for units subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart CC [6-14-00], are addressed, if applicable, in Attachment C of TA-specific permit applications, permit modification requests, or permit renewal applications.

C.9 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART DD REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart DD]

Inspection and monitoring requirements for units subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart DD [6-14-00], are addressed, if applicable, in Attachment C of TA-specific permit applications, permit modification requests, or permit renewal applications.

HAZARDOUS AND MIXED WASTE FACILITY INSPECTION RECORD FORM

[1] FACILITY: [2] Site ID #:	[3] ❑ <90-DAY ACCUMULATION AREA ❑ TREATMENT, STORAGE, OR DISPOSAL UNIT	[4] START DATE:	[5] END DATE:

[6] ❑ Containers ❑ Landfill ❑ Thermal Treatment

❑ Physical Treatment ❑ Biological Treatment ❑ Chemical Treatment

❑ Tank ❑ UST ❑ Miscellaneous Unit (OB/OD, Cementation)

PART I- Enter condition of the item inspected **(OK**, **NA** [Not Applicable], or **AR** [Action Required]**)** in column for day inspected.

ITEM	INSPECTED FOR:	MON	TUE	WED	THU	FRI	SAT	SUN
[7] NO USE	No waste opened, moved, received, treated, or removed; or no waste stored							
[8] COMMUNICATIONS EQUIPMENT	Availability and proper operating condition							
[9] WARNING SIGNS	Posted, legible, and bilingual							
[10] SECURITY	Condition of fences, gates, locks, and other access control equipment							
[11] WORK SURFACES/ FLOORS	Any conditions that could lead to an accident or spill							
[12] SPILL/FIRE EQUIPMENT	Present, appropriate, and in proper operating condition							
[13] EYEWASHES/ SAFETY SHOWERS	Proper operating condition							
[14] WIND SOCK	Proper operating condition and checked for damage							
[15] SECONDARY CONTAINMENT	Standing water/waste, integrity, surrounding vegetation, and erosion							
[16] RUN-ON/OFF CONTROL	Ponding, integrity, erosion, and damage							
[17] COVERS/LIDS OF CONTAINERS	Closed and secured properly							
[18] LABELS	Proper labels on all tanks and containers							
[19] ACCUMULATION START DATE	Present, legible, and not exceeding limit							
[20] COMPATIBILITY	Separated according to compatibility							
[21] INTEGRITY (Containers, tanks, and ancillary equipment)	Integrity, leakage, deterioration, corrosion, and damage							
[22] (UN)LOADING AREA	Spills and deterioration							
[23] AISLE SPACE/STACKING	Appropriateness and adequacy							
[24] PALLETS AND RAISED CONTAINERS	Any condition that could result in failure							
[25] TANK SYSTEMS (Aboveground portions)	Discharge controls, leakage, fill level, and corrosion							
[26] TREATMENT TANKS	Proper operating condition and leakage							
[27] SHAFTS	Presence and condition of cover							
[28] FILTER VESSELS (for open burning)	Deterioration and sand condition							
[29] OPEN BURNING UNITS	Deterioration, vegetation, sand condition, erosion, leakage, and cover							
[30] OPEN DETONATION UNITS	Condition, vegetation, and erosion							
[31] CEMENTATION UNITS	Structural integrity and condition of equipment and systems							

For Informational Purposes Only

Figure C-1

Hazardous and Mixed Waste Facility Inspection Record Form

HAZARDOUS AND MIXED WASTE FACILITY INSPECTION RECORD FORM

	MON	TUE	WED	THU	FRI	SAT	SUN
[32] **DATE**							
[33] **TIME**							
[34] **SIGNATURE OF INSPECTOR(S)**							

FACILITY:	Site ID #:	START DATE:	END DATE:

Part II- For any AR (Action Required) in PART I, describe below: action required, action taken, date, and time of action. Attach additional sheets if necessary. If more than one action is required, number each AR.

[35]

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Figure C-1 (Continued)

Hazardous and Mixed Waste Facility Inspection Record Form

Instruction for Use of the Hazardous and Mixed Waste Facility Inspection Record Form

Part I

TO BE CONDUCTED FOR ALL INSPECTIONS:
(Not all items in this section will apply to all facilities. An "NA" [not applicable] is required if the item does not apply.)

1. FACILITY: Location information, including TA, building, and room (if applicable). Other location descriptors may be necessary (e.g., TA-59-3-114 or TA-59-1-S, Dock).

2. Site ID Number: An identification number is assigned to every facility. This allows for ease in identification of a certain TSD unit <90-day accumulation area.

3. <90-DAY ACCUMULATION AREA: Should be checked if this location is intended for operation in accordance with generator requirements for storage of hazardous or mixed waste for less than 90 days.

   TREATMENT, STORAGE, OR DISPOSAL (TSD) UNIT: Should be checked if this location is listed in LANL's Hazardous Waste Facility Permit or General Part A Permit Application as a TSD operation.

4. START DATE: The date of the actual first working day of the week.

5. END DATE: The date of the actual last working day of the week.

6. Check the appropriate box for the type of operation. Several boxes may be checked, if necessary, for those locations where inspections are combined on a single sheet. You must have prior approval from RRES-SWRC to combine inspections for more than one unit.

7. NO USE: May be checked if waste was not received at, moved, or opened (to add or remove waste) within, treated at, or removed from a unit for the day in question. For some inspections that are performed weekly, "NO USE" may be checked if no waste was stored. In the situation that this box is checked, the individual responsible for the inspection must only complete this box and the signature section for that day/week. If any hazardous or mixed waste is subsequently placed at the site for any reason, a full inspection must be performed immediately and then subsequently according to the inspection plan. List "NA" to show normal nonworking days. Holidays and Laboratory closures should also be noted (e.g., by writing "H" or "Closed" in the first box and drawing a line all the way down the page).

8. Communication equipment must be inspected in order to ensure availability and proper operating condition for each piece of equipment (e.g., telephones, radios, and alarms). Consultation with RRES-SWRC prior to use of the facility/location is available, if necessary.

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Instruction for Use of the Hazardous and Mixed Waste Facility Inspection Record Form (Continued)

9. Required signs must be legible and prominently posted. TSD units must be equipped with bilingual (English/Spanish) signs with the legend "DANGER UNAUTHORIZED PERSONNEL KEEP OUT." <90-day accumulation areas must be identified with a sign with the legend "<90-DAY HAZARDOUS WASTE STORAGE AREA." TSD units are required to have signs that read "HAZARDOUS WASTE STORAGE AREA" spaced 50 feet apart and legible from 25 feet away.

10. The TSD unit or <90-day accumulation area site security must be verified. Items such as fences, gates, locks, and other access control equipment should be checked for proper operating condition.

11. Process floors and other work surfaces at TSD units must be inspected for any conditions that could lead to a spill or an accident.

12. Hazardous or mixed waste TSD units and <90-day accumulation areas must have fire control and spill control equipment. TSD units will be in compliance with the Laboratory's Hazardous Waste Facility Permit Contingency Plan. Equipment must be present, in proper operating condition, and appropriate for the material in question. Outdoor fire-water supply systems must be checked for freezing and damage.

13. If present, eyewashes and safety showers must be inspected to ensure proper operating condition. Outdoor locations must be checked for freezing.

14. Wind socks, where present at TSD units, must be inspected to ensure that they are in proper operating condition and checked for damage.

15. Secondary containment structures for hazardous or mixed waste operations must be inspected to verify proper operating condition and to ensure adequate capacity. Structures must also be inspected for the presence of standing water or hazardous/mixed waste. For certain operations, secondary containment includes inspection of gloves, gloveboxes, hoods, and ventilation systems. For locations where inflatable "Porta Berms" are used, inspectors must ensure that they are adequately inflated. All monitoring and leak detection systems must also be checked.

16. Run-on and runoff controls, wherever present, must be checked. The integrity should be inspected by looking for signs of damage, erosion, ponding, or any other conditions that could lead to a spill or an accident.

17. All tanks and containers used for treating or storing hazardous or mixed waste must have the cover or lid securely in place. Containers are not considered to be closed until the lid/cover is fastened in the manner the manufacturer originally intended. However, the lid may be off of a tank or container during treatment (if it is part of the treatment), and while waste is being placed into or removed from a container.

18. All containers and tanks containing hazardous or mixed waste must be labeled with the words "HAZARDOUS WASTE."

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Instruction for Use of the Hazardous and Mixed Waste Facility Inspection Record Form (Continued)

19. All containers and tanks of hazardous or mixed waste in <90-day accumulation areas must be marked with the accumulation start date. This date must be legible. At <90-day accumulation areas, containers must be marked with the accumulation start date at the time the container first receives any waste. For <90-day accumulation areas, no containers may exceed 90 days from the accumulation start date to the time they are delivered to a permitted treatment, storage, or disposal unit. At TSD units, all containers must be dated when they arrive at the facility. At TSD units, no hazardous or mixed waste may be stored for over one year, unless specifically exempted.

20. All hazardous or mixed waste containers holding materials that may be incompatible with any other materials at that location must be separated from those materials by dikes, berms, or other physical barriers to prevent a possible reaction.

21. All containers and tanks must be checked for structural integrity, leakage, corrosion, or damage. This includes checking the condition of all construction materials, fixtures, seams, and auxiliary equipment. There are special inspection criteria for tank systems (see Item 25 below).

22. Loading and unloading areas must be inspected daily when in use for signs of damage or deterioration that may lead to an accident or spill. This includes asphalt covered areas and areas where containers or tanks are handled or the contents thereof are transferred.

23. Adequate aisle space must be maintained to allow for inspection and for the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency. All containers of hazardous and mixed waste must be stored in a manner that ensures a minimum 2-foot aisle space, unless otherwise specified for the facility.

24. Hazardous or mixed waste containers at TSD units and <90-day accumulation areas must be stored on pallets, elevated, or otherwise protected from contact with accumulated liquid.

<u>TANKS SYSTEMS</u>:

25. For tank systems used for treatment or storage of hazardous or mixed waste, all aboveground portions of the tank system, including any and all ancillary plumbing, must be inspected for signs of leaking, corrosion, deterioration, or improper operation. Tanks must be operated with a minimum freeboard of 6 inches. If the tank system includes discharge controls, overtopping controls, tank level alarms, or other monitoring equipment, including leak detection equipment, all controls and relevant data must be checked to ensure they are operating properly and that operation is within design specifications for the system.

26. Hazardous and mixed waste treatment tanks must be operated within the design specifications and in accordance with standard operating procedures and work plans. Tanks must be inspected for leakage or damage prior to operation.

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Instruction for Use of the Hazardous and Mixed Waste Facility Inspection Record Form (Continued)

SHAFTS:

27. Shafts used for retrievable storage should have their covers securely in place and the surrounding area should show no evidence of erosion.

FILTER VESSELS:

28. The condition and adequacy of sand must be inspected in filter vessels. The vessels must also be inspected for deterioration and damage.

OPEN BURNING UNITS:

29. Open burning units must be inspected for deterioration, leakage, vegetation that could catch fire, the condition of sand (as appropriate), and assure that the unit is covered when not in use. Inspectors must also look for explosives and debris not consumed during the burn.

OPEN DETONATION UNITS:

30. Open detonation units must be inspected for deterioration, leakage, or vegetation that could catch fire. Inspectors must also look for explosives and debris not consumed by the detonation.

CEMENTATION UNITS:

31. The structural integrity and condition of equipment and systems must be inspected on cementation units. Units must also be inspected for signs of leaking, corrosion, deterioration, or improper operation.

FOR ALL INSPECTIONS:

32. Record of the date of the current inspection. Only one date is given for each inspection, whether a team or an individual performs the inspection.

33. Record of the time of the current inspection. Only one time is given for each inspection, whether a team or an individual performs the inspection.

34. Signature of each inspector involved in the current inspection.

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Instruction for Use of the Hazardous and Mixed Waste Facility Inspection Record Form (Continued)

Part II

List any action required. Document any action taken immediately and express any plans for future action to be taken. If necessary, attach additional sheets to IRF to efficiently cover the action taken or required. Initial any information or comments added, and if more than one action is required or conducted, assign a number to each AR.

For Informational Purposes Only

APPENDIX D

PERSONNEL TRAINING PLAN

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
EDS	Employee Development System
EM&R	LANL's Emergency Management and Response
EMP	Emergency Management Plan
ES&H	environment, safety, and health
FWO	LANL’s Facility and Waste Operations Division
KSL	KBR-Shaw-LATA
LANL	Los Alamos National Laboratory
OJT	on-the-job training
PS-13	LANL's ES&H Training Group
PTLA	Protection Technology Los Alamos
RCRA	Resource Conservation and Recovery Act
S-10	LANL's Hazardous Material Response Group
SWRC	LANL's Solid Waste Regulatory Compliance Group
TSF	treatment and storage facility
USC	United States Code

APPENDIX D
PERSONNEL TRAINING

This section describes the personnel training program for Los Alamos National Laboratory (LANL) treatment and storage facility (TSF) workers. Training requirements for treatment, storage, and disposal facility personnel are specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 264.16, revised June 14, 2000 [6-14-00], and are included in this document, as required by 20.4.1 NMAC § 270.14(b)(12) [6-14-00]. The primary objective of the training program is to prepare personnel to operate and maintain safely those areas managing hazardous and/or mixed waste, in accordance with 20.4.1 NMAC, Subpart V, Part 264 [6-14-00]. This training program applies to all employees of the U.S. Department of Energy, the University of California, and any subcontractors who work regularly at LANL TSFs and manage hazardous and/or mixed waste. The degree of training varies with the job duties.

D.1 HAZARDOUS AND MIXED WASTE MANAGEMENT/RESPONSIBILITIES

Waste management activities and responsibilities at specific hazardous and/or mixed waste management units are handled by the appropriate LANL division or group. Waste management groups within the Facility and Waste Operations (FWO) Division are responsible for most centralized waste management activities at LANL. The Solid Waste Regulatory Compliance Group (SWRC) is responsible for providing waste management regulatory guidance to all LANL personnel and operations. Other personnel at LANL that may provide assistance in various waste management activities are discussed in the following paragraph and in Appendix E of this document.

Laboratory-contracted support services (e.g., KBR-Shaw-LATA [KSL]) provide trained personnel to assist in waste-handling activities. Personnel in the Health Physics Operations Group, the Occupational Medicine Group, the Industrial Hygiene and Safety Group, the Nuclear Criticality Safety Group, the Occurrence Reporting Group, the Hazardous Material Response Group (S-10), the Meteorology and Air Quality Group, the Water Quality and Hydrology Group, the Ecology Group, and personnel in SWRC are trained in their respective specialties to provide emergency response support. Protection Technology Los Alamos (PTLA) is responsible for LANL security, and provides workers trained in traffic and site-access control.

The Emergency Management and Response (EM&R) Office provides emergency planning and response at LANL and has the overall responsibility for LANL's Emergency Management Plan (EMP) training. The Performance Surety Division ES&H Training Group (PS-13) is responsible for the analysis, design, development, and delivery of LANL-wide environment, safety, and health (ES&H) training. Courses on hazardous and/or mixed waste are designed with substantial input from SWRC and FWO waste management groups, and other subject matter experts, as appropriate.

D.2 TRAINING CONTENT, FREQUENCY, AND TECHNIQUES [20.4.1 NMAC § 270.14(b)(12) and 20.4.1 NMAC § 264.16(a), (b), (d), and (e)]

The training program instituted at LANL includes a combination of LANL-wide courses, facility-specific training, and on-the-job training (OJT). LANL-wide courses are provided internally or through external vendors and are usually classroom-based. Facility-specific training may be developed and delivered within a particular TSF, and OJT consists of supervised and documented training focused primarily on procedures performed by individual workers. Each of these types of training is described briefly in Sections D.2.1 through D.2.3. All LANL employees and LANL contract and support personnel who handle hazardous and/or mixed waste at TSFs receive the appropriate level of training within six months of their date of hire or transfer for work at a TSF. Personnel will not work in unsupervised waste handling positions at TSFs until they have successfully completed the appropriate level of training for their positions and responsibilities.

Records of LANL-wide training currently sponsored or administered by PS-13 are entered by that group into the Employee Development System (EDS), the official LANL training database. These records document that the required training has been successfully completed by the worker. Training records of former workers are kept for at least three years from the date that they last worked at the TSF. It is required that records documenting successful completion of facility-specific, on-the-job, or externally provided training be kept by the sponsoring LANL organization. LANL will maintain, at a minimum, hard or electronic copies of TSF training records for currently employed workers until the TSF closes.

Table D-1 presents components of the LANL-wide training program as administered through PS-13. This table includes a listing of the relevant training courses, a summary of topics, and a designation of the relevant courses for each job category. Categories of workers presented in Table D-1 include TSF hazardous/mixed waste workers, managers and supervisors of TSF hazardous/mixed

waste workers, emergency responders, and uncontrolled area potential release site workers. Table D-2 summarizes the components of facility-specific training and OJT that workers receive, as applicable. Each training element has been designed to ensure that every worker involved in hazardous and/or mixed waste handling operations is properly trained in the procedures relevant to the positions in which they are employed. Tracking the completion of training is possible through the EDS training plans. If a worker is no longer involved in hazardous and/or mixed waste handling operations, continued training to meet the components of the relevant hazardous waste management program is not required.

TSF Hazardous/Mixed Waste Workers are responsible for handling hazardous/mixed wastes at a TSF. In addition, they are responsible for assisting in TSF spill and emergency response activities, as required.

Managers and Supervisors of TSF Hazardous/Mixed Waste Workers are directly responsible for day-to-day operations related to TSF waste management activities. They are also responsible for assuring that personnel safety and training requirements are met.

Emergency Responders are trained emergency response personnel (e.g., S-10, Technical Area 55 Emergency Response Team) that respond to emergencies (e.g., spills, fires, explosions) involving hazardous and/or mixed wastes. Emergency Responders also provide support for emergency response activities.

Uncontrolled Area Potential Release Site Workers conduct investigations and remedial activities at potential release sites. They are also responsible for proper waste management from generation to disposal, including waste characterization, treatment, and storage.

Training materials of LANL-wide training courses are on file in the ES&H Training Center and are available for review by all hazardous/mixed waste management and handling personnel, emergency response personnel, and regulatory agencies. Course content will be reviewed on a regular schedule and updated as required to keep materials current with hazardous waste management regulations. Alternative forms of training (e.g., paper-based self-study courses, web-based training) may be taken to meet specific training requirements. Such alternate forms of training must be approved by PS-13 personnel and be determined to be equivalent in content to more traditional classroom-based training courses. Files listing the requisite skills, education, and

training for workers who handle hazardous and/or mixed waste and the duties and responsibilities for each job description, as well as the name of each worker filling a job description, are maintained at LANL, as required by 20.4.1 NMAC § 264.16(d)(2) [6-14-00].

D.2.1 LANL-Wide Courses

Hazardous waste management courses for TSF personnel include Waste Generation Overview Live Training, Resource Conservation and Recovery Act (RCRA) Personnel Training, and RCRA Refresher Training. Additional LANL-wide courses may be required for specific job functions.

The RCRA Personnel Training course provides an overview of state and federal hazardous waste management regulations and emphasizes compliance with the RCRA requirements that apply to job-related activities, such as the safe handling of hazardous and mixed waste. Instructors are trained in hazardous and mixed waste management programs and procedures and in RCRA *(42 United States Code [USC] § 6901 et seq.)*. PS-13, with guidance from SWRC, provides an annual refresher of applicable hazardous waste management requirements. TSF personnel who handle hazardous and/or mixed waste and/or clean up spills or releases of hazardous and/or mixed waste at TSFs and the managers and supervisors of these workers also receive instruction on appropriate topics listed in Table D-1. In addition, personnel responsible for shipping or transporting hazardous and/or mixed waste require supplementary training, as necessary.

D.2.2 Facility-Specific Training [20.4.1 NMAC § 264.16(a)(3)]

Waste-handling personnel will participate in facility-specific training at their particular work locations, as appropriate. Table D-2 addresses program requirements that ensure that hazardous and mixed waste management and handling personnel know the specific requirements for their particular facilities and are able to respond effectively to emergencies. Personnel will become familiar with emergency procedures, equipment, and systems at their particular facility, including emergency and monitoring equipment use, inspection, repair, and replacement, as appropriate. In addition, they will receive instruction on contingency plan contents and implementation (as they apply to their particular facility) including, but not limited to, communications or alarm systems, response to fires and explosions at their facility, key parameters for automatic waste-feed cutoff systems, shutdown of facility operations, and response to groundwater contamination incidents.

D.2.3 On-the-Job Training

Supervised and documented OJT may be developed and delivered by supervisors or other subject matter experts who are able to evaluate worker proficiency and determine appropriate training for the procedures required of each function-specific position. OJT topics may include implementation of facility-specific procedures, maintenance of operating records, reporting requirements, and TSF-specific inspection requirements. TSF emergency response personnel receive TSF-specific training regarding emergency response and shutdown procedures at the TSF to which they are assigned.

D.2.4 Training Coordinator [20.4.1 NMAC § 264.16(a)(2)]

The PS-13 Group Leader directs the LANL-wide ES&H training program. The Group Leader (or designee) serves as the Training Coordinator for LANL-wide waste management training. The Training Coordinator is trained in the operation of hazardous and mixed waste management facilities, waste management practices, and emergency procedures and is responsible for coordinating training courses.

D.3 EMERGENCY TRAINING [20.4.1 NMAC § 264.16(a)(3) and (c)]

If called upon by the EM&R Office, additional non-LANL emergency response personnel (e.g., KSL, PTLA) may assist the LANL Incident Commander at the scene of a hazardous or mixed waste emergency. These workers are trained in their specialties (e.g., heavy equipment operation, hazardous material cleanups, traffic control, and security). At all times during an emergency, these workers are coordinated by the Incident Commander in the Incident Command System or by the designated Emergency Manager, as appropriate. Appendix E of this document (the Contingency Plan) provides a more detailed discussion of emergency procedures, personnel, and equipment.

To ensure maximum protection of life and property and to mitigate the consequences of an emergency situation, TSF personnel involved in waste handling and emergency response must be knowledgeable about appropriate building and operating area emergency procedures. These workers receive training in TSF-specific emergency procedures or participate in the LANL-wide emergency training program. Group leaders and immediate supervisors are responsible for ensuring that education and training in TSF-specific emergency procedures are provided to all personnel under their supervision. Training in TSF-specific emergency procedures is given by the operating group. Periodic exercises may be used to familiarize workers with emergency procedures. Training may also be provided to workers through instructional displays or presentations and discussions in safety meetings.

Immediate supervisors ensure that each new or transferred worker is informed on the general and specific emergency procedures related to the work area. The immediate supervisor also ensures that each worker is advised of any changes to emergency procedures and that each worker is provided with an annual refresher of these procedures. The organization that develops and delivers TSF-specific emergency training maintains these training records.

Specialized training is given to personnel assigned special functions or specific emergency duties. Emergency response personnel are required to attend training on the implementation of the RCRA Contingency Plan (Appendix E), spill response, and Occupational Safety and Health Administration emergency response provisions. The EM&R Office provides training related to implementing LANL's EMP. In addition, TSF waste management and handling personnel participate in a training program in which they are instructed in emergency procedures pertinent to their work areas. The operating group is responsible for providing this site-specific instruction.

D.4 IMPLEMENTATION OF TRAINING PROGRAMS [20.4.1 NMAC § 264.16(b) and (c)]

Waste Generation Overview Live is an introductory course that provides an overview of federal and state waste management regulations and Laboratory policies and procedures for waste management operations. The training addresses the information needed to identify and properly manage wastes that are subject to hazardous waste regulations in 20.4.1 NMAC, Subpart II [6-14-00].

In addition to Waste Generation Overview Live, all TSF workers who handle hazardous and/or mixed waste are required to complete RCRA Personnel Training and annual RCRA refresher courses. These refresher courses are intended to update personnel on LANL procedures and changes in RCRA *(42 USC § 6901 et seq.)* provisions and 20.4.1 NMAC regulations and to provide them with an overview of their introductory training. Line managers and group leaders are responsible for ensuring that personnel participate in the appropriate introductory and annual training courses.

Table D-1

Los Alamos National Laboratory-Wide Training Program Outline

Courses[a]	TSF[b] Hazardous/Mixed Waste Worker	Manager/Supervisor of TSF Hazardous/Mixed Waste Workers	Emergency Responder	Uncontrolled Area Potential Release Site Worker
HAZWOPER[c]: First Responder (Operations Level) (provides an overview of hazardous materials emergency response, including recognition and identification of hazardous materials and associated risks, required actions, and relationships with other emergency responders)			X[d]	
HAZWOPER: General Site Worker (40 hours) (provides general information on hazardous waste operations and emergency response for general site workers engaged in corrective action, remediation, or decontamination and decommissioning activities)				X
HAZWOPER: Refresher (provides general information on hazardous waste operations)			X	X
RCRA[e] Personnel Training (includes an overview of the Code of Federal Regulations, Title 40, Parts 260-265, 268; the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (6-14-00); Department of Transportation shipping regulations; internal and external protocol for facility inspections; operating equipment, communication systems, security systems; contingency plan; and emergency equipment use, inspection, and repair)	X	X	*[f]	*
RCRA Refresher Training (includes regulatory and legislative updates, occurrence reports and lessons learned, audit findings, modification/review of the contingency plan; provides required retraining)	X	X	*	*

Table D-1 (Continued)

Los Alamos National Laboratory-Wide Training Program Outline

Courses[a]	TSF[b] Hazardous/Mixed Waste Worker	Manager/Supervisor of TSF Hazardous/Mixed Waste Workers	Emergency Responder	Uncontrolled Area Potential Release Site Worker
Waste Generation Overview Live (includes waste management regulations and policies, definition of hazardous waste, waste minimization, cycle of waste management at Los Alamos National Laboratory, storage and disposal)	X	X	X	X
Respirators: Air-Purifying (provides required annual retraining for operation and inspection of device, changing filters, donning and doffing)	*	*	X	*
Respirators: Self-Contained Breathing Apparatus (provides required annual retraining for operation and inspection, changing compressed air bottles, donning and doffing, safety features, care and cleaning, fitting)	*	*	X	*

[a] Additional training courses (not listed in this attachment) may also be taken by personnel depending on the types of hazards (e.g., chemical) associated with a particular job description.
[b] TSF = Treatment and storage facility
[c] HAZWOPER = Hazardous Waste Operations and Emergency Response
[d] X indicates a required course.
[e] RCRA = Resource Conservation and Recovery Act
[f] * indicates that a course may be required for specific job tasks and/or work areas.

Table D-2

Outline of Facility-Specific and On-the-Job Training for Treatment and Storage Facility Operations

Facility-specific and/or on-the-job training (OJT) is provided to treatment and storage facility (TSF) workers to ensure that operations are performed in a safe manner and that actual job tasks are conducted in accordance with safe operating procedures.

Facility-specific training will include, as applicable, the following topics:

- Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment
- Key parameters for automatic waste feed cut-off systems
- Communications or alarm systems
- Response to fires or explosions
- Response to groundwater contamination incidents
- Shutdown of operations.

OJT will include the following topics, as applicable:

- Implementation of facility-specific procedures
- Maintenance of operating records
- Reporting requirements
- TSF-specific inspection requirements.

OJT and facility-specific training must be documented by the sponsoring organization and training records must be maintained for a minimum of three years from the date that the trainee last worked at the TSF.

APPENDIX E

CONTINGENCY PLAN

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
BEP	building emergency plan
CAS	Central Alarm Station
DOE	U.S. Department of Energy
DX	Dynamic Experimentation
EM&R	Emergency Management and Response
EMP	Emergency Management Plan
EOC	Emergency Operations Center
HAZMAT	Hazardous Materials
HMGS	Hazardous Materials Group Supervisor
HSR	Health, Safety, and Radiation Protection
HSR-1	Health Physics Operations Group
HSR-2	Occupational Medicine Group
HSR-5	Industrial Hygiene and Safety Group
IC	Incident Commander
ICS	Incident Command System
KSL	KBR-Shaw-LATA
LACFD	Los Alamos County Fire Department
LACPD	Los Alamos County Police Department
LAMC	Los Alamos Medical Center
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

NAWAS	National Warning System
NIIMS	National Interagency Incident Management System
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
PA	public address
PPE	personal protective equipment
PS	Performance Surety
PTLA	Protection Technology Los Alamos
RRES	Risk Reduction and Environmental Stewardship
RRES-MAQ	Meteorology and Air Quality Group
RRES-SWRC	Solid Waste Regulatory Compliance Group
RRES-WQH	Water Quality and Hydrology Group
S	Security and Safeguards
S-10	Hazardous Materials Response Group
TA	technical area

APPENDIX E
CONTINGENCY PLAN

This appendix presents contingency measures applicable to all hazardous or mixed waste units at Los Alamos National Laboratory (LANL) included in technical area (TA)-specific permit applications, permit modification requests, or permit renewal applications. This Contingency Plan is intended to meet the requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart V, Part 264, Subpart D, revised June 14, 2000 [6-14-00], and 20.4.1 NMAC § 270.14(b)(7) [6-14-00], for hazardous waste treatment and storage facilities. In addition, this plan is consistent with the LANL Emergency Management Plan (EMP) (LANL, 2002), prepared by the LANL Emergency Management and Response (EM&R) Office. The provisions of this plan will be carried out immediately to minimize hazards whenever there is a fire, explosion, or release of hazardous or mixed waste or hazardous or mixed waste constituents that could threaten human health or the environment, as required by 20.4.1 NMAC § 264.51(b) [6-14-00]. When necessary, additional Contingency Plan information will be provided in Attachment E of TA-specific permit applications, permit modification requests, or permit renewal applications. Individual facilities at LANL may have their own facility-specific emergency plans and/or procedures to follow in the event of a fire, explosion, or release of hazardous and/or mixed waste.

E.1 HAZARDOUS AND MIXED WASTE EMERGENCY RESPONSE RESOURCES [20.4.1 NMAC §§ 264.52(c) and 264.53]

The management of hazardous and mixed waste emergency incidents at LANL resides within the EM&R Office, which is part of the Security and Safeguards (S) Division. During an emergency situation, line management (i.e., the Group Leader of the affected area) works with the Duty Emergency Manager from the EM&R Office. The Emergency Manager has primary responsibility for managing emergency response operations, making appropriate notifications, activating the emergency response organizations, and proceeding to the scene. The Emergency Manager has authority to assume the role of Incident Commander (IC) during an emergency and typically assumes full responsibility for management of the emergency response operations at the scene. (Personnel from other organizations, such as the Federal Bureau of Investigation or the Los Alamos County Fire Department [LACFD], may also assume the role of IC, depending upon the type of emergency and responding organizations.) Additional LANL resources that may provide assistance in an emergency include personnel from the Health, Safety, and Radiation Protection (HSR) Division, Risk Reduction and Environmental Stewardship (RRES) Division, and Performance Surety

(PS) Division at LANL. These groups as well as other groups in S Division are discussed in Sections E.1.2, E.1.3, and E.1.6.

Laboratory-contracted support services and other agencies are also available for assistance during emergencies. These are discussed in Section E.1.5 and include the contracted services of Protection Technology Los Alamos (PTLA) for security and the LACFD. Facility maintenance and heavy equipment operation are provided by KBR-Shaw-LATA (KSL). These contracted services, if changed, will be replaced and/or supplemented with functionally equivalent contracted services required to assume the same duties and responsibilities described in this section. Other outside response agencies are discussed in Section E.1.7 and include the Los Alamos County Police Department (LACPD) and the Los Alamos Medical Center (LAMC). The LACPD and the LAMC each provide assistance under a memorandum of understanding with the U.S. Department of Energy (DOE).

The Laboratory, as required by DOE and the State of New Mexico, uses the Incident Command System (ICS) in response to all emergencies. The ICS is based on the on-scene management structure protocols of the National Interagency Incident Management System (NIIMS). The NIIMS is a national standard that provides consistency in terminology/methodology and allows for an integrated emergency response both locally and nationally, if necessary. Consequently, this Contingency Plan may undergo modification.

The IC (e.g., Duty Emergency Manager) coordinates all groups and agencies responding to the emergency and personnel operating at the scene using the ICS. The general emergency notification structure, illustrated on Figure E-1, is designed to expand and contract, as appropriate, to include the response groups/agencies needed to address any particular emergency.

The IC may appoint and utilize a network of support personnel to assess, plan for, and mitigate emergencies. These personnel can include, but are not limited to, a Safety Officer, a Public Information Officer, and a Liaison Officer that report directly to the IC and are responsible for issues related to safety, information, and the interaction of various groups associated with the overall emergency. Also reporting directly to the IC are an Operations Section Chief, Logistics Section Chief, Planning Section Chief, and an Administrative Section Chief. The Operations Section Chief oversees the Fire Branch and the Emergency Medical Services Branch, and is responsible for the

actual emergency response. The Logistics Section Chief is responsible for providing support personnel and equipment necessary for the emergency response. The Planning Section Chief is responsible for planning the active mitigation and recovery for the emergency. The Administrative Section Chief is responsible for keeping records of expenditures. In some instances, some or all of these positions may be activated, as the emergency warrants. During an emergency at LANL, assistance may be provided to the IC and the IC's appointees by a large variety of response groups/agencies. The responsibilities and/or assistance available from the various response groups/agencies are listed in Table E-1 and discussed briefly in Sections E.1.2 through E.1.7.

A copy of this Contingency Plan and any revisions will be provided to each of the emergency response groups/agencies (including the LACPD, LACFD, and LAMC). LANL's Solid Waste Regulatory Compliance Group (RRES-SWRC) is responsible for the controlled distribution of this plan. Amendments to this plan are discussed in Section E.12.

E.1.1 Emergency Management and Response Office [20.4.1 NMAC §§ 264.52(d) and 264.55] The Director of LANL has delegated the authority and responsibility for administering and implementing LANL's emergency management program to the S Division, which includes the EM&R Office. The EM&R Office coordinates and issues LANL's EMP and provides response coordination for emergencies. The EM&R Office also provides a 24-hour Duty Emergency Manager to respond to emergencies, including hazardous and mixed waste releases. The LANL Emergency Manager is the functional equivalent of the Emergency Coordinator (20.4.1 NMAC § 264.55 [6-14-00]). The EM&R Office maintains an Emergency Operations Center (EOC) in a ready condition, should a center be required. The primary EOC is located at TA-59, Building 1 (TA-59-1). An alternate EOC is located at TA-49-113. After September 30, 2003, the primary EOC will be located at TA-69, Building 33 (TA-69-33). Should an EOC be activated during an emergency, additional emergency personnel can be requested by the IC through the EOC.

Assignment as the Duty (i.e., primary) Emergency Manager is rotated. The Duty Emergency Manager can be reached 24 hours a day by contacting the EM&R Office at 667-6211 or the Central Alarm Station (CAS) operator (911).

The Duty Emergency Manager will respond to emergency incidents involving the release of hazardous or mixed waste to the environment, including spills, fires, and explosions. With input from the appropriate LANL groups, the Duty Emergency Manager will initially assess the possible

hazards to human health or the environment and, if assuming incident command, will use whatever response personnel and/or emergency equipment necessary to control and contain the waste. In the event of an emergency, the Emergency Manager typically becomes the IC with full responsibility for field activities (including safety, operations, and planning, or establishing these positions within the ICS). As described previously, the exception to this is when on-site personnel can adequately address the emergency and maintain incident command internally. At the scene of the emergency, the IC will assemble the ICS, as required, for response to the emergency.

The Duty Emergency Manager responding to an emergency will have access to a copy of the appropriate building emergency plan(s) (BEP) for the area in which the incident is occurring. These plans are maintained by the facility manager where a waste management unit is located and are available at the EM&R Office at TA-59; they are also located on site for use by emergency response personnel. The various response groups will obtain specific information relating to the facilities involved (including the layout of all affected buildings; the location of evacuation routes, equipment, and personnel; properties of the materials/wastes managed at the facility; and the hazards associated with these materials/wastes) from the BEP(s) and other site-specific information.

Listed below is the name, address, and phone number of the current Primary and Alternate Emergency Coordinator, as required by 20.4.1 NMAC § 264.52(d) [6-14-00].

Primary	Alternate
Dennis Armstrong	William Purtymun
998 Capulin Road	1813 Mountain View Place
Los Alamos, NM 87544	Los Alamos, NM 87544
(H) 505-662-3514	(H) 505-662-9886
(W) 505-667-6211	(W) 505-667-6211

To assure timely notifications during an emergency, one must call 911 or 667-6211 to obtain the on-call Duty Emergency Manager.

E.1.2 Hazardous Materials Response Group

The Hazardous Materials (HAZMAT) Team is comprised of personnel from the Hazardous Materials Response Group (S-10). The HAZMAT Team is responsible for the aggressive mitigation of chemical, radiological, hazardous waste, and mixed waste emergencies, including field

decontamination of responders and response equipment. At the request of the IC, the HAZMAT Team may provide limited field decontamination support for victims. The HAZMAT Team is capable of providing a decontamination station at the scene of a hazardous material incident to process people working in a contaminated area and is prepared to perform decontamination of personnel. LANL standards require that the HAZMAT Team meet the training criteria for emergency response personnel specified in the Code of Federal Regulations, Title 29, §1910.120(q)(6)(iii), (iv), and (v). The HAZMAT Team acts as part of the ICS reporting through the HAZMAT Group Supervisor (HMGS) via the Operations Section Chief. The LANL HMGS coordinates the HAZMAT Team and radiological field monitoring activities.

During an emergency response, S-10 may also provide site field monitoring to determine the nature and extent of contamination, provide information on correct handling of chemicals, make recommendations on protective clothing and equipment, and provide exposure and treatment information to responders. To operate effectively, S-10 may obtain resources from HSR groups, such as the Health Physics Operations Group (HSR-1) and the Industrial Hygiene and Safety Group (HSR-5).

E.1.3 RRES Division Response Groups

At the scene, representatives and technical advisors from RRES Division and other response personnel are coordinated by the IC. In addition to their post-emergency duties, they may also be responsible for on-scene emergency operations such as planning. Depending on the type of emergency and the associated hazards, an individual from the most relevant group in the RRES Division will assume the position of the Environmental Safety and Health Advisor, will provide technical support, and will ensure LANL compliance with applicable federal, state, and local regulations.

E.1.3.1 Ecology Group

The Ecology Group provides field surveys of soil, foodstuffs, and biota to determine environmental effects of exposure after an emergency.

E.1.3.2 Meteorology and Air Quality Group

The Meteorology and Air Quality Group (RRES-MAQ) provides field surveys of air to determine environmental impacts and dose equivalent to members of the public after a radiological

emergency. In addition, RRES-MAQ provides expertise in meteorology to project short- and long-term environmental effects of emergency conditions.

E.1.3.3 Solid Waste Regulatory Compliance Group

RRES-SWRC provides guidance on regulatory requirements for proper treatment, storage, and transportation of hazardous and mixed wastes to other LANL groups. After an emergency, RRES-SWRC provides field sampling (e.g., of soil, spills, or potentially hazardous waste) to determine environmental effects of exposure.

E.1.3.4 Water Quality and Hydrology Group

After an emergency, the Water Quality and Hydrology Group (RRES-WQH) provides sampling of surface water runoff and sediments to determine environmental effects of an emergency and performs assessments for regulatory reporting requirements. RRES-WQH also provides expertise in hydrogeology to establish short- and long-term environmental effects of emergency conditions.

E.1.4 Other LANL Response Resources

Emergency response personnel from the Nuclear Materials Technology Division at TA-55 have been trained to respond to emergencies at that facility. Dynamic Experimentation (DX) Division personnel are responsible for the hazardous waste management units at TA-14, TA-36, and TA-39. DX personnel responsible for these units are trained in emergency procedures and may provide information and/or assistance during emergencies involving high explosive waste. Engineering Sciences and Applications Division personnel are responsible for hazardous waste management units at TA-16. These personnel are also trained in emergency procedures and may provide information and/or assistance during emergencies involving units at TA-16. Personnel from the Facilities and Waste Operations Division may provide guidance on proper treatment, storage, and transportation of hazardous and mixed waste at TA-50 and TA-54.

E.1.5 Contracted Response Groups

Contracted response groups' representatives may report directly to the IC Post, if requested. If the IC deems it necessary, the IC may designate an Operations Section Chief to aid in the coordination and direction of these groups. In addition, contracted response groups may report to a staging area, with a representative going either to the IC Post or, if activated, to the EOC.

E.1.5.1 Protection Technology Los Alamos

PTLA is the subcontractor for LANL security and provides this service under contract to LANL. During an emergency, PTLA activities include maintaining security, directing traffic within LANL, and controlling access to the emergency scene. PTLA maintains the necessary equipment (such as crowd-control equipment and patrol vehicles) to perform these functions.

E.1.5.2 KBR-Shaw-LATA (KSL)

KSL provides a maintenance support force under contract to LANL. This support force is under LANL's direction in an emergency. KSL also provides a representative to LANL in the event of an emergency and participates, as necessary, in post-emergency cleanup under the direction of a Recovery Manager designated by the IC. The duties of the Recovery Manager are discussed in Section E.10.

E.1.5.3 Los Alamos County Fire Department

The LACFD provides fire protection and ambulance coverage for the residential communities of Los Alamos and White Rock and for LANL. In the case of an emergency within LANL, the LACFD coordinates fire suppression and Emergency Medical Services. The IC retains overall responsibility for the emergency response effort.

E.1.6 LANL Support Groups

E.1.6.1 Health Physics Operations Group

HSR-1 provides field personnel to perform routine site evaluation and monitoring to determine radiological conditions in facilities. HSR-1 also provides guidance on radiological decontamination. In addition, this group augments the assessment and monitoring functions of the HAZMAT Team.

E.1.6.2 Occupational Medicine Group

LANL maintains its own medical facility operated by the Occupational Medicine Group (HSR-2). HSR-2 provides appropriate medical treatment for occupation-related illnesses and injuries and monitors employees to assess the effectiveness of health protection programs. In addition to promoting early identification and prevention of illnesses or injuries that may arise from exposures to hazardous or radioactive materials, HSR-2 maintains records of the health status of employees and related occupational medicine activities.

Although HSR-2 is not routinely involved with on-scene emergency response, the group maintains a central medical facility with a fully equipped emergency room and decontamination facilities at TA-3,

Building 409. The location of this and other emergency facilities are shown on Figure E-2. Medical staff at these facilities include physicians, physician's assistants, nurses, technicians, and counselors. All full-time physicians and nurses receive radiation accident training. HSR-2 also maintains access to a database that provides the clinical staff with timely toxic exposure and treatment information.

E.1.6.3 Industrial Hygiene and Safety Group

HSR-5 assists HSR-2 with its ability to obtain additional exposure and treatment information. In addition, HSR-5 maintains computer access to the National Institute of Occupational Safety and Health Technical Information Center and the Registry of Toxic Effects of Chemical Substances. During routine operations, HSR-5 performs site evaluations and field testing to determine the nature and extent of chemical contamination and specifies protective clothing and equipment.

E.1.6.4 Occurrence Reporting Group

The PS Division hosts the Occurrence Reporting Group, whose personnel assist the facility manager in investigating all adverse environmental, safety, health, and operational occurrences (on-site and off-site), determining the causal factors, identifying the appropriate corrective actions, and assisting in the preparation of reports documenting the occurrence to DOE. This group tracks corrective actions associated with such occurrences and maintains the information in an on-site database.

E.1.7 Outside Response Agencies

During an emergency, outside response agencies report directly to the IC. An Operations Section Chief, designated by the IC, may aid in coordinating and directing the groups responding to an emergency.

E.1.7.1 Los Alamos County Police Department

The LACPD may assume IC under unique circumstances, but usually has only minimal interaction with LANL in an on-site emergency. This interaction normally involves traffic control on DOE roads with public access, handling criminal activity, and criminal investigations.

E.1.7.2 Los Alamos County Emergency Management Coordinator

Los Alamos County has an agreement with LANL's EM&R Office to provide assistance in certain emergency situations. If an emergency occurs on LANL property that may affect the communities

of Los Alamos and White Rock, the EM&R Office will notify the Los Alamos County Emergency Management Coordinator, who will coordinate necessary emergency actions throughout the county.

E.1.7.3 Los Alamos Medical Center

LANL maintains a fully equipped decontamination room adjacent to the emergency room at LAMC. In the event that a case is sent to LAMC, support for the emergency room staff is provided by HSR-2 medical personnel. HSR-1, HSR-5, and S-10 personnel also provide assistance to the emergency room staff; assistance from additional LANL resources is provided, as necessary. Assistance is coordinated through the EM&R Office.

E.2 EMERGENCY EQUIPMENT AND COMMUNICATIONS [20.4.1 NMAC § 264.52(e)]

E.2.1 Emergency Equipment

20.4.1 NMAC, Subpart V, Part 264, Subpart D [6-14-00], requires a listing of all emergency response equipment available that can be used in the event of an emergency. Table E-2 lists emergency equipment available for use at any of LANL's hazardous or mixed waste management units. The list includes emergency equipment available in the HAZMAT vehicles and trailers as well as supplemental emergency equipment maintained by the LACFD, KSL, and HSR-2. A list of emergency equipment available for use at specific hazardous and/or mixed waste management units is presented in Attachment E of TA-specific permit applications, permit modification requests, or permit renewal applications. Emergency equipment listed in Table E-2 may be replaced and/or upgraded with functionally equivalent components and equipment, as necessary, for routine maintenance and repair.

E.2.2 Emergency Communications [20.4.1 NMAC § 264.56(a)]

Effective emergency response at LANL requires an efficient communication system that will integrate required personnel into the emergency response. The initial phase of an emergency may involve a small number of individuals at the affected area, require notification of the Duty Emergency Manager, and utilize local communication equipment and/or systems. When responding to hazardous and/or mixed waste emergencies, the EM&R Office can provide communications between response units and emergency organizations.

E.2.2.1 Central Alarm Station

The LANL CAS is manned by PTLA or security personnel 24 hours a day and is equipped with telephones (including direct-line telephones), medium- and short-range radios, a National Warning

System (NAWAS) station, and an emergency power system. The fire alarm board at the control room gives the location of automatic and manual fire alarm equipment. The CAS receives alarms from several sources and, in turn, notifies the Duty Emergency Manager of a hazardous or mixed waste emergency. Sources include:

- Telephone communication (911)
- Automatic fire alarms
- Manual pull alarms
- Computer interface (to warn of critical events at selected facilities)
- Security alarms
- Radio communications.

Upon receipt of an alarm, the CAS operator notifies the LACFD and the Duty Emergency Manager. The Emergency Manager, the EOC communicator, and/or the CAS operator may request emergency response groups to respond. Should the LANL 911 system fail, the Los Alamos County System, located at the LACPD Station, will be used to activate emergency response groups.

E.2.2.2 Power Dispatch

The Power Dispatch is maintained 24 hours a day. Alarms at this facility are connected to LANL experiments, equipment, and/or buildings to record outages and hazardous conditions. Any conditions that activate these alarms will be reported immediately to the building management or to the CAS operator for notification and response.

E.2.2.3 Additional Communication Systems

Internal communication systems at LANL include:

- The Centrex telephone system
- A telephone paging system
- A variety of frequency modulated very high frequency simplex repeater systems, including:
  - Multiple base stations
  - Mobile and hand-held units
  - Links to New Mexico public safety agencies
- An ultrahigh frequency radio system, including:
  - Multiple antenna sites

- Mobile and base units
- Links with the LACPD, the LACFD, and the State Medical System

- A 400-megahertz trunked radio system that includes a link with the LACFD

- Transmission and reception (through the EOC) for:

  - Secure telephone
  - Secure fax
  - Secure still video
  - Secure videoconference system (to all DOE EOCs and DOE Headquarters)

- Access to all radio systems outlined above (through the EOC).

Off-site communications with federal, state, tribal, county, and other agencies are available through the following:

- A Centrex telephone system
- Private telephone lines (if Centrex fails)
- Two NAWAS stations
- A link to KRSN radio (local radio station)
- The local cable television
- The Community Alert Network.

The LANL EOC, maintained by the EM&R Office, operates radio systems on key LANL and off-site channels. Emergency personnel responding to on-site incidents have the benefit of wide-area radio coverage using EOC facilities. The Duty Emergency Manager is responsible for activating whatever support personnel, equipment, or services are needed 24 hours a day.

E.3 CONTINGENCY PLAN IMPLEMENTATION [20.4.1 NMAC § 264.56]

The following sections discuss guidelines used to implement this plan, emergency notification, emergency manager actions, and actions to be taken in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents into the environment at LANL.

E.3.1 Guidelines For Implementation [20.4.1 NMAC §§ 264.51(b) and 264.56]

The decision to implement this plan depends upon whether an emergency exists, which for the purposes of this section is defined as an imminent or actual incident arising from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste

constituents that could threaten human health or the environment. The Duty Emergency Manager or IC will use the guidelines listed below to decide whether to implement this plan.

This plan will be implemented immediately in the following situations involving releases or potential releases of hazardous or mixed waste:

- Spills:
  - If a hazardous or mixed waste spill cannot be contained with secondary containment or application of sorbents
  - If a hazardous or mixed waste spill causes the release of flammable material, creating a fire or explosion hazard
  - If a hazardous or mixed waste spill results in toxic fumes that threaten human health
- Explosions:
  - If an unplanned explosion involving hazardous or mixed waste occurs
  - If an imminent danger of an explosion involving hazardous or mixed waste exists.
- Fires:
  - If a fire involving hazardous or mixed waste occurs
  - If any building, grass, forest, or nonhazardous waste fire exists that threatens to volatilize or ignite hazardous or mixed waste.
- Other Acts of Force Majeure (i.e., acts of God)
  - If an earthquake or other natural disaster threatens containment integrity, including precipitation that threatens to move spilled material off site.

E.3.2 Emergency Notification [20.4.1 NMAC § 264.56(a) and (b)]

Emergency notification requires immediate notification of 911 or the EM&R Office upon discovery of an imminent or actual incident involving hazardous and/or mixed waste. During nonworking hours, personnel will report all imminent or actual incidents involving hazardous and/or mixed waste to the Emergency Manager or the CAS operator at 667-6211. In the case of fire, notification of these individuals is superseded by the LANL fire alarm system. A fire is reported by dialing 911 (from telephone exchanges 667 and 665) or 667-7080 (from all exchanges, including cellular phones), activating automatic alarms, or activating a fire alarm pull box. All fire alarms alert the CAS operator, the LACFD, and PTLA, who in turn notify the Duty Emergency Manager.

Upon recognition of a hazardous or mixed waste emergency, the first arriving emergency-trained person will become the Facility Command Leader. Once the EM&R Office is notified of the emergency, the Duty Emergency Manager will proceed to the scene and be briefed by the Facility Command Leader, building/area personnel, and/or other emergency units/teams. The Emergency Manager will then assume the position of IC. If necessary, the IC may recommend that the EOC be activated and that the necessary members of the emergency management team be determined. The IC will form an ICS and contact the HMGS. The HMGS will notify the appropriate emergency response groups. The IC may determine from the list of response groups described in Table E-1 which groups to contact in an emergency. Each response group maintains an on-call person and/or a call-down procedure to respond to emergencies.

The EM&R Office will be notified of any potential hazardous or mixed waste emergency. The IC and the HMGS will use whatever means are available (including the assistance of other response groups, computer data searches, and sampling) to determine if a hazardous or mixed waste emergency exists.

E.3.3 Emergency Manager Actions [20.4.1 NMAC § 264.56(b-h)]

Upon notification of an emergency incident, the Duty Emergency Manager may:

- Make an initial assessment of the incident and, in conjunction with the IC, obtain resources to determine the source, quantities, and types of hazardous and/or mixed waste involved and the areal extent of any released materials.
- Request resources needed and have EOC staff begin notifications.
- Proceed directly to the scene.
- Assess the nature of the incident (e.g., through communication with the IC).
- Assume incident command after a direct briefing with the Facility Command Leader.
- Based on the guidelines in Section E.3.1 of this plan, determine if implementation of this plan is warranted.
- Activate the EOC, if necessary.

Upon deciding to implement this plan, the IC will, when appropriate:

- Assess the hazards to human health and the environment, including both direct and indirect effects, such as generation of toxic, irritating, or asphyxiating gases and/or hazards of runoff of water or chemicals used for fire suppression. An individual designated by the IC will use the guidelines in Section E.3.1 to assess the hazards to human health and the environment. If any of the criteria under Section E.3.1 are met and if the responsible Group Leader (or his/her designee) has not already accomplished evacuation of the area, the IC will initiate shelter in place or evacuation of the immediate area.

- Direct the EOC staff to initiate protective actions and immediately notify appropriate response groups and personnel as per the EM&R Guidelines. The IC may activate one or more of the following community alert mechanisms: the Community Alert (telephone) Network, the KRSN radio remote input system, or the cable television capture system, sitewide area network radios, and public radio and television channels.

- In the case of fire or release of any type, make reasonable efforts to confirm that all response personnel at the scene are aware of actual or imminent special hazards associated with hazardous or mixed waste.

- In emergency situations, contact the appropriate RRES representative to notify the New Mexico Environment Department (NMED) at (505) 827-9329 and the National Response Center at (800) 424-8802, reporting:

  - The name and telephone number of the RRES representative
  - The name and address of the facility
  - The time and type of incident
  - The name and quantity of material involved, to the extent known
  - The extent of injuries, if any
  - The possible hazards to human health or the environment outside the facility.

- When an emergency occurs at hazardous or mixed waste treatment units, ensure that appropriate LANL personnel monitor for leaks, pressure buildup, gas generation, or equipment ruptures.

Once control of the emergency is established, the IC will take all reasonable measures to minimize the occurrence, recurrence, or spread of fires, explosions, or releases. In addition, the IC will delegate cleanup and decontamination responsibilities to the Recovery Manager. These responsibilities may include:

- Arranging for site cleanup.

- Assisting with arrangements for proper handling of recovered waste, contaminated soil, or contaminated surface/groundwater.

- Assisting with arrangements for decontamination of equipment, as needed.

- Arranging for replacement and/or repair of equipment, as needed.

- Requesting that testing is conducted to verify successful cleanup.

Within 15 days of the incident, DOE National Nuclear Security Administration (NNSA) Los Alamos Site Office (LASO) will submit a report to the Secretary of the NMED. The contents of this report are generated by several LANL groups responding to the emergency, as detailed in Section E.11.

E.4 SPILLS [20.4.1 NMAC § 264.56(e)]

Sudden releases may include spills of hazardous or mixed waste that pose a significant threat to human health or the environment. Spill incidents resulting in a sudden release of hazardous or mixed waste that present a potential threat to human health or the environment, as listed in Section E.3.1, require implementation of this plan.

Hazardous and mixed wastes are stored on site at LANL in a variety of containers. Volumes of hazardous or mixed waste managed will vary from unit to unit. The general steps in handling hazardous and/or mixed waste spills are as follows:

- Isolate the immediate area and deny entry to all unauthorized personnel.
- Contain the spill by spreading sorbents or forming temporary dikes to prevent further migration (performed by properly trained personnel, if safe).
- Monitor the spill area and sample the spilled waste and contaminated media.
- Package the waste and contaminated media in sound containers.
- Decontaminate the area and all involved equipment and personnel (followed by testing to assure adequate cleanup).
- Remove the waste and contaminated media (performed by appropriate waste management personnel).

The IC will determine the steps to be taken for spill mitigation. If initial mitigation of the spill is necessary and can be accomplished safely (by appropriately trained personnel) before the Emergency Manager arrives, a qualified member of the affected area's operating group will serve as the Facility Command Leader.

Hazardous and/or mixed waste spills will be stabilized, if necessary, and cleaned up. During spill control and cleanup, all personnel will wear appropriate personal protective equipment (PPE).

Monitoring will be conducted to ensure that chemical and, as appropriate, radiological exposure is minimized. The collected material may be treated as hazardous or mixed waste, depending on the components present. Runoff from spills of listed hazardous or mixed waste that have migrated outside hazardous waste management areas must be contained and managed as hazardous or mixed waste, as appropriate. If the spill was from a characteristic hazardous or mixed waste and if it is determined that the runoff does not exhibit the characteristic (i.e., ignitability, corrosivity, reactivity, and/or toxicity), the runoff need not be managed as characteristic waste. Temporary dikes may be constructed to contain runoff.

E.4.1 Spill Control Procedures

When a flammable organic solvent spill, a highly acidic spill, or a highly caustic spill has been stabilized with the contents of an organic solvent spill kit, an acid spill kit, or a caustic spill kit, respectively, the resulting material may be sorbed using a nonbiodegradable sorbent. Nonbiodegradable sorbent can be used to control any spill if it is known to be compatible with the spilled material. Appropriate containers or packaging will be used to collect all spilled material and contaminated sorbent. Table E-1 of TA-specific permit applications, permit modification requests, or permit renewal applications lists emergency equipment available for spill control at specific units. The ultimate disposition of any contaminated sorbent or waste material will be determined by appropriate waste management personnel, according to hazardous waste management regulatory requirements.

E.4.1.1 Tank System Spill Control and Reporting

A tank system will be removed from service immediately using approved shutdown procedures if a leak or spill occurs from the tank system or its secondary containment system or if the system is determined to be unfit for use. Further addition of waste to the tank system or containment system will cease and the system will be visually inspected to determine the cause of the leak or spill. If a leak occurs from a tank system, as much of the waste as is necessary to prevent further release of waste will be removed within 24 hours after detection or as early as practicable, and the system will be inspected and repaired. All released waste will be removed within 24 hours or as soon as possible if a leak occurs to a tank's containment system.

If a spill from a tank is not immediately contained and cleaned up and exceeds a quantity of 1 pound, the release will be reported to the NMED within 24 hours of its detection in accordance with the requirements of 20.4.1 NMAC § 264.196(d)(1) [6-14-00]. In addition, a written report will be

submitted to the NMED within 30 days describing the likely migration route of the release; soil characteristics at the site; monitoring and sampling data relevant to the release; proximity to downgradient drinking water, surface water, and populated areas; and response actions taken or planned.

E.4.1.2 Tank System/Secondary Containment Repair and Closure

If the integrity of a tank system, including its secondary containment, has not been damaged by a spill, the system may be returned to service. Service may not resume until after all released waste is removed and repairs, if necessary, are made. Any tank system that cannot satisfy the criteria described above will undergo closure in accordance with the requirements of 20.4.1 NMAC § 264.197 [6-14-00].

E.4.1.3 Certification of Major Repairs

If a tank system undergoes extensive repairs (e.g., installation of an internal liner, tank system piping retrofit), the tank system will not be returned to service until a certification by an independent, qualified registered professional engineer is obtained, verifying that the repaired system is capable of handling wastes without release for the intended life of the system. This certification will be submitted to NMED within seven days after returning the tank system to use.

E.4.2 Decontamination Verification

Decontamination will be accomplished at the spill site. After the spilled material has been sorbed, the material will be containerized. If the spill occurs on a concrete or asphaltic-concrete area, water or an appropriate solvent will be used to clean the area. Liquids (i.e., spilled material and cleaning water or solvents used to clean a spill) may be sorbed with a compatible, nonbiodegradable sorbent and containerized. If a spill is from an identifiable source, the spilled material may be characterized as a newly-generated waste using acceptable knowledge or may be analyzed, as applicable, for the hazardous waste constituents known to be components of the waste managed at that unit. Analytical method(s) given in Table E-3 will be utilized, as appropriate. If the spill is from other than an identifiable source, the spilled material will be analyzed for the appropriate parameters listed in Table E-3. All personnel conducting decontamination verification will wear appropriate PPE. HSR-1 will conduct health physics monitoring whenever mixed waste is involved to ensure that radiation exposure is maintained as low as reasonably achievable. Any hazardous or mixed waste collected from decontamination activities will be handled appropriately.

In order to establish baseline data, a sample of decontamination water or solvent (and nonbiodegradable sorbent material, as applicable) will be taken prior to the start of the decontamination effort. A sample of the final washwater (or the used sorbent) will then be taken. The baseline samples and final washwater/used sorbent samples will be analyzed for the applicable parameters given in Table E-3. If the decontamination samples contain hazardous constituents that are not present in the baseline samples and the levels exceed established health-based levels, the decontamination procedure may be repeated. An alternative demonstration of decontamination may be proposed and justified to NMED, who will evaluate the proposed alternative in accordance with the standards and guidance currently in effect. If the proposed alternative is accepted, decontamination levels will meet the levels approved by NMED. Each sample will be collected with an appropriate sampling device (e.g., a thief or trier) as specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1986), and approved updates, as applicable.

If a hazardous/mixed waste spill occurs on soil, any free liquid present will be collected and containerized. Liquids may be sorbed with a compatible nonbiodegradable sorbent prior to containerization. For such a spill, contaminated soil will either be excavated and containerized or remediated in situ. HSR-5 will conduct industrial hygiene monitoring and, if mixed waste is involved, HSR-1 will conduct health physics monitoring, if deemed necessary, to minimize exposure during soil removal or remediation operations. To establish comparative background data, one or more samples will be collected from an unaffected area near the spill site. The spill site will then be characterized, and the data will be compared to the background data to ensure that contaminated material from the spill has been removed or remediated.

If a hazardous/mixed waste spill occurs in an area with flooring, the floor will either be removed in lieu of decontamination, or the floor will be decontaminated. If the decision is made to decontaminate the floor, swipe samples or other types of sampling appropriate for the contaminant will be collected at random and characterized for decontamination verification. If, after several decontamination efforts, it is subsequently determined that the affected floor area cannot be decontaminated, the floor material will be removed. In all cases, wastes generated during the decontamination and/or removal process will be managed appropriately.

E.5 EXPLOSION

Explosions and resultant releases may result in a significant threat to human health or the environment. The potential exists for hazardous or mixed waste to be released during an

explosion. Implementation of this plan is required whenever a sudden release that cannot be contained or that presents a threat to human health or the environment occurs as a result of an explosion.

In the event of an explosion at LANL, all personnel will immediately evacuate the area. Any injured personnel will be decontaminated at the site, if required and if time allows. An LACFD ambulance will transport these personnel to LAMC for treatment. If an injury is severe and requires immediate medical evacuation, the injured person will be wrapped to contain contamination, if necessary. In the case of an actual or potential explosion, on-site personnel will contact the EM&R Office immediately so that the Emergency Manager can ensure that all necessary emergency response personnel are alerted. The LACFD is notified automatically upon central alarm system activation. The Emergency Manager assumes incident command and will remain near but at a safe distance from the site in order to inform personnel responding to the explosion of the known hazards.

If a fire results from an explosion, the LACFD Senior Officer will, upon arrival at the scene, evaluate all available information and determine the appropriate firefighting methods and tactics. The LACFD Senior Officer will direct firefighting operations as the acting IC until EM&R formally assumes command.

E.6 FIRE

Fires and resultant releases of hazardous or mixed waste may result in a significant threat to human health or the environment. Implementation of this plan is required whenever a fire incident results in a sudden release of hazardous or mixed waste that cannot be contained or that presents a threat to human health or the environment.

Fire alarms will be sounded automatically or manually to alert personnel that a fire hazard exists and to evacuate the area immediately if in the vicinity. Information related to the various fire alarms at the specific units is included in tables in Attachment E of TA-specific permit applications, permit modification requests, or permit renewal applications.

Depending on the size of the fire and the fuel source, portable fire extinguishers may be used. However, LANL policy does not encourage the use of portable fire extinguishers by employees unless they are properly trained. Instead, LANL policy encourages immediate evacuation of the area and notification of the CAS operator by dialing 911. For any fire, including a fire that involves

hazardous or mixed waste, the responsible Group Leader and the EM&R Office must be contacted immediately. The Emergency Manager will alert the LACFD and all other necessary emergency response personnel. If the fire spreads or increases in intensity, all personnel must follow protective actions as designated by the Emergency Manager. The Emergency Manager assumes incident command and will remain near the scene to advise personnel responding to the fire of the known hazards.

Upon arrival at the scene, the LACFD Senior Officer will evaluate all available information and determine the appropriate firefighting methods and tactics. The LACFD Senior Officer will direct firefighting operations as the acting IC until EM&R formally assumes command.

E.7 UNPLANNED NONSUDDEN RELEASES

Nonsudden releases include those incidents that, if uncontrolled, impact the environment over a long period of time. Such incidents include minor leaks from containers and loss of secondary containment integrity.

E.7.1 Responsibility

Appropriate LANL personnel are responsible for correction of a nonsudden release from a hazardous or mixed waste unit if the correction can be performed safely with normal maintenance and management procedures. Personnel from the EM&R Office may provide assistance in mitigating releases. Any correction methods for nonsudden releases that have resulted in an impact to the environment will be coordinated with the NMED.

E.7.2 Nonsudden Releases

In general, the response to a nonsudden release will be to contain the release, to correct the cause of the release, and to clean up any release to a level that protects human health and the environment.

Appropriate LANL personnel will conduct regularly scheduled inspections to detect failure of containment at the unit(s) addressed in TA-specific permit applications, permit modification requests, or permit renewal applications. Secondary containment systems will be inspected regularly to ensure that the integrity of the containment systems has not deteriorated. If an inspection reveals that containers are leaking or that secondary containment has deteriorated,

LANL personnel will ensure that maintenance or replacement of containment is performed, as appropriate.

E.7.3 Nonsudden Release Surveillance

In addition to routine inspection and site-specific sampling and testing, LANL has established an area-wide environmental monitoring network maintained by RRES. Monitoring and sampling locations for various types of measurements are organized into three main groups. Regional monitoring stations located within the five counties surrounding Los Alamos County are placed up to 80 kilometers (50 miles) from LANL. These stations serve to determine background conditions. Perimeter stations, located within approximately 4 kilometers (2.5 miles) of the LANL boundary, document conditions in residential areas surrounding LANL. On-site stations, most of which are accessible only to employees during normal working hours, are within the LANL boundary.

Routine surveillance conducted at these stations includes measuring radiation and collecting samples of air particulates, surface waters, groundwater, soil, sediment, and foodstuffs for subsequent analysis. Additional samples provide information about particular events, such as major runoff events and nonroutine releases. Data from these efforts are used for comparison with standards, for determining background levels, and for radiation dose calculations.

E.8 EXPOSURE TO HAZARDOUS OR MIXED WASTE

If a person is exposed to hazardous or mixed waste, the affected person, a co-worker, or line management will notify the EM&R Office. Appropriate first aid should be administered immediately. An EM&R Office representative will make appropriate notifications as soon as possible so that exposure levels and decontamination requirements can be established. The affected person will then be transported to the HSR-2 medical facility or to LAMC for evaluation. If possible, the material involved in the exposure will be ascertained, and the information will be given to the medical staff.

Other potential exposures will necessitate evacuation of the area, if appropriate, or under any of the following conditions:

- Irritation of the eyes, breathing passages, or skin
- Difficulty in breathing
- Nausea, lightheadedness, vertigo, or blurred vision.

The affected person will be transferred to the HSR-2 medical facility or to LAMC. An HSR-1, HSR-5, or S-10 representative will attempt to ascertain what, if any, exposure occurred and what corrective measure is appropriate.

E.9 EVACUATION [20.4.1 NMAC § 264.52(f)]

A facility will be evacuated upon the voice command to evacuate the area or upon the sounding of the evacuation or fire alarm. The IC may call for sheltering in place when evacuation is impractical due to significant airborne hazards. Shelter in place may be possible in a designated area or in a building where all exterior windows and doors may be closed and outdoor air ventilation equipment turned off. Once the airborne hazard has decreased, personnel would then be evacuated.

E.9.1 Emergency Process Shutdown Prior To Evacuation

Personnel are instructed to shut down equipment prior to evacuating a building/area unless an immediate building/area evacuation is announced or signaled. To ensure efficient shutdown, training and exercises addressing the shutdown process are performed. In the case of an immediate evacuation, a selected team may shut down designated equipment in an evacuated area. The team will be equipped with proper equipment and PPE. If they are on location, HSR-1, HSR-5, and/or S-10 will provide advice and assistance. Process-shutdown procedures apply mainly to hazardous or mixed waste treatment units and are addressed, as appropriate, in Attachment E of TA-specific permit applications, permit modification requests, or permit renewal applications.

E.9.2 Evacuation Plan

Emergency situations may warrant the shutdown and evacuation of areas or buildings in order to protect personnel and property, to anticipate the emergency condition, or to enhance the appropriate response. Table E-4 lists the criteria for evacuation, persons responsible for initiating evacuations, and reentry conditions. Figures in Attachment E of TA-specific permit applications, permit modification requests, or permit renewal applications show evacuation routes and assembly/muster areas for specific hazardous and/or mixed waste management units.

To initiate the evacuation of a building/area, the evacuation or fire alarm is sounded and/or the public address (PA) system may be used. Evacuation alarms cannot be silenced and reset by site personnel. Only the Fire Alarm Maintenance Section and the LACFD Battalion Chief can silence and reset alarms. To evacuate a portion of a building or area, use of the PA system may be more

appropriate. The PA system will notify the occupants of the area to be evacuated and will advise personnel throughout the building of the existence of a problem in a specific area. Once evacuation has been initiated and if conditions allow, personnel will turn off all equipment that could contribute to the hazard if left unattended. All personnel will then proceed from the affected area to the assembly/muster area.

In the event of evacuation of a building, an outbuilding, or an outlying work area, the responsible Group Leader (or his/her designee) will determine a control point at the closest safe location (e.g., considering wind direction). The designated area will be outside the affected area and will serve as an assembly/muster area where the Group Leader (or designee) can oversee evacuation operations and work to prevent further spread of the hazard.

As personnel exit an affected building/area, a primary sweep of the building/area will be performed to ensure that all personnel have evacuated. If the building/area is evacuated, a Group Leader designee will take attendance at the assembly/muster area and report personnel accountability to the IC. The evacuation procedure is as follows:

- The person discovering the accident or emergency will call 911 to ensure that line management and the EM&R Office are notified.
- Site-specific BEPs and/or emergency action procedures will be followed concerning evacuation, sweep, personnel accountability, and equipment shutdown procedures.

A responsible on-site person may direct the initial evacuation and the central alarm system may be activated. The EM&R Office will be notified immediately and will dispatch the Duty Emergency Manager. A responsible on-site person may implement the evacuation process until the Duty Emergency Manager arrives at the scene to assume that responsibility.

E.10 SALVAGE AND CLEANUP [20.4.1 NMAC § 264.56(g) and (h)]

Appropriate representatives from the RRES groups will survey the affected area before salvage and cleanup begin. They will conduct visual inspections and sampling, as appropriate, of the affected area to determine whether cleanup is complete. If gases or fumes, electrical or radiological problems, or other conditions present a hazardous situation, personnel or selected teams equipped with proper PPE will reenter the area to perform designated decontamination tasks, repairs, and salvage to allow the return to normal operations. After an emergency, the IC will turn the operation over to a designated Recovery Manager, who will:

- Provide for proper handling of recovered waste, contaminated soil or surface water, or any other material that results from a spill, fire, or explosion. Contaminated material will be managed appropriately and temporarily stored at one of the hazardous or mixed waste storage areas at LANL. Waste management personnel will be responsible for determining the final disposition of the waste. This determination will be made in compliance with hazardous waste management regulations.

- Arrange to monitor for damage or improper operation of the unit and associated equipment as a result of the emergency or of plant shutdown in response to the emergency.

- Arrange for site cleanup procedures to be completed and ensure that no waste that may be incompatible with the released material is treated or stored in the same area.

- Ensure that emergency equipment is cleaned, decontaminated, and fit for its intended use before operations are resumed. Equipment will be inspected visually and then sampled, if necessary, to determine the type and degree of contamination and to determine appropriate cleanup measures.

Prior to resuming operations, the appropriate facility management at LANL will verify that the previously mentioned tasks have been performed. The owner/operator (DOE NNSA/LASO) will notify appropriate state and local authorities that cleanup procedures are completed and that emergency equipment is clean and fit for its intended use.

The IC assumes the coordination of post-emergency actions (particularly during the time period immediately following the emergency) until a Recovery Manager is appointed. The Recovery Manager then assumes this coordination role. The Recovery Manager is the functional equivalent of the Emergency Coordinator for post-emergency actions. The post-emergency actions include cleanup operations, vital equipment repair, or interim hazard-removal operations (such as arranging for demolition of unstable walls). The services of affected operational organizations, RRES groups, KSL, and other on-site resources will also be used to estimate cleanup costs and operational impact.

E.11 EMERGENCY RESPONSE RECORDS AND REPORTS [20.4.1 NMAC § 264.56(j)]

Any emergency that requires implementation of this plan will be documented by the Group Leader (or his/her designee) responsible for the hazardous or mixed waste unit associated with the emergency, and reported in writing within 15 days of the incident to the NMED. The incident report, submitted by DOE NNSA/LASO, will include the following data:

- Name, address, and phone number of owner or operator
- Name, address, and phone number of the facility
- Date, time, and type of incident (e.g. fire, explosion, spill)
- Name of material(s) involved
- Quantity of material(s) involved
- Extent of injuries (if any)
- Assessment of actual or potential hazards to human health or the environment
- Estimated quantity and disposition of material recovered from the incident.

In addition, LANL personnel responding to any emergency requiring implementation of this plan will record the date, time, location, and details of the incident. This information will be maintained in the facility operating record.

E.12 CONTINGENCY PLAN AMENDMENT [20.4.1 NMAC § 264.54]

This plan will be reviewed periodically by appropriate division personnel. The plan will be amended immediately if determined to be inadequate to handle releases (spills, explosions, and/or fires) and whenever:

- The facility permit is revised.
- There is change in the design or operation of the facility (e.g., quantities of waste handled and handling techniques) that increases the likelihood of an emergency and requires changes in emergency response.
- The Primary Emergency Manager changes.
- The list of emergency equipment changes significantly.

E.13 REFERENCES

EPA, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *EPA-SW-846*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

LANL, 2002, "Los Alamos National Laboratory Emergency Management Plan," LIR 403-00-01.0, Los Alamos National Laboratory, Emergency Management and Response Office, Los Alamos, New Mexico.

Table E-1

Response Groups and Agencies Available to the Emergency Management and Response Office for Guidance and/or Emergency Assistance

LANL[a]-Controlled Response Group	Telephone	Responsibilities
HSR-1, Health Physics Operations	667-7171	Provides routine guidance on radiological decontamination. Provides routine site evaluation and monitoring to determine the nature and extent of contamination (radiological).
HSR-2, Occupational Medicine	667-0660	Provides emergency medical treatment.
HSR-5, Industrial Hygiene and Safety	667-5231	Provides guidance on industrial hygiene equipment and operational safety. Provides routine site evaluation/support field testing to determine the nature and extent of contamination (chemical).
PS-7, Occurrence Reporting	667-0598	Reports occurrences and tracks follow-up actions.
S-10, Hazardous Materials Response	665-5237	Provides emergency site evaluation/field monitoring (chemical and radiological). Specifies protective clothing and equipment. Dispatches Hazardous Materials Response Team. Provides support for chemical, radiological, hazardous, and mixed waste incidents and decontamination of responders and response equipment.
RRES-MAQ, Meteorology & Air Quality	665-8855	Provides information on meteorological conditions.
RRES-WQH, Water Quality and Hydrology	665-1859	Provides information on hydrologic conditions.
RRES-SWRC, Solid Waste Regulatory Compliance	665-9527	Provides guidance on regulatory requirements. Provide guidance on proper treatment, storage, and off-site shipment of hazardous and mixed waste. Conducts field surveys to determine spread of contamination and adequacy of cleanup.
RRES-ECO, Ecology	665-8961	Provides information on biotic conditions.
PTLA, Protection Technology Los Alamos	667-4531	Provides traffic control and security.
KSL[b]	662-9080	Dispatches maintenance personnel and equipment. Assists in waste cleanup under the direction of the Recovery Manager.
NMT, Nuclear Materials Technology Division	667-2556	Provides initial emergency site evaluation at Technical Area (TA) 55 and conducts activities related to the prevention, notification, and control of emergencies at TA-55. In the event of an emergency at TA-55, monitors for leaks, pressure buildup, gas generation, or equipment ruptures, if necessary. Maintains and operates TA-55 Emergency Response Team. Writes TA-55 emergency plans and procedures.
DX, Dynamic Experimentation Division	667-5653	Provides information and/or assistance during emergencies involving units at TA-14, TA-15, TA-36, and TA-39.

Refer to footnotes at end of table.

Table E-1 (Continued)

Response Groups and Agencies Available to the Emergency Management and Response Office for Guidance and/or Emergency Assistance

LANL[a]-Controlled Response Group	Telephone	Responsibilities
ESA, Engineering Sciences and Applications Division	667-4136	Provides information and/or assistance during emergencies involving units at TA-16.
Los Alamos County Fire Department	911 662-8301	Dispatches firefighting personnel and equipment and provides Emergency Medical Services.
Los Alamos County Police Department	662-8222	Provides traffic control on public access roads.
Los Alamos Medical Center[c]	662-4201	Provides medical services. Provides and maintains Emergency Room.

[a] Los Alamos National Laboratory.
[b] KBR-Shaw-LATA.
[c] Medical services related to hazardous and mixed waste injuries are provided under the direction of HSR-2.

Refer to footnotes at end of table.

Table E-2

Los Alamos National Laboratory-Wide Emergency Equipment

Hazardous Materials (HAZMAT) Vehicles and Associated Emergency Equipment:

HAZMAT vehicles and trailers are located at Technical Area (TA) 64, Building 39 (TA-64-39). They are available to the Security and Safeguards (S) Hazardous Materials Response Group (S-10) for emergency response to all of the TAs at Los Alamos National Laboratory (LANL). S-10 is responsible for maintaining the supplies of appropriate emergency equipment in each vehicle and trailer.

The HAZMAT vehicles and trailers are equipped with safety and emergency equipment, personal protective clothing, and other supplies, which may include, but are not limited to, some or all of the following:

Assorted personal protective equipment, T-shirts, and gloves
Safety goggles, safety glasses, and face shields
Boots and booties
Totally encapsulating suits and boots
Level A and B suits
Flash suits
Self-contained breathing apparatus (SCBA) and SCBA bottles
Respirators and cartridges
Hazardous chemical reference books and other reference materials
Shovels
Siphon pumps
Assorted spill kits and sorbents
Neutralizing solutions: acids, bases, and caustics
Two-way radios, cellular phones, facsimile, and other communication equipment
Bottles of leak detector and leak repair kits
Emergency repair packs
HAZMAT bags
Gas detectors and chemical monitoring equipment
Radiological monitoring equipment
Sponges and cleaners
Warning signs and barricade tape
Traffic control barriers
Flashlights
Cameras and film
Knives
Portable power supplies
Warning and signal horns
Harnesses and belts
Decontamination equipment
Sampling equipment
Lifting equipment and vetter bags
Assorted tools, tape, and other supplies
Non-sparking tools
Biological detection equipment
Chemical vacuums
Sandia foam
Plugging and diking equipment
Sample van equipped with a glovebox and analysis equipment
Environmental continuous air monitoring equipment
Robot
National Atmospheric Release Advisory Center-Internet Client (NARAC iClient)

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Table E-2 (Continued)

Los Alamos National Laboratory-Wide Emergency Equipment

Hazardous Materials (HAZMAT) Vehicles and Associated Emergency Equipment:

Hotspot plume modeling program
Mass decontamination trailer with tent and supplies
Portable decontamination trailer
Portable structures
Tents
Trucks
Trailers
International Shipping Units
Portable hot water heater
Forklift
Automated external defibrillators.

Table E-2 (Continued)

Los Alamos National Laboratory-Wide Emergency Equipment

Supplemental emergency equipment and personnel available from the Los Alamos County Fire Department (LACFD):

Supplemental emergency equipment available from the LACFD may include, but is not limited to, some or all of the following:

Fire engines
Mini-tankers with compressed air foam capability
Modular ambulances
Rescue vehicles
Crash-Fire-Rescue (CFR) unit
Water tankers with compressed air foam capability
Incident Command vehicles
SCBA units
SCBA air tanks
Remote air system for confined space rescue
Ladder truck with pump
Personnel with Hazardous Material First Response Operational Level training
Personnel with Basic Emergency Medical Technician training
Personnel with Advanced Life Support training

Table E-2 (Continued)

Los Alamos National Laboratory-Wide Emergency Equipment

Supplemental emergency equipment and personnel available from KBR-Shaw-LATA (KSL):

Supplemental emergency equipment available from KSL may include, but is not limited to, some or all of the following:

TRANSPORTATION EQUIPMENT:

Pickups, 1/2 through 3/4 ton
Trucks, 1 through 3 ton
Vans, panels, and carryalls
Buses

SPECIAL EQUIPMENT:

Graders
Loaders
Snowplows and snow blowers
Bulldozers
Scrapers
Semitrailers
Chain saws
Street flushers
Mobile transceivers
Generators
Handsets (2-way)
Pageboys (1-way)
Welders
Mobile site logistics support equipment/associated heavy equipment
Fully equipped spill response unit
Utilities equipment and emergency utility support
Fuel trucks
Light banks
Dump trucks
Backhoes
Potable water trucks
Cranes
Forklifts

TRAINED PERSONNEL:

Heavy equipment operators
Dispatchers
Mechanics
Power saw operators
Radio and telephone operators
Truck drivers
Rodent/Pest Control personnel
HAZMAT response/cleanup personnel
Welders
Electricians

Table E-2 (Continued)

Los Alamos National Laboratory-Wide Emergency Equipment

Table E-2 (Continued)

Los Alamos National Laboratory-Wide Emergency Equipment

Emergency equipment and personnel at the Occupational Medicine Clinic, Occupational Medicine Group (HSR-2):

At TA-3 (SM-409) Central Clinic:

Emergency equipment and supplies available from HSR-2 may include, but are not limited to, some or all of the following:

PERSONNEL:

Physicians
Physician's Assistants
Nurses
X-ray Technician
Clinical Laboratory Technicians
Clinical Testing Technicians
Clinical Psychologist
Counselors

SPECIAL EQUIPMENT-PORTABLE:

Multichannel emergency receiver-base station
Two-way radio on the State Med Net, the LANL Emergency Management channel, and the LANL Health-Safety Net
Cardiac monitors and defibrillators
Crash cart emergency equipment with E-tank oxygen (O_2)
Portable physicians' bag with medications
Portable suction unit
Portable stretchers (ambulance, gurney, folding)
Wheelchairs
O_2 tanks
Manual resuscitators
Intravenous (IV) stands
IV solutions
Otoscopes/ophthalmoscopes
Portable sphygmomanometers
Stethoscopes
Anticontamination apparel
Eye irrigation solution
First-aid kits
Extrication and cervical collars, crutches, canes
Suture sets
Protective apparel
Morgan lens irrigation sets
Decontamination equipment (portable)

Table E-2 (Continued)

Los Alamos National Laboratory-Wide Emergency Equipment

Emergency equipment and personnel at the Occupational Medicine Clinic, HSR-2 (Continued):

At TA-3 (SM-409) Central Clinic (continued):

SUPPLIES-GENERAL:

Bedding/pillows
Rescue blankets
Burn blankets
Thermal/icing pouches
Multitrauma dressings, surgical and first aid supplies
Disposable ice bags

SPECIAL FACILITIES - NONPORTABLE:

Fully equipped decontamination room at the Occupational Medicine Clinic
Completely equipped emergency room with ambulance entrance
Emergency lighting system
Complete X-ray suite
Protective clothing and wound counters
12-lead electrocardiograph
Fully equipped crash cart with Life Pak defibrillator/external pacer, intubation equipment, emergency medications
Fully equipped decontamination room at Los Alamos Medical Center (LAMC) adjacent to the LAMC emergency room

TRANSPORTATION:

Full ambulance service is available within minutes to the central facility.

COMMUNICATION:

Base station on State Medical Net and Los Alamos County Fire Department trunked radio system.

Table E-3

Waste Analysis Parameters and Test Methods[a]

Parameter	Test Method	Reference[b]
Ignitability	Pensky-Martens closed-cup method	(L, S) SW1010, SW1020A
	Setaflash closed-cup method	(S) SW1030
	Ignitability of solids	(L, S) ASTM D93-02a
Reactivity	Test method to determine hydrogen cyanide released from waste	(L, S) SW, Section 7.3
	Test method to determine hydrogen sulfide released from waste	
Corrosivity	Electrometric (pH of aqueous solution)	(L) SW9040B
Toxicity characteristic (TC)	Toxicity characteristic leaching procedure (TCLP) extraction	(S) SW1311
TC Metals:	Graphite furnace atomic absorption (AA) spectroscopy, gaseous hydride AA, or direct aspiration AA, manual cold-vapor technique	
Arsenic		(L, S) SW7060A, SW7061A
Barium		(L, S) SW7080A, SW7081
Cadmium		(L, S) SW7130, SW7131A
Chromium		(L, S) SW7190, SW7191
Lead		(L, S) SW7420, SW7421
Selenium		(L, S) SW7740, SW7741A
Silver		(L, S) SW7760A, SW7761
Mercury	Manual cold-vapor technique	(L) SW7470A, (S) SW7471A
Volatile organics	Gas chromatography (GC)/mass spectrometry (MS)	(L, S) SW8260B
	GC/MS capillary column technique	
Semivolatile organics	GC/MS	(L, S) SW8270C[c]
	GC/MS capillary column technique	(S) SW8275A
Organochlorine pesticides	Thermal extraction/GC/MS	(L, S) SW8081A
Chlorinated herbicides	GC	(L, S) SW8151A
Cyanide, free and total	Distillation and colorimetric ultraviolet	(L, S) SW9010B, SW9012A
Total chromium	Colorimetric method for hexavalent chromium	(L, S) SW7196A
Sulfide	Colorimetric titration	(L, S) SW9030B

Table E-3 (Continued)

Waste Analysis Parameters and Test Methods[a]

Parameter	Test Method	Reference[b]
Total RCRA metals[c,d]	Acid digestion Inductively coupled plasma atomic emission spectroscopy	(L) SW3010A, (S) SW3050B (L, S) SW6010B
Arsenic		(L, S) SW6010B
Barium		(L, S) SW6010B
Cadmium		(L, S) SW6010B
Chromium		(L, S) SW6010B
Lead		(L, S) SW6010B
Selenium		(L, S) SW6010B
Silver		(L, S) SW6010B
Mercury	Manual cold-vapor technique	(L) SW7470A, (S) SW7471A
Free liquids	Paint Filter Liquids Test	(L, S) SW9095A

[a] At Los Alamos National Laboratory, current analytical capabilities include limited analyses of mixed waste samples. These analyses include gross alpha, beta, and gamma screening.

[b] "A" (e.g., A006) refers to U.S. Environmental Protection Agency, 1984, "Sampling and Analysis Methods for Hazardous Waste Combustion," *EPA-600/8-84-002*.
"ASTM" refers to American Society for Testing and Materials standards.
"SW" refers to U.S. Environmental Protection Agency, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*.
(L) refers to liquid waste.
(S) refers to solid waste.

[c] See also atomic absorption methods. Total metals may be substituted for TCLP metals, if appropriate.

[d] RCRA = Resource Conservation and Recovery Act.

Table E-4

Evacuation Determination and Reentry Conditions

Reason for Evacuation	Evacuation Determination Made by	Reentry Conditions[a]
Fire	[1]Fire or evacuation alarm, Group Leader or alternate, Lead Engineer, Senior Staff Member present, Senior Technician, or Emergency Manager	Following survey by the person designated by the IC[b]
Explosion	Same as 1 above	Same as above
Loss of ventilation	[2]Group Leader or alternate, Senior Staff Member, Lead Engineer, or Senior Technician	Same as above
Loss of electric power	Same as 2 above	Same as above
Extensive contamination	Same as 2 above or HSR-1[c] Representative	Same as above
Airborne contamination	Same as 2 above or Radiation Monitor	Same as above
Escape or release of toxic or hazardous gas or fumes	Group Leader or alternate, Senior Staff Member, Lead Engineer, Senior Technician, or Emergency Manager	Same as above
Bomb or bomb threat	EM&R[d] or PTLA[e] representative, R&D[f] Section Leader or alternate, Senior Staff Member, or Lead Engineer	Same as above

[a] All reentries are authorized by the EM&R Incident Commander.
[b] "IC" refers to the Incident Commander as defined in 29 CFR § 1910.120.
[c] "HSR-1" refers to the Health Physics Operations Group.
[d] "EM&R" refers to the Emergency Management and Response Office.
[e] "PTLA" refers to Protection Technology Los Alamos.
[f] "R&D" refers to the Research and Development Section.

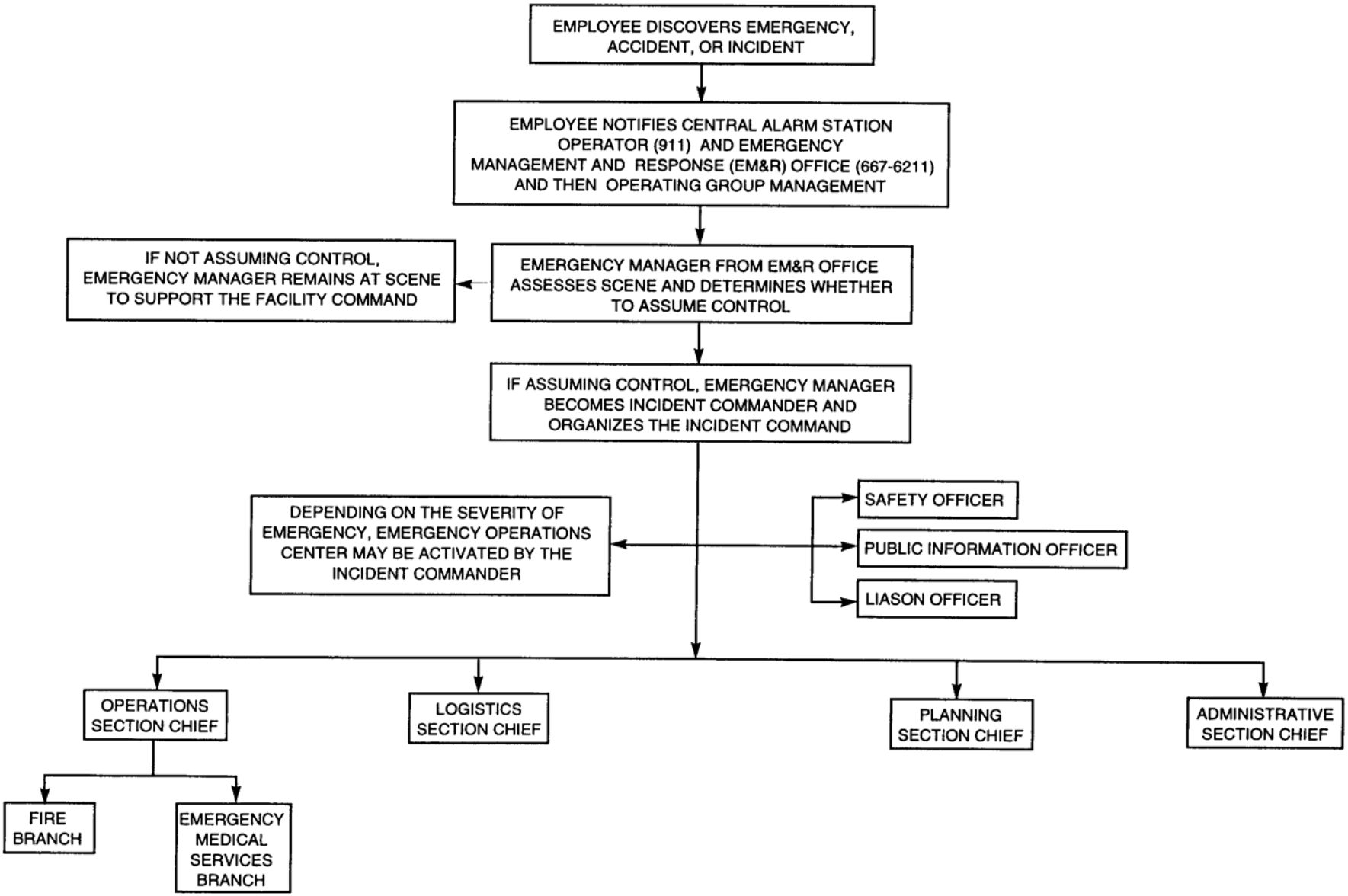
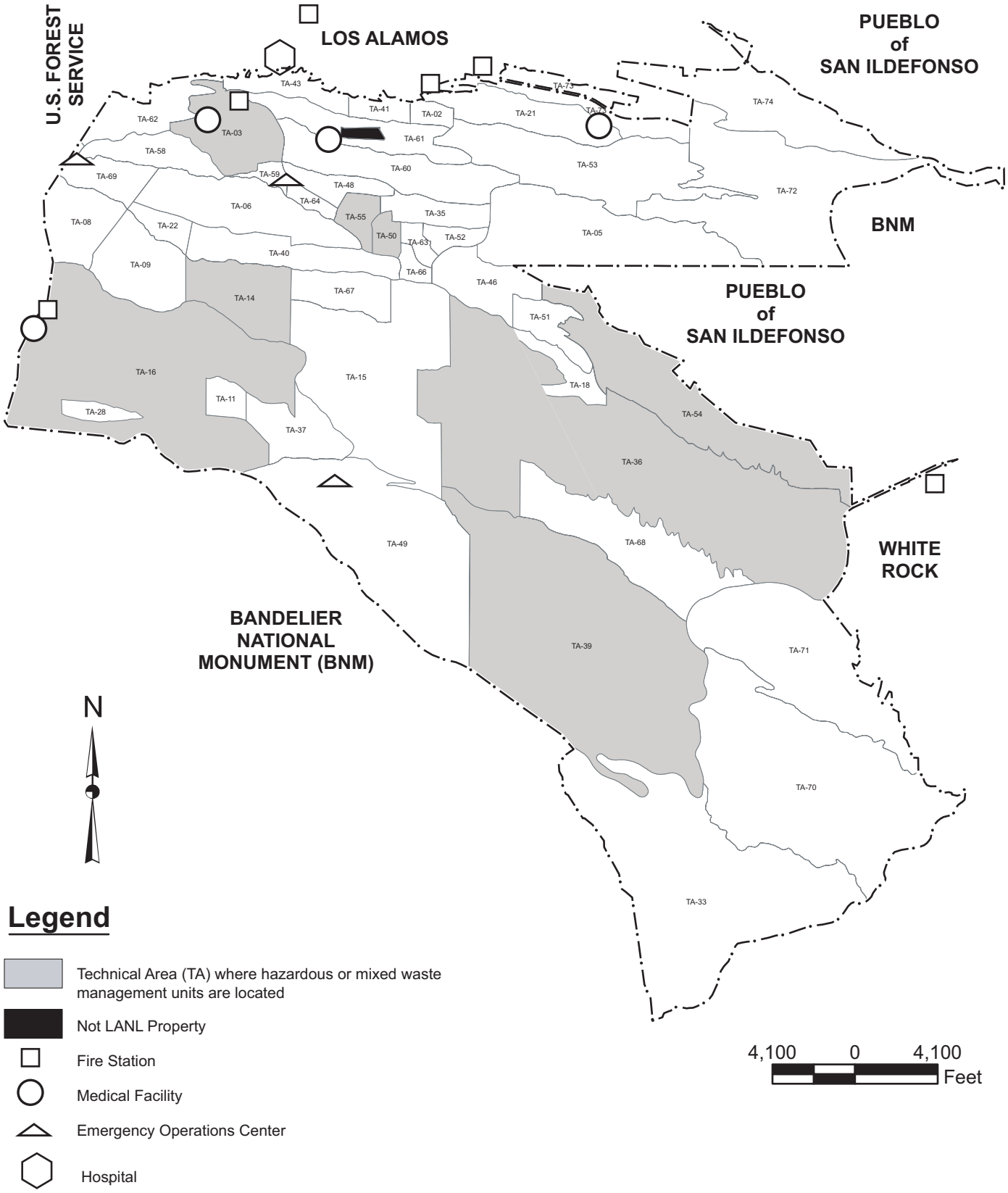


Figure E-1

General Hazardous and Mixed Waste Emergency Notification Structure



Legend

- Technical Area (TA) where hazardous or mixed waste management units are located
- Not LANL Property
- Fire Station
- Medical Facility
- Emergency Operations Center
- Hospital

Figure E-2

Emergency Facilities

State Plane Coordinate System New Mexico Central Zone North American Datum 1983 (ft)

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APPENDIX F

GENERAL CLOSURE PLAN

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ASTM	American Society for Testing and Materials
COPC	contaminant(s) of potential concern
CSU	container storage unit
DOE/NNSA	U.S. Department of Energy, National Nuclear Security Administration
EPA	U.S. Environmental Protection Agency
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
NMED	New Mexico Environment Department
OB	open burning
OD	open detonation
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SW-846	"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
SWMU	solid waste management unit
SWRC	Solid Waste Regulatory Compliance Group
TA	technical area

APPENDIX F
GENERAL CLOSURE PLAN

This appendix describes general closure activities applicable to all hazardous and/or mixed waste management units at Los Alamos National Laboratory (LANL). The general closure information presented in this appendix addresses final closure of the LANL facility and partial closures of individual hazardous/mixed waste management units. The information provided in this appendix is submitted to address applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(13), revised June 14, 2000 [6-14-00], and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H [6-14-00].

This plan includes procedures to document final closure of the LANL hazardous waste management facility. It also includes general discussions of partial closure approaches and procedures for the types of waste management units operating within the LANL facility. Partial closure information and procedures for specific hazardous/mixed waste management units are addressed in individual waste management unit closure plans included with technical area (TA)-specific permit applications, permit modification requests, or permit renewal applications. Further site-specific closure details will be included in required sampling and analysis plans (SAP) to be submitted to the New Mexico Environment Department (NMED) for approval 90 days prior to the initiation of closure activities.

There are multiple types of waste management units at LANL meeting many separate treatment, storage, and disposal requirements both by waste type and different waste management programs. Partial closure of these units will occur separately and over the active life of the LANL facility. All existing units may not be closed before 2100. There is a high potential that decontamination procedures, analytical verification procedures, and the environmental characterization of LANL will change and improve over the life of the facility. Therefore, this closure plan summarizes the general closure activities for the different types of units to be closed and establishes the procedure of submitting separate unit-specific SAPs to the NMED for approval prior to beginning partial closure activities for individual waste management units. The information requirements for the SAPs are included in Section F.2.2.7 of this plan. The SAP will provide the required level of detail to assure closure standards consistent with the appropriate decontamination and verification requirements existing at the time of closure. Closure activities will meet the closure performance standards described in Section F.1.1.

Until final closure is complete and certified in accordance with 20.4.1 NMAC § 264.115 [6-14-00], as discussed in Section F.1.6, a copy of this closure plan and any approved revisions will be on file at LANL's Solid Waste Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy, National Nuclear Security Administration (DOE/NNSA) Los Alamos Site Office (LASO).

F.1 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13) and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H, as applicable.

F.1.1 Closure Performance Standard [20.4.1 NMAC § 264.111]

The hazardous or mixed waste management units addressed in TA-specific permit applications, permit modification requests, or permit renewal applications will be closed to meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and I through DD [6-14-00].

For the majority of the storage and treatment units at LANL, partial closure will be accomplished by removal of waste from the unit(s) and decontamination, if necessary, of the structures, equipment, and areas that have been contaminated by waste materials. These activities will ensure the removal or decontamination of hazardous waste and hazardous waste residues from the unit to established cleanup levels. Land disposal units, tanks, and miscellaneous units that cannot be closed by the removal or decontamination of hazardous waste or hazardous waste residues will be managed under post-closure care requirements contained in 20.4.1 NMAC, Subpart V, Part 264, Subpart G. In the case of land disposal units and tanks or miscellaneous units that are co-located with solid waste management units (SWMU) and that cannot be closed by removal or decontamination of hazardous waste and hazardous waste residues, partial closure will be accomplished by stabilizing, as necessary, the wastes and/or waste residues that remain in place and requesting NMED approval to address such units under alternative requirements, as allowed by

20.4.1 NMAC § 264.110(c), to meet post-closure care requirements, as discussed in Appendix G, the "General Post-Closure Plan."

F.1.2 Partial and Final Closure Activities [20.4.1 NMAC § 264.112(d)]

Partial Resource Conservation and Recovery Act (RCRA) closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. Partial closure at LANL will consist of closing one or more of the hazardous/mixed waste management units at the TAs that operate them, while leaving other active units at the LANL facility in operation. Closure activities for the partial closure of a unit are addressed in Attachment F of TA-specific permit applications, permit modification requests, or permit renewal applications. Partial closure will be deemed complete when the removal or decontamination of hazardous wastes and hazardous waste residues has been verified; the unit is being addressed under alternative requirements to address closure and post-closure care requirements, if appropriate; the closure certification has been submitted to the NMED; and the NMED has approved the closure.

Final RCRA closure of the LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each unit, including all previous partial closures as well as land-based units that have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED and the NMED has approved the final closure.

F.1.3 General Closure Schedule [20.4.1 NMAC §§ 264.112(b)(6), 264.112(e), and 264.113]

Final closure of the LANL facility will occur in the year 2100, but partial closure of any LANL hazardous or mixed waste management unit may occur at any time before then. The following schedule requirements will apply for any LANL closure, partial or final. Written notification will be provided to the NMED 60 days before the start of closure activities at the waste management unit or for the LANL facility final closure review. Written notification will be provided 45 days before the start of partial closure activities for container storage units and tanks, and 60 days before the start of partial closure activities for a landfill unit. However, pursuant to 20.4.1 NMAC § 264.112(e) [6-14-00], removing hazardous wastes and decontaminating or dismantling equipment in accordance with an approved closure plan may be conducted at any time before or after notification of closure. Closure activities will begin according to the requirements of 20.4.1 NMAC § 264.112(d)(2) [6-14-00]. Treatment, removal, or disposal of hazardous wastes will begin in accordance with the

approved closure plan, as required by 20.4.1 NMAC § 264.113(a) [6-14-00], within 90 days after final receipt of waste at the hazardous or mixed waste management unit. This timeframe will be met as long as facilities are available for treatment, storage, or disposal of these wastes. In the event that closure activities cannot begin at a unit within 90 days, LANL will notify the Secretary of the NMED in accordance with the extension requirements in 20.4.1 NMAC § 264.113(a) [6-14-00]. Closure activities will be completed in accordance with the requirements of 20.4.1 NMAC § 264.113(b) [6-14-00]. Closure will be conducted in accordance with the schedule(s) presented in Attachment F of TA-specific permit applications, permit modification requests, or permit renewal applications. In the event that closure of a unit is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC § 264.113(b) [6-14-00]. In addition, the demonstrations in 20.4.1 NMAC §§ 264.113(a)(1) and (b)(1) [6-14-00] will be made in accordance with 20.4.1 NMAC § 264.113(c) [6-14-00].

F.1.4 Amendment of the General Closure Plan [20.4.1 NMAC § 264.112(c)]

In accordance with 20.4.1 NMAC § 264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the approved closure plan
- There is a change in the expected year of closure
- Unexpected events occur during closure that require modification of the approved closure plan
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC §§ 264.90(f) and/or 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions

presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

F.1.5 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for closure actions.

F.1.6 General Closure Certification [20.4.1 NMAC § 264.115]

Within 60 days after completion of closure of each hazardous waste management unit or final closure of the facility, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit or facility has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE/NNSA and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC § 264.115. A copy of the certification and supporting documentation will be maintained by both DOE/NNSA LASO and SWRC.

F.1.7 Security

Because of the ongoing nature of waste management operations at LANL, security and administrative controls at the sites of hazardous or mixed waste management units will be maintained by the DOE/NNSA or another authorized federal agency for as long as necessary to prohibit public access. Details of security measures are included in Attachment F of TA-specific permit applications, permit modification requests, or permit renewal applications.

F.1.8 Closure Reports

Upon completion of final RCRA closure of the LANL hazardous waste management facility or partial closure of individual waste management units, a closure report will be prepared and provided to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section F.1.6
- Any significant variance from the approved closure plan and the reason for the variance
- The location of the file of supporting documentation, including:
  - Closure certification reports for closed units
  - Documentation for units being closed under alternative closure requirements
  - NMED closure approvals
  - Survey plats and related field data
- A certification of accuracy of the report.

Information to be included in closure reports for waste management units is addressed in Attachment F of TA-specific permit applications, permit modification requests, or permit renewal applications.

F.1.9 Survey Plat and Post-Closure Requirements [20.4.1 NMAC §§ 264.116 and 264.117 through 264.120]

For partial closure, LANL intends to remove hazardous waste and associated constituents from the unit(s) undergoing closure, remove or conduct in-situ treatment of soil contaminated with hazardous wastes or hazardous waste residues, and decontaminate structures and equipment contained in the unit. If decontamination to the cleanup levels approved in the closure plan cannot be achieved, LANL intends to dispose of or otherwise manage the contaminated structures, equipment, soil, or other media. If decontamination to these cleanup levels is not achievable, LANL may also propose an alternate demonstration of decontamination, as circumstances indicate. A survey plat, post-closure certification, and post-closure notices will not be required for the closure of units that remove, treat in situ, or decontaminate hazardous waste or hazardous waste residues.

If a land disposal unit, tank unit, or miscellaneous unit cannot be closed by removal or decontamination of hazardous waste or hazardous waste residues, LANL will conduct post-closure or equivalent activities in accordance with Appendix G of this document. A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. Post-closure care pursuant to 20.4.1 NMAC §§ 264.117 through 264.120 [6-14-00] will begin after closure of the unit. Post-closure notices will be filed with appropriate authorities, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE/NNSA will file a “Land Use Restriction Notice” or equivalent document with

the County of Los Alamos and other authorized agencies. Within 60 days after completion of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00].

F.2. CLOSURE APPROACHES BY WASTE MANAGEMENT UNIT TYPE

F.2.1 Preliminary Closure Activities

F.2.1.1 Safety Precautions

Job hazards associated with closure activities will be identified, controls developed, and workers briefed before closure activities are conducted, in accordance with LANL safety procedures. Personnel involved in closure activities will wear appropriate personal protective equipment (PPE) specified by LANL industrial safety groups, and will follow good hygiene practices to protect themselves from exposure to hazardous and/or mixed waste. All workers involved in closure activities will be required to have appropriate training (see Appendix D in this document). Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

F.2.1.2 Background Determination

Before any decontamination activity begins, background levels for potential hazardous waste constituents will be determined. Decontamination and verification sampling procedures may involve wash water sampling, swipe sampling, soil sampling, or other methods developed before the time of closure. Background samples will be obtained from clean water, cleaning equipment, and detergent solutions if wash water methods are used for decontamination. Background samples will be obtained for the material to be decontaminated or for any sampling materials used in swipe sampling analysis used for verification purposes. Appropriate background samples and/or concentrations derived from LANL studies developed under the LANL corrective action or other programs will be used to determine hazardous constituent background/baseline levels. Details of appropriate background levels and/or necessary samples and collection techniques will be included in the unit-specific SAPs, as discussed in Section F.2.2.7 of this closure plan.

F.2.2 Storage and Treatment Units

F.2.2.1 Container Storage Units

Removal of Waste

Prior to the initiation of closure activities, wastes will be removed from the LANL container storage unit (CSU) to be closed. Containers will be removed from each unit with forklifts, cranes, hand trucks, or manually as appropriate for the size, amounts, and types of waste in the CSU. Containers will be placed onto flatbed trucks, trailers, or other vehicles appropriate for transport. Appropriate shipping papers will accompany the wastes during transport. Waste containers will be moved to an approved on-site CSU or to an off-site permitted treatment, storage, or disposal facility.

Closure Procedure and Decontamination

To the extent possible, all contaminated structures and equipment at the LANL CSUs to be closed will be decontaminated. Closure activities at LANL CSUs will generally involve the use of wash water solutions to decontaminate the waste management structure surfaces (e.g., floors, secondary containment structures, and walls). Structures and equipment that cannot or will not be decontaminated will be removed, containerized, and managed in compliance with appropriate waste management regulations. Decontamination procedures will be verified by sampling and analysis. All sampling conducted during closure activities will be done as prescribed in the CSU-specific SAP (see Section F.2.2.7). Sampling and analysis will be done in accordance with appropriate quality assurance/quality control (QA/QC) procedures as required by the individual analytical technique or the authority for the relevant standard methods (e.g., “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods” [*SW-846*] [U.S. Environmental Protection Agency (EPA), 1986]; American Society for Testing and Materials [ASTM]). Closure will be conducted in accordance with the SAPs submitted for approval prior to the actual closures.

Structural Assessment

Before decontamination activities begin, the base or secondary containment of each CSU will be inspected for any cracks or conditions that could potentially lead to loss of wash water containment if wash water procedures will be used for decontamination. Preventive maintenance inspections are conducted routinely (i.e., weekly) at each CSU. If any defects, deterioration, damage, or hazards affecting containment have developed after the most recent preventive maintenance inspection was conducted, appropriate remedial actions (including sampling, repairs, maintenance, or replacement) will be completed before decontamination activities begin. If a crack or gap is present, a swipe sample or a representative sample of the media will be taken (e.g., epoxy or paint coatings, asphaltic concrete, or concrete) to determine the presence of contamination. The sample will be analyzed for hazardous contaminants of potential concern (COPC) determined through review of the chemical properties of the waste stored during the operating history of the CSU and

through an evaluation of the history of any spills that may have occurred at the CSU. If contamination is detected, the surface flaw will be decontaminated prior to repairing the crack/gap. Complete or partial removal (e.g., scraping or cold-milling) of the material may be performed until contamination is no longer detected. If partial removal is successful in eliminating the contamination, it will be assumed that the remaining material, including underlying soil, is clean.

After any decontamination wash down process, the used wash water will be collected, transferred to containers, sampled, and analyzed for the appropriate parameters determined during the documentation review. If the used wash water is nonhazardous and nonradioactive, it will be managed appropriately in accordance with LANL policy. Otherwise, the used wash water will be managed at an appropriate on-site facility.

Decontamination of CSUs

LANL CSUs will be closed by removal and decontamination of hazardous waste and hazardous waste residues. Storage rooms, sheds, domes, and buildings will be closed by washing the interior storage surfaces to remove or decontaminate hazardous wastes and hazardous waste residues. The first step in decontamination will be to evaluate the CSU's operating record to determine the COPCs. The appropriate surfactant/solvent to be used in the wash water solution will be determined based upon the COPCs. General laboratory surfactants (e.g., Alconox) will be used for the majority of washes where many COPCs are being sampled for, and specialized solvents may be used for more focused removal purposes.

Based on the review of the operating record (e.g., spills) and an evaluation of structural areas of potential concern (e.g., sumps, stained areas, low areas), preliminary decontamination focused on these areas may be conducted prior to the overall decontamination of the CSU. Prior to overall decontamination of a structure, any portable equipment will be wiped down with wash water solution. The structure walls and floors will then be wiped down with mops and sponges to minimize the amount of liquid waste generated as a result of decontamination activities. A portable berm, existing berm or sump, or other device (e.g., absorbent socks, plastic sheeting, wading pools) designed to collect and provide containment for used wash water will be used, as necessary.

After the walls and floors have been decontaminated, any recessed areas present (e.g., sumps) will be wiped down with wash water. The used wash water will collect in the recessed area; it will then be removed and transferred to an appropriate container(s). The recessed area will be wiped down

again with wash water; this wash water will be minimized, collected with sponges and/or mops, and transferred to the same appropriate container(s), where it will be sampled. The container(s) of used wash water will be stored appropriately, pending analysis for decontamination verification.

In certain cases of closures at the LANL CSUs, soil removal or in-situ remediation may be conducted to meet the closure performance standards. Examples of when these activities may be performed include the detection of contamination that had migrated beyond CSU pads to the surrounding soil, and cases in which operating records indicate that a release of hazardous waste from storage structures to the surrounding soil has occurred. If records indicate that no release of hazardous waste to soils has occurred, soil sampling will not be conducted.

If collection of soil samples is determined to be necessary to demonstrate decontamination, background soil samples will be collected and analyzed to provide a baseline for decontamination verification. Sampling locations to determine the extent of contamination will be based upon a biased random sampling approach, including historical evidence of releases, physical evidence of distressed vegetation or visual staining, and any other information that indicates a potential contamination pathway. The number of samples, locations, depths, and sampling methods will be determined before closure and included in the CSU-specific closure SAP, as discussed in Section F.2.2.7. Results from sampling will be compared to the background samples and/or baseline concentration levels included in the closure SAP. If analysis shows that the soil at the storage areas is contaminated, soil sampling results that are above the background/baseline levels will be used to identify the extent of soil contamination. Contaminated soils may be removed in layers and sampling conducted following removal of each layer. This procedure will be used to minimize the amount of waste generated during closure. The removal and sampling process will be repeated until the decontamination criteria are achieved or it is decided to close the CSU as a landfill. Alternatively, the contaminated soil may be remediated in situ, with post-remediation sampling and analysis conducted to demonstrate successful decontamination.

In the event that closure of the CSU cannot be achieved, a post-closure plan will be prepared for the site, as required by 20.4.1 NMAC § 264.118. The plan will include provisions to stabilize the site and will describe planned monitoring activities, maintenance activities, and the frequencies at which these activities will be performed, as required by 20.4.1 NMAC § 264.118.

Sufficient sampling and analysis will be required to demonstrate that hazardous or mixed waste residue is not present at the CSU after closure. Wash water sampling, swipe sampling, or other appropriate sampling and analysis methodologies may be used to verify decontamination. The verification sampling method will be determined at the time of development of the CSU-specific closure SAP and will be based on factors such as COPCs and materials of construction for the storage structure. The SAP will establish the minimum number of verification samples based on the total surface area of the CSU. Using a biased random sampling approach, items, structures, and/or surfaces will be sampled for verification of decontamination. Sample bias will include known or likely areas of contamination, low areas, sumps, and known spill locations, as determined to be appropriate on a case-by-case basis.

For wash water-based decontamination verifications (e.g., asphaltic-concrete pads), the samples of clean wash water solution squeezed from mops and/or sponges prior to use will be collected as background before initial wash down of any CSU. The samples will be analyzed for the appropriate parameters, as presented in the closure SAP. Analytical procedures will conform to methods found in the most current version of *SW-846* (EPA, 1986). Used wash down solutions will be analyzed for the same parameters. Wash down solutions will be considered contaminated if the used wash water solution shows a significant increase (i.e., determined using statistical methods defined in *SW-846*) in the analytical parameters over those in the clean wash water solution. If subsequent wash downs are deemed necessary, an additional sample of clean wash water solution squeezed from mops and/or sponges prior to use will be taken for each additional wash down event.

Swipe sampling may be used on a case-by-case basis (e.g., for smooth or impervious surfaces such as metal and dome fabric) to determine verification of decontamination at the CSUs. Background for swipe samples will be determined by submitting an unused swipe and solvent sample for analysis. Swipe samples will be analyzed using approved methods, which will be included in the closure SAP. The rationale for when swipe sampling will be conducted will also be included in the SAP.

If other sampling methodologies have been developed at the time of closure for a CSU, their use to determine decontamination will be addressed in the closure SAP.

For any sampling methodology, decontamination will be verified if the collected samples meet any of the decontamination criteria listed in Section F.2.2.6 of this closure plan. If the verification

sampling indicates contamination higher than the approved values, additional sampling will be performed to establish the boundaries of contamination for large structures. After establishing the boundaries of contamination, the decontamination process may be repeated within those boundaries, using portable berms or other appropriate material to limit the potential for run-off from the affected area. An additional round of verification sampling will be performed for all of the areas previously determined to be contaminated. After each decontamination event and verification iteration, a decision will be made to repeat the process or remove contaminated materials and dispose of them properly.

F.2.2.2 Tank Storage Units

Tank storage units will be closed by removal and/or decontamination of hazardous waste or hazardous waste residues. All contaminated surfaces and equipment associated with storage tank systems will be decontaminated, decommissioned, or dismantled, depending on the extent of contamination and anticipated disposition or use after closure. Tank system components will be decommissioned at closure and either decontaminated or containerized and managed in compliance with appropriate regulations. Tank system ancillary equipment (e.g., piping, pumps) will be managed in the same manner.

If a tank system or its ancillary equipment is decontaminated, the following procedure will be used. The interior surfaces of the tank system components or ancillary equipment will be flushed with wash water. Following the wash down, the water will be collected and analyzed for COPCs. The exterior surfaces will be wiped down with a wash water solution using cloths and/or other absorbent material to minimize the amount of liquid waste generated as a result of the decontamination activities. The wash water will be collected and analyzed for the applicable COPCs. Used wash water will be managed in accordance with applicable regulations. The wash cycles will continue until the equipment has been cleaned to established levels or the decision is made to manage it as waste.

Random swipe samples will be taken from the areas adjacent to the storage tank system (e.g., walls, floors, sumps, and drains) and will be analyzed for the applicable COPCs. If decontamination is determined to be needed based upon the levels of contaminants determined by swipe sampling, the surfaces will be washed down using procedures to minimize dilution by limiting the amount of wash solution used. The wash solution will be collected and analyzed for the applicable COPCs. Wash cycles will continue until the surfaces have been cleaned to established levels.

Decontamination verification will be determined through this process. Used wash water will be managed in accordance with applicable regulations.

F.2.2.3 Cementation Treatment Units

Cementation units will be closed by removal and decontamination of hazardous waste and hazardous waste residues. Treatment by cementation at LANL occurs in containers. The cementation unit equipment and associated ancillary equipment will be decontaminated, decommissioned, or dismantled, depending on the extent of contamination and anticipated disposition or use after closure. If any of the cementation unit equipment is to be decommissioned or dismantled, the resulting components will be containerized and managed appropriately at an approved on-site facility, depending on the regulated constituents present.

Prior to decontamination, any visible material located within the unit will be removed and managed as waste. The cementation unit will be rinsed and washed down with specified procedures for minimizing dilution by limiting the amount of wash water solution used. The used wash water will be collected and analyzed for appropriate COPCs to verify decontamination. Successive rinse cycles will be performed until decontamination levels are achieved or the decision is made to dispose of the equipment as waste. Equipment to be disposed as waste will be containerized and managed in compliance with appropriate regulations.

Random swipe samples will be taken from the areas adjacent to the cementation unit and analyzed for the COPCs determined for the unit-specific closure. If decontamination measures are determined to be necessary to achieve closure standards, wash and analysis cycles will be performed until decontamination to established levels is verified.

F.2.2.4 Open Burning Treatment Units

Open burning (OB) units will be closed by removal and decontamination of hazardous waste and hazardous waste residues to the extent possible. LANL OB units are permitted under 20.4.1 NMAC, Subpart V, Part 264, Subpart X standards. If decontamination procedures for OB units are not effective, the unit will be subject to post-closure care requirements as required by 20.4.1 NMAC § 264.603.

The OB unit will receive a thorough visual inspection for unburned materials, which, if found, will be treated and managed appropriately. To the extent possible, contaminated OB structures will be decontaminated. Any equipment associated with the OB unit will be removed, decontaminated, decommissioned, or dismantled, depending on the extent of contamination and anticipated disposition or use after closure. If any of the unit equipment is to be decommissioned or

dismantled, the resulting components will be managed appropriately at an approved facility, depending on the regulated constituents present. Other closure activities will include the removal, treatment, segregation, and/or disposition of OB structures and related equipment, and soil sampling and removal as determined to be necessary.

Soil sampling, if determined to be necessary, will be performed and analyses conducted for the identified COPCs to determine the existence or extent of OB-related contaminants. Based upon the results of this sampling, excavation of surrounding soils may be required. Any soil removed will be properly characterized and disposed of.

If decontamination of the surrounding soil cannot be reasonably achieved, LANL may propose alternative decontamination demonstrations for approval by NMED, or request that the unit be closed and further managed under post-closure requirements. In that event, a post-closure care plan will be developed for further management of the unit. If the OB unit being closed is situated in close proximity with SWMUs, releases have been determined to be present, and the origin of the releases is not distinguished, and if the characterization and potential remediation of the SWMUs is being managed under the LANL corrective action program, LANL will request that the unit be considered for alternative requirements for post-closure care, as allowed by 20.4.1 NMAC § 264.110(c).

F.2.2.5 Open Detonation Treatment Units

Open detonation (OD) units will be closed by removal and decontamination of hazardous waste and hazardous waste residues to the extent possible. LANL OD units are permitted under 20.4.1 NMAC, Subpart V, Part 264, Subpart X standards. If decontamination procedures for OD units are not effective, the unit will be subject to post-closure care requirements as required by 20.4.1 NMAC § 264.603.

To the extent possible, contaminated OD structures will be decontaminated. Any equipment associated with the OD unit will be decontaminated, decommissioned, or dismantled, depending on the extent of contamination and anticipated disposition or use after closure. If any of the unit equipment is to be decommissioned or dismantled, the resulting components will be managed appropriately at an approved facility, depending on the regulated constituents present. Other closure activities will include the removal, treatment, segregation, and/or disposition of OD structures and related equipment, and soil sampling and removal as determined to be necessary.

The OD structure will receive a thorough visual inspection for untreated materials, which, if found, will be treated and managed appropriately. Any equipment associated with the OD unit will be removed, decontaminated, and disposed of in accordance with applicable regulations. Soil sampling for identified COPCs will be performed to determine the existence or extent of OD-related contaminants. Based upon the results of this sampling, excavation of surrounding soils will be performed and the soils collected for appropriate disposition, if contaminated. As layers or areas of soil are removed, additional soil sampling will subsequently be performed until the decontamination process is verified.

If decontamination of the surrounding soil cannot be reasonably achieved, LANL may propose alternative decontamination demonstrations for approval by NMED, or request that the unit be closed and further managed under post-closure requirements. In that event, a post-closure care plan will be developed for further management of the unit. If the OD unit being closed is situated in close proximity with SWMUs, releases have been determined to be present, and the origin of the releases is not distinguished, and if the characterization and potential remediation of the SWMUs is being managed under the LANL corrective action program, LANL will request that the unit be considered for alternative requirements for post-closure care, as allowed by 20.4.1 NMAC § 264.110(c).

F.2.2.6 Decontamination Criteria

Successful decontamination for LANL hazardous waste management units is defined as one of the following criteria:

- No detectable hazardous waste or hazardous waste constituents from hazardous waste management unit activities are found in the final sample.
- Detectable hazardous waste or hazardous waste constituents from hazardous waste management unit activities in the final sample are removed to statistically significant levels based on baseline concentrations in the clean wash water.
- Detectable hazardous waste or hazardous waste constituents from hazardous waste management unit activities in the final sample are at or below levels agreed upon with the NMED.
- Detectable hazardous waste or hazardous waste constituent concentrations from hazardous waste management unit activities do not significantly decrease after several wash downs. In such an event, hazardous constituents that pose an acceptable risk will be allowed to remain, as mutually agreed upon with the NMED.

An alternative demonstration of decontamination may be proposed and justified at the time of unit closure, as circumstances indicate. The Secretary of the NMED will evaluate the proposed alternative in accordance with the standards and guidance then in effect and, if approved, incorporate the alternative into the closure plan.

F.2.2.7 Sampling and Analytical Procedures

Sampling and analytical procedures will be performed during the decontamination and verification activities associated with the partial closure of the hazardous waste management units. These procedures will use standard approved methods (e.g., *SW-846*, ASTM) as appropriate for making closure decontamination verification determinations. However, the units may not be closed for relatively lengthy periods of time and it is probable that sampling and analytical methods will be revised and improved before closure. In order to alleviate the need for future closure plan and permit modifications until actual closure activities are finalized, LANL will submit unit-specific closure SAPs at the time of closure notification to NMED for review and approval.

The closure SAP will contain a detailed discussion of the available hazardous waste management unit information and proposed closure methodology to assure the closure standards are met. These include:

- A detailed discussion of site characteristics.
- The hazardous waste management unit operational history, to include descriptions of known spills, releases, and/or evidence of potential problems (e.g., visual stains, dead vegetation, SWMUs).
- Chemical properties of the waste managed at the hazardous waste management unit.
- Determination of applicable COPCs.
- A hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures for decontamination methods for equipment, structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the specific hazardous waste management unit.
- Methods for sampling and analysis of contaminated media.

- Removal procedures for contaminated media, if necessary.
- Sampling methods for decontamination media and hazardous waste determination. The discussion should include the rationale for using wash water samples, swipe samples, soil samples, and/or other sampling methodology.
- Sampling methods for decontamination verification procedures. The discussion should include the statistical or judgmental basis for determining the number of verification samples needed and the constituents to be analyzed for.
- Sampling equipment decontamination and disposition procedures.
- Sample handling and documentation procedures.
- Analytical methods (including detection limits) and the rationale for their determination.
- Disposition of removed waste, decontamination media, or contaminated soils. This discussion should include an identification of proposed on- or off-site hazardous waste management facilities that may be used for final disposition and the types of wastes anticipated to be shipped.
- Decontamination criteria.
- Statistical basis for verification of decontamination, if applicable. The discussion should include information on determination of statistical increases in analytical parameters and numerical values for significant increases.
- Risk assessment procedures to be used, if necessary.
- Field and laboratory QA/QC procedures.
- Schedule of closure activities, including decontamination, sampling, analysis, potential removal of soils, and closure certification submittal.
- Identification of contact person or office.

F.2.3 Land Disposal Units

Land disposal units, tank units, and miscellaneous units that cannot be closed by removal or decontamination of hazardous waste or hazardous waste residues will be managed under post-closure care requirements contained in 20.4.1 NMAC, Subpart V, Part 264, Subpart G. In the case of land disposal units and tanks or miscellaneous units that are co-located with SWMUs and that cannot be closed by removal or decontamination of hazardous waste and hazardous waste residues, partial closure will be accomplished by stabilizing, as necessary, the wastes and/or waste residues that remain in place and requesting NMED approval to address such units under

alternative requirements, as allowed by 20.4.1 NMAC § 264.110(c), to meet post-closure care requirements.

Post-closure care plans will be prepared for any hazardous waste management unit meeting the conditions discussed above. The post-closure plan will address applicable post-closure requirements specified in 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H. These requirements will include provisions for maintenance and monitoring of the unit during the post-closure care period as set forth in 20.4.1 NMAC § 264.118. General requirements for LANL post-closure plans are discussed in Appendix G of this permit renewal application. Detailed requirements for specific LANL land disposal units will be included in TA-specific permit applications, permit modification requests, or permit renewal applications.

F.3 REFERENCES

EPA, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA-*SW-846*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

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TABLE NO.	TITLE
G-1	Current Land Disposal Units at Los Alamos National Laboratory Subject to Post-Closure Requirements

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
40 CFR	Code of Federal Regulations, Title 40
CMS	Corrective Measures Study
DOE/NNSA	U.S. Department of Energy, National Nuclear Security Administration
EPA	U.S. Environmental Protection Agency
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
NMED	New Mexico Environment Department
SWMU	solid waste management unit

APPENDIX G
GENERAL POST-CLOSURE PLAN

This appendix describes general post-closure activities applicable to the regulated hazardous and/or mixed waste management units at Los Alamos National Laboratory (LANL). The general post-closure information presented in this appendix addresses post-closure of land-based units. The information provided in this appendix is submitted to address applicable post-closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(13), revised June 14, 2000 [6-14-00], and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H [6-14-00].

Detailed post-closure information and procedures for regulated units at LANL are addressed in the following documents:

- "Closure/Post-Closure Plan for the Technical Area 54 Area G Landfills (Pit 29 and Shaft 124),"
- "Compliance Demonstration with 40 CFR 264, Subparts G and F under Corrective Action Procedures for Material Disposal Area H at Technical Area 54," and
- "Closure/Post-Closure Plan for the Technical Area 54 Area L Landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D)."

The Area G landfills last received hazardous waste in 1986 (Pit 29) and 1987 (Shaft 124). The Area H landfill (Shaft 9) last received hazardous waste in 1986. The Area L landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D) last received hazardous waste in 1985. Post-closure activities for land-based units at LANL will meet the closure performance standards described in Section G.1.1.

The approved post-closure plan(s) and any approved revisions will be kept on file at the U.S. Department of Energy, National Nuclear Security Administration (DOE/NNSA) Los Alamos Site Office (LASO), in accordance with 20.4.1 NMAC § 264.118(c). Certification of completion of post-closure care in accordance with 20.4.1 NMAC §264.120 [6-14-00] is discussed in Section G.1.5.

G.1 GENERAL POST-CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13) and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H [6-14-00], as applicable.

APPENDIX G

GENERAL POST-CLOSURE PLAN

G.1.1 Closure Performance Standard [20.4.1 NMAC § 264.111]

Post-closure of the regulated units addressed in the plans cited above will meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and I through DD [6-14-00].

For land disposal units and other units that cannot be closed by removal and decontamination, closure will be accomplished by stabilizing, as necessary, the wastes and/or waste residues that remain in place. Known land disposal units at LANL are identified in Table G-1. Post-closure of such units will be accomplished under alternative closure requirements, as discussed in Section G.1.2 below, to meet post-closure care requirements.

G.1.2 Post-Closure Care and Alternative Requirements [20.4.1 NMAC § 264.117]

In accordance with 20.4.1 NMAC § 264.117(a)(1), post-closure care for each land-based unit will begin after completion of closure of the unit and will continue for 30 years. Post-closure care of the regulated unit under alternative requirements will begin after closure is completed. Closure of land-based units will be deemed complete when closure in place has been verified, the closure certification has been submitted to the New Mexico Environment Department (NMED), and the NMED has approved the closure. Alternative closure requirements are discussed below. At any time preceding partial closure or during the post-closure period, the Secretary of the NMED may shorten the post-closure care period if all disposal units at the facility are closed and it is determined that the reduced period is sufficient to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(i). Alternatively, the Secretary of the NMED may extend the post-closure care period if it is determined that the extended period is necessary to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(ii).

As required by 20.4.1 NMAC § 264.117(a)(1)(i) and (ii), post-closure care of the existing regulated units at LANL will consist of maintenance, monitoring, and reporting, as appropriate and in accordance with the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart F, and 20.4.1

NMAC § 264.310. Post-closure care activities will follow the approved post-closure plan, in accordance with 20.4.1 NMAC § 264.117(d).

Post-closure activities for the existing regulated units may be accomplished under alternative requirements pursuant to 20.4.1 NMAC § 264.118(b)(4). This is consistent with U.S. Environmental Protection Agency (EPA) guidance (EPA, 1998) because the existing regulated units at LANL are situated among solid waste management units (SWMU), releases potentially originating from both the regulated unit and the SWMU(s) have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. The EPA guidance discusses the transfer of the closure and post-closure process to the facility corrective action process as an appropriate mechanism to address this situation. Therefore, some post-closure procedures for the regulated units will be established as part of the corrective measures to be identified for the ongoing corrective action program at LANL.

In such circumstances, if corrective measures are deemed necessary to protect human health and the environment, they will be analyzed, selected, and implemented during the Corrective Measures Study (CMS)/Corrective Measures Implementation process and the most current and approved Installation Work Plan for the Environmental Restoration Project. The selected corrective measures will include the alternative requirements for post-closure of the regulated unit in a manner that complies with the requirements of 20.4.1 NMAC § 264.110(c)(2), and as approved by the NMED.

Therefore, the detailed post-closure plans for the regulated units at LANL are linked to the appropriate CMS reports and Statements of Basis associated with a permit modification for selection and implementation of corrective measures for the SWMUs associated with the regulated unit. The post-closure plans meet the requirements of 20.4.1 NMAC § 264.118(b) and identify the activities that will be carried on after closure of each disposal unit and the frequencies at which these activities will be performed to comply with 20.4.1 NMAC, Subpart V, Part 264, Subpart F, and 20.4.1 NMAC § 264.310(b). The plans include a description of the monitoring activities and frequencies; a description of the planned maintenance activities and frequencies; the name, address, and phone number of the person or office to contact about the unit during the post-closure care period; and either the alternative requirements that apply to the regulated unit or a reference to the permit modification or other enforceable document that will contain those requirements.

G.1.3 Amendment of the Post-Closure Plan [20.4.1 NMAC § 264.118(d)]

In accordance with 20.4.1 NMAC § 264.118(d)(1) [6-14-00], LANL may submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan at any time during the active life of the facility or during the post-closure care period. In accordance with 20.4.1 NMAC § 264.118(d)(2) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:

- There are changes in operating plans or facility design that affect the approved post-closure plan
- There is a change in the expected year of final closure, if applicable
- Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan
- LANL requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC § 264.90(f) and/or § 264.110(c).

The written notification or request will include a copy of the amended post-closure plan for review or approval by the NMED, in accordance with 20.4.1 NMAC § 264.118(d).

LANL will submit a written request for a permit modification at least 60 days prior to the proposed change in unit design or operation, or no later than 60 days after an occurrence of an unexpected event that affects the post-closure plan. The Secretary of the NMED will approve, disapprove, or modify this plan in accordance with the procedures in the Code of Federal Regulations, Title 40 (40 CFR), Part 124, and 20.4.1 NMAC, Subpart IX, Part 270. The approved post-closure plan will become a permit condition, in accordance with 20.4.1 NMAC § 270.32.

The Secretary of the NMED may request modifications to the plan under the conditions presented in the bulleted items above. LANL will submit the modified plan no later than 60 days after the Secretary's request. Any modifications requested by the Secretary will be approved in accordance with the procedures in 40 CFR, Part 124, and 20.4.1 NMAC, Subpart IX, Part 270.

G.1.4 Post-Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for post-closure actions.

G.1.5 Post-Closure Certification [20.4.1 NMAC § 264.120]

Within 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, LANL will submit to the Secretary of the NMED, by registered mail, a certification that the post-closure care period for the unit was performed in accordance with the approved post-closure plan. The certification will be signed by the appropriate DOE/NNSA and LANL officials and by an independent, registered professional engineer. Documentation supporting the independent, registered professional engineer's certification will be furnished to the Secretary of the NMED upon request. A copy of the certification and supporting documentation will be maintained by DOE/NNSA LASO. The supporting documentation may include, for example, the following:

- Any significant variance from the approved activities and the reason for the variance
- A summary of all sampling results
- A quality assurance/quality control statement on analytical data validation
- The location of the supporting documentation file
- Storage or disposal location of hazardous/mixed waste resulting from post-closure activities.

G.1.6 Security

Because of the ongoing nature of waste management operations at LANL, security and administrative controls for the sites of land-based units will be under the care of the DOE/NNSA or another authorized federal agency during the post-closure care period. Site security will be maintained during that period to prohibit public access to the land-based units. Details of security measures are included in the land-based unit-specific closure/post-closure plans cited previously.

G.1.7 Survey Plat and Post-Closure Requirements [20.4.1 NMAC § 264.116 and § 264.117 through § 264.120]

A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure. No later than 60 days after certification of closure of each land-based unit, LANL will submit to the County of Los Alamos and other authorized agencies and to the Secretary of the NMED a record of the type, location, and quantity of hazardous wastes disposed of within each regulated disposal unit. For hazardous wastes disposed of before January 12, 1981, LANL will identify the type, location, and quantity of the hazardous wastes to the best of their knowledge and in accordance with any records that have been kept.

Post-closure care pursuant to 20.4.1 NMAC § 264.117 through § 264.120 [6-14-00] will begin after closure of a regulated disposal unit is certified by LANL and approved by the NMED. Post-closure notices will be filed with appropriate authorities within 60 days of certification of closure of the first regulated disposal unit and within 60 days of certification of closure of the last regulated disposal unit, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE/NNSA will file a “Land Use Restriction Notice” or equivalent document with the County of Los Alamos and other authorized agencies. The “Land Use Restriction Notice” will indicate that the land has been used to manage hazardous wastes and that its use is restricted under 20.4.1 NMAC, Subpart V, Part 264, Subpart G regulations. It will also indicate that the survey plat and record of the type, location, and quantity of hazardous wastes disposed of have been filed with the County of Los Alamos and other authorized agencies and with the Secretary of the NMED. LANL will also submit a certification to the Secretary of the NMED, signed by DOE/NNSA and LANL, that they have recorded the notation specified in 20.4.1 NMAC § 264.119(b)(1), including a copy of the document in which the notation has been placed.

Within 60 days after completion of the established post-closure care period for the regulated disposal unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00]. Certification of completion of post-closure care is described in Section G.1.5.

In accordance with 20.4.1 NMAC § 264.117(c), post-closure use of property on or in which hazardous waste remains after partial or final closure will not be allowed to disturb the integrity of the final cover or any other components of the containment system, if present, or the function of the monitoring systems unless the Secretary of the NMED finds that the disturbance is necessary to the

proposed use of the property and will not increase the potential hazard to human health or the environment, or it is necessary to reduce a threat to human health or the environment.

G.1.8 References

EPA, 1998, "Standards Applicable to Owners and Operators of Closed and Closing Hazardous Waste Management Facilities: Post-Closure Permit Requirement and Closure Process; Final Rule," *Federal Register*, pp. 56710-56735.

Table G-1

Current Land Disposal Units at Los Alamos National Laboratory Subject to Post-Closure Requirements

Unit	Associated Material Disposal Area (MDA)	Structure	Type
Area G Landfills	MDA G	Shaft 124	Landfill
		Pit 29	Landfill
Area H Landfill	MDA H	Shaft 9	Landfill
Area L Landfill	MDA L	Impoundment B	Impoundment/Landfill Cell
		Impoundment D	Impoundment/Landfill Cell
		Shaft 1	Landfill Cell
		Shaft 13	Landfill Cell
		Shaft 14	Landfill Cell
		Shaft 15	Landfill Cell
		Shaft 16	Landfill Cell
		Shaft 17	Landfill Cell
		Shaft 19	Landfill Cell
		Shaft 20	Landfill Cell
		Shaft 21	Landfill Cell
		Shaft 22	Landfill Cell
		Shaft 23	Landfill Cell
		Shaft 24	Landfill Cell
		Shaft 25	Landfill Cell
		Shaft 26	Landfill Cell
		Shaft 27	Landfill Cell
		Shaft 28	Landfill Cell
		Shaft 29	Landfill Cell
		Shaft 30	Landfill Cell
		Shaft 31	Landfill Cell
		Shaft 32	Landfill Cell
		Shaft 33	Landfill Cell
		Shaft 34	Landfill Cell

Supplement 1

Off-Site Waste Information

SUPPLEMENT 1

OFF-SITE WASTE INFORMATION

Introduction

This supplement provides descriptions of waste streams proposed to be received from off-site facilities by waste management organizations at Los Alamos National Laboratory (LANL) and of the waste characterization and acceptance procedures to be used in their management. The waste streams currently identified to be received are mixed transuranic (MTRU) wastes from Sandia National Laboratories/New Mexico (SNL/NM) that will require waste certification and preparation for subsequent transport and management at the U.S. Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico.

The SNL/NM waste streams proposed to be accepted at LANL contain radioactive and potentially hazardous waste components. One reason for their shipment will be to utilize LANL capacity to confirm the hazardous component of the waste using the procedures in Section B.3.2 of the Waste Analysis Plan (WAP) contained in this General Part B Permit Renewal Application. Due to the relatively low volumes of these wastes, the shipment and waste management approach proposed here will alleviate the need for costly and redundant waste characterization facilities at both sites. The waste streams may include combustible and noncombustible waste, soil and gravel, organic and inorganic process solids, metal and noncombustible debris waste, and metal waste. Because the waste stream characterizations are consistent with LANL and DOE MTRU waste stream descriptions, the Summary Category Groups described in Section B.1.2.3 of the WAP have been used to identify these waste streams.

Sandia National Laboratories/New Mexico Waste Streams

The SNL/NM mixed wastes are predominantly generated from laboratory operations. Approximately eight cubic meters (8 m^3) of these wastes are stored at SNL/NM, although future characterization activities may significantly reduce the amount of waste currently characterized as mixed. SNL/NM may generate a yearly average volume of one cubic meter (1 m^3) of these wastes using the present generator activity level as a basis for estimation. The waste stream descriptions listed below are based on current inventories obtained from the following documents: *SNL Radioactive and Mixed Waste Department's Radtrack Database* (queried 2/4/99), *Radioactive and Mixed Waste Disposal Forms* (for legacy waste), *Preliminary Characterization of Materials in Manzano Storage Bunker 37055* (Sand98), and *Candidate Auxiliary Hot Cell Facility Containers*

(SNL, 2/9/99).

Solidified Inorganic Process Solids, Summary Category Group S3000

S3000 wastes are defined generally in the General Part B WAP as solid waste materials, excluding soil and gravel, that do not meet the U.S. Environmental Protection Agency Land Disposal Restriction criteria for classification as debris. This waste consists of solidified inorganic process residues from Hot Cell Facility (HCF) operations. These process solids have been immobilized in cement to form a noncorrosive solid matrix.

Solidified Organic Process Solids, Summary Category Group S3000

This waste consists of solidified organic process solids. The waste is generated as a result of HCF operations. These residues possibly contain the following listed spent solvents: Freon-TF, methylene chloride, acetone, ethylbenzene, xylenes, benzene, 2-butanone, carbon disulfide, and toluene. These process residues have been immobilized in cement to form a noncorrosive solid matrix.

Soils and Gravel, Summary Category Group S4000

S4000 wastes are defined as solid waste materials that are at least 50% soil and gravel by volume. Soil and gravel wastes are generated by decontamination and corrective action activities.

Combustible/Noncombustible Waste, Summary Category Group S5000

S5000 debris wastes are defined as a heterogeneous waste stream that is at least 50% by volume solid materials exceeding a 2.36-inch particle size that is intended for disposal and is a manufactured object, plant or animal matter, or natural geologic material. This waste stream consists of used personal protective equipment, laboratory wipes, metal equipment, solder, and filters from laboratory and decontamination activities.

Metal Debris Waste, Summary Category Group S5000

This waste stream includes metal equipment and other scrap from laboratory experiments that require separate remote-handling techniques for management due to relatively high radioactivity levels.

Noncombustible Debris Waste, Summary Category Group S5000

This waste stream includes filters, fuel cells, experimental pressure cells, and calorimetry cells from laboratory experiments that require remote-handling techniques for management due to relatively high radioactivity levels.

Combustible Waste, Summary Category Group S5000

This waste stream includes personal protective equipment, laboratory wipes, packaging, paraffin wax, and plastic from decontamination and recovery processes.

Noncombustible Waste, Summary Category Group S5000

This waste stream consists of metal scrap and equipment from decontamination and recovery processes.

Metal Waste, Summary Category Group S5000

This waste stream consists of metal parts from plutonium and americium source equipment.

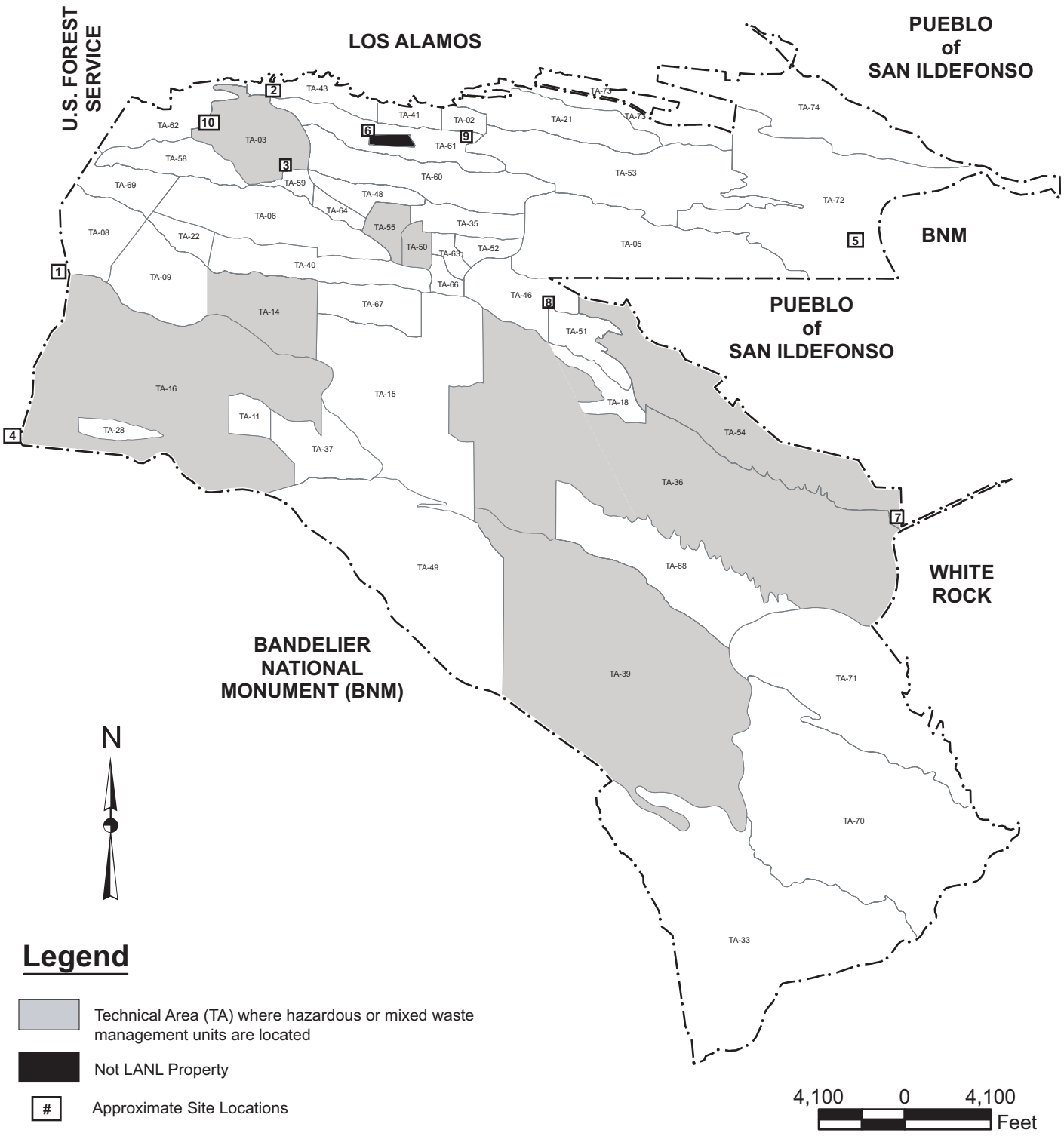
Los Alamos National Laboratory Waste Acceptance Procedures

SNL/NM mixed wastes have been characterized by acceptable knowledge procedures mainly using generator documentation of the waste or of the process generating the waste. This documentation is used for characterization, segregation, and storage at SNL/NM in compliance with 20.4.1 NMAC hazardous waste management regulations. If sufficient, this characterization will be used for transportation and subsequent staging at LANL prior to certification for the WIPP program.

The generator waste documentation will be collected and reviewed for completeness prior to shipment using LANL routine waste characterization procedures as described in the General Part B WAP. Off-site pre-shipment inspection of the waste containers by the appropriate LANL waste management organizations may be used to examine the waste and its documentation if the information provided by the generator is insufficient to meet LANL waste acceptance criteria. If necessary, further characterization to meet those criteria will be completed at the site before the waste can be shipped. Preparation of shipping documentation and waste acceptance procedures at LANL will be performed as described in Section B.4 of the General Part B WAP.

After being received at LANL, these waste streams will be stored in appropriate waste management units. These container storage units will probably be located at Technical Areas 50 and 54. Further

waste characterization activities will be performed in accordance with the procedures for mixed TRU waste contained in Section B.3.2 of the General Part B WAP, including the waste characterization parameters and methods described in Tables B-11 and B-18 of the WAP.



2003 Traffic Study Site Locations

State Plane Coordinate System New Mexico Central Zone North American Datum 1983 (ft)

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Analysis of Traffic Count Results
Selected Study Conducted 1/28/03 through 2/03/03

Site #	Site Location	Average Daily # of Vehicles (Monday-Sunday)	Average Daily # of Vehicles (Monday–Friday)
Site 1	West Jemez Road 100' East of S Site	2661	3332
Site 2	Diamond Drive 250' North of Jemez Road	20520	25820
Site 3	Pajarito Road 200' East of Diamond Drive	10118	12868
Site 4	West Jemez Road 100' East of NM 4	1386	1539
Site 5	East Jemez Road ¼ mile West of NM 4	6159	7837
Site 6	East Jemez Road 500' West of Royal Crest Trailer Park	7586	9711
Site 7	Pajarito 1000' West of NM 4	5913	7311
Site 8	Pajarito 500' West of TA-51	6446	7974
Site 9	East Jemez Road 250' West of TA-53 LANSCE Entrance	6779	8679
Site 10	West Jemez Road 150' West of Guard Station 431	4369	5592

Peak Traffic Occurs:

Monday through Thursday	6-8 am	and	4-6 pm
Friday	6-8 am	and	3-5 pm
Saturday	Approximately 10 am		
Sunday	Approximately 12 pm		

Most traffic occurs at Site 2 and least traffic occurs at Site 4.

The busiest (Tuesday) and the slowest (Sunday) days for traffic are consistent with three exceptions: Site 2 is busiest on Monday, and Site 7 and Site 8 (both along Pajarito Road) are busiest on Thursday and slowest on Saturday.

TRAFFIC STUDY DATA FOR JANUARY 28 THROUGH FEBRUARY 3, 2003

Time	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
0:00	2	47	39	2	20	25	10	23	23	2
1:00	2	23	13	3	12	11	2	8	12	3
2:00	3	10	16	2	1	4	7	8	2	3
3:00	1	18	13	1	10	10	7	15	9	2
4:00	5	43	25	2	31	34	15	18	28	6
5:00	38	154	96	29	205	171	91	93	165	56
6:00	245	1258	703	105	980	905	807	712	867	438
7:00	449	2514	1342	233	1362	1457	1127	1142	1337	694
8:00	297	2090	1214	114	594	775	566	688	733	505
9:00	203	1560	838	79	379	528	271	342	497	382
10:00	182	1288	791	69	270	403	226	329	374	348
11:00	255	2144	1032	75	302	494	422	463	453	466
12:00	256	2256	1058	88	292	513	393	434	440	454
13:00	243	1739	972	95	271	488	273	367	439	424
14:00	182	1391	919	79	316	501	258	331	458	316
15:00	257	1641	1032	101	571	756	487	581	688	457
16:00	302	1927	1014	157	973	1055	690	699	985	553
17:00	355	2298	1477	174	969	1060	1053	1037	939	571
18:00	122	1362	576	87	440	502	485	476	446	199
19:00	47	512	227	31	139	175	197	186	136	77
20:00	39	323	142	34	65	107	93	108	69	55
21:00	31	344	180	32	83	115	159	160	90	29
22:00	7	114	104	7	73	84	49	40	73	16
23:00	8	71	94	5	46	60	13	31	55	19
Total	**3531**	**25127**	**13917**	**1604**	**8404**	**10233**	**7701**	**8291**	**9318**	**6075**

Most traffic:	25127	Site 2
Least traffic:	1604	Site 4

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician: Jm
Location : On West Jemez 100' East of S Site

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS2-7
Page : 1

Both directions

Begin Time	Mon. 01/27 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	*	*	*	*	*	*	0	29	1	36	1	65
12:15	*	*	*	*	*	*	0	29	0	31	0	60
12:30	*	*	*	*	*	*	0	21	0	43	0	64
12:45	*	*	*	*	*	*	0	24	1	43	1	67
01:00	*	*	*	*	*	*	0	29	0	49	0	78
01:15	*	*	*	*	*	*	1	22	1	32	2	54
01:30	*	*	*	*	*	*	0	17	0	26	0	43
01:45	*	27	*	17	*	44	0	31	0	37	0	68
02:00	*	32	*	24	*	56	0	21	1	21	1	42
02:15	*	36	*	17	*	53	0	21	1	20	1	41
02:30	*	22	*	26	*	48	0	26	0	22	0	48
02:45	*	22	*	19	*	41	1	30	0	21	1	51
03:00	*	23	*	28	*	51	0	24	0	25	0	49
03:15	*	39	*	22	*	61	0	50	0	24	0	74
03:30	*	36	*	19	*	55	0	37	0	30	0	67
03:45	*	32	*	25	*	57	0	42	1	25	1	67
04:00	*	51	*	37	*	88	0	35	1	26	1	61
04:15	*	37	*	34	*	71	0	36	0	41	0	77
04:30	*	61	*	33	*	94	2	46	1	33	3	79
04:45	*	38	*	36	*	74	0	55	1	30	1	85
05:00	*	56	*	42	*	98	0	65	3	33	3	98
05:15	*	68	*	37	*	105	4	66	3	38	7	104
05:30	*	52	*	33	*	85	1	58	4	36	5	94
05:45	*	30	*	22	*	52	10	27	13	32	23	59
06:00	*	25	*	18	*	43	8	23	8	16	16	39
06:15	*	14	*	17	*	31	31	21	25	21	56	42
06:30	*	10	*	12	*	22	22	8	34	15	56	23
06:45	*	6	*	10	*	16	30	8	87	10	117	18
07:00	*	5	*	11	*	16	59	6	57	9	116	15
07:15	*	6	*	7	*	13	40	2	57	3	97	5
07:30	*	0	*	13	*	13	59	13	65	8	124	21
07:45	*	4	*	6	*	10	44	0	68	6	112	6
08:00	*	4	*	4	*	8	27	1	56	8	83	9
08:15	*	3	*	5	*	8	24	2	63	11	87	13
08:30	*	0	*	5	*	5	29	1	44	7	73	8
08:45	*	0	*	6	*	6	25	1	29	8	54	9
09:00	*	2	*	2	*	4	19	4	23	11	42	15
09:15	*	0	*	5	*	5	36	1	25	4	61	5
09:30	*	3	*	6	*	9	29	0	15	4	44	4
09:45	*	0	*	0	*	0	32	4	24	3	56	7
10:00	*	4	*	4	*	8	28	0	24	2	52	2
10:15	*	0	*	5	*	5	19	1	21	1	40	2
10:30	*	0	*	1	*	1	18	0	20	1	38	1
10:45	*	1	*	0	*	1	27	0	25	2	52	2
11:00	*	2	*	2	*	4	39	2	14	2	53	4
11:15	*	1	*	2	*	3	45	2	32	1	77	3
11:30	*	1	*	0	*	1	37	0	24	0	61	0
11:45	*	1	*	1	*	2	47	0	17	1	64	1
Totals	0	754	0	613	0	1367	793	941	889	908	1682	1849
Day Totals		754		613		1367		1734		1797		3531
% Total	.0%	55.1%	.0%	44.8%			22.4%	26.6%	25.1%	25.7%		
Peaks		04:30		04:30		04:30	07:00	04:45	06:45	00:30	06:45	04:45
Volume		223		148		371	202	244	256	167	454	381
P.H.F.		.81		.88		.88	.85	.92	.76	.85	.91	.91

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3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician:Jm
Location :On West Jemez 100' East of
S Site

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS2-7
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Both directions

Begin Time	Wed. 01/29 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Thur. 01/30 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	1	33	1	27	2	60	1	33	1	22	2	55
12:15	0	30	3	37	3	67	1	19	2	26	3	45
12:30	1	24	0	30	1	54	1	22	2	27	3	49
12:45	0	31	1	24	1	55	0	23	0	36	0	59
01:00	0	19	0	40	0	59	1	25	0	32	1	57
01:15	0	20	0	27	0	47	0	19	0	28	0	47
01:30	0	22	1	34	1	56	0	26	1	32	1	58
01:45	0	22	1	29	1	51	0	25	0	27	0	52
02:00	0	22	0	27	0	49	0	22	0	25	0	47
02:15	0	22	0	27	0	49	1	22	1	19	2	41
02:30	1	26	0	27	1	53	1	36	1	22	2	58
02:45	0	25	0	11	0	36	0	40	1	22	1	62
03:00	0	29	0	25	0	54	0	30	1	24	1	54
03:15	0	52	0	24	0	76	0	32	0	26	0	58
03:30	0	37	0	23	0	60	0	38	0	29	0	67
03:45	0	43	0	26	0	69	1	35	1	26	2	61
04:00	0	45	1	47	1	92	0	37	0	30	0	67
04:15	0	50	0	34	0	84	1	42	0	29	1	71
04:30	1	37	0	45	1	82	2	58	0	37	2	95
04:45	3	62	2	21	5	83	0	54	2	30	2	84
05:00	1	69	3	36	4	105	0	52	2	34	2	86
05:15	2	50	1	38	3	88	4	72	4	33	8	105
05:30	5	51	10	32	15	83	3	47	5	23	8	70
05:45	8	40	10	35	18	75	8	28	16	29	24	57
06:00	13	11	10	16	23	27	16	25	12	12	28	37
06:15	24	10	21	16	45	26	20	8	25	23	45	31
06:30	26	3	37	19	63	22	29	13	36	15	65	28
06:45	36	8	90	10	126	18	40	4	84	8	124	12
07:00	40	7	53	8	93	15	45	1	80	19	125	20
07:15	50	4	44	13	94	17	51	4	53	10	104	14
07:30	50	5	53	9	103	14	56	3	51	6	107	9
07:45	34	3	78	10	112	13	48	3	69	9	117	12
08:00	34	1	68	2	102	3	41	3	52	7	93	10
08:15	24	2	47	11	71	13	30	5	58	6	88	11
08:30	37	2	44	7	81	9	12	3	28	5	40	8
08:45	21	0	42	1	63	1	23	0	28	6	51	6
09:00	26	1	21	5	47	6	31	2	25	3	56	5
09:15	14	2	33	3	47	5	28	0	26	5	54	5
09:30	17	2	24	4	41	6	23	0	17	4	40	4
09:45	36	4	26	1	62	5	17	0	20	5	37	5
10:00	21	5	15	4	36	9	23	0	13	3	36	3
10:15	22	3	22	0	44	3	23	1	29	3	52	4
10:30	39	3	26	1	65	4	17	2	23	0	40	2
10:45	26	2	13	1	39	3	25	1	24	1	49	2
11:00	37	0	18	3	55	3	33	0	30	3	63	3
11:15	45	1	19	2	64	3	39	0	16	2	55	2
11:30	37	0	25	0	62	0	33	0	22	2	55	2
11:45	28	1	29	0	57	1	63	0	28	1	91	1
Totals	760	941	892	872	1652	1813	791	915	889	826	1680	1741
Day Totals	1701		1764		3465		1706		1715		3421	
% Total	21.9%	27.1%	25.7%	25.1%			23.1%	26.7%	25.9%	24.1%		
Peaks	06:45	04:45	07:30	03:45	06:45	04:45	07:00	04:30	06:45	04:30	06:45	04:30
Volume	176	232	246	152	416	359	200	236	268	134	460	370
P.H.F.	.88	.84	.78	.80	.82	.85	.89	.81	.79	.90	.92	.88

Technician:Jm
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Location :On West Jemez 100' East of S Site

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS2-7
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Both directions

Begin Time	Fri. 01/31 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	0	18	1	19	1	37	0	9	1	11	1	20
12:15	0	22	1	18	1	40	1	14	1	13	2	27
12:30	1	22	0	25	1	47	0	10	1	17	1	27
12:45	1	23	0	19	1	42	2	7	1	15	3	22
01:00	0	14	1	26	1	40	1	21	1	12	2	33
01:15	0	25	1	29	1	54	1	10	0	7	1	17
01:30	3	23	0	30	3	53	0	20	3	8	3	28
01:45	1	19	0	23	1	42	0	8	1	14	1	22
02:00	0	32	0	35	0	67	0	11	0	10	0	21
02:15	0	29	0	24	0	53	1	11	0	11	1	22
02:30	0	13	0	15	0	28	1	15	0	9	1	24
02:45	0	27	0	23	0	50	0	6	0	13	0	19
03:00	0	28	0	18	0	46	0	12	0	21	0	33
03:15	0	33	0	26	0	59	0	21	0	12	0	33
03:30	0	45	0	37	0	82	1	15	0	16	1	31
03:45	1	44	0	28	1	72	0	11	0	18	0	29
04:00	0	29	1	30	1	59	0	11	0	13	0	24
04:15	0	28	0	34	0	62	0	16	0	16	0	32
04:30	1	28	0	24	1	52	0	13	0	11	0	24
04:45	1	35	2	17	3	52	0	21	1	3	1	24
05:00	1	21	0	29	1	50	1	15	1	10	2	25
05:15	1	14	4	17	5	31	0	9	1	13	1	22
05:30	4	19	3	12	7	31	2	9	0	4	2	13
05:45	7	13	6	14	13	27	3	13	1	4	4	17
06:00	2	11	9	13	11	24	1	13	7	7	8	20
06:15	21	14	21	14	42	28	3	12	7	3	10	15
06:30	22	2	36	5	58	7	3	6	6	10	9	16
06:45	19	6	36	10	55	16	6	2	6	4	12	6
07:00	24	5	41	7	65	12	4	2	7	4	11	6
07:15	38	0	34	6	72	6	1	1	11	1	12	2
07:30	34	1	27	5	61	6	12	2	11	4	23	6
07:45	40	2	54	7	94	9	10	0	3	6	13	6
08:00	32	1	52	6	84	7	5	2	10	1	15	3
08:15	25	2	46	6	71	8	8	3	10	4	18	7
08:30	20	6	31	8	51	14	10	0	5	1	15	1
08:45	21	1	20	1	41	2	13	3	10	3	23	6
09:00	20	2	24	2	44	4	7	3	13	2	20	5
09:15	26	1	24	4	50	5	8	1	5	6	13	7
09:30	27	1	33	3	60	4	4	0	9	4	13	4
09:45	25	0	20	4	45	4	8	1	10	7	18	8
10:00	25	2	11	3	36	5	12	0	15	5	27	5
10:15	27	2	26	4	53	6	5	3	11	4	16	7
10:30	26	2	15	7	41	9	14	4	12	1	26	5
10:45	25	1	15	3	40	4	8	1	7	2	15	3
11:00	33	0	14	4	47	4	11	0	16	3	27	3
11:15	20	1	20	1	40	2	6	1	15	0	21	1
11:30	31	0	11	3	42	3	20	2	9	1	29	3
11:45	30	0	17	5	47	5	13	1	14	3	27	4
Totals	635	667	657	703	1292	1370	206	371	242	367	448	738
Day Totals	1302		1360		2662		577		609		1186	
% Total	23.8%	25.0%	24.6%	26.4%			17.3%	31.2%	20.4%	30.9%		
Peaks	07:15	03:15	07:45	03:30	07:15	03:30	11:00	04:15	11:00	03:00	11:00	03:00
Volume	144	151	183	129	311	275	50	65	54	67	104	126
P.H.F.	.9	.83	.84	.87	.82	.83	.62	.77	.84	.79	.89	.95

Technician: Jm
Location : On West Jemez 100' East of
S Site

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS2-7
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Both directions

Begin Time	Sun. 02/02	East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Mon. 02/03	East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00		0	11	1	7	1	18		2	30	1	20	3	50
12:15		2	12	1	17	3	29		1	15	0	25	1	40
12:30		1	7	1	12	2	19		0	28	0	25	0	53
12:45		0	12	2	13	2	25		0	22	0	30	0	52
01:00		1	15	1	13	2	28		0	22	0	40	0	62
01:15		1	10	4	11	5	21		0	21	1	24	1	45
01:30		2	10	1	7	3	17		1	23	1	29	2	52
01:45		2	11	1	15	3	26		1	30	0	16	1	46
02:00		0	15	0	11	0	26		0	31	0	24	0	55
02:15		1	10	0	9	1	19		0	23	0	28	0	51
02:30		2	17	0	12	2	29		0	32	0	34	0	66
02:45		0	9	0	15	0	24		0	31	1	20	1	51
03:00		0	11	0	6	0	17		0	28	0	21	0	49
03:15		1	15	0	13	1	28		0	33	1	18	1	51
03:30		0	11	0	7	0	18		2	55	1	26	3	81
03:45		0	17	0	3	0	20		0	31	0	23	0	54
04:00		0	6	0	9	0	15		0	29	0	34	0	63
04:15		0	12	1	10	1	22		2	41	0	31	2	72
04:30		0	10	0	7	0	17		2	59	0	33	2	92
04:45		1	18	0	13	1	31		0	73	2	30	2	103
05:00		0	7	0	5	0	12		1	51	4	33	5	84
05:15		0	9	0	7	0	16		5	54	4	47	9	101
05:30		1	14	0	3	1	17		5	39	9	40	14	79
05:45		0	5	0	3	0	8		3	32	7	28	10	60
06:00		0	13	0	10	0	23		13	11	11	24	24	35
06:15		1	3	0	8	1	11		20	34	29	15	49	49
06:30		3	9	0	3	3	12		28	12	36	11	64	23
06:45		4	8	1	3	5	11		40	7	74	5	114	12
07:00		3	6	1	1	4	7		35	4	59	8	94	12
07:15		2	3	5	6	7	9		59	2	50	7	109	9
07:30		1	2	3	1	4	3		36	9	63	6	99	15
07:45		8	1	5	1	13	2		49	3	66	6	115	9
08:00		5	4	11	3	16	7		33	1	53	3	86	4
08:15		7	1	6	2	13	3		29	3	71	5	100	8
08:30		5	2	5	8	10	10		31	2	40	4	71	6
08:45		5	2	2	4	7	6		29	0	29	8	58	8
09:00		9	2	8	4	17	6		23	0	25	3	48	3
09:15		6	3	8	5	14	8		19	0	24	4	43	4
09:30		2	2	7	0	9	2		27	0	19	6	46	6
09:45		7	3	9	1	16	4		32	1	24	2	56	3
10:00		4	2	5	2	9	4		22	1	26	2	48	3
10:15		7	1	12	4	19	5		25	2	17	4	42	6
10:30		16	1	11	2	27	3		24	1	16	4	40	5
10:45		6	3	9	0	15	3		26	1	14	3	40	4
11:00		12	0	9	2	21	2		27	1	25	1	52	2
11:15		6	0	18	0	24	0		41	0	23	2	64	2
11:30		9	2	17	2	26	4		35	0	28	0	63	0
11:45		9	0	17	1	26	1		29	1	27	2	56	3
Totals		152	347	182	301	334	648		757	929	881	814	1638	1743
Day Totals		499		483		982			1686		1695		3381	
% Total		15.4%	35.3%	18.5%	30.6%				22.3%	27.4%	26.0%	24.0%		
Peaks		10:15	03:00	11:00	00:15	11:00	00:15		07:00	04:30	07:30	04:45	07:00	04:30
Volume		41	54	61	55	97	101		179	237	253	150	417	380
P.H.F.		.64	.79	.84	.80	.93	.87		.75	.81	.89	.79	.90	.92

Technician: Jm
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Location : On West Jemez 100' East of S Site

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS2-7
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Both directions

Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	1	21	0	30	1	51	0	30	0	32	0	62
12:15	0	34	0	30	0	64	0	23	1	31	1	54
12:30	1	32	2	34	3	66	0	31	0	44	0	75
12:45	1	26	1	52	2	78	0	30	1	40	1	70
01:00	1	27	1	40	2	67	1	28	0	38	1	66
01:15	1	32	0	40	1	72	2	33	3	28	5	61
01:30	0	21	1	25	1	46	0	19	1	22	1	41
01:45	0	32	0	34	0	66	1	23	0	25	1	48
02:00	0	25	0	22	0	47	0	25	0	27	0	52
02:15	1	22	1	26	2	48	0	20	0	15	0	35
02:30	1	39	0	18	1	57	0	20	0	20	0	40
02:45	0	36	0	25	0	61	0	25	0	24	0	49
03:00	0	30	0	21	0	51	0	32	0	26	0	58
03:15	0	40	0	26	0	66	0	52	1	36	1	88
03:30	0	43	0	29	0	72	0	48	0	31	0	79
03:45	1	33	0	26	1	59	1	30	0	21	1	51
04:00	0	56	0	40	0	96	0	40	0	35	0	75
04:15	0	40	2	23	2	63	0	46	1	43	1	89
04:30	1	60	1	32	2	92	1	64	0	29	1	93
04:45	1	60	2	34	3	94	1	51	1	16	2	67
05:00	2	60	0	32	2	92	0	65	2	36	2	101
05:15	6	44	1	41	7	85	6	61	1	40	7	101
05:30	6	38	6	36	12	74	3	43	6	57	9	100
05:45	8	31	20	23	28	54	6	38	11	23	17	61
06:00	21	22	13	32	34	54	10	14	14	18	24	32
06:15	21	27	18	22	39	49	18	14	31	22	49	36
06:30	34	9	38	13	72	22	27	19	29	10	56	29
06:45	29	10	80	7	109	17	38	12	84	10	122	22
07:00	51	5	69	9	120	14	33	2	72	10	105	12
07:15	39	2	54	9	93	11	57	3	48	9	105	12
07:30	53	1	66	9	119	10	44	5	66	6	110	11
07:45	52	4	80	7	132	11	46	0	69	4	115	4
08:00	30	3	70	3	100	6	36	5	57	4	93	9
08:15	26	3	52	4	78	7	31	3	46	6	77	9
08:30	35	2	36	7	71	9	27	4	39	7	66	11
08:45	27	2	40	2	67	4	24	3	38	8	62	11
09:00	31	2	20	12	51	14	16	1	26	3	42	4
09:15	25	1	30	4	55	5	30	0	20	6	50	6
09:30	27	2	20	5	47	7	25	2	28	4	53	6
09:45	37	3	25	2	62	5	24	1	29	2	53	3
10:00	29	8	21	4	50	12	17	2	31	4	48	6
10:15	20	1	25	1	45	2	24	1	21	2	45	3
10:30	28	1	21	3	49	4	30	2	12	0	42	2
10:45	38	3	34	1	72	4	26	2	16	1	42	3
11:00	28	1	24	1	52	2	32	1	18	4	50	5
11:15	42	1	16	2	58	3	35	0	32	1	67	1
11:30	38	1	23	0	61	1	46	0	13	0	59	0
11:45	39	1	31	1	70	2	39	2	20	1	59	3
Totals	832	997	944	899	1776	1896	757	975	888	881	1645	1856
Day Totals	1829		1843		3672		1732		1769		3501	
% Total	22.6%	27.1%	25.7%	24.4%			21.6%	27.8%	25.3%	25.1%		
Peaks	07:00	04:30	07:15	00:30	07:00	04:30	07:15	04:30	06:45	05:00	06:45	04:45
Volume	195	224	270	166	464	363	183	241	270	156	442	369
P.H.F.	.91	.93	.84	.79	.87	.96	.80	.92	.80	.68	.90	.91

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician:Jm
Location :On West Jemez 100' East of
S Site

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS2-7
Page : 6

Both directions

Begin Time	Thur. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	1	*	3	*	4	*	*	*	*	*	*	*
12:15	0	*	0	*	0	*	*	*	*	*	*	*
12:30	1	*	0	*	1	*	*	*	*	*	*	*
12:45	0	*	0	*	0	*	*	*	*	*	*	*
01:00	0	*	0	*	0	*	*	*	*	*	*	*
01:15	0	*	0	*	0	*	*	*	*	*	*	*
01:30	0	*	1	*	1	*	*	*	*	*	*	*
01:45	0	*	0	*	0	*	*	*	*	*	*	*
02:00	0	*	0	*	0	*	*	*	*	*	*	*
02:15	1	*	0	*	1	*	*	*	*	*	*	*
02:30	0	*	0	*	0	*	*	*	*	*	*	*
02:45	0	*	0	*	0	*	*	*	*	*	*	*
03:00	0	*	0	*	0	*	*	*	*	*	*	*
03:15	0	*	3	*	3	*	*	*	*	*	*	*
03:30	1	*	0	*	1	*	*	*	*	*	*	*
03:45	0	*	0	*	0	*	*	*	*	*	*	*
04:00	0	*	1	*	1	*	*	*	*	*	*	*
04:15	1	*	0	*	1	*	*	*	*	*	*	*
04:30	1	*	0	*	1	*	*	*	*	*	*	*
04:45	0	*	1	*	1	*	*	*	*	*	*	*
05:00	1	*	1	*	2	*	*	*	*	*	*	*
05:15	4	*	3	*	7	*	*	*	*	*	*	*
05:30	3	*	3	*	6	*	*	*	*	*	*	*
05:45	9	*	16	*	25	*	*	*	*	*	*	*
06:00	13	*	12	*	25	*	*	*	*	*	*	*
06:15	20	*	29	*	49	*	*	*	*	*	*	*
06:30	35	*	32	*	67	*	*	*	*	*	*	*
06:45	33	*	76	*	109	*	*	*	*	*	*	*
07:00	26	*	69	*	95	*	*	*	*	*	*	*
07:15	54	*	50	*	104	*	*	*	*	*	*	*
07:30	50	*	59	*	109	*	*	*	*	*	*	*
07:45	46	*	74	*	120	*	*	*	*	*	*	*
08:00	37	*	48	*	85	*	*	*	*	*	*	*
08:15	30	*	59	*	89	*	*	*	*	*	*	*
08:30	33	*	35	*	68	*	*	*	*	*	*	*
08:45	31	*	37	*	68	*	*	*	*	*	*	*
09:00	21	*	36	*	57	*	*	*	*	*	*	*
09:15	19	*	22	*	41	*	*	*	*	*	*	*
09:30	22	*	17	*	39	*	*	*	*	*	*	*
09:45	37	*	31	*	68	*	*	*	*	*	*	*
10:00	24	*	22	*	46	*	*	*	*	*	*	*
10:15	15	*	21	*	36	*	*	*	*	*	*	*
10:30	30	*	25	*	55	*	*	*	*	*	*	*
10:45	29	*	23	*	52	*	*	*	*	*	*	*
11:00	36	*	35	*	71	*	*	*	*	*	*	*
11:15	41	*	24	*	65	*	*	*	*	*	*	*
11:30	46	*	23	*	69	*	*	*	*	*	*	*
11:45	*	*	*	*	*	*	*	*	*	*	*	*
Totals	751	0	891	0	1642	0	0	0	0	0	0	0
Day Totals	751		891		1642		0		0		0	
Total	45.7%	.0%	54.2%	.0%			*	*	*	*		

Peaks	07:15	06:45	07:00
Volume	187	254	428
P.H.F.	.86	.83	.89

Technician: JM
Location : On Diamond Drive 250' North of Jemez

DIGITAL TRAFFIC SYST
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

PAGE 02
Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS14-7
Page : 1

Both directions

Begin Time	Mon. 01/27 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.
12:00	*	*	*	*	*	*	12	329	5	223	17	552
12:15	*	*	*	*	*	*	7	248	3	283	10	531
12:30	*	*	*	*	*	*	5	264	3	329	8	593
12:45	*	*	*	*	*	*	10	229	2	351	12	580
01:00	*	*	*	*	*	*	10	232	3	300	13	532
01:15	*	207	*	256	*	463	1	210	0	239	1	449
01:30	*	168	*	195	*	363	2	154	2	205	4	359
01:45	*	182	*	204	*	386	3	189	2	210	5	399
02:00	*	151	*	134	*	285	2	160	2	185	4	345
02:15	*	173	*	179	*	352	1	175	2	197	3	372
02:30	*	165	*	179	*	344	1	157	2	166	3	323
02:45	*	189	*	172	*	361	0	197	0	154	0	351
03:00	*	214	*	167	*	381	1	182	0	167	1	349
03:15	*	205	*	190	*	395	3	216	1	234	4	450
03:30	*	279	*	148	*	427	5	280	2	163	7	443
03:45	*	238	*	154	*	392	2	255	4	144	6	399
04:00	*	345	*	138	*	483	1	384	3	140	4	524
04:15	*	278	*	159	*	437	1	276	2	144	3	420
04:30	*	341	*	134	*	475	3	381	14	151	17	532
04:45	*	330	*	142	*	472	7	343	12	108	19	451
05:00	*	499	*	149	*	648	6	476	13	151	19	627
05:15	*	444	*	146	*	590	3	477	24	147	27	624
05:30	*	394	*	145	*	539	13	450	34	137	47	587
05:45	*	377	*	106	*	483	15	354	46	106	61	460
06:00	*	284	*	92	*	376	39	333	108	107	147	440
06:15	*	245	*	69	*	314	65	297	168	92	233	389
06:30	*	198	*	49	*	247	49	187	244	59	293	246
06:45	*	155	*	53	*	208	140	221	445	66	585	287
07:00	*	106	*	58	*	164	134	115	385	62	519	177
07:15	*	84	*	58	*	142	194	63	426	49	620	112
07:30	*	65	*	57	*	122	278	57	384	52	662	109
07:45	*	87	*	35	*	122	351	66	362	48	713	114
08:00	*	42	*	40	*	82	333	44	394	39	727	83
08:15	*	43	*	30	*	73	185	43	375	49	560	92
08:30	*	37	*	46	*	83	135	33	228	42	363	75
08:45	*	25	*	44	*	69	191	32	249	41	440	73
09:00	*	20	*	44	*	64	176	22	189	99	365	121
09:15	*	26	*	31	*	57	204	34	186	71	390	105
09:30	*	21	*	28	*	49	232	20	168	48	400	68
09:45	*	26	*	17	*	43	230	25	175	25	405	50
10:00	*	25	*	16	*	41	191	21	158	10	349	31
10:15	*	10	*	26	*	36	147	17	150	12	297	29
10:30	*	9	*	15	*	24	144	19	152	13	296	32
10:45	*	6	*	11	*	17	205	13	141	9	346	22
11:00	*	25	*	6	*	31	232	12	154	8	386	20
11:15	*	16	*	1	*	17	286	12	241	3	527	15
11:30	*	17	*	4	*	21	345	21	213	5	558	26
11:45	*	5	*	4	*	9	449	6	224	4	673	10
Totals	0	6756	0	3931	0	10687	5049	8331	6100	5647	11149	13978
Day Totals		6756		3931		10687		13380		11747		25127
% Total	.0%	63.2%	.0%	36.7%			20.0%	33.1%	24.2%	22.4%		
Peaks		05:00		01:15		05:00	11:00	05:00	06:45	00:15	07:15	05:00
Volume		1714		789		2260	1312	1757	1640	1263	2722	2298
P.H.F.		.85		.77		.87	.73	.92	.92	.89	.93	.91

Site 2, Page 1

DIGITAL TRAFFIC SYST
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician:JM
Location :On Diamond Drive 250' North of Jemez

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS14-7
Page : 2

Both directions

Begin Time	Wed. 01/29 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.	Thur. 01/30 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.
12:00	12	347	3	245	15	592	17	400	9	261	26	661
12:15	10	278	3	290	13	568	4	276	3	324	7	600
12:30	4	220	3	289	7	509	5	257	4	344	9	601
12:45	5	283	2	354	7	637	8	227	2	375	10	602
01:00	2	202	1	361	3	563	0	226	1	316	1	542
01:15	4	180	2	275	6	455	5	214	3	328	8	542
01:30	1	167	0	242	1	409	3	191	0	233	3	424
01:45	5	162	2	204	7	366	1	201	0	228	1	429
02:00	8	167	0	161	8	328	3	148	0	157	3	305
02:15	4	168	1	163	5	331	3	174	6	169	9	343
02:30	1	172	1	149	2	321	3	188	8	161	11	349
02:45	1	227	0	153	1	380	3	213	0	157	3	370
03:00	2	202	2	167	4	369	0	220	1	179	1	399
03:15	2	249	2	214	4	463	5	225	5	246	10	471
03:30	0	349	0	159	0	518	2	352	3	213	5	565
03:45	3	317	6	156	9	473	0	308	3	187	3	495
04:00	2	420	5	165	7	585	3	411	3	144	6	555
04:15	0	344	4	133	4	477	2	283	6	137	8	420
04:30	3	373	7	178	10	551	3	373	8	152	11	525
04:45	6	400	12	125	18	525	5	395	10	129	15	524
05:00	2	519	12	209	14	728	5	512	15	166	20	678
05:15	12	509	28	183	40	692	12	526	32	149	44	675
05:30	9	502	42	130	51	632	10	492	23	143	33	635
05:45	39	420	56	121	95	541	18	426	65	105	83	531
06:00	18	347	100	105	118	452	24	387	101	101	125	488
06:15	63	264	153	88	216	352	63	268	160	80	223	348
06:30	58	231	271	88	329	319	55	215	268	91	323	306
06:45	122	177	430	78	552	255	148	166	443	76	591	242
07:00	150	143	378	83	528	226	148	154	409	92	557	246
07:15	176	102	402	58	578	160	219	108	428	58	647	166
07:30	272	70	423	61	695	131	277	85	424	62	701	147
07:45	368	78	449	62	817	140	428	96	429	67	857	163
08:00	321	74	405	43	726	117	384	70	412	60	796	130
08:15	196	42	309	44	505	86	283	41	357	47	640	88
08:30	176	37	258	51	434	88	232	40	247	58	479	98
08:45	220	35	215	48	435	83	226	37	244	39	470	76
09:00	154	21	178	36	332	57	168	29	202	37	370	66
09:15	152	44	164	25	316	69	139	43	199	45	338	88
09:30	190	26	152	25	342	51	140	23	171	31	311	54
09:45	174	31	201	38	375	69	194	32	177	25	371	57
10:00	172	28	134	13	306	41	152	38	177	23	329	61
10:15	138	22	136	18	274	40	174	15	133	28	307	43
10:30	150	19	140	21	290	40	142	24	153	13	295	37
10:45	196	13	162	19	358	32	197	13	156	16	353	29
11:00	268	14	157	7	425	21	254	10	153	4	407	14
11:15	341	20	155	8	496	28	354	26	172	11	526	37
11:30	383	21	181	5	564	26	438	10	183	8	621	18
11:45	377	11	244	3	621	14	432	15	238	5	670	20
Totals	4972	9047	5991	5863	10963	14910	5391	9183	6246	6080	11637	15263
Day Totals	14019		11854		25873		14574		12326		26900	
Total	19.2%	34.9%	23.1%	22.6%			20.0%	34.1%	23.2%	22.6%		
Peaks	11:00	05:00	07:15	00:15	07:15	05:00	11:00	05:00	06:45	00:30	07:15	05:00
Volume	1369	1950	1679	1294	2816	2593	1478	1956	1704	1363	3001	2519
P.H.F.	.89	.93	.93	.89	.86	.89	.84	.92	.96	.90	.87	.92

Technician: JM
Location : On Diamond Drive 250' North of Jemez

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS14-7
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Both directions

Begin Time	Fri. 01/31 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.
12:00	11	266	4	214	15	480	25	79	7	74	32	153
12:15	11	204	11	249	22	453	12	61	9	57	21	118
12:30	7	234	2	217	9	451	12	82	10	77	22	159
12:45	8	224	2	289	10	513	7	66	7	74	14	140
01:00	6	191	3	231	9	422	5	84	4	73	9	157
01:15	2	177	1	202	3	379	5	57	5	50	10	107
01:30	0	158	3	199	3	357	7	66	6	70	13	136
01:45	4	150	3	177	7	327	4	71	2	56	6	127
02:00	3	169	2	147	5	316	2	61	1	70	3	131
02:15	2	131	2	160	4	291	1	63	4	77	5	140
02:30	1	161	3	124	4	285	2	75	2	64	4	139
02:45	4	199	0	141	4	340	7	68	1	82	8	150
03:00	1	239	2	175	3	414	1	89	0	71	1	160
03:15	1	211	2	187	3	398	1	78	1	54	2	132
03:30	2	285	1	166	3	451	2	80	2	53	4	133
03:45	8	266	2	111	10	377	3	93	0	55	3	148
04:00	0	365	4	124	4	489	1	77	0	58	1	135
04:15	1	244	7	125	8	369	0	80	0	42	0	122
04:30	3	230	8	124	11	354	5	85	5	47	10	132
04:45	3	238	8	118	11	356	3	71	1	46	4	117
05:00	10	311	8	127	18	438	4	107	3	59	7	166
05:15	11	272	17	120	28	392	5	86	3	67	8	153
05:30	14	231	23	84	37	315	9	90	7	28	16	118
05:45	18	210	34	74	52	284	10	100	9	40	19	140
06:00	29	160	61	57	90	217	8	84	14	41	22	125
06:15	60	146	118	73	178	219	5	96	13	48	18	144
06:30	66	121	156	52	222	173	18	79	23	45	41	124
06:45	89	119	258	44	347	163	30	84	30	38	60	122
07:00	121	104	249	48	370	152	21	69	21	29	42	98
07:15	192	71	265	46	457	117	21	58	25	23	46	81
07:30	230	55	240	31	470	86	52	46	39	25	91	71
07:45	330	39	327	36	657	75	97	46	43	31	140	77
08:00	269	46	324	38	593	84	68	27	51	35	119	62
08:15	208	46	282	41	490	87	54	27	39	35	93	62
08:30	164	48	212	27	376	75	56	29	45	22	101	51
08:45	173	49	198	43	371	92	105	28	58	22	163	50
09:00	174	41	174	28	348	69	68	35	51	21	119	56
09:15	144	32	175	26	319	58	65	44	60	37	125	81
09:30	152	36	153	21	305	57	59	37	57	79	116	115
09:45	182	29	145	15	327	44	90	29	80	37	170	66
10:00	145	32	147	15	292	47	64	29	79	17	143	46
10:15	145	24	150	11	295	35	57	23	73	15	130	38
10:30	172	12	140	30	312	42	68	20	68	20	136	40
10:45	187	15	142	16	329	31	66	21	80	23	148	44
11:00	216	18	134	19	350	37	59	19	60	14	119	33
11:15	309	29	156	27	465	56	61	17	72	16	133	33
11:30	327	35	155	19	482	54	58	21	59	12	117	33
11:45	325	25	182	12	507	37	86	21	71	17	157	38
Totals	4540	6598	4695	4660	9235	11358	1471	2858	1300	2146	2771	5004
Day Totals	11238		9355		20593		4329		3446		7775	
Total	22.0%	32.5%	22.8%	22.6%			18.9%	36.7%	16.7%	27.6%		
Peaks	11:00	03:30	07:30	00:15	07:30	00:00	08:45	05:00	09:45	02:15	09:45	02:15
Volume	1177	1160	1173	986	2210	1897	297	383	300	294	579	589
P.H.F.	.89	.79	.89	.85	.84	.92	.70	.89	.93	.89	.85	.92

Technician: JM
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Location : On Diamond Drive 250' North of Jemèz

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS14-7
Page : 4

Both directions

Begin Time	Sun. 02/02 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.	Mon. 02/03 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.
12:00	19	65	5	96	24	161	9	398	4	231	13	629
12:15	10	65	5	127	15	192	3	313	3	266	6	579
12:30	16	63	6	73	22	136	2	280	2	342	4	622
12:45	7	92	7	78	14	170	5	375	3	394	8	769
01:00	9	74	7	78	16	152	5	230	3	322	8	552
01:15	4	66	7	51	11	117	4	183	2	252	6	435
01:30	2	67	3	55	5	122	1	142	1	347	2	489
01:45	4	56	3	54	7	110	1	123	2	361	3	484
02:00	4	62	1	54	5	116	3	128	0	319	3	447
02:15	4	58	3	73	7	131	4	139	3	327	7	466
02:30	3	63	2	68	5	131	0	127	1	301	1	428
02:45	7	68	2	62	9	130	0	161	0	332	0	493
03:00	1	66	1	59	2	125	1	157	1	328	2	485
03:15	3	63	0	53	3	116	2	162	3	351	5	513
03:30	2	73	1	37	3	110	5	246	2	366	7	612
03:45	0	76	3	43	3	119	0	240	1	342	1	582
04:00	3	68	1	47	4	115	1	350	4	439	5	789
04:15	1	74	1	37	2	111	0	232	5	301	5	533
04:30	4	73	3	45	7	118	5	371	10	379	15	750
04:45	1	101	3	36	4	137	4	397	11	339	15	736
05:00	1	74	2	51	3	125	13	563	11	393	24	956
05:15	3	74	2	48	5	122	9	520	27	437	36	957
05:30	1	74	2	38	3	112	11	472	43	324	54	796
05:45	1	64	4	44	5	108	15	371	53	321	68	692
06:00	12	70	6	42	18	112	26	318	68	277	94	595
06:15	9	73	4	35	13	108	62	267	154	258	216	525
06:30	15	94	10	44	25	138	67	173	219	219	286	392
06:45	18	93	25	30	43	123	165	134	415	157	580	291
07:00	6	50	13	31	19	81	176	98	377	158	553	256
07:15	12	44	13	25	25	69	250	93	403	138	653	231
07:30	19	37	14	21	33	58	313	50	421	107	734	157
07:45	45	37	20	15	65	52	337	57	430	88	767	145
08:00	46	36	32	23	78	59	287	40	391	72	678	112
08:15	46	31	25	18	71	49	329	38	370	85	699	123
08:30	48	16	35	31	83	47	274	35	333	64	607	99
08:45	127	45	41	50	168	95	281	24	268	68	549	92
09:00	62	32	42	33	104	65	219	29	223	62	442	91
09:15	90	21	40	23	130	44	225	20	187	47	412	67
09:30	43	23	38	18	81	41	209	23	198	46	407	69
09:45	48	18	44	25	92	43	224	10	203	37	427	47
10:00	70	34	56	20	126	54	237	17	164	41	401	58
10:15	71	8	69	14	140	22	236	12	152	31	388	43
10:30	67	23	53	14	120	37	174	19	151	37	325	56
10:45	65	17	67	16	132	33	245	7	144	20	389	27
11:00	82	10	55	11	137	21	287	18	179	17	466	35
11:15	66	21	72	5	138	26	384	12	180	27	564	39
11:30	46	20	60	11	106	31	424	20	184	31	608	51
11:45	55	8	70	7	125	15	418	13	211	27	629	40
Totals	1278	2540	978	1959	2256	4509	5952	8207	6220	10228	12172	18435
Day Totals	3818		2947		6765		14159		16448		30607	
Total	18.8%	37.5%	14.4%	29.1%			19.4%	26.8%	20.3%	33.4%		
Peaks	08:30	06:00	11:00	00:00	10:15	00:00	11:00	04:45	07:15	04:30	07:30	04:45
Volume	327	330	257	374	529	659	1513	1952	1645	1548	2878	3445
P.H.F.	.64	.87	.89	.73	.94	.85	.89	.86	.95	.88	.93	.89

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician
Location :On Diamond Drive 250' North of Jemez

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS14-7
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Both directions

Begin Time	Tues. 02/04 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.
12:00	9	283	19	486	28	769	3	320	8	470	11	790
12:15	8	255	19	483	27	738	9	351	13	525	22	876
12:30	2	233	11	515	13	748	1	252	2	466	3	718
12:45	4	235	9	539	13	774	5	238	12	527	17	765
01:00	2	177	3	445	5	622	1	173	3	467	4	640
01:15	1	163	3	411	4	574	3	221	3	479	6	700
01:30	2	133	0	368	2	501	2	162	7	341	9	503
01:45	1	123	5	321	6	444	1	138	2	337	3	475
02:00	2	129	5	307	7	436	2	121	6	295	8	416
02:15	2	148	8	334	10	482	0	140	0	288	0	428
02:30	0	151	0	328	0	479	2	182	5	327	7	509
02:45	1	160	4	292	5	452	4	194	4	327	8	521
03:00	1	188	2	351	3	539	0	181	0	298	0	479
03:15	3	170	3	380	6	550	2	182	7	343	9	525
03:30	1	208	4	441	5	649	1	220	4	382	5	602
03:45	3	197	3	362	6	559	3	195	5	335	8	530
04:00	1	298	5	458	6	756	3	276	7	469	10	745
04:15	3	245	9	379	12	624	3	288	8	292	11	580
04:30	2	314	10	418	12	732	2	391	6	350	8	741
04:45	3	359	14	333	17	692	6	399	21	313	27	712
05:00	3	537	13	451	16	988	5	507	16	426	21	933
05:15	6	509	30	374	36	883	6	523	33	396	39	919
05:30	3	514	37	316	40	830	11	534	45	403	56	937
05:45	31	373	79	258	110	631	21	473	80	345	101	818
06:00	16	337	109	229	125	566	27	323	120	259	147	582
06:15	43	293	209	196	252	489	58	291	195	283	253	574
06:30	49	217	279	209	328	426	51	265	290	206	341	471
06:45	151	171	530	153	681	324	130	203	517	178	647	381
07:00	187	107	508	139	695	246	144	131	521	115	665	246
07:15	191	95	566	133	757	228	206	114	558	107	764	221
07:30	291	47	598	102	889	149	329	101	582	104	911	205
07:45	383	51	683	93	1066	144	363	77	582	72	945	149
08:00	280	43	524	73	804	116	367	80	491	82	858	162
08:15	258	21	473	53	731	74	253	67	475	51	728	118
08:30	235	33	399	78	634	111	272	60	370	53	642	113
08:45	248	34	388	61	636	95	268	55	321	74	589	129
09:00	183	29	294	72	477	101	201	50	245	60	446	110
09:15	205	23	288	94	493	117	230	38	199	35	429	73
09:30	178	23	275	60	453	83	235	41	224	49	459	90
09:45	194	12	325	38	519	50	220	16	252	33	472	49
10:00	176	34	288	51	464	85	168	31	229	54	397	85
10:15	151	17	281	31	432	48	143	25	242	35	385	60
10:30	144	16	283	36	427	52	111	22	232	27	343	49
10:45	186	12	298	31	484	43	176	14	264	17	440	31
11:00	247	15	383	17	630	32	175	18	268	25	443	43
11:15	231	14	376	17	607	31	203	16	377	18	580	34
11:30	291	11	492	19	783	30	284	14	412	28	696	42
11:45	352	12	530	16	882	28	305	6	461	21	766	27
Totals	4964	7769	9674	11351	14638	19120	5015	8719	8724	11187	13739	19906
Day Totals	12733		21025		33758		13734		19911		33645	
Total	14.7%	23.0%	28.6%	33.6%			14.9%	25.9%	25.9%	33.2%		
Peaks	07:30	05:00	07:15	00:00	07:15	04:45	07:30	05:00	07:00	00:00	07:15	05:00
Volume	1212	1933	2371	2023	3516	3393	1312	2037	2243	1988	3478	3607
P.H.F.	.79	.89	.86	.93	.82	.85	.89	.95	.96	.94	.92	.96

Technician: JM
Location : On Diamond Drive 250' North of Jemez

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS14-7
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Both directions

Begin Time	Thur. 02/06 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 North A.M.	North P.M.	South A.M.	South P.M.	Combined A.M.	Combined P.M.
12:00	12	*	10	*	22	*	*	*	*	*	*	*
12:15	5	*	5	*	10	*	*	*	*	*	*	*
12:30	8	*	7	*	15	*	*	*	*	*	*	*
12:45	5	*	1	*	6	*	*	*	*	*	*	*
01:00	5	*	11	*	16	*	*	*	*	*	*	*
01:15	6	*	6	*	12	*	*	*	*	*	*	*
01:30	3	*	2	*	5	*	*	*	*	*	*	*
01:45	4	*	6	*	10	*	*	*	*	*	*	*
02:00	4	*	2	*	6	*	*	*	*	*	*	*
02:15	1	*	2	*	3	*	*	*	*	*	*	*
02:30	1	*	0	*	1	*	*	*	*	*	*	*
02:45	1	*	2	*	3	*	*	*	*	*	*	*
03:00	0	*	0	*	0	*	*	*	*	*	*	*
03:15	3	*	5	*	8	*	*	*	*	*	*	*
03:30	5	*	9	*	14	*	*	*	*	*	*	*
03:45	2	*	2	*	4	*	*	*	*	*	*	*
04:00	6	*	4	*	10	*	*	*	*	*	*	*
04:15	4	*	2	*	6	*	*	*	*	*	*	*
04:30	6	*	4	*	10	*	*	*	*	*	*	*
04:45	18	*	12	*	30	*	*	*	*	*	*	*
05:00	14	*	10	*	24	*	*	*	*	*	*	*
05:15	31	*	9	*	40	*	*	*	*	*	*	*
05:30	36	*	18	*	54	*	*	*	*	*	*	*
05:45	61	*	21	*	82	*	*	*	*	*	*	*
06:00	112	*	50	*	162	*	*	*	*	*	*	*
06:15	159	*	63	*	222	*	*	*	*	*	*	*
06:30	212	*	82	*	294	*	*	*	*	*	*	*
06:45	428	*	122	*	550	*	*	*	*	*	*	*
07:00	387	*	120	*	507	*	*	*	*	*	*	*
07:15	444	*	227	*	671	*	*	*	*	*	*	*
07:30	481	*	311	*	792	*	*	*	*	*	*	*
07:45	567	*	432	*	999	*	*	*	*	*	*	*
08:00	614	*	387	*	1001	*	*	*	*	*	*	*
08:15	545	*	315	*	860	*	*	*	*	*	*	*
08:30	440	*	227	*	667	*	*	*	*	*	*	*
08:45	443	*	256	*	699	*	*	*	*	*	*	*
09:00	342	*	159	*	501	*	*	*	*	*	*	*
09:15	342	*	134	*	475	*	*	*	*	*	*	*
09:30	325	*	168	*	493	*	*	*	*	*	*	*
09:45	397	*	121	*	518	*	*	*	*	*	*	*
10:00	338	*	5	*	343	*	*	*	*	*	*	*
10:15	374	*	6	*	380	*	*	*	*	*	*	*
10:30	363	*	4	*	367	*	*	*	*	*	*	*
10:45	358	*	2	*	360	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*
11:15	*	*	*	*	*	*	*	*	*	*	*	*
11:30	*	*	*	*	*	*	*	*	*	*	*	*
11:45	*	*	*	*	*	*	*	*	*	*	*	*
Totals	7912	0	3341	0	11253	0	0	0	0	0	0	0
Day Totals	7912		3341		11253		0		0		0	
Total	70.3%	.0%	29.6%	.0%			*	*	*	*		
Peaks	07:30		07:30		07:30							
Volume	2207		1445		3652							
P.H.F.	.89		.83		.91							

Technician: Jm
Location : On Pajarito 200' East of Diamond

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS12-7
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Both directions

Begin Time	Mon. 01/27 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	*	*	*	*	*	*	4	97	8	147	12	244
12:15	*	105	*	116	*	221	3	114	4	107	7	221
12:30	*	129	*	105	*	234	6	162	2	120	8	282
12:45	*	176	*	107	*	283	2	190	10	121	12	311
01:00	*	191	*	94	*	285	2	171	2	105	4	276
01:15	*	150	*	99	*	249	0	161	2	112	2	273
01:30	*	116	*	90	*	206	2	111	0	88	2	199
01:45	*	94	*	103	*	197	4	122	1	102	5	224
02:00	*	91	*	67	*	158	3	128	3	98	6	226
02:15	*	115	*	76	*	191	1	116	3	101	4	217
02:30	*	117	*	90	*	207	1	131	0	98	1	229
02:45	*	128	*	112	*	240	3	130	2	117	5	247
03:00	*	124	*	124	*	248	0	121	2	106	2	227
03:15	*	139	*	133	*	272	0	157	4	127	4	284
03:30	*	107	*	126	*	233	1	119	3	148	4	267
03:45	*	115	*	125	*	240	1	116	2	138	3	254
04:00	*	119	*	123	*	242	0	123	1	145	1	268
04:15	*	105	*	124	*	229	3	100	0	115	3	215
04:30	*	134	*	140	*	274	8	137	3	133	11	270
04:45	*	103	*	137	*	240	9	124	1	137	10	261
05:00	*	189	*	184	*	373	8	256	7	255	15	511
05:15	*	148	*	150	*	298	10	224	7	238	17	462
05:30	*	150	*	135	*	285	7	141	8	126	15	267
05:45	*	108	*	121	*	229	33	121	16	116	49	237
06:00	*	101	*	107	*	208	33	87	30	120	63	207
06:15	*	63	*	78	*	141	81	59	50	83	131	142
06:30	*	53	*	48	*	101	141	62	62	53	203	115
06:45	*	34	*	50	*	84	179	44	127	68	306	112
07:00	*	37	*	28	*	65	171	49	116	30	287	79
07:15	*	24	*	24	*	48	171	33	155	26	326	59
07:30	*	37	*	33	*	70	182	32	160	18	342	50
07:45	*	20	*	25	*	45	185	26	202	13	387	39
08:00	*	29	*	10	*	39	182	23	226	13	408	36
08:15	*	12	*	11	*	23	179	17	129	11	308	28
08:30	*	21	*	6	*	27	118	28	104	19	222	47
08:45	*	29	*	6	*	35	138	19	138	12	276	31
09:00	*	22	*	13	*	35	103	42	101	9	204	51
09:15	*	9	*	10	*	19	95	54	94	10	189	64
09:30	*	14	*	3	*	17	95	36	110	7	205	43
09:45	*	14	*	12	*	26	101	15	139	7	240	22
10:00	*	13	*	10	*	23	95	8	95	8	191	16
10:15	*	21	*	4	*	25	110	16	77	6	187	22
10:30	*	22	*	3	*	25	118	30	88	6	206	36
10:45	*	30	*	3	*	33	95	26	112	4	207	30
11:00	*	5	*	16	*	21	83	10	128	6	211	16
11:15	*	7	*	14	*	21	121	8	140	23	261	31
11:30	*	3	*	27	*	30	123	5	155	28	278	33
11:45	*	5	*	8	*	13	104	2	178	12	282	14
Totals	0	3576	0	3230	0	6808	3115	4103	3007	3692	6122	7795
Day Totals		3578		3230		6808		7218		6699		13917
% Total	.0%	52.5%	.0%	47.4%			22.3%	29.4%	21.6%	26.5%		
Peaks		00:30		04:30		04:45	07:30	04:45	07:15	04:30	07:15	04:30
Volume		646		611		1196	728	745	743	763	1463	1504
P.H.F.		.84		.83		.80	.98	.72	.82	.74	.89	.73

Site 3, Page 1

Technician: Jm
Location : On Pajarito 200' East of Diamond

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS12-7
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Both directions

Begin Time	Wed. 01/29 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Thur. 01/30 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	1	96	6	106	7	202	3	149	14	159	17	308
12:15	2	134	5	107	7	241	3	125	7	135	10	260
12:30	4	138	3	148	7	286	3	166	0	100	3	266
12:45	3	212	3	121	6	333	0	182	4	103	4	285
01:00	2	176	3	98	5	274	0	190	1	99	1	289
01:15	1	200	2	115	3	315	0	182	4	105	4	287
01:30	4	117	3	85	7	202	2	112	1	89	3	201
01:45	2	122	4	89	6	211	2	120	0	123	2	243
02:00	0	99	6	96	6	195	1	118	2	73	3	191
02:15	1	106	2	100	3	206	2	111	3	104	5	215
02:30	1	113	1	90	2	203	6	129	5	92	11	221
02:45	2	140	0	102	2	242	1	137	2	119	3	256
03:00	0	107	1	106	1	213	2	117	1	112	3	229
03:15	2	150	2	135	4	285	3	131	4	139	7	270
03:30	0	132	0	145	0	277	1	141	1	148	2	289
03:45	0	96	4	150	4	246	0	111	0	139	0	250
04:00	1	133	0	105	1	238	0	117	2	136	2	253
04:15	3	110	1	144	4	254	3	97	1	118	4	215
04:30	3	119	2	130	5	249	5	120	1	135	6	255
04:45	6	116	2	141	8	257	4	126	2	132	6	258
05:00	5	208	5	194	10	402	6	175	5	185	11	360
05:15	14	154	8	148	22	302	13	148	7	161	20	309
05:30	8	128	11	152	19	280	6	137	9	150	15	287
05:45	30	95	27	102	57	197	37	112	17	130	54	242
06:00	31	84	29	103	60	187	37	75	27	114	64	189
06:15	96	69	41	68	137	137	88	66	36	81	124	147
06:30	127	61	62	57	189	118	125	51	81	57	206	108
06:45	199	52	117	45	316	97	212	59	120	38	332	97
07:00	154	46	126	43	280	89	135	46	129	33	264	79
07:15	168	32	166	25	334	57	176	37	163	20	339	57
07:30	187	28	175	19	362	47	204	30	138	24	342	54
07:45	194	30	207	19	401	49	218	40	222	24	440	64
08:00	184	24	223	13	407	37	191	33	197	18	388	51
08:15	150	31	154	17	304	48	164	30	136	9	300	39
08:30	128	22	103	11	231	33	113	40	123	7	236	47
08:45	120	30	111	12	231	42	119	22	106	23	225	45
09:00	106	24	95	11	201	35	106	16	92	6	198	22
09:15	102	9	86	13	188	22	121	23	79	14	200	37
09:30	96	13	112	8	208	21	91	10	97	7	188	17
09:45	116	21	125	11	241	32	99	17	109	9	208	26
10:00	100	14	93	7	193	21	104	13	101	15	205	28
10:15	96	12	85	6	181	18	85	19	100	4	185	23
10:30	119	23	89	4	208	27	96	30	99	3	195	33
10:45	101	39	132	4	233	43	116	30	97	7	213	37
11:00	115	7	124	15	239	22	96	10	141	14	237	24
11:15	125	5	158	18	283	23	130	4	199	20	329	24
11:30	145	3	181	29	326	32	117	6	184	20	301	26
11:45	107	4	170	11	277	15	116	8	166	23	282	31
Totals	3161	3884	3065	3478	6226	7362	3162	3968	3035	3576	6197	7544
Day Totals	7045		6543		13588		7130		6611		13741	
% Total	23.2%	28.5%	22.5%	25.6%			23.0%	28.8%	22.0%	26.0%		
Peaks	07:15	00:30	07:15	04:45	07:15	04:45	07:15	00:30	07:15	04:45	07:15	04:45
Volume	733	726	771	635	1504	1241	789	720	720	628	1509	1214
P.H.F.	.94	.85	.86	.81	.92	.77	.90	.94	.81	.84	.85	.84

Technician:Jm
Location :On Pajarito 200' East of
Diamond

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LCS12-7
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Both directions

Begin Time	Fri. 01/31	East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01	East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00		5	94	10	87	15	181		7	37	11	31	18	68
12:15		4	100	2	87	6	187		7	27	4	16	11	43
12:30		2	109	5	107	7	216		3	27	2	26	5	53
12:45		2	136	4	100	6	236		2	36	2	21	4	57
01:00		1	129	4	72	5	201		2	30	6	34	8	64
01:15		0	91	2	108	2	199		2	21	2	21	4	42
01:30		3	105	0	76	3	181		0	23	3	24	3	47
01:45		3	85	0	63	3	148		2	28	1	15	3	43
02:00		0	75	1	74	1	149		1	23	0	17	1	40
02:15		2	99	4	77	6	176		2	35	1	23	3	58
02:30		6	103	0	78	6	181		7	43	0	23	7	66
02:45		1	100	2	93	3	193		1	48	4	24	5	72
03:00		0	101	2	105	2	206		1	33	3	31	4	64
03:15		1	102	0	97	1	199		1	23	0	29	1	52
03:30		2	106	2	127	4	233		1	19	5	41	6	60
03:45		1	67	2	110	3	177		2	23	3	40	5	63
04:00		2	104	3	113	5	217		1	25	4	30	5	55
04:15		7	71	1	82	8	153		0	22	1	18	1	40
04:30		14	86	3	67	17	153		4	20	1	27	5	47
04:45		7	83	7	65	14	148		1	22	1	22	2	44
05:00		5	85	7	92	12	177		0	29	0	36	0	65
05:15		9	96	10	59	19	155		1	27	2	22	3	49
05:30		8	68	14	60	22	128		1	23	0	26	1	49
05:45		17	64	12	55	29	119		2	21	5	24	7	45
06:00		22	37	18	31	40	68		0	27	1	21	1	48
06:15		47	47	31	38	78	85		7	17	3	22	10	39
06:30		98	31	32	32	130	63		27	22	6	30	33	52
06:45		121	27	69	21	190	48		35	14	9	20	45	34
07:00		79	18	83	28	162	46		15	19	3	26	22	45
07:15		95	24	110	18	205	42		16	15	33	15	49	30
07:30		104	16	105	18	209	34		16	8	26	10	42	18
07:45		112	16	172	9	284	25		19	14	53	7	72	21
08:00		123	10	162	13	285	23		21	18	22	6	43	24
08:15		130	20	111	17	241	37		10	17	21	9	31	26
08:30		92	21	97	9	189	30		22	12	22	9	44	21
08:45		95	24	98	11	193	35		16	13	39	5	55	18
09:00		88	15	98	10	186	25		28	11	30	8	58	19
09:15		78	7	68	5	146	12		18	17	22	10	40	27
09:30		77	13	80	8	157	21		23	51	18	9	41	60
09:45		92	9	92	11	184	20		34	24	37	12	71	36
10:00		87	8	70	12	157	20		42	12	24	11	66	23
10:15		73	12	66	12	139	24		35	16	18	4	53	20
10:30		75	27	80	7	155	34		23	21	33	8	56	29
10:45		78	40	94	10	172	50		41	39	43	6	84	45
11:00		97	14	90	8	187	22		20	15	21	10	41	25
11:15		97	22	141	28	238	50		26	15	22	20	48	35
11:30		95	15	138	29	233	44		39	3	18	20	57	23
11:45		76	10	137	17	213	27		24	11	27	15	51	26
Totals		2233	2742	2339	2456	4572	5198		613	1096	612	934	1225	2030
Day Totals		4975		4795		9770			1709		1546		3255	
% Total		22.8%	28.0%	23.9%	25.1%				18.8%	33.5%	18.8%	28.6%		
Peaks		07:30	00:15	07:30	03:15	07:30	00:30		10:00	02:15	07:15	03:00	10:00	02:15
Volume		469	474	550	447	1019	852		141	159	134	141	259	260
P.H.F.		.90	.87	.79	.87	.89	.90		.83	.82	.63	.85	.77	.90

Technician: Jm
Location : On Pajarito 200' East of Diamond

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS12-7
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Both directions

Begin	Sun.	East		West		Combined		Mon.	East		West		Combined	
Time	02/02	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	02/03	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		6	38	10	23	16	61		2	129	11	145	13	274
12:15		9	63	8	28	17	91		2	122	1	121	3	243
12:30		5	42	9	21	14	63		4	149	3	105	7	254
12:45		8	36	6	30	14	66		4	169	5	119	9	288
01:00		4	27	5	35	9	62		3	220	5	101	8	321
01:15		3	23	1	17	4	40		3	185	5	120	8	305
01:30		3	31	1	21	4	52		2	104	0	99	2	203
01:45		0	18	3	18	3	36		2	111	0	86	2	197
02:00		0	21	2	25	2	46		2	100	1	79	3	179
02:15		3	41	2	21	5	62		2	93	2	76	4	169
02:30		4	41	1	23	5	64		0	118	1	82	1	200
02:45		4	53	0	18	4	71		1	121	0	101	1	222
03:00		0	33	2	31	2	64		0	105	2	119	2	224
03:15		1	19	4	35	5	54		2	114	1	147	3	261
03:30		0	39	2	28	2	67		1	104	1	141	2	245
03:45		1	21	0	41	1	62		0	104	1	122	1	226
04:00		1	28	1	29	2	57		4	117	1	137	5	254
04:15		1	19	0	27	1	46		3	108	2	99	5	207
04:30		4	16	4	13	8	29		4	128	3	117	7	245
04:45		1	22	1	30	2	52		10	116	2	132	12	248
05:00		1	32	4	24	5	56		4	192	8	176	12	368
05:15		1	24	1	23	2	47		12	190	11	152	23	342
05:30		2	22	0	19	2	41		8	133	15	155	23	288
05:45		2	26	0	13	2	39		23	104	19	98	42	202
06:00		0	23	2	17	2	40		30	80	23	108	53	188
06:15		6	23	4	20	10	43		68	86	39	86	107	172
06:30		22	25	6	25	28	50		126	59	59	53	185	112
06:45		38	18	8	27	46	45		188	54	134	30	322	84
07:00		12	15	5	14	17	29		182	30	120	40	302	70
07:15		7	12	24	13	31	25		158	33	144	32	302	65
07:30		11	14	22	14	33	28		187	27	139	21	326	48
07:45		9	6	33	9	42	15		189	20	167	16	356	36
08:00		8	14	27	10	35	24		176	17	189	18	365	35
08:15		12	8	21	8	33	16		157	28	157	9	314	37
08:30		11	22	29	9	40	31		167	25	105	8	272	33
08:45		29	30	47	15	76	45		128	29	148	12	276	41
09:00		18	28	27	16	45	44		125	20	98	10	224	30
09:15		15	22	26	13	41	35		110	11	106	8	216	19
09:30		14	12	15	6	29	18		109	17	109	6	218	23
09:45		16	22	19	6	35	28		104	12	103	4	207	16
10:00		27	16	28	13	55	29		128	12	103	8	231	20
10:15		27	15	34	12	61	27		124	12	106	11	230	23
10:30		35	26	21	9	56	35		93	26	96	4	189	30
10:45		34	33	30	6	64	39		89	33	97	5	186	38
11:00		25	7	31	8	56	15		95	8	112	13	207	21
11:15		35	8	37	21	72	29		120	7	171	22	291	29
11:30		30	11	24	30	54	41		109	9	160	23	269	32
11:45		39	7	22	14	61	21		131	5	155	20	286	25
Totals		544	1152	609	928	1153	2080		3192	3796	2940	3396	6132	7192
Day Totals		1696		1537		3233			6988		6336		13324	
% Total		16.8%	35.6%	18.8%	28.7%				23.9%	28.4%	22.0%	25.4%		
Peaks		10:30	00:00	08:30	03:00	10:30	00:15		07:00	00:30	07:30	04:45	07:30	04:45
Volume		129	179	129	135	248	282		716	723	652	615	1361	1246
P.H.F.		.92	.71	.68	.82	.86	.77		.94	.82	.86	.87	.93	.84

Technician: Jm
Location : On Pajarito 200' East of Diamond

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS12-7
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Both directions

Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	6	129	11	138	17	267	3	103	4	168	7	271
12:15	4	104	6	110	10	214	6	121	6	126	12	247
12:30	4	151	5	89	9	240	1	138	5	90	6	228
12:45	1	178	2	125	3	303	2	152	4	131	6	283
01:00	2	168	2	116	4	284	3	165	0	140	3	305
01:15	1	136	0	112	1	248	1	153	2	133	3	286
01:30	2	126	1	86	3	212	1	132	2	91	3	223
01:45	0	112	2	79	2	191	1	127	1	107	2	234
02:00	1	112	3	82	4	194	2	111	1	82	3	193
02:15	4	139	2	102	6	241	3	110	1	83	4	193
02:30	1	146	0	109	1	255	2	129	1	95	3	224
02:45	0	143	2	108	2	251	4	165	0	112	4	277
03:00	1	119	1	128	2	247	0	118	2	106	2	224
03:15	1	132	1	150	2	282	2	151	2	139	4	290
03:30	1	127	1	162	2	289	2	163	3	123	5	286
03:45	1	72	3	136	4	208	0	107	1	123	1	230
04:00	1	140	1	134	2	274	3	135	2	128	5	263
04:15	3	98	3	137	6	235	3	103	4	95	7	198
04:30	2	115	2	121	4	236	3	116	3	132	6	248
04:45	7	130	2	109	9	239	4	114	0	112	4	226
05:00	5	142	4	173	9	315	6	190	2	194	8	384
05:15	11	193	8	189	19	382	11	151	12	135	23	286
05:30	10	117	12	127	22	244	11	144	10	152	21	296
05:45	23	110	16	99	39	209	23	121	20	110	43	231
06:00	25	101	26	86	51	187	33	102	21	83	54	185
06:15	91	77	33	73	124	150	76	81	38	91	114	172
06:30	132	70	69	68	201	138	132	67	61	58	193	125
06:45	210	38	106	39	316	77	174	50	106	49	280	99
07:00	173	46	138	39	311	85	181	39	136	36	317	75
07:15	151	43	151	34	302	77	176	31	143	29	319	60
07:30	204	44	165	20	369	64	223	29	163	13	386	42
07:45	234	31	193	17	427	48	162	37	222	21	384	58
08:00	175	24	187	12	362	36	181	30	189	17	370	47
08:15	180	23	159	12	339	35	168	35	133	15	301	50
08:30	151	30	136	14	287	44	153	17	115	17	268	34
08:45	157	27	120	15	277	42	146	20	117	14	263	34
09:00	116	18	94	11	210	29	85	19	99	11	184	30
09:15	91	39	98	10	189	49	88	17	88	3	176	20
09:30	79	19	87	6	166	25	87	17	101	11	188	28
09:45	101	15	121	8	222	23	107	9	102	9	209	18
10:00	85	16	103	9	188	25	91	9	103	12	194	21
10:15	89	13	94	8	183	21	104	13	83	5	187	16
10:30	95	33	80	9	175	42	94	28	70	5	164	33
10:45	100	41	115	5	215	46	96	33	109	8	205	41
11:00	108	9	142	14	250	23	83	10	96	9	179	19
11:15	107	7	135	24	242	31	101	3	122	23	223	26
11:30	115	6	155	26	270	32	98	10	128	23	226	33
11:45	128	5	164	20	292	25	108	4	133	29	241	33
Totals	3189	3914	2961	3500	6150	7414	3044	3929	2766	3498	5810	7427
Day Totals	7103		6461		13564		6973		6264		13237	
% Total	23.5%	28.8%	21.8%	25.8%			23.0%	29.6%	20.9%	26.4%		
Peaks	07:30	00:30	07:30	04:45	07:30	04:45	06:45	00:30	07:15	04:45	07:15	05:00
Volume	793	633	704	598	1497	1180	754	608	717	593	1459	1197
P.H.F.	.84	.88	.91	.79	.87	.77	.84	.92	.80	.76	.94	.77

3500 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician: Jm
Location : On Pajarito 200' East of Diamond

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS12-7
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Both directions

Begin Time	Thur. 02/06 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	7	120	10	155	17	275	*	*	*	*	*	*
12:15	6	107	3	112	9	219	*	*	*	*	*	*
12:30	2	168	5	114	7	282	*	*	*	*	*	*
12:45	2	*	5	*	7	*	*	*	*	*	*	*
01:00	1	*	1	*	2	*	*	*	*	*	*	*
01:15	2	*	3	*	5	*	*	*	*	*	*	*
01:30	4	*	1	*	5	*	*	*	*	*	*	*
01:45	5	*	2	*	7	*	*	*	*	*	*	*
02:00	0	*	0	*	0	*	*	*	*	*	*	*
02:15	0	*	2	*	2	*	*	*	*	*	*	*
02:30	3	*	1	*	4	*	*	*	*	*	*	*
02:45	1	*	0	*	1	*	*	*	*	*	*	*
03:00	0	*	1	*	1	*	*	*	*	*	*	*
03:15	0	*	4	*	4	*	*	*	*	*	*	*
03:30	3	*	2	*	5	*	*	*	*	*	*	*
03:45	1	*	2	*	3	*	*	*	*	*	*	*
04:00	1	*	1	*	2	*	*	*	*	*	*	*
04:15	1	*	0	*	1	*	*	*	*	*	*	*
04:30	3	*	4	*	7	*	*	*	*	*	*	*
04:45	7	*	2	*	9	*	*	*	*	*	*	*
05:00	4	*	4	*	8	*	*	*	*	*	*	*
05:15	15	*	7	*	22	*	*	*	*	*	*	*
05:30	7	*	12	*	19	*	*	*	*	*	*	*
05:45	22	*	19	*	41	*	*	*	*	*	*	*
06:00	33	*	24	*	57	*	*	*	*	*	*	*
06:15	73	*	45	*	118	*	*	*	*	*	*	*
06:30	121	*	67	*	188	*	*	*	*	*	*	*
06:45	191	*	108	*	299	*	*	*	*	*	*	*
07:00	181	*	105	*	286	*	*	*	*	*	*	*
07:15	164	*	162	*	326	*	*	*	*	*	*	*
07:30	187	*	192	*	379	*	*	*	*	*	*	*
07:45	210	*	189	*	399	*	*	*	*	*	*	*
08:00	164	*	220	*	384	*	*	*	*	*	*	*
08:15	168	*	168	*	336	*	*	*	*	*	*	*
08:30	137	*	104	*	241	*	*	*	*	*	*	*
08:45	137	*	128	*	265	*	*	*	*	*	*	*
09:00	90	*	101	*	191	*	*	*	*	*	*	*
09:15	116	*	73	*	189	*	*	*	*	*	*	*
09:30	94	*	70	*	164	*	*	*	*	*	*	*
09:45	133	*	110	*	243	*	*	*	*	*	*	*
10:00	88	*	80	*	168	*	*	*	*	*	*	*
10:15	103	*	106	*	209	*	*	*	*	*	*	*
10:30	102	*	92	*	194	*	*	*	*	*	*	*
10:45	91	*	99	*	190	*	*	*	*	*	*	*
11:00	104	*	123	*	227	*	*	*	*	*	*	*
11:15	110	*	166	*	276	*	*	*	*	*	*	*
11:30	125	*	207	*	332	*	*	*	*	*	*	*
11:45	132	*	170	*	302	*	*	*	*	*	*	*
Totals	3151	395	3000	381	6151	776	0	0	0	0	0	0
Day Totals	3546		3381		6927		0		0		0	
% Total	45.4%	5.7%	43.3%	5.5%			*	*	*	*		
Peaks	07:00	00:00	07:30	00:00	07:30	00:00						
Volume	742	395	769	381	1498	776						
P.H.F.	.88	.58	.87	.61	.93	.68						

02/07/2003 14:21 15054248704 DIGITAL TRAFFIC SYST PAGE 02/07

Technician: JM
Location : On West Jemez 100' East of
M 4

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
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Both directions

Begin Time	Mon. 01/27 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	*	*	*	*	*	*	0	8	1	14	1	22
12:15	*	*	*	*	*	*	0	7	0	14	0	21
12:30	*	*	*	*	*	*	0	9	0	21	0	30
12:45	*	*	*	*	*	*	0	6	1	9	1	15
01:00	*	*	*	*	*	*	0	5	0	10	0	15
01:15	*	*	*	*	*	*	1	11	1	18	2	29
01:30	*	*	*	*	*	*	0	8	0	13	0	21
01:45	*	*	*	*	*	*	0	14	1	16	1	30
02:00	*	15	*	8	*	23	0	6	1	11	1	17
02:15	*	13	*	7	*	20	0	12	0	6	0	18
02:30	*	8	*	7	*	15	0	13	0	9	0	22
02:45	*	9	*	10	*	19	1	11	0	11	1	22
03:00	*	6	*	17	*	23	0	8	0	9	0	17
03:15	*	6	*	9	*	15	0	12	0	17	0	29
03:30	*	9	*	12	*	21	0	7	0	21	0	28
03:45	*	3	*	16	*	19	0	7	1	20	1	27
04:00	*	11	*	35	*	46	0	9	0	22	0	31
04:15	*	6	*	30	*	36	0	9	0	36	0	45
04:30	*	7	*	31	*	38	2	10	0	37	2	47
04:45	*	5	*	35	*	40	0	11	0	23	0	34
05:00	*	5	*	39	*	44	1	7	0	35	1	42
05:15	*	12	*	42	*	54	4	11	1	32	5	43
05:30	*	10	*	33	*	43	3	7	0	45	3	52
05:45	*	5	*	24	*	29	10	4	10	33	20	37
06:00	*	8	*	21	*	29	10	5	0	20	10	25
06:15	*	2	*	20	*	22	33	11	2	20	35	31
06:30	*	2	*	11	*	13	28	4	2	15	30	19
06:45	*	2	*	10	*	12	28	1	2	11	30	12
07:00	*	0	*	11	*	11	64	2	3	10	67	12
07:15	*	2	*	6	*	8	50	0	4	4	54	4
07:30	*	0	*	13	*	13	48	4	8	6	56	10
07:45	*	4	*	5	*	9	42	0	14	5	56	5
08:00	*	4	*	5	*	9	24	1	8	8	32	9
08:15	*	1	*	5	*	6	21	1	11	10	32	11
08:30	*	0	*	5	*	5	22	0	10	7	32	7
08:45	*	1	*	6	*	7	10	0	8	7	18	7
09:00	*	1	*	2	*	3	11	4	6	9	17	13
09:15	*	0	*	5	*	5	13	1	6	6	19	7
09:30	*	2	*	5	*	7	11	0	9	4	20	4
09:45	*	0	*	1	*	1	11	4	12	4	23	8
10:00	*	5	*	4	*	9	9	0	4	2	13	2
10:15	*	0	*	2	*	2	7	1	11	1	18	2
10:30	*	0	*	4	*	4	10	0	6	1	16	1
10:45	*	1	*	0	*	1	12	0	10	2	22	2
11:00	*	0	*	1	*	1	17	0	5	1	22	1
11:15	*	1	*	2	*	3	20	2	4	1	24	3
11:30	*	1	*	0	*	1	9	0	2	0	11	0
11:45	*	1	*	1	*	2	11	1	7	0	18	1
Totals	0	168	0	500	0	668	543	254	171	636	714	890
Day Totals		168		500		668		797		807		1604
% Total	.0%	25.1%	.0%	74.8%			33.8%	15.8%	10.6%	39.6%		
Peaks		02:00		04:45		04:45	07:00	01:45	07:45	05:00	07:00	05:00
Volume		45		149		181	204	45	43	145	233	174
P.H.F.		.75		.88		.83	.79	.80	.76	.80	.86	.83

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3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician: JM
Location :On West Jemez 100' East of NM 4

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS1-7
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Both directions

Begin Time	Wed. 01/29 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Thur. 01/30 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	0	9	2	10	2	19	1	5	1	12	2	17
12:15	0	11	3	10	3	21	1	6	2	6	3	12
12:30	1	6	0	9	1	15	0	12	0	12	0	24
12:45	0	8	1	13	1	21	0	16	1	9	1	25
01:00	0	4	0	15	0	19	1	13	0	8	1	21
01:15	0	6	0	5	0	11	0	9	0	7	0	16
01:30	0	12	1	17	1	29	0	12	1	6	1	18
01:45	0	10	1	12	1	22	0	13	1	22	1	35
02:00	0	5	0	8	0	13	0	9	0	10	0	19
02:15	1	10	0	13	1	23	2	6	1	7	3	13
02:30	1	11	0	10	1	21	1	16	1	12	2	28
02:45	0	4	0	7	0	11	0	8	1	11	1	19
03:00	0	14	0	10	0	24	0	13	2	10	2	23
03:15	0	9	0	14	0	23	0	12	0	18	0	30
03:30	0	7	0	12	0	19	0	7	0	17	0	24
03:45	0	9	0	21	0	30	1	13	1	20	2	33
04:00	0	14	0	34	0	48	0	9	0	26	0	35
04:15	0	3	0	32	0	35	1	8	0	27	1	35
04:30	1	7	0	38	1	45	2	3	0	36	2	39
04:45	2	17	0	27	2	44	0	7	0	27	0	34
05:00	2	11	0	42	2	53	0	4	0	43	0	47
05:15	3	2	0	36	3	38	5	7	1	41	6	48
05:30	5	5	2	38	7	43	3	8	0	28	3	36
05:45	9	7	9	32	18	39	9	2	5	26	14	28
06:00	14	3	2	15	16	18	19	8	2	15	21	23
06:15	24	0	0	12	24	12	19	3	0	25	19	28
06:30	33	2	3	14	36	16	35	3	3	15	38	18
06:45	37	2	3	13	40	15	39	2	2	7	41	9
07:00	43	4	3	10	46	14	49	1	1	19	50	20
07:15	59	1	3	8	62	9	57	1	4	8	61	9
07:30	49	2	3	13	52	15	56	1	6	6	62	7
07:45	39	0	12	8	51	8	36	2	10	9	46	11
08:00	24	1	7	4	31	5	29	1	10	6	39	7
08:15	17	1	7	10	24	11	21	2	12	5	33	7
08:30	17	1	11	7	28	8	12	2	8	5	20	7
08:45	10	0	10	2	20	2	5	0	7	4	12	4
09:00	18	1	7	4	25	5	13	1	8	6	21	7
09:15	10	0	12	5	22	5	11	0	4	5	15	5
09:30	11	2	8	2	19	4	9	0	4	3	13	3
09:45	11	4	6	2	17	6	4	0	10	5	14	5
10:00	10	7	4	4	14	11	8	0	7	4	15	4
10:15	11	1	10	0	21	1	11	0	10	3	21	3
10:30	9	3	13	1	22	4	9	2	8	0	17	2
10:45	11	1	5	1	16	2	12	0	12	1	24	1
11:00	19	0	6	3	25	3	14	0	11	2	25	2
11:15	12	1	7	2	19	3	5	0	4	3	9	3
11:30	5	0	7	0	12	0	10	0	5	2	15	2
11:45	5	1	6	0	11	1	16	0	12	0	28	0
Totals	523	239	174	605	697	844	526	247	178	599	704	846
Day Totals	762		779		1541		773		777		1550	
% Total	33.9%	15.5%	11.2%	39.2%			33.9%	15.9%	11.4%	38.6%		
Peaks	07:00	04:00	08:30	05:00	07:00	04:30	06:45	00:30	10:15	04:30	07:00	04:30
Volume	190	41	40	148	211	180	201	50	41	147	219	168
P.H.F.	.80	.60	.83	.88	.85	.84	.88	.78	.85	.85	.88	.87

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician:JM
Location :On West Jemez 100' East of NM 4

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS1-7
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Both directions

Begin Time	Fri. 01/31 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	0	5	2	8	2	13	0	9	1	8	1	17
12:15	0	9	1	11	1	20	1	12	1	12	2	24
12:30	1	9	0	8	1	17	0	8	1	15	1	23
12:45	1	9	0	4	1	13	2	6	1	14	3	20
01:00	0	5	1	15	1	20	1	20	1	13	2	33
01:15	0	15	1	13	1	28	1	6	0	8	1	14
01:30	3	13	0	18	3	31	0	19	4	7	4	26
01:45	1	9	0	23	1	32	0	6	1	17	1	23
02:00	0	9	0	16	0	25	0	13	0	9	0	22
02:15	0	10	0	17	0	27	2	9	0	10	2	19
02:30	0	7	0	8	0	15	1	14	0	6	1	20
02:45	0	14	0	13	0	27	0	5	0	12	0	17
03:00	0	6	0	15	0	21	0	12	0	23	0	35
03:15	0	7	0	19	0	26	0	17	0	11	0	28
03:30	0	9	0	27	0	36	1	7	0	17	1	24
03:45	1	9	0	25	1	34	0	9	0	17	0	26
04:00	0	6	0	30	0	36	0	8	0	11	0	19
04:15	0	6	0	30	0	36	0	16	0	13	0	29
04:30	1	10	0	24	1	34	0	14	0	10	0	24
04:45	2	10	0	17	2	27	0	18	1	5	1	23
05:00	1	7	0	30	1	37	1	12	1	10	2	22
05:15	1	4	0	17	1	21	0	9	1	11	1	20
05:30	3	13	1	14	4	27	2	8	0	7	2	15
05:45	8	6	1	12	9	18	3	12	1	3	4	15
06:00	2	9	5	17	7	26	1	13	2	6	3	19
06:15	22	14	5	14	27	28	5	12	8	3	13	15
06:30	26	1	9	4	35	5	5	6	4	5	9	11
06:45	19	5	1	10	20	15	4	2	4	9	8	11
07:00	26	5	5	7	31	12	6	1	2	4	8	5
07:15	37	0	2	7	39	7	1	1	8	2	9	3
07:30	37	2	7	5	44	7	10	2	7	3	17	5
07:45	29	1	10	5	39	6	7	1	2	7	9	8
08:00	19	1	5	8	24	9	4	2	8	2	12	4
08:15	16	2	11	6	27	8	7	3	9	3	16	6
08:30	9	4	9	8	18	12	8	0	4	2	12	2
08:45	12	1	8	1	20	2	10	3	9	3	19	6
09:00	11	2	10	2	21	4	7	3	13	1	20	4
09:15	9	1	14	2	23	3	8	1	8	6	16	7
09:30	16	1	12	5	28	6	6	0	8	5	14	5
09:45	10	0	13	4	23	4	6	1	10	7	16	8
10:00	17	2	7	2	24	4	12	0	12	5	24	5
10:15	9	1	9	4	18	5	4	3	8	4	12	7
10:30	13	2	7	5	20	7	10	4	11	1	21	5
10:45	11	1	7	5	18	6	6	1	9	2	15	3
11:00	10	0	7	4	17	4	11	0	14	3	25	3
11:15	8	1	9	1	17	2	5	1	12	1	17	2
11:30	8	0	8	3	16	3	20	1	11	0	31	1
11:45	11	0	9	5	20	5	12	1	14	3	26	4
Totals	410	263	196	548	606	811	190	331	211	356	401	687
Day Totals	673		744		1417		521		567		1088	
% Total	28.9%	18.5%	13.8%	38.6%			17.4%	30.4%	19.3%	32.7%		
Peaks	07:00	01:15	09:00	03:30	07:00	03:30	11:00	04:15	11:00	03:00	11:00	03:00
Volume	129	46	49	112	153	142	48	60	51	68	99	113
P.H.F.	.87	.76	.87	.93	.86	.98	.6	.83	.91	.73	.79	.80

Technician:JM
Location :On West Jemez 100' East of
NM 4

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS1-7
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Both directions

Begin Time	Sun. 02/02	East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Mon. 02/03	East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00		0	11	2	14	2	25		2	4	1	3	3	7
12:15		2	8	1	15	3	24		1	6	0	5	1	11
12:30		1	6	1	9	2	15		0	9	0	13	0	22
12:45		0	12	2	13	2	25		0	10	0	12	0	22
01:00		1	15	0	10	1	25		0	8	0	12	0	20
01:15		1	10	4	15	5	25		0	10	0	9	0	19
01:30		1	7	1	8	2	15		1	8	2	9	3	17
01:45		2	13	2	12	4	25		1	15	0	6	1	21
02:00		0	13	0	10	0	23		1	15	0	10	1	25
02:15		2	11	0	9	2	20		0	12	0	16	0	28
02:30		2	15	0	10	2	25		0	16	0	17	0	33
02:45		0	9	0	16	0	25		0	9	0	11	0	20
03:00		0	11	0	5	0	16		0	8	1	9	1	17
03:15		1	14	0	13	1	27		0	7	1	10	1	17
03:30		0	9	0	8	0	17		2	18	0	17	2	35
03:45		0	18	0	3	0	21		0	7	1	13	1	20
04:00		0	6	0	8	0	14		0	6	0	33	0	39
04:15		0	12	1	8	1	20		2	4	0	27	2	31
04:30		0	9	0	8	0	17		2	9	0	29	2	38
04:45		1	16	0	11	1	27		0	11	0	35	0	46
05:00		0	7	0	6	0	13		1	4	0	36	1	40
05:15		0	9	0	8	0	17		5	7	2	55	7	62
05:30		1	14	1	5	2	19		6	8	1	37	7	45
05:45		0	3	0	1	0	4		5	5	8	33	13	38
06:00		0	13	0	8	0	21		14	3	3	20	17	23
06:15		2	3	0	8	2	11		22	21	7	19	29	40
06:30		3	8	0	2	3	10		30	4	4	11	34	15
06:45		3	6	1	4	4	10		39	2	2	5	41	7
07:00		3	6	0	2	3	8		43	1	6	7	49	8
07:15		2	2	4	4	6	6		63	1	5	7	68	8
07:30		1	1	2	1	3	2		44	6	13	7	57	13
07:45		8	2	2	1	10	3		49	0	7	5	56	5
08:00		4	3	8	2	12	5		24	1	9	4	33	5
08:15		3	1	6	3	9	4		23	2	18	5	41	7
08:30		5	0	5	6	10	6		12	2	11	4	23	6
08:45		4	2	4	4	8	6		16	0	10	7	25	7
09:00		8	2	5	5	13	7		13	0	5	4	18	4
09:15		6	2	9	4	15	6		11	0	6	3	17	3
09:30		2	3	8	1	10	4		8	0	10	6	18	6
09:45		7	3	9	1	16	4		13	1	7	3	20	4
10:00		1	2	3	2	4	4		8	1	12	2	20	3
10:15		8	2	9	5	17	7		8	2	9	3	17	5
10:30		12	1	10	2	22	3		8	1	6	5	14	6
10:45		6	3	8	0	14	3		8	1	5	2	13	3
11:00		12	0	9	1	21	1		12	0	10	0	22	0
11:15		5	0	16	1	21	1		12	0	6	3	18	3
11:30		9	2	16	2	25	4		13	0	9	0	22	0
11:45		7	0	9	1	16	1		5	0	6	0	11	0
Totals		136	325	158	296	294	621		527	265	203	589	730	854
Day Totals		461		454		915			792		792		1584	
% Total		14.8%	35.5%	17.2%	32.3%				33.2%	16.7%	12.8%	37.1%		
Peaks		10:15	01:45	11:00	00:00	11:00	01:45		07:00	01:45	08:00	04:45	07:00	04:45
Volume		38	52	50	52	83	93		199	58	48	163	230	193
P.H.F.		.79	.86	.78	.81	.83	.93		.78	.90	.66	.74	.84	.77

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician: JM
Location : On West Jemez 100' East of NM 4

Both directions

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS1-7
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Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	1	4	2	11	3	15	0	10	0	12	0	22
12:15	0	7	0	15	0	22	0	4	1	10	1	14
12:30	1	16	1	8	2	24	0	12	0	10	0	22
12:45	1	11	2	20	3	31	0	9	0	14	0	23
01:00	1	9	1	12	2	21	1	11	1	11	2	22
01:15	1	7	0	9	1	16	2	12	3	7	5	19
01:30	0	12	1	17	1	29	0	7	1	15	1	22
01:45	0	10	1	7	1	17	1	9	0	6	1	15
02:00	0	9	0	11	0	20	0	2	0	13	0	15
02:15	2	8	0	10	2	18	0	13	0	9	0	22
02:30	1	14	1	13	2	27	0	8	0	8	0	16
02:45	0	15	0	9	0	24	0	5	0	11	0	16
03:00	0	7	0	12	0	19	0	6	0	10	0	16
03:15	0	3	0	19	0	22	0	7	1	18	1	25
03:30	0	5	0	14	0	19	0	9	0	13	0	22
03:45	1	9	0	19	1	28	1	11	0	19	1	30
04:00	0	7	0	33	0	40	0	7	0	26	0	33
04:15	0	9	2	23	2	32	0	5	0	28	0	33
04:30	1	11	0	34	1	45	1	16	0	35	1	51
04:45	1	12	0	33	1	45	1	13	0	22	1	35
05:00	2	10	0	35	2	45	0	11	0	38	0	49
05:15	7	11	0	42	7	53	5	11	0	45	5	56
05:30	4	5	0	37	4	42	5	7	0	48	5	55
05:45	10	8	9	26	19	34	6	9	7	29	13	38
06:00	19	6	10	25	29	31	11	5	6	20	17	25
06:15	22	19	1	28	23	47	17	5	6	21	23	26
06:30	36	4	5	13	41	17	33	15	4	15	37	30
06:45	37	2	2	8	39	10	42	5	2	7	44	12
07:00	51	0	6	10	57	10	31	1	6	12	37	13
07:15	41	2	7	6	48	8	56	2	7	5	63	7
07:30	52	0	9	9	61	9	45	2	8	6	53	8
07:45	47	1	16	4	63	5	44	0	10	7	54	7
08:00	31	1	13	6	44	7	34	0	10	2	44	2
08:15	14	1	11	4	25	5	24	1	8	5	32	6
08:30	21	0	7	7	28	7	14	2	12	9	25	11
08:45	13	0	12	1	25	1	13	2	5	6	18	8
09:00	12	0	8	12	20	12	10	1	6	5	16	6
09:15	15	1	4	3	19	4	10	0	8	4	18	4
09:30	6	0	4	6	10	6	12	2	17	5	29	7
09:45	12	4	10	4	22	8	8	1	8	2	16	3
10:00	12	8	6	3	18	11	5	3	8	4	13	7
10:15	11	2	7	2	18	4	7	0	5	2	12	2
10:30	11	1	8	1	19	2	14	2	4	0	18	2
10:45	17	3	14	3	31	6	9	2	4	1	13	3
11:00	11	0	8	1	19	1	7	0	4	1	11	1
11:15	17	0	8	2	25	2	9	0	5	4	14	4
11:30	10	0	7	0	17	0	15	0	4	0	19	0
11:45	8	2	8	1	16	3	8	2	4	1	12	3
Totals	560	276	211	628	771	904	501	267	175	601	676	868
Day Totals	836		839		1675		768		776		1544	
% Total	33.4%	16.4%	12.6%	37.4%			32.4%	17.2%	11.3%	38.9%		
Peaks	07:00	02:00	07:30	04:45	07:00	04:30	07:15	04:30	09:15	05:00	07:15	05:00
Volume	191	46	49	147	229	188	179	51	41	160	214	198
P.H.F.	.91	.76	.76	.87	.90	.88	.79	.79	.60	.83	.84	.88

Technician: JM
Location :On West Jemez 100' East of
NM 4

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS1-7
Page : 6

Both directions

Begin	Thur.	East		West		Combined		Fri.	East		West		Combined	
Time	02/06	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	02/07	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		1	*	3	*	4	*		*	*	*	*	*	*
12:15		0	*	0	*	0	*		*	*	*	*	*	*
12:30		1	*	0	*	1	*		*	*	*	*	*	*
12:45		0	*	0	*	0	*		*	*	*	*	*	*
01:00		0	*	0	*	0	*		*	*	*	*	*	*
01:15		0	*	0	*	0	*		*	*	*	*	*	*
01:30		0	*	1	*	1	*		*	*	*	*	*	*
01:45		0	*	0	*	0	*		*	*	*	*	*	*
02:00		0	*	0	*	0	*		*	*	*	*	*	*
02:15		1	*	0	*	1	*		*	*	*	*	*	*
02:30		0	*	0	*	0	*		*	*	*	*	*	*
02:45		0	*	0	*	0	*		*	*	*	*	*	*
03:00		0	*	0	*	0	*		*	*	*	*	*	*
03:15		0	*	2	*	2	*		*	*	*	*	*	*
03:30		1	*	1	*	2	*		*	*	*	*	*	*
03:45		0	*	0	*	0	*		*	*	*	*	*	*
04:00		0	*	0	*	0	*		*	*	*	*	*	*
04:15		1	*	0	*	1	*		*	*	*	*	*	*
04:30		1	*	0	*	1	*		*	*	*	*	*	*
04:45		0	*	0	*	0	*		*	*	*	*	*	*
05:00		1	*	0	*	1	*		*	*	*	*	*	*
05:15		4	*	0	*	4	*		*	*	*	*	*	*
05:30		5	*	0	*	5	*		*	*	*	*	*	*
05:45		8	*	8	*	16	*		*	*	*	*	*	*
06:00		13	*	5	*	18	*		*	*	*	*	*	*
06:15		22	*	3	*	25	*		*	*	*	*	*	*
06:30		31	*	2	*	33	*		*	*	*	*	*	*
06:45		40	*	2	*	42	*		*	*	*	*	*	*
07:00		32	*	5	*	37	*		*	*	*	*	*	*
07:15		62	*	4	*	66	*		*	*	*	*	*	*
07:30		49	*	7	*	56	*		*	*	*	*	*	*
07:45		42	*	4	*	46	*		*	*	*	*	*	*
08:00		31	*	8	*	39	*		*	*	*	*	*	*
08:15		21	*	7	*	28	*		*	*	*	*	*	*
08:30		21	*	6	*	27	*		*	*	*	*	*	*
08:45		20	*	10	*	30	*		*	*	*	*	*	*
09:00		12	*	13	*	25	*		*	*	*	*	*	*
09:15		8	*	7	*	15	*		*	*	*	*	*	*
09:30		3	*	8	*	11	*		*	*	*	*	*	*
09:45		20	*	4	*	24	*		*	*	*	*	*	*
10:00		9	*	14	*	23	*		*	*	*	*	*	*
10:15		4	*	9	*	13	*		*	*	*	*	*	*
10:30		8	*	11	*	19	*		*	*	*	*	*	*
10:45		14	*	9	*	23	*		*	*	*	*	*	*
11:00		6	*	4	*	10	*		*	*	*	*	*	*
11:15		4	*	9	*	13	*		*	*	*	*	*	*
11:30		12	*	5	*	17	*		*	*	*	*	*	*
11:45		*	*	*	*	*	*		*	*	*	*	*	*
Totals		508	0	171	0	679	0		0	0	0	0	0	0
Day Totals		508		171		679			0		0		0	
% Total		74.8%	.0%	25.1%	.0%				*	*	*	*		

Peaks	07:00	10:00	07:15
Volume	185	43	207
P.H.F.	.74	.76	.78

Technician: JM
Location : On East Jemez 1/4 mile W of
Nm 4

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS9-7
Page : 1

Both directions

Begin Time	Mon. 01/27 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	*	33	*	23	*	56	3	41	2	26	5	67
12:15	*	31	*	44	*	75	4	35	0	40	4	75
12:30	*	17	*	36	*	53	1	27	2	40	3	67
12:45	*	31	*	41	*	72	3	38	5	45	8	83
01:00	*	31	*	30	*	61	2	30	1	60	3	90
01:15	*	30	*	27	*	57	0	32	1	40	1	72
01:30	*	28	*	23	*	51	2	37	1	20	3	57
01:45	*	22	*	27	*	49	1	27	4	25	5	52
02:00	*	23	*	25	*	48	0	28	0	24	0	52
02:15	*	33	*	24	*	57	0	48	0	34	0	82
02:30	*	47	*	33	*	80	0	48	0	57	0	105
02:45	*	48	*	25	*	73	0	45	1	32	1	77
03:00	*	72	*	19	*	91	1	87	1	22	2	109
03:15	*	63	*	34	*	97	2	103	1	25	3	128
03:30	*	190	*	31	*	221	0	187	3	26	3	213
03:45	*	114	*	21	*	135	0	99	2	22	2	121
04:00	*	272	*	12	*	284	0	260	2	14	2	274
04:15	*	160	*	30	*	190	1	192	6	17	7	209
04:30	*	246	*	21	*	267	0	233	10	13	10	246
04:45	*	221	*	19	*	240	1	221	11	23	12	244
05:00	*	258	*	27	*	285	2	258	26	23	28	281
05:15	*	249	*	26	*	275	3	240	26	32	29	272
05:30	*	214	*	19	*	233	1	218	53	15	54	233
05:45	*	181	*	11	*	192	3	165	91	18	94	183
06:00	*	126	*	16	*	142	2	147	109	15	111	162
06:15	*	104	*	13	*	117	7	96	159	17	166	113
06:30	*	65	*	21	*	86	5	68	300	28	305	96
06:45	*	40	*	13	*	53	6	47	392	22	398	69
07:00	*	36	*	9	*	45	20	46	298	10	318	56
07:15	*	20	*	11	*	31	9	30	383	6	392	36
07:30	*	25	*	8	*	33	13	18	310	5	323	23
07:45	*	22	*	9	*	31	30	12	299	12	329	24
08:00	*	24	*	6	*	30	31	13	203	5	234	18
08:15	*	8	*	8	*	16	23	9	124	8	147	17
08:30	*	14	*	10	*	24	29	16	84	4	113	20
08:45	*	1	*	6	*	7	20	6	80	4	100	10
09:00	*	10	*	9	*	19	20	19	68	6	88	25
09:15	*	7	*	4	*	21	35	25	80	10	115	35
09:30	*	8	*	9	*	17	16	8	77	6	93	14
09:45	*	6	*	3	*	9	25	3	58	6	83	9
10:00	*	7	*	7	*	14	35	6	54	7	93	13
10:15	*	6	*	10	*	16	21	2	33	16	54	18
10:30	*	7	*	12	*	19	37	3	25	20	62	23
10:45	18	1	31	10	49	11	33	5	28	14	61	19
11:00	19	10	29	3	48	13	23	4	34	2	57	6
11:15	19	10	38	1	57	11	29	9	41	3	70	12
11:30	28	11	33	3	61	14	31	15	49	1	80	16
11:45	26	11	37	0	63	11	50	11	45	1	95	12
Totals	110	3203	168	829	278	4032	584	3317	3582	921	4166	4238
Day Totals	3313		997		4310		3901		4503		8404	
Total	2.5%	74.3%	3.9%	19.2%			6.9%	39.4%	42.6%	10.9%		
Peaks	11:00	04:30	11:00	00:15	11:00	04:30	11:00	04:30	06:45	00:15	06:45	04:30
Volume	92	974	137	151	229	1067	133	952	1383	185	1431	1043
P.H.F.	.82	.94	.90	.85	.90	.93	.66	.92	.88	.77	.89	.92

Site 5, Page 1

Technician:
Location* :On East Jemez 1/4 mile W of
No 4

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 0000000C000C
Start Date: 01/27/03
File I.D. : LCS9-7
Page : 2

Both directions

Begin Time	Wed. 01/29	East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Thur. 01/30	East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00		8	35	3	26	11	61		11	41	1	32	12	73
12:15		4	37	3	42	7	79		4	42	1	34	5	76
12:30		3	27	2	42	5	69		7	34	0	39	7	73
12:45		2	30	0	42	2	72		0	33	2	39	2	72
01:00		1	32	0	43	1	75		1	40	0	40	1	80
01:15		1	32	1	34	2	66		0	39	0	31	0	70
01:30		1	36	3	29	4	65		1	29	1	29	2	58
01:45		0	36	0	33	0	69		1	31	0	17	1	48
02:00		2	36	1	24	3	60		0	27	0	23	0	50
02:15		2	33	0	46	2	79		0	47	0	29	0	76
02:30		1	52	1	35	2	87		0	46	1	46	1	92
02:45		0	54	1	27	1	81		1	53	1	32	2	85
03:00		1	58	0	29	1	87		0	54	2	20	2	74
03:15		0	78	2	23	2	101		1	87	2	20	3	107
03:30		2	177	2	24	4	201		1	176	1	20	2	196
03:45		1	118	4	17	5	135		0	125	3	26	3	151
04:00		0	243	1	17	1	260		1	217	2	25	3	242
04:15		1	201	2	27	3	228		2	150	4	6	6	156
04:30		1	243	9	18	10	261		0	239	10	10	10	249
04:45		1	226	12	24	13	250		0	201	13	34	13	235
05:00		3	261	17	22	20	283		3	236	23	16	26	252
05:15		3	249	32	24	35	273		2	266	31	30	33	296
05:30		3	239	52	24	55	263		2	189	55	24	57	213
05:45		3	162	77	20	80	182		3	169	74	34	77	203
06:00		1	137	108	20	109	157		3	136	111	21	114	157
06:15		5	86	195	10	200	96		6	112	187	8	193	120
06:30		7	75	331	13	338	88		6	82	309	18	315	100
06:45		13	55	388	15	401	70		8	68	392	18	400	86
07:00		17	33	327	15	344	48		23	40	332	11	355	51
07:15		15	28	353	7	368	35		24	28	327	2	351	30
07:30		16	25	275	5	291	30		13	26	291	11	304	37
07:45		27	20	309	6	336	26		31	32	291	10	322	42
08:00		27	20	205	6	232	26		20	19	209	9	229	28
08:15		28	9	142	8	170	17		36	12	106	7	144	19
08:30		18	5	113	10	131	15		18	17	118	7	136	24
08:45		22	10	85	6	107	16		19	13	100	1	119	14
09:00		28	11	60	4	88	15		21	8	51	11	72	19
09:15		32	2	66	6	98	8		26	11	51	12	77	23
09:30		18	2	43	8	61	10		22	8	54	7	76	15
09:45		21	8	45	7	66	15		24	5	40	7	64	12
10:00		19	6	44	9	63	15		23	1	43	12	66	13
10:15		32	7	41	6	73	13		11	3	36	13	47	16
10:30		26	6	29	16	55	22		24	5	38	17	62	22
10:45		24	5	29	12	53	17		23	1	45	13	68	14
11:00		24	7	48	1	72	8		28	9	39	1	67	10
11:15		34	12	25	0	59	12		25	10	26	4	51	14
11:30		28	10	28	2	56	12		23	9	33	3	58	12
11:45		38	9	32	1	70	10		40	16	29	2	69	18
Totals		564	3283	3546	885	4110	4168		544	3242	3485	881	4029	4123
Day Totals		3847		4431		8278			3786		4366		8152	
% Total		6.8%	39.6%	42.8%	10.6%				6.6%	39.7%	42.7%	10.8%		
Peaks		11:00	04:30	06:30	00:15	06:30	04:45		11:00	04:30	06:30	00:15	06:30	04:30
Volume		124	979	1399	169	1451	1069		118	942	1360	152	1421	1032
P.H.F.		.81	.93	.90	.98	.90	.94		.73	.88	.86	.95	.88	.87

Location :On East Jemez 1/4 mile W of
Nm 4

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : L0S9-7
Page : 3

Both directions

Begin Time	Fri. 01/31 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	6	52	4	16	10	68	8	13	3	9	11	22
12:15	7	46	0	35	7	81	5	18	0	20	5	38
12:30	8	21	2	32	10	53	4	15	3	22	7	37
12:45	0	33	1	27	1	60	4	21	1	20	5	41
01:00	1	29	1	34	2	63	3	18	0	9	3	27
01:15	2	41	0	27	2	68	2	18	3	13	5	31
01:30	1	39	0	31	1	70	3	13	1	20	4	33
01:45	1	37	3	30	4	67	0	17	0	20	0	37
02:00	1	37	0	26	1	63	1	14	0	22	1	36
02:15	0	44	1	38	1	82	0	26	2	18	2	44
02:30	1	67	0	41	1	108	1	21	1	27	2	48
02:45	0	56	3	22	3	78	0	20	3	26	3	46
03:00	1	65	1	29	2	94	1	15	0	15	1	30
03:15	5	120	4	25	9	145	0	25	0	21	0	46
03:30	0	200	3	21	3	221	1	22	2	18	3	40
03:45	2	125	6	27	8	152	3	25	1	25	4	50
04:00	0	252	2	20	2	272	0	19	0	33	0	52
04:15	1	132	5	20	6	152	1	20	3	15	4	35
04:30	0	120	9	20	9	140	0	25	4	15	4	40
04:45	0	115	8	17	8	132	1	19	1	20	2	39
05:00	2	103	10	19	12	122	2	33	3	15	5	48
05:15	0	96	25	31	25	127	1	13	4	19	5	32
05:30	5	86	30	17	35	103	1	9	6	23	7	32
05:45	2	51	50	20	52	71	0	17	5	18	5	35
06:00	3	36	84	12	87	48	0	11	12	24	12	35
06:15	5	39	128	13	133	52	2	15	14	19	16	34
06:30	12	31	219	15	231	46	0	14	32	17	32	31
06:45	8	18	273	20	281	38	2	8	35	22	37	30
07:00	15	22	218	16	233	38	6	8	13	10	19	18
07:15	17	15	223	5	240	20	9	3	9	12	18	15
07:30	20	19	178	4	198	23	9	2	35	14	44	16
07:45	21	4	224	15	245	19	14	5	30	5	44	10
08:00	26	8	133	8	159	16	19	4	15	6	34	10
08:15	42	2	97	8	139	10	10	6	14	4	24	10
08:30	19	8	76	8	95	16	12	3	20	7	32	10
08:45	27	6	75	6	102	12	9	3	22	5	31	8
09:00	22	11	68	5	90	16	15	2	18	12	33	14
09:15	20	8	34	8	54	16	13	4	17	9	30	13
09:30	23	6	48	11	71	17	10	16	22	4	32	20
09:45	21	9	51	1	72	10	15	13	23	12	38	25
10:00	24	3	38	9	62	12	13	8	19	8	32	16
10:15	25	3	39	16	64	19	13	2	24	11	37	13
10:30	19	8	42	18	61	26	11	5	9	16	20	21
10:45	19	2	31	18	50	20	21	6	17	9	38	15
11:00	32	2	33	5	65	7	18	3	18	7	36	10
11:15	41	8	27	9	68	17	21	13	19	3	40	16
11:30	38	15	29	4	67	20	14	1	18	3	32	4
11:45	37	7	38	5	75	12	15	10	18	3	33	13
Totals	582	2258	2574	864	3156	3122	313	621	519	705	832	1326
Day Totals	2840		3438		6278		934		1224		2158	
Total	9.2%	35.9%	41.0%	13.7%			14.5%	28.7%	24.0%	32.6%		
Peaks	11:00	03:30	06:30	01:45	06:30	03:30	10:45	04:15	06:15	03:15	07:30	03:15
Volume	148	709	933	135	985	797	74	97	94	97	145	188
P.H.F.	.90	.70	.85	.82	.87	.73	.88	.73	.67	.73	.82	.90

Technicium
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS9-7
Page : 4

Location :On East Jemez 1/4 mile W of
Nm 4

Both directions

Begin Time	Sun. 02/02 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Mon. 02/03 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	4	13	3	17	7	30	3	38	0	46	3	84
12:15	4	32	2	17	6	49	11	37	0	31	11	68
12:30	4	22	0	22	4	44	3	25	0	35	3	60
12:45	0	18	3	23	3	41	1	25	1	46	2	71
01:00	4	22	1	19	5	41	1	30	3	36	4	66
01:15	2	11	1	10	3	21	2	28	0	31	2	59
01:30	0	10	0	13	0	23	0	28	1	29	1	57
01:45	1	17	1	19	2	36	0	25	2	22	2	47
02:00	0	8	1	17	1	25	0	38	1	30	1	68
02:15	2	15	2	20	4	35	0	25	2	37	2	62
02:30	0	18	5	28	5	46	0	35	1	31	1	66
02:45	0	25	0	25	0	50	1	39	1	27	2	66
03:00	0	15	1	13	1	28	0	62	0	42	0	104
03:15	0	19	0	11	0	30	1	86	0	25	1	111
03:30	0	10	0	19	0	29	0	168	6	19	6	187
03:45	1	15	3	12	4	27	0	131	2	18	2	149
04:00	0	19	0	13	0	32	0	260	1	17	1	277
04:15	0	14	3	11	3	25	2	174	3	14	5	188
04:30	0	17	0	17	0	34	2	212	10	17	12	229
04:45	1	9	1	25	2	34	1	206	17	23	18	229
05:00	1	22	1	10	2	32	1	270	18	17	19	287
05:15	0	14	0	16	0	30	0	253	28	17	28	270
05:30	0	13	1	16	1	29	2	218	48	19	50	237
05:45	2	12	1	14	3	26	3	159	77	18	80	177
06:00	1	6	6	10	7	16	3	130	111	17	114	147
06:15	1	5	6	18	7	23	6	91	190	12	196	103
06:30	3	2	18	21	21	23	10	83	308	13	318	96
06:45	3	10	17	18	20	28	10	52	388	10	398	62
07:00	2	6	2	10	4	16	14	45	345	13	359	58
07:15	7	2	3	13	10	15	11	30	337	13	348	43
07:30	6	4	12	5	18	9	25	27	263	9	288	36
07:45	13	5	22	13	35	18	29	16	287	8	316	24
08:00	12	3	13	3	25	6	36	14	189	13	225	27
08:15	10	3	8	9	18	12	29	12	136	5	165	17
08:30	13	7	19	6	32	13	26	11	89	14	115	25
08:45	12	4	27	8	39	12	11	7	91	5	102	12
09:00	13	8	21	4	34	12	27	3	65	3	92	6
09:15	9	9	24	7	33	15	19	13	52	3	71	16
09:30	8	6	14	6	22	12	12	2	44	11	56	13
09:45	12	6	22	2	34	8	25	7	56	3	81	10
10:00	7	4	14	9	21	13	26	4	47	5	73	9
10:15	9	2	14	12	23	14	23	5	47	13	70	18
10:30	7	5	15	17	22	22	18	4	32	25	50	29
10:45	11	3	16	8	27	11	28	3	47	12	75	15
11:00	19	3	22	0	41	3	26	11	19	1	45	12
11:15	19	6	13	6	32	12	34	8	28	5	62	13
11:30	13	7	10	2	23	9	34	17	42	4	76	21
11:45	18	8	19	4	37	12	44	16	27	2	71	18
Totals	254	514	387	618	641	1132	560	3183	3462	866	4022	4049
Day Totals	768		1005		1773		3743		4328		8071	
% Total	14.3%	28.9%	21.8%	34.8%			6.9%	39.4%	42.8%	10.7%		
Peaks	11:00	00:15	08:30	02:00	08:30	00:15	11:00	04:45	06:30	00:00	06:30	04:45
Volume	69	94	91	90	138	175	138	947	1378	158	1423	1023
P.H.F.	.90	.73	.84	.80	.88	.89	.78	.87	.88	.85	.89	.89

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Location :On East Jemez 1/4 mile W of
Nm 4

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS9-7
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Both directions

Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	5	52	1	44	6	96	5	44	0	37	5	81
12:15	7	28	2	33	9	61	4	28	1	42	5	70
12:30	8	31	1	38	9	69	6	36	2	37	8	73
12:45	2	27	1	40	3	67	2	37	0	38	2	75
01:00	1	31	2	39	3	70	0	29	2	24	2	53
01:15	0	33	0	30	0	63	0	27	2	41	2	68
01:30	1	27	1	28	2	55	1	25	2	21	3	46
01:45	1	34	0	23	1	57	2	22	1	21	3	43
02:00	0	45	0	32	0	77	0	42	1	33	1	75
02:15	1	38	1	34	2	72	0	25	2	28	2	53
02:30	1	62	0	35	1	97	0	53	1	37	1	90
02:45	0	71	0	34	0	105	0	48	3	52	3	100
03:00	2	76	1	24	3	100	1	60	2	30	3	90
03:15	0	107	0	25	0	132	3	77	0	14	3	91
03:30	1	187	2	20	3	207	1	177	4	26	5	203
03:45	1	139	4	24	5	163	2	116	6	18	8	134
04:00	0	272	3	16	3	288	0	283	2	17	2	300
04:15	0	197	2	19	2	216	3	185	4	19	7	204
04:30	1	197	4	16	5	213	0	231	7	17	7	248
04:45	0	186	19	16	19	202	1	240	20	20	21	260
05:00	2	246	16	27	18	273	1	245	16	18	17	264
05:15	5	254	32	22	37	276	3	259	25	23	28	282
05:30	2	181	50	22	52	203	2	207	60	28	62	235
05:45	3	136	81	18	84	154	5	180	74	28	79	208
06:00	4	110	100	19	104	129	2	114	93	12	95	126
06:15	5	116	166	15	171	131	5	117	190	16	195	133
06:30	0	80	321	22	321	102	9	69	304	9	313	78
06:45	7	56	381	15	388	71	6	66	375	16	381	82
07:00	12	41	351	17	363	58	9	39	335	9	344	48
07:15	17	27	333	15	350	42	12	25	376	6	388	31
07:30	23	34	292	6	315	40	12	22	264	6	276	28
07:45	34	16	260	5	294	21	26	26	288	7	314	33
08:00	20	22	182	3	202	25	28	18	234	5	262	23
08:15	32	10	148	7	180	17	31	12	128	6	159	18
08:30	17	14	102	7	119	21	24	16	101	5	125	21
08:45	27	12	87	6	114	18	24	6	88	7	112	13
09:00	32	12	62	8	94	20	34	11	64	8	98	19
09:15	24	17	73	11	97	28	15	9	61	6	76	15
09:30	28	4	62	7	90	11	21	6	50	11	71	17
09:45	19	7	62	3	81	10	21	7	51	7	72	14
10:00	25	8	42	8	67	16	13	2	43	13	56	15
10:15	27	3	45	11	72	14	20	9	34	12	54	21
10:30	27	3	31	26	58	29	25	6	31	19	56	25
10:45	24	5	41	10	65	15	12	1	33	12	45	13
11:00	32	7	41	5	73	12	26	4	41	2	67	6
11:15	27	12	28	0	55	12	23	10	44	3	67	13
11:30	35	14	23	2	58	16	39	13	27	1	66	14
11:45	32	14	23	3	55	17	44	18	38	2	82	20
Totals	574	3301	3479	890	4053	4191	523	3303	3530	869	4053	4172
Day Totals	3875		4369		8244		3826		4399		8225	
Total	6.9%	40.0%	42.2%	10.8%			6.3%	40.1%	42.9%	10.5%		
Peaks	11:00	04:30	06:30	00:00	06:30	04:30	11:00	04:30	06:30	00:00	06:30	04:30
Volume	126	883	1386	155	1422	964	132	976	1390	154	1426	1054
P.H.F.	.9	.86	.90	.88	.91	.87	.75	.94	.92	.91	.91	.93

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician:JM
Location :On East Jemez 1/4 mile W of
Lane 4

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS9-7
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Both directions

Begin Time	Thur. 02/06 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	4	33	2	29	6	62	*	*	*	*	*	*
12:15	8	40	0	36	8	76	*	*	*	*	*	*
12:30	7	24	3	42	10	66	*	*	*	*	*	*
12:45	5	31	0	39	5	70	*	*	*	*	*	*
01:00	3	24	2	38	5	62	*	*	*	*	*	*
01:15	0	*	1	*	1	*	*	*	*	*	*	*
01:30	1	*	2	*	3	*	*	*	*	*	*	*
01:45	0	*	0	*	0	*	*	*	*	*	*	*
02:00	0	*	0	*	0	*	*	*	*	*	*	*
02:15	1	*	0	*	1	*	*	*	*	*	*	*
02:30	1	*	0	*	1	*	*	*	*	*	*	*
02:45	1	*	3	*	4	*	*	*	*	*	*	*
03:00	0	*	2	*	2	*	*	*	*	*	*	*
03:15	0	*	1	*	1	*	*	*	*	*	*	*
03:30	0	*	1	*	1	*	*	*	*	*	*	*
03:45	0	*	4	*	4	*	*	*	*	*	*	*
04:00	3	*	3	*	6	*	*	*	*	*	*	*
04:15	1	*	5	*	6	*	*	*	*	*	*	*
04:30	0	*	6	*	6	*	*	*	*	*	*	*
04:45	2	*	13	*	15	*	*	*	*	*	*	*
05:00	1	*	15	*	16	*	*	*	*	*	*	*
05:15	2	*	39	*	41	*	*	*	*	*	*	*
05:30	4	*	42	*	46	*	*	*	*	*	*	*
05:45	5	*	84	*	89	*	*	*	*	*	*	*
06:00	3	*	100	*	103	*	*	*	*	*	*	*
06:15	9	*	173	*	182	*	*	*	*	*	*	*
06:30	2	*	321	*	323	*	*	*	*	*	*	*
06:45	7	*	359	*	366	*	*	*	*	*	*	*
07:00	18	*	356	*	374	*	*	*	*	*	*	*
07:15	17	*	323	*	340	*	*	*	*	*	*	*
07:30	17	*	278	*	295	*	*	*	*	*	*	*
07:45	30	*	259	*	289	*	*	*	*	*	*	*
08:00	16	*	200	*	216	*	*	*	*	*	*	*
08:15	26	*	149	*	175	*	*	*	*	*	*	*
08:30	21	*	92	*	113	*	*	*	*	*	*	*
08:45	31	*	108	*	139	*	*	*	*	*	*	*
09:00	34	*	48	*	82	*	*	*	*	*	*	*
09:15	12	*	48	*	60	*	*	*	*	*	*	*
09:30	24	*	61	*	85	*	*	*	*	*	*	*
09:45	22	*	45	*	67	*	*	*	*	*	*	*
10:00	21	*	37	*	58	*	*	*	*	*	*	*
10:15	24	*	23	*	47	*	*	*	*	*	*	*
10:30	24	*	32	*	56	*	*	*	*	*	*	*
10:45	26	*	33	*	59	*	*	*	*	*	*	*
11:00	29	*	20	*	49	*	*	*	*	*	*	*
11:15	21	*	36	*	57	*	*	*	*	*	*	*
11:30	37	*	31	*	68	*	*	*	*	*	*	*
11:45	32	*	31	*	63	*	*	*	*	*	*	*
Totals	552	152	3391	184	3943	336	0	0	0	0	0	0
Day Totals	704		3575		4279		0		0		0	
Total	12.9%	3.5%	79.2%	4.3%			*	*	*	*		
Peaks	11:00	00:00	06:30	00:15	06:30	00:00						
Volume	119	128	1359	155	1403	274						
P.H.F.	.80	.8	.94	.92	.93	.90						

Technician
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS7-7
Page : 1

Location :On East Jemez 500' West of Royal Crest

Both directions

Begin Time	Mon. 01/27 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	*	57	*	59	*	116	4	60	3	57	7	117
12:15	*	49	*	52	*	101	4	47	2	71	6	118
12:30	*	66	*	64	*	130	3	66	2	76	5	142
12:45	*	67	*	56	*	123	3	70	4	66	7	136
01:00	*	70	*	63	*	133	0	75	3	68	3	143
01:15	*	58	*	40	*	98	0	69	1	64	1	133
01:30	*	54	*	41	*	95	2	66	1	34	3	100
01:45	*	49	*	56	*	105	1	60	3	52	4	112
02:00	*	53	*	36	*	89	0	63	1	43	1	106
02:15	*	50	*	53	*	103	2	76	0	54	2	130
02:30	*	66	*	47	*	113	0	56	0	64	0	120
02:45	*	67	*	57	*	124	0	88	1	57	1	145
03:00	*	89	*	33	*	122	1	106	1	47	2	153
03:15	*	105	*	50	*	155	2	121	1	45	3	166
03:30	*	201	*	67	*	268	0	182	3	44	3	226
03:45	*	142	*	41	*	183	0	144	2	67	2	211
04:00	*	279	*	46	*	325	1	265	3	35	4	300
04:15	*	136	*	42	*	178	1	146	3	46	4	192
04:30	*	245	*	54	*	299	1	257	11	52	12	309
04:45	*	204	*	53	*	257	3	198	11	56	14	254
05:00	*	251	*	86	*	337	4	262	24	69	28	331
05:15	*	219	*	62	*	281	1	195	27	66	28	261
05:30	*	192	*	54	*	246	3	204	42	64	45	268
05:45	*	157	*	47	*	204	2	140	68	60	70	200
06:00	*	102	*	37	*	139	8	128	101	48	109	176
06:15	*	100	*	33	*	133	20	88	155	51	175	139
06:30	*	47	*	31	*	78	28	62	213	36	241	98
06:45	*	43	*	31	*	74	32	44	348	45	380	89
07:00	*	34	*	18	*	52	32	47	298	28	330	75
07:15	*	28	*	24	*	52	41	23	354	8	395	31
07:30	*	24	*	12	*	36	50	27	294	10	344	37
07:45	*	30	*	13	*	43	57	16	331	16	388	32
08:00	*	26	*	13	*	39	74	15	219	10	293	25
08:15	*	11	*	15	*	26	65	16	138	16	203	32
08:30	*	23	*	13	*	36	64	15	78	8	142	23
08:45	*	9	*	8	*	17	43	19	94	8	137	27
09:00	*	14	*	8	*	22	59	27	66	10	125	37
09:15	*	16	*	10	*	26	42	34	98	12	140	46
09:30	*	11	*	11	*	22	32	9	82	10	114	19
09:45	41	8	68	4	109	12	53	5	96	8	149	13
10:00	33	11	66	8	99	19	59	5	78	12	137	17
10:15	41	6	64	8	105	14	41	2	58	15	99	17
10:30	49	6	48	18	97	24	53	6	34	19	87	25
10:45	38	1	52	14	90	15	40	5	40	20	80	25
11:00	31	13	60	10	91	23	48	6	51	6	99	12
11:15	32	14	71	1	103	15	45	15	68	4	113	19
11:30	46	11	66	0	112	11	52	18	74	1	126	19
11:45	47	9	72	1	119	10	74	8	82	2	156	10
Totals	358	3523	567	1600	925	5123	1150	3656	3667	1760	4817	5416
Day Totals	3881		2167		6048		4806		5427		10233	
% Total	5.9%	58.2%	9.3%	26.4%			11.2%	35.7%	35.8%	17.2%		
Peaks	09:45	04:30	11:00	04:30	11:00	04:30	07:45	04:30	05:45	00:15	07:00	04:30
Volume	164	919	269	255	425	1174	260	912	1294	281	1457	1155
P.H.F.	.83	.91	.93	.74	.89	.87	.87	.87	.91	.92	.92	.87

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Technician: Jm
Location :On East Jemez 500' West of Royal Crest

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LCS7-7
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Both directions

Begin Time	Wed. 01/29 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Thur. 01/30 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	6	65	4	69	10	134	9	66	4	69	13	135
12:15	5	58	5	66	10	124	4	52	1	49	5	101
12:30	1	70	3	48	4	118	7	92	1	59	8	151
12:45	1	76	2	60	3	136	0	75	1	58	1	133
01:00	0	72	0	64	0	136	0	76	0	61	0	137
01:15	1	61	0	50	1	111	1	68	1	51	2	119
01:30	0	74	0	43	0	117	2	54	1	40	3	94
01:45	2	60	4	60	6	120	0	59	0	48	0	107
02:00	1	64	1	47	2	111	0	48	0	30	0	78
02:15	3	46	0	57	3	103	0	72	0	61	0	133
02:30	0	63	0	56	0	119	1	58	1	56	2	114
02:45	0	72	2	67	2	139	1	66	1	58	2	124
03:00	1	74	0	41	1	115	0	68	2	35	2	103
03:15	2	104	1	79	3	183	2	119	2	36	4	155
03:30	0	188	2	71	2	259	1	187	1	50	2	237
03:45	2	153	5	46	7	199	1	153	3	52	4	205
04:00	0	273	1	42	1	315	2	221	1	45	3	266
04:15	2	168	3	58	5	226	1	145	5	44	6	189
04:30	0	258	7	43	7	301	2	240	9	46	11	286
04:45	3	180	12	50	15	230	0	175	15	65	15	240
05:00	5	276	13	81	18	357	7	275	19	70	26	345
05:15	3	221	31	66	34	287	2	218	27	63	29	281
05:30	2	223	33	58	35	281	3	184	41	70	44	254
05:45	10	142	82	57	92	199	10	120	80	62	90	182
06:00	15	98	79	39	94	137	12	123	78	56	90	179
06:15	11	75	169	28	180	103	13	92	156	26	169	118
06:30	23	73	253	33	276	106	27	73	254	35	281	108
06:45	44	55	377	34	421	89	53	56	362	35	415	91
07:00	39	28	320	24	359	52	63	51	321	22	384	73
07:15	43	24	320	18	363	42	49	34	312	13	361	47
07:30	42	25	286	11	328	36	40	28	291	18	331	46
07:45	68	31	314	11	382	42	54	29	299	20	353	49
08:00	77	16	220	15	297	31	59	16	216	14	275	30
08:15	70	10	140	7	210	17	76	12	129	10	205	22
08:30	57	9	124	11	181	20	54	19	119	10	173	29
08:45	46	18	112	8	158	26	44	15	98	4	142	19
09:00	61	16	72	6	133	22	42	16	82	11	124	27
09:15	45	4	72	11	117	15	42	15	56	17	98	32
09:30	32	7	67	12	99	19	52	13	73	8	125	21
09:45	47	16	54	8	101	24	41	8	63	12	104	20
10:00	39	8	58	11	97	19	40	5	53	6	93	11
10:15	46	12	50	7	96	19	46	5	49	14	95	19
10:30	43	9	53	15	96	24	42	3	53	19	95	22
10:45	46	3	58	20	104	23	35	4	57	16	92	20
11:00	52	10	69	3	121	13	33	11	66	3	99	14
11:15	41	16	49	1	90	17	41	13	66	6	107	19
11:30	50	9	70	3	120	12	47	12	71	3	118	15
11:45	67	9	73	2	140	11	60	12	78	4	138	16
Totals	1154	3622	3670	1717	4824	5339	1121	3556	3618	1660	4739	5216
Day Totals	4775		5387		10163		4677		5278		9955	
% Total	11.3%	35.6%	36.1%	16.8%			11.2%	35.7%	36.3%	16.6%		
Peaks	07:45	04:30	06:45	05:00	06:45	04:30	07:45	04:30	06:45	04:45	06:45	04:30
Volume	272	935	1303	262	1471	1175	243	908	1286	268	1491	1152
P.H.F.	.88	.84	.86	.80	.87	.82	.79	.82	.88	.95	.89	.83

Technician: Jm
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS7-7
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Location :On'East Jemez 500' West of Royal Crest

Both directions

Begin Time	Fri. 01/31 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	9	64	4	52	13	116	11	22	8	24	19	46
12:15	8	49	2	56	10	105	7	20	2	26	9	46
12:30	6	47	1	41	7	88	5	23	6	26	11	49
12:45	1	62	0	69	1	131	7	24	4	28	11	52
01:00	2	70	1	41	3	111	5	29	0	17	5	46
01:15	1	60	0	40	1	100	4	15	3	17	7	32
01:30	4	52	0	60	4	112	3	20	2	21	5	41
01:45	2	61	3	40	5	101	1	24	0	22	1	46
02:00	1	59	2	54	3	113	0	22	0	23	0	45
02:15	0	75	0	47	0	122	1	35	1	25	2	60
02:30	1	69	1	60	2	129	0	26	2	29	2	55
02:45	0	68	3	57	3	125	1	22	3	31	4	53
03:00	3	79	1	33	4	112	0	21	0	24	0	45
03:15	4	144	1	44	5	188	0	27	0	31	0	58
03:30	2	183	4	45	6	228	2	35	0	22	2	57
03:45	1	168	7	45	8	213	2	19	1	29	3	48
04:00	0	227	3	48	3	275	1	29	1	34	2	63
04:15	1	119	6	47	7	166	0	23	2	23	2	46
04:30	1	132	7	42	8	174	0	26	3	18	3	44
04:45	2	97	9	37	11	134	2	22	4	18	6	40
05:00	3	116	18	46	21	162	4	32	4	29	8	61
05:15	1	103	16	57	17	160	2	22	2	31	4	53
05:30	2	76	26	36	28	112	1	11	9	23	10	34
05:45	5	43	45	31	50	74	0	17	10	28	10	45
06:00	9	30	72	29	81	59	3	13	12	27	15	40
06:15	18	49	104	19	122	68	1	31	6	24	7	55
06:30	15	23	177	25	192	48	0	20	36	23	36	43
06:45	25	22	262	32	287	54	4	10	40	29	44	39
07:00	34	29	215	21	249	50	7	10	16	19	23	29
07:15	27	18	223	14	250	32	12	8	13	17	25	25
07:30	33	18	200	13	233	31	8	9	30	15	38	24
07:45	43	11	216	14	259	25	23	11	41	11	64	22
08:00	70	9	147	12	217	21	24	11	18	7	42	18
08:15	57	8	116	7	173	15	5	9	18	7	23	16
08:30	44	9	74	4	118	13	16	5	19	9	35	14
08:45	51	13	71	11	122	24	15	9	36	7	51	16
09:00	45	15	83	6	128	21	23	8	25	11	48	19
09:15	37	8	57	12	94	20	14	6	22	9	36	15
09:30	37	8	47	12	84	20	15	20	17	10	32	30
09:45	46	13	76	7	122	20	18	18	42	8	60	26
10:00	43	3	62	9	107	12	27	4	30	6	57	10
10:15	41	5	41	11	82	16	14	7	25	14	39	21
10:30	32	10	70	18	102	28	20	7	21	14	41	21
10:45	35	3	45	24	80	27	27	5	18	17	45	22
11:00	55	4	49	6	104	10	23	8	28	8	51	16
11:15	49	15	44	8	93	23	18	11	18	3	36	14
11:30	44	15	55	6	99	21	25	8	18	3	43	11
11:45	57	12	53	7	110	19	16	11	29	4	45	15
Totals	1009	2573	2719	1455	3728	4028	417	825	645	901	1062	1726
Day Totals	3582		4174		7756		1242		1546		2788	
% Total	13.0%	33.1%	35.0%	18.7%			14.9%	29.5%	23.1%	32.3%		
Peaks	08:00	03:15	06:45	00:00	06:45	03:15	10:45	03:15	09:45	03:15	09:45	03:15
Volume	222	722	900	218	1019	904	93	110	118	116	197	226
P.H.F.	.79	.79	.85	.78	.88	.82	.86	.78	.70	.85	.82	.89

Technician: Jm
Location :On East Jemez 500' West of Royal Crest

3500 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
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Both directions

Begin Time	Sun. 02/02 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Mon. 02/03 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	3	23	4	27	7	50	6	58	3	56	9	114
12:15	5	34	0	17	5	51	12	51	1	72	13	123
12:30	5	30	5	23	10	53	2	60	0	58	2	118
12:45	3	22	2	22	5	44	2	73	0	66	2	139
01:00	3	23	3	29	6	52	1	74	1	63	2	137
01:15	4	17	0	16	4	33	1	71	1	55	2	126
01:30	1	17	0	24	1	41	0	61	1	48	1	109
01:45	1	15	1	23	2	38	0	58	1	42	1	100
02:00	1	20	0	18	1	38	0	60	1	46	1	106
02:15	1	24	0	18	1	42	0	42	1	62	1	104
02:30	0	20	2	32	2	52	1	62	0	48	1	110
02:45	0	22	2	29	2	51	0	54	2	51	2	105
03:00	0	17	0	29	0	46	1	93	1	43	2	136
03:15	0	29	0	12	0	41	1	103	0	60	1	163
03:30	1	15	0	18	1	33	0	164	5	43	5	207
03:45	2	19	2	16	4	35	0	157	3	41	3	198
04:00	0	18	2	19	2	37	0	292	2	43	2	335
04:15	0	20	3	20	3	40	3	142	3	37	6	179
04:30	0	19	1	22	1	41	2	233	7	70	9	303
04:45	1	21	1	31	2	52	1	186	16	59	17	245
05:00	1	18	1	19	2	37	3	274	18	68	21	342
05:15	1	20	3	17	4	37	1	225	32	58	33	283
05:30	1	14	3	17	4	31	7	193	37	64	44	257
05:45	2	13	2	18	4	31	6	124	63	59	69	183
06:00	2	13	9	19	11	32	5	116	89	41	94	157
06:15	2	10	9	18	11	28	19	74	164	48	183	122
06:30	2	9	12	25	14	35	28	74	243	29	271	103
06:45	5	12	24	28	30	40	47	46	358	28	405	74
07:00	4	13	3	13	7	26	40	46	329	22	369	68
07:15	14	9	4	15	18	24	45	28	315	21	360	49
07:30	6	10	12	8	18	18	49	31	293	14	342	45
07:45	16	5	22	12	38	17	49	15	269	12	318	27
08:00	10	7	19	9	29	16	68	16	227	13	295	29
08:15	16	6	16	14	32	20	67	16	149	17	216	33
08:30	13	10	15	7	28	17	61	13	91	12	152	25
08:45	12	10	37	8	49	18	39	9	90	10	129	19
09:00	11	11	25	4	36	15	45	10	79	13	124	23
09:15	8	9	33	6	41	15	38	12	62	5	100	17
09:30	5	7	16	7	21	14	51	6	63	16	114	22
09:45	14	10	23	5	37	15	67	14	74	5	141	19
10:00	8	8	22	9	30	17	46	5	58	4	104	9
10:15	17	9	17	10	34	19	35	10	60	14	95	24
10:30	15	2	19	24	34	26	38	8	41	24	79	32
10:45	16	4	18	13	34	17	49	7	49	26	98	33
11:00	27	9	33	3	60	12	36	9	57	1	93	10
11:15	20	7	15	9	35	16	50	12	56	5	106	17
11:30	18	6	10	1	28	7	42	19	69	5	111	24
11:45	27	8	21	6	48	14	65	12	93	6	158	18
Totals	325	694	471	790	796	1484	1129	3518	3577	1703	4706	5221
Day Totals	1019		1261		2280		4647		5280		9927	
% Total	14.2%	30.4%	20.6%	34.6%			11.3%	35.4%	36.0%	17.1%		
Peaks	11:00	00:00	08:45	02:15	11:00	00:15	07:45	04:30	06:45	00:15	06:45	04:30
Volume	92	109	111	108	171	200	245	918	1295	259	1476	1173
P.H.F.	.85	.80	.75	.84	.71	.94	.90	.83	.90	.89	.91	.85

Technician:dm
Location :On East Jemez 500' West of Royal Crest

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
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Both directions

Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	8	66	0	56	8	122	3	49	1	75	4	124
12:15	10	55	4	62	14	118	10	46	1	89	11	135
12:30	6	62	1	67	7	129	5	60	0	57	5	117
12:45	3	62	3	56	6	118	0	68	1	50	1	118
01:00	1	73	1	67	2	140	0	69	1	44	1	113
01:15	0	76	0	61	0	137	1	57	2	57	3	114
01:30	1	58	1	40	2	98	3	48	4	51	7	99
01:45	2	56	0	48	2	104	0	51	0	48	0	99
02:00	0	68	1	49	1	117	1	56	4	47	5	103
02:15	2	62	1	51	3	113	0	56	0	50	0	106
02:30	0	75	0	67	0	142	0	67	4	52	4	119
02:45	2	85	0	62	2	147	0	64	2	75	2	139
03:00	1	106	1	45	2	151	1	84	1	59	2	143
03:15	0	120	0	50	0	170	2	115	0	41	2	156
03:30	2	190	2	53	4	243	2	192	3	56	5	248
03:45	0	168	4	39	4	207	1	149	6	36	7	185
04:00	0	281	1	32	1	313	1	300	4	30	5	330
04:15	0	177	4	46	4	223	2	162	3	47	5	209
04:30	1	220	4	65	5	285	1	262	6	66	7	328
04:45	1	181	18	65	19	246	3	173	19	63	22	236
05:00	2	242	15	74	17	316	3	270	16	65	19	335
05:15	6	224	25	59	31	283	2	203	19	70	21	273
05:30	4	172	45	58	49	230	4	203	51	61	55	264
05:45	6	105	74	51	80	156	8	136	65	75	73	211
06:00	13	121	80	53	93	174	8	109	72	34	80	143
06:15	10	92	146	40	156	132	17	98	173	38	190	136
06:30	22	64	261	38	283	102	24	70	237	29	261	99
06:45	43	50	354	42	397	92	30	53	361	35	391	88
07:00	38	37	324	17	362	54	59	32	330	20	389	52
07:15	42	30	337	26	379	56	42	22	346	11	388	33
07:30	50	33	272	12	322	45	61	34	274	12	335	46
07:45	90	19	282	10	372	29	67	20	281	15	348	35
08:00	66	22	205	10	271	32	69	23	257	11	326	34
08:15	64	13	146	7	210	20	68	18	144	7	212	25
08:30	57	18	107	8	164	26	58	14	94	9	152	23
08:45	57	18	98	3	155	21	42	11	105	10	147	21
09:00	39	11	74	11	113	22	49	13	76	8	125	21
09:15	58	20	78	12	136	32	41	10	58	8	99	18
09:30	42	10	83	14	125	24	37	12	68	14	105	26
09:45	26	13	92	2	118	15	48	6	65	5	113	11
10:00	51	7	50	11	101	18	33	9	57	10	90	19
10:15	42	5	68	13	110	18	41	11	53	17	94	28
10:30	39	4	54	20	93	24	36	3	38	20	74	23
10:45	45	8	58	20	103	28	28	5	48	19	76	24
11:00	45	8	64	9	109	17	39	8	53	6	92	14
11:15	45	17	57	0	102	17	36	21	66	3	102	24
11:30	37	10	58	1	95	11	55	11	55	5	110	15
11:45	56	13	79	3	135	16	62	17	71	2	133	19
Totals	1135	3628	3632	1705	4767	5333	1103	3570	3595	1712	4698	5282
Day Totals	4763		5337		10100		4673		5307		9980	
% Total	11.2%	35.9%	35.9%	16.8%			11.0%	35.7%	36.0%	17.1%		
Peaks	07:45	04:30	06:45	04:30	06:45	04:30	07:30	04:30	06:45	00:00	06:45	04:30
Volume	277	867	1287	263	1460	1130	265	908	1311	271	1503	1172
P.H.F.	.76	.89	.90	.88	.91	.89	.96	.84	.90	.76	.96	.87

Technician:Jm
Location :On East Jemez 500' West of Royal Crest

3600 CERRILLOS ROAD #205
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Site Code : 000000000000
Start Date: 01/27/03
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Both directions

Begin Time	Thur. 02/06 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	4	67	2	71	6	138	*	*	*	*	*	*
12:15	10	54	1	57	11	111	*	*	*	*	*	*
12:30	6	65	1	60	7	125	*	*	*	*	*	*
12:45	5	70	0	66	5	136	*	*	*	*	*	*
01:00	4	*	1	*	5	*	*	*	*	*	*	*
01:15	1	*	2	*	3	*	*	*	*	*	*	*
01:30	0	*	2	*	2	*	*	*	*	*	*	*
01:45	0	*	0	*	0	*	*	*	*	*	*	*
02:00	0	*	1	*	1	*	*	*	*	*	*	*
02:15	2	*	0	*	2	*	*	*	*	*	*	*
02:30	1	*	0	*	1	*	*	*	*	*	*	*
02:45	0	*	0	*	0	*	*	*	*	*	*	*
03:00	0	*	2	*	2	*	*	*	*	*	*	*
03:15	0	*	1	*	1	*	*	*	*	*	*	*
03:30	0	*	3	*	3	*	*	*	*	*	*	*
03:45	1	*	3	*	4	*	*	*	*	*	*	*
04:00	2	*	3	*	5	*	*	*	*	*	*	*
04:15	1	*	3	*	4	*	*	*	*	*	*	*
04:30	2	*	6	*	8	*	*	*	*	*	*	*
04:45	2	*	19	*	21	*	*	*	*	*	*	*
05:00	1	*	11	*	12	*	*	*	*	*	*	*
05:15	6	*	35	*	41	*	*	*	*	*	*	*
05:30	3	*	36	*	39	*	*	*	*	*	*	*
05:45	4	*	74	*	78	*	*	*	*	*	*	*
06:00	16	*	80	*	96	*	*	*	*	*	*	*
06:15	13	*	136	*	149	*	*	*	*	*	*	*
06:30	24	*	256	*	280	*	*	*	*	*	*	*
06:45	57	*	365	*	422	*	*	*	*	*	*	*
07:00	44	*	323	*	367	*	*	*	*	*	*	*
07:15	40	*	317	*	357	*	*	*	*	*	*	*
07:30	46	*	259	*	305	*	*	*	*	*	*	*
07:45	74	*	300	*	374	*	*	*	*	*	*	*
08:00	77	*	212	*	289	*	*	*	*	*	*	*
08:15	78	*	150	*	228	*	*	*	*	*	*	*
08:30	59	*	101	*	160	*	*	*	*	*	*	*
08:45	70	*	100	*	170	*	*	*	*	*	*	*
09:00	58	*	72	*	130	*	*	*	*	*	*	*
09:15	31	*	59	*	90	*	*	*	*	*	*	*
09:30	42	*	84	*	126	*	*	*	*	*	*	*
09:45	39	*	87	*	126	*	*	*	*	*	*	*
10:00	43	*	51	*	94	*	*	*	*	*	*	*
10:15	43	*	49	*	92	*	*	*	*	*	*	*
10:30	42	*	41	*	83	*	*	*	*	*	*	*
10:45	36	*	51	*	87	*	*	*	*	*	*	*
11:00	38	*	59	*	97	*	*	*	*	*	*	*
11:15	47	*	69	*	116	*	*	*	*	*	*	*
11:30	50	*	67	*	117	*	*	*	*	*	*	*
11:45	53	*	72	*	125	*	*	*	*	*	*	*
Totals	1175	256	3566	254	4741	510	0	0	0	0	0	0
Day Totals	1431		3820		5251		0		0		0	
% Total	22.3%	4.8%	67.9%	4.8%			*	*	*	*		
Peaks	07:45	00:00	06:45	00:00	06:45	00:00						
Volume	288	256	1264	254	1451	510						
P.H.F.	.92	.91	.86	.89	.85	.92						

Technician: JM
Location : On Pajarito 1000' W of NM 4
Other :

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS10-7
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Both directions

Begin Time	Mon. 01/27 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	*	76	*	39	*	115	1	64	0	35	1	99
12:15	*	57	*	44	*	101	2	45	1	54	3	99
12:30	*	33	*	54	*	87	2	47	2	63	4	110
12:45	*	44	*	66	*	110	1	32	1	53	2	85
01:00	*	33	*	45	*	78	0	39	0	54	0	93
01:15	*	22	*	38	*	60	1	23	0	37	1	60
01:30	*	33	*	37	*	70	1	34	0	42	1	76
01:45	*	29	*	26	*	55	0	22	0	22	0	44
02:00	*	26	*	24	*	50	2	33	1	27	3	60
02:15	*	23	*	15	*	38	2	38	0	25	2	63
02:30	*	23	*	21	*	44	0	37	2	30	2	67
02:45	*	57	*	23	*	80	0	42	0	26	0	68
03:00	*	41	*	26	*	67	0	55	0	29	0	84
03:15	*	85	*	23	*	108	0	108	2	22	2	130
03:30	*	111	*	24	*	135	1	130	1	32	2	162
03:45	*	111	*	25	*	136	0	88	3	23	3	111
04:00	*	181	*	24	*	205	0	159	0	18	0	177
04:15	*	107	*	18	*	125	0	85	1	17	1	102
04:30	*	205	*	21	*	226	0	199	2	18	2	217
04:45	*	157	*	33	*	190	3	179	9	15	12	194
05:00	*	251	*	19	*	270	0	251	6	20	6	271
05:15	*	259	*	14	*	273	1	230	10	17	11	247
05:30	*	304	*	24	*	328	1	296	27	25	28	321
05:45	*	177	*	16	*	193	1	193	45	21	46	214
06:00	*	155	*	13	*	168	3	155	87	17	90	172
06:15	*	98	*	16	*	114	0	128	147	16	147	144
06:30	*	91	*	17	*	108	4	69	244	28	248	97
06:45	*	60	*	15	*	75	3	54	319	18	322	72
07:00	*	45	*	12	*	57	14	47	268	13	282	60
07:15	*	44	*	15	*	59	11	51	287	11	298	62
07:30	*	37	*	13	*	50	20	31	231	10	251	41
07:45	*	28	*	6	*	34	36	29	260	5	296	34
08:00	*	23	*	4	*	27	35	21	176	7	211	28
08:15	*	20	*	5	*	25	24	18	125	6	149	24
08:30	*	14	*	5	*	19	22	20	90	4	112	24
08:45	*	27	*	6	*	33	24	13	70	4	94	17
09:00	*	19	*	8	*	27	16	23	49	6	65	29
09:15	*	20	*	3	*	23	11	68	64	5	75	73
09:30	*	7	*	4	*	11	27	26	44	1	71	27
09:45	*	13	*	1	*	14	28	23	32	7	60	30
10:00	*	9	*	7	*	16	23	9	19	4	42	13
10:15	*	14	*	2	*	16	19	3	35	4	54	7
10:30	*	7	*	8	*	15	31	7	31	8	62	15
10:45	*	3	*	4	*	7	35	9	33	5	68	14
11:00	*	1	*	1	*	2	38	2	39	0	77	2
11:15	49	3	27	0	76	3	50	4	29	0	79	4
11:30	72	3	33	1	105	4	89	1	27	1	116	2
11:45	66	5	34	0	100	5	91	5	59	0	150	5
Totals	187	3191	94	865	281	4056	673	3245	2878	905	3551	4150
Day Totals	3378		959		4337		3918		3783		7701	
% Total	4.3%	73.5%	2.1%	19.9%			8.7%	42.1%	37.3%	11.7%		
Peaks	11:00	05:00	11:00	00:15	11:00	05:00	11:00	05:00	06:30	00:15	06:45	05:00
Volume	187	991	94	209	281	1064	268	970	1118	224	1153	1053
P.H.F.	.64	.81	.69	.79	.66	.81	.73	.81	.87	.88	.89	.82

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Technician:JM
Location :On Pajarito 1000' W of NM 4
Other :

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
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Both directions

Begin Time	Wed. 01/29 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Thur. 01/30 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	3	57	2	36	5	93	4	75	2	37	6	112
12:15	3	59	0	55	3	114	4	66	0	60	4	126
12:30	1	44	0	57	1	101	2	37	1	65	3	102
12:45	2	47	2	55	4	102	2	42	1	68	3	110
01:00	1	33	0	55	1	88	0	52	2	43	2	95
01:15	1	27	0	30	1	57	0	36	0	36	0	72
01:30	1	41	1	27	2	68	0	33	0	42	0	75
01:45	0	24	0	29	0	53	0	19	0	16	0	35
02:00	1	38	0	28	1	66	1	29	1	36	2	65
02:15	2	35	1	23	3	58	0	33	0	26	0	59
02:30	1	42	0	40	1	82	1	45	2	34	3	79
02:45	0	42	0	26	0	68	0	47	1	37	1	84
03:00	1	44	2	24	3	68	1	52	0	26	1	78
03:15	0	107	1	26	1	133	1	86	1	36	2	122
03:30	2	120	0	27	2	147	3	136	2	31	5	167
03:45	0	65	2	30	2	95	1	91	3	32	4	123
04:00	0	173	0	28	0	201	0	183	1	26	1	209
04:15	0	123	1	28	1	151	0	123	2	18	2	141
04:30	0	184	3	18	3	202	0	154	2	24	2	178
04:45	0	161	2	24	2	185	0	180	2	21	2	201
05:00	3	225	8	16	11	241	1	241	8	17	9	258
05:15	2	298	11	19	13	317	1	283	11	32	12	315
05:30	2	302	33	21	35	323	0	293	18	35	18	328
05:45	1	214	45	8	46	222	3	203	49	30	52	233
06:00	2	142	87	19	89	161	2	112	69	20	71	132
06:15	2	114	137	19	139	133	0	118	149	16	149	134
06:30	9	84	247	17	256	101	5	74	246	17	251	91
06:45	11	64	331	21	342	85	9	75	331	9	340	84
07:00	9	44	272	15	281	59	13	47	256	14	269	61
07:15	22	41	279	8	301	49	17	44	273	13	290	57
07:30	23	38	226	9	249	47	42	41	257	9	299	50
07:45	27	36	272	10	299	46	41	36	273	13	314	49
08:00	24	21	189	13	213	34	17	38	176	4	193	42
08:15	17	30	126	6	143	36	25	30	103	8	128	38
08:30	17	21	83	8	100	29	21	35	87	14	108	49
08:45	16	31	60	6	76	37	10	33	66	4	76	37
09:00	20	19	33	10	53	29	13	11	37	3	50	14
09:15	13	17	33	6	46	23	19	17	32	7	51	24
09:30	21	13	34	7	55	20	17	14	32	2	49	16
09:45	23	13	28	6	51	19	31	11	45	8	76	19
10:00	22	15	31	2	53	17	26	8	30	5	56	13
10:15	20	5	24	2	44	7	38	13	36	3	74	16
10:30	24	7	35	6	59	13	19	11	24	7	43	18
10:45	21	4	28	10	49	14	32	2	37	11	69	13
11:00	35	4	22	0	57	4	41	3	42	0	83	3
11:15	47	3	28	0	75	3	53	3	33	2	86	5
11:30	63	0	34	2	97	2	87	3	33	0	120	3
11:45	78	2	33	0	111	2	87	7	40	0	127	7
Totals	563	3273	2786	932	3379	4205	690	3325	2816	1017	3506	4342
Day Totals	3866		3718		7584		4015		3833		7848	
% Total	7.8%	43.1%	36.7%	12.2%			8.7%	42.3%	35.8%	12.9%		
Peaks	11:00	05:00	06:30	00:15	06:30	05:00	11:00	05:00	06:45	00:15	06:45	05:00
Volume	223	1039	1129	222	1180	1103	268	1020	1117	236	1198	1134
P.H.F.	.71	.85	.85	.97	.86	.85	.77	.87	.84	.86	.88	.86

Technician: JM
Location : On Pajarito 1000' W of NM 4
Other :

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS10-7
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Both directions

Begin Time	Fri. 01/31 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	3	50	2	28	5	78	7	26	6	21	13	47
12:15	2	57	1	35	3	92	7	31	1	24	8	55
12:30	1	45	1	46	2	91	5	25	1	14	6	39
12:45	0	53	0	34	0	87	0	28	1	19	1	47
01:00	0	54	1	46	1	100	3	23	1	26	4	49
01:15	0	31	0	31	0	62	0	23	1	17	1	40
01:30	3	44	0	34	3	78	1	15	2	14	3	29
01:45	1	32	0	35	1	67	0	25	0	13	0	38
02:00	0	39	0	25	0	64	0	17	0	16	0	33
02:15	1	40	1	18	2	58	0	25	1	23	1	48
02:30	2	56	0	42	2	98	3	25	0	30	3	55
02:45	0	61	0	21	0	82	1	28	0	22	1	50
03:00	0	63	0	26	0	89	0	29	1	14	1	43
03:15	2	110	0	28	2	138	0	22	0	11	0	33
03:30	1	138	2	30	3	168	1	17	3	21	4	38
03:45	0	106	0	20	0	126	0	26	1	20	1	46
04:00	0	165	2	17	2	182	0	23	0	17	0	40
04:15	4	101	2	11	6	112	0	21	0	17	0	38
04:30	0	104	4	17	4	121	0	14	0	16	0	30
04:45	1	100	3	20	4	120	2	23	0	24	2	47
05:00	1	124	13	25	14	149	0	25	0	23	0	48
05:15	0	125	6	22	6	147	0	20	0	21	0	41
05:30	0	99	14	30	14	129	0	28	0	17	0	45
05:45	1	73	36	11	37	84	0	17	7	24	7	41
06:00	1	49	42	12	43	61	0	19	5	19	5	38
06:15	1	48	80	25	81	73	0	21	6	21	6	42
06:30	4	41	139	12	143	53	1	27	18	19	19	46
06:45	10	24	158	18	168	42	3	8	21	17	24	25
07:00	12	15	158	12	170	27	4	21	8	21	12	42
07:15	18	28	170	11	188	39	1	10	14	9	15	19
07:30	20	17	140	9	160	26	3	10	21	7	24	17
07:45	20	21	194	13	214	34	10	8	19	3	29	11
08:00	17	9	143	10	160	19	15	15	20	3	35	18
08:15	26	15	77	14	103	29	5	18	15	7	20	25
08:30	19	21	79	4	98	25	15	14	20	5	35	19
08:45	15	16	61	8	76	24	14	8	26	3	40	11
09:00	16	19	42	7	58	26	19	11	29	7	48	18
09:15	18	10	45	5	63	15	13	13	16	7	29	20
09:30	21	11	46	8	67	19	15	26	20	3	35	29
09:45	17	12	38	11	55	23	21	41	24	12	45	53
10:00	25	7	22	9	47	16	28	15	17	7	45	22
10:15	20	7	32	7	52	14	34	8	13	5	47	13
10:30	29	7	22	12	51	19	20	11	31	8	51	19
10:45	28	5	23	7	51	12	25	11	24	10	49	21
11:00	45	6	35	6	80	12	29	3	12	0	41	3
11:15	58	13	22	7	80	20	22	13	21	4	43	17
11:30	48	18	39	5	87	23	22	3	20	4	42	7
11:45	49	12	20	2	69	14	26	11	24	4	50	15
Totals	560	2301	1915	886	2475	3187	375	901	470	669	845	1570
Day Totals	2861		2801		5662		1276		1139		2415	
% Total	9.8%	40.6%	33.8%	15.6%			15.5%	37.3%	19.4%	27.7%		
Peaks	11:00	03:15	07:00	00:15	07:00	03:15	10:15	00:00	08:30	02:00	10:00	02:15
Volume	200	519	662	161	732	614	108	110	91	91	192	196
P.H.F.	.86	.78	.85	.87	.85	.84	.79	.88	.78	.75	.94	.89

Technician: JM
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS10-7
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Location : On Pajarito 1000' W of NM 4
Other :

Both directions

Begin Time	Sun. 02/02 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Mon. 02/03 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	11	38	6	29	17	67	8	79	0	57	8	136
12:15	4	33	3	25	7	58	1	56	1	50	2	106
12:30	4	62	3	20	7	82	3	47	2	52	5	99
12:45	3	33	3	23	6	56	0	51	0	75	0	126
01:00	2	28	3	17	5	45	2	48	1	58	3	106
01:15	1	20	1	17	2	37	2	45	1	41	3	86
01:30	4	21	1	11	5	32	2	28	0	35	2	63
01:45	0	22	1	22	1	44	2	36	0	30	2	66
02:00	1	13	2	16	3	29	0	36	1	32	1	68
02:15	1	25	0	16	1	41	1	24	0	26	1	50
02:30	1	30	2	30	3	60	0	30	0	33	0	63
02:45	3	16	1	21	4	37	0	42	1	29	1	71
03:00	0	23	0	23	0	46	0	57	0	56	0	113
03:15	0	23	0	9	0	32	2	57	0	25	2	82
03:30	1	23	0	18	1	41	0	116	0	20	0	136
03:45	0	35	0	20	0	55	0	58	2	26	2	84
04:00	0	20	0	15	0	35	0	168	0	14	0	182
04:15	0	21	2	15	2	36	0	118	2	18	2	136
04:30	1	14	3	24	4	38	1	155	3	30	4	185
04:45	2	20	0	17	2	37	1	180	2	13	3	193
05:00	0	21	1	14	1	35	0	276	14	65	14	341
05:15	0	21	0	23	0	44	2	270	13	20	15	290
05:30	0	26	0	13	0	39	1	316	27	33	28	349
05:45	2	28	1	10	3	38	0	209	39	22	39	231
06:00	1	17	1	20	2	37	3	127	57	20	60	147
06:15	0	17	4	20	4	37	3	122	139	11	142	133
06:30	0	18	17	20	17	38	5	83	255	17	260	100
06:45	0	22	5	14	5	36	7	65	355	14	362	79
07:00	3	6	4	8	7	14	15	42	269	11	284	53
07:15	4	11	3	13	7	24	10	35	247	18	257	53
07:30	5	9	12	8	17	17	25	28	235	6	260	34
07:45	6	10	19	7	25	17	52	33	221	10	273	43
08:00	6	7	7	8	13	15	23	22	188	6	211	28
08:15	10	9	21	10	31	19	28	22	113	6	141	28
08:30	9	12	36	5	45	17	26	25	90	4	116	29
08:45	21	26	35	14	56	40	26	27	68	8	94	35
09:00	13	31	27	7	40	38	23	18	44	11	67	29
09:15	15	16	25	3	40	19	23	10	56	1	79	11
09:30	12	8	13	4	25	12	16	11	44	3	60	14
09:45	10	20	22	6	32	26	41	15	40	5	81	20
10:00	21	11	33	7	54	18	28	10	37	9	65	19
10:15	19	8	20	6	39	14	41	5	37	5	78	10
10:30	27	5	26	14	53	19	22	4	34	5	56	9
10:45	23	4	31	7	54	11	27	5	27	10	54	15
11:00	23	3	31	2	54	5	34	0	26	0	60	0
11:15	33	3	28	5	61	8	47	2	38	2	85	4
11:30	26	9	26	6	52	15	67	6	33	0	100	6
11:45	28	7	19	1	47	8	60	11	43	3	103	14
Totals	356	905	498	663	854	1568	682	3230	2803	1045	3485	4275
Day Totals	1261		1161		2422		3912		3848		7760	
% Total	14.7%	37.3%	20.5%	27.3%			8.7%	41.6%	36.1%	13.4%		
Peaks	11:00	00:00	08:30	00:00	10:30	00:00	11:00	05:00	06:30	00:15	06:30	05:00
Volume	110	166	123	97	222	263	208	1071	1126	235	1163	1211
P.H.F.	.83	.66	.85	.83	.90	.80	.77	.84	.79	.78	.80	.86

Technician: JM
Location: On Pajarito 1000' W of NM 4
Other :

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS10-7
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Both directions

Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	4	75	0	34	4	109	3	79	0	48	3	127
12:15	3	54	4	52	7	106	2	64	0	64	2	128
12:30	2	50	2	71	4	121	2	44	0	56	2	100
12:45	0	30	0	61	0	91	0	44	2	66	2	110
01:00	1	32	0	69	1	101	1	37	0	75	1	112
01:15	2	29	2	35	4	64	1	40	0	49	1	89
01:30	0	33	1	29	1	62	1	31	0	39	1	70
01:45	0	41	0	27	0	68	0	31	0	35	0	66
02:00	1	29	1	23	2	52	1	41	0	25	1	66
02:15	0	24	0	24	0	48	1	27	0	26	1	53
02:30	0	71	0	39	0	110	1	40	0	27	1	67
02:45	0	54	0	31	0	85	1	37	0	35	1	72
03:00	0	75	1	30	1	105	0	50	0	22	0	72
03:15	2	81	0	40	2	121	0	94	1	26	1	120
03:30	1	168	2	24	3	192	1	115	1	19	2	134
03:45	0	109	1	24	1	133	1	82	1	24	2	106
04:00	0	184	1	32	1	216	0	163	1	22	1	185
04:15	1	138	1	14	2	152	1	132	1	21	2	153
04:30	0	157	4	9	4	166	0	175	1	13	1	188
04:45	0	157	5	21	5	178	0	171	1	20	1	191
05:00	1	224	7	19	8	243	2	214	11	18	13	232
05:15	0	236	12	17	12	253	0	278	14	29	14	307
05:30	1	223	22	36	23	259	2	303	24	36	26	339
05:45	2	166	45	18	47	184	2	194	48	20	50	214
06:00	1	149	54	14	55	163	0	142	62	24	62	166
06:15	7	114	146	15	153	129	2	113	141	12	143	125
06:30	10	76	272	15	282	91	10	98	262	16	272	114
06:45	10	75	317	13	327	88	6	69	335	22	341	91
07:00	9	44	271	18	280	62	11	49	282	14	293	63
07:15	11	50	279	11	290	61	18	40	256	7	274	47
07:30	23	28	244	6	267	34	17	36	236	12	253	48
07:45	49	53	215	8	264	61	47	42	255	11	302	53
08:00	33	25	209	11	242	36	27	25	196	7	223	32
08:15	23	19	122	8	145	27	27	32	106	12	133	44
08:30	15	30	77	11	92	41	18	25	92	11	110	36
08:45	23	23	64	9	87	32	23	23	73	7	96	30
09:00	25	20	48	8	73	28	25	13	46	7	71	20
09:15	24	34	40	5	64	39	15	19	40	6	55	25
09:30	27	14	35	4	62	18	18	14	33	5	51	19
09:45	24	18	44	1	68	19	31	11	47	10	78	21
10:00	26	15	23	6	49	21	22	5	33	6	55	11
10:15	32	7	31	5	63	12	20	3	29	1	49	4
10:30	21	8	23	5	44	13	20	5	25	5	45	10
10:45	34	7	35	5	69	12	25	3	29	8	54	11
11:00	38	5	27	3	65	8	36	4	26	1	62	5
11:15	37	6	26	0	63	6	50	2	26	1	76	3
11:30	73	3	37	3	110	6	55	1	32	5	87	6
11:45	79	10	34	2	113	12	90	2	49	1	139	3
Totals	675	3273	2784	965	3459	4238	636	3262	2817	1026	3453	4288
Day Totals	3948		3749		7697		3898		3843		7741	
% Total	8.7%	42.5%	36.1%	12.5%			8.2%	42.1%	36.3%	13.2%		
Peaks	11:00	05:00	06:30	00:15	06:30	05:00	11:00	05:00	06:30	00:15	06:30	05:00
Volume	227	849	1139	253	1179	939	231	989	1135	261	1180	1092
P.H.F.	.71	.89	.89	.89	.90	.90	.64	.81	.84	.87	.86	.80

Technician: JM
Location : On Pajarito 1000' W of NM 4
Other :
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LCS10-7
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Both directions

Begin Time	Thur. 02/06 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	4	85	0	38	4	123	*	*	*	*	*	*
12:15	8	*	1	*	9	*	*	*	*	*	*	*
12:30	1	*	0	*	1	*	*	*	*	*	*	*
12:45	2	*	1	*	3	*	*	*	*	*	*	*
01:00	1	*	0	*	1	*	*	*	*	*	*	*
01:15	0	*	0	*	0	*	*	*	*	*	*	*
01:30	2	*	0	*	2	*	*	*	*	*	*	*
01:45	1	*	0	*	1	*	*	*	*	*	*	*
02:00	1	*	0	*	1	*	*	*	*	*	*	*
02:15	0	*	0	*	0	*	*	*	*	*	*	*
02:30	0	*	0	*	0	*	*	*	*	*	*	*
02:45	0	*	0	*	0	*	*	*	*	*	*	*
03:00	0	*	1	*	1	*	*	*	*	*	*	*
03:15	0	*	1	*	1	*	*	*	*	*	*	*
03:30	1	*	0	*	1	*	*	*	*	*	*	*
03:45	0	*	3	*	3	*	*	*	*	*	*	*
04:00	1	*	0	*	1	*	*	*	*	*	*	*
04:15	0	*	2	*	2	*	*	*	*	*	*	*
04:30	0	*	0	*	0	*	*	*	*	*	*	*
04:45	0	*	2	*	2	*	*	*	*	*	*	*
05:00	1	*	9	*	10	*	*	*	*	*	*	*
05:15	1	*	14	*	15	*	*	*	*	*	*	*
05:30	0	*	23	*	23	*	*	*	*	*	*	*
05:45	1	*	55	*	56	*	*	*	*	*	*	*
06:00	1	*	55	*	56	*	*	*	*	*	*	*
06:15	4	*	143	*	147	*	*	*	*	*	*	*
06:30	5	*	271	*	276	*	*	*	*	*	*	*
06:45	7	*	318	*	325	*	*	*	*	*	*	*
07:00	12	*	262	*	274	*	*	*	*	*	*	*
07:15	16	*	291	*	307	*	*	*	*	*	*	*
07:30	24	*	272	*	296	*	*	*	*	*	*	*
07:45	31	*	262	*	293	*	*	*	*	*	*	*
08:00	18	*	203	*	221	*	*	*	*	*	*	*
08:15	13	*	104	*	117	*	*	*	*	*	*	*
08:30	14	*	90	*	104	*	*	*	*	*	*	*
08:45	24	*	61	*	85	*	*	*	*	*	*	*
09:00	11	*	47	*	58	*	*	*	*	*	*	*
09:15	21	*	32	*	53	*	*	*	*	*	*	*
09:30	20	*	38	*	58	*	*	*	*	*	*	*
09:45	37	*	32	*	69	*	*	*	*	*	*	*
10:00	24	*	28	*	52	*	*	*	*	*	*	*
10:15	26	*	24	*	50	*	*	*	*	*	*	*
10:30	31	*	22	*	53	*	*	*	*	*	*	*
10:45	36	*	35	*	71	*	*	*	*	*	*	*
11:00	30	*	27	*	57	*	*	*	*	*	*	*
11:15	50	*	35	*	85	*	*	*	*	*	*	*
11:30	75	*	28	*	103	*	*	*	*	*	*	*
11:45	74	*	55	*	129	*	*	*	*	*	*	*
Totals	629	85	2847	38	3476	123	0	0	0	0	0	0
Day Totals	714		2885		3599		0		0		0	
% Total	17.4%	2.3%	79.1%	1.0%			*	*	*	*		
Peaks	11:00	00:00	06:45	00:00	06:45	00:00						
Volume	229	85	1143	38	1202	123						
P.H.F.	.76	.25	.89	.25	.92	.25						

Technician: JM
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 00000000000
Start Date: 01/27/03
File I.D. : LOS11-7
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Location: On Pajarito 500' W of TA 51
Other :

Both directions

Begin Time	Mon. 01/27 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	*	75	*	44	*	119	5	83	1	37	6	120
12:15	*	52	*	49	*	101	3	45	3	49	6	94
12:30	*	43	*	57	*	100	3	47	3	59	6	106
12:45	*	52	*	67	*	119	2	48	3	66	5	114
01:00	*	52	*	63	*	115	3	55	1	62	4	117
01:15	*	35	*	57	*	92	0	52	1	42	1	94
01:30	*	44	*	36	*	80	2	35	0	44	2	79
01:45	*	36	*	43	*	79	1	32	0	45	1	77
02:00	*	32	*	26	*	58	3	46	0	26	3	72
02:15	*	36	*	36	*	72	2	39	2	35	4	74
02:30	*	47	*	32	*	79	0	52	1	34	1	86
02:45	*	64	*	26	*	90	0	56	0	43	0	99
03:00	*	53	*	33	*	86	1	71	1	32	2	103
03:15	*	104	*	34	*	138	0	115	5	46	5	161
03:30	*	102	*	47	*	149	1	122	2	45	3	167
03:45	*	123	*	37	*	160	2	113	3	37	5	150
04:00	*	146	*	27	*	173	0	123	1	35	1	158
04:15	*	102	*	26	*	128	2	85	1	27	3	112
04:30	*	207	*	41	*	248	1	190	4	42	5	232
04:45	*	143	*	49	*	192	2	162	7	35	9	197
05:00	*	257	*	37	*	294	1	240	9	35	10	275
05:15	*	261	*	27	*	288	5	240	8	33	13	273
05:30	*	270	*	31	*	301	6	268	17	28	23	296
05:45	*	154	*	23	*	177	1	168	46	25	47	193
06:00	*	143	*	23	*	166	10	146	64	22	74	168
06:15	*	88	*	15	*	103	6	104	118	22	124	126
06:30	*	75	*	21	*	96	11	73	201	29	212	102
06:45	*	60	*	18	*	78	28	53	274	27	302	80
07:00	*	47	*	12	*	59	24	51	253	11	277	62
07:15	*	33	*	16	*	49	32	47	238	13	270	60
07:30	*	42	*	18	*	60	37	30	243	10	280	40
07:45	*	26	*	5	*	31	64	21	251	3	315	24
08:00	*	24	*	8	*	32	44	25	205	9	249	34
08:15	*	21	*	4	*	25	45	15	142	10	187	25
08:30	*	14	*	4	*	18	25	22	103	5	128	27
08:45	*	29	*	8	*	37	41	17	83	5	124	22
09:00	*	18	*	8	*	26	24	22	56	2	80	24
09:15	*	19	*	4	*	23	28	65	67	8	95	73
09:30	*	10	*	4	*	14	40	33	48	2	88	35
09:45	*	14	*	2	*	16	31	19	48	9	79	28
10:00	*	11	*	8	*	19	34	6	36	4	70	10
10:15	*	13	*	3	*	16	33	6	37	3	70	9
10:30	*	5	*	3	*	8	52	9	43	3	95	12
10:45	*	5	*	3	*	8	42	6	52	3	94	9
11:00	*	2	*	3	*	5	46	4	50	1	96	5
11:15	*	3	*	3	*	6	66	7	44	4	110	11
11:30	66	4	52	3	118	7	77	5	39	2	116	7
11:45	75	4	37	4	112	8	84	2	57	6	141	8
Totals	141	3200	89	1148	230	4348	970	3275	2871	1175	3841	4450
Day Totals	3341		1237		4578		4245		4046		8291	
% Total	3.0%	69.9%	1.9%	25.0%			11.7%	39.5%	34.6%	14.1%		
Peaks	11:00	05:00	11:00	00:30	11:00	04:45	11:00	05:00	06:45	00:15	07:00	04:45
Volume	141	942	89	244	230	1075	273	916	1008	236	1142	1041
P.H.F.	.47	.87	.42	.91	.48	.89	.81	.85	.91	.89	.90	.87

Site 8, Page 1

Technician: JM
Location : On Pajarito 500' W of TA 51
Other :

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS11-7
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Both directions

Begin Time	Wed. 01/29 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Thur. 01/30 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	3	72	3	37	6	109	4	91	5	43	9	134
12:15	4	58	1	44	5	102	1	60	2	55	3	115
12:30	1	44	1	70	2	114	2	47	0	60	2	107
12:45	4	59	2	54	6	113	1	57	4	78	5	135
01:00	1	40	2	65	3	105	1	67	2	59	3	126
01:15	1	68	1	44	2	112	1	70	3	51	4	121
01:30	2	42	1	42	3	84	0	34	0	41	0	75
01:45	0	32	1	43	1	75	1	46	0	38	1	84
02:00	2	51	0	30	2	81	1	46	2	37	3	83
02:15	1	53	1	35	2	88	2	32	2	38	4	70
02:30	1	51	0	49	1	100	1	52	1	38	2	90
02:45	1	50	0	36	1	86	2	62	0	43	2	105
03:00	2	64	3	37	5	101	2	56	1	40	3	96
03:15	4	132	0	36	4	168	1	114	1	50	2	164
03:30	0	108	2	39	2	147	1	121	2	40	3	161
03:45	0	73	3	51	3	124	0	107	1	50	1	157
04:00	0	142	0	35	0	177	0	152	3	47	3	199
04:15	1	110	0	39	1	149	0	117	0	34	0	151
04:30	0	174	4	33	4	207	0	136	4	47	4	183
04:45	2	157	2	31	4	188	0	179	0	31	0	210
05:00	1	248	5	37	6	285	6	258	9	36	15	294
05:15	4	280	13	26	17	306	0	255	8	35	8	290
05:30	4	291	26	26	30	317	1	260	19	37	20	297
05:45	5	164	36	21	41	185	5	174	34	43	39	217
06:00	3	140	71	24	74	164	5	112	56	30	61	142
06:15	7	96	109	17	116	113	4	108	112	21	116	129
06:30	15	81	191	18	206	99	15	64	193	20	208	84
06:45	29	55	290	26	319	81	44	74	296	15	340	89
07:00	27	48	237	16	264	64	33	50	230	9	263	59
07:15	39	35	248	12	287	47	31	43	255	16	286	59
07:30	42	41	242	8	284	49	57	34	237	10	294	44
07:45	50	37	254	12	304	49	54	41	268	13	322	54
08:00	27	23	230	10	257	33	41	30	209	8	250	38
08:15	37	29	125	15	162	44	35	37	127	8	162	45
08:30	24	21	101	11	125	32	34	37	90	9	124	46
08:45	34	33	75	5	109	38	27	27	98	12	125	39
09:00	34	23	55	8	89	31	31	14	41	6	72	20
09:15	33	10	45	7	78	17	30	15	43	8	73	23
09:30	35	13	45	5	80	18	29	14	34	3	63	17
09:45	37	17	46	9	83	26	50	16	51	9	101	25
10:00	35	12	41	4	76	16	46	8	45	6	91	14
10:15	37	8	38	1	75	9	38	11	53	3	91	14
10:30	37	7	39	8	76	15	37	13	40	5	77	18
10:45	40	6	42	1	82	7	54	2	41	7	95	9
11:00	53	6	44	4	97	10	61	4	61	1	122	5
11:15	56	4	47	4	103	8	63	6	57	5	120	11
11:30	67	3	52	4	119	7	82	4	52	2	134	6
11:45	68	5	46	4	114	9	74	4	45	7	119	11
Totals	910	3316	2820	1193	3730	4509	1008	3361	2837	1304	3845	4665
Day Totals	4226		4013		8239		4369		4141		8510	
Total	11.0%	40.2%	34.2%	14.4%			11.8%	39.4%	33.3%	15.3%		
Peaks	11:00	05:00	06:45	00:15	06:45	04:45	11:00	04:45	06:45	00:15	06:45	05:00
Volume	244	983	1017	233	1154	1096	280	952	1018	252	1183	1098
P.H.F.	.89	.84	.87	.83	.90	.86	.85	.91	.85	.80	.86	.92

Technician: JM
Location : On Pajarito 500' W of TA 51
Other :

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS11-7
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Both directions

Begin Time	Fri. 01/31 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	4	62	3	37	7	99	8	33	6	22	14	55
12:15	3	65	2	41	5	106	5	26	4	22	9	48
12:30	3	49	2	52	5	101	5	28	2	14	7	42
12:45	1	74	2	34	3	108	1	29	2	17	3	46
01:00	2	68	4	63	6	131	4	30	2	23	6	53
01:15	0	46	0	35	0	81	0	16	2	18	2	34
01:30	3	49	0	32	3	81	1	16	1	17	2	33
01:45	1	43	0	47	1	90	1	32	2	12	3	44
02:00	1	50	0	30	1	80	1	17	1	16	2	33
02:15	2	49	1	32	3	81	1	25	0	22	1	47
02:30	0	50	0	43	0	93	4	24	0	24	4	48
02:45	0	69	0	40	0	109	1	27	1	26	2	53
03:00	2	79	1	39	3	118	0	30	2	16	2	46
03:15	1	119	0	44	1	163	1	25	0	14	1	39
03:30	1	141	2	48	3	189	1	25	3	19	4	44
03:45	0	98	0	41	0	139	1	24	2	28	3	52
04:00	2	145	0	29	2	174	0	22	0	16	0	38
04:15	3	84	2	15	5	99	0	19	0	19	0	38
04:30	4	105	9	23	13	128	2	18	0	18	2	36
04:45	2	107	1	18	3	125	1	22	1	18	2	40
05:00	13	123	15	39	28	162	0	26	1	28	1	54
05:15	4	112	9	27	13	139	0	28	0	22	0	50
05:30	10	94	9	32	19	126	0	30	0	22	0	52
05:45	13	68	29	18	42	86	1	14	5	28	6	42
06:00	14	43	38	12	52	55	0	26	4	16	4	42
06:15	27	54	77	21	104	75	1	20	4	25	5	45
06:30	73	37	149	19	222	56	1	26	14	24	15	50
06:45	42	27	142	14	184	41	7	13	17	12	24	25
07:00	18	21	135	20	153	41	3	18	7	24	10	42
07:15	26	21	165	12	191	33	4	11	14	12	18	23
07:30	36	26	131	12	167	38	7	8	21	7	28	15
07:45	40	15	177	13	217	28	17	15	21	6	38	21
08:00	34	11	181	13	215	24	16	19	25	7	41	26
08:15	36	17	90	12	126	29	8	14	18	7	26	21
08:30	33	24	89	11	122	35	26	13	19	5	45	18
08:45	34	21	67	7	101	28	12	10	31	4	43	14
09:00	25	16	56	8	81	24	20	11	31	6	51	17
09:15	23	13	44	5	67	18	15	15	19	10	34	25
09:30	26	10	45	12	71	22	24	36	16	6	40	42
09:45	29	16	53	9	82	25	27	39	34	11	61	50
10:00	29	3	38	14	67	17	31	10	25	10	56	20
10:15	41	9	28	10	69	19	32	10	12	3	44	13
10:30	34	10	37	10	71	20	17	11	24	7	41	18
10:45	42	6	38	5	80	11	36	14	25	7	61	21
11:00	56	7	30	5	86	12	26	6	22	4	48	10
11:15	52	16	53	10	105	26	18	17	18	7	36	24
11:30	54	17	39	5	93	22	26	4	19	6	45	10
11:45	53	12	44	9	97	21	29	10	24	10	53	20
Totals	952	2401	2037	1127	2989	3528	442	962	501	717	943	1679
Day Totals	3353		3164		6517		1404		1218		2622	
% Total	14.6%	36.8%	31.2%	17.2%			16.8%	36.6%	19.1%	27.3%		
Peaks	11:00	03:15	07:15	00:15	07:15	03:15	10:00	00:00	08:30	05:00	09:45	05:00
Volume	215	503	654	190	790	665	116	116	100	100	202	198
P.H.F.	.95	.86	.90	.75	.91	.87	.80	.87	.80	.89	.82	.91

Technician: JM
Location: On Pajarito 500' W of TA 51
Other :

3500 CERRILLOS ROAD #235
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS11-7
Page : 4

Both directions

Begin Time	Sun. 02/02 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Mon. 02/03 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	7	37	5	28	12	65	2	82	6	63	8	145
12:15	5	43	3	28	8	71	0	53	1	54	1	107
12:30	3	57	4	17	7	74	6	63	3	45	9	108
12:45	5	42	3	28	8	70	2	54	3	71	5	125
01:00	5	22	7	22	12	44	5	75	4	70	9	145
01:15	4	22	1	15	5	37	3	53	0	56	3	109
01:30	2	19	3	14	5	33	2	41	1	43	3	84
01:45	1	25	2	17	3	42	1	48	0	36	1	84
02:00	1	20	2	23	3	43	0	46	0	43	0	89
02:15	2	25	1	13	3	38	1	41	1	34	2	75
02:30	2	29	0	26	2	55	1	36	1	44	2	80
02:45	3	23	1	20	4	43	0	55	1	37	1	92
03:00	1	26	3	21	4	47	2	67	1	58	3	125
03:15	0	21	0	17	0	38	2	79	0	54	2	133
03:30	0	31	0	13	0	44	0	92	0	36	0	128
03:45	0	29	0	26	0	55	0	80	3	34	3	114
04:00	0	23	0	19	0	42	0	148	0	38	0	186
04:15	0	20	1	20	1	40	0	109	0	23	0	132
04:30	2	16	3	18	5	34	1	152	3	45	4	197
04:45	3	23	1	23	4	46	1	156	2	33	3	189
05:00	1	23	3	16	4	39	1	267	10	31	11	298
05:15	0	28	1	27	1	55	4	267	16	48	20	315
05:30	0	21	0	12	0	33	2	284	19	35	21	319
05:45	2	27	0	10	2	37	0	175	35	23	35	198
06:00	1	20	1	22	2	42	6	128	44	24	50	152
06:15	1	18	4	22	5	40	5	115	104	15	109	130
06:30	1	21	11	18	12	39	12	76	188	26	200	102
06:45	2	19	4	21	6	40	22	65	308	15	330	80
07:00	4	12	5	15	9	27	35	37	244	14	279	51
07:15	10	10	5	9	15	19	31	38	251	16	282	54
07:30	12	13	19	10	31	23	44	30	214	8	258	38
07:45	7	8	21	10	28	18	81	24	221	6	302	30
08:00	7	9	15	9	22	18	38	21	199	13	237	34
08:15	9	13	19	12	28	25	47	29	122	6	169	35
08:30	11	20	28	7	39	27	36	23	112	6	148	29
08:45	22	30	43	18	65	48	32	28	80	13	112	41
09:00	11	26	31	6	42	32	45	20	63	7	108	27
09:15	19	16	24	6	43	22	32	7	64	7	96	14
09:30	15	11	14	7	29	18	41	13	61	1	102	14
09:45	12	25	21	6	33	31	53	12	42	8	95	20
10:00	23	6	29	5	52	11	48	14	48	5	96	19
10:15	27	8	28	8	55	16	48	6	40	9	88	15
10:30	25	4	23	9	48	13	37	4	48	2	85	6
10:45	30	10	30	4	60	14	36	5	42	2	78	7
11:00	21	2	29	4	50	6	40	1	34	4	74	5
11:15	36	6	30	8	66	14	63	3	51	6	114	9
11:30	31	13	20	6	51	19	72	11	58	0	130	11
11:45	26	6	20	3	46	9	64	6	48	9	112	15
Totals	412	978	518	718	930	1696	1004	3239	2796	1276	3800	4515
Day Totals	1390		1236		2626		4243		4072		8315	
% Total	15.6%	37.2%	19.7%	27.3%			12.0%	38.9%	33.6%	15.3%		
Peaks	10:45	00:00	08:30	00:00	10:45	00:00	11:00	05:00	06:45	00:30	06:45	05:00
Volume	118	179	126	101	227	280	239	993	1017	242	1149	1130
P.H.F.	.81	.78	.73	.90	.85	.94	.82	.87	.82	.85	.87	.88

Technician: JM
Location: On Pajarito 500' W of TA 51
Other :

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 0000000000000
Start Date: 01/27/03
File I.D. : LOS11-7
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Both directions

Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	5	68	4	46	9	114	6	69	2	58	8	127
12:15	11	55	5	45	16	100	1	68	3	62	4	130
12:30	3	55	4	74	7	129	2	53	0	64	2	117
12:45	3	58	0	63	3	121	2	55	2	61	4	116
01:00	1	42	2	70	3	112	2	43	1	75	3	118
01:15	2	55	2	46	4	101	2	55	0	65	2	120
01:30	0	43	0	39	0	82	0	55	2	46	2	101
01:45	2	53	4	35	6	88	0	48	0	47	0	95
02:00	1	40	3	37	4	77	2	64	0	47	2	111
02:15	1	55	0	32	1	87	1	59	0	38	1	97
02:30	0	73	0	50	0	123	1	64	1	34	2	98
02:45	0	65	1	43	1	108	4	54	0	44	4	98
03:00	1	90	3	55	4	145	0	58	2	33	2	91
03:15	3	108	1	52	4	160	1	107	0	35	1	142
03:30	1	161	1	50	2	211	2	128	2	41	4	169
03:45	0	109	1	50	1	159	0	92	1	40	1	132
04:00	1	163	1	41	2	204	0	127	2	32	2	159
04:15	1	117	2	31	3	148	1	125	2	27	3	152
04:30	0	152	3	28	3	180	0	162	1	34	1	196
04:45	1	154	5	27	6	181	1	151	0	33	1	184
05:00	3	219	7	37	10	256	4	255	14	39	18	294
05:15	0	228	9	31	9	259	2	233	14	40	16	273
05:30	1	196	23	39	24	235	6	259	18	22	24	281
05:45	4	147	33	27	37	174	3	175	35	25	38	200
06:00	3	133	49	20	52	153	3	132	49	26	52	158
06:15	11	104	113	17	124	121	9	106	111	23	120	129
06:30	18	77	203	15	221	92	16	82	189	18	205	100
06:45	24	64	277	18	301	82	26	58	303	19	329	77
07:00	24	41	248	19	272	60	29	51	247	19	276	70
07:15	36	43	250	16	286	59	40	34	242	9	282	43
07:30	51	39	255	6	306	45	62	34	209	11	271	45
07:45	63	42	223	5	286	47	66	44	259	13	325	57
08:00	51	29	210	14	261	43	54	27	228	9	282	36
08:15	46	22	140	7	186	29	42	35	120	10	162	45
08:30	26	30	89	12	115	42	33	20	106	14	139	34
08:45	48	23	93	11	141	34	41	24	89	7	130	31
09:00	34	19	54	6	88	25	30	15	63	10	93	25
09:15	38	37	45	7	83	44	26	19	51	7	77	26
09:30	29	17	47	7	76	24	30	13	58	8	88	21
09:45	39	17	52	4	91	21	56	13	49	6	105	19
10:00	33	14	41	7	74	21	63	5	46	11	109	16
10:15	38	9	37	4	75	13	55	6	41	2	96	8
10:30	36	10	34	4	70	14	37	5	34	3	71	8
10:45	45	5	46	3	91	8	36	3	35	4	71	7
11:00	46	7	35	2	81	9	50	3	36	1	86	4
11:15	51	6	37	5	88	11	58	4	44	3	102	7
11:30	80	10	52	6	132	16	66	2	45	8	111	10
11:45	85	6	56	8	141	14	95	3	57	7	152	10
Totals	1000	3310	2800	1271	3800	4581	1066	3297	2813	1290	3879	4587
Day Totals	4310		4071		8381		4363		4103		8466	
% Total	11.9%	39.4%	33.4%	15.1%			12.5%	38.9%	33.2%	15.2%		
Peaks	11:00	04:45	06:45	00:30	06:45	04:45	11:00	05:00	06:45	00:30	07:15	05:00
Volume	262	797	1030	253	1165	931	269	922	1001	265	1160	1048
P.H.F.	.77	.87	.92	.85	.95	.89	.70	.88	.82	.88	.89	.89

Technician: JM
Location: On Pajarito 500' W of TA 51
Other : :

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS11-7
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Both directions

Begin Time	Thur. 02/06 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	7	77	1	36	8	113	*	*	*	*	*	*
12:15	4	61	1	54	5	115	*	*	*	*	*	*
12:30	2	*	0	*	2	*	*	*	*	*	*	*
12:45	2	*	2	*	4	*	*	*	*	*	*	*
01:00	3	*	1	*	4	*	*	*	*	*	*	*
01:15	0	*	2	*	2	*	*	*	*	*	*	*
01:30	2	*	1	*	3	*	*	*	*	*	*	*
01:45	2	*	0	*	2	*	*	*	*	*	*	*
02:00	1	*	1	*	2	*	*	*	*	*	*	*
02:15	0	*	1	*	1	*	*	*	*	*	*	*
02:30	1	*	0	*	1	*	*	*	*	*	*	*
02:45	0	*	0	*	0	*	*	*	*	*	*	*
03:00	2	*	2	*	4	*	*	*	*	*	*	*
03:15	0	*	3	*	3	*	*	*	*	*	*	*
03:30	2	*	1	*	3	*	*	*	*	*	*	*
03:45	1	*	2	*	3	*	*	*	*	*	*	*
04:00	0	*	1	*	1	*	*	*	*	*	*	*
04:15	0	*	1	*	1	*	*	*	*	*	*	*
04:30	0	*	1	*	1	*	*	*	*	*	*	*
04:45	0	*	0	*	0	*	*	*	*	*	*	*
05:00	5	*	9	*	14	*	*	*	*	*	*	*
05:15	2	*	14	*	16	*	*	*	*	*	*	*
05:30	5	*	20	*	25	*	*	*	*	*	*	*
05:45	4	*	50	*	54	*	*	*	*	*	*	*
06:00	3	*	36	*	39	*	*	*	*	*	*	*
06:15	8	*	111	*	119	*	*	*	*	*	*	*
06:30	12	*	206	*	218	*	*	*	*	*	*	*
06:45	31	*	278	*	309	*	*	*	*	*	*	*
07:00	34	*	216	*	250	*	*	*	*	*	*	*
07:15	47	*	273	*	320	*	*	*	*	*	*	*
07:30	51	*	275	*	326	*	*	*	*	*	*	*
07:45	60	*	244	*	304	*	*	*	*	*	*	*
08:00	38	*	231	*	269	*	*	*	*	*	*	*
08:15	41	*	124	*	165	*	*	*	*	*	*	*
08:30	28	*	96	*	124	*	*	*	*	*	*	*
08:45	46	*	87	*	133	*	*	*	*	*	*	*
09:00	27	*	50	*	77	*	*	*	*	*	*	*
09:15	31	*	51	*	82	*	*	*	*	*	*	*
09:30	40	*	35	*	75	*	*	*	*	*	*	*
09:45	39	*	52	*	91	*	*	*	*	*	*	*
10:00	34	*	36	*	70	*	*	*	*	*	*	*
10:15	49	*	42	*	91	*	*	*	*	*	*	*
10:30	46	*	43	*	89	*	*	*	*	*	*	*
10:45	49	*	39	*	88	*	*	*	*	*	*	*
11:00	42	*	44	*	86	*	*	*	*	*	*	*
11:15	59	*	53	*	112	*	*	*	*	*	*	*
11:30	94	*	54	*	148	*	*	*	*	*	*	*
11:45	75	*	76	*	151	*	*	*	*	*	*	*
Totals	1029	138	2867	90	3896	228	0	0	0	0	0	0
Day Totals	1167		2957		4124		0		0		0	
% Total	24.9%	3.3%	69.5%	2.1%			*	*	*	*		
Peaks	11:00	00:00	06:45	00:00	07:15	00:00						
Volume	270	138	1042	90	1219	228						
P.H.F.	.71	.44	.93	.41	.93	.49						

Technician:Jm
Location: :On East Jemez 250' W of
TA 53 LANSE Entrance

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LCS8-7
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Both directions

Begin	Mon.	East		West		Combined		Tues.	East		West		Combined	
Time	01/27	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	01/28	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		*	49	*	52	*	101		3	38	3	55	6	93
12:15		*	38	*	47	*	85		4	41	2	61	6	102
12:30		*	60	*	57	*	117		2	58	2	62	4	120
12:45		*	65	*	52	*	117		3	66	4	59	7	125
01:00		*	59	*	47	*	106		1	65	3	68	4	133
01:15		*	55	*	33	*	88		0	65	1	56	1	121
01:30		*	43	*	35	*	78		2	54	1	35	3	89
01:45		*	44	*	48	*	92		1	50	3	46	4	96
02:00		*	40	*	32	*	72		0	53	1	40	1	93
02:15		*	44	*	51	*	95		0	68	0	55	0	123
02:30		*	59	*	38	*	97		0	49	0	73	0	122
02:45		*	56	*	54	*	110		0	68	1	52	1	120
03:00		*	85	*	29	*	114		1	104	1	47	2	151
03:15		*	83	*	44	*	127		2	105	0	36	2	141
03:30		*	189	*	62	*	251		0	169	3	43	3	212
03:45		*	119	*	32	*	151		0	128	2	56	2	184
04:00		*	279	*	30	*	309		1	271	3	25	4	296
04:15		*	130	*	38	*	168		1	142	3	36	4	178
04:30		*	229	*	47	*	276		0	239	10	39	10	278
04:45		*	178	*	43	*	221		2	188	8	45	10	233
05:00		*	225	*	73	*	298		4	233	24	57	28	290
05:15		*	225	*	57	*	282		1	199	25	50	26	249
05:30		*	185	*	38	*	223		3	177	39	45	42	222
05:45		*	142	*	38	*	180		2	135	67	43	69	178
06:00		*	95	*	36	*	131		8	121	96	42	104	163
06:15		*	89	*	23	*	112		14	72	144	43	158	115
06:30		*	47	*	32	*	79		26	58	211	33	237	91
06:45		*	37	*	28	*	65		32	39	336	38	368	77
07:00		*	27	*	16	*	43		38	44	254	22	292	66
07:15		*	18	*	18	*	36		40	17	345	2	385	19
07:30		*	23	*	11	*	34		43	19	276	9	319	28
07:45		*	20	*	9	*	29		56	10	285	13	341	23
08:00		*	26	*	9	*	35		64	11	208	10	272	21
08:15		*	8	*	9	*	17		59	8	132	11	191	19
08:30		*	15	*	9	*	24		58	12	75	4	133	16
08:45		*	4	*	9	*	13		46	8	91	5	137	13
09:00		*	11	*	7	*	18		51	25	66	9	117	34
09:15		*	14	*	10	*	24		38	24	90	8	128	32
09:30		*	10	*	11	*	21		30	5	87	9	117	14
09:45		*	9	*	4	*	13		47	4	88	6	135	10
10:00		*	6	*	8	*	14		54	6	75	9	129	15
10:15		40	6	56	7	96	13		38	1	58	12	96	13
10:30		38	5	46	16	84	21		40	3	35	18	75	21
10:45		33	1	43	13	76	14		37	5	37	19	74	24
11:00		26	10	53	7	79	17		38	2	49	6	87	8
11:15		27	11	70	2	97	13		39	14	73	5	112	19
11:30		39	12	63	1	102	13		39	13	78	0	117	13
11:45		39	8	70	1	109	9		61	12	76	3	137	15
Totals		242	3193	401	1373	643	4566		1029	3298	3471	1520	4500	4818
Day Totals		3435		1774		5209			4327		4991		9318	
% Total		4.6%	61.3%	7.7%	26.3%				11.0%	35.3%	37.2%	16.3%		
Peaks		10:15	04:30	11:00	04:30	11:00	04:30		07:45	04:30	06:45	00:15	06:45	04:30
Volume		137	857	256	220	387	1077		237	859	1211	250	1364	1050
P.H.F.		.85	.93	.91	.75	.88	.90		.92	.89	.87	.91	.88	.90

Site 9, Page 1

Technician:JM
Location, :On East Jemez 250' W of
TA 53'LANSE Entrance

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS8-7
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Both directions

Begin	Wed.	East		West		Combined		Thur.	East		West		Combined	
Time	01/29	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	01/30	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00		7	48	2	61	9	109		7	60	2	61	9	121
12:15		4	48	4	56	8	104		4	43	1	50	5	93
12:30		2	55	2	48	4	103		6	82	0	49	6	131
12:45		1	71	2	47	3	118		0	68	1	53	1	121
01:00		1	66	0	53	1	119		0	69	0	55	0	124
01:15		1	55	0	51	1	106		0	63	0	37	0	100
01:30		0	60	1	40	1	100		1	50	1	39	2	89
01:45		0	54	3	50	3	104		1	54	0	46	1	100
02:00		2	56	1	42	3	98		0	42	0	27	0	69
02:15		2	42	0	56	2	98		0	57	0	50	0	107
02:30		1	56	0	53	1	109		0	53	0	52	0	105
02:45		0	67	2	61	2	128		1	64	2	52	3	116
03:00		1	72	0	46	1	118		0	62	2	38	2	100
03:15		1	88	1	73	2	161		2	107	2	25	4	132
03:30		1	168	2	50	3	218		0	161	1	42	1	203
03:45		2	140	4	40	6	180		1	147	3	43	4	190
04:00		0	272	1	36	1	308		2	212	0	42	2	254
04:15		2	151	3	42	5	193		0	136	5	31	5	167
04:30		0	235	6	37	6	272		1	221	7	35	8	256
04:45		2	169	14	39	16	208		0	169	13	53	13	222
05:00		4	255	11	66	15	321		6	251	19	52	25	303
05:15		2	210	28	51	30	261		0	211	27	54	27	265
05:30		2	196	30	50	32	246		3	177	42	53	45	230
05:45		7	139	82	50	89	189		7	119	70	62	77	181
06:00		12	96	81	35	93	131		13	104	76	52	89	156
06:15		13	73	159	27	172	100		10	89	160	20	170	109
06:30		24	60	257	18	281	78		23	64	239	34	262	98
06:45		43	53	329	26	372	79		38	52	338	24	376	76
07:00		41	24	296	22	337	46		49	41	275	14	324	55
07:15		40	23	311	11	351	34		48	24	295	8	343	32
07:30		36	18	254	11	290	29		37	23	263	15	300	38
07:45		68	23	289	8	357	31		57	27	272	18	329	45
08:00		70	17	199	11	269	28		50	15	202	9	252	24
08:15		58	10	145	7	203	17		69	11	120	10	189	21
08:30		57	6	110	10	167	16		50	18	108	9	158	27
08:45		36	12	109	7	145	19		45	13	97	2	142	15
09:00		53	8	66	4	119	12		36	10	71	7	107	17
09:15		44	3	71	8	115	11		42	5	51	15	93	20
09:30		27	2	56	10	83	12		48	8	66	7	114	15
09:45		40	9	52	8	92	17		38	5	59	10	97	15
10:00		35	4	63	11	98	15		41	1	51	7	92	8
10:15		41	8	47	5	88	13		39	5	47	15	86	20
10:30		35	9	52	15	87	24		33	3	50	18	83	21
10:45		41	2	52	15	93	17		33	2	51	16	84	18
11:00		43	6	59	4	102	10		29	10	63	3	92	13
11:15		38	13	48	0	86	13		35	13	66	5	101	18
11:30		35	11	68	3	104	14		40	9	68	3	108	12
11:45		53	10	64	2	117	12		45	13	73	3	118	16
Totals		1029	3273	3436	1476	4465	4749		990	3243	3359	1425	4349	4668
Day Totals		4302		4912		9214			4233		4784		9017	
% Total		11.1%	35.5%	37.2%	16.0%				10.9%	35.9%	37.2%	15.8%		
Peaks		07:45	04:30	06:30	02:30	06:45	04:30		07:45	04:30	06:45	05:00	06:45	04:30
Volume		253	869	1193	233	1350	1062		226	852	1171	221	1343	1046
P.H.F.		.90	.85	.90	.79	.90	.82		.81	.84	.86	.89	.89	.86

Technician:Jm
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS8-7
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Location. :On East Jemez 250' W of
TA 53 LANSE Entrance

Both directions

Begin Time	Fri. 01/31 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	8	52	5	47	13	99	10	17	6	16	16	33
12:15	6	42	1	40	7	82	4	18	1	19	5	37
12:30	7	33	1	36	8	69	3	15	1	20	4	35
12:45	0	59	1	48	1	107	5	22	3	20	8	42
01:00	1	59	1	39	2	98	3	26	0	14	3	40
01:15	2	51	1	36	3	87	3	9	4	10	7	19
01:30	4	46	0	51	4	97	2	13	1	18	3	31
01:45	0	53	4	29	4	82	1	22	0	20	1	42
02:00	1	52	1	46	2	98	0	18	0	23	0	41
02:15	0	56	1	42	1	98	0	24	1	21	1	45
02:30	1	75	0	55	1	130	1	23	2	20	3	43
02:45	0	56	2	52	2	108	1	19	3	28	4	47
03:00	2	73	1	32	3	105	0	16	0	19	0	35
03:15	4	122	1	43	5	165	0	21	0	27	0	48
03:30	2	174	4	38	6	212	1	30	1	21	2	51
03:45	0	150	5	43	5	193	3	16	2	19	5	35
04:00	0	216	3	43	3	259	1	25	0	35	1	60
04:15	1	114	7	36	8	150	0	16	2	18	2	34
04:30	1	119	9	27	10	146	0	25	2	14	2	39
04:45	1	94	3	33	4	127	2	19	4	19	6	38
05:00	2	93	16	36	18	129	3	26	3	20	6	46
05:15	1	83	16	48	17	131	2	17	1	17	3	34
05:30	3	70	25	30	28	100	0	12	7	19	7	31
05:45	6	46	48	26	54	72	0	13	7	26	7	39
06:00	7	24	69	22	76	46	2	10	13	21	15	31
06:15	20	39	100	16	120	55	1	19	7	21	8	40
06:30	12	20	167	26	179	46	1	10	32	17	33	27
06:45	27	14	246	25	273	39	2	7	37	23	39	30
07:00	30	21	197	18	227	39	7	9	14	11	21	20
07:15	27	16	219	9	246	25	12	1	9	13	21	14
07:30	32	14	166	5	198	19	7	3	28	15	35	18
07:45	45	6	202	11	247	17	19	4	37	9	56	13
08:00	62	4	132	10	194	14	23	6	15	5	38	11
08:15	55	3	94	10	149	13	6	4	13	4	19	8
08:30	39	8	66	7	105	15	19	4	18	6	37	10
08:45	43	11	62	10	105	21	12	4	28	6	40	10
09:00	45	11	72	2	117	13	15	4	15	12	30	16
09:15	28	6	56	9	84	15	16	6	17	8	33	14
09:30	31	5	38	13	69	18	12	18	15	9	27	27
09:45	40	8	77	4	117	12	18	11	32	9	50	20
10:00	43	2	49	8	92	10	19	3	21	8	40	11
10:15	37	3	40	9	77	12	10	4	21	13	31	17
10:30	26	7	65	18	91	25	15	7	15	14	30	21
10:45	26	2	40	24	66	26	22	4	13	13	35	17
11:00	50	3	42	7	92	10	22	7	20	8	42	15
11:15	45	11	38	10	83	21	13	8	15	2	28	10
11:30	38	13	48	4	86	17	16	6	17	3	33	9
11:45	40	6	56	5	96	11	12	8	20	4	32	12
Totals	901	2245	2497	1238	3398	3483	346	629	523	737	869	1366
Day Totals	3146		3735		6881		975		1260		2235	
% Total	13.0%	32.6%	36.2%	17.9%			15.4%	28.1%	23.4%	32.9%		
Peaks	07:45	03:15	06:30	02:00	06:45	03:15	10:45	03:15	07:30	03:15	09:45	03:15
Volume	201	662	829	195	944	829	73	92	93	102	151	194
P.H.F.	.81	.76	.84	.88	.86	.80	.82	.76	.62	.72	.75	.80

Technician: Jm
Location :On East Jemez 250' W of
TA 53 LANSE Entrance

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LCS8-7
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Both directions

Begin Time	Sun. 02/02 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Mon. 02/03 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	1	16	3	21	4	37	5	50	1	51	6	101
12:15	4	31	0	16	4	47	11	47	0	65	11	112
12:30	4	18	2	16	6	36	2	51	0	44	2	95
12:45	0	22	2	19	2	41	1	52	0	55	1	107
01:00	5	21	3	27	8	48	2	79	3	54	5	133
01:15	2	13	1	9	3	22	0	62	0	42	0	104
01:30	0	12	0	15	0	27	0	52	1	39	1	91
01:45	1	14	1	17	2	31	0	52	2	37	2	89
02:00	0	11	1	15	1	26	0	49	1	42	1	91
02:15	1	20	1	18	2	38	0	37	2	56	2	93
02:30	0	14	3	28	3	42	1	49	0	44	1	93
02:45	0	20	2	26	2	46	0	44	2	47	2	91
03:00	0	13	0	23	0	36	0	89	0	40	0	129
03:15	0	23	1	7	1	30	1	91	0	54	1	145
03:30	0	11	0	20	0	31	0	156	6	37	6	193
03:45	1	17	2	15	3	32	0	144	3	30	3	174
04:00	0	15	1	16	1	31	0	286	1	35	1	321
04:15	0	17	3	15	3	32	3	138	3	27	6	165
04:30	0	16	0	17	0	33	2	217	8	49	10	266
04:45	2	13	1	25	3	38	1	166	13	45	14	211
05:00	1	15	0	12	1	27	1	259	15	59	16	318
05:15	0	15	1	18	1	33	1	213	30	44	31	257
05:30	0	11	1	15	1	26	7	182	36	51	43	233
05:45	2	13	1	16	3	29	5	122	61	43	66	165
06:00	1	6	4	13	5	19	4	106	86	38	90	144
06:15	3	3	8	14	11	17	17	67	166	34	183	101
06:30	1	3	12	20	13	23	22	65	235	24	257	89
06:45	5	11	21	25	26	36	43	41	335	22	378	63
07:00	2	5	2	13	4	18	37	41	301	15	338	56
07:15	10	4	4	13	14	17	44	25	296	21	340	46
07:30	7	4	6	7	13	11	51	23	249	12	300	35
07:45	14	4	21	13	35	17	53	12	256	9	309	21
08:00	12	3	15	3	27	6	65	15	190	11	255	26
08:15	12	2	13	8	25	10	56	8	146	12	202	20
08:30	16	8	10	6	26	14	56	12	87	13	143	25
08:45	9	6	30	8	39	14	36	7	86	6	122	13
09:00	15	8	21	5	36	13	38	8	76	9	114	17
09:15	9	8	26	7	35	15	35	8	57	3	92	11
09:30	6	6	14	6	20	12	46	2	58	12	104	14
09:45	14	6	12	4	26	10	58	10	77	3	135	13
10:00	5	3	20	8	26	11	43	1	52	5	95	6
10:15	11	4	14	10	25	14	27	6	54	9	81	15
10:30	8	3	13	20	21	23	33	5	39	24	72	29
10:45	15	3	14	10	29	13	43	2	47	22	90	24
11:00	18	5	29	1	47	6	35	10	52	1	87	11
11:15	19	6	11	6	30	12	46	9	48	5	94	14
11:30	15	6	10	2	25	8	36	20	69	2	105	22
11:45	20	8	16	5	36	13	56	12	85	4	141	16
Totals	272	516	376	655	648	1171	1023	3202	3335	1406	4358	4608
Day Totals	788		1031		1819		4225		4741		8966	
% Total	14.9%	28.3%	20.6%	36.0%			11.4%	35.7%	37.2%	15.6%		
Peaks	11:00	00:15	08:45	02:15	11:00	00:15	07:45	04:30	06:45	00:15	06:45	04:30
Volume	72	92	91	95	138	172	230	855	1181	218	1356	1052
P.H.F.	.9	.74	.75	.84	.73	.89	.88	.62	.88	.83	.89	.82

Technician:
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Location, :On East Jemez 250' W of
TA 53 LANSE Entrance

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS8-7
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Both directions

Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	5	56	1	57	6	113	3	41	2	72	5	113
12:15	7	45	2	55	9	100	8	41	1	82	9	123
12:30	7	58	1	56	8	114	3	51	2	50	5	101
12:45	1	53	2	49	3	102	0	73	0	41	0	114
01:00	0	61	1	58	1	119	0	56	0	39	0	95
01:15	0	72	0	53	0	125	1	55	2	53	3	108
01:30	1	51	1	38	2	89	3	40	3	36	6	76
01:45	2	57	0	42	2	99	0	43	0	40	0	83
02:00	0	61	1	45	1	106	0	53	4	45	4	98
02:15	2	55	1	43	3	98	0	44	0	36	0	80
02:30	0	72	0	60	0	132	0	63	4	42	4	105
02:45	1	79	0	53	1	132	0	55	2	68	2	123
03:00	2	95	1	36	3	131	1	78	2	54	3	132
03:15	0	111	0	44	0	155	3	94	0	34	3	128
03:30	2	177	1	49	3	226	2	186	3	41	5	227
03:45	0	156	5	30	5	186	1	129	5	26	6	155
04:00	0	265	0	28	0	293	1	288	4	25	5	313
04:15	0	176	5	32	5	208	2	157	4	41	6	198
04:30	2	204	2	51	4	255	1	235	5	55	6	291
04:45	0	175	16	49	16	224	2	176	19	43	21	219
05:00	2	214	14	63	16	277	2	239	13	64	15	303
05:15	6	204	26	47	32	251	2	201	22	42	24	243
05:30	4	149	41	42	45	191	4	187	46	52	50	239
05:45	6	112	68	47	74	159	7	134	65	55	72	189
06:00	12	111	80	46	92	157	7	99	74	31	81	130
06:15	10	88	135	37	145	125	17	85	159	32	176	117
06:30	18	56	253	27	271	83	18	59	233	21	251	80
06:45	38	46	320	32	358	78	40	52	320	28	360	80
07:00	40	35	297	17	337	52	37	34	303	17	340	51
07:15	50	23	300	23	350	46	38	20	299	8	337	28
07:30	44	31	257	11	301	42	48	25	262	9	310	34
07:45	86	10	249	9	335	19	62	17	253	12	315	29
08:00	63	23	180	8	243	31	66	18	231	7	297	25
08:15	66	10	134	5	200	15	63	16	131	5	194	21
08:30	49	12	104	9	153	21	49	8	90	6	139	14
08:45	53	16	92	3	145	19	48	7	96	6	144	13
09:00	36	9	65	12	101	21	38	9	67	9	105	18
09:15	54	16	82	11	136	27	41	7	60	6	101	13
09:30	36	4	80	10	116	14	30	7	59	13	89	20
09:45	28	9	78	2	106	11	48	4	56	6	104	10
10:00	46	8	39	10	85	18	26	5	54	12	80	17
10:15	32	2	67	10	99	12	38	9	49	15	87	24
10:30	39	3	53	20	92	23	26	5	40	17	66	22
10:45	37	4	56	21	93	25	29	1	47	19	76	20
11:00	42	7	60	6	102	13	31	4	53	2	84	6
11:15	35	16	49	1	84	17	27	16	69	4	96	20
11:30	35	9	54	3	89	12	46	12	47	1	93	13
11:45	43	13	69	2	112	15	52	13	66	3	118	16
Totals	1042	3319	3342	1462	4384	4781	971	3252	3326	1425	4297	4677
Day Totals	4361		4804		9165		4223		4751		8974	
% Total	11.3%	36.2%	36.4%	15.9%			10.8%	36.2%	37.0%	15.8%		
Peaks	07:45	04:00	06:45	00:15	06:45	04:30	07:45	04:00	06:45	00:00	06:45	04:30
Volume	264	820	1174	218	1346	1007	240	857	1184	245	1347	1056
P.H.F.	.76	.77	.91	.93	.93	.90	.90	.74	.92	.74	.93	.87

Technician: Jm
Location: On East Jemez 250' W of
TA 53 LANSE Entrance

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS8-7
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Both directions

Begin Time	Thur. 02/06 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	3	51	1	69	4	120	*	*	*	*	*	*
12:15	10	50	1	50	11	100	*	*	*	*	*	*
12:30	5	56	2	47	7	103	*	*	*	*	*	*
12:45	5	61	0	57	5	118	*	*	*	*	*	*
01:00	2	*	1	*	3	*	*	*	*	*	*	*
01:15	1	*	3	*	4	*	*	*	*	*	*	*
01:30	0	*	2	*	2	*	*	*	*	*	*	*
01:45	0	*	0	*	0	*	*	*	*	*	*	*
02:00	0	*	0	*	0	*	*	*	*	*	*	*
02:15	1	*	0	*	1	*	*	*	*	*	*	*
02:30	1	*	0	*	1	*	*	*	*	*	*	*
02:45	0	*	0	*	0	*	*	*	*	*	*	*
03:00	0	*	3	*	3	*	*	*	*	*	*	*
03:15	0	*	1	*	1	*	*	*	*	*	*	*
03:30	0	*	2	*	2	*	*	*	*	*	*	*
03:45	1	*	3	*	4	*	*	*	*	*	*	*
04:00	2	*	3	*	5	*	*	*	*	*	*	*
04:15	1	*	4	*	5	*	*	*	*	*	*	*
04:30	2	*	6	*	8	*	*	*	*	*	*	*
04:45	1	*	14	*	15	*	*	*	*	*	*	*
05:00	1	*	11	*	12	*	*	*	*	*	*	*
05:15	3	*	35	*	38	*	*	*	*	*	*	*
05:30	6	*	33	*	39	*	*	*	*	*	*	*
05:45	6	*	71	*	77	*	*	*	*	*	*	*
06:00	8	*	79	*	87	*	*	*	*	*	*	*
06:15	19	*	127	*	146	*	*	*	*	*	*	*
06:30	21	*	251	*	272	*	*	*	*	*	*	*
06:45	36	*	326	*	362	*	*	*	*	*	*	*
07:00	41	*	288	*	329	*	*	*	*	*	*	*
07:15	43	*	282	*	325	*	*	*	*	*	*	*
07:30	40	*	237	*	277	*	*	*	*	*	*	*
07:45	70	*	271	*	341	*	*	*	*	*	*	*
08:00	61	*	186	*	247	*	*	*	*	*	*	*
08:15	84	*	140	*	224	*	*	*	*	*	*	*
08:30	55	*	89	*	144	*	*	*	*	*	*	*
08:45	69	*	87	*	156	*	*	*	*	*	*	*
09:00	55	*	73	*	128	*	*	*	*	*	*	*
09:15	25	*	56	*	81	*	*	*	*	*	*	*
09:30	36	*	81	*	117	*	*	*	*	*	*	*
09:45	36	*	77	*	113	*	*	*	*	*	*	*
10:00	38	*	51	*	89	*	*	*	*	*	*	*
10:15	36	*	45	*	81	*	*	*	*	*	*	*
10:30	41	*	40	*	81	*	*	*	*	*	*	*
10:45	32	*	45	*	77	*	*	*	*	*	*	*
11:00	34	*	54	*	88	*	*	*	*	*	*	*
11:15	35	*	66	*	101	*	*	*	*	*	*	*
11:30	42	*	62	*	104	*	*	*	*	*	*	*
11:45	40	*	68	*	108	*	*	*	*	*	*	*
Totals	1048	218	3277	223	4325	441	0	0	0	0	0	0
Day Totals	1266		3500		4766		0		0		0	
% Total	21.9%	4.5%	68.7%	4.6%			*	*	*	*		
Peaks	07:45	00:00	06:30	00:00	06:45	00:00						
Volume	270	218	1147	223	1293	441						
P.H.F.	.80	.89	.87	.80	.89	.91						

Technician: JM
Location : On West Jemez 150' W of
Guard Station 431

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS3-7
Page : 1

Both directions

Begin Time	Mon. 01/27 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Tues. 01/28 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	*	*	*	*	*	*	0	58	0	49	0	107
12:15	*	*	*	*	*	*	0	50	0	51	0	101
12:30	*	*	*	*	*	*	0	42	2	76	2	118
12:45	*	*	*	*	*	*	0	45	0	83	0	128
01:00	*	*	*	*	*	*	0	46	0	89	0	135
01:15	*	*	*	*	*	*	0	46	1	55	1	102
01:30	*	41	*	48	*	89	0	34	0	50	0	84
01:45	*	36	*	32	*	68	1	47	1	56	2	103
02:00	*	49	*	40	*	89	0	30	1	35	1	65
02:15	*	57	*	36	*	93	0	44	1	31	1	75
02:30	*	44	*	38	*	82	0	38	0	35	0	73
02:45	*	46	*	32	*	78	1	57	0	46	1	103
03:00	*	46	*	41	*	87	0	54	0	49	0	103
03:15	*	86	*	35	*	121	0	87	0	31	0	118
03:30	*	78	*	34	*	112	0	79	0	46	0	125
03:45	*	71	*	42	*	113	0	69	2	42	2	111
04:00	*	81	*	39	*	120	0	94	1	33	1	127
04:15	*	76	*	43	*	119	1	91	0	46	1	137
04:30	*	123	*	33	*	156	2	113	1	36	3	149
04:45	*	87	*	36	*	123	0	104	1	36	1	140
05:00	*	132	*	51	*	183	0	123	4	32	4	155
05:15	*	120	*	35	*	155	3	123	5	46	8	169
05:30	*	96	*	40	*	136	2	123	7	37	9	160
05:45	*	64	*	19	*	83	8	64	27	23	35	87
06:00	*	42	*	21	*	63	10	45	26	18	36	63
06:15	*	36	*	20	*	56	26	38	60	23	86	61
06:30	*	23	*	11	*	34	33	24	87	12	120	36
06:45	*	18	*	11	*	29	29	19	167	20	196	39
07:00	*	13	*	8	*	21	53	12	117	8	170	20
07:15	*	8	*	9	*	17	60	11	113	3	173	14
07:30	*	4	*	12	*	16	55	19	118	9	173	28
07:45	*	4	*	5	*	9	53	7	125	8	178	15
08:00	*	8	*	6	*	14	37	2	105	9	142	11
08:15	*	4	*	4	*	8	35	11	119	13	154	24
08:30	*	0	*	7	*	7	40	2	75	7	115	9
08:45	*	1	*	5	*	6	45	2	49	9	94	11
09:00	*	2	*	3	*	5	33	4	68	9	101	13
09:15	*	1	*	6	*	7	52	1	46	3	98	4
09:30	*	4	*	6	*	10	51	1	34	5	85	6
09:45	*	0	*	1	*	1	53	2	45	4	98	6
10:00	*	3	*	3	*	6	46	0	48	2	94	2
10:15	*	2	*	5	*	7	47	2	30	2	77	4
10:30	*	2	*	1	*	3	37	4	45	1	82	5
10:45	*	2	*	0	*	2	54	2	41	3	95	5
11:00	*	1	*	2	*	3	73	3	26	1	99	4
11:15	*	4	*	5	*	9	82	1	56	4	138	5
11:30	*	1	*	0	*	1	59	6	35	1	94	7
11:45	*	2	*	2	*	4	93	0	42	3	135	3
Totals	0	1518	0	827	0	2345	1174	1879	1731	1291	2905	3170
Day Totals		1518		827		2345		3053		3022		6075
Total	.0%	64.7%	.0%	35.2%			19.3%	30.9%	28.4%	21.2%		
Peaks		04:30		04:15		04:30	11:00	04:45	06:45	00:30	06:45	04:45
Volume		462		163		617	307	473	515	304	712	624
P.H.F.		.87		.79		.84	.82	.96	.77	.85	.90	.92

Site 10, Page 1

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician: JM
Location: On West Jemez 150' W of Guard Station 431

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS3-7
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Both directions

Begin Time	Wed. 01/29 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Thur. 01/30 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	1	63	0	53	1	116	2	65	1	43	3	108
12:15	1	58	3	59	4	117	3	40	3	44	6	84
12:30	1	38	0	62	1	100	1	44	1	55	2	99
12:45	0	57	2	64	2	121	0	43	1	66	1	109
01:00	0	36	0	76	0	112	0	44	0	81	0	125
01:15	1	45	0	47	1	92	0	44	1	69	1	113
01:30	0	43	1	57	1	100	0	41	1	56	1	97
01:45	0	41	2	52	2	93	0	54	0	53	0	107
02:00	0	43	0	55	0	98	2	37	1	43	3	80
02:15	0	58	0	42	0	100	1	45	2	51	3	96
02:30	1	88	2	37	3	125	3	48	1	31	4	79
02:45	0	78	0	24	0	102	1	75	2	36	3	111
03:00	0	42	0	38	0	80	0	66	2	38	2	104
03:15	0	71	0	30	0	101	0	69	0	38	0	107
03:30	0	93	0	38	0	131	0	80	0	47	0	127
03:45	1	68	2	34	3	102	1	70	2	38	3	108
04:00	2	77	4	54	6	131	0	73	0	34	0	107
04:15	0	96	0	72	0	168	0	107	0	36	0	143
04:30	1	99	0	54	1	153	3	124	0	34	3	158
04:45	5	112	3	27	8	139	0	103	2	27	2	130
05:00	1	130	4	35	5	165	0	109	5	40	5	149
05:15	2	98	3	37	5	135	4	142	5	27	9	169
05:30	5	102	13	35	18	137	4	94	8	26	12	120
05:45	6	82	22	28	28	110	7	72	31	29	38	101
06:00	10	32	23	19	33	51	15	53	29	16	44	69
06:15	29	35	64	17	93	52	25	24	58	24	83	48
06:30	24	16	97	18	121	34	31	31	98	12	129	43
06:45	37	16	163	10	200	26	44	12	171	10	215	22
07:00	39	14	103	8	142	22	52	7	121	21	173	28
07:15	53	9	112	14	165	23	59	9	106	8	165	17
07:30	60	6	118	9	178	15	64	5	120	8	184	13
07:45	55	4	144	9	199	13	53	3	121	7	174	10
08:00	40	3	125	4	165	7	47	2	116	5	163	7
08:15	31	4	88	10	119	14	41	4	90	6	131	10
08:30	47	5	64	7	111	12	33	1	75	6	108	7
08:45	36	1	63	1	99	2	43	2	58	5	101	7
09:00	35	2	43	6	78	8	42	2	52	5	94	7
09:15	37	2	43	3	80	5	41	0	40	5	81	5
09:30	30	2	27	3	57	5	35	0	37	4	72	4
09:45	56	4	50	4	106	8	39	1	41	6	80	7
10:00	39	7	34	1	73	8	31	0	35	3	66	3
10:15	36	4	41	1	77	5	39	0	42	1	81	1
10:30	65	2	37	0	102	2	32	5	27	0	59	5
10:45	50	6	44	2	94	8	49	2	38	1	87	3
11:00	69	1	45	4	114	5	65	0	36	3	101	3
11:15	81	2	33	4	114	6	80	0	34	6	114	6
11:30	79	2	25	2	104	4	64	1	33	0	97	1
11:45	51	0	49	0	100	0	103	1	47	1	150	2
Totals	1117	1897	1696	1266	2813	3163	1159	1854	1694	1205	2853	3059
Grand Totals	3014		2962		5976		3013		2899		5912	
% Total	18.6%	31.7%	28.3%	21.1%			19.6%	31.3%	28.6%	20.3%		
Peaks	11:00	04:45	07:15	00:15	07:15	04:15	11:00	04:30	06:45	00:45	06:45	04:30
Volume	280	442	499	261	707	625	312	478	518	272	737	606
P.H.F.	.86	.85	.86	.85	.88	.93	.75	.84	.75	.83	.85	.89

Technician: JM
3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Location : On West Jemez 150' W of Guard Station 431

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS3-7
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Both directions

Begin Time	Fri. 01/31 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Sat. 02/01 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	0	33	2	29	2	62	0	15	0	13	0	28
12:15	0	42	0	37	0	79	1	19	3	13	4	32
12:30	1	34	0	37	1	71	1	14	1	17	2	31
12:45	1	36	1	53	2	89	0	6	1	23	1	31
01:00	0	32	3	55	3	87	3	22	1	11	4	33
01:15	0	48	0	34	0	82	1	12	2	8	3	20
01:30	3	32	0	42	3	74	0	18	1	10	1	28
01:45	1	33	0	35	1	68	0	15	1	12	1	27
02:00	0	49	0	44	0	93	0	13	0	11	0	24
02:15	0	51	1	38	1	89	1	11	1	11	2	22
02:30	2	49	0	23	2	72	1	17	0	11	1	28
02:45	0	54	0	26	0	80	0	11	0	18	0	29
03:00	0	57	0	26	0	83	1	16	2	20	3	36
03:15	0	60	0	34	0	94	0	20	0	17	0	37
03:30	0	88	0	40	0	128	1	24	0	17	1	41
03:45	1	58	0	28	1	86	0	14	0	15	0	29
04:00	0	57	2	32	2	89	1	15	1	16	2	31
04:15	0	45	1	41	1	86	0	19	0	12	0	31
04:30	3	50	1	22	4	72	0	18	1	12	1	30
04:45	0	55	2	21	2	76	0	21	0	4	0	25
05:00	2	48	1	27	3	75	1	24	1	11	2	35
05:15	1	33	6	18	7	51	0	9	1	16	1	25
05:30	4	29	4	14	8	43	1	11	0	4	1	15
05:45	6	22	10	14	16	36	4	17	2	8	6	25
06:00	3	18	23	16	26	34	3	8	12	4	15	12
06:15	17	19	45	11	62	30	4	21	5	4	9	25
06:30	26	8	56	11	82	19	3	5	13	10	16	15
06:45	20	8	92	5	112	13	8	3	15	8	23	11
07:00	28	6	58	9	86	15	8	4	11	2	19	6
07:15	36	7	64	5	100	12	3	2	17	5	20	7
07:30	43	1	55	7	98	8	11	3	16	4	27	7
07:45	58	1	85	5	143	6	16	0	12	6	28	6
08:00	39	1	97	10	136	11	6	2	15	3	21	5
08:15	34	1	87	2	121	3	10	3	13	2	23	5
08:30	30	8	50	8	80	16	9	1	10	2	19	3
08:45	34	1	35	3	69	4	14	4	17	4	31	8
09:00	31	3	58	1	89	4	11	2	9	1	20	3
09:15	32	2	51	4	83	6	8	2	9	6	17	8
09:30	37	2	35	3	72	5	5	1	11	5	16	6
09:45	35	0	37	3	72	3	10	1	13	7	23	8
10:00	34	3	26	6	60	9	12	1	15	7	27	8
10:15	40	2	31	2	71	4	11	4	16	3	27	7
10:30	42	4	17	7	59	11	18	5	21	1	39	6
10:45	37	1	29	3	66	4	10	2	9	5	19	7
11:00	57	0	23	3	80	3	18	2	18	3	36	5
11:15	56	2	28	5	83	7	7	2	14	3	21	5
11:30	45	2	20	7	65	9	21	4	9	2	30	6
11:45	46	3	31	5	77	8	16	1	15	2	31	3
Totals	884	1198	1167	911	2051	2109	259	466	334	409	593	875
Day Totals	2082		2078		4160		725		743		1468	
% Total	21.2%	28.8%	28.0%	21.9%			17.6%	31.7%	22.7%	27.8%		
Peaks	11:00	03:00	07:30	00:45	07:30	03:15	11:00	04:15	09:45	02:45	10:15	02:45
Volume	203	263	324	184	498	397	62	82	65	72	121	143
P.H.F.	.89	.74	.83	.83	.87	.77	.73	.85	.77	.9	.77	.87

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician: JM
Location: On West Jemez 150' W of
Guard Station 431

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS3-7
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Both directions

Begin Time	Sun. 02/02 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Mon. 02/03 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	0	16	1	17	1	33	1	56	1	46	2	102
12:15	3	15	4	13	7	28	1	41	0	55	1	96
12:30	1	8	0	13	1	21	0	47	0	60	0	107
12:45	0	15	2	13	2	28	0	47	0	63	0	110
01:00	0	10	3	23	3	33	0	32	2	68	2	100
01:15	1	19	2	7	3	26	2	42	1	54	3	96
01:30	2	14	1	9	3	23	1	40	0	48	1	88
01:45	2	14	1	17	3	31	0	43	0	44	0	87
02:00	1	15	1	9	2	24	1	52	0	50	1	102
02:15	1	12	0	11	1	23	0	53	0	38	0	91
02:30	4	21	0	14	4	35	0	52	0	40	0	92
02:45	0	10	0	14	0	24	0	56	2	39	2	95
03:00	0	10	0	9	0	19	0	60	1	26	1	86
03:15	1	18	0	12	1	30	1	60	0	30	1	90
03:30	0	10	0	7	0	17	1	104	1	38	2	142
03:45	0	27	0	6	0	33	0	47	1	35	1	82
04:00	0	6	1	6	1	12	0	72	0	43	0	115
04:15	0	14	1	13	1	27	4	84	1	41	5	125
04:30	0	9	0	8	0	17	2	125	0	42	2	167
04:45	0	21	0	12	0	33	0	111	3	34	3	145
05:00	1	7	0	9	1	16	1	120	5	37	6	157
05:15	0	9	0	4	0	13	4	111	7	48	11	159
05:30	0	14	0	4	0	18	7	81	13	42	20	123
05:45	1	7	1	7	2	14	4	76	19	25	23	101
06:00	0	11	0	7	0	18	12	40	25	23	37	63
06:15	3	5	1	8	4	13	21	61	56	15	77	76
06:30	3	10	3	5	6	15	27	33	95	13	122	46
06:45	7	9	3	5	10	14	41	19	156	4	197	23
07:00	2	7	2	3	4	10	39	11	114	13	153	24
07:15	4	3	6	5	10	8	62	6	102	8	164	14
07:30	3	2	4	1	7	3	44	7	117	7	161	14
07:45	8	2	10	1	18	3	56	7	117	5	173	12
08:00	7	5	17	4	24	9	45	6	141	3	187	9
08:15	5	2	8	3	13	5	44	2	109	6	153	8
08:30	7	2	5	8	12	10	45	5	72	4	117	9
08:45	5	1	4	4	9	5	51	2	68	11	119	13
09:00	10	5	9	5	19	10	44	0	37	2	81	2
09:15	6	4	10	4	16	8	45	2	43	6	88	8
09:30	3	3	9	1	12	4	36	1	36	5	72	6
09:45	6	5	9	1	15	6	44	2	50	1	94	3
10:00	7	4	7	3	14	7	43	1	52	3	95	4
10:15	9	1	11	4	20	5	42	3	31	6	73	9
10:30	14	1	14	2	28	3	52	1	30	1	82	2
10:45	7	4	9	1	16	5	47	2	32	3	79	5
11:00	15	0	17	2	32	2	46	1	47	1	93	2
11:15	8	0	15	2	23	2	69	1	34	5	103	6
11:30	8	3	17	4	25	7	72	1	39	2	111	3
11:45	9	1	18	1	27	2	63	2	32	2	95	4
Totals	174	411	226	341	400	752	1122	1828	1692	1195	2814	3023
Day Totals	585		567		1152		2950		2887		5837	
% Total	15.1%	35.6%	19.6%	29.6%			19.2%	31.3%	28.9%	20.4%		
Peaks	10:15	03:00	11:00	00:15	11:00	01:00	11:00	04:30	06:45	00:15	07:15	04:30
Volume	45	65	67	62	107	113	250	467	489	246	685	628
P.H.F.	.75	.60	.93	.67	.83	.85	.86	.93	.78	.90	.91	.94

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Technician: JM
Location: On West Jemez 150' W of
Guard Station 431

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LCS3-7
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Both directions

Begin Time	Tues. 02/04 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Wed. 02/05 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	2	51	0	49	2	100	1	50	1	50	2	100
12:15	1	64	2	56	3	120	0	47	2	50	2	97
12:30	1	51	2	70	3	121	0	57	0	63	0	120
12:45	1	51	0	76	1	127	1	48	1	79	2	127
01:00	0	49	3	81	3	130	0	43	0	79	0	122
01:15	3	56	2	53	5	109	3	49	3	48	6	97
01:30	0	37	0	43	0	80	0	32	1	47	1	79
01:45	0	43	0	52	0	95	1	47	0	47	1	94
02:00	0	53	0	44	0	97	0	41	0	40	0	81
02:15	1	34	1	40	2	74	0	34	0	35	0	69
02:30	0	58	0	37	0	95	0	36	0	31	0	67
02:45	1	69	0	38	1	107	0	45	1	41	1	86
03:00	0	52	0	40	0	92	0	53	1	40	1	93
03:15	0	76	0	31	0	107	1	90	0	40	1	130
03:30	0	69	0	36	0	105	0	83	1	45	1	128
03:45	1	60	1	35	2	95	1	59	0	27	1	86
04:00	0	88	0	41	0	129	0	74	0	54	0	128
04:15	0	73	1	33	1	106	0	92	1	49	1	141
04:30	1	130	1	37	2	167	1	127	0	27	1	154
04:45	1	109	2	31	3	140	1	90	1	25	2	115
05:00	3	115	2	37	5	152	0	120	4	38	4	158
05:15	6	102	5	45	11	147	5	114	3	43	8	157
05:30	7	96	8	30	15	126	4	97	12	57	16	154
05:45	9	56	32	24	41	80	5	78	19	21	24	99
06:00	20	46	31	30	51	76	9	53	33	24	42	77
06:15	23	65	48	19	71	84	20	39	62	20	82	59
06:30	28	25	76	13	104	38	29	29	80	9	109	38
06:45	39	14	171	7	210	21	41	22	159	10	200	32
07:00	51	11	140	9	191	20	33	13	136	13	169	26
07:15	47	9	106	9	153	18	60	10	97	11	157	21
07:30	57	6	123	12	180	18	56	8	114	6	170	14
07:45	63	11	131	6	194	17	59	5	133	4	192	9
08:00	44	7	127	4	171	11	49	9	91	6	140	15
08:15	31	4	100	3	131	7	48	3	100	5	148	8
08:30	53	2	63	8	116	10	42	7	66	8	108	15
08:45	44	3	71	5	115	8	47	3	65	7	112	10
09:00	47	3	50	11	97	14	20	2	34	3	54	5
09:15	53	1	48	3	101	4	46	1	37	6	83	7
09:30	34	3	38	4	72	7	32	1	46	3	78	4
09:45	57	5	31	2	88	7	43	3	51	3	94	6
10:00	44	7	37	4	81	11	37	2	48	4	85	6
10:15	42	2	42	2	84	4	39	2	34	2	73	4
10:30	42	1	52	3	94	4	39	2	34	0	73	2
10:45	60	7	52	0	112	7	45	3	22	2	67	5
11:00	66	1	40	1	106	2	64	3	25	4	89	7
11:15	68	2	27	5	95	7	71	2	42	5	113	7
11:30	70	1	40	2	110	3	75	2	20	0	95	2
11:45	76	2	47	0	123	2	63	4	43	1	106	5
Totals	1197	1880	1753	1221	2950	3101	1091	1834	1623	1232	2714	3066
Day Totals	3077		2974		6051		2925		2855		5780	
% Total	19.7%	31.0%	28.9%	20.1%			18.8%	31.7%	28.0%	21.3%		
Peaks	11:00	04:30	06:45	00:15	06:45	04:30	11:00	04:30	06:45	00:15	06:45	04:30
Volume	280	456	540	283	734	606	273	451	506	271	696	584
P.H.F.	.92	.87	.78	.87	.87	.90	.91	.88	.79	.85	.87	.92

Technician: JM
Location: On West Jemez 150' W of
Guard Station 431

3600 CERRILLOS ROAD #205
SANTA FE, NM 87507
TEL (505)474-4922 FAX (505)424-8704

Site Code : 000000000000
Start Date: 01/27/03
File I.D. : LOS3-7
Page : 6

Both directions

Begin Time	Thur. 02/06 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.	Fri. 02/07 East A.M.	East P.M.	West A.M.	West P.M.	Combined A.M.	Combined P.M.
12:00	1	*	6	*	7	*	*	*	*	*	*	*
12:15	1	*	0	*	1	*	*	*	*	*	*	*
12:30	1	*	2	*	3	*	*	*	*	*	*	*
12:45	0	*	1	*	1	*	*	*	*	*	*	*
01:00	2	*	0	*	2	*	*	*	*	*	*	*
01:15	0	*	3	*	3	*	*	*	*	*	*	*
01:30	0	*	0	*	0	*	*	*	*	*	*	*
01:45	0	*	0	*	0	*	*	*	*	*	*	*
02:00	0	*	1	*	1	*	*	*	*	*	*	*
02:15	0	*	0	*	0	*	*	*	*	*	*	*
02:30	2	*	0	*	2	*	*	*	*	*	*	*
02:45	0	*	0	*	0	*	*	*	*	*	*	*
03:00	0	*	0	*	0	*	*	*	*	*	*	*
03:15	0	*	2	*	2	*	*	*	*	*	*	*
03:30	2	*	0	*	2	*	*	*	*	*	*	*
03:45	0	*	1	*	1	*	*	*	*	*	*	*
04:00	0	*	1	*	1	*	*	*	*	*	*	*
04:15	1	*	0	*	1	*	*	*	*	*	*	*
04:30	1	*	0	*	1	*	*	*	*	*	*	*
04:45	0	*	2	*	2	*	*	*	*	*	*	*
05:00	2	*	3	*	5	*	*	*	*	*	*	*
05:15	3	*	4	*	7	*	*	*	*	*	*	*
05:30	4	*	9	*	13	*	*	*	*	*	*	*
05:45	8	*	28	*	36	*	*	*	*	*	*	*
06:00	13	*	25	*	38	*	*	*	*	*	*	*
06:15	22	*	60	*	82	*	*	*	*	*	*	*
06:30	32	*	77	*	109	*	*	*	*	*	*	*
06:45	37	*	166	*	203	*	*	*	*	*	*	*
07:00	30	*	133	*	163	*	*	*	*	*	*	*
07:15	60	*	100	*	160	*	*	*	*	*	*	*
07:30	65	*	125	*	190	*	*	*	*	*	*	*
07:45	67	*	115	*	182	*	*	*	*	*	*	*
08:00	61	*	97	*	158	*	*	*	*	*	*	*
08:15	50	*	101	*	151	*	*	*	*	*	*	*
08:30	46	*	76	*	122	*	*	*	*	*	*	*
08:45	47	*	58	*	105	*	*	*	*	*	*	*
09:00	41	*	48	*	89	*	*	*	*	*	*	*
09:15	40	*	43	*	83	*	*	*	*	*	*	*
09:30	38	*	41	*	79	*	*	*	*	*	*	*
09:45	58	*	47	*	105	*	*	*	*	*	*	*
10:00	30	*	38	*	68	*	*	*	*	*	*	*
10:15	28	*	47	*	75	*	*	*	*	*	*	*
10:30	40	*	36	*	76	*	*	*	*	*	*	*
10:45	48	*	50	*	98	*	*	*	*	*	*	*
11:00	56	*	54	*	110	*	*	*	*	*	*	*
11:15	91	*	35	*	126	*	*	*	*	*	*	*
11:30	*	*	*	*	*	*	*	*	*	*	*	*
11:45	*	*	*	*	*	*	*	*	*	*	*	*
Totals	1028	0	1635	0	2663	0	0	0	0	0	0	0
Day Totals	1028		1635		2663		0		0		0	
Total	38.6%	.0%	61.4%	.0%			*	*	*	*		

Peaks	07:15	06:45	06:45
Volume	253	524	716
P.H.F.	.94	.78	.88

Supplement 3

Copy of
"Mapping 100-Year Floodplain Boundaries Following the Cerro Grande Wildfire"

LA-UR-01-5218

LA-UR-01-5218

Approved for public release; distribution is unlimited.

Title: Mapping 100-Year Floodplain Boundaries Following the Cerro Grande Wildfire

Author(s): Stephen G. McLin
Mark E. van Eeckhout
Andrew Earles

Submitted to: State of New Mexico Environment Department
Hazardous Waste Bureau

Los Alamos
NATIONAL LABORATORY

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Form 836 (8/00)

Mapping 100-Year Floodplain Boundaries Following the Cerro Grande Wildfire

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Abstract

A combined ArcView GIS-HEC modeling application for floodplain analysis of pre- and post-burned watersheds is described. The burned study area is located on Pajarito Plateau near Los Alamos National Laboratory (the Laboratory), where the Cerro Grande Wildfire burned 42,878 acres (17,352 ha) in May 2000. This area is dominated by rugged mountains that are dissected by numerous steep canyons having both ephemeral and perennial channel reaches. Vegetation consists of pinon-juniper woodlands located between 6,000-7,000 feet (1,829-2,134 m) above mean sea level (ft MSL), and Ponderosa pine stands between 7,000-10,000 ft MSL (2,134-3,048 m). Approximately seventeen percent of the burned area is located within the Laboratory, and the remainder is located in upstream or adjacent watersheds. Pre-burn floodplains were previously mapped in 1990-91 using early HEC models as part of the hazardous waste site permitting process. Precipitation and stream gage data provide essential information characterizing rainfall-runoff relationships before and after the fire. They also provide a means of monitoring spatial and temporal changes as forest recovery progresses. The 2000 summer monsoon began in late June and provided several significant runoff events for model calibration. HEC-HMS modeled responses were sequentially refined so that observed and predicted hydrograph peaks were matched at numerous channel locations. The 100-year, 6-hour design storm was used to predict peak hydrographs at critical sites. These results were compared to pre-fire simulations so that new flood-prone areas could be systematically identified. Stream channel cross-sectional geometries were extracted from a gridded 1-foot (0.3 m) DEM using ArcView GIS. Then floodpool topwidths, depths, and flow velocities were remapped using the HEC-RAS model. These floodplain boundaries are depicted on 1:2400 scale maps for all major watersheds within the Laboratory facility. Continued refinement of these maps is essential as forest recovery progresses because these floodplains will slowly recede back toward their pre-fire configurations.

INTRODUCTION

The Los Alamos National Laboratory (the Laboratory) was established in 1943 as part of the Manhattan Project. It is located (35° 52′ N, 106° 19′ W) in north-central New Mexico (USA) about 60 miles (97 km) north-northeast of Albuquerque, and 25 miles (40 km) northwest of Santa Fe (Figure 1). Los Alamos has a semiarid, temperate mountain climate. This 43-square mile (111-square km) facility is situated on Pajarito Plateau between the Jemez Mountains on the west and the Rio Grande Valley to the east. The Plateau slopes east-southeast for more than 15 channel miles (24 km), where it terminates along the Rio Grande in White Rock Canyon. Topography ranges from 7,800 feet (2,377 m) above mean sea level (ft MSL) along the western Laboratory margin to about 6,400 ft MSL (1,951 m) at the canyon rim. The Plateau is dissected by a system of gaged and ungaged watersheds that are dominated by ephemeral stream drainage. Here we define a gaged watershed as one having at least one rain gage (input) and one stream gage (output) so that the system response can be estimated (Dooge, 1959, 1973). Some perennial channel reaches are also locally defined. All of these watersheds are elongated in the west-to-

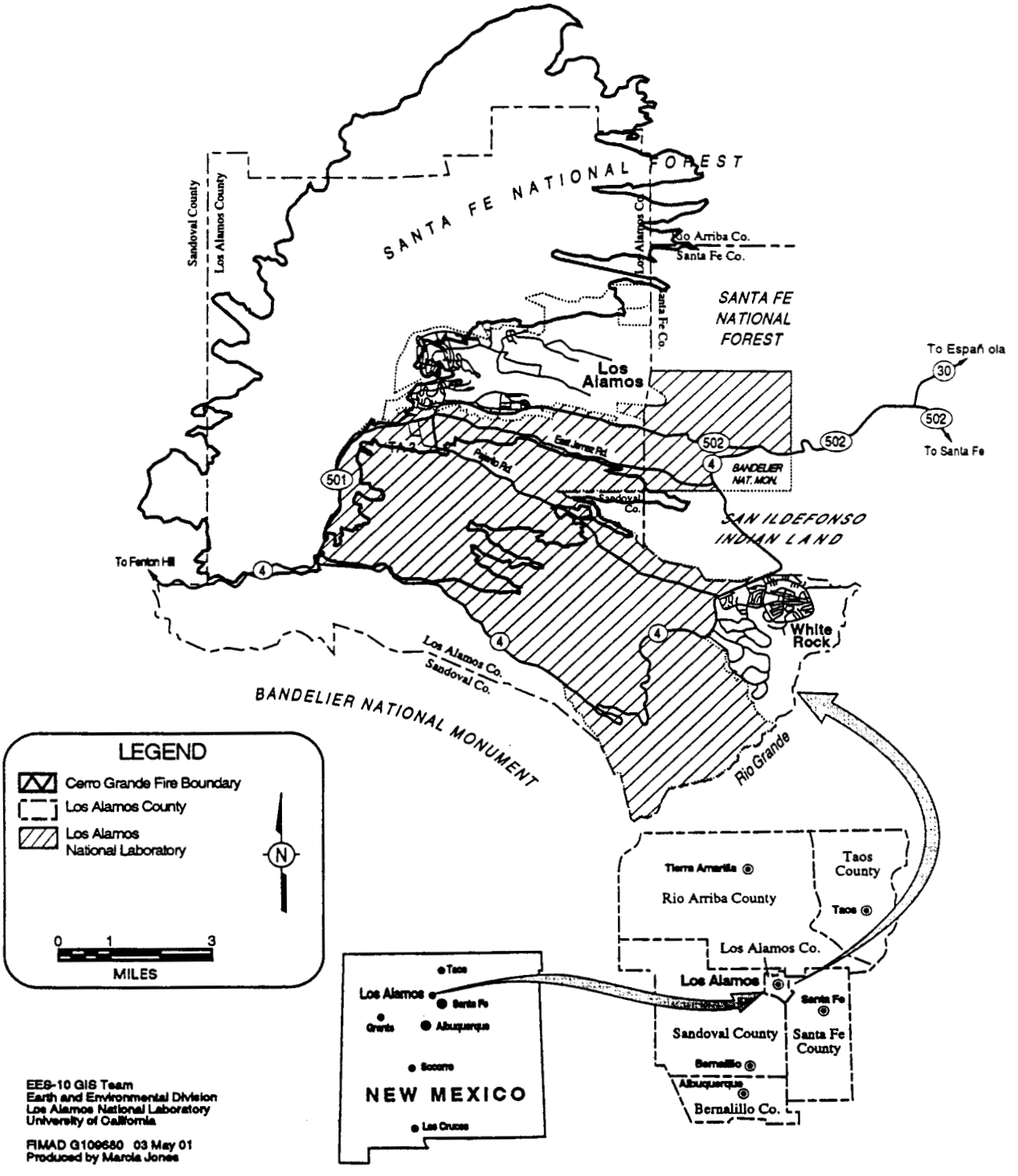

Figure 1. Location map showing Cerro Grande wildfire near Los Alamos, New Mexico.

east flow direction along Pajarito Plateau, and are extremely narrow in the north-south direction. All total, there are 13 separate watersheds draining Laboratory lands that contain over 100 channel miles (161 km) requiring floodplain identification. These floodplains are defined at

approximately 200-foot (61 m) intervals using topographic data obtained from a 1-foot (0.3 m) gridded digital elevation model (DEM). These data were obtained from a 1992 aerial photogrammetric survey of the Laboratory and surrounding areas.

The Cerro Grande wildfire began as a US National Park Service prescribed burn on May 4, 2000. It quickly spread out of control because of high winds and extremely dry conditions. The fire was contained on June 6, 2000, after consuming approximately 42,878 acres (17,352 ha), including 7,439 acres (3,010 ha) within the Laboratory. The fire continued to burn inside the containment line throughout July as seen in Figure 1. A complete summary of fire-related events is available (BAER, 2000).

Although the Laboratory has maintained a comprehensive environmental monitoring program since 1949, it became a permitted hazardous waste treatment, storage, and disposal facility in 1990. Permit conditions stipulate that these Resource Conservation and Recovery Act (RCRA) facilities must delineate all 100-year floodplain elevations within their boundaries [40 CFR 270.14(b)(11)(iii)]. These floodplains were originally mapped (McLin, 1992) using the US Army Corps of Engineers (USACE) Hydrologic Engineering Center (HEC) computer-based Flood Hydrograph Package (HEC-1) and the Water Surface Profiles Package (HEC-2). These techniques are well-documented and routinely used for floodplain analyses (USACE, 1985, 1982; Hoggan, 1996). Updated models (USACE, 2001a, 2001b) now include HEC-HMS (Hydrologic Modeling System) and HEC-RAS (River Analysis System). The Laboratory's RCRA operating permit is subject to renewal in 2001. All floodplain boundaries have been remapped for this renewal because they have expanded following the fire. These changes are in direct response to fire-related modifications in the rainfall-runoff process due to reductions in watershed vegetation cover and development of hydrophobic soil conditions. As the forest around the Laboratory recovers over the next several decades, these floodplain boundaries are expected to recede slowly back toward their pre-fire boundaries at some undetermined rate.

The US Geological Survey (USGS) has produced probabilistic techniques to estimate peak discharges in New Mexico streams (Waltemeyer, 1986; Thomas and Gold, 1982). These studies define the regional magnitude and flood frequency within stream channels using multiple regression techniques for the 2, 5, 10, 25, 50, and 100-year storm events. However, as seen in Figures 2 and 3, these empirical equations produce significantly larger pre-fire hydrograph peaks for ungaged watersheds compared to observed peaks or HEC-HMS simulations (McLin, 1992). The observed peaks in Figure 2 were obtained from backwater calculations (Veenhuis, 2000), while the observed peaks in Figure 3 were recorded at stream gages (Shaull et al., 2000). The USGS procedure yields peaks that are typically one to two orders of magnitude larger than physical observations or HEC-HMS simulated peaks using equivalent subbasin parameters. More importantly, there is no known methodology to extrapolate the USGS technique to post-fire watershed conditions. Hence, these probabilistic techniques are not used in this evaluation.

HEC-HMS is a single event, rainfall-runoff model that can be used to simulate real or hypothetical storm hydrographs in gaged or ungaged watersheds in response to user specified rainfall hyetographs (USACE, 2001a). As used here, HEC-HMS employs traditional 50, 100, or 500-year, 6-hour design storm events for Los Alamos. These representative design storms are

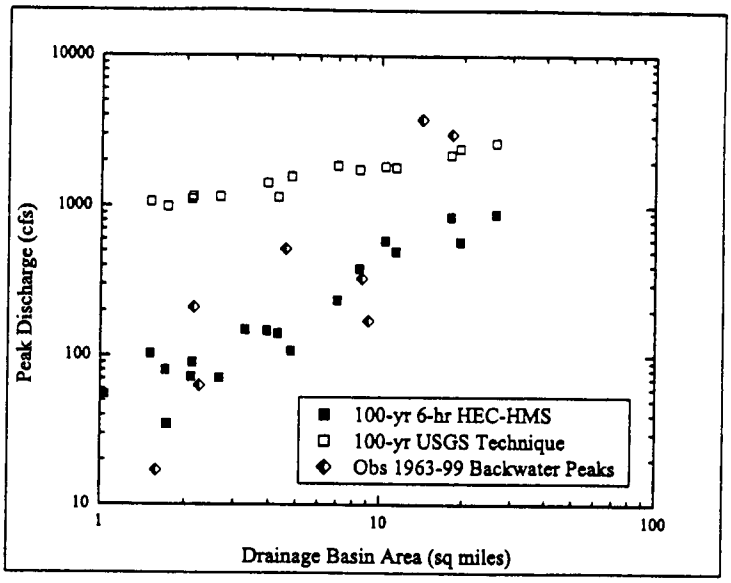

Figure 2. Comparison of simulated HEC-HMS and USGS 100-year pre-fire peak discharges at eastern Laboratory boundary. Observed peaks are from backwater calculations.

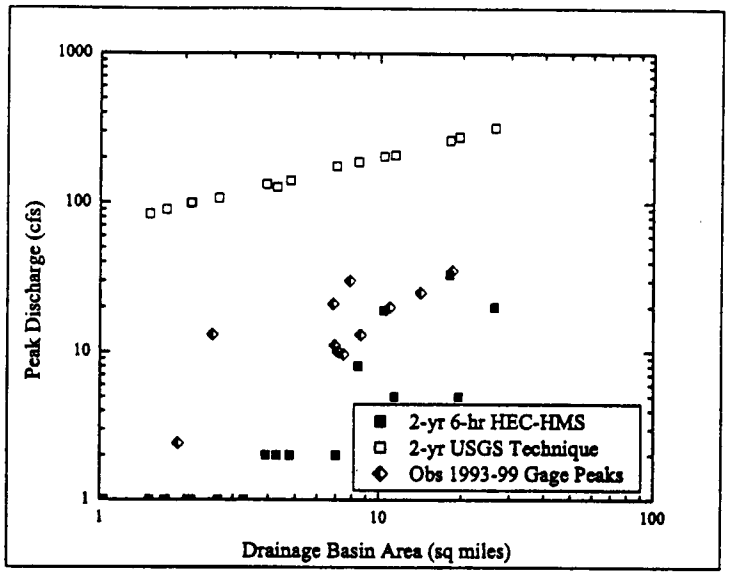

Figure 3. Comparison of simulated HEC-HMS and USGS 2-year pre-fire peak discharges at eastern Laboratory boundary. Observed peaks are from stream gage records.

hypothetical events that were constructed using historical precipitation patterns from six Pajarito Plateau recording rain gages (McLin, 1992). Predicted HEC-HMS hydrograph peaks, along with stream channel geometry and watershed drainage characteristics, are then utilized by the HEC-

RAS model to compute either 50, 100, or 500-year floodplain boundaries. This procedure is well established in modern engineering practice.

For the modeling efforts described here, stream channel cross-sections at varying locations were obtained from the Laboratory's computer-based graphical information system (ArcView GIS) and is similar to an earlier GIS-HEC topographic data extraction procedure (McLin, 1993). For this study, cross-sections are located approximately every 200 feet (61 m) along each reach. Topographic data are automatically extracted from the DEM database in order to minimize channel-surveying tasks. This procedure is performed for each cross-section following the pre-selected channel reach pathway. Each DEM point along the cross-section forms an (x, y, z) topographic point that is geo-referenced to the New Mexico State Plane coordinate system. A typical 100-foot (30 m) long cross section contains between 15 and 50 data points. These cross-sectional features are exported to the HEC-RAS model using HEC-geoRAS, an ArcView extension capability developed by the USACE-HEC.

The independently executed HEC-RAS model employs a HEC-HMS hydrograph peak to simulate a water surface elevation at each channel section using a steady, gradually varied flow approximation. Here the water surface elevation is computed as a function of channel distance using an iterative standard-step method (USACE, 2001b). The model computes a pair of left and right overbank floodpool coordinates for each section that identifies where the DEM land surface and computed floodpool intersect. Coordinate pairs from adjacent channel sections are imported back into ArcView GIS and linked together using the geo-referenced New Mexico State Plane coordinate system. These linked coordinates define the floodplain over the entire channel reach. Parameter estimation procedures and construction of input data files for pre- and post-fire conditions are described in the sections below. Finally, 1:2400 scale maps depicting the Laboratory boundary and all floodplains have been generated.

DESIGN STORM FOR LOS ALAMOS

An observed storm hydrograph for a given watershed is closely related to the spatial and temporal storm distribution that generated it. However, observed large recurrence interval storms are generally unavailable so hypothetical design storms must be used in most engineering applications. In this paper, we describe the 100-year, 6-hour design storm event for Los Alamos that is assumed to produce the 100-year floodplain. The reader should note that other 100-year storm events (e.g., the 100-year, 24-hour event) will produce different 100-year floodplain definitions. Other design storm construction methodologies also exist (e.g., Chow et al., 1988; USBR, 1977; Miller et al., 1973) and depend on availability of precipitation records.

In constructing a design storm event, several important steps are required, including (1) storm frequency or return period; (2) storm duration, total rainfall depth, and watershed area adjustment; and (3) storm time distribution and duration of rainfall excess. In our case, the US Environmental Protection Agency (EPA) stipulates that RCRA permitted facilities must use the 100-year storm to define all floodplains. The USACE recommends (M. Magnuson, USACE Albuquerque District Office, personal communication, 1989) that a 6-hour storm event should be

used for northern New Mexico in most 100-year flood simulations. Bowen (1990, 1996) has tabulated statistically based rainfall depths for various storms. No areal adjustment was made for rainfall depths because individual subbasins are less than about 3 mi^2 (8 km^2). Hence, factors (1) and (2) above are fixed via institutional constraints and rainfall observations. The selection rationale for factor (3) is described below.

A representative rainfall hyetograph must be selected that is based either on the worst possible storm pattern or from recorded storm distribution patterns. This hyetograph will significantly affect the shape and peak value of the resulting runoff hydrograph for a given watershed. Daily precipitation depths have been measured in Los Alamos since 1911 (Bowen, 1990, 1996). Individual storm patterns have been recorded at 15-minute intervals beginning in 1964. These data were used to develop intensity-duration-frequency (IDF) relationships (McLin, 1992, 2001). These IDF curves (Figure 4) were used to establish individual 6-hour design storm distributions for the 2, 5, 10, 25, 50, 100, and 500-year events.

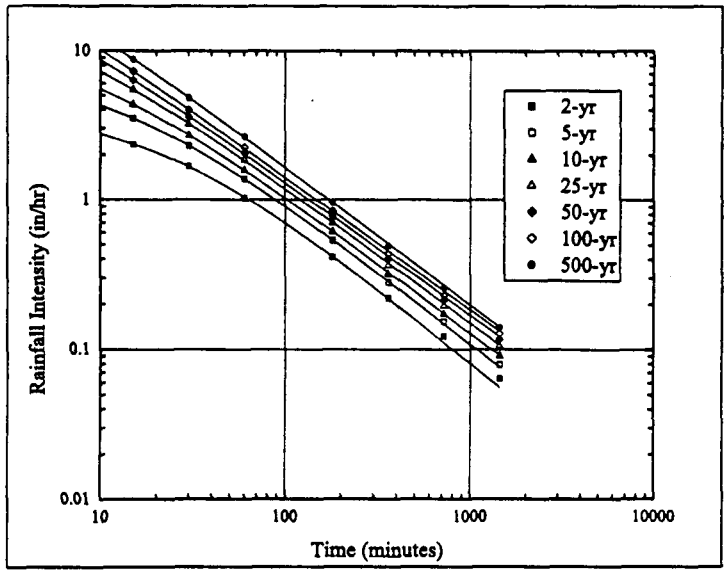

Figure 4. Intensity-duration-frequency curves for Los Alamos, New Mexico.

Once IDF curves are constructed, then a 6-hour design storm hyetograph can be developed for each return period event using the alternating block method (Chow et al., 1988, p. 454-466). Results for the dimensionless 2 and 100-year instantaneous storm events are shown in Figure 5. All of the cumulative 6-hour storm distributions developed and used in this report are summarized in Appendix A; these include the 2, 5, 10, 25, 50, 100, and 500-year events. The SCS (Soil Conservation Service, now the Natural Resources Conservation Service) 100-year, 6-hour design storm distribution (SCS, 1993) is also shown in Figure 5 for comparison. Note that the SCS curve will produce a more uniform rainfall distribution, and lower corresponding hydrograph peak. As seen in Figure 5, the 6-hour instantaneous design storm distributions used here are bell-shaped with a midpoint peak intensity at 3 hours. These distributions imply

gradually increasing and decreasing intensities preceding and following peak values. This design storm pattern essentially satisfies soil infiltration and other abstraction loss requirements with low rainfall intensity, and generates higher hydrographs in response to higher rainfall intensities later. Observed New Mexico summer thunderstorms typically result from intense prefrontal squall lines moving south to north. These thunderstorms are exceptionally localized events that rarely cover more than about 0.5 mi^2 (1.3 km^2). Hence, our design is conservative since it is simultaneously applied to all subbasins within the west-east oriented watersheds.

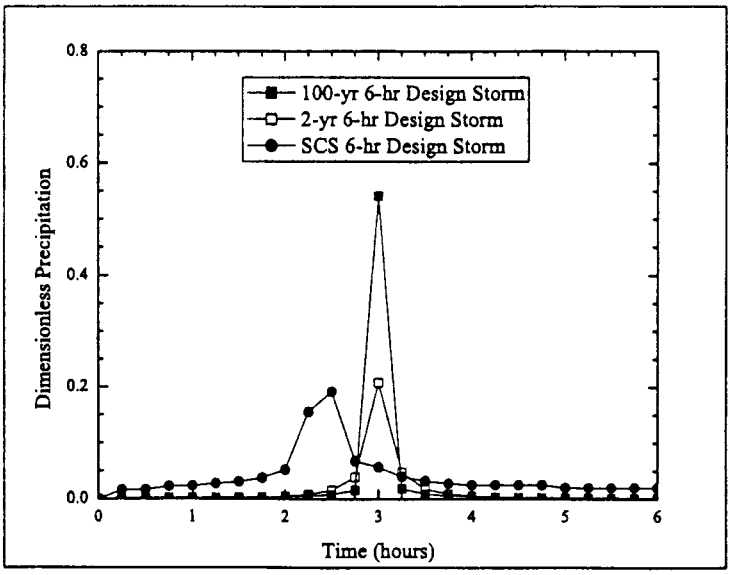

Figure 5. Six-hour design storms for Los Alamos; the SCS 6-hour storm is shown for comparison.

Each of the 6-hour design storm distributions described above contains all of the shorter duration events with the same recurrence interval. For example, the 100-year, 6-hour design storm contains the 100-year, 15-minute storm in its central 15-minute interval. Likewise, the 100-year, 1-hour storm is contained within the central 60-minute interval of the 100-year, 6-hour design distribution. In other words, the 100-year, 6-hour design storm incorporates all 100-year events with storm durations of 6 hours or less. This observation is directly related to the alternating block method used to construct the design storm. Hence, the 6-hour design storm will produce larger hydrographs than shorter duration design storms with the same recurrence interval because it has a longer period of low intensity rainfall before its central peak. For example, the 6-hour design storm will yield larger hydrograph peaks than its 1-hour counterpart. This is a significant point that is often overlooked.

As employed here, the HEC-HMS simulations used total rainfall depths reported by Bowen (1990, 1996) and the cumulative design storm distributions computed from the instantaneous distributions described above. Rainfall depths from Bowen (1990) were also adjusted for elevation differences between subbasin centroids using a least squares linear

regression of rain gage elevations and recorded precipitation depths (McLin, 1992). This was done to account for orthographic effects across Pajarito Plateau. These elevation-corrected rainfall depths are listed in Appendix B according to subbasins within individual watersheds.

HEC-HMS MODEL

HEC-HMS is a general-purpose model that can predict the optimal unit hydrograph, channel loss rate, stream flow routing parameters, snowmelt computations, unit hydrograph computations, hydrograph routing and combinations, and hydrograph balancing operations. HEC-HMS can be used to forecast both pre- and post-burn flooding impacts associated with these changing land-use patterns. Output from the model includes the design storm hydrograph for each subbasin. Hydrograph peaks are then utilized in the HEC-RAS model as input data.

HEC-HMS can utilize five different unit hydrographs (UH) to simulate runoff, including a user specified UH, kinematic wave, Clark, Snyder, or SCS UH. The SCS UH was selected in this study to characterize the relationship between rainfall-runoff and peak discharge. The SCS rainfall abstraction loss rate was also utilized as explained later. Finally, HEC-HMS can route computed flood flows through downstream subbasins using a variety of techniques, including modified Puls, Muskingum, Muskingum-Cunge, kinematic wave, and level-pool reservoir routing. The Muskingum method was selected for this option because channel losses and flood-wave attenuation in individual watersheds have not been fully characterized. Hence these losses were assumed to be zero even though they are known to be relatively high in certain pre-fire stream channel reaches (e.g., those channel reaches with relatively thick alluvial deposits). Muskingum routing parameters were computed from average channel flow velocities using Manning's equation. In addition, level-pool reservoir routing was selected to move water through road culverts with high embankments and for flood detention structures.

Obviously, not all rainfall from a storm contributes to direct runoff since some is lost during the overland flow process. These abstractions include vegetation interception, depression storage, soil infiltration, evaporation, and other minor losses. Five theoretical rainfall loss calculation techniques are incorporated in HEC-HMS, including the initial and uniform, HEC exponential, Green-Ampt, Holton, and SCS curve number (CN). However, the SCS CN loss method provides a systematic method for computing composite CN values that can account for changing impervious areas or dramatic land use alterations. The SCS synthetic UH expresses the ratio of discharge to peak discharge against the ratio of time to basin lag time. Here lag time is given by (Viessman et al., 1977):

$$t_p = D/2 + t_l \quad \text{and} \quad t_l = [l^{0.8}\,(S+1)^{0.7}]/[1900\,Y^{0.5}] \qquad (1)$$

where t_p is the time (hours) from rainfall beginning to peak discharge, D is rainfall duration (hours), t_l is subbasin lag time (hours), l is the longest water course length (feet) from the subbasin outflow toward the upstream watershed divide, S is potential maximum retention after rainfall begins (inches), and Y is the average watershed slope (%) along the flowpath. Note that

in (1) the lag time is directly related to CN since S=1000/CN-10. Once rainfall excess has been determined, a unit hydrograph can be computed for each subbasin.

In Figure 6, pre-fire Los Alamos watershed data are used to show SCS basin lag times from (1) as a function of Snyder lag times (Viessman et al., 1977). Empirical coefficients used in the Snyder technique were obtained from USACE studies (M. Magnuson, USACE Albuquerque District Office, personal communication, 1989) from the Rio Puerco in New Mexico and Rio Grande near El Paso, Texas (lower curve). Synder lag times for the upper curve were obtained using a modified form of the Snyder relationship and coefficients for mountainous watersheds near Los Angeles, California (Linsley et al., 1982, pp. 223-225). Figure 6 clearly shows that SCS basin lag times used in this study are bracketed by extremes produced with the Snyder technique. Computation of post-fire changes in Snyder lag times was not possible because changes in empirical coefficients associated with the fire could not be evaluated. Appendix C summarizes pre-fire HEC-HMS model parameters; these data were originally reported in McLin (1992). Appendix D summarizes post-fire HEC-HMS model parameters that were used in the present study. Appendix E shows a HEC-HMS model input data file for Pajarito Canyon, including the flood retention structure located above Technical Area 18 (TA-18).

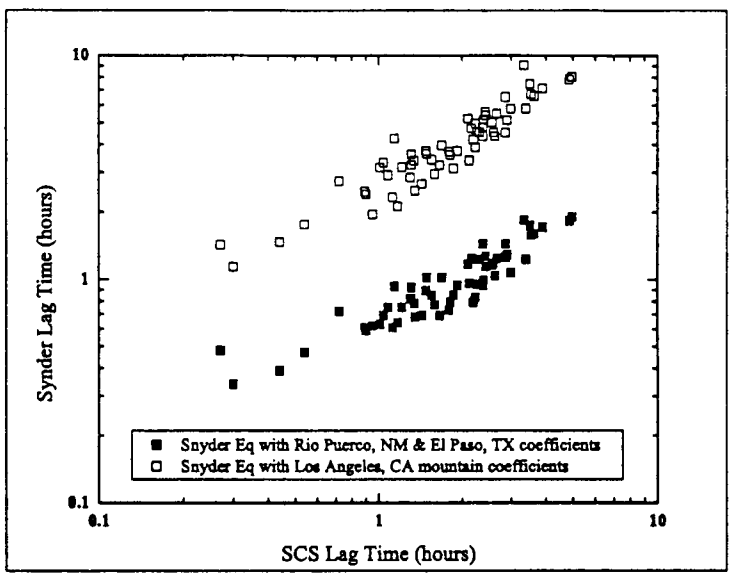

Figure 6. Comparison of SCS and Snyder pre-fire basin lag times for Los Alamos using equivalent basin parameters.

Figure 7 shows a plot of changes in pre- and post-fire SCS CN values and lag times for impacted watersheds. Note that t_l values from (1) have been dramatically reduced in upland subbasins where CN values have increased the most. Fire impacts are also the most pronounced in these same locations (e.g., Wilson et al., 2001). In some headwater subbasins, lag time has been reduced from 90 minutes to under 33 minutes. This implies that both recording rain and stream gages need to be collecting data every 15 minutes or less in order to capture the dynamic

nature of the rainfall-runoff process. In other words, data acquisition rates for systems inputs and outputs need to be less than one-half the system response time (approximated here by t_l) in order to avoid data aliasing (Jenkins and Watts, 1968, p. 285).

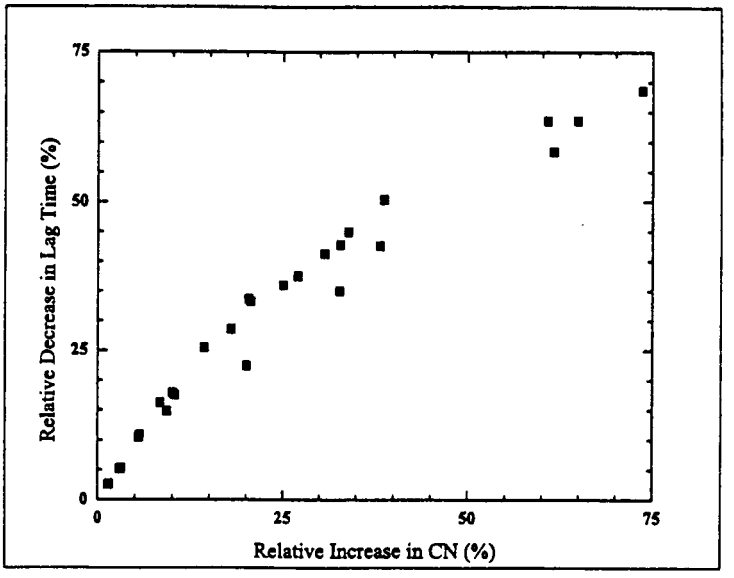

Figure 7. Cerro Grande wildfire changes in curve number (CN) and basin lag times. Here a relative change is defined as (pre-fire value - post-fire value)/(pre-fire value).

In addition to ease of use, (1) has the advantage that impacts of development within a given watershed can be evaluated since changes in CN over time are easily estimated. These same impacts can not be systematically evaluated with the kinematic wave, Snyder, or Clark UH methods.

Pre-fire CN values were determined for all watersheds (McLin, 1992) and formed a starting point for post-fire simulations. These pre-fire values typically ranged from the mid-50s and 60s for wooded alpine forests, to 70s and 80s for mountain brush and pinon-juniper woodlands. These values were originally obtained using a quasi-model calibration procedure for ungaged watersheds as discussed below.

Once all pre-fire basin characteristic parameters had been estimated, then individual watershed hydrographs could be generated. Before this was done, however, a parameter sensitivity analysis was made. All model parameters were constrained to a vary narrow range of observed values except for composite subbasin CN numbers. These CN values were estimated from county soil maps (Nyhan et al., 1978) and standard tables (Hoggan, 1996), although alternative methodologies are available (Hawkins 1993; Hjelmfelt, 1980). To evaluate the uncertainty in estimated pre-fire CN values, hydrograph peaks produced by the 2-year, 6-hour design storm event for Los Alamos were examined for all subbasins. The logic for this design procedure is straightforward: one can quickly develop a general appreciation for flood

magnitudes associated with individual pre-fire 2-year storm events from physical observation. These qualitative observations suggest that pre-fire 2-year flood peaks in Los Alamos County are only slightly larger than zero. This same appreciation can not be easily developed for pre-fire 100-year magnitude events because these events are rarely observed. Following this logic, all HEC-HMS simulations should accurately reflect observed pre-fire 2-year events if one is to have confidence in large recurrence-interval flood predictions. One should recognize that once all pre-fire subbasin characteristic parameters have been determined, then one only needs to change subbasin rainfall totals and design storm distribution patterns in order to generate larger recurrence interval hydrographs.

Each pre-fire watershed simulation was made for the 2-year, 6-hour Los Alamos design storm event. If a given subbasin yielded a hydrograph peak that was unreasonably high or low, then the composite CN was adjusted either downward or upward, respectively, and a new simulation was made. Recall that a change in CN implies a corresponding change in basin lag time, as suggested by (1). This iterative process was repeated several times for each watershed. Individual composite CN values were typically adjusted less than 3% until the predicted 2-year hydrograph peak was greater than zero but less than about 3 cfs (85 l/s) for an average sized subbasin. Approximately half of all subbasins required a composite CN adjustment; these adjustments were nearly equally divided between increases and decreases in CN values. Once these CN values were fixed, then the larger recurrence interval hydrographs were computed using the 6-hour rainfall totals and the design storm distribution patterns developed earlier.

The post-fire CN values were initially modified from original values using weighting factors based on the percent of subbasin areas that were burned. These burned areas were subdivided into low (57% of total burn area), medium (8% of total), and high (34% of total) severity burned areas as defined by the Burned Area Emergency Rehabilitation team (BAER, 2000). This classification is qualitatively linked to changes in soil texture and infiltration capacity. High burn severity areas are located in those areas where the surficial soil structure has been altered. These soils typically have a hydrophobic layer that was formed during the fire. This layer is located approximately 0.25 inch (6.4 mm) below the surface and is between 0.25 to 3.0 inches thick (6.4 to 76 mm). These hydrophobic soils develop when high temperature fires produce heavy volatile organics that migrate into soils and condense (Imeson et al., 1992; Dekker and Ritsema, 1994). For the Cerro Grande wildfire, these hydrophobic soils are preferentially located on north-facing canyon slopes with heavy ponderosa pine forests. They occur on approximately 22% of the total burn area. Medium severity burn areas show little or no hydrophobicity and are concentrated on south-facing canyon slopes with sparser vegetation, on mesa tops, and in canyon bottoms. Low severity burn areas are generally located along the perimeter of more severely burned areas. This hydrophobic soil distribution is related to the distribution of fuels, temperature, and heavy winds during the fire. Quantitative evaluation of infiltration capacity changes in these hydrophobic soils is currently underway.

The BAER team originally assigned CN values of 65, 85, and 90 to the low, medium, and high severity burn areas, respectively. We modified these CN values to include a range of values for each severity classification. Thus for low severity burns, we estimated CN values range from a low of 65 to a high of 85, with an expected value of 75. For moderate severity burned areas,

we estimated than CN values range from a low of 80 to a high of 90, with an expected value of 85. Finally, for high severity burned areas, we estimated that CN values range from a low of 85 to a high of 95, with an expected value of 90. Unburned areas retained their original pre-fire CN values; however, we assumed these values could range four CN points above and below this original value. A composite CN value was computed for each subbasin using these four burn severity weight factors and four expected CN values. These weight factors were computed according to the fraction of burned area within each subbasin area (i.e., unburned, low, medium, or high severity). Each respective weight factor was multiplied by each respective CN value and the results were summed to obtain the composite CN value. This process was then repeated for the low and high CN estimates to establish lower and upper limits on these CN composites. All of these weighted CN values are listed in Appendix F. Calibration efforts will be repeated as forest recovery progresses to document the time rate of change in CN values. This procedure was implemented because public safety and environmental questions needed addressing before the summer (2000) monsoon season created flooding hazards at the Laboratory.

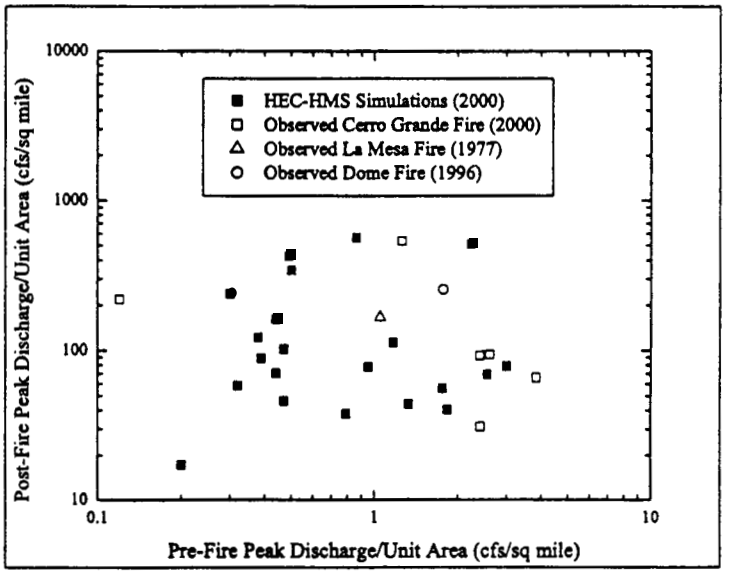

Figure 8. Comparison of observed and simulated peak discharges per unit drainage basin area. The La Mesa and Dome wildfires occured south of the Cerro Grande wildfire in the years indicated.

Figure 8 shows a dramatic increase between pre- and post-fire hydrograph peaks per unit area for both observed and simulated storm events. The observed data in Figure 8 were obtained from stream gages (Cerro Grande fire) and backwater calculations (La Mesa and Domes fires) for several regional wildfires (McLin,2001; Veenhuis, 2000; Cannon and Reneau, 2000). Simulated values were obtained with the HEC-HMS model using the pre- and post-burn CN values described earlier. In addition, the 2-year, 1-hour design storm distribution was used for these simulations because this pattern best represented the observed rainfall pattern following each of the fires. Figure 8 suggests that the final CN values for the post–burn areas yield simulated hydrograph peaks that compare favorably with observed values.

Figure 9 shows a comparison between observed and HEC-HMS predicted hydrographs for Starmer Canyon, a small tributary watershed located in the Santa Fe National Forest along the western Laboratory perimeter. This watershed was severely burned during the Cerro Grande wildfire. The observed hydrograph was in response to approximately 0.69 inches (17.5 mm) of rain that fell in less than 45 minutes on 28 June 2000. The observed and predicted hydrograph peaks match well. However, total observed runoff volume is considerably less than the predicted volume. Five additional observed and predicted hydrographs for other small watersheds follow a similar pattern. These comparisons suggest that the shape of the SCS unit hydrograph may not completely represent Pajarito Plateau watersheds or that channel infiltration losses are significant. These preliminary results are encouraging however.

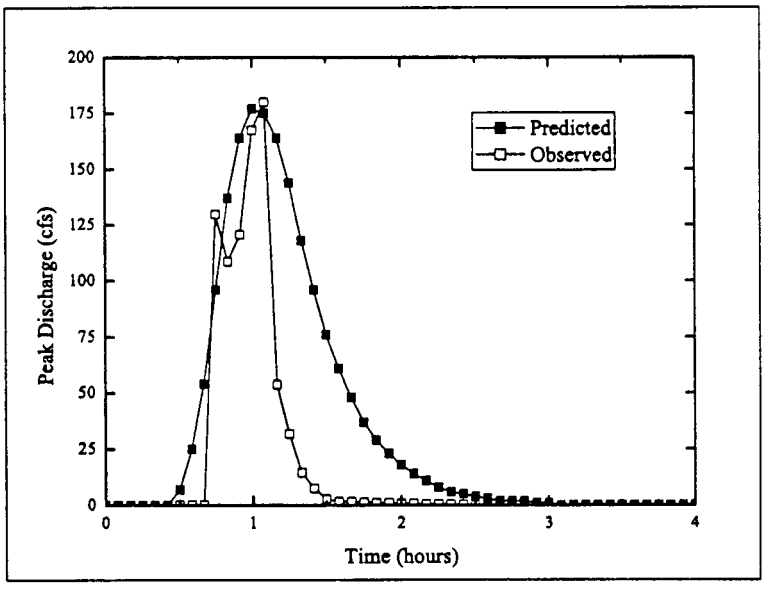

Figure 9. Observed and simulated hydrographs for the Starmer Canyon watershed following a small thunderstorm on 28 June 2000.

HEC-RAS FLOODPLAIN MAPPING

The HEC-RAS model calculates and plots water surface profiles for subcritical, critical, and supercritical gradually varied, steady flows in channels of any cross-sectional configuration. Surface water profile analyses are commonly used to map floodplains at RCRA sites, determine flood protection levee heights, and establish flood hazard zones for insurance purposes. The HEC-HMS and HEC-RAS models are typically used in conjunction with one another for these floodplain assessment studies.

Flow regime boundary geometry is defined in the HEC-RAS model with cross-sections and reach distances between adjacent cross-sections. These cross-sections are located at user

specified intervals along the stream channel so that the flow capacity in the channel and overbank areas can be characterized. Reducing the distance between adjacent sections will increase the model's accuracy because erratic fluctuations in energy losses between sections can be minimized. Manning's equation is initially used to determine how much of the cross-sectional flow is in the channel and how much is in the overbank areas. Values for subarea conveyance (i.e., all terms in Manning's equation except the friction slope term) are known if the friction slope is assumed constant throughout a given cross-section. A starting water surface elevation at either the downstream (subcritical) or upstream (supercritical) end of the watercourse, expansion or contraction coefficients, Manning's roughness factor n, and stream discharge are specified as input data.

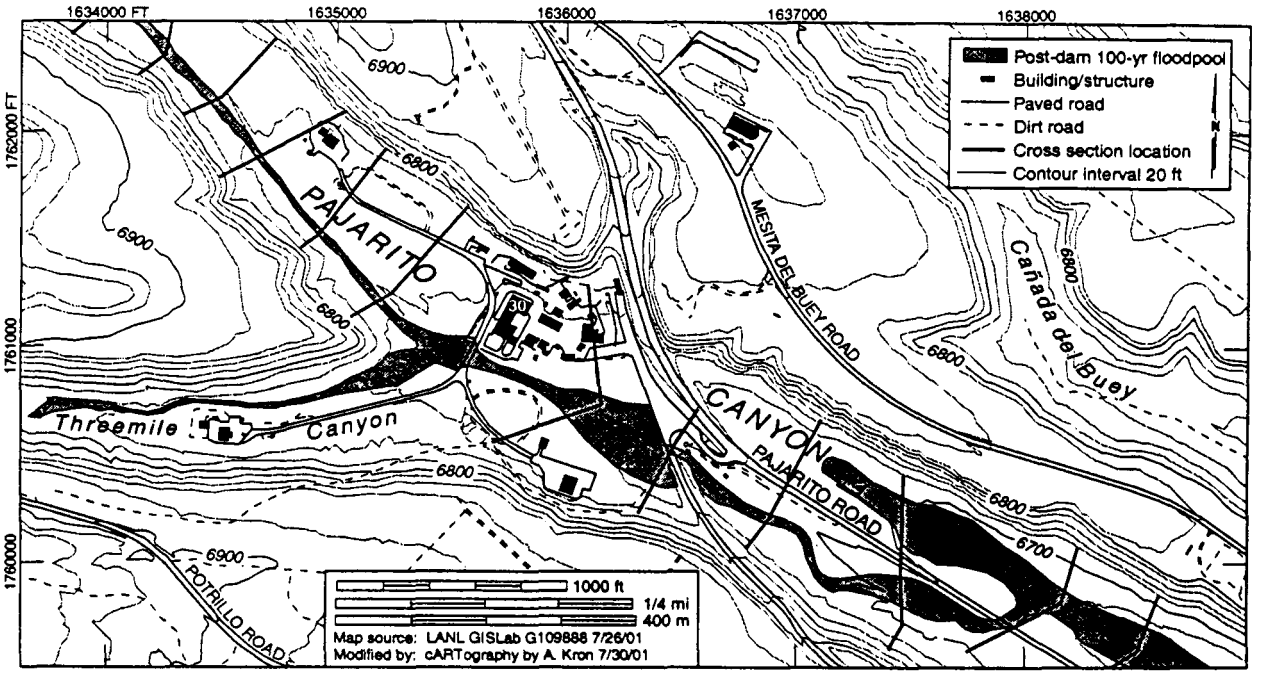

Figure 10. Predicted post-fire 100-year floodplain map for TA-18 following construction of the upstream flood control structure.

This floodplain mapping procedure implies that natural channels meet uniform flow conditions, that the energy grade is approximately equal to the average channel bed slope, and that water surface elevations can be obtained from a normal-depth calculation. These assumptions are conservative in most natural channels. Figure 10 depicts an example of the predicted post-fire 100-year floodpools in Pajarito Canyon near TA-18 after construction of the flood control structure. Other floodplain maps are attached to this report for all canyons crossing Laboratory lands. Table 1 summarizes the Environmental Dynamics and Spatial Analysis Group's (EES-10) GISlab map numbers that define all 100-year floodplains within the Laboratory facility. These maps are the ultimate work-product of this report. However, continued refinement of these floodplain maps will continue as additional rainfall-runoff calibration data are collected.

Table 1. Identification numbers for 100-year floodplain maps.

Watershed	Map Number	GISlab ID Number
Pueblo-Los Alamos	1	110088
	2	110089
	3	110090
	4	110091
	5	110092
	6	110093
	7	110094
	8	110095
	9	110096
	10	110097
	11	110098
Sandia	1	109957
	2	109958
	3	109959
	4	109960
	5	109961
Mortandad-Canada del Buey	1	109984
	2	109985
	3	109986
	4	109987
	5	109988
	6	109989
	7	109990
	8	109991
	9	109992
Pajarito	1	106978
	2	106979
	3	106980
	4	106981
	5	106982
	6	106983
Water-Canon de Valle	1	109962
	2	109963
	3	109964
	4	109965
	5	109966
	6	109967
	7	109968
	8	109969
	9	109970
	10	109971
	11	109972

Table 1. Identification numbers for 100-year floodplain maps.

Watershed	Map Number	GISlab ID Number
Potrillo-Fence	1	110078
	2	110079
	3	110080
	4	110081
	5	110082
Ancho	1	110035
	2	110036
	3	110037
	4	110038
Chaquequi	1	110083
	2	110084

DISCUSSION AND CONCLUSIONS

Many of the maps listed in Table 1 have not been finalized. For example, maps 110092 and 110093 for Pueblo Canyon at Diamond Drive shows the 100-year floodpool overtopping the land bridge. However, the new large-diameter culvert has not been incorporated into the HEC-RAS model. When this task is accomplished, the revised floodpool may or may not be predicted to overtop the land bridge. Finally, it should be remembered that all these floodplains will continue to change as forest recovery progresses.

The successful integration of modern GIS databases and hydrologic models is an emerging technology (Maidment and Djokic, 2000). Most federal, and many State, facilities already have significant GIS topographic coverage. This paper describes an application of HEC-HMS and HEC-RAS floodplain models to complex terrain using ArcView GIS extracted topographic data. These models are recognized by the EPA, USACE, and others as the best available technology for floodplain definition in ungaged watersheds. Combining these models with a GIS capability represents a refinement in their continued use.

The SCS curve number method was used in this study to predict runoff. The relative merits of this empirical approach versus physically based representations have been openly debated in the literature for years. However, Loague and Freeze (1985) have shown that physically based models generally do not predict runoff any better than the relatively simple approach used here. In addition, extension of physical models to ungaged watersheds retains many limitations of simple approaches. Furthermore, the SCS method has the advantage that future changes in land use patterns (e.g., pre- and post-fire watershed alterations or urbanization) are easily addressed.

Most event simulation models represent the rainfall-runoff process as a linear input-output system. This implies that model calibration studies can utilize data from low recurrence-interval storm and runoff events to characterize the watershed response. Typically, these calibration results are then extended to large recurrence-interval events. This well-established practice is far from perfect because the system response may not be linear over this entire range. For example, the calibration efforts described here utilize convective summer thunderstorm data that rarely exceed three hours in duration. However, large recurrence-interval storms in the southwest are often associated with long-duration hurricanes that move inland from the Gulf of Mexico or the Baja Peninsula. One practical solution to this problem is to use a 6- or 24-hour design storm with peak rainfall intensities near the middle of the storm distribution to mimic these rare events.

Finally, observed increases in hydrograph peaks and total runoff volume following wildfires are well documented in the literature. For northern New Mexico, these increases in peak flow appear to be in the range of one to two orders of magnitude per unit drainage basin area. Furthermore, recording rain and stream gages should collect data at less than one-half the post-fire system response time, or basin lag time, to capture the dynamic nature of the rainfall-runoff process.

ACKNOWLEDGEMENTS

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Appendix A

Six-Hour Design Storm Distributions for Los Alamos

Table A-1. Individual 6-hour design storm distributions for Los Alamos County.

Time	Time	Cummulative 6-Hour Design Storm Distributions (dimensionless)						
(min)	(hrs)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
0	0.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5	0.0833	0.000651	0.000988	0.001274	0.001410	0.001599	0.001612	0.001120
10	0.1667	0.001342	0.002017	0.002591	0.002863	0.003243	0.003267	0.002272
15	0.2500	0.002078	0.003090	0.003954	0.004361	0.004933	0.004968	0.003458
20	0.3333	0.002862	0.004211	0.005366	0.005907	0.006673	0.006716	0.004681
25	0.4167	0.003699	0.005382	0.006831	0.007504	0.008466	0.008515	0.005941
30	0.5000	0.004595	0.006609	0.008353	0.009156	0.010316	0.010369	0.007243
35	0.5833	0.005554	0.007897	0.009936	0.010868	0.012225	0.012280	0.008589
40	0.6667	0.006584	0.009251	0.011585	0.012642	0.014199	0.014253	0.009982
45	0.7500	0.007693	0.010676	0.013306	0.014486	0.016243	0.016292	0.011426
50	0.8333	0.008888	0.012181	0.015106	0.016403	0.018361	0.018403	0.012925
55	0.9167	0.010180	0.013773	0.016990	0.018400	0.020559	0.020589	0.014482
60	1.0000	0.011581	0.015462	0.018969	0.020486	0.022845	0.022859	0.016104
65	1.0833	0.013104	0.017258	0.021050	0.022666	0.025226	0.025218	0.017796
70	1.1667	0.014766	0.019174	0.023246	0.024952	0.027710	0.027674	0.019564
75	1.2500	0.016584	0.021224	0.025568	0.027354	0.030308	0.030236	0.021416
80	1.3333	0.018580	0.023425	0.028031	0.029884	0.033030	0.032915	0.023361
85	1.4167	0.020782	0.025798	0.030652	0.032557	0.035890	0.035722	0.025407
90	1.5000	0.023222	0.028367	0.033453	0.035390	0.038904	0.038671	0.027568
95	1.5833	0.025936	0.031161	0.036457	0.038404	0.042089	0.041779	0.029857
100	1.6667	0.028975	0.034217	0.039695	0.041623	0.045468	0.045063	0.032291
105	1.7500	0.032395	0.037578	0.043203	0.045077	0.049066	0.048548	0.034890
110	1.8333	0.036271	0.041301	0.047027	0.048803	0.052916	0.052260	0.037677
115	1.9167	0.040698	0.045455	0.051224	0.052848	0.057057	0.056233	0.040685
120	2.0000	0.045797	0.050132	0.055867	0.057270	0.061538	0.060510	0.043950
125	2.0833	0.051728	0.055452	0.061053	0.062146	0.066423	0.065145	0.047523
130	2.1667	0.058706	0.061574	0.066909	0.067575	0.071795	0.070206	0.051469
135	2.2500	0.067024	0.068721	0.073612	0.073697	0.077767	0.075786	0.055876
140	2.3333	0.077099	0.077209	0.081411	0.080704	0.084493	0.082010	0.060868
145	2.4167	0.089534	0.087502	0.090675	0.088881	0.092198	0.089059	0.066624
150	2.5000	0.105244	0.100318	0.101973	0.098668	0.101223	0.097201	0.073419
155	2.5833	0.125677	0.116833	0.116246	0.110789	0.112122	0.106863	0.081710
160	2.6667	0.153276	0.139117	0.135177	0.126551	0.125880	0.118788	0.092316
165	2.7500	0.192491	0.171211	0.162161	0.148639	0.144500	0.134449	0.106947
170	2.8333	0.252349	0.222289	0.205381	0.183807	0.173032	0.157470	0.130064
175	2.9167	0.354224	0.318917	0.291784	0.256815	0.230839	0.201581	0.179897
180	3.0000	0.562600	0.588462	0.614820	0.654523	0.695267	0.742916	0.750146
185	3.0833	0.703960	0.737874	0.759785	0.787259	0.803799	0.824356	0.850593
190	3.1667	0.780733	0.806111	0.818537	0.835488	0.842266	0.854579	0.882527
195	3.2500	0.828665	0.845971	0.852050	0.862773	0.864833	0.873203	0.900495

Table A-1. Individual 6-hour design storm distributions for Los Alamos County.

Time	Time	Cummulative 6-Hour Design Storm Distributions (dimensionless)						
(min)	(hrs)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
200	3.3333	0.861321	0.872452	0.874403	0.881215	0.880662	0.886734	0.912804
205	3.4167	0.884940	0.891507	0.890721	0.894936	0.892825	0.897403	0.922113
210	3.5000	0.902783	0.905985	0.903356	0.905773	0.902698	0.906237	0.929583
215	3.5833	0.916715	0.917428	0.913548	0.914686	0.911011	0.913792	0.935816
220	3.6667	0.927879	0.926747	0.922023	0.922236	0.918192	0.920401	0.941162
225	3.7500	0.937014	0.934518	0.929237	0.928771	0.924518	0.926285	0.945843
230	3.8333	0.944619	0.941120	0.935491	0.934526	0.930174	0.931592	0.950007
235	3.9167	0.951042	0.946817	0.940993	0.939664	0.935291	0.936430	0.953757
240	4.0000	0.956534	0.951798	0.945894	0.944302	0.939965	0.940878	0.957169
245	4.0833	0.961280	0.956201	0.950303	0.948527	0.944269	0.944998	0.960300
250	4.1667	0.965418	0.960130	0.954306	0.952406	0.948259	0.948836	0.963194
255	4.2500	0.969056	0.963664	0.957965	0.955992	0.951978	0.952430	0.965883
260	4.3333	0.972277	0.966867	0.961333	0.959324	0.955463	0.955812	0.968396
265	4.4167	0.975147	0.969787	0.964450	0.962437	0.958742	0.959005	0.970756
270	4.5000	0.977719	0.972464	0.967350	0.965358	0.961839	0.962031	0.972979
275	4.5833	0.980035	0.974932	0.970058	0.968108	0.964774	0.964907	0.975081
280	4.6667	0.982131	0.977216	0.972598	0.970708	0.967564	0.967649	0.977075
285	4.7500	0.984035	0.979339	0.974988	0.973172	0.970222	0.970268	0.978972
290	4.8333	0.985772	0.981320	0.977245	0.975514	0.972762	0.972776	0.980781
295	4.9167	0.987362	0.983174	0.979382	0.977746	0.975193	0.975183	0.982510
300	5.0000	0.988822	0.984915	0.981411	0.979878	0.977525	0.977496	0.984166
305	5.0833	0.990168	0.986555	0.983341	0.981919	0.979766	0.979723	0.985756
310	5.1667	0.991410	0.988102	0.985182	0.983875	0.981924	0.981871	0.987283
315	5.2500	0.992561	0.989566	0.986942	0.985755	0.984004	0.983945	0.988754
320	5.3333	0.993629	0.990955	0.988626	0.987563	0.986012	0.985951	0.990172
325	5.4167	0.994623	0.992275	0.990242	0.989306	0.987954	0.987892	0.991541
330	5.5000	0.995549	0.993532	0.991794	0.990987	0.989833	0.989774	0.992864
335	5.5833	0.996415	0.994731	0.993286	0.992611	0.991653	0.991600	0.994146
340	5.6667	0.997225	0.995876	0.994724	0.994182	0.993419	0.993374	0.995387
345	5.7500	0.997984	0.996972	0.996112	0.995704	0.995134	0.995098	0.996591
350	5.8333	0.998698	0.998023	0.997451	0.997179	0.996801	0.996775	0.997760
355	5.9167	0.999368	0.999031	0.998746	0.998610	0.998422	0.998408	0.998895
360	6.0000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

Appendix B

Total 6-Hour Precipitation for Pajarito Plateau Watersheds

Table B-1. Elevation-adjusted 6-hour precipitation for Pajarito Plateau watershed basins.

Location	Elevation	500-yr Ppt	100-yr Ppt	50-yr Ppt	25-yr Ppt	10-yr Ppt	5-yr Ppt	2-yr Ppt
TA-59	7379	3.08	2.61	2.42	2.21	1.94	1.71	1.34
TA-54	6690	2.39	1.94	1.77	1.59	1.36	1.17	0.89
Regression Equation: y = ax + b where y = 6-hr prec (in) and x = watershed basin centroid elevation (ft).								
slope (a)		1.001E-03	9.724E-04	9.434E-04	8.999E-04	8.418E-04	7.837E-04	6.531E-04
intercept (b)		-4.310	-4.566	-4.541	-4.430	-4.272	-4.073	-3.479
Watershed	**Centroid**							
Guaje	**Elevation**	**500-yr Ppt**	**100-yr Ppt**	**50-yr Ppt**	**25-yr Ppt**	**10-yr Ppt**	**5-yr Ppt**	**2-yr Ppt**
1	8100	3.80	3.31	3.10	2.86	2.55	2.28	1.81
2	6700	2.40	1.95	1.78	1.60	1.37	1.18	0.90
3	7105	2.81	2.34	2.16	1.96	1.71	1.50	1.16
4	6400	2.10	1.66	1.50	1.33	1.12	0.94	0.70
5	5920	1.62	1.19	1.04	0.90	0.71	0.57	0.39
Rendija								
1	8250	3.95	3.46	3.24	2.99	2.67	2.39	1.91
2	8250	3.95	3.46	3.24	2.99	2.67	2.39	1.91
3	7420	3.12	2.65	2.46	2.25	1.97	1.74	1.37
4	7720	3.42	2.94	2.74	2.52	2.23	1.98	1.56
5	7780	3.48	3.00	2.80	2.57	2.28	2.02	1.60
6	7000	2.70	2.24	2.06	1.87	1.62	1.41	1.09
7	7420	3.12	2.65	2.46	2.25	1.97	1.74	1.37
8	6910	2.61	2.15	1.98	1.79	1.55	1.34	1.03
9	6880	2.58	2.12	1.95	1.76	1.52	1.32	1.01
10	6400	2.10	1.66	1.50	1.33	1.12	0.94	0.70
Barrancas								
1	6580	2.28	1.83	1.67	1.49	1.27	1.08	0.82
2	6200	1.90	1.46	1.31	1.15	0.95	0.79	0.57
3	6600	2.30	1.85	1.69	1.51	1.28	1.10	0.83
4	6140	1.84	1.41	1.25	1.10	0.90	0.74	0.53
Bayo								
1	7220	2.92	2.46	2.27	2.07	1.81	1.59	1.24
2	6500	2.20	1.76	1.59	1.42	1.20	1.02	0.77
3	6100	1.80	1.37	1.21	1.06	0.86	0.71	0.50
Pueblo								
1	8400	4.10	3.60	3.38	3.13	2.80	2.51	2.01
2	7300	3.00	2.53	2.35	2.14	1.87	1.65	1.29
3	6480	2.18	1.74	1.57	1.40	1.18	1.01	0.75
Los Alamos								
1	9200	4.90	4.38	4.14	3.85	3.47	3.14	2.53
2	7700	3.40	2.92	2.72	2.50	2.21	1.96	1.55
3	7050	2.75	2.29	2.11	1.91	1.66	1.45	1.13
4	6000	1.70	1.27	1.12	0.97	0.78	0.63	0.44
5	5740	1.44	1.02	0.87	0.74	0.56	0.43	0.27
6	5600	1.30	0.88	0.74	0.61	0.44	0.32	0.18
Sandia								
1	6900	2.60	2.14	1.97	1.78	1.54	1.33	1.03
2	6400	2.10	1.66	1.50	1.33	1.12	0.94	0.70
3	6300	2.00	1.56	1.40	1.24	1.03	0.86	0.64
4	5800	1.50	1.07	0.93	0.79	0.61	0.47	0.31

Table B-1. Elevation-adjusted 6-hour precipitation for Pajarito Plateau watershed basins.

Watershed Mortandad	Centroid Elevation	500-yr Ppt	100-yr Ppt	50-yr Ppt	25-yr Ppt	10-yr Ppt	5-yr Ppt	2-yr Ppt
1	7200	2.90	2.44	2.25	2.05	1.79	1.57	1.22
2	7045	2.75	2.29	2.10	1.91	1.66	1.45	1.12
3	6730	2.43	1.98	1.81	1.63	1.39	1.20	0.92
4	6640	2.34	1.89	1.72	1.55	1.32	1.13	0.86
5	6650	2.35	1.90	1.73	1.55	1.33	1.14	0.86
6	6340	2.04	1.60	1.44	1.28	1.07	0.90	0.66
Canada del Buey								
1	6865	2.57	2.11	1.94	1.75	1.51	1.31	1.00
2	6500	2.20	1.76	1.59	1.42	1.20	1.02	0.77
Pajarito								
1	8720	4.42	3.91	3.69	3.42	3.07	2.76	2.22
2	7500	3.20	2.73	2.53	2.32	2.04	1.80	1.42
3	7500	3.20	2.73	2.53	2.32	2.04	1.80	1.42
4	6850	2.55	2.10	1.92	1.73	1.49	1.30	0.99
5	7030	2.73	2.27	2.09	1.90	1.65	1.44	1.11
6	6610	2.31	1.86	1.69	1.52	1.29	1.11	0.84
7	6330	2.03	1.59	1.43	1.27	1.06	0.89	0.65
Potrillo								
1	6750	2.45	2.00	1.83	1.64	1.41	1.22	0.93
2	6700	2.40	1.95	1.78	1.60	1.37	1.18	0.90
3	6400	2.10	1.66	1.50	1.33	1.12	0.94	0.70
Water								
1	8400	4.10	3.60	3.38	3.13	2.80	2.51	2.01
2	7400	3.10	2.63	2.44	2.23	1.96	1.73	1.35
3	6600	2.30	1.85	1.69	1.51	1.28	1.10	0.83
4	6500	2.20	1.76	1.59	1.42	1.20	1.02	0.77
5	5700	1.40	0.98	0.84	0.70	0.53	0.39	0.24
Valle								
1	8680	4.38	3.88	3.65	3.38	3.04	2.73	2.19
2	7510	3.21	2.74	2.54	2.33	2.05	1.81	1.43
3	7300	3.00	2.53	2.35	2.14	1.87	1.65	1.29
Ancho								
1	6900	2.60	2.14	1.97	1.78	1.54	1.33	1.03
2	6800	2.50	2.05	1.87	1.69	1.45	1.26	0.96
3	6400	2.10	1.66	1.50	1.33	1.12	0.94	0.70
4	6300	2.00	1.56	1.40	1.24	1.03	0.86	0.64
5	5750	1.45	1.03	0.88	0.74	0.57	0.43	0.28
Chaquehui								
1	6450	2.15	1.71	1.54	1.37	1.16	0.98	0.73
Frijoles								
1	8900	4.60	4.09	3.85	3.58	3.22	2.90	2.33
2	7300	3.00	2.53	2.35	2.14	1.87	1.65	1.29
3	7000	2.70	2.24	2.06	1.87	1.62	1.41	1.09

Appendix C

Pre-Cerro Grande Wildfire Watershed Data

Table C-1. Guaje Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	34000	3277	55	8.18	9.64	11.30	3.38
2	24000	947	68	4.71	3.95	3.25	2.86
3	46000	3600	69	4.49	7.83	9.59	3.33
4	12750	355	75	3.33	2.78	2.13	1.69
5	9000	215	70	4.29	2.39	1.45	1.59

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	34000	13.60	0.69	2.78	3	2.08	1.33
2	24000	8.70	0.77	3.06	4	3.06	1.00
3	46000	12.25	1.04	4.17	5	5.21	0.80
4	12750	7.31	0.48	1.94	2	0.97	2.00
5	9000	6.77	0.37	1.48	2	0.74	2.00

Table C-2. Rendija Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	12250	2180	58	7.24	17.80	1.15	1.02
2	9750	1520	58	7.24	15.59	0.71	0.91
3	9750	480	58	7.24	4.92	0.75	1.61
4	13000	1500	58	7.24	11.54	1.15	1.33
5	12500	1100	58	7.24	8.80	1.14	1.47
6	7500	215	69	4.49	2.87	1.05	1.29
7	13250	875	69	4.49	6.60	1.24	1.34
8	13250	385	69	4.49	2.91	1.67	2.02
9	6000	520	69	4.49	8.67	0.32	0.62
10	6000	280	69	4.49	4.67	0.41	0.85
All	48750	3540	63	5.78	7.26	9.59	4.20

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$ — x = 0.20

Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R (ft) = 1.00

K = L/(3600*Vel) (hrs) — n = 0.060

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps — NMIN = 15.00

NMIN = Minutes from Card IT — 1/[2(1-x)]= 0.63

$1/[2(1-x)] < \text{Check} < 1/(2x)$ — 1/(2x)= 2.50

Check = (60*K)/(NMIN*NSTPS)

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	12250	10.48	0.32	1.30	2	0.65	2.00
2	9750	9.81	0.28	1.10	2	0.55	2.00
3	9750	5.51	0.49	1.97	2	0.98	2.00
4	13000	8.44	0.43	1.71	2	0.86	2.00
5	12500	7.37	0.47	1.89	2	0.94	2.00
6	7500	4.20	0.50	1.98	2	0.99	2.00
7	13250	6.38	0.58	2.31	3	1.73	1.33
8	13250	4.23	0.87	3.48	4	3.48	1.00
9	6000	7.31	0.23	0.91	1	0.23	4.00
10	6000	5.36	0.31	1.24	2	0.62	2.00
All	48750	6.69	3.02	8.09	9	13.21	0.44

Table C-3. Barrancas Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	25500	1245	72	3.89	4.88	1.79	2.42
2	7250	750	76	3.16	10.34	0.33	0.54
3	23000	1267	72	3.89	5.51	2.52	2.10
4	3250	365	76	3.16	11.23	0.21	0.27

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$ — x = 0.20

Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R (ft) = 5.00

K = L/(3600*Vel) (hrs) — n = 0.100

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps — NMIN = 15.00

NMIN = Minutes from Card IT — 1/[2(1-x)]= 0.63

1/[2(1-x)] < Check < 1/(2x) — 1/(2x)= 2.50

Check = (60*K)/(NMIN*NSTPS)

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	25500	9.68	0.73	2.93	3	2.20	1.33
2	7250	14.09	0.14	0.57	1	0.14	4.00
3	23000	10.28	0.62	2.49	3	1.86	1.33
4	3250	14.68	0.06	0.25	1	0.06	4.00

Table C-4. Bayo Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	16750	745	65	5.38	4.45	1.57	2.19
2	15250	535	74	3.51	3.51	1.16	1.79
3	12750	945	75	3.33	7.41	1.19	1.04

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	16750	9.24	0.50	2.01	3	1.51	1.33
2	15250	8.20	0.52	2.07	3	1.55	1.33
3	12750	11.92	0.30	1.19	2	0.59	2.00

Table C-5. Pueblo Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	15000	1930	56	7.86	12.87	2.24	1.48
2	24000	694	65	5.38	2.89	4.61	3.62
3	14000	246	74	3.51	1.76	1.55	2.37

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	15000	15.71	0.27	1.06	2	0.53	2.00
2	24000	7.45	0.90	3.58	4	3.58	1.00
3	14000	5.81	0.67	2.68	3	2.01	1.33

Table C-6. Los Alamos Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	20000	1943	52	9.23	9.72	6.33	2.37
2	10000	531	62	6.13	5.31	0.74	1.43
3	35000	846	68	4.71	2.42	3.31	4.95
4	11750	525	80	2.50	4.47	1.96	1.08
5	5000	100	75	3.33	2.00	0.77	0.95
6	7750	165	75	3.33	2.13	0.67	1.30

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	20000	13.65	0.41	1.63	2	0.81	2.00
2	10000	10.09	0.28	1.10	2	0.55	2.00
3	35000	6.81	1.43	5.71	6	8.57	0.67
4	11750	9.26	0.35	1.41	2	0.71	2.00
5	5000	6.19	0.22	0.90	1	0.22	4.00
6	7750	6.39	0.34	1.35	2	0.67	2.00

Table C-7. Sandia Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	36750	1000	68	4.71	2.72	2.65	4.85
2	11750	370	75	3.33	3.15	0.85	1.49
3	10000	300	76	3.16	3.00	1.32	1.31
4	9000	635	79	2.66	7.06	0.75	0.72

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	36750	7.23	1.41	5.65	6	8.48	0.67
2	11750	7.77	0.42	1.68	2	0.84	2.00
3	10000	7.59	0.37	1.46	2	0.73	2.00
4	9000	11.63	0.21	0.86	1	0.21	4.00

Table C-8. Mortandad Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	9000	390	65	5.38	4.33	0.55	1.35
2	10500	277	67	4.93	2.64	0.81	1.86
3	6000	125	72	3.89	2.08	0.36	1.17
4	12250	203	72	3.89	1.66	1.61	2.31
5	16000	465	72	3.89	2.91	0.86	2.16
6	13500	855	74	3.51	6.33	1.72	1.21

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	9000	9.12	0.27	1.10	2	0.55	2.00
2	10500	7.11	0.41	1.64	2	0.82	2.00
3	6000	6.32	0.26	1.05	2	0.53	2.00
4	12250	5.64	0.60	2.41	3	1.81	1.33
5	16000	7.47	0.60	2.38	3	1.79	1.33
6	13500	11.02	0.34	1.36	2	0.68	2.00

Table C-9. Canada del Buey Canyon Watershed							
HEC-1 Input Data File Parameter Calculation							
See UD Data Card for SCS Unit Hydrograph Lag Time Definitions							
T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)							
L = Channel Length to Water Divide (ft)							
X = Basin Elevation Change over Length (ft)							
CN = SCS Curve Number for AMC-II Moisture Conditions (dim)							
S = 1000/CN - 10 = Potential Rainfall Retention (in)							
Y = 100X/L = Gross Watershed Slope (%)							
A = Basin Drainage Area (square miles)							
Basin No.	**L (ft)**	**X (ft)**	**CN**	**S**	**Y (%)**	**A (sm)**	**T (hrs)**
1	29500	836	69	4.49	2.83	2.10	3.88
2	14750	1345	72	3.89	9.12	2.42	1.14
HEC-1 Input Data File Parameter Calculation							
See RM Data Card for Muskingum Routing Parameter Definitions							
$0.1 < x < 0.3$						x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)						R (ft) =	5.00
K = L/(3600*Vel) (hrs)						n =	0.100
Nstps = 60K/NMIN (dimensionless)							
NSTPS = Interger Value for Nstps						NMIN =	15.00
NMIN = Minutes from Card IT						1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$						1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)							
Basin No.	**L (ft)**	**Vel**	**K**	**Nstps**	**NSTPS**	**AMSKK**	**Check**
1	29500	7.37	1.11	4.45	5	5.56	0.80
2	14750	13.23	0.31	1.24	2	0.62	2.00

Table C-10. Pajarito Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	17250	2711	52	9.23	15.72	1.99	1.66
2	18250	795	62	6.13	4.36	2.57	2.56
3A(2-Mi N)	7000	2060	61	6.39	29.43	1.29	0.47
3B(2-Mi S)	17750	930	61	6.39	5.24	1.99	2.34
4	11000	205	70	4.29	1.86	0.67	2.12
5	19500	710	67	4.93	3.64	1.70	2.59
6	15000	225	72	3.89	1.50	1.15	2.86
7	15500	1050	73	3.70	6.77	2.24	1.34

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$ — x = 0.20

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R (ft) = 5.00

K = L/(3600*Vel) (hrs) — n = 0.100

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps — NMIN = 15.00

NMIN = Minutes from Card IT — 1/[2(1-x)]= 0.63

$1/[2(1-x)] < Check < 1/(2x)$ — 1/(2x)= 2.50

Check = (60K)/(NMIN*NSTPS)

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	17250	17.36	0.28	1.10	2	0.55	2.00
2	18250	9.14	0.55	2.22	3	1.66	1.33
3A(2-Mi N)	7000	23.76	0.08	0.33	1	0.08	4.00
3B(2-Mi S)	17750	10.03	0.49	1.97	2	0.98	2.00
4	11000	5.98	0.51	2.04	3	1.53	1.33
5	19500	8.36	0.65	2.59	3	1.94	1.33
6	15000	5.36	0.78	3.11	4	3.11	1.00
7	15500	11.40	0.38	1.51	2	0.76	2.00

Table C-11. Potrillo Canyon Watershed							
HEC-1 Input Data File Parameter Calculation							
See UD Data Card for SCS Unit Hydrograph Lag Time Definitions							
T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)							
L = Channel Length to Water Divide (ft)							
X = Basin Elevation Change over Length (ft)							
CN = SCS Curve Number for AMC-II Moisture Conditions (dim)							
S = 1000/CN - 10 = Potential Rainfall Retention (in)							
Y = 100X/L = Gross Watershed Slope (%)							
A = Basin Drainage Area (square miles)							
Basin No.	**L (ft)**	**X (ft)**	**CN**	**S**	**Y (%)**	**A (sm)**	**T (hrs)**
1	28500	875	70	4.29	3.07	2.78	3.53
2	18000	630	71	4.08	3.50	1.03	2.23
3	9750	620	75	3.33	6.36	0.96	0.90
HEC-1 Input Data File Parameter Calculation							
See RM Data Card for Muskingum Routing Parameter Definitions							
$0.1 < x < 0.3$						x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)						R (ft) =	5.00
K = L/(3600*Vel) (hrs)						n =	0.100
Nstps = 60K/NMIN (dimensionless)							
NSTPS = Interger Value for Nstps						NMIN =	15.00
NMIN = Minutes from Card IT						1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$						1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)							
Basin No.	**L (ft)**	**Vel**	**K**	**Nstps**	**NSTPS**	**AMSKK**	**Check**
1	28500	7.67	1.03	4.13	5	5.16	0.80
2	18000	8.19	0.61	2.44	3	1.83	1.33
3	9750	11.05	0.25	0.98	1	0.25	4.00

Table C-12. Water Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	18000	2305	54	8.52	12.81	4.07	1.81
2	17750	705	62	6.13	3.97	2.63	2.62
3	19000	405	72	3.89	2.13	1.42	2.90
4	13750	615	72	3.89	4.47	1.97	1.55
5	5000	405	77	2.99	8.10	0.32	0.44

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	18000	15.67	0.32	1.28	2	0.64	2.00
2	17750	8.73	0.56	2.26	3	1.69	1.33
3	19000	6.40	0.83	3.30	4	3.30	1.00
4	13750	9.26	0.41	1.65	2	0.82	2.00
5	5000	12.47	0.11	0.45	1	0.11	4.00

Table C-13. Valle Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	22500	2756	53	8.87	12.25	2.33	2.26
2	7500	393	63	5.87	5.24	0.78	1.12
3	12500	477	64	5.63	3.82	1.17	1.92

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
1/[2(1-x)] < Check < 1/(2x)	1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	22500	15.33	0.41	1.63	2	0.82	2.00
2	7500	10.03	0.21	0.83	1	0.21	4.00
3	12500	8.56	0.41	1.62	2	0.81	2.00

Table C-14. Ancho Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	25750	1044	68	4.71	4.05	2.19	2.99
2	22000	1035	69	4.49	4.70	2.48	2.38
3	13000	1102	74	3.51	8.48	1.11	1.01
4	10000	688	75	3.33	6.88	1.04	0.89
5	2500	168	75	3.33	6.72	0.19	0.30

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	25750	8.82	0.81	3.24	4	3.24	1.00
2	22000	9.50	0.64	2.57	3	1.93	1.33
3	13000	12.75	0.28	1.13	2	0.57	2.00
4	10000	11.49	0.24	0.97	1	0.24	4.00
5	2500	11.35	0.06	0.24	1	0.06	4.00

Table C-15. Chaquequi Canyon Watershed							
HEC-1 Input Data File Parameter Calculation							
See UD Data Card for SCS Unit Hydrograph Lag Time Definitions							
T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)							
L = Channel Length to Water Divide (ft)							
X = Basin Elevation Change over Length (ft)							
CN = SCS Curve Number for AMC-II Moisture Conditions (dim)							
S = 1000/CN - 10 = Potential Rainfall Retention (in)							
Y = 100X/L = Gross Watershed Slope (%)							
A = Basin Drainage Area (square miles)							
Basin No.	**L (ft)**	**X (ft)**	**CN**	**S**	**Y (%)**	**A (sm)**	**T (hrs)**
1	16500	1292	73	3.70	7.83	1.50	1.31
HEC-1 Input Data File Parameter Calculation							
See RM Data Card for Muskingum Routing Parameter Definitions							
0.1 < x < 0.3						x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)						R (ft) =	5.00
K = L/(3600*Vel) (hrs)						n =	0.100
Nstps = 60K/NMIN (dimensionless)							
NSTPS = Interger Value for Nstps						NMIN =	15.00
NMIN = Minutes from Card IT						1/[2(1-x)]=	0.63
1/[2(1-x)] < Check < 1/(2x)						1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)							
Basin No.	**L (ft)**	**Vel**	**K**	**Nstps**	**NSTPS**	**AMSKK**	**Check**
1	16500	12.26	0.37	1.50	2	0.75	2.00

Table C-16. Frijoles Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	20200	2499	50	10.00	12.37	4.97	2.23
2	24400	1030	70	4.29	4.22	4.92	2.66
3	24000	633	68	4.71	2.64	8.13	3.50

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	20200	15.41	0.36	1.46	2	0.73	2.00
2	24400	9.00	0.75	3.01	4	3.01	1.00
3	24000	7.11	0.94	3.75	4	3.75	1.00

Appendix D

Post-Cerro Grande Wildfire Watershed Data

Table D-1. Guaje Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	1992 Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
GU100	G1	7955	1050	55	8.18	13.19	1.36	0.90
GU090	G1+G1-1	7750	490	67	4.96	6.32	2.45	0.94
GU080	G1-1	14857	830	83	2.10	5.58	2.21	1.07
GUT4a	G1-2	11965	2560	78	2.75	21.39	1.12	0.52
GUT4b	G1-2	13702	2560	81	2.28	18.68	1.18	0.57
GUT4	G1-2	6273	510	83	1.99	8.13	0.33	0.43
GU070	G1-1	2991	150	86	1.56	5.01	0.15	0.27
GUT3	G1-3	15703	1600	83	1.99	10.18	1.54	0.80
GU060	G1-1+G2	18455	1710	93	0.76	9.26	1.47	0.66
GU050	G2	11453	500	78	2.73	4.36	1.26	1.12
GUT2	G2	15107	1050	81	2.33	6.95	0.70	1.02
GU040	G2	7259	265	68	4.62	3.65	0.63	1.13
GU030	G4	10989	325	75	3.33	2.95	1.41	1.45
GUT1	G4	7299	600	75	3.33	8.22	0.65	0.63
GU020	G4	1529	40	75	3.33	2.61	0.07	0.32
GU010	G5	8649	210	70	4.28	2.42	1.44	1.52

Table D-1. Guaje Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$							x =	0.20
Vel $= 1.49R^{0.67}S^{0.5}/n$ (ft/sec)							R (ft) =	2.00
K = L/(3600*Vel) (hrs)							n =	0.080
Nstps = 60K/NMIN (dimensionless)								
NSTPS = Interger Value for Nstps							NMIN =	5.00
NMIN = Minutes from Card IT							1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$							1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)								
Basin No.	**1992 Basin No.**	**L (ft)**	**Vel**	**K**	**Nstps**	**NSTPS**	**AMSKK**	**Check**
GU100	G1	7955	8.61	0.25	3.07	3	0.76	1.02
GU090	G1+G1-1	7750	5.96	0.36	4.33	4	1.44	1.08
GU080	G1-1	14857	5.60	0.73	8.83	9	6.62	0.98
GUT4a	G1-2	11965	10.96	0.30	3.63	4	1.21	0.90
GUT4b	G1-2	13702	10.24	0.37	4.45	5	1.85	0.89
GUT4	G1-2	6273	6.75	0.25	3.09	3	0.77	1.03
GU070	G1-1	2991	5.30	0.15	1.87	2	0.31	0.93
GUT3	G1-3	15703	7.56	0.57	6.91	7	4.03	0.98
GU060	G1-1+G2	18455	4.73	0.46	5.55	6	2.77	0.92
GU050	G2	11453	4.95	0.64	7.70	8	5.13	0.96
GUT2	G2	15107	6.25	0.67	8.05	8	5.37	1.00
GU040	G2	7259	4.52	0.44	5.34	5	2.22	1.06
GU030	G4	10989	4.07	0.74	8.98	9	6.73	0.99
GUT1	G4	7299	6.79	0.29	3.57	4	1.19	0.89
GU020	G4	1529	3.83	0.11	1.32	1	0.11	1.32
GU010	G5	8649	3.69	0.65	7.80	8	5.20	0.97

Table D-2. Rendija Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	1992 Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
REN050	G3	12405	2230	92	0.83	17.97	1.15	0.35
RENT4	G3	10334	1550	93	0.75	14.99	0.71	0.32
REN040	G3	10166	460	89	1.27	4.52	0.54	0.70
RENT3	G3	14594	1540	93	0.80	10.55	1.14	0.52
RENT2	G3	12596	1160	92	0.88	9.20	1.15	0.51
REN030	G3	16270	585	76	3.23	3.59	1.25	1.78
RENT1	G3	12393	845	89	1.23	6.81	1.23	0.66
REN020	G3	13971	380	74	3.45	2.71	1.99	1.87
REN010	G3	6449	280	69	4.49	4.34	0.36	0.92

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$

Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hrs)

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps

NMIN = Minutes from Card IT

$1/[2(1-x)] < \text{Check} < 1/(2x)$

Check = (60*K)/(NMIN*NSTPS)

							x =	0.20
							R (ft) =	2.00
							n =	0.080
							NMIN =	5.00
							1/[2(1-x)]=	0.63
							1/(2x)=	2.50

Basin No.	1992 Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
REN050	G3	12405	10.05	0.34	4.11	4	1.37	1.02
RENT4	G3	10334	9.18	0.31	3.75	4	1.25	0.93
REN040	G3	10166	5.04	0.55	6.71	7	3.91	0.95
RENT3	G3	14594	7.70	0.52	6.31	6	3.15	1.05
RENT2	G3	12596	7.19	0.48	5.83	6	2.91	0.97
REN030	G3	16270	4.03	0.58	7.00	7	4.08	1.00
RENT1	G3	12393	6.19	0.55	6.67	7	3.89	0.95
REN020	G3	13971	3.90	0.99	11.91	12	11.91	0.99
REN010	G3	6449	4.93	0.36	4.35	4	1.45	1.08

Table D-3. Barrancas Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	1992 Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
BAR070	BAR2	8058	715	76	3.15	8.87	0.33	0.63
BAR060	BAR1	27863	1280	72	3.88	4.59	1.89	2.68
BAR050	BAR4	1158	50	76	3.15	4.31	0.10	0.19
BAR040	BAR3	16708	985	72	3.88	5.89	0.74	1.57
BAR030	BAR3	17520	985	72	3.88	5.62	1.27	1.67
BAR020	BAR3	5886	265	72	3.88	4.50	0.51	0.78
BAR010	BAR4	2410	90	76	3.15	3.73	0.10	0.37

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$ — x = 0.20

Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R (ft) = 2.00

K = L/(3600*Vel) (hrs) — n = 0.080

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps — NMIN = 5.00

NMIN = Minutes from Card IT — 1/[2(1-x)]= 0.63

$1/[2(1-x)] < \text{Check} < 1/(2x)$ — 1/(2x)= 2.50

Check = (60*K)/(NMIN*NSTPS)

Basin No.	1992 Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
BAR070	BAR2	8058	7.06	0.31	3.80	4	1.26	0.95
BAR060	BAR1	27863	5.08	1.52	18.27	18	27.41	1.01
BAR050	BAR4	1158	4.92	0.06	0.78	1	0.05	1.00
BAR040	BAR3	16708	5.75	0.80	9.67	10	8.06	0.96
BAR030	BAR3	17520	5.62	0.86	10.38	10	8.65	1.03
BAR020	BAR3	5886	5.03	0.32	3.90	4	1.30	0.97
BAR010	BAR4	2410	4.58	0.14	1.75	2	0.29	0.87

Table D-4. Bayo Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	1992 Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
BAY020U	BAY1	17910	790	65	5.38	4.41	1.64	2.31
BAY020L	BAY2	16168	530	74	3.51	3.27	1.13	1.94
BAYT1	BAY3	6903	630	75	3.33	9.12	0.37	0.57
BAY010	BAY3	9425	320	75	3.33	3.39	0.85	1.20

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$

Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hrs)

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps

NMIN = Minutes from Card IT

$1/[2(1-x)] < \text{Check} < 1/(2x)$

Check = (60K)/(NMIN*NSTPS)

x = 0.20

R (ft) = 2.00

n = 0.080

NMIN = 5.00

1/[2(1-x)]= 0.63

1/(2x)= 2.50

Basin No.	1992 Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
BAY020U	BAY1	17910	4.97	0.99	11.99	12	11.99	0.99
BAY020L	BAY2	16168	4.29	1.04	12.55	13	13.60	0.96
BAYT1	BAY3	6903	7.16	0.26	3.21	3	0.80	1.07
BAY010	BAY3	9425	4.36	0.59	7.19	7	4.19	1.02

Table D-5. Pueblo Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	1992 Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
PUE020	PUE1	12744	1738	91	0.96	13.63	1.39	0.44
PUETrib1	PUE1A	17681	1828	91	0.97	10.33	0.89	0.65
PUE010uu	PUE2	1977	84	70	4.33	4.24	0.11	0.35
School	PUE2	9115	672	83	2.11	7.37	0.58	0.63
PUE010um	PUE2	4291	184	65	5.27	4.28	0.42	0.74
Acid	PUE2	8595	506	65	5.36	5.88	0.45	1.11
PUE010UL	PUE2	995	30	65	5.38	3.01	0.07	0.27
Walnut	PUE2	9400	586	67	4.88	6.23	0.62	1.09
PUE010mu	PUE2	5672	192	65	5.38	3.38	0.49	1.05
Graduation	PUE2	5950	603	65	5.38	10.13	0.21	0.63
PUE010ml	PUE2	12404	202	65	5.38	1.62	1.52	2.84
PUE010l	PUE3	11451	174	74	3.51	1.51	1.46	2.16
PUE010ll	PUE3	3081	62	74	3.51	2.01	0.13	0.65

Table D-5. Pueblo Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$							x =	0.20
Vel $= 1.49R^{0.67}S^{0.5}/n$ (ft/sec)							R (ft) =	2.00
K = L/(3600*Vel) (hrs)							n =	0.080
Nstps = 60K/NMIN (dimensionless)								
NSTPS = Interger Value for Nstps							NMIN =	5.00
NMIN = Minutes from Card IT							1/[2(1-x)]=	0.63
1/[2(1-x)] < Check < 1/(2x)							1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)								
Basin No.	**1992 Basin No.**	**L (ft)**	**Vel**	**K**	**Nstps**	**NSTPS**	**AMSKK**	**Check**
PUE020	PUE1	12744	8.75	0.40	4.85	5	2.02	0.97
PUETrib1	PUE1A	17681	7.62	0.64	7.73	8	5.15	0.96
PUE010uu	PUE2	1977	4.88	0.11	1.34	2	0.22	0.67
School	PUE2	9115	6.43	0.39	4.72	5	1.96	0.94
PUE010um	PUE2	4291	4.90	0.24	2.91	3	0.72	0.97
Acid	PUE2	8595	5.75	0.41	4.98	5	2.07	0.99
PUE010UL	PUE2	995	4.11	0.06	0.80	1	0.06	0.80
Walnut	PUE2	9400	5.91	0.44	5.29	5	2.20	1.05
PUE010mu	PUE2	5672	4.36	0.36	4.33	4	1.44	1.08
Graduation	PUE2	5950	7.54	0.21	2.62	3	0.65	0.87
PUE010ml	PUE2	12404	3.02	1.13	13.66	14	15.94	0.97
PUE010l	PUE3	11451	2.92	1.08	13.06	13	14.14	1.00
PUE010ll	PUE3	3081	3.36	0.25	3.05	3	0.76	1.01

Table D-6. Los Alamos Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	1992 Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
LAT2	LA1-1	11237	2040	63	5.78	18.15	1.57	0.82
LAT1a	LA1-1	10965	1440	68	4.67	13.13	1.26	0.83
LAT1b	LA1-1	2676	202	84	1.84	7.54	0.12	0.22
LAT1	LA1	15335	1742	88	1.36	11.35	1.59	0.63
LA040U	LA1-2	6398	352	90	1.17	5.50	1.02	0.42
LA040UM	LA2	7871	420	90	1.16	5.33	0.47	0.51
LA040M	LA2+LA3	21620	622	68	4.66	2.87	1.61	3.07
DP Canyon	LA3	15474	675	75	3.33	4.36	0.57	1.58
LA040ML	LA3	11057	236	68	4.70	2.13	1.09	2.09
LA040L	LA3	4796	102	68	4.70	2.12	0.36	1.07
LA030	LA4	12286	516	80	2.50	4.19	1.93	1.15
LA020	LA5	4738	100	75	3.33	2.11	0.68	0.88
LA010	LA6	7017	144	75	3.33	2.05	0.74	1.22

Table D-6. Los Alamos Canyon Watershed								
HEC-1 Input Data File Parameter Calculation								
See RM Data Card for Muskingum Routing Parameter Definitions								
0.1 < x < 0.3							x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)							R (ft) =	2.00
K = L/(3600*Vel) (hrs)							n =	0.080
Nstps = 60K/NMIN (dimensionless)								
NSTPS = Interger Value for Nstps							NMIN =	5.00
NMIN = Minutes from Card IT							1/[2(1-x)]=	0.63
1/[2(1-x)] < Check < 1/(2x)							1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)								
Basin No.	**1992 Basin No.**	**L (ft)**	**Vel**	**K**	**Nstps**	**NSTPS**	**AMSKK**	**Check**
LAT2	LA1-1	11237	10.10	0.30	3.70	4	1.23	0.92
LAT1a	LA1-1	10965	8.59	0.35	4.25	4	1.41	1.06
LAT1b	LA1-1	2676	6.51	0.11	1.36	2	0.22	0.68
LAT1	LA1	15335	7.99	0.53	6.39	6	3.19	1.06
LA040U	LA1-2	6398	5.56	0.31	3.83	11	3.51	0.34
LA040UM	LA2	7871	5.47	0.39	4.79	5	1.99	0.95
LA040M	LA2+LA3	21620	4.02	1.49	17.92	4	5.97	4.48
DP Canyon	LA3	15474	4.95	0.86	10.41	10	8.68	1.04
LA040ML	LA3	11057	3.46	0.88	10.64	18	15.96	0.59
LA040L	LA3	4796	3.45	0.38	4.62	5	1.92	0.92
LA030	LA4	12286	4.85	0.70	8.42	8	5.61	1.05
LA020	LA5	4738	3.44	0.38	4.58	5	1.75	1.00
LA010	LA6	7017	3.39	0.57	6.88	7	4.01	0.98

Table D-7. Sandia Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	36750	1000	75	3.33	2.72	2.65	4.00
2	11750	370	75	3.33	3.15	0.85	1.49
3	10000	300	76	3.16	3.00	1.32	1.31
4	9000	635	79	2.66	7.06	0.75	0.72

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	36750	7.23	1.41	5.65	6	8.48	0.67
2	11750	7.77	0.42	1.68	2	0.84	2.00
3	10000	7.59	0.37	1.46	2	0.73	2.00
4	9000	11.63	0.21	0.86	1	0.21	4.00

Table D-8. Mortandad Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	9000	390	71	4.08	4.33	0.55	1.15
2	10500	277	68	4.71	2.64	0.81	1.81
3	6000	125	78	2.82	2.08	0.36	0.98
4	12250	203	73	3.70	1.66	1.61	2.25
5	16000	465	72	3.89	2.91	0.86	2.16
6	13500	855	74	3.51	6.33	1.72	1.21

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60*K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	9000	9.12	0.27	1.10	2	0.55	2.00
2	10500	7.11	0.41	1.64	2	0.82	2.00
3	6000	6.32	0.26	1.05	2	0.53	2.00
4	12250	5.64	0.60	2.41	3	1.81	1.33
5	16000	7.47	0.60	2.38	3	1.79	1.33
6	13500	11.02	0.34	1.36	2	0.68	2.00

Table D-9. Canada del Buey Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	29500	836	71	4.08	2.83	2.10	3.68
2	14750	1345	72	3.89	9.12	2.42	1.14

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < Check < 1/(2x)$	1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	29500	7.37	1.11	4.45	5	5.56	0.80
2	14750	13.23	0.31	1.24	2	0.62	2.00

Table D-10. Pajarito Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	17250	2711	81	2.35	15.72	1.99	0.76
2	18250	795	79	2.66	4.36	2.57	1.60
3A(2-Mi N)	7000	2060	78	2.82	29.43	1.29	0.30
3B(2-Mi S)	17750	930	74	3.51	5.24	1.99	1.66
4	11000	205	76	3.16	1.86	0.67	1.79
5	19500	710	74	3.51	3.64	1.70	2.14
6	15000	225	72	3.89	1.50	1.15	2.86
7	15500	1050	73	3.70	6.77	2.24	1.34

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec)

K = L/(3600*Vel) (hrs)

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps

NMIN = Minutes from Card IT

$1/[2(1-x)] < Check < 1/(2x)$

Check = (60K)/(NMIN*NSTPS)

x =	0.20
R (ft) =	5.00
n =	0.100
NMIN =	15.00
1/[2(1-x)]=	0.63
1/(2x)=	2.50

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	17250	17.36	0.28	1.10	2	0.55	2.00
2	18250	9.14	0.55	2.22	3	1.66	1.33
3A(2-Mi N)	7000	23.76	0.08	0.33	1	0.08	4.00
3B(2-Mi S)	17750	10.03	0.49	1.97	2	0.98	2.00
4	11000	5.98	0.51	2.04	3	1.53	1.33
5	19500	8.36	0.65	2.59	3	1.94	1.33
6	15000	5.36	0.78	3.11	4	3.11	1.00
7	15500	11.40	0.38	1.51	2	0.76	2.00

Table D-11. Potrillo Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	28500	875	77	2.99	3.07	2.78	2.90
2	18000	630	71	4.08	3.50	1.03	2.23
3	9750	620	75	3.33	6.36	0.96	0.90

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	28500	7.67	1.03	4.13	5	5.16	0.80
2	18000	8.19	0.61	2.44	3	1.83	1.33
3	9750	11.05	0.25	0.98	1	0.25	4.00

Table D-12. Water Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	18000	2305	89	1.24	12.81	4.07	0.66
2	17750	705	86	1.63	3.97	2.63	1.30
3	19000	405	72	3.89	2.13	1.42	2.90
4	13750	615	72	3.89	4.47	1.97	1.55
5	5000	405	77	2.99	8.10	0.32	0.44

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$ — x = 0.20

Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R (ft) = 5.00

K = L/(3600*Vel) (hrs) — n = 0.100

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps — NMIN = 15.00

NMIN = Minutes from Card IT — 1/[2(1-x)]= 0.63

$1/[2(1-x)] < \text{Check} < 1/(2x)$ — 1/(2x)= 2.50

Check = (60*K)/(NMIN*NSTPS)

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	18000	15.67	0.32	1.28	2	0.64	2.00
2	17750	8.73	0.56	2.26	3	1.69	1.33
3	19000	6.40	0.83	3.30	4	3.30	1.00
4	13750	9.26	0.41	1.65	2	0.82	2.00
5	5000	12.47	0.11	0.45	1	0.11	4.00

Table D-13. Valle Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	22500	2756	92	0.87	12.25	2.33	0.71
2	7500	393	80	2.50	5.24	0.78	0.70
3	12500	477	80	2.50	3.82	1.17	1.23

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$ — x = 0.20

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R (ft) = 5.00

K = L/(3600*Vel) (hrs) — n = 0.100

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps — NMIN = 15.00

NMIN = Minutes from Card IT — 1/[2(1-x)]= 0.63

1/[2(1-x)] < Check < 1/(2x) — 1/(2x)= 2.50

Check = (60K)/(NMIN*NSTPS)

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	22500	15.33	0.41	1.63	2	0.82	2.00
2	7500	10.03	0.21	0.83	1	0.21	4.00
3	12500	8.56	0.41	1.62	2	0.81	2.00

Table D-14. Ancho Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

$T = (L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	25750	1044	68	4.71	4.05	2.19	2.99
2	22000	1035	70	4.29	4.70	2.48	2.32
3	13000	1102	74	3.51	8.48	1.11	1.01
4	10000	688	75	3.33	6.88	1.04	0.89
5	2500	168	75	3.33	6.72	0.19	0.30

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$ — x = 0.20

$Vel = 1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R (ft) = 5.00

K = L/(3600*Vel) (hrs) — n = 0.100

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps — NMIN = 15.00

NMIN = Minutes from Card IT — 1/[2(1-x)]= 0.63

1/[2(1-x)] < Check < 1/(2x) — 1/(2x)= 2.50

Check = (60*K)/(NMIN*NSTPS)

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	25750	8.82	0.81	3.24	4	3.24	1.00
2	22000	9.50	0.64	2.57	3	1.93	1.33
3	13000	12.75	0.28	1.13	2	0.57	2.00
4	10000	11.49	0.24	0.97	1	0.24	4.00
5	2500	11.35	0.06	0.24	1	0.06	4.00

Table D-15. Chaquequi Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	16500	1292	73	3.70	7.83	1.50	1.31

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$	x =	0.20
Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec)	R (ft) =	5.00
K = L/(3600*Vel) (hrs)	n =	0.100
Nstps = 60K/NMIN (dimensionless)		
NSTPS = Interger Value for Nstps	NMIN =	15.00
NMIN = Minutes from Card IT	1/[2(1-x)]=	0.63
$1/[2(1-x)] < \text{Check} < 1/(2x)$	1/(2x)=	2.50
Check = (60K)/(NMIN*NSTPS)		

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	16500	12.26	0.37	1.50	2	0.75	2.00

Table D-16. Frijoles Canyon Watershed

HEC-1 Input Data File Parameter Calculation

See UD Data Card for SCS Unit Hydrograph Lag Time Definitions

T = $(L^{0.8})(S+1)^{0.7}/(1900Y^{0.5})$ = SCS Basin Lag Time (hrs)

L = Channel Length to Water Divide (ft)

X = Basin Elevation Change over Length (ft)

CN = SCS Curve Number for AMC-II Moisture Conditions (dim)

S = 1000/CN - 10 = Potential Rainfall Retention (in)

Y = 100X/L = Gross Watershed Slope (%)

A = Basin Drainage Area (square miles)

Basin No.	L (ft)	X (ft)	CN	S	Y (%)	A (sm)	T (hrs)
1	20200	2499	60	6.67	12.37	4.97	1.73
2	24400	1030	70	4.29	4.22	4.92	2.66
3	24000	633	68	4.71	2.64	8.13	3.50

HEC-1 Input Data File Parameter Calculation

See RM Data Card for Muskingum Routing Parameter Definitions

$0.1 < x < 0.3$ — x = 0.20

Vel = $1.49R^{0.67}S^{0.5}/n$ (ft/sec) — R (ft) = 5.00

K = L/(3600*Vel) (hrs) — n = 0.100

Nstps = 60K/NMIN (dimensionless)

NSTPS = Interger Value for Nstps — NMIN = 15.00

NMIN = Minutes from Card IT — 1/[2(1-x)]= 0.63

1/[2(1-x)] < Check < 1/(2x) — 1/(2x)= 2.50

Check = (60K)/(NMIN*NSTPS)

Basin No.	L (ft)	Vel	K	Nstps	NSTPS	AMSKK	Check
1	20200	15.41	0.36	1.46	2	0.73	2.00
2	24400	9.00	0.75	3.01	4	3.01	1.00
3	24000	7.11	0.94	3.75	4	3.75	1.00

Appendix E

HEC-HMS Input Data File for Pajarito Canyon Post-Cerro Grande Wildfire

Appendix E. HEC-HMS input data file for Pajarito Canyon.

```
ID    LOS ALAMOS NATIONAL LABORATORY
ID    POST-CERRO GRANDE WILDFIRE - PAJARITO CANYON WATERSHED
ID    HEC-1 SIMULATION - 100-YR, 6-HR DESIGN STORM FOR LOS ALAMOS
ID    S.G. McLin, ESH-18, MS-K497, 505-665-1721
IT   15 28JUN00     00    197
IO   0     0
PG  GAG1   3.91
PG  GAG2   2.73
PG  GAG3   2.73
PG  GAG4   2.10
PG  GAG5   2.27
PG  GAG6   1.86
PG  GAG7   1.59
PG  LADS
IN   15     0     0
PC .0000  .0051  .0106  .0167  .0234  .0310  .0397  .0499  .0624  .0784
PC .1012  .1424  .8081  .8797  .9090  .9278  .9418  .9530  .9624  .9705
PC .9777  .9840  .9898  .9951  1.0000
KKPAJ1
KM     PAJARITO C. ABOVE HW-501 AT WEST DOE BOUNDARY
KO                          22
BA  1.99
PR  LADS
PW    1
PT  GAG1
PW    1
LS    0     84
UD   .69
KKRTE2
KM     ROUTE FLOW THRU PAJ2
KO                          22
RM    3   1.66    0.2
KKPAJ2
KM     PAJARITO C. BELOW HW-501 AND ABOVE 2-MILE CANYON CONFLUENCE
KO                          22
BA  2.57
PR  LADS
PW    1
PT  GAG2
PW    1
LS    0     83
UD  1.41
KKQP2
KM     COMBINED PAJARITO C. FLOW ABOVE 2-MILE CONFLUENCE
KO                          22
HC    2
KK2-MI
KM     2-MILE CANYON ABOVE PAJARITO CONFLUENCE = PAJARITO BASIN #3
KO                          22
BA  3.28
PR  LADS
PW    1
```

Appendix E. HEC-HMS input data file for Pajarito Canyon (continued).

```
PT  GAG3
PW    1
LS    0     81
UD  1.39
KKQ2MI
KM     COMBINED FLOW BELOW PAJARITO-2 MILE CANYON CONFLUENCE
KO                          22
HC    2
KK2MIDAM
KMRESERVOIR AT PAJARITO AND 2MI CONFLUENCE
KO                          22
RS    1   ELEV   6928
SA    0    .37   1.33   4.02   7.46   9.78  13.17   16.9   17.6   26.6
SE 6928   6930   6940   6950   6960   6970   6980   6990   7000   7010
SL6928.7   9.62   0.55    0.5
SS6996.0  200.0    3.1    1.5
KKRTE4
KM     ROUTE FLOW THRU PAJ4
KO                          22
RM    3   1.53    0.2
KKPAJ4
KM     PAJARITO BETWEEN 2-MI & 3-MI CANYONS
KO                          22
BA  0.67
PR  LADS
PW    1
PT  GAG4
PW    1
LS    0     80
UD  1.58
KKQP4
KM     COMBINED PAJARITO C. FLOW ABOVE 3-MILE CONFLUENCE
KO                          22
HC    2
KKPAJ5
KM     3-MILE CANYON = PAJARITO BASIN #5
KO                          22
BA  1.70
PR  LADS
PW    1
PT  GAG5
PW    1
LS    0     79
UD  1.85
KKQ3MI
KM     COMBINED FLOW BELOW PAJARITO-3 MILE CANYON CONFLUENCE
KO                          22
HC    2
KKRTE6
KM     ROUTE FLOW THRU PAJ6
KO                          22
RM    4   3.11    0.2
```

Appendix E. HEC-HMS input data file for Pajarito Canyon (continued).

```
KKPAJ6
KM     PAJARITO C. AT WHITE ROCK ABOVE HW-4
KO                          22
BA  1.15
PR  LADS
PW    1
PT  GAG6
PW    1
LS    0     76
UD  2.55
KKQHW4
KM     COMBINED PAJARITO C. FLOW AT EAST DOE LINE (HW-4 AT WHITE ROCK)
KO                          22
HC    2
KKRTE7
KM     ROUTE FLOW THRU PAJ7 = PAJARITO ACRES
KO                          22
RM    2    0.76    0.2
KKPAJ7
KM     WHITE ROCK - PAJARITO ACRES BELOW HW-4
KO                          22
BA  2.24
PR  LADS
PW    1
PT  GAG7
PW    1
LS    0     77      5
UD  1.20
KKQPRIO
KM     COMBINED PAJARITO FLOW INTO RIO GRANDE
KO                          22
HC    2
ZZ
```

Appendix F

Cerro Grande Wildfire Burned Acreage by Watershed

Table F-1. Cerro Grande Burned Areages by Watershed

SUMMARY OF BURNED AREAS AND BURN INTENSITY BY DRAINAGE BASIN

Basin	Total Sq. Mi.	Fire Intensity			Unburned
		Low	Moderate	High	
Los Alamos Canyon					
LA-1	6.36	2.88	0.01	1.82	1.64
LA-2	0.78	0.14	0.03	0.45	0.16
LA-3	3.29				3.29
LA-4	1.98				1.98
LA-5	0.65				0.65
LA-6	0.75				0.75
TOTALS:	**13.81**	**3.02**	**0.04**	**2.28**	**8.47**
Pajarito Canyon					
PAJ-1	1.99	0.70	0.06	1.03	0.20
PAJ-2	2.52	1.94	0.10	0.44	0.05
PAJ-3	3.18	2.08	0.19	0.48	0.44
PAJ-4	0.65	0.64			0.01
PAJ-5	1.68	1.53			0.15
PAJ-6	1.08	0.01			1.07
PAJ-7	2.20				2.20
TOTALS:	**13.30**	**6.90**	**0.35**	**1.94**	**4.11**
Sandia Canyon					
SAN-1	2.64	1.01			1.63
SAN-2	0.87				0.87
SAN-3	1.39				1.39
SAN-4	0.69				0.69
TOTALS:	**5.59**	**1.01**			**4.58**

VARIABILITY IN WEIGHTED AVE CN VALUES BY DRAINAGE BASIN

Basin	Original CN	Weighted Ave CN Values			BAER
		Min	Expected	Max	FS
Fire Intensity CN					
Low		75	80	85	65
Moderate		80	85	90	85
High		85	90	95	90
Unburned	OCN	OCN-4	OCN	OCN+4	OCN
Los Alamos Canyon					
LA-1	52	71	76	80	69
LA-2	62	77	82	87	80
LA-3	68	64	68	72	68
LA-4	80	76	80	84	80
LA-5	75	71	75	79	75
LA-6	75	71	75	79	75
Pajarito Canyon					
PAJ-1	52	78	82	87	77
PAJ-2	62	77	82	87	70
PAJ-3	61	74	79	84	69
PAJ-4	70	75	80	85	65
PAJ-5	67	74	79	84	65
PAJ-6	72	68	72	76	72
PAJ-7	73	69	73	77	73
Sandia Canyon					
SAN-1	68	68	73	77	67
SAN-2	75	71	75	79	75
SAN-3	76	72	76	80	76
SAN-4	79	75	79	83	79

Table F-1. Cerro Grande Burned Areages by Watershed

SUMMARY OF BURNED AREAS AND BURN INTENSITY BY DRAINAGE BASIN

Basin	Total Sq. Mi.	Fire Intensity			Unburned
		Low	Moderate	High	
Mortandad Canyon					
MOR-1	0.56	0.28	0.14		0.14
MOR-2	0.82	0.81	0.02		0.00
MOR-3	0.37	0.23	0.14		0.00
MOR-4	1.56	0.73	0.11		0.72
MOR-5	0.89	0.09	0.01		0.79
MOR-6	1.69				1.69
TOTALS:	**5.89**	**2.13**	**0.42**		**3.34**
Canada del Buey					
CAN-1	2.05	0.64	0.21		1.21
CAN-2	2.41		0.00		2.41
TOTALS:	**4.47**	**0.64**	**0.21**		**3.61**
Potrillo Canyon					
POT-1	2.69	0.62			2.07
POT-2	0.98	0.01			0.98
POT-3	0.97				0.97
TOTALS:	**4.64**	**0.63**			**4.01**
Canon de Valle					
VAL-1	2.35	1.69	0.10	0.42	0.13
VAL-2	0.82	0.79	0.03		0.00
VAL-3	1.15	1.11	0.05		0.00
TOTALS:	**4.32**	**3.59**	**0.18**	**0.42**	**0.13**
Water Canyon					
WAT-1	3.85	1.99	0.19	1.62	0.05
WAT-2	2.58	1.92	0.60		0.07
WAT-3	1.36	0.21			1.15
WAT-4	1.90				1.90
WAT-5	0.32				0.32
TOTALS:	**10.01**	**4.12**	**0.78**	**1.62**	**3.47**

VARIABILITY IN WEIGHTED AVE CN VALUES BY DRAINAGE BASIN

Basin	Original CN	Weighted Ave CN Values			BAER
		Min	Expected	Max	FS
Mortandad Canyon					
MOR-1	65	73	77	82	70
MOR-2	67	75	80	85	65
MOR-3	72	77	82	87	73
MOR-4	72	72	77	81	70
MOR-5	72	69	73	77	71
MOR-6	74	70	74	78	74
Canada del Buey					
CAN-1	69	70	74	78	69
CAN-2	72	68	72	76	72
Potrillo Canyon					
POT-1	70	68	72	77	69
POT-2	71	67	71	75	71
POT-3	75	71	75	79	75
Canon de Valle					
VAL-1	53	76	81	85	70
VAL-2	63	75	80	85	66
VAL-3	64	75	80	85	66
Water Canyon					
WAT-1	54	79	84	89	76
WAT-2	62	76	81	86	70
WAT-3	72	69	73	77	71
WAT-4	72	68	72	76	72
WAT-5	77	73	77	81	77

Table F-1. Cerro Grande Burned Areages by Watershed

SUMMARY OF BURNED AREAS AND BURN INTENSITY BY DRAINAGE BASIN

Basin	Total Sq. Mi.	Fire Intensity: Low	Moderate	High	Unburned
Ancho Canyon					
ANC-1	2.24				2.24
ANC-2	2.42	0.18			2.24
ANC-3	1.11				1.11
ANC-4	1.04				1.04
ANC-5	0.19				0.19
TOTALS:	**7.01**	**0.18**			**6.83**
Frijoles Canyon					
FRI-1	5.10	1.25	0.06	0.05	3.74
FRI-2	5.04	0.07	0.04	0.02	4.91
FRI-3	8.30	0.31	0.01	0.08	7.89
TOTALS:	**18.43**	**1.63**	**0.12**	**0.15**	**16.54**
Pueblo Canyon					
PUE-1	2.27	0.04	0.03	2.18	0.01
PUE-2	4.61	0.13	0.08	0.24	4.16
PUE-3	1.55				1.55
TOTALS:	**8.42**	**0.17**	**0.11**	**2.42**	**5.72**
Guaje Canyon					
G-1	11.37	6.27		2.28	2.82
G-2	3.20	1.47	0.13	1.07	0.53
G-4	2.18				2.18
G-5	1.45				1.45
TOTALS:	**18.20**	**7.74**	**0.13**	**3.35**	**6.99**
Rendija Canyon					
REND	9.58	1.26	0.59	5.43	2.30

VARIABILITY IN WEIGHTED AVE CN VALUES BY DRAINAGE BASIN

Basin	Original CN	Weighted Ave CN Values: Min	Expected	Max	BAER FS
Ancho Canyon					
ANC-1	68	64	68	72	68
ANC-2	69	66	70	74	69
ANC-3	74	70	74	78	74
ANC-4	75	71	75	79	75
ANC-5	75	71	75	79	75
Frijoles Canyon					
FRI-1	50	54	58	62	54
FRI-2	70	66	70	74	70
FRI-3	68	65	69	73	68
Pueblo Canyon					
PUE-1	56	85	90	95	89
PUE-2	65	63	67	71	67
PUE-3	74	70	74	78	74
Guaje Canyon					
G-1	55	71	76	81	68
G-2	68	77	82	86	75
G-4	75	71	75	79	75
G-5	70	66	70	74	70
Rendija Canyon					
REND	69	79	83	88	81

Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Sandra Martin, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Dear Ms. Martin:

Subject: Resource Conservation and Recovery Act (RCRA) Part B Permit Renewal Application Submittal - Los Alamos National Laboratory (LANL), EPA ID No. NM 890010515

The purpose of this letter is to submit and request approval for the most recent versions of the RCRA permit applications supporting the renewal of the LANL hazardous waste facility permit. The original RCRA Hazardous Waste Facility Permit was issued to the U.S. Department of Energy (DOE) and the University of California (UC) by the New Mexico Environmental Improvement Division on November 8, 1989.

The permit applications included in this submittal have been revised to incorporate the text and information indicated in DOE/UC's responses to nine requests for information received from the Hazardous Waste Bureau (HWB) since the original applications were submitted for the permit renewal. These revisions of the applications were modified to include additional information regarding various waste management programs or procedures that have changed since the last responses.

This submittal contains three revised permit applications. These include the LANL General Part B, Technical Area 16, and Technical Area 54. As discussed during our meeting on August 21, 2003 the application for Technical Area 55 will be submitted in mid-September 2003. The enclosed applications have been prepared separately to reflect the permit guidance received from HWB in March 1998 regarding the required format. The documents are:

- Los Alamos National Laboratory General Part B Permit Renewal Application, Revision 2.0, LA-UR-03-5923
- Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Application, Revision 4.0, LA-UR-03-3903
- Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application, Revision 3.0, LA-UR-03-3579

In addition, this submittal contains three supporting documents designed to aid final review of the applications in the form of crosswalks or change tables. These documents were discussed with Mr. Carl Will, HWB, on March 10, 2003. The documents are intended to provide a way of referencing the comments received in the HWB's requests for information and the sections of the permit applications affected by subsequent text changes or additions as described in DOE/UC's responses. Additional copies of the relevant requests for information are included with the crosswalk documents to assist in reviewing the detailed responses. These copies do not contain the appendices and attachments included with the original submittals in the interest of brevity and since the full submittals are already available at HWB. The crosswalks are each specific for the included revised permit renewal applications (General, TA-16, TA-54).

The enclosure for this letter contains a list of the changes that have been incorporated in the General Part B permit application since the last DOE/UC response to a request for information. The changes reflect new information regarding LANL waste management procedures developed since that time and text edits to address issues of concern to DOE/UC.

If you should have any questions or comments concerning this permit renewal submittal, please contact Gene Turner, DOE, of my staff at (505) 667-5794 or Jack Ellvinger, UC, at (505) 667-0633.

Sincerely,

for Ralph E. Erickson
Manager

OFO:1GT-020

Enclosure

cc w/enclosure:
Carl Will
Permits Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Laurie King (6PD-N)
New Mexico/Federal Facilities Section
Environmental Protection Agency – Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

LA-UR-03-3903
June 2003

Los Alamos National Laboratory
Technical Area 16
Part B Permit Renewal Application

Revision 4.0

Prepared by:

Los Alamos National Laboratory
Risk Reduction and Environmental Stewardship Division
Solid Waste Regulatory Compliance Group (RRES-SWRC)
Los Alamos, New Mexico 87545

Los Alamos National Laboratory
Technical Area 16
Part B Permit Renewal Application

Revision 4.0

LA-UR-03-3903
June 2003

Prepared by:
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1-1	Regulatory References and Corresponding Permit Renewal Application Location
4-1	Technical Area (TA) 16 Solid Waste Management Units (SWMU) at or in the Vicinity of the TA-16 Burn Ground

LIST OF ATTACHMENTS

ATTACHMENT	TITLE
A	Facility Description
B	Waste Analysis Plan
C	Inspection Plan
D	Personnel Training Plan
E	Contingency Plan
F	Closure Plan for the Technical Area 16 Open Burning Units
G	Technical Area (TA) 16 Open Burning Units Management
H	Environmental Performance Standards

LIST OF SUPPLEMENTS

SUPPLEMENT	TITLE
4-1	Solid Waste Management Units in the Immediate Vicinity of the Technical Area 16 Burn Ground: Information Extracted from "The 2003 Solid Waste Management Unit Report"—LA-UR-03-6000

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
EPA	U.S. Environmental Protection Agency
HE	high explosives
HRMB	Hazardous and Radioactive Materials Bureau
LANL	Los Alamos National Laboratory
MDA	Material Disposal Area
NMED	New Mexico Environment Department
OB	open burning
SWMU	solid waste management unit
SWPP	Stormwater Pollution Prevention
TA	technical area

1.0 INTRODUCTION

This "Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Application" is submitted to address the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00], requirements specific to hazardous waste open burning (OB) operations at Technical Area (TA) 16. The two OB units to be permitted at TA-16 include the TA-16-388 Flash Pad and the TA-16-399 HE Burn Tray.

This document serves as Revision 4.0 to previous applications submitted to the New Mexico Environment Department (NMED) in June 1995 (Revision 2.0; Los Alamos National Laboratory [LANL], 1995), April 1996 (Revision 2.1; LANL, 1996); and January 2000 (Revision 3.0; LANL, 2000a). It also presents revisions included in Responses to Notices of Deficiency submitted to the NMED in February 2002 (LANL, 2002a) and August 2002 (LANL, 2002b). Revision 3.0 and this revision were prepared to be consistent with the permitting strategy outlined by the NMED Hazardous and Radioactive Materials Bureau (HRMB) in correspondence dated February 5, 1998.

As presented in that correspondence, TA-specific permit applications, permit modification requests, and permit renewal applications would include any details and/or requirements not addressed in the "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0 (LANL, 1998a). The most recent version of that document, hereinafter referred to as the LANL General Part B, complements this permit renewal application. Certain portions of the LANL General Part B will serve in the operating permit as "umbrella" documents, covering the requirements of the New Mexico Hazardous Waste Act and implementing regulations, specifically 20.4.1 NMAC [6-14-00], common to all TAs. Together, information provided in this application and in the LANL General Part B will meet the applicable Part B requirements specified in 20.4.1 NMAC, Subparts V and IX [6-14-00].

In accordance with HRMB's permitting strategy, LANL submitted the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0, in April 1998 (LANL, 1998b). That Part A consolidated information from previous site-wide and TA-specific Part A submittals into one comprehensive document identifying all hazardous and mixed waste treatment, storage, and disposal facilities at LANL subject to 20.4.1 NMAC, Subparts V, VI, and IX [6-14-00], at that time. The Part A was subsequently revised and submitted to the NMED in November 1999 (Revision 1.0; LANL, 1999), July 2000 (Revision 2.0; LANL, 2000b), and August 2002 (Revision 3.0; LANL, 2002c). The most recent version of that document, hereinafter referred to as the LANL General Part A, serves as a companion document to the LANL General Part B and TA-specific permit

applications, permit modification requests, and permit renewal applications, including this TA-16 Part B permit renewal application.

In the LANL General Part A, the LANL General Part B, and this permit renewal application, a unit to be permitted may sometimes be referred to as a "facility." The term "facility," as it appears in this context, is used only to denote building names and does not imply the regulatory meaning of "facility" as defined in 20.4.1 NMAC, Subpart I, § 260.10 [6-14-00]. However, pursuant to 20.4.1 NMAC, Subpart I, § 260.10 [6-14-00], the LANL facility as a whole does meet the regulatory definition of a facility.

Table 1-1 provides a list of regulatory references and the corresponding location in this permit renewal application, as appropriate. Where applicable, regulatory citations in this document reference 20.4.1 NMAC, which adopts, with few exceptions, all of the Code of Federal Regulations, Title 40, Parts 260 to 266, Part 268, and Part 270.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(1)	General facility description	Attachment A[a] (A.1)
§270.14(b)(2)	Chemical and physical analyses	Attachment B[a] Attachment G (G.2.3)
§270.14(b)(3)	Waste analysis plan	Attachment B[a]
§264.13(b)	Development and implementation of waste analysis plan	Attachment B[a]
§264.13(c)	Off-site waste analysis requirements	Attachment B[a]
§270.14(b)(4)	Security procedures and equipment	Attachment G (G.2.6)
§264.14	Security	Attachment G (G.2.6)
§270.14(b)(5)	General inspection requirements	Attachment C[a]
§264.15(b)	General inspection requirements	Attachment C[a]
§264.174	Container inspections	NA[b]
§264.193(i)	Tank inspections	NA
§264.195	Overfill control inspections	NA
§264.226	Surface impoundments monitoring and inspection	NA
§264.254	Waste pile monitoring and inspection	NA
§264.273	Land treatment design and operating requirements	NA
§264.303	Landfill monitoring and inspection	NA
§264.347	Incinerator monitoring and inspection	NA
§264.602	Miscellaneous units (monitoring, testing, analytical data, inspection, response, reporting, corrective action)	Attachment C[a], 2.0 (2.4), 4.0
§264.1033	Process vent standards	NA
§264.1052	Equipment leak air emission standards	NA
§264.1053	Compressor standards	NA
§264.1058	Standards for pumps, valves, pressure relief devices, flanges and connections	NA
§264.1088	Subpart CC inspection and monitoring requirements	NA
§270.14(b)(6)	Request for waiver from preparedness and prevention requirements of 264 Subpart C	NA
§270.14(b)(7)	Contingency plan requirements under 264 Subpart D	Attachment E[a]
§264, Subpart D	Contingency plan and emergency procedures	Attachment E[a]
§264.227	Surface impoundment emergency repairs; contingency plans	NA

Table 1-1 (Continued)
Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§264, Subpart C	Preparedness and prevention	2.0 (2.7), Attachment G (G.2.7)
§270.14(b)(8)	Preparedness and prevention	2.0 (2.7), Attachment G (G.2.7)
§270.14(b)(8)(i)	Prevention of hazards in unloading operations (ramps and special forklifts)	Attachment G (G.2.7.6)
§270.14(b)(8)(ii)	Runoff prevention with berms, trenches, and dikes	2.0 (2.7)
§270.14(b)(8)(iii)	Prevention of contamination of water supplies	Attachment G (G.2.7.6), Attachment H (H.3, H.4)
§270.14(b)(8)(iv)	Mitigation effects of equipment failure and power outages	Attachment G (G.2.7.6)
§270.14(b)(8)(v)	Prevention of undue exposure of personnel by use of personal protective equipment	Attachment G (G.2.7.6)
§270.14(b)(8)(vi)	Prevention of release to the atmosphere	Attachment G (G.2.7.6), Attachment H (H.5)
§270.14(b)(9)	Prevention of accidental ignition or reaction	2.0[a] (2.5), Attachment G (G.2.7.7)
§264.17	General requirements for ignitable, reactive, or incompatible wastes	2.0[a] (2.5), Attachment G (G.2.7.7)
§264.17(c)	Documentation of compliance with 264.17 (general requirements for ignitable, reactive, or incompatible wastes)	2.0[a] (2.5), Attachment G (G.2.7.7)
§270.14(b)(10)	Traffic pattern, volume, and controls	Attachment A[a] (A.2)
	Identification of turn lanes	NA
	Identification of traffic/stacking lanes	NA
	Description of road surface	Attachment A[a] (A.2)
	Description of road load-bearing capacity	Attachment A[a] (A.2)
	Identification of type and number of traffic controls	Attachment A (A.2)
§270.14(b)(11)	Facility/unit location information	Attachment A (A.3)
§264.18	Location standards	Attachment A (A.3)
§270.14(b)(11)(i)	Seismic standard applicability [264.18(a)]	Attachment A (A.3.1)
§270.14(b)(11)(ii)	Seismic standard requirements	Attachment A (A.3.1)
§270.14(b)(11)(ii)(A)	No fault within 3,000 feet (ft) with displacement in Holocene time	NA
§270.14(b)(11)(ii)(A)(1)	Published geological studies	NA
§270.14(b)(11)(ii)(A)(2)	Aerial reconnaissance of a five-mile radius from the facility	NA
§270.14(b)(11)(ii)(A)(3)	Analysis of aerial photographs covering 3,000-ft radius from the facility/unit	NA

Table 1-1 (Continued)
Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(11)(ii)(A)(4)	Reconnaissance based on walking portions of the area within 3,000 ft of the facility	NA
§270.14(b)(11)(ii)(B)	If faults which have displacement in Holocene time are present within 3,000 ft, no faults pass within 200 ft of portions of the facility where treatment, storage, or disposal will be conducted	NA
§270.14(b)(11)(iii)	100-year floodplain standard	Attachment A[a] (A.3.2)
§270.14(b)(11)(iv)	If facility is within 100-year floodplain	NA
§270.14(b)(11)(iv)(A)	Engineering analyses of hydrostatic forces expected in a 100-year flood	NA
§270.14(b)(11)(iv)(B)	Structural engineering studies for flood protection to prevent washout	NA
§270.14(b)(11)(iv)(C)	Detailed description of procedures to remove hazardous waste to safety before flood reaches the waste	NA
§270.14(b)(11)(iv)(C)(1)	Timing of removal	NA
§270.14(b)(11)(iv)(C)(2)	Location to be moved to	NA
§270.14(b)(11)(iv)(C)(3)	Dedicated equipment and personnel to ensure removal	NA
§270.14(b)(11)(iv)(C)(4)	Potential for accidental discharge during movement	NA
§270.14(b)(11)(v)	Plan to show how the facility will be brought into compliance with 264.18(b)	NA
§270.14(b)(12)	Personnel training program	Attachment D[a]
§270.14(b)(13)	Closure and post-closure plans	Attachment F
§264.112	Amendment of closure plan	Attachment F[a] (F.1.4)
§264.118	Post-closure plan; amendment of plan	Attachment F[a] (F.1.4, F.1.9)
§264.178	Closure/containers	NA
§264.197	Closure/tanks	NA
§264.228	Closure/post-closure/surface impoundments	NA
§264.258	Closure/post-closure/waste piles	NA
§264.280	Closure/post-closure/land treatment	NA
§264.310	Closure/post-closure/landfills	NA
§264.351	Closure/incinerators	NA
§264.601	Miscellaneous units	Attachment F
§264.603	Post-Closure care	Attachment F
§270.14(b)(14)	Post-closure notices (264.119)	Attachment F (F.1.9)
§270.14(b)(15)	Closure cost estimate (264.142)	Attachment (F.1.5)
	Financial assurance (264.143)	Attachment F (F.1.5)

Table 1-1 (Continued)
Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(16)	Post-closure cost estimate (264.144)	Attachment F (F.1.5)
	Post-closure care financial assurance (264.145)	Attachment F (F.1.5)
§270.14(b)(17)	Liability insurance (264.147)	Attachment F (F.1.5)
§270.14(b)(18)	Proof of financial coverage (264.149-150)	Attachment F (F.1.5)
§270.14(b)(19)	Topographic map requirements	Attachment A[a,c] (A.4)
§270.14(b)(19)(i)	Map scale and date	Attachment A[a,c] (A.4)
§270.14(b)(19)(ii)	100-year floodplain	Attachment A[a] (A.4)
§270.14(b)(19)(iii)	Surface waters	Attachment A (A.4)
§270.14(b)(19)(iv)	Land use	Attachment A (A.4)
§270.14(b)(19)(v)	Wind rose	Attachment A (A.4)
§270.14(b)(19)(vi)	Map orientation	Attachment A[a,c] (A.4)
§270.14(b)(19)(vii)	Legal boundaries	Attachment A[c] (A.4)
§270.14(b)(19)(viii)	Access controls	Attachment A (A.4)
§270.14(b)(19)(ix)	Wells	Attachment A (A.4)
§270.14(b)(19)(x)	Buildings	Attachment A (A.4)
	Treatment, storage, and disposal operations	Attachment A (A.4)
	Run-on/run-off control systems	2.0 (2.7), Attachment A (A.4), Attachment G (G.2.7.6)
	Storm sewer systems	Attachment A[a] (A.4)
	Sanitary sewer systems	Attachment A[a] (A.4)
	Process sewer systems	Attachment A[a] (A.4)
	Loading/unloading areas	Attachment A (A.4)
	Fire control facilities	Attachment A[a] (A.4)
§270.14(b)(19)(xi)	Drainage barriers	2.0 (2.7), Attachment A (A.4)
§270.14(b)(19)(xii)	Location of operational units	2.0 (2.1), Attachment A (A.1, A.4)
§270.14(b)(20)	Other federal laws	3.0[a]
§270.3(a)	Wild and Scenic Rivers Act	3.0[a]
§270.3(b)	National Historic Preservation Act	3.0[a]
§270.3(c)	Endangered Species Act	3.0[a]
§270.3(d)	Costal Zone Management	3.0[a]
§270.3(e)	Fish and Wildlife Coordination Act	3.0[a]
§270.3(f)	Executive Orders	3.0[a]
§270.14(b)(21)	Notice of extension approval for land disposal facilities	NA

§270.14(c)	Groundwater monitoring requirements	Attachment A[a] (A.5)

Table 1-1 (Continued)
Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(c)(1)	Groundwater monitoring under 265.90 through 265.94	NA
§270.14(c)(2)	Identification of uppermost aquifer, groundwater flow rate and direction	NA
§270.14(c)(3)	A topographic map required under 270.14(b)(19) that identifies proposed point of compliance	NA
	Proposed location of groundwater monitoring wells under 264.97	NA
§270.14(c)(4)	Description of plume of contamination that has entered groundwater	NA
§270.14(c)(4)(i)	Extent of plume indicated on topographic map	NA
§270.14(c)(4)(ii)	Identification of constituents and concentration for Appendix IX of 264	NA
§270.14(c)(5)	Detailed plan and an engineering report describing proposed groundwater monitoring program under 264.97	NA
§270.14(c)(6)	No releases detected in groundwater (264.98)	NA
§270.14(c)(6)(i)	List of proposed indicator parameters	NA
§270.14(c)(6)(ii)	Proposed groundwater monitoring system	NA
§270.14(c)(6)(iii)	Background values for each proposed monitoring parameter	NA
§270.14(c)(6)(iv)	Description of proposed sampling, analyses and statistical comparisons to be used	NA
§270.14(c)(7)	Release detected at point of compliance requires corrective action under 264.100	NA
§270.14(d)	Information requirements for solid waste management units (SWMU)	4.0
§270.14(d)(1)(i)	Location of SWMUs on topographic map	4.0 (Supplement 4-1)
§270.14(d)(1)(ii)	Types of SWMUs	4.0 (Supplement 4-1)
§270.14(d)(1)(iii)	Dimensions and descriptions of SWMUs	4.0 (Supplement 4-1)
§270.14(d)(1)(iv)	Dates of operation	4.0 (Supplement 4-1)
§270.14(d)(1)(v)	Waste types managed at SWMU	4.0 (Supplement 4-1)
§270.14(d)(2)	Information on releases from SWMUs	4.0 (Supplement 4-1)
§270.15	Containers	NA
§270.16	Tank systems	NA
§270.16(a)	Written assessment and certification	NA
§270.16(b)	Capacity/dimensions	NA
§270.16(c)	Systems and controls	NA
§270.16(d)	Piping and process flow	NA
§270.16(e)	External corrosion protection	NA

Table 1-1 (Continued)
Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.16(f)	Installation	NA
§270.16(g)	Secondary containment system	NA
§270.16(h)	Request for variance from secondary containment	NA
§270.16(i)	Spill prevention	NA
§270.16(j)	Ignitable, reactive, or incompatible wastes	NA

[a] Requirement or information is also addressed in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," as appropriate.
[b] NA = not applicable.
[c] Some of the topographic map requirements are addressed in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application."

2.0 TREATMENT AT TECHNICAL AREA 16

This section presents a general description of the open burning (OB) units at the Los Alamos National Laboratory (LANL) Technical Area (TA) 16 Burn Ground. It also presents the general waste management practices for wastes treated at the two units. The information provided in this section is submitted to address the applicable miscellaneous unit requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.23, and 20.4.1 NMAC, Subpart V, Part 264, Subpart X, revised June 14, 2000 [6-14-00]. Attachment G of this permit renewal application contains more detailed information on and figures of the TA-16 OB units and the waste management practices associated with them. A summary of applicable regulatory references for these units and the corresponding location where the requirement is addressed in this permit renewal application is located in Attachment G, Table G-1.

2.1 TA-16 OPEN BURNING UNITS

TA-16 is located in the southwestern quadrant of LANL at the west end of the Pajarito Plateau, near the foothills of the Jemez Mountains (see Figure A-1 in Attachment A). The two OB units at the TA-16 Burn Ground (see Figures G-1 and G-2 in Attachment G), are described below.

The TA-16-388 Flash Pad (see Figures G-3 and G-4 in Attachment G) is used to treat dry high explosives (HE), wet HE, and waste that is contaminated with HE. The wastes that may be treated include, but are not limited to: HE-contaminated solvents and water/solvent mixtures; oils; particulate wastes (e.g., soils and activated carbon); solid combustibles (e.g., wood, cardboard, paper, and cloth); incombustible materials (e.g., glass, metal parts, and equipment); and wastewater treatment residues (wet HE and filters). Most of the waste treated at TA-16-388 is treated using propane burners to supply heat to dry the HE, if necessary, and destroy the HE contamination. In the past, a separate kettle with smaller propane burners also located at TA-16-388 was used to treat HE-contaminated solvents and oils. However, the larger propane burners at the flash pad proved more effective for the destruction of solvents and oils; these materials are now treated in a burn tray with secondary containment at the flash pad. Therefore, the kettle will be removed, flashed, and the metal recycled. The smaller propane burners will be kept as spare parts for the larger propane burners.

The maximum treatment capacity of the TA-16-388 Flash Pad is 40,000 pounds of waste solids for each treatment; however, burns are usually much smaller to assure that all materials are sufficiently

heated to destroy the HE. The maximum treatment capacity for HE-contaminated liquids (e.g., oils and solvents) is approximately 100 gallons. However, the amount of liquid waste treated per burn is adjusted to the amount of liquid that can be treated in a single day. This amount is usually 5 to 30 gallons, considerably less than the maximum treatment capacity. The maximum amount of wet HE that is treated is limited to about 1,000 pounds so that the water can evaporate while the HE is burning.

The TA-16-399 HE Burn Tray (see Figure G-5 in Attachment G) treats bulk HE to destroy the characteristic of reactivity (D003). Most HE burns very well so that no additional source of heat is needed. If any HE residue remains after burning, the waste may be burned again to ensure that all HE is destroyed. The capacity of the HE Burn Tray is 1,000 pounds per burn.

LANL minimizes the impact to the environment by conducting treatment operations in strictly controlled, remote areas within LANL boundaries. Treatment operations are not conducted during adverse atmospheric conditions. The operational and waste management practices for the OB units at the TA-16 Burn Ground are more fully described in Attachment G.

2.2 AUTHORIZED WASTE IDENTIFICATION

The TA-16 OB units are used to treat hazardous wastes bearing a variety of U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers. The numbers for wastes that may be treated at the OB units are listed in the most recent version of the “Los Alamos National Laboratory General Part A Permit Application,” hereinafter referred to as the LANL General Part A.

2.3 CONTAINMENT SYSTEMS

Containment is used to prevent releases during waste staging, burning, and residue management, as described below.

The TA-16-388 Flash Pad is located on a concrete pad with walls on the back and on two sides. The pad is sloped toward the back wall, so that any releases will be contained on the pad and can be removed and properly treated or disposed. The flash pad has a retractable cover, mainly used to prevent run-on. However, the cover also acts as containment to reduce the potential for residues to be blown off the pad by wind.

The TA-16-399 HE Burn Tray is installed on a concrete pad that is surrounded by earthen berms. Wastes are staged on this pad just before a burn, so releases during staging are highly unlikely. After a burn is completed, any residue is covered until it can be removed, reducing the likelihood of ash dispersion by wind.

2.4 INSPECTION SCHEDULES AND PROCEDURES

In accordance with the requirements of 20.4.1 NMAC §§ 264.15 and 264.602 [6-14-00], the TA-16 OB units are inspected daily when in use (i.e., when wastes are managed at the unit) and weekly when not in use. Inspection parameters are specified in Appendix C of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B.

2.5 SPECIAL REQUIREMENTS FOR IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTES [20.4.1 NMAC § 264.17(a)]

Prior to treatment at the TA-16 OB units, the wastes are protected from sources of ignition or reaction. Ignitable or reactive waste is separated and protected from welding activities, hot surfaces, frictional heat, and sources of sparks. Smoking is not allowed within the TA-16 Burn Ground, and a "No Smoking" sign is conspicuously placed at the entrance to the Burn Ground. Together, these measures meet the requirements of 20.4.1 NMAC § 276.17(a) and (b) [6-14-00].

2.6 CLOSURE

Should partial closure of the TA-16 OB units become necessary, partial closure activities will include treatment or removal of untreated hazardous waste from the unit to be closed and management of hazardous waste residues and contaminated system components to meet the closure performance standards. Closure will minimize the need for further maintenance, preclude the release of hazardous waste or constituents to environmental media, and be protective of human health. Detailed closure procedures for the TA-16 OB units are addressed in Attachment F of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC § 264.111 [6-14-00].

2.7 CONTROL OF RUN-ON AND RUNOFF

The TA-16-388 Flash Pad is equipped with a retractable cover and secondary containment to prevent run-on and runoff. The TA-16-399 Burn Tray is equipped with a movable cover to prevent run-on into this structure.

A Storm Water Pollution Prevention (SWPP) Plan has been developed for the TA-16 Burn Ground. The plan is designed to identify any potential pollutants and to provide pollution prevention or control methods to prevent the discharge of pollutants in storm water runoff at the Burn Ground and the surrounding area. Under the SWPP Plan, the facility is required to implement best management practices to reduce the likelihood of pollutants entering the storm water discharges. The plan includes storm water run-on/runoff measures for active units as well as erosion control (e.g., rock check dams) to prevent dispersion of legacy contamination. Because this plan is updated frequently, it is not included as part of this application; however, updates are available upon request. A copy of the September 2001 version of the TA-16 Burn Ground Unit SWPP Plan was included as Appendix E in LANL's "Response to Notice of Deficiency; TA-16 Part B Application Revision 3.0, January 31, 2000" (LANL, 2002a), submitted to the New Mexico Environment Department in February 2002.

3.0 OTHER FEDERAL LAWS

A discussion of federal laws, as required by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, §§ 270.3 and 270.14(b)(20), revised June 14, 2000, is provided in Section 3.0 in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

4.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

The information provided in this section is submitted to address the Part B information requirements for solid waste management units (SWMU), in accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 270.14(d), revised June 14, 2000. Because Technical Area (TA) 16 at Los Alamos National Laboratory (LANL) includes a relatively large area and contains numerous SWMUs that would not significantly impact or be impacted by the TA-16 Burn Ground, this section addresses only those SWMUs that are located at or in the immediate vicinity of the Burn Ground, as discussed below.

LANL uses the definition of a SWMU presented in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (U.S. Environmental Protection Agency, 1994), referred to as Module VIII. This definition states that SWMUs are "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

Two of the SWMUs located at the TA-16 Burn Ground are the open burning (OB) units [SWMU Nos. 16-010(c) and (d)] addressed in this permit renewal application. These OB units are located near the Fish Ladder Drainage in the southern portion of the TA-16 Burn Ground. The topography around the OB units directs runoff towards the Fish Ladder Drainage; therefore, this drainage is the only area that could potentially be impacted by leaks or spills of HE waste from the OB units. Other SWMUs located at or in the immediate vicinity of the TA-16 Burn Ground and that may impact the Fish Ladder Drainage include the Former Burning Ground Structures [Consolidated SWMU No. 16-010(h)-99], the Sump-Fish Ladder [SWMU No. 16-003(o)], and the HE Filter Vessels [SWMU Nos. 16-010(e) and (f)]. Investigations to date suggest that releases from the Sump-Fish Ladder SWMU have been the major source of contaminants detected in the Fish Ladder Drainage.

Two SWMUs are located in the northern portion of the TA-16 Burn Ground. These SWMUs are the former locations of the Flash Pad (16-387) [SWMU No. 16-010(b)] and the Burning Ground [Consolidated SWMU No. 16-016(c)-99]. Another SWMU, Material Disposal Area (MDA P) [SWMU No. 16-018], is located just north of the Burn Ground near the south rim of Cañon de Valle. The topography around these SWMUs directs runoff towards Cañon de Valle.

Table 4-1 lists the SWMUs at and in the immediate vicinity of the TA-16 Burn Ground. Descriptions of the SWMUs listed in Table 4-1 are included herein as Supplement 4-1, which has been extracted from the TA-16 section of "The 2003 Solid Waste Management Unit Report" (LANL, 2003). These descriptions include, to the extent available, the unit type, general dimensions and structural descriptions, the dates of operation, and the wastes managed at the unit. Supplement 4-1 also includes the most current available information pertaining to releases of hazardous wastes or hazardous constituents from the units and results of sampling and analysis conducted to date. In addition, the location of each SWMU is presented on a topographic map included in Supplement 4-1.

Table 4-1

Technical Area (TA) 16
Solid Waste Management Units (SWMU)
at or in the Vicinity of the TA-16 Burn Ground

SWMU No./Former SWMU No.	Consolidated SWMU No.	SWMU Description	Unit Status
16-003(o)		Physical/Chemical Treatment Unit (Sump-Fish Ladder)	Inactive; operated under National Pollutant Discharge Elimination System permit
16-010(b)		Open burning/open detonation (Flash Pad [16-387])	Closure Approval Pending
16-010(c)		Open burning/open detonation (Burn Site 16-388)	Active, To Be Permitted
16-010(d)		Open burning/open detonation (Burn Site 16-399)	Active, To Be Permitted
16-010(e)		Physical/Chemical Treatment Unit (HE Filter Vessel [16-401])	To Undergo Closure
16-010(f)		Physical/Chemical Treatment (HE Filter Vessel [16-406])	To Undergo Closure
16-005(g), 16-010(h), 16-010(i), 16-010(j), 16-010(k), 16-010(l), 16-010(m), 16-010(n)	16-010(h)-99	Outfall/effluent discharge; physical/chemical treatment unit; open burning/open detonation; wastewater treatment plant/waste lines (Former Burning Ground Structures)	Inactive

Table 4-1 (Continued)

Technical Area (TA) 16
Solid Waste Management Units (SWMU)
at or in the Vicinity of the TA-16 Burn Ground

SWMU No./Former SWMU No.	Consolidated SWMU No.	SWMU Description	Unit Status
16-006(e), 16-010(a), 16-016(c)	16-016(c)-99	Storage areas/waste piles/magazines; subsurface liquid disposal (Burning Ground)	Inactive; Voluntary Corrective Action Completed/ Approval Pending
16-018		Material Disposal Area (MDA P)	Closure Approval Pending

Supplement 4-1

Solid Waste Management Units in the Immediate Vicinity of the Technical Area 16 Burn Ground

Information Extracted from
"The 2003 Solid Waste Management Unit Report"
LA-UR-03-6000

TA-16, S-Site

TA-16 contains many of LANL's HE facilities, LANL's state-of-the-art tritium facility, and substantial administrative support buildings. HE activities that take place at TA-16 are fabricating and testing HE, plastics, and adhesives and conducting research in process development for manufacturing items that use these and other materials. Tritium activities include repackaging tritium, chemical purification of tritium by removing helium-3 and other contaminants, mixing tritium with other gases, analyzing gas mixtures, repackaging tritium to user-specified pressures, reclaiming tritium, and conducting applied research and development for boost systems.

MDA-P has been remediated, is now being evaluated, and will eventually be closed. Additional storage structures have been installed. New office buildings are under construction, and the main steam plant has closed and been replaced by smaller local plants.

The Cerro Grande fire swept across TA-16 and destroyed four of the five historical V-Site structures. It burned MDA R, igniting a tree root and cabling insulation that smoldered underground for several days until excavated and extinguished. In addition, it created post-fire flood concerns in Los Alamos Canyon, requiring the activities at TA-41 to be moved to TA-16.

An environmental assessment is currently in progress to address new activities proposed for TA-16. The environmental assessment addresses increasing administrative support and laboratory activities by modifying Building 202 to accept laboratory activities previously performed at TA-41; removing Building 195, a gas station; constructing a machining fabrication facility; and modifying Building 193, an office and laundry facility, to handle plastics.

The HE research, development, and testing capabilities provided at TA-16 include large-scale HE processing; manufacturing HE powders; casting, machining, and pressing HE components; inspection and radiography of HE components to guarantee integrity and ensure quality control for design intent; assembling test devices; and performing chemical analysis of HE. Capability also exists for storing special nuclear material and for storing, treating, and disposing of HE.

TA-16 — HE-processing area

SWMU 16-003(o) — Physical/chemical treatment units

Administrative Authority	NMED	**Former Operable Unit**	OU 1082
Technical Area	TA-16	**Dates of Operation**	1950s-mid 1990s
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	Yes
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 16-003(o) consists of six inactive HE sumps and the outfall associated with the explosives synthesis building (Building 16-340). The sumps historically discharged to former NPDES-permitted Outfall 05A054. The outfall was removed from the LANL NPDES permit effective July 20, 1998. Building 16-340 was used in producing plastic-bonded explosives. VOCs are used in plastic explosive preparation. Most VOCs are distilled during processing. The remaining solvents historically were discharged with the wastewater to the sumps. A solvent distillation unit, the “fish ladder,” was installed in the late 1980s to trap and volatilize residual solvents. The OU 1082 work plan reported that Building 16-340 was the largest solvent user at TA-16. The building is slated for decommissioning.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The RFI work plan proposed including this SWMU in a generic TA-16 sump sampling plan. Sampling was completed in 1995 and confirmed the presence of contamination. Seed, mulch, and a straw-bale barrier were installed in 2000 as a BMP to minimize contaminant migration and erosion at this site.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
HEs	8	N/A	2
Inorganic chemicals	22	20	2
SVOCs	22	N/A	7
VOCs	1	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

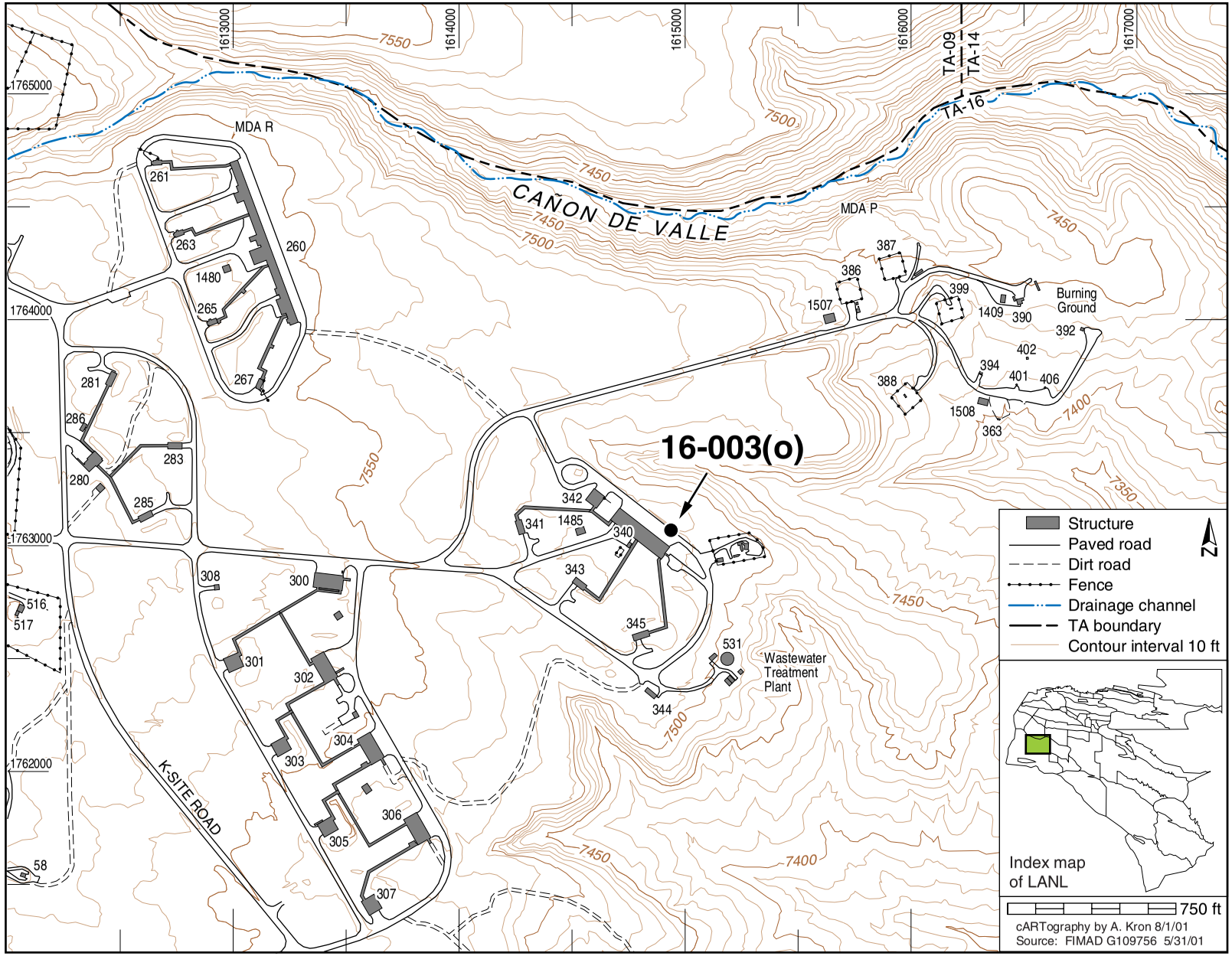
Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
HEs	Amino-2,6-dinitrotoluene[4-]	1.07 mg/kg	N/A
	RDX	40.7 mg/kg	4.4 mg/kg
Inorganic chemicals	Arsenic	68.3 mg/kg	0.39 mg/kg
	Iron	44,400 mg/kg	23,000 mg/kg
SVOCs	Benzo(a)anthracene	26 mg/kg	0.62 mg/kg
	Benzo(a)pyrene	26 mg/kg	0.062 mg/kg
	Benzo(b)fluoranthene	38 mg/kg	0.62 mg/kg
	Benzo(k)fluoranthene	13 mg/kg	6.2 mg/kg
	Bis(2-ethylhexyl)phthalate	150 mg/kg	35 mg/kg
	Dibenz(a,h)anthracene	2.9 mg/kg	0.062 mg/kg
	Indeno(1,2,3-cd)pyrene	10 mg/kg	0.62 mg/kg

References

RFI Work Plan for Operable Unit 1082 LA-UR Number: 93-1196

View of SWMU 16-003(o)

View of SWMU 16-003(o)


16-003(o)
CAÑON DE VALLE
MDA R
MDA P
TA-09
TA-14
TA-16
Burning Ground
Wastewater Treatment Plant
K-SITE ROAD
1613000
1614000
1615000
1616000
1617000
1765000
1764000
1763000
1762000
7550
7500
7450
7400
7350
261
263
260
1480
265
267
281
286
280
283
285
516
517
58
308
300
301
302
303
304
305
306
307
342
341
1485
340
343
345
344
531
1507
386
387
399
1409
390
392
402
394
401
406
388
1508
363
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map of LANL
750 ft
cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01

SWMU 16-010(b) — Open burning/open detonation

Administrative Authority	NMED	**Former Operable Unit**	OU 1082
Technical Area	TA-16	**Dates of Operation**	1951-1990s
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	Yes
Structure Number	16-387	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 16-010(b) was a flash pad identified as structure 16-387. It operated as a hazardous waste treatment unit under RCRA interim status and is undergoing RCRA closure. The pad was built in 1951 and was used to flash-burn HE-contaminated material. The burn area was enclosed within a 100-ft x 100-ft fenced area, and was made of a layer of sand several inches thick over a soil base.

ER Project Activities

RFI and closure activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project requested a Class I permit modification to remove this SWMU from Module VIII of LANL's Hazardous Waste Facility Permit because it is a hazardous waste treatment unit that is undergoing closure in accordance with state and federal regulations.

Closure activities and verification sampling for this site were completed in 2000 and 2001, in concert with the MDA P closure. Final closure approval is pending.

ER Project Sampling Summary

Results from analytical samples collected at this site are reported with SWMU 16-018 (MDA P).

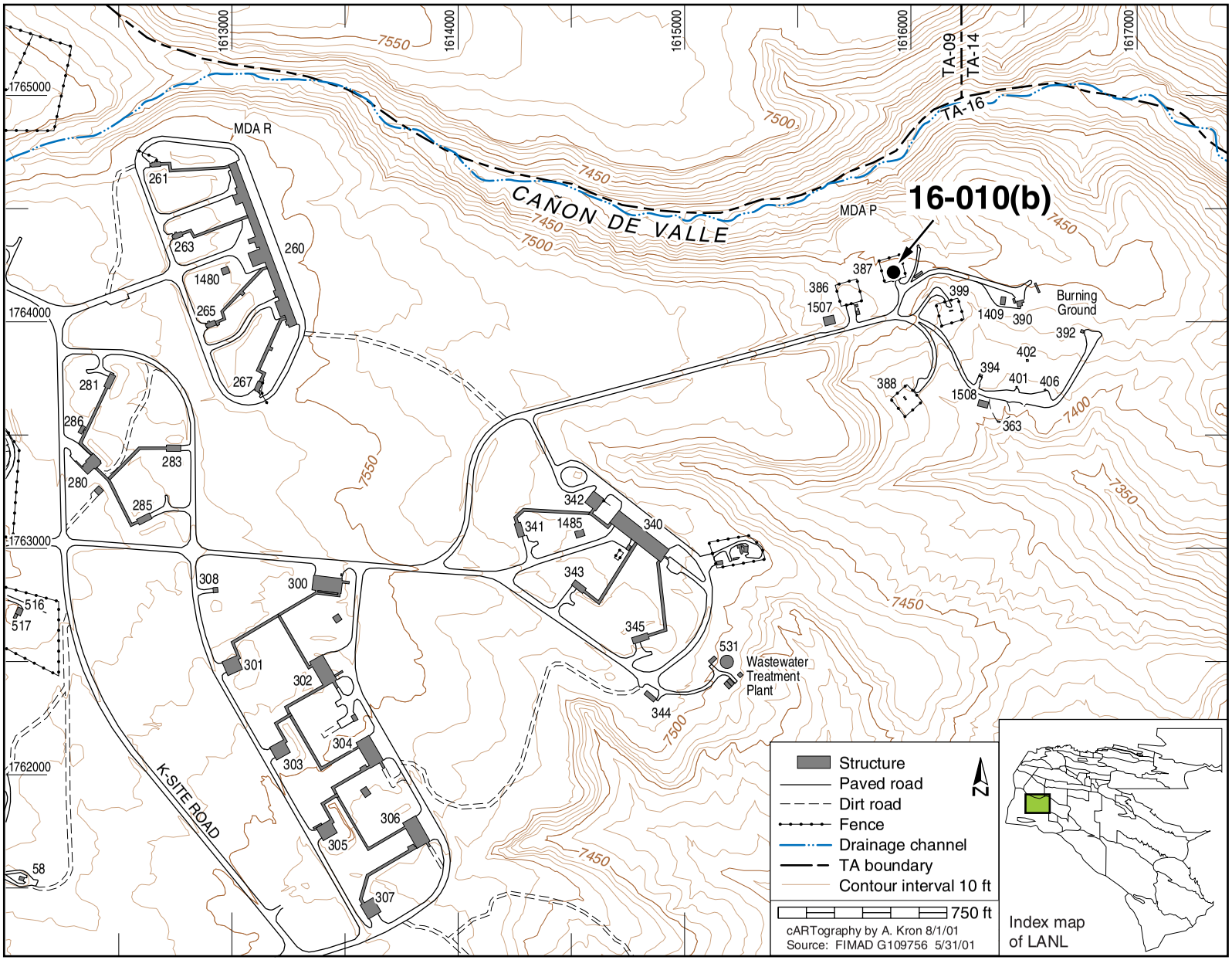
References

Sampling and Analysis Plan for Material Disposal Area P	LA-UR Number: 99-3630
Closure Plan for the TA-16-387 Flash Pad	LA-UR Number: 99-4010
RFI Work Plan for Operable Unit 1082	LA-UR Number: 93-1196
MDA P Area Closure Certification Report	LA-UR Number: 02-7819

View of SWMU 16-010(b)

View of SWMU 16-010(b)

View of 16-010(b) after closure activities


16-010(b)
CAÑON DE VALLE
MDA R
MDA P
TA-09
TA-14
TA-16
Burning Ground
Wastewater Treatment Plant
K-SITE ROAD
1613000
1614000
1615000
1616000
1617000
1765000
1764000
1763000
1762000
7550
7500
7450
7400
7350
261
263
260
1480
265
267
281
286
280
283
285
308
300
301
302
303
304
305
306
307
516
517
58
342
341
1485
340
343
345
344
531
387
386
1507
399
1409
390
392
402
394
401
406
388
1508
363
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
750 ft
N
cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01
Index map of LANL

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SWMU 16-010(c) — Open burning/open detonation

Administrative Authority	NMED	**Former Operable Unit**	OU 1082
Technical Area	TA-16	**Dates of Operation**	1950s-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	16-388	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 16-010(c) is a former burn table that was converted to a flash pad/burn tray (structure 16-388). The burn table was used to treat HE scrap. The 100-ft x 100-ft enclosed area consisted of a concrete pad that was used to unload explosives and a 16-ft x 4-ft metal tray that was approximately 2 ft above the ground surface. Scrap HE was placed on the tray and burned.

The current flash pad consists of a 22-ft x 22-ft concrete pad set on a secondary containment area and surrounded on three sides by a concrete wall. Prior to treatment, the HE-contaminated wastes are placed on steel pallets or steel trays. Propane burners are used as heat sources to treat the wastes at the flash pad, which can be covered with a movable steel roof when not in use.

The current burn tray consists of a stainless-steel kettle that is 30 in. in diameter and 24 in. high. Propane burners are used to treat HE-contaminated liquid wastes at the burn tray. The entire assembly, which can be covered with a retractable cover, is provided with secondary containment.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project requested a Class I permit modification for this SWMU because it is an active hazardous waste treatment unit and is managed in accordance with state and federal regulations.

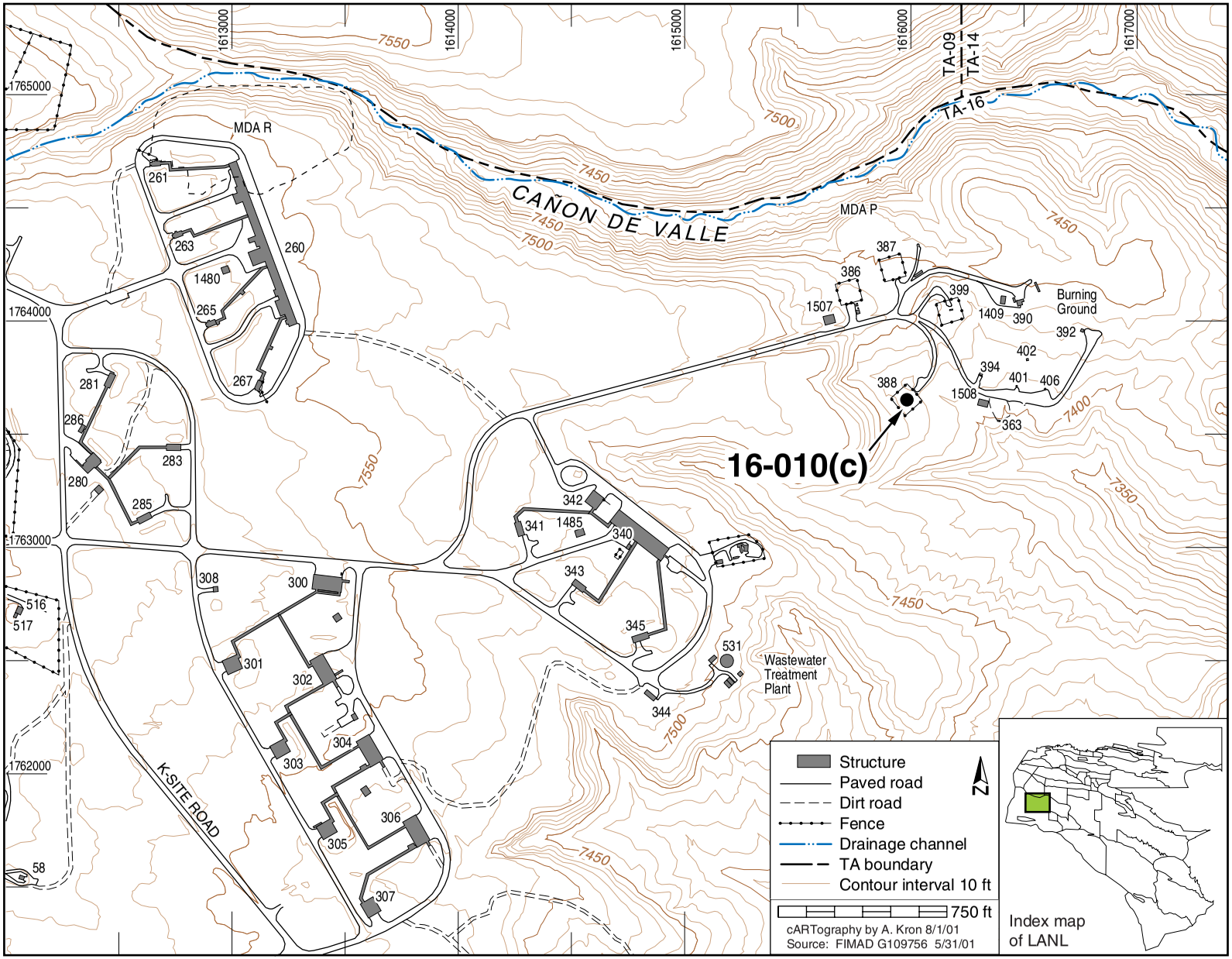
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Work Plan for Operable Unit 1082	LA-UR Number: 93-1196

View of SWMU 16-010(c)


16-010(c)
CAÑON DE VALLE
TA-16
TA-09
TA-14
MDA R
MDA P
Burning Ground
Wastewater Treatment Plant
K-SITE ROAD
1613000
1614000
1615000
1616000
1617000
1765000
1764000
1763000
1762000
7550
7500
7450
7400
7350
261
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1480
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1507
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401
406
388
1508
363
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
750 ft
N
cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01
Index map of LANL

SWMU 16-010(d) — Open burning/open detonation

Administrative Authority	NMED	**Former Operable Unit**	OU 1082
Technical Area	TA-16	**Dates of Operation**	1950s-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	Yes
Structure Number	16-399	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 16-010(d) is a former burn slab that was converted to a burn tray (structure 16-399). The burn table is used to treat HE scrap. The 100-sq-ft enclosed area consists of a concrete pad that is used to unload explosives and a 16-ft x 4-ft metal tray on the burn table that is approximately 2 ft above the ground surface. HE is placed on the tray and burned. A metal-covered rain guard can be rolled back to expose the tray.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project requested a Class I permit modification for this SWMU because it is an active hazardous waste management unit and is managed in accordance with state and federal regulations. In 1998, BMPs were installed at this site in the form of run-on diversion, repaving, and installation of an earthen berm and a roof covering.

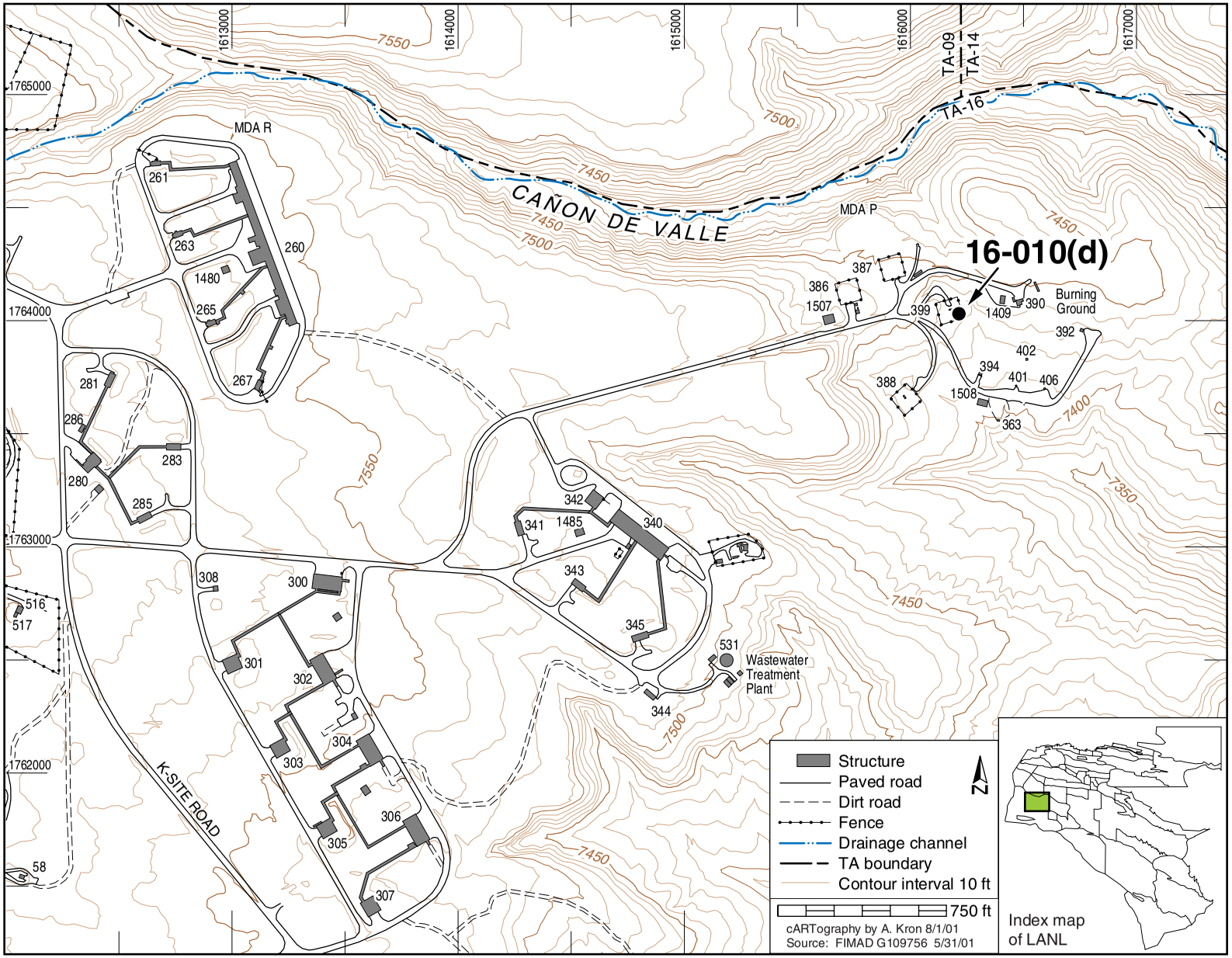
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Work Plan for Operable Unit 1082	LA-UR Number: 93-1196

View of SWMU 16-010(d)


16-010(d)
CAÑON DE VALLE
TA-16
TA-09
TA-14
MDA R
MDA P
Burning Ground
Wastewater Treatment Plant
K-SITE ROAD
1613000
1614000
1615000
1616000
1617000
1765000
1764000
1763000
1762000
7550
7500
7450
7400
7350
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1507
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1409
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401
406
388
1508
363
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
750 ft
N
cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01
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SWMU 16-010(e) — Physical/chemical treatment units

Administrative Authority	NMED	**Former Operable Unit**	OU 1082
Technical Area	TA-16	**Dates of Operation**	1961-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	16-401	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 16-010(e) is a steel filter vessel (structure 16-401) that was built in 1961 to replace a filter bed. The filter vessel is 8 ft, 9 in. in diameter and 4 ft high. It is equipped with a jib crane-operated conical steel cover. About half of the vessel is above grade. The structure is conical with a surface layer of sand over layers of fine and coarse gravel. The vessel is used to filter HE/water sludge from HE sumps. The sludge, which is trucked in from sitewide HE sumps, is pumped into the structure and dried by blowing hot air across filtered residue. The residue is burned in the vessel and any residual ash and the top layer of sand are removed, characterized, and disposed of. A drainage system previously transferred the filtered water from the filter vessel to a filter/treatment unit [structure 16-363, SWMU 16-010(g)]. The filtered water is now transferred to the HEWTF's sump tank via an underground pipe.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project requested a Class I permit modification to remove this SWMU from Module VIII of LANL's Hazardous Waste Facility Permit because it is an active hazardous waste treatment unit and is managed in accordance with state and federal regulations. This unit is also included in the NPDES permit for the HEWTF.

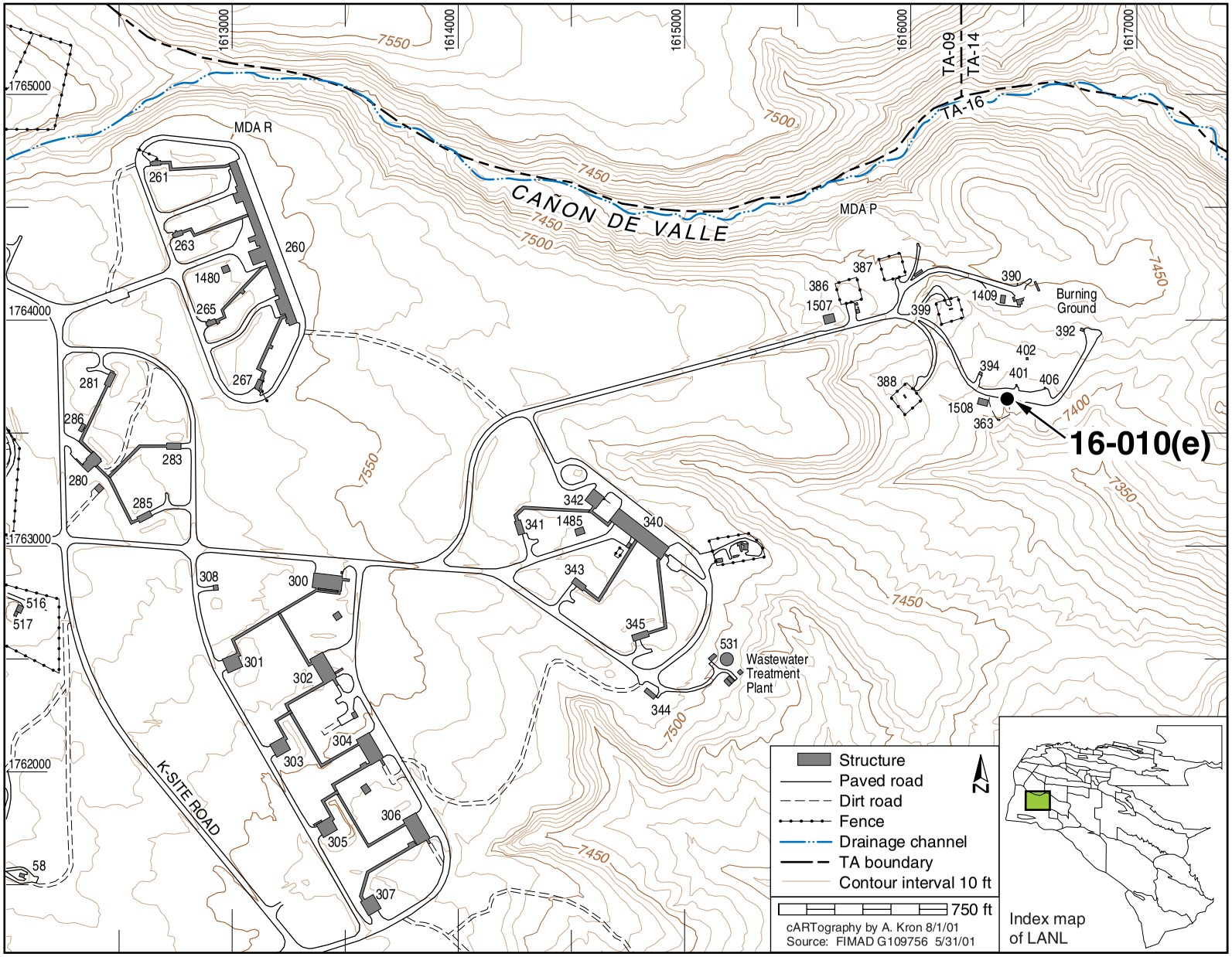
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Work Plan for Operable Unit 1082 — LA-UR Number: 93-1196

View of SWMU 16-010(e)


16-010(e)
CAÑON DE VALLE
MDA R
MDA P
TA-09
TA-14
TA-16
K-SITE ROAD
Burning Ground
Wastewater Treatment Plant
1613000
1614000
1615000
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401
406
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1508
363
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
750 ft
N
cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01
Index map of LANL

SWMU 16-010(f) — Physical/chemical treatment units

Administrative Authority	NMED	**Former Operable Unit**	OU 1082
Technical Area	TA-16	**Dates of Operation**	1965-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	16-406	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 16-010(f) is a steel filter vessel (structure 16-406). This vessel replaced filter bed 16-393 in 1965. The filter vessel is 8 ft, 4 in. in diameter and 4 ft high. It is equipped with a jib crane-operated conical steel cover. About half of the vessel is above grade. The structure is conical, with a surface layer of sand over layers of fine and coarse gravel. The vessel is used to filter HE/water sludge from HE sumps. The sludge, which is trucked in from sitewide HE sumps, is pumped into the structure and dried by blowing hot air across filtered residue. The residue is burned in the vessel and any residual ash and top layer of sand are removed, characterized, and disposed of.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project requested a Class I permit modification for this SWMU because it is an active hazardous waste treatment unit and is managed in accordance with state and federal regulations. This unit is also included in the HEWTF's NPDES permit.

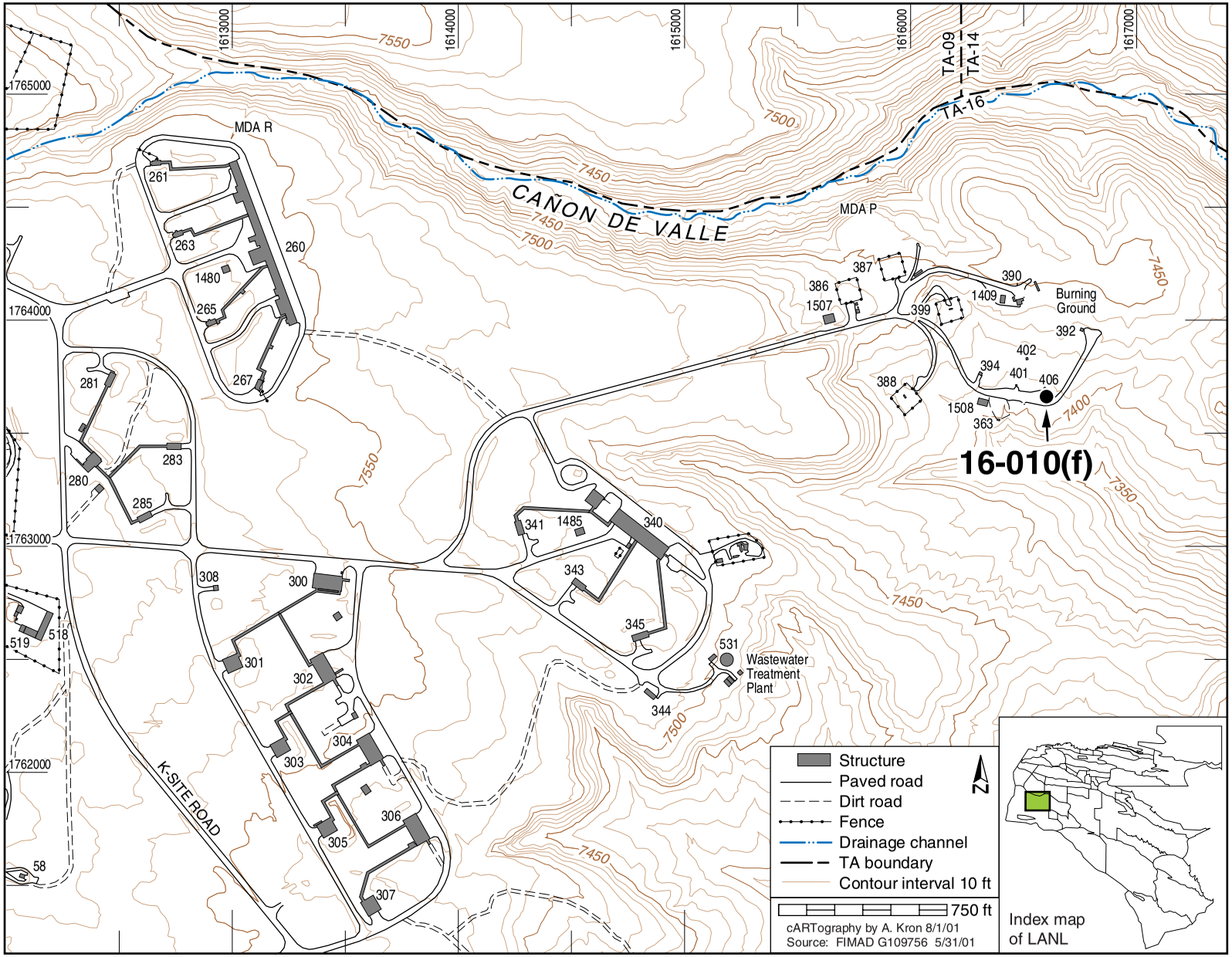
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Work Plan for Operable Unit 1082 — LA-UR Number: 93-1196

View of SWMU 16-010(f)


16-010(f)
CAÑON DE VALLE
MDA R
MDA P
TA-09
TA-14
TA-16
Burning Ground
Wastewater Treatment Plant
K-SITE ROAD
1613000
1614000
1615000
1616000
1617000
1765000
1764000
1763000
1762000
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1508
363
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
750 ft
cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01
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SWMU 16-010(h)-99 — Open burning/open detonation - physical/ chemical treatment units - wastewater treatment plant/waste lines

Administrative Authority	NMED	**Former Operable Unit**	N/A
Technical Area	TA-16	**Dates of Operation**	1951-1990
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	Various	**Other Remedial Action Conducted?**	Yes

Unit Description

Consolidated SWMU 16-010(h)-99 consists of former SWMUs 16-005(g), 16-010(h), 16-010(i), 16-010(j), 16-010(k), 16-010(l), 16-010(m), and 16-010(n). The former SWMUs do not include the active hazardous waste management units that are part of the TA-16 burning ground operation. The burning ground is located in the northeast corner of TA-16. The burning ground was constructed in 1951 for HE treatment. Treated material was placed in the MDA P landfill until 1984; after 1984, the treated material was taken to TA-54 for disposal.

Former SWMU 16-005(g) is the historical location of a filter bed (structure 16-393), which was decommissioned and disposed of at TA-54. The unit was built to receive HE residue wash water from the basket-wash facility [former SWMU 16-010(h)]. Structure 16-406, HE filter vessel [SWMU 16-010(f), which was not included in this consolidated unit] was built on top of the location of former structure 16-393. Former SWMU 16-005(g) was proposed for NFA in the OU 1082 work plan because it is located beneath a RCRA interim status unit, SWMU 16-010(f).

Former SWMU 16-010(h), the decommissioned basket-wash facility (Building 16-390), operated from 1951 to 1966 and was used to clean filters from sitewide HE sumps and to divert residual filtered wash water to troughs (former SWMUs 16-010(k-n), then to filter beds [former SWMUs 16-010(e,i, and j) and SWMU 16-005(g)]. The basket-wash facility and troughs have not been used as intended since 1966. The basket-wash facility currently is used for storage.

Former SWMU 16-010(i) is structure 16-392, an inactive burn pad that formerly was a filter bed that received wash water from the basket-wash facility. The wash water was received through a trough (structure 16-1136). Filtered wash water from the basket-wash facility collected within perforated piping along the bottom of the filter bed and drained via gravity through a pipe to an adjacent outfall southeast of the filter bed. The filter bed was modified to a burn pad to burn suspected uranium-contaminated objects. The trough was dismantled when the filter bed was modified.

Former SWMU 16-010(j) was a filter bed (structure 16-394) that was used from 1951 to 1966. It received wash water from the basket-wash facility. The filter bed was converted to a burn tray in 1990 and operated as a hazardous waste treatment unit under RCRA interim status. The burn tray was used to burn HE-contaminated oils, solvents, and water mixed with oils and solvents. Once materials were poured onto the tray, wood that was stacked beneath the tray was ignited remotely. Residues from burning were managed in accordance with state and federal regulations.

Former SWMU 16-010(k) is a steel trough with a V-shaped cross section that carried wash water from the basket-wash facility to a filter bed [SWMU 16-010(e)]. The trough was built in 1951. It is open at the top, elevated 3 ft off the ground on a steel framework, and is about 370 ft long. The filter bed was replaced with a filter vessel (structure 16-401).

Former SWMU 16-010(l) is a trough (structure 16-1134) similar in construction to former SWMU 16-010(k). It carried wash water from the basket-wash facility to a filter bed [structure 16-394, former SWMU 16-010(j)] that was converted to a burn tray.

Former SWMU 16-010(m) is a trough (structure 16-1135) that carried wash water from the basket-wash facility to a filter bed (structure 16-393). In 1965, a filter vessel [structure 16-406, SWMU 16-010(f)] replaced structure 16-393.

Former SWMU 16-010(n) is a trough (structure 16-1136) that carried wash water from the basket-wash facility to a filter bed (structure 16-392). The trough was dismantled in 1988. This is the only trough through which materials that were potentially contaminated with uranium were transported.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project submitted a RCRA closure plan for the burn tray [SWMU 16-010(j)] after burn operations were relocated to another hazardous waste treatment unit [structure 16-388, SWMU 16-010(c)].

In 1995, the former SWMUs were sampled for HE, inorganic and organic chemicals, and in some cases, uranium. This sampling confirmed the presence of contamination.

Consolidated SWMU 16-010(h)-99 will be further investigated, characterized, assessed, and potentially remediated as part of future corrective action activities at the TA-16 burning ground.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
HEs	12	N/A	6
Inorganic chemicals	24	13	2
SVOCs	8	N/A	1
VOCs	5	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
HEs	Amino-2,6-dinitrotoluene[4-]	15.2 mg/kg	N/A
	Amino-4,6-dinitrotoluene[2-]	21.7 mg/kg	N/A
	HMX	18,700 mg/kg	3100 mg/kg
	Nitrotoluene[2-]	3.03 mg/kg	N/A
	RDX	10,700 mg/kg	4.4 mg/kg
	Trinitrotoluene[2,4,6-]	2060 mg/kg	31 mg/kg
Inorganic chemicals	Arsenic	7.3 mg/kg	0.39 mg/kg
	Lead	800 mg/kg	400 mg/kg
SVOCs	Nitrosodimethylamine[N-]	0.33 mg/kg	0.0095 mg/kg

References

Closure Plan for the TA-16-394 Burn Tray — LA-UR Number: 99-6216

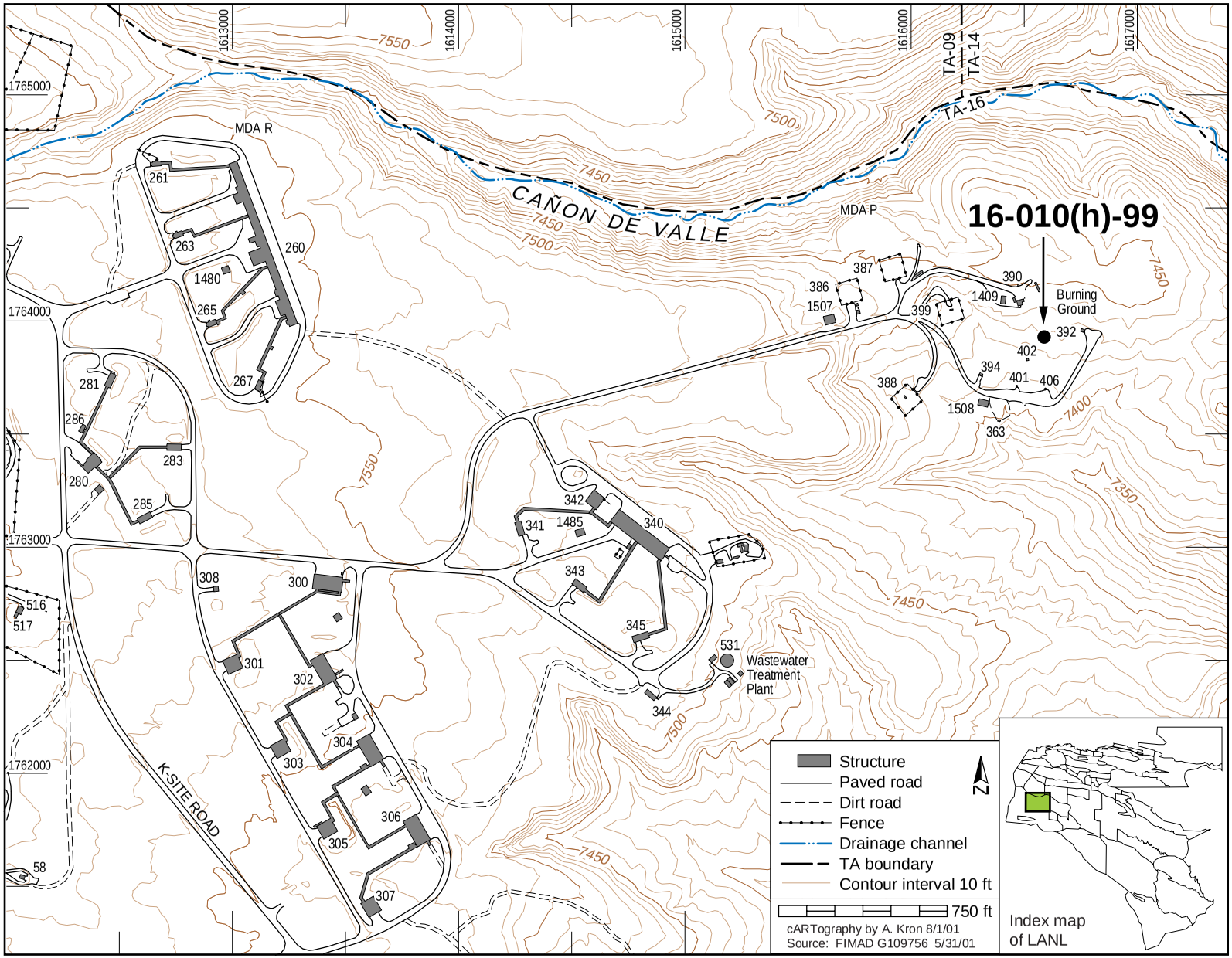
RFI Work Plan for Operable Unit 1082 — LA-UR Number: 93-1196

Closure Plan for the TA-16-394 Burn Tray, Rev. 1 — LA-UR Number: N/A

View of SWMU 16-010(h)-99, looking northeast

View of SWMU 16-010(h)-99, looking northeast

View of SWMU 16-010(h)-99, looking southwest


16-010(h)-99
Burning Ground
CAÑON DE VALLE
MDA R
MDA P
TA-09
TA-14
TA-16
K-SITE ROAD
Wastewater Treatment Plant
1613000
1614000
1615000
1616000
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1508
363
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
750 ft
N
cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01
Index map of LANL

SWMU 16-016(c)-99 — Storage areas/waste piles/magazines - subsurface liquid disposal

Administrative Authority	NMED	**Former Operable Unit**	N/A
Technical Area	TA-16	**Dates of Operation**	1951–2002
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	Yes
Structure Number	Various	**Other Remedial Action Conducted?**	Yes

Unit Description

Consolidated SWMU 16-016(c)-99 consists of former SWMUs 16-006(e), 16-010(a), and 16-016(c). The former SWMUs are part of the TA-16 burning ground operations. These SWMUs are located adjacent to MDA P (SWMU 16-018).

Former SWMU 16-006(e) was an approximately 100-gal., steel septic tank that was part of a septic system constructed in 1963. The system included a drainfield, outfall, and associated piping that served a control shelter (structure 16-389) for a burning site. The water closet, lavatory, and floor drain in the control shelter discharged to the septic tank. Structure 16-389 (control shelter) generally was occupied only during burning ground operations, which occurred one to two days a week from the 1950s to 1984. In 1987, LANL obtained a sanitary waste permit for the septic tank from Los Alamos County. The overflow outlet from the tank was sealed in 1988 and the contents subsequently were routinely pumped and disposed of through LANL's SWSC centralized sanitary treatment plant.

Former SWMU 16-010(a) is a former HE flash pad (structure 16-386) that now is used for materials storage. This structure also was designated as a barium nitrate storage site. The flash pad was built in 1951 and is located approximately 150 ft west of another flash pad [structure 16-387, SWMU 16-010(b)] not included in this consolidated SWMU. The flash pad is a rectangular, fenced, level area of bare soil within a 100-ft x 100-ft fenced area. The northeastern corner of the area enclosed by the fence was used in the 1950s and 1960s as a storage site for a pile of barium nitrate [SWMU 16-016(c)].

Former SWMU 16-016(c) is a historical barium nitrate storage area/pile located next to and partially overlapping an inactive flash pad [structure 16-386, former SWMU 16-010(a)]. The footprint of the barium nitrate pile is about 0.85 acre. The site is on a steep, north-facing slope at the head of a small drainage channel into Cañon de Valle. The pile was removed in the early 1970s.

The tank [former SWMU 16-006(e)] was sampled in September 1995 as part of a survey for radioactivity in LANL septic tanks. No elevated radioactivity was found in the tank. The ER Project drilled two boreholes at the proximal and distal ends of the septic system in September 1995. The locations were field-screened for HE; two locations had elevated HE. Four samples were submitted for laboratory analysis based on field-screening results. Samples were analyzed for HE, organic chemicals, and inorganic chemicals. No elevated concentrations were found by the laboratory analyses. The septic tank contents were sampled in April 1998 and the results confirmed that the wastewater would meet SWSC's WAC.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted an RFI at SWMU 16-010(a) in 1995. Thirty samples from thirty locations were field-screened for HE and inorganic chemicals. Samples were collected from areas with the highest barium concentrations and were submitted for laboratory analysis. Barium concentrations were highest in surface samples collected near the former location of the barium nitrate storage pile [former SWMU 16-016(c)]. The RFI recommended NFA at former SWMU 16-010(a) by attributing the barium contamination to former SWMU 16-016(c).

Initial sampling was conducted at former SWMU 16-016(c) in March 1995. A field-randomized, 20-ft grid was used to collect barium, HE, and radiation field-screening data. The grid extended over the area of former SWMU 16-010(a). Using the grid, surface-soil samples from the five highest barium readings were submitted for laboratory analysis. The drainage channel was field-screened for barium, HE, and radiation at groups of 3 points every 30 ft downgradient for a distance of 210 ft. A total of 18 samples were collected from the grid and drainage transect for laboratory analysis. Analysis showed several inorganic chemicals, particularly barium and lead, at elevated concentrations. Results also showed PAHs and HE. Total uranium was elevated. In 1998, BMPs were installed at former SWMU 16-016(c) in the form of run-on diversion, a vegetative buffer strip, regrading, and straw-bale barriers to minimize contaminant migration from the site.

The ER Project submitted a SAP for this consolidated SWMU in 1999 to evaluate residual contamination. A VCA plan was submitted for the consolidated SWMU as an attachment to the SAP. The VCA plan documented how former SWMUs 16-010(a) and 16-016(c) would be cleaned up. The project proposed field-screening to locate lead, barium, and HE contamination. Field-screening results would be used to direct removal of contaminated soils. Proposed sampling is designed to confirm that former SWMU 16-006(e) received only sanitary waste, therefore supporting a recommendation to remove former SWMU 16-006(e) from Module VIII of LANL's Hazardous Waste Facility Permit. Cleanup levels at consolidated SWMU 16-016(c)-99 would be confirmed by laboratory sample analysis.

The remediation of SWMU 16-016(c)-99 was performed as part of the consolidated closure of MDA P (SWMU 16-018) and the 387 Flash Pad [16-010(b)], and occurred primarily from August 2000 to March 2001.

Excavation within the footprint of the barium nitrate pile [SWMU 16-016(c)] included both remote and conventional means. Because part of the boundary of the barium nitrate pile extended down the western margin of MDA P, contaminated materials in this area were excavated during the excavation of MDA P. Soils within the 386 Flash Pad [SWMU 16-010(a)] areas were excavated and staged with soils from adjacent areas of the MDA P excavation. Field-screening for barium was used to identify the extent of the excavation. Surface soils and some bedrock materials were removed from within the flash pad area. Discontinuous areas downgradient of the flash pad were removed. Barium was not found to have penetrated the bedrock. Some residual bedrock contamination was identified in the drainage along the western margin of MDA P, but it was below the operational PRG of 2000 mg/kg. The remaining areas of exposed soil within the 386 Flash Pad fence were screened for barium concentration. After excavation, a layer of soil and gravel was placed in the excavation within the current fence. Gravel was placed on the north side of the current fence as an erosion control measure.

The septic tank [SWMU 16-016(e)] and waste line were remediated in two stages, in March 2001 and March 2002. In March 2001, the waste line (4-in. diameter VCP) was located and excavated from the tank to its endpoint. The pipe was empty and the connection with the tank had been severed. Field-screening of the pipe interior indicated that no HE or barium contamination was present. The distal 10 ft of the waste line was crushed pipe with no defined outfall. The metal top and riser of the tank were excavated to expose the tank itself. A representative of the NMED Field Operations Division inspected the tank and the tank was backfilled with clean soil to grade and left in place. The pipe inlet was plugged with a PVC pipefitting and the water was turned off inside the building restroom to decommission the source. Soil surrounding the tank and the edges and interior portions of the tank were field-screened for HE and barium and found to be below operational PRGs for both. In March 2002, the tank and pipe were excavated, sampled, and removed completely.

ER Project Sampling Summary

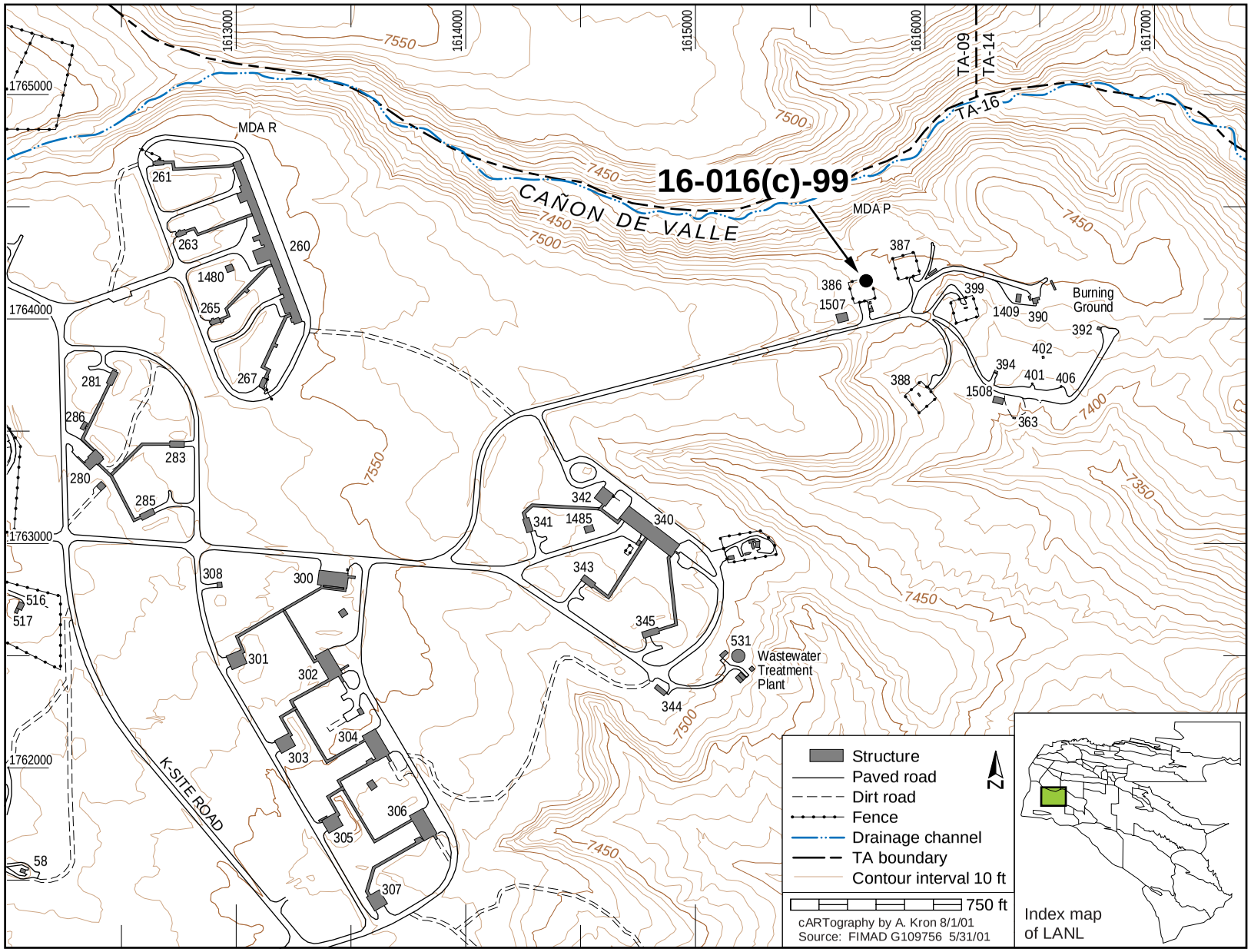
Results from analytical samples collected at this site are reported with SWMU 16-018 (MDA P).

References

Material Disposal Area P Area Closure Certification Report	LA-UR Number: 02-7819
Sampling and Analysis Plan for Material Disposal Area P	LA-UR Number: 99-3630
Voluntary Corrective Action Plan for Remediation of Consolidated PRS 16-016(c)-99	LA-UR Number: 99-3630
RFI Report for TAs -11, -13, -16: PRSs 11-012(a,b), 13-003(a), 16-006(c,d), 16-010(a), 16-021(a), 16-026(c,d,v), 16-028(a), 16-030(g)	LA-UR Number: 97-3072

View of SWMU 16-016(c)-99, looking south

View of SWMU 16-016(c)-99, looking north


16-016(c)-99
CAÑON DE VALLE
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MDA P
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TA-14
TA-16
Burning Ground
Wastewater Treatment Plant
K-SITE ROAD
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
750 ft
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cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01
Index map of LANL

SWMU 16-018 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1082
Technical Area	TA-16	**Dates of Operation**	1950-1984
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	Yes
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 16-018 (known as MDA P) is located north of the TA-16 burning ground near the south rim of Cañon de Valle. The site operated from 1950 until 1984 as a disposal site for debris that resulted from burning HE and HE-contaminated material at TA-16. Concrete and construction debris was deposited directly on the slopes leading down the canyon. Other materials were burned at one of the nearby open-burn units and the resulting debris or residue was pushed over the mesa rim. The western area of MDA P primarily received construction debris from the demolition of World War II buildings; the eastern area received debris and residue from the open-burn units. The contaminants of primary concern at MDA P included detonable HE, HE residues in soil, barium, and asbestos. MDA P also contained low levels of uranium and metals such as lead and cadmium.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project submitted a closure plan to NMED in 1995. The plan was approved in 1997 and Phase I work began on removing the waste from MDA P. The closure of MDA P was combined with closure and VCA activities at Flash Pad 387 [16-010(b)] and SWMU 16-016(c)-99, respectively. The discovery of detonable HE in the MDA P landfill required the use of a remote excavator. Remote landfill excavation began in February 1999 and was completed on May 3, 2000, just before the Cerro Grande fire. Nonremote excavation of contaminated soil beneath the landfill resumed after fire recovery and was completed in March 2001. Waste disposal was completed in June 2001. Phase II confirmatory sampling and geophysical measurements began in June 2001. During the Phase II sampling, additional contamination was found and addditional excavation of localized contamination was completed.

Nearly 55,000 cubic yards of soil, rock, and metal and concrete debris were excavated from MDA P. Of this quantity, 21,506 cubic yards of soil were disposed as hazardous waste. The remainder of this quantity consisted of industrial waste soils, concrete and metal debris that was recycled or managed as industrial waste, and rock that was decontaminated and then used as riprap within TA-16. Other excavated waste included 3947 lb of asbestos-containing material; 888 containers of unknown content; 95 miscellaneous metal objects; 3240 lb of low-level radioactive waste; 5389 lb of mixed waste; and various smaller quantities of HE, HE-contaminated debris, and residuals from treating HE. Scrap metal and concrete were shipped to recycling facilities. Contaminated soils and industrial wastes were shipped to off-site solid waste landfills. Solid, nonhazardous wastes were disposed of at MDA J.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Dioxin/Furans	0	N/A	0
HEs	12	N/A	3
Herbicides	0	N/A	0
Inorganic chemicals	20	20	2
Pesticide/PCBs	2	0	0
Radionuclides	4	1	0
SVOCs	4	N/A	0
VOCs	4	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
HEs	Amino-2,6-dinitrotoluene[4-]	0.908 mg/kg	N/A
	Amino-4,6-dinitrotoluene[2-]	1.1 mg/kg	N/A
	RDX	37 mg/kg	4.4 mg/kg
Inorganic chemicals	Arsenic	7.2 mg/kg	0.39 mg/kg
	Barium	6,980 mg/kg	5,200 mg/kg

References

Material Disposal Area P Area Closure Certification Report — LA-UR Number: 02-7819

Sampling and Analysis Plan for Material Disposal Area P — LA-UR Number: 99-3630

DOE/LANL Closure Plan for TA 16, MDA P — LA-UR Number: 96-1092

RFI Work Plan for Operable Unit 1082 — LA-UR Number: 93-1196

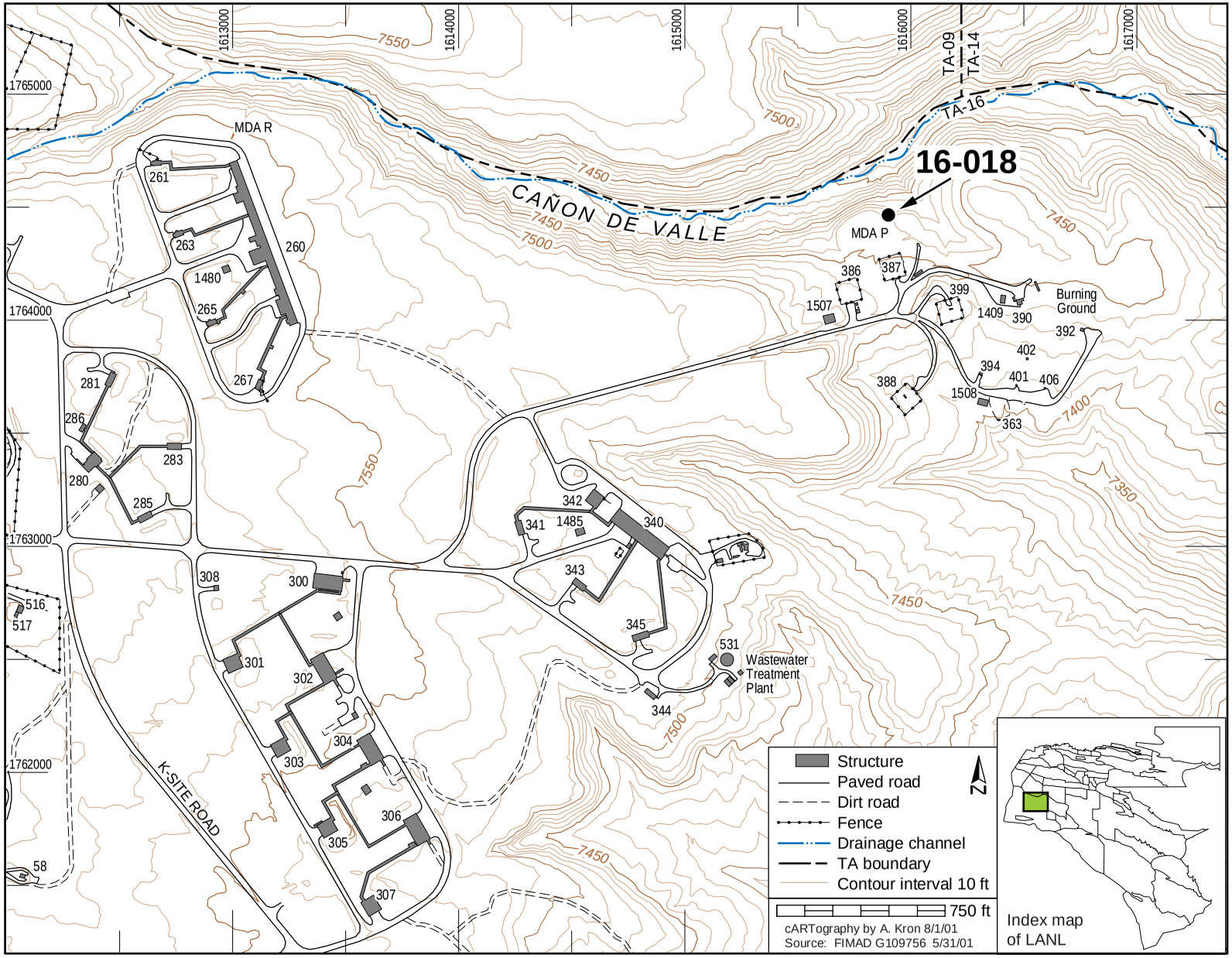
Preparing staging areas (SWMU 16-018)

MDA P excavator (SWMU 16-018)

Recycle metal (SWMU 16-018)

After remediation (SWMU 16-018)

After remediation (SWMU 16-018)


16-018
CAÑON DE VALLE
MDA R
MDA P
TA-09
TA-14
TA-16
Burning Ground
Wastewater Treatment Plant
K-SITE ROAD
1613000
1614000
1615000
1616000
1617000
1765000
1764000
1763000
1762000
7550
7500
7450
7400
7350
261
263
260
1480
265
267
281
286
283
280
285
308
300
301
302
303
304
305
306
307
516
517
58
342
341
1485
340
343
345
344
531
386
387
1507
399
1409
390
392
402
394
401
406
388
1508
363
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
750 ft
N
cARTography by A. Kron 8/1/01
Source: FIMAD G109756 5/31/01
Index map of LANL

5.0 CERTIFICATION

I certify under penalty of law that this document 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
University of California
Operator

8/22/03
Date Signed

for
Ralph E. Erickson
Manager, Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy
Owner/Operator

8/22/03
Date Signed

6.0 REFERENCES

EPA, 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515," effective date May 19, 1994, U.S. Environmental Protection Agency, Region 6, Hazardous Waste Management Division, Dallas, Texas.

LANL, 2003, "The 2003 Solid Waste Management Unit Report," LA-UR-03-6000, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002a, "Response to Notice of Deficiency; TA-16 Part B Application Revision 3.0, January 31, 2000," LA-UR-02-0890, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002b, "Response to Second Notice of Deficiency: Review of LANL Response to Notice of Deficiency; TA-16 Part B Application Revision 3.0, January 31, 2000 (LA-UR-02-0890); Los Alamos National Laboratory (LANL) EPA ID# NM0890010515," LA-UR-02-5002, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002c, "Los Alamos National Laboratory General Part A Permit Application," Revision 3.0, LA-UR-02-5273, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2000a, "Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Document," Revision 3.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2000b, "Los Alamos National Laboratory General Part A Permit Application," Revision 2.0, LA-UR-00-4148, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1999, "Los Alamos National Laboratory General Part A Permit Application," Revision 1.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998a, "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998b, "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1996, "RCRA Part B Permit Application: Technical Area 16; Building 88, Container Storage Area; Flash Pads 387 and 388, Open Burn Units; Burn Pads 388 and 399, Open Burn Units; Burn Trays 388 and 394, Open Burn Units; and Filter Vessels 401 and 406, Open Burn Units," Revision 2.1, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1995, "RCRA Part B Permit Application: Technical Area 16; Building 88, Container Storage Area; Flash Pads 387 and 388, Open Burn Units; Burn Pads 388 and 399, Open Burn Units; Burn Trays 388 and 394, Open Burn Units; and Filter Vessels 401 and 406, Open Burn Units," Revision 2.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

ATTACHMENT A

FACILITY DESCRIPTION

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
AASHTO	American Association of State Highway and Transportation Officials
HE	high explosives
LANL	Los Alamos National Laboratory
OB	open burning
TA	technical area

ATTACHMENT A
FACILITY DESCRIPTION

The information provided in this attachment is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00]. The following subject areas are addressed in this attachment:

- A general description of Technical Area (TA) 16 at Los Alamos National Laboratory (LANL) [20.4.1 NMAC § 270.14(b)(1)];
- Site-specific traffic patterns, volume, and control [20.4.1 NMAC § 270.14(b)(10)];
- Site-specific location information for compliance with the seismic and floodplain standard requirements [20.4.1 NMAC § 270.14(b)(11), and 20.4.1 NMAC § 264.18(a) and (b)];
- Site-specific topographic map requirements [20.4.1 NMAC § 270.14(b)(19)];
- Site-specific groundwater monitoring and protection information [20.4.1 NMAC § 270.14(c), and 20.4.1 NMAC § 264.90(a)].

A LANL-wide facility description addressing additional regulatory requirements is provided in Appendix A of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B.

A.1 TA-16 GENERAL DESCRIPTION [20.4.1 NMAC § 270.14(b)(1)]

TA-16 is located in the southwestern portion of LANL (Figure A-1). It is situated on a broad mesa that is bounded on the north by Cañon de Valle, on the south by State Road 4 and Bandelier National Monument, and on the west by West Jemez Road (State Road 501) and the Santa Fe National Forest. Elevation ranges from approximately 7,700 feet at the west end of the TA to approximately 6,800 feet at the lower east end. Topography is varied, ranging from steep precipitous canyon walls to sloping mesa tops.

The open burning (OB) units at TA-16 are shown on Figures A-2 and A-3. The TA-16 OB units include the TA-16-388 Flash Pad and the TA-16-399 HE Burn Tray. The TA-16-388 Flash Pad is where high explosives (HE) contamination is removed from excess equipment or scrap, HE-contaminated liquids and dry HE are burned, and wet HE is dried and burned. The TA-16-399 HE Burn Tray is used for the destruction of solid HE material. Descriptions of these two units are provided in Section 2.0 and Attachment G of this permit renewal application.

A.2 TRAFFIC PATTERNS [20.4.1 NMAC § 270.14(b)(10)]

General traffic pattern information, traffic volumes, and traffic control signals for the LANL-wide facility are provided in Appendix A of the LANL General Part B.

A.2.1 Routes of Travel

The primary traffic routes that may be used to transport hazardous waste to or from the OB units at TA-16 include Pajarito Road, Trinity Drive (State Road 502), Diamond Drive, West Jemez Road (State Road 501), Anchor Ranch Road, K-Site Road, State Road 4, and East Jemez Road (see Map 1 in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application" [hereinafter referred to as the LANL General Part A] and Figure A-4 herein).

A.2.2 Traffic Volumes

Due to the nature of operations at TA-16 and because the TA is in a secured area, the traffic volume in the area of the Burn Ground is kept to an absolute minimum to conduct safe treatment operations. Vehicle types are generally cars, light- and medium-duty trucks, vans, tank trucks, dump trucks, and sometimes forklifts and cranes. At the TA-16 Burn Ground, vehicles may be parked next to the Control Building (TA-16-389), driven on the TA-16 Burn Ground roads, or parked adjacent to the OB units.

A.2.3 Traffic Control Signals

Traffic control signals within TA-16 include stop signs, posted speed limits, and other traffic and pedestrian control signs. The locations of existing signs in the vicinity of the TA-16 Burn Ground are shown on Figure A-4.

A.2.4 Road Surfacing and Load-Bearing Capacity

Roads within TA-16 are generally two-lane roads with asphaltic-concrete surfaces. Load-bearing capacity for these roads is 32,000 pounds per axle. These roads are typically constructed with a 6-inch-thick base overlain with a 3-inch-thick asphaltic-concrete surface. These roads were designed and constructed to meet the American Association of State Highway and Transportation Officials (AASHTO) specification HS-20 (AASHTO, 1996).

A.3 LOCATION INFORMATION [20.4.1 NMAC § 270.14(b)(11)]

A.3.1 Seismic Standard [20.4.1 NMAC § 270.14(b)(11)(i and ii) and 20.4.1 NMAC § 264.18(a)]

The OB units at the TA-16 Burn Ground are exempt from the seismic standards in 20.4.1 NMAC § 270.14(b)(11), and 20.4.1 NMAC § 264.18(a) [6-14-00], because they existed prior to November 19, 1980, the effective date of regulation for hazardous waste.

A.3.2 Floodplain Standard [20.4.1 NMAC §§ 270.14(b)(11)(iii through v) and 270.14(b)(19)(ii); 20.4.1 NMAC § 264.18(b)]

The OB units at TA-16 are located on top of a broad mesa. In accordance with 20.4.1 NMAC § 270.14(b)(11)(iii through v) [6-14-00], these hazardous waste management units are not located within the 100-year floodplain boundary. Additional floodplain information is provided in Appendix A of the LANL General Part B.

A.4 TOPOGRAPHIC MAPS [20.4.1 NMAC § 270.14(b)(19)]

Topographic maps and figures are provided herein or referenced to meet the requirements of 20.4.1 NMAC § 270.14(b)(19) [6-14-00]. The maps include the map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- LANL-wide 100-year floodplain maps were provided as Appendix C of the "Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application; General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM0890010515" (LANL, 2001) .
- A map showing surface waters, including intermittent streams, near the OB units at TA-16 is included as Figure A-5.
- Surrounding land uses are shown on Map 1 in the LANL General Part A.
- Wind roses for TA-6 and TA-49, the locations of the closest wind observation towers to TA-16, are shown on Figures A-6 and A-7.
- A map showing the legal boundaries of LANL (including TA-16) is provided as Map A-2 in the LANL General Part B.
- Access control features for TA-16 (e.g. fences, gates) are shown on Figure A-8.
- The locations of buildings, hazardous waste management units and structures, and loading and unloading areas at TA-16 are shown on Figure A-5.
- A map showing National Pollutant Discharge Elimination System discharge structure

locations is included as Map 2 in the LANL General Part A

- Storm, sanitary, and process sewer systems at LANL are shown on Map A-1 of the LANL General Part B.
- Drainage control features at the TA-16 Burn Ground are shown on Figure A-9.
- Fire stations serving LANL and the County of Los Alamos are shown on Figure E-2 of Appendix E in the LANL General Part B.
- The equipment cleanup area for LANL is located at TA-50-1. The location of TA-50-1 is shown on Figure 50-1 in the LANL General Part A.

Contour lines on all topographic maps are in intervals sufficient to detail natural drainage at LANL and in the vicinity of the waste management units. As provided in 20.4.1 NMAC § 270.14(b)(19) [6-14-00], LANL has submitted the maps to the New Mexico Environment Department at these scales and contour intervals due to the size of the waste management units, the extent of the LANL facility, and the topographic relief in the area.

A.5 GROUNDWATER MONITORING [20.4.1 NMAC § 270.14(c) and 20.4.1 NMAC § 264.90(a)]

Groundwater monitoring information is provided in Appendix A of the LANL General Part B.

A.6 OTHER PERMIT ACTIVITIES

Other types of Resource Conservation and Recovery Act permits include, but are not limited to, the following:

- Permits by Rule
- Emergency Permits
- Hazardous Waste Incinerator Permits
- Permits for Land Treatment Demonstrations Using Field Test or Laboratory Analyses
- Interim Permits for Underground Injection Control Program Wells
- Research, Development, and Demonstration Permits
- Permits for Boilers and Industrial Furnaces Burning Hazardous Waste

Currently, none of these permit types are relevant for the operations at TA-16.

A.7 REFERENCES

AASHTO, 1996, “Standard Specifications for Highway Bridges,” 16th Edition, American Association of State Highway and Transportation Officials.

LANL, 2001, “Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application; General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0, Los Alamos National Laboratory, EPA ID No. NM0890010515,” LA-UR-01-6054, Los Alamos National Laboratory, Los Alamos, New Mexico.

CG0003.03.03\16RENEW A1

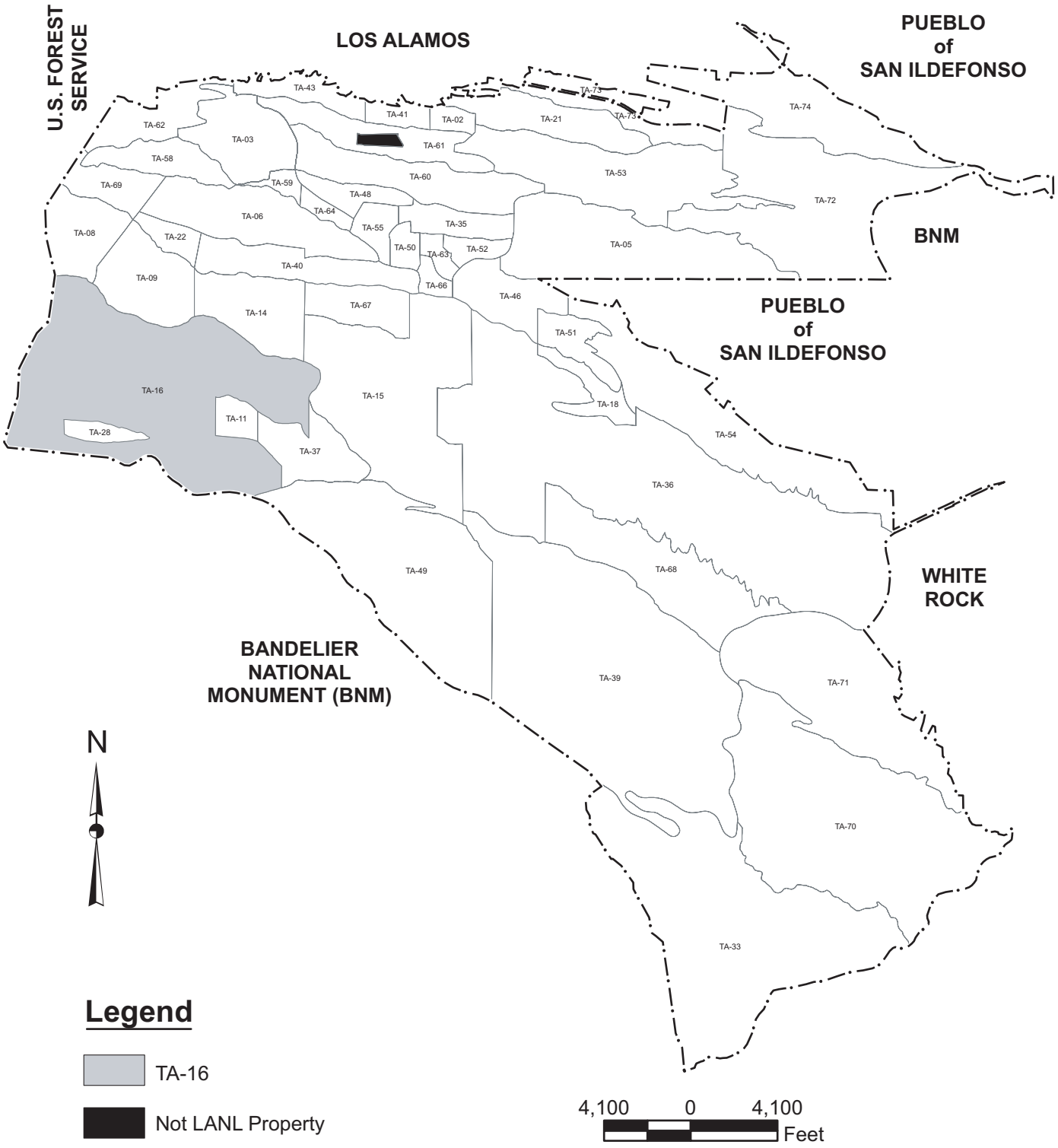

Figure A-1

Location Map of Technical Area (TA) 16 at Los Alamos National Laboratory (LANL)

State Plane Coordinate System New Mexico Central Zone North American Datum 1983 (ft)

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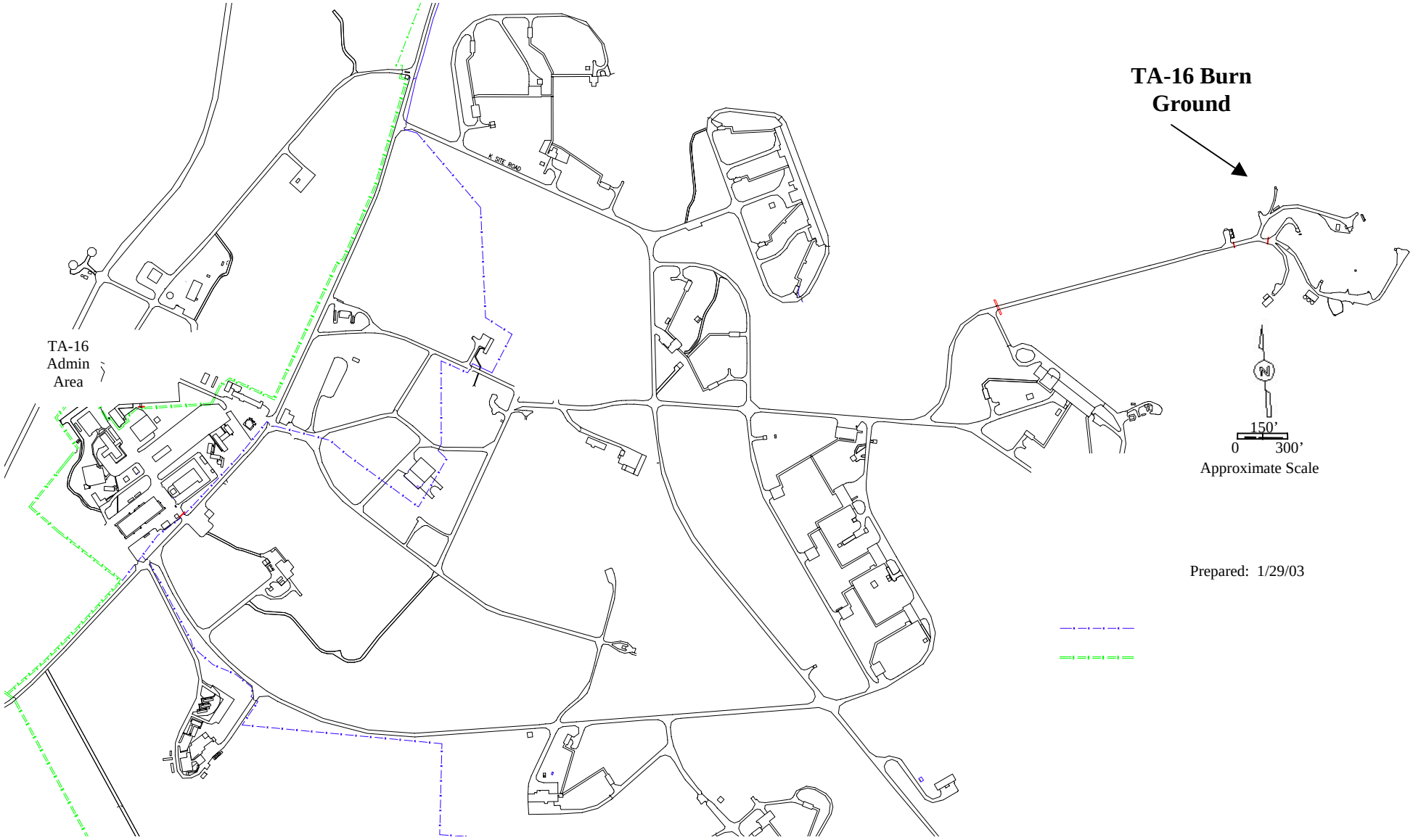
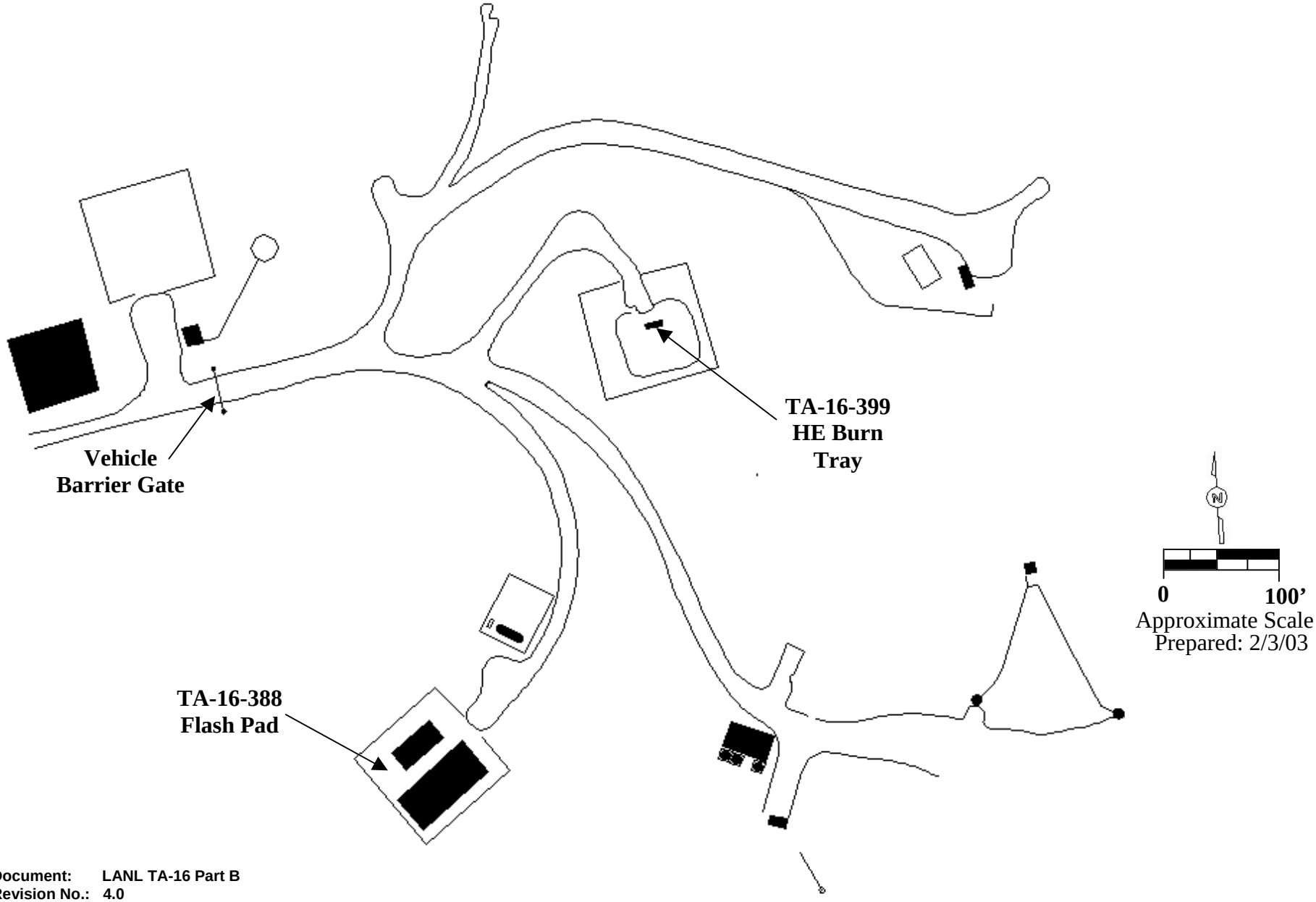


Figure A-2

Site Location Map of Technical Area (TA) 16 Burn Ground



Document: LANL TA-16 Part B
Revision No.: 4.0
Date: June 2003

Figure A-3

Technical Area (TA) 16 Open Burning Units

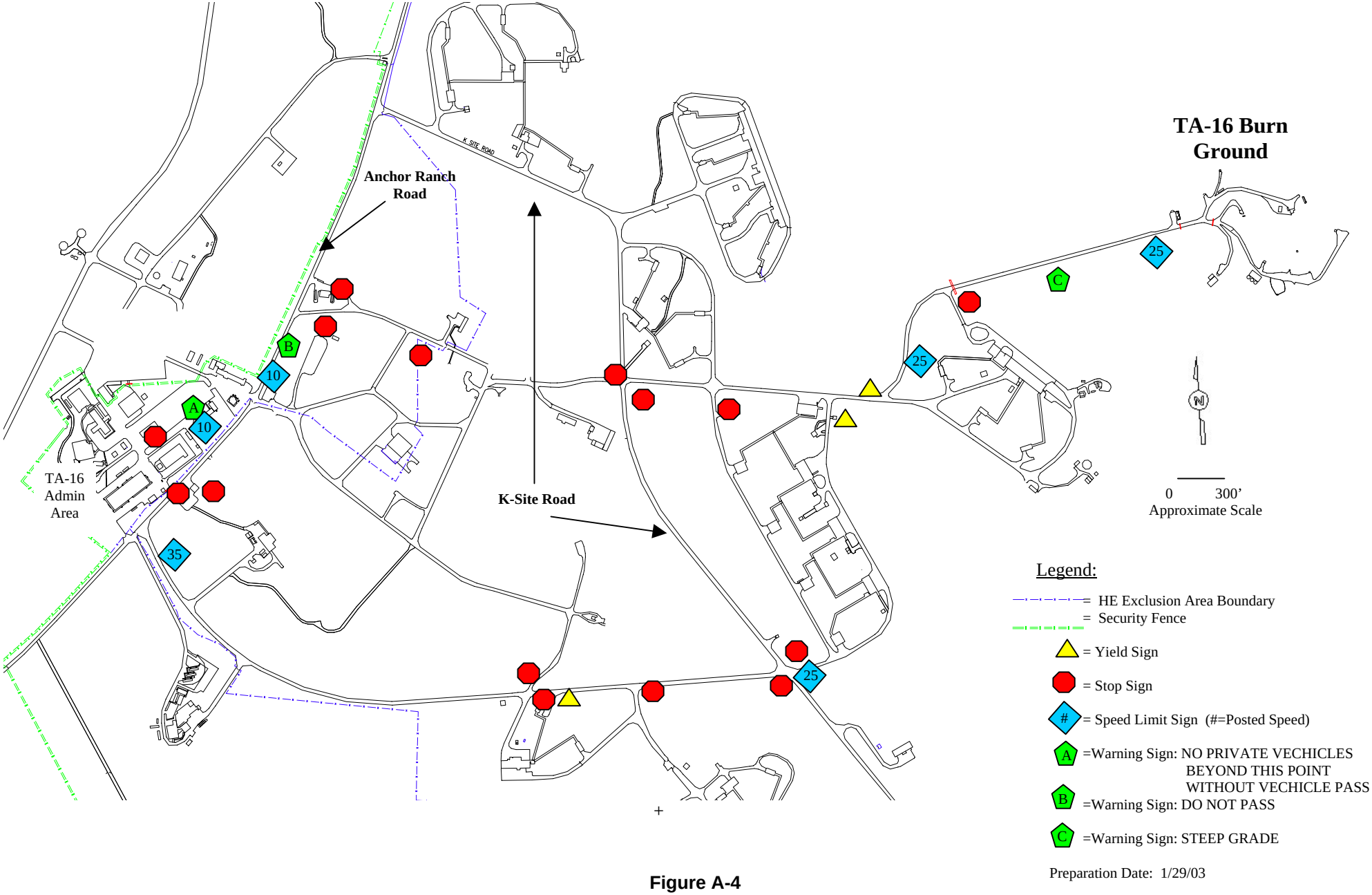
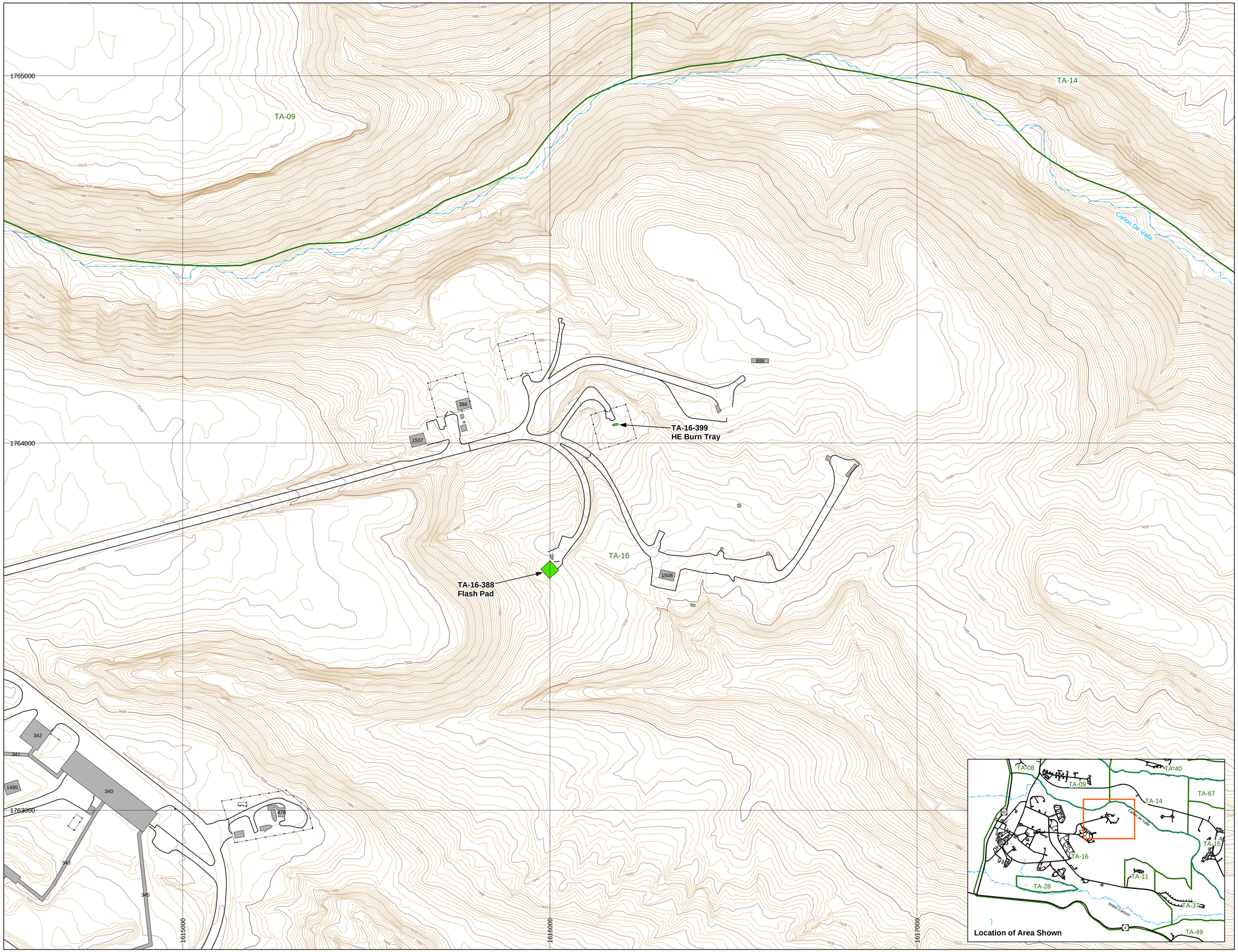


Figure A-4

Location Map of Access Roads and Traffic Control Signs in the Vicinity of the Technical Area (TA) 16 Burn Ground

Document: LANL TA-16 Part B
Revision No.: 4.0
Date: June 2003

Map A-5: Contour Map Showing the Locations of the Hazardous Waste Units at Technical Area (TA) 16



Contour, 100 foot
Contour, 10 foot
Contour, 2 foot
Fence
Drainage
Road, Dirt
Road, Paved
Boundary, TA
Hazardous Waste Management Unit
Structure

DATA SOURCES FOR PLOT: 200670

Title; Owner, ID; Intended Scale; Pub Date; Comments

Boundary, TA; Los Alamos National Laboratory, FWO, NA; Unknown; 20020812; Provided by RRES-R SDE server, sde.DBO.tabndy_ply

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Fences; Los Alamos National Laboratory, FWO, NA; Unknown; 20020912; Provided by RRES-R SDE server, sde.DBO.fences_arc

Gates; Los Alamos National Laboratory, FWO, NA; Unknown; 20020812 Provided by RRES-R SDE server, sde.DBO.gates_arc

Modeled Surface Drainage, 1991; Los Alamos National Laboratory, RRES-R, ER2002-0591; 1:24,000; Unknown; Provided by RRES-R SDE server, sde.DBO.drainage_dem_arc

Roads, Dirt; Los Alamos National Laboratory, FWO, NA; Unknown; 20020912; Provided by RRES-R SDE server, sde.DBO.dirt_rds_arc

Roads, Paved; Los Alamos National Laboratory, FWO, NA; Unknown; Unknown Provided by RRES-R SDE server, sde.DBO.paved_rds_arc

Structures; Los Alamos National Laboratory, FWO, NA; Unknown; 20020812; Provided by RRES-R SDE server, sde.DBO.structures_ply

GISLab
Los Alamos National Laboratory

Cartography by: Doug Walther Request: 13083
Date: April 28, 2003 M#: 200670

N

State Plane Coordinate System, New Mexico Central Zone, 1983 North American Datum. Units Feet.

Grid displays New Mexico State Plane coordinates in feet.

1:1,500

0 125 250 375 500
Feet

0 38 76 114
Meters

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2002 Windroses, Daytime

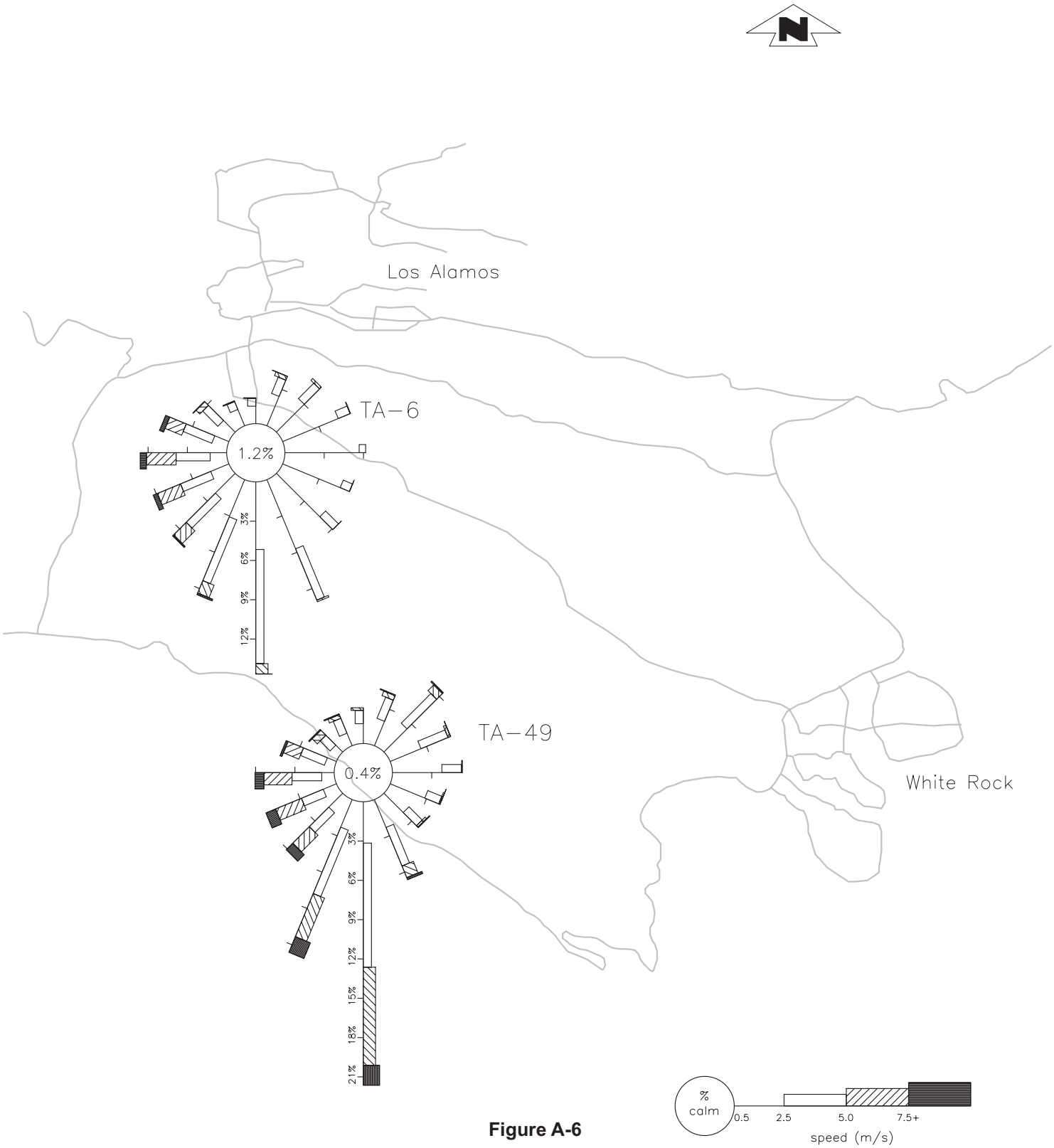

Figure A-6

Annual Wind Roses for Los Alamos National Laboratory -- Daytime (2002)

2002 Windroses, Nighttime

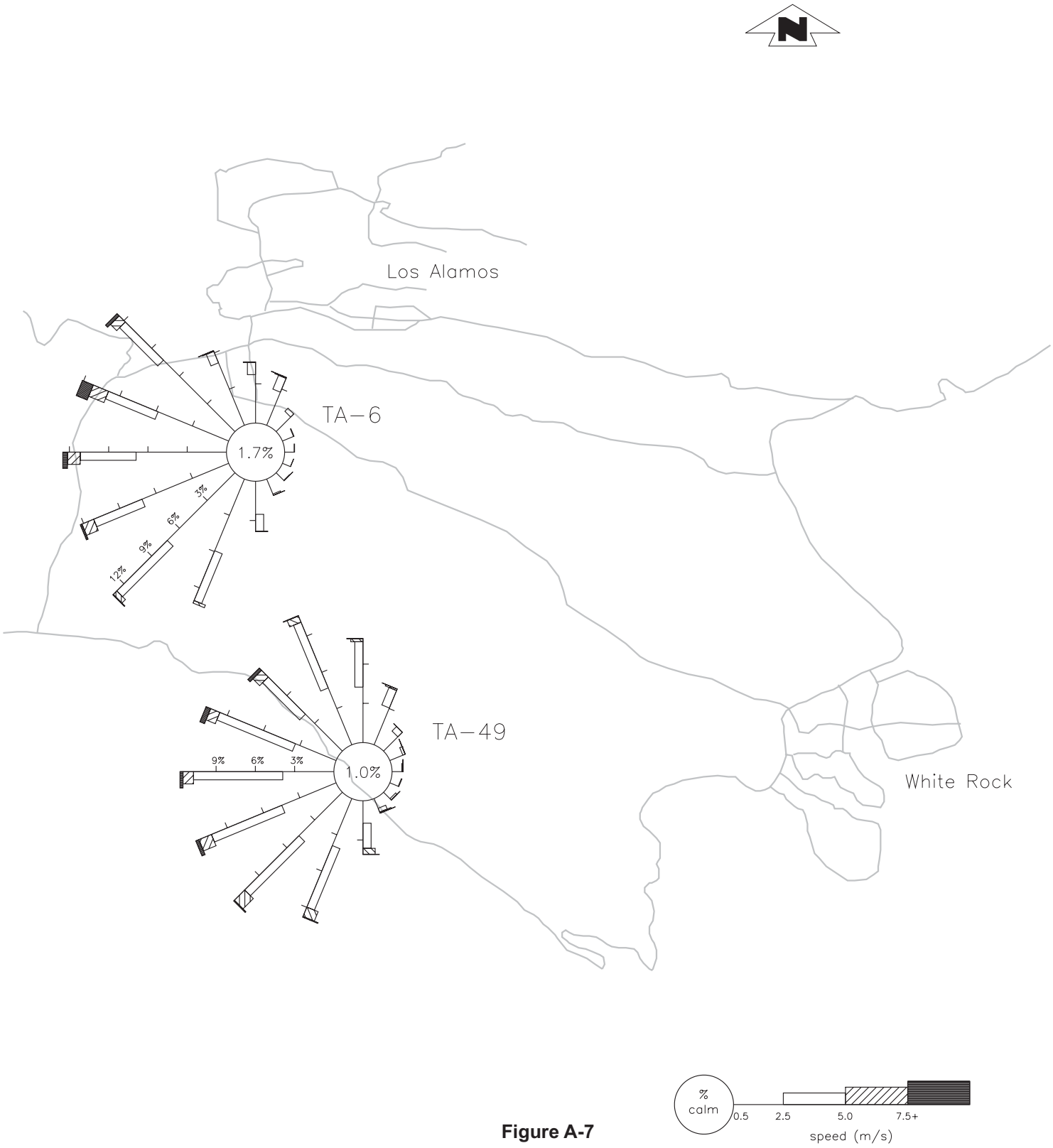

Figure A-7

Annual Wind Roses for Los Alamos National Laboratory -- Nighttime (2002)

Figure A-8

Location Map of Access Gates, HE Exclusion Area Boundary, and Security Fences in the Vicinity of Technical Area 16

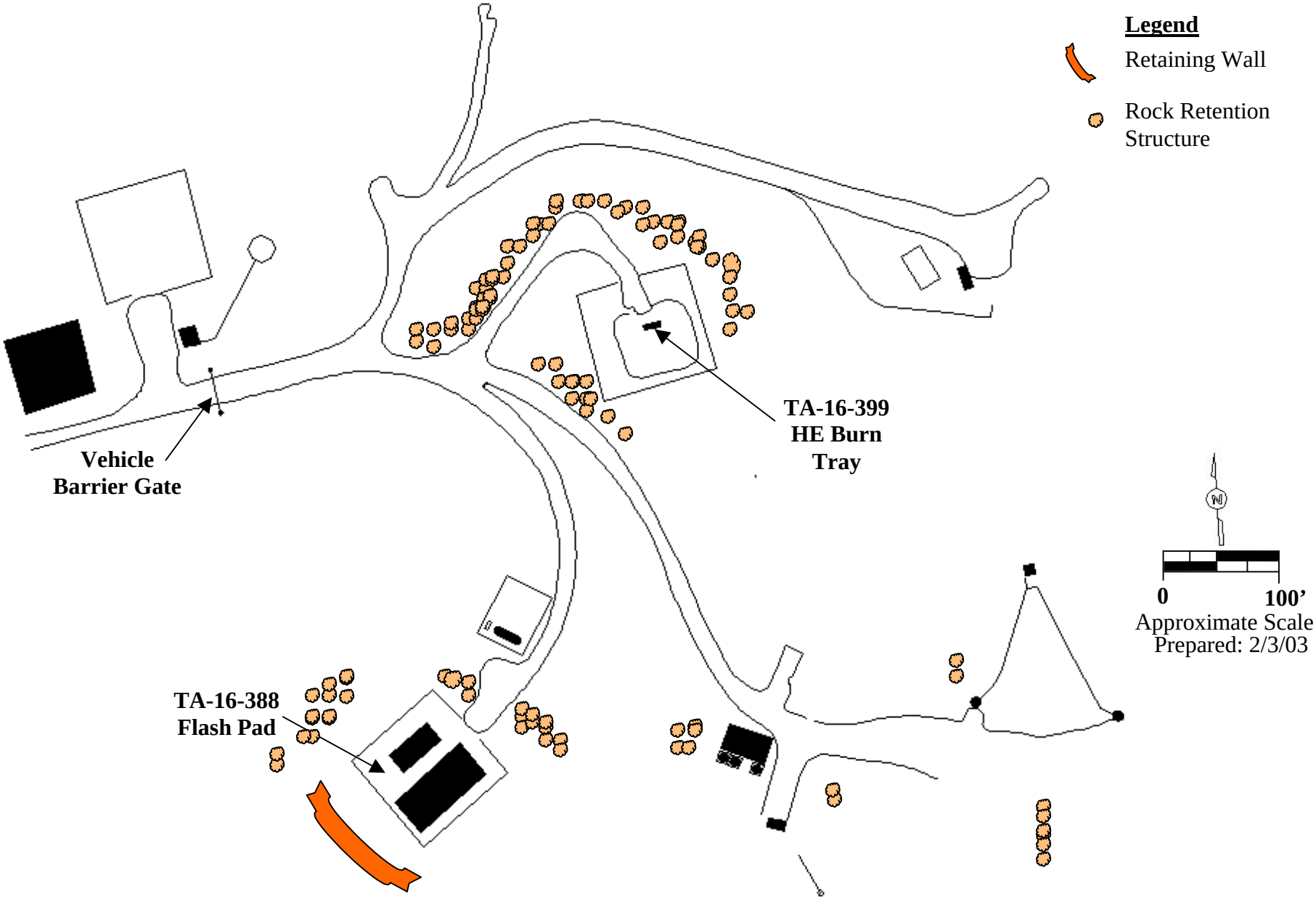

Figure A-9

Drainage Control Features for the Technical Area (TA) 16 Burn Ground

ATTACHMENT B

WASTE ANALYSIS PLAN

ATTACHMENT B
WASTE ANALYSIS PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(2); 20.4.1 NMAC § 264.13; and 20.4.1 NMAC § 268.7, revised June 14, 2000, waste analysis requirements for hazardous wastes managed at Technical Area 16 are addressed in Appendix B of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT C

INSPECTION PLAN

ATTACHMENT C
INSPECTION PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(5), and 20.4.1 NMAC § 264.15, revised June 14, 2000, inspection requirements for the hazardous waste management units at Technical Area 16 are addressed in Appendix C of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT D

PERSONNEL TRAINING PLAN

ATTACHMENT D

PERSONNEL TRAINING PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(12), and 20.4.1 NMAC § 264.16, revised June 14, 2000, training requirements for workers who manage hazardous waste at the Technical Area 16 open burning units are addressed in Appendix D of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT E

CONTINGENCY PLAN

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E-1	Emergency Equipment at the Technical Area (TA) 16 Burn Ground

LIST OF FIGURES

FIGURE NO.	TITLE
E-1	Evacuation Routes and Muster Area at the Technical Area (TA) 16 Burn Ground

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ESA	Engineering Sciences and Applications
LANL	Los Alamos National Laboratory
OB	open burning
TA	technical area

ATTACHMENT E

CONTINGENCY PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart V, Part 264, Subpart D, and 20.4.1 NMAC § 270.14(b)(7), revised June 14, 2000, contingency measures applicable to the open burning (OB) units at the Technical Area (TA) 16 Burn Ground are provided in Appendix E of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. Specific information on emergency response resources and release prevention/mitigation at TA-16 is provided below.

Figure E-1 shows the evacuation routes and muster area that may be used at the TA-16 OB units in the event of an emergency. In addition, a listing of emergency equipment currently available for use at the TA-16 Burn Ground is included as Table E-1. The evacuation routes, muster area location, and emergency equipment are subject to change as conditions or facility procedures warrant.

E.1 EMERGENCY RESPONSE RESOURCES

The Engineering Sciences and Applications (ESA) Division is responsible for the TA-16 OB units. Appropriate ESA personnel have been trained in emergency procedures.

E.2 RESPONSIBILITY

At TA-16, ESA Division is responsible for correction of a nonsudden release from the TA-16 OB units if the correction can be performed safely with normal maintenance and management procedures. Personnel from the Emergency Management and Response Office may provide assistance in mitigating releases. Any correction methods for nonsudden releases that have resulted in an impact to the environment will be coordinated with the New Mexico Environment Department.

E.3 REMEDIAL ACTION

Contingency or emergency measures are unanticipated "fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste . . . " for which a schedule of remedial actions cannot be reasonably ascertained. Any remedial actions carried out under the provisions of the contingency plan will be performed as soon as possible to ensure protection of human health and the environment, as described in Appendix E of the LANL General Part B. These remedial actions

may include site cleanup; proper handling of recovered waste, contaminated soil, or contaminated surface water; decontaminating equipment, as needed; replacing or repairing equipment, as needed; and testing to verify successful cleanup.

ESA Division personnel conduct regularly scheduled inspections at TA-16 to detect deterioration and/or failure of containment at the TA-16 OB units. If an inspection reveals deterioration or failure, personnel ensure that maintenance or replacement is performed, as appropriate.

Table E-1
Emergency Equipment at the Technical Area (TA) 16 Burn Ground[a]

FIRE CONTROL EQUIPMENT

Fire extinguishers are located at or in:

Tank-truck garage (TA-16-1507)
Control Building (TA-16-389)
High Explosives Wastewater Treatment Facility (HEWTF) (TA-16-1508)
Each truck used to transport high explosives

General Capabilities

These portable units may be used by any properly trained employee in the event of fire.

Seven fire hydrants are located at the TA-16 Burn Ground.

General Capabilities

The fire hydrants will supply water at adequate volume and pressure to satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 264.32, revised June 14, 2000.

Water spigots are located at TA-16-388 and TA-16-399.
A fire alarm pull station is located at the HEWTF.
The Central Alarm Station is notified before all open burning operations. In dry conditions, when operations may result in a grass fire, the Los Alamos County Fire Department is notified and requested to prepare to respond.

SPILL CONTROL

Portable berms to contain spills are stored in an all-weather cabinet near the center of the TA-16 Burn Ground, at the less-than-90-day storage area (TA-16-386), and beside the Control Building.

COMMUNICATION EQUIPMENT

Telephones are available at the Control Building, at the HEWTF, and at the railroad gate at the entrance to the Burn Ground.

General Capabilities

Telephones for internal and external communication are available for use by all employees.

See footnotes at end of table.

Table E-1 (continued)
Emergency Equipment at the Technical Area (TA) 16
Burn Ground[a]

DECONTAMINATION EQUIPMENT

Eyewash stations are located in the tank-truck garage and in the HEWTF.

Water spigots with hoses attached are available at the TA-16-388 Flash Pad/Burn Tray and the TA-16-399 HE Burn Tray for general wash down.
Material Safety Data Sheets (MSDS) are available at the Control Building.

General Capabilities

Eyewashes are used by personnel who receive a chemical splash to the eyes. MSDSs for the chemical(s) should be obtained prior to working with hazardous waste or hazardous material to determine if the application water is indicated for decontamination. The MSDSs are also maintained to provide information during emergency response.

PERSONNEL PROTECTION EQUIPMENT

Respirators, coveralls, and safety glasses are available for TA-16 personnel during waste-handling operations.
All vehicles are equipped with first-aid kits.

[a] Equipment types and locations are subject to change.

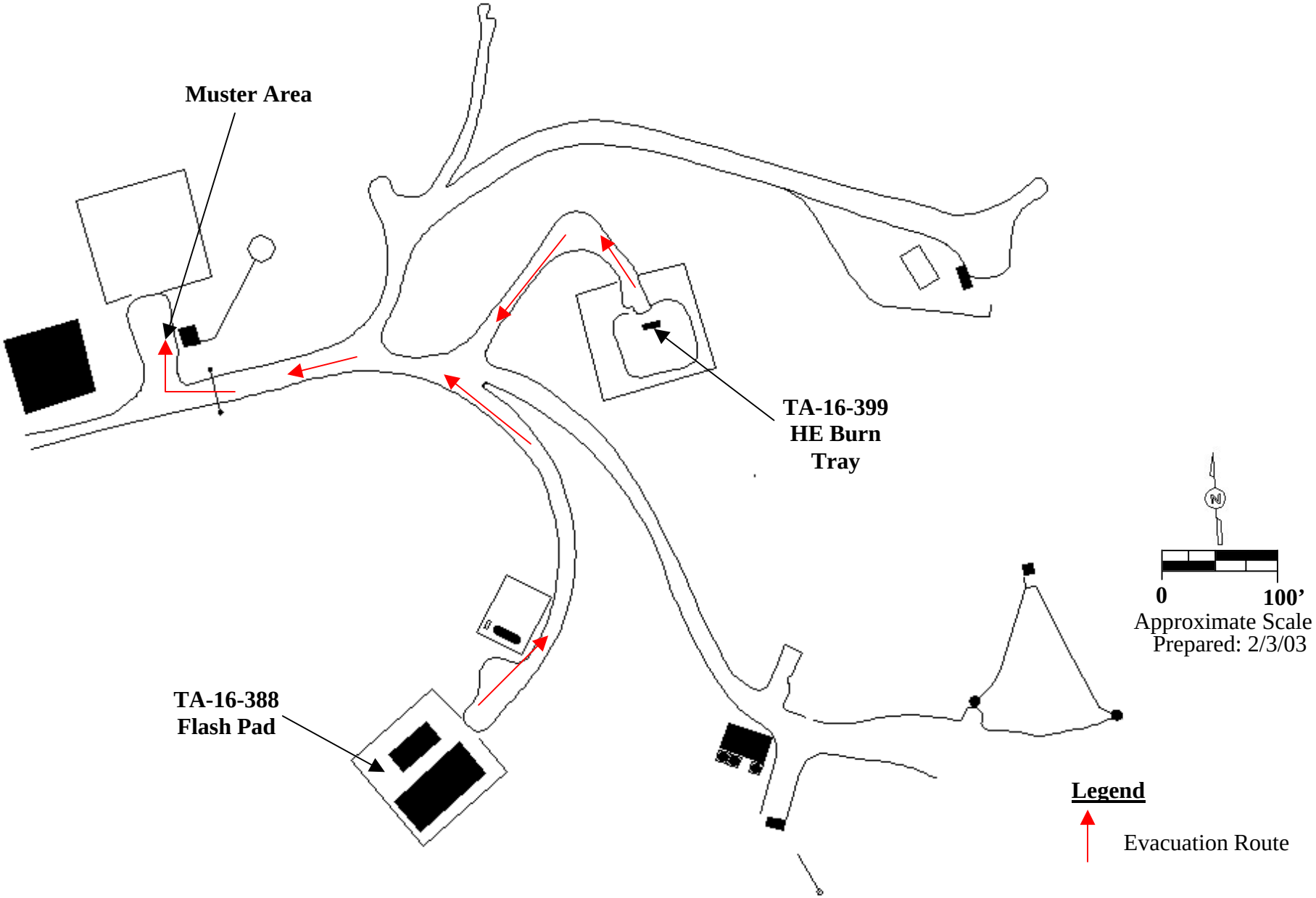

Figure E-1

Evacuation Routes and Muster Area at the Technical Area (TA) 16 Burn Ground

ATTACHMENT F

CLOSURE PLAN FOR THE TECHNICAL AREA 16 OPEN BURNING UNITS

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F-1	General Schedule for Closure Activities at the Technical Area 16 Open Burning Units

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ASTM	American Society for Testing and Materials
COPC	contaminants of potential concern
DOE/NNSA	U.S. Department of Energy, National Nuclear Security Administration
EPA	U.S. Environmental Protection Agency
HE	high explosives
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
lb(s)	pound(s)
NMED	New Mexico Environment Department
OB	open burning
PPE	personal protection equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RRES-SWRC	Risk Reduction and Environmental Stewardship Division Solid Waste Regulatory Compliance Group
SAP	sampling and analysis plan
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
TA	technical area

ATTACHMENT F
CLOSURE PLAN FOR THE TECHNICAL AREA 16 OPEN BURNING UNITS

This closure plan describes the activities necessary to close the hazardous waste open burning (OB) units at Los Alamos National Laboratory (LANL) Technical Area (TA) 16. The information provided in this closure plan addresses the applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(13), and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and X, revised June 14, 2000 [6-14-00].

Closure of each OB unit will include treatment or removal of any remaining untreated hazardous waste and management of hazardous waste residues and contaminated system components in accordance with the closure performance standards. Verification that closure performance standards have been met will be provided to the New Mexico Environment Department (NMED). In the event that the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G cannot be achieved, this closure plan may be modified to request alternative closure requirements, as allowed by 20.4.1 NMAC § 264.110(c). Closure activities will minimize the need for further maintenance, preclude the release of hazardous waste or hazardous constituents to environmental media, and be protective of human health.

This closure plan will be used to provide guidance and permit conditions for the partial closure of the OB units at TA-16. Closure of the TA-16 OB units will likely occur separately and over the active life of the TA-16 facility. Because there is a high potential that decontamination procedures, analytical verification procedures, and the environmental characterization of TA-16 will change and improve over the active life of the facility, this closure plan describes the general closure activities for the OB units at TA-16 and establishes the procedure of submitting a separate detailed TA-16 OB unit-specific sampling and analysis plan (SAP) to the NMED for approval 90 days prior to the time of closure for each OB unit. The SAP will provide the required level of detail to assure that closure performance standards are met, consistent with the appropriate decontamination and verification requirements existing at the time of closure.

This attachment is organized as follows:

- General closure information (Section F.1)
- Descriptions of the TA-16 OB units (Section F.2)
- Closure procedures for the TA-16 OB units (Section F.3)
- Sampling and analysis plan (Section F.4).

Until closure is complete and has been certified in accordance with 20.4.1 NMAC § 264.115 [6-14-00], as discussed in Section F.1.6, a copy of the approved closure plan and any approved revisions will be on file at LANL's Risk Reduction and Environmental Stewardship Division Solid Waste Regulatory Compliance Group (RRES-SWRC) and at the U.S. Department of Energy, National Nuclear Security Administration (DOE/NNSA) Los Alamos Site Office (LASO).

F.1 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13), and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H [6-14-00], as applicable.

F.1.1 Closure Performance Standard [20.4.1 NMAC § 264.111]

The TA-16 OB units will be closed to meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Subparts G and X [6-14-00].

F.1.2 Partial and Final Closure Activities [20.4.1 NMAC § 264.112(d)]

Partial Resource Conservation and Recovery Act (RCRA) closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. Partial closure at TA-16 will consist of closing one or more of the TA-16 OB units, while leaving the other units at LANL in operation. Partial closure (hereinafter simply referred to as closure) will be deemed complete when the closure performance standards have been met and verified; the closure certification has been submitted to the NMED; and the NMED has approved the closure.

Final RCRA closure of the LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each waste management unit, including all previous closures as well as land-based units where closures have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED, and the NMED has approved the final closure.

F.1.3 General Closure Schedule [20.4.1 NMAC §§ 264.112(b)(6), 264.112(e), and 264.113]

Closure of the TA-16 facility is anticipated to occur in the year 2100; however, closure of a TA-16 OB unit may occur at any time before then. Written notification will be provided to the NMED before the start of closure activities for each TA-16 OB unit. Removing hazardous wastes and decontaminating or dismantling equipment in accordance with an approved closure plan may be conducted at any time before or after notification of closure, pursuant to 20.4.1 NMAC § 264.112(e) [6-14-00]. Closure activities will begin according to the requirements of 20.4.1 NMAC § 264.112(d)(2) [6-14-00]. Treatment, removal, or disposal of hazardous wastes will begin in accordance with the approved closure plan, as required by 20.4.1 NMAC § 264.113(a) [6-14-00]. In the event that closure activities cannot begin at a unit within 90 days, LANL will notify the Secretary of the NMED in accordance with the extension requirements in 20.4.1 NMAC § 264.113(a) [6-14-00]. Closure activities will be completed in accordance with the requirements of 20.4.1 NMAC § 264.113(a) [6-14-00]. Closure will be conducted in accordance with the general schedule presented in Table F-1. Further details regarding the schedule of closure activities on an OB unit-specific basis will be included with the OB unit-specific closure SAP discussed in Section F.4 of this plan. In the event that closure of an OB unit is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC § 264.113(b) [6-14-00]. In addition, the demonstrations in 20.4.1 NMAC §§ 264.113(a)(1) and (b)(1) will be made in accordance with 20.4.1 NMAC § 264.113(c) [6-14-00].

F.1.4 Amendment of the Closure Plan [20.4.1 NMAC § 264.112(c)]

In accordance with 20.4.1 NMAC § 264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan
- There is a change in the expected year of closure

- Unexpected events occur during closure that require modification of the approved closure plan
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC § 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

F.1.5 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for closure actions.

F.1.6 Closure Certification [20.4.1 NMAC § 264.115]

Within 60 days after completion of closure activities at each OB unit at TA-16 or final closure of the LANL facility, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit or facility has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE/NNSA and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED, as specified in 20.4.1 NMAC § 264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both DOE/NNSA LASO and RRES-SWRC.

F.1.7 Security

Because of the ongoing nature of waste management operations at TA-16, security and administrative controls for the TA-16 OB units will be maintained by the DOE/NNSA or another authorized federal agency for as long as necessary to prohibit public access. Security and/or administrative fences in the vicinity of the OB units will be maintained to ensure that public access into the vicinity of the OB units is prevented.

F.1.8 Closure Reports

Upon completion of RCRA closure activities at a TA-16 OB unit, a closure report will be prepared and provided to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- The certification described in Section F.1.6
- A general summary of closure activities
- Any significant variance from the approved closure plan and the reason for the variance
- A summary of any sampling data associated with the closure
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data)
- Storage or disposal location of hazardous waste resulting from closure activities
- A certification of accuracy of the report.

F.1.9 Survey Plat and Post-Closure Requirements [20.4.1 NMAC §§ 264.116 and 264.117 through 264.120]

For closure, LANL intends to treat or remove hazardous waste from the TA-16 OB unit undergoing closure, and properly manage hazardous waste residues and contaminated structures and equipment associated with the unit. If decontamination to the cleanup levels approved in the OB unit-specific closure SAP cannot be achieved, LANL intends to dispose of or otherwise manage the contaminated structures, equipment, soil, or other media. If decontamination to these cleanup levels is not achievable, LANL may propose an alternate demonstration of decontamination, as circumstances indicate. A survey plat, post-closure certification, and post-closure notices will be submitted to the NMED, in accordance with 20.4.1 NMAC §§ 264.116, 264.119, and 264.120, if necessary.

If a TA-16 OB unit cannot be closed as described above, LANL will conduct post-closure or equivalent activities in accordance with Appendix G of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the General Part B. A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. A survey plat indicating the location and dimensions of the OB unit with respect to permanently surveyed benchmarks will be submitted to the local zoning authority (i.e., Los Alamos County) and to the NMED at the time of submission of the certification of closure. The plat filed with the local zoning authority will contain a prominently displayed note, which states the obligation of LANL and DOE/NNSA to restrict disturbance of the unit in accordance with the applicable regulations in 20.4.1 NMAC, Subpart V, Part 264, Subpart G. Post-closure notices will be filed with the appropriate authorities, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE/NNSA will file a "Land Use Restriction Notice" or equivalent document with the County of Los Alamos and other authorized agencies. Within 60 days after completion of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00].

F.2 DESCRIPTIONS OF THE TA-16 OB UNITS

This section provides a general description of TA-16 and the TA-16 OB units. LANL does not currently intend to reduce the areal extent or the design capacities of the OB units at TA-16 during the active life of those units. Estimated annual quantities for the OB units at TA-16 are provided in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application," hereinafter referred to as the General Part A.

TA-16 is located in the southwestern portion of LANL. It is situated on a broad mesa that is bound on the north by Cañon de Valle, on the south by State Road 4 and Bandelier National Monument, and on the west by West Jemez Road (State Road 501) and the Santa Fe National Forest. Elevation ranges from approximately 7,700 feet at the west end of the TA to approximately 6,800 feet at the east end. Topography is varied, ranging from steep precipitous canyon walls to sloping mesa tops.

The OB units located at TA-16 are:

- The TA-16-388 Flash Pad, and

- The TA-16-399 HE Burn Tray.

F.2.1 Estimate of Maximum Waste Treated

The maximum total capacity of hazardous waste that may be flashed at the TA-16-388 Flash Pad at any time is 40,000 pounds (lb) per burn; this capacity consists mainly of non-combustible materials. The maximum total capacity of liquid hazardous waste that may be treated at the TA-16-388 Flash Pad is 100 gallons per burn, and the maximum total capacity of wet HE that may be treated is 1,000 lb per burn. The maximum total capacity of hazardous waste that may be treated at the TA-16-399 HE Burn Tray is1,000 lb.

The estimates of the total maximum inventory of hazardous wastes treated over the active life (1980 to present) of each OB unit are:

- TA-16-388 Flash Pad = 273,334 lbs of solids and 666 gallons of liquids
- TA-16-399 HE Burn Tray = 155,315 lbs

F.2.2 Description of Treated Wastes

The TA-16 OB units are used to treat a variety of high explosives (HE)-contaminated wastes including, but not limited to, scrap HE, HE-contaminated equipment and debris, combustible solids, HE wastewater treatment residues (e.g., wet HE and filters), and HE-contaminated liquids. The hazardous wastes treated at the TA-16 OB units are generated at LANL primarily from HE processing (e.g., machining and pressing), research and development activities, decontamination and decommissioning, and environmental restoration activities. Information on the hazardous component(s) of the wastes treated at the TA-16 OB units is provided in the General Part A. Additional information is available in the Waste Analysis Plan in Appendix B of the General Part B.

F.3 CLOSURE PROCEDURES FOR THE TA-16 OB UNITS

Closure activities at the TA-16 OB units will involve the treatment or removal of untreated hazardous wastes, proper management of hazardous waste residues and contaminated structures and equipment associated with the OB units and subsequent appropriate disposition, and verification that the closure performance standards have been achieved.

F.3.1 Removal of Hazardous Waste

After hazardous wastes are treated at each OB unit, non-combustible debris and ash are removed promptly, characterized, and disposed of properly. Therefore, removal of hazardous waste prior to

the initiation of closure activities is not anticipated. Appropriate shipping papers will accompany the treated debris and ash during transport to a waste management facility.

F.3.2 Closure Procedure and Decontamination

Closure activities may include the removal, treatment, segregation, and/or disposition of structures, associated equipment, concrete pads, and/or soil. After removal, materials will be evaluated to determine the need for treatment by OB at TA-16 and/or characterization prior to recycling, further treatment, or disposal. Decontamination procedures, if conducted as part of closure activities, will be verified by sampling and analysis. Decontamination conducted during closure activities will be done as discussed generally in Section F.3.4 and as prescribed in the OB unit-specific SAP (see Section F.4). Sampling and analysis will be done in accordance with appropriate quality assurance/quality control (QA/QC) procedures as required by the individual analytical technique or the authority for the relevant standard methods (e.g., U.S. Environmental Protection Agency [EPA] "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," [*SW-846*], EPA, 1986; American Society for Testing and Materials [ASTM]). Information from the operating record for the OB unit to be closed will be reviewed before proceeding with closure activities. Closure will be conducted in accordance with the general schedule presented in Table F-1, as amended by the TA-16 OB unit-specific SAPs submitted 90 days prior to the actual closures.

F.3.3 Preliminary Closure Activities

F.3.3.1 Safety Precautions

Job hazards associated with closure activities will be identified, controls developed, and workers briefed before closure activities are conducted, in accordance with LANL safety procedures. Before proceeding with closure activities, the OB unit to be closed will receive a thorough visual inspection for unburned materials. Personnel involved in closure activities will wear appropriate personal protective equipment (PPE), specified by the Industrial Hygiene and Safety Group, and will follow good hygiene practices to protect themselves from exposure to hazardous waste. The level of PPE that will be required will depend upon the physical hazards present and the levels of chemical contamination that are detected, if any. Workers involved in closure activities will be required to have appropriate training (see Attachment D in this document and Appendix D in the General Part B). Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

F.3.3.2 Background Determination

Before any decontamination activity begins, background levels for potential hazardous waste constituents will be determined. Decontamination and verification sampling procedures may involve wash water sampling, swipe sampling for HE, soil sampling, or other methods available at the time of closure. If wash water methods are used to decontaminate structures and equipment at the TA-16 OB units, background samples will be obtained from clean water, cleaning equipment, and detergent solutions, if used. Background soil concentration values derived from LANL studies developed under the LANL corrective action or other programs will be used to determine the hazardous constituent background/baseline levels. Details of appropriate background levels and or necessary samples and collection techniques will be included in the TA-16 OB unit-specific SAPs, as discussed in Section F.4 of this closure plan.

F.3.3.3 Structural Assessment

After removal of equipment, the concrete base (if present) of the OB unit will be inspected for any cracks or conditions that could potentially lead to loss of wash water or steam condensate containment if wash water or steam cleaning procedures are used for decontamination. If a crack or gap is present, either a swipe sample or a representative sample of the media (e.g., concrete) will be collected to determine the presence of contamination or the concrete base will be removed and managed appropriately.

If a sample is collected, it will be analyzed for hazardous contaminants of potential concern (COPC) determined through a review of the chemical properties of the waste treated during the operating history of the OB unit and through an evaluation of the history of any spills that may have occurred at the OB unit. If contamination is detected, the surface flaw will be decontaminated prior to repairing the crack or gap.

F.3.4 Decontamination of the TA-16 OB Units

F.3.4.1 Decontamination of Structures, Associated Equipment, Concrete Pads, and Soil

Structures, associated equipment, concrete pads, and soil will be decontaminated, if necessary, and/or removed during closure activities at the TA-16 OB units. The anticipated decontamination procedures are discussed generally in this closure plan, as specific details will be included in the OB unit-specific SAPs to be submitted to the NMED for approval (see Section F.4 of this closure plan). Before proceeding with closure activities, the OB unit to be closed will receive a thorough visual inspection for unburned materials and the OB unit's operating record will be evaluated to determine appropriate COPCs.

OB unit structures and associated equipment are essentially comprised of steel trays and plates, firebrick, sand, burners, mounts, steel pallets, and thermocouples. Most of the structures and equipment will be decontaminated by treatment (i.e., flashing or burning) to remove any HE residuals. Other potential closure activities for the concrete pads, walls, and liners (where present) include decontamination or removal. If the decision is made to decontaminate the concrete pads and/or walls, they will be washed down with decontamination solutions using mops and/or sponges or steam cleaned to minimize the amount of liquid waste generated as a result of decontamination activities. If any portion of an OB unit cannot or will not be decontaminated to acceptable levels, the contaminated portion will be disposed of in accordance with appropriate waste management regulations. Concrete pads and other equipment that are successfully decontaminated may be reused if a potential use is identified.

For structures and associated equipment that will be decontaminated by washing, a portable berm or other device (e.g., plastic sheeting, wading pools, or existing secondary containment) designed to collect and provide containment for used wash water will be used, as necessary. The used wash water will be collected and transferred to appropriate containers, where it will be sampled and analyzed for the COPCs determined during the documentation review. The containers of used wash water will be stored appropriately, pending analysis for decontamination verification. If structures or equipment are steam cleaned at TA-16-400, sumps will be used to contain the steam condensate. Subsequent disposition options for the decontaminated structures and equipment include reuse, recycling, or disposal.

Decontamination of OB unit concrete pads and/or walls will involve removing any contamination through washing the surface with appropriate decontamination solutions, steam cleaning, or physically removing material until decontamination is achieved. Washes will be done with mops and/or sponges or steam cleaning to minimize the amount of liquid waste generated as a result of decontamination activities. A portable berm or other device (e.g., absorbent socks, plastic sheeting, wading pools, or existing secondary containment) designed to collect and provide containment for used wash water or steam condensate will be used, as necessary. After the decontamination process, the used wash water and/or steam condensate will be collected, sampled for analysis, and stored in appropriate containers at the site. Each concrete structure may undergo several wash cycles; however, the option to remove the concrete and manage it as hazardous waste may be exercised at any time.

If the decision is made to not decontaminate the concrete or to remove only the contaminated portions (e.g., by scraping or cold-milling), it will be totally or partially removed and disposed of appropriately in lieu of decontamination activities. The concrete may be transported to and stored at other hazardous waste management locations to facilitate the closure process. If the concrete is totally removed, soil samples will be collected from the area underlying the original concrete. Soil sampling procedures are described generally in Section F.3.4.2. If removal of the contaminated portion of the concrete is successful, the underlying soil will be presumed to be uncontaminated and soil sampling will not be required.

Complete or partial removal of the concrete may be performed until one of the decontamination verification criteria are met. If partial removal is successful in eliminating contamination, it will be assumed that the remaining material, including underlying soil, is clean.

The polypropylene liner associated with the concrete pad at the TA-16-388 Flash Pad will be removed and managed appropriately.

F.3.4.2 Soil Sampling

Closures at the TA-16 OB units may require soil removal to meet one of the decontamination verification criteria. Examples include the detection of contamination that may have migrated beyond a TA-16 OB unit to the surrounding soil, and cases in which operating records indicate that a release of hazardous waste from an OB unit to the surrounding soil has occurred.

If collection of soil samples is determined to be necessary to demonstrate decontamination, background soil concentration values will be established as described in Section F.3.3.2 to provide a baseline for decontamination verification. Sampling locations to determine the extent of contamination will be based upon a biased random sampling approach, including historical evidence of releases, physical evidence of distressed vegetation or visual staining, and any other information that indicates potential contamination. The number of samples, locations, depths, and sampling methods will be determined before closure and included in the TA-16 OB unit-specific closure SAP, as discussed in Section F.4. Results from sampling will be compared to the background samples and/or baseline concentration levels included in the closure SAP. If analysis shows that the soil at the OB unit(s) is contaminated, soil sampling results that are above the background/baseline levels will be used to identify the extent of soil contamination. Soils with levels

of contamination that exceed the decontamination criteria will be removed in layers and sampling will be conducted following removal of each layer. This procedure will be used to minimize the amount of waste generated. The removal and sampling process will be repeated until one of the decontamination criteria is achieved or it is decided to close the OB unit in place, pursuant to 20.4.1 NMAC § 264.603. OB units (i.e., miscellaneous units) that cannot meet the closure performance standards will be managed under post-closure care requirements contained in 20.4.1 NMAC, Subpart V, Part 264, Subpart G. In the case of OB units that are co-located with other solid waste management units and that cannot meet the closure performance standards, closure will be accomplished by stabilizing, as necessary, the wastes and/or waste residues that remain in place and requesting NMED approval to address such units under alternative requirements, as allowed by 20.4.1 NMAC § 264.110(c), to meet post-closure care requirements.

F.3.4.3 Decontamination of Equipment

Prior to use, sampling personnel will ensure that all reusable and/or disposable sampling equipment to be used during decontamination in closure activities is clean. Sampling equipment rinsate blanks, if necessary, will be collected and analyzed in accordance with the QA/QC procedures described in the OB unit-specific closure SAP. Reusable decontamination equipment, including protective clothing and tools, used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash water solution (the OB unit-specific closure SAP will include a discussion of wash water solutions). Residue and disposable equipment as well as reusable decontamination equipment that cannot be decontaminated will be containerized and managed appropriately at an approved on-site facility, depending on the hazardous waste constituents present.

F.3.5 Decontamination Verification

Sampling and analysis sufficient to demonstrate that hazardous waste residue is not present above the decontamination criteria levels at the OB unit after closure will be performed, as needed. Wash water or steam condensate sampling, swipe sampling for HE, or other appropriate sampling and analysis methodologies may be used to verify decontamination. The verification sampling method will be determined at the time of development of the TA-16 OB unit-specific closure SAP and will be based on factors such as COPCs and construction materials of the OB unit. The SAP will establish the minimum number of verification samples based on the overall sampling conditions of the OB unit. Using a biased random sampling approach, structures and/or equipment will be sampled for

verification of decontamination. Sample bias will include known or likely areas of contamination, low areas, and known spill locations, as determined on a case-by-case basis.

For wash water- or steam cleaning-based decontamination verifications (e.g., concrete pads and/or walls), samples of clean wash water solution squeezed from mops and/or sponges prior to use or from the steam cleaner will be collected as background before the initial wash down of any OB unit, as described in Section F.3.3.2 of this closure plan. The samples will be analyzed for the appropriate parameters, as presented in the closure SAP. Analytical procedures will conform to methods found in the most current version of *SW-846* (EPA, 1986) or other approved methods. Used wash down solutions will be analyzed for the same parameters. Structures and/or equipment will be considered contaminated if the used wash water solution shows a significant increase (i.e., determined using statistical methods defined in *SW-846*) in the analytical parameters over those in the clean wash water solution or does not meet other decontamination criteria in Section F.3.6. If subsequent wash downs are deemed necessary, an additional sample of clean wash water solution squeezed from mops and/or sponges prior to use or from the steam cleaner will be taken for each additional wash down event.

Swipe sampling and/or visual examination for HE may be used on a case-by-case basis to determine verification of decontamination at the TA-16 OB units. HE swipe samples will be analyzed using approved methods, which will be included in the closure SAP. The rationale for when the appropriate verification methods will be conducted will also be included in the SAP.

If other sampling methodologies have been developed at the time of closure for the TA-16 OB units, their use to determine decontamination will be addressed in the closure SAP.

For any sampling methodology, decontamination will be verified if the collected samples meet any of the decontamination criteria listed in Section F.3.6 of this closure plan. If the verification sampling indicates contamination higher than the approved values, additional sampling will be performed to establish the boundaries of contamination. After establishing the boundaries of contamination, the decontamination process will be repeated within those boundaries, using portable berms or other appropriate material to limit the potential for run-off from the affected area. An additional round of verification sampling will be performed for all of the areas previously determined to be contaminated. After each decontamination event and verification iteration, a

decision will be made to repeat the process or remove contaminated materials and dispose of them properly.

F.3.6 Decontamination Criteria

Successful decontamination is defined as one of the following criteria:

- No detectable hazardous waste or hazardous waste constituents from treatment activities are found in the final samples.
- Detectable hazardous waste or hazardous waste constituents from treatment activities in the final samples are at or below existing regulatory action levels, as agreed upon with the NMED.
- Detectable hazardous waste or hazardous waste constituents from treatment activities in the final samples identify no statistically significant levels based on baseline concentrations in the clean wash water.
- Detectable hazardous waste or hazardous waste constituents from treatment activities in the final samples are at or below levels agreed upon with the NMED.
- Detectable hazardous waste or hazardous waste constituent concentrations from treatment activities do not significantly decrease after several wash downs. In such an event, hazardous waste constituents that pose an acceptable risk will be allowed to remain, as mutually agreed upon with the NMED.

An alternative demonstration of decontamination may be proposed and justified at the time of unit closure, as circumstances indicate. The Secretary of the NMED will evaluate the proposed alternative in accordance with the standards and guidance then in effect and, if approved, incorporate the alternative into this closure plan.

F.4 SAMPLING AND ANALYSIS PLAN

Sampling and analytical procedures will be performed, as necessary, during the decontamination and verification activities associated with the closure of the TA-16 OB units covered by this plan. These procedures will use standard approved methods (e.g., *SW-846*, ASTM), as appropriate, for making closure decontamination verification determinations. However, the TA-16 OB units may not undergo closure for a relatively long time, and it is probable that sampling and analytical methods will be revised and improved before closure. In order to alleviate the need for future closure plan and permit modifications until actual closure activities are scheduled, LANL will submit TA-16 OB unit-specific closure SAPs to the NMED 90 days prior to the time of closure for NMED review and approval.

The TA-16 OB unit-specific closure SAPs will contain a detailed discussion of the available OB unit information and proposed closure methodology to assure that the closure performance standards are met. The closure SAPs for the TA-16 OB units will include:

- A detailed discussion of site characteristics.
- The OB unit operational history, to include descriptions of known spills, releases, and/or evidence of potential problems (e.g., visual stains, dead vegetation, solid waste management units).
- Chemical properties of the waste treated at the OB unit.
- Determination of applicable COPCs.
- A hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures for decontamination methods for equipment, structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the specific OB unit.
- Methods for sampling and analysis of contaminated media.
- Removal procedures for contaminated media, if necessary.
- Sampling methods for decontamination media and hazardous waste determination. The discussion should include the rationale for using wash water samples, HE swipe samples, soil samples, and/or other sampling methodology.
- Sampling methods for decontamination verification procedures. The discussion should include the statistical or judgmental basis for determining the number of verification samples needed and the constituents to be analyzed for.
- Sampling equipment decontamination and disposition procedures.
- Sample handling and documentation procedures.
- Analytical methods (including detection limits) and the rationale for their determination.
- Disposition of removed waste, decontamination media, or contaminated soils. This discussion should include an identification of proposed on- or off-site hazardous waste management facilities that may be used for final disposition and the types of wastes anticipated to be shipped.

- Decontamination criteria.
- Statistical basis for verification of decontamination, if applicable. The discussion should include information on determination of statistical increases in analytical parameters and numerical values for significant increases.
- Risk assessment procedures to be used, if necessary.
- Field and laboratory QA/QC procedures.
- Schedule of closure activities, including decontamination, sampling, analysis, potential removal of soils, and closure certification submittal.
- Identification of contact person or office.

F.5 REFERENCES

EPA, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA-*SW-846*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

Table F-1

General Schedule for Closure Activities at the Technical Area 16 Open Burning Units

Activity	Maximum Time Required[a]
Submit OB unit-specific sampling and analysis plan (SAP)	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Collect background samples (as specified in SAP)	-5 Days
Final receipt of waste	Day 0
Begin closure activities – final treatment of wastes	Day 5
Decontamination of structure(s) and/or equipment	Day 10
Perform verification sampling of the structures and/or equipment	Day 20
Evaluate analytical data	Day 50
Perform additional decontamination (if necessary)	Day 55
Perform additional sampling (if necessary)	Day 60
Evaluate analytical data	Day 75
Perform asphaltic concrete or concrete decontamination and sampling (if necessary)	Day 80
Evaluate analytical data (if necessary)	Day 95
Perform soil sampling (if necessary)	Day 100
Evaluate analytical data	Day 120
Perform final cleanup (e.g., removal of decontaminated equipment and decontamination wastes)	Day 140
Verify decontamination	Day 150
Submit closure certification to NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously, may not require the maximum time listed, or may require more time than indicated above. Extensions to the schedule may be requested, as necessary.

ATTACHMENT G

TECHNICAL AREA (TA) 16 OPEN BURNING UNITS MANAGEMENT

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
AEHA	U.S. Army Environmental Hygiene Agency
BTU/hr	British thermal units per hour
ºC	degrees centigrade
DOE	U.S. Department of Energy
ESA	Engineering Science and Applications
ft	feet/foot
HE	high explosives
LANL	Los Alamos National Laboratory
NMED	New Mexico Environment Department
OB	open burning
PPE	personal protective equipment
PTLA	Protection Technology Los Alamos
SOP	standard operating procedure
TA	technical area
WMM	Weapon Materials and Manufacturing

ATTACHMENT G

TECHNICAL AREA (TA) 16 OPEN BURNING UNITS MANAGEMENT

The information provided in this attachment is submitted to address the applicable miscellaneous unit requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.23, and 20.4.1 NMAC, Subpart V, Part 264, Subpart X, revised June 14, 2000 [6-14-00], as well as thermal treatment requirements in 20.4.1 NMAC, Subpart VI, Part 265, Subpart P [6-14-00]. This attachment provides an overview of current facility operations and waste management practices for the open burning (OB) units at the Technical Area (TA) 16 Burn Ground and complements the information provided in Section 2.0 of this permit renewal application. It includes detailed descriptions of the OB treatment units, their locations within the Burn Ground, and the current operational and waste management practices associated with them. Requirements for treatment effectiveness; ignitable, reactive, and incompatible wastes; security and access; preparedness and prevention; and volatile organic air emission standards are also discussed. Table G-1 summarizes applicable regulatory references for miscellaneous units and the corresponding location where the requirement is addressed in this permit renewal application.

The TA-16 Burn Ground and the OB units (Figures G-1 and G-2) are managed by Los Alamos National Laboratory's (LANL's) Engineering Science and Applications (ESA)-Weapon Materials and Manufacturing (WMM) Group, which is responsible for the safe treatment, storage, and handling of high explosives (HE)-contaminated waste material generated by the HE production facilities.

G.1 TA-16 OPEN BURNING UNITS

TA-16 is located in the southwestern quadrant of LANL at the west end of the Pajarito Plateau, near the foothills of the Jemez Mountains (see Figure A-1 in Attachment A). The TA-16 OB units are described below.

G.1.1 TA-16-388 Flash Pad

In 1998, the New Mexico Environment Department (NMED) granted LANL Temporary Authorization to upgrade the TA-16-388 HE Burn Tray to a propane-fueled flash pad and burn tray. The upgrade began shortly thereafter. The new designation for TA-16-388 was reflected in the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0 (LANL,

1998), submitted to the NMED in April 1998. The TA-16-388 conversion was subsequently approved by the NMED on May 12, 1999, as a Change During Interim Status, pursuant to 20.4.1 NMAC § 270.72 [6-14-00].

The TA-16-388 Flash Pad (Figures G-3 and G-4) consists of a 22-foot (ft) by 22-ft concrete pad set on a secondary containment area. The base of the flash pad is 12 inches thick. The entire flash pad is contained in a 45-mil Hypalon liner, which is 6 inches below the bottom of the pad and curved up to ground level on all 4 sides, extending out 2 ft from the pad perimeter. Inset one ft from the edge of the concrete pad along the two sides and back is a 3-ft-high, 8-inch-thick, integrally-poured concrete wall. The pad is slanted down toward the back concrete wall, thus providing secondary containment for any spills or run-on/runoff of stormwater. These are collected in the rear of the pad where they either evaporate or can be collected by one of the Burn Ground HE wastewater tank trucks.

Between burns, the unit can be covered with a retractable steel roof, tarps, or other types of covers, unless ash sampling, ash removal, or waste staging requires that the cover be retracted. When waste is being staged or if burning is delayed, the retractable roof, tarps, or other types of covers may be used to cover the waste and prevent it from becoming wind-blown.

The maximum treatment capacity of the flash pad is estimated at 40,000 pounds of solids per burn to accommodate the weights of large machine tools and other equipment. However, large burns are conducted only when absolutely necessary because it is more difficult to assure the HE is destroyed on all materials treated. Instead, burns of several hundred pounds of solids are usually conducted. Liquids are also treated on the flash pad, using steel trays. Although the trays used to treat liquids will hold approximately 100 gallons, usually only about 5 to 30 gallons of liquid waste are treated in any batch. Face shields or other suitable eye protection are worn while liquid is discharged and during cleanup operations when airborne particles constitute an eye hazard. Respirators may be worn when highly hazardous volatile solvents are being handled. Up to 1,000 pounds of wet explosives (e.g., machining chips and filtered HE particles) are also treated at TA-16-388. Occasionally, the wet HE may also contain small amounts of solvents or acids and bases. The propane burners are used to dry the explosives, which burn as they dry. In the event that TA-16-399 is not operational, dry explosives may also be treated at TA-16-388.

The configuration of the flash pad and burners is shown on Figure G-4. The heat sources for the flash pad consist of three 5-ft-long forced-air propane burners with adjustable mounts. A burner is mounted outside the wall on each side and the back of the pad. One to three burners can be used, depending on the amount and configuration of the material to be flashed. The total capacity of the propane supply system is approximately 7 million British thermal units per hour (BTU/hr). Therefore, the output of each burner is dependent on how many are used for a burn. Usually, they are operated at approximately 2 million BTU/hr. This provides adequate heat to bring the material being flashed to a temperature sufficient to destroy HE, typically to a temperature above 400 degrees centigrade (ºC) (see Section G.2.1). To accommodate burning of wet explosives on the TA-16-388 Flash Pad, the propane burners will be modified to remotely pan and tilt. ESA-WMM intends to replace the propane with natural gas to provide a more efficient fuel. The burners and other components will be maintained, modified, and/or replaced, as needed.

Television cameras mounted above the front of TA-16-388 monitor operations at the flash pad, and Burn Ground personnel observe the operations on the monitor in the Control Building (TA-16-389). Lockout keys for the power that operates the flash pad are also located in the Control Building. The lockout keys are removed and carried by personnel working at the flash pad. Once the flash pad has been set up for a treatment and has been barricaded to prevent traffic from approaching the pad, personnel return to the Control Building and monitor the burners using a computer display.

Movable steel equipment is used on the TA-16-388 Flash Pad to stage the many types of HE-contaminated waste to be treated at the pad. This equipment is constructed to be moved with a forklift and will be stored at the unit. One type of waste treated is large, metallic equipment that has been used for HE machining, handling, transportation, and storage. Several steel pallets are positioned in the middle of the flash pad and the equipment to be treated is set on the steel pallets. The pallets protect the integrity of the concrete pad, preventing deterioration caused by the heat and by mechanical impacts. Thermocouples can be placed on and within the equipment being flashed to measure temperatures and document that the materials reached and maintained the required temperature levels for the necessary time (see Section G.2.1).

Much of the noncombustible waste consists of smaller metal items that can be moved by hand. These items are treated in a steel tray, which is lined on the bottom with sand and on the sides

with firebrick. The smaller metal items are positioned in this tray for treatment. After cooling, the items can be reoriented for additional treatment. Thermocouples can be used to determine treatment durations for specific waste streams (see Section G.2.1).

Steel trays are also used in treating combustible solids. Cardboard HE storage containers, cloth and paper used to clean HE, packing material for HE, wooden HE packing crates, and rags used to absorb oil from around HE-processing machines are some of the common combustible materials that must be treated. These materials are stacked on the steel tray and covered with a steel screen. The burners are used to thoroughly ignite the material and may be turned off if the burn is self-sustaining. Before removing the residues (if any), the material is inspected for thorough combustion and burned again, if necessary.

A steel tray, combined with a smaller steel tray, is used to destroy HE contamination in small batches of water-solvent solutions, acids, bases, or oils. These wastes are usually received in small polyethylene jars packed in a secondary container. These liquids are placed in the smaller tray and the propane-fired burners are used to ignite combustible gases and heat HE to the temperatures necessary for its destruction (see Section G.2.1).

Soil contaminated with explosives, residues from the TA-16-399 HE Burn Tray that require further treatment, and similar contaminated noncombustible particulate matter are also treated at the flash pad. These waste types are placed in a tray that is set on an open frame and covered with a steel plate. This assembly is set in the middle of another tray. Thermocouples can be set in the middle of the particulate matter to monitor the temperature (see Section G.2.1).

In addition to the steel pallets and steel trays already described, several other movable steel devices are being considered for use on the flash pad to optimize burning and/or prevent waste compaction. The first device is a cage of expanded steel screen to better contain combustibles during burning. The second device is an apparatus for treating the noncombustible particulate material described above in a more efficient manner. For the second device, one method being considered is to trap the material between two narrowly separated steel plates and heat both plates until the desired temperature is reached. The treated material would then be released into a container and the apparatus would be refilled from a hopper. A second method is to continuously release the material from a hopper, through a flame, and into a container. A third

device required may be steel stands on which HE-contaminated pipes are supported. As waste types change, other devices may be needed to effectively treat the wastes.

G.1.2 TA-16-399 HE Burn Tray

The TA-16-399 HE Burn Tray is a 4-ft-wide, 16-ft-long steel tray, supported on 1.5-ft-high legs, and lined with firebricks (Figure G-5). The treatment capacity of the TA-16-399 HE Burn Tray is 1,000 pounds of waste per burn. Explosives to be burned, usually rejects from pressing and machining operations and also HE pieces that are no longer useful, are transported to the HE burn tray packed in cardboard and wooden boxes. Padding is placed on the tray and the explosives are removed from the boxes and set on the padding. The padding is then dampened with kerosene, electric matches (squibs) are connected to the firing cables, and a train of excelsior saturated with kerosene is run from the squibs to the padding. All personnel then go to the Control Building and the squibs are fired remotely. The burn is observed by Burn Ground personnel located in the Control Building, using a television camera located near TA-16-388 and a monitor and a periscope located in the Control Building. The ash is later inspected for unburned HE or other residues that do not appear to be fully treated. The cover of the TA-16-399 HE Burn Tray is placed over the residue until it can either be treated again on the burn tray or on the TA-16-388 Flash Pad.

Between burns, the TA-16-399 HE Burn Tray is covered, unless an ash sample is being collected, ash is being removed, or waste is being staged. The portable cover or a tarp is used to cover the unit.

G.2 OPERATIONAL AND WASTE MANAGEMENT PRACTICES

The OB units at TA-16 treat only hazardous solid and liquid wastes that are either pure HE or contaminated with HE. This section describes the operational and waste management practices used to stage and treat the waste, as well as the disposition of residues. Information on treatment effectiveness; ignitable, reactive, and incompatible wastes; security and access; preparedness and prevention; and volatile organic air emissions standards are also presented herein. The waste streams treated at these units are described in Table B-6 of Appendix B in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B.

G.2.1 General Burning Procedures

Treatment of hazardous waste at the TA-16 OB units is conducted using a non-continuous [batch] thermal treatment process, in accordance with the requirements specified in 20.4.1 NMAC § 265.373 [6-14-00]. Open burning of wastes at the TA-16 OB units is conducted in a manner that does not threaten human health or the environment. Prior to OB operations at the TA-16 Burn Ground, the area is cleared of all but authorized Burn Ground personnel. A barrier is placed across the road to prevent entry.

The closest property not owned by LANL is at a distance greater than one mile from the TA-16 OB units. Therefore, a safe distance is maintained between the HE burn sites and the property of others, as required in 20.4.1 NMAC § 265.382 [6-14-00].

The master controls for each of the TA-16 OB unit's firing circuits are located inside the Control Building. The Control Building is no less than 300 ft from all OB operations. Operational procedures require that OB not be undertaken at a time of impending electrical storms and during high wind conditions. OB may also be restricted during periods of high fire danger and adverse atmospheric conditions. All OB operations are conducted in accordance with appropriate LANL standard operating procedures (SOP). Adherence to the SOPs ensures safe and efficient HE destruction and decontamination of flashed materials. Although it is highly unlikely, both of the TA-16 OB units could be operated in one day.

A minimum temperature of 400 ºC has been determined as the temperature needed to thermally degrade the types of HE-contaminated wastes generated at LANL and treated at the TA-16 OB units. For incombustible solid HE-contaminated wastes, thermocouples can be placed on the wastes to be treated and temperatures monitored to determine the treatment duration for various waste streams. Thermocouples can also be used when a new waste type is introduced and the treatment duration needs to be determined. For liquids, heat is applied until the liquids are consumed. In the unlikely event that complete destruction of HE cannot be achieved, any incompletely treated wastes are treated again.

G.2.2 Waste Staging

Waste staging varies by treatment process. The factors influencing how wastes are staged are safety, the degree of difficulty in placing or removing wastes from an OB unit, and the influence of weather conditions. The staging procedures by unit are described below.

Bulk HE treated at the TA-16-399 HE Burn Tray and at the TA-16-388 Flash Pad are initially accumulated in less-than-90-day storage areas and satellite accumulation areas until the day of treatment. Safety concerns dictate that HE be immediately burned after arriving at the Burn Ground. These wastes are not staged unless they can be burned immediately.

Because the amount of liquid waste treated at the TA-16-388 Flash Pad is small and staging of this waste does not involve complicated collection and transport procedures, the waste to be treated is transported from less-than-90-day storage areas and satellite accumulation areas just before a planned burn. It is usually possible to ensure that the environmental conditions (e.g., wind speed, fire conditions) required by the NMED Air Quality Bureau can be met before the waste is staged. In the event of an unforeseen delay, the waste is covered until it can be burned.

The most difficult wastes to stage are the solids treated at the TA-16-388 Flash Pad. The wastes are accumulated in less-than-90-day storage areas and satellite accumulation areas until several days before flashing. Depending on the size and amount of waste to be flashed, it may take several days to stage the waste on the pad. The waste material to be treated may include relatively large quantities that involve extensive scheduling of collection and transport resources, may require equipment such as cranes or additional procedures for lifting large pieces, and require complicated stacking arrangements on removable steel supports. Because the staging of this material is complex, it may not always be possible to ensure that the meteorological conditions required for good dispersion will exist at the scheduled burn time. If burning is delayed, a cover is placed over the waste.

G.2.3 Waste Management Practices [20.4.1 NMAC, Subpart V, Part 264, Subpart X]

The wastes treated are both homogeneous (e.g., solid explosives, scrap explosives) and heterogeneous (e.g., excess equipment, remediation debris). The waste streams are described in Appendix B of the LANL General Part B. The wastes are treated to remove the characteristic of reactivity, although other characteristic and listed hazardous waste may be present in the

wastes being treated. Whereas burning will treat a number of waste constituents (e.g., HE, solvents), metals (if present) will not be destroyed. They will remain in the residues, which are characterized by acceptable knowledge or are sampled and analyzed for appropriate Toxicity Characteristic Leaching Procedure metals and other metallic underlying hazardous constituents, as needed. If hazardous, the residues are sent to an appropriate permitted facility for treatment/disposal. HE-contaminated wastes may be treated at the TA-16 OB units to desensitize or declassify the waste. Components of the OB units (e.g., burn trays, steel plates) consist of nonhazardous materials only (e.g., steel).

Waste containers for small pieces of explosives-contaminated waste and explosive material generally consist of plastic bags, 55-gallon drums, 30-gallon carboys, or paper-lined cardboard boxes. The waste is placed within a container, sealed, and labeled appropriately. These waste containers are then stored in a less-than-90-day storage area or a satellite accumulation area. Pieces of waste that cannot fit into boxes or drums (e.g., large equipment and debris) are stored in movable storage bins, such as covered roll-off bins. These bins are designated as less-than-90-day accumulation areas. They can be transported directly to the TA-16 OB units for staging and subsequent treatment of the waste.

Waste to be treated is collected from various less-than-90-day storage areas and satellite accumulation areas at the facility. When loading waste, the cargo compartment of the transport vehicle(s) is checked to ensure that it is clean and contains no loose items such as tools or pieces of metal. For transport, the wastes are placed in an enclosed compartment or secured with tie-downs. The load limit for transporting explosives is determined by the capacity of the transport vehicle(s). Wastes are transported by appropriately trained personnel in a designated vehicle(s) to the TA-16 Burn Ground. The waste is unloaded from the vehicle(s) and placed at the OB unit by qualified technicians/specialists. A visual examination is conducted after unloading to ensure that no explosive material remains in the transport vehicle(s).

Wetting of an area around a TA-16 OB unit prior to use is done only when vegetation is dry enough to create a potential fire danger. A garden hose is used and only the ground surface is wetted. The amount of water is not sufficient to cause ponding, erosion, or act as a driving force for dispersing legacy contamination from past uses of the area.

For safety reasons, the U.S. Department of Energy (DOE) Explosives Safety Manual (DOE M 440.1-1; DOE, 1996) requires that no entry should be allowed into the treatment area until 8 hours have elapsed, unless it can be determined through visual observation that all explosives have been destroyed. The manual also requires that no ash be collected or removed for 24 hours following a burn. In accordance with this requirement, ash is usually removed, drummed, and sampled (if necessary) immediately after the 24-hour period, unless a visual inspection and/or HE Spot Test indicates that the waste must be treated again, or if the ash is heterogeneous and requires special sampling. In the first case, the waste is left on the structure, covered, and treated again as soon as weather conditions allow. In the second case, the ash is covered until sampling personnel can be scheduled to conduct proper sampling (typically in a day or two); as soon as samples are collected, the ash is drummed. Drums containing the ash are stored in a less-than-90-day storage area. The ash is then sent off site for disposal or for further treatment, based on the analytical results and on the original U.S. Environmental Protection Agency Hazardous Waste Numbers assigned to the waste before treatment. Scrap metal that can be certified as free of HE is sent off site for recycling. Other residues are disposed as New Mexico Special Waste in accordance with 20.9.1 NMAC in a landfill licensed to accept these wastes.

LANL minimizes the impact to the environment by conducting treatment operations in a strictly controlled, remote area within the LANL boundaries. Treatment operations are not conducted during adverse conditions to minimize wind dispersal of ash and particulate matter to the environment. Wind dispersal of ash is minimized by prohibiting burns during periods of high winds, removing ash as soon as practicable, and for waste types likely to generate ash (e.g., cardboard boxes, wipes), covering the waste with a screen prior to burning. Ash production has also been minimized through the use of propane burners instead of wood as fuel.

G.2.4 Treatment Effectiveness [20.4.1 NMAC § 270.23(d)]

To address the applicable miscellaneous unit requirement specified in 20.4.1 NMAC § 270.23(d) [6-14-00], a demonstration of treatment effectiveness must be included for the TA-16 OB units. As indicated in the U.S. Army Environmental Hygiene Agency (AEHA) guidance document titled "RCRA Part B Permit Writer's Guidance Manual for Department of Defense Open Burning/Open Detonation Units" (AEHA, 1987), a demonstration of treatment effectiveness can be based on laboratory or field data. For wastes treated by OB, information demonstrating that any residues remaining after burning are not reactive (i.e., as defined by the

Resource Conservation and Recovery Act) should be provided. At the TA-16 OB units, this is accomplished by testing the residue for HE. If HE is present in the residue, it is treated again.

G.2.5 Ignitable, Reactive, and Incompatible Wastes [20.4.1 NMAC § 264.17(a)]

Applicable requirements for the management of ignitable, reactive, and incompatible wastes at the TA-16 OB units are addressed in Section 2.5 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC § 270.14(b)(9), and 20.4.1 NMAC § 264.17(a) and (b) [6-14-00].

G.2.6 Security and Access [20.4.1 NMAC §§ 270.14(b)(4) and 270.14(b)(19)(viii); 20.4.1 NMAC § 264.14]

The following describes the security features in place at the TA-16 Burn Ground in accordance with the requirements of 20.4.1 NMAC §§ 270.14(b)(4) and 270.14(b)(19)(viii), and 20.4.1 NMAC § 264.14 [6-14-00].

After clearing non-authorized personnel from the OB unit area, a barrier is placed across the road before OB operations are conducted to reduce the possibility of entry into this area. In accordance with 20.4.1 NMAC § 270.14(b)(19)(viii) [6-14-00], the locations of the security fence and access gates at TA-16 are shown on Figure A-8 of Attachment A. (The locations of fences and gates are subject to change.) Collectively, these security procedures and the security features discussed below prevent the unknowing entry and minimize the possibility for unauthorized entry of persons into the units, in accordance with the requirements of 20.4.1 NMAC § 264.14(b)(2) [6-14-00].

The TA-16 OB units are located within a secured area at which security is maintained through both administrative controls and physical barriers. Access to the area can only be gained through controlled entry stations by persons possessing appropriate security clearance and site-specific training. The access stations are controlled by Protection Technology Los Alamos (PTLA) security personnel or by badge and palm readers 24 hours a day. In addition, entry into the Burn Ground is through an industrial fence with access granted through an ESA-controlled station. PTLA security personnel inspect security fences on a regular basis, and repairs are made as necessary. Warning signs are posted near the entrance to the area and can be seen by personnel approaching the area. The legends on the signs indicate "Danger--Authorized Personnel Only" or “Danger--Unauthorized Personnel Keep Out.” Warning signs are legible from a distance of 25 ft and are written in English and Spanish.

G.2.7 Preparedness and Prevention Requirements [20.4.1 NMAC, Subpart V, Part 264, Subpart C]

The following sections present how operations at the TA-16 OB units comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00].

G.2.7.1 Required Equipment [20.4.1 NMAC § 264.32]

In accordance with the requirements of 20.4.1 NMAC § 264.32 [6-14-00], the TA-16 Burn Ground is equipped with adequate emergency equipment, which includes internal and external communication equipment, alarm systems, fire extinguishers, and fire control and decontamination equipment. Emergency equipment at the Burn Ground is discussed in the following sections and is summarized in Table E-1 in Attachment E of this permit renewal application. LANL-wide emergency equipment available for use at any of the LANL waste management units is presented in Appendix E of the LANL General Part B.

G.2.7.2 Testing and Maintenance of Equipment [20.4.1 NMAC § 264.33]

Communications and alarm systems and fire protection and decontamination equipment associated with the OB units are tested and maintained according to the inspection schedule detailed in Appendix C of the LANL General Part B. The frequency of inspection is adequate to assure proper operation in the event of an emergency. Repair and replacement of emergency equipment are performed, as needed.

G.2.7.3 Access to Communications or Alarm Systems [20.4.1 NMAC § 264.34]

Whenever treatment operations are being conducted at the OB units, personnel have immediate access to an emergency communication device, either directly or through visual or voice contact with another individual. In the event of an emergency, two-way radios, pagers, and/or telephones allow personnel to contact the operating group management, the Emergency Management and Response Office, and/or the Central Alarm Station operator (refer to Appendix E of the LANL General Part B).

G.2.7.4 Space Requirements [20.4.1 NMAC § 264.35]

Adequate space is maintained at the TA-16 OB units to allow the unobstructed movement of personnel and fire protection, spill control, and decontamination equipment in the event of an emergency.

G.2.7.5 Support Agreements with Outside Agencies [20.4.1 NMAC § 264.37]

Information on support agreements with outside agencies, as required by 20.4.1 NMAC § 264.37 [6-14-00], is presented in Section 2.0 of the LANL General Part B.

G.2.7.6 Preventive Procedures, Structures, and Equipment [20.4.1 NMAC § 270.14(b)(8)]

Descriptions of the preventive procedures, structures, and equipment at the TA-16 OB units are presented below. This information is provided in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(8) [6-14-00]. Adherence to the procedures and proper use of the structures and equipment will help to prevent hazards, prevent undue exposure of personnel to hazardous waste, and prevent releases to the environment.

At the TA-16 OB units, large pieces of explosives-contaminated waste or explosive materials are typically handled using mechanical equipment such as a truck-mounted crane or a hydraulic lift gate. Small containers of waste are handled manually or with a dolly. The use of proper handling equipment, appropriate to the size and weight of the waste item, helps to prevent hazards while moving waste at the units. Additionally, personnel involved in waste-handling and container-handling operations at the units are knowledgeable about the physical and chemical properties of the waste managed at the site and take additional precautions, as necessary, to ensure that wastes are handled safely.

Pursuant to the requirements of 20.4.1 NMAC § 270.14(b)(19)(xi) [6-14-00], Figure A-5 in Attachment A shows surface contours and drainage around the units. Engineering controls are in place to prevent runoff of wastes from the units to other areas of the facility or to the environment (see Figure A-9 in Attachment A).

It is not anticipated that there will be any impact to groundwater or other water supplies as a result of treatment operations at the units because engineering and operational controls ensure that run-on and runoff are minimized. The TA-16-388 Flash Pad is equipped with a retractable cover and secondary containment to prevent run-on and runoff. The TA-16-399 HE Burn Tray is equipped with a movable cover to prevent run-on into this structure. Tarps or other types of covers may also be used at the TA-16-388 Flash Pad and the TA-16-399 HE Burn Tray.

Electrical power is supplied to the Control Building. Supplied power at this building operates lighting, telephone, alarm, and monitoring systems. Operations at the units would be discontinued temporarily if electrical power was not restored quickly.

Safety shoes, safety glasses, and other personal protective equipment (PPE) required in explosives areas are worn by workers during routine operations at the units. Additional appropriate PPE is available should abnormal or unusual conditions require such equipment.

Releases to the atmosphere resulting from treatment activities at the units cannot be prevented. However, impacts are kept to a minimum through operating practices and burning under appropriate atmospheric conditions. Air releases from OB operations are regulated by NMED's Air Quality Bureau under 20.2.60 NMAC. The regulation of air impacts is discussed further in Section H.5.

G.2.7.7 Prevention of Accidental Ignition or Reaction of Ignitable, Reactive, or Incompatible Waste [20.4.1 NMAC §§ 270.14(b)(9) and 270.15(c) and (d); and 20.4.1 NMAC § 264.17]

This section details the precautions taken to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes at the TA-16 OB units.

Ignitable or reactive wastes are located at least 50 ft from the facility's property line at all times and are protected from sources of ignition or reaction. Smoking is not permitted in areas where wastes are managed. Signs indicating "No Smoking" are conspicuously placed near the entrance to the units, as required by 20.4.1 NMAC § 264.17(a) [6-14-00]. Together, these measures meet the requirements of 20.4.1 NMAC §§ 264.17(a) and (b) and 264.176 [6-14-00].

Incompatible wastes, if managed at the units, will be segregated to prevent adverse reactions from occurring through commingling of the wastes. In addition, no incompatible wastes will be mixed, and no waste will be placed in a container that previously held an incompatible waste, as required by 20.4.1 NMAC § 264.177(a) and (b), and 20.4.1 NMAC § 270.15(d) [6-14-00]. If incompatible wastes are managed at the units, the requirements of 20.4.1 NMAC § 264.177(c) [6-14-00], will also be met. Only containers made of or lined with materials that will not react with and are otherwise compatible with the waste to be managed will be used at the units.

G.2.8 Volatile Organic Air Emission Standards [20.4.1 NMAC, Subpart V, Part 264,

Subpart CC]

The TA-16 OB units are not subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart CC [6-14-00], "Air Emission Standards for Tanks, Surface Impoundments, and Containers," based on the applicability criteria specified in 20.4.1 NMAC § 264.1080(b)(2) [6-14-00]. The hazardous wastes accepted in containers for treatment at the OB units have a design capacity less than or equal to 0.1 cubic meters (approximately 26 gallons); therefore, the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart CC are not applicable to the TA-16 OB units.

G.3 REFERENCES

AEHA, 1987, "RCRA Part B Permit Writers' Guidance Manual for Department of Defense Open Burning/Open Detonation Units," U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, Maryland.

DOE, 1996, "DOE Explosives Safety Manual," DOE M 440.1-1, Revision 8.0, with changes approved by the DOE Explosives Safety Committee.

LANL, 1998, "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Table G-1

Miscellaneous Unit Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§264.601(a)	Prevention of release of contaminants to groundwater	2.0 (2.3, 2.7), Attachment G (G.1, G.2.7.6), Attachment H (H.3)
§264.601(a)(1)	Volume and characteristics of waste considering potential for migration through containing structures	2.0 (2.1, 2.3, 2.7), Attachment G (G.1.1, G.1.2)
§264.601(a)(2)	Hydrologic/geologic characteristics	Attachment H (H.2)
§264.601(a)(3)	Quality of groundwater including other sources of contamination and their cumulative impact on groundwater	Attachment H (H.2, H.3)
§264.601(a)(4)	Quantity and direction of groundwater flow	Attachment H (H.2.4)
§264.601(a)(5)	Proximity to and withdrawal rates of potential groundwater users	Attachment H (H.3)
§264.601(a)(6)	Regional patterns of land use	Attachment A (A.4)
§264.601(a)(7)	Potential for deposition and migration of waste constituents	Attachment H (H.3)
§264.601(a)(8)	Potential for health risks caused by human exposure to waste constituents	Attachment H (H.6)
§264.601(a)(9)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	Attachment H (H.6)
§264.601(b)	Prevention of release of contaminants to surface water	Attachment G (G.1, G.2.7.6), Attachment H (H.4)
§264.601(b)(1)	Volume and characteristics of the waste	2.0 (2.1, 2.3, 2.7), Attachment G (G.1.1, G.1.2)
§264.601(b)(2)	Effectiveness and reliability of containment, confinement, and collection systems and structures	2.0 (2.3), Attachment G (G.1.1, G.1.2)
§264.601(b)(3)	Hydrologic characteristics of the unit and local area	Attachment H (H.2)
§264.601(b)(4)	Regional precipitation patterns	Attachment H (H.4)
§264.601(b)(5)	Quantity, quality, and direction of groundwater flow	Attachment H (H.2.4)
§264.601(b)(6)	Proximity of the unit to surface water	Attachment A (A.4), Attachment H (H.3)

Table G-1 (Continued)

Miscellaneous Unit Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§264.601(b)(7)	Current and potential uses of nearby surface waters and water quality standards for those waters	Attachment H (H.2.5, H.4)
§264.601(b)(8)	Quality of surface waters and soils including other sources of contamination and their cumulative impact on surface waters and soils	Attachment H (H.4)
§264.601(b)(9)	Regional patterns of land use	Attachment A (A.4)
§264.601(b)(10)	Potential for health risks caused by human exposure to waste constituents	Attachment H (H.6)
§264.601(b)(11)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	Attachment H (H.6)
§264.601(c)	Prevention of release of contaminants to air	2.0 (2.3), Attachment G (G.2), Attachment H (H.5)
§264.601(c)(1)	Volume and characteristics of waste including its potential for emission	2.0 (2.1, 2.3, 2.7), Attachment G (G.2)
§264.601(c)(2)	Effectiveness and reliability of systems/structures to reduce/prevent emissions of hazardous constituents to the air	2.0 (2.1, 2.3, 2.7), Attachment G (G.2)
§264.601(c)(3)	Operating characteristics of the unit	2.0 (2.1), Attachment G (G.2)
§264.601(c)(4)	Characteristics of the unit and the surrounding area	2.0, Attachment A (topographic map), Attachment H (H.5)
§264.601(c)(5)	Existing quality of the air including other sources of contaminants and their cumulative impact on the air	Attachment H (H.5)
§264.601(c)(6)	Potential health risks caused by human exposure to waste constituents	Attachment H (H.6)
§264.601(c)(7)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	Attachment H (H.6)
§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	2.0 (2.3, 2.4), 4.0, Attachment C[a], Attachment H
§264.603	Post-closure care	Attachment F
§264.15	General inspection requirements	Attachment C[a]

Table G-1 (Continued)

Miscellaneous Unit Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§264.33	Testing and Maintenance of Equipment	Attachment G (G.2.7.2)
§264.75	Biennial report	2.0 (2.3.1)
§264.76	Unmanifested waste report	2.0 (2.3.2)
§264.77	Additional reports	2.0 (2.3.3)
§264.101	Corrective action for solid waste management units	4.0

[a] Requirement or information is also addressed in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," as appropriate.

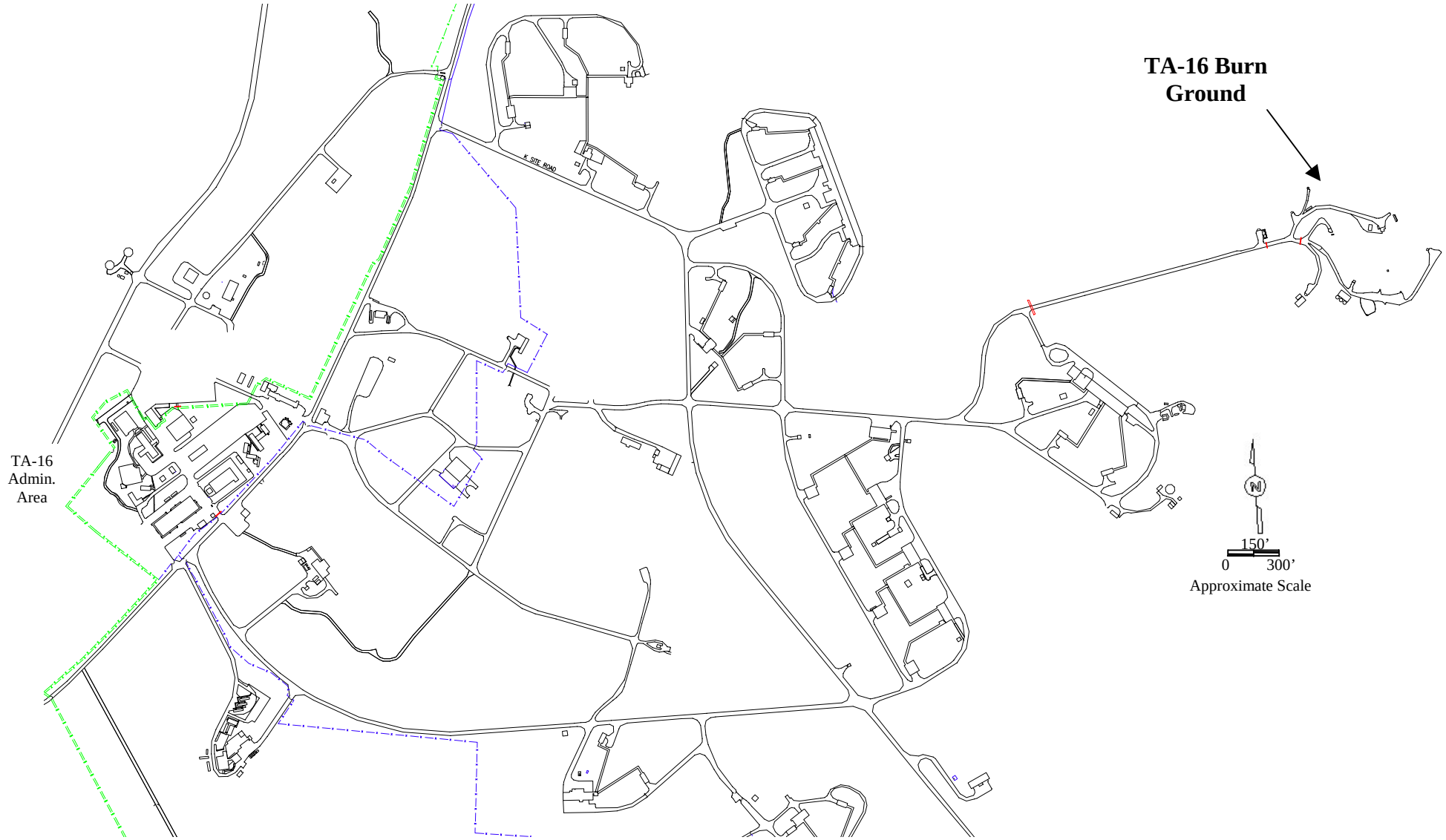

Figure G-1

Site Location Map of Technical Area (TA) 16 Burn Ground

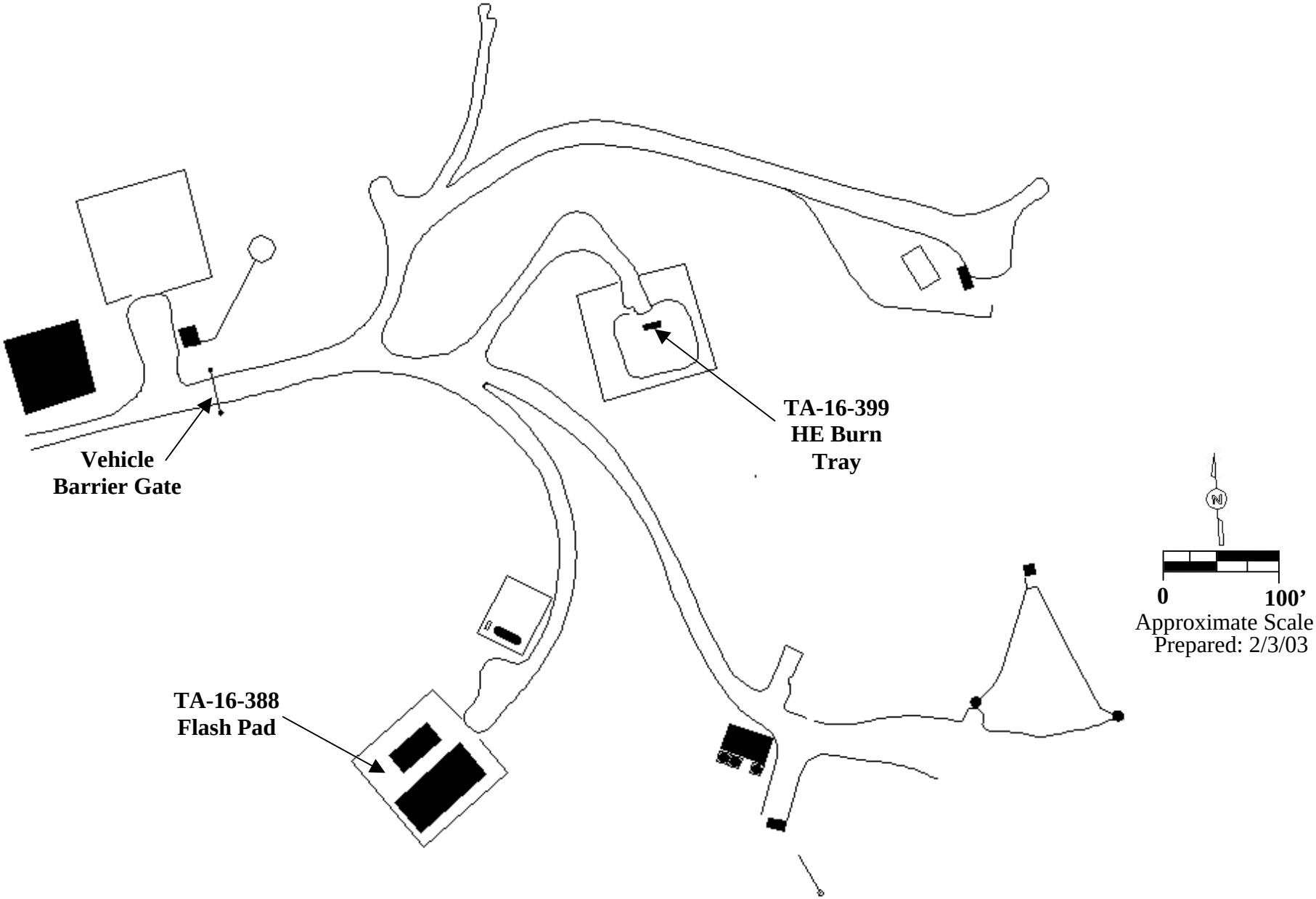

Figure G-2

Technical Area (TA) 16 Open Burning Units

Figure G-3

Technical Area (TA) 16-388 Flash Pad, Plan View

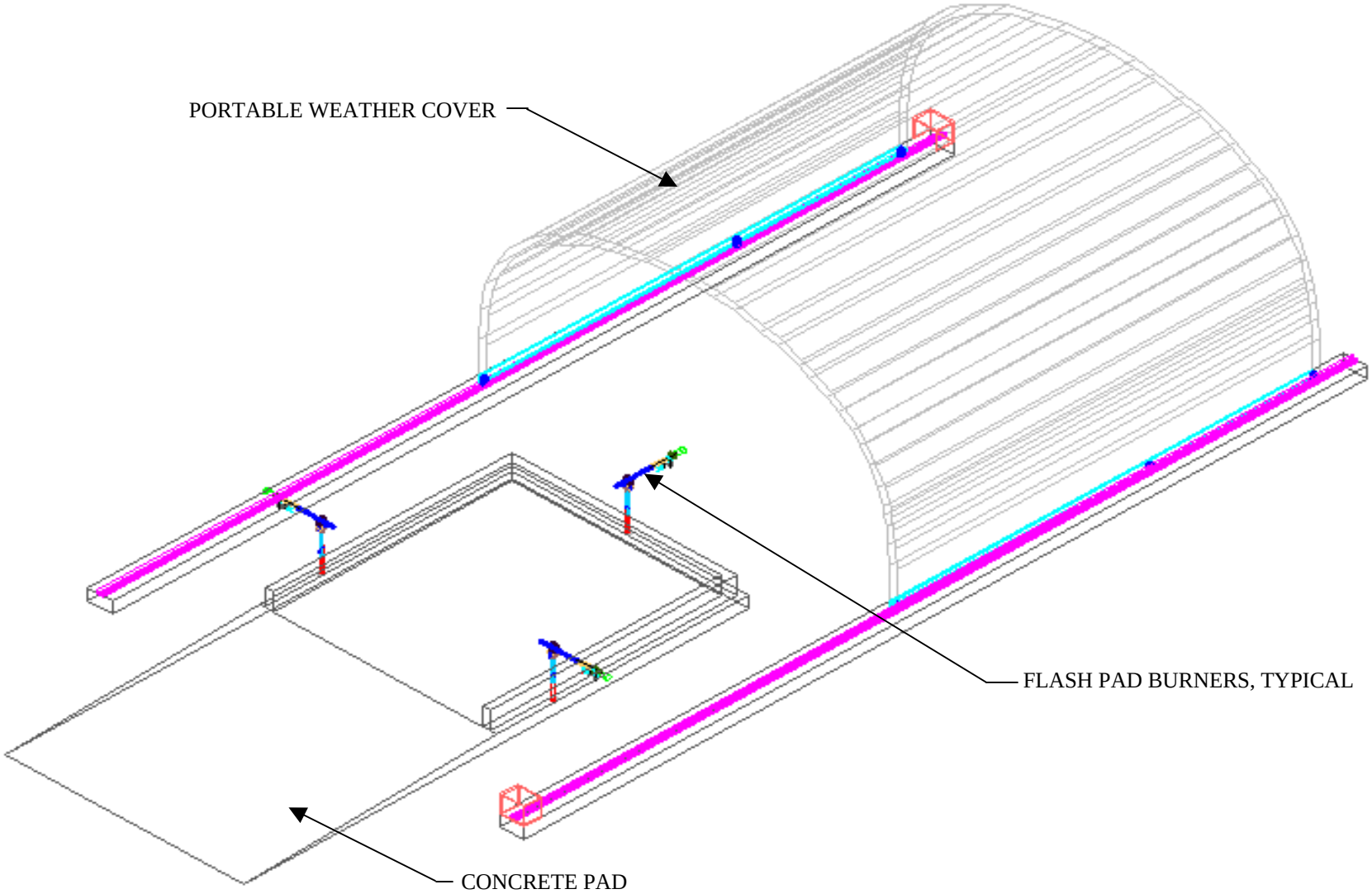

Figure G-4

Technical Area (TA) 16-388 Flash Pad

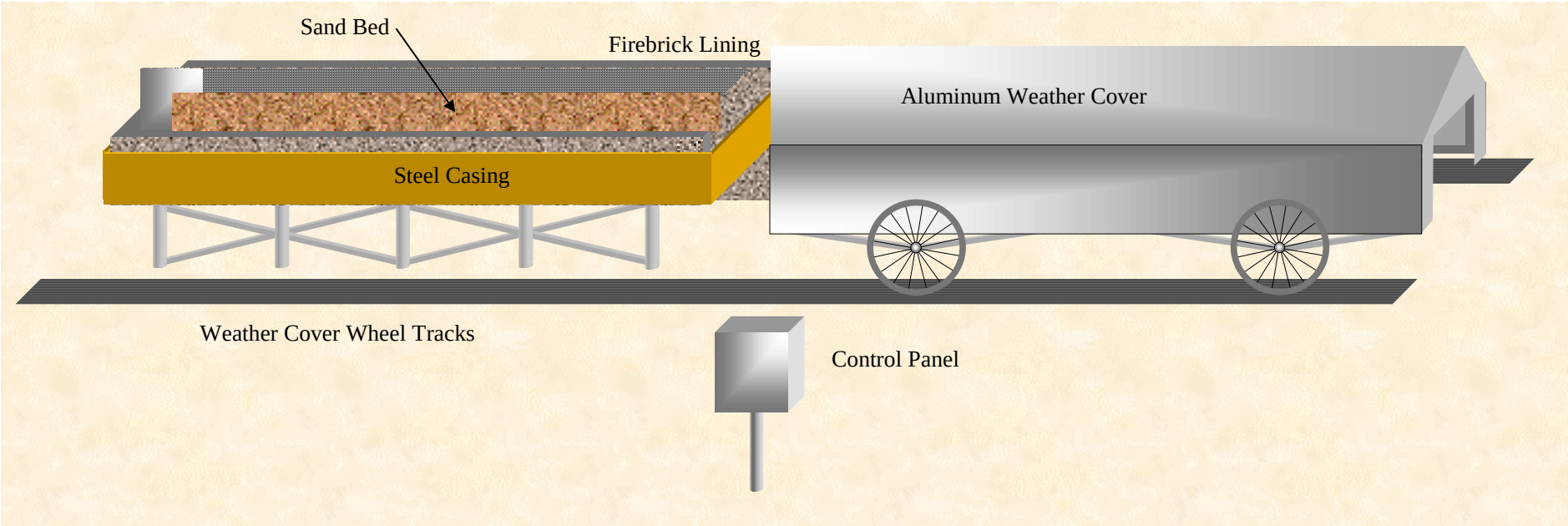

Figure G-5

Technical Area (TA) 16-399 HE Burn Tray

ATTACHMENT H

ENVIRONMENTAL PERFORMANCE STANDARDS

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
AQB	Air Quality Bureau
cm	centimeter(s)
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ESR	LANL's annual environmental surveillance report
ft	feet/foot
HE	high explosives
HEWTF	HE Wastewater Treatment Facility
LANL	Los Alamos National Laboratory
MDA	Material Disposal Area
µg/L	micrograms per liter
mg/L	milligrams per liter
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
OB	open burning
OSHA	Occupational Safety and Health Administration
pCi/L	picocuries per liter
RCRA	Resource Conservation and Recovery Act
RDX	cyclonite (hexahydro-1,3,5-trinitro-1,3,5-triazine)
SWPP	Storm Water Pollution Prevention
TA	technical area
TNT	2,4,6-trinitrotoluene

LIST OF SUPPLEMENTS

SUPPLEMENT	TITLE
H-1	Deposition Modeling

ATTACHMENT H
ENVIRONMENTAL PERFORMANCE STANDARDS

H.1 ENVIRONMENTAL PERFORMANCE STANDARDS [20.4.1 NMAC § 264.601]

The Technical Area (TA) 16 open burning (OB) units are located in a remote area of Los Alamos National Laboratory (LANL). The units are operated and maintained and will be closed in a manner that will continue to ensure protection of human health and the environment, in accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 264.601, revised June 14, 2000 [6-14-00]. Land use patterns in the Los Alamos area are shown on Map 1 in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application." Discussions of the hydrogeology in the region of TA-16, protection of the groundwater/vadose zone, protection of surface water/wetlands and the soil surface, protection of the atmosphere, and routes and pathways of exposure are presented in this attachment.

The TA-16 OB units are designed to facilitate safe handling and treatment of wastes to prevent adverse human health and environmental impacts. Design information and waste management practices for these units are detailed in Attachment G. The waste analysis plan for the OB units is included as Appendix B in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. A description of emergency response actions to be taken to minimize adverse impacts of unanticipated events is presented in Attachment E of this permit renewal application and Appendix E of the LANL General Part B.

H.2 HYDROGEOLOGY IN THE REGION OF TA-16

H.2.1 Geology

TA-16 is immediately underlain by the Pleistocene Bandelier Tuff, which outcrops in a few places on the mesa top and is exposed along canyon walls (LANL, 1999). During late 1998 and 1999, Well R-25 was drilled approximately 1,000 feet (ft) west of the TA-16 OB units. This borehole penetrated the Bandelier Tuff units and the underlying Puye Formation to a depth of 1,942 ft (LANL, 2000). Well R-25 was drilled through 383 ft of the Tshirege Member of the Bandelier Tuff (Broxton et al., 2002). This member is a chemically-zoned ignimbrite that exhibits complex zones of welding and crystallization, and is subdivided into four cooling units.

Tephras and volcaniclastic sediments of the Cerro Toledo interval underlie the Tshirege Member at the R-25 location, where it extends from a depth of 384 ft to 509 ft (Broxton et al., 2002). This formation consists of vitric, tuffaceous, sandy silt, which was likely deposited within a fluvial environment. The Otowi Member of the Bandelier Tuff underlies the Cerro Toledo interval at the R-25 location, and consists of massive, poorly consolidated, vitric, non-welded ash-flow tuff from 509 ft to 843.8 ft (Broxton et al., 2002). The lowermost 6.7 ft of the Otowi Member, which occurs at a depth of 843.8 to 850.5 ft at R-25, is the Guaje Pumice Bed. At this location, the Guaje Pumice Bed deposit consists of stratified pumice beds, lithic beds that include quartzose sandstone, and fine ash beds. At the base of the Otowi Member, the Puye Formation extends from 850.5 ft to the bottom of the borehole at a depth of 1,942 ft (Broxton et al, 2002). The Puye Formation at R-25 is an alluvial fan deposit consisting primarily of coarse clastic rocks derived from dacitic to rhyodacitic units of the Tschicoma Formation that outcrop in the Jemez Mountains.

The TA-16 OB units are located on the mesa top, which is composed of Unit 4l of the Tshirege Member of the Bandelier Tuff (Lewis et al., 2002). Geologic mapping and detailed core descriptions suggest that the TA-16 OB units are underlain by approximately 40 to 50 ft of Unit 4l. This subunit, the basal part of Unit 4, consists of poorly- to moderately-welded, crystal- and pumice-poor ignimbrites. Unit 4l in the vicinity of the TA-16 OB units is underlain by about 7 to 20 ft of Unit 3T, which is a moderately- to densely-welded ignimbrite in this area (Lewis et al., 2002). Below Unit 3T is Unit 3 of the Tshirege Member, which is at least 110 ft thick at nearby Material Disposal Area (MDA) P and extends to below the bottom of Cañon de Valle. Here, it is a non-welded to densely-welded ignimbrite, and locally contains crystal-rich surge deposits (Lewis et al., 2002).

H.2.2 Structure

The Pajarito fault zone defines the regional setting of the TA-16 OB units. This fault zone is a bounding fault of the Rio Grande rift and is described by Gardner et al. (2001). The main escarpment of the Pajarito fault is west of the TA-16 administrative area along the western boundary of TA-16, and faulting and related deformation extends at least 5,000 ft to the east to the approximate location of the TA-16 OB units. Grabens and monoclinal folds are common

within the Pajarito fault zone, and the tensional upper hinge zones of the monoclines are typically associated with open-fissure networks (Gardner et al., 2001; Lewis et al., 2002).

The TA-16 OB units are located 420 ft south-southeast and 700 ft south, respectively, of MDA P at TA-16. MDA P lies at the transition from a graben structure to the west and a bedrock promontory to the east (Lewis et al., 2002). The TA-9 graben identified by Lewis et al. (2002) is defined just west of MDA P by a series of north-trending faults. The eastern boundary is defined by a pair of faults with down-to-the-west displacement, and the western boundary is defined by a fault with down-to-the-east displacement (Lewis et al., 2002). Within the graben, springs feed the Cañon de Valle stream. Five small faults at MDA P associated with the fracture zone on the west side were identified; however, the lack of stratigraphic markers prevented an estimate of the displacement along these faults. Even so, the displacement was thought to be small because the fault traces averaged only about 16 ft. On the west side of MDA P, the local high-fracture density suggested a small amount of horizontal extension over possible deep-seated normal faults (Lewis et al., 2002).

H.2.3 Surficial Deposits

Surficial deposits at TA-16 consist of coarse-grained colluvium on steep hill slopes and along the bases of cliffs, finer-grained alluvial and colluvial sediments with a thin cover of eolian sediments on the flatter parts of mesa surfaces, and alluvial to colluvial fan deposits at the mouths of steeper drainages or on escarpments related to post-Bandelier faulting (LANL, 1999). Deposits in Cañon de Valle and Water Canyon consist of colluvial materials on and at the base of cliffs and canyon walls and fluvial sediments deposited by intermittent streams along the axes of the canyon floors (LANL, 1999).

A wide variety of soil types occur at TA-16 (Nyhan et al., 1978). These include both clayey-skeletal and fine Typic Eutroboralfs from 46 to over 122 centimeters (cm) thick, Tocal very fine sandy loam (28 to 36 cm thick), Frijoles very fine sandy loam (46 to more than 152 cm thick), Pogna fine sandy loam (13 to 30 cm thick), Totavi gravelly loam (0 to 152 cm thick), Sanjue-Arriba complex (46 to 153 cm thick), Typic Ustorthents (15 to 35 cm thick), and Carjo loam (51 to 102 cm thick) (Nyhan et al., 1978). According to Nyhan et al. (1978), soils at the TA-16 Burn Ground consist of Tocal very fine sandy loam, with low to moderate permeability and low water-

holding capacity. Soils at TA-16, which are generally thicker in the western portions of the TA, grade into rock outcrops along the margins of the mesa tops. In the soil zone previously described by Nyhan et al. (1978) as Tocal very fine sandy loam, nine soil profiles were subsequently characterized on the north and south slopes of Cañon de Valle near the TA-16 Burn Ground (McDonald et al., 1996). This work suggests that soil horizons range from 40 to 237 cm in depth, the soils are poorly developed, and they consist of A-R, A-Bw-R, or A-Bw-C soil profiles. The work also indicated that the soils are classified as Lithic Ustorthents, Typic Haplumbredt, Cumulic Haplumbredt, Typic Ustochrept, and Udic Paleoustalf (McDonald et al., 1996).

H.2.4 Groundwater

Groundwater elevation measurements suggest that groundwater flows from the Jemez Mountains east and southeast toward the Rio Grande, where a portion discharges into the river through seeps and springs. The hydraulic gradient of the regional aquifer averages about 60 to 80 ft per mile within the Puye Formation but increases to 80 to 100 ft per mile along the eastern edge of the Pajarito Plateau as the groundwater enters the less permeable sediments of the Santa Fe Group. In the upper section of the regional aquifer, the rate of movement of groundwater varies, depending on the materials in the aquifer. Groundwater travel time between Well R-25 and a distance equal to that of the nearest water supply well, PM-2, is estimated to range from 50 to 200 years, based on the plateau-wide average groundwater flow rates of between 95 and 345 ft per year determined by Purtymun (1995). Although actual groundwater flow rates and flow direction in the vicinity of Well R-25 are not yet known, modeling efforts are ongoing to refine travel times to the supply wells.

The full range of recharge rates at TA-16 has probably not been identified. However, existing data clearly show that there is a wide range of rates in the mesas and canyons at TA-16. For example, chloride mass balance-based estimates suggest that rates are on the order of only a few millimeters per year in some mesa locations (Newman, 1999). However, the presence of localized saturation and high explosives (HE) contamination below 100 ft in the mesas suggests that recharge rates may be relatively rapid in other locations (LANL, 1998a). In addition, the presence of HE below 700 ft in Well R-25 demonstrates that recharge to the 747-ft-deep intermediate perched aquifer can occur within a 50 year timeframe (Broxton et al., 1999).

There are three main factors that may control rapid recharge. The first factor is the existence of ponded water on the mesas (e.g., historical and current ditches and ponds) and the perennial reach of Cañon de Valle. These localized surface water areas create higher hydraulic heads and higher hydraulic conductivities in the subsurface. The second factor is that strongly welded tuff units occur on the western part of the Pajarito Plateau. These units have low matrix conductivities, but can have high fracture conductivities. Contaminant distributions and tracer studies support the importance of fracture pathways at TA-16 (LANL, 1998a). The third factor is the close proximity of TA-16 to the Pajarito Fault (LANL, 1998a). The fault is considered a possible significant recharge pathway to the regional aquifer and pathways related to faulting could extend into TA-16.

Based on drilling results for the R-25 well at TA-16, located approximately 1,000 ft west of the TA-16 OB units, the depth to the regional aquifer at R-25 is 1,286 ft (Broxton et al., 2002). At the R-25 well, the intermediate perched aquifer was encountered at a depth of 747 ft, followed by an interval of alternating wet and dry conditions to a depth of 1,286 ft, where it is believed that regional saturation is encountered and continues to the total depth (1,942 ft) of the well (Broxton et al., 2002). The upper saturated zone had a static level of 711 ft (Broxton et al., 2002). Groundwater samples collected from R-25 at depths ranging from 747 to 1,942 ft were found to contain HE compounds and their associated degradation products. The two contaminants of most concern are cyclonite (RDX) and 2,4,6-trinitrotoluene (TNT) because they exceeded U.S. Environmental Protection Agency (EPA) health advisory limits (0.61 micrograms per liter [µg/L] for RDX and 2.2 µg/L for TNT) for drinking water (Broxton et al., 2002). Down-gradient drinking water-supply wells were also sampled but found to contain no HE; the closest drinking water-supply well to R-25 is three miles to the east (LANL, 1999). Discharges from past HE-manufacturing activities at TA-16 are believed to be the source of the constituents found in Well R-25.

At the TA-16 Burn Ground, 17 boreholes up to 200 ft deep were drilled in 1987 (Boreholes P-0 through P-16); tuff samples recovered during drilling operations were not saturated (LANL, 1988). In 1997, thirteen moderate-depth boreholes were drilled near the TA-16-260 outfall (Boreholes 16-2655 through 16-2667) and no perennial saturated zone was encountered

(LANL, 1999). Moderate-depth boreholes drilled near Martin Spring and the 90s-Line Pond encountered saturated zones that dried up one month after drilling (LANL, 1999). In 1993, Well SHB-3 on the western side of TA-16 contained perched aquifer water at a depth of 664 ft. The R-25 well contained a thick perched zone that extended from a depth of 747 ft to 1,286 ft, and this zone is hypothesized to correlate with the saturated zone observed in SHB-3 (LANL, 1999).

An extensive near-surface alluvial system is present in Cañon de Valle (LANL, 1999). During the fall of 1997, six alluvial wells were drilled at five locations at TA-16 (LANL, 1999). Four of these well locations are in Cañon de Valle; the remaining well location is in the steam plant drainage area. Depths to tuff ranged from 4 to 6 ft, and all five locations contained saturated intervals at depths starting from 1 to 3 ft (LANL, 1999). These wells are sampled quarterly. However, the wells are sited to measure impacts from the TA-16-260 outfall and are located in Cañon de Valle above the point where the TA-16 Burn Ground runoff enters the canyon. Therefore, these data are not pertinent to the TA-16 Burn Ground.

In August 2001, six boreholes were drilled in the vicinity of MDA P, which is north of the TA-16 OB units. These boreholes (Boreholes 257, 273, 516, 526, 554, and 557) were drilled to provide continuous core for sample material to investigate the potential for residual contamination in the bedrock and for lithologic and fracture descriptions of the bedrock beneath MDA P. In addition, these boreholes were drilled to provide for geophysical measurements and to measure water levels. All six boreholes were dry, with no water observed during or after drilling; they were filled with grout and abandoned in October 2001. A more detailed summary of these boreholes is presented in Annex III of “Material Disposal Area P Area Closure Certification Report: Material Disposal Area P, 387 Flash Pad, and SWMU 16-016(c)-99” (LANL, 2003).

Three perennial springs and two seeps have been identified within TA-16 (LANL, 1999). All three springs appear to discharge from near the Tshirege Member Unit 3/Unit 4 contact, and their presence suggests the existence of one or more shallow perched zones beneath TA-16.

Recent geophysical studies performed as part of the TA-16-260 corrective measures study suggest that conductive (and possibly water-bearing) zones are more prominent in the western sections of TA-16 (west of MDA P and the TA-16 OB units) and that these zones are localized and sub-vertical. Intermediate-depth (800 to 1,000 ft) boreholes to be drilled in the near future will address this issue.

H.2.5 Surface Water

Perennial and intermittent surface water exists at many locations at TA-16 due to both natural and anthropogenic sources (LANL, 1999). Surface water occurs primarily as ephemeral streams in the two major canyons adjacent to TA-16; however, perennial water flow does occur in a reach of Cañon de Valle due to spring and seep discharge (LANL, 1993). This reach begins near the TA-16-260 outfall. Its length varies seasonally and, depending on discharges, extends up to approximately 7,000 ft downstream.

The topography in the southern portion of the TA-16 Burn Ground directs runoff into a side canyon of Cañon de Valle, the Fish Ladder drainage. This drainage intersects the Cañon de Valle drainage about a mile downstream of the TA-16 Burn Ground. A possible outfall-associated wetlands, probably as a result of past operations at the TA-16-340 HE Formulation Building, is located southeast of the TA-16 OB units in the Fish Ladder drainage.

H.2.6 Hydrologic Conceptual Model

In the wetter areas of TA-16 (i.e., before the sumps connected to the TA-16-260 outfall were plugged), surface water run-off (primarily from the outfalls) and infiltration into soil and tuff are hypothesized to be the most important hydrologic transport pathways (LANL, 1999). Run-off can mobilize contaminants and transport them off site or concentrate dispersed surficial contaminants through solution and reprecipitation or sorption processes (LANL, 1999). The principal contaminants at TA-16 are HE and barium; HE is slightly soluble and barium is moderately to strongly soluble, depending on its form. Both may be transported in surface water (LANL, 1999). It is now recognized that the perennial, contaminated reach of Cañon de Valle down gradient from the TA-16-260 outfall is mobilizing contaminants down gradient (LANL, 1999). Surface water run-off from TA-16 either flows from ephemeral streams on the mesa tops into Cañon de Valle and Water Canyon and ultimately into the Rio Grande, or

infiltrates down gradient and recharges perched aquifers in the region (LANL, 1999). Most of the contaminants observed in TA-16 surface waters are attributed to the TA-16-260 outfall (LANL, 1999).

Fluid transport via perched alluvial aquifers to springs and seeps is an important mechanism for contaminant transport at TA-16 (LANL, 1999). Infiltration into the subsurface may occur by porous flow into the soil, alluvium, and bedrock, and by flow through fractures that intersect bedrock surfaces. Water may accumulate within units of the Bandelier Tuff, especially in units overlying more densely welded units, retarding downward transport. Water may also move laterally within the tuff in response to gradients on the welded horizons until it is able to move downward through the tuff or along fractures. More heavily welded units of the tuff may fracture more readily than intervening porous units, thus promoting transport of contaminants through the tuff.

H.3 PROTECTION OF GROUNDWATER/VADOSE ZONE [20.4.1 NMAC § 264.601(a)]

The TA-16 OB units are located in a semiarid, temperate, mountain climate. In 2002, total precipitation in Los Alamos at the TA-6 station was 11.71 inches, and the average precipitation for the period from 1971 through 2002 was 18.58 inches (TA-6 is located approximately 3,500 ft north of TA-16). In the vicinity of the TA-16 OB units, the regional aquifer is at a depth of 1,286 ft, and the extensive uppermost intermediate perched aquifer is at a depth of 747 ft. Small-scale shallow perched zones, which discharge at the springs, are located at approximate depths of 80 to 110 ft at the Tshirege Member Unit 3/Unit 4 contact. Collectively, the depth to the regional aquifer and the low annual precipitation significantly limit the potential for contaminants resulting from the TA-16 OB operations to migrate through the vadose zone to the regional aquifer, which is the only aquifer in Los Alamos known to be capable of supplying municipal and industrial water users. No drinking water supply wells are located within the boundary of TA-16 or within 3,500 ft of the TA-16 OB units.

A detailed description of the hydrogeology in the TA-16 region is provided in Section H.2. Much of the information presented in that section was obtained from the R-25 well, which was proposed in the site-wide “Hydrogeologic Workplan” (LANL, 1998b). The workplan was developed to address the requirements of the Resource Conservation and Recovery Act (RCRA) and the Hazardous and Solid Waste Amendments of 1984. It was approved by the

New Mexico Environment Department (NMED) in March 1998. Implementation of the workplan is intended to characterize the hydrogeology of the LANL facility, including TA-16; establish detection monitoring programs; and provide potential monitoring capabilities, should they be deemed necessary and appropriate.

H.4 PROTECTION OF SURFACE WATER/WETLANDS AND THE SOIL SURFACE [20.4.1 NMAC § 264.601(b)]

As stated previously, net annual precipitation for the Los Alamos area, including the site of the TA-16 OB units, is low. Perennial and intermittent surface waters exist at many locations at TA-16 due to both natural and anthropogenic sources. The locations of these surface waters, including intermittent streams, are shown on Figure A-5 in Attachment A. In Cañon de Valle, perennial water flow occurs in a reach from near the TA-16-260 outfall and extends up to approximately 7,000 ft downstream. The topography in the southern portion of the TA-16 Burn Ground directs runoff into a side canyon of Cañon de Valle, the Fish Ladder drainage, which intersects the Cañon de Valle drainage about a mile downstream of the TA-16 Burn Ground. A possible outfall-associated wetlands is located southeast of the TA-16 OB units in the Fish Ladder drainage.

The TA-16 OB units are part of the University of California/U.S. Department of Energy (DOE) National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit for storm water discharges associated with industrial activity (current Permit Numbers NMR05A509 and NMR05A510, effective January 1, 1999). A Storm Water Pollution Prevention (SWPP) Plan, as required by the NPDES Multi-Sector General Permit and the Baseline General Permit, has been developed for the TA-16 Burn Ground. The plan identifies any potential pollutants and provides pollution prevention or control methods to prevent the discharge of pollutants in storm water runoff at the units and the surrounding area. Under the SWPP Plan, the facility is required to implement best management practices to reduce the likelihood of pollutants entering the storm water discharges. The plan includes storm water run-on/runoff measures for active units as well as erosion control (e.g., rock check dams) to prevent dispersion of legacy contamination and sediments (see Figure A-9 in Attachment A). To maintain compliance with the NPDES Multi-Sector General Permit, site inspections and an annual compliance evaluation are conducted at the TA-16 Burn Ground to evaluate the effectiveness of the SWPP Plan. The compliance evaluations are documented in a report that describes any major observations,

incidents of noncompliance with the SWPP Plan, corrective actions, and any observations or changes made with respect to the SWPP Plan.

Storm water from the TA-16 Burn Ground flows into the Fish Ladder Drainage and can become contaminated by mobilizing either material deposited during current OB operations or contamination remaining from past practices, referred to as legacy contamination. Modeling of current OB operations, described in Supplement H-1, demonstrates that only very low levels of contaminants are released (or deposited) during current operations. Other impacts to soils from ongoing operations are minimized through the waste management practices described in Section G.2 of Attachment G and with the storm water run-on and runoff controls described in Section 2.7 of this permit renewal application. The other, more likely, source of potential storm water contamination is legacy contamination. Supplement 4-1 describes past operations at SWMUs and resultant contamination.

Contaminants in stormwater down gradient of the TA-16 Burn Ground are measured at station E257, which is part of LANL's Storm Water Monitoring Station Network. Station E257, shown on Figure H-1, became operational in July 2002. LANL collects samples quarterly to meet the permit conditions in the NPDES Multi-Sector General Permit and to include in LANL's annual environmental surveillance report (ESR). Because 2002 was a drought year, sufficient runoff for sampling occurred only in the third calendar year quarter. The first sample, taken on September 4, 2002, was analyzed for the specific constituents required by the NPDES Multi-Sector General Permit. The second sample, taken on September 9, 2002, was analyzed for the constituents of interest for the ESR, mainly trace radioactive and non-radioactive metals. Although most of the analytes are not RCRA-regulated, all the data are presented for informational purposes in Tables H-1 and H-2. Additional storm water data will be posted on the LANL website as it becomes available. The NPDES-required stormwater data are provided to EPA quarterly in Discharge Monitoring Reports. The ESR results are published annually.

The Fish Ladder Drainage has also been affected by an existing and a closed NPDES-permitted outfall. The existing outfall is the HE Wastewater Treatment Facility (HEWTF), located adjacent to the TA-16 Burn Ground. The HEWTF primarily treats HE-contaminated wastewater from HE-processing buildings. The second outfall is the inactive TA-16-340 outfall [Solid Waste

Management Unit 16-003(o)]. TA-16-340 was an HE-formulation building and discharged solvent-contaminated waste to the Fish Ladder Drainage for many years. Its operations are described in Supplement 4-1. LANL's Environmental Restoration Project has collected water quality samples both at a seep within the drainage and at the confluence of the Fish Ladder Drainage and Cañon de Valle. The data are presented in Table H-3. These data represent impacts from NPDES-permitted sources and contain constituents that are not regulated by RCRA; they are included in this attachment for informational purposes and to describe the surface water quality in the vicinity of the TA-16 Burn Ground.

H.5 PROTECTION OF THE ATMOSPHERE

The predominant exposure pathway for open burning of reactive wastes is inhalation of airborne products of complete and incomplete combustion. The NMED's Air Quality Bureau (AQB) regulates the air emissions from the TA-16 OB units under a permit issued under 20.2.60 NMAC, "Open Burning" (current Permit No. TA-16-OB-2003, effective January 1, 2003). To obtain a permit under 20.2.60 NMAC, LANL submitted a permit application containing the following information (which also satisfies 20.4.1 NMAC requirements) for this pathway:

- The type and quantity of material to be burned. This meets the requirements of 20.4.1 NMAC § 264.601(c)(1) [6-14-00];
- The methods that will be used to ignite, maintain, and control the burning. This meets the requirements of 20.4.1 NMAC § 264.601(c)(3) [6-14-00]; and
- An ambient air quality impacts analysis at the nearest off-site receptor modeled with a Gaussian plume model using site-specific meteorology, topography, and worst-case emissions estimates. This meets the requirements of 20.4.1 NMAC § 264.601(c)(4) [6-14-00].

The NMED AQB's open burning program recognizes that engineering controls are not available to prevent air emissions of hazardous constituents from OB units. Instead, the program evaluates the methods of burning and relies on burning under good atmospheric dispersion conditions to minimize hazardous emissions impacts. Thus, this program also meets the requirements of 20.4.1 NMAC § 264.601(c)(2) [6-14-00]. Burning must take place under atmospheric conditions (e.g., stability and wind speed/direction) that favor dispersion. However, winds cannot be so high that significant amounts of ash would become windborne. Figures A-6

and A-7 in Attachment A of this permit renewal application show the wind roses for TA-6 and TA-49, where the wind observation towers closest to the TA-16 OB units are located.

In 1990, the National Park Service, the NMED, and LANL began joint operation of an ambient air quality monitoring station at the nearest off-site receptor, Bandelier National Monument. This monitoring site operated for three (3) years. NMED's AQB determined, based on the monitoring information and the impacts assessment, combined with knowledge of local air quality conditions, that air quality standards would not be exceeded. Air quality standards are set to protect human health (primary standards) and welfare (secondary standards). Secondary standards take into account the health and ecological impacts to domestic animals, wildlife, crops, vegetation, and physical structures. The open burning program meets the requirements of 20.4.1 NMAC § 264.601(5), (6), and (7) [6-14-00]. The AQB requires no monitoring of open burning at the TA-16 Burn Ground.

H.6 ROUTES AND PATHWAYS OF EXPOSURE

Two populations could potentially receive exposures from waste or residuals managed at the TA-16 OB units: 1) the on-site workers and environment; and 2) the off-site public and environment. They could be impacted through three routes of exposure:

- dermal (skin or other covering),
- ingestion (eating or drinking), and
- inhalation (breathing).

Although typical pathways include air, soil, and water, the only realistic pathway for ongoing operations at the TA-16 OB units is air, as discussed below. Legacy contamination from past uses of the area is being addressed through the RCRA corrective action process, which will include a formal risk assessment.

H.6.1 Dermal Exposure

Dermal exposure occurs when chemicals directly contact an organism's skin or other covering. This route is potentially important for workers because they can be exposed when they handle wastes or residues. The Occupational Safety and Health Administration (OSHA) is the federal

agency responsible for protecting workers. OSHA requires that three types of controls be considered: protective equipment; administrative controls; and engineering controls. Protective equipment and administrative controls are the primary controls for worker protection at the TA-16 OB units. Engineering controls are used to prevent migration of wastes and residues from the units to the environment.

Workers at the TA-16 OB units are required to wear protective equipment when handling waste or residues. The type and level of protective equipment are chemical and hazard specific. Typically, for a low hazard waste, coveralls, safety glasses, gloves, and steel-toed shoes or boots are worn. For a higher hazard waste, goggles, face shields, respirators, rubber aprons, or other protective clothing are donned, as needed. This required use of protective equipment prevents any direct contact with waste, eliminating dermal exposure as an important route of exposure for workers.

Administrative controls also protect workers from all routes of exposure. Wastes are typically handled in small amounts for safety purposes. For instance, the maximum amount of liquids that can be treated at the TA-16-388 Flash Pad is approximately 100 gallons, but this waste type is usually burned in batches of 5 to 25 gallons to maximize worker safety and minimize exposure. Workers leave the area as soon as the waste is staged and occupy a protective shelter (the TA-16-389 Control Building) during burning. The Control Building is located a minimum of 300 ft from the nearest OB unit. Burns are ignited remotely from this shelter and workers observe the burns by remote cameras. They may not approach the unit until they can visually verify the destruction of HE or determine by thermocouple data that HE has been completely decomposed.

The dermal route becomes important for the on-site environment and off-site public and environment only if the pathways are contaminated and contaminants are transported away from the TA-16 OB units to receptors. The remote location of the units decreases this risk; only a major spill that could not be cleaned up quickly could potentially migrate from the units. The release potential is managed by minimizing the amounts of wastes handled. In the event of a spill, solid HE would contact the soil surface and would be removed immediately. While up to

1,000 pounds of bulk HE can be managed, it is rare that this amount is handled at one time; burns more typically involve less than 100 pounds of explosive. Large pieces of HE-contaminated equipment (e.g., a lathe or an HE oven) may be handled, but these have low levels of contamination and are easily retrieved if dropped. Solids and liquids are handled in separate structures of the TA-16 OB units; thus, there is no opportunity for them to commingle and be transported in a liquid waste stream.

Engineering controls have been installed at the OB units to prevent migration of wastes or residues into the environment. They primarily include precipitation covers and secondary containment. The precipitation covers are used as follows:

- The TA-16-388 Flash Pad is covered between burns unless sampling, ash removal, or waste staging requires that the cover be moved. Two types of covers may be used. One type is a large retractable cover (see Figures G-3 and G-4 in Attachment G); the second includes tarps or other types of covers (e.g., a removable cover similar to that used at the TA-16-399 HE Burn Tray).

- The TA-16-399 HE Burn Tray is covered between burns, unless an ash sample is being taken, ash is being removed, or HE is being staged. A moveable cover (see Figure G-5 in Attachment G) or tarp may be used.

Secondary containment is provided for the TA-16-388 Flash Pad. The secondary containment is designed to prevent any downward or lateral migration of potential leakage from/through the concrete pad. The base of the flash pad is 12 inches thick with integrally-poured 8-inch-thick walls. The entire flash pad is contained in a 45 mil Hypalon liner (6 inches below the bottom of the pad and curved up to ground level on all 4 sides, 2 ft out from the pad perimeter). The pad was designed and constructed with a quarter-inch drop/ft towards the back of the pad to contain precipitation in case an unexpected rain event occurs during flashing. For safety purposes, the pad cannot be approached for 8 hours after a burn unless it can be visually confirmed that all HE is destroyed. Water build-up on the pad as a result of precipitation is removed with the HE wastewater (vacuum) truck and treated at the HEWTF. HE-contaminated solvents are burned on the flash pad in a stainless-steel tray, inside a second tray which provides additional containment. The containment devices are visually inspected for cracks or other signs of leaking daily during operation or weekly if no operations occur that week.

The combination of having only a small amount of chemicals at risk at any one time, the ability to rapidly respond to spills, and engineered controls ensures that there is no realistic pathway for dermal exposure of off-site receptors.

H.6.2 Ingestion

Ingestion may be an important route of exposure if foodstuffs or drinking water becomes contaminated. The contamination may occur from deposition of airborne contaminants, uptake of pollutants from soil by plants, or from contact of pollutants with water. On-site workers are not affected because food and drink may not be consumed in the vicinity of the treatment units (both an OSHA and DOE requirement). Crops are not grown on site. The nearest locations where crops may be grown are in gardens in the communities of Los Alamos and White Rock, which are approximately 2.5 and 6 miles away, respectively. Off-site soil and water contamination are not viable pathways for the same reasons discussed under dermal exposure; transport off site is limited by administrative and engineering controls. Small amounts of air pollutants generated during burning could be carried from the site and deposited on foodstuffs and water. However, the modeling discussed in Supplement H-1 shows that deposition from TA-16 Burn Ground operations is minimal. This potential release pathway is reviewed and mitigated, if necessary, when air quality standards and burning conditions are set, as described in the following discussion of the inhalation exposure route.

H.6.3 Inhalation

As with the other pathways, OSHA requires workers to be protected from unhealthy exposure to air emissions and publishes occupational exposure standards. Worker exposure is kept below these standards through the use of protective equipment and administrative controls, as described under the dermal route of exposure.

Airborne exposure to the public and environment is regulated by NMED's AQB under 20.2.60 NMAC, "Open Burning." The AQB's open burning program evaluates the methods of burning and relies on burning under good atmospheric dispersion conditions to minimize hazardous emissions impacts. The AQB requires that a source estimate emissions from the burning of wastes, model impacts, and compare the impacts to federal and New Mexico primary and secondary air quality standards. Primary standards set limits to protect public health, including

the health of “sensitive” populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. These standards take into account not only direct impacts from air pollutants but also from deposition of pollutants on the surfaces, uptake into plants, and other indirect impacts. Thus, these standards already account for human health and ecological risks.

Air quality standards are based on short-term (1-, 3-, 8-, or 24-hours) or long-term (monthly or annual) averages of pollutant concentrations. Because burning at the TA-16 OB units is intermittent and is almost always completed within an hour, the short-term averages are more restrictive. This influences the type of model and the input to the models. Depending on the source characteristics, the Laboratory currently uses one of two EPA-approved Gaussian plume models: SCREEN3 or ISC3.

The basic input parameters required for the models are:

- The source term for each pollutant (emission factors) in pounds per hour;
- Type of emission point (area source, volume source, or point source);
- Emission point dimensions;
- Emission point height above ground;
- Gas flow rate out of the emission point;
- Emission gas temperature;
- Ambient air temperature;
- Location, size, and height of adjacent buildings (to account for plume cavitation effects);
- Wind speed;
- Atmospheric stability (the vertical temperature structure of the atmosphere);
- Ceiling (inversion) height (how high above the ground the mixing depth extends);
- Receptor distance (the distance from the emission point that impacts are estimated, any distance or array of distances can be specified); and
- Receptor height above or below the emission point.

The meteorological information remains constant for modeling impacts from both of the TA-16 OB units, but the source term will depend on the types and maximum amounts of material burned at each unit. The physical information for the units will also vary. Because short-term air quality standards are the most restrictive for this source, “event” rather than “long-term” modeling is performed. The time to complete each burn will vary by unit and the waste being treated, but it is rarely more than an hour. Therefore, only 1- and 3-hour impacts are modeled, unless otherwise requested by the AQB. The models are run in the “rural” mode.

SCREEN3 uses simplified worst-case meteorological input that is designed to overestimate impacts. For instance, actual wind speeds and directions are not input. Instead, the wind is assumed to blow directly toward receptors at a low speed for the entire modeling period. EPA estimates that SCREEN3 overestimates impacts by 110% for 3-hour modeling, 142% for 8-hour modeling, 250% for 24-hour modeling, and 1250% for annual modeling (EPA, 1992). The advantage of using SCREEN3 is that modeling is simple and fast.

If the open burning source shows acceptable impacts with SCREEN3, no further modeling is performed. Otherwise, a more reasonable estimate of impacts is made with ISC3. The basic difference between SCREEN3 and ISC3 is that ISC3 uses actual facility wind rose data (wind direction, length of time in that direction, and wind speed).

Model selection and input must be approved by the AQB. The AQB reviews the results of modeling, assures that no standards will be exceeded, and places restrictions on the meteorological conditions under which burning can occur.

Restrictions may also be placed upon burns if fire danger is high. High fire danger occurs after prolonged dry periods when fuel moisture is very low and fine dead fuels ignite readily. If burns are conducted during high fire danger periods, special precautions, such as having the fire department stand by, are taken.

A report submitted annually to the NMED AQB summarizes burn location, burn type, burn date, fuel type, and fuel quantity. An estimate of total annual air emissions is also provided.

LANL has minimized the air impacts by both reducing the amount of waste burned and reengineering the units to burn more effectively and with lower emissions. The biggest source of air emissions in the past was from wood used as the fuel for flashing and for destroying HE in oils and solvents. In 1999, this practice was discontinued and propane was substituted. This change resulted in reduction of air emissions by an order of magnitude. With the change to propane, oils and solvents could be burned using propane burners positioned above the waste. This increases the destruction efficiency of vapors. Other significant reductions occurred by modifying processes to filter and reuse water contaminated with HE. Pollution prevention is an ongoing program at the Laboratory.

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Table H-1

NPDES Surface Water Sampling Data from Sampling Station E257 (9/4/02)

Analyte	Result	Unit of Measure	Preparation Code
Silver	U		UF
Arsenic	U		UF
Cadmium	U		UF
Cyanide (Total)	0.00537	milligrams per liter (mg/L)	UF
Chemical Oxygen Demand	227	mg/L	UF
Mercury	U		UF
Magnesium	3.72	mg/L	UF
Ammonia – as Nitrogen	0.36	mg/L	UF
Lead	27	micrograms per liter (ug/L)	UF
Selenium	U		UF

U = The analyte is classified as “non-detected”.
UF = Unfiltered sample.

Table H-2

ESR Surface Water Sampling Data from Sampling Station E257 (9/9/02)

Analyte	Result	Unit of Measure	Preparation Code
Max TSS	1110	milligrams per liter (mg/L)	UF
Tritium	U		UF
Lead-210	U		F
Strontium-90	U		F
Lead-210	7.79	picocuries per liter (pCi/L)	UF
Strontium-90	0.432	pCi/L	UF
Americium-241	U		F
Polonium-210	U		F
Plutonium-238	0.191	pCi/L	F
Plutonium-239/240	U		F
Thorium-228	U		F
Thorium-230	U		F
Thorium-232	U		F
Uranium-234	0.0852	pCi/L	F
Uranium-235/236	U		F
Uranium-238	U		F
Americium-241	U		UF
Polonium-210	1.15	pCi/L	UF
Plutonium-238	U		UF
Plutonium-239/240	U		UF
Thorium-228	U		UF
Thorium-230	U		UF
Thorium-232	0.0826	pCi/L	UF
Uranium-234	0.863	pCi/L	UF
Uranium-235/236	U		UF
Uranium-238	0.878	pCi/L	UF
Radium-228	U		F
Radium-228	2.26	pCi/L	UF
Radium-226	0.544	pCi/L	F
Radium-226	3.38	pCi/L	UF
Actinium-228	U		F
Americium-241	U		F
Barium-133	U		F
Beryllium-7	U		F
Bismuth-211	U		F

Table H-2 (Continued)

ESR Surface Water Sampling Data from Sampling Station E257 (9/9/02)

Analyte	Result	Unit of Measure	Preparation Code
Bismuth-212	U		F
Bismuth-214	U		F
Cadmium-109	U		F
Cerium-139	U		F
Cerium-141	U		F
Cerium-144	U		F
Cobalt-57	U		F
Cobalt-60	U		F
Chromium-51	U		F
Cesium-134	U		F
Cesium-137	U		F
Europium-152	U		F
Europium-154	U		F
Iron-59	U		F
Gross gamma	U		F
Mercury-203	U		F
Iodine-133	U		F
Potassium-40	U		F
Manganese-54	U		F
Sodium-22	U		F
Niobium-95	U		F
Neptunium-237	U		F
Neptunium-239	U		F
Protactinium-231	U		F
Protactinium-233	U		F
Protactinium-234M	U		F
Lead-211	U		F
Lead-212	U		F
Lead-214	U		F
Radium-223	U		F
Radium-224	U		F
Radium-226	U		F
Radium-228	U		F
Rhodium-106	U		F
Radon-219	U		F
Ruthenium-103	U		F
Ruthenium-106	U		F
Antimony-124	U		F
Antimony-125	U		F
Selenium-75	U		F

Table H-2 (Continued)

ESR Surface Water Sampling Data from Sampling Station E257 (9/9/02)

Analyte	Result	Unit of Measure	Preparation Code
Tin-113	U		F
Strontium-85	U		F
Thorium-227	U		F
Thorium-231	U		F
Thorium-234	U		F
Thallium-208	U		F
Uranium-235	U		F
Uranium-238	U		F
Yttrium-88	U		F
Zinc-65	U		F
Zirconium-95	U		F
Actinium-228	U		UF
Americium-241	U		UF
Barium-133	U		UF
Beryllium-7	U		UF
Bismuth-211	U		UF
Bismuth-212	U		UF
Bismuth-214	U		UF
Cadmium-109	U		UF
Cerium-139	U		UF
Cerium-141	U		UF
Cerium-144	U		UF
Cobalt-57	U		UF
Cobalt-60	U		UF
Chromium-51	U		UF
Cesium-134	U		UF
Cesium-137	U		UF
Europium-152	U		UF
Europium-154	U		UF
Iron-59	U		UF
Gross gamma	U		UF
Mercury-203	U		UF
Iodine-133	U		UF
Potassium-40	U		UF
Manganese-54	U		UF
Sodium-22	U		UF
Niobium-95	U		UF
Neptunium-237	U		UF

Table H-2 (Continued)

ESR Surface Water Sampling Data from Sampling Station E257 (9/9/02)

Analyte	Result	Unit of Measure	Preparation Code
Neptunium-239	U		UF
Protactinium-231	U		UF
Protactinium-233	U		UF
Protactinium-234M	U		UF
Lead-211	U		UF
Lead-212	11.8	pCi/L	UF
Lead-214	11.2	pCi/L	UF
Radium-223	U		UF
Radium-224	U		UF
Radium-226	U		UF
Radium-228	U		UF
Rhodium-106	U		UF
Radon-219	U		UF
Ruthenium-103	U		UF
Ruthenium-106	U		UF
Antimony-124	U		UF
Antimony-125	U		UF
Selenium-75	U		UF
Tin-113	U		UF
Strontium-85	U		UF
Thorium-227	U		UF
Thorium-231	U		UF
Thorium-234	U		UF
Thallium-208	U		UF
Uranium-235	U		UF
Uranium-238	U		UF
Yttrium-88	U		UF
Zinc-65	U		UF
Zirconium-95	U		UF
Gross alpha	U		F
Gross beta	6.52	pCi/L	F
Gross alpha	206	pCi/L	UF
Gross beta	317	pCi/L	UF

F = Filtered sample.
UF = Unfiltered sample.
U = The analyte is classified as “non-detected”.

Table H-3

Fish Ladder Seep Surface Water Sampling Data

Analyte	Sample Value in Micrograms per Liter	Qualifier (see Footnotes)
Confluence of Cañon de Valle and Fish Ladder Canyon (12/13/99)		
Barium	120	
Iron	4300	
Uranium	0.333000004	
Total Phosphorus	110	
Alkalinity-HCO_3	52000	
Sodium	12000	
Calcium	9300	
Magnesium	3700	
Potassium	3500	
Manganese	190	
Sulfate	2700	
Fluoride	170	
Tritium	24	
Aluminum	6500	
Chloride	12000	
Nickel	4	J
Boron	42	J
Cobalt	1.700000048	J
Vanadium	7.300000191	J
Lead	2.700000048	J
Chromium	3.700000048	J
Arsenic	3.199999809	J
Beryllium	1.100000024	J
Iron	2000	
Magnesium	3200	
Manganese	14	
Calcium	8700	
Sodium	11000	
Potassium	3000	
Aluminum	3400	
Barium	71	J
Cobalt	1.399999976	J
Vanadium	3.5	J
Boron	10	J
Chromium	2	J

Table H-3 (Continued)

Fish Ladder Seep Surface Water Sampling Data

Analyte	Sample Value in Micrograms per Liter	Qualifier (see Footnotes)
Confluence of Cañon de Valle and Fish Ladder Canyon (3/29/00)		
Potassium	4400	
Zinc	38	
Vanadium	16	
Sodium	11000	
Perchlorate	7.78000021	
Fluoride	422	
Chloride	14000	
Barium	150	
Uranium	0.495000005	
Sulfate	2470	
Alkalinity-HCO_3	44000	
Manganese	65	
Magnesium	4200	
Iron	13000	
Calcium	7900	
Lead	5.599999905	
Nickel	6.800000191	J
Beryllium	1.299999952	J
Chromium	9.300000191	J
Cobalt	2.099999905	J
Copper	5.199999809	J
Selenium	4.099999905	J+
Aluminum	18000	J+
Barium	120	
Zinc	31	
Iron	10000	
Lead	4	
Magnesium	3700	
Calcium	7400	
Sodium	11000	
Potassium	4000	
Vanadium	13	
Manganese	46	
Nickel	5.5	J
Arsenic	3.299999952	J
Beryllium	1	J

Table H-3 (Continued)

Fish Ladder Seep Surface Water Sampling Data

Analyte	Sample Value in Micrograms per Liter	Qualifier (see Footnotes)
Chromium	7.699999809	J
Cobalt	2.5	J
Copper	4.300000191	J
Antimony	4	J
Aluminum	15000	J+
Confluence of Cañon de Valle and Fish Ladder Canyon (4/25/01)		
Fluoride	236	
Tritium	155.519989	
Sulfate	23000	
Chloride	5130	
Barium	343	
HMX	2.700000048	
RDX	0.939999998	
Sodium	9640	
Alkalinity-HCO_3	38000	
Zinc	24.5	
Calcium	14100	
Manganese	82.69999695	
Aluminum	5180	
Boron	51.79999924	J
Chromium	4.400000095	J
Lead	1.399999976	J
Beryllium	0.569999993	J
Potassium	4860	J
Nickel	2.599999905	J
Vanadium	6	J
Magnesium	3900	J
Iron	3240	J-
Nitrate-Nitrite as N	93.69999695	J-
Aluminum	4310	
Manganese	42.09999847	
Sodium	9580	
Barium	345	
Calcium	14700	
Vanadium	4.800000191	J
Zinc	8.5	J
Nickel	1.5	J
Selenium	1.899999976	J

Table H-3 (Continued)

Fish Ladder Seep Surface Water Sampling Data

Analyte	Sample Value in Micrograms per Liter	Qualifier (see Footnotes)
Magnesium	3900	J
Boron	47.5	J
Potassium	4980	J
Chromium	2.400000095	J
Iron	2580	J-
Fish Ladder Seep (3/3/98)		
Strontium	39.5	
Iodide	50	
Sodium	7370	
Barium	417	
Aluminum	5870	
Zinc	26.79999924	
Alkalinity-HCO_3	11000	
Iron	5700	
Calcium	5430	
Cesium	700	
RDX	5.400000095	
Lead	4.800000191	
HMX	3.420000076	
Lithium	18.10000038	
Manganese	74.40000153	
Total Organic Carbon	14000	
Sulfate	9000	
Fluoride	100	
Chloride	4500	
Silicon Dioxide	15000	
Boron	32	J
Cobalt	1.399999976	J
Magnesium	1840	J
Potassium	3060	J
Nickel	4.599999905	J
Copper	6.599999905	J
Vanadium	12.30000019	J
Dichloroethene [cis-1,2-]	9	J-
Tetrachloroethene	10	J-
Acetone	25	J-
Alkalinity-HCO_3	14000	
Iron	17700	
Zinc	59	

Table H-3 (Continued)

Fish Ladder Seep Surface Water Sampling Data

Analyte	Sample Value in Micrograms per Liter	Qualifier (see Footnotes)
Sulfate	10000	
Fluoride	100	
Chromium	10.39999962	
Calcium	7620	
Total Organic Carbon	22000	
Chloride	4000	
RDX	5.909999847	
Manganese	1260	
Lead	14.60000038	
HMX	4.159999847	
Silicon Dioxide	14200	
Sodium	7700	
Aluminum	14000	
Cesium	500	
Lithium	25.79999924	
Strontium	57.70000076	
Barium	979	
Cobalt	12.89999962	J
Copper	13	J
Magnesium	3210	J
Nickel	9.199999809	J
Selenium	3.700000048	J
Vanadium	33.09999847	J
Arsenic	8.300000191	J
Molybdenum	6.300000191	J
Boron	49.70000076	J
Potassium	4610	J
Tetrachloroethene	12	J-
Acetone	27	J-
Dichloroethene [cis-1,2-]	9	J-
Magnesium	2200	
HMX	16	
Barium	360	
Calcium	8700	
Potassium	2800	
Iron	1200	
RDX	2.200000048	
Zinc	22	
Manganese	130	
Aluminum	1300	

Table H-3 (Continued)

Fish Ladder Seep Surface Water Sampling Data

Analyte	Sample Value in Micrograms per Liter	Qualifier (see Footnotes)
Alkalinity-HCO_3	10000	
Sodium	12000	
Sulfate	31700	
Dichloroethene [cis-1,2-]	27	
Trichloroethene	10	
Uranium	0.323000014	
Chloride	21500	
Nitrate-Nitrite as N	110	
Perchlorate	17.10000038	
Tritium	120	
Tetrachloroethene	42	
Fluoride	96	
Cobalt	1.399999976	J
Boron	55	J
Chromium	1.799999952	J
Silver	0.75	J
Vanadium	3.799999952	J
Copper	3.199999809	J
Beryllium	0.150000006	J
Nickel	2.200000048	J
Antimony	3.299999952	J
Sodium	13000	
Potassium	2700	
Manganese	53	
Magnesium	2100	
Iron	410	
Calcium	8700	
Barium	330	
Aluminum	470	
Vanadium	1.799999952	J
Boron	56	J
Zinc	19	J
Cobalt	1.599999905	J
Chromium	0.49000001	J
Nickel	1.799999952	J
Silver	0.699999988	J
Copper	2	J

Table H-3 (Continued)

Fish Ladder Seep Surface Water Sampling Data

Analyte	Sample Value in Micrograms per Liter	Qualifier (see Footnotes)
Fish Ladder Seep (4/17/01)		
Calcium	14900	
Aluminum	13000	
Tetrachloroethene	1.200000048	
Tritium	167.3600006	
Chloride	13700	
Zinc	44.59999847	
Fluoride	256	
Sulfate	15500	
Manganese	131	
Sodium	11900	
HMX	13.89999962	
RDX	4.5	
Nickel	6.400000095	J
Vanadium	18.60000038	J
Magnesium	4500	J
Beryllium	0.50999999	J
Cobalt	1.899999976	J
Arsenic	3.400000095	J
Boron	54.29999924	J
Potassium	4650	J
Chromium	7.900000095	J
Trichloroethene	0.25	J
Copper	18.5	J
Iron	8260	J-
Lead	5.699999809	J-
Aluminum	10800	
Sodium	10500	
Calcium	9500	
Manganese	87.59999847	
Zinc	27	
Vanadium	14.30000019	J
Beryllium	0.449999988	J
Copper	7.199999809	J
Potassium	2610	J
Nickel	4.400000095	J
Chromium	6.199999809	J
Selenium	1.399999976	J
Arsenic	2.400000095	J

Table H-3 (Continued)

Fish Ladder Seep Surface Water Sampling Data

Analyte	Sample Value in Micrograms per Liter	Qualifier (see Footnotes)
Boron	53.20000076	J
Magnesium	3090	J
Lead	4.199999809	J-
Iron	6360	J-

J = The analyte is classified as detected but the reported concentration value is expected to be more uncertain than is usual.
J- = The analyte is classified as detected but the reported concentration value is expected to be more uncertain than is usual with a potential negative bias.
J+ = The analyte is classified as detected but the reported concentration value is expected to be more uncertain than is usual with a potential positive bias.

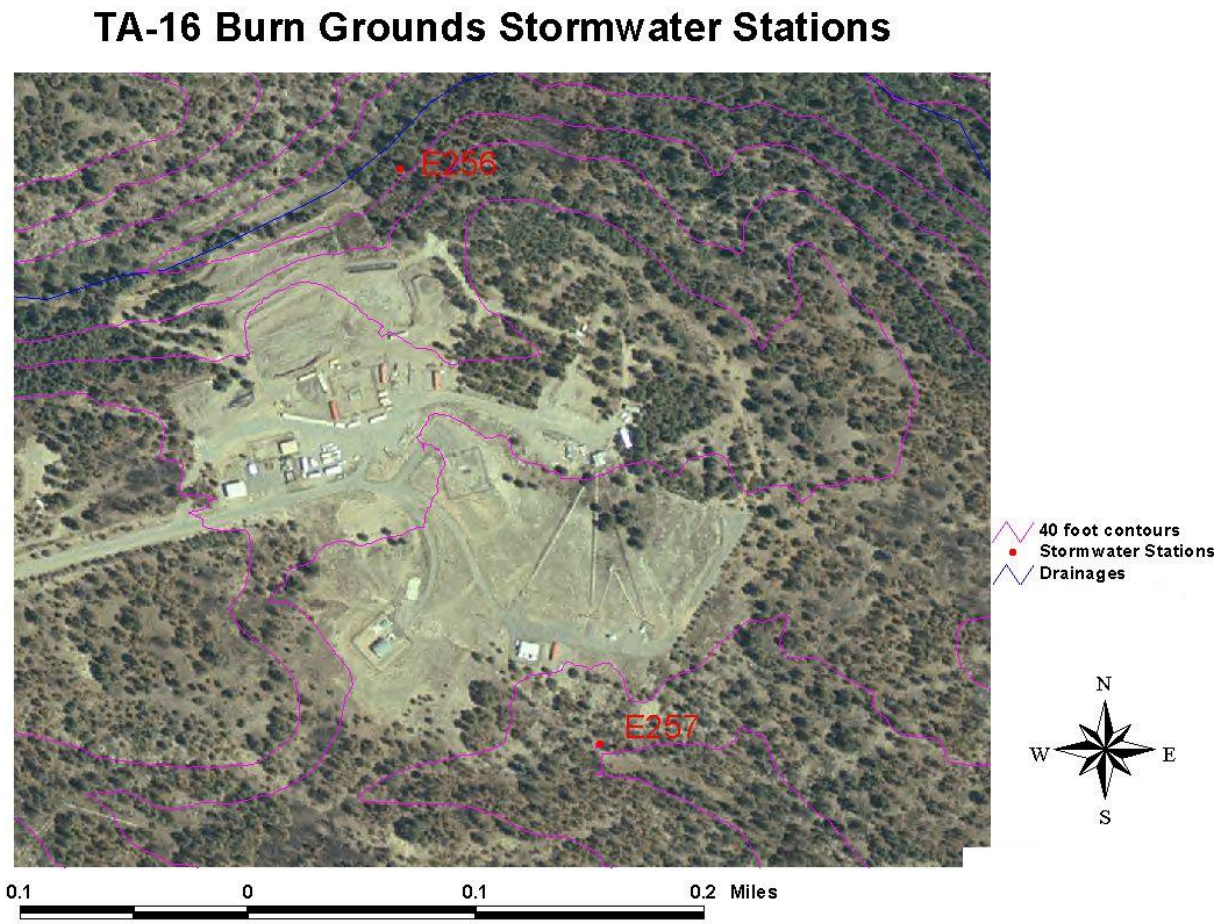


Figure H-1

Location of Sampling Station E257

Supplement H-1

Deposition Modeling

Supplement H-1
Deposition Modeling

Introduction

The Air Quality Group at Los Alamos National Laboratory (LANL) applied the CALPUFF (Scire et. al., 2000) modeling package to assess pollutants deposited from open burning operations at the TA-16 Burn Ground. The CALPUFF package consists of a meteorological program with both diagnostic and prognostic wind-field calculations (CALMET), a non-steady state dispersion model (CALPUFF), and a post-processing program (CALPOST). The CALPUFF package was developed and intended for regulatory use in air quality programs, and is considered a "guideline" model by the Environmental Protection Agency (EPA) (EPA, 2000). This package is considered by the EPA to be suitable for complex and rugged terrain conditions similar to those that exist at LANL (see Figure 1). Because of the terrain, Los Alamos surface winds often vary dramatically with time of day, location, and height above ground (Bowen, 1990).

In addition to incorporating the influences of terrain in dispersion modeling, the CALPUFF system has many other capabilities; one important aspect being that it is a non-steady state model or "puff" trajectory model. Therefore, output results incorporate downwind changes in dispersion conditions with time, on an hour-by-hour basis. Some of the other components of the system include the handling of building wake effects, calculating maximum or ranked air concentration values, wet and dry deposition functions, treatment of calms, allowing for constant or varying release rates, and calculating varying mixing heights. The CALPUFF system is suitable for modeling domains from tens of meters to hundreds of kilometers. Predictions for averaging times can range from one hour to one year (Scire et. al., 2000).

The purpose of this CALPUFF analysis was to derive conversion values that, when multiplied by the estimated annual emissions rate of a particular pollutant (in grams/year [g/yr]), result in soil concentration levels in milligrams of pollutant per kilogram of soil (mg/kg) for comparison with risk screening levels.

Methods

For the air dispersion modeling, LANL used a 3-kilometer (km) by 3-km modeling domain. The size of the modeling grid was based on previous air dispersion modeling using SCREEN3, an EPA screening model, which showed the maximum impact of the TA-16 Burn Ground occurred within the LANL boundaries at 0.5 km from the Burn Ground. This given modeling domain captures the highest concentrations, later used to calculate soil activity levels.

The release sites were centered within the modeling domain. Terrain data were supplied to the model from digitized topography data obtained from the USGS. The predominant wind direction at the site is from the S, SSW, and SW; consequently, the maximum air concentrations (and deposition) occur on LANL property in the N, NNE, and NE sectors. The CALMET model calculates hour wind fields based on the meteorological input data supplied from the surface and upper air stations, and uses digitized terrain data files obtained from the USGS.

The CALMET and CALPUFF models have a large number of parameters and flags, which the user can set or change. Most of the default values pre-set in the code were appropriate to LANL. However, some of them did require change. Complete input/output files have been provided under separate cover to the New Mexico Environment Department (NMED). They are not included in this application due to their length. Input variables (of significance) that were set or changed in CALMET include:

NUSTA = 1	This is the number of upper air stations used. CALPUFF requires at least one upper air station.
IRTYPE = 1	This value was set at 1 to compute all micrometeorological variables, as required to complete the dispersion analysis.
LCALGRD = T	Set to compute all data fields required by CALGRID, needed to complete the dispersion analysis.
DGRIDKM = 0.1	This is the grid spacing used in the dispersion modeling, equal to 100 m, the most common value used for fine scale modeling.
NZ = 4	This is the number of additional horizontal wind field layers used in the modeling, Heights were set at 20 m, 40 m, 80 m, and 160

m, the values suggested in CALPUFF training course for near field analysis.

NSSTA = 4 — The variable represents the number of surface stations. This analysis used the four main surface stations at LANL.

IWFCOD = 1 — This value activates the diagnostic wind field module needed to complete the dispersion analysis.

BIAS = -1, -.8, -.5, -.2 — This is the layer dependant bias given to specify how much to weigh upper air meteorological data to surface meteorological data. These were set based on previous modeling experience with CALPUFF for LANL.

RMIN2 = 4.0
LVARY = T
RMAX1 = 5
RMAX2 = 20
RMIN = 1
TERRAD = 1
R1 = 1
R2 = 20

These values govern the influence of the site terrain on the local and upper level wind fields. They were determined (previously) by conducting a large number of trial runs of CALPUFF and incorporating the topography of the Pajarito Plateau.

The CALPUFF input variables (of significance) that were set or changed were:

METRUN = 1 — This causes CALPUFF to use the entire set of meteorological data.

NSPEC = 3 — This selected the three different species of pollutants to be modeled.

MCATDJ = 2 — This was set to utilize the CALPUFF terrain adjustment method. This option provides for a more complete handling of terrain adjustments.

MTRANS = 0 — This sets transitional plume rise set to zero since there are no building wake effects for the source.

MTIP = 0 — No stack tip downwash was selected because the release site has minimal physical height.

MCHEM = 0 — No chemical transformation was selected because we lack sufficient data to support chemical transformation of the emitted pollutants.

MDISP = 1 — This allows the use of the most advanced method to calculate the dispersion coefficients.

MPARTL = 0 — Partial plume penetration was set to zero to maximize

	ground level concentrations under expected dispersion conditions.
MREG = 0	The must be set to zero since MCHEM, MTRANS, and MPARTL were set to their non-regulatory default value.
X = 379.74, Y=3967.73	These are the UTM coordinates of the source in km.
Z = 2270 m	This is the base elevation of the source.
source release height = 1.0 m	This is the release height of the source.
source diameter = 7.0 m	This best approximates the source.
gas exit velocity = 1.0 m/s	This is a typical/conservative value.
source temperature = 1200 degrees K	This was the value that provided conservative dispersion results. It was based on a number of trial runs at the various temperatures given for the burn operations.

A unit release rate of one gram/second (g/s) was used in order to preclude having to run the model for each specific pollutant. This is common practice in air modeling. The air concentration and deposition are directly proportional to the emission rate and likewise can be adjusted to specific values by using the estimated emission rate for each pollutant (Scire et. al., 2000).

The burn site is located in moderately vegetated Ponderosa Pine forest, and is surrounded by DOE/LANL property that has light to moderate use. The predominate wind direction at the site is from the S, SSW, and SW; consequently, the maximum air concentrations (and deposition) occur on LANL property in the N, NNE, and NE sectors. The CALMET model calculates hour wind fields based on the meteorological input data supplied from the surface and upper air stations, and uses digitized terrain data files obtained from the USGS.

Pollutant emissions can occur as particles, vapors, and gases. The CALPUFF model, in addition to containing species-specific data for the primary air pollutants (particulate matter, oxides of nitrogen, oxides of sulfur, and carbon monoxide), includes some toxic pollutants in the species library such as toluene and xylene. It does not, however, contain data for many of the constituents of concern from the TA-16 Burn Ground.

Therefore, LANL used particulate matter with a diameter of less than ten microns to represent particulate emissions (e.g., metals), oxides of nitrogen to represent non-metallic inorganics (e.g., acids and bases that would be volatilized during treatment), and toluene to represent emissions from the burning of organic compounds (e.g., vapors emitted from the burning of solvents). Both air concentration and dry deposition rates were modeled with CALPUFF. Figure 2 shows the resultant ground level air-concentration values and Figure 3 shows deposition flux predicted by CALPUFF.

Estimating Soil Concentrations

To estimate soil deposition, the Table 1 deposition rates (in g/yr) had to be converted to the soil concentration levels (in mg/kg) shown in Table 2 for comparison with risk-based screening levels. The calculations performed are described below and assume that the soil active layer is 0.02 m, and the soil density is 1200 kg per cubic meter, and the unit release rate is 1g/s.

Step 1. The soil input concentration rate (CR) is the deposition rate (DR) divided by the active soil volume, or
CR = DR / (D * BD)
CR = 9.0×10^{-10} (g/m^2 s) / (0.02 m) * (1200 kg /m3)
Where CR = soil input concentration rate (mg/kg s) per unit release rate of 1g/s
DR = deposition rate
D = depth of soil mixing layer
BD = soil bulk density

Step 2. Convert g to mg
CR= 3.75×10^{-11} (g/kg s) * 1000mg/g
CR= 3.75×10^{-08} (mg/kg s)

Step 3. Convert to an annual value
CR = 3.8×10^{-08} (mg/kg s) * $3.1536 \times 10^{+07}$ (s/yr)
CR = 1.1826 (mg/kg yr)

Step 4. Remembering that the soil input concentration rate (CR) is for a 1g/s release rate, we must now express it as an annual value so that we can multiply by the annual pollutant emissions rate to obtain the annual soil conversion factor (CF), given emission rate: 1 g/s = $3.1536 \times 10+^{07}$ g/yr
If CR = 1.1826 (mg/kg yr) per $3.1536 \times 10^{+07}$ (g/yr)
Then CF = 3.8×10^{-08} (mg/kg yr) per pollutant release rate in g/yr

Comparison to Risk Screening Values

NMED requested that LANL compare deposition to the appropriate NMED Soil Screening Levels (SSLs) (NMED, 2000) and the LANL Ecological Screening Levels (ESLs) (LANL, 1999). Levels above the SSLs or ESLs would represent possible risks that required further analysis. Soil concentrations were calculated for pollutants emitted by burning operations that have SSLs and/or ESLs, as summarized in Table 3. Column 1 of Table 3 was calculated by using the year 2000 TA-16 Burn Ground activity as a baseline. The year 2000 data were used because the analysis was conducted in 2001 and the 2000 emissions were the most recent complete year of emissions data and were considered typical of ongoing operations. Emissions were calculated using EPA emission factors for open burning. Column 2 was calculated by multiplying the annual emission by 10 to calculate emissions that would occur over the 10-year duration of a RCRA hazardous waste facility permit and multiplying by the appropriate Table 2 factor. For example, the cadmium (emitted as a particle) concentration in soils resulting from TA-16 Burn Ground operations, was calculated as follows:

$$\frac{3.9\text{ E-02 g}}{\text{yr}} * 10\text{ yr} * \frac{2.6\text{ E-08 mg/kg}}{\text{g/yr}} = 1.0\text{ E-08 mg/kg}$$

The original spreadsheet used to perform calculations contained more than two significant figures and slight differences will occur due to rounding to the two significant figures shown in Table 3.

Conclusions

The results of this analysis show that impacts from the TA-16 Burn Ground are orders of magnitude lower than the risk-based screening levels. Even if pollutant emissions or other assumptions used in the calculation varied somewhat, the risks would be well below the SSL/ESL screening values.

References

Bowen, B. M, 1990, “Los Alamos Climatology” Los Alamos National Laboratory report LA-11735-MS, Los Alamos, New Mexico.

EPA, 2000, "Requirements of Preparation, Adoption, and Submittal of State Implementation Plans, Guideline on Air Quality Models – Proposed Rule" Federal Register, April 21, 2000.

Scire, J.S., Stimanitis D. G., and Yamartino R.J., 2000, "A Users Guide for the CALPUFF Dispersion Model," Section 2.1, Earth Tech. Inc. January 2000.

LANL, 1999, "Screening Level Ecological Risk Assessment Methods," LA-UR-99-1406, Los Alamos National Laboratory, Los Alamos, New Mexico.

NMED, 2000, "Technical Background Document for Development of Soil Screening Levels," December 18, 2000.

Table 1

Deposition Rate for Pollutants Emitted During Open Burns at TA-16 Burn Ground

Variable	Rate (g/m2/s)
CALPUFF derived particle deposition rate	6.2×10^{-10}
CALPUFF derived hydrocarbon deposition rate	1.5×10^{-10}
CALPUFF derived gas deposition rate	3.8×10^{-11}

Table 2

Values for Converting Pollutant Emissions In "g/yr" To Soil Concentration Levels in "mg/kg"

Variable	Conversion value
Particulate emission type from CALPUFF	2.6×10^{-08}
Hydrocarbon emission type from CALPUFF	6.3×10^{-09}
Other gaseous emissions type from CALPUFF	1.6×10^{-09}

Table 3

Ten-Year Deposition Calculations

Constituent	Air Emissions (lbs/yr)	Air Emissions (g/yr)	Deposition over 10 years (mg/kg)	SAL FOR Industrial Soil (mg/kg)	ESL (mg/kg)
Acetone	1	4.5 E+02	2.9 E-05		3.7 E+00
Anthracene	7 E-07	3.1 E-04	2.0 E-11	3.4 E+04	2.0 E+02
Barium	9.4 E-04	4.2 E-01	1.1 E-07	1.5E+04	2.4 E+00
Benzo(b)flouranthene	2 E-06	9.1 E-04	5.7 E-11	2.6 E+01	1.8 E+01
Benzo(a)anthracene	2 E-06	9.1 E-04	5.7 E-11	2.6 E+01	
Cadmium	8.6 E-05	3.9 E-02	1.0 E-08	1.9 E+02	1.0 E-01
Chloroform	0.1	4.5 E+01	2.9 E-06	3.0 E-01	2.8 E+01
Chrysene	2 E-06	9.1 E-04	5.7 E-11	2.5 E+03	2.5 E+00
Chromium	0.003	1.4 E+00	3.5 E-07	1.0 E+05 (III) 6.6 E+02 (VI)	1.4 E+00 (TOTAL) 2.0 E-01 (VI)
1,2-dichloroethane	2	9.1 E+02	5.7 E-05	7.2 E+00	
2.4-dinitrotoluene	0.3	1.4 E+02	8.6 E-06	3.0 E+02	1.0 E+0
Fluoranthene	7 E-06	3.2 E-03	2.0 E-10	5.3 E+03	2.6 E+01
Fluoride	38	1.7 E+04	2.8 E-04	8.9 E+03	3.1 E+01
Mercury, elemental	0.002	9.1 E-01	2.4 E-07	2.0 E+01	5.0 E-02
Methylene chloride	0.2	9.1 E+01	5.7 E-06		7.0 E+00
Nitrate	6	2.3 E+03	4.4 E-05	1.0 E+05	
Nitrite	15	6.8 E+03	1.1 E-04	1.5 E+04	
Phenanthrene	2 E-06	9.1 E-04	5.7 E-11	4.4 E+03	1.1 E+01
Pyrene	1 E-05	4.5 E-03	2.9 E-10	4.3 E+03	1.5 E+01
Toluene	0.2	9.1 E+01	5.7 E-6	1.8 E+02	7.1 E+01
Trichloroethylene	0.4	1.8 E+02	1.1 E-5	1.8 E+01	1.9 E+00

Figure 1

USGS 7.5 Minute Contour Map and CALPUFF Modeling Domain for TA-16 Open Burns.

Figure 2. CALPUFF Annual Air Concentration Values (g/m**3) per Unit Release Rate (g/s) for TA16 Open Burning Site

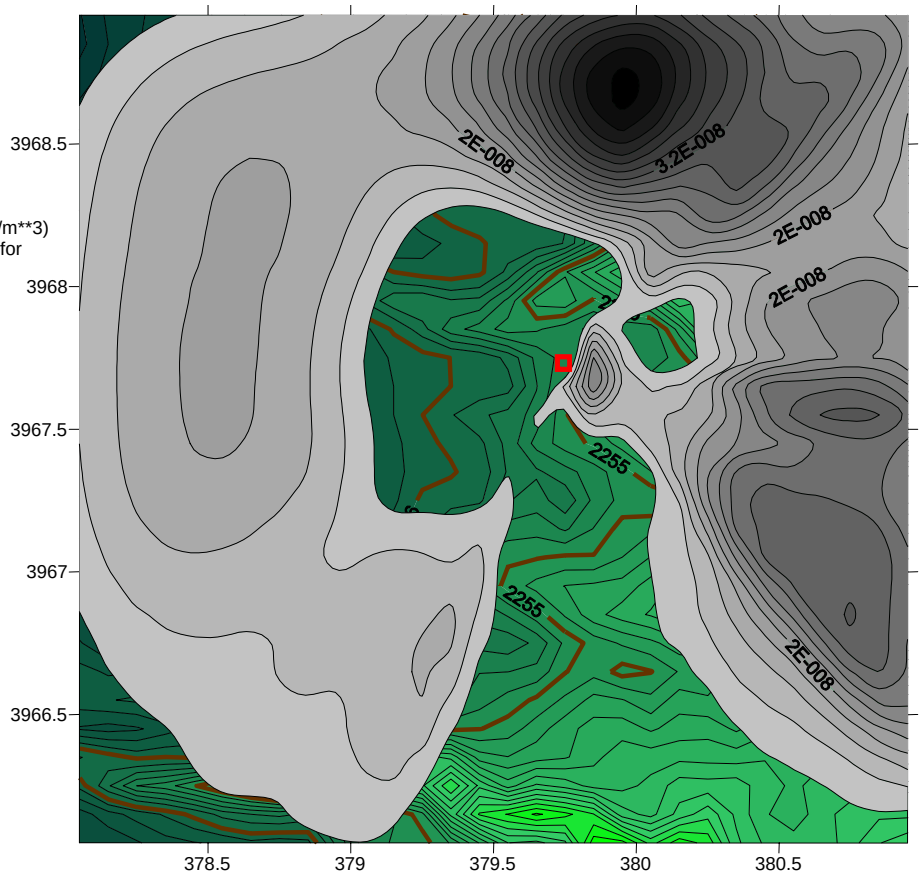
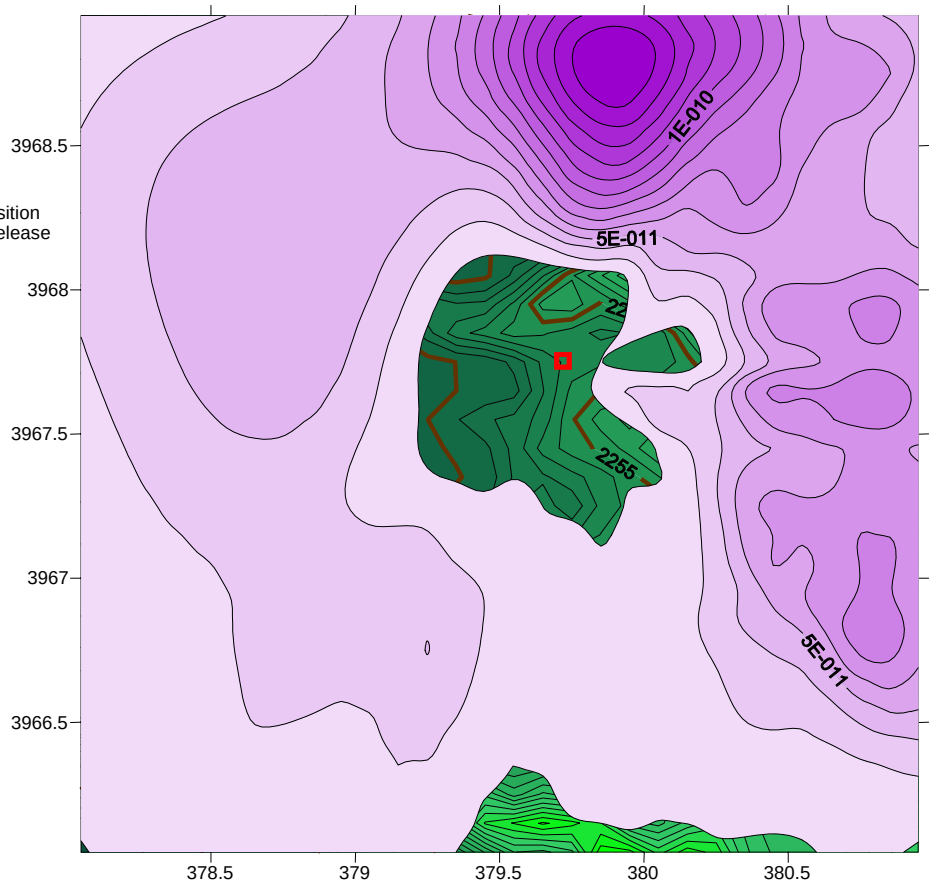


Figure 3. CALPUFF Deposition Flux (g/m**2/s) per Unit Release Rate (g/s) for Toluene TA16 Open Burning Site



Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Sandra Martin, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Dear Ms. Martin:

Subject: Resource Conservation and Recovery Act (RCRA) Part B Permit Renewal Application Submittal - Los Alamos National Laboratory (LANL), EPA ID No. NM 890010515

The purpose of this letter is to submit and request approval for the most recent versions of the RCRA permit applications supporting the renewal of the LANL hazardous waste facility permit. The original RCRA Hazardous Waste Facility Permit was issued to the U.S. Department of Energy (DOE) and the University of California (UC) by the New Mexico Environmental Improvement Division on November 8, 1989.

The permit applications included in this submittal have been revised to incorporate the text and information indicated in DOE/UC's responses to nine requests for information received from the Hazardous Waste Bureau (HWB) since the original applications were submitted for the permit renewal. These revisions of the applications were modified to include additional information regarding various waste management programs or procedures that have changed since the last responses.

This submittal contains three revised permit applications. These include the LANL General Part B, Technical Area 16, and Technical Area 54. As discussed during our meeting on August 21, 2003 the application for Technical Area 55 will be submitted in mid-September 2003. The enclosed applications have been prepared separately to reflect the permit guidance received from HWB in March 1998 regarding the required format. The documents are:

- Los Alamos National Laboratory General Part B Permit Renewal Application, Revision 2.0, LA-UR-03-5923
- Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Application, Revision 4.0, LA-UR-03-3903
- Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application, Revision 3.0, LA-UR-03-3579

In addition, this submittal contains three supporting documents designed to aid final review of the applications in the form of crosswalks or change tables. These documents were discussed with Mr. Carl Will, HWB, on March 10, 2003. The documents are intended to provide a way of referencing the comments received in the HWB's requests for information and the sections of the permit applications affected by subsequent text changes or additions as described in DOE/UC's responses. Additional copies of the relevant requests for information are included with the crosswalk documents to assist in reviewing the detailed responses. These copies do not contain the appendices and attachments included with the original submittals in the interest of brevity and since the full submittals are already available at HWB. The crosswalks are each specific for the included revised permit renewal applications (General, TA-16, TA-54).

The enclosure for this letter contains a list of the changes that have been incorporated in the General Part B permit application since the last DOE/UC response to a request for information. The changes reflect new information regarding LANL waste management procedures developed since that time and text edits to address issues of concern to DOE/UC.

If you should have any questions or comments concerning this permit renewal submittal, please contact Gene Turner, DOE, of my staff at (505) 667-5794 or Jack Ellvinger, UC, at (505) 667-0633.

Sincerely,

for Ralph E. Erickson
Manager

OFO:1GT-020

Enclosure

cc w/enclosure:
Carl Will
Permits Management Program
Hazardous Waste Bureau
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LA-UR-03-3579
June 2003

Los Alamos National Laboratory
Technical Area 54
Part B Permit Renewal Application

Revision 3.0

Prepared by:

Los Alamos National Laboratory
Risk Reduction and Environmental Stewardship Division
Solid Waste Regulatory Compliance Group (RRES-SWRC)
Los Alamos, New Mexico 87545

Los Alamos National Laboratory
Technical Area 54
Part B Permit Renewal Application

Revision 3.0

LA-UR-03-3579
June 2003

Prepared by:
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LIST OF ATTACHMENTS

ATTACHMENT	TITLE
A	Facility Description
B	Waste Analysis Plan
C	Inspection Plan
D	Personnel Training Plan
E	Contingency Plan
F	Closure Plan for Technical Area 54 Container Storage Units
G	Container Management
H	Closure/Post-Closure Plan for the Technical Area 54 Area L Landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D)
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LIST OF SUPPLEMENTS

SUPPLEMENT	TITLE
2-1	Secondary Containment Capacities
4-1	Solid Waste Management Units at Technical Area 54: Information Extracted from "The 2003 Solid Waste Management Unit Report"—LA-UR-03-6000

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CFR	Code of Federal Regulations
CSU	container storage unit
DOT	Department of Transportation
FRP	fiberglass-reinforced plywood
ft	foot/feet
ft^3	cubic feet
HRMB	Hazardous and Radioactive Materials Bureau
LANL	Los Alamos National Laboratory
MLLW	mixed low-level waste
MTRUW	mixed transuranic waste
NMED	New Mexico Environment Department
RANT	Radioassay and Nondestructive Testing Facility
RTR	real-time radiography
SWB	standard waste box
SWMU	solid waste management unit
TA	Technical Area
TDOP	ten drum overpack
TRU	transuranic
TRUPACT-II	Transuranic Package Transporter-II
WIPP	Waste Isolation Pilot Plant
yd^3	cubic yard(s)

1.0 INTRODUCTION

This "Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application" is submitted to address the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00], requirements specific to hazardous and mixed waste container storage operations at Technical Area (TA) 54. This document serves as Revision 3.0 to previous applications submitted to the New Mexico Environment Department (NMED) in January 1999 (Revision 0.0; Los Alamos National Laboratory [LANL], 1999a), September 1999 (Revision 0.1; LANL, 1999b), December 1999 (Revision 1.0; LANL, 1999c), and December 2000 (Revision 2.0; LANL, 2000a), and includes revisions presented in the "Response to Notice of Deficiency: TA-54 Part B RCRA Permit Application; September 1999, Revision 0.1; December 2000, Revision 2.0; Los Alamos National Laboratory EPA ID# NM0890010515," submitted to the NMED in July 2002 (LANL, 2002a). Each application was prepared to be consistent with the permitting strategy outlined by the NMED Hazardous and Radioactive Materials Bureau (HRMB) in correspondence dated February 5, 1998.

As presented in that correspondence, TA-specific permit applications, permit modification requests, and permit renewal applications would include any details and/or requirements not addressed in the "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0 (LANL, 1998a). The most recent version of that document, hereinafter referred to as the LANL General Part B, complements this permit renewal application. Certain portions of the LANL General Part B will serve in the operating permit as "umbrella" documents, covering the requirements of the New Mexico Hazardous Waste Act and implementing regulations, specifically 20.4.1 NMAC [6-14-00], common to all TAs. Together, information provided in this application and in the LANL General Part B will meet the applicable Part B requirements specified in 20.4.1 NMAC, Subparts V and IX [6-14-00].

In accordance with HRMB's 1998 permitting strategy, LANL submitted the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0 (LANL, 1998b). That Part A consolidated information from previous site-wide and TA-specific Part A submittals into one comprehensive document, identifying all hazardous and mixed waste treatment, storage, and disposal facilities at LANL subject to 20.4.1 NMAC, Subparts V, VI, and IX [6-14-00] at that time. The Part A was subsequently revised and submitted to the NMED in November 1999 (Revision 1.0; LANL, 1999d), July 2000 (Revision 2.0; LANL, 2000b), and August 2002 (Revision 3.0; LANL,

2002b). The most recent version of that document, hereinafter referred to as the LANL General Part A, serves as a companion document to the LANL General Part B and TA-specific permit applications, permit modification requests, and permit renewal applications, including this TA-54 Part B permit renewal application.

In the LANL General Part A, the LANL General Part B, and this permit renewal application, a unit to be permitted may sometimes be referred to as a “facility.” The term “facility,” as it appears in this context, is used only to denote building names and does not imply the regulatory meaning of “facility” as defined in 20.4.1 NMAC §260.10 [6-14-00]. However, pursuant to 20.4.1 NMAC §260.10 [6-14-00], the LANL facility as a whole does meet the regulatory definition of a facility.

This permit renewal application also includes the closure/post-closure plans for the Area L and Area G disposal units regulated as landfills. These plans, presented as Attachments H and I herein, were originally submitted to the NMED in April 2002 (LANL, 2002c; LANL, 2002d). The closure/post-closure plan for Area L addresses Shafts 1, 13-17, and 19-34 and Impoundments B and D. The closure/post-closure plan for Area G addresses Pit 29 and Shaft 124. In addition, Attachment J included in this permit renewal application is the compliance demonstration document for Material Disposal Area H, which was also submitted to the NMED in April 2002 (LANL, 2002e). LANL is not seeking operating permitted status for any of those waste management units.

Table 1-1 provides a list of regulatory references and the corresponding location in the permit renewal application, as appropriate. Where applicable, regulatory citations in this document reference 20.4.1 NMAC, which adopts, with few exceptions, all of the Code of Federal Regulations, Title 40, Parts 260 to 266, Part 268, and Part 270.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(1)	General facility description	Attachment A[a] (A.1)
§270.14(b)(2)	Chemical and physical analyses	Attachment B[a]
§270.14(b)(3)	Waste analysis plan	Attachment B[a]
§264.13(b)	Development and implementation of waste analysis plan	Attachment B[a]
§264.13(c)	Off-site waste analysis requirements	Attachment B[a]
§270.14(b)(4)	Security procedures and equipment	Attachment G (G.1.2, G.2.1, G.3.1, G.4.1)
§264.14	Security	Attachment G (G.1.2, G.2.1, G.3.1, G.4.1)
§270.14(b)(5)	General inspection requirements	2.7, Attachment C[a]
§264.15(b)	General inspection requirements	2.7, Attachment C[a]
§264.174	Container inspections	2.7, Attachment C[a]
§264.193(i)	Tank inspections	NA[b]
§264.195	Overfill control inspections	NA
§264.226	Surface impoundments monitoring and inspection	NA
§264.254	Waste pile monitoring and inspection	NA
§264.273	Land treatment design and operating requirements	NA
§264.303	Landfill monitoring and inspection	Attachments H and I
§264.347	Incinerator monitoring and inspection	NA
§264.602	Miscellaneous units	NA
§264.1033	Process vent standards	NA
§264.1052	Equipment leak air emission standards	NA
§264.1053	Compressor standards	NA
§264.1058	Standards for pumps, valves, pressure relief devices, flanges and connections	NA
§264.1088	Subpart CC inspection and monitoring requirements	Attachment C (C.2), Attachment G (G.1.6)
§270.14(b)(6)	Request for waiver from preparedness and prevention requirements of 264 Subpart C	NA

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(7)	Contingency plan requirements under 264 Subpart D	Attachment E[a]
§264, Subpart D	Contingency plan and emergency procedures	Attachment E[a]
§264.227	Surface impoundment emergency repairs; contingency plans	NA
§264, Subpart C	Preparedness and prevention	Attachment G (G.1.3, G.2.2, G.3.2, G.4.2)
§270.14(b)(8)	Preparedness and prevention	Attachment G (G.1.3, G.2.2, G.3.2, G.4.2)
§270.14(b)(8)(i)	Prevention of hazards in unloading operations (ramps and special forklifts)	Attachment G (G.1.4.1)
§270.14(b)(8)(ii)	Runoff prevention with berms, trenches, and dikes	2.10, Attachment G (G.1.4.2)
§270.14(b)(8)(iii)	Prevention of contamination of water supplies	Attachment G (G.1.4.3)
§270.14(b)(8)(iv)	Mitigation effects of equipment failure and power outages	Attachment G (G.1.4.4, G.2.3, G.3.3, G.4.3)
§270.14(b)(8)(v)	Prevention of undue exposure of personnel by use of personal protective equipment	Attachment G (G.1.4.5)
§270.14(b)(8)(vi)	Prevention of release to the atmosphere	Attachment G (G.1.4.6)
§270.14(b)(9)	Prevention of accidental ignition or reaction	2.8[a], Attachment G (G.1.5)
§264.17	General requirements for ignitable, reactive, or incompatible wastes	2.8, Attachment G (G.1.5)
§264.17(c)	Documentation of compliance with 264.17 (general requirements for ignitable, reactive, or incompatible wastes)	2.8[a], Attachment G (G.1.5)
§270.14(b)(10)	Traffic pattern, volume, and controls	Attachment A[a] (A.2)
	Identification of turn lanes	Attachment A
	Identification of traffic/stacking lanes	Attachment A
	Description of road surface	Attachment A[a] (A.2)
	Description of road load-bearing capacity	Attachment A[a] (A.2)

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
	Identification of type and number of traffic controls	Attachment A (A.2)
§264.18	Location standards	Attachment A (A.3)
§270.14(b)(11)	Facility/unit location information	Attachment A (A.3)
§270.14(b)(11)(i)	Seismic standard applicability [264.18(a)]	Attachment A (A.3)
§270.14(b)(11)(ii)	Seismic standard requirements	Attachment A (A.3)
§270.14(b)(11)(ii)(A)	No fault within 3,000 feet (ft) with displacement in Holocene time	NA
§270.14(b)(11)(ii)(A)(1)	Published geological studies	NA
§270.14(b)(11)(ii)(A)(2)	Aerial reconnaissance of a five-mile radius from the facility	NA
§270.14(b)(11)(ii)(A)(3)	Analysis of aerial photographs covering 3,000-ft radius from the facility/unit	NA
§270.14(b)(11)(ii)(A)(4)	Reconnaissance based on walking portions of the area within 3,000 ft of the facility	NA
§270.14(b)(11)(ii)(B)	If faults which have displacement in Holocene time are present within 3,000 ft, no faults pass within 200 ft of portions of the facility where treatment, storage, or disposal will be conducted	NA
§270.14(b)(11)(iii)	100-year floodplain standard	Attachment A[a] (A.3)
§270.14(b)(11)(iv)	If facility is within 100-year floodplain	NA
§270.14(b)(11)(iv)(A)	Engineering analyses of hydrostatic forces expected in a 100-year flood	NA
§270.14(b)(11)(iv)(B)	Structural engineering studies for flood protection to prevent washout	NA
§270.14(b)(11)(iv)(C)	Detailed description of procedures to remove hazardous waste to safety before flood reaches the waste	NA
§270.14(b)(11)(iv)(C)(1)	Timing of removal	NA
§270.14(b)(11)(iv)(C)(2)	Location to be moved to	NA
§270.14(b)(11)(iv)(C)(3)	Dedicated equipment and personnel to ensure removal	NA
§270.14(b)(11)(iv)(C)(4)	Potential for accidental discharge during movement	NA

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(11)(v)	Plan to show how the facility will be brought into compliance with 264.18(b)	NA
§270.14(b)(12)	Personnel training program	Attachment D[a]
§270.14(b)(13)	Closure and post-closure plans	2.9, Attachment F[a]
§264.112	Amendment of closure plan	Attachment F[a] (F.1.4)
§264.118	Post-closure plan; amendment of plan	Attachment F[a]
§264.178	Closure/containers	Attachment F
§264.197	Closure/tanks	NA
§264.228	Closure/post-closure/surface impoundments	NA
§264.258	Closure/post-closure/waste piles	NA
§264.280	Closure/post-closure/land treatment	NA
§264.310	Closure/post-closure/landfills	Attachments H, I, and J
§264.351	Closure/incinerators	NA
§264.601	Miscellaneous units	NA
§264.603	Post-closure care	Attachment F (F.1.9)
§270.14(b)(14)	Post-closure notices (264.119)	Attachment F[a] (F.1.9)
§270.14(b)(15)	Closure cost estimate (264.142)	Attachment F[a] (F.1.5)
	Financial assurance (264.143)	Attachment F[a] (F.1.5)
§270.14(b)(16)	Post-closure cost estimate (264.144)	Attachment F[a] (F.1.5)
	Post-closure care financial assurance (264.145)	Attachment F[a] (F.1.5)
§270.14(b)(17)	Liability insurance (264.147)	Attachment F[a] (F.1.5)
§270.14(b)(18)	Proof of financial coverage (264.149-150)	Attachment F[a] (F.1.5)
§270.14(b)(19)	Topographic map requirements	Attachment A[a, c] (A.4)
§270.14(b)(19)(i)	Map scale and date	Attachment A[a, c] (A.4)
§270.14(b)(19)(ii)	100-year floodplain	Attachment A[a] (A.4)
§270.14(b)(19)(iii)	Surface waters	Attachment A (A.4)
§270.14(b)(19)(iv)	Land use	Attachment A (A.4)
§270.14(b)(19)(v)	Wind rose	Attachment A (A.4)
§270.14(b)(19)(vi)	Map orientation	Attachment A[a, c] (A.4)

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.14(b)(19)(vii)	Legal boundaries	Attachment A[a, c] (A.4)
§270.14(b)(19)(viii)	Access controls	Attachment A (A.4)
§270.14(b)(19)(ix)	Wells	Attachment A (A.4)
§270.14(b)(19)(x)	Buildings	Attachment A (A.4)
	Treatment, storage, and disposal operations	Attachment A (A.4)
	Run-on/run-off control systems	2.10, Attachment A (A.4), Attachment G (G.1.4.2)
	Storm sewer systems	Attachment A[a] (A.4)
	Sanitary sewer systems	Attachment A[a] (A.4)
	Process sewer systems	Attachment A[a] (A.4)
	Loading/unloading areas	Attachment A (A.4)
	Fire control facilities	Attachment A[a] (A.4)
§270.14(b)(19)(xi)	Drainage barriers	2.10, Attachment A (A.4)
§270.14(b)(19)(xii)	Location of operational units	Attachment A (A.4)
§270.14(b)(20)	Other federal laws	3.0[a]
§270.3(a)	Wild and Scenic Rivers Act	3.0[a]
§270.3(b)	National Historic Preservation Act	3.0[a]
§270.3(c)	Endangered Species Act	3.0[a]
§270.3(d)	Costal Zone Management	3.0[a]
§270.3(e)	Fish and Wildlife Coordination Act	3.0[a]
§270.3(f)	Executive Orders	3.0[a]
§270.14(b)(21)	Notice of extension approval for land disposal facilities	NA
§270.14(c)	Groundwater monitoring requirements	Attachment A[a] (A.5), Attachments H, I, and J
§270.14(c)(1)	Groundwater monitoring under 265.90 through 265.94	Attachments H, I, and J
§270.14(c)(2)	Identification of uppermost aquifer, groundwater flow rate and direction	Attachments H, I, and J
§270.14(c)(3)	A topographic map required under 270.14(b)(19) that identifies proposed point of compliance	Attachments H, I, and J
	Proposed location of groundwater	Attachments H, I, and J

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
	monitoring wells under 264.97.	
§270.14(c)(4)	Description of plume of contamination that has entered groundwater	Attachments H, I, and J
§270.14(c)(4)(i)	Extent of plume indicated on topographic map	Attachments H, I, and J
§270.14(c)(4)(ii)	Identification of constituents and concentration for Appendix IX of 264	Attachments H, I, and J
§270.14(c)(5)	Detailed plan and an engineering report describing proposed groundwater monitoring program under 264.97	Attachments H, I, and J
§270.14(c)(6)	No releases detected in groundwater (264.98)	Attachments H, I, and J
§270.14(c)(6)(i)	List of proposed indicator parameters	Attachments H, I, and J
§270.14(c)(6)(ii)	Proposed groundwater monitoring system	Attachments H, I, and J
§270.14(c)(6)(iii)	Background values for each proposed monitoring parameter	Attachments H, I, and J
§270.14(c)(6)(iv)	Description of proposed sampling, analyses and statistical comparisons to be used	Attachments H, I, and J
§270.14(c)(7)	Release detected at point of compliance requires corrective action under 264.100	Attachments H, I, and J
§270.14(d)	Information requirements for solid waste management units (SWMU)	4.0, Supplement 4-1
§270.14(d)(1)(i)	Location of SWMUs on topographic map	4.0, Supplement 4-1
§270.14(d)(1)(ii)	Types of SWMUs	4.0, Supplement 4-1
§270.14(d)(1)(iii)	Dimensions and descriptions of SWMUs	4.0, Supplement 4-1
§270.14(d)(1)(iv)	Dates of operation	4.0, Supplement 4-1
§270.14(d)(1)(v)	Waste types managed at SWMU	4.0, Supplement 4-1
§270.14(d)(2)	Information on releases from SWMUs	4.0, Supplement 4-1
§270.15	Containers	2.0, Attachment G
§270.16	Tank systems	NA
§270.16(a)	Written assessment and certification	NA
§270.16(b)	Capacity/dimensions	NA

Refer to footnotes at end of table.

Table 1-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.16(c)	Systems and controls	NA
§270.16(d)	Piping and process flow	NA
§270.16(e)	External corrosion protection	NA
§270.16(f)	Installation	NA
§270.16(g)	Secondary containment system	NA
§270.16(h)	Request for variance from secondary containment	NA
§270.16(i)	Spill prevention	NA
§270.16(j)	Ignitable, reactive, or incompatible wastes	NA

[a] Requirement or information is also addressed in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," as appropriate.
[b] NA = not applicable.
[c] Some of the topographic map requirements are addressed in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application."

Refer to footnotes at end of table.

2.0 CONTAINER STORAGE

The information provided in this section is submitted to address the applicable container storage requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.15, and 20.4.1 NMAC, Subpart V, Part 264, Subpart I, revised June 14, 2000 [6-14-00]. This section presents general descriptions of the Technical Area (TA) 54 container storage units (CSU) and waste management practices. Detailed information on and figures of the CSUs at TA-54 and the waste management practices associated with them are provided in Attachment G of this permit renewal application. A summary of applicable regulatory references and the corresponding location where the requirement is addressed in this permit renewal application is located in Attachment G, Table G-1.

2.1 TA-54 CONTAINER STORAGE UNITS

TA-54 at Los Alamos National Laboratory (LANL) is presently used for storage of hazardous and mixed waste generated throughout LANL. At TA-54, containers are stored at Area L, Area G, and TA-54 West. There are two CSUs at Area L, nine CSUs at Area G, and two CSUs at TA-54 West. The following section provides brief descriptions of the CSUs and their capacities; the types of storage containers used; and the minimum aisle space for each CSU.

2.1.1 Area L

Area L is a 2.58-acre site located in the central portion of TA-54. The two CSUs at Area L are: 1) the aboveground CSU within the fence; and 2) the Storage Shafts CSU (Shafts 36 and 37). The Area L CSUs are surrounded by an 8-foot (ft) chain-link fence. The aboveground CSU within the fence includes the asphaltic concrete-covered area and the following structures: TA-54-31, TA-54-32, TA-54-35, TA-54-36, TA-54-39, TA-54-58, TA-54-68, TA-54-69, TA-54-70, TA-54-215, and TA-54-216. These structures provide waste containers with secondary containment and/or protection from the weather. The Area L CSUs are used for storage of hazardous waste and/or mixed low-level waste (MLLW) containers, which are subsequently transported to various off-site treatment, storage, and disposal facilities.

2.1.1.1 Area L CSUs and Capacities

The aboveground CSU within the fence at Area L has an overall storage capacity of 407,880 gallons, or the equivalent of 7,416 55-gallon drums. The aboveground CSU within the fence stores hazardous waste and MLLW in solid or liquid form (see Appendix B in the most recent version of

the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B, for definitions of hazardous waste and MLLW). Waste containers are stored in the storage structures or on the asphaltic concrete-covered storage area at this aboveground CSU. The storage structures and the asphaltic concrete-covered area are shown on Figure 2-1. The maximum storage capacity and total storage area of the aboveground CSU at Area L are provided in Table 2-1. The volume of waste stored in the structures and on the asphaltic-concrete area comprising this CSU will not exceed the maximum storage capacity, which is based on the maximum storage configuration within the storage structures (see Figure 2-2). No medical, infectious, or explosive wastes are accepted at Area L. The Storage Shafts CSU stores solid MLLW (lead stringers). The location of this CSU is also shown on Figure 2-1. The maximum storage capacity of this CSU is 600 gallons.

General dimensions, containment features, and materials of construction for the two Area L CSUs are described in Attachment G of this permit renewal application to satisfy the requirements of 20.4.1 NMAC §270.15(a)(1) and (2) [6-14-00].

2.1.1.2 Storage Containers

Hazardous waste and MLLW at Area L are stored in containers that comply with the packaging requirements established by the U.S. Department of Transportation (DOT) in the Code of Federal Regulations (CFR), Title 49, Parts 171 through 180, and that are specific to the hazardous material which they contain. Specifications for the containers used for storage of hazardous waste and MLLW are listed in Table 2-2.

Waste containers stored at the aboveground CSU at Area L include 5-, 14-, 30-, 55-, 85-, and 110-gallon steel, polyethylene, and fiber drums; fiberglass-reinforced plywood (FRP) boxes; steel standard waste boxes (SWB); various steel boxes; metal overpack boxes; cardboard shipping containers; gas cylinders; roll-off bins; labpacks; and some oversized, custom metal and wooden containers. Detailed information on these containers is presented in Section 2.3 of this permit renewal application.

All waste containers (including gas cylinders at Canopy 216) are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers, baskets, in structures elevated by design) to prevent contact with accumulated liquids, which meets the requirements of 20.4.1 NMAC § 264.175(b)(2) [6-

14-00]. Information regarding the presence of free liquids in containers of hazardous waste and MLLW is obtained through generator waste-characterization knowledge, visual examinations, and/or the Paint Filter Liquids Test. Waste containers bearing free liquids are stored with secondary containment.

2.1.1.3 Minimum Aisle Space and Storage Configuration

Waste containers stored at Area L are placed in rows with a minimum aisle space of 24 inches. In addition, emergency egress aisles with a minimum aisle space of 24 inches are maintained at all personnel doors. At larger structures or locations, a main aisle down the center is maintained. Containers stored in these larger structures are typically placed in rows angled from the main aisle.

The storage configuration for the aboveground CSU at Area L is shown on Figure 2-2. The storage configuration shown on Figure 2-2 reflects the maximum storage inside the structures at Area L; however, storage operations are dynamic, and the storage configuration is subject to change based on daily operations. Storage is also conducted on the asphaltic concrete-covered area within the fence. At Area L, hazardous waste and MLLW containers are arranged in rows and stacked to a maximum of 10 ft high, based on the requirements in 49 CFR § 178.606(c), “Performance-Oriented Stack Test”. Gas cylinders are stored in cylinder racks, baskets, or on specially constructed pallets that provide support and restraint.

2.1.2 Area G

Area G is located on 63 acres in the east-central portion of TA-54. It is surrounded by an 8-ft chain-link fence and includes nine CSUs that provide waste containers with secondary containment and/or protection from the weather. The nine CSUs at Area G include the following:

- Storage Domes 229, 230, 231, and 232, and Pad 9;
- TA-54-412, Storage Dome 226, and Pad 1;
- Storage Dome 48 and Pad 3;
- Pad 10 (former Pads 2 and 4) and transuranic waste characterization facilities;
- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7;
- Storage Domes 153 and 283, and Pad 6;
- Storage Shed 8;
- TA-54-33, and;

- Storage Dome 375 and Pad 11.

The Area G CSUs store hazardous waste, MLLW, and mixed transuranic waste (MTRUW) containers. The majority of the MTRUW is awaiting characterization and/or certification for shipment to the Waste Isolation Pilot Plant (WIPP).

2.1.2.1 Area G CSUs and Capacities

The Area G CSUs have an overall storage capacity of 4,506,590 gallons, or the equivalent of 81,938 55-gallon drums, and store hazardous waste and MLLW in solid or liquid form. MTRUW stored at Area G is essentially in solid form; however, waste containers with potential residual liquids are also stored at Area G. Waste containers are stored in structures or on associated asphaltic-concrete pads at the Area G CSUs. The storage structures and pads are shown on Figure 2-3. The maximum storage capacity and total storage area at each Area G CSU are provided in Table 2-3. The volume of waste stored in the structures and on the asphaltic-concrete pads comprising each CSU will not exceed the maximum storage capacity, which is based on the maximum storage configuration within the storage structures (see Figures 2-4 through 2-13). Figure 2-5 is provided to show examples of dome storage configurations based on waste container type (i.e., 55-gallon drums on metal pallets, FRP boxes, and SWBs).

General dimensions, containment features, and materials of construction for the Area G CSUs are described in Attachment G of this permit renewal application to satisfy the requirements of 20.4.1 NMAC § 270.15(a)(1) and (2) [6-14-00].

2.1.2.2 Storage Containers

Hazardous waste and MLLW stored at the Area G CSUs are stored in containers that comply with the packaging requirements established by the DOT in 49 CFR, Parts 171 through 180, and that are specific to the hazardous material which they contain. Specifications for the containers used for hazardous waste and MLLW at the Area G CSUs are listed in Table 2-2.

MTRUW is stored at the Area G CSUs in a variety of containers. The container types include any container used for storage of hazardous waste or MLLW listed in Table 2-2, and containers authorized for receipt at WIPP listed in Table 2-4. The types of waste containers used to store MTRUW at the Area G CSUs vary depending on whether the waste is newly-generated or legacy

(generated before October 1999). Newly-generated MTRUW containers include 55-gallon steel drums, 85-gallon steel drums used for overpacks, 71-inch x 54.25-inch x 37-inch SWBs, and metal overpacks for oversized waste. The types of waste containers used for legacy MTRUW include FRP boxes, 55-gallon steel drums, and overpacks.

Waste containers stored at the Area G CSUs include 5-, 14-, 30-, 55-, 85-, and 110-gallon steel, polyethylene, and fiber drums; FRP boxes; steel SWBs; various steel boxes; ten drum overpacks (TDOP); metal overpack boxes; roll-off bins; cardboard shipping containers; labpacks; gas cylinders; and some oversized, custom metal and wooden containers. Detailed information on these containers is presented in Section 2.3 of this permit renewal application.

All waste containers at the Area G CSUs are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers, in structures elevated by design) to prevent contact with accumulated liquids, which meets the requirements in 20.4.1 NMAC § 264.175(b)(2) [6-14-00]. Information regarding the presence of free liquids in containers of hazardous waste and MLLW is obtained through generator waste-characterization knowledge, visual examinations, real-time radiography (RTR), and/or the Paint Filter Liquids Test. MTRUW destined for storage at Area G must meet the following waste acceptance criteria for free liquids: 1) no more than two liters of liquid in a 55-gallon drum; 2) no more than eight liters of liquid in an SWB; and 3) no more than one inch of liquid in the bottom of any container. Waste generators are required to participate in a certification program that documents how the generators ensure that the above criteria are met. Compliance with this requirement is verified through RTR. Waste containers bearing free liquids are stored with secondary containment.

2.1.2.3 Minimum Aisle Space and Storage Configuration

Waste containers stored at the Area G CSUs are placed in rows with a minimum aisle space of 24 inches. In addition, emergency egress aisles with a minimum aisle space of 24 inches are maintained at all personnel doors. At larger structures or locations, a main aisle down the center is maintained. Containers stored in these larger structures are typically placed in rows angled from the main aisle.

The storage configurations for the CSUs at Area G are shown on Figures 2-4 through 2-13. These storage configurations reflect the maximum storage inside the structures at Area G; however, storage operations are dynamic and the storage configuration is subject to change based on daily

operations. Storage also occurs on the asphaltic-concrete pads. At Area G, hazardous waste containers are arranged in rows and stacked to a maximum of 10 ft high, based on the requirements in 49 CFR § 178.606(c), "Performance-Oriented Stack Test". Containers of MLLW and MTRUW (drums, FRP boxes, SWBs, and metal overpack boxes) are arranged in rows and stacked to a maximum of three high. For MLLW and MTRUW, the stacking limit is based on a criticality assessment, which shows that there is not a criticality concern for these containers in an infinite array stacked three high.

2.1.3 TA-54 West

TA-54 West is located on approximately two acres in the northwest corner of TA-54. It is surrounded by an 8-ft chain-link fence. TA-54 West contains the Radioassay and Nondestructive Testing (RANT) Facility and is used to receive, stage, and assemble payload containers of TRU waste and MTRUW. These payload containers are placed in Transuranic Package Transporter-II (TRUPACT-II) shipping containers for shipment to WIPP. TA-54 West is also used to store hazardous waste, MLLW, and MTRUW containers. The two CSUs at the RANT Facility at TA-54 West are: 1) the Indoor CSU; and 2) the Outdoor CSU. Storage and staging will occur at any location within the two CSUs at TA-54 West.

2.1.3.1 TA-54 West CSUs and Capacities

The two CSUs at TA-54 West have an overall storage capacity of 11,660 gallons, or the equivalent of 212 55-gallon drums, and store only MLLW and MTRUW in solid form. Waste containers are stored in either the Indoor CSU or the Outdoor CSU at TA-54 West. The CSUs are shown on Figure 2-14**.** The maximum storage capacity and total storage area at the TA-54 West CSUs are provided in Table 2-5. The volume of waste stored in the structure and on the asphaltic-concrete pad comprising the CSUs will not exceed the maximum storage capacity.

General dimensions, containment features, and materials of construction for the TA-54 West CSUs are described in Attachment G of this permit renewal application to satisfy the requirements of 20.4.1 NMAC § 270.15(a)(1) and (2) [6-14-00].

2.1.3.2 Storage Containers

MLLW stored at the TA-54 West CSUs is stored in containers that comply with the packaging requirements established by the DOT in 49 CFR, Parts 171 through 180, and that are specific to the

hazardous material which they contain. Specifications for the containers used for storage of MLLW at the TA-54 West CSUs are listed in Table 2-2.

MTRUW is stored at the TA-54 West CSUs in a variety of containers. The container types include any container used for storage of MLLW listed in Table 2-2, and containers authorized for receipt at WIPP listed in Table 2-4. The types of waste containers used to store MTRUW at the TA-54 West CSUs vary depending on whether the waste is newly-generated or legacy (generated before October 1999). Newly-generated MTRUW containers include 55-gallon steel drums, 85-gallon steel drums used for overpacks, 71-inch x 54.25-inch x 37-inch SWBs, and metal overpacks for oversized waste. The types of waste containers used for legacy MTRUW include FRP boxes, 55-gallon steel drums, and overpacks.

Waste containers stored at the TA-54 West CSUs include 30-, 55-, 85-, and 110-gallon steel, polyethylene, and fiber drums; steel SWBs; various steel boxes; TDOPs; metal overpack boxes; TRUPACT-II containers; and some oversized custom metal and wooden containers. Detailed information on these containers is presented in Section 2.3 of this permit renewal application.

All waste containers at the TA-54 West CSUs are stored in areas with sloped floors and sumps, on pallets, or are otherwise elevated (e.g., on dollies) to prevent contact with accumulated liquids. Information regarding the presence of free liquids in containers of MLLW is obtained through generator waste-characterization knowledge, visual examinations, and/or the Paint Filter Liquids Test. MTRUW is characterized to verify the absence of free liquids using RTR. Containers at the TA-54 West CSUs found to contain liquids are placed on self-containment pallets and returned to one of the Area G CSUs. These measures meet the requirements of 20.4.1 NMAC § 264.175(b)(2) [6-14-00].

2.1.3.3 Minimum Aisle Space and Storage Configuration

Waste containers stored at the TA-54 West CSUs may be placed in rows with a minimum aisle space of 24 inches. A main aisle may be maintained down the center of a storage location, as needed. In addition, emergency egress aisles with a minimum aisle space of 24 inches are maintained at all personnel doors.

The storage configurations for the CSUs at TA-54 West are shown on Figure 2-15. These storage configurations reflect the existing storage capacity at the TA-54 West CSUs; however, storage

operations are dynamic and the storage configuration is subject to change based on daily operations. Wastes contained in 55- or 85-gallon and/or other DOT-approved drums are typically stored on pallets. Prepared payloads for TRUPACT-II shipping containers consist of two 7-packs of drums or two SWBs. Each pallet of seven drums is wrapped in multiple layers of plastic, and another seven drums are wrapped on a pallet and stacked above. The entire 14-drum package is wrapped again. Prepared payloads of SWBs are stacked two high; the SWBs are ratchet-strapped together. Other containers are not stacked at the TA-54 West CSU.

2.2 AUTHORIZED WASTE IDENTIFICATION

The TA-54 hazardous and mixed waste CSUs store containers that bear hazardous constituents or hazardous wastes with the U.S. Environmental Protection Agency Hazardous Waste Numbers presented in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application."

2.3 TYPES AND CONDITION OF CONTAINERS [20.4.1 NMAC § 264.171]

Containers must be in good condition, without severe rust, dents, deep scratches, bulges, or other structural defects. Any waste container that is not in good condition (e.g., severe rusting, apparent structural defects) is overpacked or the waste is repackaged in a container in good condition and compatible with the waste, packaging material, and/or other container. In addition, the overpack container and/or new container must be resistant to environmental conditions. This meets the requirements of 20.4.1 NMAC § 264.171 [6-14-00]. The following describes storage containers considered acceptable for waste storage at the TA-54 CSUs. Tables 2-2 and 2-4 provide additional information on storage containers.

The most common container used for waste storage at TA-54 is the 55-gallon drum. Standard 55-gallon drums have a gross internal volume of 7.24 cubic ft (ft^3). The standard drum is constructed of mild steel, has an inner diameter of approximately 22 inches, and a usable inside height of approximately 33 inches. These drums may also contain rigid, molded polyethylene or other compatible material liners. These liners are procured to a DOT specification describing the functional requirements of fitting inside the drum, material thickness and tolerances, and quality controls and required testing. Another type of drum commonly used at TA-54 is the polyethylene drum. Constructed of high-density polyethylene, these drums come in various sizes and dimensions. Capacities range from 5 gallons to 55 gallons. Types of closure mechanisms include screw-type bungs (for closed-head containers), lever-lock releases, snap-on lids, and screw-on lids.

Eighty-five-gallon drum overpacks are used for overpacking 55-gallon drums and have a gross internal volume of 11.3 ft^3. They are also used for collecting and storing derived waste.

Standard-size FRP boxes measure 4 ft by 4 ft by 8 ft, for a total volume of 128 ft^3. The outer surface of FRP boxes is coated with a layer of epoxy-impregnated fiberglass. Nonstandard-size containers, including FRP boxes, are designed and constructed to contain irregular-shaped and/or oversized waste. Various types of metal boxes are used for storage. One type, the SWB, is constructed of steel and has rounded ends. It has welds on all four sides and the bottom and has a lid gasket. After waste is placed into the container, the lid is either bolted on or clamped down and welded. General dimensions include an inside height of 36.75 inches, an inner length of 68.75 inches, and an inside width of 51.875 inches, for a gross internal volume of 66.3 ft^3. A second type of metal box is also constructed of steel, but is rectangular in shape. It has welds on all four sides and the bottom, and a lid that is clamped in place and then welded. Other metal boxes (including overpacks) vary in size and typically have welds both inside and outside on all four sides and on the bottom. The metal overpack boxes are elevated by design or on pallets for ease in handling. Steel overpack boxes are constructed of welded carbon steel and are elevated by design. Metal boxes typically have lid gaskets with bolt-on, clip-pinned, or hinged lids. Custom metal and wooden boxes are constructed for oversized and/or unique wastes. Other fiber boxes are also used, as appropriate.

Gas cylinders must meet the specific criteria identified in 49 CFR Part 178, Subpart C, to be accepted for transport. The cylinders must not have welded seams, must have the appropriate valves, and must be DOT-approved for the contained material. The cylinders range in size from lecture bottles (2 inches in diameter and 12 inches tall) to large standing cylinders (9 to 12 inches in diameter and up to 58 inches tall). Cylinders containing compressed gases are stored in cylinder racks, baskets, or drums. Small gas cylinders or metal receptacles with DOT Specification 2P, 2Q, 3E, 3HT, 4BA spherical type, 4D, 4DA, or 4DS are packaged in strong outside packaging drums or crates.

Roll-off bins are larger boxes designed for bulk solid waste streams (e.g., soils) that can be rolled on and off of a transport vehicle. The bins are constructed of heavy gauge steel with capacities ranging from 7 cubic yards (yd^3) to 40 yd^3. Bin lids have several designs (e.g., roll-top, hydraulic); various types of lids are currently used. The roll-top type has two halves that can be rolled back

manually to expose either side of the bin. The hydraulic type is hinged in the middle, allowing the lid to fold up and be pulled hydraulically to one side (to allow for loading).

The use of overpacks is one option when a container's integrity is suspect. Eighty-five-gallon drums are commonly used to overpack 55-gallon drums, and 110-gallon drums are used to overpack 85-gallon drums. Rounded-end SWBs are used to overpack drums of various sizes. Another type of overpack that may be used at TA-54 is the TDOP, which consists of a steel-welded cylindrical body and typically has a gasket with a bolt-on lid. TDOPs are approximately 6 ft tall and 6 ft in diameter. They can be used to overpack up to 10 standard 55-gallon drums or one SWB. TDOPs are certified to be noncombustible. Metal boxes are generally used when overpacking FRP boxes. TRUPACT-II shipping packages are used at TA-54 West to store TRU and mixed TRU waste containers prior to shipment to WIPP. This double containment, stainless-steel shipping package can hold 14 drums, a TDOP, or up to 2 rounded-end SWBs. Additional information on container specifications is provided in Tables 2-2 and 2-4.

Waste Operating Technicians visibly inspect all incoming drums for evidence (e.g., corrosion, visible staining, bulges, ruptures, dents, leaks) that may indicate surface contamination. Visual inspections of containers are conducted at the time of waste pickup at the generator's site, at the time of receipt at TA-54, and during weekly inspections. A visual inspection of a container's overall condition is also conducted when the waste container is shipped off site. If any evidence of surface contamination is detected, the waste container is either overpacked in an appropriate container or the waste is repackaged in a new container.

MTRUW containers are vented with one or more filters. The filter vents on the containers, including overpacks, meet the specifications described in Appendix 2.5 of the TRUPACT-II Authorized Methods for Payload Control (Westinghouse, 2000). The containers are vented to allow any gases that are generated by radiolytic and microbial processes within a waste container to escape, thereby preventing over-pressurization within the container. The high-efficiency particulate air grade vent filters prevent the escape of any radioactive particulates.

2.4 COMPATIBILITY OF WASTE WITH CONTAINERS [20.4.1 NMAC § 264.172]

The TA-54 CSUs will only store containers made of or lined with materials that will not react with and are otherwise compatible with the waste stored in them. All wastes transported to the TA-54 CSUs must be packaged in full compliance with DOT requirements. DOT packaging requirements

are based on the Packing Group of the material, its vapor pressure, and the chemical compatibility between the package and the hazardous material. The DOT specifications and United Nations standards that identify any additional packaging requirements that must also be met (such as chemical compatibility) are presented in Tables 2-2 and 2-4. This fulfills the requirements of 20.4.1 NMAC § 264.172 [6-14-00].

2.5 MANAGEMENT OF CONTAINERS [20.4.1 NMAC § 264.173(a)(b)]

Waste containers stored at the TA-54 CSUs are handled in a manner that will not cause them to rupture or leak, as required in 20.4.1 NMAC § 264.173(b) [6-14-00].

All containers stored at the TA-54 Area L and Area G CSUs are kept closed during storage in accordance with 20.4.1 NMAC § 264.173(a) [6-14-00], except when waste is added to or removed from containers; when the containers are opened for visual examination, sampling, or other characterization activities; or when the contents need to be repackaged. At TA-54-412, waste containers are opened during waste segregation, volume reduction, sample collection, repackaging, coring, visual examination, and/or decontamination. Waste containers are opened within a work enclosure that provides confinement, preventing any release of waste constituents. With the exception of TRUPACT-II shipping containers, all waste containers stored at the TA-54 West CSUs are kept closed during storage in accordance with 20.4.1 NMAC § 264.173(a) [6-14-00].

When waste is transported within or between CSUs at Areas L and G and TA-54 West, the waste containers are segregated, loaded, and secured on a transport vehicle following the appropriate safety practices. When transporting waste between Area G and TA-54 West, the west entrance of the TA-54 facility is blocked while the transport vehicle travels between the two areas, thus denying access by other vehicles and personnel. Examples of transport vehicles used for inter-site waste transport include stake bed trucks, forklifts, and cranes.

2.6 CONTAINMENT SYSTEMS [20.4.1 NMAC §§ 264.175(b)(3) and (5); 20.4.1 NMAC §§ 270.15(a)(3) and (5)]

Liquid that might accumulate at the TA-54 CSUs is contained within a secondary containment system (e.g., sump, berms, or secondary containment pallet) at each storage location or structure until the liquid is removed. All secondary containment systems are designed to contain at least 10% of the volume of potential liquid-bearing waste containers or the volume of the largest container, whichever is greater, pursuant to the requirements of 20.4.1 NMAC § 264.175(b)(3) [6-

14-00] (see Supplement 2-1). Any accumulated liquids are removed in as timely a manner as is necessary to prevent overflow of the collection system, pursuant to 20.4.1 NMAC § 264.175(b)(5). Any accumulated liquids are removed with a vacuum truck, a high-efficiency particulate air vacuum, a portable pump, or by other means, as appropriate and depending on the waste type and volume. The collected liquids are then transferred to appropriate containers and characterized. If the accumulated liquids are from an identified source or from precipitation, snowmelt, or water generated during fire-suppression activities, the resulting material will be characterized as a newly-generated waste using acceptable knowledge or will be analyzed, as applicable, for the hazardous waste constituents known to be components of the source. If the accumulated liquids are from an unidentified source, the resulting material will be analyzed for the appropriate potential parameters listed in Table E-3 of Appendix E in the LANL General Part B. Containers of collected liquids are stored with secondary containment, pending analytical results that determine how the liquids will be managed. This method of removal and analysis of accumulated liquids fulfills the requirements of 20.4.1 NMAC § 270.15(a)(5) [6-14-00], for prevention of overflow.

2.7 INSPECTION SCHEDULES AND PROCEDURES [20.4.1 NMAC § 264.174]

The purpose of CSU inspections is to identify leaking containers, deterioration of containers, and loss of integrity of a containment system, as required by 20.4.1 NMAC § 264.174 [6-14-00]. The inspections include checking the structural integrity of the containers (e.g., for bulging or warping) and the secondary containment structures for integrity and the presence of accumulated liquids. Inspections will follow the Inspection Plan in Appendix C of the LANL General Part B and in Attachment C of this permit renewal application.

2.8 SPECIAL REQUIREMENTS FOR IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTE [20.4.1 NMAC §§ 264.17(a) and (b), 264.176, and 264.177(a),(b), and (c); 20.4.1 NMAC §§ 270.14(b)(9) and 270.15(d)]

Containers holding ignitable or reactive wastes are located at least 50 ft from the facility's property line at all times (see Figures 2-1, 2-3, and 2-14) and are protected from sources of ignition or reaction. The distance to the nearest facility boundary is approximately 780 feet. Waste management practices at the TA-54 CSUs minimize the possibility of accidental ignition. There are no sources of open flames allowed at the CSUs. Cutting and welding activities are never conducted in the vicinity of waste containers. Ignitable and reactive wastes are segregated and separated by distance to minimize the possibility of spontaneous ignition and can be stored inside structures at the CSUs to minimize exposure to hot surfaces and radiant heat. Only non-sparking tools are used in handling waste containers, and lightning rods are located on storage structures.

Smoking is not allowed in any of the CSUs. "No Smoking" signs are conspicuously placed wherever there is a potential hazard from ignitable or reactive waste, as required by 20.4.1 NMAC § 264.17(a) [6-14-00]. Precautions taken to prevent reactions that may generate extreme heat or pressure, fire or explosions, or violent reactions and to prevent reactions that may damage the structural integrity of the CSU include segregating and separating (by distance) ignitable and reactive wastes stored in the structures. Precautions taken to prevent reactions that may produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment, or produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions include keeping containers closed during storage and venting containers of MTRUW. Together, these measures meet the requirements of 20.4.1 NMAC §§ 264.17(a) and (b) and 264.176 [6-10-00].

Incompatible wastes are segregated and separated during storage in accordance with 20.4.1 NMAC § 264.177(c) [6-14-00]. All waste is segregated and stored in accordance with DOT compatibility groups. These DOT compatibility groups are: flammables (Class 3), oxidizers (Class 5.1), combustible and noncombustible miscellaneous hazardous material (Class 9), corrosives (Class 8), poisons (Class 6), radioactive (Class 7), acids (Class 8), reactives (Class 4), and non-regulated materials. Incompatible wastes are separated and segregated from other wastes and materials by means of a berm, dike, wall, or other specific means (e.g., secondary containment pallets, modular sheds, distance). In addition, no incompatible wastes will be mixed, and no waste will be placed in a container that previously held an incompatible waste, as required by 20.4.1 NMAC §§ 264.177(a) and (b), and 20.4.1 NMAC § 270.15(d) [6-14-00].

2.9 CLOSURE [20.4.1 NMAC §§ 264.111 and 264.178]

Partial closure activities at the TA-54 CSUs will include removal of hazardous and/or mixed waste from the CSU to be closed and decontamination or removal of structures and equipment that have been contaminated by waste materials. Closure will minimize the need for further maintenance, preclude the release of hazardous waste or constituents to environmental media, and be protective of human health. A consolidated closure plan for the TA-54 CSUs is presented in Attachment F of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC §§ 264.111 and 264.178 [6-14-00]. The consolidated closure plan meets the applicable requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G.

2.10 CONTROL OF RUN-ON AND RUNOFF [20.4.1 NMAC § 264.175(b)(4); 20.4.1 NMAC § 270.14(b)(8)(ii)]

At TA-54, controlling run-on and runoff at the locations where waste management operations regularly occur is accomplished by appropriate contouring of surface areas and the use of control structures such as drainage channels, berms, and culverts. Canopies, dome structures, and other buildings are used to eliminate or minimize contact between run-on and waste containers. In addition, all stored waste containers are elevated or are placed in areas with sloped floors and sumps to provide protection from liquids that could be introduced through fire-suppression activities. Run-on/runoff management methods specific to the Area L, Area G, and TA-54 West CSUs are discussed below. This information is provided to meet the requirements of 20.4.1 NMAC § 264.175(b)(4), and 20.4.1 NMAC § 270.14(b)(8)(ii) [6-14-00].

2.10.1 Area L

The Area L CSUs rely on structural and operational controls that are designed to divert storm water to a single outfall. They include asphaltic-concrete channels, a 12-inch corrugated pipe storm drain to convey storm water to a single outfall at the northeast corner of Area L, and a contoured paved surface to direct storm water to the conveyances. Drainage control features at Area L are shown on Figure 2-1; these features are subject to change. Operational controls include inspecting run-on and runoff controls (see Item 16 on Figure C-1 [and instructions] in Appendix C of the General Part B) and maintaining the structural run-on/runoff controls, as necessary. Snow removal is also performed to minimize run-on and runoff.

2.10.2 Area G

In certain drainage areas at Area G, structures have been provided to efficiently channel storm water to the ephemeral streams draining the mesa. These structures include asphaltic-concrete and concrete drainage channels, a weir, riprap-lined channels, a retention dam, berms, and culverts. Roads and drive pads are configured, by grading and paving, to carry storm water away from the areas of active vehicular and loading operations. Silt fences and other erosion control structures are established throughout the drainage areas in locations prone to erosion or affected by heavy runoff during storm events. Drainage control features at Area G are shown on Figure 2-3; these features are subject to change.

2.10.3 TA-54 West

The foundation at the RANT Facility (TA-54-38) is above grade to prevent run-on of storm water. Storm drains and trenches are included in the building design to collect any precipitation or snowmelt that may enter the facility through the loading bays. The Outdoor CSU storage pad is sloped away from the RANT Facility building towards the edges of the pad, allowing storm water to flow to the edges of the pad. All containers of waste stored at the TA-54 West CSUs are located in areas with sloped floors and sumps or are elevated by design, on dollies, or on pallets. This prevents the containers from coming into contact with liquids. All waste-containing drums and SWBs on the Outdoor CSU storage pad are covered by a canopy or tarp to prevent contact with precipitation. Loaded TRUPACT-II containers may also be stored on the Outdoor CSU storage pad until shipment to WIPP occurs. TRUPACT-II containers are leak-resistant containers with an acceptable leak rate of 2.6×10^{-7} cubic centimeters of helium per second, which prevents the containerized waste within the TRUPACT-II containers from contact with precipitation. Positive surface drainage throughout TA-54 West directs potential run-on away from the TA-54 West CSUs. A drainage swale and curbing direct storm water runoff toward an outfall on the northeast side of the storage pad. Drainage control features at TA-54 West are shown on Figure 2-14; these features are subject to change.

Table 2-1

Maximum Storage Capacity and Total Storage Area at the Area L Container Storage Units

Container Storage Unit (CSU)	Storage Structure	Structure Maximum Storage Capacity	CSU Total Maximum Storage Capacity	Structure Storage Area (Square Feet)	CSU Total Storage Area (Square Feet)
Aboveground CSU Within the Fenced Area	TA-54-31	1,320 gallons (24 55-gallon drum equivalents [DE])	407,880 gallons	179	28,913
	TA-54-32	17,160 gallons (312 55-gallon DE)		1,806	
	TA-54-35	15,840 gallons (288 55-gallon DE)		1,056	
	TA-54-36	13,200 gallons (240 55-gallon DE)		1,056	
	TA-54-39	40,920 gallons (744 55-gallon DE)		3,456	
	TA-54-58	15,840 gallons (288 55-gallon DE)		1,056	
	TA-54-68	1,760 gallons (32 55-gallon DE)		128	
	TA-54-69	1,760 gallons (32 55-gallon DE)		128	
	TA-54-70	1,760 gallons (32 55-gallon DE)		128	
	TA-54-215	261,360 gallons (4,752 55-gallon DE)		15,960	
	TA-54-216	36,960 gallons (672 55-gallon DE)		3,960	
Storage Shafts CSU (Shafts 36 & 37)	TA-54-36	300 gallons	600 gallons	4.9	9.8
	TA-54-37	300 gallons		4.9	

Table 2-2

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Non-Bulk Performance-Oriented Packaging for Which the Manufacturer has Provided the Required UN Marking in Accordance with 49 CFR § 178.503	Intermediate Bulk Performance-Oriented Containers for Which the Container has been Marked by the Manufacturer in Accordance with 49 CFR § 178.703	Cylinders for Which the Cylinder has been Properly Marked with the Applicable DOT Specification Number in Accordance with 49 CFR § 178.35	Containers Used for Transport of Radioactive Materials
Steel drums meeting the standards of 49 CFR § 178.504. Maximum capacity will not exceed 119 gallons (gal); maximum net mass will not exceed 882 pounds (lbs). If materials used for body, heads, closures, and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments must be applied. These coatings or treatments must retain their protective properties under normal conditions of transport.	Metal intermediate bulk containers meeting the standards of 49 CFR § 178.705.	Seamless steel cylinders meeting the requirements of DOT Specification 3A, 3AX, 3AA, 3AAX, 3B, 3E, or 3T in 49 CFR, Part 178, Subpart C.	Containers meeting the requirements of DOT Specification 7A in 49 CFR § 178.350.
Aluminum drums meeting the standards of 49 CFR § 178.505. Maximum capacity will not exceed 119 gal; maximum net mass will not exceed 882 lbs.	Rigid plastic intermediate bulk containers meeting the standards of 49 CFR § 178.706.	Welded or brazed steel cylinders meeting the requirements of DOT Specification 4B, 4BA, 4B240ET, 4AA480, 4L, or 4BW in 49 CFR, Part 178, Subpart C.	Containers meeting the requirement of Industrial Packaging IP-1, IP-2, or IP-3 in 49 CFR § 173.411.
Metal drums other than steel or aluminum meeting the standards of 49 CFR § 178.506. Maximum capacity will not exceed 119 gal; maximum net mass will not exceed 882 lbs.	Composite intermediate bulk containers meeting the standards of 49 CFR § 178.707.	Seamless or welded aluminum cylinders meeting the requirements of DOT Specification 3AL or 4E in 49 CFR, Part 178, Subpart C.	Containers meeting the requirements of excepted packaging and the requirements of 49 CFR § 173.410.

Table 2-2 (continued)

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Non-Bulk Performance-Oriented Packaging for Which the Manufacturer has Provided the Required UN Marking in Accordance with 49 CFR § 178.503	Intermediate Bulk Performance-Oriented Containers for Which the Container has been Marked by the Manufacturer in Accordance with 49 CFR § 178.703	Cylinders for Which the Cylinder has been Properly Marked with the Applicable DOT Specification Number in Accordance with 49 CFR § 178.35	Containers Used for Transport of Radioactive Materials
Fiber drums meeting the standards of 49 CFR § 178.508. Maximum capacity will not exceed 119 gal; maximum net mass will not exceed 882 lbs.	Fiberboard intermediate bulk containers meeting the standards of 49 CFR § 178.708. The strength of the material used and the construction of the liner must be appropriate to the capacity and intended use of the container. Joints and closures must be sift-proof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and transport. Joints must be made with appropriate overlap and if metal staples are used for fastening, they must pass completely through all pieces and be formed or protected so that any inner liner cannot be abraded or punctured by them.	Seamless nickel cylinders meeting the requirements of DOT Specification 3BN in 49 CFR, Part 178, Subpart C.	
Plastic drums meeting the standards of 49 CFR § 178.509. Maximum capacity will not exceed 119 gal; maximum net mass will not exceed 882 lbs.	Wooden intermediate bulk containers meeting the standards of 49 CFR § 178.709. The strength of the material used and the construction of the liner must be appropriate to the capacity and intended use of the container. Joints and closures must be sift-proof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and transport.		

Table 2-2 (continued)

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Non-Bulk Performance-Oriented Packaging for Which the Manufacturer has Provided the Required UN Marking in Accordance with 49 CFR § 178.503	Intermediate Bulk Performance-Oriented Containers for Which the Container has been Marked by the Manufacturer in Accordance with 49 CFR § 178.703	Cylinders for Which the Cylinder has been Properly Marked with the Applicable DOT Specification Number in Accordance with 49 CFR § 178.35	Containers Used for Transport of Radioactive Materials
Plastic Jerricans meeting the standards of 49 CFR § 178.509. Maximum capacity will not exceed 16 gal; maximum net mass will not exceed 265 lbs.	Flexible intermediate bulk containers meeting the standards of 49 CFR § 178.710. Flexible intermediate bulk containers are intended to contain solid hazardous materials. The types with liners or coatings are designated: 13H2, woven plastic, coated; 13H3,woven plastic with liner; 13H4, woven plastic, coated with liner; 13L2, textile, coated; 13L3, textile with liner; and 13L4 textile, coated with liner.		
Steel or aluminum boxes meeting the standards of 49 CFR § 178.512. Maximum net mass will not exceed 882 lbs. Boxes must be lined with fiberboard or felt packing pieces or must have an inner liner or coating of suitable material in accordance with 49 CFR 173 Subpart C. If a double seamed metal liner is used, steps must be taken to prevent the ingress of materials, particularly explosives, into the recesses of the seams.			

Table 2-2 (continued)

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Non-Bulk Performance-Oriented Packaging for Which the Manufacturer has Provided the Required UN Marking in Accordance with 49 CFR § 178.503	Intermediate Bulk Performance-Oriented Containers for Which the Container has been Marked by the Manufacturer in Accordance with 49 CFR § 178.703	Cylinders for Which the Cylinder has been Properly Marked with the Applicable DOT Specification Number in Accordance with 49 CFR § 178.35	Containers Used for Transport of Radioactive Materials
Aluminum or steel Jerricans meeting the standards of 49 CFR 178.511. Maximum capacity will not exceed 16 gal; maximum net mass will not exceed 265 lbs.). If materials used for body, heads, closures, and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments must be applied. These coatings or treatments must retain their protective properties under normal conditions of transport.			
Plywood boxes meeting the standards of 49 CFR § 178.514. Maximum net mass will not exceed 882 lbs.			
Fiberboard boxes meeting the standards of 49 CFR § 178.516. Maximum net mass will not exceed 882 lbs.			
Composite packaging with inner receptacles meeting the standards of 49 CFR § 178.522. Maximum capacity is 66 gal; maximum net mass is 882 lbs.			
Composite packaging with inner glass, porcelain, or stone receptacles meeting the standards of 49 CFR § 178.523. Maximum net capacity for liquids is 16 gal; maximum net mass for solids is 165 lbs.			

Table 2-2 (continued)

Storage Containers Used for Hazardous and Mixed Low-Level Waste

Table 2-3

Maximum Storage Capacity and Total Storage Area at the Area G Container Storage Units

Container Storage Unit (CSU)	Storage Structure/Pad	Structure/Pad Maximum Storage Capacity	CSU Total Maximum Storage Capacity	CSU Total Storage Area (Square Feet)
Storage Shed 8	TA-54-8	11,880 gallons (gal.) (216 55-gal. drum equivalents [DE])	11,880 gal.	698
TA-54-33	TA-54-33	108,240 gal. (1,968 55-gal. DE)	108,240 gal.	5,000
Storage Dome 48 and Pad 3	TA-54-48 and Pad 3	213,840 gal. (3,888 55-gal. DE)	213,840 gal.	19,250
Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7	TA-54-49 and Pad 5	520,080 gal. (9,456 55-gal. DE)	623,480 gal.	59,933
	TA-54-224 and Pad 8	95,040 gal. (1,728 55-gal. DE)		
	TA-54-144, TA-54-145, TA-54-146, TA-54-177	1,320 gal. (24 55-gal. DE) [330 gal./shed; 6 55-gal. DE/shed]		
	TA-54-1027, TA-54-1028, TA-54-1030, TA-54-1041, and Pad 7	7,040 gal. (128 55-gal. DE) [1,760 gal./shed; 32 55-gal. DE/shed]		
Storage Domes 153 and 283 and Pad 6	TA-54-153 and Pad 6	316,140 gal. (5,748 55-gal. DE)	597,300 gal.	68,310
	TA-54-283 and Pad 6	281,160 gal. (5,112 55-gal. DE)		
TA-54-412, Storage Dome 226, and Pad 1	TA-54-412 and Pad 1	91,080 gal. (1,656 55-gal. DE)	502,920 gal.	13,180
	TA-54-226 and Pad 1	411,840 gal. (7,488 55-gal. DE)		22,250
Storage Domes 229, 230, 231, and 232, and Pad 9	TA-54-229 and Pad 9	330,000 gal. (6,000 55-gal. DE)	1,446,720 gal.	158,460
	TA-54-230 and Pad 9	330,000 gal. (6,000 55-gal. DE)		
	TA-54-231 and Pad 9	393,360 gal. (7,152 55-gal. DE)		
	TA-54-232 and Pad 9	393,360 gal. (7,152 55-gal. DE)		
Storage Dome 375 and Pad 11	TA-54-375 and Pad 11	682,440 gal. (12,408 55-gal. DE)	682,440 gal.	30,000
Pad 10 (former Pads 2 and 4) and transuranic waste characterization facilities	Pad 10 (former Pads 2 and 4)	313,830 gal. (5,706 55-gal. DE)	319,770 gal.	120,122
	Transuranic Waste Characterization Facilities	5,940 gal. (108 55-gal. DE)		

Table 2-4

Storage Containers Used at the Area G Container Storage Units for Mixed Transuranic Waste Awaiting Processing, Characterization, and Transport to the Waste Isolation Pilot Plant (WIPP) and Authorized for Receipt at WIPP

Standard 55-gallon (208-liter) Drum	Standard Waste Box	Standard 85-gallon (322-liter) Drum Overpack
Gross internal volume of 7.3 cubic feet (ft^3) (0.21 cubic meters [m^3]) constructed of mild steel. May also contain ridge, molded polyethylene (or other compatible material) liner. Must meet requirements of DOT Specification 7A in 49 CFR § 178.350.	Gross internal volume of 66 ft^3 (1.88 m^3). Must meet requirements of DOT Specification 7A in 49 CFR § 178.350.	Gross internal volume of 11.3 ft^3 (0.32 m^3). Used for overpacking contaminated 55-gallon drums containing mixed transuranic (TRU) waste.
One or more filter vents installed on top of the container. Vents are high-efficiency particulate air (HEPA) grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 millimeters [mm]) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).	One or more filter vents installed on top of the container. Vents are HEPA-grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 mm) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).	One or more filter vents installed on top of the container. Vents are HEPA-grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 mm) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).

Table 2-4 (continued)

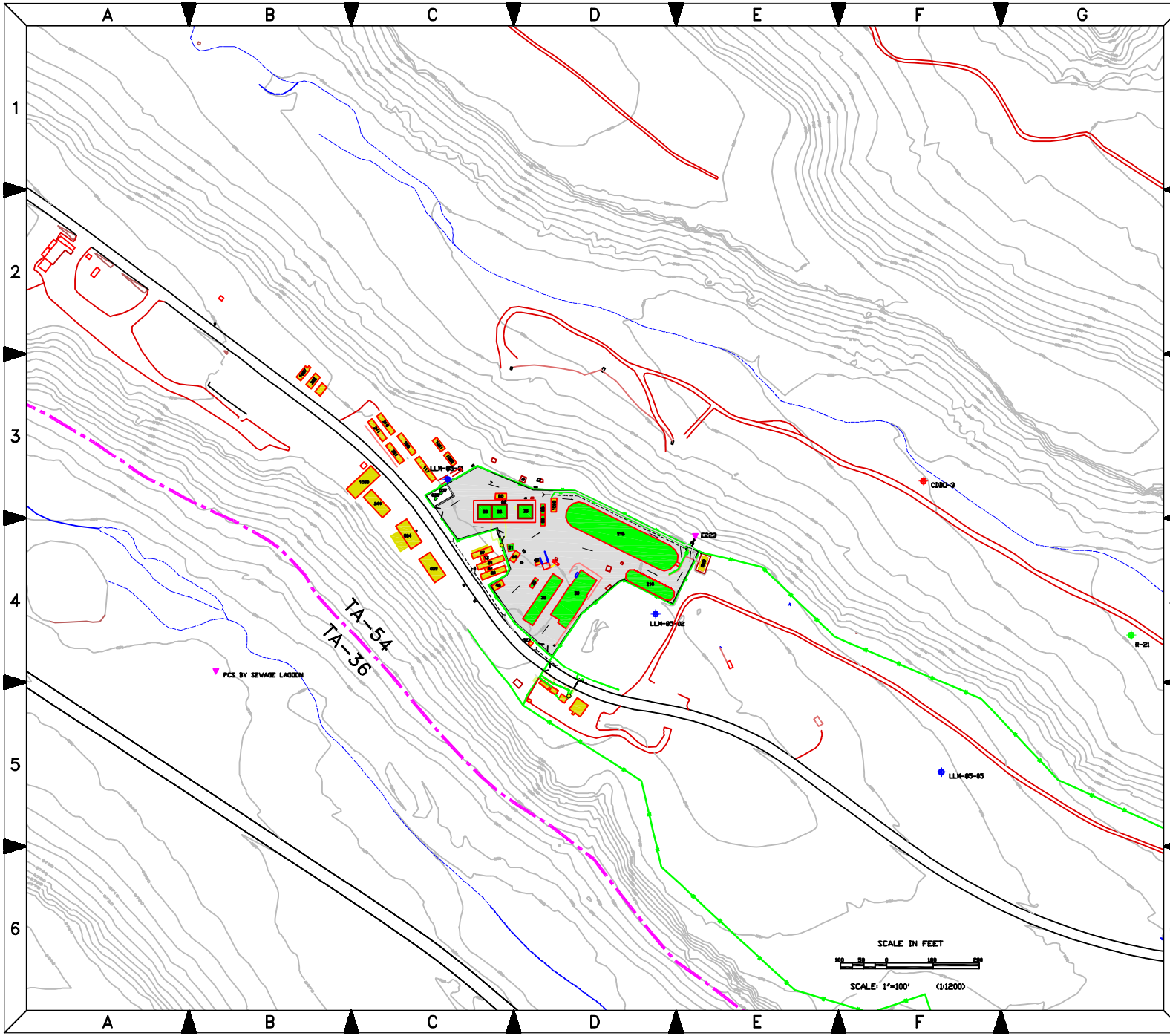
Storage Containers Used at the Area G Container Storage Units for Mixed Transuranic Waste Awaiting Processing, Characterization, and Transport to the Waste Isolation Pilot Plant (WIPP) and Authorized for Receipt at WIPP

Ten-Drum Overpack (TDOP)	Staging Containers
The ten-drum overpack is a metal container (similar to the SWB) that meets DOT specification 7A and is certified to meet all applicable requirements for Type A packaging. The TDOP is a welded-steel, right circular cylinder, approximately 74 inches high and 71 inches in diameter. The maximum loaded weight is 6,700 pounds. A bolted lid on one end is removable; sealing is accomplished by clamping a neoprene gasket between the lid and the body. A TDOP may contain up to 10 standard 55-gallon drums or one SWB.	As a result of facility modifications over the years, a large amount of equipment and other materials have been removed from TRU operations throughout the Laboratory. This equipment is currently staged in Area G for eventual processing through the Decontamination and Volume Reduction System Facility. After processing, the waste will be placed into authorized WIPP containers for characterization and transport to WIPP. The staging containers are custom designed containers made to specifically hold the contents for which they were made. The containers are constructed of fiberglass-reinforced plywood or metal. A number of these containers are made of raw plywood and are overpacked in metal containers. The size and weight of these containers vary depending on their contents; however, all containers meet the requirements of 49 CFR 173.410.
One or more filter vents installed on top of the container. Vents are HEPA-grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 mm) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).	

Table 2-5

Storage Capacity and Total Storage Area at the TA-54 West Container Storage Units

Container Storage Unit (CSU)	Storage Structure/Pad	Structure/Pad Storage Capacity	CSU Total Storage Capacity	Structure/Pad Storage Area (Square Feet)	CSU Total Storage Area (Square Feet)
Indoor CSU	TA-54-38, Low Bay	880 gallons (16 55-gallon drum equivalents)	3,080 gallons	1,330	4,056
	TA-54-38, High Bay	2,200 gallons (40 55-gallon drum equivalents)		2,726	
Outdoor CSU	TA-54-38, Pad	7,920 gallons (144 55-gallon drum equivalents)	8,580 gallons	37,248	37,864
	TA-54-38, Loading Dock	660 gallons (12 55-gallon drum equivalents)		616	



LEGEND

- STRUCTURE ASSOCIATED WITH A CONTAINER STORAGE UNIT
- STRUCTURE NOT ASSOCIATED WITH A CONTAINER STORAGE UNIT
- CONTAINER STORAGE UNIT BOUNDARY
- DOE/TECHNICAL AREA BOUNDARY
- PAVED ROAD
- DIRT ROAD
- ASPHALTIC CONCRETE
- DIRECTION OF STORM WATER FLOW
- GATE
- PERSONNEL ACCESS TURNSTILE
- STORM WATER SAMPLING STATION
- INDUSTRIAL FENCE
- CULVERTS
- CONCRETE PAD
- INTERMITTENT STREAM
- R WELL
- MOISTURE MONITORING WELL-DRY
- OBSERVATION WELL-DRY

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-1
AREA L
Container Storage Units

DRAWN	R Spencer
VERIFIED	R Spencer
CHECKED	R. Lechel
DATE	03-26-03

BLDG TA-54

SUBMITTED R. Lechel

APPROVED FOR RELEASE
APPROVED D. Mclain

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

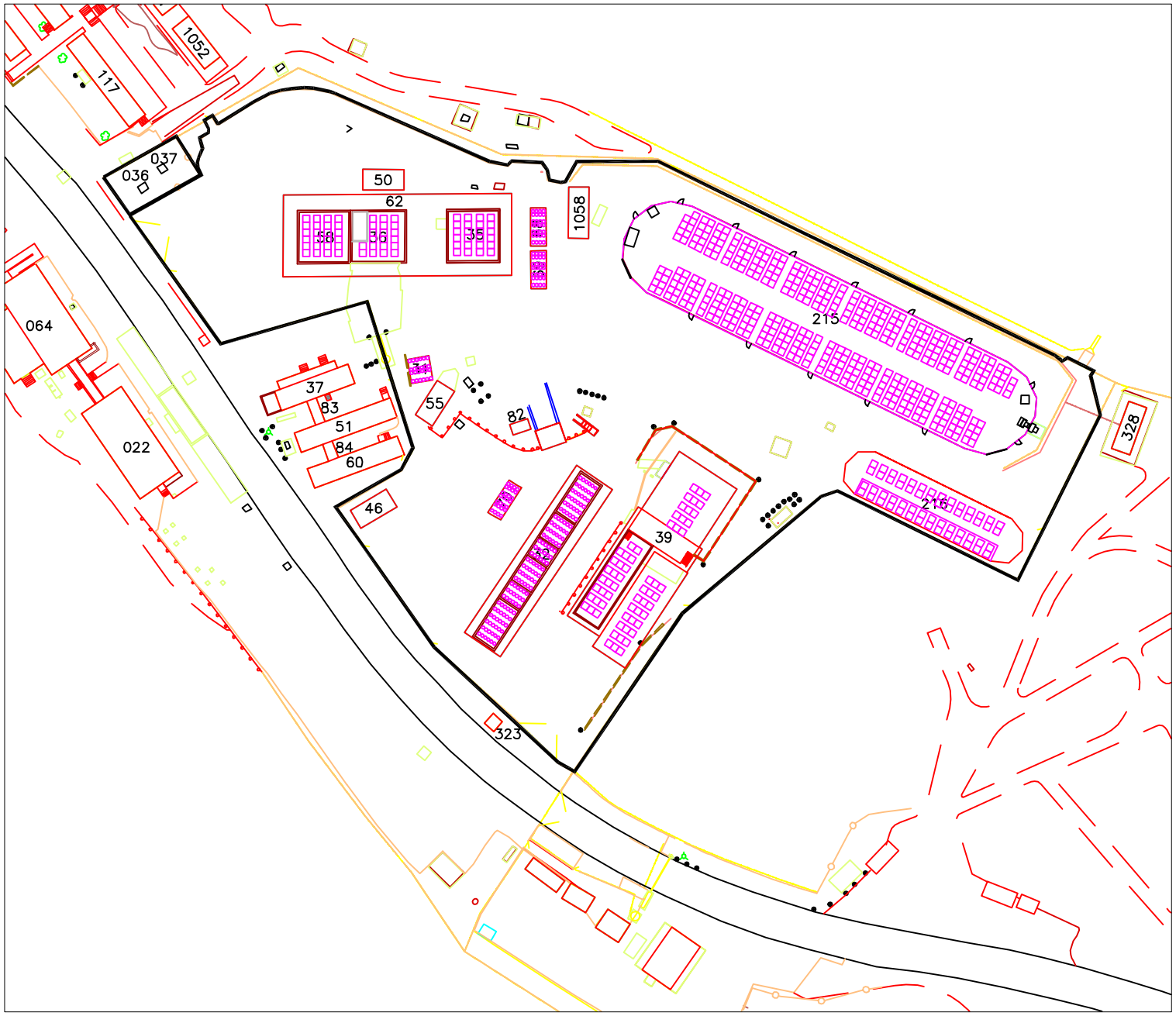
SHEET OF

CLASSIFICATION REVIEWER REVIEWER DATE

PROJECT ID

DRAWING NO SK-54-L-01

REV 1



LEGEND

Metal pallet (4ftX4ft)

Storage unit boundary

55-gallon drum

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high
3. Pallets stacked 2 high in bldg 32

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm Facility & Waste Operations Waste Facility Management Los Alamos National Laboratory

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-2
Storage Configuration and Capacity for the Aboveground Container Storage Unit Within the Fence at Area L

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

APPROVED FOR RELEASE
APPROVED D. Mclain

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PROJECT ID

DRAWING NO SK-54-L-02

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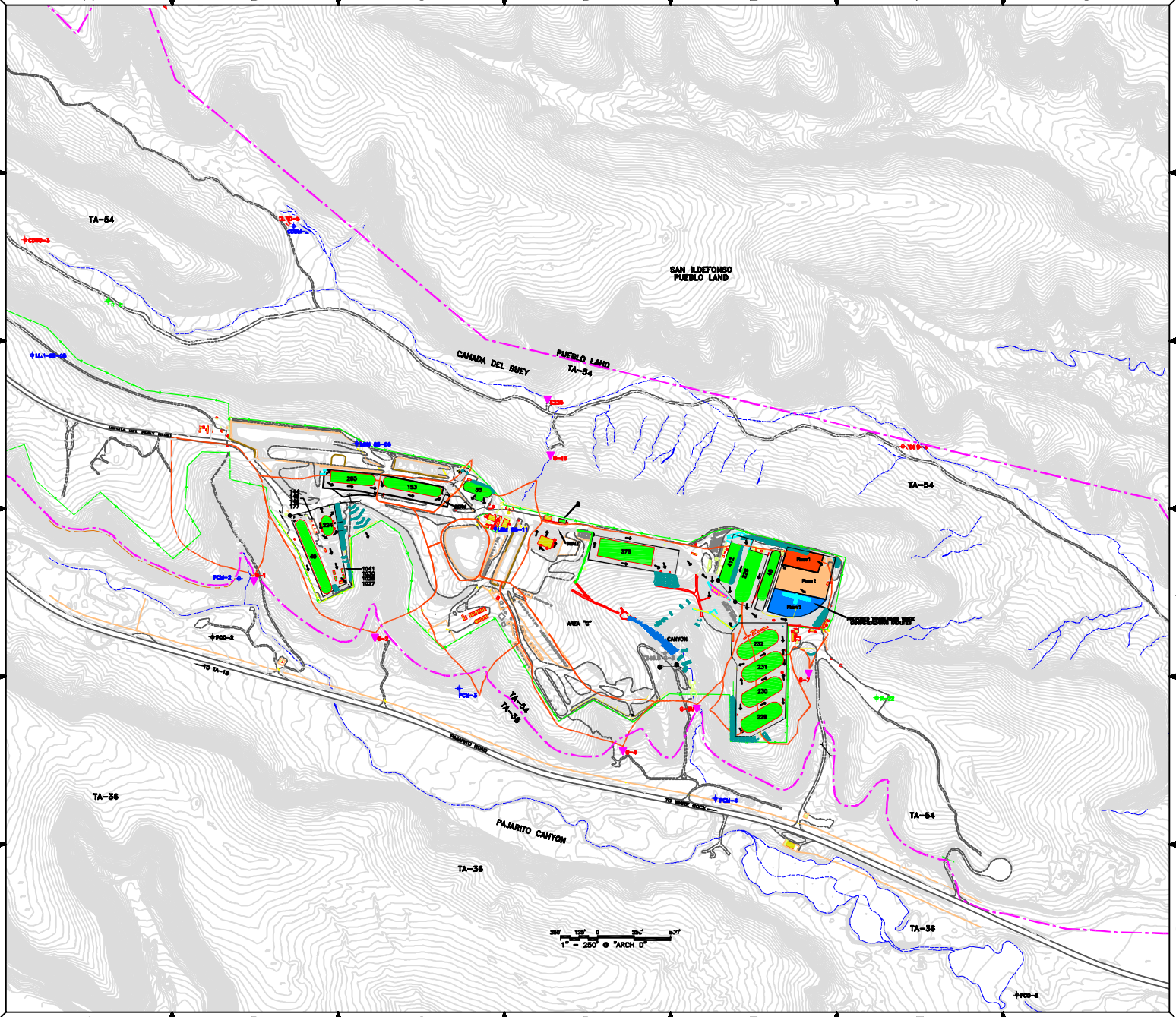

LEGEND

- STRUCTURE ASSOCIATED WITH A CONTAINER STORAGE UNIT
- STRUCTURE NOT ASSOCIATED WITH A CONTAINER STORAGE UNIT
- PROPOSED STRUCTURE ASSOCIATED WITH A CONTAINER STORAGE UNIT
- CONTAINER STORAGE UNIT BOUNDARY
- DOE/TECHNICAL AREA BOUNDARY
- ASPHALTIC CONCRETE
- DIRECTION OF STORM WATER FLOW
- DRAINAGE AREA BOUNDARY
- STORM WATER SAMPLING STATION
- GRAVEL OR DIRT ROAD
- GATE
- INDUSTRIAL FENCE
- SINGLE-STRAND CHAIN FENCE
- INTERMITTENT STREAM
- RIP RAP
- SILT FENCE
- CULVERT
- ROCK BLANKET
- OBSERVATION WELL SATURATED
- R WELL
- MOISTURE MONITORING WELL-DRY
- OBSERVATION WELL-DRY

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm Facility & Waste Operations Waste Facility Management

TA-54 FMU-54

Figure 2-3
AREA G CONTAINER STORAGE UNITS

DRAWN	R. SPENCER
VERIFIED	R. SPENCER
CHECKED	R. LECHEL
DATE	03-26-03

BLDG TA-54

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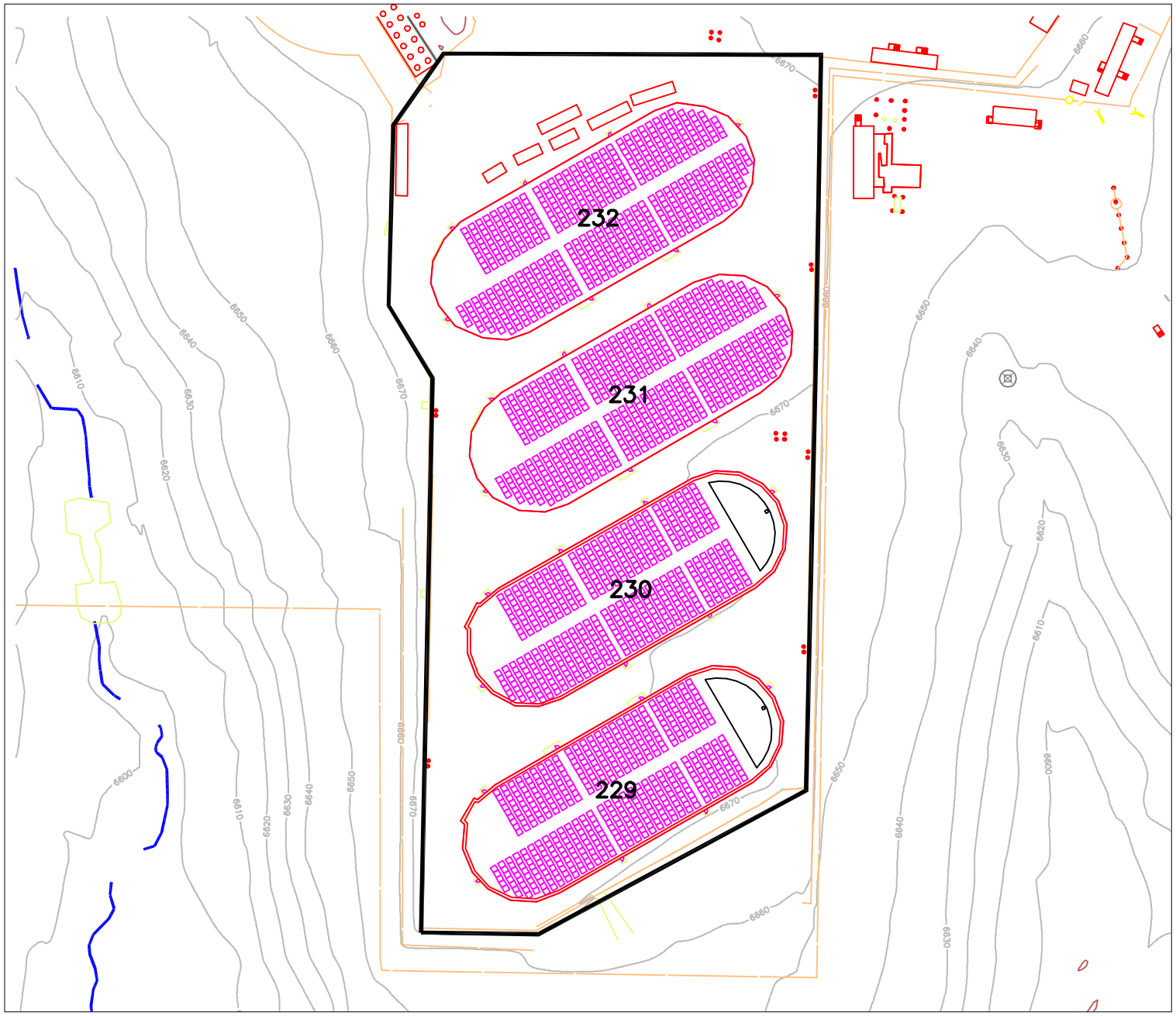
REV 1



LEGEND

Metal pallet (4ft x 4ft)
CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm Facility & Waste Operations Waste Facility Management

TA-54 FMU-54

Figure 2-4

TA-54-229, -230, -231, and -232
Container Storage Unit
Configuration and Capacity

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

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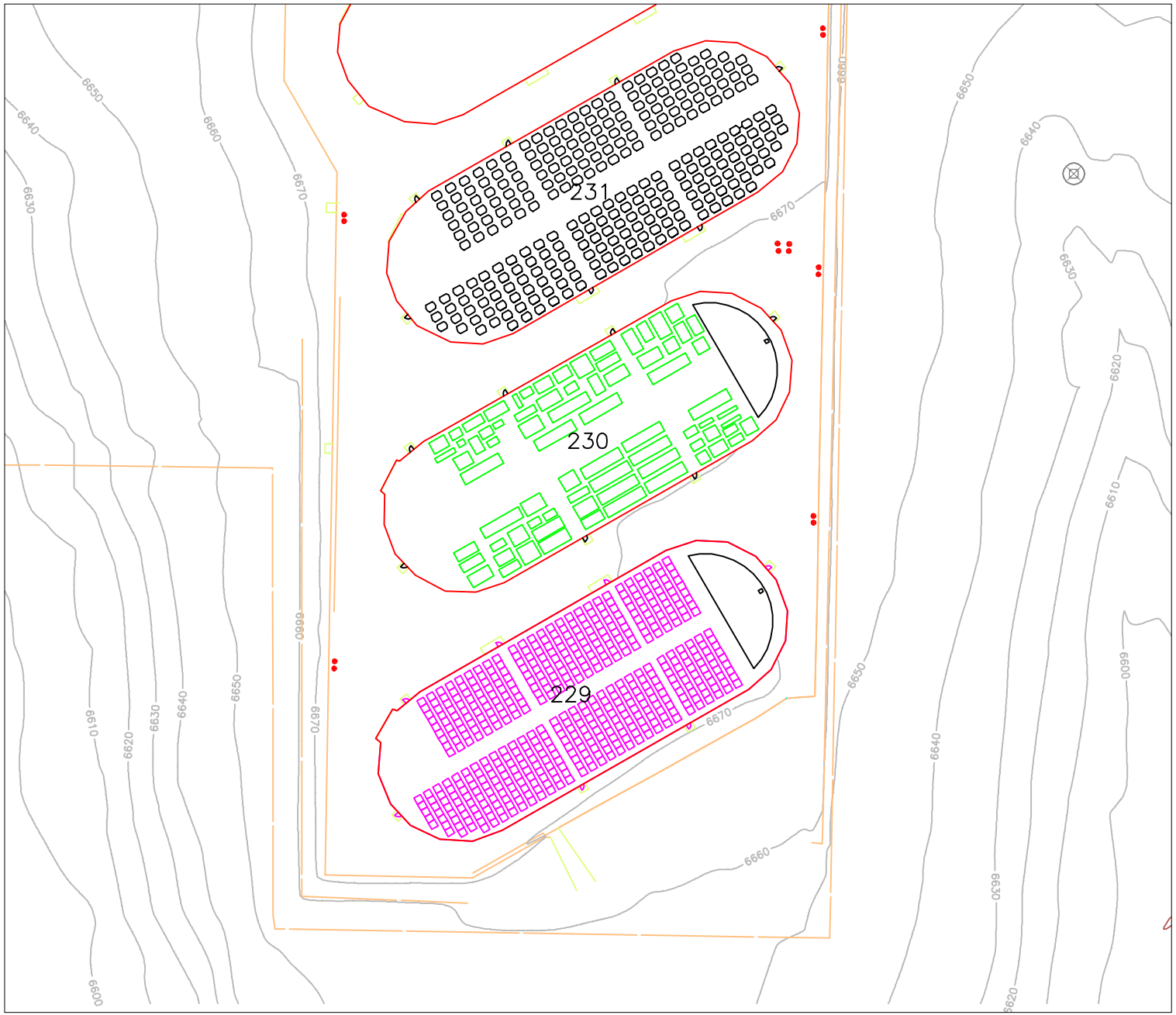
REV 0



LEGEND

Metal pallet (4ft X 4ft)

FRP Box

SWB

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets and SWBs stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-5
Examples of Dome Storage Configurations Based on Waste Container Type

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

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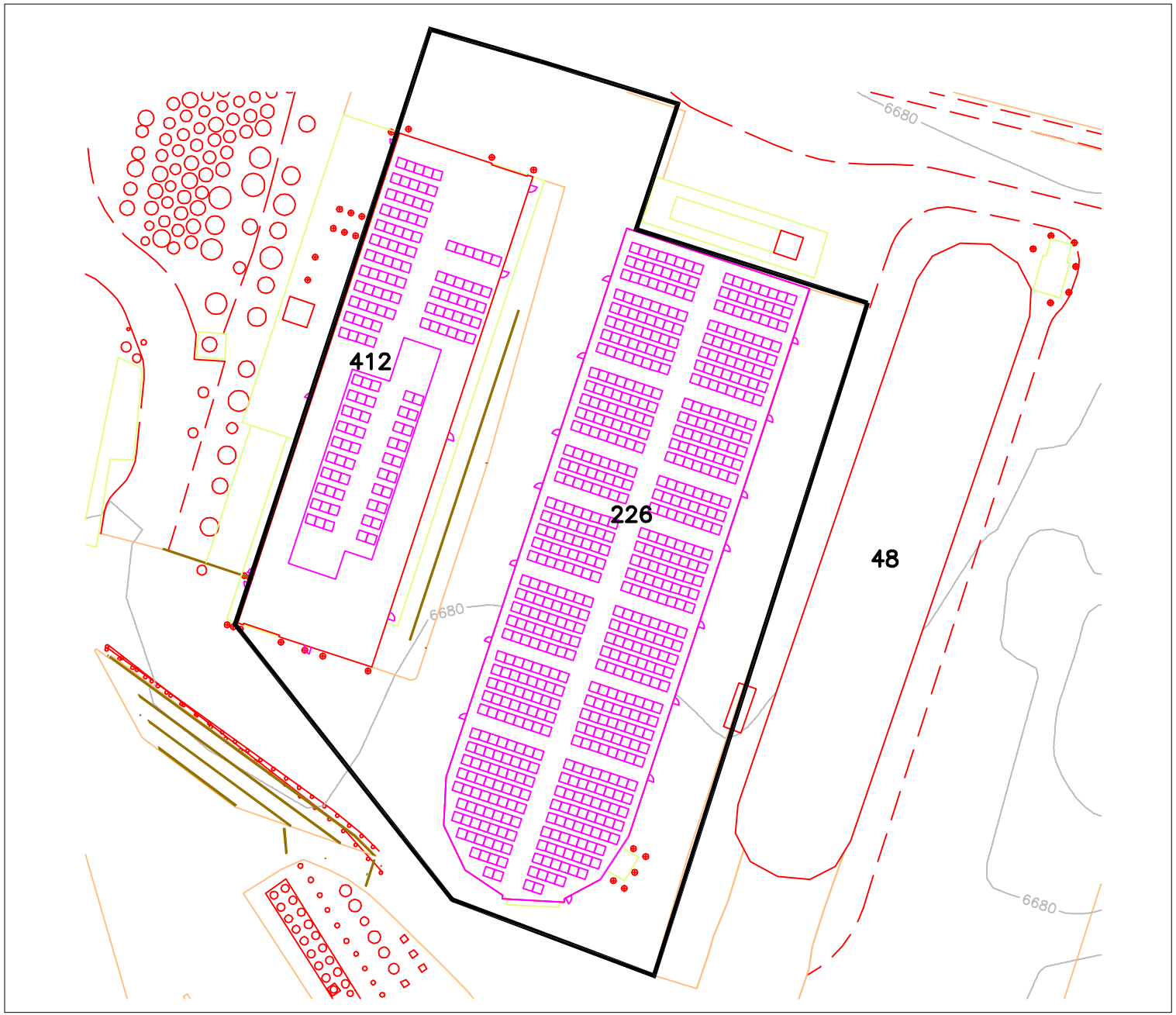
REV 0



LEGEND

Metal pallet (4ft x 4ft)

CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-6

TA-54-226 and -412
Container Storage Unit
Configuration and Capacity

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

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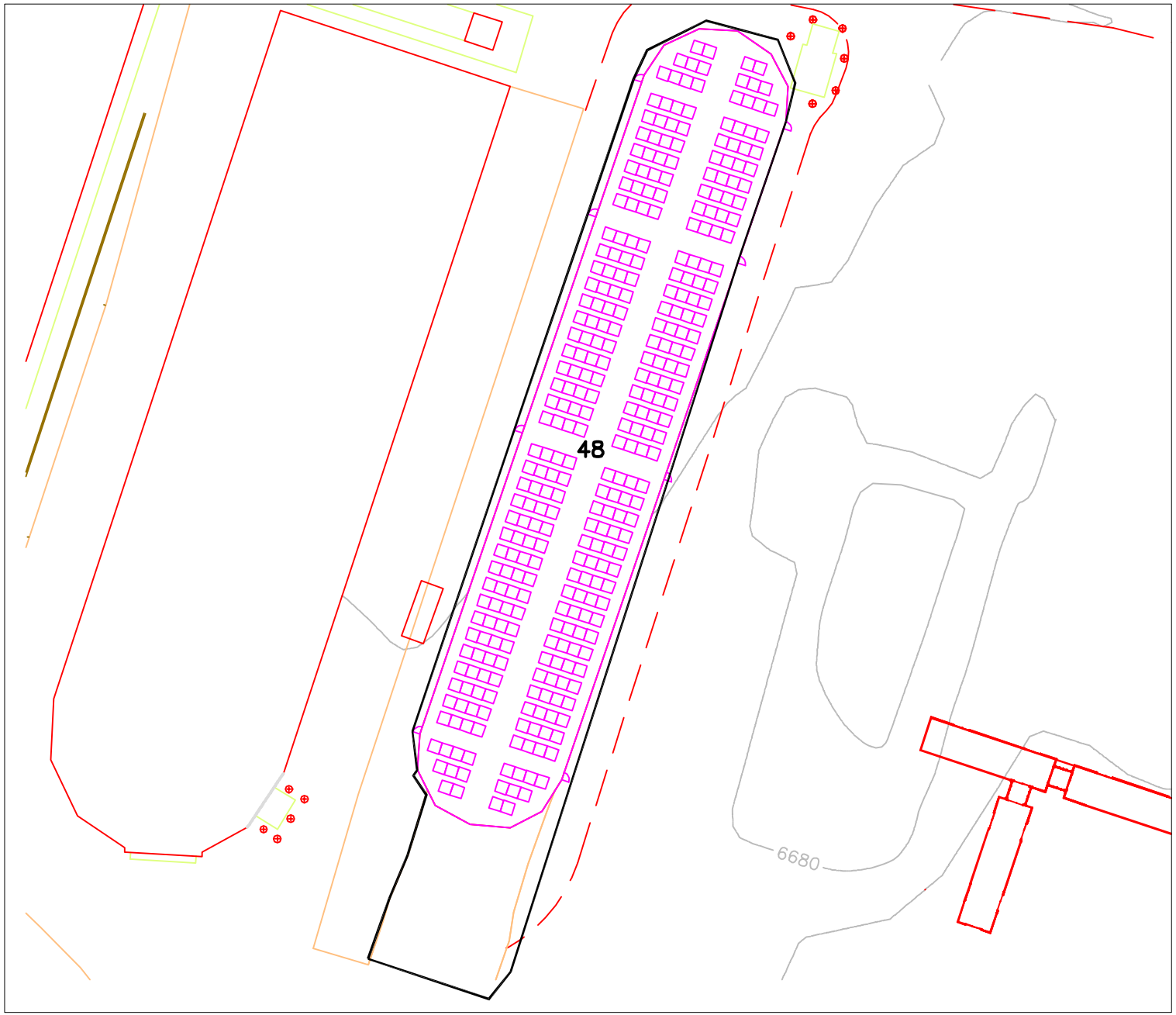
REV 0



LEGEND

Metal pallet (4ft x 4ft)

CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-7
TA-54-48
Container Storage Unit
Configuration and Capacity

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

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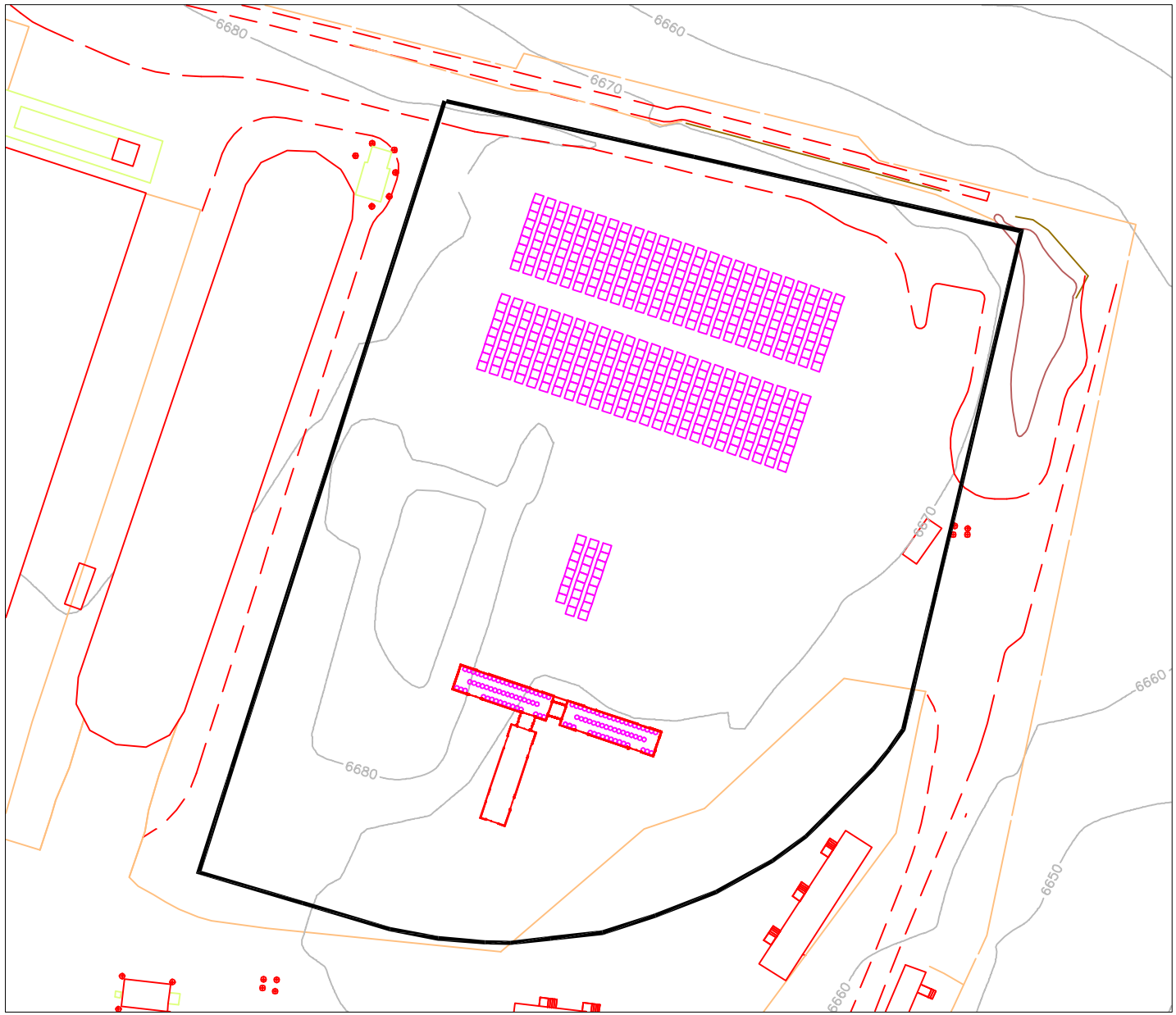
PROJECT ID

DRAWING NO SK-54-G-04

REV 0



LEGEND

Metal pallet (4ft x 4ft)

55-gallon drum

CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

Facility & Waste Operations
Waste Facility Management
TA-54 FMU-54

Figure 2-8
Proposed Transuranic Waste Characterization Facilities and Pad 10 Container Storage Unit Configuration and Capacity

BLDG TA-54

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

SUBMITTED R. Lechel
APPROVED FOR RELEASE APPROVED D. Mclain

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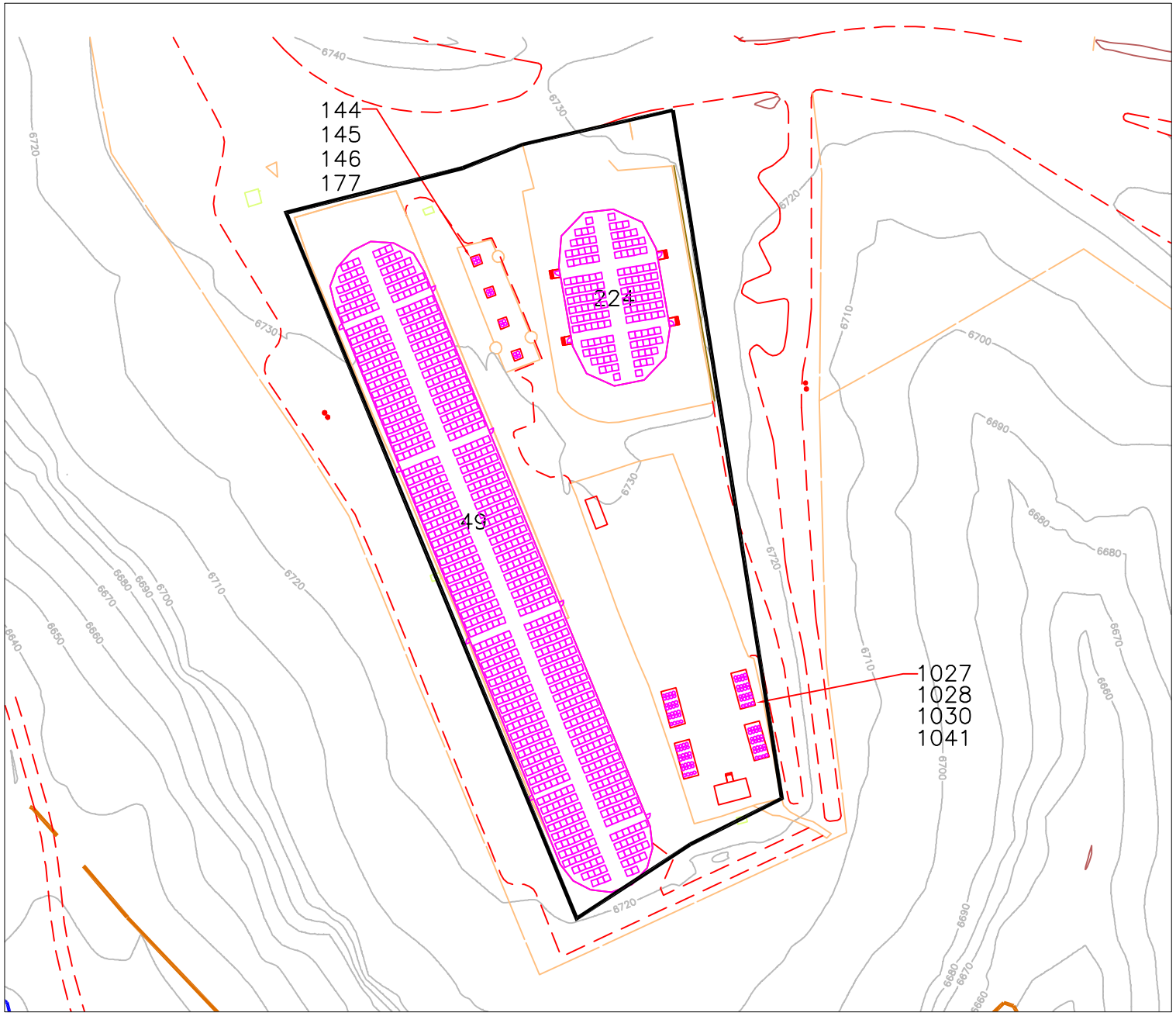
PROJECT ID

DRAWING NO SK-54-G-05

REV 0



LEGEND

Metal pallet (4ft x 4ft)

55-gallon drum

CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-9
TA-54-49, -144, -145, -146, -177, -224, -1027, -1028, -1030, and -1041
Container Storage Unit Configuration and Capacity

BLDG TA-54

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

SUBMITTED R. Lechel

APPROVED FOR RELEASE
APPROVED D. Mclain

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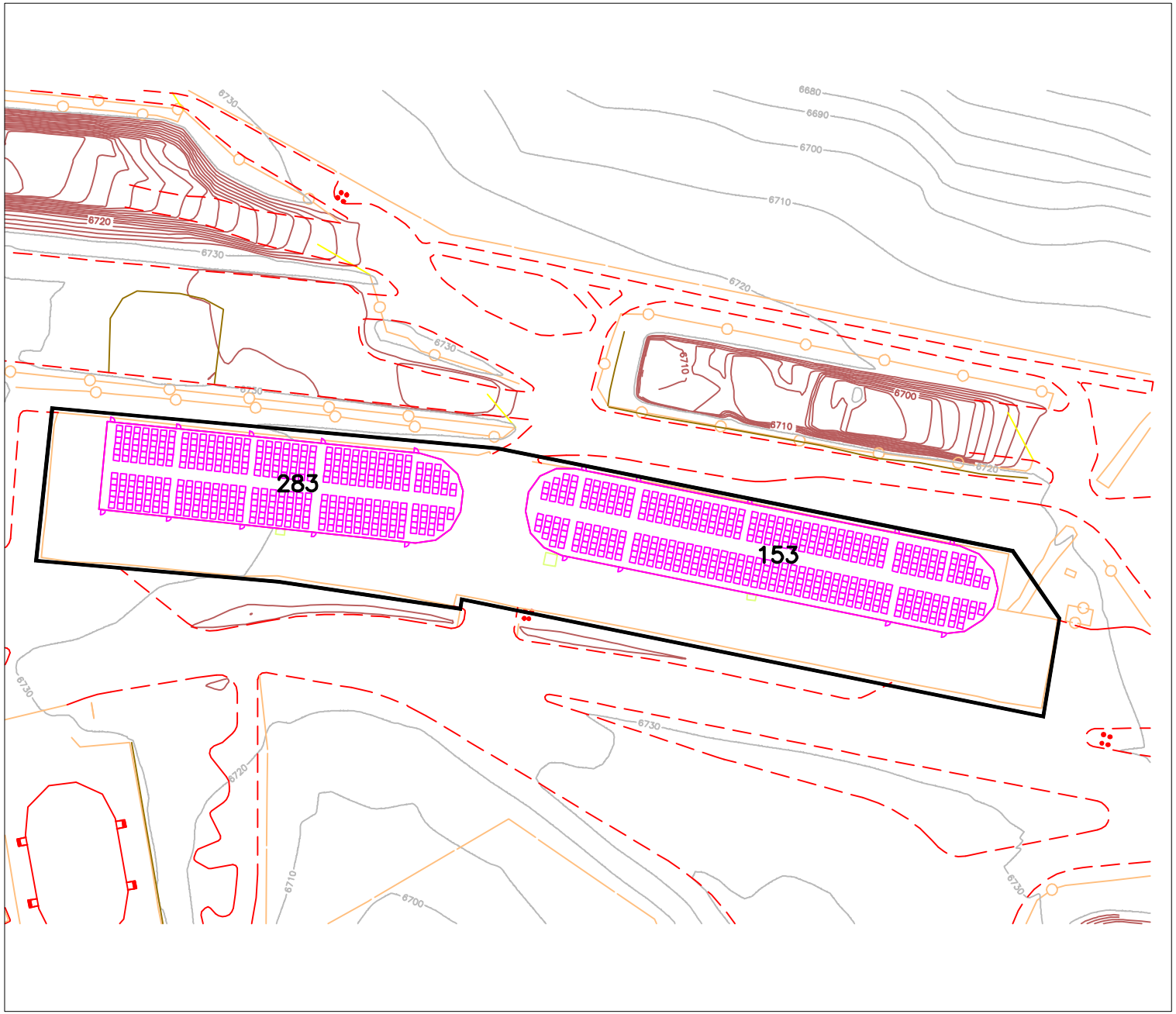
PROJECT ID

DRAWING NO SK-54-G-06

REV 0



LEGEND

Metal pallet (4ft x 4ft)

CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-10

TA-54-153 and -283

Container Storage Unit Configuration and Capacity

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

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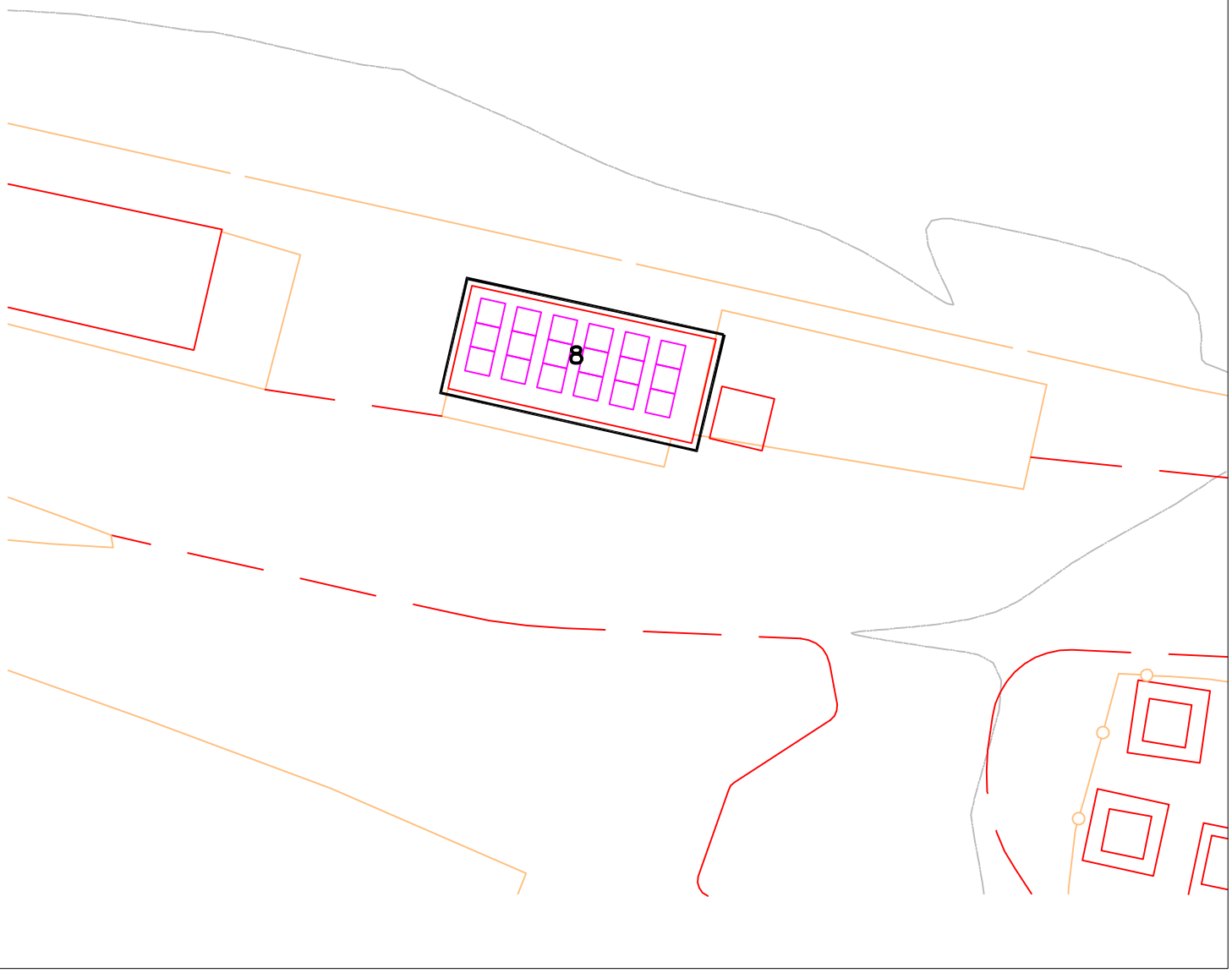
PROJECT ID

DRAWING NO SK-54-G-07

REV 0



LEGEND

Metal pallet (4ft x 4ft)

CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2–11
TA–54–8
Container Storage Unit
Configuration and Capacity

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06–17–02

BLDG TA–54

SUBMITTED R. Lechel

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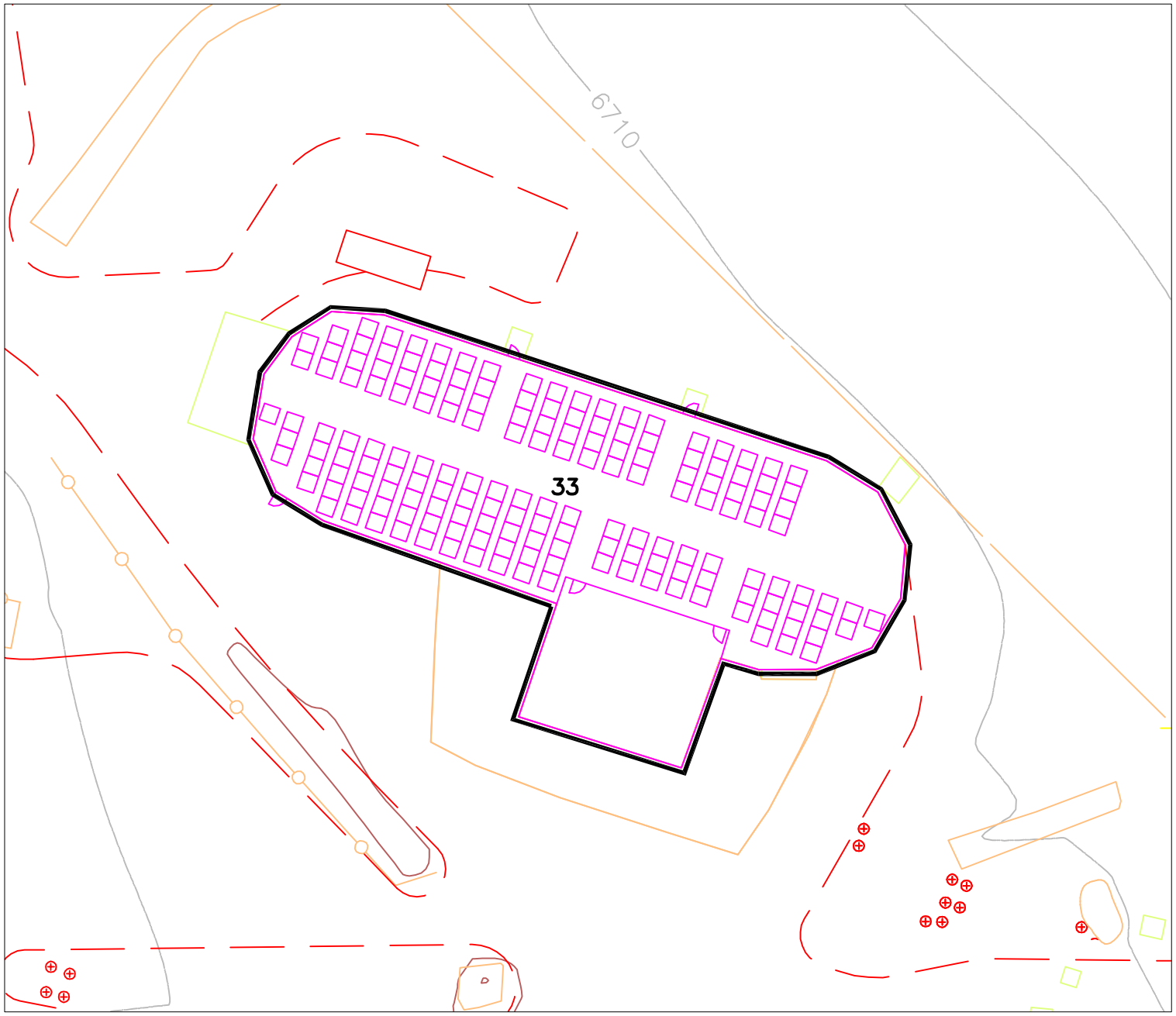
CLASSIFICATION REVIEWER REVIEWER DATE

PROJECT ID

DRAWING NO SK–54–G–08

REV 0



LEGEND

Metal pallet (4ft x 4ft)

CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-12
TA-54-33
Container Storage Unit
Configuration and Capacity

BLDG TA-54

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

SUBMITTED R. Lechel

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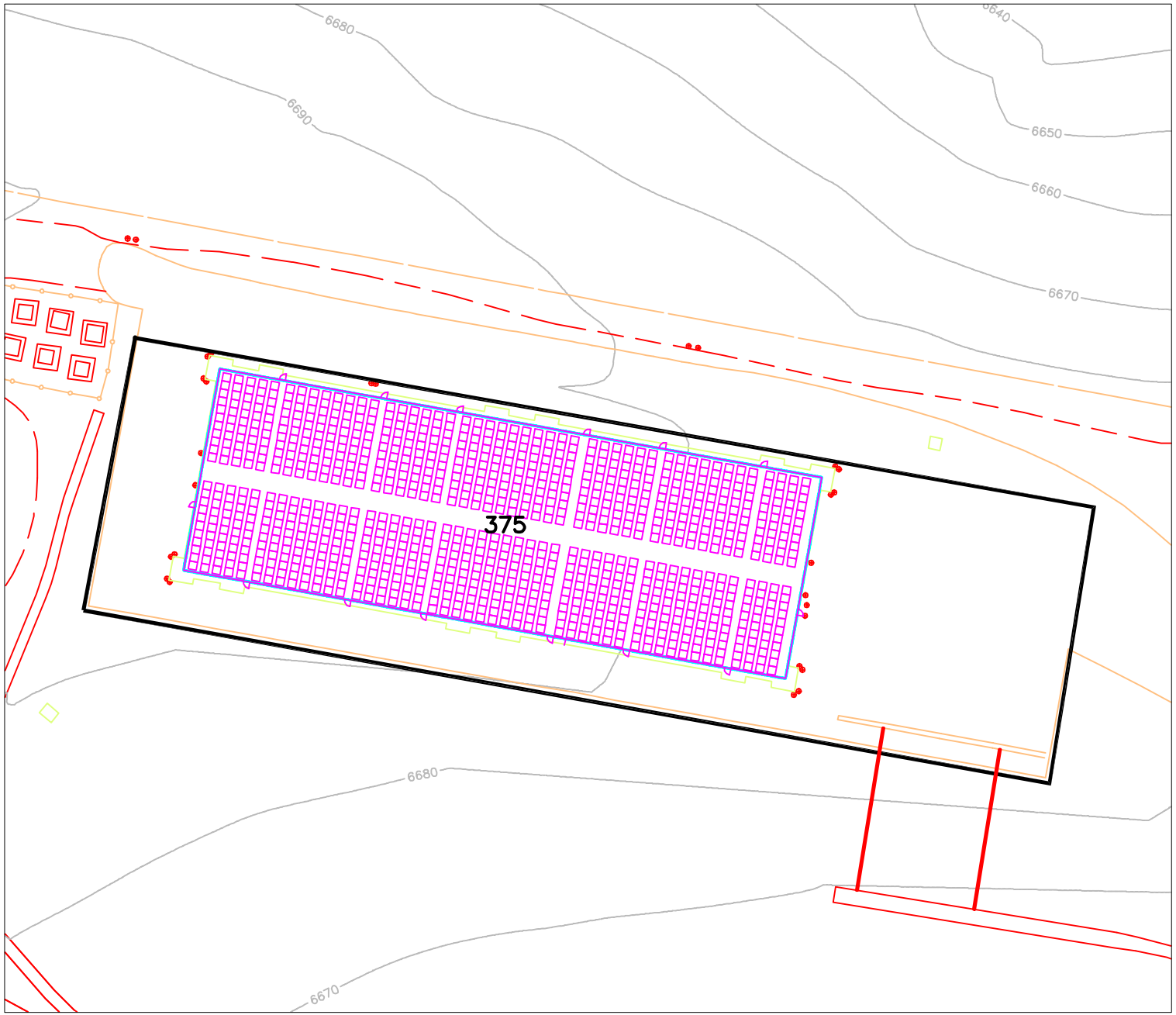
CLASSIFICATION REVIEWER REVIEWER DATE

PROJECT ID

DRAWING NO SK-54-G-09

REV 0



LEGEND

Metal pallet (4ft x 4ft)

CSU Boundary

NOTES:

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 3 high

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-13
TA-54-375
Proposed Container Storage Unit
Configuration and Capacity

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

APPROVED FOR RELEASE
APPROVED D. Mclain

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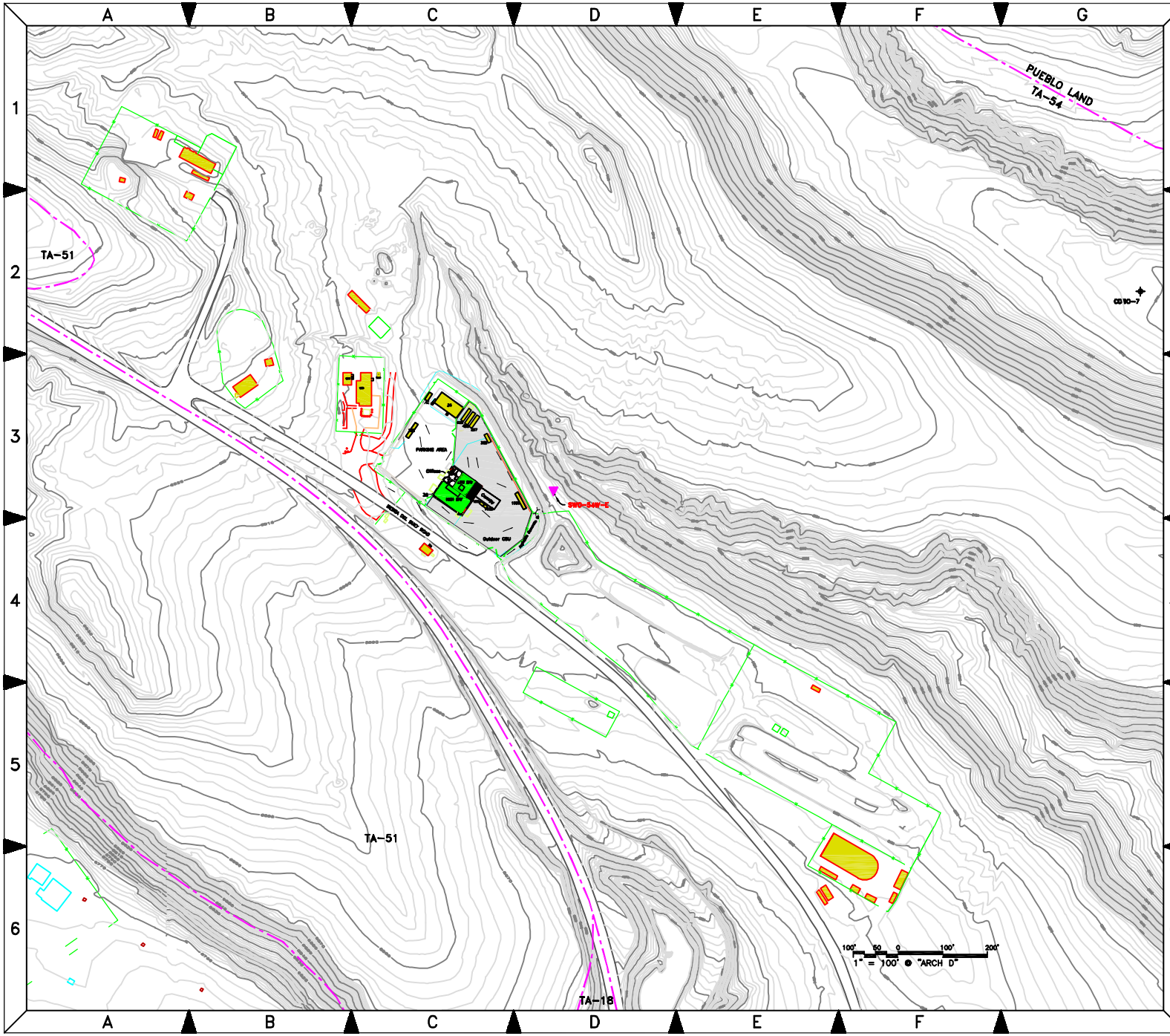
PROJECT ID

DRAWING NO SK-54-G-10

REV 0



LEGEND

- STRUCTURE ASSOCIATED WITH A CONTAINER STORAGE UNIT
- STRUCTURE NOT ASSOCIATED WITH A CONTAINER STORAGE UNIT
- CONTAINER STORAGE UNIT BOUNDARY
- RCRA/TECHNICAL AREA BOUNDARY
- ASPHALTIC CONCRETE
- PAVED ROADS
- GATE
- INDUSTRIAL FENCE
- LOADING DOCK PORTION OF OUTDOOR CSU
- CONCRETE PAD
- ASPHALTIC CONCRETE SWALE WITH SWALED RECESSED DRAIN
- DIRECTION OF STORM WATER FLOW
- ASPHALTIC CONCRETE CURB/BERM
- CULVERT
- STORM WATER SAMPLING STATION
- OBSERVATION WELL SATURATED

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm Facility & Waste Operations Waste Facility Management

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2-14
TA-54 West
Container Storage Units

DRAWN	R Spencer
VERIFIED	R Spencer
CHECKED	R. Lechel
DATE	03-26-03

BLDG TA-54

SUBMITTED
SUBMITTED R. Lechel

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PROJECT ID

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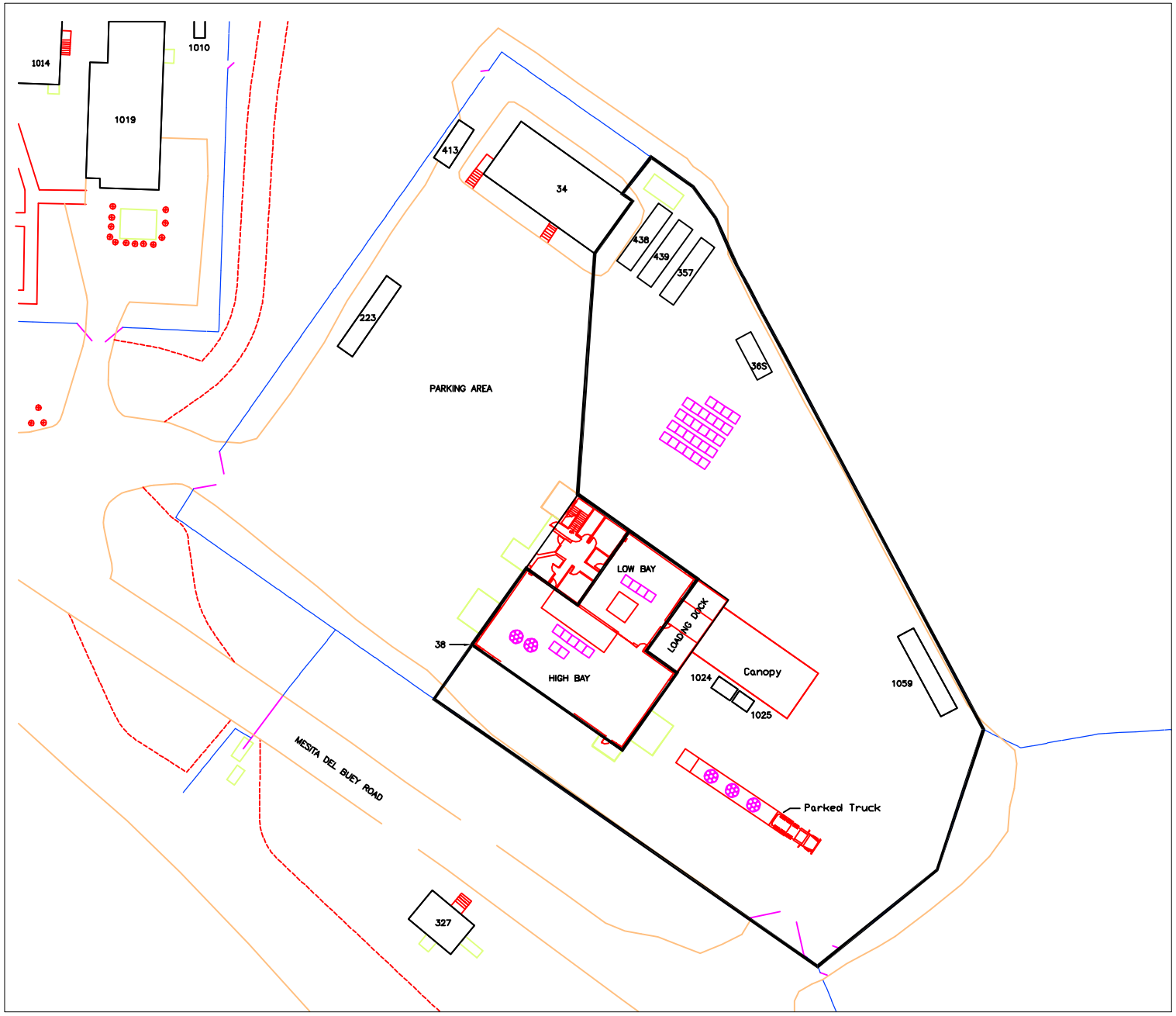
REV 1



LEGEND

Metal pallet (4ftX4ft)

CSU Boundary

TRUPACT–II

NOTES

1. Minimum 24" aisle spacing between pallets and emergency egress
2. Pallets stacked 1 high

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure 2–15
TA–54 West
Container Storage Units
Configuration and Capacity

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06–17–02

BLDG TA–54

SUBMITTED R. Lechel

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Supplement 2-1

Secondary Containment Capacities

Area L

CSU	Structure	Length (Feet)	Width (Feet)	Depth (Feet)	Secondary Containment Surface Area (Square Feet)		Secondary Containment Capacity (Gallons)	Structure Maximum Storage Capacity (Gallons)
Aboveground CSU Within the Fence	TA-54-58	30. 5	25	0.5	762		2,852	15,840
	TA-54-36	30 -8	30 -20	0.83 0.83	900 -160	740	4,595	13,200
	TA-54-35	29.5	24.5	0.66	723		3,568	15,840
	TA-54-68	22	8.1	0.56	178		750	1,760
	TA-54-69	22	8.1	0.56	178		750	1,760
	TA-54-70	22	8.1	0.56	178		750	1,760
	TA-54-32: Cells 1 & 6	26.5	13.5	1	358		2,676	
	TA-54-32: Cells 3 & 5	16.83	13.5	1	227		1,700	
	TA-54-32: Cells 2 & 4	13.5	11.17	1	151		1,128	17,160
	TA-54-39: Room 101	39	22.5	0.5	878		3,282	9,900
	TA-54-39: Containment Pad-Western Section	59.5	16	1	952		7,121	15,180
	TA-54-31: Sump 1	4	6	0.42	24		75	
	TA-54-31: Sump 2	4	6	0.42	24		75	
	TA-54-31: Sump 3	6	7	0.42	42		132	1,320
	CSU Total:				**5,415**		**29,454**	

Supplement 2-1 (continued)

Secondary Containment Capacities

Area G

CSU	Structure	Length (Feet)	Width (Feet)	Depth (Feet)	Secondary Containment Surface Area (Square Feet)	Secondary Containment Capacity (Gallons)	Structure Maximum Storage Capacity (Gallons)
Storage Domes 229, 230, 231, and 232 and pad	TA-54-230 (Sump)	See Note 1 for Calculation Details		1.75	1,388	18,170	330,000
	TA-54-230 (Curbed Area)	See Note 2 for Calculation Details		0.25	16,088	30,088	
	CSU Total:				**17,476**	**48,258**	
Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, & 7	TA-54-224	See Note 3 for Calculation Details		0.46	5,566	19,153	95,040
	TA-54-144	6	5	0.535	30	120	330
	TA-54-145	6	5	0.535	30	120	330
	TA-54-146	6	5	0.535	30	120	330
	TA-54-177	6	5	0.535	30	120	330
	TA-54-1027	22	8.1	0.56	178	750	1,760
	TA-54-1028	22	8.1	0.56	178	750	1,760
	TA-54-1030	22	8.1	0.56	178	750	1,760
	TA-54-1041	22	8.1	0.56	178	750	1,760
	CSU Total:				**6,398**	**22,633**	

Notes:

1. Surface area for sump estimated by enlarging sump semicircle to 36 feet for the radius in all directions, which puts the center of the circle 9 feet west of the sump. The area of the circle was divided by two (for the semicircle) and then the additional 9 foot by 72 foot area (previously added to make the semicircle) was subtracted. Sump surface area: $\pi (r)^2$ with radius of 36 feet. Calculation is $\pi(36)^2/2 – (9 \times 72) = 1{,}388$ square feet.

2. Surface area for curbed area estimated with following calculation: $\pi (r)^2$ with radius of 41 feet divided by two (for the semicircle) and then adding the 82-foot by 164-foot area. Calculation is $\pi(41)^2/2 + (82 \times 164) = 16{,}088$ square feet.

3. Surface area estimated with the following calculation: $\pi (r)^2$ with radius of 28.58 feet and then adding the 50-foot by 60-foot area. Calculation is $\pi (28.58)^2 + (50 \times 60) = 5{,}566$ square feet.

3.0 OTHER FEDERAL LAWS

A discussion of federal laws, as required by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, §§ 270.3 and 270.14(b)(20), revised June 14, 2000, is provided in Section 3.0 in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

4.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

The information provided in this section is submitted to address the applicable solid waste management unit (SWMU) requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 270.14(d), revised June 14, 2000. This section addresses the SWMUs that are located at Technical Area (TA) 54 at Los Alamos National Laboratory (LANL).

LANL uses the definition of a SWMU presented in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (U.S. Environmental Protection Agency, 1994), referred to as Module VIII. This definition states that SWMUs are "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

Table 4-1 lists the SWMUs at TA-54. Supplement 4-1, which has been extracted from “The 2003 Solid Waste Management Unit Report” (LANL, 2003), provides descriptions of the SWMUs listed in Table 4-1. These descriptions include, to the extent available, the unit type, general dimensions and structural descriptions, the dates of operation, and the wastes managed at the unit. Supplement 4-1 also includes the most current information available pertaining to releases of hazardous wastes or hazardous constituents from the units and results of sampling and analyses conducted to date. In addition, the location of each SWMU is presented on topographic maps included within Supplement 4-1.

Table 4-1

Technical Area (TA) 54
Solid Waste Management Units (SWMU)

SWMU No./Former SWMU No.	Consolidated SWMU No.	Location	SWMU Description	Unit Status
54-001(a)		TA- 54-215, Area L	Container Storage (Storage Area)	Active; operating under the New Mexico Hazardous Waste Act (NMHWA); to be permitted
54-004		TA- 54, Area H	Material Disposal Area (Material Disposal Area [MDA H])	Inactive; to undergo corrective action
54-005		TA- 54, Area J	Material Disposal Area (MDA J, [Pits 1-5, Shafts 1-4])	Inactive; operated under New Mexico Solid Waste regulations; closure approval pending
54-006		TA- 54, Area L	Material Disposal Area (MDA L, [all subsurface units such as Pit A; Impoundments B, C, D; Shafts 1-28 and 29-34])	Inactive; Shafts 1, 13-17, and 19-34 and Impoundments B and D have been proposed to undergo closure/post-closure in accordance with alternative requirements, as allowed by 20.4.1 NMAC §264.110(c) [6-14-00], to meet post-closure care requirements

Table 4-1 (Continued)

Technical Area (TA) 54
Solid Waste Management Units (SWMU)

SWMU No./Former SWMU No.	Consolidated SWMU No.	Location	SWMU Description	Unit Status
54-007(a)		TA- 54-16, Area G	Subsurface Liquid Disposal (Septic System)	Inactive; voluntary corrective action [VCA] completed; no further action (NFA) recommended
54-007(c)	54-007(c)-99	TA- 54 West	Subsurface Liquid Disposal (Former Septic Systems)	Inactive; VCA completed; NFA recommended
54-012(b)		TA- 54-82, Area L	Physical/Chemical Treatment Unit (Drum Compactor, Reduction Site)	Inactive; to undergo corrective action
See below	54-013(b)-99	TA- 54, Area G	Material Disposal Area (MDA G subsurface waste management units]:	See below
54-013(b)	54-013(b)-99		MDA G, Vehicle Monitoring/Decontamination Area	Inactive; to undergo corrective action
54-014(b)	54-013(b)-99		MDA G, Pit 9	Inactive; to undergo corrective action
54-014(c)	54-013(b)-99		MDA G, Shafts 200-233	Inactive; to undergo corrective action
54-014(d)	54-013(b)-99		MDA G, Trenches A-D	Inactive; to undergo corrective action
54-015(k)	54-013(b)-99		MDA G, Retrievable Storage	Inactive; to undergo corrective action

Table 4-1 (Continued)

Technical Area (TA) 54
Solid Waste Management Units (SWMU)

SWMU No./Former SWMU No.	Consolidated SWMU No.	Location	SWMU Description	Unit Status
54-017	54-013(b)-99		MDA G, Pits 1-8, 10, 12, 13, 16-22, and 24	Inactive; to undergo corrective action
54-018	54-013(b)-99		MDA G, Pits, 25-33 and 35-37	Inactive; Pit 29 has been proposed to undergo closure/post-closure in accordance with alternative requirements, as allowed by 20.4.1 NMAC §264.110(c) [6-14-00], to meet post-closure care requirements
54-019	54-013(b)-99		MDA G, Shafts 1-20, 24-34, 38-92, 96, 109-112, and 150	Inactive; to undergo corrective action
54-020	54-013(b)-99		MDA G, shafts C1-C10, C12, C13, 22, 35-37, 93-95, 99-108, 114, 115, 118-136, 138-140, 151-160, 189-192, and 196	Inactive; Shaft 124 has been proposed to undergo closure/post-closure in accordance with alternative requirements, as allowed by 20.4.1 NMAC §264.110(c) [6-14-00], to meet post-closure care requirements

Supplement 4-1

Solid Waste Management Units at Technical Area 54

Information Extracted from
"The 2003 Solid Waste Management Unit Report"
LA-UR-03-6000

TA-54, Waste Management Site

TA-54 is one of the largest (943 acres) technical areas at LANL. Its primary function is management of radioactive solid and hazardous chemical wastes. The site's 3-mi northern border forms the boundary between the LANL facility and San Ildefonso Pueblo, and its southeastern boundary borders the part of Los Alamos County known as White Rock. Nearly 70 archaeological sites have been found in TA-54.

Many of the operations at LANL generate liquid, solid, and gaseous wastes that contain radioactive materials, hazardous materials, or a combination of both. All of these types of wastes are characterized and stored at TA-54. Waste handled at the site is characterized as low-level radioactive waste, low-level mixed waste, TRU waste, mixed TRU waste, hazardous waste, PCB waste, and nonhazardous chemical wastes. Low-level waste and PCB waste may be disposed of at TA-54.

TA-54 has 120 structures, of which 101 house waste management personnel and operations.

TA-54's facilities are grouped in various areas according to the type of waste managed. Area G operations include low-level radioactive waste treatment and disposal, legacy TRU waste container exhumation venting and storage (TWISP), newly generated TRU waste storage, the Green-is-Clean project (identifies wastes that do not contain radionuclides and may be disposed of as solid waste), and mixed-waste certification for offsite shipment. TA-54 also has the RANT Facility, used to determine the characteristics of packaged TRU waste.

Classified wastes, some of which are radioactive and potentially hazardous, were disposed at MDA H until 1986. MDA H is now inactive and undergoing corrective action.

Treated barium solid wastes, classified wastes, and other solid wastes were formerly disposed of at MDA J. This area became inactive in the summer of 2001 and underwent closure under the New Mexico Solid Waste Act. Area L is the chemical waste management area.

TA-54 — Waste Disposal Site

SWMU 54-001(a) — Container storage

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-215	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-001(a) is within an active RCRA-permitted hazardous waste storage area that also operates in accordance with RCRA interim status requirements for the storage of mixed waste. The 150-ft x 40-ft bermed storage area is situated on the paved surface of Area L directly over the location of pit A, and currently is covered by a storage dome (structure 54-215). The storage area capacity is 100,000 gal.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

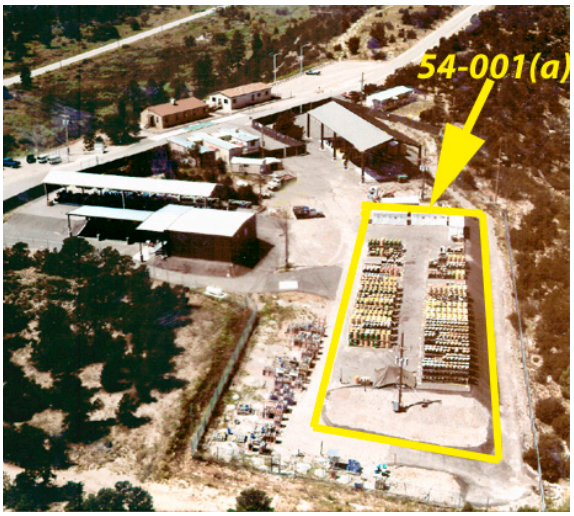
ER Project Sampling Summary

No analytical samples were collected at this site.

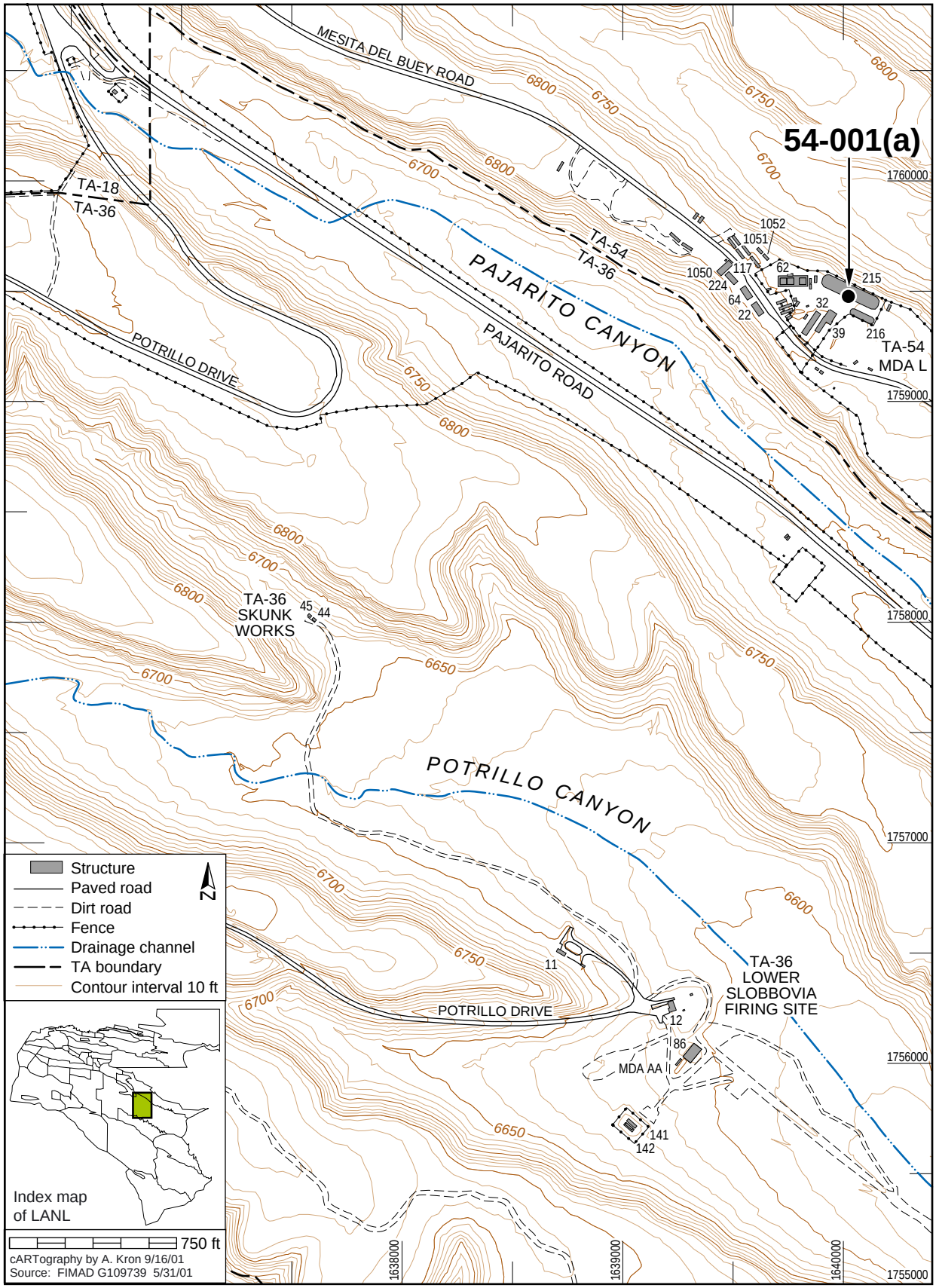
References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of the south end of storage dome [SWMU 54-001(a)]



Aerial close-up of SWMU 54-001(a), before dome


54-001(a)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
POTRILLO DRIVE
1052
1051
1050
117
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215
224
64
32
22
39
216
45
44
11
12
86
141
142
6800
6750
6700
6650
6600
1760000
1759000
1758000
1757000
1756000
1755000
1638000
1639000
1640000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

AOC 54-001(b) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-31	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-001(b) is part of the active RCRA-permitted hazardous waste storage area that also operates in accordance with RCRA interim status requirements for the storage of mixed waste. The area is located inside structure 54-31 at Area L. The structure is 13.5 ft x 14.5 ft; the floor is paved, sealed, and bermed. The structure's storage capacity is 440 gal. Secondary containment mechanisms consist of three 6-in.-deep sumps, one measuring 7 ft x 6 ft and the other two measuring 6 ft x 4 ft. A paved drainage diversion ditch surrounds the outside of the building to prevent stormwater run-on. No releases have been identified at AOC 54-001(b). This operational waste management unit is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

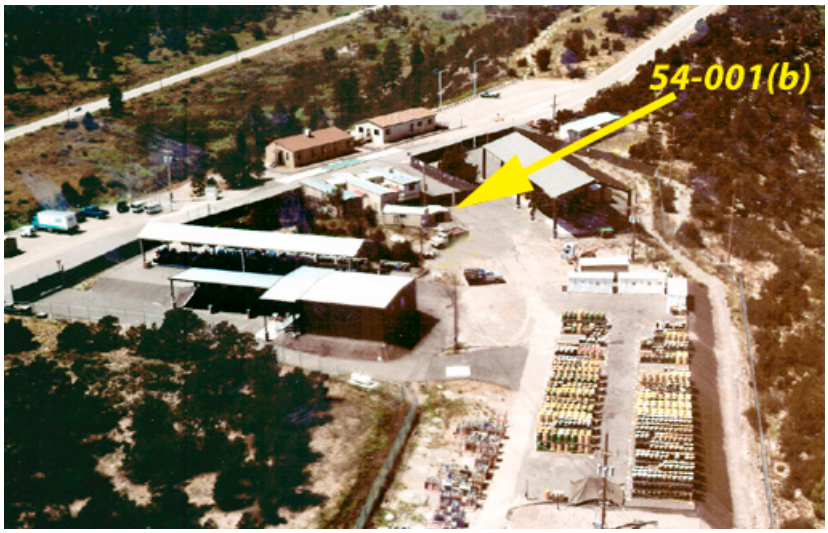
No analytical samples were collected at this site.

References

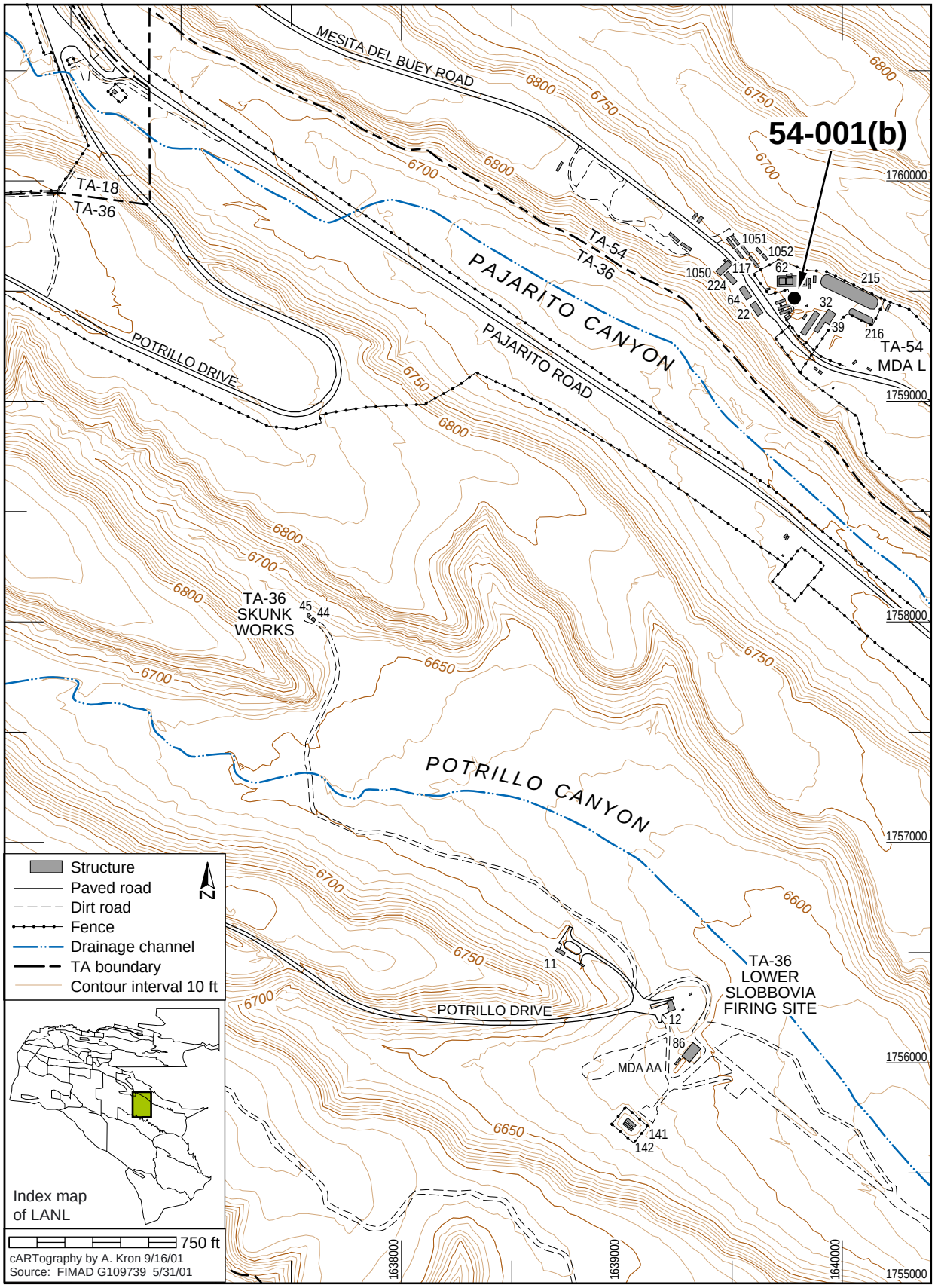
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 — LA-UR Number: N/A

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855

View of AOC 54-001(b) - building on right



Aerial view of AOC 54-001(b)


54-001(b)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
WORKS
POTRILLO CANYON
POTRILLO DRIVE
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1051
1052
1050
117
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224
64
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215
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39
216
45
44
11
12
86
141
142
6800
6750
6700
6650
6600
1760000
1759000
1758000
1757000
1756000
1755000
1638000
1639000
1640000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-001(d) — Storage areas

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-39, 54-81	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-001(d) is part of the operational waste storage area situated on the paved surface of Area L. Radioactive and PCB waste is managed here in accordance with a TSCA approval letter issued by EPA and interim status requirements. EPA issued the initial approval letter in June 1980; renewal authorization is pending. The area consists of an enclosed PCB storage building (Building 54-39), and a PCB storage pad (structure 54-81). The building is equipped with a bermed concrete floor that forms a sump with ramps at all entrances and a foam fire-suppression system with temperature sensors. The storage pad consists of bermed and sealed concrete measuring 59 ft x 17 ft; it has a roof, sheet-metal back wall, and secondary containment system. Typical materials handled at the facilities include PCB-contaminated transformer and capacitor oil, carcasses from transformers and capacitors, debris, protective clothing, PCB-contaminated soil, and stormwater from secondary containment systems around aboveground tanks. Wastes are stored in accordance with TSCA requirements. No known releases are associated with AOC 54-001(d).

ER Project Activities

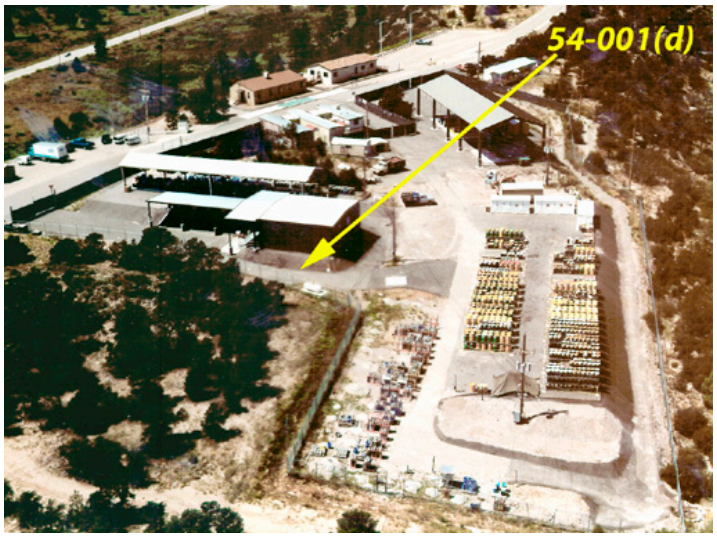
RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

No analytical samples were collected at this site.

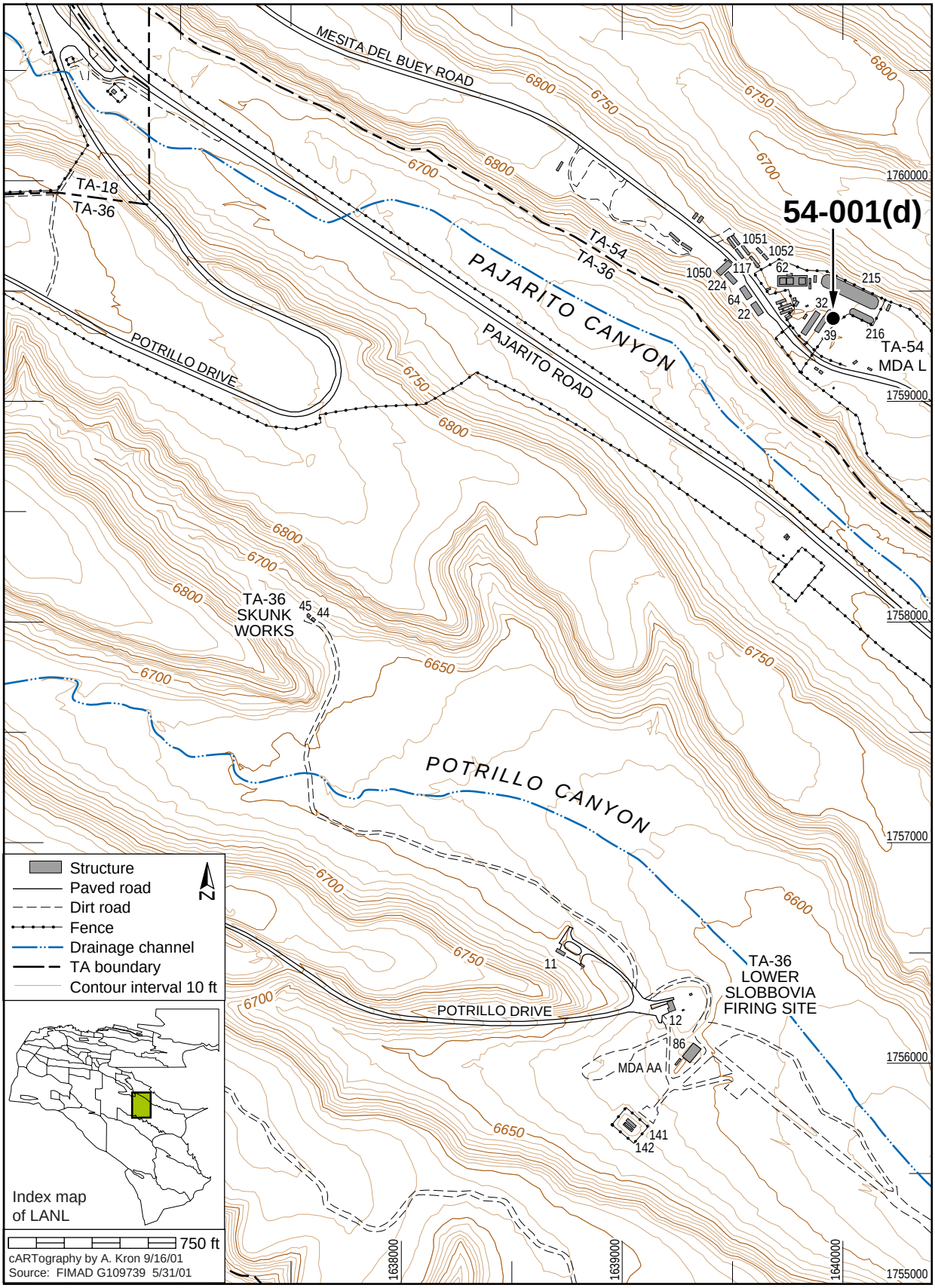
References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



Aerial view of AOC 54-001(d)

View of AOC 54-001(d)


54-001(d)
MESITA DEL BUEY ROAD
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
POTRILLO CANYON
TA-18
TA-36
TA-54
TA-36
TA-54
MDA L
TA-36
SKUNK
WORKS
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1051
1052
1050
117
62
224
64
22
215
32
39
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11
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6800
6750
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-001(e) — Storage areas

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1987-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-32	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-001(e) is part of the operational RCRA-permitted hazardous waste storage unit (structure 54-32) which also contains solid waste, situated on the paved surface of Area L. The storage area consists of a bermed and sealed concrete pad that is divided into six cells, each equipped with a secondary containment collection sump. Containers are elevated several inches above the floor by fiberglass or metal grating. The 15.5 ft x 116.5 ft storage area was built in 1987 and has a storage capacity of 16,720 gal. A 117.75-ft x 25.75-ft canopy covers the storage area. Containers are inspected weekly and no releases have been identified. This active waste management unit is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

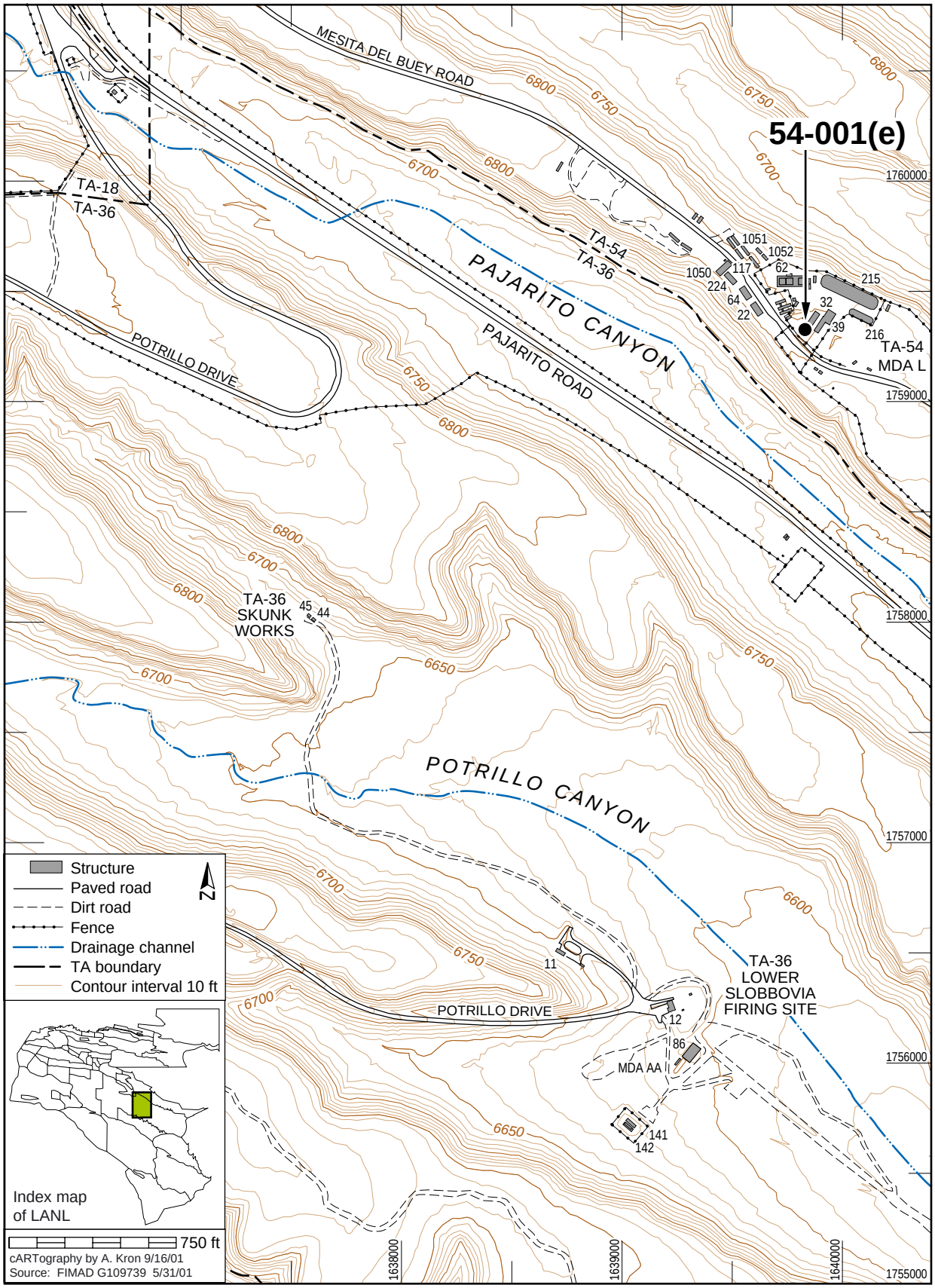
No analytical samples were collected at this site.

References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of AOC 54-001(e)

Aerial close-up of AOC 54-001(e)


54-001(e)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-002 — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-216	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-002 is part of the operational active RCRA-permitted hazardous waste storage unit where gas cylinders are stored. The unit also operates in accordance with interim status requirements for the storage of mixed waste. The storage area (structure 54-216) is situated on the paved surface of Area L and has a capacity of 1950 gal. Cylinders are stored beneath a canopy in racks or baskets along the southern and eastern fence lines in the eastern part of Area L. The cylinders are staged here before they are transported to an off-site location for final disposition. The gases are classified as mixed, hazardous, and solid wastes and are managed in accordance with RCRA and LANL safety requirements. This active waste management unit is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

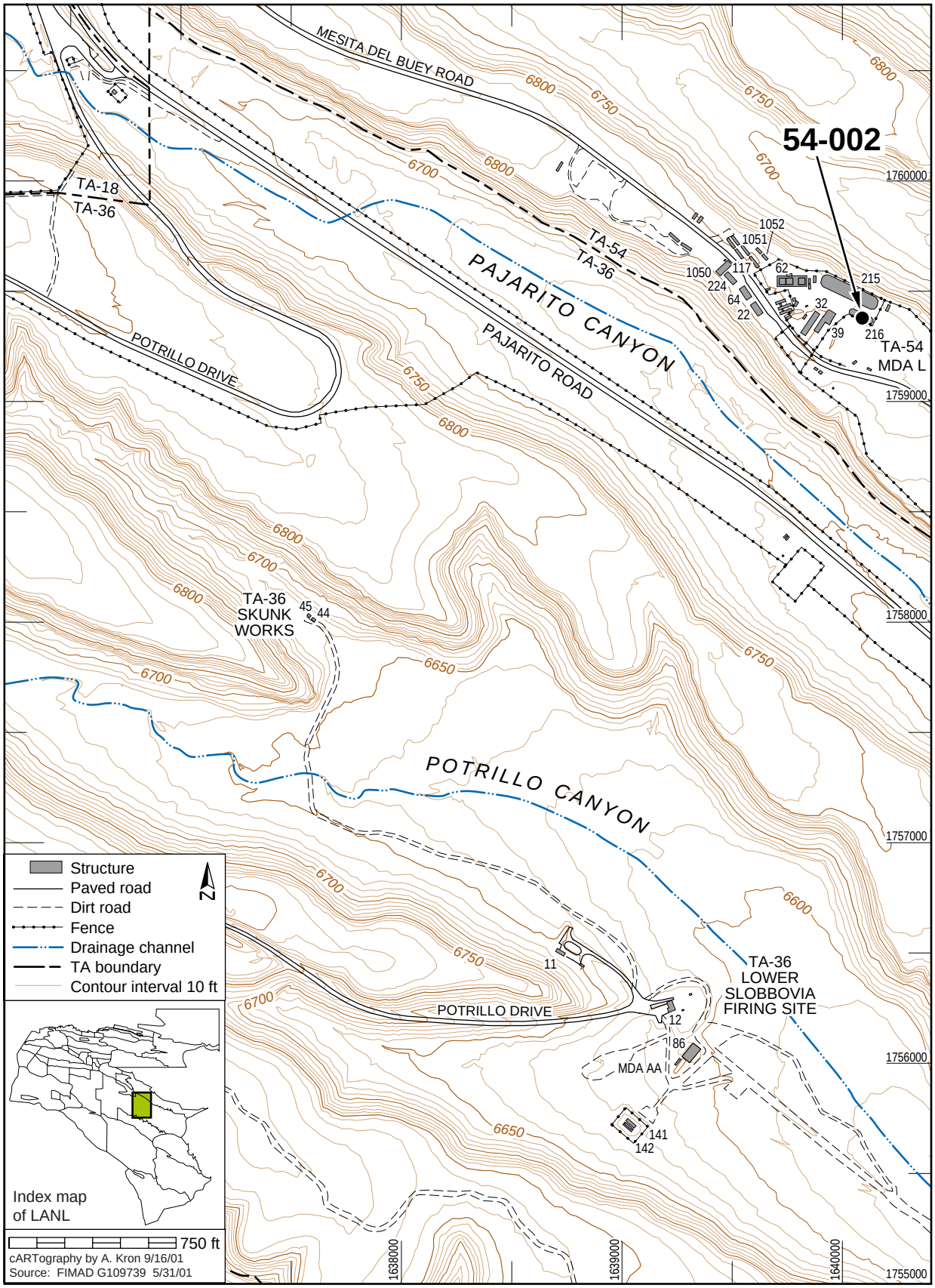
No analytical samples were collected at this site.

References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of AOC 54-002

Aerial close-up of AOC 54-002


54-002
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
TA-54
MDA L
TA-36
SKUNK
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POTRILLO CANYON
TA-36
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SLOBBOVIA
FIRING SITE
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6800
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6700
6650
6600
1760000
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1758000
1757000
1756000
1755000
1638000
1639000
1640000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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SWMU 54-004 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1960-1986
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-004 is MDA H, a 0.3-acre site on Mesita del Buey that contains nine inactive shafts that were used for disposal of LANL classified waste such as weapon-component mock-up shapes, detonators, papers, and tritium-contaminated items. Much of the classified waste was nonhazardous; however, scraps and shapes were contaminated with depleted uranium, fuel elements, residual plutonium, and HE. One shaft, shaft 9, received hazardous waste after July 26, 1982 and is therefore considered a RCRA-regulated unit. Each shaft is 6 ft in diameter and 60 ft deep. The shafts were capped when waste came to within 6 ft of the surface. Shafts 1 through 8 are capped with 3 ft of crushed tuff followed by 3-ft-thick concrete caps; shaft 9 is capped solely by a 6-ft-thick layer of concrete. The surface area of MDA H has been reseeded. The nine shafts at MDA H were used from 1960 to 1986.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

Tritiated water was encountered at a depth of 40 ft in shaft 8 in 1969 during a LANL-wide effort to determine the background value for tritium in tuff. To determine the extent of tritium at MDA H, the investigation was expanded to include sampling and analysis of air and soil in and around the disposal shafts. The highest tritium concentrations were measured around shaft 8. Additional soil and flora samples were collected in 1973 and analyzed for tritium. Plants growing in the area were found to have concentrations of tritium 3 orders of magnitude higher than species in uncontaminated areas. Surface soils near the shafts had measured concentrations of tritium two to three times the concentration measured in background samples outside the area. Data from the historic tritium investigation were used to support the conceptual model for fate and transport of tritium at MDA H.

The RFI report for sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than on individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport, and if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling, based on their potential for having collected sediment run-off from the four MDAs. Fourteen drainage channels originate near MDA G; the other three MDAs each have only one significant drainage channel. Sample locations were selected within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for radioactivity. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL inorganic chemicals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that have no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape condition for potential receptor access. The drainage channels associated with each MDA were determined not to be of ecological concern because there was little receptor access. The sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

In January 2000, NMED, DOE, and LANL formed the MDA HPT to work on the TA-54 RFI report. In September 2000, the HPT were directed to expedite implementation of a corrective measure alternative at one MDA. The HPT selected MDA H and narrowed the scope of its effort to accommodate the change. The RFI for MDA H subsequently was separated from the RFI reports for MDAs G and L to expedite the evaluation and implementation of a corrective measure at MDA H. The ER Project reissued the RFI report for just MDA H in May 2001.

The RFI fieldwork included the collection of 4 storm drainage sediment samples and 33 core samples from 4 boreholes. Channel sediment samples were analyzed for inorganic chemicals, cyanides, PCBs, pesticides, tritium, and radionuclides. Core samples were analyzed for TAL metals, cyanide, VOCs, SVOCs, PCBs, pesticides, tritium, and radionuclides. Background comparisons (inorganic chemicals and radionuclides) and data evaluations (organic chemicals) identified cadmium, selenium, methoxychlor and tritium in channel sediments and copper, cyanide, selenium, several organic chemicals, and tritium in subsurface tuff as COPCs. None of the VOCs or inorganic chemicals was detected above its SALs. The maximum reported tritium concentration of 777,000 pCi/mL at a

depth of 52.5 ft bgs is equivalent to approximately 1543 pCi/g based on the sample soil moisture of 0.2%. This concentration is an order of magnitude greater than the SAL of 880 pCi/g. The maxiumum concentration of tritium at 10 ft bgs was 5890 pCi/mL, which is equivalent to 182 pCi/g based on the sample soil moisture of 3%. Methoxychlor was not disposed of at MDA H and its presence most likely is due to routine application. Copper, cyanide, and selenium do not appear to be related to a release from the PRS. Tritium and VOCs are related to a release from MDA H. Tritium is in the form of water vapor. Data gathered during the RFI identified the nature and partial extent of contamination in the surface and subsurface media. Analytical results from the RFI were used to assess the present-day impacts to ecological and human health receptors. The present-day risk assessment concluded that existing contamination does not exceed applicable EPA risk thresholds.

To address the remaining data gaps regarding the extent of tritium and VOC contamination and at the request of NMED, the ER Project prepared and implemented a supplemental RFI SAP in 2001. Supplemental RFI activities completed during 2001 included collecting additional subsurface samples to further define the lateral extent of tritium and organic chemical contamination from borehole 54-1023 and from two newly drilled boreholes, installing an air-monitoring station adjacent to the southeastern boundary of MDA H to monitor for tritium in air at the MDA H fence line, and collecting a sediment sample near sample location 54-5132 at the interface of the alluvial sediments and bedrock to collect data where all the sediment accumulated over time. An RFI addendum will be issued in April 2002. The report will summarize the 2001 data and assess whether there are changes to the present-day risk assessment presented in the MDA H RFI report.

In a letter dated December 27, 2000, NMED directed the Laboratory to prepare a CMS plan for MDA H because NMED believes that contaminants at MDA H may present a future threat to human health and the environment over the life of the buried wastes. In this letter, NMED stated that the requirements for closure of Shaft 9 could be met by the corrective measures evaluated in the CMS. Therefore, the unit would be subject to corrective action along with the other eight shafts. Pursuant to DOE orders, LANL also planned to complete a CMS to address the potential for adverse impacts from future releases of radionuclides (tritium). The CMS plan identified corrective action objectives, preliminary corrective measure alternatives that address potential unacceptable future risks, and the methodology to be followed in evaluating the alternatives during the CMS. The CMS plan was approved by NMED in December 2001. The CMS is being conducted in accordance with RCRA requirements and will also meet the intent of DOE Order 5400.5, “Radiation Protection of the Public and the Environment.”

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	23	7	1
Pesticide/PCBs	2	N/A	1
Radionuclides	12	3	1
SVOCs	5	N/A	0
VOCs	12	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	2.1 mg/kg	0.39 mg/kg
Pesticide/PCBs	Endosulfan Sulfate	0.000674 mg/kg	N/A
Radionuclides	Tritium	1543 pCi/g	880 pCi/g

References

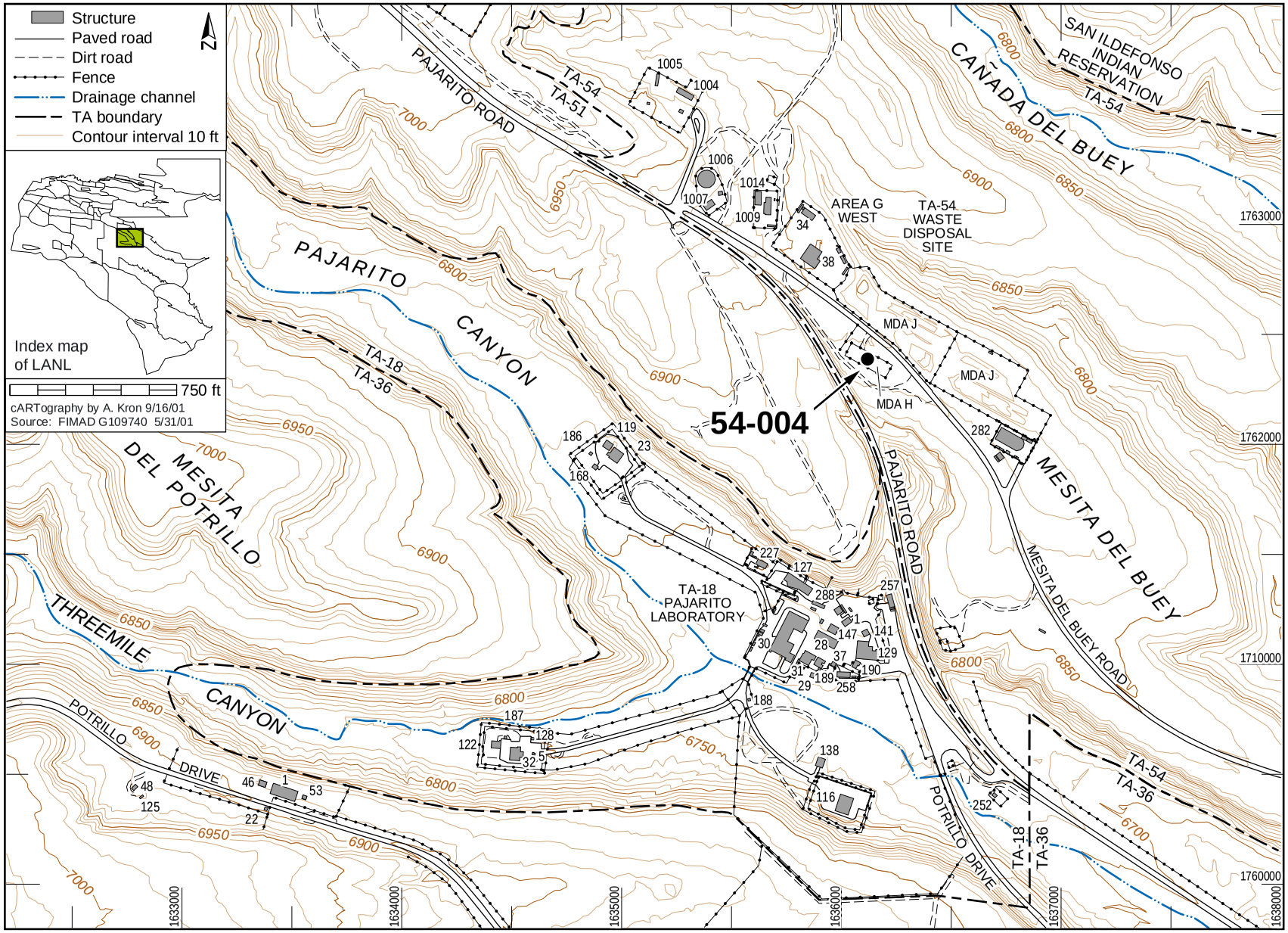
Plan for Supplemental Sampling for the RCRA Facility Investigation at Material Disposal Area H — LA-UR Number: 01-2516

RFI Report for Material Disposal Area H at Technical Area -54 — LA-UR Number: 01-1208

Corrective Measures Study (CMS) Plan for Material Disposal Area (MDA) H at Technical Area 54 — LA-UR Number: 01-1629

Aerial view of SWMU 54-004

View of SWMU 54-004, looking east


Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109740 5/31/01
54-004
PAJARITO ROAD
TA-54
TA-51
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
AREA G WEST
TA-54 WASTE DISPOSAL SITE
MDA J
MDA H
PAJARITO CANYON
TA-18
TA-36
MESITA DEL POTRILLO
MESITA DEL BUEY
MESITA DEL BUEY ROAD
TA-18 PAJARITO LABORATORY
THREEMILE CANYON
POTRILLO DRIVE
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SWMU 54-005 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1961-2001
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 54-005, MDA J, is an inactive 5.5-acre facility consisting of six pits and four shafts. The site was opened in 1961. Waste disposed of in the pits at MDA J consisted of treated barium sand and administratively controlled waste. Surface sites at MDA J previously included a small land-farming project for aeration of soil contaminated with petroleum products, a transfer facility for containers of asbestos awaiting transport to a licensed off-site facility, and two container storage areas. All pits and shafts at MDA J are closed and covered with crushed tuff.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than on individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport, and if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment runoff from the four MDAs. Fourteen drainage channels originate near MDA G, and the other three MDAs each have only one significant drainage channel. Sample locations were selected within dispositional areas determined by on-site geomorphic analysis of each channel. Samples were screened for alpha, beta, and gamma radiation. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that had no history of receiving contaminated runoff. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. In total, 4 sediment channel samples were collected from MDA J during this sampling event. The pesticide, methoxychlor, was detected in one of the channel sediment samples. Am-241, Cs-137, and Po-210 concentrations were reported below SALs.

In May 1995, soil samples were collected from four boreholes at MDA J. A total of 16 soil samples were collected at 5-ft intervals from angled Borehole 54-1019, located on the east side of Pit 1, and were analyzed in the mobile laboratory for gravimetric moisture, tritium, and gross alpha, beta, and gamma radiation. Eight additional soil samples were collected at 10-ft intervals in this borehole and were submitted for analysis for inorganic chemicals, pesticides and PCBs, and organic chemicals at a fixed laboratory. The other three vertical boreholes were sampled at 5-ft intervals for analysis by the rad van, and at 20-ft intervals for analysis by a fixed analytical laboratory for inorganic compounds, pesticides and PCBs, and organic compounds. Eight screening samples were collected from Borehole 54-1020, located on the east side of Pit 2 for analysis by the mobile laboratory and another 2 samples were submitted for analysis by a fixed laboratory. Eight soil samples were collected from the other two boreholes. In total, 18 samples were collected from core in the four boreholes and submitted to a fixed analytical laboratory for analysis. Twenty inorganic chemicals were detected and, of these, six were detected above background values (BVs). Of the six inorganic chemicals detected above BVs, only arsenic exceeded SALs. Four organic chemicals were detected, but none exceeded SALs.

MDA J currently is undergoing closure in accordance with New Mexico Solid Waste Regulations, 20 NMAC 9.1, Subpart V.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	20	6	1
Pesticides/PCBs	1	N/A	0
Radionuclides	13	2	0
SVOCs	1	N/A	0
VOCs	3	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	1.9 mg/kg	0.39 pCi/g

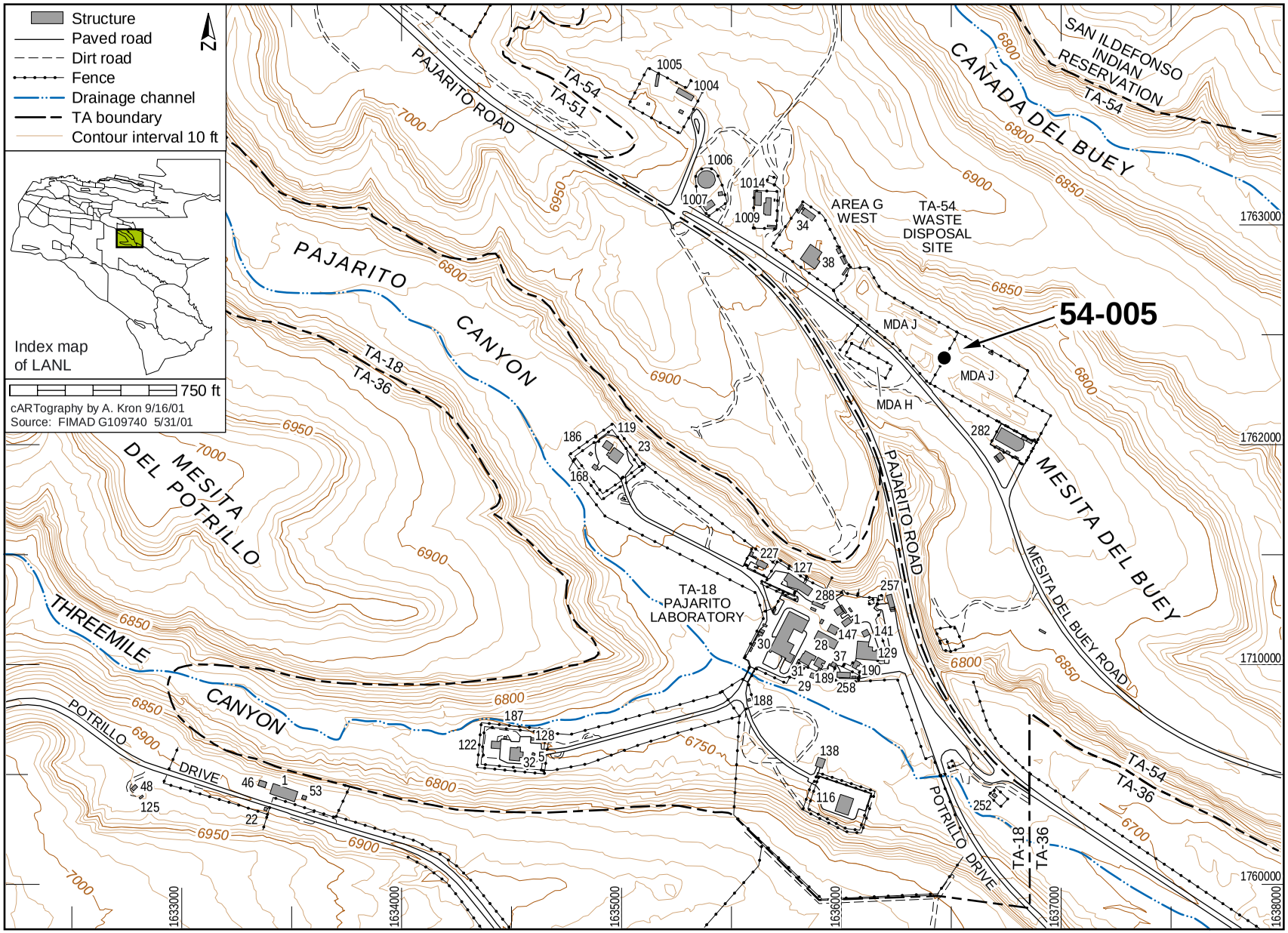
References

RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 11 — LA-UR Number: 96-0110

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855

Aerial view of SWMU 54-005

View of SWMU 54-005, looking northeast


Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109740 5/31/01
54-005
PAJARITO ROAD
TA-54
TA-51
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
AREA G WEST
TA-54 WASTE DISPOSAL SITE
MDA J
MDA H
PAJARITO CANYON
TA-18
TA-36
MESITA DEL POTRILLO
MESITA DEL BUEY
MESITA DEL BUEY ROAD
THREEMILE CANYON
POTRILLO DRIVE
TA-18 PAJARITO LABORATORY
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SWMU 54-006 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1959-1985
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-006 (also called MDA L) is included in Module VIII of LANL's Hazardous Waste Facility Permit. Area L is a 2.5-acre fenced area that includes MDA L, which consists of 1 inactive subsurface disposal pit (pit A); 3 inactive subsurface treatment and disposal impoundments (impoundments B, C, and D); and 34 inactive disposal shafts (shafts 1 through 34). Although no longer in use, impoundments B, D, and shafts 1, 13-17, and 19-34 are considered regulated units until RCRA closure is certified and approved by NMED. The entire fenced surface area of Area L is an active RCRA-permitted hazardous waste unit. Disposal pit A is located in the eastern portion of MDA L beneath a Dome 54-215. The pit is 200 ft long x 12 ft wide x 12 ft deep. It received chemical waste from the late 1950s until December 1978. Initial waste disposal practices included disposal of uncontainerized chemical wastes and liquids in drums without added sorbents. The pit also was used as an evaporative pit. Pit A was filled with waste to within approximately three feet of the surface between 1964 and 1978, and then was covered with crushed, consolidated tuff.

The three impoundments (impoundments B, C, and D) are located northwest of pit A. Impoundment B was excavated in 1978 and is 60 ft long x 18 ft wide x 10 ft deep. It had a capacity of 7,560 cubic feet (asssuming it was filled to within 3 ft of the surface) and operated from January 1979 to June 1985 to evaporate treated salt solutions and electroplating wastes. Impoundment C was closed in the early 1978. This impoundment, which is 35 ft long x 12 ft wide x 10 ft deep, was used for the same disposal purposes as impoundment B. Impoundment C had a capacity of 2940 cubic feet (asssuming it was filled to within 3 ft of the surface). Impoundment D is approximately 75 ft long x 18 ft wide x 10 ft deep and had a capacity of 9450 cubic feet (asssuming it was filled to within 3 ft of the surface). It was used to treat small quantities of lithium hydride by reaction with water. This practice began in 1972 and was discontinued in 1984. Impoundment D later was used as secondary containment for used oil storage tanks (see AOC 54-021). All three impoundments are covered with crushed tuff.

The 34 disposal shafts at MDA L were drilled directly into the subsurface tuff. Shafts 1 through 28 are located south of pit A. Shafts 29 through 34 are located northwest of impoundments B, C and D. Three feet of crushed tuff were placed in the bottom of each shaft to fill cracks and joints. The shafts range from 15 ft to 65 ft deep and vary in diameter from 3 ft to 8 ft. Groups of shafts were constructed as needed. When in use, the shafts were covered with a steel cap that could be opened or removed, depending on design, to allow placement of waste. The operational dates of the shafts vary, but collectively the shafts were operated from February 1975 to August 1985. The shafts were used to dispose of containerized and bulk liquid chemical wastes. Before 1982, containerized liquids were disposed of without adding absorbents to the containers. Space around the drums was filled with crushed tuff and a 6-in. layer of crushed tuff was placed between each layer of drums. After 1981, uncontainerized waste was no longer disposed of in the shafts. From 1982 to 1985, wastes were accumulated on the site and packaged in drums until sufficient quantity had accumulated to put the drum in a shaft. When filled, the shafts were covered with a concrete plug approximately 3 ft thick.

Early disposal practices at MDA L resulted in a subsurface volatile organic vapor plume that extends beneath the facility and beyond its boundary. Several previous investigations have taken place at MDA L. Since 1982, channel sediments have been collected from permanent stations in the main drainages surrounding TA-54 to monitor the potential transport of radionuclides by stormwater run-off. In 1985 NMED issued a compliance order to LANL that required quarterly pore-gas monitoring at MDAs G and L. Nine boreholes were drilled between 1985 and 1988 to monitor the subsurface VOC plume. Analytical data from the pore-gas monitoring shows that 1,1,1-trichloroethane is the primary plume constituent; it is present to at least 200 ft below the mesa surface, and concentrations vary across the plume. In 1986, additional boreholes were drilled to measure air permeability in the tuff. The data were used to evaluate the nature and extent and fate and transport of subsurface contamination at MDA L.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted RFI fieldwork at MDA L from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases.

The 1996 RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigations focused on the MDAs collectively rather than individual disposal cells, shafts or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport, and if so, to determine if concentrations likely

would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment run-off from the four MDAs. Four sample locations were selected for sampling at MDA L, within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for alpha, beta, and gamma radiation. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that had no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape condition for potential receptor access. Each MDA-related drainage was determined not to be an ecological concern because there was little receptor access. The channel sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

An RFI report for MDAs G, H, and L was issued in 2000. The report was a collaborative effort (high performing team) between the NMED and LANL. In September 2000, the high performing team received direction from senior management to expedite the implementation of a preferred remedy at one MDA. The team selected MDA H and narrowed the scope of its effort to accomodate the change. The high performing team agreed that HWB would not review the 2000 combined RFI Report and that LANL would submit individual RFI reports on each of the MDAs. The first of the three RFI reports was submitted in May, 2001. The next scheduled submittal is for MDA L, (SWMU 54-006) in August, 2003. RFI fieldwork at MDA L included the collection and analysis of 4 drainage sediment samples, over 180 core samples from 16 boreholes, VOC and tritium surface flux samples, and ambient air sampling. The sediment samples were analyzed for inorganic chemicals, cyanide, PCBs/pesticides, herbicides, radionuclides, and tritium. The ambient air samples were analyzed for VOCs. The core samples were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs/pesticides, herbicides, cyanide, and radionuclides. The RFI data were supplemented by environmental surveillance surface water data, VOC emissions data from passive extraction tests, and quarterly VOC pore-gas monitoring samples. Analytical results showed the presence of tritium at elevated levels in the surface flux samples and the subsurface tuff samples and organic chemicals in the subsurface and ambient air samples, which indicated a subsurface release. The primary VOCs identified are 1,1,1-trichloroethane and trichloroethene. Barium, cobalt, copper, chromium, mercury, nickel, uranium, and zinc were detected at concentrations greater than BVs in subsurface tuff samples. The pesticide methoxychlor and plutonium-238 are present at concentrations below SALs in site channel sediments.

Quarterly pore-gas sampling of the vapor phase VOC plume at MDA L is ongoing; sampling results are reported in the ER quarterly reports.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Herbicides	0	N/A	0
Inorganic chemicals	26	20	2
Pesticide/PCBs	3	N/A	1
Radionuclides	14	4	0
SVOCs	3	N/A	1
VOCs	18	N/A	2

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

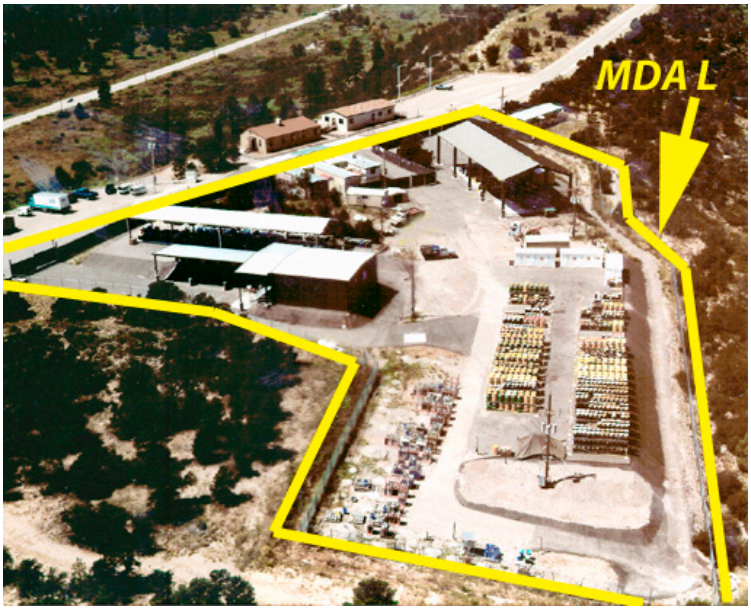
Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	1.7 mg/kg	0.39 mg/kg
	Cyanide (total)	0.96 mg/kg	N/A
Pesticide/PCBs	Aroclor-1260	0.313 mg/kg	0.22 mg/kg
SVOCs	Pentachlorophenol	13 mg/kg	3 mg/kg
VOCs	Dichloropropane[1,3-]	0.0068 mg/kg	N/A
	Trichloropropane[1,2,3-]	0.014 mg/kg	0.0014 mg/kg

References

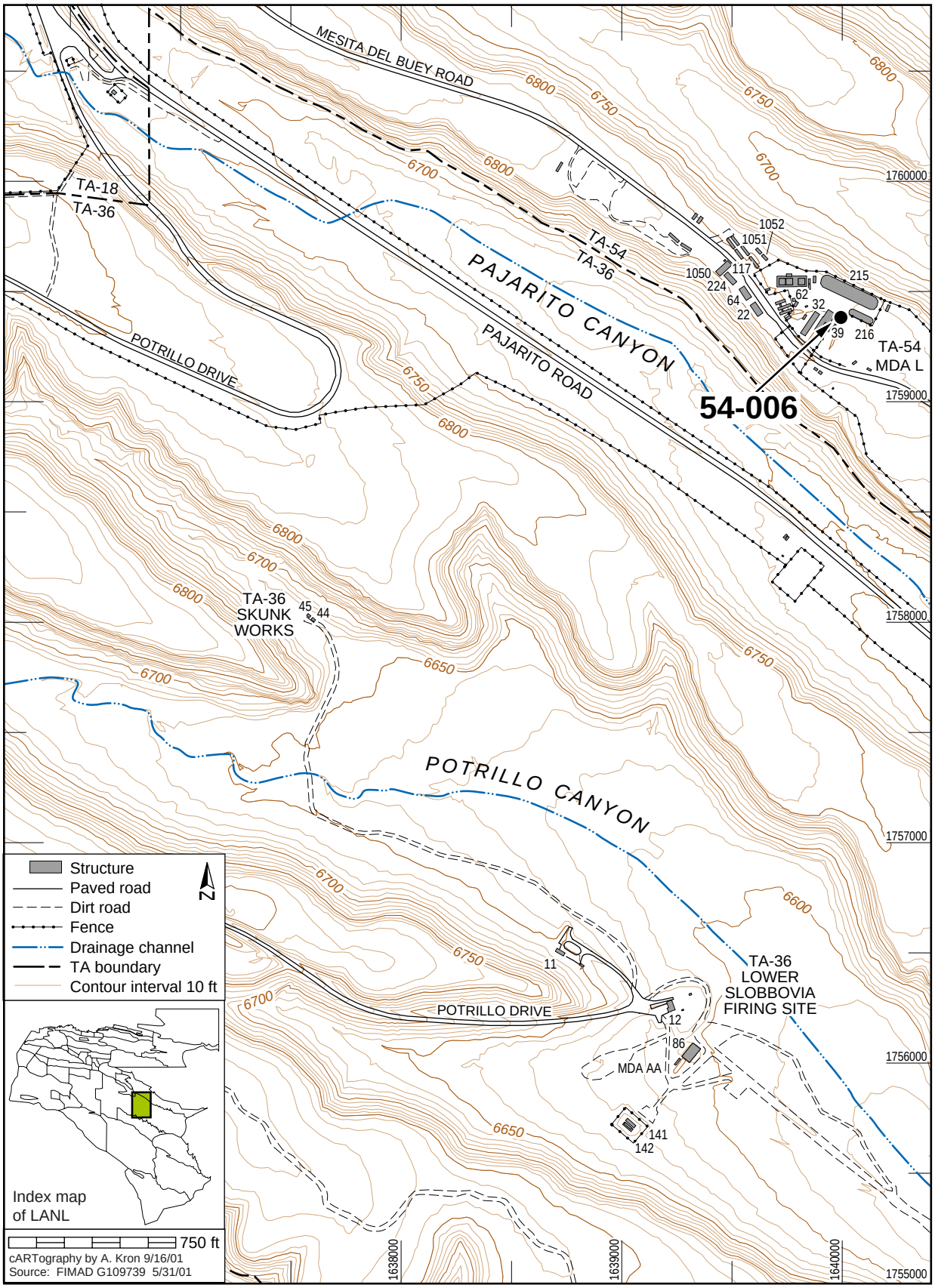
RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) — LA-UR Number: 96-0110

Proposed Action Plan Drilling Near Area [MDA] L, TA-54, OU 1148 — LA-UR Number: N/A

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



Aerial close-up of SWMU 54-006, before domes


MESITA DEL BUEY ROAD
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POTRILLO CANYON
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

SWMU 54-007(a) — Subsurface liquid disposal

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-1998
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-16	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-007(a) is an inactive septic system located within Area G at TA-54. The system was constructed in 1976 and consists of a 1000-gal. concrete septic tank (54-16), concrete distribution box, and VCP drainlines. The outlet line from the distribution box discharged to a drainfield. The system served the former compactor building [Building 54-2, SWMU 54-012(a)] and the waste management control facility for Area G (Building 54-11). The septic system received sanitary wastes, but historically may have received radioactive constituents, based on previous activities conducted in the buildings it served. The septic system was left in place in 1998 when the buildings it served were tied into the Laboratory's SWCS.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

In accordance with ER Project BMPs, a VCA/VCM is scheduled for this SWMU during fiscal year 2002 to characterize and remove the septic tank and its contents and the distribution box. Samples were collected from the tank and distribution box excavations to determine if there has been a release and the nature and extent of any release. Characterization/confirmation samples will be collected within and around the drainfield to determine the nature and extent of any release. Human health and ecological screening risk assessments will be conducted on analytical data from the confirmation samples to determine if additional excavation of soil is required and results will be reported in a VCA/VCM completion report.

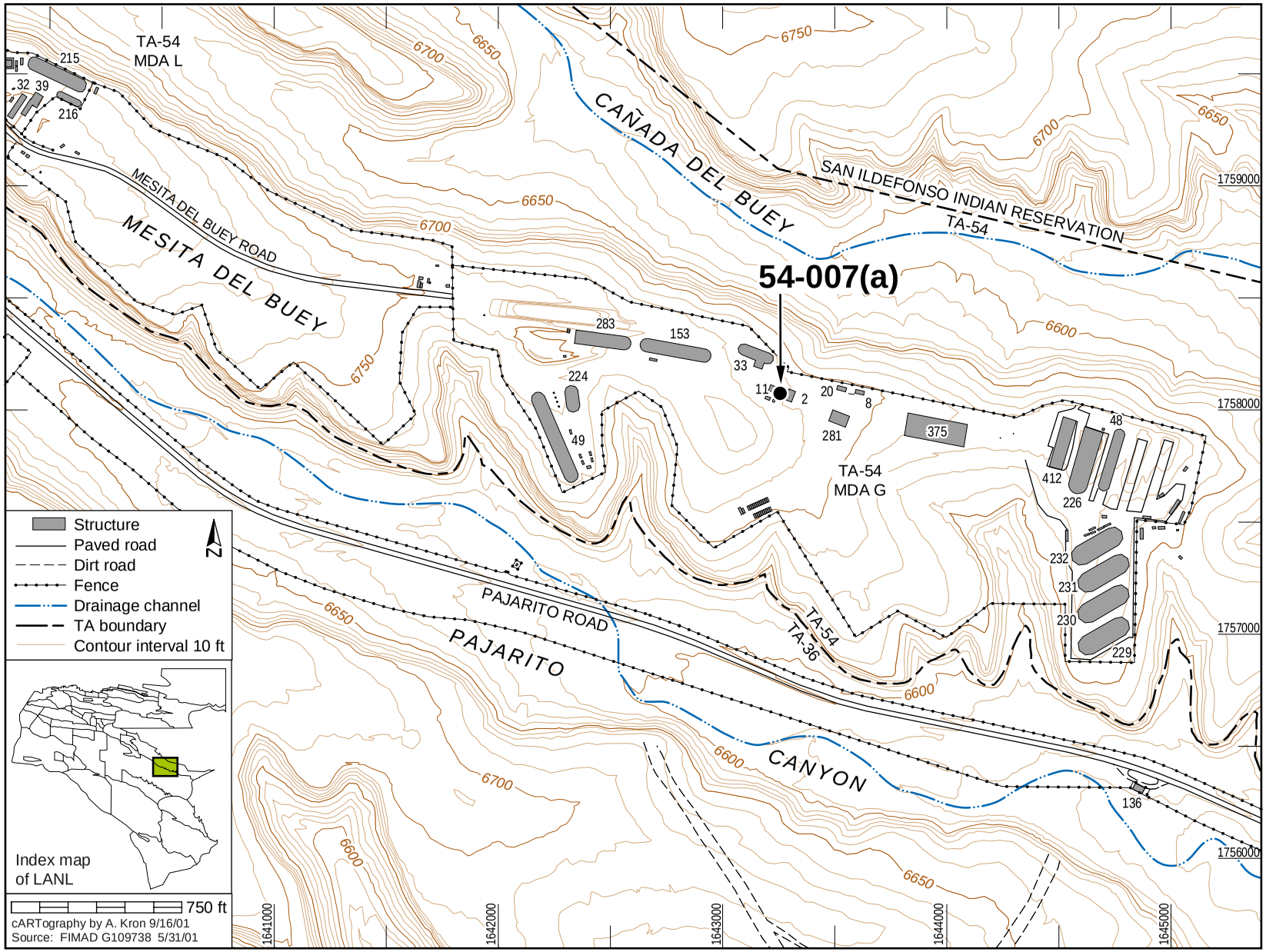
ER Project Sampling Summary

No analytical samples were collected at this site.

References

VCA Completion Report for SWMU 54-007(a)	LA-UR Number: 02-5114
Voluntary Corrective Action Plan for SWMU 54-007(a), Inactive Septic System at Technical Area -54	LA-UR Number: 02-1866
RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

No photo; subsurface unit


54-007(a)
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MESITA DEL BUEY
PAJARITO ROAD
PAJARITO
CANYON
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232
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1641000
1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

SWMU 54-007(c)-99 — Subsurface liquid disposal

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1960s-1992
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	Yes
Structure Number	54-9	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 54-007(c)-99 consists of former SWMU 54-007(c) and former AOC 54-007(e). Former SWMU 54-007(c) was an inactive septic system that served an office building (Building 54-34) and the Radioassay and Nondestructive Testing (RANT) Facility (Building 54-38). The septic system consisted of a fiberglass tank 4 ft in diameter and 12 ft long, a drainline, and a drainfield formed by three parallel-buried lines of slotted PVC pipe, approximately 4 ft below ground surface. The septic system was constructed in the late 1980s and decommissioned in 1992. Former AOC 54-007(e) was an inactive septic system that served an animal holding facility (Building 54-1015) from the time of construction in the mid-1960s until the late 1980s. In 1992, the facility was remodeled as an analytical laboratory for environmental samples. The septic system consisted of a 1500-gal. concrete septic tank (structure 54-9) and a 4-in. PVC drainline connected to a drainfield formed by two parallel lines of 4-in. slotted PVC pipe. The two septic system drainfields were interconnected. Both septic systems were left in place in 1992 when the buildings they served were tied to a new sewer line installed as part of LANL's SWCS. Because the two septic system drainfields were connected, received similar waste streams (sanitary wastewater), and were located adjacent to each other, they were consolidated during the 1999 AUA with NMED HWB.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

During the 1995 Phase I RFI, 4 subsurface soil samples (3 RFI samples and 1 duplicate) were collected adjacent to drainlines (5 ft bgs) in each of the two septic system drainfields; the contents of each septic tank were sampled and analyzed. All samples were screened for radioactivity and analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganic chemicals. Results showed elevated gross beta levels in soils around the drainfield of former SWMU 54-007(c) and extremely low concentrations of several VOCs and SVOCs in the contents of both septic tanks and soils adjacent to the connected drainfields. No inorganic chemicals were detected above LANL BVs; however, DLs for antimony and cyanide were greater than SAL and 0.1 SAL, respectively. Because the nature and extent of potential contamination were not determined, a Phase I RFI report was not prepared.

VCA activities were implemented at SWMU 54-007(c)-99 in 2000/2001 that involved resampling both septic tank contents for waste characterization purposes. The sludge samples from both tanks were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs, pesticides, isotopic plutonium and uranium, gamma spec, and tritium. Both septic tanks and their contents were removed. The contents of both septic tanks were disposed of at SWCS (after waste characterization data were determined to meet the SWSC WAC) and the septic tanks were excavated and removed. Inlet and outlet drainlines were plugged and left in place. Six confirmation samples were collected from two depths at three locations within each septic tank footprint and two samples were collected from two depths at a single location beneath each tank inlet line connection. Twelve confirmation samples were collected from two depths at six locations within each drainfield. The drainfield sample locations were selected to supplement the 1995 Phase I RFI data. The confirmation sample analytical suite was based on the 2000 waste characterization results for the contents of both septic tanks and included screening for radioactivity, and fixed laboratory analysis for VOCs and SVOCs. Results showed consistently low concentrations of organic COPCs, most at concentrations below their EQLs; the EQLs decreased with depth. Acetone was the only organic chemical detected in both the septic tank sludge samples and confirmatory soil samples. A VCA completion report was submitted to NMED in September 2001. In the human health screening assessment, maximum concentrations of COPCs were less than 0.1 SAL for noncarcinogens and less than SAL for carcinogens. The detected COPECs did not result in an HQ greater than 0.3 for ecological receptors at this PRS. SWMU 54-007(c)-99 was recommended for NFA.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	16	1	1
Pesticides/PCBs	0	N/A	0
Radionuclides	3	0	0
SVOCs	9	N/A	0
VOCs	8	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	0.73 mg/kg	0.39 mg/kg

References

Los Alamos National Laboratory Permit Modification Request, September 2002 — LA-UR Number: N/A

Voluntary Corrective Action Completion Report for PRS 54-007(c)-99, Revision 1 — LA-UR Number: 02-0635

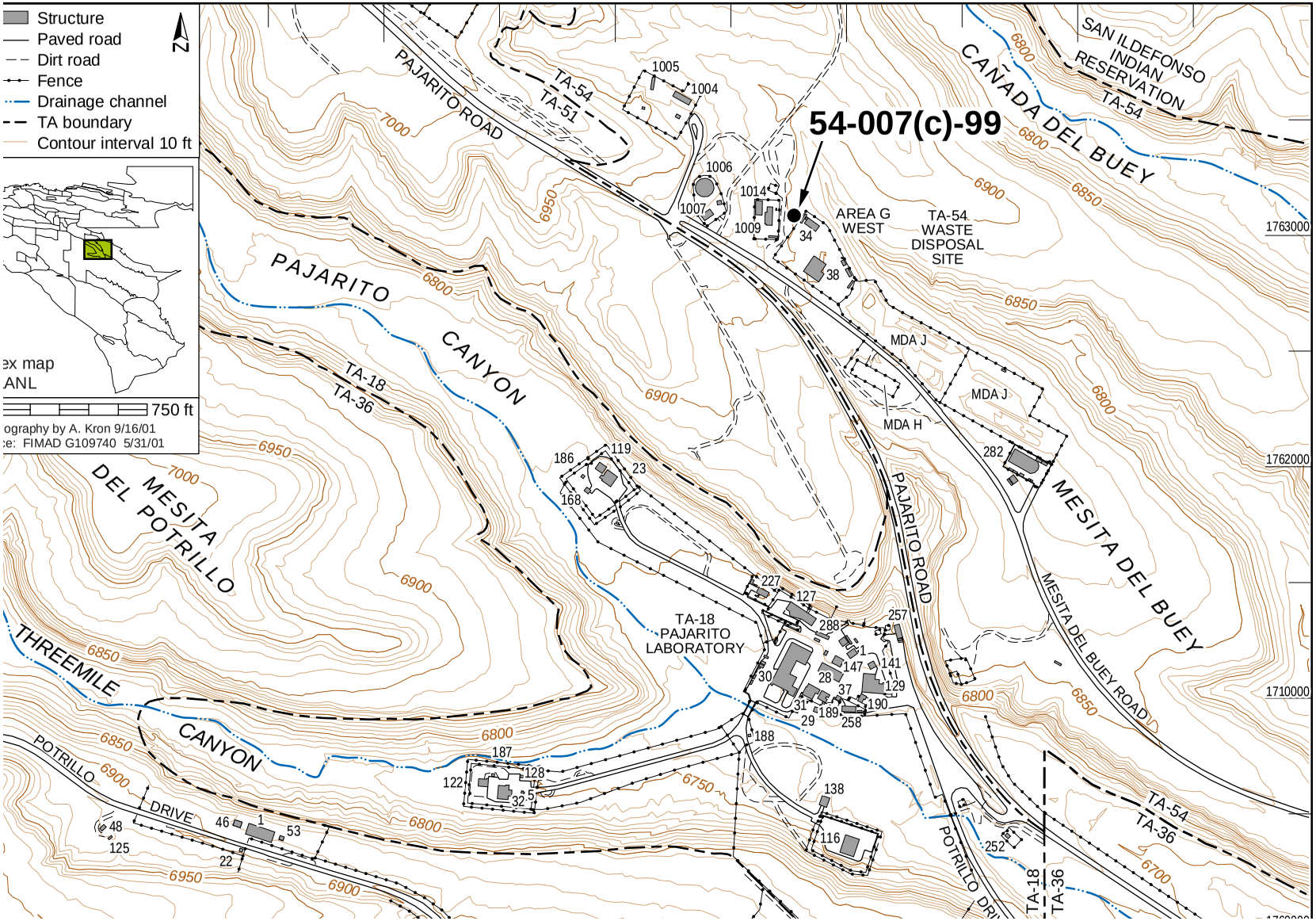
Voluntary Corrective Action (VCA) Completion Report for Consolidated for PRS 54-007(c)-99 — LA-UR Number: 01-5311

Voluntary Corrective Action (VCA) Plan for Consolidated Potential Release Site (PRS) 54-007(c)-99 — LA-UR Number: 00-3905

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 — LA-UR Number: N/A

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855

No photo; subsurface unit


Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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ANL
750 ft
ography by A. Kron 9/16/01
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54-007(c)-99
PAJARITO ROAD
TA-54
TA-51
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
AREA G WEST
TA-54 WASTE DISPOSAL SITE
PAJARITO CANYON
TA-18
TA-36
MDA J
MDA J
MDA H
MESITA DEL BUEY
MESITA DEL POTRILLO
PAJARITO ROAD
MESITA DEL BUEY ROAD
TA-18 PAJARITO LABORATORY
THREEMILE CANYON
POTRILLO DRIVE
POTRILLO DRI
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AOC 54-007(d) – Subsurface liquid disposal

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1962-1993
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	Yes
Structure Number	54-4	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-007(d) is a former septic system that served the Radiation Exposure Facility (Buildings 54-1001, 54-1002, 54-1003, and 54-1004). The septic system consisted of a 972-gal. concrete septic tank (structure 54-4), drainlines, a distribution box, and a split drainfield. A 4-in. drainline from the septic tank connected to a reinforced concrete distribution box that diverted effluent east and west into the drainfield. The drainfield consists of two 60-ft-long, 4-in.-diameter tile drainlines that run east and west from the former location of the distribution box. The Radiation Exposure Facility operated from 1962 to the mid-1970s and was used for biomedical research on the exposure of animals to gamma radiation from sealed cobalt-60 sources. The sources were removed from the facility when the research was terminated and the facility was used for research on the exposure of animals to nitrogen oxides. The septic system was left in place in 1993 when the buildings it served were tied to a new sewer line installed as part of LANL's SWCS. Effluent now flows to a new manhole (structure number 54-151), which is located south of the former septic tank location.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

During the 1995 Phase I RFI, 4 subsurface soil samples (3 RFI samples and 1 duplicate) were collected adjacent to drainlines (5 ft bgs) in the two septic system drainfields and the contents of the septic tank were sampled and analyzed. All samples were screened for radioactivity and analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganic chemicals. Results showed extremely low concentrations of several VOCs in the septic tank contents soils adjacent to the drain field. Because the nature and extent of potential contamination were not determined, a Phase I RFI report was not prepared.

The ER Project characterized the contents and removed the septic tank in a VCA that was conducted in 2000 and 2001. During 2000, the liquid and sludge in the septic tank were sampled and analyzed for pesticides/PCBs, inorganic chemicals, organic chemicals, gamma-emitting radionuclides, tritium, isotopic plutonium, and isotopic uranium. Waste characterization results meet the SWSC WAC. The contents of the septic tank were disposed of at the SWCS and the septic tank was excavated and removed. Inlet and outlet drainlines were plugged and left in place. Seven confirmation samples were collected from two depths at three locations within the septic tank footprint and two samples were collected from two depths at a single location beneath the tank inlet line connection. Drainfield sample locations were selected to supplement the 1995 RFI data and to ensure determination of the nature and extent of contamination. A total of 24 subsurface soil samples were collected from 12 locations in the in the drainfield. The confirmation sample analytical suite was based on the 2000 waste characterization results for the septic tank contents and included screening for gross alpha, beta, and gamma radiation and fixed laboratory analysis for VOCs and SVOCs. Results showed no elevated gross radiation screening levels, and no VOCs or SVOCs above their respective SALs. AOC 54-007(d) was recommended for NFA.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	16	0	1
Pesticides/PCBs	3	N/A	1
SVOCs	1	N/A	0
VOCs	11	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Pesticides	Aroclor-1254	0.25 mg/kg	0.22 mg/kg

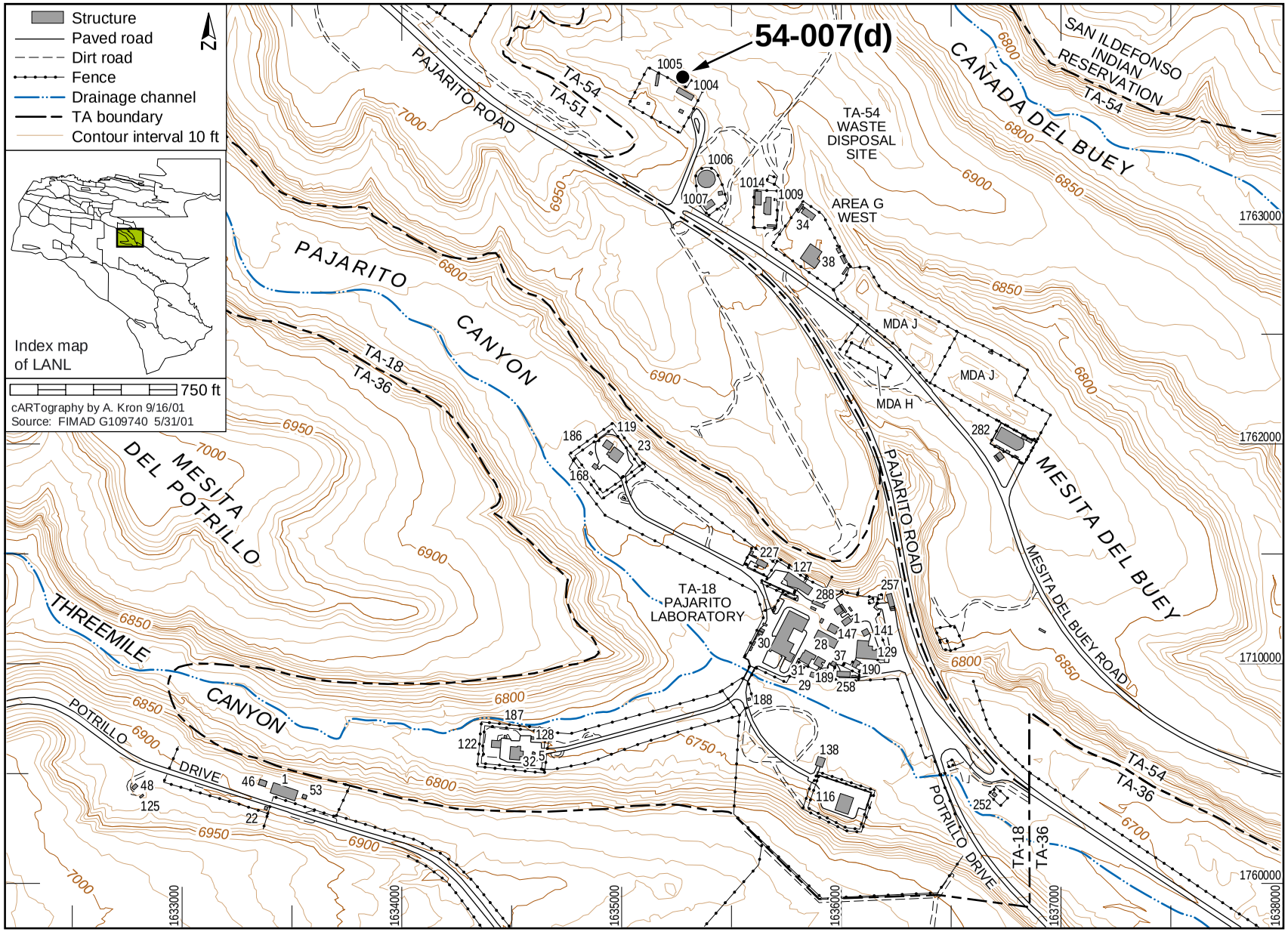
References

Voluntary Corrective Action (VCA) Completion Report for Potential Release Sites (PRSs) 51-001 and 54-007(d) — LA-UR Number: 01-5223

Voluntary Corrective Action Plan for Potential Release Sites 51-001 and 54-007(d) — LA-UR Number: 00-3617

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855

No photo; subsurface unit


54-007(d)
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109740 5/31/01
PAJARITO ROAD
TA-54
TA-51
TA-54 WASTE DISPOSAL SITE
AREA G WEST
CANADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
PAJARITO CANYON
TA-18
TA-36
MDA J
MDA H
MESITA DEL BUEY
MESITA DEL POTRILLO
THREEMILE CANYON
TA-18 PAJARITO LABORATORY
MESITA DEL BUEY ROAD
POTRILLO DRIVE
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AOC 54-009 – Physical/chemical treatment units

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1988-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-35	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-009 consists of two aboveground, open-top RCRA-permitted treatment tanks situated on the paved surface of Area L. The tanks are not included in Module VIII of LANL's Hazardous Waste Facility Permit. The carbon steel tanks each have a capacity of 1660 gal. and are 9 ft in diameter and 3.5 ft high. The tanks are located on a bermed concrete pad with a containment capacity of 3554 gal. Installed in 1988, the tanks were last used to treat barium-contaminated sand from burn pads at other LANL areas; they are not in use currently. Barium was precipitated in the tanks as barium sulfate, a nonhazardous salt, and was drummed and shipped to MDA J. The treatment sand also was disposed of at MDA J. Two additional open-top treatment tanks and a 210-gal. mixing tank previously were included as part of this AOC, but were removed in the 1990s. Historically, the tanks were used to treat ammonium bifluoride, neutralize acids and bases, and oxidize reactive wastes. The tanks have been removed by the operating group and closure certification is being provided to the NMED. No releases have been identified from AOC 54-009.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

No analytical samples were collected at this site.

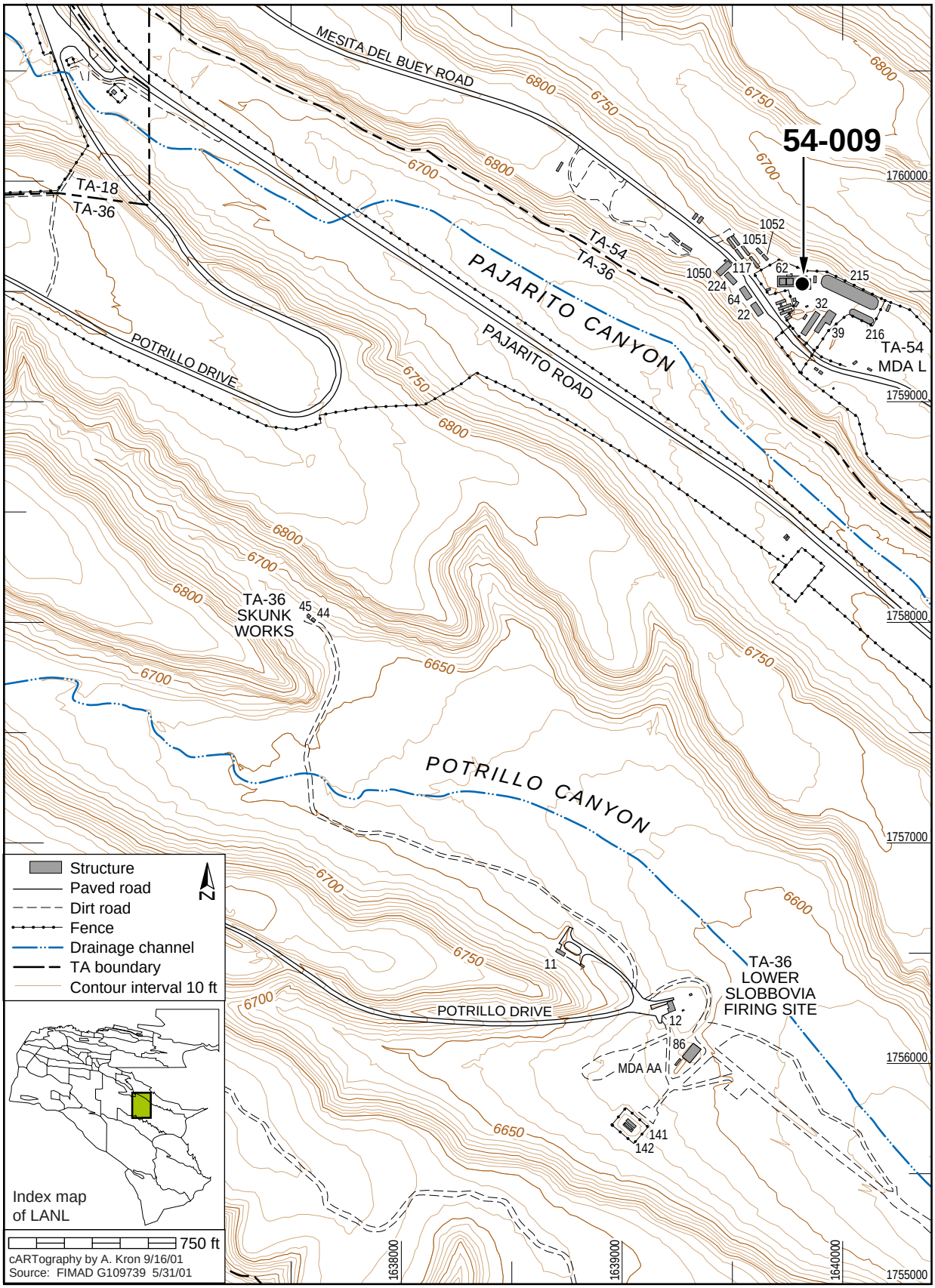
References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 — LA-UR Number: N/A

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855

Aerial close-up of AOC 54-009

View of AOC 54-009


54-009
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
1052
1051
1050
117
62
224
64
22
32
39
215
216
TA-54
MDA L
TA-36
SKUNK
WORKS
45
44
POTRILLO CANYON
11
12
86
MDA AA
141
142
TA-36
LOWER
SLOBBOVIA
FIRING SITE
POTRILLO DRIVE
6800
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-012(a) – Physical/chemical treatment units

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

AOC 54-012(a) was a drum compactor formerly located inside Building 54-2. The compactor was used to compact radioactive solid waste. The compactor was removed in the mid-1990s and replaced with a new compactor located in Building 54-281. Building 54-2 was decontaminated and currently is used to store, assemble, and repair tools in support of Area G operations.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

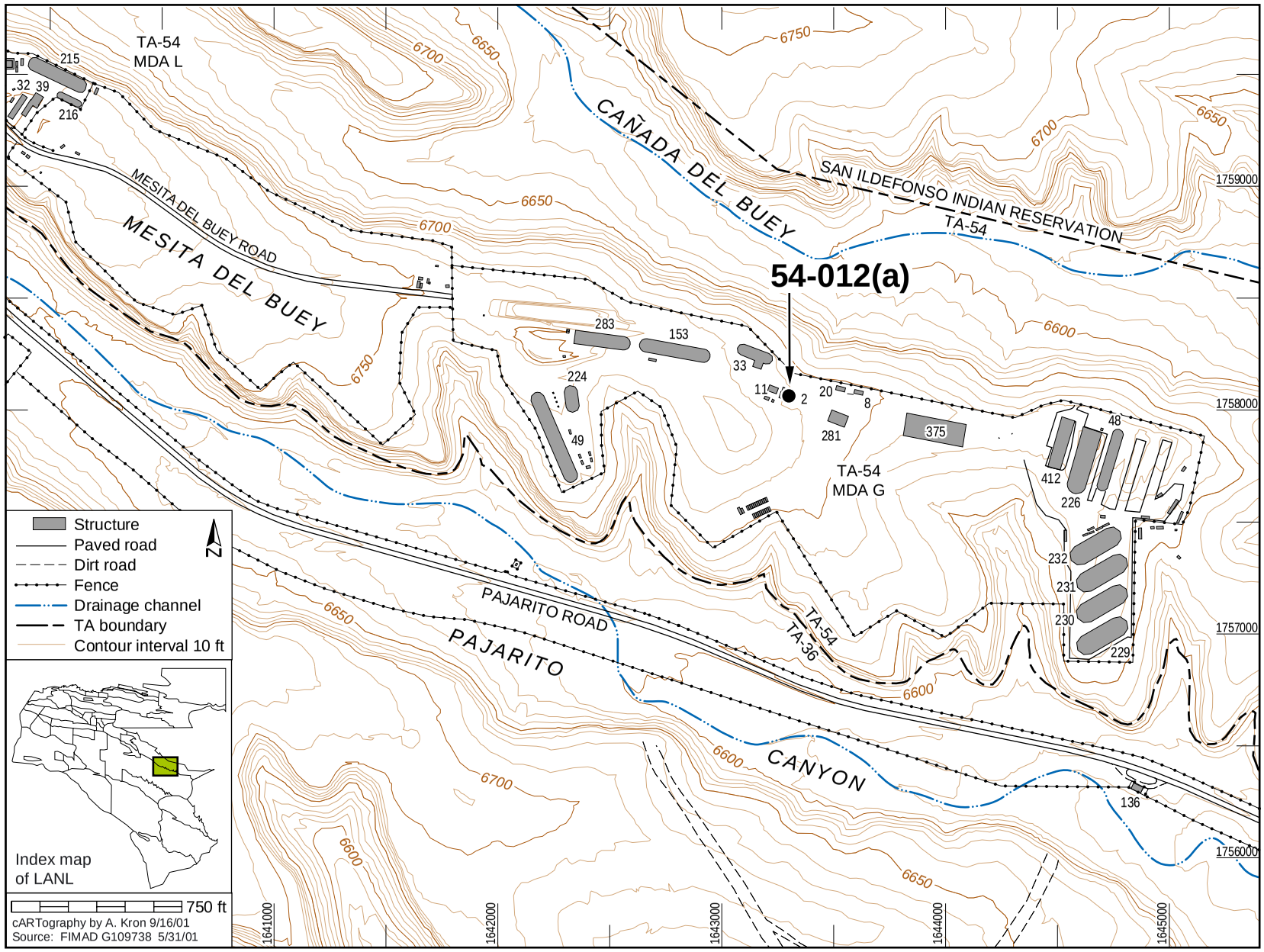
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of AOC 54-012(a)


54-012(a)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
MESITA DEL BUEY
MESITA DEL BUEY ROAD
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
215
32
39
216
283
153
33
11
2
20
8
281
375
224
49
48
412
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

SWMU 54-012(b) — Physical/chemical treatment units

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-82	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 54-012(b) is the former and current location of a drum compactor in the central portion of Area L. The compactor is used to crush empty, discarded 30- and 55-gal. drums. The compactor uses hydraulic pressure to move, ram and crush the drums. Prior to crushing, all containers are inspected to ensure they met the RCRA definition of “empty.” The drum compactor, which was included in Module VIII of LANL's Hazardous Waste Facility Permit, was situated on bare soil prior to relocation to the current SWMU 54-012(b)location. The compactor was relocated to a concrete containment pad (structure 54-82) at Area L in late 1989 or early 1990, and the stained soil from the previous location was removed. The compactor currently is inactive.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

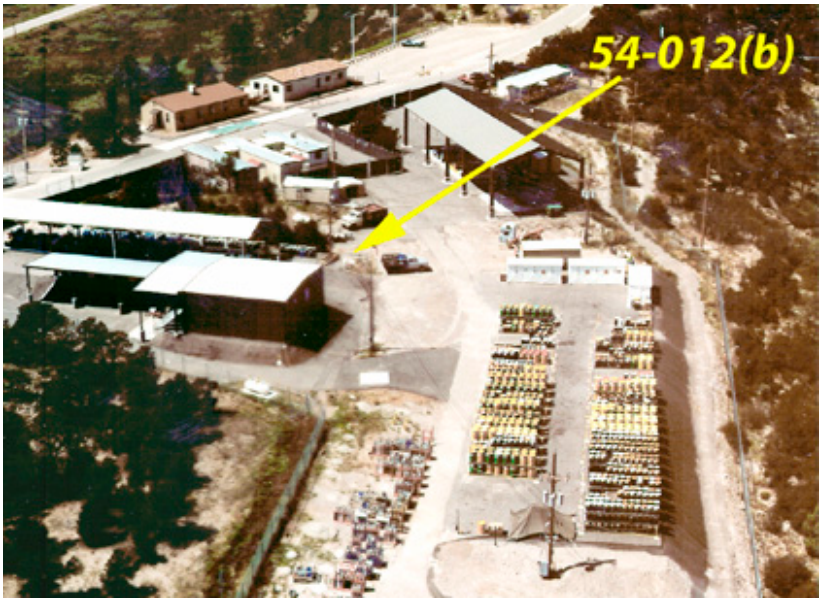
ER Project Sampling Summary

No analytical samples were collected at this site.

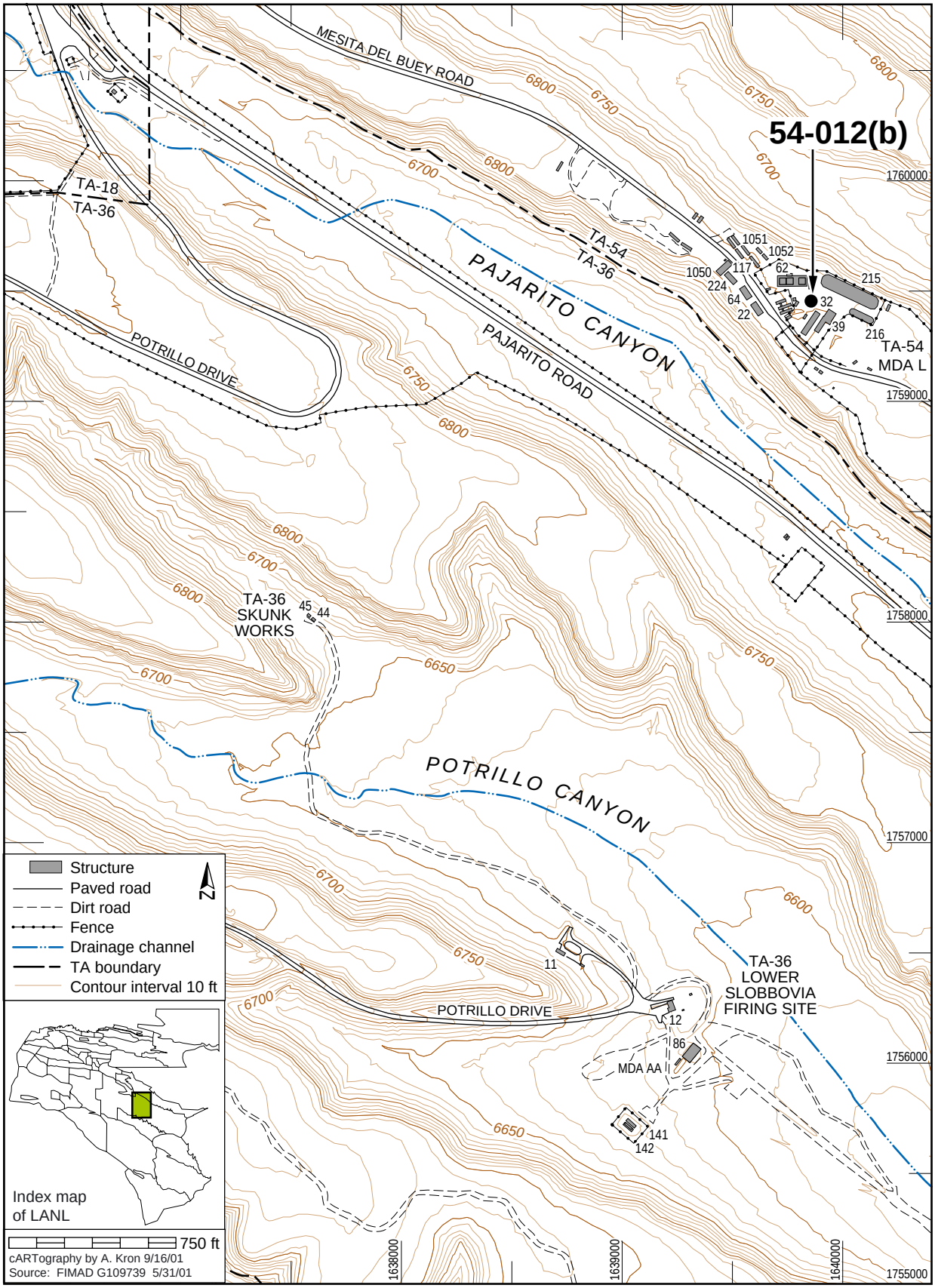
References

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 — LA-UR Number: N/A

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855



Aerial close-up of SWMU 54-012(b)


54-012(b)
MESITA DEL BUEY ROAD
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

SWMU 54-013(b)-99 — Material disposal area (MDA)

Administrative Authority	NMED	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1957-1997
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	Yes

Unit Description

SWMU 54-013(b)-99, MDA G, consists of former SWMUs 54-013(b), 54-014(b), 54-014(c), 54-014(d), 54-015(k), 54-017, 54-018, 54-019, and 54-020. The MDA G former SWMUs are inactive subsurface disposal units within MDA G; they no longer receive waste. Portions of MDA G began operation in 1957. DOE initially authorized Area G for the disposal of low-level radioactive waste and certain radioactively contaminated infectious waste, asbestos-contaminated material, and PCBs, and for the temporary placement of TRU waste. Area G is located on Mesita del Buey between Pajarito Canyon to the south and Cañada del Buey to the north. Current disposal activities at Area G include only DOE-authorized disposal of LLW and EPA-authorized disposal of PCB waste. RCRA interim status mixed waste and DOE-authorized, RCRA interim status mixed TRU waste are stored in surface structures erected over many of the subsurface SWMUs.

Former SWMU 54-013(b) was a vehicle monitoring/decontamination area located in the central portion of Area G on the surface of pit 19. The area was used to decontaminate trucks and TRU waste drums but is no longer in use and is included in Module VIII of LANL's Hazardous Waste Facility Permit.

Former SWMU 54-014(b) is pit 9, which is included in Module VIII of LANL's Hazardous Waste Facility Permit. It is 30 ft wide x 400 ft long by 20 ft deep. Pit 9 received retrievable TRU and mixed TRU waste from 1974 to 1978, and remains inactive. Once filled, the pit was covered with 3.3 ft of consolidated crushed tuff and 4 in. of topsoil, and reseeded with native grasses.

Former SWMU 54-014(c) consists of TRU waste disposal shafts 200 through 233 and is located in the northeastern quadrant of Area G. Former SWMU 54-014(c) is included in Module VIII of LANL's Hazardous Waste Facility Permit. The shafts each measure 1 ft in diameter, 18 ft deep; they are lined with concrete and contain TRU waste. Some of the shafts began receiving TRU waste in 1978 and were closed between 1979 and 1987, and remain inactive. Shafts were used for wastes that required special packaging (primarily tritium), special handling (e.g., highly active metals), or segregation. Once filled, disposal shafts typically were filled with waste to within 3 ft of the ground surface, backfilled with crushed tuff, and covered with a concrete dome.

Former SWMU 54-014(d), which consists of TRU disposal trenches A, B, C, and D, is located in the south-central portion Area G and is included in Module VIII of LANL's Hazardous Waste Facility Permit. These trenches began receiving TRU and mixed LLW in 1974. Trenches A, B, and C vary in size from 219 ft to 262.5 ft long by 13 ft wide by 6 ft to 8 ft deep. Trench D is 60 ft long x 13 ft wide x 6 ft deep. TRU waste placed in trenches was packaged in 30-gal. containers inside concrete casks. Once filled, the trenches were backfilled with 3.3 ft of crushed tuff followed by 4 in. of topsoil. The surface was reseeded with native grasses.

Former SWMU 54-015(k) consists of a layer of retrievable TRU waste in cement-filled sections of corrugated pipe located inside a mound of fill material within the top of pit 29 in the northeast quadrant of Area G; the site is included in Module VIII of LANL's Hazardous Waste Facility Permit.

Former SWMU 54-017 consists of inactive disposal pits 1 through 8, 10, 12, 13, 16 through 22, and 24. Former SWMU 54-018 consists of disposal pits 25 through 33 and 35 through 37. Only pit 29 (although no longer in use) is considered a regulated unit until RCRA closure is certified and approved by NMED. Pits 11, 14, 23, and 24 were never excavated. Both sites are included in Module VIII of LANL's Hazardous Waste Facility Permit. Pits 1 through 24 were operational between 1959 and 1980 and received radioactive, mixed, and TRU wastes in the form of wing tanks, dry boxes, building debris, sludge drums, lab waste, contaminated soil, D&D waste, filter plenums, and uranium. Pits 1 through 24 are located in the eastern portion of Area G with volumes ranging from 1371 to 56,759 cubic yards. Pits 25 through 28 and 30 through 36 were operational between 1979 and 1980 and received radioactive, mixed, and TRU waste in the form of reactor control rods, D&D waste, contaminated soil, transformers, gloveboxes, asbestos, and lab waste and range in volume from 20,957 to 59,930 cubic yards. Pit 29 operated until 1986. Pit 37 operated from 1990 to 1997 and primarily received circuit boards and contaminated soil. Once filled, the pits were covered with 3.3 ft of consolidated crushed tuff and 4 in. of topsoil, and reseeded with native grasses.

Former SWMU 54-019 consists of disposal shafts 1 through 20, 24 through 34, 38 through 92, 96, 109 through 112, and 150. These 92 shafts are included in Module VIII of LANL's Hazardous Waste Facility Permit and were operational between 1966 and 1980. The shafts received LLW and hazardous and mixed waste. They range in size from 1 ft to 6 ft in diameter and 25 ft to 60 ft deep and are located primarily in the northeast quadrant of Area G. Disposal shafts typically were filled with waste to within 3 ft of the ground surface, backfilled with crushed tuff, and covered with a concrete dome.

Former SWMU 54-020 consists of disposal shafts C1 through C10, C12, C13, 22, 35 through 37, 93 through 95, 99 through 108, 114, 115, 118 through 136, 138 through 140, 151 through 160, 189 through 192, and 196. These shafts are included in the Module VIII of LANL's Hazardous Waste Facility Permit and were operational between 1970 and the early 1990s. Only shaft 124 (although no longer in use) is considered active until RCRA closure is certified and approved by NMED. The shafts contain one or a combination of the following waste types: PCB residues, LLW, hazardous and mixed waste. The shafts range in size from 1 ft to 8 ft in diameter and 25 to 65 ft deep, and are located throughout the eastern portion of Area G. Disposal shafts were typically filled with waste to within 3 ft of the ground surface, backfilled with crushed tuff, and covered with a concrete dome.

Sampling of sediment and surface water runoff downgradient from MDA G has been part of LANL environmental surveillance activities since 1982. From 1982-1992, analyses of sediment at nine sampling stations indicated plutonium concentrations above background in most of the drainages. Additional sediment sampling along the perimeter of MDA G is part of the ongoing LANL environmental surveillance program. Data indicated low levels of tritium, plutonium, and cesium at concentrations above background levels but below SALs.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

The ER Project conducted RFI fieldwork at MDA G from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases.

The RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water, sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than on individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface-sediment transport, and if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment runoff from the four MDAs. Fourteen drainage channels originate near MDA G. Sample locations were selected within depositional areas determined by an on-site geomorphic analysis of each channel. Samples were screened for radioactivity. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results from the sediment samples showed the presence of americium-241, plutonium-238, plutonium-239, and cobalt-60 at elevated concentrations. Also detected at elevated concentrations were beryllium, cobalt, mercury, selenium, and silver. Methoxychlor was also detected in sediment samples.

In 1997, the ER Project submitted an RFI status report that addressed the tritium distribution in surface soils at MDA G. The report presented the results of environmental surveillance data available from 57 samples that ESH-19 collected from 53 locations. These data showed the tritium distribution in mesa-top surface soils. Tritium concentrations were compared with a SAL of 260 pCi/g for tritium in soil. Comparisons with baseline data collected from the expansion area at MDA G (the west end of the site) indicated that tritium concentrations throughout MDA G are greater than background concentrations but only one location exceeded SAL (2191 pCi/g). Because the physical site model has unique characteristics not captured in the SAL calculation, the SAL was determined to be inadequate as a screening tool for the human health risk assessment. The RFI status report stated that further assessment of tritium must incorporate surface-soil data and consider the possibility that tritium flux from buried waste is the likely source of the observed surface-soil concentrations. The RFI status report recommended integrating information from each MDA G status report into a multipathway assessment that will be incorporated into a final report. Recommendations about any additional site investigations or other RFI-related activities were deferred until the final RFI report for MDA G.

An RFI report for MDAs G, H, and L was issued in 2000. The report was a collaborative effort (high performing team) between the NMED and LANL. In September 2000, the high performing team received direction from senior management to expedite the implementation of a preferred remedy at one MDA. The team selected MDA H and narrowed the scope of its effort to accommodate the change. The high performing team agreed that HWB would not review the 2000 combined RFI Report and that LANL would submit individual RFI reports on each of the MDAs. The first of the three RFI reports was submitted in May, 2001. The MDA G RFI Report is scheduled for submittal in 2003. RFI fieldwork at MDA G included the collection and analysis of over 50 drainage sediment samples, core samples from 20 boreholes, VOC and tritium surface flux samples, and ambient air sampling. The sediment samples were analyzed for inorganic chemicals, cyanide, PCBs/pesticides, herbicides, radionuclides, and tritium. The ambient air samples were analyzed for VOCs. The core samples were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs/pesticides, herbicides, cyanide, and radionuclides. Analytical results from subsurface tuff samples showed the presence of americium-241, cesium-137, europium-152, lead-210, plutonium-238, plutonium-239, strontium-90, uranium-235, and tritium at elevated concentrations. Cadmium, cyanide, molybdenum, selenium, silver, thallium, and vanadium were also detected at concentrations higher than their respective BVs. Numerous organic chemicals were detected in subsurface tuff samples. Analytical results from subsurface pore-gas samples showed the presence of multiple VOCs and tritium. The RFI data were supplemented by environmental surveillance surface water data, VOC emissions data from passive extraction tests, and quarterly VOC pore-gas monitoring samples. Americium-241, plutonium-238, plutonium-239,uranium-234, uranium-235, uranium-238, and tritium were detected at elevated concentrations in ambient air samples. VOCs were also detected. The dominant VOC detected in ambient air was TCA.

The present-day risks posed by MDA G to human and ecological receptors were characterized using a human health risk assessment and an ecological screening assessment. The site is assumed to be operational until 2044. The present-day human health risk assessment concluded that residual contamination in surface soil, sediments, and air does not pose an unacceptable risk. Chemical hazards from the COPCs and radiation doses from tritium diffusing upward from the site were orders of magnitude less than pertinent health effects criteria of 15 mrem/yr (radionuclides) and a hazard quotient of 1.0 for chemical hazard.

Quarterly pore-gas sampling of the vapor phase VOC plume at MDA G is ongoing. Sampling results are reported in the ER Project quarterly reports. At the request of NMED, the RFI report for MDA G is being rewritten to be consistent with the RFI report for MDA H, to incorporate additional recent information on the nature and extent of contamination, and to clearly identify remaining data gaps.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	24	18	3
Pesticides/PCBs	5	N/A	0
Radionuclides	18	16	5
SVOCs	9	N/A	1
VOCs	10	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	3.5 mg/kg	0.39 mg/kg
	Cyanide (total)	0.71 mg/kg	N/A
	Iron	39,000 mg/kg	23,000 mg/kg
Radionuclides	Lead-210	0.81 pCi/g	N/A
	Polonium-210	3.51 pCi/g	N/A
	Thorium-228	3.25 pCi/g	2.0 pCi/g
	Tritium	13,958 pCi/g	880 pCi/g
	Yttrium-90	0.38 pCi/g	N/A
SVOCs	Benzo(a)pyrene	0.23 mg/kg	0.062 mg/kg

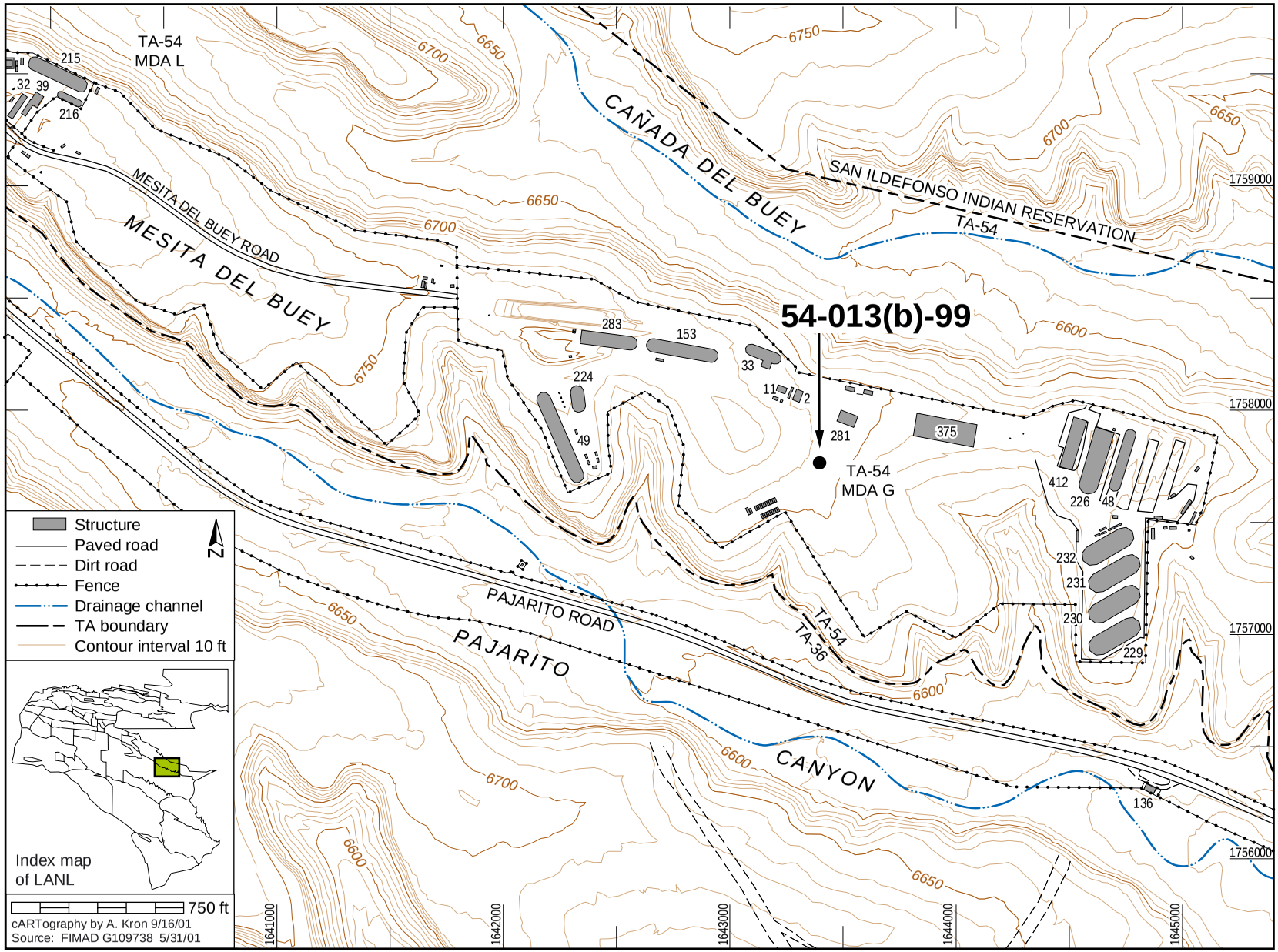
References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54 — LA-UR Number: 97-1308

RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) — LA-UR Number: 96-0110

RFI Work Plan for Operable Unit 1148 — LA-UR Number: 92-0855

View of SWMU 54-013(b)-99


54-013(b)-99
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
MESITA DEL BUEY
MESITA DEL BUEY ROAD
PAJARITO
PAJARITO ROAD
CANYON
TA-54
TA-36
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

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AOC 54-014(a) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Unknown	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-014(a) refers to the lead stringer storage shafts (shafts 36 and 37) located adjacent to the northwest corner of Area L that are currently operated under RCRA interim status requirements for storage of mixed waste. The lead stringers were placed in storage in the mid-1980s. Lead stringers are steel rods filled with irradiated lead and concrete. Shaft 36 is 30 in. in diameter and 27.5 ft deep, and shaft 37 is 48 in. in diameter and 35.75 ft deep, each with a storage capacity of 300 gal. Both of the shafts are constructed of corrugated metal pipe and equipped with a 1-ft-thick concrete plug at the bottom of the shaft. Each shaft is capped with a steel cap and concrete shielding block. AOC 54-014(a) is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

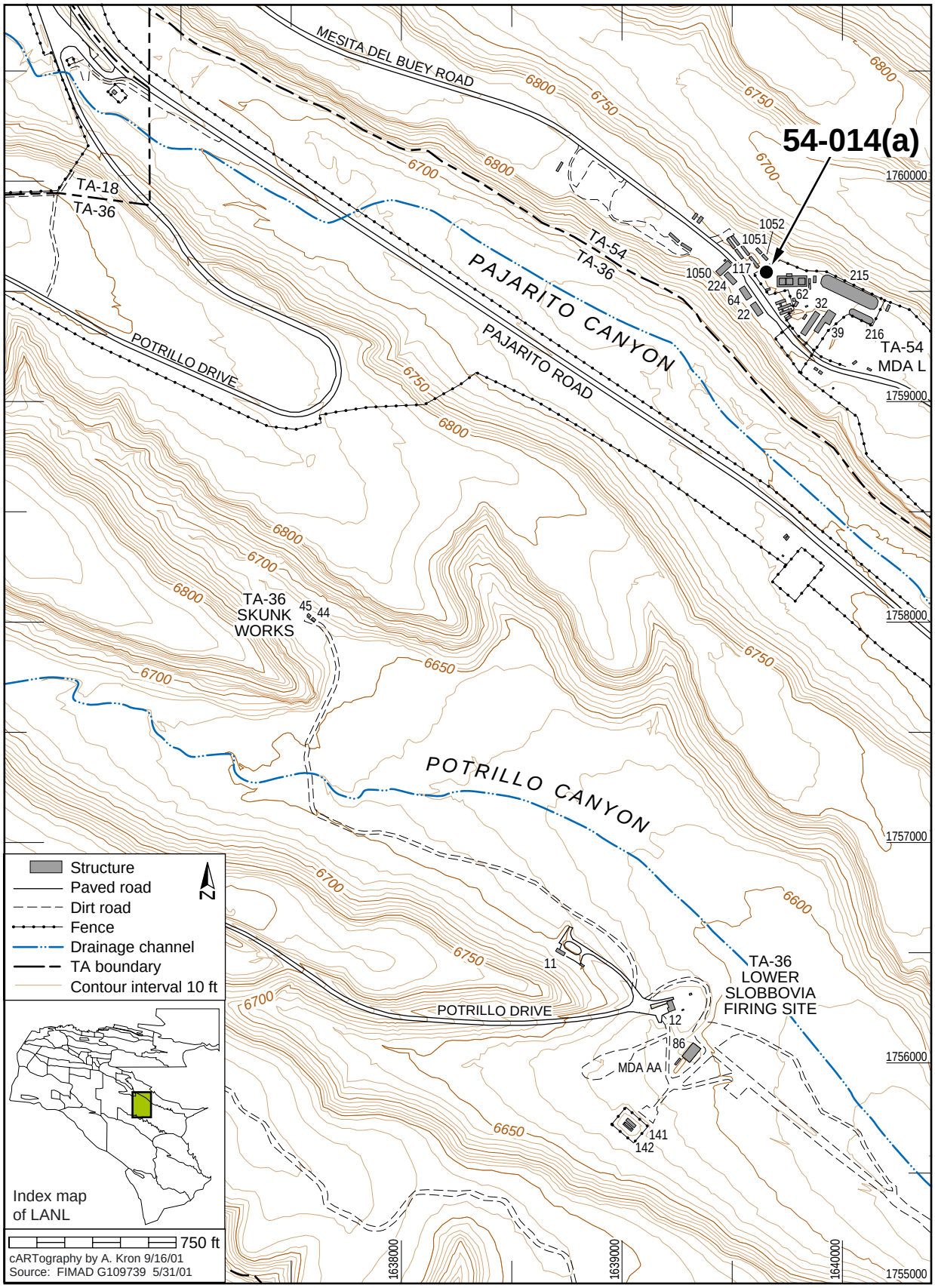
No analytical samples were collected at this site.

References

RFI Report for Material Disposal Areas G, H, and L at Technical Area -54	LA-UR Number: 00-1140
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
Proposed Action Plan Drilling Near Area [MDA] L, TA-54, OU 1148	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

Aerial close-up of AOC 54-014(a)

View of the surface AOC 54-014(a)


54-014(a)
MESITA DEL BUEY ROAD
TA-18
TA-36
TA-54
TA-36
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
1052
1051
1050
117
224
64
22
62
32
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215
216
TA-54
MDA L
TA-36
SKUNK
WORKS
45
44
POTRILLO CANYON
11
12
86
MDA AA
141
142
TA-36
LOWER
SLOBBOVIA
FIRING SITE
POTRILLO DRIVE
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1640000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

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AOC 54-015(a) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-8	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(a) is a mixed-waste container storage area operated under RCRA interim status requirements. The storage area is located in structure 54-8, a 15-ft x 40-ft x 12-ft-high metal shed. The structure was previously used for the storage of mixed TRU waste containers before being sprayed with a corrosion inhibitor for placement in retrievable storage on the TRU pads. The structure is currently used to store TRU drums retrieved during TWISP activities, before the corrosion inhibitor is removed from them in Building 54-33, and before they are placed in a storage dome pending disposal at WIPP. This AOC is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

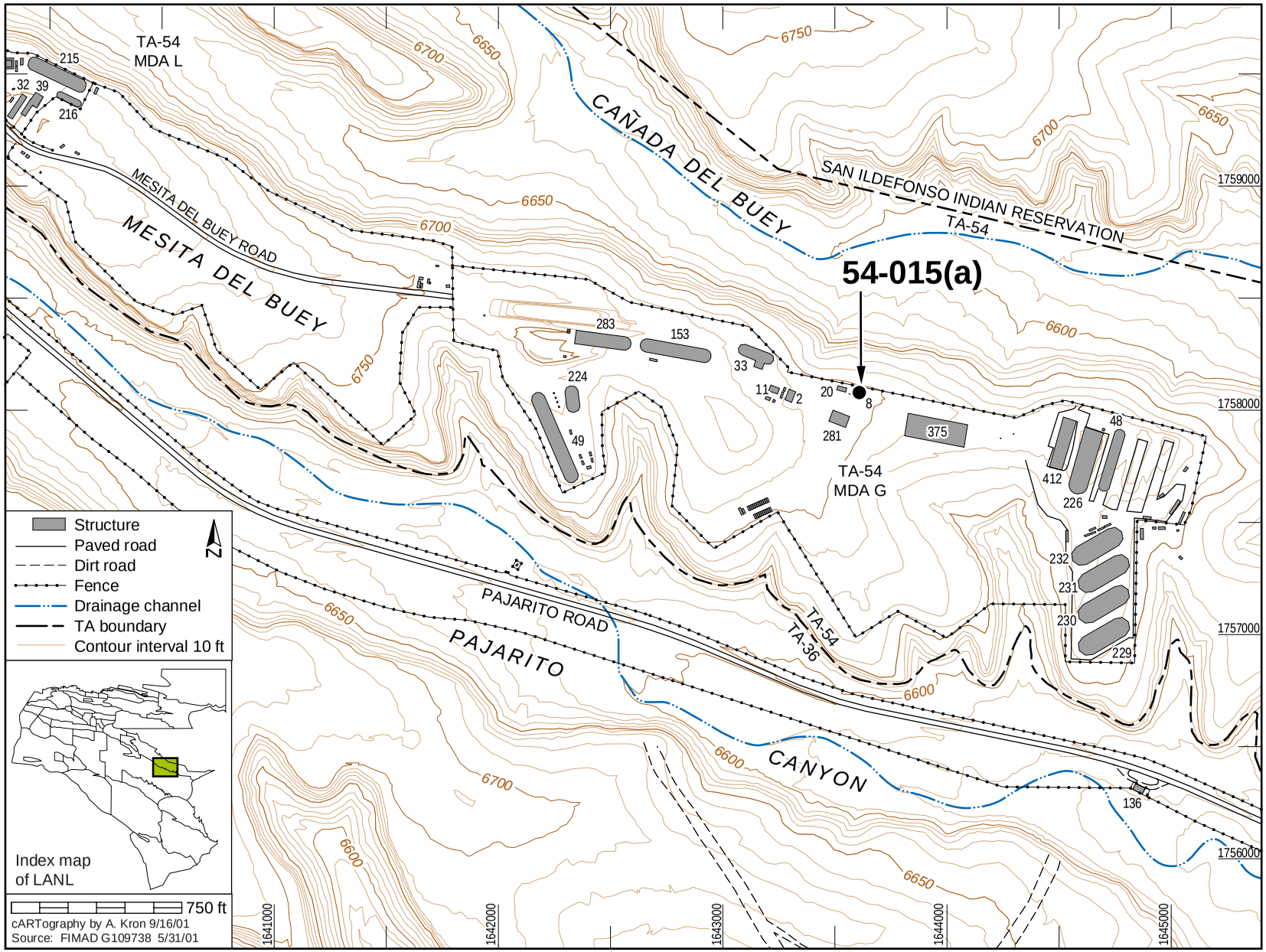
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A

View of AOC 54-015(a)


54-015(a)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
MESITA DEL BUEY
MESITA DEL BUEY ROAD
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
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Structure
Paved road
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Drainage channel
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Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

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AOC 54-015(b) — Storage areas/waste piles/magazines

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Pit 39	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(b) is pit 39, an active low-level radioactive waste disposal area at Area G. At the time the RFI work plan was written, the surface of AOC 54-015(b) was the location of an aboveground TRU waste container storage area; however, the TRU waste was subsequently moved and placed in a storage dome. Pit 39 is located approximately 100 ft southwest of the Area G waste management control facility (Building 54-11).

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

The OU 1148 work plan proposed sampling groupings of related SWMUs to focus on contaminant identification and the nature and extent of migration. The ER Project, in collaboration with other LANL divisions, is investigating Area G.

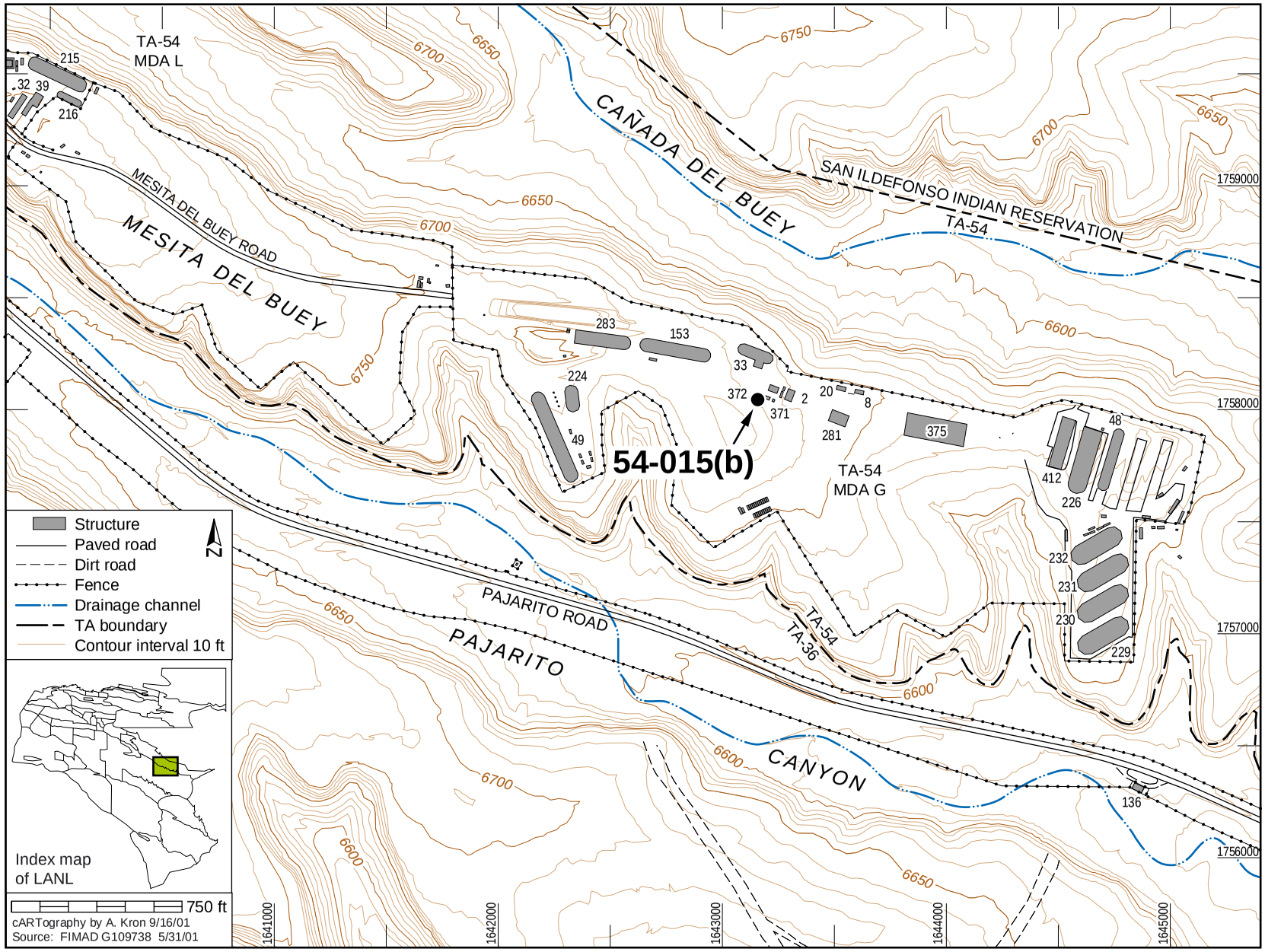
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of AOC 54-015(b)


TA-54
MDA L
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MESITA DEL BUEY ROAD
MESITA DEL BUEY
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
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54-015(b)
TA-54
MDA G
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PAJARITO ROAD
PAJARITO
CANYON
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-015(c) – Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	TRU Pad 1	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(c) is TRU pad 1, one of four TRU waste storage areas located in the northwest corner of Area G. The pad overlies the western ends of inactive disposal pits 2, 4, and 5 [SWMU 54-013(b)-99]. The pad stores three levels of retrievable contact-handled TRU waste in 55-gal. containers inside a dome (structure 54-226) with a total storage capacity of 960,000 gal. The pad was partially filled with drums and partly covered with tuff when the RFI work plan was written. The dome was constructed directly over pad 1 for use in the retrieval of TWISP drums being moved from pads to storage domes. The TRU waste containers are destined for disposal at WIPP. This is an active waste management unit that operates under interim status requirements for storage and is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

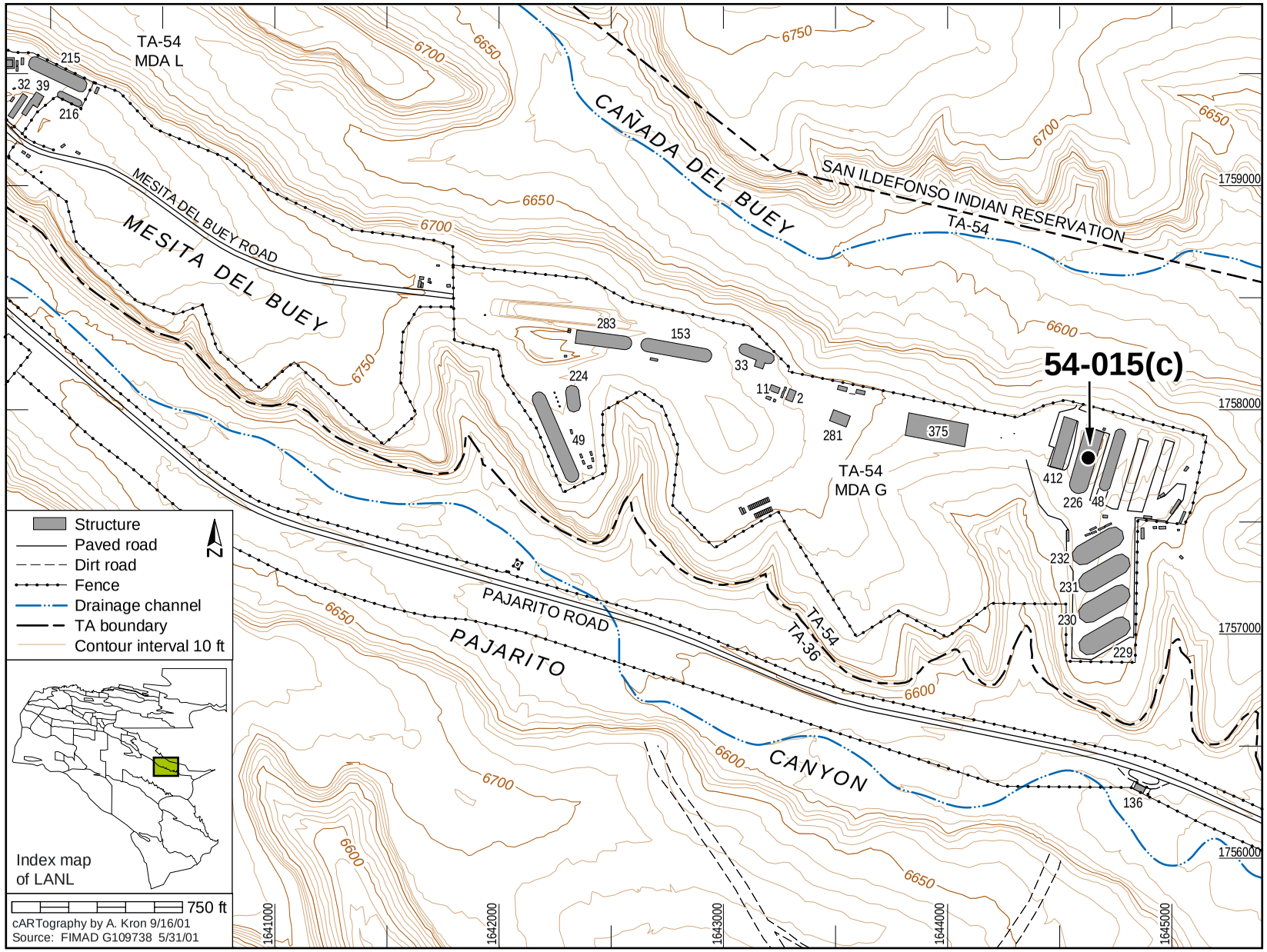
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of AOC 54-015(c)


54-015(c)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
MESITA DEL BUEY
MESITA DEL BUEY ROAD
PAJARITO ROAD
PAJARITO
CANYON
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-015(d) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1974-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	TRU Pad 2	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(d) is the former location of TRU pad 2, one of four TRU waste storage areas in the northwest corner of Area G. The pad previously stored six levels of retrievable contact-handled TRU waste in 55-gal. containers with a total storage capacity of 430,000 gal. The pad was completely filled and covered with tuff when the RFI work plan was written. All of the TRU containers previously stored at pad 2 were retrieved and moved to a TRU storage dome during the TWISP activities and are destined for disposal at WIPP. The former pad location is currently unoccupied and overlies inactive disposal pits 2, 4, and 5 [SWMU 54-013(b)-99]. This is an active waste management unit that operates under interim status requirements for storage and is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

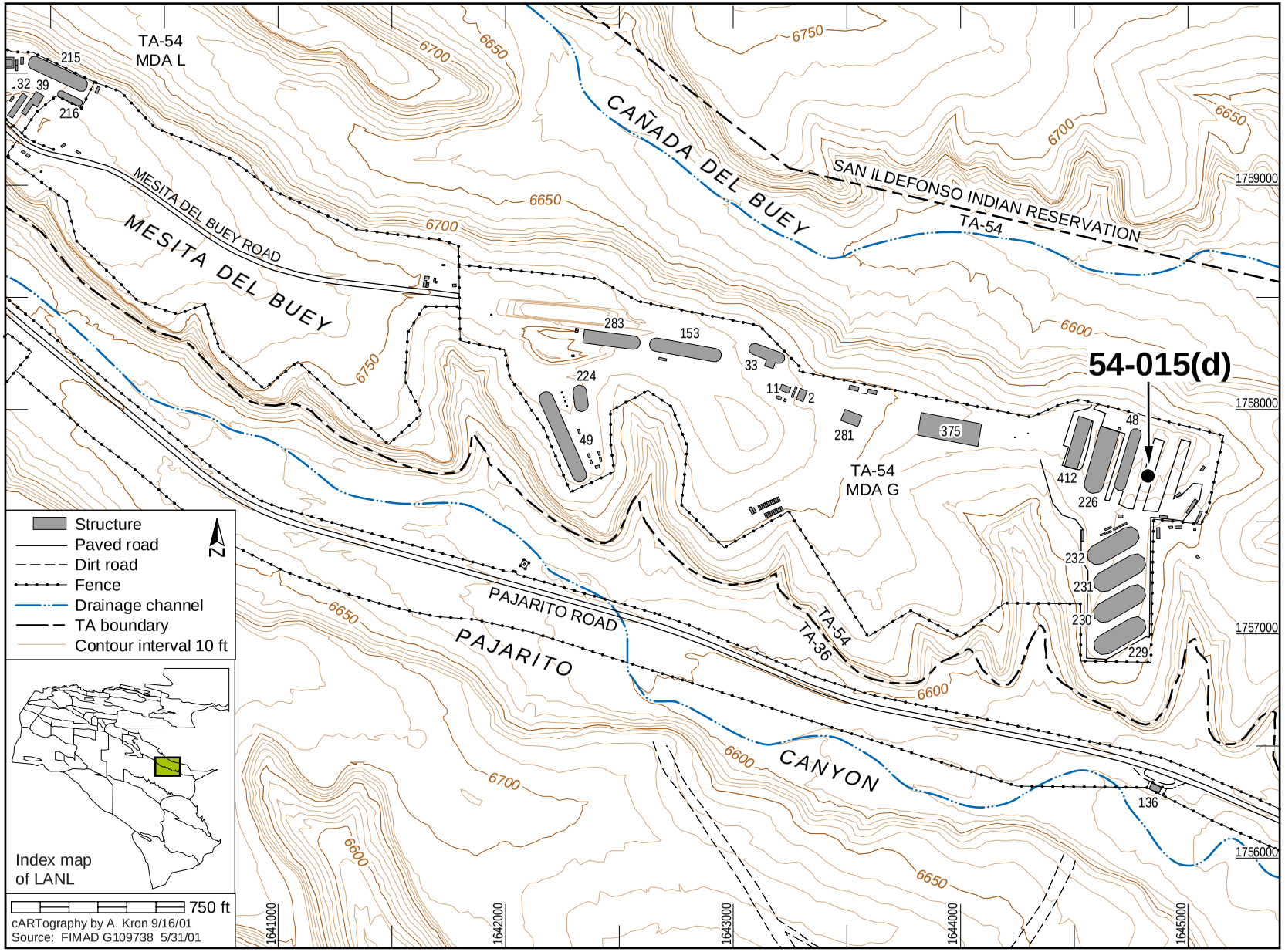
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

Aerial view of AOC 54-015(d)


54-015(d)
TA-54
MDA L
TA-54
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MESITA DEL BUEY
MESITA DEL BUEY ROAD
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
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PAJARITO ROAD
PAJARITO
CANYON
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Structure
Paved road
Dirt road
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Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

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AOC 54-015(e) – Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1974-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	TRU Pad 3	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(e) is TRU pad 3, one of four TRU waste storage areas located in the northwest corner of Area G. The pad overlies inactive disposal Pits 2, 4, and 5 [SWMU 54-013(b)-99]. The pad stores three levels of retrievable contact-handled TRU waste in 55-gal. containers inside a dome (structure 54-48) with a total storage capacity of 300,000 gal. The dome was constructed directly over pad 3 for use in the retrieval of TWISP drums being moved from pads to storage domes. The TRU waste containers are destined for disposal at WIPP. This is an active waste management unit that operates under interim status requirements for storage and is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

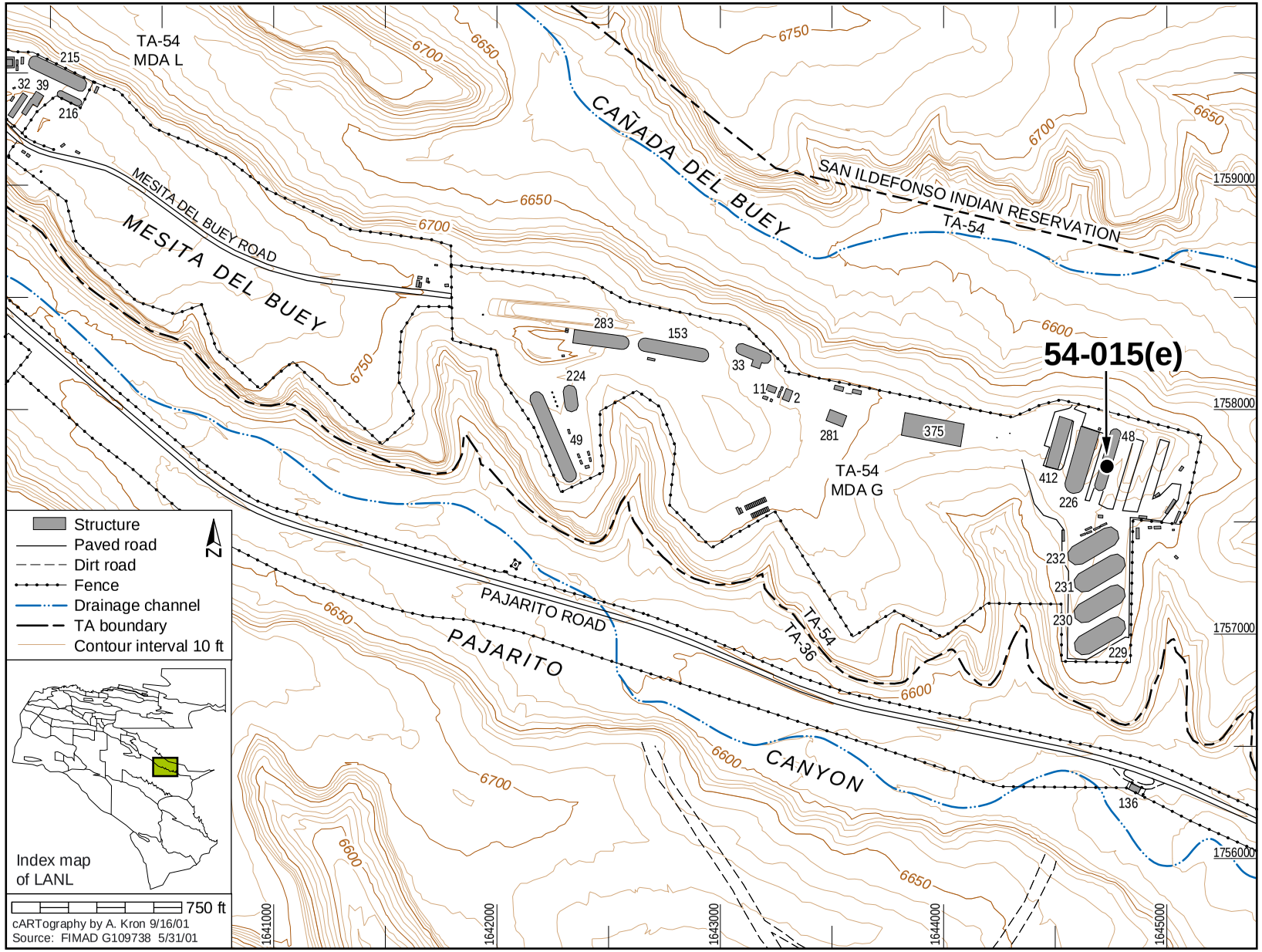
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of AOC 54-015(e)


54-015(e)
TA-54
MDA L
TA-54
MDA G
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
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MESITA DEL BUEY
MESITA DEL BUEY ROAD
PAJARITO ROAD
PAJARITO
CANYON
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-015(f) — Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	1974-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	TRU Pad 4	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(f) is the former location of TRU pad 4, one of four TRU waste storage areas in the northwest corner of Area G. The pad previously stored six levels of retrievable contact-handled TRU waste in 55-gal. containers with a total storage capacity of 970,000 gal. The pad was partially filled and covered with tuff when the RFI work plan was written. All of the TRU containers previously stored at pad 4 were retrieved and moved to a TRU storage dome during the TWISP activities and are destined for disposal at WIPP. The former pad location is currently unoccupied and overlies inactive disposal pits 2, 4, and 5 (SWMU 54-013(b)-99). This is an active waste management unit that operates under interim status requirements for storage and is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

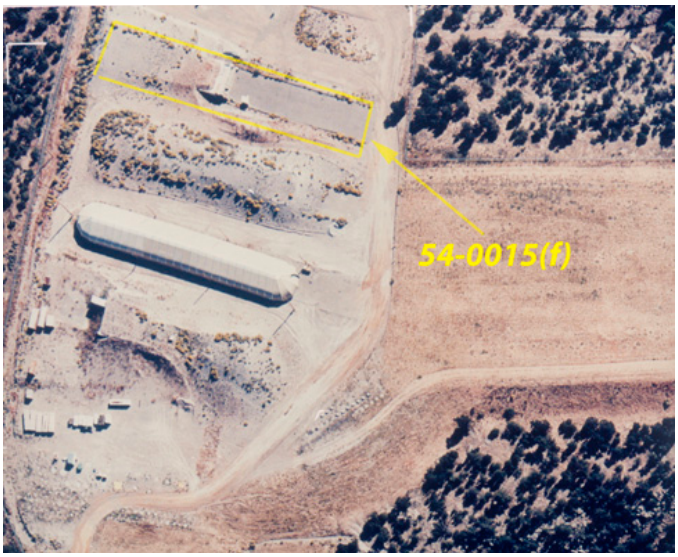
RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

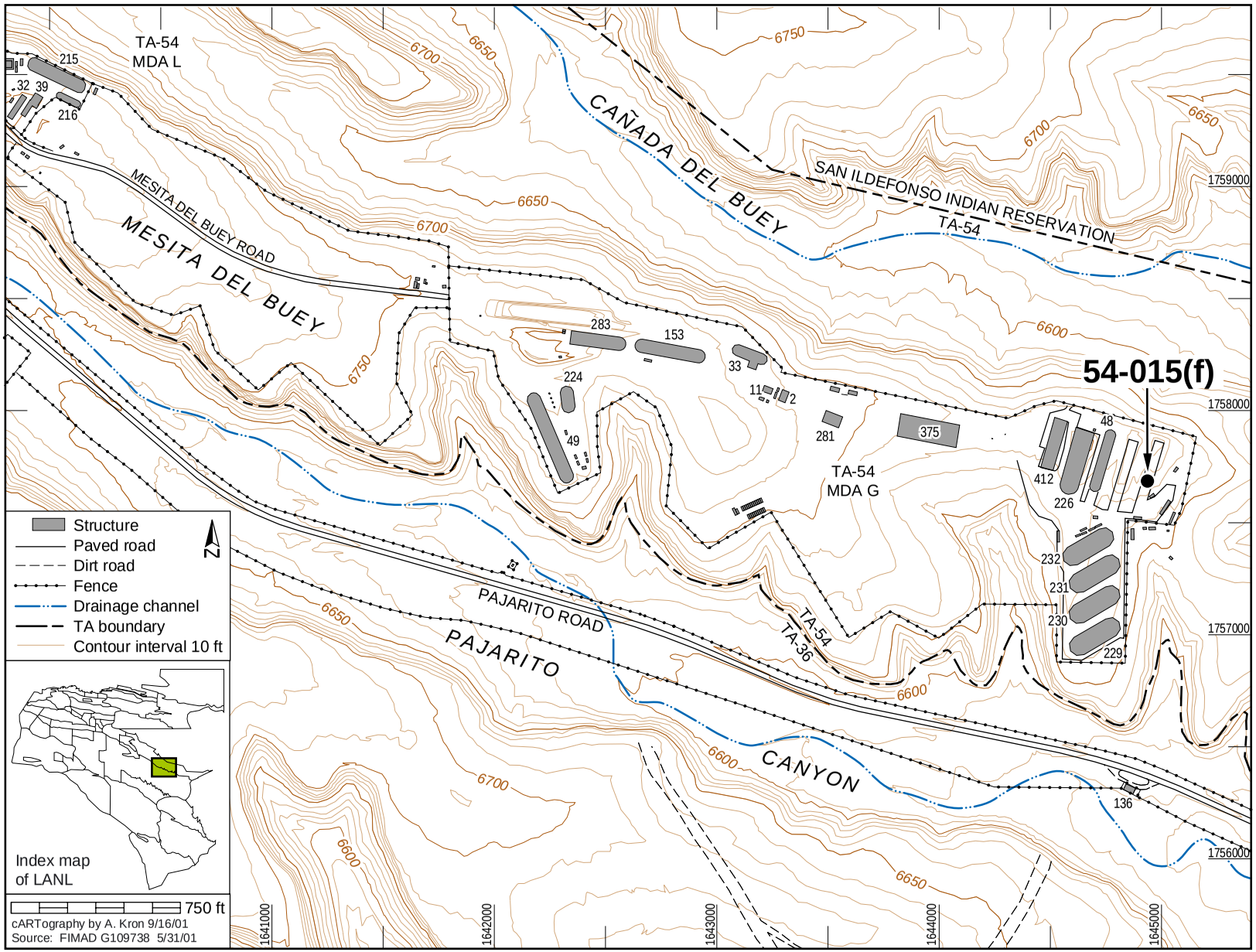
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



Aerial view of AOC 54-015(f)


54-015(f)
TA-54
MDA L
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CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
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MESITA DEL BUEY
MESITA DEL BUEY ROAD
PAJARITO ROAD
PAJARITO
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Drainage channel
TA boundary
Contour interval 10 ft
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of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-015(j) – Container storage

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	54-49	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-015(j) is an active mixed waste storage area operated under RCRA interim status. The bermed storage area is situated on top of pit 32 [SWMU 54-013(b)-99] and is currently covered by a storage dome (structure 54-49). This AOC is not included in Module VIII of LANL's Hazardous Waste Facility Permit.

ER Project Activities

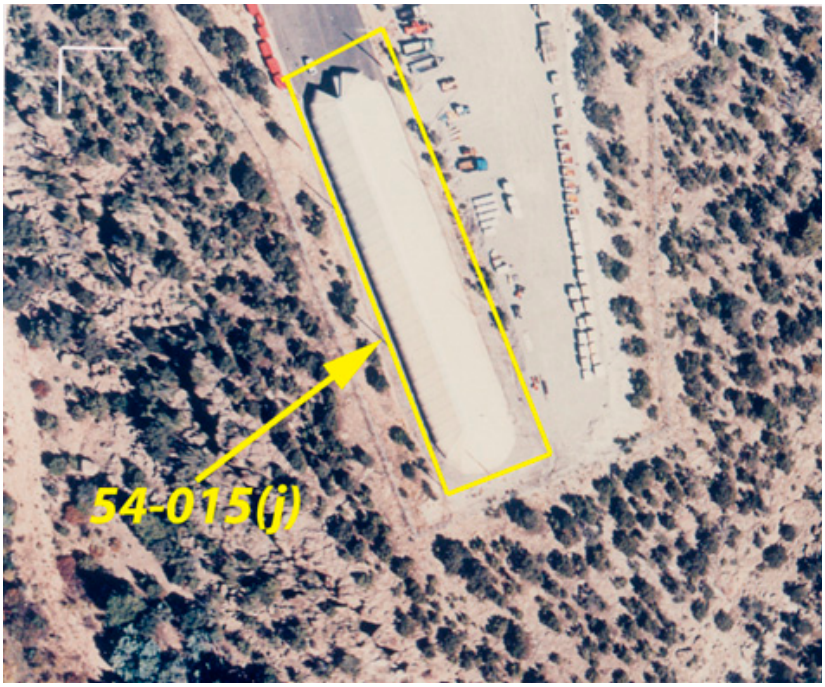
RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

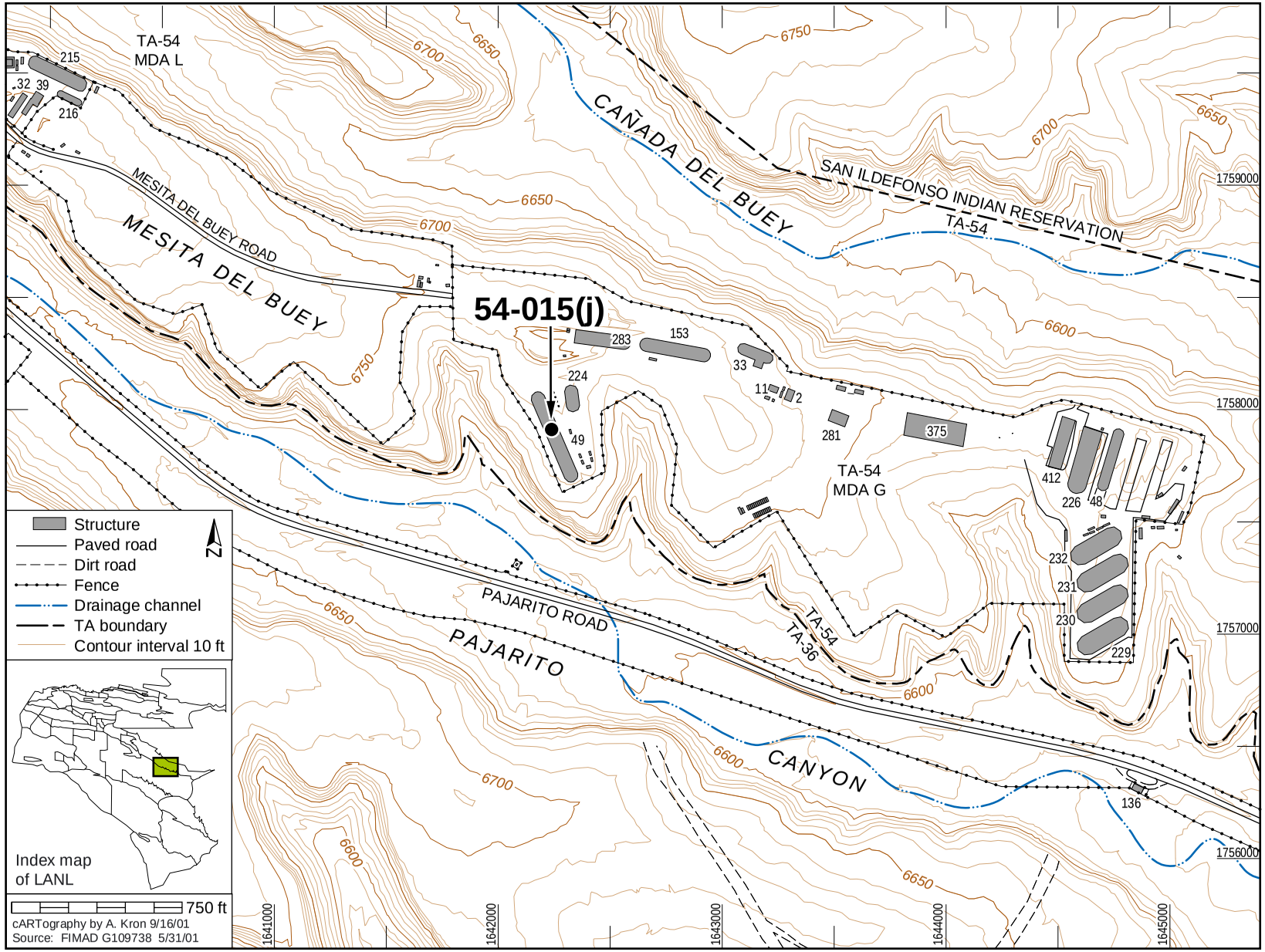
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855



Aerial close-up of AOC 54-015(j)


54-015(j)
TA-54
MDA L
TA-54
MDA G
MESITA DEL BUEY
MESITA DEL BUEY ROAD
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
215
32
39
216
283
153
33
11
2
224
49
281
375
412
226
48
232
231
230
229
136
6750
6700
6650
6600
1759000
1758000
1757000
1756000
1641000
1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-016(b) – Sumps

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Unknown	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-016(b) is a sump at Area G located within the TRU waste drum facility (Building 54-33). The sump was designed to collect wash water from the removal of the corrosion inhibitor that is sprayed on TRU waste drums [see AOC 54-015(a)]; however, there has never been any release to the sump. This AOC is not listed in Module VIII of LANL'S Hazardous Waste Facility Permit.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

ER Project Sampling Summary

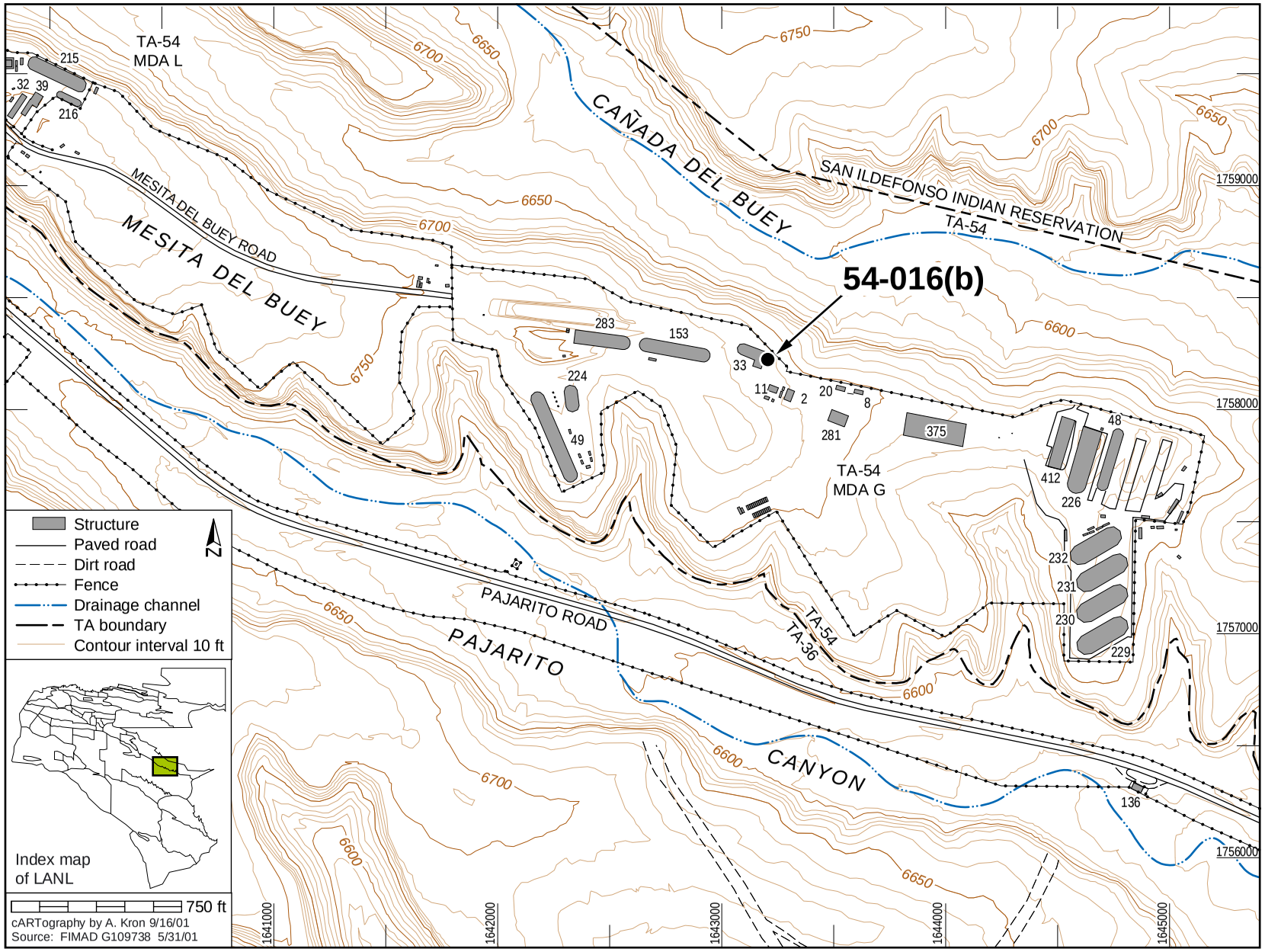
No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of AOC 54-016(b)

View of AOC 54-016(b)


54-016(b)
TA-54
MDA L
TA-54
MDA G
MESITA DEL BUEY
MESITA DEL BUEY ROAD
CAÑADA DEL BUEY
SAN ILDEFONSO INDIAN RESERVATION
TA-54
PAJARITO ROAD
PAJARITO
CANYON
TA-54
TA-36
215
32
39
216
283
153
33
11
2
20
8
281
375
224
49
48
412
226
232
231
230
229
136
6750
6700
6650
6600
1759000
1758000
1757000
1756000
1641000
1642000
1643000
1644000
1645000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109738 5/31/01

AOC 54-021 — Aboveground storage tanks

Administrative Authority	DOE	**Former Operable Unit**	OU 1148
Technical Area	TA-54	**Dates of Operation**	Unknown
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	Unknown	**Other Remedial Action Conducted?**	No

Unit Description

AOC 54-021 is the former location of six aboveground fiberglass oil storage tanks that were located at Area L. Four of the tanks had a capacity of 771 gal. each. The other two tanks had capacities of 5650 gal. and 5086 gal., respectively, and were situated within the dirt berms of former impoundment D at MDA L (for containment purposes). The tanks, which stored waste oil, were pumped out in 1989 and moved from MDA L to MDA G to make room for new facilities. The tanks were closed in 1990 under RCRA regulations, and a closure report was submitted to NMED in 1991. Any associated contaminated soil that may be at Area L will be addressed during closure of the RCRA-permitted surface treatment and storage units currently located on the surface of Area L or during corrective action.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

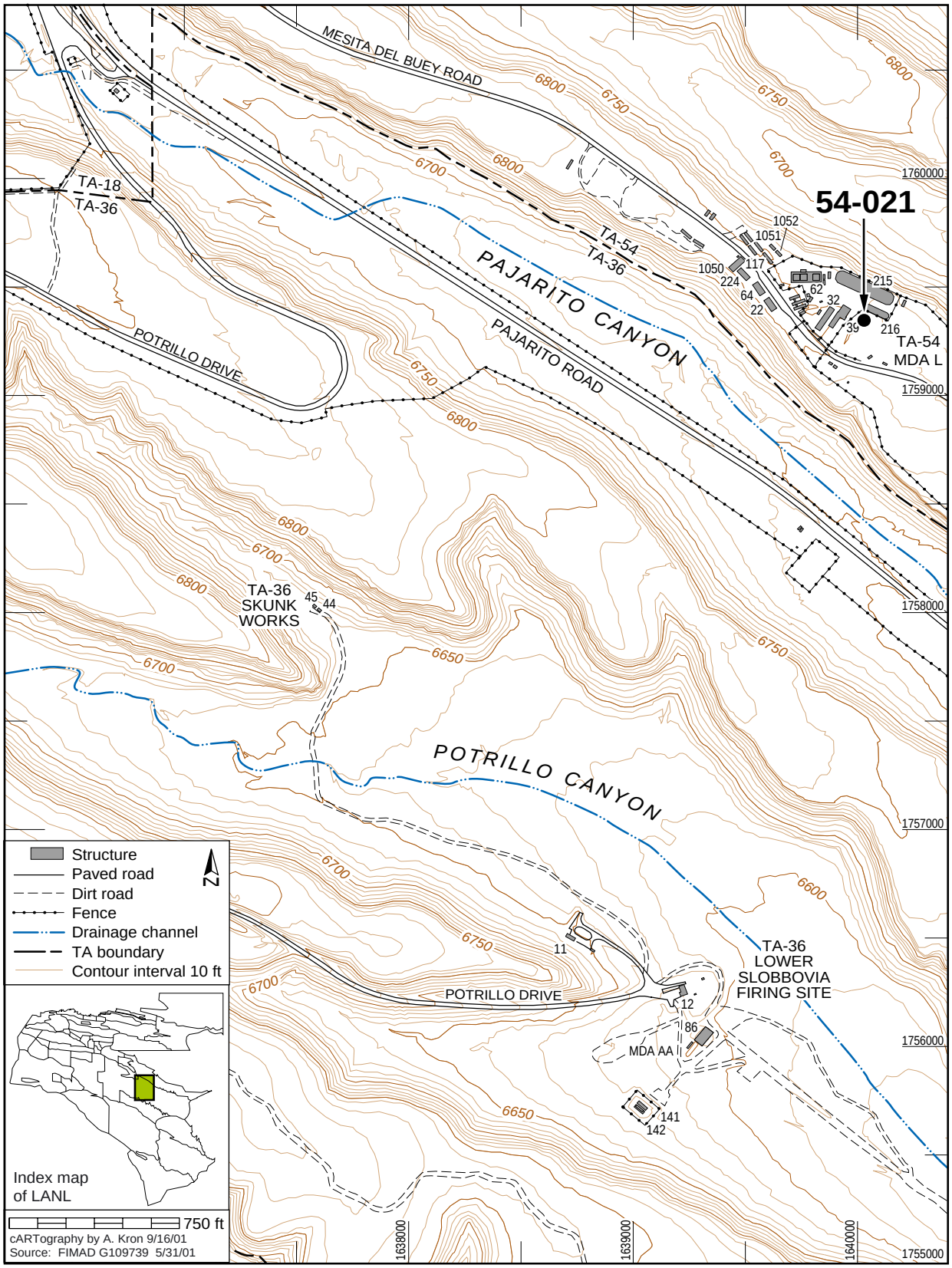
ER Project Sampling Summary

No analytical samples were collected at this site.

References

RFI Status Report for Tritium in Surface Soils at MDA G, in TA-54	LA-UR Number: 97-1308
Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5	LA-UR Number: N/A
Request for Permit Modification, Units Proposed for NFA, March 1995	LA-UR Number: 95-0767
RFI Work Plan for Operable Unit 1148	LA-UR Number: 92-0855

View of AOC 54-021


54-021
MESITA DEL BUEY ROAD
PAJARITO CANYON
PAJARITO ROAD
POTRILLO DRIVE
POTRILLO CANYON
TA-18
TA-36
TA-54
TA-36
TA-54
MDA L
TA-36
SKUNK
WORKS
TA-36
LOWER
SLOBBOVIA
FIRING SITE
MDA AA
1052
1051
1050
117
224
64
22
62
32
39
215
216
45
44
11
12
86
141
142
6800
6750
6700
6650
6600
1760000
1759000
1758000
1757000
1756000
1755000
1638000
1639000
1640000
Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
750 ft
cARTography by A. Kron 9/16/01
Source: FIMAD G109739 5/31/01

5.0 CERTIFICATION

I certify under penalty of law that this document 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
University of California
Operator

8/22/03
Date Signed

Ralph E. Erickson
Manager, Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy
Owner/Operator

8/22/03
Date Signed

6.0 REFERENCES

EPA, 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515," effective date May 19, 1994, U.S. Environmental Protection Agency, Region 6, Hazardous Waste Management Division, Dallas, Texas.

LANL, 2003, “The Solid Waste Management Unit Report,” LA-UR-03-6000, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002a, “Response to Notice of Deficiency: TA-54 Part B RCRA Permit Application; September 1999, Revision 0.1; December 2000, Revision 2.0; Los Alamos National Laboratory EPA ID# NM0890010515,” LA-UR-02-4263, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002b, “Los Alamos National Laboratory General Part A Permit Application,” Revision 3.0, LA-UR-02-5273, August 2002, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002c, “Closure/Post-Closure Plan for the Technical Area 54 Area L Landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D),” LA-UR-02-2304, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002d, “Closure/Post-Closure Plan for the Technical Area 54 Area G Landfill (Pit 29 and Shaft 124),” LA-UR-02-2303, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002e, “Compliance Demonstration with 40 CFR 264, Subparts G and F under Corrective Action Procedures for Material Disposal Area H at Technical Area 54,” LA-UR-02-2174, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2000a, “Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application,” Revision 2.0, December 2000, LA-UR-00-5666, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2000b, “Los Alamos National Laboratory General Part A Permit Application,” Revision 2.0, July 2000, LA-UR-00-4148, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1999a, “Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application,” Revision 0.0, January 1999, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1999b, “Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application,” Revision 0.1, September 1999, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1999c, “Los Alamos National Laboratory Technical Area 54 Part B Permit Renewal Application,” Revision 1.0, December 1999, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1999d, “Los Alamos National Laboratory General Part A Permit Application,” Revision 1.0, November 1999, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998a, "Los Alamos National Laboratory General Part B Permit Application," Revision 1.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998b, "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Westinghouse, 2000, “TRUPACT-II Authorized Methods for Payload Control,” Revision 19, April 2000, Westinghouse TRU Solutions, LLC, Carlsbad, New Mexico.

ATTACHMENT A

FACILITY DESCRIPTION

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
AASHTO	American Association of State Highway and Transportation Officials
CSU	container storage unit
JCI	Johnson Controls World Services, Inc.
LANL	Los Alamos National Laboratory
MLLW	mixed low-level waste
MTRUW	mixed transuranic waste
TA	technical area

ATTACHMENT A
FACILITY DESCRIPTION

The information provided in this attachment is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00]. The following subject areas are addressed in this attachment:

- A general description of Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) [20.4.1 NMAC § 270.14(b)(1)];
- Site-specific traffic patterns, volume, and control [20.4.1 NMAC § 270.14(b)(10)];
- Site-specific location information for compliance with the seismic and floodplain standard requirements [20.4.1 NMAC § 270.14(b)(11), and 20.4.1 NMAC § 264.18(a) and (b)];
- Site-specific topographic map requirements [20.4.1 NMAC § 270.14(b)(19)];
- Site-specific groundwater monitoring and protection information [20.4.1 NMAC § 270.14(c), and 20.4.1 NMAC § 264.90(a)].

A LANL-wide facility description addressing additional regulatory requirements is provided in Appendix A in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B.

A.1 TA-54 GENERAL DESCRIPTION [20.4.1 NMAC § 270.14(b)(1)]

TA-54 is located in the east-central portion of LANL (Figure A-1) on Mesita del Buey, an east-west-trending finger mesa bounded by Cañada del Buey to the north and by Pajarito Canyon to the south. Mesa-top elevations at TA-54 range from approximately 6,400 to 6,650 feet above mean sea level. TA-54 consists of several waste management areas, including Area L, Area G, and TA-54 West, and supporting offices.

The TA-54 hazardous and mixed waste management units addressed in this permit renewal application are located at Area L, Area G, and TA-54 West (Figure A-2).

At Area L, there are two container storage units (CSU) for storage of hazardous waste and/or mixed low-level waste (MLLW). They include the aboveground CSU within the fence and the Storage Shafts CSU (Shafts 36 and 37).

At Area G, there are nine CSUs for storage of hazardous waste, MLLW, and mixed transuranic waste (MTRUW). They include the following:

- Storage Domes 229, 230, 231, and 232, and Pad 9;
- TA-54-412, Storage Dome 226, and Pad 1;
- Storage Dome 48 and Pad 3;
- Pad 10 (former Pads 2 and 4) and the transuranic waste characterization facilities;
- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7;
- Storage Domes 153 and 283, and Pad 6;
- Storage Shed 8;
- TA-54-33, and;
- Storage Dome 375 and Pad 11.

At TA-54 West, there are two CSUs for storage of MLLW and MTRUW in solid form. They include the Indoor CSU and the Outdoor CSU at TA-54-38.

Descriptions of the Area L, Area G, and TA-54 West CSUs are provided in Section 2.0 and Attachment G of this permit renewal application. The locations of these CSUs are shown on Figures 2-1, 2-3, and 2-14 in Section 2.0.

A.2 TRAFFIC PATTERNS [20.4.1 NMAC § 270.14(b)(10)]

General traffic pattern information, traffic volumes, and traffic control signals for the LANL-wide facility are provided in Appendix A of the LANL General Part B.

A.2.1 Routes of Travel

The primary traffic routes used to transport hazardous and mixed waste to TA-54 include Pajarito Road, Diamond Drive, and West Jemez Road (State Road 501) (see Map 1 in the most recent version of the “Los Alamos National Laboratory General Part A Permit Application” [hereinafter referred to as the LANL General Part A]). Within TA-54, waste is transported along Mesita del Buey Road to TA-54 West, Area L, or Area G (Figure A-2).

A.2.2 Traffic Volumes

Traffic volumes on Mesita del Buey Road are generally light to moderate. A traffic study was conducted in 1993 at the intersection of Pajarito Road and Rex Drive, which immediately joins Mesita del Buey Road. Based on this study, the Pajarito Road and Rex Drive intersection had a volume of 380 vehicles turning off of Pajarito Road between 6:30 and 9:00 in the morning (Johnson

Controls World Services, Inc. [JCI], 1993). Vehicle types are generally cars, light- and medium-duty trucks, and vans. Flatbed trucks or trailers also use Mesita del Buey Road to transport waste containers.

A.2.3 Traffic Control Signals

Traffic control signals within TA-54 include stop signs, posted speed limits, caution lights, and other traffic and pedestrian control signs. The locations of existing signs at TA-54 are shown on Figure A-3.

A.2.4 Road Surfacing and Load-Bearing Capacity

Roads within TA-54 are generally two-lane roads with asphaltic-concrete surfaces. Load-bearing capacity for these roads is 32,000 pounds per axle. These roads are typically constructed with a 6-inch-thick base overlain with a 3-inch-thick asphaltic-concrete surface. These roads were designed and constructed to meet the American Association of State Highway and Transportation Officials (AASHTO) specification HS-20 (AASHTO, 1996). In TA-54, Area G, road surfaces consist of asphaltic-concrete, graded gravel, and/or dirt.

A.3 LOCATION INFORMATION [20.4.1 NMAC § 270.14(b)(11)]

A.3.1 Seismic Standard [20.4.1 NMAC § 270.14(b)(11)(i and ii) and 20.4.1 NMAC § 264.18(a)]

The hazardous and mixed waste management units at TA-54, Areas L and G, are exempt from the seismic standards in 20.4.1 NMAC § 270.14(b)(11), and 20.4.1 NMAC § 264.18(a) [6-14-00], because these units or the interim status storage capacity existed prior to January 25, 1985, and July 25, 1990, when the State of New Mexico received hazardous and mixed waste authorization, respectively. The mixed waste management units at TA-54 West are exempt from the seismic standards in 20.4.1 NMAC § 270.14(b)(11), and 20.4.1 NMAC § 264.18(a) [6-14-00], because this unit existed prior to July 25, 1990 when the State of New Mexico received mixed waste authorization. Consistent with the criteria provided in 20.4.1 NMAC § 270.14(b)(11)(i), and 20.4.1 NMAC § 264.18(a) [6-14-00], the waste management units at TA-54 existed prior to the effective date of regulations or were approved under interim status; thus, the seismic standards are not applicable.

A.3.2 Floodplain Standard [20.4.1 NMAC §§ 270.14(b)(11)(iii through v) and 270.14(b)(19)(ii); 20.4.1 NMAC § 264.18(b)]

The hazardous and mixed waste management units at TA-54 are located on a mesa top, Mesita del Buey. In accordance with 20.4.1 NMAC § 270.14(b)(11)(iii through v) [6-14-00], the hazardous and mixed waste management units at TA-54 are not located within the 100-year floodplain boundary. Additional floodplain information is provided in Appendix A of the LANL General Part B.

A.4 TOPOGRAPHIC MAPS [20.4.1 NMAC § 270.14(b)(19)]

Topographic maps and figures are provided herein or referenced to meet the requirements of 20.4.1 NMAC § 270.14(b)(19) [6-14-00]. The maps clearly show the map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- LANL-wide 100-year floodplain maps were provided as Appendix C of the "Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application; General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM0890010515" (LANL, 2001).
- Maps showing surface waters, including intermittent streams, near TA-54 are included as Figures 2-1, 2-3, and 2-14 in Section 2.0 of this permit renewal application.
- Surrounding land uses are shown on Map 1 in the LANL General Part A.
- Wind roses for TA-54 are shown on Figures A-4 and A-5.
- A map showing the legal boundaries of LANL (including TA-54) is provided as Map A-2 in the LANL General Part B.
- Access control features at TA-54 (e.g., fences, gates) are shown on Figures 2-1, 2-3, and 2-14 in Section 2.0 of this permit renewal application.
- The locations of buildings, hazardous and/or mixed waste management units and structures, and loading and unloading areas at TA-54 are shown on Figures 2-1, 2-3, and 2-14 in Section 2.0 of this permit renewal application.
- A map showing National Pollutant Discharge Elimination System discharge structure locations is included in the LANL General Part A.
- Storm, sanitary, and process sewer systems at LANL are shown on Map A-1 of the LANL General Part B.

- Drainage control features (e.g., run-on/runoff, drainage barriers) are shown on Figures 2-1, 2-3, and 2-14 of this permit renewal application.

- Fire stations serving LANL and the County of Los Alamos are shown on Figure E-2 of Appendix E in the LANL General Part B.

- The equipment cleanup area for LANL is located at TA-50-1. The location of TA-50-1 is shown on Figure 50-1 in the LANL General Part A.

Contour lines on all topographic maps are in intervals sufficient to detail natural drainage at LANL and in the vicinity of the waste management units. As provided in 20.4.1 NMAC § 270.14(b)(19) [6-14-00], LANL has submitted the maps to the New Mexico Environment Department at these scales and contour intervals due to the size of the waste management units, the extent of the LANL facility, and the topographic relief in the area.

A.5 GROUNDWATER MONITORING [20.4.1 NMAC § 270.14(c) and 20.4.1 NMAC § 264.90(a)]

Groundwater monitoring information is provided in Appendix A of the LANL General Part B.

A.6 OTHER PERMIT ACTIVITIES

Other types of Resource Conservation and Recovery Act permits include, but are not limited to, the following;

- Permits by Rule
- Emergency Permits
- Hazardous Waste Incinerator Permits
- Permits for Land Treatment Demonstrations Using Field Test or Laboratory Analyses
- Interim Permits for Underground Injection Control Program Wells
- Research, Development, and Demonstration Permits
- Permits for Boilers and Industrial Furnaces Burning Hazardous Waste.

Currently, none of these permit types are relevant for operations at TA-54.

A.7 REFERENCES

AASHTO, 1996, “Standard Specifications for Highway Bridges,” 16th Edition, American Association of State Highway and Transportation Officials.

JCI, 1993, “Conceptual Study Report for Entrances to TA-54 at Pajarito Road and Rex Drive, at New Intersection Between TA-51 and TA-54 West, and at TA-54, Area G, Dirt Road Connecting Pajarito Road to Waste Site on Top of Mesa,” JCI 93-128, Johnson Controls World Services, Inc., Design Department, Los Alamos, New Mexico.

LANL, 2001, "Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application: General Part A, April 1998, Revision 0.0; General Part B, October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM0890010515," LA-UR-01-6054, Los Alamos National Laboratory, Los Alamos, New Mexico.

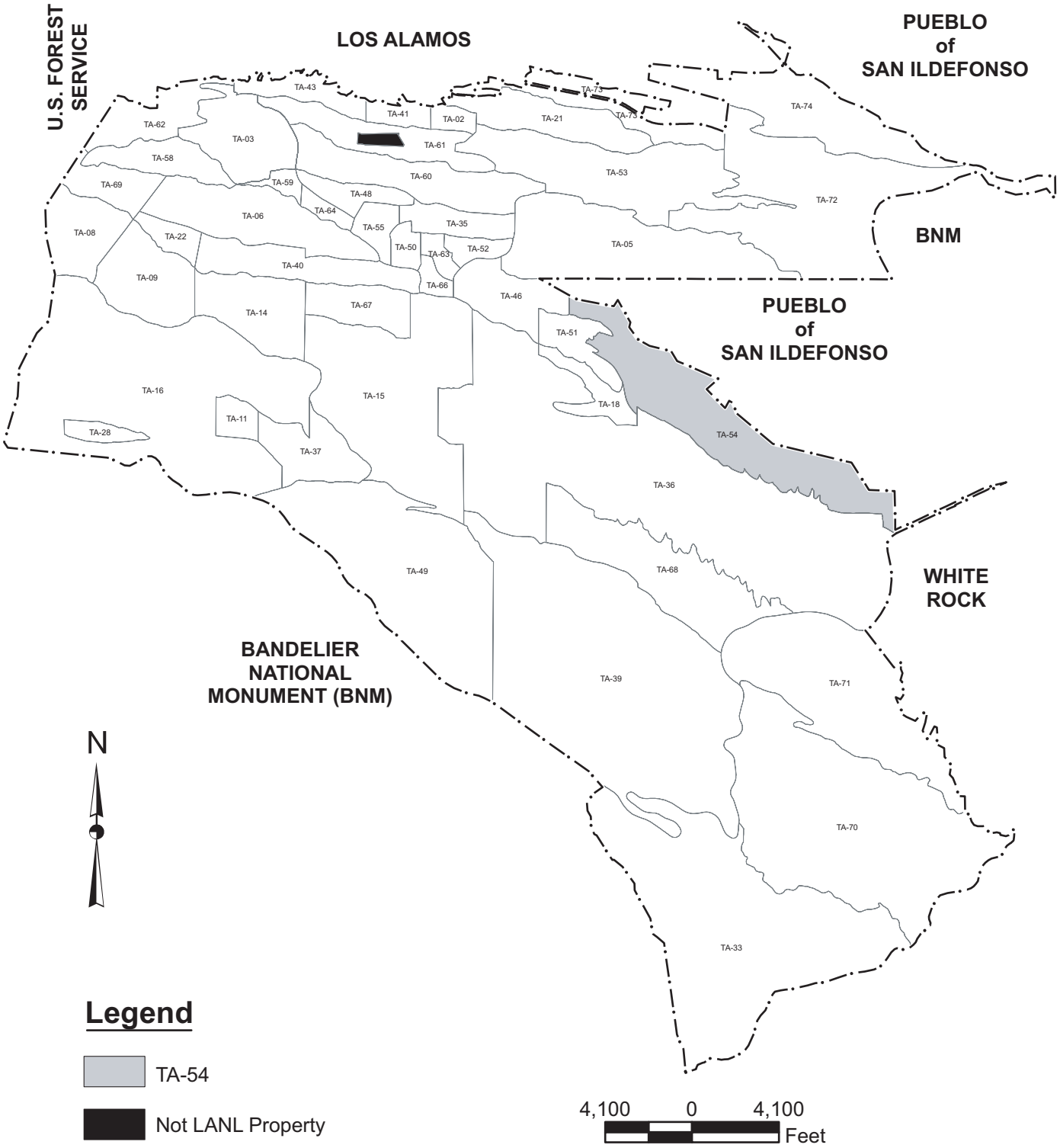

Figure A-1

Location Map of Technical Area (TA) 54 at Los Alamos National Laboratory

State Plane Coordinate System New Mexico Central Zone North American Datum 1983 (ft)

Disclaimer: Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, including the warranties of merchantability and fitness for a particular purpose, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.

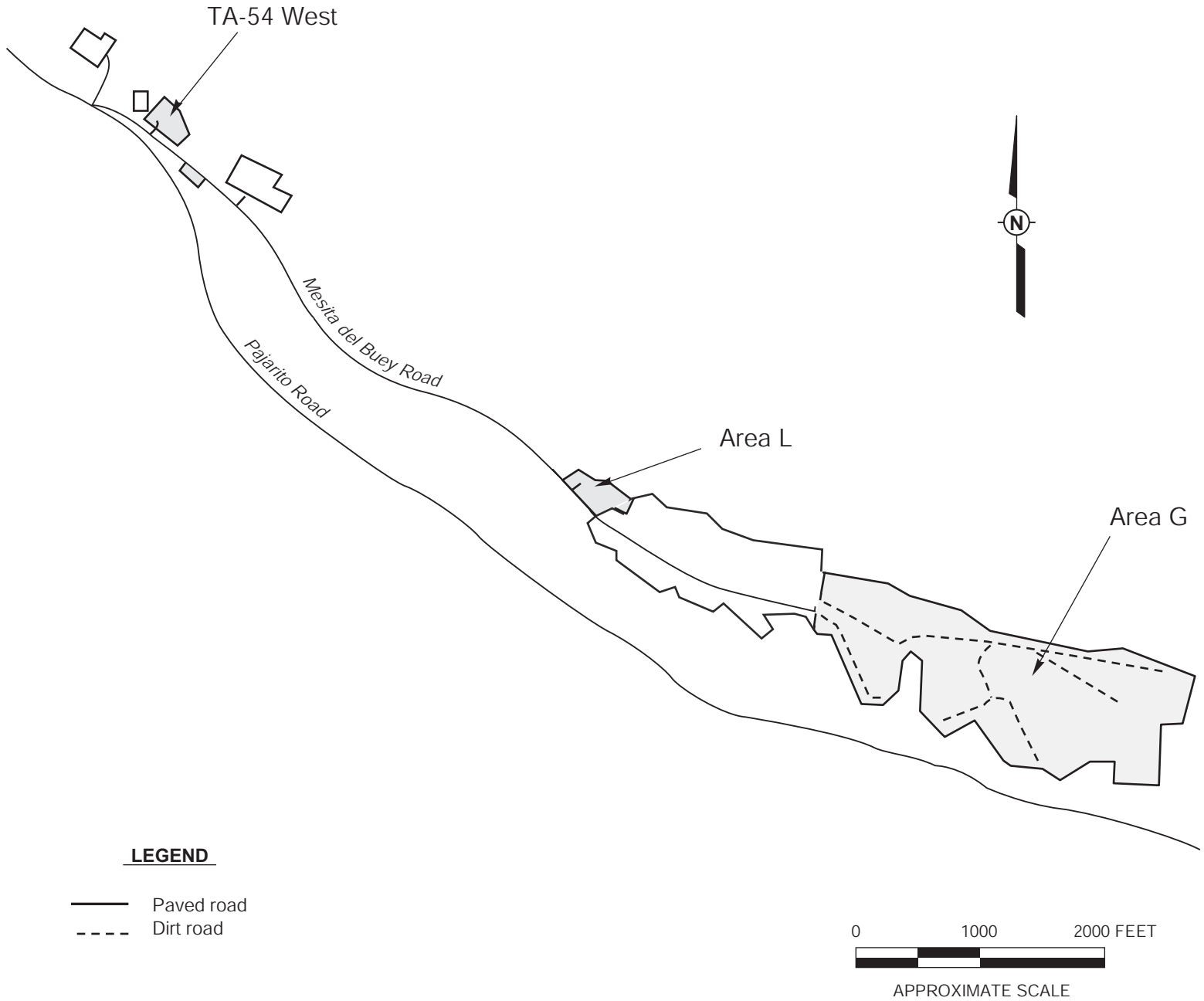

Figure A-2
Technical Area (TA) 54 Location Map of Area L, Area G, and TA-54 West

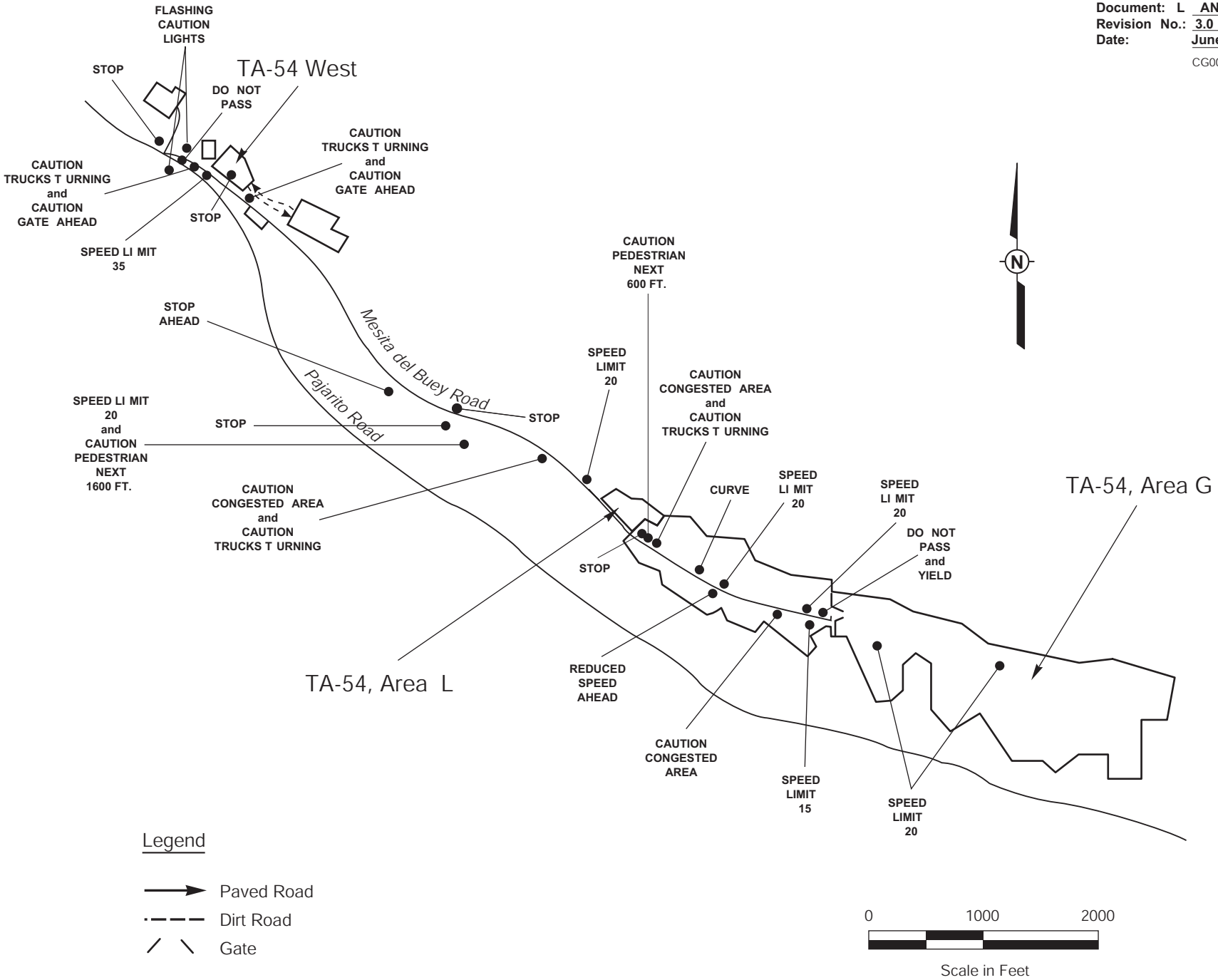

Figure A-3
Location Map of Traffic Control Signs in Technical Area (TA) 54

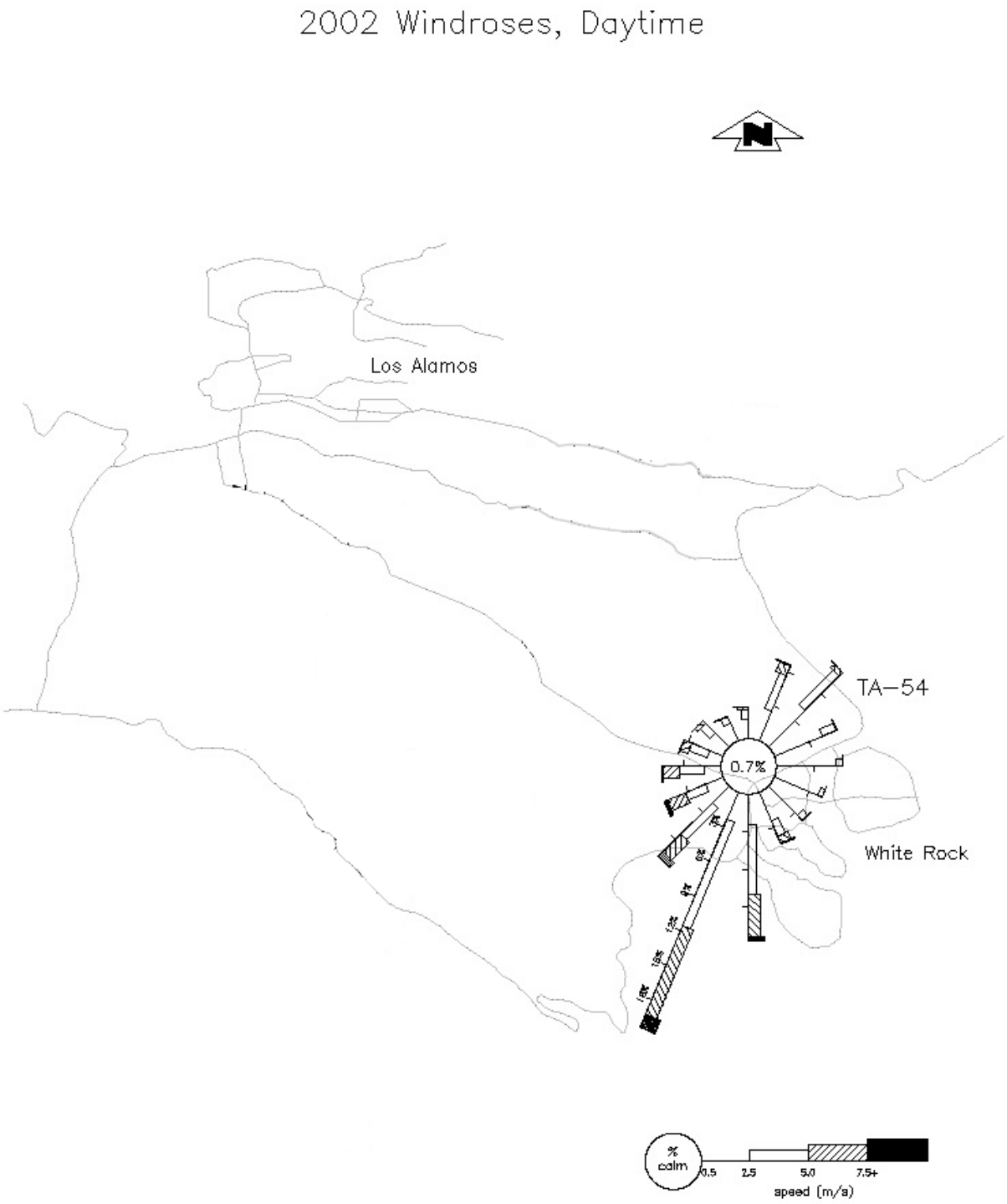

Figure A-4

Annual Wind Roses for Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) – Day

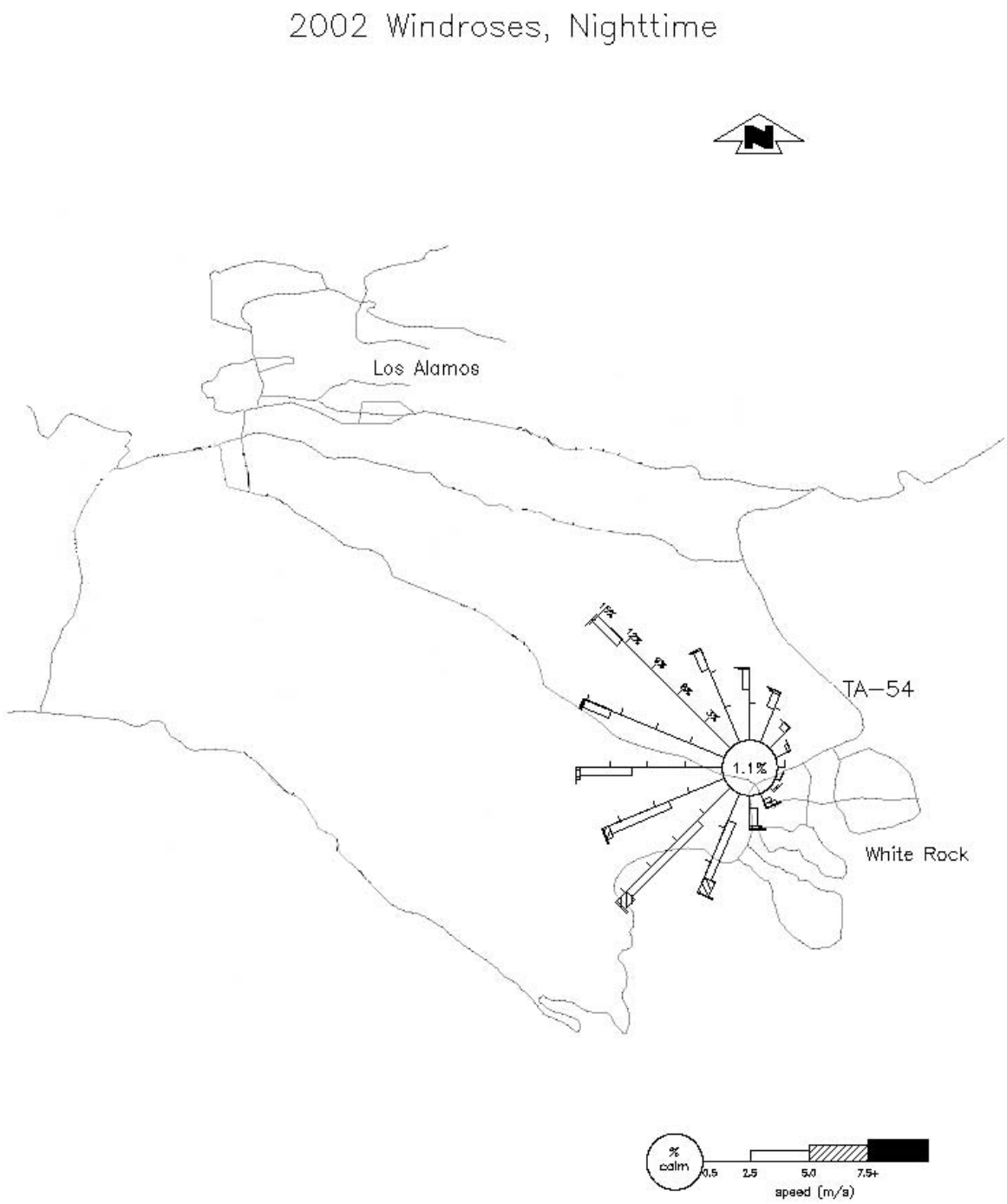

Figure A-5

Annual Wind Roses for Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) – Night

ATTACHMENT B

WASTE ANALYSIS PLAN

ATTACHMENT B
WASTE ANALYSIS PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), § 270.14(b)(2); 20.4.1 NMAC § 264.13; and 20.4.1 NMAC § 268.7, revised June 14, 2000, waste analysis requirements for hazardous and/or mixed wastes managed at Technical Area 54 are addressed in Appendix B in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT C

INSPECTION PLAN

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CFR	Code of Federal Regulations
LANL	Los Alamos National Laboratory
m^3	cubic meters
ppmw	parts per million by weight
TA	technical area
TRU	transuranic
TRUPACT-II	Transuranic Package Transporter-II

ATTACHMENT C
INSPECTION PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), § 270.14(b)(5), and 20.4.1 NMAC § 264.15, revised June 14, 2000 [6-14-00], inspection requirements for all hazardous and/or mixed waste management units at Los Alamos National Laboratory (LANL) are addressed in Appendix C of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. This attachment presents additional inspection requirements specific to the container storage units at Technical Area (TA) 54. Inspections will be conducted often enough to identify problems in time to correct them before they harm human health or the environment.

C.1 INSPECTION REQUIREMENTS FOR TRUPACT-II CONTAINERS [20.4.1 NMAC §§ 264.15(b) and 264.174]

Transuranic Package Transporter-II (TRUPACT-II) containers will be used to store transuranic (TRU) and mixed TRU waste containers prior to shipment from TA-54 West to the Waste Isolation Pilot Plant. These double containment, stainless-steel shipping containers are designed to contain up to 14 drums, two rounded-end standard waste boxes, or one ten-drum overpack.

TRUPACT-II containers are intended to store only waste containers of structural integrity. Waste containers will be visually inspected prior to their placement in the TRUPACT-II containers to ensure their integrity. The inspection will include a close examination of the cover and closure devices for visible cracks, holes, gaps, or other open spaces into the interior of the waste container when the cover and closure devices are secured in the closed position. The TRUPACT-II will be loaded with waste containers and sealed with a locking-ring closure mechanism. After the TRUPACT-II has been sealed, only the outside of the TRUPACT-II will be inspected to ensure its integrity and that there has been no human intervention.

C.2 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART CC REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart CC]

The hazardous wastes stored in containers at TA-54 may be subject to 20.4.1.500 NMAC (incorporating the Code of Federal Regulations [CFR], Title 40, Part 264, Subpart CC, "Air Emission Standards for Tanks, Surface Impoundments, and Containers") based on the applicability criteria specified in 40 CFR § 264.1080. Subpart CC standards for containers, as currently set forth by the

U.S. Environmental Protection Agency, require that containers of hazardous waste be covered so that there are no detectable emissions of volatile organic compounds to the air. Inspection and monitoring requirements are also specified.

As indicated in 40 CFR § 264.1080(b)(6), these standards are not currently applicable to containers that are used solely for management of radioactive mixed waste in accordance with all regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act. The standards are also not applicable to containers of hazardous waste with less than 500 parts per million by weight (ppmw) volatile organics, containers of less than 0.1 cubic meters (m^3) (approximately 26 gallons) capacity, or that have received waste prior to the effective date of the regulation (December 6, 1996). The following management standards apply for hazardous wastes managed at LANL that do not meet any of the exemptions listed in 40 CFR §264.1080(b).

LANL requires that Subpart CC requirements be evaluated by the generator as part of the waste characterization process. Generator information is used to determine whether the concentration of volatile organics in a waste stream at the point of generation is equal to or greater than 500 ppmw, which is the threshold concentration for Subpart CC requirements. The generator documents this determination for that waste stream. In the event that this information is not available, the waste will be characterized in accordance with Appendix B of the LANL General Part B prior to being received by TA-54. Any hazardous waste that is newly-generated through the treatment or re-characterization of mixed waste at TA-54 will be characterized for the volatile organic content in accordance with Appendix B.

Three levels of air emission controls based on container design capacity are established in 40 CFR § 264.1086(b). TA-54 hazardous waste storage procedures require Level 1 controls based upon container design capacities. Containers of greater than 0.1 m^3 and less than 0.46 m^3 (approximately 119 gallons) capacity and that meet U.S. Department of Transportation specifications under 49 CFR, Part 178, are kept closed during storage pursuant to 40 CFR § 264.1086(c)(3). Containers undergoing waste characterization activities may be opened for access for the purposes described in 40 CFR § 264.1086(c)(3). As required by 40 CFR § 264.1086(c)(4), these containers are subject to a visual inspection and monitoring program. On or before acceptance of the waste container at TA-54, the container is inspected to check for visible cracks, holes, gaps, or other open spaces into the interior of the container when the cover and closure devices are secured in the closed position, in accordance with 40 CFR § 264.1086(c)(1)(ii). This

inspection is documented in uniform hazardous waste manifests. Pursuant to the Inspection Plan in Appendix C of the LANL General Part B, the containers are inspected weekly at TA-54 to ensure that the containers remain closed during storage, thereby exceeding the monthly inspection requirements of 40 CFR § 264.1086(c)(4)(ii).

ATTACHMENT D

PERSONNEL TRAINING PLAN

ATTACHMENT D

PERSONNEL TRAINING PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), § 270.14(b)(12), and 20.4.1 NMAC § 264.16, revised June 14, 2000, training requirements for workers who manage hazardous or mixed waste at Technical Area 54 are addressed in Appendix D of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT E

CONTINGENCY PLAN

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ATTACHMENT E
CONTINGENCY PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart V, Part 264, Subpart D, and 20.4.1 NMAC § 270.14(b)(7), revised June 14, 2000, contingency measures applicable to the hazardous and mixed waste management units at Technical Area (TA) 54 are provided in Appendix E of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

Listings of emergency equipment currently available for use at Area L, Area G, and TA-54 West are presented in Tables E-1 through E-3. Figures E-1 and E-2 show evacuation routes and muster areas that may be used at TA-54 in the event of an emergency. Emergency equipment, evacuation routes, and muster area locations are subject to change.

Table E-1

Emergency Equipment at Technical Area (TA) 54, Area L[a]

FIRE CONTROL EQUIPMENT:

Halon, water, dry chemical, and/or carbon dioxide fire extinguishers are available at TA-54-37, TA-54-60, TA-54-51, TA-54-32, TA-54-39, the southeast end of Area L, TA-54-31, 30 feet from the southeast side of TA-54-32, TA-54-117, TA-54-62, on the forklift and Bobcat operating in Area L, TA-54-68, TA-54-69, TA-54-70, TA-54-185, TA-54-215, and TA-54-221.

A dry-pipe sprinkler system is located at TA-54-215.

Dry chemical fire-suppression systems are located in the storage sheds.

Description of General Capabilities:
Fire extinguishers may be used by any qualified employee in the event of a small fire. The automatic dry-pipe sprinkler system is heat activated. Protection Technology Los Alamos (PTLA) and the Los Alamos County Fire Department (LACFD) are alerted when this system has been activated.

Fire alarm pull boxes are located inside TA-54-37, TA-54-39, TA-54-51, TA-54-60, TA-54-117, TA-54-210, and TA-54-221.

Description of General Capabilities:
Fire alarms may be activated by any employee in the event of a fire to notify the LACFD and PTLA.

There are fire hydrants located near TA-54-37 and the southeast corner of TA-54-62. These fire hydrants supply water at an adequate volume and pressure to satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart V, 264.32, revised January 1, 1997.

A freeze-proof faucet is located approximately 25 feet east of TA-54-31.

SPILL CONTROL EQUIPMENT:

Shovels (located in TA-54-46)
Oversized drums (various locations on site)
Absorbent (various locations on site)

Spill kits are located throughout Area L. Each kit includes bags of Zorball, caustic neutralizer, acid neutralizer, and an inventory of tools and supplies.

Refer to footnotes at end of table.

Table E-1 (Continued)

Emergency Equipment at Technical Area (TA) 54, Area L[a]

COMMUNICATION EQUIPMENT:

Telephones are located in TA-54-32, TA-54-37, TA-54-51, TA-54-60, TA-54-62, TA-54-117, TA-54-185, TA-54-210, TA-54-211, and TA-54-221.

Paging phones and evacuation alarms are located at the northeast end of TA-54-32, the exterior west end of TA-54-215, at TA-54-37, and at TA-54-62.

Additional equipment includes two-way radios and portable telephones.

Description of General Capabilities:
The evacuation alarm is a pulsating sound that can be heard throughout Area L. The fire alarm is a double slow-whoop sound.

DECONTAMINATION EQUIPMENT:

Emergency shower and eyewash stations are located immediately east of TA-54-31, at TA-54-215, at TA-54-35, and at TA-54-39.

Material Safety Data Sheets (MSDS) are available in TA-54-46.

Description of General Capabilities:
Emergency shower and eyewash stations are used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs for the chemical(s) should be obtained prior to working with hazardous or mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Personnel at Area L are required to use appropriate personal protective equipment (PPE) to protect themselves from the hazards found in the workplace under normal conditions. This PPE may include gloves, steel-toed shoes, and safety glasses. Additional PPE may be required during an unusual hazardous situation or during sampling and can be found in the spill kits or at TA-54-50.

Self-contained breathing apparatus are located in TA-54-50.

Gloves, goggles, safety glasses, coveralls, and face shields are found in the spill kits located throughout Area L.

---

[a]Equipment types and locations are subject to change.

Table E-2

Emergency Equipment at Technical Area (TA) 54, Area G[a]

FIRE CONTROL EQUIPMENT:

Halon, water, and/or carbon dioxide fire extinguishers are available at TA-54-2, TA-54-8, TA-54-11, TA-54-20, TA-54-33, TA-54-48, TA-54-49, TA-54-92, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, and TA-54-412.

Description of General Capabilities:
Fire extinguishers may be used by any qualified employee in the event of a small fire. For larger fires, Protection Technology Los Alamos (PTLA) and the Los Alamos County Fire Department (LACFD) are alerted.

Dry-chemical fire suppression systems are available at TA-54-1027, TA-54-1028, TA-54-1030, and TA-54-1041.

A dry-pipe fire suppression system is available at TA-54-412.

Fire alarm pull stations are available at TA-54-2, TA-54-11, TA-54-33, TA-54-48, TA-54-49, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-273, TA-54-283, TA-54-375, and TA-54-412.

Description of General Capabilities:
Fire alarms may be activated by any employee in the event of a fire to notify the LACFD and PTLA.

Several fire hydrants are located in Area G. These fire hydrants will supply water at an adequate volume and pressure to satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 264.32, revised June 14, 2000.

SPILL CONTROL EQUIPMENT:

Spill control stations and/or portable spill kits are located at TA-54-8, TA-54-11, TA-54-20, TA-54-33, TA-54-48, TA-54-49, TA-54-92, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, and TA-54-412.

Each spill kit generally includes bags of Zorball and an inventory of tools and supplies.

Refer to footnotes at end of table.

Table E-2 (Continued)

Emergency Equipment at Technical Area (TA) 54, Area G[a]

COMMUNICATION EQUIPMENT:

Pole-mounted paging telephones are located near TA-54-33, TA-54-48, TA-54-49, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, and TA-54-283, inside TA-54-2, and at TA-54-11, and TA-54-412.

Evacuation alarm buttons are located at or near TA-54-2, TA-54-11, TA-54-33, TA-54-48, TA-54-49, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, TA-54-412, and at various muster stations.

Additional equipment includes portable two-way radios located at muster stations.

Description of General Capabilities:
Telephones and alarms are located throughout Area G. Paging telephones are equipped with public address capabilities. Evacuation alarms have horns mounted on telephone poles throughout Area G. The evacuation alarm is a high-pitched wailing sound that can be heard throughout Area G.

DECONTAMINATION EQUIPMENT:

Portable eyewash stations equipped with first aid kits are located in TA-54-33, TA-54-224, and TA-54-412.

One permanent, hard-plumbed eyewash station and a safety shower are located in TA-54-33.

Material Safety Data Sheets (MSDS) and waste characterization documentation are available in the event of an exposure.

Description of General Capabilities:
Emergency shower and eyewash stations are used by personnel who receive a chemical splash to the skin or eyes. Specific MSDSs for the chemical(s) should be obtained prior to working with hazardous or mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Personnel at Area G are required to use appropriate personal protective equipment (PPE) to protect themselves from the hazards found in the workplace under normal conditions. This PPE may include gloves, steel-toed shoes, and safety glasses. Additional PPE may be required during an unusual hazardous situation and can be found in the spill kits or at various locations listed below.

Gloves and goggles or safety glasses are available in the spill kits located at TA-54-8, TA-54-11, TA-54-20, TA-54-33, TA-54-48, TA-54-49, TA-54-92, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, and TA-54-412.

Refer to footnotes at end of table.

Table E-2 (Continued)

Emergency Equipment at Technical Area (TA) 54, Area G[a]

OTHER:

Continuous air monitors and giraffe monitors (or other appropriate air monitoring equipment) are located in TA-54-33, TA-54-48, TA-54-49, TA-54-153, TA-54-224, TA-54-226, TA-54-229, TA-54-230, TA-54-231, TA-54-232, TA-54-283, TA-54-375, TA-54-412, TA-54-1027, and TA-54-1028 for detection of airborne radioactive constituents.

Heavy equipment available on site includes:
- Scraper
- Bulldozer
- Front-end loader

Portable emergency generators

Vehicles available to evacuate personnel from Area G include:
- All-terrain vehicles
- Pickup truck
- Flat-bed truck
- Daihatsu vehicles
- Vans

[a]Equipment types and locations are subject to change.

Table E-3

Emergency Equipment at Technical Area (TA) 54 West[a]

FIRE CONTROL EQUIPMENT:

Halon fire extinguishers are available at TA-54-38 in the high and low bays and at the outdoor container storage unit.

Description of General Capabilities:
Fire extinguishers may be used by any employee in the event of a small fire. Protection Technology Los Alamos (PTLA) and the Los Alamos County Fire Department (LACFD) are alerted when the automatic dry-pipe sprinkler system has been activated.

A dry-pipe sprinkler system is available throughout TA-54-38, including the loading dock area. The dry-pipe sprinkler system is heat activated in the high bay and at the loading dock. It is smoke activated in the low bay.

Fire alarm pull boxes are available inside TA-54-38 at the main entrance, in the high bay, and in the low bay.

Description of General Capabilities:
Fire alarms may be activated by any employee in the event of a fire to notify the LACFD and PTLA.

A fire hydrant is located approximately 220 feet west of TA-54-38 near the entrance to TA-54 West. This fire hydrant supplies water at adequate volume and pressure to satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, § 264.32, revised June 14, 2000.

A wall hydrant is located on the northwest side of TA-54-38.

Freeze-proof faucets are located on the northwest, southwest, and southeast sides of TA-54-38.

SPILL CONTROL EQUIPMENT:

A mobile response kit is located at TA-54-38. The kit includes sorbent socks, pillows, and sheets; goggles; and large plastic bags.

COMMUNICATION EQUIPMENT:

Telephones with public address (PA) capabilities are located in TA-54-38 in the high bay, in the low bay, and outside the main entrance. An emergency telephone is also located outside the main entrance.

Description of General Capabilities:
Telephones with PA capabilities for internal and external communication are available for use by any employee. The evacuation alarm is a high-pitched wailing sound that can be heard throughout TA-54-38 and TA-54-34. The fire alarm is a double slow-whoop sound. Fire and evacuation alarms are activated in the event of a fire or evacuation.

Refer to footnotes at end of table.

Table E-3 (Continued)

Emergency Equipment at Technical Area (TA) 54 West[a]

DECONTAMINATION EQUIPMENT:

Safety showers and eyewash stations are located in TA-54-38 in the high bay and on the loading dock.

Material Safety Data Sheets (MSDS) are located at the TA-54-38 muster area (approximately 120 feet northwest of TA-54-38) and in the TA-54-38 main entry area.

Description of General Capabilities:
Safety showers and eyewashes are used by personnel who receive a chemical splash to the skin or to the eyes. Specific MSDSs for the chemical(s) being managed should be obtained prior to working with mixed waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Personnel at TA-54 West are required to use appropriate personal protective equipment (PPE) to protect themselves from the hazards found in the workplace under normal conditions. This PPE includes gloves, steel-toed shoes, and safety glasses. Additional PPE may be required during an unusual hazardous situation and can be found in the spill kits.

Gloves, goggles, safety glasses, coveralls, and face shields are found in the spill kits located at TA-54-38.

All workers located within the operating limits of a crane (fixed or mobile) wear hard hats.

[a]Equipment types and locations are subject to change.

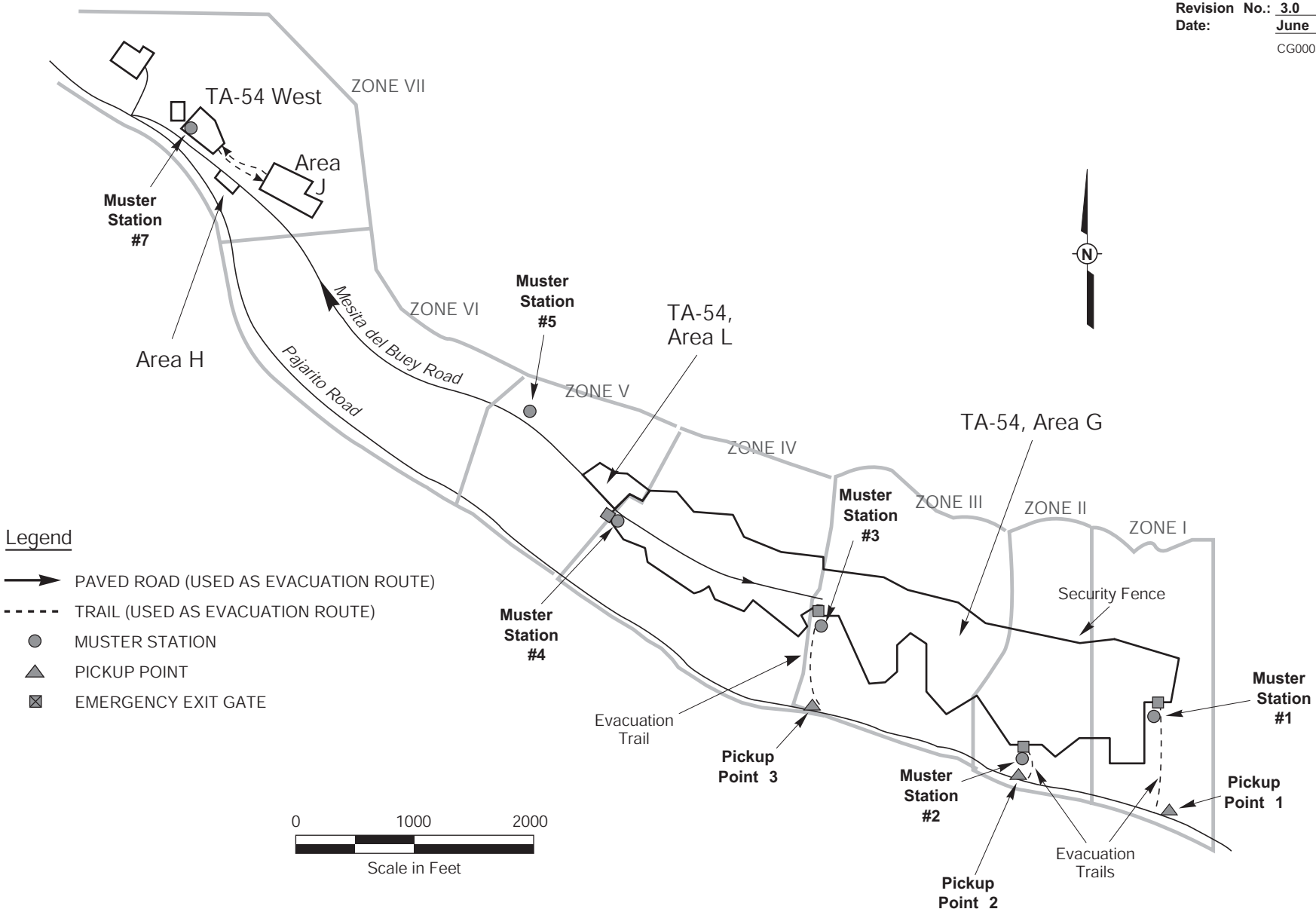
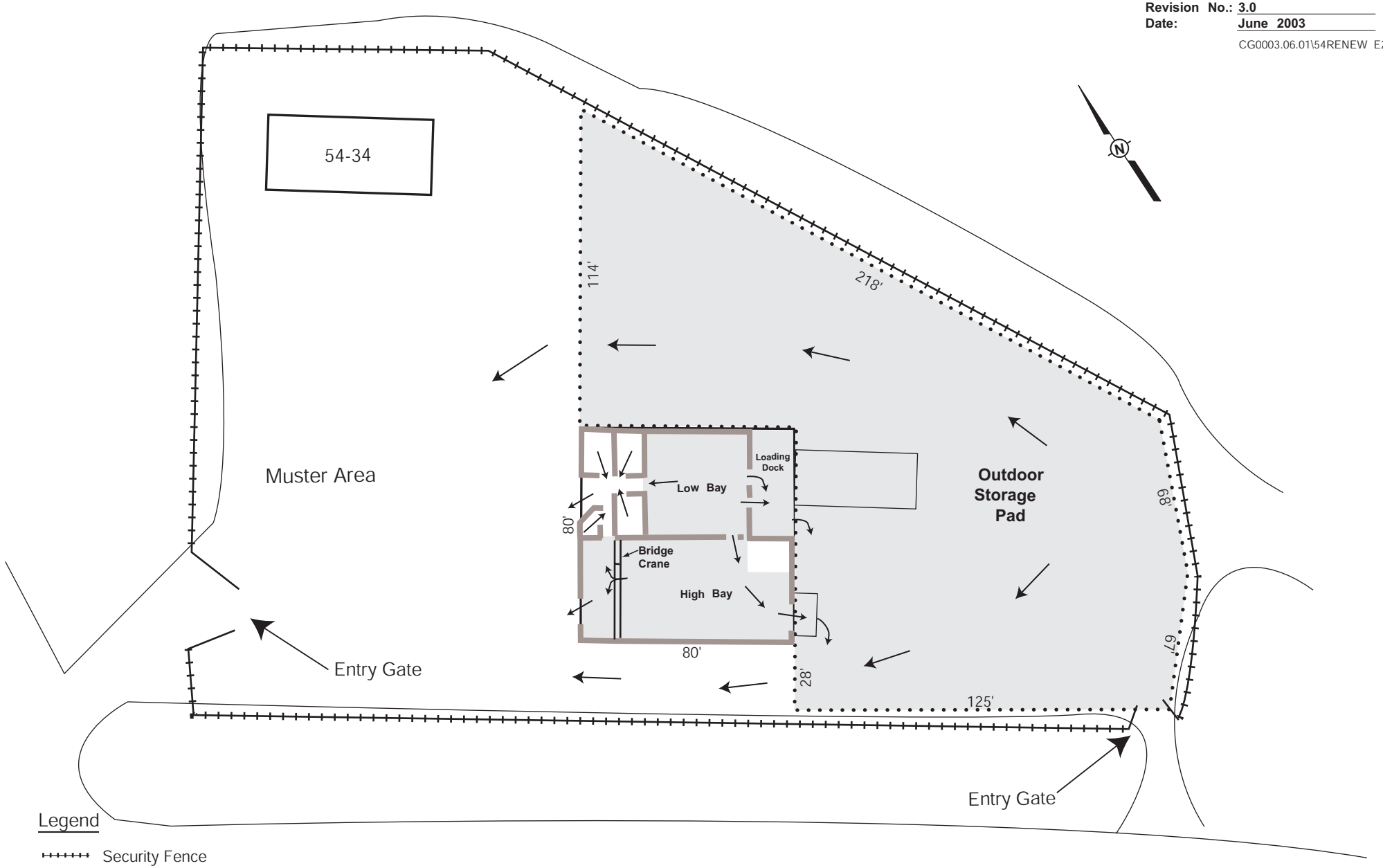


Figure E-1

Evacuation Roads, Trails, and Zones; Emergency Exit Gates; Muster Stations; and Pickup Points at Technical Area (TA) 54



Legend

- Security Fence
- Gate
- Outdoor Storage Pad Boundary
- TA-54 West Container Storage Units

NOT TO SCALE

Figure E-2
Evacuation Routes at Technical Area (TA) 54 West

ATTACHMENT F

CLOSURE PLAN FOR TECHNICAL AREA 54 CONTAINER STORAGE UNITS

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ASTM	American Society for Testing and Materials
COPC	contaminant of potential concern
CSU	container storage unit
DOE/NNSA	U.S. Department of Energy, National Nuclear Security Administration
D&D	decontamination and decommissioning
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
m^3	cubic meters
MLLW	mixed low-level waste
MSDS	Material Safety Data Sheet
MTRUW	mixed transuranic waste
NMED	New Mexico Environment Department
PPE	personal protective equipment
QA/QC	quality control/quality assurance
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SW-846	"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
SWRC	Solid Waste Regulatory Compliance Group
TA	technical area

ATTACHMENT F
CLOSURE PLAN FOR TECHNICAL AREA 54
CONTAINER STORAGE UNITS

The information provided in this closure plan addresses the applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(13), revised June 14, 2000 [6-14-00], and 20.4.1 NMAC, Subpart V, Part 264, Subparts G, H, and I [6-14-00]. This closure plan describes the activities necessary to close the container storage units (CSU) at Los Alamos National Laboratory (LANL) Technical Area (TA) 54.

Closure of the TA-54 CSUs will involve removal or decontamination of hazardous wastes and hazardous waste residues after the active storage period for the CSUs. Closure activities will include removal of any remaining waste, decontamination or removal of contaminated equipment and the unit structure, and verification that all residues have been removed. In the event that closure by removal and decontamination for a CSU cannot be met, the closure plan will be modified to include alternative decontamination demonstrations or alternative closure requirements, as necessary. Closure activities will minimize the need for further maintenance, preclude the release of hazardous waste or hazardous constituents to environmental media, and be protective of human health.

This closure plan will be used to provide guidance and permit conditions for the partial closure of all the CSUs at TA-54, which include the CSUs at Area L, Area G, and TA-54 West. There are several types of CSUs at TA-54 that meet various storage requirements, both by waste type and different waste management programs. Closure of the TA-54 CSUs will occur separately and over the active life of the TA-54 facility, which is not anticipated to end before 2050. There is a high potential that decontamination procedures, analytical verification procedures, and the environmental characterization of TA-54 will change and improve over the active life of the facility. Therefore, this closure plan describes the general closure activities for the different types of storage structures at TA-54 and establishes the procedure of submitting a separate detailed TA-54 CSU-specific sampling and analysis plan (SAP) to the New Mexico Environment Department (NMED) for approval at the time of closure for each CSU. The SAP will provide the required level of detail to assure that closure performance standards are met, consistent with the appropriate decontamination and verification requirements existing at the time of closure.

This plan is organized as follows:

- General closure information (Section F.1)
- Description of the TA-54 CSUs (Section F.2)
- Closure procedures for the TA-54 CSUs (Section F.3)
- Sampling and analysis plan (Section F.4)

Until closure is complete and certified in accordance with 20.4.1 NMAC § 264.115 [6-14-00], as discussed in Section F.1.6, a copy of the approved closure plan and any approved revisions will be on file at LANL's Solid Waste Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy National Nuclear Security Administration (DOE/NNSA) Los Alamos Site Office (LASO).

F.1 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13) and 20.4.1 NMAC, Subpart V, Part 264, Subparts G, H, and I [6-14-00], as applicable.

F.1.1 Closure Performance Standard [20.4.1 NMAC § 264.111]

The TA-54 CSUs will be closed to meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and I [6-14-00].

F.1.2 Partial and Final Closure Activities [20.4.1 NMAC § 264.112(d)]

Partial Resource Conservation and Recovery Act (RCRA) closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. Partial closure at TA-54 will consist of closing one or more of the TA-54 CSUs, while leaving the other units at LANL in operation. Partial closure (hereinafter simply referred to as closure) will be deemed complete when the waste has been removed from the CSU; the CSU and related equipment, structures, and areas have been decontaminated, if necessary; closure by removal and/or decontamination of hazardous waste and hazardous waste residues has been verified; the closure certification has been submitted to the NMED; and the NMED has approved the closure.

Final RCRA closure of the LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each waste management unit, including all previous closures as well as land-based units where closures have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED, and the NMED has approved the final closure.

F.1.3 General Closure Schedule [20.4.1 NMAC §§ 264.112(b)(6), 264.112(e), and 264.113]

Closure of the TA-54 facility is anticipated to occur in the year 2050; however, closure of any TA-54 CSU may occur at any time before then. Written notification will be provided 45 days before the start of closure activities for each TA-54 CSU. However, pursuant to 20.4.1 NMAC § 264.112(e) [6-14-00], removing hazardous wastes and decontaminating or dismantling equipment in accordance with an approved closure plan may be conducted at any time before or after notification of closure. Closure activities will begin according to the requirements of 20.4.1 NMAC § 264.112(d)(2) [6-14-00]. Treatment, removal, or disposal of hazardous wastes will begin in accordance with the approved closure plan, as required by 20.4.1 NMAC § 264.113(a) [6-14-00], within 90 days after final receipt of waste at the hazardous or mixed waste management unit. This timeframe will be met as long as facilities are available for treatment or disposal of these wastes. In the event that closure activities cannot begin at a unit within 90 days, LANL will notify the Secretary of the NMED in accordance with the extension requirements in 20.4.1 NMAC § 264.113(a) [6-14-00]. Closure activities will be completed in accordance with the requirements of 20.4.1 NMAC § 264.113(b) [6-14-00]. Closure will be conducted in accordance with the general schedule presented in Table F-1. Further details regarding the schedule of closure activities on a CSU-specific basis will be included with the TA-54 CSU-specific closure SAP discussed in Section F.4 of this plan. In the event that closure of a CSU is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC § 264.113(b) [6-14-00]. In addition, the demonstrations in 20.4.1 NMAC § 264.113(a)(1) and (b)(1) [6-14-00] will be made in accordance with 20.4.1 NMAC § 264.113(c) [6-14-00].

F.1.4 Amendment of the Closure Plan [20.4.1 NMAC § 264.112(c)]

In accordance with 20.4.1 NMAC § 264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the approved closure plan
- There is a change in the expected year of closure
- Unexpected events occur during closure that require modification of the approved closure plan
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC §§ 264.90(f) and/or 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

F.1.5 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for closure actions.

F.1.6 Closure Certification [20.4.1 NMAC § 264.115]

Within 60 days after completion of closure of each CSU at TA-54 or final closure of the facility, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit or facility has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE/NNSA and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC § 264.115 [6-14-00]. A copy of the

certification and supporting documentation will be maintained by both DOE/NNSA LASO and SWRC.

F.1.7 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the TA-54 CSUs will be maintained by the DOE/NNSA or another authorized federal agency for as long as necessary to prohibit public access. The security fence at the TA-54 boundary will be maintained to ensure that public access into TA-54 is prevented.

F.1.8 Closure Reports

Upon completion of RCRA closure activities at a TA-54 CSU, a closure report will be prepared and provided to the Secretary of the NMED. The report will document closure and contain, for example, the following:

- A copy of the certification described in Section F.1.6
- A general summary of closure activities
- Any significant variance from the approved closure plan and the reason for the variance
- A summary of any sampling data associated with the closure
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data)
- Storage or disposal location of hazardous/mixed waste resulting from closure activities
- A certification of accuracy of the report.

F.1.9 Survey Plat and Post-Closure Requirements [20.4.1 NMAC §§ 264.116 and 264.117 through 264.120]

For closure, LANL intends to remove hazardous waste and associated constituents from the CSU undergoing closure, remove or treat soil contaminated with hazardous wastes or hazardous waste residues resulting from storage operations, and remove or decontaminate structures and equipment contained in the unit. If decontamination to the cleanup levels approved in the CSU-specific closure SAP cannot be achieved, LANL intends to dispose of or otherwise manage the contaminated structures, equipment, soil, or other media. If decontamination to these cleanup levels is not

achievable, LANL may propose an alternate demonstration of decontamination, as circumstances indicate.

If a CSU cannot be closed as described above, LANL will conduct post-closure or equivalent activities in accordance with Appendix G in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. A survey plat indicating the location and dimensions of the CSU with respect to permanently surveyed benchmarks will be submitted to the local zoning authority (i.e., Los Alamos County) and to the NMED at the time of submission of the certification of closure. The plat filed with the local zoning authority will contain a prominently displayed note, which states the obligation of LANL and DOE/NNSA to restrict disturbance of the unit in accordance with the applicable regulations in 20.4.1 NMAC, Subpart V, Part 264, Subpart G. Post-closure notices will be filed with appropriate authorities, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE/NNSA will file a "Land Use Restriction Notice" or equivalent document with the County of Los Alamos and other authorized agencies. Within 60 days after completion of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00].

F.2 DESCRIPTION OF THE TA-54 CSUs

This section provides a general description of TA-54 and the TA-54 CSUs. LANL does not currently intend to reduce the areal extent or the design capacities of the CSUs at TA-54 during the active life of those units. Estimated annual quantities for the CSUs at TA-54 are provided in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application," hereinafter referred to as the LANL General Part A.

TA-54 is located on top of Mesita del Buey, an east-west trending mesa that is bordered on the north by Cañada del Buey and on the south by Pajarito Canyon. The elevation at TA-54 is approximately 6,800 feet. TA-54 is used primarily for waste management. It includes four material disposal areas, one each at Areas G, H, J, and L. It also includes hazardous/mixed waste storage areas and numerous supporting offices. The Radioassay and Nondestructive Testing Facility (TA-54-38) is located in the western part of TA-54 (TA-54 West).

The TA-54 CSUs are located at Area L, Area G, and TA-54 West. There are two CSUs at Area L, nine CSUs at Area G, and two CSUs at TA-54 West, as indicated below.

The two Area L CSUs are the aboveground CSU within the fence and the Storage Shafts CSU (Shafts 36 and 37).

The nine Area G CSUs are:

- Storage Domes 229, 230, 231, and 232, and Pad 9;
- TA-54-412, Storage Dome 226, and Pad 1;
- Storage Dome 48 and Pad 3;
- Pad 10 (former Pads 2 and 4) and the transuranic waste characterization facilities;
- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7;
- Storage Domes 153 and 283 and Pad 6;
- Storage Shed 8;
- TA-54-33, and;
- Storage Dome 375 and Pad 11.

The two TA-54 West CSUs are the Indoor CSU at TA-54-38 and the Outdoor CSU at and adjacent to TA-54-38.

F.2.1 Estimate of Maximum Waste in Storage

The maximum total capacity of hazardous and mixed waste potentially in storage at any time at the aboveground CSU within the fence at Area L is 407,880 gallons. The maximum total capacity of mixed waste potentially in storage at any time in the Storage Shafts CSU at Area L is 600 gallons. The estimate of the total maximum inventory of hazardous and mixed waste stored in Area L over the active life (1980 to 2003) is 23,150 cubic meters (m^3). The maximum total inventory of hazardous waste potentially disposed of in the regulated unit at Area L is 42,050 cubic feet.

The maximum total capacity of hazardous and mixed waste potentially in storage at any time at the Area G CSUs is 4,506,590 gallons, as shown below:

- Storage Domes 229, 230, 231, and 232 and Pad 9 = 1,446,720 gallons;
- TA-54-412, Storage Dome 226, and Pad 1 = 502,920 gallons;
- Storage Dome 48 and Pad 3 = 213,840 gallons;
- Pad 10 (former Pads 2 and 4) and the transuranic waste characterization facilities = 319,770 gallons;

- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7 = 623,480 gallons;
- Storage Domes 153 and 283 and Pad 6 = 597,300 gallons;
- Storage Shed 8 = 11,880 gallons;
- TA-54-33 = 108,240 gallons, and;
- Storage Dome 375 and Pad 11 = 682,440 gallons.

The estimate of the total maximum inventory of mixed waste stored in Area G over the active life (1990 to 2003) is 6,691 m^3. The maximum total inventory of hazardous waste disposed of in the two regulated units at Area G is 8.1 m^3.

The maximum total capacity of mixed waste potentially in storage at any time at the Indoor CSU at TA-54 West is 3,080 gallons. The maximum total capacity of mixed waste potentially in storage at any time at the Outdoor CSU at TA-54 West is 8,580 gallons. The maximum total inventory of mixed waste stored on site over the active life of TA-54 West (1995 to 2003) is estimated to be 137,500 gallons.

F.2.2 Description of Stored Waste

The TA-54 CSUs are used for storage of hazardous waste, mixed low-level waste (MLLW), and mixed transuranic waste (MTRUW). The hazardous waste stored in the TA-54 CSUs was generated from research and development activities, general facility operations, decontamination and decommissioning (D&D) operations, and environmental restoration (ER) activities throughout LANL. Mixed waste is any solid waste that has both a hazardous waste component (as defined by 20.4.1 NMAC, Subpart II, Part 261) and a radioactive waste component (as defined by DOE Order 435.1, “Radioactive Waste Management” [DOE, 1999]). The MLLW stored in the TA-54 CSUs was generated during research and development activities, radioactive material processing and recovery operations, general facility operations, D&D operations, and ER activities at various TAs throughout LANL. The MTRUW stored in the TA-54 CSUs was generated during research activities, radioactive material processing and recovery operations, D&D operations, and ER activities at various TAs throughout LANL. Information on the hazardous component(s) of all wastes that can be stored at the TA-54 CSUs is provided in the LANL General Part A. Additional information on waste-generating activities at LANL is available in the waste analysis plan in Appendix B of the LANL General Part B.

F.3 CLOSURE PROCEDURES FOR THE TA-54 CSUs

Closure activities at the TA-54 CSUs will involve the removal of hazardous wastes and/or residues, decontamination or removal of the storage structures and associated waste management equipment with subsequent appropriate disposition, and verification of decontamination.

F.3.1 Removal of Waste

Prior to the initiation of closure activities, wastes will be removed from the TA-54 CSU to be closed. Containers will be removed from each CSU primarily with forklifts and/or cranes. Small containers may be handled manually or with a dolly. Containers will be placed onto closed bed trucks, flatbed trucks, forklifts, or trailers for transport. Appropriate shipping papers will accompany the wastes during transport. RCRA-regulated waste containers will be moved to an approved on-site CSU or to an off-site permitted treatment, storage, or disposal facility.

F.3.2 Closure Procedure and Decontamination

To the extent possible, all contaminated structures and equipment at the TA-54 CSU to be closed will be decontaminated. Structures and equipment that cannot or will not be decontaminated will be removed, containerized, and managed in compliance with appropriate waste management regulations. Decontamination will be verified by sampling and analysis. All sampling conducted during closure activities will be done as generally discussed in Section F.3.4 and as included in the CSU-specific SAP (see Section F.4). Sampling and analysis will be done in accordance with appropriate quality assurance/quality control (QA/QC) procedures as required by the individual analytical technique or the authority for the relevant standard methods (e.g., “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods” [*SW-846*]; American Society for Testing and Materials [ASTM]). Closure will be conducted in accordance with the general schedule presented in Table F-1, as amended by TA-54 CSU-specific SAPs submitted prior to the actual closures.

F.3.3 Preliminary Closure Activities

F.3.3.1 Safety Precautions

Job hazards associated with closure activities will be identified, controls developed, and workers briefed before closure activities are conducted, in accordance with LANL safety procedures. Personnel involved in closure activities will wear appropriate personal protective equipment (PPE), specified by the Health Physics Group and the Industrial Hygiene and Safety Group, and will follow good hygiene practices to protect themselves from exposure to hazardous and/or mixed waste. The level of PPE that will be required will depend upon the physical hazards present and the levels of radiological and/or chemical contamination that are detected, if any. All workers involved in closure activities will be required to have appropriate training (see Attachment D in this application and Appendix D in the LANL General Part B). Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

F.3.3.2 Background Determination

Before any decontamination activity begins, background levels for potential hazardous waste constituents will be determined. Decontamination and verification sampling procedures may involve wash water sampling, swipe sampling, soil sampling, or other methods available at the time of closure. Background samples will be obtained from clean water, cleaning equipment, and detergent solutions if wash water methods are used to decontaminate TA-54 CSUs. Background samples will be obtained for the material to be decontaminated or for any sampling materials used in swipe sampling analysis used for verification purposes. Appropriate background samples and/or concentrations derived from LANL studies developed under the LANL corrective action or other programs will be used to determine hazardous constituent background/baseline levels. Details of appropriate background levels and/or necessary samples and collection techniques will be included in the TA-54 CSU-specific SAP, as discussed in Section F.4 of this closure plan.

F.3.3.3 Structural Assessment

Before decontamination activities begin, the base or secondary containment of each CSU will be inspected for any cracks or conditions that could potentially lead to loss of wash water containment if wash water procedures will be used for decontamination. Preventive maintenance inspections are conducted routinely (i.e., weekly) at each CSU. If any defects, deterioration, damage, or hazards affecting containment have developed after the most recent preventive maintenance inspection was conducted, appropriate remedial actions (including sampling, repairs, maintenance, or replacement) will be completed before decontamination activities begin. If a crack or gap is present, a swipe sample or a representative sample of the media will be taken (e.g., asphaltic concrete or concrete) to determine the presence of contamination. The sample will be analyzed for hazardous contaminants of potential concern (COPC) determined through review of the chemical properties of the waste stored during the operating history of the CSU and through an evaluation of the history of any spills that may have occurred at the CSU. If contamination is detected, the surface flaw will be decontaminated prior to repairing the crack/gap. Complete or partial removal (e.g., cold milling) of the material may be performed until contamination is no longer detected. If partial removal is successful in eliminating the contamination, it will be assumed that the remaining material, including underlying soil, is clean.

After any decontamination wash down process, the used wash water will be collected, transferred to containers, sampled, and analyzed for the appropriate parameters determined during the

documentation review. If the used wash water is nonhazardous and nonradioactive, it will be managed appropriately in accordance with LANL policy. Otherwise, the used wash water will be managed at an appropriate on-site facility.

F.3.4 Decontamination of the TA-54 CSUs

The TA-54 CSUs that may be decontaminated during closure activities are comprised of storage sheds, domes, and buildings; shafts; and asphaltic-concrete pads. The following discussion is organized by types of structures because the decontamination approach differs. These procedures are discussed generally, as specific details will be included in the SAPs to be submitted to the NMED for approval (see Section F.4 of this closure plan). If any portable equipment, structure walls, or floors cannot or will not be decontaminated, the contaminated portion will be disposed of in accordance with appropriate waste management regulations.

F.3.4.1 Decontamination of Storage Sheds, Domes, and Buildings

Decontamination of storage sheds, domes, and buildings will be initiated by washing the interior storage surfaces. The first step in decontamination will be to evaluate the CSU's operating record to determine the COPCs. The appropriate surfactant/solvent to be used in the wash water solution will be determined based upon the COPCs. General laboratory surfactants (e.g., Alconox®) will be used for the majority of washes where many COPC analytes are being sampled for, and specialized solvents may be used for more focused removal purposes.

Based on the review of the operating record (e.g., spills) and an evaluation of structural areas of potential concern (e.g., sumps, stained areas, low areas), preliminary decontamination focused on these areas may be conducted prior to the overall decontamination of the CSU. Prior to overall decontamination of a structure, any portable equipment will be wiped down with wash water solution. The structure walls and floors will then be wiped down with mops and/or sponges to minimize the amount of liquid waste generated as a result of decontamination activities. A portable berm, existing berm or sump, or other device (e.g., absorbent socks, plastic sheeting, wading pools) designed to collect and provide containment for used wash water will be used, as necessary.

After the walls and floors have been decontaminated, any recessed areas present (e.g., sumps) will be wiped down with wash water. The used wash water will collect in the recessed area; it will then be removed and transferred to an appropriate container(s). The recessed area will be wiped down again with wash water; this wash water will be minimized, collected with sponges and/or mops, and

transferred to the same appropriate container(s), where it will be sampled. The container(s) of used wash water will be stored appropriately, pending analysis for decontamination verification and waste characterization.

Used wash water samples may exhibit contamination due to leaching of storage structure walls or floors during wash down. If this is the case, record reviews (e.g., manufacturer's specifications, Material Safety Data Sheets [MSDS]) and additional analyses may be performed to determine if leaching of contaminants from the walls or floors contributed to the contaminant concentration in used wash water. If this additional evaluation confirms the structure walls or floors as the source of contamination, baseline concentrations for the clean wash water will be adjusted accordingly. If sampling and analysis indicate that hazardous constituents are present and are not attributed to leaching of contaminants from storage structure walls or floors, the wash cycles and analyses will continue until the structure or equipment has been decontaminated or the decision is made to manage it appropriately as contaminated waste. This material may be transported to and stored at other hazardous waste management locations to facilitate the closure process.

F.3.4.2 Decontamination of the Storage Shafts CSU (Shafts 36 and 37)

The Storage Shafts CSU (Shafts 36 and 37) at TA-54, Area L, contains radioactive isotope production lead stringers. Shaft 36 contains three stringers; Shaft 37 contains four stringers. Each stringer consists of two rectangular steel tubes, one partially inside the other. Each inner tube is filled with a mixture of concrete and lead shot. The outer tubes are filled with concrete only. The ends of the tubes are capped and the lower eight feet of each stringer is in a stainless-steel sheath. Each stringer assembly is also wrapped in plastic.

Because of the multiple containment barriers (i.e., concrete, steel tubes, stainless-steel sheath, and plastic wrap) between the lead and the shafts and because concrete and steel covers extend beyond the diameter of each shaft to prevent run-on into the shafts, it is anticipated that hazardous constituents will not be present in the shafts once the stringers are removed. Therefore, if the integrity of the plastic wrap and/or stainless-steel sheath surrounding the stringers appears uncompromised, sampling for hazardous constituents within the shafts will not be required. If the stainless-steel sheath appears corroded or damaged, samples will be obtained from the bottom of the shaft and analyzed for lead.

F.3.4.3 Decontamination of Asphaltic Concrete at the TA-54 CSUs

Potential closure activities of asphaltic concrete at the TA-54 CSUs include decontamination or removal. If the decision is made to decontaminate the asphaltic concrete, it will be wiped down with mops and/or sponges to minimize the amount of liquid waste generated as a result of decontamination activities. A portable berm, existing berm or sump, or other device (e.g., absorbent socks, plastic sheeting, wading pools) designed to collect and provide containment for used wash water will be used, as necessary. After the wash down process, the used wash water will be collected, sampled for analysis, and stored in appropriate containers at the site. Each asphaltic-concrete location may undergo several wash cycles; however, the option to remove the asphaltic concrete and manage it as hazardous waste may be exercised at any time after the initial wash cycle.

Used wash water samples may exhibit contamination due to leaching of the asphaltic concrete during wash down. If this is the case, record reviews (e.g., manufacturer's specifications, MSDSs) and additional analyses will be performed to determine if leaching from the asphaltic concrete contributed to the contaminant concentration in the used wash water. If this additional evaluation confirms the asphaltic concrete as the source of contamination, baseline concentrations for the clean wash water will be adjusted accordingly. Decontamination verification is discussed further in Section F.3.5.

If sampling and analysis indicate that hazardous constituents are present and are not attributed to leaching from the asphaltic concrete, the wash cycles and analyses will be repeated until the asphaltic concrete has been decontaminated or the decision is made to manage it appropriately as hazardous waste.

If the decision is made to not decontaminate the asphaltic concrete or to remove only the contaminated portions (e.g., by cold milling, see Section F.3.3.3), it will be totally or partially removed and disposed of appropriately in lieu of decontamination activities. The asphaltic concrete may be transported to and stored at other hazardous waste management locations to facilitate the closure process. If the asphaltic concrete is totally removed, soil samples will be collected from the area underlying the original asphaltic concrete. Soil sampling procedures are described in Section F.3.4.4. If removal of only the contaminated portion of the asphaltic concrete is successful, the underlying soil will be presumed to be uncontaminated and soil sampling will not be required.

F.3.4.4 Soil Sampling

In certain cases of closures at the TA-54 CSUs, soil removal may be conducted to meet the closure performance standards. Examples include detection of contamination that had migrated beyond TA-54 CSU asphaltic-concrete pads to the surrounding soil, and cases in which operating records indicate that a release of hazardous waste from storage structures to the surrounding soil has occurred. If records indicate that no release of hazardous waste to soils has occurred, soil sampling will not be conducted.

If collection of soil samples is determined to be necessary to demonstrate decontamination, appropriate background samples and/or concentrations derived from LANL studies (see Section F.3.3.2) will be used to determine background/baseline levels for decontamination verification. Sampling locations to determine the extent of contamination will be based upon a biased random sampling approach, including historical evidence of releases, physical evidence of distressed vegetation or visual staining, and any other information that indicates a potential contamination pathway. The number of samples, locations, depths, and sampling methods will be determined before closure and included in the TA-54 CSU-specific closure SAP, as discussed in Section F.4. Results from sampling will be compared to the background samples and/or baseline concentration levels included in the closure SAP. If analysis shows that the soil at the storage areas is contaminated, soil sampling results that are above the background/baseline levels will be used to identify the extent of soil contamination. Contaminated soils will either be treated in place or removed in layers and sampling conducted following removal of each layer. This procedure will be used to minimize the amount of soil removed. The removal and sampling process will be repeated until the decontamination criteria are achieved or it is decided to close the CSU as a landfill.

In the event closure of the CSU by removal and decontamination cannot be achieved, a post-closure plan will be prepared for the site as required by 20.4.1 NMAC § 264.118. The plan will include provisions to stabilize the site and will describe planned monitoring activities, maintenance activities, and the frequencies at which these activities will be performed, as required by 20.4.1 NMAC § 264.118.

F.3.4.5 Decontamination of Equipment

Prior to use, sampling personnel will ensure that all reusable and/or disposable sampling equipment to be used during decontamination in closure activities is clean. If reusable sampling equipment is used, sampling equipment rinsate blanks will be collected and analyzed in accordance with the

QA/QC procedures described in the closure SAP. Reusable decontamination equipment, including protective clothing and tools, used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash water solution (the closure SAP will include a discussion of wash water solutions). Residue and disposable decontamination equipment as well as reusable decontamination equipment that cannot be decontaminated will be containerized and managed appropriately at an approved on-site facility, depending on the regulated constituents present.

F.3.5 Decontamination Verification

Sufficient sampling and analysis will be required to demonstrate that hazardous waste residue is not present at the CSU after closure. Wash water sampling, swipe sampling, or other appropriate sampling and analysis methodologies may be used to verify decontamination. The verification sampling method will be determined at the time of development of the TA-54 CSU-specific closure SAP and will be based on factors such as COPCs and materials of construction for the storage structure. The SAP will establish the minimum number of verification samples based on the total surface area of the CSU. Using a biased random sampling approach, items, structures, and/or surfaces will be sampled for verification of decontamination. Sample bias will include known or likely areas of contamination, low areas, sumps, and known spill locations, as determined to be appropriate on a case-by-case basis.

For wash water-based decontamination verifications (e.g., asphaltic-concrete pads), the samples of clean wash water solution squeezed from mops and/or sponges prior to use will be collected as background before initial wash down of any CSU, as described in Section F.3.3.2 of this closure plan. The samples will be analyzed for the appropriate parameters, as presented in the closure SAP. Analytical procedures will conform to methods found in the most current version of *SW-846* (U.S. Environmental Protection Agency [EPA], 1986). Used wash down solutions will be analyzed for the same parameters. Areas will be considered contaminated if the used wash water solution shows a significant increase (i.e., determined using statistical methods defined in *SW-846*) in the analytical parameters over those in the clean wash water solution or does not meet other decontamination criteria in Section F.3.6. If subsequent wash downs are deemed necessary, an additional sample of clean wash water solution squeezed from mops and/or sponges prior to use will be taken for each additional wash down event.

Swipe sampling may be used on a case-by-case basis (e.g., for smooth or impervious surfaces such as metal and dome fabric) to determine verification of decontamination at the TA-54 CSUs.

Background for swipe samples will be determined by submitting an unused swipe and solvent sample for analysis. Swipe samples will be analyzed using approved methods, which will be included in the closure SAP. The rationale for when swipe sampling will be conducted will also be included in the SAP.

If other sampling methodologies have been developed at the time of closure for the TA-54 CSU, their use to determine decontamination will be addressed in the closure SAP.

For any sampling methodology, decontamination will be verified if the collected samples meet any of the decontamination criteria listed in Section F.3.6 of this closure plan. If the verification sampling indicates contamination higher than the approved values, additional sampling will be performed to establish the boundaries of contamination for large structures. After establishing the boundaries of contamination, the decontamination process will be repeated within those boundaries, using portable berms or other appropriate material to limit the potential for run-off from the affected area. An additional round of verification sampling will be performed for all of the areas previously determined to be contaminated. After each decontamination event and verification iteration, a decision will be made to repeat the process or remove contaminated materials and dispose of them properly.

F.3.6 Decontamination Criteria

Successful decontamination is defined as one of the following criteria:

- No detectable hazardous waste or hazardous waste constituents from container storage activities are found in the final sample.
- Detectable hazardous waste or hazardous waste constituents from container storage activities in the final sample are removed to statistically significant levels based on baseline concentrations in the clean wash water.
- Detectable hazardous waste or hazardous waste constituents from container storage activities in the final sample are at or below levels agreed upon with the NMED.
- Detectable hazardous waste or hazardous waste constituent concentrations from container storage activities do not significantly decrease after several wash downs. In such an event, hazardous constituents that pose an acceptable risk will be allowed to remain, as mutually agreed upon with the NMED.

An alternative demonstration of decontamination may be proposed and justified at the time of unit closure, as circumstances indicate. The Secretary of the NMED will evaluate the proposed

alternative in accordance with the standards and guidance then in effect and, if approved, incorporate the alternative into this closure plan.

F.4 SAMPLING AND ANALYSIS PLAN

Sampling and analytical procedures will be performed during the decontamination and verification activities associated with the closure of the TA-54 CSUs covered by this plan. These procedures will use standard approved methods (e.g., *SW-846*, ASTM), as appropriate, for making closure decontamination verification determinations. However, the TA-54 CSUs are not anticipated to undergo closure for a relatively long time, and it is probable that sampling and analytical methods will be revised and improved before closure. In order to alleviate the need for future closure plan and permit modifications until actual closure activities are scheduled, LANL will submit TA-54 CSU-specific closure SAPs to the NMED at the time of closure notification for review and approval.

The TA-54 CSU-specific closure SAPs will contain a detailed discussion of the available CSU information and proposed closure methodology to assure the closure performance standards are met. These closure SAPs for the TA-54 CSUs will include:

- A detailed discussion of site characteristics.
- The CSU operational history, to include descriptions of known spills, releases, and/or evidence of potential problems (e.g., visual stains, dead vegetation, solid waste management units).
- Chemical properties of the waste stored at the CSU.
- Determination of applicable COPCs.
- A hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures for decontamination methods for equipment, structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the specific CSU.
- Methods for sampling and analysis of contaminated media.
- Removal procedures for contaminated media, if necessary.

- Sampling methods for decontamination media and hazardous waste determination. The discussion should include the rationale for using wash water samples, swipe samples, soil samples, and/or other sampling methodology.

- Sampling methods for decontamination verification procedures. The discussion should include the statistical or judgmental basis for determining the number of verification samples needed and the constituents to be analyzed for.

- Sampling equipment decontamination and disposition procedures.

- Sample handling and documentation procedures.

- Analytical methods (including detection limits) and the rationale for their determination.

- Disposition of removed waste, decontamination media, or contaminated soils. This discussion should include an identification of proposed on- or off-site hazardous waste management facilities that may be used for final disposition and the types of wastes anticipated to be shipped.

- Decontamination criteria.

- Statistical basis for verification of decontamination, if applicable. The discussion should include information on determination of statistical increases in analytical parameters and numerical values for significant increases.

- Risk assessment procedures to be used, if necessary.

- Field and laboratory QA/QC procedures.

- Schedule of closure activities, including decontamination, sampling, analysis, potential removal of soils, and closure certification submittal.

- Identification of contact person or office.

F.5 REFERENCES

DOE, 1999, “Radioactive Waste Management,” *DOE Order 435.1*, U.S. Department of Energy, Washington, D.C.

EPA, 1986 and all approved updates, “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” *SW-846*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

Table F-1

General Schedule for Closure Activities at Technical Area 54 Container Storage Units (CSU)

Activity	Maximum Time Required[a]
Submit CSU-specific sampling and analysis plan (SAP)	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Collect background samples (as specified in SAP)	-5 Days
Final receipt of waste	Day 0
Begin closure activities - removal of wastes	Day 5
Decontamination of structure(s) and/or equipment	Day 10
Perform verification sampling of the structure(s) and/or equipment	Day 20
Evaluate analytical data	Day 50
Perform additional decontamination (if necessary)	Day 55
Perform additional sampling (if necessary)	Day 60
Evaluate analytical data	Day 75
Perform asphaltic concrete decontamination and sampling (if necessary)	Day 80
Evaluate analytical data (if necessary)	Day 95
Perform soil sampling (if necessary)	Day 100
Evaluate analytical data	Day 120
Perform final cleanup (e.g., removal of decontaminated equipment and decontamination wastes)	Day 140
Verify decontamination	Day 150
Submit closure certification to NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously and/or may not require the maximum time listed. Extensions to this schedule may be requested, as needed.

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CFR	Code of Federal Regulations
CMP	corrugated metal pipe
CSU	container storage unit
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DVRS	Decontamination and Volume Reduction System
FRP	fiberglass-reinforced plywood
ft	feet/foot
ft^2	square feet/foot
HDPE	high-density polyethylene
HEPA	high-efficiency particulate air
LACFD	Los Alamos County Fire Department
LANL	Los Alamos National Laboratory
m^3	cubic meters
MLLW	mixed low-level waste
MSDS	Material Safety Data Sheet
MTRUW	mixed transuranic waste
PPE	personal protective equipment
ppmw	parts per million by weight
PTLA	Protection Technology Los Alamos
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
TA	technical area
TRU	transuranic
UV	ultraviolet

ATTACHMENT G
CONTAINER MANAGEMENT

The information provided in this attachment addresses the applicable container storage requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), § 270.15, and 20.4.1 NMAC , Subpart V, Part 264, Subpart I, revised June 14, 2000 [6-14-00]. This attachment provides an overview of current facility operations and waste management practices at Technical Area (TA) 54 at Los Alamos National Laboratory (LANL) and complements the information provided in Section 2.0 of this permit renewal application. It includes detailed descriptions of the TA-54 container storage units (CSU) and the current waste management practices associated with them. Detailed drawings are included in this attachment. Other detailed information (e.g., technical specifications for prefabricated sheds, coatings, liners) is provided in Supplement G-1 of this attachment, and is provided for informational purposes only. Table G-1 summarizes applicable regulatory references and the corresponding location where the requirement is addressed in this permit renewal application.

G.1 GENERAL FACILITY OPERATIONS AND WASTE MANAGEMENT PRACTICES [20.4.1 NMAC, Subpart V, Part 264, Subpart I]

TA-54 consists of 130 acres atop Mesita del Buey and is used for storage of hazardous and mixed waste generated throughout LANL. A principal mission of TA-54 is to manage LANL waste safely and efficiently, consistent with federal and state regulations and U.S. Department of Energy (DOE) requirements. TA-54 has three separate areas where hazardous and/or mixed waste is stored; the three areas include Area L, Area G, and TA-54 West (Figure G-1). There are two CSUs at Area L, nine CSUs at Area G, and two CSUs at TA-54 West. These CSUs are described in Sections G.2, G.3, and G.4.

The following provides an overview of current facility operations and waste management practices that are applicable to the CSUs at TA-54. This overview includes a discussion of container handling and inspection; security and access control; preparedness and prevention; hazards prevention; special requirements for ignitable, reactive, or incompatible waste; and air emission standards for containers. Similar information specific to the Area L, Area G, and TA-54 West CSUs is provided in Sections G.2, G.3, and G.4 of this attachment. This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Specific waste management practices and procedures detailed herein are subject to change.

G.1.1 Container Handling and Inspection [20.4.1 NMAC §§ 264.171, 264.173, and 264.174]

Handling and inspection requirements for containers stored within the TA-54 CSUs are presented in Sections 2.5 and 2.7, respectively, of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC §§ 264.171, 264.173, and 264.174 [6-14-00].

G.1.2 Security and Access Control [20.4.1 NMAC §§ 270.14(b)(4) and 270.14(b)(19)(viii); 20.4.1 NMAC § 264.14]

The CSUs at TA-54 are provided security by both their locations on top of Mesita del Buey and by 8-foot (ft) industrial chain-link fences topped by razor wire or barbed wire. Additional security is provided by a system of facility access controls to ensure that only authorized personnel are granted access. These access controls also ensure that all facility personnel can be identified and located in an emergency.

Depending on national security conditions, a guard station will be manned west of the TA-54 timed vehicle-access control gate. During intervals of high national security, it is currently planned that guard stations will also control public access on Pajarito Road east and west of TA-54. Therefore, only properly identified LANL and DOE employees or individuals under their escort will have access to TA-54 during those times.

During low national security conditions, any access to the TA-54 administrative area for Areas L and G is limited by a timed vehicle-access control gate on the entrance road to TA-54. This gate is open during normal working hours from 6:00 a.m. to 6:30 p.m., Monday through Friday (except holidays). Gate hours are subject to change. Access to TA-54 West is by a manually operated gate on the west side of the facility. The gate is also open during normal working hours. Access to any part of TA-54 before or after normal working hours or on weekends requires approval of the appropriate Group Leader or Facility Manager at TA-54. TA-54 is patrolled by Protection Technology Los Alamos (PTLA) security personnel during non-operational hours to ensure that the gates are locked and that unauthorized entry has not occurred.

Anyone entering the fenced Area L and Area G waste management areas from the TA-54 administrative area must be “badged in” via access control at TA-54-245 before proceeding. Badging in is the process of identifying the person, assessing his/her security and training status using DOE security badges, and determining the need for an escort. Authorized personnel may

enter the fenced portions of Areas L and G only after negotiating additional access controls in the form of walk-through turnstiles and motorized vehicle gates. Each turnstile and vehicle gate is equipped with a badge reader to ensure authorized access only.

Resident personnel are required to badge in upon arrival and prior to leaving TA-54, Areas L and G, and TA-54 West. Nonresident personnel and visitors are required to badge or sign in and out at an access control point. Depending on their level of training, nonresident personnel may be required to be escorted in order to access TA-54, Areas L and G, and TA-54 West. Access to the Area L, Area G, and TA-54 West CSUs requires additional controls. These controls are described in Sections G.2.1, G.3.1, and G.4.1, respectively.

G.1.3 Preparedness and Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; and 20.4.1 NMAC § 270.14(b)(8)]

The following presents information on the waste management techniques used at TA-54 to comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. This includes a discussion of the emergency equipment required at the facility, testing and maintenance of this equipment, personnel access to communications or alarm systems, aisle space and storage configuration, and support agreements with outside agencies. Each CSU at TA-54 has been or will be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment, in accordance with 20.4.1 NMAC § 264.31.

G.1.3.1 Required Equipment [20.4.1 NMAC § 264.32]

Emergency equipment is located throughout TA-54 and includes internal communications, alarm systems, fire alarms, spill kits, and decontamination equipment. Detailed information on the required emergency and safety equipment located at the Area L, Area G, and TA-54 West CSUs is provided in Sections G.2.2, G.3.2 and G.4.2, respectively. For additional information, see Tables E-1, E-2, and E-3 in Attachment E of this permit renewal application.

G.1.3.2 Testing and Maintenance of Equipment [20.4.1 NMAC § 264.33]

The communication, alarm system, fire protection, spill control, and decontamination equipment located within TA-54 is inspected and/or tested according to the inspection schedule detailed in Appendix C in the most recent version of the “Los Alamos National Laboratory General Part B

Permit Application," hereinafter referred to as the LANL General Part B. Maintenance, repair, and replacement of emergency equipment are performed, as needed.

G.1.3.3 Access to Communications or Alarm System [20.4.1 NMAC § 264.34]

All personnel involved in waste management activities at TA-54 have immediate access to internal alarms or emergency communication devices, either directly or through visual or voice contact with another individual. These devices include fire alarms, evacuation alarms, paging telephones, radios, and cellular telephones. The nature and locations of these devices are specific to the Area L, Area G, and TA-54 West CSUs. Detailed information for Area L, Area G, and TA-54 West is provided in Sections G.2.2, G.3.2, and G.4.2, respectively.

G.1.3.4 Aisle Space and Storage Configuration [20.4.1 NMAC § 264.35]

Information on aisle space and storage configurations for the TA-54 CSUs is presented in Sections 2.1.1.3, 2.1.2.3, and 2.1.3.3 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC § 264.35 [6-14-00].

G.1.3.5 Support Agreements with Outside Agencies [20.4.1 NMAC § 264.37(a)]

DOE maintains support agreements and contracts with outside agencies for emergency response assistance. Information regarding these contracts and support agreements is provided in Section 2.1.2.4 of the LANL General Part B.

G.1.4 Hazards Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

The following discusses the general procedures, equipment, and structures that are currently used at TA-54 to prevent hazards. This includes preventing hazards during unloading of waste containers, preventing run-on and runoff, preventing contamination of the water supply, mitigating the effects of power outages, preventing undue exposure to personnel, and preventing releases to the atmosphere.

G.1.4.1 Preventing Hazards in Unloading [20.4.1 NMAC § 270.14(b)(8)(i)]

Waste containers are transported to the Area L, Area G, and TA-54 West CSUs by flatbed trucks, closed-box trucks, or trailers. The CSUs have design features that promote safe unloading and handling of waste containers from these trucks and trailers. Ramps are typically located at the vehicle entrances to the dome structures at the Area L and Area G CSUs. Shed 31 at Area L and Shed 8 at Area G have sloped entryways for container-handling equipment. The storage domes

have roll-up or roll-away vehicle access doors. The loading dock at TA-54 West allows access from the transport vehicles to the loading dock platform. These design features facilitate safe handling of containers in and out of the CSUs.

All waste containers at the TA-54 CSUs are handled in a manner that will not cause them to rupture or leak, as required in 20.4.1 NMAC § 264.173(b) [6-14-00]. Most containers are handled with forklifts (using drum grapplers, when appropriate) and are placed directly in the appropriate CSU. For larger containers, personnel can use a boom or, at TA-54 West and in portions of Area L, a bridge crane or mobile crane, respectively. At TA-54-412, waste containers (FRP crates, drums, and large boxes) are generally handled with forklifts, overhead cranes, and frictionless air pallets. Smaller containers are generally handled manually or with drum dollies. The use of proper handling equipment, appropriate to a container's size and weight, helps to prevent hazards while moving containers (e.g., when loading and unloading containers).

G.1.4.2 Preventing Run-on and Runoff [20.4.1 NMAC § 270.14(b)(8)(ii)]

Run-on and runoff control methods for the TA-54 CSUs are presented in Section 2.10 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC § 270.14(b)(8)(ii) [6-14-00].

G.1.4.3 Preventing Water Supply Contamination [20.4.1 NMAC § 270.14(b)(8)(iii)]

It is not anticipated that there will be any impact to groundwater or other water supplies as a result of routine waste-handling operations at TA-54 because engineering and operational controls ensure that run-on and runoff are minimized. Containers are stored inside structures or with second containment, as necessary. Water supply lines are under pressure and are equipped with backflow prevention devices. Therefore, no impact to water supplies as a result of storage at the TA-54 CSUs is expected.

The depth to groundwater is approximately 890 ft (Ball et. al., 2002, p. 30), and no perched aquifers have been identified beneath Mesita del Buey (LANL, 1998, p. 4-59). In 1985, test wells were installed in the canyons north and south of TA-54 to determine if perched water exists within canyon alluvium, to determine if perched water extends beneath Mesita del Buey, and to sample/monitor perched water, if present. Three test wells were installed in a tributary to Cañada del Buey; they include CDBO-1, CDBO-2, and CDBO-3. Test well CDBO-4 was installed further to the east in Cañada del Buey (see Figures 2-1 and 2-3 in Section 2.0). All four wells were dry; however, they

were completed as observation wells to monitor the alluvium for possible water in the future (LANL, 1995, pp. 116 and 127-128).

Three test wells were installed in Pajarito Canyon; they are PCO-1, PCO-2, and PCO-3 (LANL, 1995, pp. 116 and 129) (see Figures 2-1 and 2-3 in Section 2.0). These three wells are sampled annually for radionuclides, metals, and general inorganics; they are sampled triennially for organics. Sampling results are compiled annually in environmental surveillance reports and submitted to the New Mexico Environment Department. To ensure that the alluvial aquifer in Pajarito Canyon did not extend northward beneath Mesita del Buey, four test holes were drilled in the canyon floor north of the intermittent stream channel. These four test holes, designated PCM-1, PCM-2, PCM-3, and PCM-4, were dry. They were completed for use as moisture-access holes (LANL, 1995, pp. 115 and 130). It was concluded that perched water in Pajarito Canyon is confined to the alluvium in the stream channel and does not extend to the flank of the canyon (LANL, 1995, p. 113).

Five observation wells were installed in Cañada del Buey, mostly up-gradient from Area L, as part of a 1992 investigation for a proposed sanitary wastewater treatment plant. These wells, installed to study the effect of effluent release on the environment in the canyon, are CDBO-5, CDBO-6, CDBO-7, CDBO-8 and CDBO-9. In addition, two moisture-access holes (CDBM-1 and CDBM-2) were drilled north of Area L in 1992. Perched water was encountered in the canyon alluvium at wells CDBO-6 and CDBO-7. It was determined that the perched water at these locations is likely the result of operational discharges from well PM-4 (LANL, 1995, p. 114).

Regional well R-22, located on Mesita del Buey just east of Area G, was drilled to a total depth of 1,489 ft in 2000. Two potential perched zones and one regional zone of saturation were originally predicted at well R-22. The two zones that could potentially support perched water were predicted at a depth of 148 ft in the Cerros del Rio basalt and at a depth of 487 ft in the Puye Formation; the regional water table was anticipated to be at a depth of 922 ft in the Puye Formation. No water was encountered until the drillers first noted water at a depth of approximately 890 to 900 ft. The water is believed to be associated with the regional zone of saturation because the regional water table was projected to be at a similar depth, no obvious perching horizon was encountered, and saturation continued from 900 ft to the total depth drilled.

Regional well R-21, located in Cañada del Buey just north of Mesita del Buey, was drilled in 2002. A report describing this well will be provided to the NMED upon completion.

G.1.4.4 Mitigating Effects of Power Outages [20.4.1 NMAC § 270.14(b)(8)(iv)]

Electrical power is supplied to the structures at TA-54 to operate evacuation alarms, lighting, and various types of monitoring equipment. Battery backup systems (uninterruptible power systems) are provided at Areas G and L for the emergency evacuation alarm, which will continue to operate for eight hours. TA-54-412 has a backup generator that will provide electricity to the Decontamination and Volume Reduction System (DVRS) operations and its monitoring equipment to allow workers to safely cease operations and exit the building. TA-54-33 and TA-54-412 at Area G and TA-54-39 and TA-54-215 at Area L have battery-powered emergency lighting. Operations in each CSU are discontinued if the electrical power is not restored quickly. Specific procedures and contingencies have been developed to handle power outages at the Area L, Area G, and TA-54 West CSUs. These include the procedure to exit domes when electricity goes out. When power is restored, performance tests on monitoring equipment are conducted to ensure they are operating properly prior to allowing any workers to return to the domes. Based on the TA-54 procedures, the loss of electricity will not affect secondary containment or significantly affect health and safety issues.

TA-54 has a Maintenance Implementation Plan that addresses maintenance implementation for equipment associated with all facility operations. The plan provides the basis for planning, scheduling, and coordinating preventive and/or corrective maintenance to keep equipment associated with all facility operations in proper working order.

G.1.4.5 Preventing Undue Exposure [20.4.1 NMAC § 270.14(b)(8)(v)]

Personnel at the TA-54 CSUs are required to use appropriate personal protective equipment (PPE) to protect themselves from the hazards found in the workplace under normal conditions. Use of PPE protects workers from direct contact with and inhalation or ingestion of hazardous materials. At TA-54, PPE is used routinely during waste-handling operations and when responding to unusual hazardous situations. The different levels of PPE are defined by the Occupational Safety and Health Administration as follows:

- *Level D*: Coveralls; safety boots; safety glasses or goggles; hard hat; and appropriate gloves
- *Level C*: Full-face, air-purifying respirator with appropriate cartridges for the chemicals or hazards present; chemical-resistant suits; chemical-resistant safety boots or booties; and inner and outer gloves

- *Level B*: All Level C equipment plus self-contained breathing apparatus in place of a Level C full-face respirator
- *Level A*: All Level B equipment, plus a fully-encapsulating chemical-resistant suit.

Most waste-handling operations at the TA-54 CSUs require that personnel handling wastes or working in the CSUs wear modified Level D PPE, depending on the associated work hazards identified in job-specific hazard control plans. Modified Level D may include any item in Level D. There are instances where an increased level of PPE is required, such as during an emergency or unusual hazardous situation. If a situation arises during an emergency and an increased level of PPE is required, the PPE will be compatible with the wastes present. All personnel that use PPE are trained and qualified to use the equipment properly.

All personnel involved in waste-handling operations in the TA-54 CSUs are required to have training appropriate for their work. Training requirements are presented in Attachment D of this permit renewal application and in Appendix D of the LANL General Part B. Personnel are also required to review job hazards prior to performing waste-handling activities. Sampling plans, hazard control plans (which address monitoring equipment), and work authorizations are required, in accordance with LANL safety procedures. Personal monitoring equipment is established using the job hazard review process. Together, the required training, plans, and work authorizations help to prevent undue exposure to personnel.

G.1.4.6 Preventing Releases to the Atmosphere [20.4.1 NMAC § 270.14(b)(8)(vi)]

Releases to the atmosphere are limited at the TA-54 CSUs because containers are kept closed during storage. In routine hazardous waste and mixed low-level waste (MLLW) operations, the only exceptions to this practice are when, upon inspection, it is determined that a container currently in storage needs to be overpacked or repackaged in a new container, or during waste characterization or verification activities.

For MLLW and mixed transuranic waste (MTRUW), operations at TA-54-412 are contained in a pre-engineered metal structure to provide containment. An external secondary confinement structure surrounds the internal primary confinement structure. Both primary and secondary confinement structures are equipped with an air filtration system that includes a high-efficiency particulate air (HEPA) ventilation system to prevent the release of particulates to the environment.

The transuranic waste characterization facilities on Pad 10 (former Pads 2 and 4) will include glove boxes and hoods for managing mixed waste. The transuranic waste characterization facilities transportainers will provide external confinement for those operations. The equipment and the transportainers will have HEPA filtration systems to contain potential releases.

MTRUW containers are vented with one or more filters to allow any gases that are generated by radiolytic and microbial processes within a waste container to escape, thereby preventing over pressurization within the container. The HEPA-grade vent filters prevent the escape of any radioactive particulates.

G.1.5 Special Requirements for Ignitable, Reactive, or Incompatible Waste [20.4.1 NMAC §§ 264.17(a), 264.176, and 264.177(a)(b) and (c); 20.4.1 NMAC § 270.14(b)(9)]

Special requirements for ignitable, reactive, or incompatible waste at the TA-54 CSUs are presented in Section 2.8 of this permit renewal application. This information is provided to meet the requirements of 20.4.1 NMAC §§ 264.17(a), 264.176, and 264.177(a)(b) and (c); and 20.4.1 NMAC §§ 270.14(b)(9) and 270.15(d) [6-14-00].

G.1.6 Air Emission Standards for Containers [40 CFR, Part 264, Subpart CC]

The hazardous wastes stored in containers at TA-54 may be subject to 20.4.1.500 NMAC (incorporating the Code of Federal Regulations [CFR], Title 40, Part 264, Subpart CC, “Air Emission Standards for Tanks, Surface Impoundments, and Containers”) based on the applicability criteria specified in 40 CFR § 264.1080. Subpart CC standards for containers, as currently set forth by the U.S. Environmental Protection Agency, require that containers of hazardous waste be covered so that there are no detectable emissions of volatile organic compounds to the air. Inspection and monitoring requirements are also specified.

As indicated in 40 CFR § 264.1080(b)(6), these standards are not currently applicable to containers that are used solely for management of radioactive mixed waste in accordance with all regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act. The standards are also not applicable to containers of hazardous waste with less than 500 parts per million by weight (ppmw) volatile organics, containers of less than 0.1 cubic meters (m^3) (approximately 26 gallons) capacity, or that have received waste prior to the effective date of the regulation (December 6,

1996). The following management standards apply for hazardous wastes managed at LANL that do not meet any of the exemptions listed in 40 CFR §264.1080(b).

LANL requires that Subpart CC requirements be evaluated by the generator as part of the waste characterization process. Generator information is used to determine whether the concentration of volatile organics in a waste stream at the point of generation is less than 500 ppmw, or is equal to or greater than 500 ppmw, which is the threshold concentration for Subpart CC requirements. The generator documents this determination for that waste stream. In the event that this information is not available, the waste will be characterized in accordance with Appendix B of the LANL General Part B prior to being received by TA-54. Any hazardous waste that is newly-generated through the treatment or re-characterization of mixed waste at TA-54 will be characterized for the volatile organic content in accordance with Appendix B.

Three levels of air emission controls based on container design capacity are established in 40 CFR § 264.1086(b). TA-54 hazardous waste storage procedures require Level 1 controls based upon container design capacities. Containers of greater than 0.1 m^3 and less than 0.46 m^3 (approximately 119 gallons) capacity and that meet U.S. Department of Transportation (DOT) specifications under 49 CFR, Part 178, are kept closed during storage pursuant to 40 CFR § 264.1086(c)(3). Containers undergoing waste characterization activities may be opened for access for the purposes described in 40 CFR § 264.1086(c)(3). As required by 40 CFR § 264.1086(c)(4), these containers are subject to a visual inspection and monitoring program. On or before acceptance of the waste container at TA-54, the container is inspected to check for visible cracks, holes, gaps, or other open spaces into the interior of the container when the cover and closure devices are secured in the closed position, in accordance with 40 CFR § 264.1086(c)(1)(ii). This inspection is documented in uniform hazardous waste manifests. Pursuant to the Inspection Plan in Appendix C of the LANL General Part B, containers are inspected weekly at TA-54 to ensure that the containers remain closed during storage, thereby exceeding the requirements of 40 CFR § 264.1086(c)(4)(ii).

G.2 AREA L CONTAINER STORAGE UNITS [20.4.1 NMAC, Subpart V, Part 264, Subpart I]

The following provides specific information on current facility operations and waste management practices at the two Area L CSUs. This includes a discussion of security and access control, preparedness and prevention, hazards prevention, and design information for the Area L CSUs.

This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Detailed information is subject to change.

G.2.1 Security and Access Control [20.4.1 NMAC §§ 270.14(b)(4) and 270(b)(19)(viii); 20.4.1 NMAC § 264.14]

Security at the Area L CSUs is maintained by both artificial and natural barriers. These barriers prevent unauthorized entry of persons or livestock into Area L and satisfy the requirements of 20.4.1 NMAC §§ 264.14(a) and 264.14(b)(2) [6-14-00]. An 8-ft-high chain-link security fence with razor or barbed wire at the top surrounds the entire perimeter of Area L. Bilingual (i.e., English and Spanish) warning signs are posted on the fence at 50- to 75-ft intervals and can be seen from any approach to this area. The legends on the signs indicate "Danger—Hazardous Waste Storage Area" and "Unauthorized Persons Keep Out." The signs are legible from a distance of 25 ft. The security fence is inspected by on-site personnel and repairs are made, as necessary. An entry gate and station are located on Mesita del Buey Road at the west central portion of Area L. In accordance with 20.4.1 NMAC § 270.14(b)(19)(viii) [6-14-00], the locations of the security fence, entry gates, and entry stations are shown on Figure 2-1 in Section 2.0 of this permit renewal application. Cliffs on the north and south sides of Area L provide additional security as a natural barrier to discourage unauthorized entry.

Access to the Area L CSUs is controlled by a gate. Authorized resident personnel must badge in/out at the magnetic badge reader to enter or leave through the gate. Individuals who do not have a DOE-issued badge must be escorted after signing the visitor's log located in the administrative area's access control building. These procedures limit access to the Area L CSUs and provide a means of tracking personnel on site, should there be an emergency or evacuation.

G.2.2 Preparedness and Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; and 20.4.1 NMAC § 270.14(b)(8)]

The following presents information on the emergency equipment available at the Area L CSUs to comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. This includes the approximate locations of fire extinguishers, shower/eyewash stations, spill kits, windsocks, and communication/alarm systems.

Required Equipment [20.4.1 NMAC § 264.32]

Area L is equipped with an audible alarm system to alert personnel of a fire or the need to evacuate the area. This alarm can be activated by pulling a fire alarm or by pushing the evacuation alarm

button. These alarms are located throughout Area L and are connected to the Los Alamos County Fire Department (LACFD) through LANL's central alarm system at all times. In addition to the alarms, there are numerous telephones located in and around the structures within Area L. These telephones ensure that personnel can contact on-site and LANL emergency personnel at all times. Many of these telephones also serve as emergency paging phones so that information can be announced throughout the area. Windsocks are also located at strategic locations to indicate wind direction and strength.

Fire control equipment at Area L includes fire extinguishers (halon, water, carbon dioxide, and/or dry chemical), a dry-pipe sprinkler system, and dry chemical systems. The fire extinguishers are available at or near most structures within Area L for use by on-site personnel, depending on the size and fuel source of a fire. Dome 215 has an automatic dry-pipe sprinkler system that is heat activated in the event of a fire. Storage Sheds 68, 69, and 70 have dry chemical systems. Fire hydrants are located near TA-54-37 and the southeast corner of TA-54-62. The fire hydrants supply water at an adequate volume and pressure to satisfy the requirements of 20.4.1 NMAC § 264.32 [6-14-00].

Personal decontamination equipment at Area L includes emergency eyewash stations and showers. This equipment is for use by personnel in emergencies involving chemical and/or radiological materials. These stations are generally located near or inside structures where waste is being handled. Emergency shower and eyewash stations are currently located at or near TA-54-39, TA-54-31, TA-54-215, TA-54-216, and TA-54-35. Waste characterization documentation and/or Material Safety Data Sheets (MSDS) are also available in the event of a chemical exposure.

There are several spill kits available at Area L to mitigate small containable spills. These kits typically contain sorbents, neutralizers, PPE, and other equipment essential for containment of small spills. Trained personnel use the spill kits only if they know what has been spilled and they are sure their actions will not put themselves or others at risk. In addition to the spill kits, shovels for cleanup are stored in TA-54-46. Oversized drums and sorbents are also stored at various locations throughout Area L. For larger spills or other unusual hazardous situations, a variety of equipment is available to emergency personnel. This equipment includes forklifts, self-propelled loaders, and other heavy equipment from Area G.

G.2.3 Hazards Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

The Area L CSUs are designed and operated to minimize the possibility of a fire, explosion, or any unplanned releases of hazardous wastes or hazardous waste constituents which could threaten human health or the environment. The following discusses the procedures, equipment, and structures that are used at Area L to mitigate the effects of power outages. Prevention of run-on and runoff at Area L is discussed in Section 2.10.1 of this permit renewal application.

Mitigating Effects of Power Outages [20.4.1 NMAC § 270.14(b)(8)(iv)]

Electrical power is supplied to Area L to operate evacuation alarms, lighting, and various types of monitoring equipment. Operations at Area L are discontinued if the electrical power is not restored quickly or if there is the possibility of an ignition. A power failure will not affect containment at the Area L CSUs.

G.2.4 Area L CSUs [20.4.1 NMAC § 270.15]

The following describes the two CSUs at Area L (see Figure 2-1). The two CSUs are the aboveground CSU within the fence and the Storage Shafts CSU. The aboveground CSU within the fence is comprised of several storage structures (TA-54-215; TA-54-216; Storage Sheds 68, 69, and 70; Storage Shed 31; TA-54-32; TA-54-35; TA-54-36; TA-54-58; and TA-54-39) and the asphaltic concrete-covered area. General dimensions, containment features, and materials of construction are discussed in this section to fulfill the requirements of 20.4.1 NMAC §§ 270.15(a)(1) and (2) [6-14-00].

G.2.4.1 Aboveground CSU within the Fence

The aboveground CSU within the fence stores containers of hazardous waste and MLLW in solid and liquid form. Liquid wastes are stored primarily in structures that are designed for secondary containment; however, secondary containment pallets are also used. Secondary containment pallets are typically constructed of polyethylene or metal painted with a chemical-resistant coating (see Supplement G-1 for additional details, including compatibility). Polyethylene secondary containment pallets used at TA-54 are generally 50 inches long by 50 inches wide by 17 inches deep, with a designed capacity of 83 gallons. Currently, two sizes of metal secondary containment pallets are used at TA-54. One is 52 inches long by 52 inches wide by 6.5 inches deep, with a designed capacity of 57 gallons; the other is 60 inches wide by 60 inches long by 6.5 inches deep,

with a designed capacity of 77 gallons. The metal secondary containment pallets are coated with chemically-resistant urethane.

The stressed- or tensioned-membrane fabric used on Storage Dome 215 and Canopy 216 at the aboveground CSU within the fence at Area L are similar. This fabric is coated with ultraviolet (UV)-stabilized plasticized polyvinyl chloride (PVC). It is fungus-resistant and certified flame-retardant (i.e., self-extinguishing). See Supplement G-1, SPRUNG Instant Structures, for additional details.

Storage Dome 215

Storage Dome 215 (TA-54-215) is 60 ft wide, approximately 266 ft long, and 26 ft high (see Figure G-2). It is an arch frame-supported stressed-membrane structure. The dome is of modular construction and uses light construction materials (i.e., aluminum framework with membrane/fabric covering). It is equipped with 14 personnel doors and two roll-up doors. The dome's pad is equipped with a 6-inch-high, 8-inch-wide concrete ring wall that surrounds the perimeter of the dome, and the dome is anchored to the concrete ring wall with anchor bolts. A ramp is located at the vehicle entrance to the dome and allows vehicles and container handling equipment to pass safely over the ring wall. The ring wall and the ramp prevent run-on into the dome. Any liquid that might accumulate within the storage dome (e.g., liquids resulting from fire-suppression activities) is contained within the ring-walled area. Liquid that may result from fire-suppression activities and that is in excess of the capacity inside the ring wall is collected in a double-walled holding tank connected to TA-54-215 by a double-walled pipe.

All waste containers at TA-54-215 are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. All liquid wastes are stored on secondary containment pallets that have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any accumulated liquids are removed and collected for characterization as described in Section 2.6 of this permit renewal application.

Canopy 216

Canopy 216 (TA-54-216) is approximately 33 ft wide and 120 ft long (see Figure G-3). This storage structure consists of a rigid aluminum frame that supports a tensioned membrane. A series of aluminum I-beam trusses, spanning the width of the structure, comprise its framework. The

membrane is integrally connected to the frame to provide a fully-tensioned fit for the roof and one side of the structure. The membrane on the remaining three sides of the structure can be rolled down to provide further containment or protection from the weather. The canopy frame is anchored to a sloped asphaltic-concrete pad.

All waste containers at TA-54-216, including gas cylinders, are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers, baskets) to prevent contact with accumulated liquids. All liquid wastes are stored on secondary containment pallets that have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any accumulated liquids are removed and collected for characterization as described in Section 2.6 of this permit renewal application.

Storage Sheds 68, 69, and 70

Storage sheds 68, 69, and 70 are prefabricated sheds constructed of steel (see Supplement G-1, Safety Storage Building, Model 22). Each shed measures approximately 23 ft long, 9 ft wide, and 8.5 ft high. Access to these storage sheds is obtained through one of three sets of double doors. Storage Shed 68 has three separate compartments, with one door leading to each compartment. Storage Sheds 69 and 70 each have two separate compartments, with one door leading to the smaller compartment and two doors leading to the larger compartment. The sheds are elevated by design, which prevents run-on.

Each shed is constructed with liquid-tight sumps to ensure containment of any potential leaks or spills and to prevent runoff. The floor of each shed consists of a metal grate that covers the sump areas. Containers are placed directly on the metal grates, which prevent contact with liquids that may have accumulated in the sumps. The interior of each shed and sump is coated with chemically-resistant epoxy paint. The designed sump storage capacity of each shed is 750 gallons, which exceeds the amount necessary to hold 10% of the total storage capacity of each shed (1,760 gallons; see Supplement 2-1). Shed 68 has three separate compartments (see Figure G-4), each having its own sump with individual capacities of 250 gallons. Sheds 69 and 70 have two separate compartments (see Figure G-4), each having its own sump. One compartment consists of two thirds of the surface area (and capacity) of Sheds 69 and 70. The capacity of this compartment's sump is 500 gallons; the smaller compartment's sump capacity is 250 gallons. Additional engineering details and technical specifications for these sheds are provided in Supplement G-1.

Potential liquids that might accumulate within the sump areas (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

Storage Shed 31

Storage Shed 31 is a prefabricated shed constructed of steel. It measures approximately 14 ft long, 13 ft wide, and 8 ft high (see Figure G-4). The shed sits on a concrete foundation that has a raised edge and is surrounded by asphaltic concrete that is sloped away from the shed to prevent run-on.

The shed has three separate liquid-tight recessed sumps in the concrete foundation that are each covered with a steel grate (see Figure G-4). Containers are stored on the steel grates, which prevent contact with liquids that may have accumulated in the sumps. The sumps and the concrete foundation are coated with chemically-resistant paint. Two of the sumps are approximately 6 ft long by 4 ft wide; the third sump is approximately 7 ft long by 6 ft wide. All three sumps are 5 inches deep. The total capacity of the three sumps is approximately 285 gallons, which exceeds the amount necessary to hold 10% of the total storage capacity of the shed (1,320 gallons; see Supplement 2-1). Potential liquids that might accumulate within the sumps (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-32

TA-54-32 (see Figure G-5) consists of a concrete pad that is 116.5 ft long by 15.5 ft wide. The structure is covered by a 117.75-ft-long by 25.75-ft-wide canopy. The canopy provides protection from the weather. The concrete pad is bermed by a 1-ft-wide, 6- to 8-inch-high concrete curb. This curbed area is divided into six separate containment cells to segregate wastes with different hazard classes. The curb prevents run-on of storm water.

Each containment cell consists of a recessed sump covered with a grate flooring on which containers are stored (see Figure G-6); this prevents contact with liquids that may have accumulated in the sumps. The cells are separated by metal partitions above the flooring. The concrete sumps are treated with chemical-resistant epoxy filler-sealer and protective coating, providing an impervious seal to contain any potential leaks, spills, or accumulation of precipitation (see Supplement G-1 for details). Cells 1 and 6 are approximately 26.5 ft long by 13.5 ft wide by 1 ft deep, with a sump capacity of 2,675 gallons each. Cells 3 and 5 are approximately 16.8 ft long by 13.5 ft wide by 1 ft deep, with a sump capacity of 1,700 gallons each. Cells 2 and 4 are approximately 13.5 ft long by 11.2 ft wide by 1 ft deep, with a sump capacity of approximately 1,130 gallons each. These sump capacities exceed the amount necessary to hold 10% of the maximum

storage capacity for TA-54-32 (see Supplement 2-1). Potential liquids that might accumulate within the containment cells (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-35

TA-54-35 (see Figure G-7) consists of a concrete pad that measures 31.5 ft long by 31.5 ft wide. The area is covered by a 136-ft-long, 48-ft-wide canopy that provides protection from the weather. The pad has a 6-inch-high concrete berm that prevents run-on and runoff of liquids. The bermed area has an elevated ramp on one side to allow access for equipment to move waste containers. The ramp also helps to prevent run-on of precipitation and runoff of any accumulated liquids.

The bermed secondary containment area of the pad is approximately 29.5 ft long by 24.5 ft wide by 8 inches deep (see Figure G-8). Stored waste containers are elevated on pallets to prevent contact with any potential accumulated liquids. The concrete berms and the base of the concrete pad are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any leaks, spills, or accumulation of precipitation. The secondary containment capacity of the bermed area is approximately 3,570 gallons, which exceeds the amount necessary to hold 10% of the maximum storage capacity for TA-54-35 (15,840 gallons; see Supplement 2-1). Potential liquids that might accumulate within the bermed area (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-36

TA-54-36 (see Figure G-7) is a 33-ft-long by 31.5-ft-wide concrete pad. It is covered by a 136-ft-long, 48-ft-wide canopy that provides protection from the weather. The pad is surrounded by a 1-ft-wide berm that varies from 6 inches to 1 ft in height. The berm prevents run-on and runoff of liquids.

The bermed secondary containment area of the pad is approximately 30.5 ft long by 30 ft wide by 9 inches deep (see Figure G-8). The berm and the base of the concrete pad are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any leaks, spills, or accumulation of precipitation. The secondary containment capacity of the bermed area is approximately 4,595 gallons, which exceeds

the amount necessary to hold 10% of the maximum storage capacity for TA-54-36 (13,200 gallons; see Supplement 2-1).

The pad also contains a Perma-Con® structure. The Perma-Con® is constructed of 4-ft-wide, 8- or 4-ft-long, 22-gauge stainless-steel panels that interlock in a self-supporting structural steel framework. The Perma-Con® system can be assembled into multiple configurations (see Supplement G-1 for additional details on the Perma-Con®). The Perma-Con® is 28 ft wide by 28 ft long by 12 ft high. It is equipped with a 20-ft-long observation room that attaches to the main enclosure. The main enclosure has two personnel doors and an 8-ft-wide roll-up door. The floor in the main enclosure is the concrete pad covered with multiple layers of heavy duty plastic sheeting that are taped together and are extended approximately 1 ft up the sides of the Perma-Con®. The Perma-Con® has a tarp covering its roof to provide additional protection from the elements, thereby preventing the influx of precipitation, including melting snow.

All waste containers at TA-54-36 are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Potential liquids that might accumulate within the bermed area or the Perma-Con® (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-58

TA-54-58 (see Figure G-7) measures 33 ft long by 31.5 ft wide. It is covered by a 136-ft-long, 48-ft-wide canopy that provides protection from the weather. The pad has a 1-ft-wide berm that varies from 6 inches to 1 ft in height. The berm prevents run-on and runoff of liquids. The bermed area has an elevated ramp on one side to allow access for equipment to move waste containers. The ramp also helps to prevent run-on of precipitation and runoff of any accumulated liquids.

The bermed secondary containment area of the pad is approximately 30.5 ft long by 25 ft wide by 6 inches deep (see Figure G-8). Stored waste containers are elevated on pallets to prevent contact with any potential accumulated liquids. The berm and the base of the concrete pad are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any leaks, spills, or accumulation of precipitation. The secondary containment capacity of the bermed area is approximately 2,850 gallons, which exceeds the amount necessary to hold 10% of the maximum storage capacity for TA-54-58 (15,840 gallons;

see Supplement 2-1). Potential liquids that might accumulate within the bermed area (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

TA-54-39 and Containment Pad

TA-54-39 measures 40 ft long by 40 ft wide (see Figure G-9). It is a metal panel building set on a concrete foundation with a metal canopy attached to the south side of the building. The rectangular metal canopy measures 83 ft long by 46 ft wide.

There are two areas associated with TA-54-39 that provide secondary containment. These areas include Room 101, located inside the building, and a containment pad located at the south end of the building.

Room 101 (see Figure G-10) inside TA-54-39 has a 6-inch-high concrete curb that surrounds the room. The curb and floor of this 878 square foot (ft^2) room are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any potential leaks, spills, or accumulation of precipitation. The secondary containment capacity for Room 101 is approximately 3,280 gallons, which exceeds the amount necessary to hold 10% of the maximum storage capacity of the room (9,900 gallons; see Supplement 2-1).

The containment pad at the south end of TA-54-39 consists of two sections. The pad is covered by a metal canopy, which provides protection from the weather. The eastern section of the containment pad is constructed of asphaltic concrete and measures 83 ft long by 23 ft wide. The western section of the containment pad is approximately 58 ft long by 16 ft wide (see Figure G-10) and is surrounded by a 1-ft-high concrete curb, which prevents run-on and runoff of liquids. The concrete floor and curb are treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details). This provides an impervious seal that will contain any potential leaks, spills, or accumulation of precipitation. The curbed area slopes toward a sump for collection of any accumulated liquids. The secondary containment capacity for the western section of the TA-54-39 containment pad is approximately 7,120 gallons, which exceeds the amount necessary to hold 10% of the maximum storage capacity of this section of the containment pad (15,180 gallons; see Supplement 2-1).

All waste containers stored at TA-54-39 are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Potential liquids that might accumulate within Room 101 or within the western section of the containment pad (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

Asphaltic Concrete-Covered Areas

The asphaltic concrete-covered areas consist of a 4- to 6-inch-thick asphaltic concrete over a base course. Asphaltic concrete-covered areas are typically sloped 1 to 1.5% to facilitate drainage (see Figure 2-1). Some areas include a 6-inch-high, 8-inch-wide asphaltic-concrete berm to prevent run-on and runoff.

All waste containers on the asphaltic concrete-covered areas are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. All liquid wastes are stored on secondary containment pallets that have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any accumulated liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.2.4.2 Storage Shafts CSU

The Storage Shafts CSU is comprised of two retrievable storage shafts, Shafts 36 and 37. This CSU is located in the northwest corner of Area L. It stores highly radioactive mixed waste lead stringers that were used to hold targets in the particle beam operated at TA-53. Shaft 36 is constructed of 30-inch-diameter corrugated metal pipe (CMP); Shaft 37 is constructed of 48-inch-diameter CMP (see Figures G-11 and G-12). Each shaft has a welded metal plate and a 1-ft-deep concrete plug at the base. Shaft 36 is 27.25 ft deep; Shaft 37 is 35.75 ft deep. The annular space in the ground surrounding the CMP is filled with crushed tuff to 48 inches from the surface and concrete to the surface. Each shaft has a steel cover. At the surface, the CMP is raised above a concrete pad, which extends from the edge of the pipe to prevent infiltration of precipitation. The shafts are also covered with one or two 4-ft-long, 4-ft-wide concrete blocks that rest on railroad ties for stability.

The Storage Shafts CSU stores only solid-form wastes and, as stated above, a concrete pad extends outward from each shaft to prevent infiltration of precipitation. Therefore, in accordance with 20.4.1 NMAC § 264.175(c)(1), a containment system for this CSU is not required. The CMP is compatible with the lead stringer wastes; thus, the requirements of 20.4.1 NMAC § 264.172 are met. The shafts are kept closed during storage and the wastes are not stored in a manner that may rupture the shafts or cause them to leak, which meets the requirements of 20.4.1 NMAC § 264.173. Weekly inspections are conducted at this CSU, as described in Section C.2 of the Inspection Plan in Appendix C of the LANL General Part B. This satisfies the requirements of 20.4.1 NMAC § 264.174.

G.3 AREA G CONTAINER STORAGE UNITS [20.4.1 NMAC, Subpart V, Part 264, Subpart I]

The following provides specific information on current facility operations and waste management practices at the Area G CSUs. This includes a discussion of security and access control, preparedness and prevention, hazards prevention, and design information for the Area G CSUs. This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Detailed information is subject to change.

G.3.1 Security and Access Control [20.4.1 NMAC §§ 270.14(b)(4) and 270.14(b)(19)(viii); 20.4.1 NMAC § 264.14]

Security at the Area G CSUs is maintained with both artificial and natural barriers. These barriers prevent unauthorized entry of persons or livestock into Area G and satisfy the requirements of 20.4.1 NMAC §§ 264.14(a) and 264.14(b)(2) [6-14-00]. An 8-ft-high chain-link security fence with razor wire at the top surrounds the entire perimeter of Area G. Bilingual (i.e., English and Spanish) warning signs are posted on the fence at approximately 50- to 75-ft intervals and can be seen from any approach to this area. The legends on the signs indicate "Danger—Hazardous Waste Storage Area" and "Unauthorized Persons Keep Out." The signs are legible from a distance of 25 ft. Two entry gates are located on Mesita del Buey Road at the west end of Area G, and an entry station is located adjacent to the inner gate. TA-54 is patrolled by PTLA security personnel during non-operational hours to ensure that the gates are locked and that unauthorized entry has not occurred. The security fence is also inspected by on-site personnel and repairs are made, as necessary. In accordance with 20.4.1 NMAC § 270.14(b)(19)(viii) [6-14-00], the locations of the security fence, entry gates, and entry stations are shown on Figure 2-3 in Section 2.0 of this permit renewal application. In addition to the fence and entry station, cliffs on the north and south sides outside of Area G provide natural barriers to discourage unauthorized entry.

Access to the Area G CSUs is controlled by a gate. Authorized resident personnel must badge in/out at the magnetic badge reader to enter or leave through the gate. Individuals who do not have a DOE-issued badge must be escorted after signing the visitor's log located in the administrative area's access control building. These procedures limit access to the Area G CSUs and provide a means of tracking personnel on site, should there be an emergency or evacuation.

G.3.2 Preparedness and Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; and 20.4.1 NMAC § 270.14(b)(8)]

The following describes the emergency equipment available at the Area G CSUs to comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. This includes the approximate locations of fire extinguishers, shower/eyewash stations, spill kits, windsocks, and communication/alarm systems.

Required Equipment [20.4.1 NMAC § 264.32]

PPE and emergency equipment supplies are stored at various locations throughout Area G. All personnel who may be required to use PPE and emergency equipment are trained in its use. In addition, essential information for emergency personnel is located at the main gate to Area G in the event of an emergency after normal working hours, or if Area G personnel are unavailable.

Area G is equipped with an audible alarm system to alert personnel of a fire or the need to evacuate the area. The alarms can be activated by pulling a fire alarm or by pushing the evacuation alarm button. Fire alarms, evacuation alarms, and strobe lights are in place at strategic locations to alert personnel of emergency conditions. These alarms are located throughout Area G and are connected to the LACFD through LANL's central alarm system at all times. Personnel working in Area G also carry pagers, cellular telephones, or two-way radios. Emergency paging telephones are in place so that information can be announced throughout the area. This equipment ensures that personnel can contact on-site and LANL emergency personnel at all times. Windsocks are at strategic locations to indicate wind direction and strength.

There are different types of monitoring equipment located at the Area G CSUs that are used to qualitatively and/or quantitatively evaluate airborne contaminants. Alarms and strobe lights warn personnel when airborne concentrations exceed preset limits.

Fire control equipment is located throughout Area G. This equipment includes halon, water, and/or carbon dioxide fire extinguishers, dry-chemical fire suppression systems, fire blankets, and several fire hydrants. Trained personnel can use the fire extinguishers and fire blankets to extinguish small, non-chemical fires. For larger fires, PTLA and the LACFD are alerted. The fire hydrants supply water at adequate volume and pressure to satisfy the requirements of 20.4.1 NMAC § 264.32 [6-14-00].

Eyewash stations, showers, and other first aid/decontamination equipment are maintained at various locations within Area G. They are for use by personnel in emergencies involving chemical and/or radiological materials. Waste characterization documentation and/or MSDSs are available in the event of a chemical exposure. First aid equipment can be used to treat injuries until trained medical personnel arrive at the scene.

Spill control equipment is maintained at various structures within Area G. Trained personnel use this equipment to mitigate small, containable spills if they know what has been spilled and are sure their actions will not put themselves or others at risk. PPE is also maintained at various structures within Area G and is available for use during routine and non-routine operations to protect personnel from exposure to chemical and radiological contaminants. Warning tapes and barricades are used to post areas and prevent unauthorized entry into restricted areas. Heavy equipment is also available at Area G to move heavy objects.

G.3.3 Hazards Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

In accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00], the Area G CSUs have been or will be designed and operated to minimize the possibility of a fire, explosion, or any unplanned releases of hazardous wastes or hazardous waste constituents which could threaten human health or the environment. The following discusses the procedures, equipment, and structures used at Area G to mitigate the effects of power outages. Prevention of run-on and runoff at Area G is discussed in Section 2.10.2 of this permit renewal application.

Mitigating Effects of Power Outages [20.4.1 NMAC § 270.14(b)(8)(iv)]

Electrical power is supplied to the Area G CSUs to operate lighting and other electrical and monitoring equipment. Evacuation alarms located throughout Area G are equipped with a battery backup and will continue to operate for eight hours during a power failure. Operations in Area G

are discontinued temporarily if electrical power is not restored quickly or if container handling equipment fails. However, neither a power nor an equipment failure would affect containment at the Area G CSUs.

Although not needed during daytime operations, emergency lighting for Area G consists of individual battery-pack halogen units located in TA-54-33 and TA-54-412. These lights are actuated by a loss of line voltage and are reset upon resumption of line voltage. A trickle charger keeps the self-contained battery pack at full charge and allows these lighting units a minimum of 30 minutes operability.

G.3.4 Area G CSUs [20.4.1 NMAC § 270.15]

The following describes the nine CSUs at Area G. The nine CSUs include the following:

- Storage Domes 229, 230, 231, and 232, and Pad 9;
- TA-54-412, Storage Dome 226, and Pad 1;
- Storage Dome 48 and Pad 3;
- Pad 10 (former Pads 2 and 4) and transuranic waste characterization facilities;
- Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7;
- Storage Domes 153 and 283, and Pad 6;
- Storage Shed 8;
- TA-54-33, and;
- Storage Dome 375 and Pad 11.

General dimensions, containment features, and materials of construction are provided to fulfill the requirements of 20.4.1 NMAC §§ 270.15(a)(1) and (2) [6-14-00].

The CSUs at TA-54 are used to store containers of hazardous waste, MLLW, and MTRUW in solid and liquid form. Liquid wastes are stored primarily in structures that are designed for secondary containment; however, secondary containment pallets are also used. Secondary containment pallets are typically constructed of polyethylene or metal painted with a chemical-resistant coating (see Supplement G-1 for additional details, including compatibility). Polyethylene secondary containment pallets used at TA-54 are generally 50 inches long by 50 inches wide by 17 inches deep, with a designed capacity of 83 gallons. Two sizes of metal secondary containment pallets are typically used at TA-54. One is 52 inches long by 52 inches wide by 6.5 inches deep, with a designed capacity of 57 gallons; the other is 60 inches long by 60 inches wide by 6.5 inches deep, with a designed capacity of 77 gallons. The metal secondary containment pallets are coated with chemically-resistant urethane.

G.3.4.1 Storage Domes 229, 230, 231, and 232, and Pad 9 CSU

Storage Domes 229, 230, 231, and 232 are located on Pad 9 at the east end of Area G. The irregularly-shaped, asphaltic-concrete pad is approximately 570 ft long and 275 ft wide (see Figure 2-3). The asphaltic concrete is 4 to 6 inches thick. Each dome is approximately 246 ft long and 88 ft, 7 inches wide (see Figures G-13a, G-13b, G-14a, and G-14b). The domes consist of a rigid aluminum frame that supports a tensioned-membrane (see Supplement G-1 for additional details on domes). A series of aluminum I-beam trusses spanning the width of the structures comprise the dome framework. The membrane material is a polyester fabric coated with UV-stabilized plasticized PVC. The material is fungus-resistant and fire-retardant (i.e., self-extinguishing). The membrane is integrally connected to the frame to provide a fully tensioned fit. Each dome is equipped with personnel doors and a roll-up door for vehicle access. The domes are anchored to a concrete ring-wall with anchor bolts.

The interior floor perimeter of each dome is surrounded with a minimum 6-inch-high, 6-inch-wide asphaltic-concrete curb. A ramp is located at the vehicle entrance to each dome, which allows vehicles and container handling equipment to pass safely over the curbs and prevents run-on into the domes. The asphaltic-concrete pad is sloped 1 to 1.5% towards one end to allow any accumulated liquids to be contained within the curbed area at one end of the dome.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons.

The floor of Dome 230 is designed for secondary containment of liquids. The asphaltic-concrete floor is sloped (1%) towards a concrete sump at the east end of the dome (see Figure G-15). The asphaltic-concrete floor and curbs in Dome 230 are lined with a double layer of 40 mil high-density polyethylene (HDPE), and the sump is lined with a single layer of 40 mil HDPE, creating an impervious layer to contain any liquids that might accumulate (see Supplement G-1 for details on HDPE liners). The secondary containment capacity for Dome 230, which includes the sump and curbed area, is approximately 48,255 gallons, which exceeds the amount necessary to hold 10% of the total storage capacity of the dome (330,000 gallons; see Supplement 2-1). Any liquid that might

accumulate within these storage domes (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets or curbed area or, at Dome 230, in the sump and curbed area. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.2 TA-54-412, Storage Dome 226, and Pad 1 CSU

TA-54-412 and Storage Dome 226 are located on Pad 1 in the northeastern portion of Area G (see Figure 2-3). The irregularly-shaped, asphaltic-concrete pad is approximately 358 ft long and 213 ft wide, and is 4 to 6 inches thick.

TA-54-412 (see Figure G-16) is a one story building that is approximately 220 ft long by 60 ft wide (13,200 ft^2). It consists of two structures: an internal primary confinement structure that houses the DVRS processing operations; and an external secondary confinement structure, which surrounds the primary confinement structure. The external secondary confinement structure (hereinafter referred to as “building”) provides protection from the elements and a temperature-controlled space for the internal structures and associated process equipment. A 16-ft by 16-ft roll-up vehicle-access door is located on the north end of the building. The roll-up vehicle access door opens to the secondary confinement structure area and serves as a pass-through for moving DVRS feed-stock waste into the primary confinement structure. There is also vehicle access on the south end of the building for removal of compacted waste from DVRS operations.

The floor and foundation of the building are concrete and the floor is painted with an epoxy sealant (see Supplement G-1 for details). The concrete slab provides a structural foundation for the building and the shearer/baler system, and provides a direct working surface for movement of FRP boxes and processing equipment. The concrete slab is above grade to direct potential run-on away from the building. The floor in the building is sloped to a sump that has a grating cover to provide traction and a level working surface. The sump is treated with chemical-resistant epoxy filler-sealer and protective coating (see Supplement G-1 for details).

The primary confinement structure is housed entirely within the building and consists of five interconnected enclosures or cells. The system is approximately 150 ft long by 50 ft wide by 16 ft high and sits directly on the sealed concrete floor. The primary confinement structure is constructed of 6-inch-thick, two-hour fire-rated sandwich panels made of 16-gauge steel and gypsum wallboard, measuring 40 ft wide by 4 or 8 ft long. The structure interlocks in a self-

supporting steel framework that can be assembled into multiple configurations. The primary confinement structure has five cells, each of which is used for a specific function of the DVRS process. The cells are equipped with both personnel and large roll-up doors so that personnel, equipment, and material can access the structure and move from one cell to the next.

A cell is used to sort and segregate transuranic (TRU) waste and MTRUW, and contains various tools used to dismantle the FRP boxes; other cells are used for decontamination and packaging; and a final cell contains the shearer and baler used to compact waste items. The shearing and baling process takes place within a tightly sealed compartment. Waste containers that need to be dismantled are processed using circular saws, reciprocating saws, hammers, pry bars, and other tools, as needed. Waste containers are moved with trucks, forklifts, air pallets, and hand dollies.

The primary and secondary confinement structures are built to meet criteria specified in DOE-STD-1020-92, "*Natural Phenomena Hazards Design and Evaluation Criteria for DOE Facilities"* (DOE, 1992), for Performance Criteria 2 structures. Performance Criteria 2 structures include active fire suppression, emergency communications, and confinement systems that provide important safety functions related to emergency handling or hazard recovery, and are designed to protect the health and safety of workers and visitors during active operations. The building contains fire protection piping and heating, ventilation, and air conditioning ducting, and is a two-hour code-compliant fire-rated building. Panels in the primary confinement structure are the same material as the two-hour fire-rated wall construction with additional supports. A dry-pipe fire-protection system provides coverage for the primary confinement structure. A water collection area in the south end of the building provides for containment of any potential leaks, spills, or accumulated water resulting from the activation of the fire protection system. Liquids that potentially accumulate within the sump area (e.g., liquids resulting from fire-suppression activities) are collected for characterization, as described in Section 2.6 of this permit renewal application. Negative ventilation air pressure is maintained throughout the building and primary confinement structure, with discharge through a multi-stage HEPA-filtered stack.

Storage Dome 226 is approximately 286 ft long and 88 ft, 7 inches wide (see Figures G-17a and G-17b). The design and materials of construction for Dome 226 are the same as for domes described in Section G.3.4.1. The dome is equipped with personnel doors and a roll-up door for vehicle access. It is anchored to the concrete ring wall with anchor bolts.

The interior floor perimeter of Dome 226 is surrounded with a minimum 6-inch-high, 6-inch-wide asphaltic-concrete curb. A ramp is located at the vehicle entrance to the dome, which allows vehicles and container handling equipment to pass safely over the curb and prevents run-on into the dome. The asphaltic-concrete pad is sloped 1 to 1.5% towards one end to allow any accumulated liquids to be contained within the curbed area at one end of the dome.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate within this dome (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets or curbed area. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.3 Storage Dome 48 and Pad 3 CSU

Storage Dome 48 is located at the eastern end of Area G on Pad 3. Pad 3 is constructed of asphaltic concrete to a thickness of four inches, and is approximately 339 ft long and 50 ft wide. Storage Dome 48 is 285 ft long and 50 ft wide, and has a peak height of 24 ft (see Figure G-18). The design and materials of construction for Dome 48 are the same as for the domes described in Section G.3.4.1. The dome is equipped with a double-panel rolling door at the south end of the dome and eight personnel doors, located approximately every 80 ft along the dome's length, allow for adequate access both by vehicles and by personnel. The interior perimeter of the dome is surrounded by a 6-inch-high, 8-inch-wide asphaltic-concrete curb, which helps prevent run-on into and runoff from the dome. An asphaltic-concrete ramp located at the vehicle entrance allows vehicles and container handling equipment to pass safely over the curb. The dome is anchored to Pad 3 with standard drift pins.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any

liquid that might accumulate within this dome (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets or curbed area. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.4 Pad 10 (former Pads 2 and 4) and Transuranic Waste Characterization Facilities CSU

Pad 10 will be constructed at the location of former Pads 2 and 4. The irregularly-shaped pad is planned to measure approximately 350 ft long by 250 ft wide and will be constructed of asphaltic concrete (see Figures 2-3 and 2-8). The transuranic waste characterization facilities and container storage will be located on this pad.

The transuranic waste characterization facilities will consist of mobile and/or modular units equipped with instruments and equipment for waste characterization and repackaging. The transuranic waste characterization facilities may include the following: drum-loading or receiving unit(s); equilibration units(s); gas mobile characterization unit(s); mobile repack units; and nondestructive radioassay unit(s).

All waste containers at this CSU will be stored on pallets or otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes will have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate (e.g., precipitation, liquids resulting from fire-suppression activities) will be contained within the secondary containment pallets. These liquids will be removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.5 Storage Domes 49 and 224; Storage Sheds 144, 145, 146, 177, 1027, 1028, 1030, and 1041; and Pads 5, 8, and 7 CSU

This CSU is located in the south-central portion of Area G, and consists of three pads, two domes, and eight sheds (see Figure 2-3). Storage Dome 49 is located on Pad 5, and Storage Dome 224 is located on Pad 8. The storage sheds are located on Pad 7. The pads are constructed of asphaltic concrete. Pad 5 is approximately 500 ft long, 65 ft wide, and 4 inches thick. It is sloped approximately 2% from north to south. Pad 8 is approximately 150 ft long, 95 ft wide, and 3 inches

thick. It is sloped approximately 1% from west to east. Pad 7 is approximately 200 ft long, 64 ft wide, and 4 inches thick. It is sloped approximately 1% from west to east.

Storage Dome 49 is 440 ft long and 60 ft wide, and has a peak height of approximately 26 ft (see Figure G-19). The design and materials of construction for Dome 49 are the same as for the domes described in Section G.3.4.1. The dome is equipped with a double-panel rolling door at the north end of the dome and six personnel doors to allow for adequate access both by vehicles and by personnel. The interior perimeter of the dome is surrounded by a 6-inch-high, 8-inch-wide asphaltic-concrete curb, which helps prevent run-on into and runoff from the dome. An asphaltic-concrete ramp located at the vehicle entrance to Dome 49 allows vehicles and container handling equipment to pass safely over the curb. The dome is anchored to Pad 5 with standard drift pins.

Storage Dome 224 is approximately 110 ft long and 60 ft wide, with a peak height of 26 ft (see Figure G-20). The design and materials of construction for Dome 224 are essentially the same as for the domes described in Section G.3.4.1. This dome is anchored to Pad 8 with anchor bolts. It is equipped with a single-panel roll-up door at the north end and four personnel doors to allow adequate access by vehicles and by personnel. A 1-ft, 8-inch wide by 2-ft, 4-inch deep concrete ring wall surrounds the interior of Dome 224.

Storage Sheds 144, 145, 146, and 177 are prefabricated sheds constructed of steel. Each shed measures 6 ft long, 5 ft wide, and 9 ft high (see Supplement G-1, Ideal Environmental Products, Model C). Access to each shed is obtained through a single door. The sheds are elevated by design, which prevents run-on. Each shed is constructed with a liquid-tight sump to ensure containment of any potential leaks or spills and to prevent runoff. The floor of each shed is constructed of steel and has a metal grate that covers the entire sump area. Containers are placed directly on the metal grates, which prevent contact with liquids that may have accumulated in the sumps. The interior of each shed and sump is coated with chemically-resistant epoxy paint. The designed sump storage capacity of each shed is 120 gallons (see Supplement G-1, Ideal Environmental Products, Model C), which exceeds the amount necessary to hold 10% of the total storage capacity of each shed (330 gallons; see Supplement 2-1). Additional engineering details and technical specifications for these sheds are provided in Supplement G-1.

Storage Sheds 1027, 1028, 1029, and 1041 have the same basic design specifications as Sheds 68, 69, and 70 described in Section G.2.4.1. Each shed is equipped with three sets of double doors

on one side of the shed for ease of access. Sheds 1027, 1028, 1030, and 1041 contain a single compartment and sump within each shed (see Figure G-21). The designed storage capacity of each sump is 750 gallons, which exceeds the amount necessary to hold 10% of the total capacity of each shed (1,760 gallons; see Supplement 2-1). Additional engineering details and technical specifications for these sheds are provided in Supplement G-1.

Dome 224 is designed for secondary containment of liquids (see Figure G-22). The asphaltic-concrete floor is sloped 0.5% towards a concrete sump in the center of the dome. A ramp at the entrance to the dome allows movement of waste containers and prevents run-on. The floor, sump, and curbs are lined with a double layer of HDPE (80 mil and 40 mil) creating an impervious layer to contain any liquids that might accumulate (see Supplement G-1 for details on HDPE liners). The secondary containment capacity for Dome 224 is approximately 19,150 gallons, which exceeds the amount necessary to hold 10% of the total storage capacity of the dome (95,040 gallons; see Supplement 2-1).

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate within the domes and sheds (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets, curbed areas, or sumps (where present). These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.6 Storage Domes 153 and 283 and Pad 6 CSU

This CSU is located in the north-central portion of Area G, and consists of two domes on a pad (see Figure 2-3). Storage Domes 153 and 283 are located on Pad 6. The design and materials of construction for Domes 153 and 283 are the same as for domes described in Section G.3.4.1. Pad 6 is constructed of asphaltic concrete, and is approximately 633 ft long, 99 ft wide, and 4 inches thick. It is sloped approximately 1.2% from west to east.

Dome 153 is approximately 326 ft long and 60 ft wide, with a peak height of 26 ft (see Figure G-23). A double-panel rolling door is located at the west end of the dome, and 10 personnel doors are

located approximately every 40 to 125 ft along the dome's length. Dome 283 is approximately 250 ft long and 60 ft wide, with a peak height of 26 ft (see Figure G-24). A double-panel rolling door is located at the east end of the dome, and 10 personnel doors are located approximately every 50 ft along the dome's length. These accesses allow adequate traffic flow of vehicles and personnel into and out of the dome. A 6-inch-high, 8-inch-wide asphaltic-concrete curb surrounds the interior perimeter of both domes to help prevent run-on and runoff. An asphaltic-concrete ramp is located at the vehicle entrance of each dome to allow vehicles and container-handling equipment to pass safely over the curb. Domes 153 and 283 are anchored to Pad 6 with standard drift pins.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate within the domes (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the secondary containment pallets and curbed areas. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.7 Storage Shed 8 CSU

Storage Shed 8 is located in the north-central portion of Area G (see Figure G-25). The shed is 40 ft long and 16 ft wide, and has a 14-ft-high galvanized steel roof that slopes to the north. The siding of Storage Shed 8 is constructed of galvanized steel and the foundation is constructed of concrete. Two overhead doors and one personnel door on the south side of the shed allow both vehicles and personnel to access the shed. The shed also has a 6-inch high, 8-inch-wide asphaltic-concrete curb to prevent runoff. A concrete slab on the south side of the shed is sloped away from the shed's foundation to prevent run-on.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate (e.g., precipitation, liquids resulting from fire-suppression activities) is

contained within the secondary containment pallets and curbed area. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.8 TA-54-33 CSU

TA-54-33 is located in the north-central portion of Area G and consists of a dome attached to a concrete-block building (see Figure G-26). This CSU is used for waste storage and potential or future waste characterization activities. The dome and building are located on a concrete foundation surrounded by an asphaltic-concrete pad. The concrete slab is 8 inches thick and overlies 6 inches of base course. The concrete-block building attached to the dome is approximately 40 ft long and 34 ft wide. The dome is 157 ft long and 50 ft wide, with a peak height of 24 ft. A double-panel rolling door is located at the west end of the dome for vehicle access. A single-panel rolling door is located at the southeast end of the dome for container-handling access. Two personnel doors are located approximately 40 ft apart along the north wall of the dome. Two additional personnel doors are located in the concrete-block building; one on the west side, and one on the east side. In addition, two overhead doors are located on the north side of the building to allow free movement of personnel and container-handling equipment between the building and the dome. The interior perimeter of the dome is surrounded with a 6-inch-high, 8-inch-wide concrete curb to prevent run-on and runoff. The concrete floors of Rooms 100, 100A, 100B, 100C, and 105 also slope inward to prevent runoff.

The design and materials of construction for the TA-54-33 dome are the same as for domes described in Section G.3.4.1. The dome's aluminum frame is directly connected to the building, which extends approximately 5 ft into the dome. Inside the dome, the concrete foundation is sloped to a 6-inch-wide centralized concrete drainage trench that is covered with 12-inch-wide steel grating. The trench slopes toward a steel sump located at the east end of the dome. Two additional trenches, located in Rooms 100A and 100B, are perpendicular to and feed into the main trench. A floor drain in Room 105 connects with the trench in Room 100A.

The steel sump is located within a concrete basin that has 8-inch-thick walls, a 9-inch-thick base, and measures approximately 15 ft long by 7 ft wide by 6 ft deep. The sump is approximately 14 ft long by 6.5 ft wide by 5 ft deep and has a capacity of 3,473 gallons. A primary holding tank associated with the sump is located in a concrete basin that is 15 ft long by 12 ft wide by 5.5 ft deep and has a capacity of approximately 7,405 gallons. A secondary holding tank associated with the sump is located in a separate concrete basin that is 12 ft long by 12 ft wide by 5.5 ft deep and has a

capacity of approximately 5,924 gallons. These basins have the capacity to contain any spills or leaks resulting from a potential overflow or breach of the holding tanks.

The discussions of the trench and holding tank system at TA-54-33 are provided for completeness and informational purposes only. The trench and tank system, including all associated structures and systems (e.g., basins, piping) do not require a Resource Conservation and Recovery Act (RCRA) permit.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any liquid that might accumulate (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the curbed area of the dome, within the sump, within the building, or within secondary containment pallets. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.3.4.9 Storage Dome 375 and Pad 11 CSU

Storage Dome 375 is located in the western portion of Area G and is used for storage of hazardous waste, MLLW, and MTRUW. It measures approximately 300 ft long by 100 ft wide (see Figure G-27). The building is an aluminum A-frame truss design that is anchored to a concrete ring wall. The dome is of modular construction utilizing a membrane/fabric covering. It is equipped with 14 personnel doors and two roll-up doors, one each at the east and west ends of the building. Ramped entrances allow for safe movement of container handling equipment and vehicle access. The storage dome is located on Pad 11, which is constructed of asphaltic-concrete and measures approximately 478 ft long by 137 ft wide. Pad 11 is approximately 4 inches thick and slopes approximately 1 to 2% to the southeast.

All waste containers at this CSU are stored on pallets or are otherwise elevated (e.g., metal supports, wooden timbers) to prevent contact with accumulated liquids. Secondary containment pallets used to store liquid wastes have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container stored on them, whichever is greater. Secondary containment pallets typically used at TA-54 have a capacity ranging from 57 to 83 gallons. Any

liquid that might accumulate (e.g., precipitation, liquids resulting from fire-suppression activities) is contained within the building and/or within secondary containment pallets. These liquids are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.4 TA-54 WEST CONTAINER STORAGE UNITS [20.4.1 NMAC, Subpart V, Part 264, Subpart I]

The following provides specific information on current facility operations and waste management practices at the TA-54 West CSUs. This includes a discussion of security and access control, preparedness and prevention, hazards prevention, and design information for the TA-54 West CSUs. This information is submitted to fulfill the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart I [6-14-00]. Detailed information is subject to change.

G.4.1 Security and Access Control [20.4.1 NMAC §§ 270.14(b)(4) and 270.14(b)(19)(viii); 20.4.1 NMAC § 264.14]

Security at TA-54 West is maintained by both artificial and natural barriers. These barriers prevent unauthorized entry of persons or livestock into TA-54 West and satisfy the requirements of 20.4.1 NMAC §§ 264.14(a) and 264.14(b)(2) [6-14-00]. An 8-ft-high chain-link security fence with barbed wire at the top surrounds the entire perimeter of TA-54 West. Bilingual (i.e., English and Spanish) warning signs are posted on the fence at 50- to 75-ft intervals and can be seen from any approach to this area. The legends on the signs indicate "Danger—Hazardous Waste Storage Area" and "Unauthorized Persons Keep Out." The signs are legible from a distance of 25 ft. TA-54 West is patrolled by PTLA security personnel during non-operational hours to ensure that the gates are locked and that unauthorized entry has not occurred. The entire security fence is also inspected by on-site personnel and repairs are made, as necessary. In accordance with 20.4.1 NMAC § 270.14(b)(19)(viii) [6-14-00], the locations of the security fence, entry gates, and entry stations are shown on Figure 2-14 in Section 2.0 of this permit renewal application. In addition to the fence and entry station, cliffs on the north side of TA-54 West provide a natural barrier to discourage unauthorized entry.

Authorized individuals are permitted access to the Indoor CSU at TA-54-38 through the badge reader at the west entrance to the building. Visitors, subcontractors, and other personnel that do not have a badge must gain access to the building by contacting an authorized person, and must sign the visitor logbook. When leaving TA-54-38 to go to the adjacent building (TA-54-34) or the Outdoor CSU, it is not necessary for authorized personnel to use the badge reader to exit TA-54-

38. If leaving TA-54 West completely, however, authorized personnel must badge out at the badge reader. Visitors must always sign out on the visitor logbook when leaving the building.

G.4.2 Preparedness and Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

The following presents information on the emergency equipment available at the TA-54 West CSUs to comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. This includes the approximate locations of the fire extinguishers, shower/eyewash stations, spill center, and communication systems.

Required Equipment [20.4.1 NMAC § 264.32]

TA-54-38 is equipped with an audible alarm system to alert personnel of fire or the need to evacuate the area. Fire alarm pull stations are located throughout the building and can be activated in the event of a fire. Strobe lights mounted at the fire alarms and at TA-54-34, just north of TA-54-38, flash upon activation of the fire alarms to visually alert personnel. The alarm system can also be activated by using evacuation alarm buttons located near the entrances to the building. Upon activation of the evacuation alarm system, horns sound to alert personnel of emergency conditions. The building's manual fire alarm pull stations at TA-54 West are connected to the LACFD through LANL's central alarm system at all times. The evacuation alarm system is a local system that notifies occupants in TA-54-38 and TA-54-34 of a local emergency. Additionally, a roll-up door between the high and low bays has heat sensitive links attached to a safety chain that melt at a certain temperature and cause the door to close.

TA-54-38 is also equipped with telephones to provide adequate communication and to summon external emergency assistance, if necessary. Paging telephones are located throughout the building and are used to contact on-site personnel. Paging telephones are also used in the event of an emergency to communicate the nature and location of hazardous conditions to personnel in the area. The alarm system is interrupted when the paging telephone system is activated to allow personnel to hear the announcement. Additionally, an emergency telephone is located outside the main entry area. Personnel working within the building can also use these telephones to summon assistance from local emergency response teams in case of emergency.

Fire control equipment is available for use within TA-54-38 and at the Outdoor CSU. Portable halon fire extinguishers are located in the high bay, low bay, and at the Outdoor CSU. The fire extinguisher located by the east personnel entrance door in the low bay can also be used at the

loading dock. Depending on the size of the fire and the fuel source, fire extinguishers can be used by on-site personnel. However, LANL policy encourages immediate evacuation of the area and notification of appropriate emergency personnel. TA-54-38 is equipped with a smoke-activated dry-pipe sprinkler system in the low bay and with heat-activated dry-pipe fire suppression systems in the high bay and at the loading dock. A fire hydrant installed according to National Fire Protection Association standards is located approximately 220 ft west of TA-54-38 near the west entrance to TA-54 West. Water is supplied to the fire hydrant by a municipal water system through 8-inch pipes at an adequate volume and pressure to satisfy the requirements of 20.4.1 NMAC § 264.32 [6-14-00].

A portable chemical spill center is maintained within TA-54-38. It contains sorbents and PPE. Personnel working anywhere within the building have access to this spill center. Trained personnel use this equipment to mitigate small containable spills when they are certain their actions will not put themselves or others at risk. Personnel decontamination equipment available includes a safety shower and eyewash located in the high bay and a safety shower and eyewash on the loading dock.

G.4.3 Hazards Prevention [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC § 270.14(b)(8)]

In accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00], the TA-54 West CSUs are designed and operated to minimize the possibility of a fire, explosion, or any unplanned releases of hazardous wastes or hazardous waste constituents which could threaten human health or the environment. The following discusses the specific procedures, equipment, and structures used at TA-54 West to mitigate the effects of power outages. Prevention of run-on and runoff at TA-54 West is discussed in Section 2.10.3 of this permit renewal application.

Mitigating Effects of Power Outages [20.4.1 NMAC § 270.14(b)(8)(ii)]

Electrical power is supplied to TA-54-38 through a transformer located north of the building. In the event of a power failure, operations in the building cease. If electrical power is not restored quickly or if container handling equipment fails, containment at the TA-54 West CSUs is not affected. Monitoring equipment alarms are operated by supplied power, but will continue to operate on a backup battery. Emergency lighting is equipped with backup batteries.

G.4.4 TA-54 West CSUs [20.4.1 NMAC § 270.15]

The following describes the two CSUs at TA-54 West. The two CSUs include the Indoor CSU and the Outdoor CSU. The Indoor CSU is comprised of the low bay and the high bay at TA-54-38. The Outdoor CSU is comprised of the storage pad surrounding the north, east, and south sides of TA-54-38 and the loading dock at TA-54-38. The CSUs at TA-54 West are used to store MLLW and MTRUW in solid form. General dimensions, containment features, and materials of construction are discussed in this section to fulfill the requirements of 20.4.1 NMAC §§ 270.15(a)(1) and (2) [6-14-00].

G.4.4.1 Indoor CSU

TA-54-38 is constructed of 36-ft-high precast concrete panel walls topped by prestressed double-T concrete roof sections. Its foundation consists of a 6-inch reinforced concrete slab on compacted fill. The building is divided into several offices and houses the Indoor CSU, which includes the low bay and the high bay (see Figure G-28).

The low bay is approximately 40 ft wide and 34 ft long. An 8-ft-wide by 12-ft-high roll-up door is located at the east end and opens to an outdoor loading dock. A second 8-ft-wide by 12-ft-high roll-up door is located in the southeast corner and opens into the high bay. The walls and floor of the low bay are coated with industrial grade enamel paint.

The high bay is approximately 40 ft wide and 80 ft long. The high bay is used for loading TRU waste and MTRUW into Transuranic Package Transporter-II containers. It is equipped with 14-ft-wide by 18-ft-high roll-up doors on the east and west ends to allow convenient, indoor loading of the tractor-trailers that transport shipments of waste to the Waste Isolation Pilot Plant. The high bay floor is unpainted and slopes at an angle of 1.5 degrees toward a central trench and sump. The trench is 5 inches wide, 6 inches deep, and 50 ft long. The entire length of the trench is covered with a metal grate and is designed to hold precipitation and snow melt from tractor-trailers. The sump is locked out. Potential liquids that accumulate within the sump area (e.g., precipitation, liquids resulting from fire-suppression activities) are removed and collected for characterization, as described in Section 2.6 of this permit renewal application.

G.4.4.2 Outdoor CSU

The Outdoor CSU consists of the loading dock at TA-54-38 and the storage pad located on the north, east, and south sides of TA-54-38. The loading dock is 16 ft wide by 38 ft, 10 inches long

and is covered by a metal awning. The platform is constructed of 6-inch cast-in-place concrete and is located approximately 4 inches above grade.

The boundary of the storage pad is delineated by the fence surrounding the pad. The approximate dimensions of the pad at the Outdoor CSU are shown on Figure 2-14**.** The pad is constructed of asphaltic concrete to a thickness of approximately 4 inches and slopes toward the curbed edges (see Figure 2-14 in Section 2.0). This slope allows for storm water to run off the pad. Storage containers on this pad are elevated either by design or on a pallet.

Mobile radioassay trailers and storage sheds for supplies and equipment are also stored on the pad at the Outdoor CSU.

G.5 REFERENCES

Ball, T., M. Everett, P. Longmire, D. Vaniman, W. Stone, D. Larssen, K. Greene, N. Clayton, and S. McLin, 2002, "Characterization Well R-22 Completion Report," Los Alamos National Laboratory report LA-13893-MS, Los Alamos New Mexico.

DOE, 1992, "*Natural Phenomena Hazards Design and Evaluation Criteria for DOE Facilities,"* DOE-STD-1020-92.

LANL, 1998, "Hydrogeologic Workplan," May 1998, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1995, "Geologic and Hydrologic Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface Water Stations in the Los Alamos Area," LA-12883-MS, January 1995.

Table G-1

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.15	Specific requirements for containers:	
§270.15(a)	A description of the containment system to demonstrate compliance with §264.175 including at a minimum:	2.6, G.2.4, G.3.4, G.4.4
§270.15(a)(1)	Basic design parameters, dimensions, and materials of construction	G.2.4, G.3.4, G.4.4
§270.15(a)(2)	How the design promotes drainage or how containers are kept from contact with standing liquids in the containment system	2.6, G.2.4, G.3.4, G.4.4
§270.15(a)(3)	Capacity of the containment system relative to the number and volume of containers to be stored	2.6, Supplement 2-1
§270.15(a)(4)	Provisions for managing run-on	2.10, G.2.4, G.3.4, G.4.4
§270.15(a)(5)	How accumulated liquids can be analyzed and removed to prevent overflow	2.6
§270.15(b)	For storage areas that store containers holding wastes that do not contain free liquids, a demonstration of compliance with §264.175(c) includes:	2.1.3.2
§270.15(b)(1)	Test procedures and results or other documentation or information to show that the wastes do not contain free liquids	2.1.3.2
§270.15(b)(2)	A description of how the storage area is designed or operated to drain or remove liquids or how containers are kept from contact with standing liquids	2.1.3.2, G.4.4
§270.15(c)	Provide sketches, drawings, or data demonstrating compliance with §264.176 (location of buffer zone and containers holding ignitable or reactive wastes) and §264.177(c) (location of incompatible wastes), where applicable	2.8
§270.15(d)	Where incompatible wastes are stored or otherwise managed in containers, a description of the procedures used to ensure compliance with §264.177(a) and (b) and §264.17(b) and (c)	2.8
§270.15(e)	Information regarding air emission control equipment as required in §270.27	G.1.6
§270.27(a)	If applicable, specific information requirements for air emissions for containers:	G.1.6

Table G-1 (Continued)

Regulatory References and Corresponding Permit Renewal Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Document
§270.27(a)(2)	Identification of each container area subject to the requirements of 40 CFR Part 264, Subpart CC and certification by the owner or operator that the requirements are met	G.1.6
§270.27(a)(3)	Documentation that each enclosure used to control air emissions from containers are in accordance with the requirements of §264.1086(b)(2)(i) includes information prepared by the owner or operator or manufacturer or vendor describing the enclosure design and certification that the enclosure meets the specifications listed in §265.1087(b)(2)(ii)	Not applicable (NA)
§270.27(a)(5)	Documentation for each closed-vent system and control device installed in accordance with the requirements of §264.1087 that includes design and performance information as specified in §270.24(c) and (d)	NA
§270.27(a)(6)	An emission monitoring plan for both Method 21 and control device monitoring methods. The plan must include:	NA
§270.27(a)(6)	monitoring point(s)	NA
§270.27(a)(6)	monitoring methods for control devices	NA
§270.27(a)(6)	monitoring frequency	NA
§270.27(a)(6)	procedures for documenting exceedances	NA
§270.27(a)(6)	procedures for mitigating noncompliances	NA

CG0003.06.01/LANL TA-54 Renewal G-1

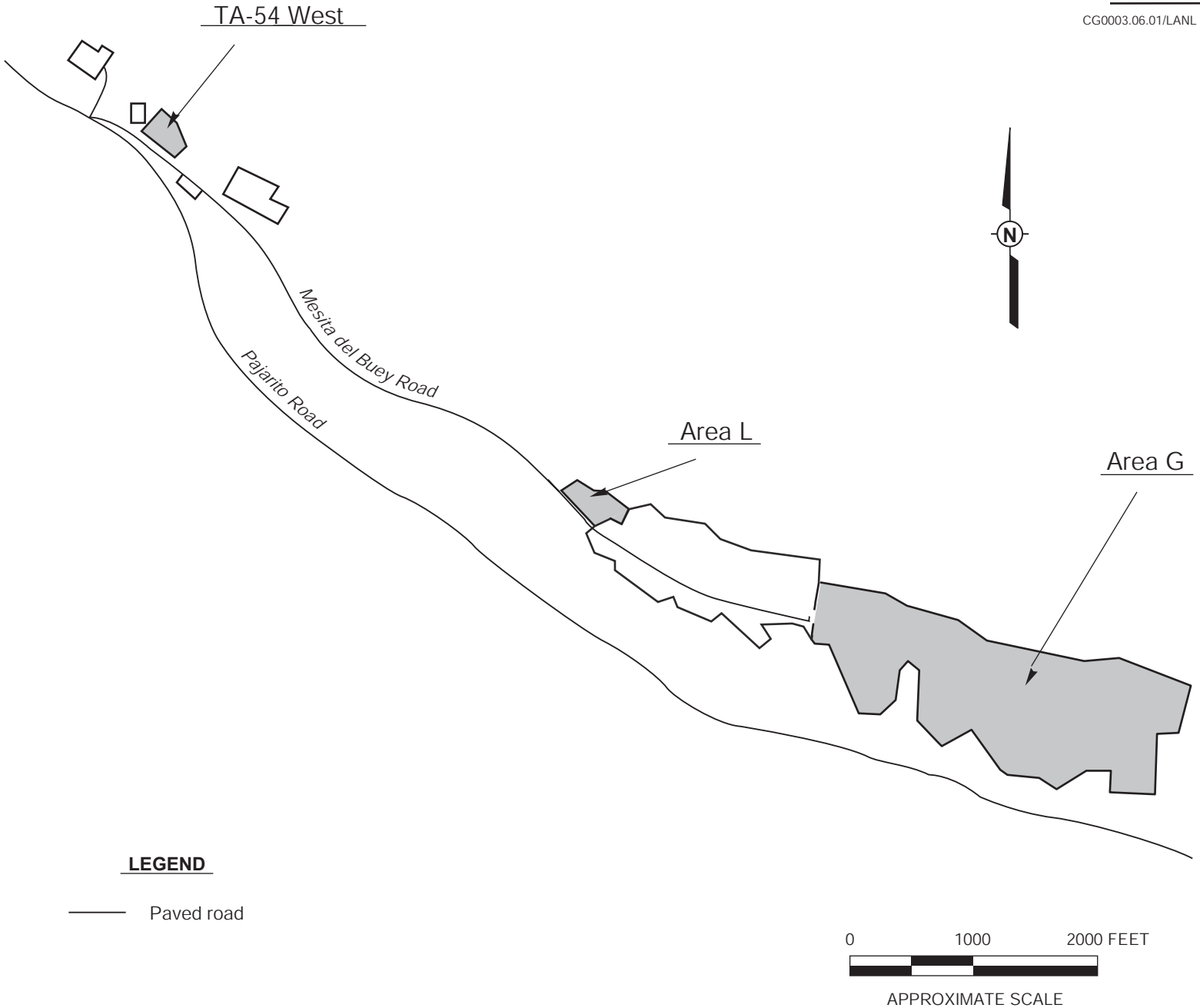
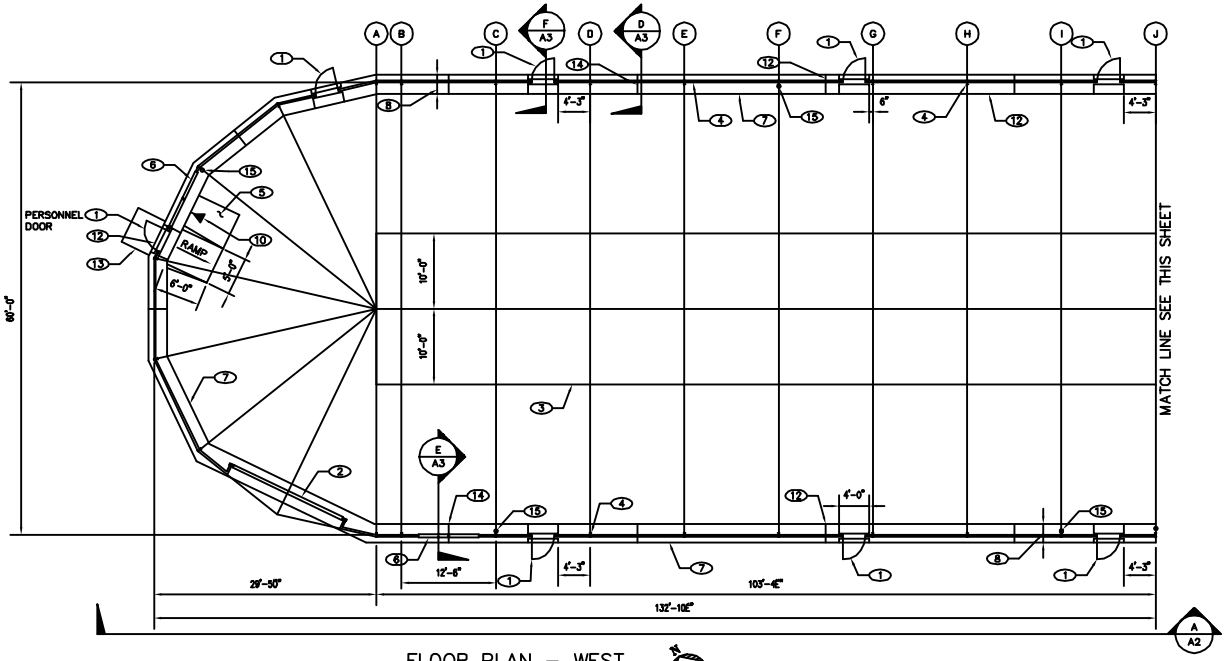
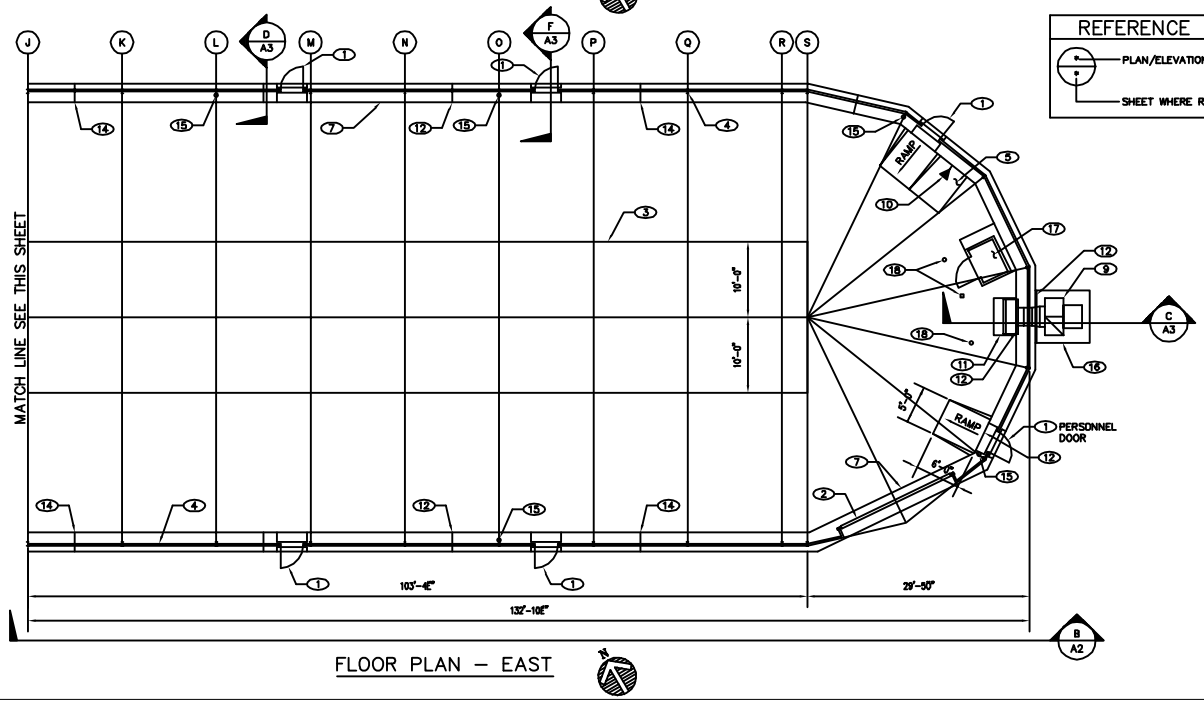


Figure G-1

Technical Area (TA) 54 Site Location Map



FLOOR PLAN – WEST



FLOOR PLAN – EAST

REFERENCE "BUBBLE" DESCRIPTION

PLAN/ELEVATION/DETAIL REFERENCE NUMBERS

SHEET WHERE REFERENCE IS LOCATED

KEYED NOTES

1. 3'-0" x 6'-8" PERSONNEL DOOR (2), EXIT DOORS (12).
2. 16'-0" x 16'-0" OVERHEAD ROLL-UP DOOR.
3. SKYLIGHT AREA (ABOVE).
4. STEEL STRUCTURAL FRAME AND FABRIC COVER.
5. CONCRETE EYEWASH PAD. SEE SHEET C5 DETAIL 3.
6. WALL LOUVER. SEE SHEET A3 SECTION E.
7. CONCRETE RINGWALL AND CONTAINMENT CURB. PROVIDE CONTRACTION JOINTS @ 20 FEET ON CENTER MAXIMUM, SEE SHEET A3 DETAIL 1. PROVIDE EXPANSION JOINTS AT 120 FEET ON CENTER MAXIMUM. SEE SHEET A3 DETAIL 2. LOCATE JOINTS HALFWAY BETWEEN FRAMES.
8. RINGWALL WIDTH AS REQUIRED BY DOME MANUFACTURER.
9. EXHAUST FAN PLENUM. SEE SHEET M2 DETAIL 2.
10. EYEWASH. SEE SHEET M2 DETAIL 1.
11. EXHAUST PLENUM PAD. SEE SHEET C5 DETAIL 2.
12. 8" EXPANSION JOINTS.
13. CONCRETE STOOP.
14. CONTRACTION JOINT TYPICAL UNLESS NOTED OTHERWISE.
15. FIRE EXTINGUISHER. (GFE)
16. EXHAUST FAN PAD. SEE SHEET C3 DETAIL 2.
17. SPRINKLER RISER CLOSET AND CONCRETE SLAB, FOR DETAILS, SEE SHEET A4.
18. FOR PLACEMENT OF BOLLARDS, SEE SHEET A4, ENLARGED PLAN.

LEGEND

- ELEVATION SYMBOL
- CENTERLINE OF DOME AND/OR FRAME
- CONCRETE
- ROLL-UP DOOR
- ASPHALT PAVING
- AGGREGATE BASE COURSE
- SUBGRADE
- ALUMINUM
- METAL STUD PARTITION
- SKYLIGHT MATERIAL

96/93023.51AD1/MIXEDFP/04-24-96/PCS

NO.	DATE	CLASS REVIEW	REVISIONS	DRN	DES	CHKD	REL	SUB	REC	APP
2	4/96		AS-BUILT WITH CHANGES							
1	3-27-95		F01: ADDED SPRINKLER RISER CLOSET AND SKYLIGHT							

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN DIEGO

Figure G-2
Storage Dome 215

BLDG. 54-215 TA-54

DRAWN	S HAUGLAND
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	S KOFFMAN
DATE	6/10/94

A/E STAMP

SUBMITTED	RECOMMENDED	APPROVED
DAVID DOZIER	DAVID POWELL	CORY HIGGINS

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

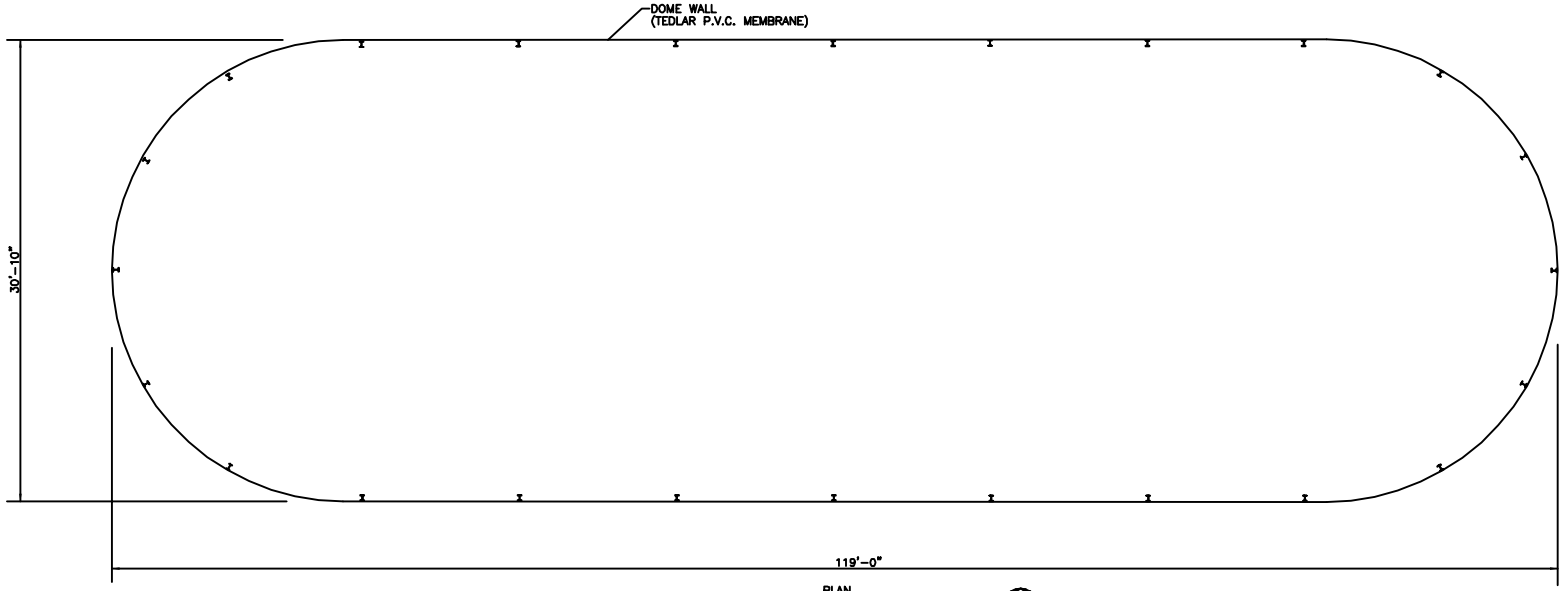
SHEET A1 9 OF 25

CLASSIFICATION REVIEWER DATE

PROJECT ID 14020

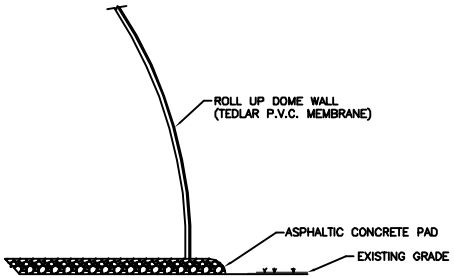
DRAWING NO. C49510

REV. 2

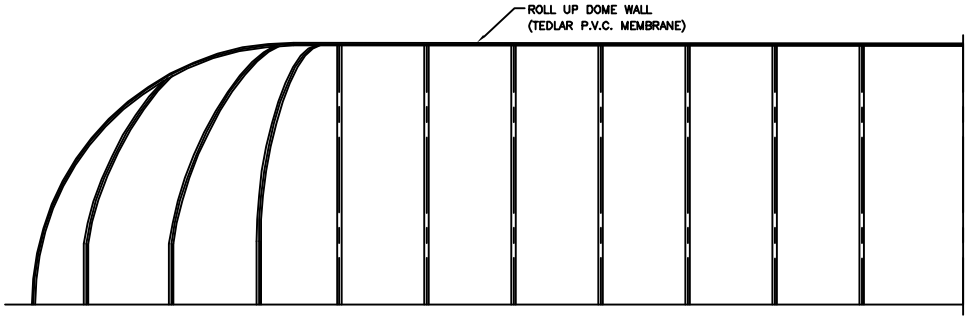


PLAN
NOT TO SCALE

N



SECTION
NOT TO SCALE



ELEVATION
NOT TO SCALE

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

fwo-wfm
Facility & Waste Operations
Waste Facility Management
Los Alamos National Laboratory

Facility & Waste Operations
Waste Facility Management
TA-54 FMU-54

Figure G-3
Canopy 216

DRAWN	J. FULK
VERIFIED	R. SPENCER
CHECKED	R. LECHEL
RELEASED	
DATE	06-28-02

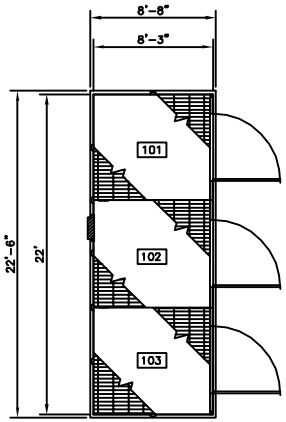
SUBMITTED: R. LECHEL
RECOMMENDED:
APPROVED: D. MCLAIN

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

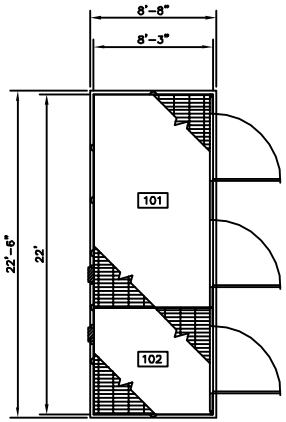
SHEET 1 OF 1

CLASSIFICATION | REVIEWER | DATE

PROJECT ID | DRAWING NO: SK-54-L-03 | REV



54-68



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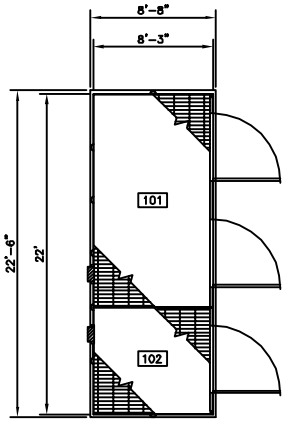
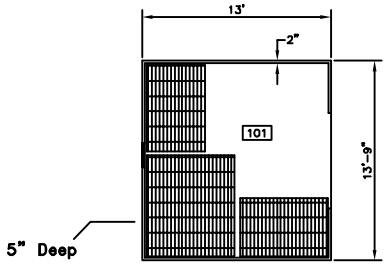


54-70



54-31

FIRST FLOOR PLAN

LEGEND

LOUVER
METAL SIDING
WINDOW
WOOD OR METAL STUD

FIELD VERIFIED 04-01-93

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G-4
Storage Sheds 31, 68, 69, and 70
Secondary Containment

DRAWN	C. SAMORA
VERIFIED	C.E.S/C.D.S
CHECKED	H. SALAZAR
RELEASED	H. SALAZAR
DATE	09-07-93

BLDGS 68, 69, 70, 31 TA-54

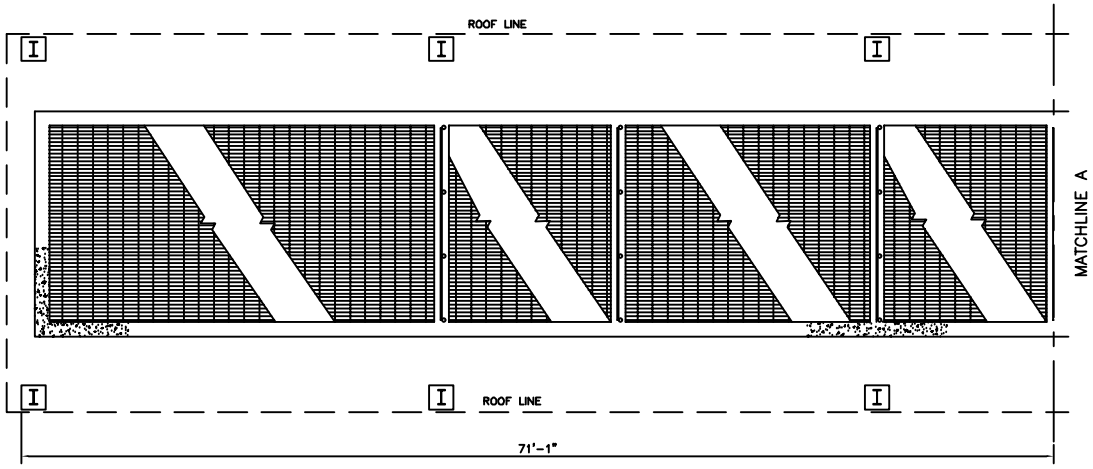
SUBMITTED	RECOMMENDED	APPROVED
JERRY FORTE	FRED THOMPSON	ED LOPEZ

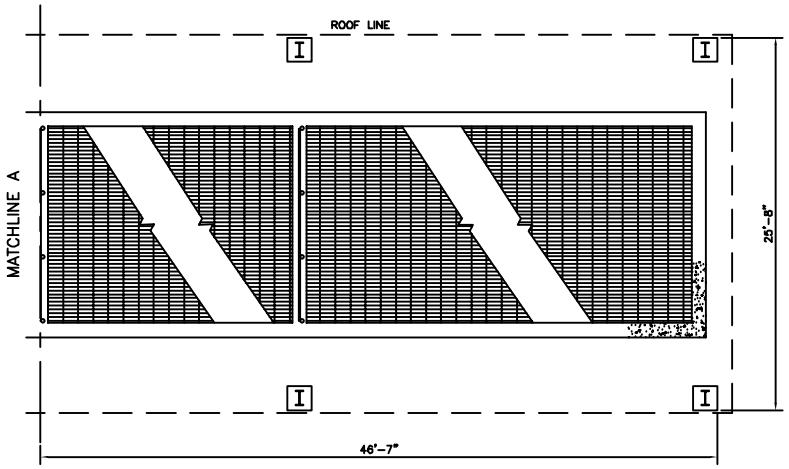
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET A8 21 OF 36

CLASSIFICATION REVIEWER H. SALAZAR DATE

PROJECT ID	DRAWING NO	REV
014292	AB113	





FIRST FLOOR PLAN

N

LEGEND

□	COLUMNS
▭	CONCRETE
I	I BEAM
○	POST

FIELD VERIFIED 04-01-93

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G-5
TA-54-32

DRAWN	C. SAMORA
VERIFIED	C.E.S/C.D.S
CHECKED	H. SALAZAR
RELEASED	H. SALAZAR
DATE	09-07-93

BLDG 32 TA-54

SUBMITTED	RECOMMENDED	APPROVED
JERRY FORTE	FRED THOMPSON	ED LOPEZ

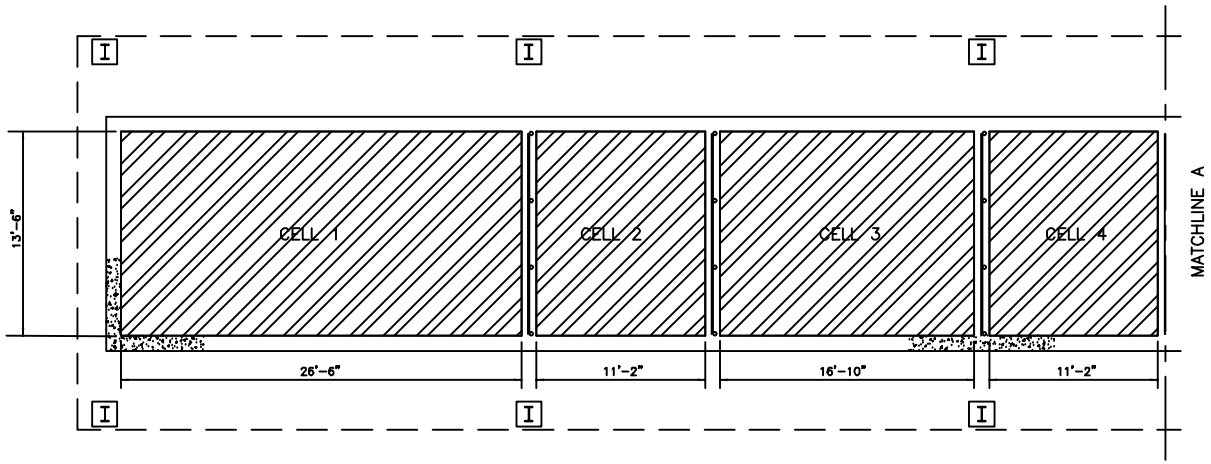
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET A5 18 OF 36

CLASSIFICATION REVIEWER H. SALAZAR DATE

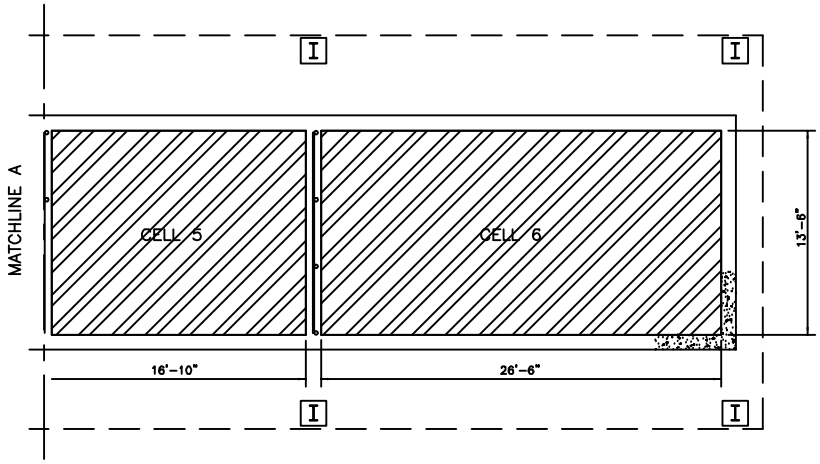
PROJECT ID	DRAWING NO	REV
014292	AB113	

JCI NO 93-016



LEGEND

12" DEPTH



FIRST FLOOR PLAN

N

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

Facility & Waste Operations
Waste Facility Management
TA-54 FMU-54

Figure G-6
TA-54-32
Secondary Containment

DRAWN	J. FULK
VERIFIED	J. FULK
CHECKED	R. LECHEL
RELEASED	D. MCLAIN
DATE	06-02

BLDG 32 TA-54

SUBMITTED R. LECHEL | RECOMMENDED | APPROVED D. MCLAIN

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

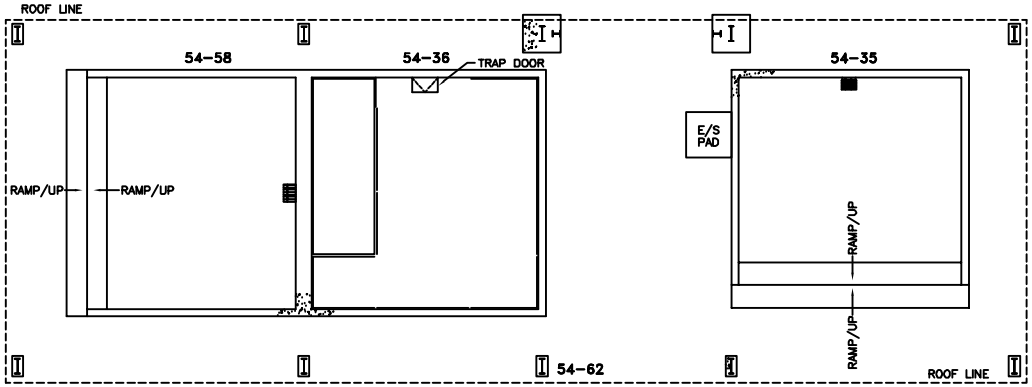
SHEET A5 1 OF 1

CLASSIFICATION | REVIEWER | DATE

PROJECT ID | DRAWING NO SK-54-L-04 | REV 0

LEGEND

o □	COLUMNS
	CONCRETE
I	I BEAM
E/S	EMERGENCY SHOWER



FIRST FLOOR PLAN

N

FIELD VERIFIED 04-01-93

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G-7
TA-54-35, -36, -58, and -62

DRAWN	C. SAMORA
VERIFIED	C.E.S/C.D.S
CHECKED	H. SALAZAR
RELEASED	H. SALAZAR
DATE	00-00-00

BLDGS 62, 58, 36, 35 TA-54

SUBMITTED	RECOMMENDED	APPROVED
JERRY FORTE	FRED THOMPLON	FRED THOMPSON

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

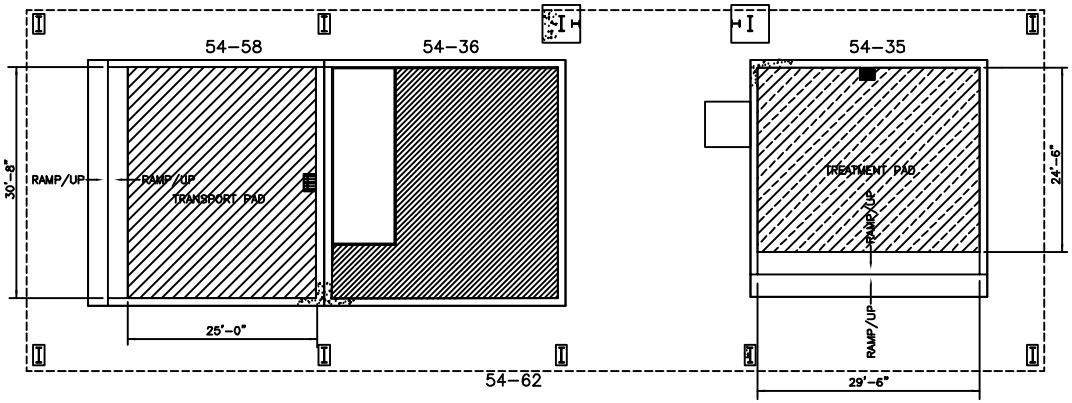
SHEET 1 OF 1

CLASSIFICATION REVIEWER H. SALAZAR DATE

PROJECT ID	DRAWING NO	REV
7556	AB214	

LEGEND

- 6" DEPTH
- 8" DEPTH
- 10" DEPTH



FIRST FLOOR PLAN

N

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

Facility & Waste Operations
Waste Facility Management
TA-54 FMU-64

Figure G–8
TA–54–35, –36, and –58
Secondary Containment

DRAWN	J. FULK
VERIFIED	J. FULK
CHECKED	R. LECHEL
RELEASED	D. MCLAIN
DATE	06–02

BLDGS 35, 36, 58 TA–54

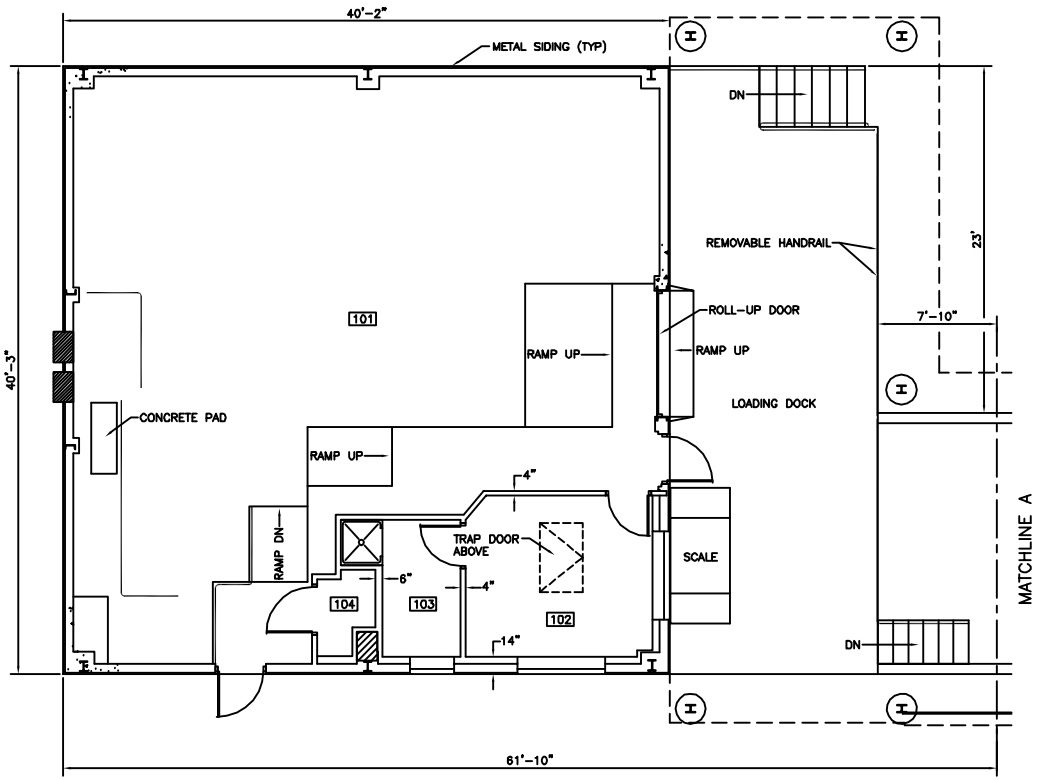
SUBMITTED R. LECHEL | RECOMMENDED | APPROVED D. MCLAIN

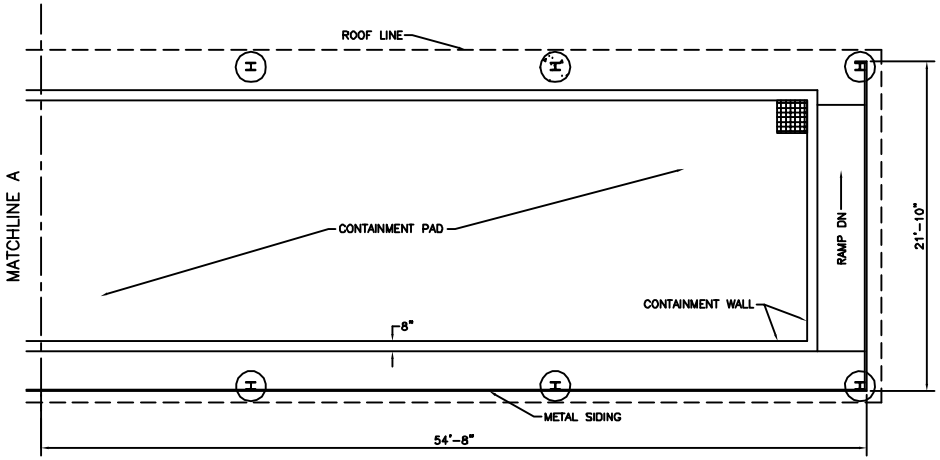
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 1

CLASSIFICATION | REVIEWER | DATE

PROJECT ID | DRAWING NO SK–54–L–05 | REV 0





FIRST FLOOR PLAN

N

FIELD VERIFIED 04-06-93

ROOM INFORMATION CHART

RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE	RM NO	NET SQ FOOTAGE
101	1,378	102	135	103	60
104	21	UTILITY	3	–	–

TOTAL ROOM NET SQUARE FOOTAGE = 1,595

GROSS SQUARE FOOTAGE = 2,173

LEGEND

- COLUMNS
- CONCRETE
- I BEAM
- LOUVER
- UTILITY SPACE
- WINDOW
- WOOD OR METAL STUD

NOTES

1. ALL EXTERIOR WALLS ARE 8" THICK UNLESS OTHERWISE NOTED.
2. ROOM NET SQUARE FOOTAGE IS COMPUTED BY MEASURING FROM THE INSIDE FACE OF EXTERIOR WALLS TO THE CENTERLINE OF ALL OTHER WALLS.
3. GROSS SQUARE FOOTAGE IS EQUAL TO ALL FLOOR AREA (INCLUDING ALL OPENINGS IN FLOOR SLABS) MEASURED TO THE OUTER SURFACES OF EXTERIOR OR ENCLOSING WALLS, AND INCLUDES ALL FLOORS, MEZZANINES, HALLS, VESTIBULES, STAIRWELLS, SERVICE AND EQUIPMENT ROOMS, PENTHOUSES, ENCLOSED PASSAGES AND WALKS, FINISHED USABLE SPACE WITH SLOPING CEILINGS (SUCH AS ATTIC SPACES) HAVING 5 FEET OR MORE HEADROOM, AND APPENDED COVERED SHIPPING OR RECEIVING PLATFORMS AT TRUCK OR RAILROAD CAR HEIGHT. ALSO INCLUDED IN GROSS FLOOR AREA, BUT CALCULATED ON ONE-HALF OF ACTUAL FLOOR AREA, ARE COVERED OPEN PORCHES, PASSAGES AND WALKS, WITH APPENDED UNCOVERED RECEIVING AND SHIPPING PLATFORMS AT TRUCK AND RAILROAD HEIGHT.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G-9
TA-54-39

DRAWN	C. SANDOVAL
VERIFIED	C.E.S/C.D.S
CHECKED	H. SALAZAR
RELEASED	H. SALAZAR
DATE	09-07-93

BLDG 39 TA-54

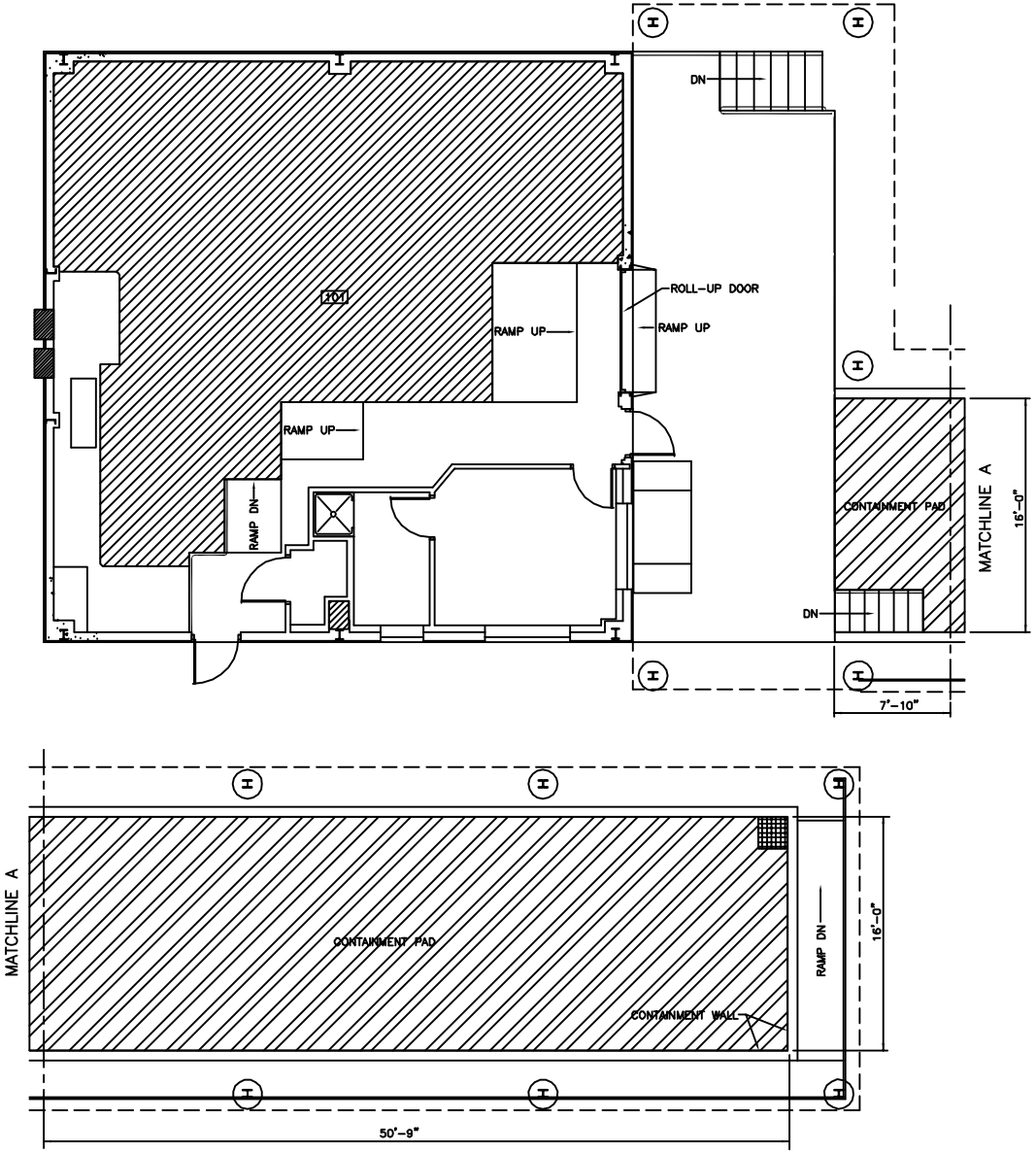
SUBMITTED	RECOMMENDED	APPROVED
JERRY FORTE	FRED THOMPSON	FRED THOMPSON

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 1

CLASSIFICATION REVIEWER H. SALAZAR DATE

PROJECT ID	DRAWING NO	REV
7556	AB211	



FIRST FLOOR PLAN

LEGEND

6" DEPTH

12" DEPTH

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

Facility & Waste Operations
Waste Facility Management
TA-54 FMU-54

Figure G-10
TA-54-39
Secondary Containment

DRAWN	J. FULK
VERIFIED	J. FULK
CHECKED	R. LECHEL
RELEASED	D. Mclain
DATE	06-02

BLDG 39 TA-54

SUBMITTED R. Lechel | RECOMMENDED | APPROVED D. Mclain

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 1

CLASSIFICATION | REVIEWER | DATE

PROJECT ID | DRAWING NO SK-54-L-06 | REV 0

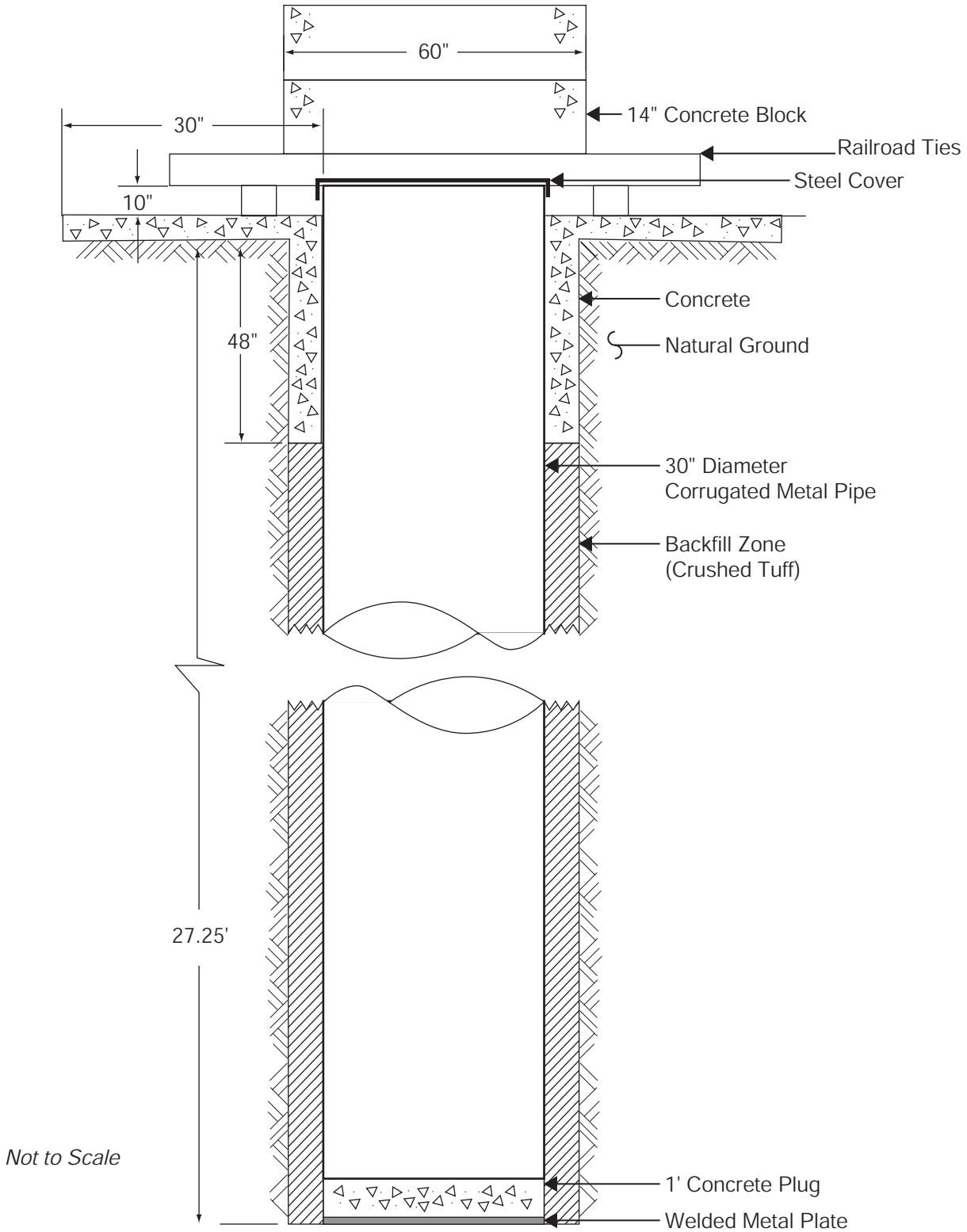


Figure G-11

Shaft 36

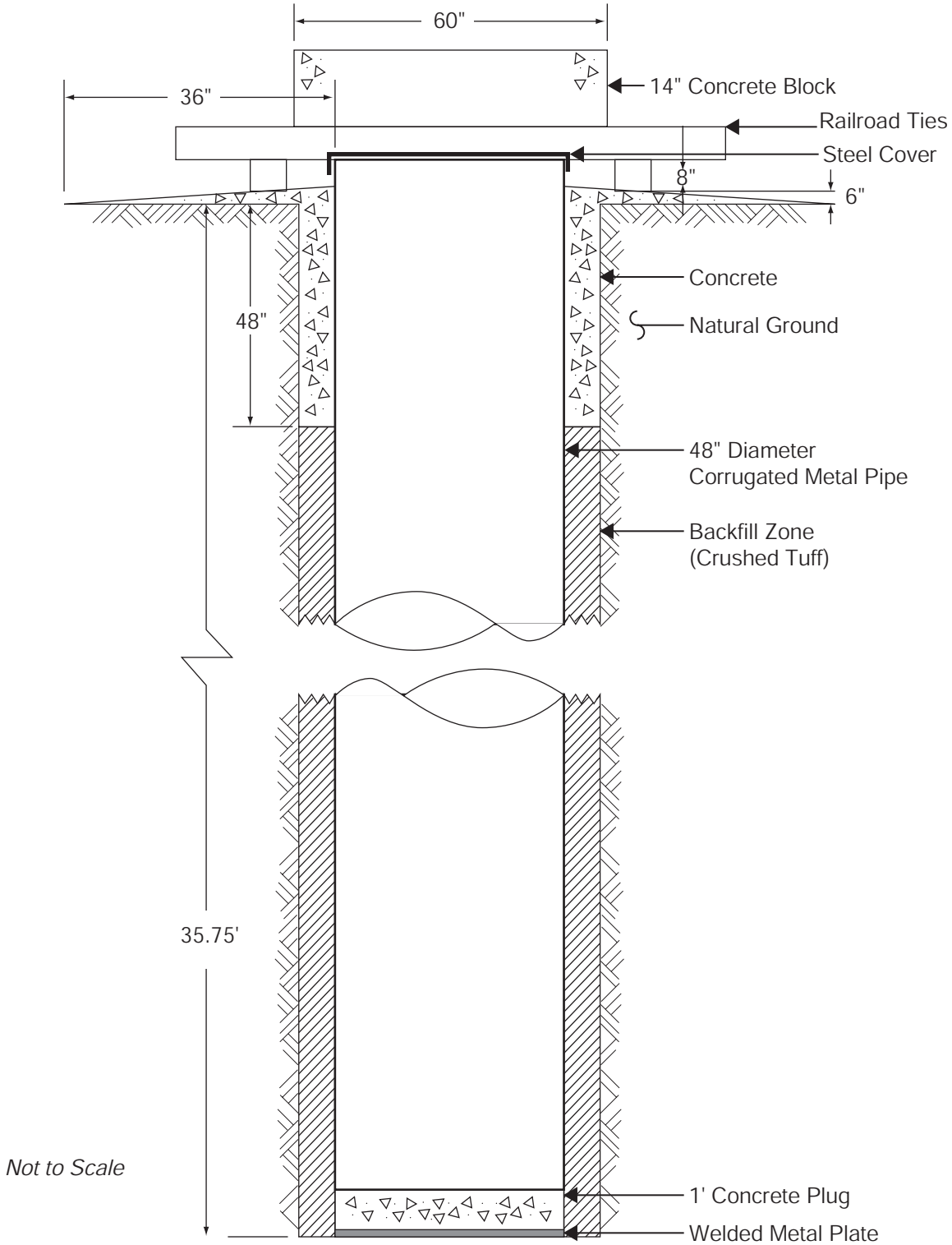
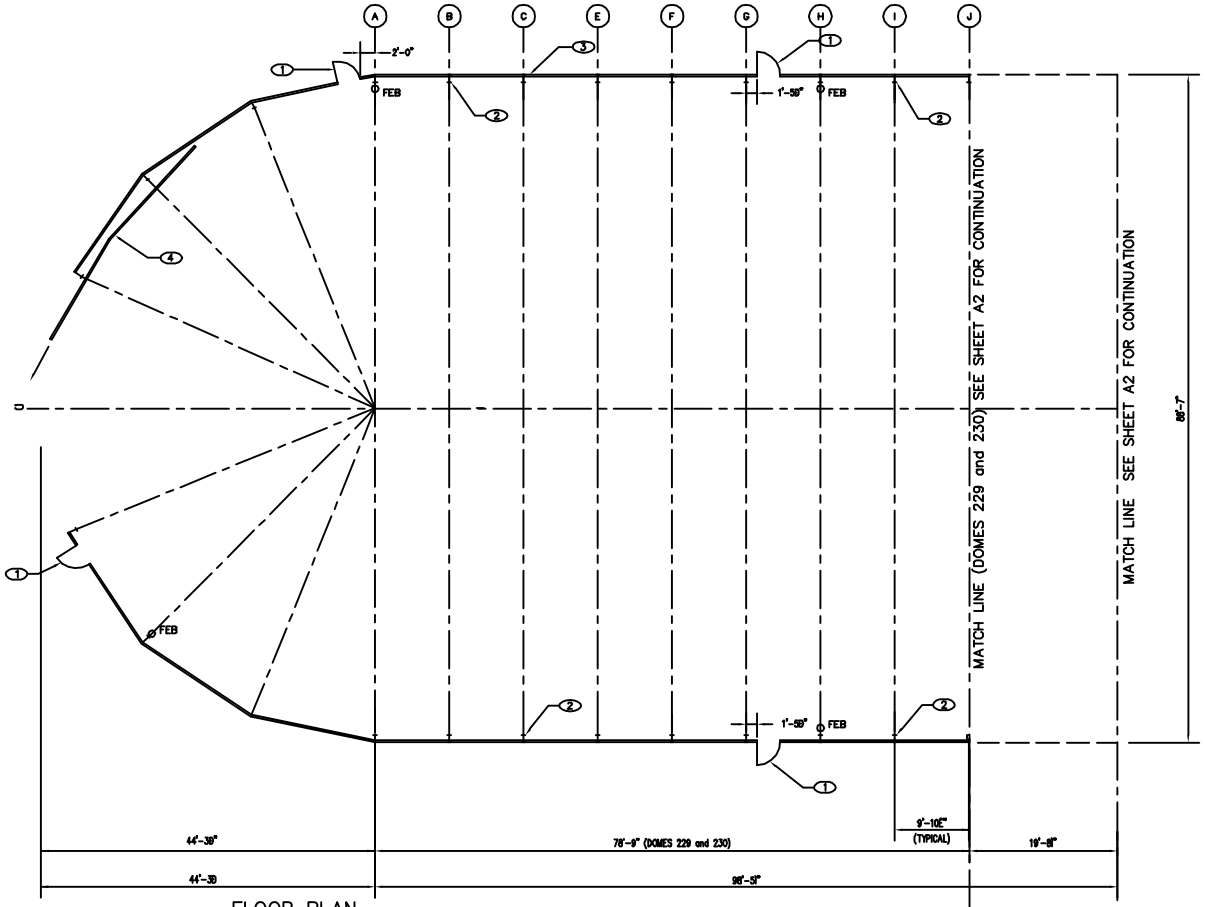
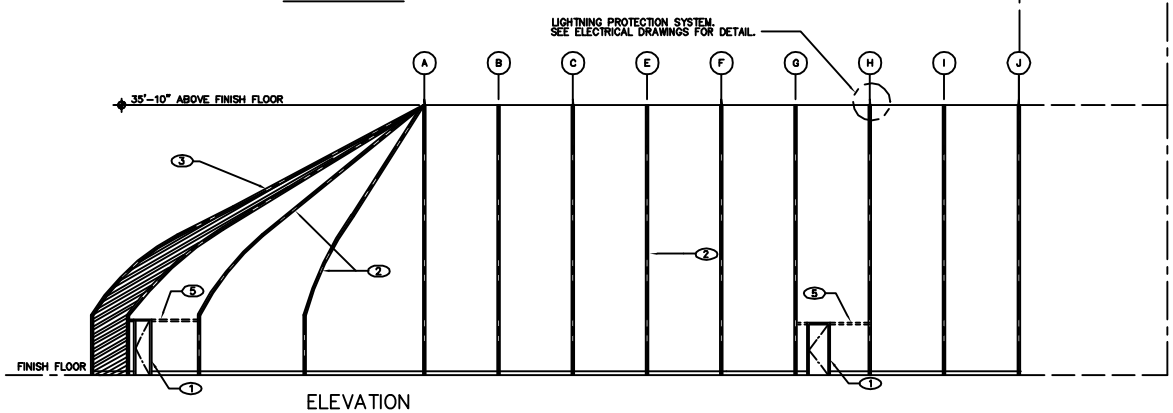


Figure G-12

Shaft 37



FLOOR PLAN



ELEVATION

NOTES

A DOMES ARE CONTRACTOR FURNISHED AND INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B STORAGE DOME LOCATION AND SIZE ARE AS FOLLOWS:

BUILDING #	DOME	SIZE	PHASE
~~54-227~~	~~PAD 1'S~~	~~[illegible]'C59" x 88'-7"~~	~~PHASE III-S~~
~~54-228~~	~~PAD 4'S~~	~~[illegible]'C59" x 88'-7"~~	~~PHASE IV-S~~
54-229	A	246'-1" x 88'-7"	PHASE I-S
54-230	B	246'-1" x 88'-7"	PHASE I-S
~~54-231~~	~~C~~	~~[illegible]'C1" x 88'-7"~~	~~PHASE II-S~~
~~54-232~~	~~D~~	~~[illegible]'C1" x 88'-7"~~	~~PHASE II-S~~

C DOME(S) SHOWN ON THESE DRAWINGS ARE BASED ON DOMES MANUFACTURED BY SPRUNG INSTANT STRUCTURES. SEE SPECIFICATION SECTION 13127 FOR OTHER APPROVED DOME MANUFACTURERS AND ASSOCIATED CONTRACTOR RESPONSIBILITIES.

KEYED NOTES

1. 3'-0" x 6'-8" METAL PERSONNEL DOOR.
2. ALUMINUM FRAME. (TYPICAL)
3. MODULAR RELOCATABLE STRUCTURE (DOME).
4. DOUBLE PANEL HORIZONTAL ROLLING DOOR.
5. ALUMINUM SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.

LEGEND

— — — CENTERLINE OF DOME AND/OR FRAME.

ELEVATION SYMBOL

SEE COVER SHEET FOR ADDITIONAL RECORD DRAWING INFORMATION

THIS DRAWING SET WAS DEVELOPED FOR FOUR PHASES. BID ONLY WORK DESIGNATED AS PHASE I-S. WORK DESIGNATED AS BELONGING TO PHASE II-S, PHASE III-S OR PHASE IV-S IS FOR INFORMATION ONLY.

98/93023.31A01/DOMELFPA/12-27-95/SJH

NO.	DATE	CLASS REVIEW	REVISIONS	DWN	DES	CHKD	REL	SUB	REC	APP
1	12/95		AS-BUILT WITHOUT CHANGES							

RECORD DRAWING
Date DECEMBER 1995
These drawings have been revised based on the construction records of the owner. While the information submitted by the Owner will be assumed to be reliable, the Engineer will not be responsible for the accuracy of this information nor for errors or omissions which may appear in the record document as a result thereof.

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN DIEGO

Figure G-13a
Storage Domes 229 and 230

BLDG. TA-54

DRAWN	F PHILLIPS
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	J JARRARD
DATE	6/8/94

A/E STAMP

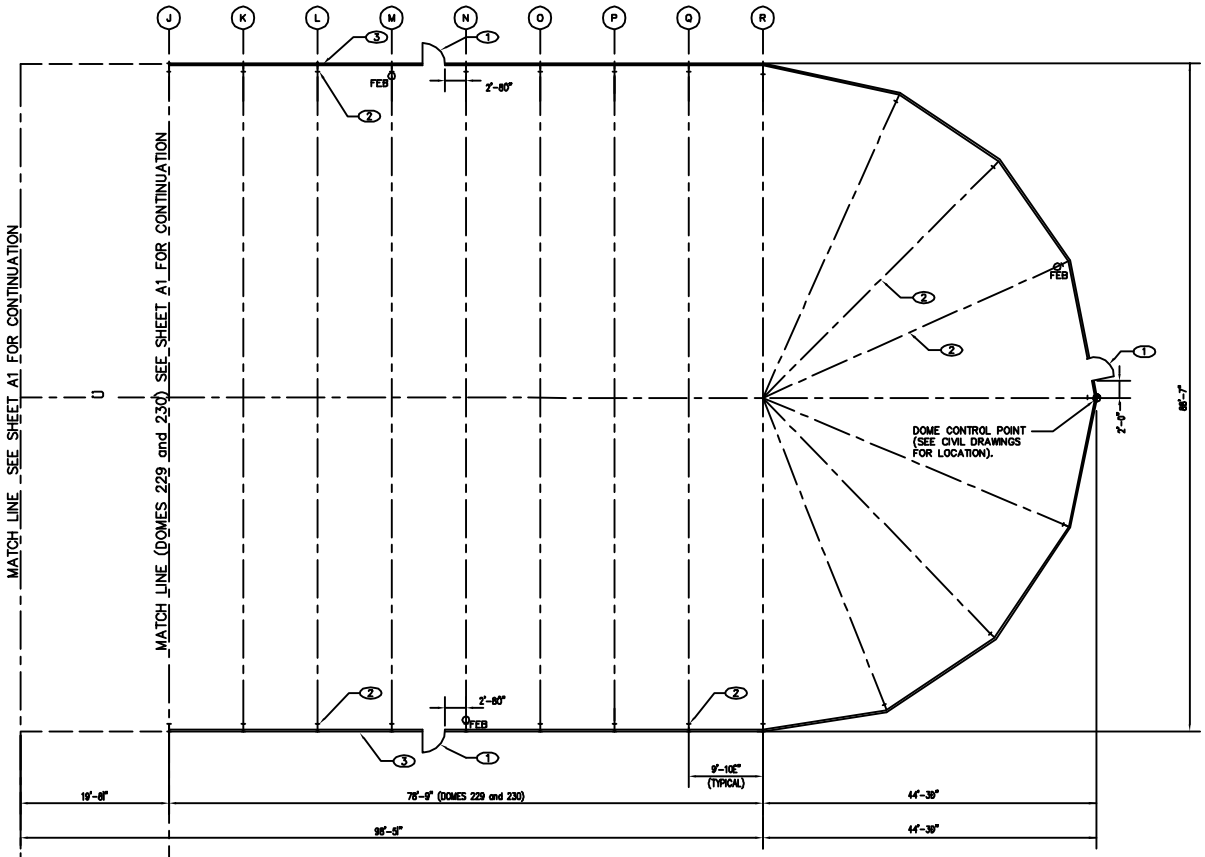
SUBMITTED	RECOMMENDED	APPROVED
DAVID DOZIER	DAVID POWELL	CORY HIGGINS

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

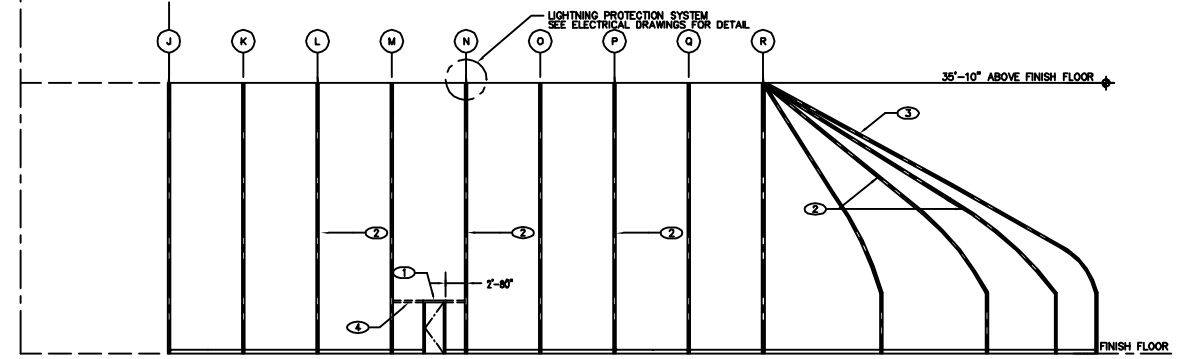
SHEET A1 27 OF 41

CLASSIFICATION REVIEWER DATE

PROJECT ID	DRAWING NO.	REV.
13868	C49421	1



FLOOR PLAN



ELEVATION

NOTES

A DOMES ARE CONTRACTOR FURNISHED AND INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B STORAGE DOME LOCATION AND SIZE ARE AS FOLLOWS:

BUILDING	DOME	SIZE	PHASE
~~54-227~~	~~PAD 1'S~~	~~245'-0½" x 88'-7"~~	~~PHASE III-S~~
~~54-228~~	~~PAD 4'S~~	~~245'-0½" x 88'-7"~~	~~PHASE IV-S~~
54-229	A	246'-1" x 88'-7"	PHASE I-S
54-230	B	246'-1" x 88'-7"	PHASE I-S
~~54-231~~	~~C~~	~~244'-0"~~ x 88'-7"	~~PHASE II-S~~
~~54-232~~	~~D~~	~~244'-0"~~ x 88'-7"	~~PHASE II-S~~

C DOME(S) SHOWN ON THESE DRAWINGS ARE BASED ON DOMES MANUFACTURED BY SPRUNG INSTANT STRUCTURES. SEE SPECIFICATION SECTION 13127 FOR OTHER APPROVED DOME MANUFACTURERS AND ASSOCIATED CONTRACTOR RESPONSIBILITIES.

KEYED NOTES

1. 3'-0" x 6'-8" METAL PERSONNEL DOOR.
2. ALUMINUM STRUCTURAL FRAME.
3. MODULAR RELOCATABLE STORAGE STRUCTURE (DOME).
4. ALUMINUM SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.

LEGEND

— - — CENTERLINE OF DOME AND/OR FRAME.

ELEVATION SYMBOL.

SEE COVER SHEET FOR ADDITIONAL RECORD DRAWING INFORMATION

THIS DRAWING SET WAS DEVELOPED FOR FOUR PHASES. BID ONLY WORK DESIGNATED AS PHASE I-S. WORK DESIGNATED AS BELONGING TO PHASE II-S, PHASE III-S OR PHASE IV-S IS FOR INFORMATION ONLY.

98/93023.31AD1/DOMELFPB/12-27-95/SJH

NO.	DATE	CLASS REVIEW	REVISIONS	DRAWN	DES	CHKD	REL	SUB	REC	APP
1	12/95		AS-BUILT WITHOUT CHANGES							

RECORD DRAWING
Date DECEMBER 1995
These drawings have been revised based on the construction records of the owner. While the information submitted by the Owner will be assumed to be reliable, the Engineer will not be responsible for the accuracy of this information nor for errors or omissions which may appear in the record document as a result thereof.

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN DIEGO

Figure G-13b
Storage Domes 229 and 230

BLDG. TA-54

DRAWN	F PHILLIPS
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	J JARRARD
DATE	6/8/94

A/E STAMP

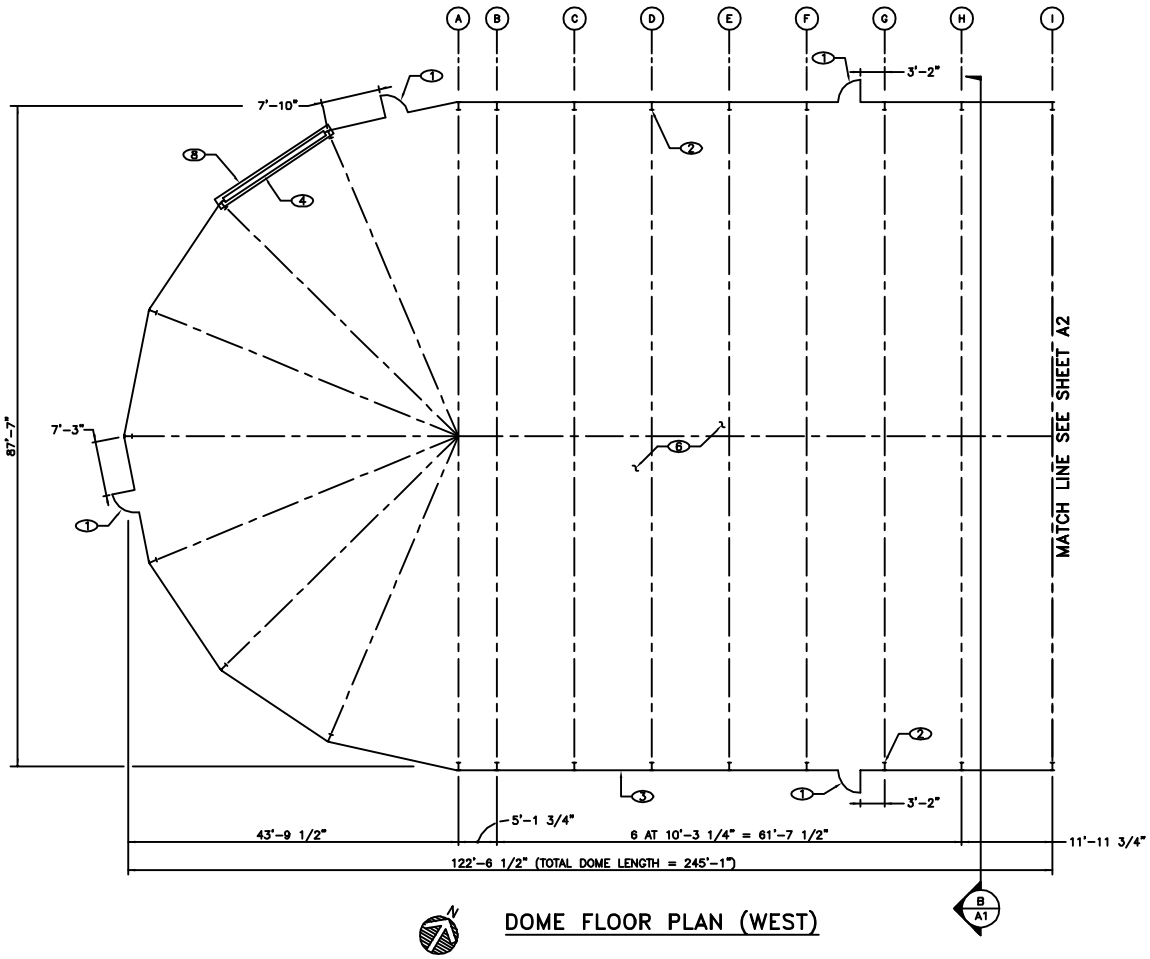
SUBMITTED	RECOMMENDED	APPROVED
DAVID DOZIER	DAVID POWELL	CORY HIGGINS

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

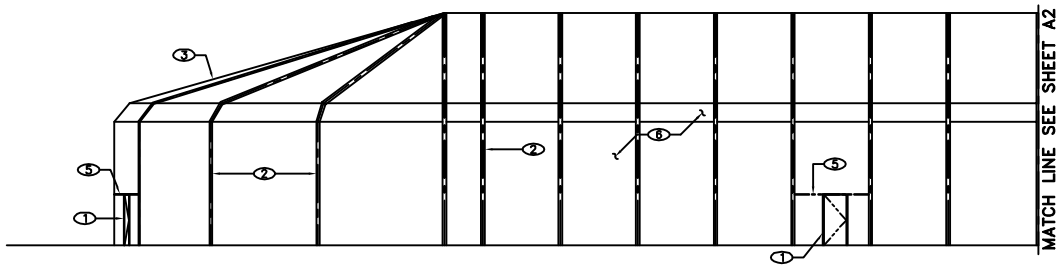
SHEET A2 28 OF 41

CLASSIFICATION REVIEWER DATE

PROJECT ID 13868 DRAWING NO. C49421 REV. 1



DOME FLOOR PLAN (WEST)



ELEVATION (WEST) A/A1

NOTES

A MODULAR RELOCATABLE STRUCTURE (DOME) WILL BE GFE FOR CONTRACTOR INSTALLATION. DOME MANUFACTURER WILL FURNISH UNASSEMBLED DOME COMPONENTS INCLUDING PERSONNEL DOORS WITH THRESHOLDS AND OVERHEAD COILING DOORS. FLOOR PLAN ON THIS SHEET IS FOR GENERAL LAYOUT INFORMATION ONLY. SEE SECTION 13127 OF THE SPECIFICATIONS FOR COMPLETE SHOP DRAWINGS AND DETAILS REGARDING CONTRACTOR DOME INSTALLATION RESPONSIBILITY.

B BUILDING DIMENSIONS ARE FROM CENTERLINE OF COLUMN.

KEYED NOTES

1 3'-0" X 6'-8" METAL PERSONNEL DOOR (PAINT DOOR AND FRAME).

2 FRAME (TYPICAL).

3 MODULAR RELOCATABLE STRUCTURE (DOME).

4 OVERHEAD COILING DOOR (16'-0" X 16'-0") (PAINT DOOR AND FRAME).

5 SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.

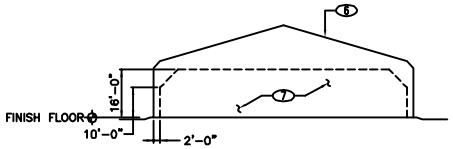
6 INSTALL GOVERNMENT FURNISHED (GFE) MODULAR RELOCATABLE STRUCTURE (DOME) ON EXISTING RING WALL FOUNDATION.

7 MINIMUM CLEAR ENVELOPE. DOME STRUCTURE, INCLUDING CABLE BRACES, FIRE PROTECTION SYSTEM, ETC MUST BE OUTSIDE THIS AREA.

8 18'-0" X 1'-6" X 1'-0" FOOTING AT OVERHEAD DOOR.

LEGEND

CENTERLINE OF DOME AND/OR STRUCTURE



TYPICAL DOME SECTION B/A1

NTS

RECORD DRAWING
Date MARCH 1998
These drawings have been revised based on the construction records of the owner. While the information submitted by the Owner will be assumed to be reliable, the Engineer will not be responsible for the accuracy of this information nor for errors or omissions which may appear in the record document as a result thereof.

A/E STAMP

98/98023_11/DWG/E/LCDA1/08-21-98/PDS

NO.	DATE	CLASS REVIEW	REVISIONS	DWN	DES	CHKD	SUB	APP
1	3/2/98		AS-BUILT WITH CHANGES					

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE

Figure G-14a
Storage Domes 231
and 232

BLDG. 54-231 TA-54

DRAWN	P SCHMITTLE
DESIGN	J JARRARD
CHECKED	D KLEIN
DATE	08/21/98

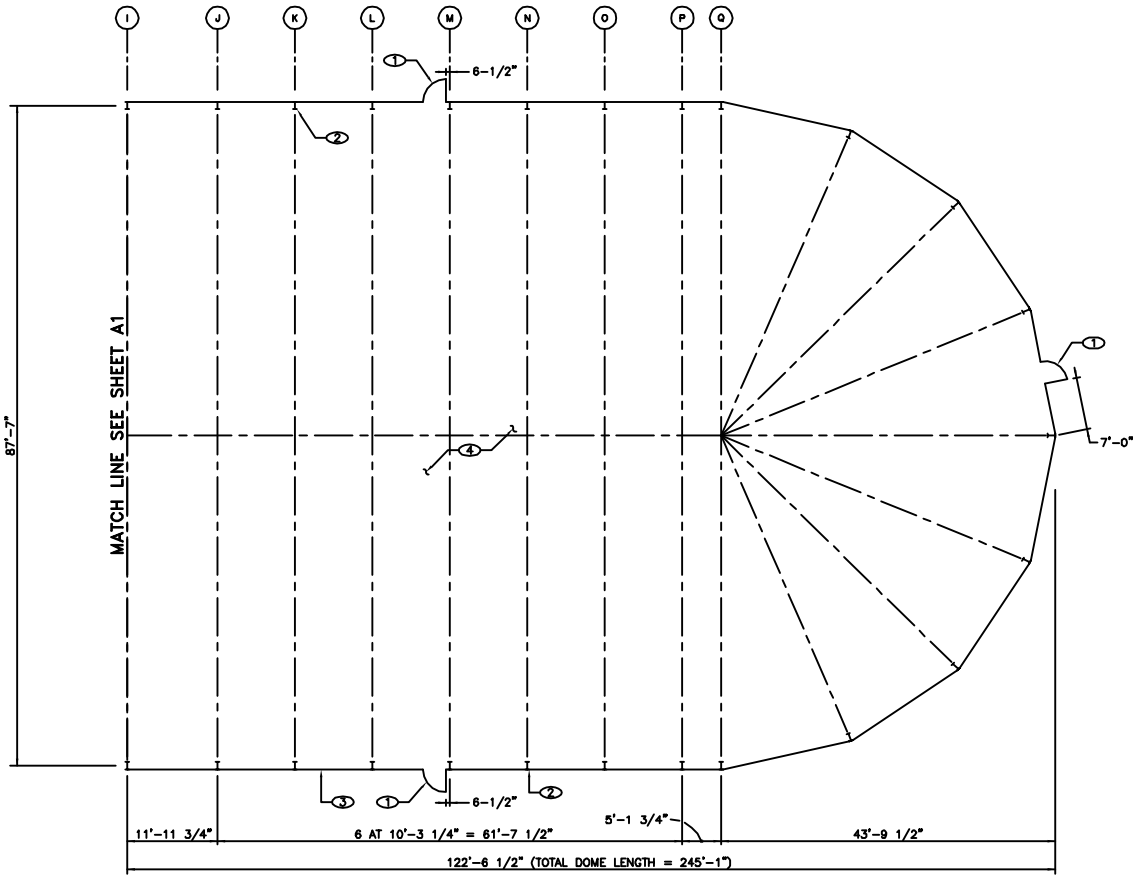
SUBMITTED: DAVID DOZIER
APPROVED FOR RELEASE: JIM BELL

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

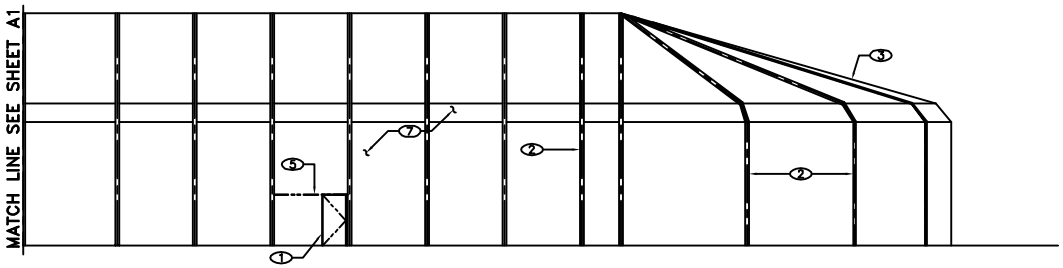
SHEET A1 4 OF 13

CLASSIFICATION REVIEWER DATE

PROJECT ID 13830
DRAWING NO. C49840-A
REV. 1



DOME FLOOR PLAN (EAST)



ELEVATION (EAST) A/A2

NOTES

A MODULAR RELOCATABLE STRUCTURE (DOME) WILL BE GFE FOR CONTRACTOR INSTALLATION. DOME MANUFACTURER WILL FURNISH UNASSEMBLED DOME COMPONENTS INCLUDING PERSONNEL DOORS WITH THRESHOLDS AND OVERHEAD COILING DOORS. FLOOR PLAN ON THIS SHEET IS FOR GENERAL LAYOUT INFORMATION ONLY. SEE SECTION 13127 OF THE SPECIFICATIONS FOR COMPLETE SHOP DRAWINGS AND DETAILS REGARDING CONTRACTOR DOME INSTALLATION RESPONSIBILITY.

B SPRINKLER RISER CLOSET NOT FURNISHED WITH GFE DOME. CONSTRUCT CLOSET ON SITE AS SHOWN ON SHEET A3.

C BUILDING DIMENSIONS ARE FROM CENTERLINE OF COLUMN.

D FOR TYPICAL DOME SECTION, SEE SHEET A1.

KEYED NOTES

1 3'-0" X 6'-8" METAL PERSONNEL DOOR (PAINT DOOR AND FRAME).

2 FRAME (TYPICAL).

3 MODULAR RELOCATABLE STRUCTURE (DOME).

4 INSTALL GOVERNMENT FURNISHED (GFE) MODULAR RELOCATABLE STRUCTURE (DOME) ON EXISTING RING WALL FOUNDATION.

5 SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.

LEGEND

CENTERLINE OF DOME AND/OR STRUCTURE

RECORD DRAWING
Date MARCH 1998
These drawings have been revised based on the construction records of the owner. While the information submitted by the Owner will be assumed to be reliable, the Engineer will not be responsible for the accuracy of this information nor for errors or omissions which may appear in the record document as a result thereof.

A/E STAMP

98/98023_11/DWG/E/LCDA2/02-25-98/SJH

NO.	DATE	CLASS REVIEW	REVISIONS	DWN	DES	CHKD	SUB	APP
1	3/2/98		AS-BUILT WITH CHANGES					

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE

Figure G-14b
Storage Domes 231
and 232

BLDG. 54-231 TA-54

DRAWN	P SCHMITTLE
DESIGN	J JARRARD
CHECKED	D KLEIN
DATE	08/21/96

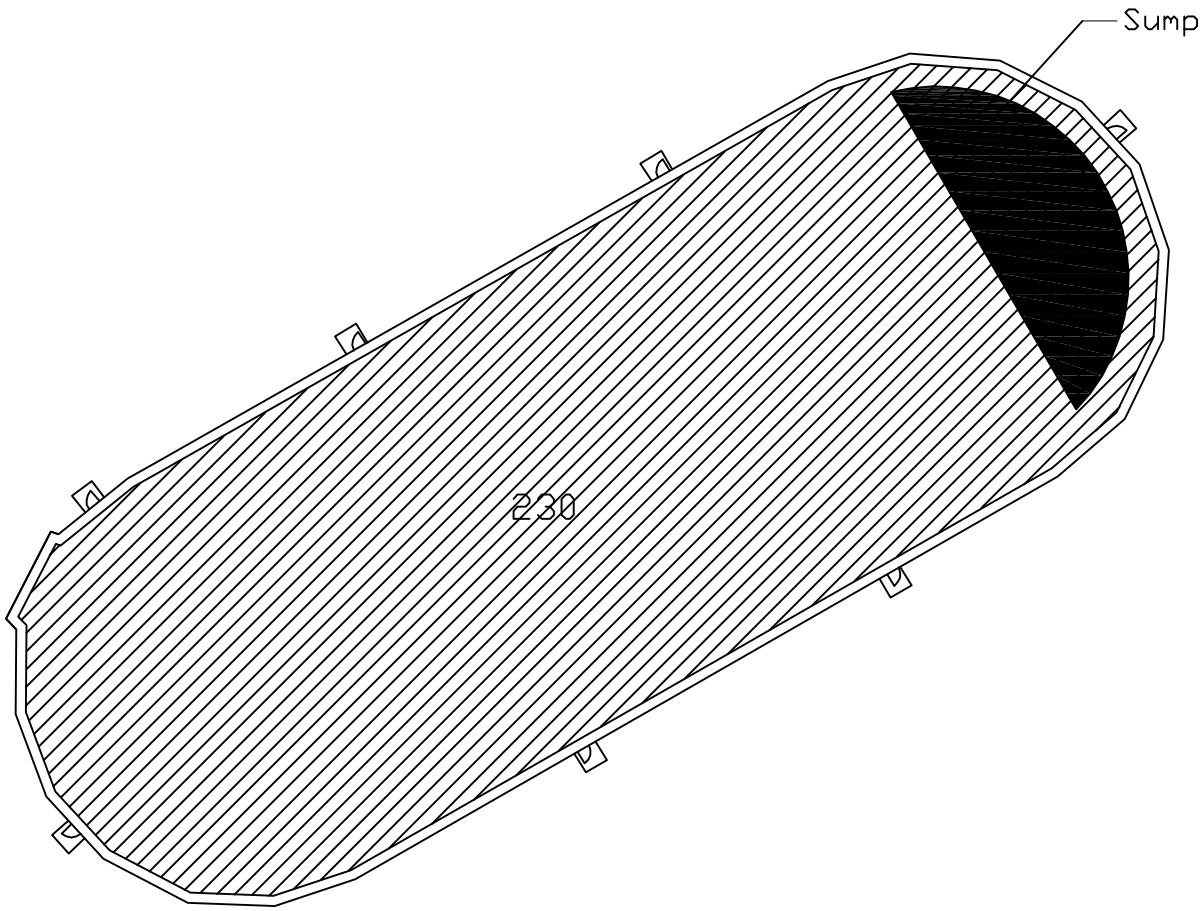
SUBMITTED DAVID DOZIER
APPROVED FOR RELEASE JIM BELL

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SHEET A2 5 OF 13

CLASSIFICATION REVIEWER DATE

PROJECT ID 13830
DRAWING NO. C49840-A
REV. 1



LEGEND

Min. 3" Depth

Min. 1'-9" Depth

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure G-15
Storage Dome 230
Secondary Containment

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

APPROVED FOR RELEASE D. Mclain

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

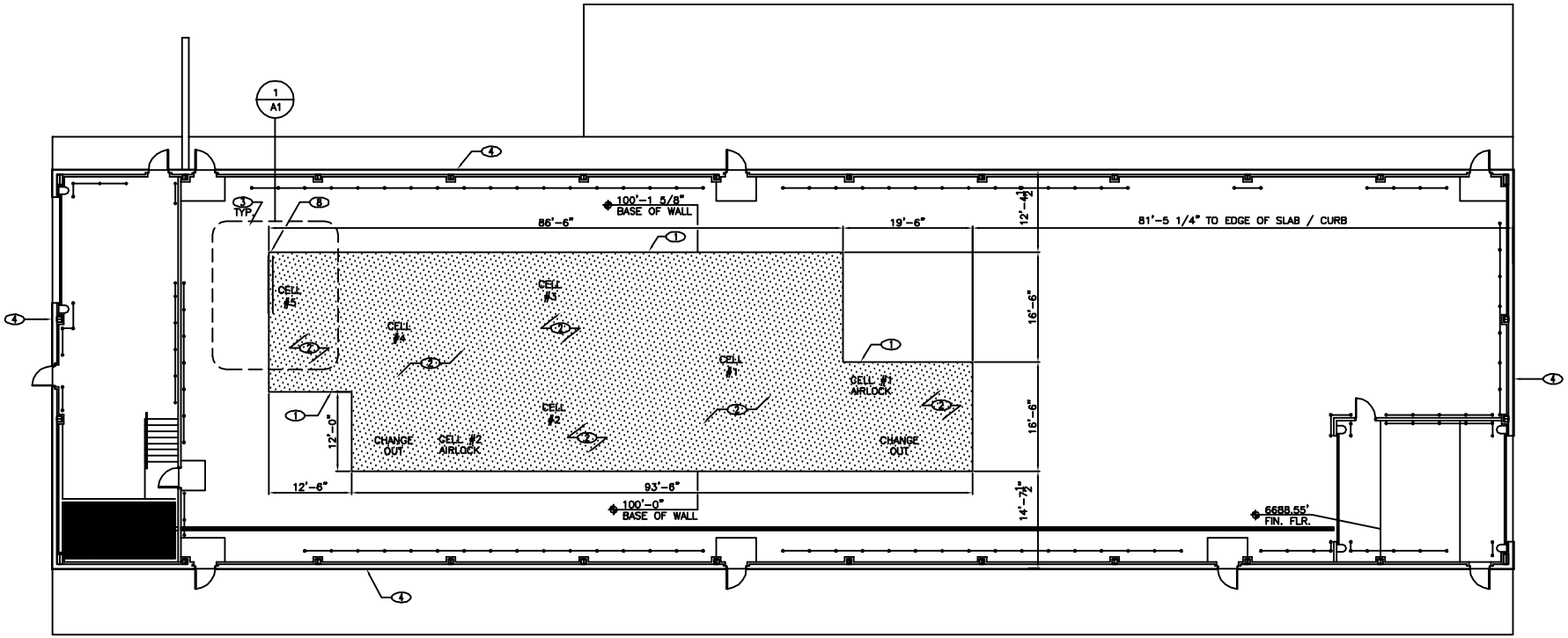
SHEET OF

CLASSIFICATION REVIEWER REVIEWER DATE

PROJECT ID

DRAWING NO SK-54-G-12

REV 0



FLOOR PLAN

N

NOTES

A

B SEAL ALL PENETRATIONS IN SECONDARY CONFINEMENT STRUCTURE WITH FIRE-RESISTIVE SEALANT. SEE SPECIFICATION 07841.

C DIMENSIONS SHOWN FOR THE FLOOR COATING ARE TO EDGE OF SLAB / CURB. COORDINATE LOCATION WITH PRIMARY CONTAINMENT STRUCTURE.

KEYED NOTES

1 PRIMARY CONTAINMENT STRUCTURE

2 SPECIAL FLOOR COATING AT PRIMARY CONTAINMENT STRUCTURE. SEE GENERAL NOTE C.

3 SHEARER / BALER (G.F.E.) – SEE STRUCTURAL FOR FOUNDATION REQUIREMENTS.

4 SECONDARY CONFINEMENT STRUCTURE.

5 STEEL TUBE FRAMING – SEE STRUCTURAL.

6 6-3/4" WIDE EXPANSION JOINT BOOT WITH GALVANIZED COVER.

7 WALL PANEL BELOW

8 ALIGN OUTSIDE EDGE OF STRUCTURE (FRAMING) WITH OUTSIDE EDGE OF EDGE OF SHEARER / BALER FLANGE.

9 HEPA FILTER FRAME OR STAINLESS-STEEL PASS THROUGH

10 5/8" TYPE "X" GYP. BD.

11 0.090" FRP PANEL

12 2" x 2" x 1/8" RETAINING ANGLE

13 FIRE-PROOF DUCT WRAP

14 FIRE RESISTANT SEALANT, CONT. SEE GEN. NOTE "B".

THIS SHEET HAS BEEN REDRAWN. SEE ORIGINAL DRAWING FOR SIGNATURES AND ENGINEER'S SEAL

KEYED NOTES (CONT.)

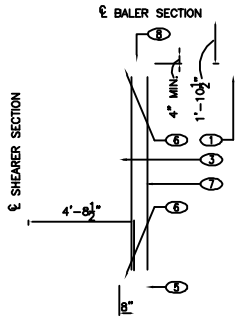
15 6" METAL STUD WALL FRMING

16 OPEN-WEB JOIST – SEE STRUCTURAL.

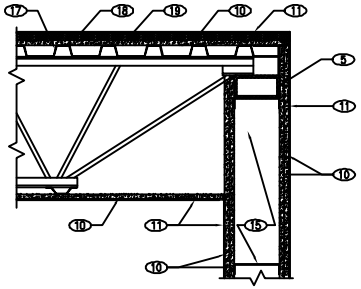
17 1-1/2" x 22 GA. STEEL ROOF DECK – SEE STRUCTURAL

18 ~~1" THICK CLASS A RIGID GLASS FIBER BOARD~~ FIBER BOARD CHANGE TO 1 ADDITIONAL LAYER 5/8" SHEETROCK (MOD. 13)

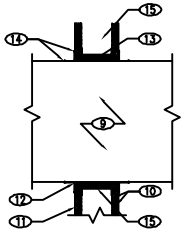
19 VINYL FILM VAPOR BARRIEER ADHERED TO GYP. BD.



STRUCTURE LOCATION DETAIL (PLAN VIEW) 1/A1



FIRE-RATD ASS'Y DETAIL 2/A1



TYPICAL FRAMED OPENING 3/A1

RECORD DRAWING
Date 8/01
These drawings have been revised based on field data and every reasonable attempt has been made to depict construction as actually performed.

A/E STAMP

NO.	DATE	CLASS REVIEW	REVISIONS	DWN	DES	CHKD	SUB	APP
	8/01		RECORD DRAWING					

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE

Figure G-16
TA-54-412

DRAWN	T. APGAR
DESIGN	S. STEPHENS
CHECKED	C. E. STOEHR
DATE	7/6/00

TA-54

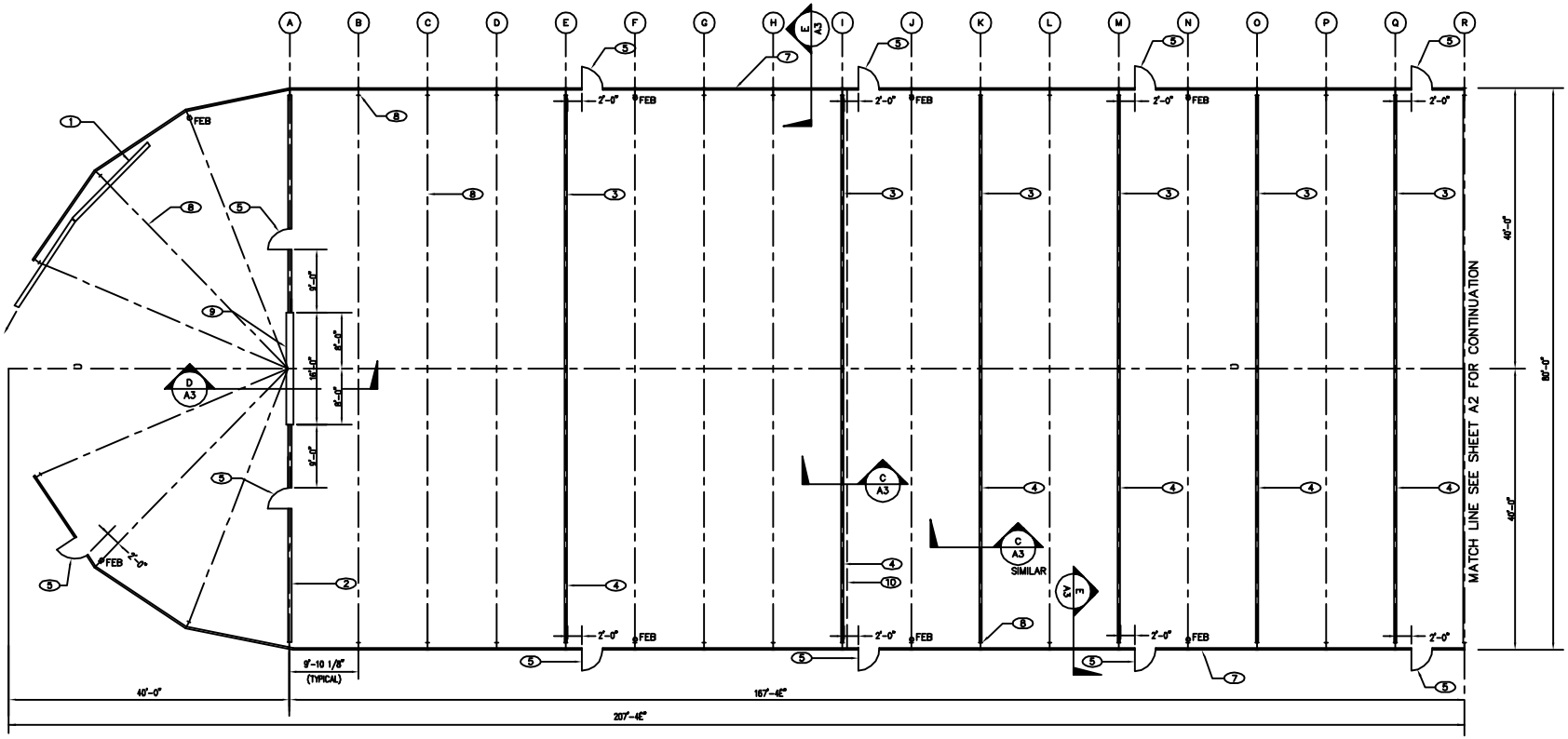
SUBMITTED JIM WEEKS
APPROVED FOR RELEASE JIM BELL

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

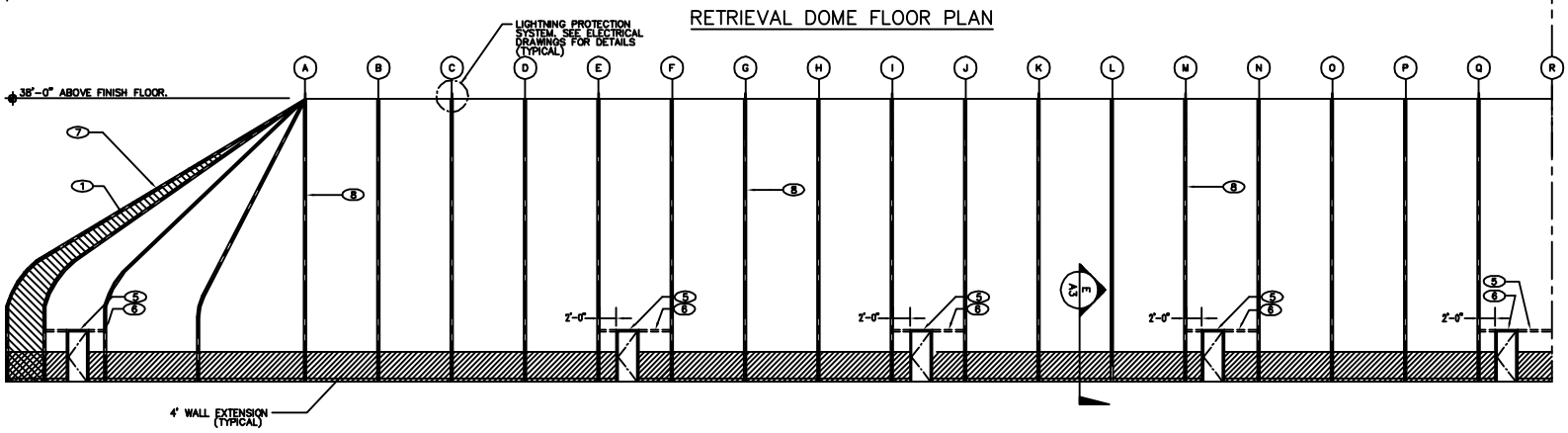
SHEET A1 6 OF 17

CLASSIFICATION REVIEWER DATE

PROJECT ID 19303
DRAWING NO. C52204
REV. 2



RETRIEVAL DOME FLOOR PLAN



RETRIEVAL DOME ELEVATION (A / A1)

NOTES

A DOMES ARE CONTRACTOR FURNISHED AND INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B DOME(S) SHOWN ON THESE DRAWINGS ARE BASED ON DOMES MANUFACTURED BY SPRUNG INSTANT STRUCTURES. SEE SPECIFICATION SECTION 13127 FOR OTHER APPROVED DOME MANUFACTURERS AND ASSOCIATED CONTRACTOR RESPONSIBILITIES.

KEYED NOTES

1. 32'H x 33'W DOUBLE PANEL HORIZONTAL ROLLING DOOR.
2. MOVABLE DIVIDING FLAT INTERIOR WALL
3. UPPER DIVIDING WALL. (PAD 1 & 4)
4. UPPER DIVIDING WALL (PAD 2)
5. 3'-0" x 6'-8" METAL PERSONNEL DOOR
6. ALUMINUM SUPPORT FRAMING TYPICAL AT ALL PERSONNEL DOORS.
7. MODULAR RELOCATABLE STRUCTURE
8. ALUMINUM FRAME (TYPICAL)
9. 16'H x 16'W RAPID ROLL-UP DOOR
10. MOVABLE CURTAIN

LEGEND

- 4' WALL EXTENTION.
- CENTERLINE OF BUILDING AND/OR FRAME.
- (A) FRAME SYMBOL.
- ELEVATION SYMBOL.
- FEB — FIRE EXTINGUISHER WITH BRACKET. MOUNTED AT 48" ABOVE FLOOR. (BY UNIVERSITY)

SEE COVER SHEET FOR ADDITIONAL RECORD DRAWING INFORMATION

THIS DRAWING SET WAS DEVELOPED FOR FOUR PHASES. BID ONLY WORK DESIGNATED AS PHASE I-R. WORK DESIGNATED AS BELONGING TO PHASE II-R, PHASE III-R OR PHASE IV-R IS FOR INFORMATION ONLY.

1/93023.21A01/1541LFPA/12-29-95/PDS

NO.	DATE	CLASS REVIEW	REVISIONS	DRAWN	DES	CHKD	REL	SUB	REC	APP
1	12/95		AS-BUILT WITHOUT CHANGES							

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN DIEGO

Figure G-17a
Storage Dome 226

BLDG. 54-226 TA-54

DRAWN	F PHILLIPS
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	J JARRARD
DATE	6/8/94

A/E STAMP

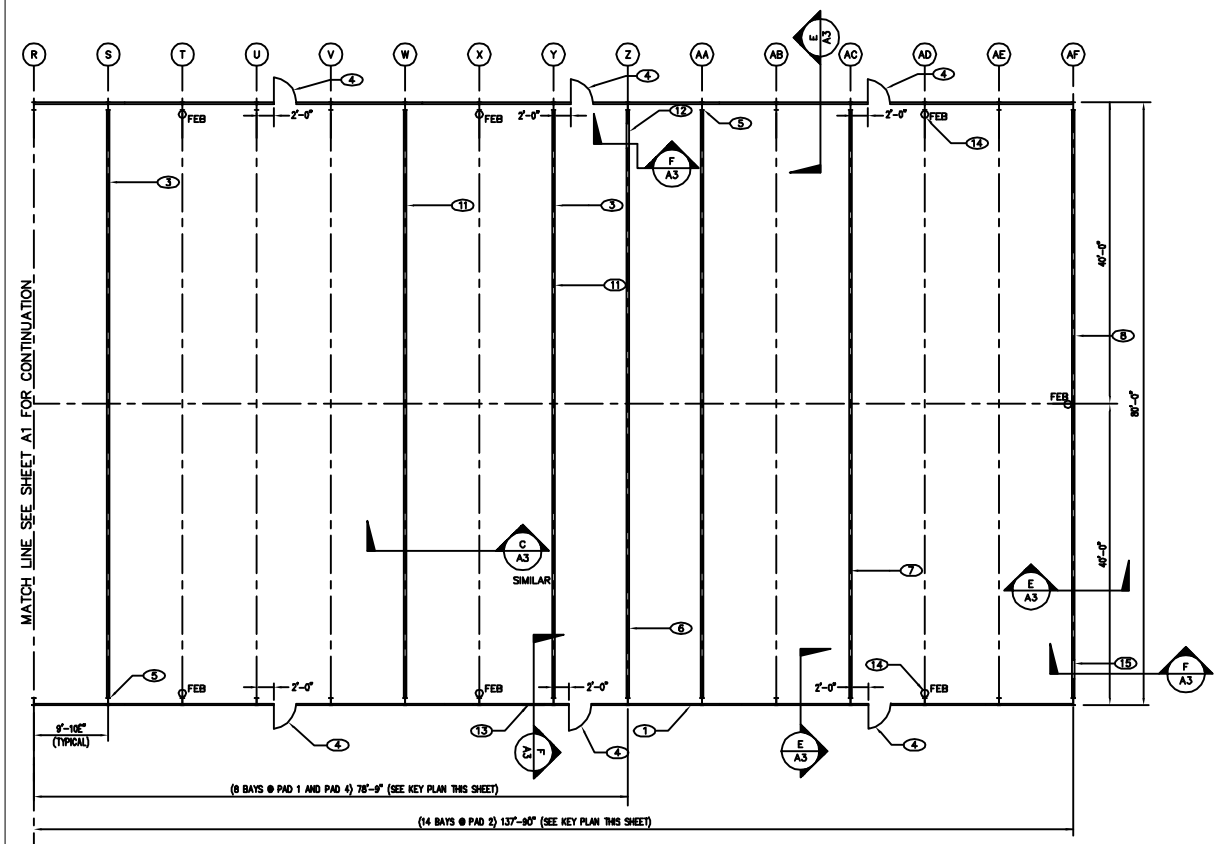
SUBMITTED	RECOMMENDED	APPROVED
DAVID DOZIER	DAVID POWELL	CORY HIGGINS

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

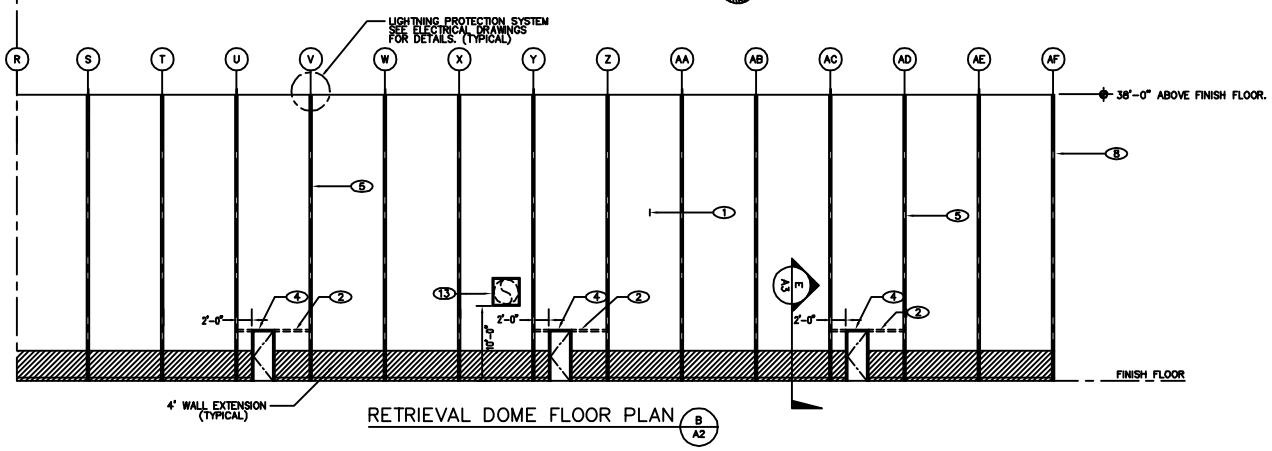
SHEET A1 38 OF 66

CLASSIFICATION REVIEWER DATE

PROJECT ID	DRAWING NO.	REV.
14211	C49422	1



RETRIEVAL DOME FLOOR PLAN



RETRIEVAL DOME FLOOR PLAN (B A2)

LEGEND

- 4' WALL EXTENSION.
- CENTERLINE OF BUILDING AND/OR FRAME. (GFE)
- ELEVATION SYMBOL.
- (AA) FRAME SYMBOL.

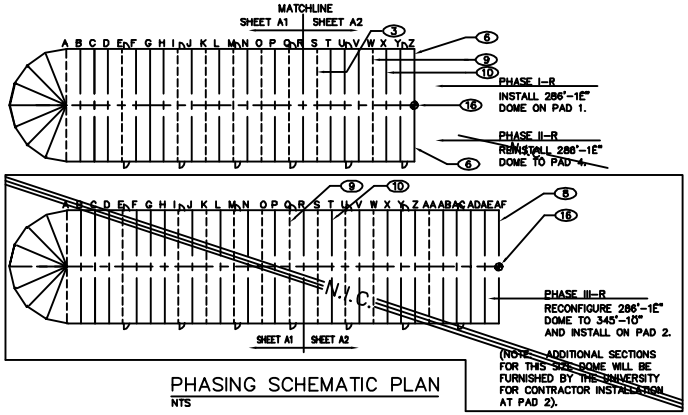
NOTES

A DOMES ARE CONTRACTOR FURNISHED AND INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B DOME(S) SHOWN ON THESE DRAWINGS ARE BASED ON DOMES MANUFACTURED BY SPRUNG INSTANT STRUCTURES. SEE SPECIFICATION SECTION 13127 FOR OTHER APPROVED DOME MANUFACTURERS AND ASSOCIATED CONTRACTOR RESPONSIBILITIES.

KEYED NOTES

1. MODULAR RELOCATABLE STRUCTURE
2. ALUMINUM SUPPORT FRAMING. TYPICAL AT ALL PERSONNEL DOORS.
3. UPPER DIVIDING WALL. (PAD 1 & 4)
4. 3'-0" x 6'-8" METAL PERSONNEL DOOR
5. ALUMINUM FRAME (TYPICAL)
6. FLAT END WALL (PAD 1 & 4)
7. UPPER DIVIDING WALL. (PAD 2)
8. FLAT END WALL (PAD 2)
9. UPPER DIVIDING WALL (DASHED)(TYPICAL)
10. COLUMN LINE. (TYPICAL)
11. UPPER DIVIDING WALL. (PAD 2)
12. FRAMED MECHANICAL DUCT OPENING. (PAD 1)
13. FRAMED MECHANICAL DUCT OPENING. (PAD 4)
14. FIRE EXTINGUISHER WITH BRACKET (PAD 2 ONLY)
15. FRAMED MECHANICAL DUCT OPENING. (PAD 2 ONLY)
16. CONTROL POINT. (SEE CIVIL DRAWINGS).



PHASING SCHEMATIC PLAN
NTS

SEE COVER SHEET FOR ADDITIONAL RECORD DRAWING INFORMATION

THIS DRAWING SET WAS DEVELOPED FOR FOUR PHASES. BID ONLY WORK DESIGNATED AS PHASE I-R. WORK DESIGNATED AS BELONGING TO PHASE II-R, PHASE III-R OR PHASE IV-R IS FOR INFORMATION ONLY.

96/93023.21A01/T64ELFP8/12-29-95/PDS

NO.	DATE	CLASS REVIEW	REVISIONS	DRAWN	DES	CHKD	REL	SUB	REC	APP
1	12/95		AS-BUILT WITH CHANGES							

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN DIEGO

Figure G-17b
Storage Dome 226

BLDG. 54-226 TA- 54

DRAWN	F PHILLIPS
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	J JARRARD
DATE	6/8/94

A/E STAMP

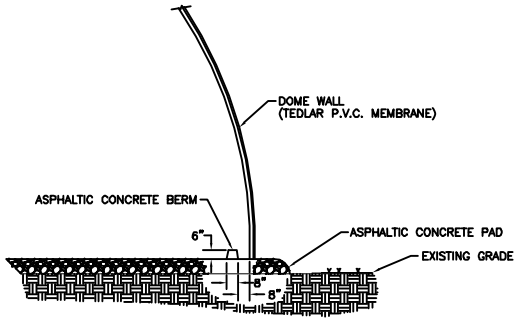
SUBMITTED	RECOMMENDED	APPROVED
DAVID DOZIER	DAVID POWELL	CORY HIGGINS

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

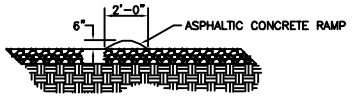
SHEET A2 39 OF 66

CLASSIFICATION REVIEWER DATE

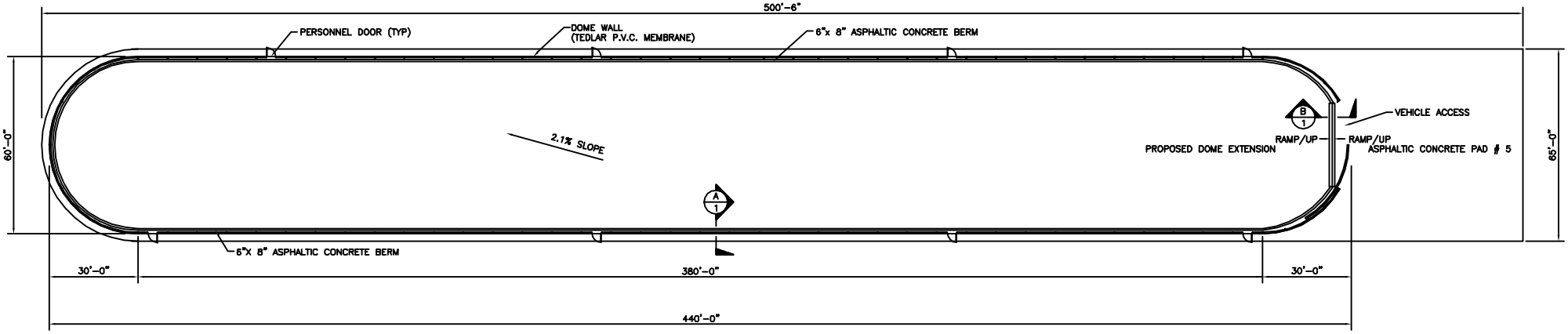
PROJECT ID	DRAWING NO.	REV.
14211	C49422	1

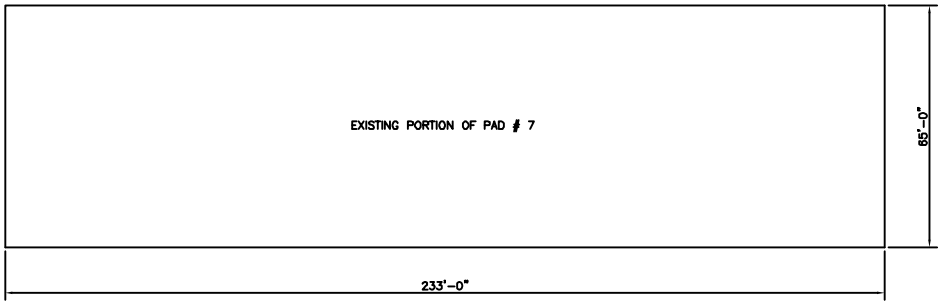


SECTION A/1
NOT TO SCALE



SECTION B/1
NOT TO SCALE





FLOOR PLAN

N

FIELD VERIFIED 03-03-95

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	REL	SUB	REC	APP

JOHNSON CONTROLS WORLD SERVICES INC.

Figure G-19
Storage Dome 49

DRAWN	C. SAMORA
VERIFIED	C. SAMORA
CHECKED	
RELEASED	
DATE	03-03-95

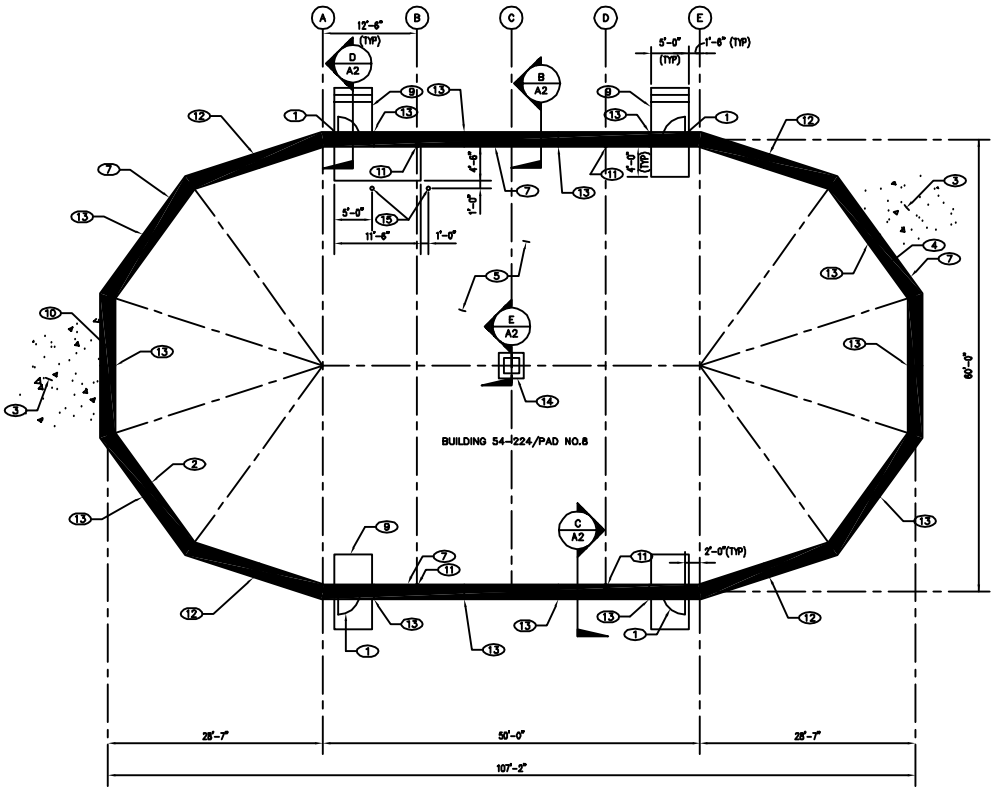
SUBMITTED | RECOMMENDED | APPROVED

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

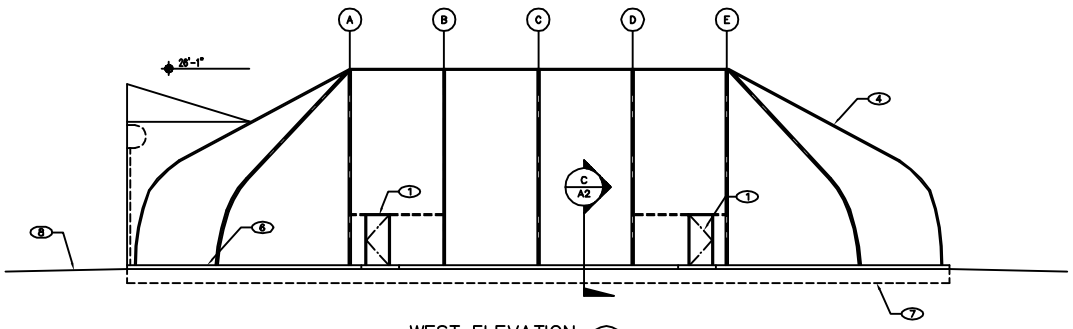
SHEET 1 OF 1

CLASSIFICATION | REVIEWER | DATE

PROJECT ID | DRAWING NO | REV



MODULAR RELOCATABLE STRUCTURE – FLOOR PLAN (A/A1)



WEST ELEVATION (A/A1)

ABBREVIATIONS

TYP	TYPICAL
DOME	MODULAR RELOCATABLE STRUCTURE
HDPE	HIGH DENSITY POLYETHELENE
GFE	GOVERNMENT FURNISHED EQUIPMENT
@12	CENTER TO CENTER SPACING OF CONRETE REINFORCEMENT, IN INCHES

KEYED NOTES

1. 3'-0" x 6'-8" PERSONNEL DOOR. (4 EACH)
2. ROLLING SINGLE PANEL DOOR.
3. ASPHALTIC CONCRETE PAVING AROUND PERIMETER OF CONCRETE RINGWALL.
4. FRAME AND FABRIC COVER.
5. HDPE LINER ON ASPHALTIC CONCRETE PAVING.
6. TOP OF RINGWALL.
7. CONCRETE RINGWALL PERIMETER FOUNDATION.
8. FINISH GRADE.
9. CONCRETE LANDING.
10. 1" x 4" x DOOR WIDTH – STEEL PLATE THRESHOLD ANCHORED TO CONCRETE RINGWALL THROUGH HDPE LINER WITH 1"ø ROUND HEAD SLEEVE ANCHORS @ 12 INCHES ON CENTER WITH 15" MINIMUM EMBEDMENT (RED HEAD OR APPROVED EQUAL).
11. FIRE EXTINGUISHER. (GFE)
12. 9" EXPANSION JOINT. AT MIDPOINT BETWEEN FRAME ELEMENTS. SEE SHEET A2 DETAIL 2.
13. CONTRACTION JOINT, AT MIDPOINT BETWEEN FRAME ELEMENTS TYPICAL UNLESS OTHERWISE NOTED. SEE SHEET A2, DETAIL 1.
14. SUMP
15. BOLLARD, SEE SHEET C4A, DETAIL 4.

LEGEND

- ELEVATION SYMBOL
- CENTERLINE OF DOME AND/OR FRAME
- CONCRETE
- CONCRETE RINGWALL
- ASPHALTIC PAVING
- EARTH (UNDISTURBED)
- ALUMINUM

REFERENCE "BUBBLE" DESCRIPTION

PLAN/ELEVATION/DETAIL REFERENCE NUMBERS

SHEET WHERE REFERENCE IS LOCATED

96/93023.41AD1/DSPFP/11-8-95/PDS

NO.	DATE	CLASS REVIEW	REVISIONS	DRN	DES	CHKD	REL	SUB	REC	APP
3	11/95		ASBUILT WITH CHANGES							
2	11-03-94		CHANGED PAD DIMENSION							
1	10-17-94		REVISED DOME, RINGWALL, AND ADDED NOTES.							

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN DIEGO

Figure G-20
Storage Dome 224

BLDG. 54-224 TA-54

DRAWN	F PHILLIPS
DESIGN	D JONES
CHECKED	S KOFFMAN
RELEASED	D JONES
DATE	6/17/94

A/E STAMP

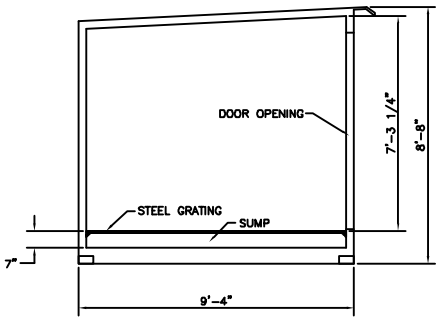
SUBMITTED	RECOMMENDED	APPROVED
DAVID DOZIER	DAVID POWELL	CORY HIGGINS

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

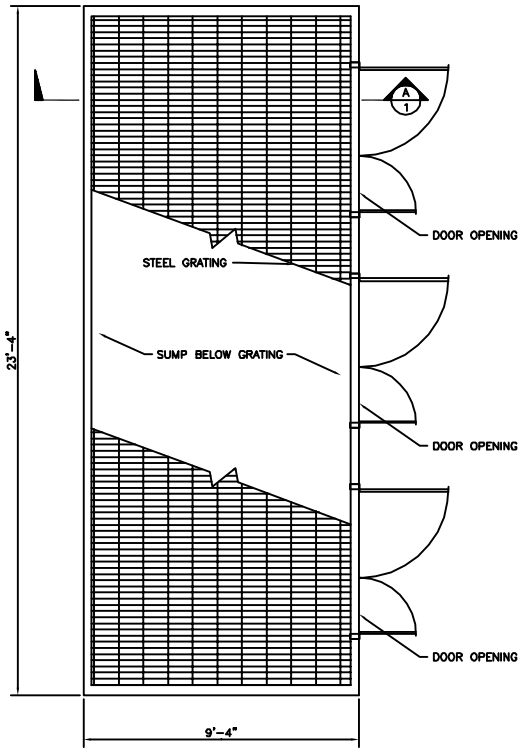
SHEET A1 9 OF 22

CLASSIFICATION REVIEWER DATE

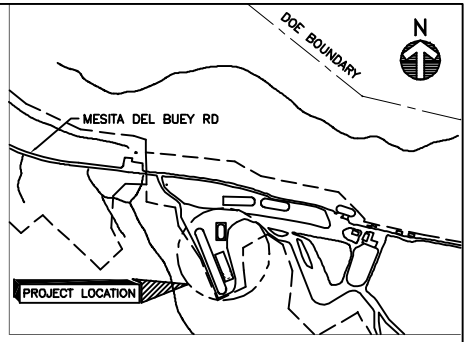
PROJECT ID	DRAWING NO.	REV.
13871	C49548	3



CROSS SECTION A/1

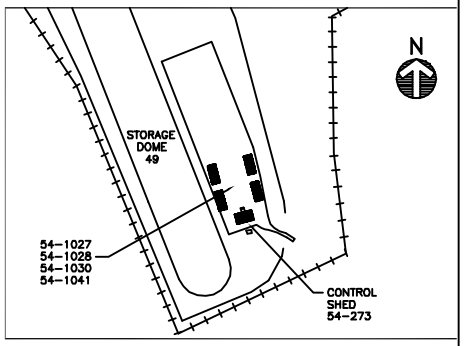


FLOOR PLAN



LOCATION MAP

SCALE: NONE



SITE PLAN

SCALE: NONE

NOTE

1. ALL STORAGE SHEDS TYPICAL TO FLOOR PLAN

FIELD VERIFIED N/A

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

Environmental Management
Solid Waste Operations

Figure G-21
TA-54-1027, -1028
-1030, and -1041
Secondary Containment

BLDG VARIES TA-54

DRAWN	S.MADRID
VERIFIED	N/A
CHECKED	DMEADOWS
DATE	07-10-98

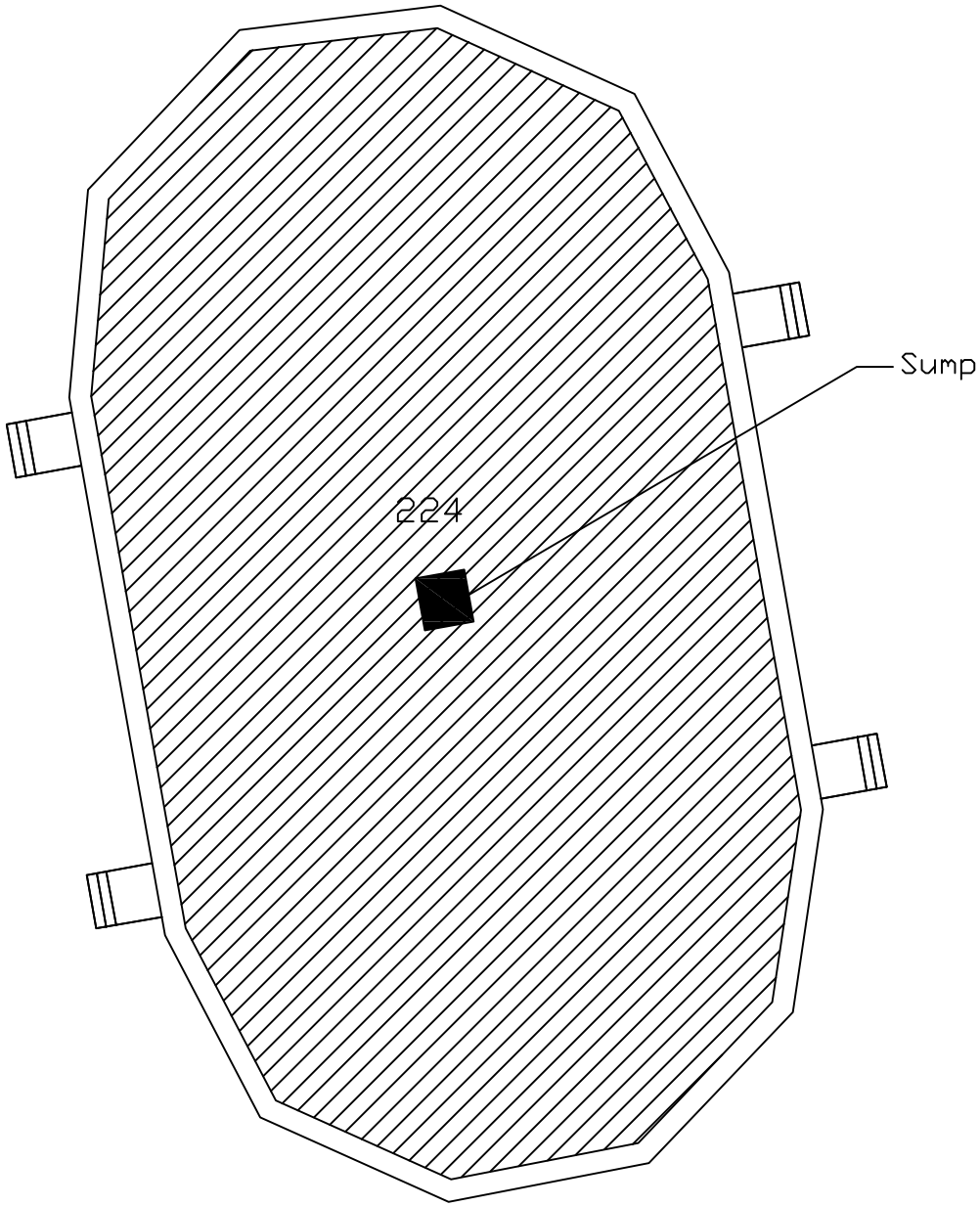
SUBMITTED
SUBMITTED
APPROVED FOR RELEASE
B.DODGE

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET SK15 1 OF 1

CLASSIFICATION REVIEWER REVIEWER DATE

PROJECT ID	DRAWING NO	REV
018538	FMU64-SK15	0



LEGEND

Min. 6" Depth

N.T.S.

NO	DATE	CLASS REV	DESCRIPTION	DWN	VER	CHKD	SUB	APP

fwo-wfm

Facility & Waste Operations
Waste Facility Management

TA-54 FMU-54

Figure G-22
Storage Dome 224
Secondary Containment

DRAWN	J. Fulk
VERIFIED	Spencer
CHECKED	R. Lechel
DATE	06-17-02

BLDG TA-54

SUBMITTED R. Lechel

APPROVED FOR RELEASE
APPROVED D. Mclain

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

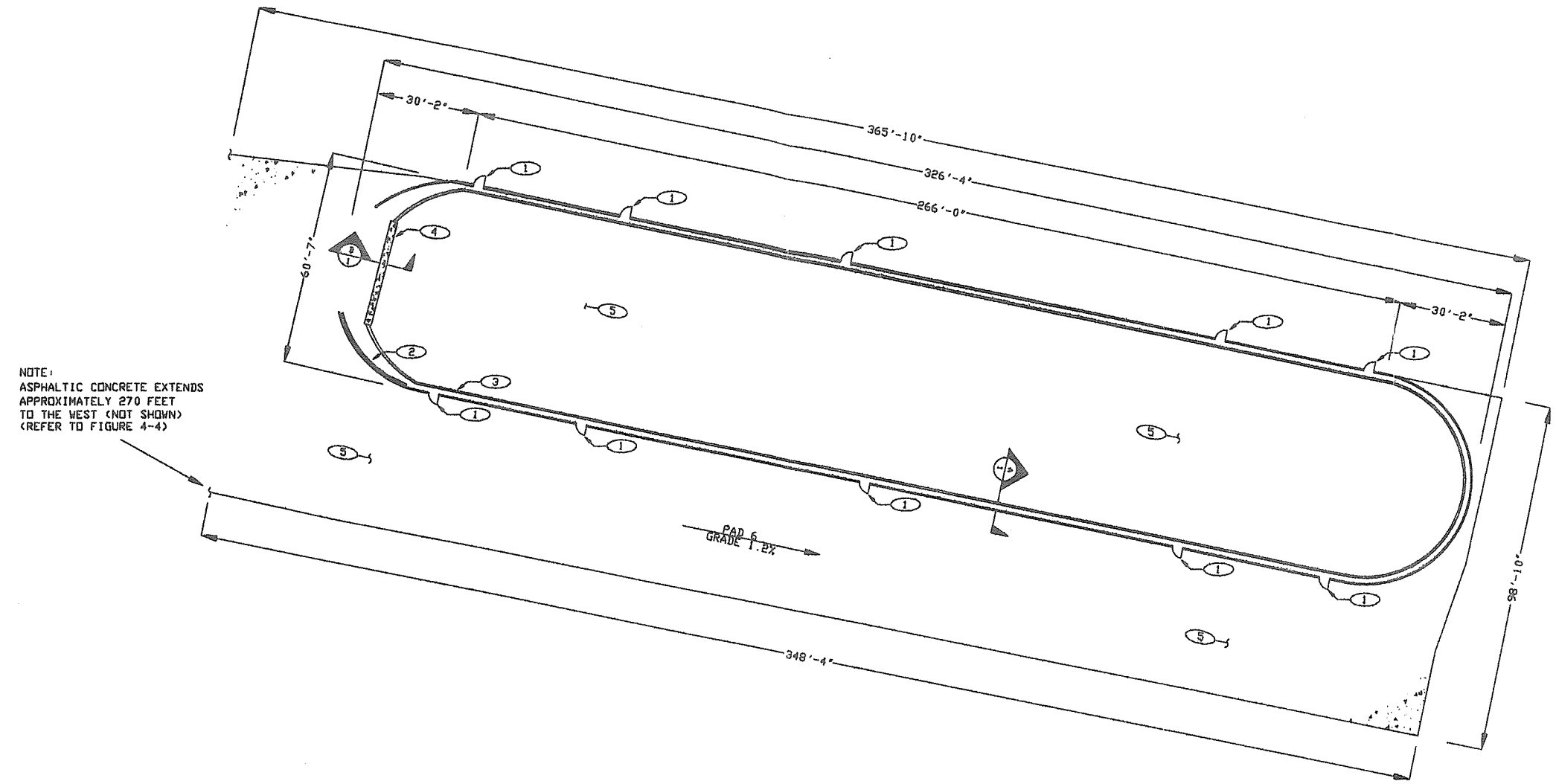
SHEET OF

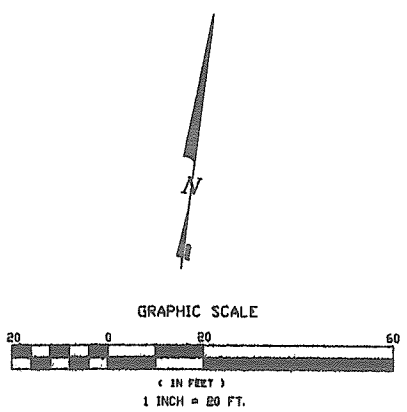
CLASSIFICATION REVIEWER REVIEWER DATE

PROJECT ID

DRAWING NO SK-54-G-11

REV 0





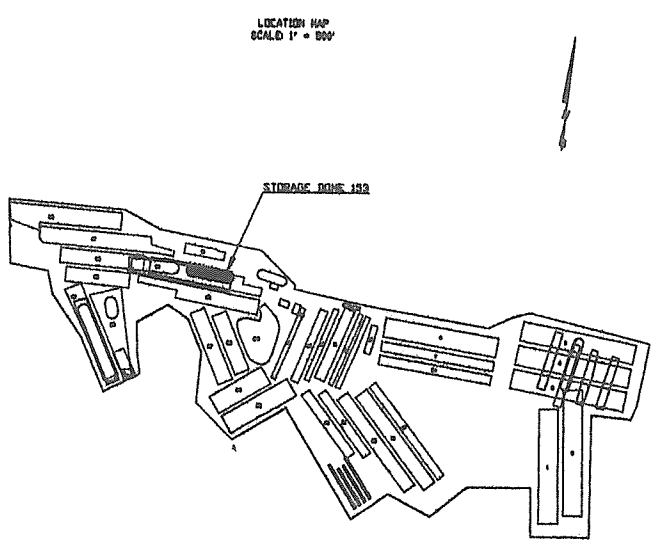
KEY NOTES

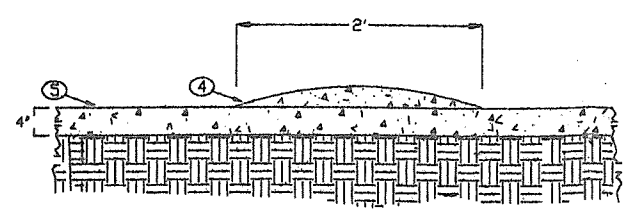
1. 3'-0" X 6'-8" PERSONNEL DOOR
2. DOUBLE PANEL ROLLING DOOR
3. ASPHALTIC CONCRETE BERM
4. ASPHALTIC CONCRETE RAMP
5. ASPHALTIC CONCRETE PAVING
6. DOME WALL

LEGEND

ASPHALTIC CONCRETE PAVING

EARTH (COMPACTED BACKFILL)





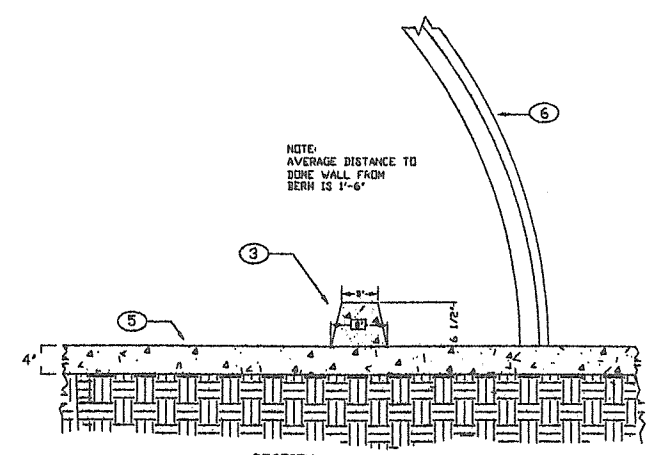


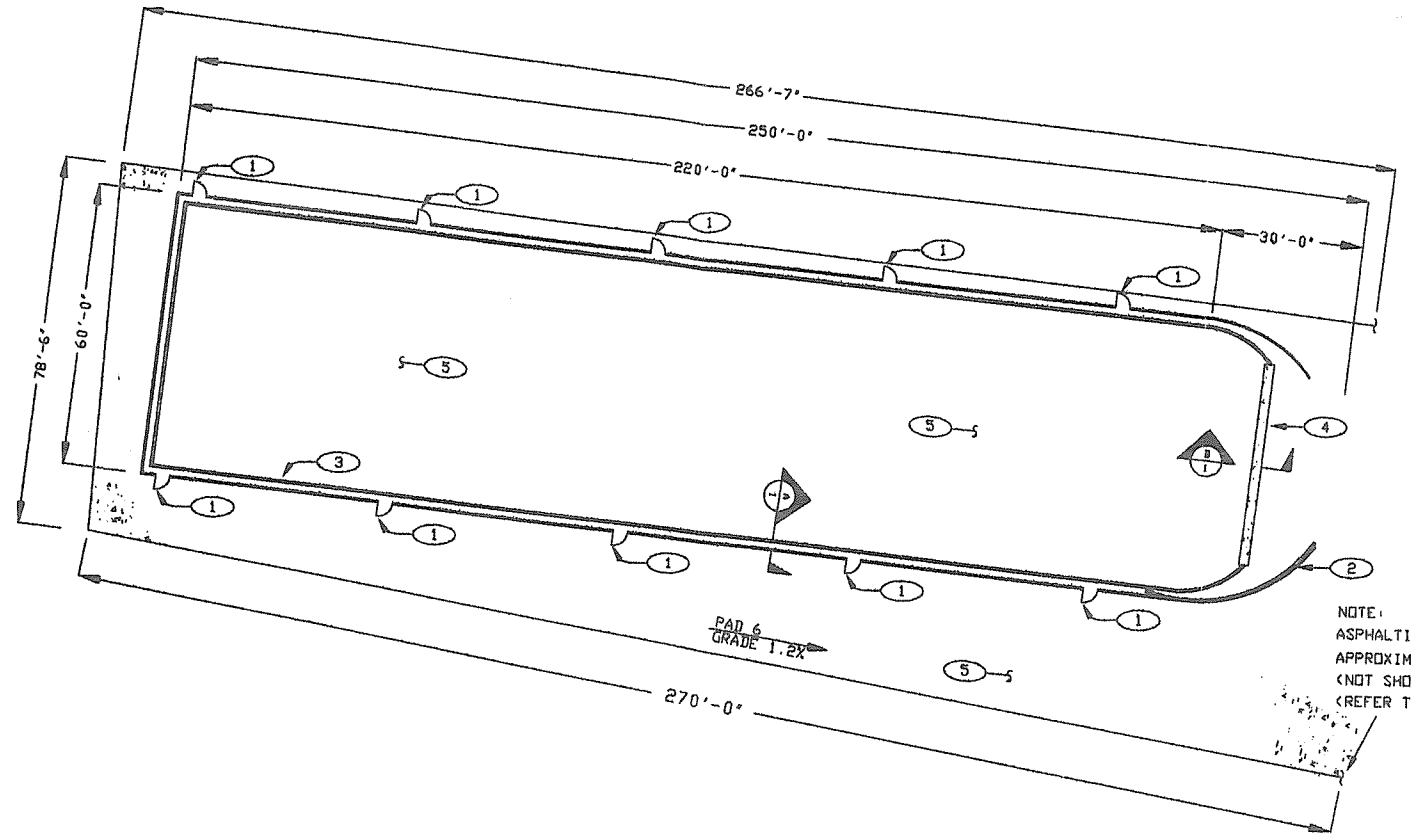
Figure G-23
Storage Dome 153

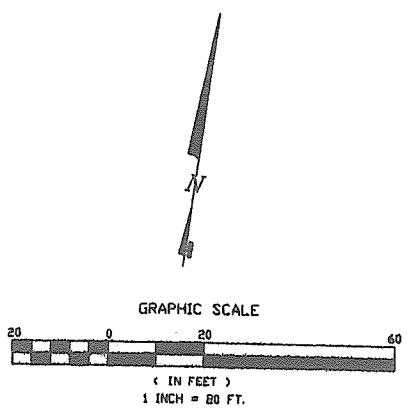
JAMES A. HAUGEN
NEW MEXICO
10763
REGISTERED
PROFESSIONAL ENGINEER

FACILITY DEVELOPMENT TEAM
CST-14

TECHNICAL AREA 54 (TA-54), AREA G
STORAGE DOME 153
TA-54-153
AS-BUILT FLOOR PLAN

DRAWN BY	DATE	APPROVED	
R. O'REAR	03/27/95	J. HAUGEN	
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545		SHEET 1	OF 1
		DRAWING NO. CST-14G-DWG-628,R5	





KEY NOTES

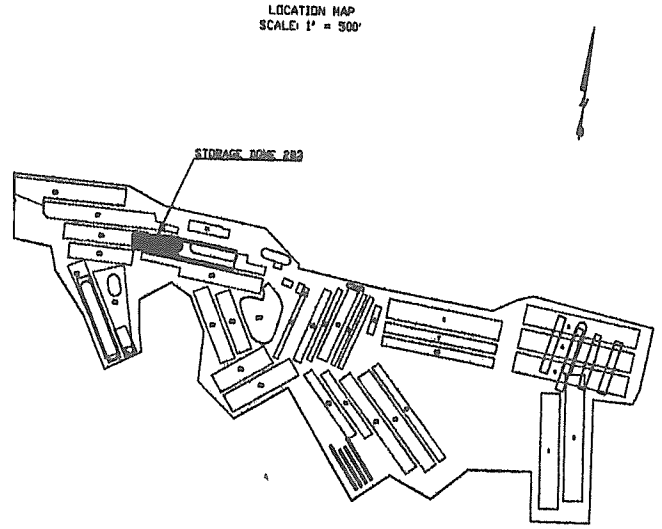
1. 3'-0" X 6'-8" PERSONNEL DOOR
2. DOUBLE PANEL ROLLING DOOR
3. ASPHALTIC CONCRETE BERM
4. ASPHALTIC CONCRETE RAMP
5. ASPHALTIC CONCRETE PAVING
6. DOME WALL

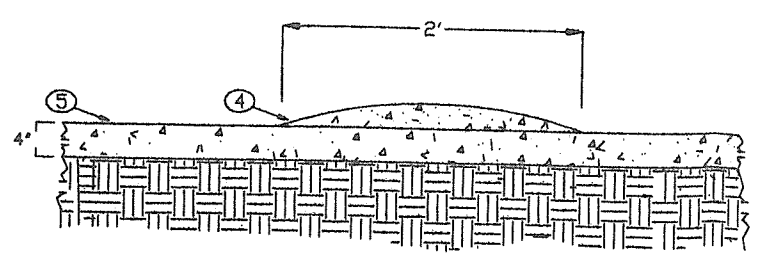
LEGEND

ASPHALTIC CONCRETE PAVING

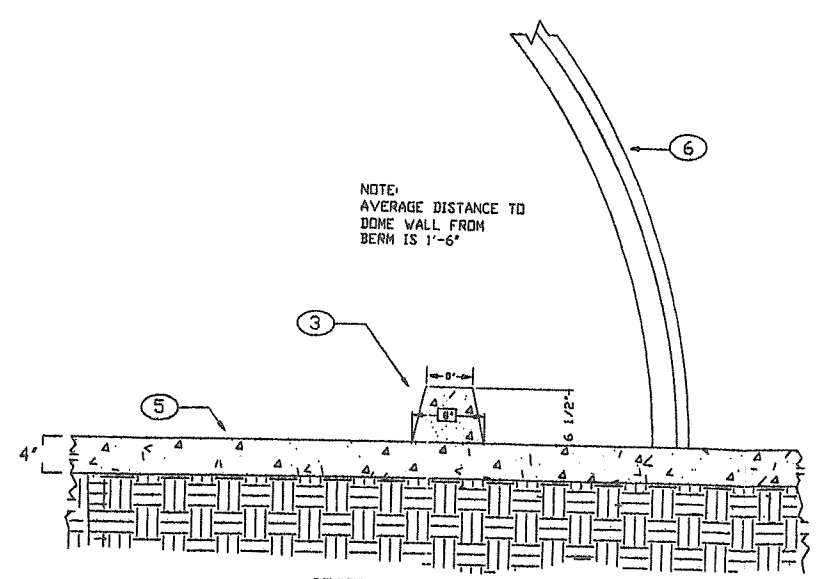
EARTH (COMPACTED BACKFILL)

LOCATION MAP
SCALE: 1" = 500'





SECTION B/1
NOT TO SCALE



SECTION A/1
NOT TO SCALE

Figure G-24
Storage Dome 283

JAMES A. HAUGEN
NEW MEXICO
10763
REGISTERED PROFESSIONAL ENGINEER

FACILITY DEVELOPMENT TEAM
CST-14

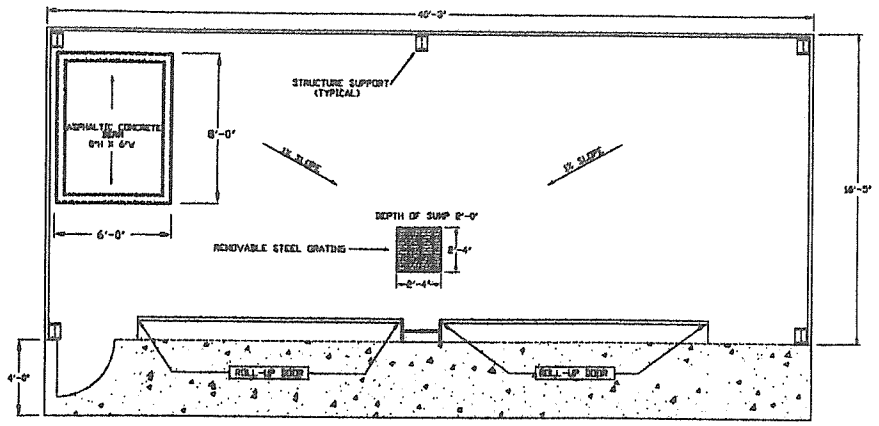
TECHNICAL AREA 54 (TA-54), AREA G
STORAGE DOME 283
TA-54-283
AS-BUILT FLOOR PLAN

DRAWN BY	DATE	APPROVED
R. O'REAR	03/27/95	J. HAUGEN

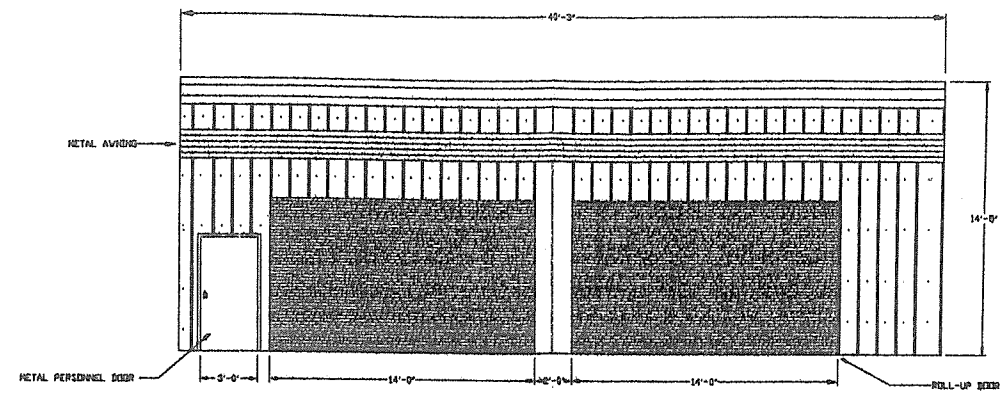
Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET 1 OF 1

DRAWING NO.
CST-14G-DWG-629,R5



FLOOR PLAN



FRONT VIEW

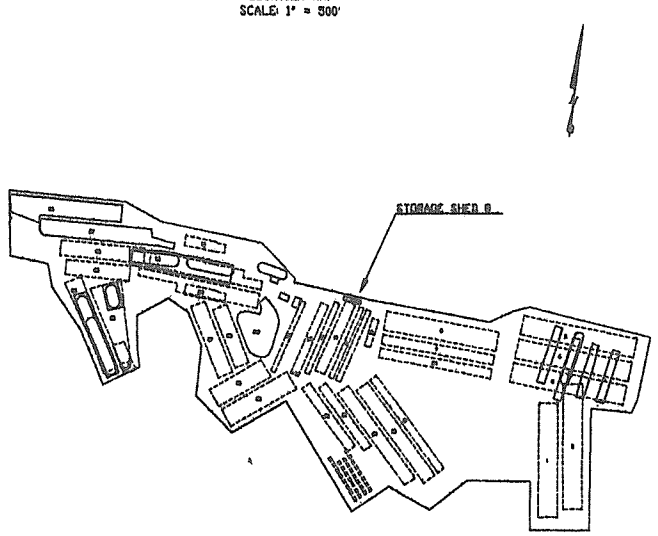
GRAPHIC SCALE

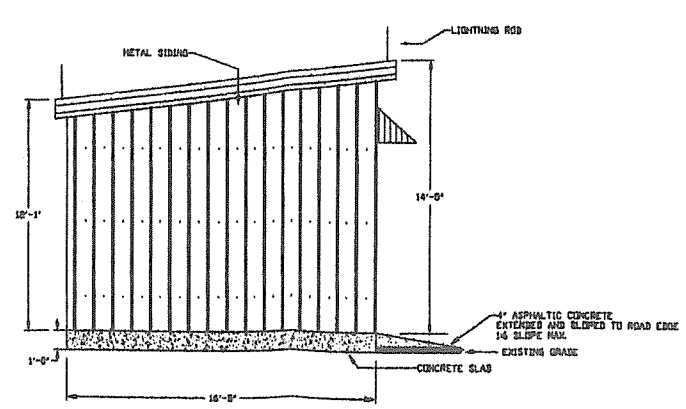
5 0 5 15

(IN FEET)

1 INCH = 5 FT.

LOCATION MAP
SCALE: 1" = 500'





SIDE VIEW

Figure G-25
Storage Shed 8

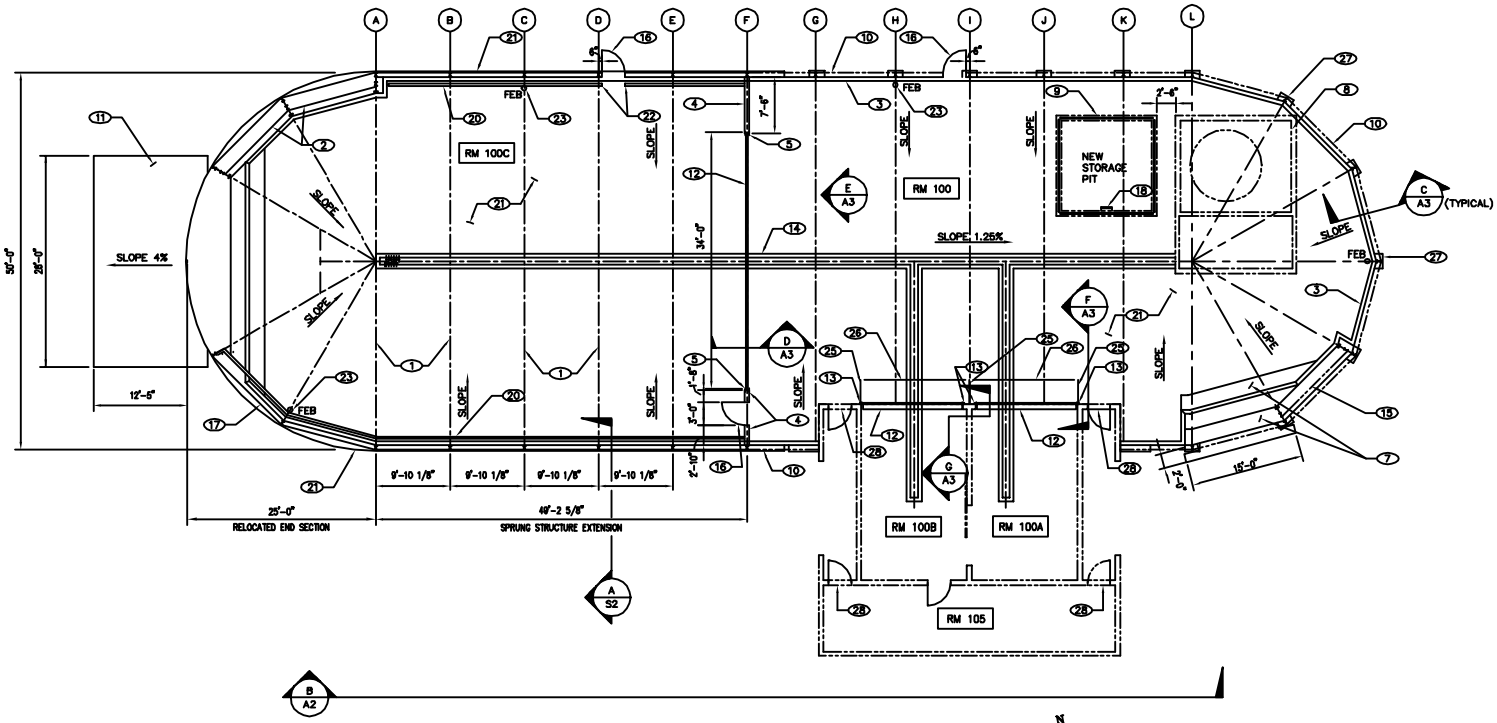
JAMES A. HAUGEN
NEW MEXICO
10763
REGISTERED PROFESSIONAL ENGINEER

FACILITY DEVELOPMENT TEAM
CST-14

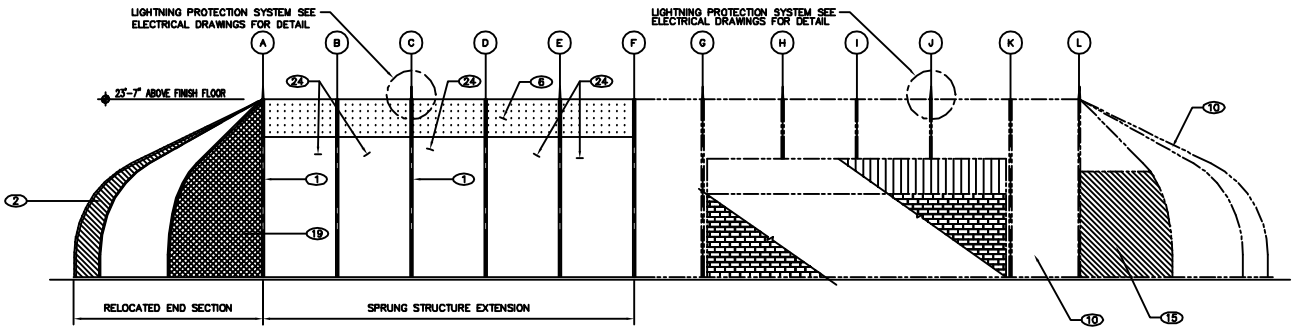
TECHNICAL AREA 54 (TA-54), AREA G
STORAGE SHED 8
TA-54-8
AS-BUILT FLOOR PLAN

DRAWN BY	DATE	APPROVED	
R. O'REAR	03/27/95	J. HAUGEN	
Los Alamos	Los Alamos National Laboratory Los Alamos, New Mexico 87545	SHEET 1	1 OF 1

DRAWING NO.
CST-14G-DWG-630,R5



DRUM PREP FACILITY FLOOR PLAN



DRUM PREP FACILITY – SOUTH ELEVATION

NOTES

A DOME EXTENSION IS GOVERNMENT FURNISHED EQUIPMENT AND CONTRACTOR INSTALLED. SEE CIVIL DRAWINGS FOR LOCATION.

B SEE MECHANICAL DRAWINGS FOR PLUMBING AND PIPING LOCATIONS.

C ALL CONCRETE SURFACES TO BE SEALED WITH "PLASITE" SEALER. SEE SHEET S1.

D ITEMS SHOWN ON DRAWINGS AS "GFE" WILL BE GOVERNMENT FURNISHED AND CONTRACTOR INSTALLED EQUIPMENT. COORDINATE WITH THE CONTRACT ADMINISTRATOR THE LOCATION AND SCHEDULE OF EQUIPMENT DELIVERIES.

KEYED NOTES

1. ALUMINUM FRAME. (GFE)
2. DOUBLE PANEL END SLIDING DOOR. (GFE)
3. CONCRETE CURB (SEE STRUCTURAL DRAWINGS)
4. INTERIOR DIVIDING WALL. (GFE)
5. SUPPORT FOR PARTITION WALL. (GFE)
6. SKYLIGHT. (GFE)
7. NEW CONCRETE LANDING. SEE SHEET S2
8. EXISTING STORAGE PIT AND HANDRAIL TO REMAIN.
9. NEW STORAGE PIT WITH HANDRAIL. SEE SHEET S3
10. EXISTING DOME TO REMAIN.
11. NEW 8" CONCRETE DRIVEPAD. SEE SHEET S2
12. FLEXIBLE VINYL STRIP CURTAIN. SEE SHEET A1
13. EXISTING OVERHEAD COILING DOORS. PROVIDE MANUFACTURERS APPROVED STOP IN DOOR GUIDE TO PREVENT DOOR FROM CLOSING BELOW 10'-0" AFF.
14. NEW CONCRETE TRENCH DRAIN AND GRATING. (SEE STRUCTURAL DRAWINGS)
15. EXISTING SINGLE PANEL SLIDING DOOR TO REMAIN.
16. 3'-0" x 6'-8" PERSONNEL DOORS. (GFE) INSTALL PER MANUFACTURERS RECOMMENDATION.
17. EXISTING RELOCATED END SECTION
18. FIXED ALUMINUM LADDER. SEE SHEET S3
19. INSTALL EXISTING FABRIC IN DOOR OPENING. FABRIC RELOCATED FROM NEW DOOR PANEL LOCATION.
20. PVC SKIRT. (GFE)
21. NEW CONCRETE FLOOR SLAB. SEE SHEET S2
22. TERMINATE PVC SKIRT AT DOOR FRAME.
23. FIRE EXTINGUISHER AND BRACKET (GFE). MOUNT ON ALUMINUM FRAME AT 42" ABOVE FINISH FLOOR.
24. DOME SECTIONS TO MATCH EXISTING (GFE).
25. TS 3 x 2 x .25
26. C12 x 25 ABOVE.
27. NEW CONCRETE FOOTINGS. SEE SHEET S2
28. CAULK THRESHOLD OF THE FOUR EXISTING EXTERIOR PERSONNEL DOORS TO PREVENT MINOR EGRESS OF FIRE WATER FROM INTERIOR OF BUILDING TO OUTSIDE. (TO BE ABLE TO CONTAIN APPROXIMATELY 1/4 INCH OF WATER.)

98/93023.11AD1/DRUMFP/4-16-98/SLM

NO.	DATE	CLASS REVIEW	REVISIONS	DWN	DES	CHKD	REL	SUB	REC	APP
2	4/98		AS-BUILT WITH CHANGES							
1	3/27/95		F01: ADDED NOTE 28							

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE SAN DIEGO

Figure G-26
TA-54-33

BLDG. 54-33 TA-54

DRAWN	F PHILLIPS
DESIGN	J JARRARD
CHECKED	D JONES
RELEASED	J JARRARD
DATE	4/1/94

A/E STAMP

SUBMITTED	RECOMMENDED	APPROVED
DAVID DOZIER	DAVID POWELL	CORY HIGGINS

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

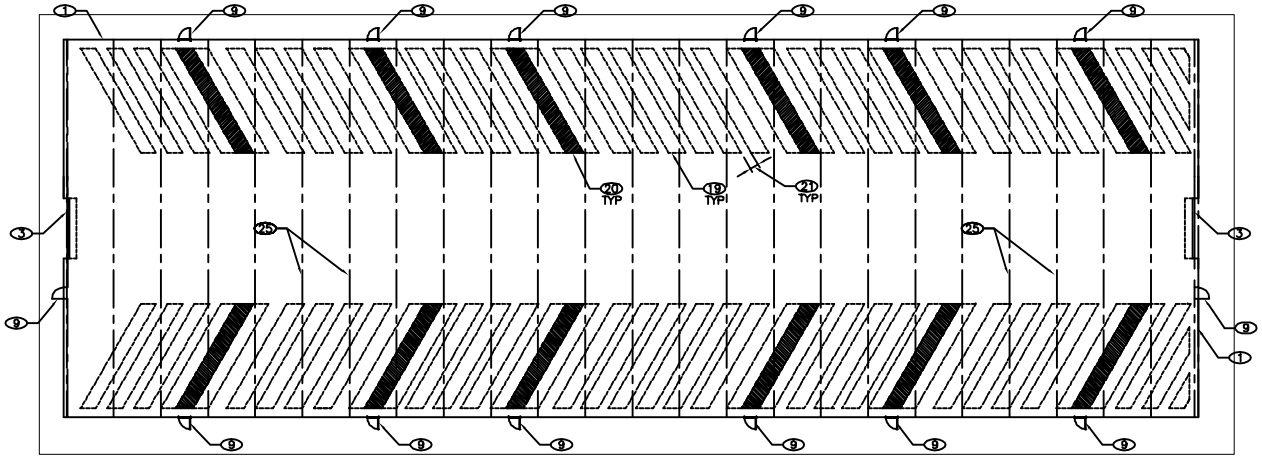
SHEET A2 7 OF 30

CLASSIFICATION REVIEWER DATE

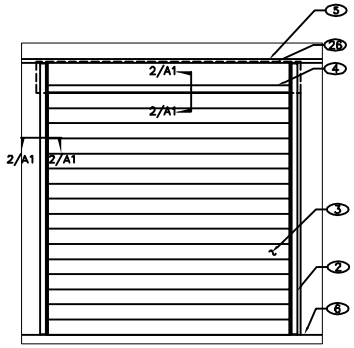
PROJECT ID	DRAWING NO.	REV.
13867	C49423	2

KEYED NOTES

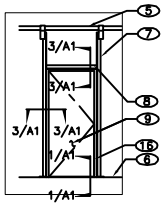
1 STORAGE DOME (SUPPLIED BY DOME MANUFACTURER)
2 OVERHEAD COILING DOOR SIDE TRIMMERS (SUPPLIED BY DOME MANUFACTURER)
3 16'-0" x 16'-0" OVERHEAD COILING DOOR
4 ANGLE (SUPPLIED BY DOME MANUFACTURER)
5 STRUCTURAL PVC TUBE (SUPPLIED BY DOME MANUFATURER)
6 FINISH FLOOR
7 ACCESS DOOR SIDE TRIMMER (SUPPLIED BY DOME MANUFACTURER)
8 ACCESS DOOR HEADER ANGLE (SUPPLIED BY DOME MANUFACTURER)
9 3'-0" x 7'-0" STEEL ACCESS DOOR (TYPICAL OF 8)
10 1-1/2" x 2-1/2" x 16 GA. SEALING ANGLE (SUPPLIED BY DOME MANUFACTURER)
11 PVC MEMBRANE (SUPPLIED BY DOME MANUFACTURER)
12 ALUMINUM STRIP (SUPPLIED BY DOME MANUFACTURER)
13 #10 x 3/4" TEK SCREW
14 3/8"ø x 1" BOLT
15 FLAT HEAD MACHINE BOLT
16 2" STEEL DOOR FRAME
17 BUTTERFLY SPACER
18 OVERHEAD COILING DOOR TRACK (JAMB DETAIL ONLY)
19 48" OR 60" WIDE STORAGE PALLET AREA
20 48" MIN. WIDE AISLE WIDTH TO EXIT DOORS (HATCH INDICATES GRAPHIC REPRESENTATION ONLY)
21 28" MIN. AISLE WIDTH BETWEEN STORAGE PALLETS
22 ALUMINUM THRESHOLD
23 NOT USED
24 EXPANSION JOINT AT CONCRETE DOOR STOOPS
25 TYPICAL BAY SPACING (REFER TO DOME MANUFACTURER)
26 CORDED NEOPRENE WEATHERSTRIPPED HOOD BAFFLE



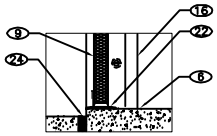
DOOR KEY PLAN



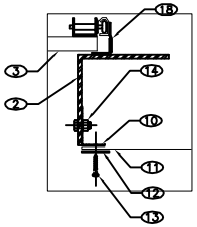
OVERHEAD COILING DOOR ELEVATION (A/A1)



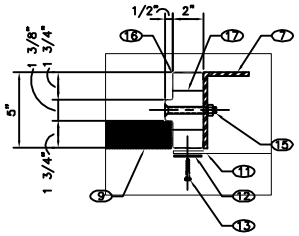
ACCESS DOOR ELEVATION (B/A1)



THRESHOLD DETAIL (1/A1)



JAMB/HEAD DETAIL (2/A1)



JAMB/HEAD DETAIL (3/A1)

REDRAWN FOR RECORD PURPOSES

RECORD DRAWING
Date AUGUST 1999
These drawings have been revised based on the construction records of the owner. While the information submitted by the Owner will be assumed to be reliable, the Engineer will not be responsible for the accuracy of this information nor for errors or omissions which may appear in the record document as a result thereof.

A/E STAMP

1/z/98049/DWG/ARCH/LA-8341/09-24-98/PDS

NO.	DATE	CLASS REVIEW	REVISIONS	DWN	DES	CHKD	SUB	APP
2	8/99		ASBUILT WITH CHANGES	PS	JW	PS	JW	
1	12/98		CO2: DOME EXPANSION TO 300'					

LEEDSHILL-HERKENHOFF, INC.
ARCHITECTS ENGINEERS
ALBUQUERQUE SANTA FE

Figure G-27
Storage Dome 375

TA-54

DRAWN	J GALLEGOS
DESIGN	J GALLEGOS
CHECKED	D KLEIN
DATE	8/27/98

SUBMITTED: JIM WEEKS
APPROVED FOR RELEASE: MARK HARRIS

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET A1 — 9 OF 20

CLASSIFICATION | REVIEWER | DATE

PROJECT ID: 18645
DRAWING NO.: C52062
REV.: 2

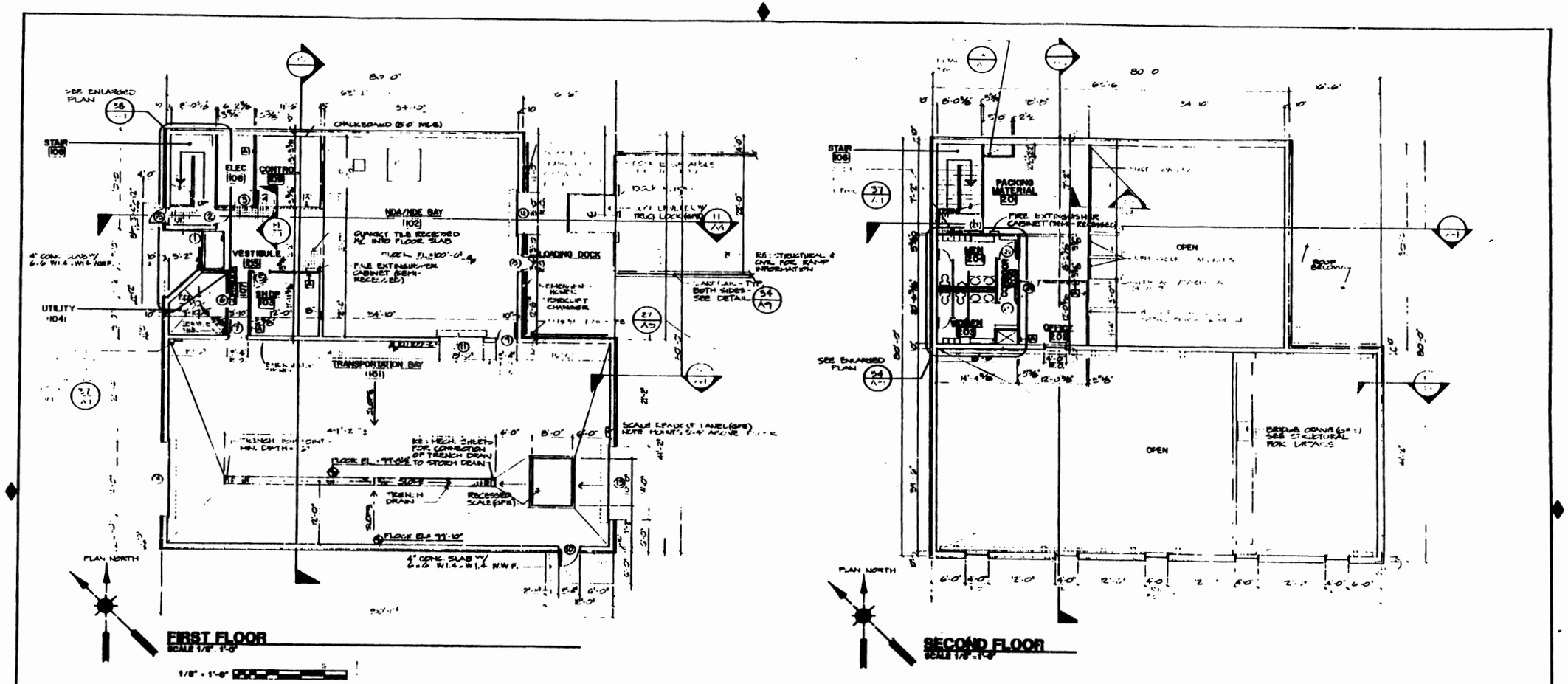


Figure G-28
TA-54-38

TRU-WASTE NDA/HDE TRANSPORTATION FACILITY	
FLOOR PLANS	
DRAWN	W. JO
DESIGN	Eyres
CHECKED	Wolf
RELEASED	
DATE	9-4-87
BLDG. NO. 88	TA-54
Los Alamos National Laboratory, Los Alamos, New Mexico 87545	SHEET A1
LAB JOB NO.	8931-54
DRAWING NO.	ENG-C 45302

Supplement G-1

Engineering Details and Technical Specifications for Structures, Coatings, Liners, PermaCon®, Metal Pallets, and Secondary Containment Pallets at the Area L, Area G, and TA-54 West Container Storage Units

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specification for Storage Domes at Technical Area 54

The Construction, Exhibition, Hazardous Waste, Military, Prison and Warehouse Shelter Systems by *SPRUNG* Instant Structures

THE STRUCTURE

Designed and engineered on the principle of the "Membrane Stress Theory" the structure is the result of almost a decade of intensive research and development. The Sprung Instant Structure is constructed from extruded aluminum arches, integrally connected to an all-weather outer membrane of P.V.C. coated polyester scrim. This synthetic fabric is certified flame retardant.

APPLICATION

Sprung Instant Structures are the answer to any need for enclosed space, quickly and economically, especially where transportation is difficult and speed of installation is essential. Aesthetically pleasing, the structures are available in different colours and sizes, and are suited to both the city and country environments.

ENGINEERING

Sprung Structures may be designed to meet special requirements or to comply with local and special usage codes and standards. By design the structures shed snow, however they can be designed to meet any loading requirement. They also withstand high winds and hail. Standard pre-engineered drawings are available upon request.

FLEXIBILITY

The free-span structure can be erected quickly, and needs little or no surface preparation. The modular design allows built-up areas of unlimited length, easy extension of existing structures and quick dismantling and re-location.

TECHNICAL SPECIFICATIONS

Width:	Feet Meters	30 (9.14)	40 (12.19)	50 (15.24)	60 (18.29)	88.6 (27)	120 (36.58)
Module Length:	Feet Meters	9.84 (3)	9.84 (3)	9.84 (3)	9.84 (3)	9.84 (3)	15 (4.57)
Height:	Feet Meters	15.9 (4.8)	18.4 (5.6)	23.6 (7.2)	26.2 (8)	35.9 (10.9)	58 (17.7)
Weight:	lbs./sq. ft. kgs./m²	1.5 (7.3)	1.5 (7.3)	1.5 (7.3)	1.5 (7.3)	2.5 (12.2)	3.6 (17.6)

Sprung Instant Structures Inc.

OFFICES IN: San Francisco, Ca. Fontana, Ca. Houston, Tx. Allentown, Pa. Atlanta, Ga.

Toll Free
1-800-528-9899

MODULAR RELOCATABLE STRUCTURES
Available From Inventory

Doors: A personnel door is provided with each structure. Doors can be placed in virtually any panel to meet your requirements.

Additional doors, double personnel doors, single or double personnel doors complete with panic hardware, vehicle doors and oversize vehicle doors are also available as optional extras.

Drainage: Drainage should be provided around the pad to permit adequate dissipation of rain water.

Asphalt, concrete or gravel pads should be crowned to assist in water runoff.

Equipment: All hand tools required for erection will be provided. It will be the customer's responsibility to provide a crane or cherry picker for a short period of time to erect structures 50 feet (15.24 m) wide to 88.6 feet (27 m) wide.

Scaffolding must also be supplied by the customer.

Erection: Erection, with a normal sized crew, should proceed at the rate of 1200 to 1500 square feet (110 to 140 sq. m.) per day, weather permitting. When necessary, this figure can be increased significantly by increasing the work force or extending the work day past 8 hours, or a combination of both. Dismantling should proceed at double this rate.

An erection consultant will be provided to direct the erection of the structure by the customer's unskilled work force. The consultant's transportation at cost, and living expenses are the customer's responsibility. The consultant will also be provided on the same terms for the dismantling of leased structures.

Fabric: The fabric is a durable P.V.C. coated polyester scrim treated with inhibitors to prevent degeneration from the ultraviolet rays of the sun and it is fire retardant (i.e. self-extinguishing). Normal life expectancy is 10 to 12 years. We provide a five year pro-rata guarantee.

Footings: Reasonably flat and firm ground requires no preparation or foundation for structures up to 60 feet (18.29 m) in width. Anchorage is obtained with two drift pins at each column base plate. Specific anchor systems are used for sand and muskeg. Structures 88.6 feet wide (27 m) should have concrete footings, if a concrete pad is not being installed. Alternative methods are available if ground conditions meet certain criteria.

Freight: Domestic sales are quoted "knocked down" F.O.B. Plant. International sales are quoted C+F Seaport, Country of Destination.

Return freight on all leases, is to the customer's account.

Labour: It is the customer's responsibility to provide a work force of 6-10 unskilled labourers for erection of single structures up to 88.6 feet in width.

Lease: Leases are available in North America for a minimum of one year, with the option to renew semi-annually, as often as required.

Patents: Patents are held in Canada, the United States and throughout the world.

Permits: It is the customer's responsibility to obtain all necessary building and/or development permits, licenses or clearances of any type for erection and use of the structure.

Purchase Option: Leases will have a purchase option exercisable anytime within 12 months from commencement, upon payment of the purchase price in full. Provided that lease payments have been made on time, a credit of 50% of paid lease amounts will be applied to the purchase.

Options to purchase will EXPIRE at the end of the first year of the lease.

Rental: Month to month rentals can be entered into subject to product availability.

Repairs: Fabric and components can be repaired or replaced in a minimum time frame without affecting the stability of the structure.

Taxes: All taxes and fees of any type are payable by the purchaser.

erms:

Sales: 50% with order. Balance due upon erection O.A.C.

Leases: 50% of lease payment plus all options with order. 50% of lease payment payable semi-annually in advance until lease cancelled by lessee. O.A.C.

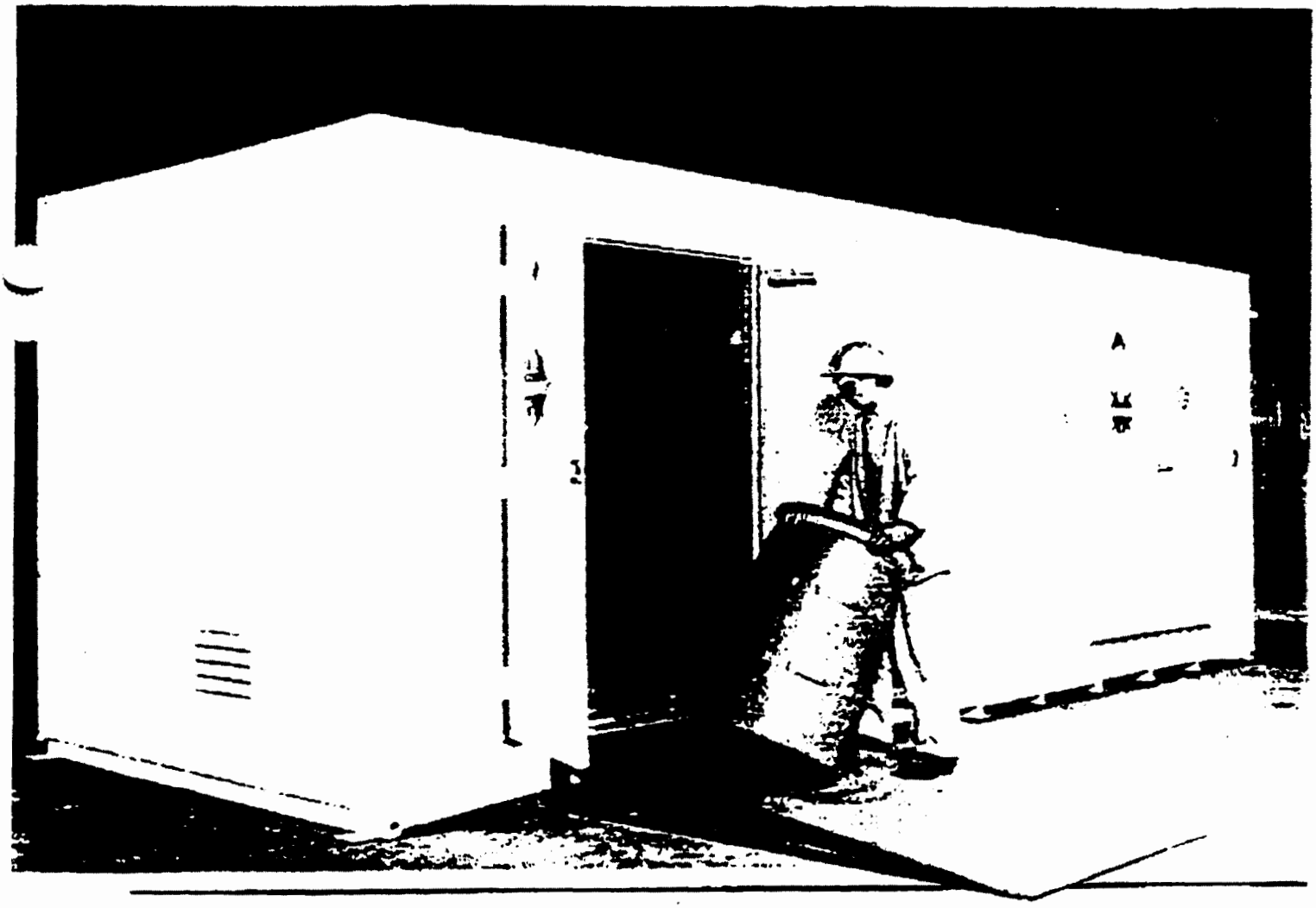
Rentals: 1st month and all extras with order. Additional months in advance, upon receipt of invoice O.A.C.

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specifications for Storage Sheds 68, 69, 70, 1027, 1028, 1030, and 1041 at Technical Area 54

Help Us Help You...

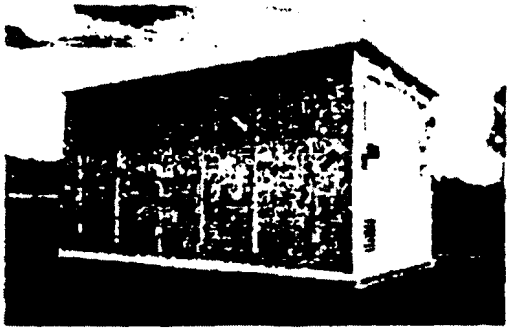
Select the Right Safety Storage™ Building



Achieve regulatory compliance for storage of hazardous materials

SAFETY STORAGE™

SAFETY STORAGE™



Steel and 2-Hour Fire-Rated Prefabricated Storage Buildings

Safety Storage™ prefabricated, weather-proof buildings offer a low cost solution to protect your facility from chemical hazards, provide secondary containment for soil and groundwater protection, minimize liability, meet fire safety needs, and safeguard personnel, while complying with federal, state, and local requirements.

These relocatable, turnkey buildings are available in a wide choice of building sizes and storage capacities, at a potential 60% savings over the cost of permanent structures. They are designed to Factory Mutual System standards and utilize UL listed components throughout.

Safety Storage buildings are designed to comply with all federal, state, and local regulations and can be pre-engineered to meet special structural, electrical, fire, and ventilation requirements.

Safety Storage is the nation's leading manufacturer of prefabricated chemical and hazardous material storage buildings. Custom engineering assistance and special application buildings are offered to meet specific requirements.

FEATURES

Steel Buildings

- Walls and sump walls constructed of 10-gauge welded steel
- Roof/ceiling constructed of 12-gauge steel
- Double-doors

FireShield Buildings

- Two-hour fire-rated walls, roof/ceiling, and sump walls, in accordance with UL 263 and ASTM-E119 requirements.
- Air inlet vents equipped with 1½ hour UL Classified fire dampers
- UL Classified three-hour fire-rated double doors (60"x80") with UL listed frame and hardware. Active door equipped with automatic door closer, security lock, and interior safety release

All Buildings

- Chemical resistant coated surfaces
- Water sprinkler piping assembly
- Secondary containment sump, with fiberglass floor grating
- Open-channel construction for visual inspection and crane/forklift openings
- Security locks with inside safety release
- Static grounding system
- Forklift pockets for ease of relocation
- Hold-down brackets
- Hazard placards and labeling
- One-year limited warranty

OPTIONS

- UL listed interior and exterior lighting (Class I, Division 1)
- Heating and air conditioning systems (Class I, Division 1)
- Thermostatic control switches
- Electromechanical exhaust ventilation systems (Class I, Division 1)
- Liquid level detectors (Class I, Division 1)
- Dry chemical fire suppression system
- Interior separation wall(s), steel and 2-hour fire-rated
- Chemical resistant sump liner
- Explosion relief construction
- Safety eye/face wash units
- Sump overflow pipe fitting with cap
- Shelving
- Loading ramp(s)

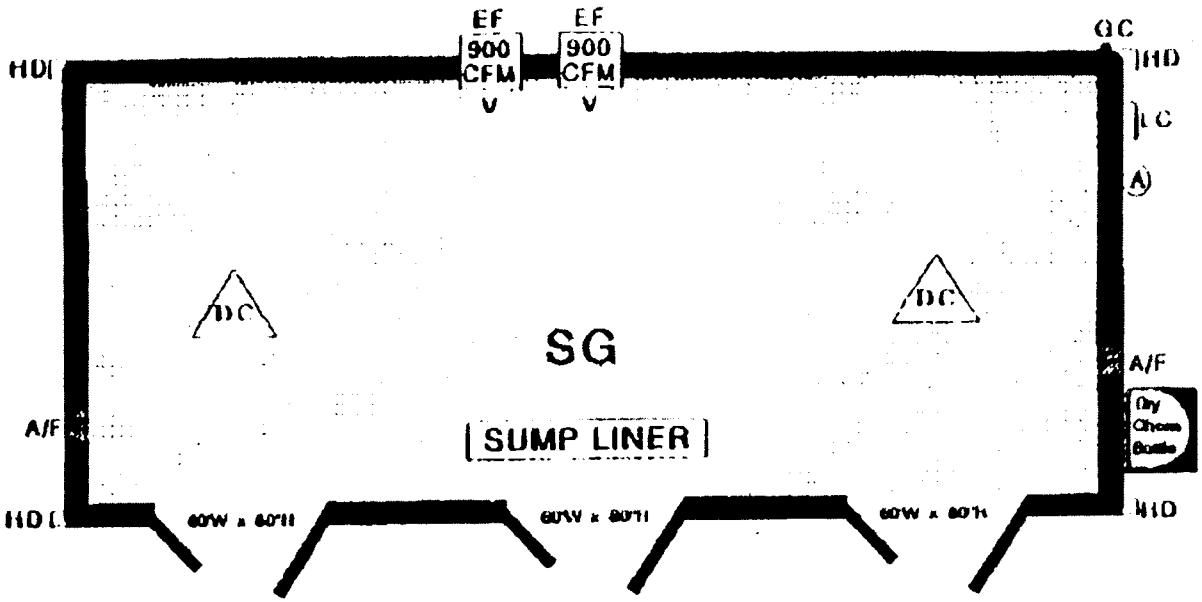
Model	Outside Dimensions			Inside Dimensions			Tare Weight (Lbs.)	Door Openings		Designed Storage Capacity			Sump Capacity (Gallons)
	Length*	Width	Height	Length	Width	Height		Height	Width	Weight (lbs.)	Sq. Ft.	Drums**	
32	33'3¾"	11'5¼"	8'8"	32'7¼"	10'8¼"	7'3¼"	23,325	6'7¾"	4'10¾"	97,125	348	90	1460
24	25'3¾"	11'5¼"	8'8"	24'7½"	10'8¼"	7'3¼"	17,600	6'7¾"	4'10¾"	65,750	263	60	1100
22	23'3¾"	9'3¾"	8'8"	22'7¼"	8'9¼"	7'3¼"	16,750	6'7¾"	4'10¾"	49,500	198	50	330
15	15'11¾"	9'3¾"	8'8"	15'3½"	8'9¼"	7'3¼"	8,775	6'7¾"	4'10¾"	33,500	134	33	560
7	8'7¾"	9'3¾"	8'8"	7'11¾"	8'3¼"	7'3¼"	5,250	6'7¾"	4'10¾"	17,375	69	16	290
10	10'11"	8'5"	8'4"	10'4"	5'9¼"	7'	2,600	5'9¾"	3'1"	14,875	59	14	220
32FS	33'3¾"	11'5¼"	8'8"	32'	10'	7'1"	35,300	6'7¾"	4'10¾"	80,000	320	80	1340
24FS	25'3¾"	11'5¼"	8'8"	24'	10'	7'1"	26,575	6'7¾"	4'10¾"	60,000	240	60	1000
22FS	23'3¾"	9'3¾"	8'8"	21'11½"	8'1¼"	7'1"	24,025	6'7¾"	4'10¾"	44,500	178	44	750
15FS	15'11¾"	9'3¾"	8'8"	14'7½"	8'1¼"	7'1"	13,975	6'7¾"	4'10¾"	29,625	118	28	500
7FS	8'7¾"	9'3¾"	8'8"	7'3¼"	8'1¼"	7'1"	8,125	6'7¾"	4'10¾"	14,750	59	12	250
10FS	10'11"	6'5"	8'4"	9'8"	5'1¼"	6'10"	8,300	5'7¾"	4'10¾"	11,000	44	8	150

*Includes hold-down brackets. **55 gallon drums.

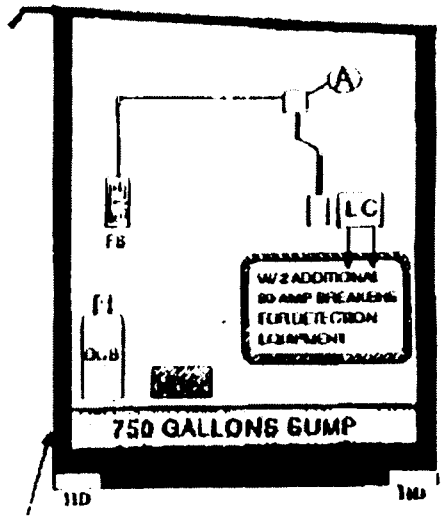
LOS ALAMOS NATIONAL LAB - "2-HOUR FIRE RATED" MODEL SSI-22FS

ONE VENT SYSTEM TO BE INVERTED SO "V" IS TOWARD CEILING

LOCKER "B" HTS
SAFETY STORAGE MODEL 22FS
"LITHIUM HYDRIDE"



"2-HOUR" FIRE RATED
- *Roof
- *Sill
- *Vertical Walls

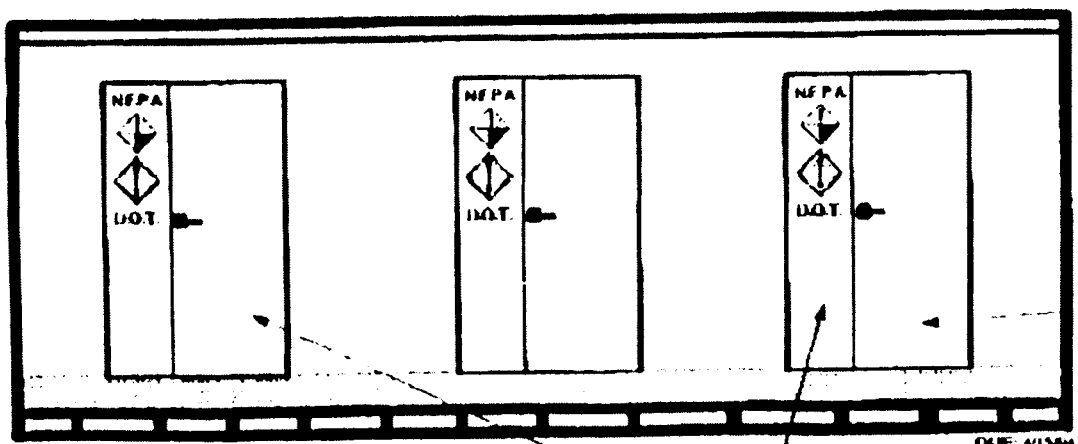


SILL HEIGHT AT SUMP = "2-HOUR" FIRE RATED

23'4" LENGTH x 9'4" WIDTH x 8'8" HEIGHT

"LITHIUM HYDRIDE"

STORAGE



DRAWN BY: EUGENE NAGEL

DATE: 4/15/94

"3-HOUR" FIRE - RATED DOORS

MEETS NATIONAL WHEELCHAIR ACCESS REQUIREMENTS 24" & 36" → 60"

LEGEND

A: AUDIBLE ALARM FOR DRY CHEM
A/F: 1.5 HOUR FIRE RATED VENTS
CFM: CUBIC FEET PER MINUTE
DC: DRY CHEM SPRINKLER
DCB: DRY CHEM BOTTLE INCLOSURE
EF: EXPLOSION PROOF EXHAUST FAN EXIT
FS: FAN SWITCH
FL: FUSIBLE LINKS
GC: GROUNDING CONNECTION (EXT)
HD: HOLD-DOWN BRACKETS
LC: LOAD CENTER W/ TWO 20 AMP BREAKERS
SG: STEEL FLOOR RATING
V: VENT SCREEN FOR FUME REMOVAL
CLASS 1, DIV 1, EXPLOSION PROOF

DRAWN BY: KARLIN BOELLE
12/2/94

Accepted for production

SAFETY STORAGE INC.
8306 Wilshire Boulevard • Suite 9000
Beverly Hills, CA 90211-2344
Tel: (213) 939-5715 • Fax: (213) 939-1646

LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

MODEL: Safety Storage Inc., Model # 22-FS

APPROVAL from TESTING / ENGINEERING LABS: **Factory Mutual Laboratory APPROVED (SEE ATTACHED FM LETTER FOR VERIFICATION)**

DIMENSIONS: 23'3.75" Length x 9'3.75" Width x 8'8" Height

COMPLIANCE: The lockers comply with all present Federal, State, and Local building, electrical, mechanical and fire codes; hazardous materials / waste and Cal/OSHA regulations.

CONSTRUCTION: The Pre-Fabricated lockers are weather-proof, New prime steel Construction, continuously welded at all four (4) vertical seams and liquid tight. ASTM-graded steel.

RELOCATABLE: The lockers are designed around the premise that they will be relocatable (when empty). The bottom must have four-inch (4") "C" channels for forklift or crane strap access every two-feet the entire length. The "C" channels shall provide a uniform load spread in use or in relocation. The subfloor welds are liquid-tight.

RECESSED SPILL CONTAINMENT: Minimum 750 Gallons of "spill containment" capacity required.

SILL HEIGHT="2-HOUR FIRE RATED" CONSTRUCTION AT THE "RECESSED SPILL CURB AREA": The recessed sump sill height is a crucial element of the entire vertical wall surface area of all four (4) sidewalls and are constructed to the same **"2-Hour Fire Rated"** standards of Gypsum "sandwiched by steel" design used from sump up to and including the ceiling/roof **("UL" approved design)**. This Non-combustible construction is in accordance with ASTM-E119.

SUMP SILL HEIGHT: Minimum seven-Inch (7") recession in the spill containment sump sill height to meet and exceed all code requirements for spill curb heights etc. (including PCB requirements).

ROOF DESIGN: The entire Roof will be **"2-Hour Fire Rated"**. The roof Class-A Flame Spread classification, and I-60 wind uplift rating. This Non-combustible construction is in accordance with ASTM-E119. The manufacturer's product literature must state that the roof is capable of handling 40 psf snow loads plus equipment such as lights and sprinkler system

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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

FLOORING: STEEL GRATING is standard. The Steelgrate has a minimum 500 psf uniform load bearing capacity. The steelgrate installation is designed for ease of access by chemical users for spill clean-up. The Steelgrate installation shall run front-to-back and in approximately four-foot (4') sections. Bowing is eliminated by the uniform load spreads designed throughout the flooring substratum section. The Flooring is of an "open-channel" design for visual inspection of the recessed sump and spill flow control.

SUBFLOOR: The horizontal subfloor shall be constructed of no less than 10-gauge steel. The 10-gauge steel is new, prime steel and welded at all seams. Tests must be done by the manufacturer that shows that the sump created by the sub-floor is liquid-tight as required by code.

SEISMIC HOLD-DOWNS: Each corner of each building has a 4" seismic hold-down bracket installed for end-user finish into the foundation. The hold-downs are calc'd for **"worst case" Zone-4 rating** if installed.

GROUNDING: Each building has three (3) interior bonding lugs, one (1) exterior grounding assembly and an eight-foot (8') copper/clad grounding rod shipped inside for end-user installation into the foundation upon delivery.

DOOR REQUIREMENTS: Two (2) Door Openings per Locker, consisting of one set of dual-doors at least sixty inches (60") wide and eighty inches (80") tall. The passive leaf of each set of dual-doors is equipped with UL-Listed Top and Bottom surface bolts. Each door opening includes weatherstripping. Each door frame and hardware (i.e. keyed lock system) is "UL-Listed" and approved. Each door opening has an inside safety latch for end-users staff to open the doors in the event of an emergency per the building codes. Each door opening exceeds building code requirements with **"3-Hour Fire Rated"** Dual-Doors that are approved and labeled by **Underwriters Laboratory UL-Labeled. "3-Hour FIRE RATED DOORS"**. The doors design shall meet Federal Legal requirements set by the "American Disabilities Act" requirements. Each set of Dual-doors will be customized with automatic door closures that work with fusible links on both sides of each set of dual-doors.

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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

SECURITY:WELDED-ONLY The design and building construction is focused on the SECURITY of the end-users inventory and materials stored. The design shall be of four (4) Vertical Walls welded together and to the Roof and Sub-Floor. Security and integrity of design are primary to the end-users risk and liability reduction with the storage or dispensing of Hazardous Materials. Each dual-door opening will be secured by an exterior single-point dead bolt style key lock. The interior shall be provided with an emergency safety latch to open doors as required by building codes.

VISUAL INSPECTION: The lockers design and construction integrity shall be visually inspected by compliance agencies on a regular basis, so each manufacturer must design in the ability to inspect the secure containment of spills, the flow of spills inside the locker into a recessed sump, seismic load capacity, fire prevention and suppression methods, etc..

SIGNAGE: Each door opening must receive one (1) "D.O.T." all-metal placard on an aluminum rust-proof wall-holder and stainless steel clips which act as a flip-chart type chemical content clarifier sign to meet California "Right-to-Know" laws. Each door opening must receive one (1) pressure sensitive "NFPA" 704M hazardous rating sign for fire professionals .

AIR FLOW: Two (2) Air Inlet Vents with **UL-Classified "1.5 Hour Rated" fire dampers** are required per locker (see diagram). These air inlet vents shall be galvanized steel framed, curtain-type galvanized steel blades, and equipped with UL-Listed 165 degrees Fahrenheit fusible-links to close in the event of a fire and the source is in the interior or on the exterior. These vents are designed to provide "in coming make-up air" only **(no suction devices are to be placed near this equipment).**

DRUM STORAGE CAPACITY:@ Single-Level: FORTY-FOUR (44) Drum single-level storage capacity is required in a packed configuration design with single drum movement and no aisle space. (55-GALLON TYPE)

FINISHES:INTERIOR Finish is primed and painted with a chemically-resistant white epoxy. The interior finish has been tested against a minimum of fifty (50) common industrial chemicals and has stood-up to actual field use for nine (9) years now. *EXTERIOR Finish* is a glossy, heat reflective white colored aliphatic polyurethane (5-mil thick). The surface is also graffiti resistant.

PRESENTATION: Each building shall be shipped after inspection with a heavy-duty industrial"SHRINK-WRAP" to protect the building in route to the end-users site. The buildings are delivered free of diesel exhaust markings, road grime, mud, etc..

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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

WARRANTY: 12 month on components / 10 year structural

MANUALS: A "Manual" explaining the grounding, off-loading, seismic hold-downs, suggested pad creation, fire suppression, and electrical systems shall be sent upon placement of order.

FIRE-RATING: Locker shall be "2-Hour Fire Rated" from sump up to and including the ceiling/roof ("UL" approved design). GYPSUM is the Fire-Retardant utilized to achieve the "2-Hour rating".The VERTICAL WALLS Construction are from the "UL" book of universally accepted DESIGNS (e.g. U-263 design which uses Gypsum, Steel studs, and a sandwich wall design). This Non-combustible construction is in accordance with ASTM-E119.

FIRE SUPPRESSION SYSTEM DESIGN: The Fire Suppression System shall be an "AUTOMATIC" Dry Chemical Fire Suppression System which includes two (2) dump heads with plastic cap covers that blow-off Minimum 1,920 cubic feet of dump upon activation, an audible alarm, activation points both automatic via fusible-links or by manual pull station. Exterior Enclosure of the bottle holding the dry chemical and its "system brains".

ELECTRICAL SYSTEM: The interior electrical components shall all be explosion-proof (wiring, seals, and conduits). One (1) exterior breaker box shall be located on the right side wall and will hold all required breakers. One breaker is for the normal service wired 120 volt / 20 amp for the lights, forced air ventilation system, etc..

FUME REMOVAL: *INTERIOR MOUNTING / DUCTING:* One (1) Electrically Powered, explosion-proof, forced air, mechanical, ventilation system for fume removal. The system is designed with interior ducting to draw fumes up and out to the exterior for removal from within twelve-inches (12") above the flooring surface meeting code requirements (per locker). The system is designed and installed to run with direct control on the exterior from a fan switch for on / off determination. Each system providing 19-57 air changes per hour (Class I, Division 1). System has a minimum 900 cfm motored fume removal rated motor (Class I, Division 1) with a non-sparking aluminum fan blade. One (1) exterior mounted on / off Fan switch is included.

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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

LOS ALAMOS NATIONAL LAB RESPONSIBILITIES (upon purchase):

1) **FOUNDATION:** The installation site foundation must be completed and well cured prior to shipment of the building. Typical curing time for new concrete foundations can run 14-21 days.

2) **OFF-LOADING:** END-USERS will be responsible for having a 15-ton capacity crane and experienced crane operator with spreader bar and associated cabling at the site prior to delivery for off-loading.

3) **ELECTRICAL:** Power must be brought to the breaker box located on the right side wall of the locker by the end-user. All interior electrical wiring must be completed prior to shipment. Power for the normal electrical features are on the 120 volt / 20 amp breaker. Two (2) additional 20 amp breakers shall be included to detection equipment to be provided by Los Alamos National Lab.

4) **ARMING DRY CHEM SYSTEM:** The END-USER will need to "arm" the dry chemical fire suppression system after delivery to prevent accidental discharge during transportation and off-load. Any special "dump tests" required by local authorities are the sole-responsibility of the chemical user entity and staff.

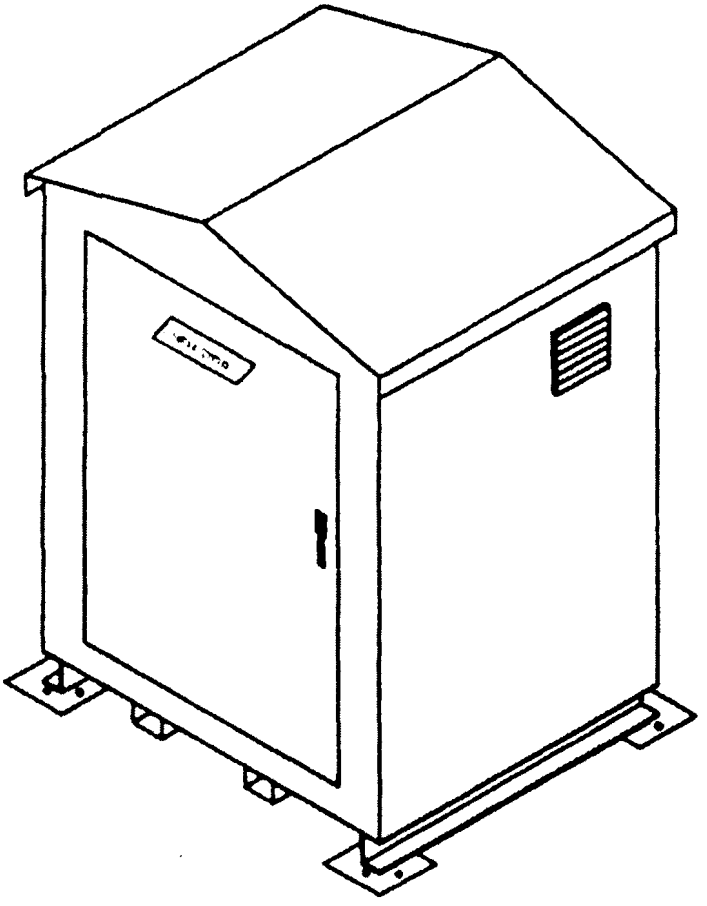
5) **GROUNDING:** The eight-foot (8') grounding rod shipped inside the building must be installed into the foundation and completed to the exterior bonding lug after delivery by END-USER staff.

6) **SEISMIC FINISH WORK:** The enduser site staff is responsible to "TIE-DOWN" the locker to the foundation to achieve the "SEISMIC ZONE-4" Rating.

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specifications for Storage Sheds 144, 145, 146, and 177 at Technical Area 54

MODEL D



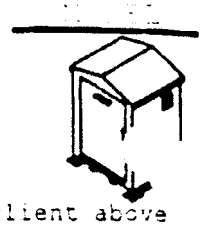
INTERIOR DIMENSION	EXTERIOR DIMENSION	STORAGE CAPACITY	SECONDARY CONTAINMENT	DOOR CONFIGURATION			APPROXIMATE SHIPPING WT
				NO.	RATING	DIMENSION	
6'0" X 5'0" X 7'0"	6'6" X 5'6" X 9'0"	6/55 Gal. Drums	120 Gallons	1 set	None	4'6" X 6'3" Opening	1600 LBS.

Standard Equipment:
Two Part Chemical Resistant Epoxy Paint Interior & Exterior. Polyurethane Top Coat on Exterior
Six air changes per hour natural ventilation Exterior Ground Connection. Corrosion Resistant Epoxy Coated
Steel Grate Flooring. Forklift Pockets, Stainless Steel Hinges Industrial Grade 3 pt. Locking Mechanism
Seismic Tie-Down Pads.

Construction:
10, 12 & 14 Gauge HRS

Dimensions Noted Above are - Length X Width X Height

Specifications for Portable
Hazardous Waste Storage Building
Manufactured by Ideal Environmental Products
CHEM-STOR Model C



The portable hazardous materials storage container is designed to bring the client above compliance levels for hazardous material and waste storage. The container provides secondary spill containment, and security for hazardous materials storage in accordance with federal, state and local regulations. The material, design and workmanship are specified in the following outline.

Product Qualification:
The product has a history of production, sales and service for more than nine years.

Design:
A) Dimensions - Exterior dimensions approximately five feet wide by six feet long by nine feet tall. (5'-0"W x 6'-0"L x 9'-0"H)
The building design exceeds the recommendations of:

The Uniform Building Code	NFPA 30	Factory Mutual
The Uniform Fire Code	OSHA	

B) Spill Containment - Internal spill containment is a major design feature of the storage container. When filled with 55 gallon drums stored upright and unstacked, the container will contain a minimum of the total leakage from one-quarter (25%) of the drums.
C) Floor - The floor of the container is constructed of 10 gauge steel and incorporates a false floor system to prevent the release of hazardous liquids and solids if they are discharged from a primary container.
D) Walls & Roof - The walls and roof are fabricated using 12 and 14 Gauge HRS.
E) Doors - The container has one door opening which is 4'-6" wide by 6'-3" high located on the front of the container. The door is equipped with an industrial grade 3 pt lock and interior safety release.
F) Ventilation - The container is equipped with vents which are sized to allow for a minimum of 6 air changes per hour.
G) Grounding - The container is equipped with one exterior static grounding connection.
H) Seismic Tie Down - The container is equipped with provisions for securing the building to the ground per seismic Zone 4 regulations.

Workmanship:
A) Steel Fabrication - The steel used to fabricate the container is free from kinks, and sharp bends. The manufacturing process does not reduce the strength of the steel to a value less than intended by the design. Each manufacturing process is done neatly and accurately, and all bends are made by controlled means to insure uniformity of size and shape.
B) Welding - The welding procedures employed are in accordance with the filler metal specifications of the American Welding Society and in cooperation with the ASTM. All welds are of sufficient size and shape to develop the full design strength of the parts connected by the welds. These welds transmit the imposed stresses without permanent deformation or failure when subject to proof of storage loads.
C) Painting - After a thorough cleaning process the exterior and interior of the container are painted with a self-priming chemical resistant epoxy paint. All exterior surfaces are then painted with a durable polyurethane paint.

Structural Design:

Wind Load	110 MPH
Floor Load	250 PSF
Snow Load	40 PSF
Seismic Load	Zone 4

Units equipped with explosion relief venting:

Internal Pressure	100 PSF

SEPARATION OF NON-COMPATIBLE MATERIALS
TABLE NO 51.110-A

MATERIAL SEPARATION

	MINIMUM SEPARATION FROM						
	TOXICS	ACIDS	BASES	FLAM-MABLES	OXI-DIZERS	WATER REACTIVE	PYRO-PHORIC
TOXICS		1 HR	1 HR	1 HR	1 HR	1 HR	1 HR
ACIDS	1 HR		S	S 2	S	S	S 2
BASES	1 HR	S		S	S	S	S
FLAMMABLES	1 HR	S 2	S		S	*	S
OXIDIZERS	1 HR	S	S	S		S	S 2
WATER REACTIVE	1 HR	S	S	*	S		S
PYROPHORIC	1 HR	S 2	S	S	S 2	S	

1. FOR SEPARATION OF HAZARDOUS PRODUCTION MATERIAL GASES FROM HAZARDOUS PRODUCTION LIQUIDS AND SOLIDS, SEE SECTION 51.110 (B) 3

2. SEPARATION BY NOT LESS THAN 20 FEET MAY BE USED AS AN ALTERNATIVE TO A NONCOMBUSTIBLE PARTITION.

NOTES:

S = NONCOMBUSTIBLE PARTITION. THE PARTITION SHALL EXTEND NOT LESS THAN 18 INCHES ABOVE AND TO FRONT AND REAR OF STORED MATERIAL

1 HR = ONE-HOUR NONCOMBUSTIBLE FIRE-RESISTIVE OCCUPANCY SEPARATION EXCEPT WHEN APPROVED GAS CABINETS ARE USED.

* = NOT ALLOWED: A SEPARATE STORAGE ROOM IS REQUIRED

ACIDS	CAUSTICS	SOLVENTS	OXIDIZERS

STORAGE AS SMENT

NUMBER & TYPE	GENERIC NAME	HAZARDOUS CLASSIFICATION	STORAGE PERIOD CYCLE TIME
BOXES, PAILS, TUBS BOTTLES, DRUMS BARRELS, PALLETS	FUEL, SULFURIC ACID, WASTE OIL PAINT, PROPANE	FLAMMABLE SOLIDS CORROSIVES, OXI- DIZERS, TOXICS FLAMMABLE LIQUID GASES, ORGANIC PEROXIDES	CONTINUOUS INTERMITTENT 30 DAYS, 90 DAYS INDEFINITE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

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[illegible] COMMENTARY AS APPLIED TO CHEM-STOR LOCKERS

- GENERAL INFORMATION

CODES: Whether or not specific codes, regulations or ordinances apply to the use of Chem-Stor lockers depends on several factors, principally, the type, quantity and physical state of materials to be stored; whether or not dispensing is to take place, the location of the locker at the specific site and of course the interpretations of local code-enforcing authorities.

References used for this commentary include Uniform Fire Code, UFC 1988 Ed.; Uniform Building Code, UBC 1988 Ed.; Santa Clara County, Model Ordinance for Hazardous Materials Storage; Flammable and Combustible Liquids Code, NFPA 30, 1987 Ed.; California Code of Regulations, Title 22 T-22 , Div. 4, Chapter 31, Minimum Standards for Management of Hazardous Waste; Guide for Venting of Deflagrations, NFPA 68, 1988 Ed.; and NFPA Annotated OSHA Regulations, Volume 1 published 1977.

COMMENTS: Chem-Stor lockers are designed specifically for hazardous materials storage, providing sound environmental protection against contamination due to spills or leaks while at the same time providing a high level of security and protection from the elements. The lockers are suitable for storing usable as well as waste materials.

Requirements for separation or isolation as well as the fire-hazard nature of many materials makes safe storage difficult. Chem-Stor lockers offer an easy, safe, and very practical solution to many hazardous materials storage problems. Each locker contains the basic features necessary for a hazardous materials storage facility; spill control, explosion relief (optional on some models), natural ventilation of storage spaces, shelving construction and structural design for heavy storage. In addition, each locker is small enough and strong enough to be picked up with a fork lift for relocation.

- STRUCTURAL APPLICATION AND PERMITS

CODES: The UBC defines a structure as "...an edifice or building of any kind or any piece of work artificially built up or composed of parts joined together in some definite manner." UBC Section 301 regarding building permits required, exempts one-story detached accessory buildings used as tool or storage sheds from permit requirements provided the projected roof are does not exceed 120 sq. ft. The UFC and local Hazardous Materials Storage Ordinances require permits to be obtained to storing hazardous materials.

COMMENTS: Chem-Stor lockers may or may not require a building permit to install. Regardless of permit requirements, however, local jurisdictions may require structural calculations and a site plan. Ideal Environmental will provide structural calculations upon request. Information regarding construction materials and loading is included in the specifications. Regardless of the UBC permit requirements, Chem-Stor lockers must not be installed or used in a manner or location which constitutes a violation of Building or Fire Codes. Hazardous materials storage permits issued under the UFC or local Ordinance generally specify types and quantities of hazardous materials permitted to be stored as well as approved locations and monitoring and

[illegible] that our cabinets satisfy [illegible] property for a complete storage facility with known quantities [illegible] can be relocated from one approved location to another.
Pads or foundations are not necessary for Chem-Stor cabinets [illegible] load distribution design. Some jurisdictions however require anchorage against seismic activity. Upon customer request, IDEAL ENVIRONMENTAL will provide information regarding anchoring methods.

- SPILL CONTROL AND SECONDARY CONTAINMENT

CODES: The UFC, UBC and Model Ordinance, as well as many state and local laws throughout the country, require that hazardous materials, whether stored in a usable state or as a waste, must be stored in an approved storage facility providing spill control so that spills or leakage is prevented from creating fire and health hazards and contaminating the surrounding environment. The model ordinance requires spill control in the form of "secondary containment." The secondary containment construction must be such that it will not be structurally weakened through contact with leaked or spilled material for a period of time equal to the maximum time needed to clean up the leakage or spilled hazardous material. The secondary containment must have capacity to contain 150% of the volume of the largest primary container stored (110% if only one container) or 10% of the aggregate volume of all primary containers stored, whichever is greater. If the storage facility is open to rainfall, the secondary containment must additionally have capacity to accomodate the volume of a 24-hour rainfall based on a 25-year storm history.
UFC, Art. 80 requires that, "..rooms, buildings or areas used for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off the spillage and fire protection water". The spill control must, at minimum, be liquid-tight recessed (4") floors or liquid-tight sills (4") connected to a drainage system to direct the spillage and fire protection water to an approved location. When "secondary containment" is specifically required the spill control and drainage system must be designed as secondary containment OR the building, room or area shall be designed to provide secondary containment through the use of liquid-tight floors or sills. Secondary containment shall have capacity equal to the volume of the largest single container stored plus flow from the automatic fire extinguishing system for a period of 20 minutes.
UFC, Art. 80 specifically requires a liquid-tight floor and secondary containment for the storage of : liquid and solid oxidizers, organic peroxides, pyrophoric materials, unstable (reactive) materials, water reactive materials, highly toxic solids and liquids, radioactive materials, corrosives, other health hazard type materials.
UFC, Art. 79; and NFPA 30 (which includes OSHA requirements in this instance) have similar requirements for containing spills of flammable or combustible liquids in "storage rooms," "inside storage rooms," attached buildings and "cut-off rooms." Methods include liquid-tight sills floors depressed 4" below surrounding floors or grated trenching to direct spills to a safe area. These regulations also require that run-off water from fire suppression be controlled and impounded in a safe location. The UFC and NFPA 30 also requires outside storage areas

[illegible]
so as to [illegible]
T-22, Chapter [illegible], Section [illegible], pertaining to [illegible] Waste, requires that "storage [illegible] minimize the possibility of spills and escape from the area [illegible]
COMMENTS: Chem-Stor lockers are designed specifically to [illegible] Model Hazardous Materials Storage Ordinance and UFC requirements. [illegible] lockers are designed with containment adequate for [illegible] volume based on 55 gallon drums as primary containers.
Chem-Stor locker secondary containment is static-tested for [illegible] tightness using water at the factory before application of any [illegible] material. After the containment has proven to be leak-tight, all surfaces are coated with a chemical resistant epoxy to protect the steel construction from corrosion.
Where local jurisdictions require automatic fire sprinklers and will not accept "approved" alternate systems, provisions for fire flow run-off to a safe location will have to be developed by the user.

- MONITORING
CODES: The Model Ordinances and UFC have similar monitoring requirements for leakage or spills. Both require that: "Monitoring methods shall include at least one system for detecting leakage from the primary container. A monitoring system capable of detecting that the hazardous material stored in the primary containment has entered the secondary containment shall be provided. Visual inspections of the primary containment is the preferred method, however, other means of monitoring may be required..." (Most enforcement authorities will require a monitoring plan wherein the frequency and method of inspection to detect leakage must be specified.)
COMMENTS: Chem-Stor lockers are designed with a 50" minimum, wide door for easy visual inspection of primary containers and a Chemical Resistant Steel Grate Floor or Corrosion Resistant Fiberglass Grate Floor installed in lift out floor panels for quick, easy access and inspection of the secondary containment.

-SECURITY
CODES: UFC, Art. 79 and Art. 80, NFPA 30, OSHA, the Model Ordinance, and T-22 all require security for hazardous materials storage; NFPA 30 and UFC Art. 79, "Storage areas shall be protected against tampering or trespassers..."; Model Ordinance, "Access to storage facilities shall be secured by means of fences and/or locks. The storage facilities shall be securely locked when unattended;" T-22, "Storage of hazardous waste shall be in a secure enclosure, including but not limited to, a building, room or fenced area which shall prevent unauthorized persons from gaining access to the waste..."; UFC, Art. 80, "The storage of hazardous materials shall be safeguarded with such protective facilities as public safety requires."
COMMENTS: Chem-Stor lockers' steel construction, versatile hardware and security bars on the roof hatch provide excellent security against unauthorized entry. The lockers also provide a simple way to isolate materials which may require special security measures while not restricting access to general storage areas.

[illegible] material [illegible] and associated [illegible]. UFC, Art. [illegible] requirements [illegible] principally to inside storage, mixing and handling [illegible]. The general intent is to prevent accumulation of flammable vapors and to that end, six air changes per hour are required; NFPA [illegible] on the same subject does not specify air changes per hour for gravity ventilation but requires mechanical ventilation at 150 cfm if Class I liquids are dispensed. OSHA requires six air changes per hour by either gravity or mechanical exhaust ventilation. In all instances where flammable or combustible liquids are stored and ventilation is required, ventilation must occur within 12" of the floor. Where gases are stored, required ventilation must be designed to provide air outlets near the ceiling or roof and make up air inlets near the floor. Air changes per hour are not specified for gas storage. OSHA requires that openings must be at least 1 sq. ft. for each 1,000 cu. ft. of room volume. An additional information source; Factory Mutual System's "Industrial Loss Prevention Handbook" recommends ventilation in work areas where flammable vapors might be present at 1 sq. ft. of vent opening for each 500 sq. ft. of floor area. UFC Art. 81 generally requires mechanical ventilation for indoor storage areas and storage buildings at 1 cu. ft./m for each 1 sq. ft. of floor area. Exceptions may be made where natural ventilation can be shown to be adequate for the materials stored.

COMMENTS: Chem-Stor lockers standard features provide natural ventilation openings on at least two sides within 12" of the floor, in the doors and at the roof. The internal volume of the standard locker is nominally 450 cu. ft. Assuming an empty locker, 6 air changes per hour (2700 cu. ft.) would require a very slight air movement (less that 1/2mph) through a 1 sq. ft. opening. Where mechanical ventilation is required, the optional forced air system is recommended. This system pushes outside air into the locker to provide ventilation up to 20 air changes per hour.

- DEFLAGRATION VENTING

CODES: The UBC, UFC, NFPA 30 and OSHA all contain some requirement for "explosion venting" where flammable liquids, dusts or gases are stored or handled. UBC, Chapter 9, says, in part that, "when required by the UFC, explosion venting shall be provided to vent the gases resulting from deflagrations of dusts, gases or mists in rooms, buildings or other enclosures. The venting shall be in exterior walls or roof only and shall be designed to prevent serious structural damage and production of lethal projectiles. The venting shall consist of any one or a combination of: walls of lightweight material, lightly fastened hatch covers, lightly fastened outward opening swinging doors or lightly fastened walls or roof. Venting shall discharge vertically or to an unoccupied yard at least 50' in width on the same lot."

UFC, Art. 80 specifically requires "explosion venting" be provided in indoor areas and buildings used for the storage of: highly toxic or flammable gases stored outside of gas cabinets or exhausted enclosures; flammable solids; solid or liquid oxidizers Class 1, 2 or 3; organic peroxides Class II, III, IV or V; unstable (reactive) materials.

UFC, Art. 79 for "inside use, dispensing and mixing rooms" requires

"adequate explosion" vent [illegible] design.
NFPA 30, for container and portable tank storage requires exp[illegible] venting only where dispensing is done, and in areas where [illegible] unstable liquids are processed. Explosion venting is to be through [illegible] of more of the following methods a open air construction; [illegible] lightweight walls and roof; c lightweight wall panels and roof hatches; (d) windows of explosion venting type." NFPA 30 references NFPA 68 "Guide for Venting of Deflagrations." OSHA 1910.106 [illegible] repeats the NFPA 30 requirements but makes no reference to NFPA 68.
NFPA 68 in its "Basic Recommendations for Venting" section says, "Since venting of deflagrations is a complex subject of many variables on which information in limited only general guidelines are provided." In very general terms the required vent area will depend on the size and strength of the enclosure to be vented, the acceptable level of resulting damage, the maximum anticipated rate of pressure rise, the anticipated maximum pressure developed by the fuel mixture and the design of the venting devices. Formulas are provided for calculating required vent areas when the required information is know or can be calculated.
COMMENTS: Chem-Stor standard lockers are designed to comply with the intent of the codes by providing deflagration relief in the form of an 11.6 sq. ft. roof cap constructed of 16 gauge metal securely hinged and tethered. Internal volume of the standard locker is nominally 450 cu. ft.: this places the vent area to locker volume ratio at 1 sq. ft. of vent for each 37.8 cu. ft. of volume. For comparison purposes OSHA 1910.103 (3) (ii) (c) and NFPA 50A require explosion venting for "gaseous hydrogen systems in separate buildings" at the rate of 1 sq. ft. for each 30 cu. ft. of room volume.
The most common method of deflagration venting is the so-called weak roof of wall panel design; however, Chem-Stor's hinged cap design provides more functional certainty because it can be easily maintained and manually exercised from time to time and it is not as likely to become a projectile as would weakly attached or light weight panels.

- FIRE PROTECTION

CODES: Portable fire extinguishers suitable for the type hazard will in all cases be required. Most jurisdictions reference NFPA 10 or UFC Standard 10-1 for the selection and installation of portable fire extinguishers.
UBC 3802(f) and UFC 10.308(f) require automatic fire extinguishing systems in buildings containing Group H Division 1, 2, 3 and 7 occupancies (storing/handling hazardous materials in excess of the exempt quantities listed in UBC Table 9-A and 9-B).
NFPA 30 and OSHA when referring to "inside storage rooms" do not specifically require quantities permitted when such protection is not provided.
It should be noted that all the referenced regulations except UFC require "automatic systems" which could be sprinklers, water spray, CO2, dry chemical, halon, or other approved systems.
UFC, Art. 79 however specifically calls for automatic fire sprinkler systems in "liquid storage rooms" and "inside liquid storage rooms."

[illegible] Art. [illegible] generally calls for automatic fire sprinkler system [illegible] unless permit approved alternate automatic fire extinguishing system.
COMMENTS: The code requirements are obviously intended to protect those areas within the same building which may be exposed to high fire hazard storage, use, handling, mixing, etc. and also takes into consideration fire fighting access to these hazards.
Whether the Chem-Stor locker is considered to be a building or simply enclosed outside storage and where the locker is placed on site is probably the key as to whether or not automatic fire protection is required. For example, if the locker is placed against or inside a sprinklered building, sprinklers will surely be required. In one jurisdiction, if the locker is within 10' of any building it must have a sprinkler.
Most jurisdictions will accept alternative or equivalent protection depending on the specific situation. For that reason, Chem-Stor provides an optional factory-installed u.l. listed dry chemical system.

- FIRE-RESISTIVE CONSTRUCTION
CODES: When the UBC requires fire-resistive construction the reference is to a time rating assigned as a result of having withstood fire exposure as established by a standard test procedure. The requirements for fire-resistive construction are generally based on: the size, use and type of construction of the building; the exposure of one use to another in the same building; the exposure of other buildings on the same property; exposure potential relative to property lines; or the protection of specific situations within buildings, e.g., vertical shafts and exitways (stairs and corridors).
Noncombustible construction simply means the materials will not ignite and burn or will not contribute, within a limited criteria, fuel to a fire. The terms fire-resistive and noncombustible are not interchangeable.
COMMENTS: The standard Chem-Stor lockers are of completely noncombustible construction. Fire-resistive exterior walls rated up to two hours can be easily provided on one or more sides to accommodate locations where distances to property lines or buildings dictate or where storage in two or more lockers side by side require fire separation walls. Locker interiors can be easily divided by either fire-resistive or noncombustible partitions to accommodate requirements for separation or segregation of materials. Chem-Stor, also offers a complete line of Fire Rated units which are built in accordance with Underwriters Laboratories listing #425.

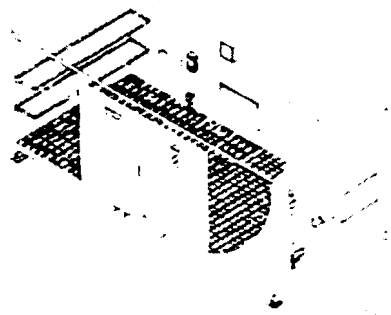

TABLE NO. 9A - EXEMPT AMOUNTS OF HAZARDOUS MATERIALS, LIQUIDS AND CHEMICALS PRESENTING A PHYSICAL HAZARD BASIC QUANTITIES PER CONTROL AREA [1]

When two units are given, values within parentheses are in cubic feet (Cu.Ft.) of pounds (Lbs.)

CONDITION		STORAGE [2]			USE [2] - CLOSED SYSTEMS			USE [2] - OPEN SYSTEMS		
MATERIAL	CLASS	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)
1.1 Combustible liquid [3]	II	—	120 [4,5]	—	—	120 [4,5]	—	—	30 [4]	—
	III-A	—	330 [4,5]	—	—	330 [4,5]	—	—	80 [4]	—
	III-B	—	13,200 [6]	—	—	13,200 [5]	—	—	3300 [5]	—
1.2 Combustible dust lbs./1000 cu. ft		1 [7]	—	—	1 [7]	—	—	1 [7]	—	—
1.3 Combustible fiber (loose)		(100)	—	—	(100)	—	—	(20)	—	—
(baled)		(1,000)	—	—	(1,000)	—	—	(200)	—	—
1.4 Cyrogenic, flammable or oxidizing			45	—	—	45	—	—	10	—
2.1 Explosives		1 [5,8,9]	(1) [5,8,9]	—	1/4 [5]	(1/4) [6]	—	1/4 [5]	(1/4) [4]	—
3.1 Flammable Solid		125 [4,5]	—	—	25 [4]	—	—	25 [4]	—	—
3.2 Flammable gas (gaseous)		—	—	750 [4,5]	—	—	750 [4,5]	—	—	—
(liquefied)		—	15 [4,5]	—	—	15 [4,5]	—	—	—	—
3.3 Flammable liquid [3]	I-A	—	30 [4,5]	—	—	30 [4]	—	—	10 [4]	—
	I-B	—	60 [4,5]	—	—	60 [4]	—	—	15 [4]	—
	I-C	—	90 [4,5]	—	—	90 [4]	—	—	20 [4]	—
Combination 1A, 1B, 1C		—	120 [4,5,10]	—	—	120 [4,10]	—	—	30 [4,10]	—
4.1 Organic Peroxide unclassified detonatable		1 [5,8]	(1) [5,8]	—	1/4 [5]	(1/4) [5]	—	1/4 [5]	(1/4) [5]	—
4.2 Organic Peroxide	I	5 [4,5]	(5) [4,5]	—	(1) [4]	(1) [4]	—	1 [4]	1 [4]	—
	II	50 [4,5]	(50) [4,5]	—	50 [4]	(50) [4]	—	10 [4]	(10) [4]	—
	III	125 [4,5]	(125) [4,5]	—	125 [4]	(125) [4]	—	25 [4]	(25) [4]	—
	IV	500	(500)	—	500 [4]	(500)	—	100	(100)	—
	V	N.L.	N.L.	—	N.L.	N.L.	—	N.L.	N.L.	—
4.3 Oxidizer	4	1 [5,8]	(1) [5,8]	—	1/4 [5]	(1/4) [5]	—	1/4 [5]	(1/4) [5]	—
	3	10 [4,5]	(10) [4,5]	—	2 [4]	(2) [4]	—	2 [4]	(2) [4]	—
	2	250 [4,5]	(250) [4,5]	—	250 [4]	(250) [4]	—	50 [4]	(50) [4]	—
	1	1000 [4,5]	(1000) [4,5]	—	1000 [4]	(1000) [4]	—	200 [4]	(200) [4]	—
4.4 Oxidizer - Gas (gaseous)		—	—	1500 [4,5]	—	—	1500 [4,5]	—	—	—
(liquefied)		—	15 [4,5]	—	—	15 [4,5]	—	—	—	—
5.1 Pyrophoric		4 [5,8]	(4) [5,8]	50 [5,8]	1 [5]	(1) [5]	10 [5,8]	0	0	0
6.1 Unstable (reactive)	4	1 [5,8]	(1) [5,8]	10 [5,8]	1/4 [5]	(1/4) [5]	2 [5,8]	1/4 [5]	(1/4) [5]	0
	3	5 [4,5]	(5) [4,5]	50 [4,5]	1 [4]	(1) [4]	10 [4,5]	1 [4]	(1) [4]	0
	2	50 [4,5]	(50) [4,5]	250 [4,5]	50 [4]	(50) [4]	250 [4,5]	10 [4]	(10) [4]	0
	1	125 [4,5]	(125) [4,5]	750 [4,5]	125 [4]	(125) [4]	750 [4,5]	25 [4]	(25) [4]	0
7.1 Water (reactive)	3	5 [4,5]	(5) [4,5]	—	5 [4]	(5) [4]	—	1 [4]	(1) [4]	—
	2	50 [4,5]	(50) [4,5]	—	50 [4]	(50) [4]	—	10 [4]	(10) [4]	—
	1	125 [5,8]	(125) [5,8]	—	125 [5]	(125) [5,8]	—	25 [4]	(25) [4]	—

N.L. = Not Limited

1. Control area is a space bounded by not less than a one-hour fire-resistive occupancy separation within which the exempted amounts of hazardous materials may be stored dispensed, handled or used. The number of control areas within a building used for retail and wholesale stores shall not exceed two. The number of control areas in buildings with other uses shall not exceed four.
2. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.
3. The quantities of alcoholic beverages in retail sales uses are unlimited provided the liquids are packaged in individual containers not exceeding four liters. The quantities of medicines, foodstuffs and cosmetics containing not more than 50 percent of volume of water-miscible liquids and with the remainder of the solutions not being flammable in retail sales or storage occupancies are unlimited when packaged in individual containers not exceeding four liters.
4. Quantities may be increased 100 percent in sprinklered buildings. When Footnote 5 also applies, the increase for both footnotes may be applied.
5. Quantities may be increased 100 percent when stored in approved storage cabinets or safety cans as specified in the Fire Code. When Footnote 4 also applies, the increase for both footnotes may be applied.
6. The quantities permitted in a sprinklered building are not limited.
7. A dust explosion potential is considered to exist if 1 pound or more of combustible dust per 1,000 cubic feet of volume is normally in suspension or could be put into suspension in all or a portion of an enclosure or inside pieces of equipment. This also includes combustible dust which accumulates on horizontal surfaces inside buildings or equipment and which could be put into suspension by an accident, sudden force or small explosion.
   Permitted in sprinklered buildings only. None is allowed in unsprinklered buildings.
   One pound of black sporting powder and 20 pounds of smokeless powder are permitted in sprinklered or unsprinklered buildings.
10. Containing not more than the exempt amounts of Class I-A, Class I-B or Class I-C flammable liquids.

Manufacturer's Information on Epoxy Filler-Sealer and Protective Coating

PLASITE ®

TECHNICAL BULLETIN

9028
May 1989
(Replaces Jan. 1984)

PLASITE 9028M1 & 9028M2 MASONRY & CONCRETE FILLER-SEALER

TYPE: PLASITE 9028M1—A 100% solids epoxy blended with a properly graded combination of silica fillers and inerts to provide excellent bulking, film strength and working properties.
PLASITE 9028M2—A 100% solids epoxy blended with an inert flaking pigment providing excellent workability and ease of application.
CURING AGENT: Combined Amine.
INTENDED USE: As a filler-sealer for all types of concrete finishes, as well as a repair or grout material. Topcoating with PLASITE Series 700, 4000, 7000 and 9000 coatings should be used to increase chemical resistance and to meet the requirements of the environment. Tank linings, floors, ceilings and walls are common applications.

PLASITE 9028M1 is a general purpose filler-sealer that will fill holes up to ¼" in depth. For larger holes or concrete repair, an addition of a properly graded silica sand may be used to obtain the proper consistency.

PLASITE 9028M2 has less body than PLASITE 9028M1 and will fill holes up to approximately ⅛" in depth and for general thin film surfacing for specifications calling for flush surface up to 40 mils. It is ideal for horizontal surfaces as it is self-leveling and needs no finishing.

FOR INDUSTRIAL USE ONLY!

CHEMICAL RESISTANCE: Good all-around chemical resistance but not as resistant as the PLASITE topcoats. Refer to our laboratory for exposures where topcoats may not be required.
TEMPERATURE RESISTANCE: Dry temperature basis is 300°F continuous or 400°F for short periods of time. Immersion temperatures are based on the topcoat.
SURFACE PREPARATION: Requires hard, dense, clean, uncontaminated prime masonry surface, free of glaze and laitance. For further information refer to SURFACE PREPARATION on Page 2.
APPLICATION: PLASITE 9028M1 may be applied to surface by spray, brush, roller or trowel and requires finishing by squeegee or plastic finishing blade. PLASITE 9028M2 may be applied to surface by spray, brush or roller and requires less finishing than PLASITE 9028M1. For first filling and sealing operation, both materials require working with squeegee to fill voids.
COLORS: PLASITE 9028M1 - Light Green PLASITE 9028M2 - Medium Gray.
COVERAGE: 1604 Mil Ft.²/Gallon theoretical.
COVERAGE & COATS: Severe spillage or immersion service will require two (2) coats. The first coat will normally provide a flush surface; the second coat (applied in the same manner) will fill small leftover voids and assure a completely sealed surface. Field experience indicates a coverage rate of 60 to 80 ft.²/gallon for this 2 coat system.
For less severe service, the second coat may not be required. Coverage rate for a single coat application is approximately 80 to 120 ft.²/gallon.
NOTE: When bulking is required for grouting and plugging large holes, a clean wash silica sand may be used with an approximate U.S. Sieve Size (percent retained on screen): 3% - #40; 31% - #50; 43% - #70; 19% - #100. Bulking factor of specified filler is approximately 80% based on dry volume measure of sand. Example—one gallon of coating plus one-half gallon of recommended filler will yield 1.4 gallons with a coverage of 2245 mil ft.² (1.4x1604) or 1.4 x 232 = 325 Cu. In.
DRYING TIME: Where low temperatures of 50 to 60°F are involved with low humidity the drying time may be 16 hours. At 70°F and relative humidity of 40 to 60%, the drying time may be from 8 to 10 hours. Under conditions of high temperatures and high humidity the drying time may be as low as two hours.
INITIAL SET: 8 to 10 hours at 70°F.
CURING TIME: 5 to 7 days at 70°F or force cure on the same schedule as for topcoat.
OVERCOATING TIME: PLASITE 9028 systems may be overcoated within one hour at 70°F by high solids epoxies in the range of 80 to 100% volume. For a lower solids coating in the range of 40 to 80% by volume the overcoating time is 8 to 10 hours. Lower solids materials, and any coating that is used as topcoat that has not been tried, should be checked for bleed-through if earlier overcoating is required.

PHYSICAL SPECIFICATIONS

PIGMENTS: 9028M1—Inert Fillers Including Silica
9028M2—Inert Fillers Combined with Special Flake Pigments
SOLIDS: 100%
POT LIFE: Approx. 6 hrs. at 70°F
SHELF LIFE: 24 Months at 70°F
SHIPPING WT.: 9028M1—14½ lbs. 9028M2—15½ lbs.

ABRASIVE RESISTANCE: Average loss per 1000 cycles. Taber CS-17 Wheel, 1000 Gram Weight:
9028M1..... 64 milligrams
9028M2.....105 milligrams
THERMAL SHOCK: Unaffected 5 Cycles -70°F to +200°F on concrete substrate.

9028-1
R 7/91

WISCONSIN PROTECTIVE COATINGS CORP.
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414-437-6561

Represented by:

THINNERS

Thinning of the PLASITE 9028 Series is not usually required. Should it be desirable to reduce application air pressure requirements and improve flow-out or workability, the addition of 5% to 10% PLASITE 20 thinner may be used.

SURFACE PREPARATION (For Immersion Service)

1. Inspect for structural failures, cracks, protrusions and fins. Grind surface flush and grind cracks to "V" configuration. Chip all loose concrete to width of ¼" minimum.
2. Repair all large holes, cracks, voids and other imperfections with PLASITE 9028M1 or 9028M2 filler-sealer with addition of specified sand, as required, to provide proper stiffness used as the grout. Mixtures of specified sand up to equal parts of sand to resin may be used. See note in COVERAGE section.
3. Concrete surface must have minimum 30 days cure, be clean, hard, dense and free of laitance, form oil and release agents. Blow holes, pits and cavities must be open in order that they may be properly filled and sealed. To provide the foregoing requirements, it is necessary to prepare the surface using one or more of the methods listed in order of preference.
   a. Whip blast with a fine grade of sand reducing the normal nozzle pressures. Pressure and distance of nozzle from surface depends on characteristic of concrete. CAUTION: Do not overblast as it will result in high consumption of material and labor.
   b. Water blasting at a pressure of approximately 3000 psi may be used to produce similar results.

NOTE: Surface preparation for exposures other than immersion service will require less surface preparation and will depend on environment, condition of concrete surface and other factors. In general, the foregoing Paragraphs 1, 2 and 3 will be a requirement. Satisfactory surface preparation, sanding, grinding, brushing, pressure washing, etching and other methods must be determined on a job-to-job basis. Contact our Sales Engineers or Laboratory for specific information.

EQUIPMENT

Due to heavy viscosity of the material, a fine atomization cannot be obtained. Spray equipment is utilized to apply material to surface prior to working into voids with a squeegee or flexible plastic blade. Suggested application equipment:

SPRAY EQUIPMENT:

Graco—Pump Feed—225 President Heavy Material Air Spray Unit (10:1 ratio); 204-000 Spray Gun; 330 Fluid Tip; 520 Air Cap (slotted type). For 9028M1 only may use 167-331 Fluid Tip; 160-663 Air Cap.

Speeflo—Pump Feed—914-552 Heavy Duty Coatings Pump with Hopper; Heavy Fluid Gun; 701-628 Fluid Tip; 701-618 Air Cap.

Binks No. 98-930 Unit - Pump Feed - Specify a 45 x ¼" E Air Cap and Fluid Nozzle to fit 7E-2 Gun.

NOTE: For Pump Feed equipment, a ½" to ¾" ID fluid hose is recommended depending on length.

Normal solvent flushing of airless pumps may not remove the 9028 material adequately. It is suggested that cleaning by disassembly of the lower unit be performed after each application.

Binks—Pressure Pot Feed—18 Gun; 59ASS Fluid Tip; 251 Air Cap; 59SS Needle and Heavy Duty Spring.

NOTE: For Pressure Pot Feed equipment, PLASITE 20 thinner may be added, as required (not over 20%).

BRUSH: A high quality stiff brush should be used.

ROLLER: Use short nap (½" or less) fiber, resistant to ketone solvents.

READ THIS NOTICE!
SAFETY AND MISCELLANEOUS EQUIPMENT

1. It is recommended that the operator wear clean coveralls, rubber-soled shoes, gloves and maintain a high degree of personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE THINNER FOR THIS COATING, WHEN ADDED, IS FLAMMABLE AND CARE IS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks, and open flame and use necessary safety equipment (such as, air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and clothing and the breathing of vapor or spray mist. When working in tanks, rooms, and other enclosed spaces, adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

MIXING

The PLASITE 9028 Series are shipped in one and five gallon containers. An appropriate amount of curing agent is shipped with each unit. Thoroughly mix resin and pigment (Part 1), add curing agent (Part 2) and continue mixing until fully blended. Always use a mechanical mixer to assure optimum workability. A 15-minute sweat-in period shall be allowed prior to application.

APPLICATION PROCEDURE (For Immersion Service)

1. Apply first coat by spray or hand method and thoroughly work into surface with squeegee or flexible plastic blade to provide a flush uniform surface.
2. Apply second coat in same manner as first coat. This coat may be applied immediately after the first coat or whenever first coat is hard.
3. Damp concrete surfaces may be filled and sealed with PLASITE 9028M1 or 9028M2.
4. Visually inspect all surfaces and repair any voids.

This bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult your local sales representative or PLASITE Technical Service Department for further information.

METRIC COMPARISONS

1 mil = .001" = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. × 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

9028-2
R:7/91

We guarantee our product to be free of defects in material and workmanship and to be in accordance with our company quality control standards. All data, statements and recommendations made herein are based upon information we believe to be reliable, but are made without any representation or guarantee or warranty of accuracy and are made with reservation of all patent rights. Our products are sold on the condition that the user himself will evaluate them, as well as our recommendations, to determine their suitability for his own purpose before adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations. Liability under any condition shall be limited to replacement of material only. No liability is assumed or implied, for injury to personnel, labor costs, product loss or any other expenses incidental to the structure or operation of the plant and equipment where the coating is applied.

PLASITE ®

TECHNICAL BULLETIN

7122
February 1987
(Replaces Jan. 1983)

PLASITE 7122 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy-phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.
INTENDED USE: As a tank lining and for industrial maintenance. May be applied to metal, concrete and wood (Refer to ZONE OF USAGE below.)
FOR INDUSTRIAL USE ONLY!
GOVERNMENT AGENCY ACCEPTANCE: Meets the requirements of the U. S. Food and Drug Administration, 21 CFR 175.300 (NOTE: The color "Green" is not suitable for food service. Special colors may not meet FDA requirements; consult PLASITE Technical Service Department).
PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Department of Agriculture for use in direct food contact areas.
PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Environmental Protection Agency for surfaces which contact potable water.
CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.
TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods. Continuous immersion temperatures depend on particular reagent.
SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.
APPLICATION: PLASITE 7122H is formulated for standard production spray equipment. 7122B is formulated for brush and roller application and should be force cured for immersion service. Refer to page 4 for details on APPLICATION PROCEDURE.
COLORS: Green; Light gray; Medium gray; Black; White; Light blue; Tile red. Special colors are available, but may not be suitable for food service. Consult PLASITE Technical Service Department.
FILM THICKNESS PER COAT: A 6 to 7 mil film is produced in one multi-pass spray coat. A 2 to 4 mil film may be produced by one "flow on" brush coat.
COVERAGE: 898 mil ft²/gallon ± 4% theoretical. For estimating purposes, 50 ft²/gallon will produce a 12 to 15 mil DFT film (20% loss included). Two multi-pass spray coats will produce the 12 to 15 mil DFT film recommended for immersion service.
DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.
CURING TIME: 5 days at 90°F or 7 days at 70°F. Refer to Page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.
SOLIDS: 67% by weight; 56% ± 4% by volume, depending on color and pigmentation.
POT LIFE: Approximately 24 hours at 70°F.
SHELF LIFE: 24 months at 70°F. Material in stock should be turned upside down every 3 months.
SPRAY VISCOSITY: 28 ± 7 seconds - Ford Cup #4 depending on color.
SHIPPING WT.: Approximately 12 lbs./gallon.
ELECTRICAL RESISTANCE: 5.5 × 10¹⁰ ohm-cm Volume Resistivity - ASTM D-257-66.
***ABRASIVE RESISTANCE:** 47 milligrams average loss 1000 cycles TABER CS-17 Wheel - 1000 Gr. Wt., lt. gray color.
***HARDNESS:** Konig Pendulum Hardness of 136 seconds. (Glass Standard = 250 seconds); ASTM METHOD D4366-84.
THERMAL SHOCK: Unaffected 5 cycles -70°F to +200°F
GLOSS: 86 at 60°.
***NOTE:** Above tests were conducted on film cured at 150°F.

VOLATILE ORGANIC COMPOUNDS CONTENT

	COATING AS SUPPLIED (ASTM METHOD D2369)		THINNED 10% BY VOLUME WITH PLASITE 71 THINNER	
Color	Lbs./Gal.	Grams/Liter	*Lbs./Gal.	*Grams/Liter
Lt. Gray	3.09 ±2%	370 ±2%	3.43 ±2%	410 ±2%

NOTE: VOC content varies between colors. Contact PLASITE Technical Service Department for VOC of specific colors.
*Determined theoretically by using ASTM Method test results.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.
B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces are subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.
C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, (primer and topcoat) of 7 to 10 mils required.
D ZONE: Process plant exterior subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, (primer and topcoat) of 6 to 8 mils required.

R 8/89

WISCONSIN PROTECTIVE COATINGS CORP.
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Represented by:

CHEMICAL RESISTANCE

The following list of laboratory tests is an indication of the range of chemical resistance. These tests consisted mild steel test panels [illegible] film thickness of 12 to 15 mils. The panels are one-half immersed in the solution at temperatures of 70° to 100°F for a period of six [illegible] no effect on the coating.

ACIDS	ALKALIES	SOLVENTS	MISCELLANEOUS
[illegible]% Sulfuric*	50% Sodium Hydroxide	Alcohol	Calcium Chloride
50% Oxalic*	Magnesium Hydroxide	Ethyl, Iso-Propyl,	Latex Rubber
30% Phosphoric*	10% Potassium Hydroxide	Butyl, Decyl	Linseed Oil
25% Boric*	Calcium Hydroxide	Gasoline	Brine
50% Citric*	50% Sodium Carbonate	Kerosene	Ferric Chloride*
	Tri-Sodium Phosphate	Iso-Propyl Acetate	Ammonium Nitrate
		Naptha	Sour-Crude Oil — 150°F

***NOTE:** Although the chemical tests indicated may show that PLASITE 7122 is unaffected by immersion as listed, it is not meant to imply an express guarantee in actual service. The service is dependent upon proper application and actual operating conditions and it is generally recommended that users confirm adaptability of the product for a specific use by their own tests.

PLASITE 7122 is classified as a relatively thin film coating and should not be used for total and continuous immersion in certain chemicals such as those acids referred to under CHEMICAL RESISTANCE which have extremely high corrosion rate to mild steel and other substrates. Use in such chemical exposure should be confined to fumes and spills.

THINNERS

The following thinners are recommended:

PLASITE 71 THINNER — is a medium fast thinner to be used under most conditions.

PLASITE 69 THINNER — recommended for airless or conventional spray. A special blend of fast evaporating solvents and containing no hydrocarbons.

It will always be necessary to thin the coating. The applicator must make exact thinner adjustments based on his equipment and air and surface temperatures. The following thinning guidelines are approximate:

Normal application temperatures and conditions will require the addition of approximately 10% thinner by volume with approximately 5% additional thinner added for each 5° of increased temperature.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

PRIMERS

Primers of the inhibitive type must be used when steel surfaces are not blasted to white metal and when finish coatings are below 8 mils in thickness. These primers may be applied by either brush or spray application:

PLASITE 7100 ANTI-CORROSIVE PRIMER described in Bulletin 7100-AC is an epoxy-phenolic catalyzed primer of heavy duty type applicable for B, C and D Zones.

PLASITE 7103 HEAVY DUTY PRIMER described in Bulletin 7103 is an epoxy metal primer with superior bond and water resistance, as well as chemical resistance, for B, C and D Zones.

NOTE: The primers listed above are NOT recommended for food or potable water service, or any service where FDA compliance is required.

CURING

1. Normally polymerization and curing will take place in 5 days at 90°F or 7 days at 70°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied, a minimum substrate temperature of 70°F is required for proper polymerization. Force curing is required for the PLASITE 7122B (brush formulation) when used in immersion service. 7122 should be force cured for all taste sensitive immersion service.
2. Force curing at elevated temperature does increase resistance to certain exposures; therefore, when exposure is severe, force curing is recommended to obtain maximum resistance.
3. Listed below are a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70° to 100°F be allowed. After the air dry period has elapsed, the temperature should be raised by approximately 30°F each 30 minutes until the desired force curing temperatures are reached.

METAL TEMPERATURE °F	°C	CURING TIME	METAL TEMPERATURE °F	°C	CURING TIME
130	54.4	18 Hours	170	76.6	3½ Hours
140	60.0	10 Hours	180	82.2	2½ Hours
150	65.5	6 Hours	190	87.7	2 Hours
160	71.1	4½ Hours	200	93.3	1¾ Hours

4. Final cure may be checked by exposing coated surface to MIBK for ten minutes. If no dissolving and only minor softening of film occurs, the curing can be considered complete. The film should reharden after exposure if cured.

PLASITE ®

TECHNICAL BULLETIN

7122
February 1987
(Replaces Jan. 1983)

PLASITE 7122 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy-phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.
INTENDED USE: As a tank lining and for industrial maintenance. May be applied to metal, concrete and wood. (Refer to ZONE OF USAGE below.)
FOR INDUSTRIAL USE ONLY!
GOVERNMENT AGENCY ACCEPTANCE: Meets the requirements of the U. S. Food and Drug Administration, 21 CFR 175.300. (NOTE: The color "Green" is not suitable for food service. Special colors may not meet FDA requirements; consult PLASITE Technical Service Department).
PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Department of Agriculture for use in direct food contact areas.
PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Environmental Protection Agency for surfaces which contact potable water.
CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.
TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods. Continuous immersion temperatures depend on particular reagent.
SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.
APPLICATION: PLASITE 7122H is formulated for standard production spray equipment. 7122B is formulated for brush and roller application and should be force cured for immersion service. Refer to page 4 for details on APPLICATION PROCEDURE.
COLORS: Green; Light gray; Medium gray; Black; White; Light blue; Tile red. Special colors are available, but may not be suitable for food service. Consult PLASITE Technical Service Department.
FILM THICKNESS PER COAT: A 6 to 7 mil film is produced in one multi-pass spray coat. A 2 to 4 mil film may be produced by one flow on brush coat.
COVERAGE: 698 mil ft²/gallon ± 4% theoretical. For estimating purposes, 50 ft²/gallon will produce a 12 to 15 mil DFT film (20% loss included). Two multi-pass spray coats will produce the 12 to 15 mil DFT film recommended for immersion service.
DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.
CURING TIME: 5 days at 90°F or 7 days at 70°F. Refer to Page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.
SOLIDS: 67% by weight; 56% ± 4% by volume, depending on color and pigmentation.
POT LIFE: Approximately 24 hours at 70°F.
SHELF LIFE: 24 months at 70°F. Material in stock should be turned upside down every 3 months.
SPRAY VISCOSITY: 28 ± 7 seconds - Ford Cup #4 depending on color.
SHIPPING WT.: Approximately 12 lbs./gallon.

ELECTRICAL RESISTANCE: 5.5 × 10¹⁰ ohm-cm Volume Resistivity - ASTM D-257-66.
***ABRASIVE RESISTANCE:** 47 milligrams average loss 1000 cycles TABER CS-17 Wheel - 1000 Gr. Wt., lt. gray color.
***HARDNESS:** Konig Pendulum Hardness of 136 seconds (Glass Standard = 250 seconds); ASTM METHOD D4366-84.
THERMAL SHOCK: Unaffected 5 cycles -70°F to +200°F.
GLOSS: 86 at 60°.
***NOTE:** Above tests were conducted on film cured at 150°F.

VOLATILE ORGANIC COMPOUNDS CONTENT

Color	COATING AS SUPPLIED (ASTM METHOD D2369) Lbs./Gal.	Grams/Liter	THINNED 10% BY VOLUME WITH PLASITE 71 THINNER *Lbs./Gal.	*Grams Liter
Lt. Gray	3.09 ±2%	370 ±2%	3.43 ±2%	410 ±2%

NOTE: VOC content varies between colors. Contact PLASITE Technical Service Department for VOC of specific colors.
*Determined theoretically by using ASTM Method test results.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.
B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces are subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.
C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, (primer and topcoat) of 7 to 10 mils required.
D ZONE: Process plant exterior subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, (primer and topcoat) of 6 to 8 mils required.

R 8/89

WISCONSIN PROTECTIVE COATINGS CORP.
614 Elizabeth Street
P.O. Box 8147
Green Bay, WI 54308-8147
414-437-6561

Represented by:

CHEMICAL RESISTANCE

The following list of laboratory tests is an indication of the range of chemical resistance. These tests consist of mild steel test panels [illegible] film thickness of 12 to 15 mils. The panels are one-half immersed in the solution at temperatures of 70° to 100°F for a period of six [illegible] no effect on the coating.

ACIDS	ALKALIES	SOLVENTS	MISCELLANEOUS
[illegible]% Sulfuric*	50% Sodium Hydroxide	Alcohol	Calcium Chloride
50% Oxalic*	Magnesium Hydroxide	Ethyl, Iso-Propyl,	Latex Rubber
30% Phosphoric*	10% Potassium Hydroxide	Butyl, Decyl	Linseed Oil
25% Boric*	Calcium Hydroxide	Gasoline	Brine
50% Citric*	50% Sodium Carbonate	Kerosene	Ferric Chloride*
	Tri-Sodium Phosphate	Iso-Propyl Acetate	Ammonium Nitrate
		Naptha	Sour-Crude Oil — 150°F

***NOTE:** Although the chemical tests indicated may show that PLASITE 7122 is unaffected by immersion as listed, it is not meant to imply an express guarantee in actual service. The service is dependent upon proper application and actual operating conditions and it is generally recommended that users confirm adaptability of the product for a specific use by their own tests.

PLASITE 7122 is classified as a relatively thin film coating and should not be used for total and continuous immersion in certain chemicals such as those acids referred to under CHEMICAL RESISTANCE which have extremely high corrosion rate to mild steel and other substrates. Use in such chemical exposure should be confined to fumes and spills.

THINNERS

The following thinners are recommended:

PLASITE 71 THINNER — is a medium fast thinner to be used under most conditions.

PLASITE 69 THINNER — recommended for airless or conventional spray. A special blend of fast evaporating solvents and containing no hydrocarbons.

It will always be necessary to thin the coating. The applicator must make exact thinner adjustments based on his equipment and air and surface temperatures. The following thinning guidelines are approximate:

Normal application temperatures and conditions will require the addition of approximately 10% thinner by volume with approximately 5% additional thinner added for each 5° of increased temperature.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

PRIMERS

Primers of the inhibitive type must be used when steel surfaces are not blasted to white metal and when finish coatings are below 8 mils in thickness. These primers may be applied by either brush or spray application:

PLASITE 7100 ANTI-CORROSIVE PRIMER described in Bulletin 7100-AC is an epoxy-phenolic catalyzed primer of heavy duty type applicable for B, C and D Zones.

PLASITE 7103 HEAVY DUTY PRIMER described in Bulletin 7103 is an epoxy metal primer with superior bond and water resistance, as well as chemical resistance, for B, C and D Zones.

NOTE: The primers listed above are <u>NOT</u> recommended for food or potable water service, or any service where FDA compliance is required.

CURING

1. Normally polymerization and curing will take place in 5 days at 90°F or 7 days at 70°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied, a minimum substrate temperature of 70°F is required for proper polymerization. Force curing is required for the PLASITE 7122B (brush formulation) when used in immersion service. 7122 should be force cured for all taste sensitive immersion service.
2. Force curing at elevated temperature does increase resistance to certain exposures; therefore, when exposure is severe, force curing is recommended to obtain maximum resistance.
3. Listed below are a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70° to 100°F be allowed. After the air dry period has elapsed, the temperature should be raised by approximately 30°F each 30 minutes until the desired force curing temperatures are reached.

METAL TEMPERATURE °F	°C	CURING TIME	METAL TEMPERATURE °F	°C	CURING TIME
130	54.4	18 Hours	170	76.6	3½ Hours
140	60.0	10 Hours	180	82.2	2½ Hours
150	65.5	6 Hours	190	87.7	2 Hours
160	71.1	4½ Hours	200	93.3	1¾ Hours

4. Final cure may be checked by exposing coated surface to MIBK for ten minutes. If no dissolving and only minor softening of film occurs, the curing can be considered complete. The film should reharden after exposure if cured.

SURFACE PREPARATION

STEEL

High Temperature & Immersion Service (A & B Zones are described under ZONE OF USAGE.)

1. All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag shall be corrected prior to abrasive blasting. Skip welds shall be welded solid.
2. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease etc. may be used. Pre-baking of old tanks is recommended.
3. The surface shall be blasted to an SSPC-SP5 or NACE No. 1 white metal surface using a Venturi blast nozzle supplied with 80 to 100 psi. An anchor pattern or "tooth" in the metal shall correspond to approximately 20 to 25% of the total film thickness of the coating.
4. Contaminated grit shall not be used for the finish work.
5. The blasting media used shall be a natural abrasive, or steel grit, or slag grit (similar or equal to BLACK BEAUTY®). These abrasives shall be sharp with a hard-cutting surface, properly graded, dry and of best quality. The media shall be of proper size to obtain the specified anchor pattern and shall be free of objectionable contaminants.
6. The anchor pattern shall be sharp and no evidence of a polished surface is allowed.
7. Remove all traces of grit and dust with a vacuum cleaner or by brushing. Care must be taken to avoid contaminating the surface with fingerprints or from detrimental material on the workers' clothes.
8. The surface temperature shall be maintained at a minimum of 5° above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared.

Service in Corrosive Atmosphere (B, C and D Zones as described under ZONE OF USAGE.)

1. Degrease surface as described in Item 2 under A & B Zones.
2. Remove all loose mill scale, rust scale and old paint scale by one of the following methods:
   a. Near white metal blast cleaning — (B Zone) SSPC-SP10 or NACE No. 2.
   b. Commercial blast cleaning — (C Zones) SSPC-SP6 or NACE No. 3.
   c. Brush-off blast cleaning — (C & D Zones) SSPC-SP7 or NACE No. 4.
   d. Power tool cleaning — (D Zone) SSPC-SP3.

When utilized, inhibitive primer should be applied as soon as possible after surface preparation.

D Zone application surface preparation as in above Paragraph 2 (d) must result in a relatively rough surface. If the steel is new and this type of surface preparation does not leave a reasonably rough surface on the steel, then the heavy film system is not recommended.

NOTE: The above specification numbers are from Steel Structure Painting Council Surface Preparation Specifications, 4400 Fifth Ave., Pittsburgh, PA 15213 and National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218.

CONCRETE

A ZONE: All concrete surfaces require whip blasting for immersion service. Fully cured concrete must be blasted to provide a hard, firm and clean surface for coating. All concrete surfaces must be filled and sealed with PLASITE 9028M1 or PLASITE 9028M2 applied in accordance with PLASITE Bulletin 9028. All surface imperfections, "bug holes," etc. must be completely repaired before application of PLASITE 7122.

PLASITE 9028M1 and 9028M2 are <u>NOT</u> recommended for food or potable water service. (When coating system requires food or potable water service, or any service where FDA acceptance is required, refer to PLASITE Bulletin 9029 Concrete Filler-Sealer.)

B ZONE: Severity of expected service will dictate minimum concrete surface preparation. Severe service (strong fumes, spillage, etc.) will probably require A Zone surface preparation and PLASITE 9028M1 or PLASITE 9028M2 filling and sealing before application of PLASITE 7122.

GALVANIZED SURFACE

The surface shall be clean and grease free and properly etched with a standard solution such as GALVAPREP® 5 (as produced by Parker & Amchem) or a phosphating solution. After the surface is properly etched, it should be thoroughly rinsed with water and thoroughly dried prior to the coating application. No inhibitive primer is required providing the galvanized surface is continuous.

ALUMINUM

Surface shall be clean and grease free with a blast produced anchor pattern or "tooth" as described earlier under "STEEL". In addition, the blasted surface shall be given a chemical treatment such as:

ALODINE® 1200S available from Parker & Amchem 32100 Stephenson Highway Madison Heights, MI 48071 (800) 521-1355	OR	IRIDITE® 14-2 produced by Allied-Kelite Division of Witco Corporation 2701 Lake Street Melrose Park, IL 60160 (800) 323-9784

For immersion, blasting with sharp grit followed by the chemical surface treatment is required.

NOTE: On metallic surfaces prepared only by chemical etching, the total coating film thickness applied should be restricted to only half the film normally applied to blasted surfaces. This reduced film thickness should be considered during selection of the coating for the service and the type of surface preparation performed.

WOOD, TRANSITE, AND SIMILAR SURFACES

Normally these materials need no surface treatment provided they are free of grease, oil and dirt and they are dry. It is generally recommended that the first coat be diluted one part of recommended PLASITE Thinner to one part of material and brush applied.

EQUIPMENT

SPRAY APPLICATION

1. All spray equipment should be thoroughly cleaned and the hose, in particular, should be free of old paint film and other contaminants.
2. Use standard production-type spray guns:

GUN	FLUID	AIR
DeVilbiss JGA-502	E	704
Binks #18	66-SS	63-PB
Graco PS00	04	02

3. When airless spray equipment is used the recommended liquid pressure is 1500 to 1800 psi with the tip size from .013" to .021". Thinning requirements are more than for conventional spray.

BRUSH APPLICATION

Use a high quality brush.

READ THIS NOTICE!
SAFETY AND MISCELLANEOUS EQUIPMENT

1. For tank lining work, it is recommended that the [illegible] provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE SOLVENT IN THIS COATING IS FLAMMABLE AND CARE AS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks and open flame and use necessary safety equipment, such as air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms and other enclosed spaces adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

MIXING

The catalyst is in a separate container and measured for the coating unit supplied. Thoroughly mix the pigments. After the pigment and liquid is thoroughly mixed, add the measured liquid catalyst slowly and mix completely with the coating. The coating should stand approximately 30 minutes after the catalyst has been thoroughly mixed.

APPLICATION PROCEDURE

SPRAY GUN

1. Air supply shall be uncontaminated. Adjust air pressure to approximately 50 lbs. at the gun and provide 10 to 15 lbs. of pot pressure. Adjust spray gun first by opening liquid valve and then adjusting air valve to give an 8" to 12" wide spray pattern with best possible atomization.
2. Apply a "mist" bonding pass.
3. Allow to dry approximately one minute but not long enough to allow film to completely dry.
4. Apply crisscross multi-passes, moving gun at fairly rapid rate, maintaining a wet appearing film. Observe the coating surface and, when it appears to be flowing together, you will have an average 4 to 5 mils wet film. By allowing the solvents to flash-off for a few minutes, several more fast multi-passes may be applied until you have a film thickness of approximately 5 to 7 mils (approximately 10 to 12 wet mils).
5. Overcoat Time will vary both with temperature and ventilation. Will require from 8 to 12 hours at 70°F for enclosed spaces. Less time required for exteriors. Remove all overspray by dry brushing or scraping if required.
6. By repeating Step No. 4 a homogeneous film of 12 to 15 mils is obtained.
7. Equipment must be thoroughly cleaned immediately after use with PLASITE thinner to prevent the setting of the coating.

NOTE: Prior to spray application all irregular steel areas, including weld seams should be brush coated with 7122 thinned a minimum of 30% by volume.

BRUSH APPLICATION

1. Apply a very light crisscross brush coat.
2. Allow to dry for approximately 5 minutes.
3. Apply a heavy coat using crisscross brush pattern. "Flow" the coating on rather than try to "brush out."
4. Allow to dry tack free.
5. Repeat Steps 3 and 4 until sufficient film thickness is obtained. Normally a film thickness of 2½ to 3 mils can be obtained per coat by this method.

INSPECTION

Refer to PLASITE Bulletin PA-3, Section 3, for inspection requirements.

PLASITE 7122 SPECIAL FORMULATIONS

7122 HAR: Formulated for added abrasion resistance. Refer to Technical Bulletin 7122 HAR.
7122 TFE: Formulated with fluorocarbon pigments for excellent release and mass flow properties. Same chemical resistance, coverage and application as for standard 7122.

This Bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult with your local sales representative or PLASITE Technical Service Department for further information.

METRIC COMPARISONS

1 mil = .001" = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. x 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

We guarantee our product to be free of defects in material and workmanship and to be in accordance with our company quality control standards. All data, statements and recommendations made herein are based upon information we believe to be reliable, but are made without any representation or guarantee or warranty of accuracy and are made with reservation of all patent rights. Our products are sold on the condition that the user himself will evaluate them as well as our recommendations, to determine their suitability for his own purpose and their adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations. Liability under any condition shall be limited to replacement of material only. No liability is assumed or implied, for injury to personnel, [illegible] product loss or any other expenses incidental to the structure or operation of the plant and equipment where this coating is applied.

High-Density Polyethylene Liner Information

SLT

HyperFlex®
Premium Grade HDPE Lining Material

SLT HyperFlex is uniquely produced from a specially formulated virgin HDPE geomembrane resin. **HyperFlex** has outstanding chemical resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. **HyperFlex** contains approximately 97.5% polymer and 2.5% carbon black, anti-oxidants and heat stabilizers, and contains no additives, fillers or extenders. **HyperFlex** has excellent resistance to UV radiation and is suitable for exposed conditions.

SMOOTH HDPE

PROPERTY	TEST METHOD	NOMINAL VALUES					
Thickness, mils	ASTM D751/1593/374	30	40	60	80	100	120
Density (g/cc)	ASTM D792/1505	0.944	0.944	0.944	0.944	0.944	0.944
Melt Flow Index (g/10 minutes)	ASTM D1238-E	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
Tensile Properties Either Direction	ASTM D638 Type IV Dumbell, 2 ipm Gauge length per N.S.F. Std. 54						
Tensile Strength at Break (lbs/in, width)		150	200	300	400	500	600
Tensile Strength at Yield (lbs/in, width)		72	96	144	192	240	288
Elongation at Break (percent)		700	800	800	800	800	800
Elongation at Yield (percent)		15	15	15	15	15	15
Tear Resistance Initiation (lbs)	ASTM D1004	25	33	50	66	83	100
Low Temperature Brittleness °F	ASTM D746 B	<-120	<-120	<-120	<-120	<-120	<-120
Dimensional Stability Each Direction (percent)	ASTM D1204 100°C 1 hr.	±1	±1	±1	±1	±1	±1
Volatile Loss (max. percent)	ASTM D1203 Meth. A	0.10	0.10	0.10	0.10	0.10	0.10
Ozone Resistance	ASTM D1149 7 days 100 ppm 104°F	No Cracks	No Cracks	No Cracks	No Cracks	No Cracks	No Cracks
Environmental Stress Crack Resistance (hrs)	ASTM D1693 Cond. B	>2000	>2000	>2000	>2000	>2000	>1500
Puncture Resistance (lbs)	FTMS 101C Method 2065	45	60	90	120	150	180
Water Absorption (percent weight change)	ASTM D570	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Coef. Linear Thermal Expansion 10⁻⁴/°C	ASTM D696	1.2	1.2	1.2	1.2	1.2	1.2
Moisture Vapor Transmission (g/m²day)	ASTM E96	<0.002	<0.001	<0.001	<0.0009	<0.00085	<0.0008
Oxidative Induction Time (minutes) Pure O_2 at 1 Atmosphere	ASTM D3895 200°C	100	100	100	100	100	100
Tensile Impact Strength (ft-lbs/in²)	ASTM D1822	381	381	381	381	381	381
Carbon Black Content (percent)	ASTM D1603	2.5	2.5	2.5	2.5	2.5	2.5
Carbon Black Dispersion	ASTM D3015	A1	A1	A1	A1	A1	A1

SLT HyperFlex is available in 24-foot widths and up to 8,000 lb. rolls. Special length rolls available upon request.

This data is provided for informational purposes only and is not intended as a warranty or guarantee. SLT assumes no liability in connection with the use of this data.

For environmental lining solutions...the world comes to SLT.®

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SLT

SLT North America Inc

FrictionFlex® Textured HyperFlex® Lining Material

SLT's FrictionFlex patented texturing process provides the industry's leading textured liners. Uniquely produced from a specially formulated virgin HDPE geomembrane resin, FrictionFlex has outstanding chemical resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. HyperFlex, textured with the FrictionFlex process, contains approximately 97.5% polymer and 2.5% carbon black, antioxidants and heat stabilizers, and contains no additives, fillers or extenders. SLT textured liners have excellent resistance to UV radiation and are suitable for exposed conditions.

PROPERTY	TEST METHOD	NOMINAL VALUES			
Thickness, mils	ASTM D751/374/1593	40	60	80	100
Density (g/cc)	ASTM D792/1505	0.944	0.944	0.944	0.944
Melt Flow Index (g/10 minutes)	ASTM D1238-E	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0
Tensile Properties Either Direction	ASTM D638 Type IV Dumbell, 2 ipm				
Tensile Strength at Break (lbs/in. width)	Gauge length per	200	300	400	500
Tensile Strength at Yield (lbs/in. width)	N.S.F. Std. 54	96	144	192	240
Elongation at Break (percent)		600	600	600	600
Elongation at Yield (percent)		15	15	15	15
Tear Resistance Initiation (lbs)	ASTM D1004 Die C	33	50	66	83
Low Temperature Brittleness	ASTM D746 B	<-120°F	<-120°F	<-120°F	<-12
Dimensional Stability Each Direction (percent)	ASTM D1204 248°F 1 hr.	± 1	± 1	± 1	± 1
Volatile Loss (max. percent)	ASTM D1203 Meth. A	0.10	0.10	0.10	0.10
Ozone Resistance	ASTM D1149 7 days 100 pphm 104°F	No Cracks	No Cracks	No Cracks	No Cracks
Environmental Stress Crack Resistance (hrs)	ASTM D1693 Cond. C	>2000	> 2000	> 2000	> 2000
Puncture Resistance (lbs)	FTMS 101C Method 2065	60	90	120	160
Water Absorption (percent weight change)	ASTM D570	<0.01	<0.01	<0.01	<0.01
Coef. Linear Thermal Expansion 10^{-4}/°C	ASTM D696	1.2	1.2	1.2	1.2
Moisture Vapor Transmission (g/m²day)	ASTM E96	<0.001	<0.001	<0.0009	<0.00085
Oxidative Induction Time (minutes) Pure O_2 at 1 Atmosphere	ASTM D3895 200°C	100	100	100	100
Tensile Impact Strength (ft-lbs/in²)	ASTM D1822	381	381	381	381
Carbon Black Content (percent)	ASTM D1603	2.5	2.5	2.5	2.5
Carbon Black Dispersion	ASTM D3015	A1	A1	A1	A1

SLT FrictionFlex is available in 24-foot widths and up to 8,000 lb. rolls. Special length rolls and other material thicknesses are available upon request.

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For environmental lining solutions...the world comes to SLT.®

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10-95, SLT

SLT

SLT PolyLock® Cast-in-Place Component for Embedded Concrete Sealing

SLT PolyLock is an extruded high-density polyethylene profile designed for use as a cast-in-place mechanical anchor for HDPE lining terminations with concrete. In addition to providing a superior juncture, the elimination of anchor bolts, batten strip and gasket materials, PolyLock generally offers a more cost effective assembly. The PolyLock design provides a wide face for lining attachment, ease of installation and rounded corners to reduce stress crack initiation.

Dimensions:	Available in 10-foot lengths Width: 6" Anchor Finger Length: 1-1/2"
Chemical Resistance:	Excellent
Tensile Strength:	> 4,000 lbs/in²
Low Temperature Brittleness:	< -70°F
Resistance to Creep:	Excellent
Puncture Resistance:	Excellent

SLT PolyLock Concrete Embedment Profile

For environmental lining solutions...the world comes to SLT.®

North American Headquarters:
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Conroe, Texas 77385
Phone 713-350-1813
Fax 409-273-2266

European Headquarters:
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24 Regent Crescent
Moorebank, New South Wales
Australia 2170
Phone 61-2-821-2977
Fax 61-2-821-5611

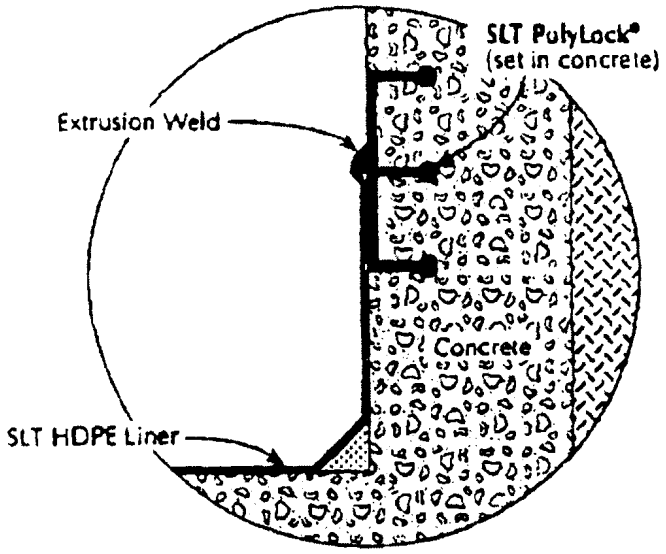
Far East Headquarters:
SLT Lining Technology (Far East) Pte., Ltd.
182 Tagore Ln.
Singapore 2678
Phone 65-459-2466
Fax 65-459-4366

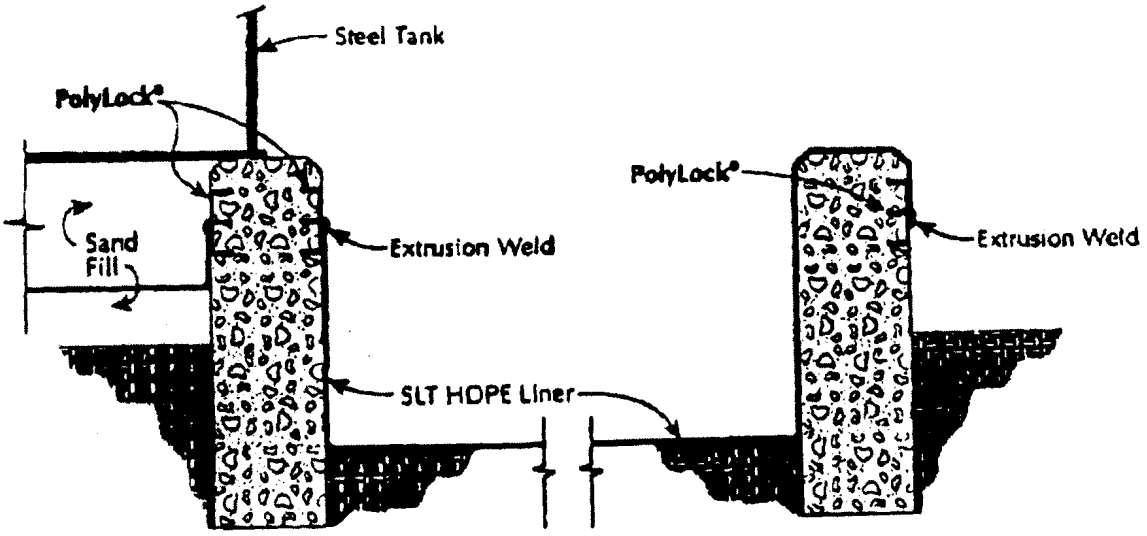
SLT PolyLock®

SLT PolyLock extruded profile is one of a family of geosynthetic products offered by SLT. PolyLock offers a mechanically stable, cost effective attachment to concrete and masonry. The HDPE resin used to manufacture PolyLock exhibits excellent chemical resistance and superior creep resistance. PolyLock can be installed in horizontal or vertical positions for a wide variety of attachments and applications.

SLT is the pioneer in the development and installation of HDPE liners for environmental protection applications. Continuing its tradition of technological leadership, SLT was the first company to develop a concrete embedment for membrane attachment; the first to manufacture the PolyLock extruded profile; and the first to install PolyLock. PolyLock is the first cast-in-place mechanical anchor system for HDPE lining termination with concrete. You can get the original PolyLock technology only from SLT.

Other special products, including extrusions, fabrications and formed items, are available through SLT for specialty applications.





This data is provided for informational purposes only and is not intended as a warranty or guarantee. SLT assumes no liability in connection with the use of this data.

PR0015/06-94

4

POLY-FLEX
POLYETHYLENE GEOMEMBRANES

Quality Control & Quality Assurance

7.1.2
Properties Met By Poly•Flex Geomembrane Rolls

Property	Test Method	Typical Value* 20 mil (0.5mm)	30 mil (0.75mm)	40 mil (1.0mm)	60 mil (1.5mm)	80 mil (2.0mm)	100 mil (2.5mm)
Thickness, mils, minimum	[redacted]	18	27	36	54	72	90
Density (g/cc), minimum	[redacted]	0.94	0.94	0.94	0.94	0.94	0.94
Melt Index (g/10 min., maximum)	[redacted]	0.4	0.4	0.4	0.4	0.4	0.4
Carbon Black content (%)	[redacted]	2-3	2-3	2-3	2-3	2-3	2-3
Carbon Black Dispersion	[redacted]	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1
Tensile Properties	[redacted]						
1. Tensile Strength at Yield (pounds/inch width)	[redacted]	50	75	100	150	200	250
2. Tensile Strength at Break (pounds/inch width)	[redacted]	85	125	165	250	330	400
3. Elongation at Yield (%)	[redacted]	13	13	13	13	13	13
4. Elongation at Break (%)	[redacted]	750	750	750	750	750	750
5. Modulus of Elasticity (1% secant; pounds/square inch)	[redacted]	90,000	90,000	90,000	90,000	90,000	90,000
Tear Strength (lbs.)	[redacted]	15	23	31	47	63	79
Puncture Resistance (lbs.)	[redacted]	100	140	180	260	340	420
	[redacted]	40	53	65	90	120	155
Hydrostatic Resistance (lbs./square inch)	[redacted]	165	245	330	495	660	800
Low Temperature Brittleness (°F)	[redacted]	<-94°	<-94°	<-94°	<-94°	<-94°	<-94°
Dimensional Stability (% change max.)	[redacted]	± 1	± 1	± 1	± 1	± 1	± 1
Volatile Loss (%)	[redacted]	0.1	0.1	0.1	0.1	0.1	0.1
Resistance to Soil Burial (% change max. in orig. value)	[redacted]						
A. Tensile Strength at Yield & Break	[redacted]	10	10	10	10	10	10
B. Elongation at Yield & Break	[redacted]	10	10	10	10	10	10
Ozone Resistance	[redacted]	no cracks	no cracks	no cracks	no cracks	no cracks	no cracks
Environmental Stress Crack (hours)	[redacted]	>2000	>2000	>2000	>2000	>2000	>2000
Water Absorption (% change max in original weight)	[redacted]	0.1	0.1	0.1	0.1	0.1	0.1
Coefficient of Linear Thermal Expansion (cm/cm °c) x 10^{-4}	[redacted]	1.2	1.2	1.2	1.2	1.2	1.2
Moisture Vapor Transmission Rate (g/100 in² day)	[redacted]	0.040	0.030	0.025	0.020	0.018	0.017
Roll Dimensions							
1. Width (feet):		22.5	22.5	22.5	22.5	22.5	22.5
2. Length (feet):		1000	800	600	400	300	250
3. Area (square feet):		22,500	18,000	13,500	9000	6750	5625
4. Weight (pounds), approx.:		2250	2700	2700	2700	2700	2800

* All values, except when specified as minimum or maximum, represent average lot property values.

Trevira® Spunbond nonwoven engineering products are highly needled fabrics with excellent tensile properties, high filtration potential and outstanding permeability.

Trevira® Spunbond Type 11 products are 100% continuous filament polyester nonwoven needlepunched engineering fabrics. They deliver a combination of advantages unmatched by any other spunbonded geotextiles. They're resistant to freeze-thaw, soil chemicals and ultraviolet light exposure.

Trevira® Spunbond nonwoven engineering fabrics offer excellent performance where the requirement is tensile reinforcement, planar flow, filtration, or separation. They are ideal for roadways, railbeds, drainage systems, lining systems, retaining walls. And much more.

TYPICAL PHYSICAL PROPERTIES OF TREVIRA® TYPE 11 PRODUCTS

Fabric Property	Unit	Test Method	011/120	011/140	011/200	011/250	011/280	011/350	011/430	011/450	011/560
Fabric Weight	oz/yd²	ASTM D-5261	3.5	4.2	6.0	7.5	8.5	10.5	12.4	13.5	16.5
Fabric Thickness, t	mils	ASTM D-5199	80	70	90	110	120	140	165	170	210
Grab Strength (MD/CD)*	lbs	ASTM D-4632	120/105	150/125	230/180	300/235	320/260	420/350	475/400	540/450	650/570
Grab Elongation (MD/CD)*	%	ASTM D-4632	75/85	75/85	75/85	75/80	75/80	75/80	75/80	80/80	85/85
Trapezoid Tear Strength (MD/CD)*	lbs	ASTM D-4533	50/40	55/50	80/75	105/86	110/100	140/125	170/145	180/185	225/200
Puncture Resistance	lbs	ASTM D-4833	55	65	95	115	125	155	170	185	225
Mullen Burst Strength	psi	ASTM D-3786	185	225	330	400	435	580	600	700	855
Water Flow Rate	gpm/ft²	ASTM D-4491	195	190	170	150	130	120	105	100	80
Permittivity, Ψ	sec⁻¹	ASTM D-4491	2.61	2.54	2.27	2.01	1.76	1.6	1.47	1.34	1.07
Permeability, k = Ψxt	cm/sec	ASTM D-4491	.40	.45	.52	.58	.53	.57	.62	.58	.57
AOS	Sieve Size mm	ASTM D-4751	70-100 .210-.149	70-100 .210-.149	70-100 .210-.149	70-100 .210-.149	70-120 .210-.125	100-120 .149-.125	100-140 .149-.106	120-140 .125-.106	140-170 .106-.088
Standard Roll Width**	ft		12.5 and 15.0								
Standard Roll Length**	ft		400	400	300	300	300	300	300	300	300

*MD = Machine Direction, CD = Cross Machine Direction.

**Other width and length rolls are available upon request.

MINIMUM† PHYSICAL PROPERTIES OF TREVIRA® TYPE 11 PRODUCTS

Fabric Property	Unit	Test Method	011/120	011/140	011/200	011/250	011/280	011/350	011/430	011/450	011/560
Fabric Weight	oz/yd²	ASTM D-5261	3.3	4.0	5.7	7.1	8.0	10.0	12.0	13.0	16.0
Fabric Thickness, t	mils	ASTM D-5199	50	55	75	95	105	125	145	150	185
Grab Strength	lbs	ASTM D-4632	90	110	160	210	230	305	350	390	500
Grab Elongation	%	ASTM D-4632	60	60	60	60	60	60	60	65	70
Trapezoid Tear Strength	lbs	ASTM D-4533	30	40	60	75	80	100	120	130	150
Puncture Resistance	lbs	ASTM D-4833	46	50	80	95	100	130	150	155	195
Mullen Burst Strength	psi	ASTM D-3786	170	190	285	380	360	510	550	640	780
Water Flow Rate	gpm/ft²	ASTM D-4491	155	150	130	110	90	80	65	60	40
Permittivity, Ψ	sec⁻¹	ASTM D-4491	2.07	2.01	1.74	1.47	1.20	1.07	0.87	0.80	0.53
Permeability, k = Ψxt	cm/sec	ASTM D-4491	.28	.28	.33	.36	.32	.34	.32	.31	.25
AOS	Sieve Size mm	ASTM D-4751	50 .300	50 .300	70 .210	70 .210	70 .210	70 .210	70 .210	100 .149	100 .148

†These minimum values represent minimum test values as determined from Quality Control (Q.C.) testing.

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9/93

P.06

APR-26-95 FRI 6:44

Manufacturer's Information on Perma-Con® Modular Containment System

3.3 All welding shall be performed by welders qualified by the American Welding Society. Welder qualifications shall be submitted with any proposal or supplied material.

3.4 Assembled modular panel containments shall be designed to be sufficiently air-tight and structurally rigid to maintain and withstand a negative pressure of 0.1 inch, water column upon completion of prescribed field erection instructions.

3.5 A seismic strength analysis for the assembled, ordered containment shall be provided using the equivalent static loads prescribed by the Uniform Building Code for the zone that applies to the location where the structure is to be used. Accepted engineering practices supported by test data when appropriate shall be used for this shear strength justification.

3.6 Each stainless steel sheet on a panel shall have the edges offset toward the steel frame. This offset will cause the sheet metal edges to press into the frame when the panel is fastened to the frame. This will preclude the sheathing from exposing raised/sharp edges.

3.7 Each stainless steel sheet panel shall have a 'crossbuck' crease on four foot centers. This crossbuck creasing feature will increase the rigidity of the sheet metal and reduce the possibility of an "oil canning" effect.

3.8 Panel sections shall be secured together using 1/2"dia. x 1" or longer bolted fasteners for primary field erection of modular panels. Fasteners shall comply to ASTM A307-84.

3.9 Carbon steel components shall be factory coated so as to resist rusting and mild acid and caustic wash down. Interior panel joints and seams shall be readily sealed to prevent contamination release after building assembly.

3.10 Materials to be excluded from use in the modular containment design (exclusive of fasteners) include *galvanized materials and other hard to decontaminate materials such as wood, aluminum and polyethylene.*

Large Span Modular Panel Containment Specifications

NFS-Radiation Protection Systems

PERMA-CON TAPE Part No. BA03

Description

Perma-Con Tape is used to cover and seal the small seam that occurs between Perma-Con Panels. The tape provides a smooth air-tight finish to the interior wall and is cosmetically matched to the stainless steel. The tape adhesive is designed to provide secure adhesion yet leave no residue when removed.

Physical Characteristics

Substrate: Poly Vinyl Chloride

Adhesive: Rubber based pressure sensitive

Thickness-- Substrate: .004"--10 mm

Adhesive: .001"--.025 mm

Total: .005"--125 mm

Tensile Strength: 17 lbs., inch width--3.1 kg cm width

Elongation (at break): 140%

Adhesion (to steel): 30 oz. inch width--340 grams cm width

Adhesion (to backing): 30 oz. inch width--340 grams cm width

Moisture Absorption: 1.50%

Moisture Vapor Transmission: 3 grams 100 hrs., (650 cm^2) 24 hrs.

Flame Retardancy: Self-Extinguishing

Tear Resistance: MD.--11 oz. (300 grams) TD--28 oz. (800 grams)

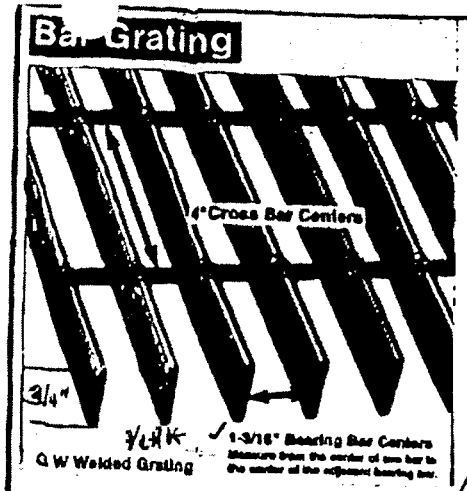
Operating Temperature: 13°F to 176°F--25°C to 80°C

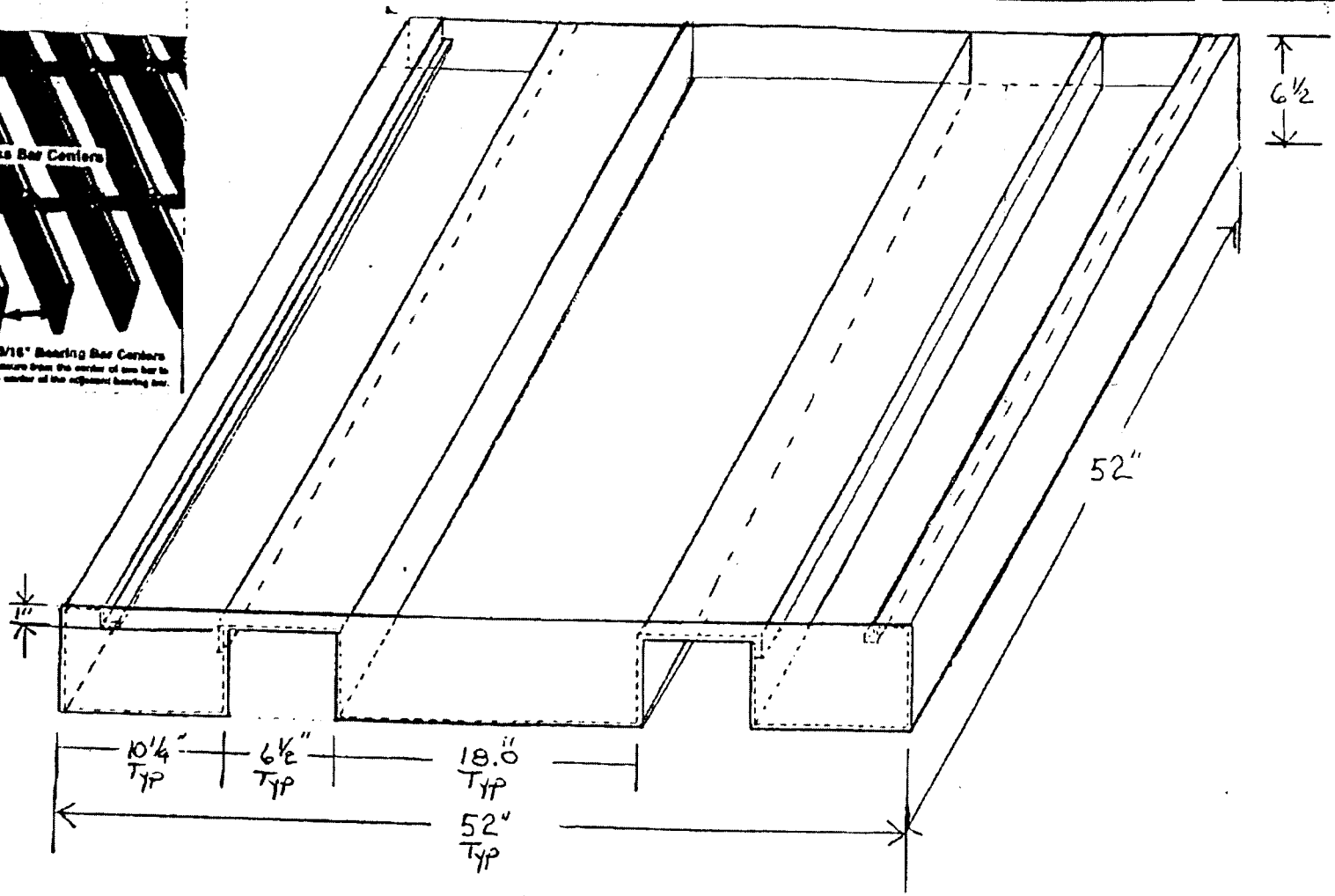
Chemical Characteristics:

Resistance To:

Sunlight--Excellent; Saltwater--Excellent; Alkalies--Excellent; Alcohols, Water Soluble--Good; Acids Organic & Inorganic--Excellent; Animals & Plant Acids--Excellent; Hydrocarbons, Aliphatic--Fair, Hydrocarbons, Aromatic--Poor; Oils--Excellent; Bacteria--Excellent; Fungus--Excellent

Manufacturer's Information on Metal Pallets and Secondary Containment Pallets





Notes:
material: 10ga HRS
Finish: urethane White or Black
Bar Grating Finish: Galvanized
Bar Grating To Be Installed on Top of Containment Pallet
Volume = 57 gallons

International Metal Pallet Co.

SCALE: N/A	APPROVED BY Len L. DIRECTOR	
DATE: May of 98		
TITLE: Containment Pallet		
REVIEWED BY Kevin L	DRAWN BY —	DRAWING NUMBER № 1290

XR-5®, Urethane, Copolymer 2000®, and Polyethylene

CHEMICAL COMPATIBILITY GUIDE*

For Ultra-Containment Berms

According to EPA guidelines, spills must be cleaned up within 24 hours and any secondary containment areas must be inspected once a week. The chart below lists chemical compatibility of XR5, Urethane, Copolymer 2000 and Polyethylene. The information has been developed from industry available data and offers compatibility based on exposure of one week or less.

The rating system is indicated as:

A. Fluid has little or no effect at Room Temperature
B. Fluid has minor to moderate effect at Room
C. Fluid has severe effect at Room Temperature

Chemical	XR-5	Urethane	Copolymer 2000	Polyethylene
Kerosene	A	A	A	A
Diesel Fuel	A	A	A	A
Ohio Crude Oil	A	A	A	A
Hydraulic Fluid- Petroleum Based	A	A	A	A
Naptha	A	A	A	A
Conc. Ammonia Hydroxide	A	C	A	A
50% Acetic Acid	C	C	C	A
50% Phosphoric Acid	A	C	A	A
50% Hydrochloric Acid	A	C	A	A
50% Nitric	C	C	C	B
50% Sulfuric Acid	A	C	A	A
60% Sodium Hydroxide	A	C	A	A
Methyl Alcohol	A	A	A	A
JP-4 Jet Fuel	A	A	A	A
Salt Water 180°F	A	B	A	A
Phtlalate Plasticizers	B	A	B	A
SAE-30 Oil	A	A	A	A
Raw Linseed Oil	A	A	A	A

The above ratings were arrived at by visual and physical examination of the membrane samples after their removal from the test chemical. When considering XR-5Ò, Urethane, Copolymer 2000®, Polyethylene for specific applications, it is important to study the requirements such as permeability, service temperature, concentration, size to be contained, etc. Samples of XR-5Ò, Urethane, Copolymer 2000®, or Polyethylene should be tested close to actual service conditions and also your distributor should be consulted.

***IMPORTANT USER NOTICE FOR**
XR-5Ò, URETHANE, COPOLYMER 2000® & POLYETHYLENE CHEMICAL COMPATIBILITY GUIDE

This listing is offered only as a guide and utilizes information which, to the best of UltraTech's knowledge, is accurate and reliable. Due to variables and conditions of application beyond the control of UltraTech, none of the data shown in this guide is to be construed as a guarantee, expressed or implied. UltraTech International, Inc. assumes no responsibility, obligation or liability in conjunction with the use or misuse of the information herein.

ENPAC CORPORATION

POLY–SPILLPALLET™ 6000

PART NO. 5001
94 GALLON CAPACITY
49.5" X 49.5" X 17" O.D.
40 CFR 264.175

PATENT PENDING

ENPAC CORPORATION
Chardon, Ohio

LIMITED WARRANTY

ENPAC Corporation warrants its products to be free from defects in material and workmanship upon delivery, provided claim is made within 90 days from shipment of product by ENPAC. ENPAC's liability is limited in that ENPAC's sole obligation shall be to repair or replace product that ENPAC determines is defective in material or workmanship. In no event shall ENPAC be liable for indirect, incidental, consequential or special damages arising out of defects in material or workmanship, or arising out of misuse of product, or arising out of delay in or failure of delivery.

* User responsible for chemical compatibility.

FROM: SARA CREEMER
SUBJECT: BRIAN WILLIAMS
PLEASE HAND DELIVER TO EXECUTIVE CONFERENCE ROOM

08-May-2002 08:12 AM

ENPAC CORPORATION Quality Technology Today

POLY-SPILLPALLET™ 6000

Designed to hold the heavy load.

Rated at 6,000 lbs. UDL weight with a 83-gallon sump capacity that meets EPA 40 CFR 264.175. Square 50" x 50" footprint saves space yet easily holds four 55- gallon drums. Includes the same rugged features as the 2000. Optional drain.

- Two removable grates hold up to 6,000 lbs. of UDL wt.
- Forkliftable from all sides

	Poly-spillpallet 6000
Product no.	5001-YE, 5001-YE-D
Dimensions	50"L x 50"W x 17"H
	127 cm x 127 cm x 43 cm
Weight	88 lbs. /40 kg
Load Bearing Capacity UDL	6000 lbs / 2700 kg
Sump	83 gal. / 315.4 liters
Regulations	EPA 40 CFR 264.175

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Polyethylene Chemical Compatibility Guide

Used in determining the compatibility of our polyethylene products with the chemicals you work with.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

KEY

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L Products should be suitable for prolonged or repeated contact with these substances, under the conditions specified.

S These substances may adversely affect the polyethylene.ENPAC products may be suitable for intermittent contact, however, some deterioration in properties may occur. The use should perform qualification tests before or during usage of the container.

N These substances aggressively attack polyethylene or have vapor pressures incompatible with closed containers. Do not use polyethylene containers in these applications.

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Acetaldehyde (40%)	L	Acetaldehyde (40%)	L	Acetamide	L
Acetic Acid (50%)	L	Acetic Acid Anhydride	S	Acetic Ether	S
Acetone	L	Acetylene Tetrabromide	S	Acrylic Emulsions	S
Acrylonitrile	L	Adipic Acid	L	Aliphatic Hydrocarbons (Hexane, Octane, Hexene, Octane, Etc.)	L
Allyl Alcohol (96%)	L	Alum (Aqueous Solutions)	L	Aluminum Chloride (20%)	L
Aluminum Fluoride	L	Aluminum Hydrogen Solution (10%)	L	Aluminum Hydroxide	L
Alums (All Types)	L	Ammonia (Anhydrous)	L	Ammonia (Aqueous)	L
Ammonia (100% Dry Gas)	L	Ammonium Salts	L	Ammonium Acetate	L
Ammonium Bifloride	L	Ammonium Carbonate 50%	L	Ammonium Chloride	L

Ammonium Hydrogen Fluoride (50%)	L	Ammonium Hydroxide	L	Ammonium Metaphosphate Sat'd	L
Ammonium Nitrate (10%)	L	Ammonium Nitrate Sat'd	L	Ammonium Persulfate Sat'd	L
Ammonium Phosphate	L	Ammonium Sulfate (10%)	L	Ammonium Sulfate Sat'd	L
Ammonium sulfide Sat'd	L	Ammonium Thiocyanate Sat'd	L	Amyl Acetate	L
Amyl Alcohol (100%)	L	Amyl Chloride	N	Aniline (100%)	S
Aniline Hydrochloride	S	Animal Fats	L	Anti-Freeze	L
Antimony Salts	L	Antimony Trichloride 90%	L	Aqua Regia	N
Aqueous Salt Solutions (NaCl)	L	Aqueous Alkalies (NaOH)	L	Arsenic Acid	L
Arsenic Salts	L				

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Barium Salts	L	Barium Carbonate	L	Barium Chloride	L
Barium Cyanide	L	Barium Hydroxide	L	Barium Nitrate	L
Barium Sulfate	L	Barium Sulfide	L	Battery Fluid Acid	S
Beef Tallow Emulsion, Sulfonated	L	Beer	L	Benzaldehyde,	L
Benzene	L	Benzene Sulfonic Acid	S	Benzoic Acid	L
Benzyl Alcohol	L	Benzyl Chloroformate	L	Bismuth Salts	L
Bleach Lye (10%)	S	Black Liquor	L	Borax Cold Sat'd	L
Boric Acid Dilute	L	Boric Acid Conc.	L	Bromine, Liquid	N
Bromine, Water	N	Bromobenzene	N	Bromoform	N
Butadiene	L	Butane	L	Butanediol (100%)	L
Butanol	L	Butyl Acetate	L	Butyl Alcohol (100%)	L
Butylene	N	Butylene Glycol	L	Butylene, Liquid	N
Butyl Phenol	N	Butyric Acid	L		

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Calcium Carbonate	L	Calcium Chloride	L	Calcium Hydroxide	L
Calcium Hypochlorite	L	Calcium Nitrate (50%)	L	Calcium Sulfate	L
Camphor Oil	N	Carbon Disulfide	N	Carbonic Acid (Aq CO2)	L
Carbon Monoxide	L	Carbon Tetrachloride	N	Castor Oil Conc.	L
Caustic (Aqueous)	L	Caustic Potash Sol. (50%)	L	Caustic Soda Sol. (10%).	L
Chloral Hydrate	L	Chloroethanol	L	Chloric Acid (10%)	L

Chloroacetic Acid	L	Chlorobenzene	L	Chloroform	N
Chloromethane	N	Chlorosulfonic Acid 100%	N	Chrome Alum Sat'd	L
Chromic Acid (50%)	S	Cider	L	Citric Acid (All Conc.)	L
Clorox Bleach	L	Coconut Oil Alcohols	L	Cola Concentrates	L
Compressed Air Conditioning Oil	L	Copper Salts	L	Copper Cyanide	L
Copper Nitrate (50%)	L	Copper Sulfate	L	Camphor Oil	N
Cottonseed Oil	L	Cresol (90%)	L	Cresylic Acid	L
Crotonic Aldehyde	L	Cuprous Chloride Sat'd	L	Cyclohexane	L
Cyclohexanol	L	Cyclohexanone	S		

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Detergents, General	L	Developer, Photographic	L	Dextrin Sat'd	L
Dextrose Sat'd	L	Dibutyl Ether	N	Dibutylphthalate	S
Dibutyl Sebacate	S	Dichloroacetic Acid	S	Dichloroacetic Acid, Methyl Ester	S
Dichlorobenzene, Liquid	N	Dichloroethylene	N	Diesel Fuel	S
Diesel Oil	S	Diethyl Carbonate	L	Disodium Phosphate	L
Diazo Salts	L	Diethylene Glycol	L	Dithanolamine	S
Diglycolic Acid (30%)	L	Di-Isobutyl Ketone	S	Dimethylamine	S
Dimethyl Formamide	S	Dinonyl Phthalate	N	Dioctyl Phthalate	N
Dioxane	L	Diphenyl Oxide	N		

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Electrolyte	L	Emulsions, Photographic	L	Ethanol	L
Ether	N	Ethyl Acetate (100%)	S	Ethyl Alcohol	L
Ethyl Butyrate	S	Ethyl Chloride	N	Ethyl Ether	N
Ethylene Chloride	N	Ethylene Chlorohydrin	L	Ethylene Diamine	L
Ethylene Dichloride	N	Ethylene Glycol	L	Ethylene Oxide	N

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Fatty Acids	L	Fatty Alcohol Sulfonate	L	Ferric Salts	L
Ferric Sulfate	L	Ferrous Salts	L	Ferrous Sulfate	L
Fertilizer Salts	L	Fish Solubles	L	Fluoboric Acid	L

Fluosilicic Acid (All Conc.)	L	Formaldehyde (40%)	L	Formamide	L
Formic Acid (All Conc.)	L	Fruit Pulp	L	Fuel Oil	L
Furfural (100%)	L	Furfuryl Alcohol	N		

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Gallic Acid Sat'd	L	Gasoline	L	Gasohol	L
Gelatine	L	Gin	L	Gluconic Acid (All Conc.)	L
Glucose	L	Glycerine	L	Glycol	L
Glycol Ethers	L	Glycolic Acid (All Conc.)	L	Grape Sugar Sat'd Aq	L

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Heptane	L	Hexane	L	Hexanol Tert	L
Hydrazine Hydrate	L	Hydrosulfite (10%)	L	Hydroxylamine Sulfate	L
Hydrozine (35%)	L	Hydrazine Hydrochloride	L	Hydroiodic Acid (All Conc.)	L
Hydrobromic Acid (50%)	L	Hydrocyanic Acid Sat'd	L	Hydrochloric Acid (All Conc.)	L
Hydrofluoric Acid (All Conc.)	L	Hydrofluorisilicic Acid (All Conc.).	L	Hydrogen Bromide (10%)	L
Hydrogen Peroxide (90%)	L	Hydrogen Phosphide 100%	L	Hydroquinone	L
Hydrogen Sulfide	L	Hypochlorous Acid	L		

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Inks	L	Iodine (Alc. Sol.) Conc.	L	Iron Salts	L
Iso-Octane	S	Isopropyl Acetate	L	Isopropyl Alcohol	L
Isopropyl Ether	N				

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Jetfuel	S

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Kerosene	S

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Lactic Acid (All Conc.)	L	Lanolin	L	Latex	L
Lead Salts	L	Lead Acetate Sat'd	L	Lime	L
Linseed Oil	L	Lithium Salts	L	Lube Oil	L

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Magnesium Salts	L	Magnesium Carbonate	L	Magnesium Hydroxide	L
Magnesium Nitrate	L	Magnesium Oxide	L	Magnesium Sulfate	L
Maleic Acid	L	Malic Acid (1%)	L	Mercuric Salts	L
Mercurous Salts	L	Mercury	L	Methanol	L
Methyl Acetate	L	Methyl Alcohol (100%)	L	Methyl Amine (32%)	L
Methyl Bromide	N	Methyl Chloride	N	Methylene Chloride	N
Methyl Ethyl Ketone	S	Methyl Isobutyl Ketone	S	Methyl Isopropyl Ketone	S
Methyl Sulfate	L	Methyl Sulfuric Acid (All Conc.)	L	Milk	L
Mineral Oils	L	Molasses	L	Monochloroacetic Acid Ethyl Ester	L
Monochloroacetic Acid Methyl Ester	L	Morphalin	L	Mowilith D	L

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Naptha	S	Napthalene	S	Nickel Salts	L
Nicotine, Dilute	L	Nicotinic Acid	L	Nitric Acid <50%	L
Nitrobenzene	S	Nitrotoluene	S		

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Octyl Cresol	L	Oils and Fats	L	Oleic Acid (All Conc.)	L
Oleum Conc	N	Olive Oil	L	Orange Extract	L
Oxalic Acid (All Conc.)	L				

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Sodium Nitrate	L	Sodium Oxalate	L	Sodium Persulfate	L
Sodium Phosphate	L	Sodium Silicate	L	Sodium Sulfide	L
Sodium Sulfide	L	Sodium Sulfite	L	Sodium Sulfonates	L
Sodium Thiosulfate	L	Spindle Oil	L	Stannic Salts	L
Stannous Salts	L	Starch Solution Sat'd	L	Stearic Acid (All Conc.)	L
Succinic Acid	L	Sugar Solutions, Glucose, Lactose, Sucrose, Etc.	L	Sulfur	L
Sulfuric Acid (98%)	S	Sulfuric Acid, Fuming	N	Sulfurous Acid	L
Sulfuryl Chloride	N				

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Tallow	L	Tannic Acid	L	Tanning Extracts	L
Tartaric Acid Sat'd	L	Tetrachloroethane	L	Tetrachloroethylene	N
Tetraethyl Lead	L	Tetrahydrofuran	N	Tetrahydronapthalene	N
Thionyl Chloride	N	Tin Salts	L	Titanium Salts	S
Toluene	S	Toluene Sulfonic Acid (All Conc.)	S	Transformer Oil	L
Tributylphosphate	L	Trichloroacetic Acid	S	Trichloroethane	N
Trichloroethylene,	N	Tricresyl Phosphate	L	Triethanolamine	L
Trioctyl Phosphate	N	Trisodium Phosphate Sat'd	L	Trichloroethylene	N
Turpentine Oil	N				

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Urea	L	Urine	L

V

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Vegetable Oil	L	Vinegar	L	Vanilla Extract	L

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Wax Alcohol	N	Wetting Agents	L	Whisky	L
White Acid (75%)	L	Wine	L		

X

Xylene	N			

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Y

Yeast	L			

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Z

Zinc Salts	L	Zinc Sulfate	L	

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ATTACHMENT H

CLOSURE/POST-CLOSURE PLAN
FOR THE TECHNICAL AREA 54
AREA L LANDFILL
(SHAFTS 1, 13-17, AND 19-34 AND IMPOUNDMENTS B AND D)

Closure/Post-Closure Plan for the Technical Area 54 Area L Landfill

(Shafts 1, 13-17, and 19-34 and Impoundments B and D)

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ATTACHMENT	TITLE
A	MDA L: Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities
B	Geology, Hydrology, and Groundwater Characterization at Technical Area 54, Area L
C	Nature and Extent of Releases and Present-Day Risk Assessment for Technical Area 54, Material Disposal Area L

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
40 CFR	Code of Federal Regulations, Title 40
CMS	RCRA Corrective Measures Study
COC	contaminant(s) of concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ft	feet (foot)
FY	Fiscal Year
LANL	Los Alamos National Laboratory
MDA	material disposal area
NMED	New Mexico Environment Department
NMEID	New Mexico Environmental Improvement Division
OLASO	Office of Los Alamos Site Operations
R	regional aquifer
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	solid waste management unit
SWRC	Solid Waste and Regulatory Compliance Group
TA	technical area
TCA	1,1,1-trichloroethane
VOC	volatile organic compound

CLOSURE/POST-CLOSURE PLAN FOR THE TECHNICAL AREA 54 AREA L LANDFILL (SHAFTS 1, 13-17, AND 19-34 AND IMPOUNDMENTS B AND D)

This closure/post-closure plan describes the activities necessary to achieve closure and post-closure of the Area L landfill at Los Alamos National Laboratory (LANL) Technical Area (TA) 54. The Area L landfill is an "active" unit comprised of Shafts 1, 13-17, and 19-34 and Impoundments B and D because they received hazardous waste after November 19, 1980. Hereinafter, the phrase "Area L landfill" is used to denote the active unit. The Area L landfill is also a "regulated unit," as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 264.90(a)(2), revised June 14, 2000 [6-14-00]. The information provided in this plan is submitted to address the applicable closure and post-closure requirements specified in 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts F and G; and 20.4.1 NMAC § 264.310 [6-14-00].

The Area L landfill is located within the TA-54 Area L treatment and storage facility, which will continue to operate. The Area L landfill will be closed in place without removing the waste and is co-located with land disposal units that comprise solid waste management unit (SWMU) No. 54-006 managed under the LANL corrective action program. The closure and post-closure activities for the Area L landfill will be addressed through alternative requirements, as allowed by 20.4.1 NMAC § 264.110(c), to meet closure and post-closure care requirements. Alternative requirements are discussed further in Sections 1.3 and 3.2. Closure of the landfill will ensure that the existing asphalt cover and wastes and/or waste residues that remain in place are stabilized, as described in Section 2.0 of this plan. The cover will minimize the need for further maintenance and be protective of human health. Post-closure care will include monitoring, maintenance, and reporting, as described in Section 4.0 of this plan. These activities will occur in conjunction with and subject to the investigation and potential remediation efforts of the LANL corrective action program, as allowed by the alternative requirements process. Therefore, the final remedy for the Area L landfill will be part of the corrective measure for Area L as a whole when operations cease and will be implemented in accordance with the Corrective Action Chapter of this permit. An aid in demonstrating the proposed corrective action activities that will meet the applicable post-closure requirements for the regulated unit at Material Disposal Area (MDA) L is presented in Attachment A (MDA L: Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities) of this plan.

A "Closure and Post-Closure Plan for TA-54 Area H and Area L Landfill at Los Alamos National Laboratory" was submitted to the New Mexico Environmental Improvement Division (NMEID, precursor to the New Mexico Environment Department [NMED]) in November 1986 (LANL, 1986). A "Closure Plan for Technical Area 54, Material Disposal Area L" was submitted in March 1998 (LANL, 1998a). This closure/post-closure plan is a revision to the previous plans.

This plan for the Area L landfill is organized as follows:

- General closure information (Section 1.0).
- Specific closure information (Section 2.0).
- General post-closure information (Section 3.0)
- Specific post-closure information (Section 4.0)

Until closure is complete and has been certified in accordance with 20.4.1 NMAC § 264.115 [6-14-00], as discussed in Section 1.7, a copy of the approved closure/post-closure plan and any approved revisions will be on file at LANL's Solid Waste and Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy (DOE) Office of Los Alamos Site Operations (OLASO). Until final closure of the entire LANL facility, a copy of the approved plan will be furnished to the Secretary of the NMED, upon request, in accordance with 20.4.1 NMAC § 264.118(c) [6-14-00].

1.0 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H; and 20.4.1 NMAC § 264.310 [6-14-00], as applicable.

1.1 Partial and Final Closure Activities [20.4.1 NMAC § 264.112(d)]

Partial Resource Conservation and Recovery Act (RCRA) closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. This partial closure will consist of closing the Area L landfill, while leaving the other units at LANL in operation. Partial closure (hereinafter referred to as closure) will be deemed complete when closure in place has been verified, alternative requirements to meet post-closure care requirements have been implemented, the closure certification has been submitted to the NMED, and the NMED has approved the closure.

As described in the proposed General Closure Plan submitted to the NMED in November 2001, final RCRA closure of the entire LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each unit, including all previous partial clean closures as well as land-based units that have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED and the NMED has approved the final closure.

1.2 Closure Performance Standard [20.4.1 NMAC § 264.111]

The Area L landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D) will be closed to meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G and 20.4.1 NMAC § 264.310 [6-14-00].

To meet the above closure performance standards and the closure requirements in 20.4.1 NMAC § 264.310(a), the existing covers on the specified shafts and impoundments that comprise the Area L landfill have been designed and constructed to:

- Minimize migration of liquids through the closed unit
- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the cover
- Accommodate settling and subsidence so that the cover's integrity is maintained, and
- Have a permeability that is less than or equal to the permeability of the natural subsoils present.

1.3 Closure Activities and Alternative Requirements

Closure activities for the Area L landfill will be addressed under alternative requirements, pursuant to 20.4.1 NMAC § 264.118(b)(4). This allowable option is defined in 20.4.1 NMAC § 264.110(c) when a regulated unit is located among other SWMUs, releases potentially originating from both the regulated unit and the SWMU(s) have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. At

Area L, the impoundments and shafts identified as the regulated unit are in close proximity to (i.e., co-located with) similar disposal units (included in SWMU No. 54-006) to be addressed under the LANL corrective action program. A subsurface volatile organic compound (VOC) vapor-phase plume was detected in the vadose zone and has been monitored at MDA L since the mid-1980s. U. S. Environmental Protection Agency (EPA) guidance for the rule (EPA, 1998) discusses the transfer of the closure and post-closure process to the facility corrective action process (contained in the Corrective Action Chapter of this permit) as an appropriate mechanism to address this situation.

Closure of the Area L landfill will ensure that the existing cover and wastes and/or waste residues that remain in place are stabilized, as described in Section 2.0. The cover will minimize the need for further maintenance and be protective of human health.

1.4 Closure Schedule [20.4.1 NMAC § 264.112(b)(6)]

Written closure plans are required for owners and operators of a hazardous waste management facility, pursuant to 20.4.1 NMAC § 264.112(a)(1). In addition, the plan must be submitted with the permit application and approved by the Secretary of the NMED as part of the permit issuance procedures under the Code of Federal Regulations, Title 40 (40 CFR), Part 124.

In accordance with 20.4.1 NMAC § 264.112(d)(1), written notification must be provided to the Secretary of the NMED at least 60 days prior to the date on which final closure of the landfill is expected to begin. Closure will be conducted in accordance with the schedule presented in Table 1. In the event that the closure of the Area L landfill is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC § 264.113(b) [6-14-00].

1.5 Amendment of the Closure Plan [20.4.1 NMAC § 264.112(c)]

In accordance with 20.4.1 NMAC § 264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan
- There is a change in the expected year of closure
- Unexpected events occur during closure that require modification of the approved closure plan
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC §§ 264.90(f) and/or 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

1.6 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00] to provide a cost estimate, financial assurance mechanism, and liability insurance for closure actions.

1.7 Closure Certification [20.4.1 NMAC § 264.115]

Within 60 days after completion of closure activities for the Area L landfill, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC § 264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both the DOE/OLASO and the SWRC Group.

1.8 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the Area L landfill will be maintained by the DOE or another authorized federal agency for as long as necessary to prohibit public access. The security fence at TA-54 will be maintained to ensure that public access into Area L is prevented.

1.9 Closure Report

Upon completion of the closure activities at the Area L landfill, a closure report will be prepared and, upon request, provided to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section 1.7 of this plan
- A general summary of closure activities
- Any significant variance from the approved activities and the reason for the variance
- A summary of any sampling data associated with closure
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data)
- Storage or disposal location of hazardous/mixed waste resulting from closure activities
- A certification of accuracy of the report.

1.10 Survey Plat [20.4.1 NMAC § 264.116]

LANL intends to meet closure/post-closure requirements by implementing alternative requirements allowable under 20.4.1 NMAC § 264.110(c): leaving waste in place; ensuring waste/waste residues are stabilized; and performing the activities described in Sections 3.0 and 4.0. A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. A survey plat indicating the location and dimensions of Shafts 1, 13-17, and 19-34 and Impoundments B and D at MDA L with respect to permanently surveyed benchmarks will be submitted to the local zoning authority (i.e., Los Alamos County) and to the NMED at the time of submission of the certification of closure. The plat will be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority will contain a prominently displayed note, which states the obligation of LANL and DOE to restrict disturbance of the unit in accordance with the applicable regulations in 20.4.1 NMAC, Subpart V, Part 264, Subpart G.

2.0 SPECIFIC CLOSURE INFORMATION

This section provides a general description of TA-54, Area L, and MDA L. It also presents a more detailed description of the Area L regulated unit, as defined in 20.4.1 NMAC § 264.90(a)(2), and includes a discussion of the wastes in and the maximum capacities of the specified shafts and impoundments. In addition, specific closure information for the shafts and impoundments is

presented herein. LANL does not currently intend to reduce the areal extent nor the design capacities of the treatment and storage units at Area L during the active life of those units. The most recent estimated annual quantities for the waste treatment and storage units at Area L are provided in the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0/0.1/1.0/2.0 (LANL, 2001). A description of the geology, hydrology, and groundwater characterization at TA-54, Area L, is presented in Attachment B of this plan. Attachment C of this plan presents information on the nature and extent of releases at MDA L, as well as a brief assessment of present-day risk.

2.1 TA-54 Description

TA-54 is located on top of Mesita del Buey, an east-west trending mesa that is bordered on the north by Cañada del Buey and on the south by Pajarito Canyon. The elevation at TA-54 is approximately 6,800 feet (ft). TA-54 is used primarily for waste management. It includes four MDAs (one each at Areas G, H, J, and L) (Figure 1), hazardous/mixed waste storage and treatment areas, and numerous supporting offices. The Radioassay and Nondestructive Testing Facility is located in the western part of TA-54 (TA-54 West).

2.2 Area L and MDA L Description

Area L is a 2.58-acre site in the north-central portion of TA-54 (Figure 2). The irregularly-shaped area, located on the north side of Mesita del Buey Road, is surrounded by an 8-ft-high chain-link security fence with barbed wire or razor wire at the top. The fence is inspected weekly and repairs made, if necessary. Area L is kept locked at all times, with entrance to the area restricted to authorized and/or escorted personnel. Historically, MDA L was used for disposal of chemical wastes in 34 shafts, 3 impoundments, and 1 pit. MDA L is designated as SWMU No. 54-006. Disposal no longer occurs at MDA L. The surface of Area L is presently used for hazardous waste storage and treatment, and for mixed waste storage.

Near Area L, Cañada del Buey is roughly 100 ft below the north mesa rim, and Pajarito Canyon is approximately 140 ft below the south mesa rim. Runoff at Area L is primarily from sheet flow, which is channeled northward into a drainage that is a tributary of Cañada del Buey. Erosion controls at Area L divert water away from MDA L; these include an asphalt cover, asphalt curbing, and asphalt drainage channels.

The following are descriptions of the subsurface shafts, impoundments, and pit at MDA L. The descriptions were taken from the "RFI Work Plan for Operable Unit 1148" (LANL, 1992a) and the "Closure Report: Technical Area 54 Waste Oil Storage Tanks" (LANL, 1992b).

Between 1975 and 1985, 34 chemical waste disposal shafts at Area L were dry-drilled with an auger into the Bandelier Tuff. The shafts, located at the east and west ends of Area L, have all been capped with concrete and are no longer in use. Backfill was added around some of the shafts, where necessary, and the surface covered with asphalt. Only Shafts 1, 13-17, and 19-34 (Figure 2) received hazardous waste after November 19, 1980, making them subject to regulation under RCRA as active disposal shafts. Therefore, these shafts are subject to RCRA closure standards and are addressed in this plan.

Three unlined impoundments once used for waste treatment and disposal are located at MDA L. These impoundments are located in the north-central region of Area L and are designated from east to west as Impoundments B, C, and D (Figure 2). Only Impoundments B and D received hazardous waste after November 19, 1980. Hence, they are subject to RCRA closure standards and are addressed in this plan. Upon concurrence in 1988 with the NMEID, the impoundments were backfilled and the ground surface was covered with asphalt. Until RCRA closure is complete, these impoundments are considered active. Impoundment C became inactive prior to November 19, 1980, and is therefore subject to the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility Permit, but not closure standards. Impoundment C is currently included in an investigation of Area L by LANL's Environmental Restoration (ER) Project. A container storage dome (TA-54-215) was placed over a portion of the asphalt pad above the impoundments in 1995.

In previous documents, Impoundment C was described as a unit that received hazardous waste after November 19, 1980. Upon further investigation of LANL records, this has been determined to be incorrect. Logbooks of waste management activities indicate that Impoundment C was closed in July 1978. The impoundment is included in SWMU No. 54-006 and is subject to corrective action. Therefore, it is not addressed in this plan.

Pit A is located in the eastern portion of Area L. This unlined disposal pit was used from 1964 to 1978. Pit A became inactive prior to November 19, 1980, and is therefore subject to the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility permit, but not closure standards. It is currently included in an investigation of Area L by LANL's ER Project.

2.2.1 Shafts 1, 13-17, and 19-34

Shafts 1, 13-17, and 19-28 are located at the eastern end of Area L; Shafts 29-34 are located at the northwest end (Figure 2). The dates of use, dimensions, capacities, and waste contents of these shafts are presented in Table 2. Three feet of crushed tuff was placed in the bottom of each shaft to fill cracks and joints in the tuff. When in use, the shafts were covered with a heavy steel cap to prevent inflow of precipitation. The steel cap could be opened or removed, depending on the design, to allow emplacement of waste.

Prior to 1982, liquids were disposed of in drums or other containers without adding sorbents; containers were sometimes dropped into a shaft (LANL, 1992a). Noncontainerized waste was also disposed of in these shafts. After 1981, no noncontainerized wastes were disposed of in the shafts. From November 1982 until February 1985, wastes were accumulated on site and packaged in drums until sufficient quantities had amassed to facilitate subsequent emplacement. The drums were lowered by crane into a shaft through doors in the steel cap and arranged in layers. Layers in 3-ft and 4-ft diameter shafts contain 1 drum, layers in 6-ft diameter shafts contain 4 to 5 drums, and layers in 8-ft diameter shafts contain 6 drums. The space around the drums was filled with crushed tuff, and a 6-inch layer of crushed tuff was placed between each layer of drums. The crushed tuff provides structural support to help prevent failure of drums in the bottom of the shafts (LANL, 1992a). When the use period for these disposal shafts ended, they were backfilled with crushed tuff and approximately the uppermost 3 ft of each shaft was plugged with concrete, which was rounded at the surface to form a dome (LANL, 1986).

2.2.2 Impoundments B and D

Impoundment B was excavated in 1978. It is approximately 60 ft long, 18 ft wide, and 10 ft deep. Impoundment B was used from January 1979 through June 1985. This 7,560-cubic-ft capacity impoundment was used to evaporate batch-treated salt solutions (e.g., ammonium bifluoride) and electroplating wastes (e.g., chromium wastes). The impoundment capacity was calculated assuming it was to be filled to within 3 ft of the surface. The treated aqueous waste was discharged into the impoundment, where it pooled and was left to evaporate. Impoundment B was backfilled with clean fill and later covered with asphalt.

Impoundment D was used to treat small batch quantities of lithium hydride by reacting it with water. The neutralized liquid from this treatment was then allowed to evaporate. This practice, which began in 1972, was discontinued in 1984 for safety reasons. The approximately 75-ft-long, 18-ft-wide, 10-ft-deep impoundment was not used for disposal of any other hazardous wastes. Air

photos indicate that Impoundment D was backfilled with clean fill and covered with asphalt in the late 1980s (LANL, 1992a).

After treatment of lithium hydride was discontinued, a rectangular 5,650-gallon steel waste-oil storage tank was placed in the 9,450-cubic-ft capacity impoundment (LANL, 1992a). The impoundment capacity was calculated assuming it was to be filled to within 3 ft of the surface. A 5,086-gallon waste-oil tanker truck was parked at the surface adjacent to and just west of Impoundment D, and four 771-gallon fiberglass waste-oil storage tanks were stored at the surface adjacent to and just east of the impoundment. When the six waste-oil storage tanks were closed, it was decided that closure would not include removal of any associated contaminated soil; rather, the soil would be addressed during closure and corrective actions at Area L. Prior to backfilling the area with clean fill, a plastic liner was placed on the ground and in the open impoundment (LANL, 1992b). Closure of the tanks was completed by removal in 1990, and a closure report was submitted to the NMED in 1992 (LANL, 1992b).

2.3 Closure Procedures

The Area L landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D) is capped by the existing asphalt cover and the vadose zone is monitored. The wastes and/or waste residues in these specified shafts and impoundments will be closed in place as a landfill. No wastes will be removed at the end of active operations.

2.3.1 Shafts 1, 13-17, and 19-34 Closure Procedures

Historically, when a shaft was filled or when it was determined that a shaft would no longer be used for disposal, it was backfilled with crushed tuff. Concrete was used to plug approximately the uppermost 3 ft of each shaft. The surface of this plug was capped with a concrete dome, which extends approximately 1 ft beyond the shaft circumference. The height of each concrete cap above the surface ranged from 8 to 12 inches. Brass markers were placed in the centers of the domed concrete caps to identify individual shafts. The backfill in the shafts helps to stabilize the wastes in the shafts and accommodate settling and subsidence so that the cap's integrity is maintained, and the existing asphalt (described below) helps to minimize infiltration of precipitation to the closed shafts. The existing asphalt cover over the Area L landfill will be inspected and repaired (as necessary), as described in Section 4.2.1.

At the east end of Area L and near the south fence, between 4 and 8 inches of soil was used to backfill the area around the shafts to bring the surface level to near the top of the shafts. This

resulted in a benched area, over which a nominal 4-inch-thick layer of asphalt was then laid down. Asphalt also covers the sloped area between the benches, as well as the surrounding areas. The asphalt at the eastern end of Area L slopes to the northeast, providing a gradient for surface water runoff to the area's single discharge point through a flume that discharges into a tributary of Cañada del Buey. At the western end of Area L and along the north fence, up to 1.5 ft of soil was used to backfill the area and provide a gently sloping surface. A nominal 4-inch-thick layer of asphalt was then laid down over the backfill and the surrounding areas. Asphalt also covers the sloped areas at the edge of the backfill. The asphalt at the western end of Area L slopes gently to the north, and an asphalt swale surrounding the north side of the backfilled area channels precipitation toward the area's discharge point. The gently sloping asphalt, which also covers the surrounding areas, will help to minimize infiltration of precipitation, as well as function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and have a permeability less than that of the natural subsoils present, in accordance with 20.4.1 NMAC § 264.310(a). In addition, the asphalt provides run-on and runoff control, pursuant to 20.4.1 NMAC § 264.112(b)(5).

2.3.2 Impoundments B and D Closure Procedures

When it was determined that an impoundment would no longer be used for treatment or disposal, it was backfilled with clean fill and later covered with asphalt. Prior to placement of Storage Dome 215, this asphalt layer was broken up and left in place as a base coarse, upon which approximately four ft of clean fill was placed and compacted in lifts and graded. The new clean fill was then covered with an approximate 3-inch-thick asphalt pad. The original backfill helps to stabilize the waste residues in the impoundments, and the subsequent backfill helps to accommodate settling and subsidence so that the asphalt cover's integrity is maintained. The existing asphalt (further described below) helps to minimize infiltration of precipitation to the closed impoundments. The existing asphalt cover over the Area L landfill will be inspected and repaired (as necessary), as described in Section 4.2.1.

The asphalt cover slopes gently to the northeast and channels surface runoff to the area's discharge point. The gently sloping asphalt, which also covers the surrounding areas, will also help to minimize infiltration of precipitation, as well as function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and have a permeability less than that of the natural subsoils present, in accordance with 20.4.1 NMAC § 264.310(a). In addition, the asphalt provides run-on and runoff control, pursuant to 20.4.1 NMAC § 264.112(b)(5).

3.0 GENERAL POST-CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H; and 20.4.1 NMAC § 264.310 [6-14-00], as applicable.

3.1 Closure Performance Standard

Post-closure of the Area L landfill (Shafts 1, 13-17, and 19-34 and Impoundments B and D) will meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and N [6-14-00].

After closure, the measures by which LANL will meet the applicable 20.4.1 NMAC § 264.310(b) requirements (or equivalents thereof) are presented in Sections 4.1 and 4.2 of this plan. Post-closure of the landfill will be accomplished under alternative closure requirements, as allowed by 20.4.1 NMAC § 264.110(c) and as discussed in Section 3.2 below, to meet post-closure care requirements.

3.2 Post-Closure Care and Alternative Requirements

In accordance with 20.4.1 NMAC §264.117(a)(1), post-closure care for the Area L landfill will begin after completion of closure of the unit and will continue for 30 years. Post-closure care of the regulated unit under alternative requirements will begin after closure is complete, as described in Section 2.3 of this plan, and closure is certified by LANL and approved by the NMED. The Secretary of the NMED may shorten the post-closure care period at any time preceding partial closure or during the post-closure period if all disposal units at the facility are closed and it is determined that the reduced period is sufficient to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(i). Alternatively, the Secretary of the NMED may extend the post-closure care period if it is determined that the extended period is necessary to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(ii).

Post-closure activities for the Area L landfill will be addressed under alternative requirements, as allowed by 20.4.1 NMAC § 264.118(b)(4). This allowable option is defined in 20.4.1 NMAC §

264.110(c) when a regulated unit is located among SWMUs, releases potentially originating from both the regulated unit and the SWMU(s) have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. At the Area L landfill, the impoundments and shafts identified as the regulated unit are in close proximity to (i.e., co-located with) similar disposal units (SWMU No. 54-006) to be addressed under the LANL corrective action program. A subsurface VOC vapor-phase plume was detected in the vadose zone and has been monitored at MDA L since the mid-1980s. EPA guidance for the rule (EPA, 1998) discusses the transfer of the post-closure process to the facility corrective action process (contained in the Corrective Action Chapter of this permit) as an appropriate mechanism to address this situation. Therefore, some post-closure procedures for the Area L regulated unit will be established as part of the corrective measures to be identified for the ongoing corrective action program at TA-54.

As required by 20.4.1 NMAC § 264.117(a)(1)(i and ii), post-closure care of the Area L landfill will include maintenance, monitoring, and reporting as appropriate and in accordance with the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310, as described in Section 4.0. As described in Section 2.3 of this plan, the landfill is covered by the existing asphalt. The integrity and effectiveness of the cover will be maintained, including conducting inspections and making necessary repairs to correct the effects of settling, erosion, water damage, or other events.

A RCRA Facility Investigation (RFI) is currently ongoing at MDA L. NMED will determine whether a RCRA Corrective Measures Study (CMS) is required, based on the findings of the RFI. Vadose zone monitoring of the Area L landfill will be performed in accordance with the findings of the RFI regarding the current monitoring system. Groundwater monitoring will be developed for TA-54 as an aggregate under the LANL “Hydrogeologic Workplan” (LANL, 1998b) and implemented as appropriate by LANL’s Groundwater Protection Program, as described in Section 4.1.2.

If further corrective measures at the Area L landfill are deemed necessary to protect human health and the environment, they will be analyzed, selected, and implemented during the CMS process according to the requirements of the Corrective Action Chapter of LANL’s renewed Hazardous Waste Facility Permit and the most current and approved Installation Work Plan for the ER Project. The selected corrective measure will include alternative requirements for post-closure of the Area L landfill in a manner that complies with the requirements of 20.4.1 NMAC § 264.110(c)(2), and the selection and implementation must be approved by the NMED as a permit modification.

An aid in demonstrating the proposed corrective action activities that will meet the applicable post-closure requirements for the regulated unit at MDA L is presented in Attachment A of this plan.

3.3 Amendment of the Post-Closure Plan

In accordance with 20.4.1 NMAC § 264.118(d)(1) [6-14-00], LANL may submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan at any time during the active life of the facility or during the post-closure care period. In accordance with 20.4.1 NMAC § 264.118(d)(2) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:

- There are changes in operating plans or facility design that affect the approved post-closure plan
- There is a change in the expected year of final closure, if applicable
- Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan
- LANL requests the Secretary of the NMED to apply alternative requirements (e.g., if corrective action necessitates changes to the closure configuration or the post-closure care requirements) to a regulated unit under 20.4.1 NMAC § 264.90(f) and/or §264.110(c).

The written notification or request will include a copy of the amended post-closure plan for review or approval by the NMED, in accordance with 20.4.1 NMAC § 264.118(d).

LANL will submit a written request for a permit modification at least 60 days prior to the proposed change in unit design or operation, or no later than 60 days after an occurrence of an unexpected event that affects the post-closure plan. The Secretary of the NMED will approve, disapprove, or modify this plan in accordance with the procedures in 40 CFR, Part 124 and 20.4.1 NMAC, Subpart IX, Part 270. The approved post-closure plan will become a permit condition, in accordance with 20.4.1 NMAC § 270.32.

The Secretary of the NMED may request modifications to the plan under the conditions presented in the bulleted items above. LANL will submit the modified plan no later than 60 days after the Secretary's request. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in 40 CFR, Part 124 and 20.4.1 NMAC, Subpart IX, Part 270.

In accordance with 20.4.1 NMAC § 264.119(c), LANL or a subsequent owner or operator may request a modification to the approved post-closure plan to authorize the removal of hazardous wastes and hazardous waste residues or contaminated soils. If a permit modification to conduct such removal activities is granted, the owner or operator may request that the Secretary of the NMED approve the removal of the post-closure notice filed with the County of Los Alamos, other authorized agencies, or the Secretary of the NMED. Alternatively, the owner or operator may provide an additional post-closure notice indicating the removal of the hazardous waste, with approval from the Secretary of the NMED.

3.4 Post-Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00] to provide a cost estimate, financial assurance mechanisms, and liability insurance for post-closure actions.

3.5 Post-Closure Certification [20.4.1 NMAC § 264.120

Within 60 days after completion of the established post-closure care period for the Area L landfill, LANL will submit to the Secretary of the NMED, by registered mail, a certification that the post-closure care period for the unit was performed in accordance with the approved post-closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent, registered professional engineer. Documentation supporting the independent, registered professional engineer's certification will be furnished to the Secretary of the NMED upon request. A copy of the certification and supporting documentation will be maintained by DOE/OLASO. The supporting documentation may include, for example, the following:

- Any significant variance from the approved activities and the reason for the variance
- A summary of all sampling results
- A quality assurance/quality control statement on analytical data validation
- The location of the file of supporting documentation
- Storage or disposal location of hazardous/mixed waste resulting from post-closure activities.

3.6 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the Area L landfill will be under the care of the DOE or another

authorized federal agency during the post-closure care period. The security fence at TA-54 will be maintained during that period to prohibit public access into Area L.

3.7 Survey Plat and Post-Closure Requirements [20.4.1 NMAC § 264.116 and § 264.117 through § 264.120]

As stated in Section 1.10, a survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure. No later than 60 days after certification of closure of the Area L landfill, LANL will submit to the County of Los Alamos and other authorized agencies and to the Secretary of the NMED a record of the type, location, and quantity of hazardous wastes disposed of within the unit. For hazardous wastes disposed of before January 12, 1981, LANL will identify the type, location, and quantity of the hazardous wastes to the best of their knowledge and in accordance with any records that have been kept.

Post-closure care pursuant to 20.4.1 NMAC § 264.117 through § 264.120 [6-14-00] will begin after closure of a disposal unit. Post-closure notices will be filed with appropriate authorities within 60 days of certification of closure of the first disposal unit and within 60 days of certification of closure of the last disposal unit, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE will file a “Land Use Restriction Notice” or equivalent document with the County of Los Alamos and other authorized agencies. The “Land Use Restriction Notice” will indicate that the land has been used to manage hazardous wastes and that its use is restricted under 20.4.1 NMAC, Subpart V, Part 264, Subpart G regulations. It will also indicate that the survey plat and record of the type, location, and quantity of hazardous wastes disposed of have been filed with the County of Los Alamos and other authorized agencies and with the Secretary of the NMED. LANL will also submit a certification, signed by DOE and LANL, that they have recorded the notation specified in 20.4.1 NMAC § 264.119(b)(1), including a copy of the document in which the notation has been placed, to the Secretary of the NMED.

Within 60 days after completion of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00]. Certification of completion of post-closure care is described in Section 3.5.

4.0 SPECIFIC POST-CLOSURE INFORMATION

Pursuant to 20.4.1 NMAC § 264.118(b), the post-closure portion of this plan identifies the activities that will be conducted after closure of the Area L landfill and the frequency of these activities. Post-closure activities for the Area L landfill will be addressed under alternative requirements, pursuant

to 20.4.1 NMAC § 264.118(b)(4). These post-closure activities are described below in Sections 4.1 and 4.2, and include activities that are planned as well as those that may be conducted as a result of the corrective action process.

This section describes these activities, which include monitoring activities and the frequencies at which they will be performed to be consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F, as appropriate, and 20.4.1 NMAC § 264.310 during the post-closure care period, in accordance with 20.4.1 NMAC § 264.118(b)(1). The activities also include maintenance activities and the frequencies at which they will be performed, as required in 20.4.1 NMAC § 264.118(b)(2).

4.1 Monitoring and Frequency

The monitoring activities and the frequencies at which they will be performed, pursuant to 20.4.1 NMAC § 264.118(b)(1), are described to the extent known in the following sections. Monitoring of the vadose zone and groundwater will be conducted as appropriate according to currently existing schedules, pending potential modifications as determined by the RFI/CMS process and/or implementation of LANL's Groundwater Protection Program. The frequency of monitoring for each medium is also discussed.

4.1.1 Vadose Zone

Vadose zone monitoring at MDA L has been ongoing since the mid-1980s. As reported in Appendix C of the "Quarterly Technical Report July-September 2001" (ER Project, 2001), the VOC vapor-phase plume (as represented by 1,1,1-trichloroethane [TCA] screening data) has been measured to be near a steady condition since the first quarter of Fiscal Year (FY) 99. As indicated by the screening results, the 10-parts per million by volume contour remained relatively constant at depth, approximately 650 ft above the regional groundwater table. The report also indicated that the maximum TCA concentrations have been measured to remain relatively steady since FY 99.

As concluded in the "Subsurface Vapor-Phase Transport of TCA at MDA L: Model Predictions" (Stauffer et al., 2000), the observed site data and site numerical modeling results also indicate that, currently, the vapor-phase plume at MDA L is at a near steady condition, both in concentration and size. The authors also concluded that the current location of the vapor-phase plume is not expected to spread any closer to White Rock or to the deep aquifer. In addition, because there is no evidence of liquid migration and it has been determined that saturated flow through the tuff is not a viable transport mechanism, it is not anticipated that VOCs can migrate as liquids to the uppermost aquifer (Stauffer et al., 2000; IT Corporation, 1987). It is predicted that the plume size will begin to

decrease when the contaminant source is depleted (likely before the year 2060), based on estimates of a conservative TCA source. The site numerical model will provide a useful tool in the future to explore the effects of potential corrective measures (e.g., passive venting, optimized passive venting) (Stauffer et al., 2000).

The pore-gas monitoring program has been successful in defining both the nature and extent of the vapor-phase plume at MDA L, as indicated by the agreement of the numerical model with pore-gas and surface flux data. Both the current and future plume growth over the next 50 years are anticipated to be quite small, according to the simulations (e.g., by the year 2050, the simulation results for the 50 parts per million by volume TCA contour show very little lateral growth) (Stauffer et al., 2000). The modeling results indicate that pore-gas monitoring could be performed less frequently than the current quarterly regime, and less frequent monitoring is supported by the recent observations of slowly changing pore-gas concentrations. It is believed that annual monitoring would be sufficient to identify any significant changes in the plume, as demonstrated by the simulation of catastrophic drum failure that predicts that such an event would be captured in the monitoring data for several years. Overall, annual monitoring is believed to be capable of assessing the current rate of plume growth as well as detecting a large perturbation to the system (e.g., a drum failure) (Stauffer et al., 2000).

Although the actual frequency of monitoring is not precisely known at this time, the “RFI Report for Material Disposal Area L at Technical Area 54”, which will be submitted to the NMED in 2002, may recommend semi-annual pore-gas monitoring for a 2-year period, followed thereafter with annual pore-gas monitoring. Monitoring and monitoring frequency of the vadose zone will also be addressed under the remaining portions of the corrective action process (e.g., CMS, Corrective Measures Implementation).

4.1.2 Regional Aquifer Groundwater

Five regional aquifer (R) wells are planned for installation in the vicinity of TA-54. These wells include R-16, R-20, R-21, R-22, and R-23. The five wells are included in or associated with Aggregate 2, the boundaries of which were drawn to encompass the SWMUs at TA-54. Well R-22 was installed in the fall of 2000. Currently, well R-21 is planned for completion in FY 02. The remaining wells (R-16, R-20, and R-23) are also planned for completion in FY 02, contingent upon the approval of additional funding requested in April 2002.

The groundwater analytical strategy being implemented at LANL is described herein. The first step in the strategy is installation of a characterization well, followed by collection of water samples from each well screen upon well completion. For single-completion wells, there is no activity for a 3-month period after borehole sampling while the well equilibrates. For multiple-completion wells, no activity occurs for a 6-month period after borehole sampling while the well equilibrates. The second step is collection of initial characterization samples (i.e., the first sampling round) from each well screen and analysis for a full suite of analytes, provided the yield at any screened interval is a sufficient volume for a full analytical suite. Otherwise, the analyses will be prioritized according to suspected contaminants of concern (COC). For each well screen, if compounds and/or radionuclides are not detected in the first sampling round, they will be deleted from the analyte list for the second and third sampling rounds unless the compound or radionuclide is a COC. If compounds and/or radionuclides are detected in the first sampling round, the appropriate well screens will be selected for subsequent sampling based on data needs; the plans for subsequent sampling and analysis will be discussed with the NMED. The third step is conducting the second and third sampling and analysis rounds. The final step is collection of the fourth round of samples from each well screen and analysis for a full suite of analytes.

Upon completion of four sampling rounds at each well installed pursuant to the “Hydrogeologic Workplan” (LANL, 1998b), the well will be incorporated into LANL’s Groundwater Protection Program. These wells will be used to enhance the program by serving as monitoring wells and/or providing information to determine potential future locations for additional monitoring wells. The well data will be entered into the well inventory module of the Water Quality Database. This database will be available to LANL and external stakeholders. Data customers (e.g., regulators, LANL personnel, or other stakeholders) can then examine the information and, if appropriate and necessary, request samples, measurements, or other data to be collected from any well. Under the Groundwater Protection Program, all water sampling, water-level measurements, and other testing will be implemented consistent with laws, regulations, and DOE orders, and in consultation with the data customers.

Consistent with the site characterization and following a determination of the need for monitoring, the detection-type monitoring prescribed in 20.4.1 NMAC § 264.98 will be initiated. Detection is defined in 20.4.1 NMAC § 264.91(a)(1) as statistically significant evidence of contamination, as described in 20.4.1 NMAC § 264.98(f). A monitoring system and compliance period as described in Attachment A consistent with 20.4.1 NMAC §§ 264.96 and 264.97 will be utilized. In accordance with 20.4.1 NMAC § 264.98(f), LANL will determine whether there is statistically significant evidence

of contamination for any chemical parameter or hazardous constituent. An appropriate frequency for sample collection and statistical analysis will be proposed to the NMED that will be capable of determining statistically significant evidence of contamination, as required by 20.4.1 NMAC § 264.98(d). Data will be collected that are appropriate for the statistical methodology applied, sufficient in sample size, and utilizing sampling procedures and frequencies of sample collection established by the Groundwater Protection Program to ensure that potential contaminant release(s) to groundwater from the regulated unit can be detected, in accordance with 20.4.1 NMAC § 264.97. For TA-54, the point of compliance is the boundary of Aggregate 2. If a more comprehensive monitoring program is established, as described in Attachment A consistent with 20.4.1 NMAC § 264.99, and an increase in contamination is indicated, a program that takes action to address the increase will be implemented. Descriptions of each proposed activity equivalent to operating unit regulations for groundwater are presented in Attachment A.

4.2 Maintenance and Frequency

Pursuant to 20.4.1 NMAC § 264.118(b)(2), the planned maintenance activities and the frequencies at which they will be performed are discussed in the following sections. Planned maintenance will include inspections at prescribed frequencies and potential resulting maintenance activities consistent with 20.4.1 NMAC § 264.310. The planned maintenance will also ensure the function of the monitoring equipment consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310.

4.2.1 Integrity of Cap/Cover

The existing asphalt cover at the Area L regulated unit will be maintained during post-closure to preserve its integrity and effectiveness in accordance with 20.4.1 NMAC § 264.310(b)(1). Inspections of the existing cover will be conducted monthly while treatment and storage operations continue on the surface, and repairs will be made to the existing cover, if necessary, to correct the effects of settling, subsidence, erosion, or other events. After active operations cease, the asphalt cover will be inspected quarterly, unless changes are necessitated by the outcome of investigations currently being conducted under the corrective action program. Inspection results and subsequent repairs will be noted in the facility record. The final selected corrective measure will be maintained to prevent run-on and runoff from eroding or otherwise damaging the selected measure if waste remains in place, consistent with 20.4.1 NMAC § 264.310(b)(5).

4.2.2 Monitoring Equipment

As discussed in Section 4.1.1, LANL will continue to conduct vadose zone monitoring at MDA L and may modify the existing vadose zone monitoring program based on the results of groundwater transport modeling. Continued vadose zone monitoring will allow early detection of potential contaminant transport toward the regional aquifer. The continued vadose zone monitoring will be conducted in lieu of 20.4.1 NMAC § 264.310(b)(2) and (3) requirements, as allowed by the alternative requirements in 20.4.1 NMAC § 264.110(c). Prior to each sampling event, the protective surface casing of each selected borehole will be inspected to ensure that it has not been damaged. The locking mechanisms at each borehole will be checked to verify that they have not been compromised. Vapor ports will also be inspected to ensure that they are not obstructed and have not degraded or lost their plugs. In addition, vapor port depth tags will be inspected for legibility, as will the identification number on the inside of the borehole. Sampling equipment will also be inspected and tested, as necessary, prior to each sampling event. Over time, the monitoring systems that contain the sampling membranes (e.g., socks) within a borehole may require replacement. If the borehole is in an area where vehicle traffic might pose a hazard, the guard or bumper posts will be inspected to ensure their integrity is maintained. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

The groundwater monitoring system, discussed in Section 4.1.2, will also be maintained to ensure maximum operating conditions, consistent with 20.4.1 NMAC § 264.310(b)(4). Prior to each sampling event, the protective steel casing and locking mechanism(s) will be inspected to ensure that they have not been compromised. The well identification number on the inside and/or outside of the cover will also be inspected for legibility. In addition, the brass monument on the concrete protective pad, placed around the well casing to ensure long-term structural integrity of the well, will be inspected to verify that the location identification number remains clearly imprinted on the monument. If the well is in an area where vehicle traffic might pose a hazard, the guard or bumper posts will be inspected to ensure their integrity is maintained. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

Surveyed benchmarks used in accordance with 20.4.1 NMAC § 264.309 will be protected and maintained throughout the post-closure period, pursuant to 20.4.1 NMAC § 264.310(b)(6). If a benchmark is in an area where vehicle traffic might pose a hazard, guard or bumper posts will be installed to provide protection. The condition of the surveyed benchmarks will be inspected for legibility and to identify any potential maintenance needs. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

4.3 Reporting

Post-closure care will also include reporting consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310, as appropriate.

As described in Attachment A consistent with 20.4.1 NMAC § 264.98, LANL will notify the Secretary of the NMED if, under the detection monitoring program, it is determined [in accordance with 20.4.1 NMAC § 264.98(f)] that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents at any of the Aggregate 2 monitoring wells. This notification will be provided in writing within seven days of the determination. The notification will indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination.

If a more comprehensive monitoring program is established as described in Attachment A consistent with 20.4.1 NMAC § 264.99, LANL will analyze samples from the Aggregate 2 monitoring wells for all 20.4.1 NMAC, Subpart V, Part 264, Appendix IX constituents at least annually, in accordance with 20.4.1 NMAC § 264.99(g). This analysis will be used to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to the procedures in 20.4.1 NMAC § 264.98(f). If LANL finds Appendix IX constituents in the groundwater that are not identified as monitoring constituents in the permit, LANL may resample within one month and repeat the Appendix IX analysis. If the presence of new hazardous constituents is confirmed by the second analysis, LANL will report the concentration of these additional constituents to the Secretary of the NMED within seven days after completion of the second analysis. If LANL decides not to resample, the concentrations of the additional hazardous constituents will be reported to the Secretary of the NMED within seven days after completion of the initial analysis. In either event, these hazardous constituents will be added to the monitoring list.

If a compliance monitoring program is established in accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and LANL determines, pursuant to 20.4.1 NMAC § 264.99(d), that any concentration limits under 20.4.1 NMAC § 264.94 are being exceeded at any of the Aggregate 2 monitoring wells, notification to the Secretary of the NMED will be submitted in writing within seven days. Pursuant to 20.4.1 NMAC § 264.99(h)(1), the notification will indicate which concentration limits have been exceeded.

If a compliance monitoring program is established in accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and LANL determines, pursuant to 20.4.1 NMAC § 264.99(d), that the groundwater concentration limits are being exceeded at any of the Aggregate 2 monitoring wells, LANL may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the groundwater. In this case, LANL will notify the Secretary of the NMED within seven days that a demonstration will be made, in accordance with 20.4.1 NMAC § 264.99(i).

If a groundwater corrective action program is established pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart F, LANL will report in writing to the Secretary of the NMED on the effectiveness of the program. LANL will submit these reports semiannually, in accordance with 20.4.1 NMAC § 264.100(g).

4.4 Post-Closure Use of Property

In accordance with 20.4.1 NMAC § 264.117(c), post-closure use of property on or in which hazardous waste remains after partial or final closure will not be allowed to disturb the integrity of the final cover or any other components of the containment system, if present. In addition, post-closure use of property will not be allowed to disturb the function of the monitoring systems unless the Secretary of the NMED finds that the disturbance is necessary to the proposed use of the property and will not increase the potential hazard to human health or the environment, or it is necessary to reduce a threat to human health or the environment.

4.5 Post-Closure Care Period Contact Office

As required by 20.4.1 NMAC § 264.118(b)(3), the name, address, and phone number of the office to contact about the Area L landfill during the post-closure care period is:

U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
528 35th Street
Los Alamos, New Mexico
87544
505-667-5105

5.0 REFERENCES

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Table 1

Schedule for Closure Activities at Technical Area 54 Area L Landfill

Activity	Maximum Time Required[a]
Let contract request for proposals	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Approval of closure plan	Day 0
Submit closure certification to the NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously, may not require the maximum time listed, or may require more time than indicated above. Extensions to the schedule may be requested, as needed.

Table 2

Dates of Use, Dimensions, Capacities, and Contents of Shafts 1, 13-17, and 19-34 at Technical Area 54 Area L Landfill

Shaft No.	Start Date of Use	End Date of Use	Depth (feet)	Diameter (feet)	Capacity (cubic feet)	Waste Contents
1	4/80	8/83	60	3	424	Organics
13	6/79	4/82	60	8	3016	Inorganics
14	6/79	4/82	60	3	424	Reactives
15	6/79	4/82	60	3	424	Reactives
16	6/79	4/82	60	3	424	Gas Cylinders
17	6/79	4/82	60	3	424	Organics
19	4/80	4/82	60	8	3016	Waste Oil
20	3/82	8/83	60	3	424	Inorganics
21	3/82	12/85	60	3	424	Gas Cylinders
22	3/82	8/83	60	3	424	Organics
23	4/82	2/84	60	4	754	Waste Oil
24	4/82	3/84	60	4	754	Organics & Waste Oil
25	9/82	4/85	60	6	1696	Inorganics
26	9/82	2/84	60	6	1696	Organics
27	1/83	1/85	60	4	754	Special Waste[a]
28	1/82	4/85	60	4	754	Special Waste
29	12/83	7/84	65	6	1838	Organics
30	12/83	4/84	65	6	1838	Organics
31	12/83	8/84	61	6	1725	Organics
32	3/84	8/84	15	4	188	Organics
33	3/84	1/85	65	6	1838	Organics
34	2/85	4/85	63	6	1781	Organics

[a] Used for miscellaneous wastes requiring greater isolation.

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Revision No.: 0.0
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819592/TA-54 MDA Closures

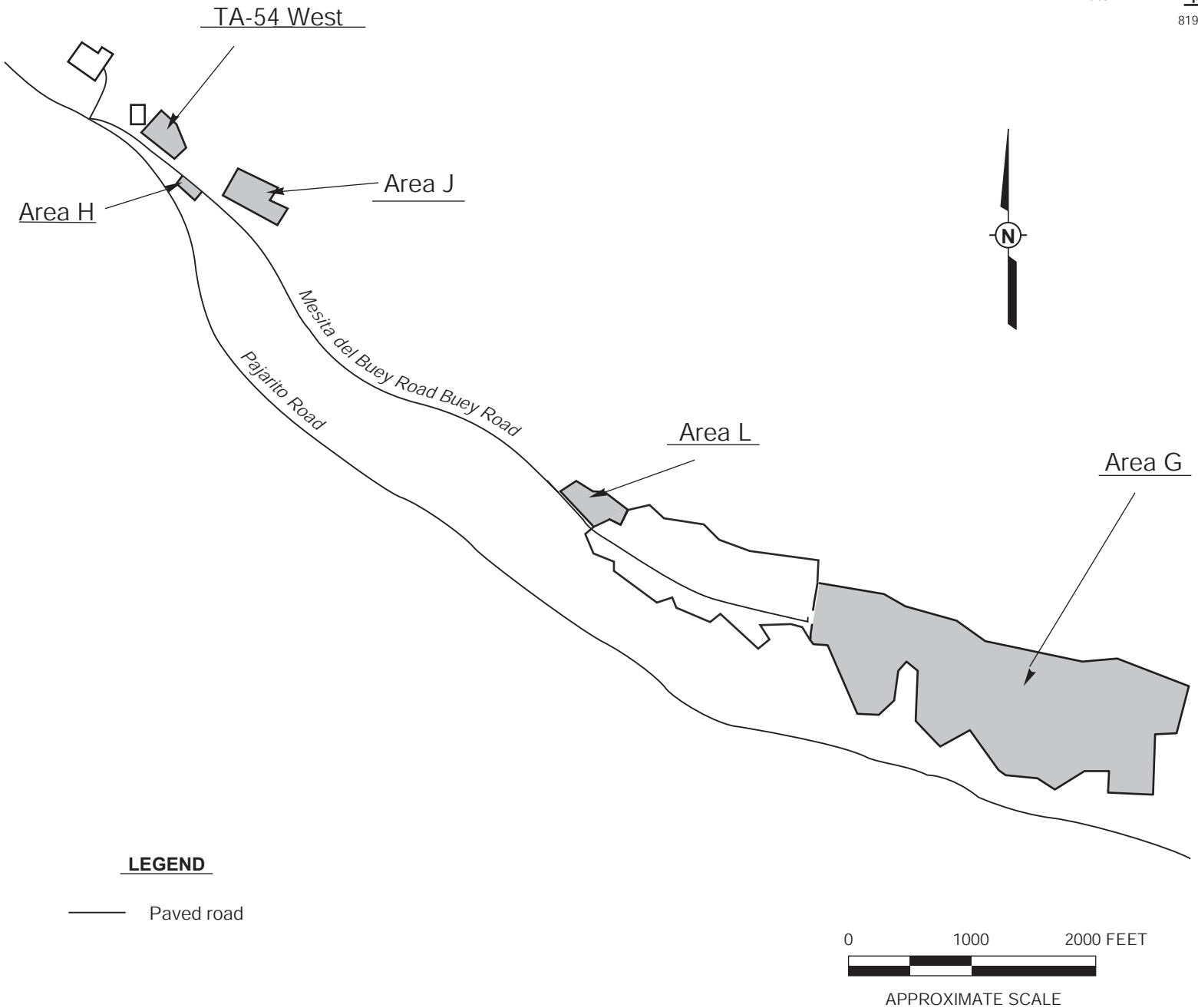

Figure 1
Technical Area (TA) 54 Site Location Map

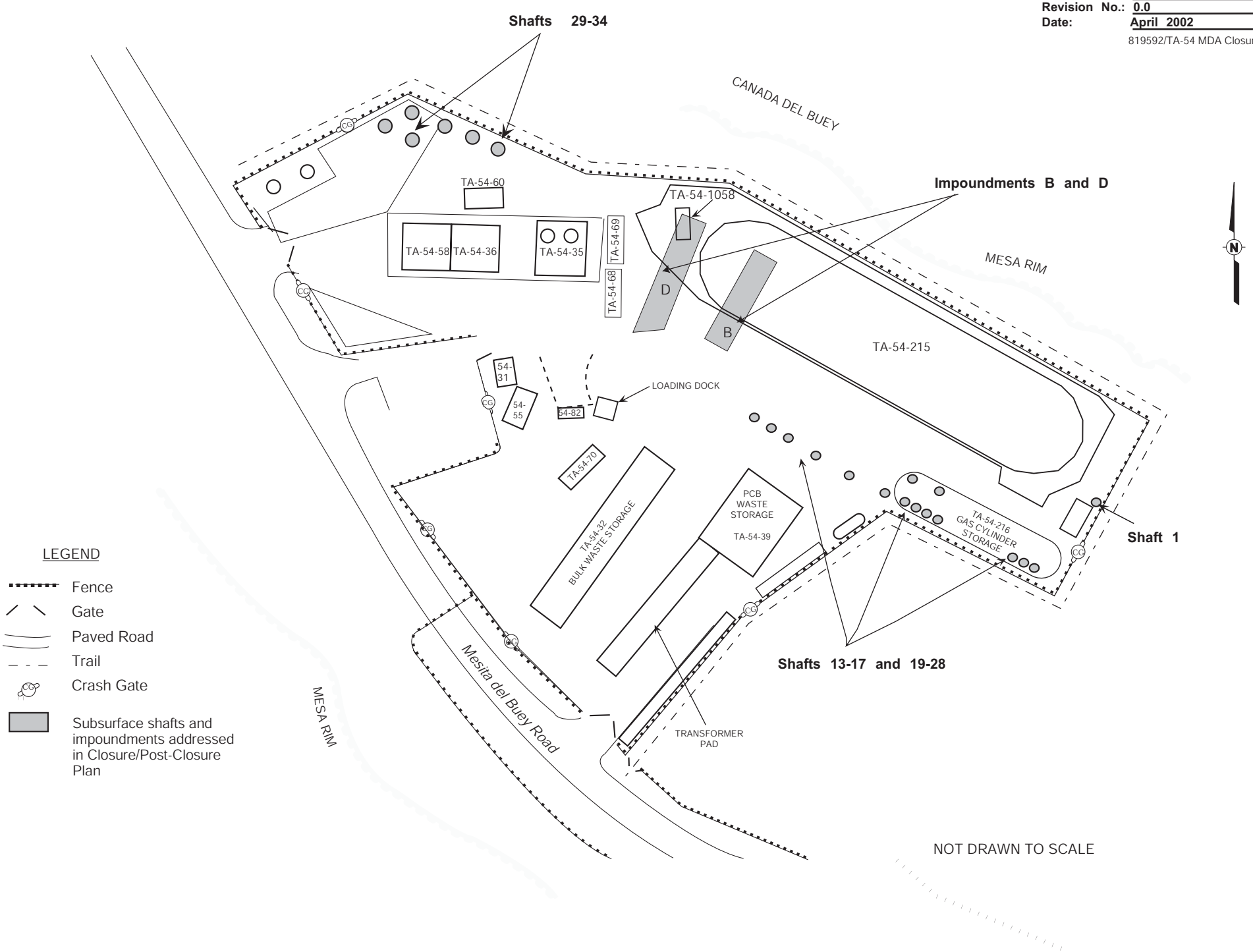

Figure 2
Technical Area (TA) 54, Area L

ATTACHMENT A

MDA L

OPERATING UNIT REGULATIONS FOR GROUND WATER/CLOSURE/POST-CLOSURE CARE AND CORRESPONDING HSWA ACTIVITIES

Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90	Applicability		
§264.90(a)(1)	Except as provided in paragraph (b) of this section, the regulations in this subpart apply to owners or operators of facilities that treat, store or dispose of hazardous waste. The owner/operator must satisfy the requirements identified in paragraph (a)(2) of this section for all wastes (or constituents thereof) contained in solid waste management units at the facility, regardless of the time at which waste was placed in such units.		
§264.90(a)(2)	All solid waste management units must comply with the requirements in §264.101. A surface impoundment, waste pile, and land treatment unit or landfill that receives hazardous waste after July 26, 1982 (hereinafter referred to as a "regulated unit") must comply with the requirements of §§264.91 through 264.100 in lieu of §264.101 for purposes of detecting, characterizing and responding to releases to the uppermost aquifer. The financial responsibility requirements of §264.101 apply to regulated units.		
§264.90(b)	The owner/operator's regulated unit or units are not subject to regulation for releases into the uppermost aquifer under this subpart if:		
§264.90(b)(1)	The owner/operator is exempted under §264.1; or	NA	NA
§264.90(b)(2)	He operates a unit which the Secretary finds:	NA	NA
§264.90(b)(2)(i)	Is an engineered structure,	NA	NA
§264.90(b)(2)(ii)	Does not receive or contain liquid waste or waste containing free liquids,	NA	NA
§264.90(b)(2)(iii)	Designed and operated to exclude liquid, precipitation, and other run-on and run-off,	NA	NA
§264.90(b)(2)(iv)	Has inner and outer layers of containment enclosing the waste,	NA	NA
§264.90(b)(2)(v)	Has a leak detection system built into each containment layer,	NA	NA
§264.90(b)(2)(vi)	Continuing operation and maintenance of leak detection systems will be provided during active life and during closure/post-closure care periods, and	NA	NA
§264.90(b)(2)(vii)	To reasonable degree of certainty, will not allow hazardous constituents to migrate beyond outer containment layer prior to end of post-closure care period.	NA	NA
§264.90(b)(3)	The Secretary finds, pursuant to §264.280(d), that the treatment zone of a land treatment unit that qualifies as a regulated unit does not contain levels of hazardous constituents that are above background levels of those constituents by an amount that is statistically significant, and if an unsaturated zone monitoring program meeting the requirements of §264.278 has not shown a statistically significant increase in hazardous constituents below the treatment zone during the operating life of the unit. An exemption under this paragraph can only relieve an owner or operator of responsibility to meet the requirements of this subpart during the post-closure care period; or	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(b)(4)	The Secretary finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and the post-closure care period specified under §264.117. This demonstration must be certified by a qualified geologist or geotechnical engineer. In order to provide an adequate margin of safety in the prediction of potential migration of liquid, the owner or operator must base any predictions made under this paragraph on assumptions that maximize the rate of liquid migration.	Should sufficient information support this exemption for a regulated unit in the future, the HSWA activity would be equivalent to that prescribed by the exemption.	
§264.90(b)(5)	He designs and operates a pile in compliance with §264.250(c).	NA	NA
§264.90(c)	The regulations under this subpart apply during the active life of the regulated unit (including the closure period). After closure of the regulated unit, the regulations in this subpart:		NA
§264.90(c)(1)	Do not apply if all waste, waste residues, contaminated containment system components, and contaminated subsurface soils removed or decontaminated at closure;	For MDA L, a CMS report will be developed and will address this issue. If appropriate, the report will include a general description of an excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure is selected, details will be provided in the approved CMI Plan following permit modification.	
§264.90(c)(2)	Apply during post-closure care period if owner/operator is conducting a detection monitoring program under §264.98; or	The probable corrective measure to be implemented at MDA L will include monitoring in the vadose zone beneath MDA L. The LANL hydrogeologic characterization program (as implemented through the LANL Hydrogeologic Workplan) proposes the locations for characterization wells for TA-54 that after four sampling events will be included in LANL Environmental Surveillance Program, and may, if appropriate, be used as repetitive monitoring wells for TA-54 as a whole.	
§264.90(c)(3)	Apply during compliance period under §264.96 if the owner/operator is conducting a compliance monitoring program under §264.99 or a corrective action program under §264.100.	If monitoring indicates a more comprehensive program is needed to adequately comply with ground water protection standards in 264.91 and 264.92, additional characterization and/or well installation will occur, if appropriate.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(d)	Regulations in this subpart may apply to miscellaneous units when necessary to comply with §§264.601-603.	NA	NA
§264.90(e)	The regulations of this subpart apply to all owners and operators subject to the requirements of 40 CFR 270.1(c)(7), when the Bureau issues either a post-closure permit or an enforceable document (as defined in 40 CFR 270.1(c)(7)) at the facility. When the Bureau issues an enforceable document, references in this subpart to "in the permit" mean "in the enforceable document."	CMS and CMI plans and resulting CMS and CMI reports describing activities equivalent to post-closure permit requirements will be "enforceable documents" consistent with 265.121.	
§264.90(f)	The Secretary may replace all or part of the requirements of §§ 264.91 through 264.100 applying to a regulated unit with alternative requirements for groundwater monitoring and corrective action for releases to groundwater set out in the permit (or in an enforceable document) (as defined in 40 CFR 270.1(c)(7)) where the Secretary determines that:	Activities proposed and implemented in the above referenced plans will be effectively equivalent to the cited Subpart F requirements.	
§264.90(f)(1)	The regulated unit is situated among SWMUs or areas of concern (AOC), a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	As the possibility for this situation exists, alternative activities may appropriately replace all or part of the above cited Subpart F requirements.	
§264.90(f)(2)	It is not necessary to apply the groundwater monitoring and corrective action requirements of §§264.91-100 because alternative requirements will protect human health and the environment.	Should the above situation exist, §264.90(f)(1), alternative activities protective of human health and the environment and proposed in lieu of §264.91-264.100 will preclude the need for application of Subpart F requirements.	
§264.91	Required programs		
§264.91(a)	Owner/operators subject to this subpart must conduct a monitoring and response program as follows:		
§264.91(a)(1)	Whenever hazardous constituents under §264.93 from a regulated unit are detected at a compliance point under §264.95, owner/operator must institute a compliance monitoring program under §264.99. Detection is defined as statistically significant evidence of contamination as described in §264.98(f);	If detection is indicated, additional characterization and/or well installation will occur if appropriate - 264.90(c)(3)	
§264.91(a)(2)	Whenever the groundwater protection standard under §264.92 is exceeded, owner/operator must institute a corrective action program under §264.100. Exceedance is defined as statistically significant evidence of increased contamination as described in §264.99(d);	If detection is indicated, concentrations protective of human health and the environment will be established similar to ground water protection standards in §264.92. Actions necessary to correct any exceedances of such concentrations will be taken as necessary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.91(a)(3)	Whenever hazardous constituents under §264.93 from a regulated unit exceed concentration limits under §264.94 in groundwater between the compliance point under §264.95 and the downgradient facility property boundary, owner/operator must institute a corrective action program under §264.100; or	Should established concentration limits be exceeded between the point of compliance and the downgradient boundary, actions to correct such exceedances will be taken as necessary.	
§264.91(a)(4)	In all other cases, owner/operator must institute a detection monitoring program under §264.98.	TA-54 characterization wells will be sampled and analyzed as repetitive monitoring wells as appropriate through the LANL Environmental Surveillance Program.	
§264.91(b)	The Secretary will specify in the facility permit the specific elements of the monitoring and response program. The Secretary may include one or more of the programs identified in paragraph (a) of this section in the facility permit as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs will be required. In deciding whether to require the owner or operator to be prepared to institute a particular program, the Secretary will consider the potential adverse effects on human health and the environment that might occur before final administrative action on a permit modification application to incorporate such a program could be taken.	See above.	
§264.92	The owner/operator must comply with conditions specified in the facility permit that are designed to ensure that hazardous constituents under §264.93 detected in the ground water from a regulated unit do not exceed the concentration limits under §264.94 in the uppermost aquifer underlying the waste management area beyond the point of compliance under §264.95 during the compliance period under §264.96. The Secretary will establish this ground-water protection standard in the facility permit when hazardous constituents have been detected in the ground water.	Should "detection" consistent with the definition in §264.91(a)(1) occur, LANL will comply with concentration limits established through a process similar to that described in §264.94.	
§264.93	Hazardous constituents		
§264.93(a)	The Secretary will specify in the facility permit the hazardous constituents to which the ground-water protection standard of §264.92 applies. Hazardous constituents are constituents identified in appendix VIII of part 261 of this chapter that have been detected in ground water in the uppermost aquifer underlying a regulated unit and that are reasonably expected to be in or derived from waste contained in a regulated unit, unless the Secretary has excluded them under paragraph (b) of this section.	For any of the following information that is not already available or developed, it will be prepared and included in a manner consistent with §264.93 in corresponding corrective action/HSWA activity documents.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)	The Secretary will exclude an Appendix VIII constituent from the list of hazardous constituents specified in the facility permit if he finds that the constituent is not capable of posing a substantial present or potential hazard to human health or the environment. In deciding whether to grant an exemption, the Secretary will consider the following:	Concentration limits established for hazardous constituents following "detection" will not include those incapable of posing a substantial present or potential hazard to human health or the environment considering the following:	
§264.93(b)(1)	Potential adverse effects on groundwater quality, considering:	Potential adverse effects on groundwater quality considering:	
§264.93(b)(1)(i)	Physical and chemical characteristics of waste in the regulated unit, including its potential for migration;	Detailed information on waste inventory and chemical characteristics for Shafts 1, 13-17, and 19-34 and Impoundments B and D will be presented in the MDA L RFI Report and CMS Report including potential for migration and site conceptual model.	
§264.93(b)(1)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site specific information for MDA L will be presented in the MDA L RFI Report and MDA L CMS Report.	
§264.93(b)(1)(iii)	Quantity of groundwater and the direction of groundwater flow;	Information regarding quantity and direction of flow of groundwater can be obtained through the LANL Hydrogeologic Work Plan.	
§264.93(b)(1)(iv)	Proximity and withdrawal rates of groundwater users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	
§264.93(b)(1)(v)	Current and future uses of groundwater in the area;	Information regarding current and future users of groundwater in the area will be developed.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(1)(vi)	Existing quality of groundwater, including other sources of contamination and their cumulative impact on groundwater quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Workplan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER site characterization efforts.	
§264.93(b)(1)(vii)	Potential health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA L will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Attachment C
§264.93(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA L will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Attachment C
§264.93(b)(1)(ix)	Persistence and permanence of the potential adverse effects; and	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	
§264.93(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	RFI and CMS Reports for MDA L will be developed and will address this issue.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(2)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA L can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, and will be presented in the MDA L RFI and CMS Reports.	
§264.93(b)(2)(iii)	Quantity and quality of groundwater, and the direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	
§264.93(b)(2)(iv)	Rainfall patterns in the region;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)(v)	Proximity of regulated unit to surface waters;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described, will be developed.	
§264.93(b)(2)(vii)	Existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program multi-sector CWA permit, as well as through ER Project characterization activities.	
§264.93(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(b)(2)(x)	Persistence and permanence of potential adverse effects.	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.93(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility, the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	
§264.94	Concentration limits		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(a)	The Secretary will specify in the facility permit the concentration limits in the groundwater for hazardous constituents established under §264.93. The concentration of a hazardous constituent:	Proposed concentration limits of detected hazardous constituents will be consistent with evaluation of parameters set forth in 264.94. To the extent that information necessary to establish provisions of this section do not already exist, they will be developed. Otherwise this information will be found in the previously identified documents.	
§264.94(a)(1)	Must not exceed background level of that constituent in the groundwater at the time that limit is specified in the permit; or	See above.	
§264.94(a)(2)	For any constituent listed in §264.94, Table 1, must not exceed the respective value given in that table if the background level of the constituent is below the value given in Table 1; or	See above.	
§264.94(a)(3)	Must not exceed an alternate limit established by the Secretary under paragraph (b) of this section.	See above.	
§264.94(b)	The Secretary will establish an alternate concentration limit for a hazardous constituent if he finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In establishing alternate concentration limits, the Secretary will consider the following factors:	See above.	
§264.94(b)(1)	Potential adverse effects on groundwater quality, considering:		
§264.94(b)(1)(i)	Physical and chemical characteristics of the waste in the regulated unit, including its potential for migration;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(b)(1)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization in facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site-specific information for MDA L will be found in the MDA L RFI Report and CMS Report.	
§264.94(b)(1)(iii)	Quantity of groundwater and direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(1)(iv)	Proximity and withdrawal rates of groundwater users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	
§264.94(b)(1)(v)	Current and future uses of groundwater in the area;	Information regarding current and future users of groundwater in the area will be developed.	
§264.94(b)(1)(vi)	Existing quality of groundwater, including other sources of contamination and their cumulative impact on groundwater quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Workplan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER Project site characterization efforts.	
§264.94(b)(1)(vii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA L will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA L will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(1)(ix)	Persistence and permanence of potential adverse effects; and	RFI and CMS Reports for MDA L will be developed and will address this issue.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	
§264.94(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(b)(2)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site-specific information for MDA L will be presented in the MDA L RFI Report and CMS Report.	
§264.94(b)(2)(iii)	Quantity and quality of groundwater and direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	
§264.94(b)(2)(iv)	Patterns of rainfall in the region;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(b)(2)(v)	Proximity of regulated unit to surface waters;	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described, will be developed.	
§264.94(b)(2)(vii)	Existing surface water quality, including other sources of contamination and their cumulative impact on surface water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program multi-sector CWA permit, as well as through ER Project characterization activities.	
§264.94(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA L will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area L closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA L will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(2)(x)	Persistence and permanence of potential adverse effects.	RFI and CMS Reports for MDA L will be developed and will address this issue.	
§264.94(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	
§264.95	Point of compliance	In establishing a point of compliance, the limits of the waste management area can be delineated by circumscribing an imaginary line around more than one unit. The aggregate approach used in the Hydrogeologic Workplan was intended to be consistent with this concept. As characterization efforts progress, the appropriateness of the aggregate boundary for TA-54 will be assessed.	
§264.95(a)	The Secretary will specify in the facility permit the point of compliance at which the groundwater protection standard of §264.92 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.	See above. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the aggregate that extends down into the uppermost aquifer underlying the regulated units.	
§264.95(b)	The waste management area is the limit projected in horizontal plane of the area on which waste will be placed during active life of regulated unit.	See above.	
§264.95(b)(1)	The waste management area includes horizontal space taken up by any liner, dike, or other barrier designed to contain waste in a regulated unit.	NA	
§264.95(b)(2)	If facility contains more than one regulated unit, the waste management area is described by an imaginary line circumscribing the several regulated units.	See above.	
§264.96	Compliance period		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.96(a)	The Secretary will specify in the facility permit the compliance period during which the ground-water protection standard of §264.92 applies. The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting, and the closure period.)	The implementing document for these alternative activities will specify the period during which concentration limits similar groundwater protection standards and will be equivalent to the remaining active life (including closure period) of the waste management area.	
§264.96(b)	The compliance period begins when the owner/operator initiates a compliance monitoring program meeting requirements of §264.99.	This period will begin upon detection as defined in 264.91, and, if a more comprehensive program is needed to adequately address concentration limits, additional characterization and/or monitoring well installation will occur if appropriate.	
§264.96(c)	If the owner/operator is engaged in a corrective action program at the end of the compliance period specified in paragraph (a) of this section, the compliance period is extended until the owner/operator can demonstrate that the ground-water protection standard of § 264.92 has not been exceeded for a period of three consecutive years.	This period will be established for a period of 3 years if, at the end of the active life and closure period, the concentration limits described above continue to be exceeded.	
§264.97	The owner/operator must comply with following requirements for any groundwater monitoring program developed to satisfy §264.98, §264.99, or §264.100:	Alternative requirements will be met there.	
§264.97(a)	The groundwater monitoring system must consist of sufficient number of wells, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that:	All groundwater monitoring wells will be sufficient in number and placed at appropriate locations and depths in the uppermost aquifer as determined by characterization efforts performed during implementation of the Hydrogeologic Workplan.	
§264.97(a)(1)	Represent the quality of background water that has not been affected by leakage from a regulated unit;	Background wells will be placed in an upgradient locations determined to be unaffected by potential releases from the waste management area.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(a)(1)(i)	A determination of background quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:	Should existing conditions preclude the location of background wells upgradient, other wells will be used. These wells will be capable of determining background quality passing the aggregate boundary. This determination will be made in part by ongoing characterization efforts establishing groundwater gradient, flow directions, potential transport mechanisms, and waste-specific migration characteristics.	
§264.97(a)(1)(i)(A)	Hydrogeologic conditions do not allow the owner/operator to determine what wells are hydraulically upgradient; and	See above.	
§264.97(a)(1)(i)(B)	Sampling at other wells will provide an indication of background groundwater quality that is representative or more representative than that provided by the upgradient wells; and	See above.	
§264.97(a)(2)	Represent the quality of groundwater passing the point of compliance.	The above-mentioned geologic, hydrologic, and waste characteristics will be considered in determining the representativeness of the groundwater passing the downgradient aggregate boundary and the monitoring system's capability of detecting contamination if hazardous waste or hazardous constituents migrate from the aggregate to the uppermost aquifer.	
§264.97(a)(3)	Allow for the detection of contamination when hazardous waste or hazardous constituents have migrated from the waste management area to the uppermost aquifer.	See above.	
§264.97(b)	If a facility contains more than one regulated unit, separate groundwater monitoring systems are not required for each unit provided that provisions for sampling the groundwater in the uppermost aquifer will enable detection and measurement at the compliance point of hazardous constituents from the regulated units that have entered groundwater in the uppermost aquifer.	Consistent with establishing a point of compliance by circumscribing an imaginary line around more than one unit, a groundwater monitoring system capable of detecting and measuring hazardous constituents at the aggregate boundary will meet the intent of this requirement.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(c)	All monitoring wells must be cased in a manner that maintains the integrity of the monitoring-well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.	The integrity of the monitoring well borehole will be maintained by casing in a manner most appropriate for the use and surrounding subsurface environment. Screen materials should be selected based on compatibility with geochemistry and long-term structural integrity. Well casing size should be determined based on the size of purging and equipment necessary to sample the well and the depth of the well. Filter pack material should be inert (i.e., silica sand). Gravel filters are acceptable pending sieve analysis. Annular space should be sealed with materials chemically compatiable with the anticipated contaminants and have a permeability one to two orders of magnitude less than the surrounding formation. A cement and bentonite mixture, bentonite chips, or antishrink cement mixtures can be used in the unsaturated zone and below the frost line. The cap should consist of concrete blending into an apron extending at least three feet from the outer edge of the borehole. Remaining annular space should be sealed with expanding cement. A suitable threaded or flanged cap or compression seal should then be placed and locked. A quarter-inch vent hole pipe will allow gas to escape, and bumper guards should be placed around the well to prevent damage by vehicles.	
§264.97(d)	The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results provide a reliable indication of groundwater quality below the waste management area. At a minimum, the program must include procedures and techniques for:	Groundwater sampling and analysis procedures will be in written form and will address the following:	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(d)(1)	Sample collection;	1) Groundwater level measurements will be determined prior to collection of sample in accordance with a written procedure describing level of accuracy, measurement reference points, required equipment decontamination, and time period measured. 2) Water collection will occur in accordance with a written procedure describing sampling devices and procedures for use and decontamination, well evacuation volumes and procedures, field measurements, and appropriate sample container types.	
§264.97(d)(2)	Sample preservation and shipment;	*SW-846* requirements will be followed to ensure appropriate preservation and temperature controls are utilized.	
§264.97(d)(3)	Analytical procedures; and	*SW-846* or other approved analytical methods, holding times, and approved QA/QC analytical procedures will be used.	
§264.97(d)(4)	Chain-of-Custody control.	Chain-of-custody will include: sample number, time, and date; collector's signature; sample type; well identification; number of containers; parameters to be analyzed; signatures of subsequent handlers; inclusive dates of possession; storage temperature at shipment and receipt; and verification of temperature control upon receipt at analytical laboratory.	
§264.97(e)	The groundwater monitoring program must include sampling and analytical methods appropriate for groundwater sampling and that accurately measure hazardous constituents in groundwater samples.	See above.	
§264.97(f)	The groundwater monitoring program must include determination of the groundwater surface elevation each time the water is sampled.	Groundwater levels will be determined each time water is sampled.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(g)	In detection monitoring or where appropriate in compliance monitoring, data on each hazardous constituent specified in the permit will be collected from background wells and wells at the compliance point(s). The number and kinds of samples collected to establish background shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. Sample size shall be as large as necessary to ensure with reasonable confidence that a contaminant release to ground water from a facility will be detected. The owner or operator will determine an appropriate sampling procedure and interval for each hazardous constituent listed in the facility permit which shall be specified in the unit permit upon approval by the Secretary. The sampling procedure shall be:	Data will be collected that are appropriate for the statistical methodology applied, sufficient in sample size, and utilizing sampling procedures and frequencies of sample collection to ensure that potential contaminant release(s) to groundwater from the waste management unit(s) can be detected.	
§264.97(g)(1)	A sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained, by reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants, or	An adequate number of samples will be collected at appropriate frequencies to ensure representativeness considering aquifer and potential contaminant characteristics. Information such as retardation potential for metals and organics and transport time based on groundwater velocity and constituent mobility will be considered in developing the sampling procedure.	
§264.97(g)(2)	An alternate sampling procedure proposed by the owner/operator and approved by the Secretary.	Should an alternative to the sampling procedure described above be more appropriate, it will be proposed.	
§264.97(h)	Owner/operator will specify one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent which will be specified in the unit permit. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. Where practical quantification limits (pql's) are used in any of the following statistical procedures to comply with §264.97(i)(5), the pql must be proposed by the owner or operator and approved by the Secretary. Use of any of the following statistical methods must be protective of human health and the environment and must comply with the performance standards outlined in paragraph (i) of this section.	One of the statistical methods described in §264.97(h) or an alternative approved by the Secretary will be chosen to evaluate groundwater monitoring data. It is premature at this time to prescribe a specific method until adequate characterization has been performed.	
§264.97(h)(1)	A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(h)(2)	An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.	See above.	
§264.97(h)(3)	A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.	See above.	
§264.97(h)(4)	A control chart approach that gives control limits for each constituent.	See above.	
§264.97(h)(5)	Another statistical test method submitted by the owner or operator and approved by the Secretary.	See above.	
§264.97(i)	Any statistical method chosen under §264.97(h) for specification in the unit permit shall comply with the following performance standards, as appropriate:	The appropriate performance standard used for the statistical method applied will be consistent with those prescribed in §264.97(i).	
§264.97(i)(1)	The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.	See above.	
§264.97(i)(2)	If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experimentwise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts.	See above.	
§264.97(i)(3)	If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be proposed by the owner or operator and approved by the Secretary if he or she finds it to be protective of human health and the environment.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(i)(4)	If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be proposed by the owner or operator and approved by the Secretary if it finds these parameters to be protective of human health and the environment. These parameters will be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.	See above.	
§264.97(i)(5)	The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantification limit (pql) approved by the Secretary under §264.97(h) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.	See above.	
§264.97(i)(6)	If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.	See above.	
§264.97(j)	Ground-water monitoring data collected in accordance with paragraph (g) of this section including actual levels of constituents must be maintained in the facility operating record. The Secretary will specify in the permit when the data must be submitted for review.	Groundwater monitoring data obtained will be maintained in the facility records.	
§264.98	An owner/operator required to establish a detection monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Upon completion of adequate characterization through the Hydrogeologic Workplan, and a determination that monitoring would be appropriate, the detection-type monitoring prescribed in §264.98 would be initiated.	
§264.98(a)	The owner/operator must monitor for indicator parameters (e.g., specific conductance, total organic carbon, or total organic halogen), waste constituents, or reaction products that provide a reliable indication of the presence of hazardous constituents in ground water. The Secretary will specify the parameters or constituents to be monitored in the facility permit, after considering the following factors:	As a result of sampling performed during the four events following well installation under the Hydrogeologic Workplan, indicator parameters, waste constituents, or reaction products will be prescribed that consider the following:	
§264.98(a)(1)	The types, quantities, and concentrations of constituents in wastes managed at the regulated unit;	Waste information has been obtained and reviewed, identifying hazardous constituents, concentrations, and waste volumes during the RFI/CMS process.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(a)(2)	The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;	Further refinement of the hydrogeologic regime at TA-54 and the behavior of hazardous constituents in the unsaturated zone will be developed and reported through the Hydrogeologic Workplan activities and the RFI/CMS process. Substantial information regarding these issues has already been provided in the "Hydrogeologic Assessment of Technical Area 54, Areas G and L", the "Performance Assessment and Composite Analysis for Los Alamos National Laboratory Material Disposal Area G", and the "RFI Report for Material Disposal Areas G, H and L at Technical Area 54".	
§264.98(a)(3)	The detectability of indicator parameters, waste constituents, and reaction products in ground water; and	Based on data collected during the four sampling events following well installation under the Hydrogeologic Workplan, detectability of indicator parameters, waste constituents, and reaction products will be established using *SW-846* or Secretary-approved methodologies and detection limits.	
§264.98(a)(4)	The concentrations or values and coefficients of variation of proposed monitoring parameters or constituents in ground-water background values.	Considerations for establishing concentrations and coefficients of varience of background parameters or constituents include: location of the unit, groundwater flow direction, depth to groundwater, appropriate number and location of background wells, available geologic and hydrologic information, drilling methods, well installation details, and sampling data.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(b)	Owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Should it be determined that a groundwater monitoring system will be necessary, installation of this system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary. Vadose zone investigation including delineation of contaminant movement and potential impact can be used to enhance and/or supplement monitoring efforts as an early detection mechanism.	
§264.98(c)	The owner/operator must conduct ground-water monitoring for each chemical parameter and hazardous constituent specified in the permit pursuant to paragraph (a) of this section in accordance with §264.97(g), and maintain a record of ground-water analytical data as measured and in a form necessary for the determination of statistical significance under §264.97(h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance.	
§264.98(d)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine whether there is statistically significant evidence of contamination for any parameter or hazardous constituent specified in the permit under paragraph (a) of this section in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during detection monitoring.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of contamination as described in §264.98(d).	
§264.98(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the upper-most aquifer will be determined and reevaluated annually.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(f)	The owner/operator must determine whether there is statistically significant evidence of contamination for any chemical parameter of hazardous constituent specified in the permit pursuant to paragraph (a) of this section at a frequency specified under paragraph (d) of this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of contamination exists within a reasonable timeframe.	
§264.98(f)(1)	In determining whether statistically significant evidence of contamination exists, the owner/operator must use the method(s) specified in the permit under §264.97(h). These method(s) must compare data collected at the compliance point(s) to the background ground-water quality data.	See above.	
§264.98(f)(2)	The owner/operator must determine whether there is statistically significant evidence of contamination at each monitoring well as the compliance point within a reasonable period of time after completion of sampling. The facility permit will specify what period of time is reasonable, based on the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of ground-water samples.	See above.	
§264.98(g)	If the owner/operator determines pursuant to paragraph (f) of this section that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she must:	If statistically significant evidence of contamination for established chemical parameters or hazardous constituents exists, notification will be made and ground water wells will be sampled for Appendix IX constituents. If present and confirmed with a second analysis within the timeframes described in §264.98(g), these constituents will be used in a more comprehensive monitoring program.	
§264.98(g)(1)	Notify the Secretary of this finding in writing within seven days. The notification must indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination;	See above.	
§264.98(g)(2)	Immediately sample the ground water in all monitoring wells and determine whether constituents in the list of Appendix IX of part 264 are present, and if so, in what concentration.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(3)	For any Appendix IX compounds found in the analysis pursuant to paragraph (g)(2) of this section, resample within one month and repeat the analysis for those compounds detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If groundwater is not resampled for the compounds found pursuant to paragraph (g)(2) of this section, the hazardous constituents found during this initial Appendix IX analysis will form the basis for compliance monitoring.	See above.	
§264.98(g)(4)	Within 90 days, submit to the Secretary an application for a permit modification to establish a compliance monitoring program meeting the requirements of §264.99. The application must include the following information:	Within 90 days, a request for modification of an enforceable document will be submitted to establish a more comprehensive monitoring program. It will include:	
§264.98(g)(4)(i)	An identification of the concentration or any Appendix IX constituent detected in the ground water at each monitoring well at the compliance point;	Appendix IX constituents and associated concentrations confirmed in downgradient aggregate boundary wells;	
§264.98(g)(4)(ii)	Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of §264.99;	Any proposed modifications/enhancements to the existing groundwater monitoring system if necessary:	
§264.98(g)(4)(iii)	Any proposed additions or changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical methods used at the facility necessary to meet the requirements of §264.99;	Any proposed changes to monitoring frequency, sampling and analysis procedures or statistical methods, if necessary to address provisions of the more comprehensive monitoring program.	
§264.98(g)(4)(iv)	For each hazardous constituent detected at the compliance point, a proposed concentration limit under §264.94(a)(1) or (2), or a notice of intent to seek an alternate concentration limit under §264.94(b); and	For hazardous constituents detected (as defined in §264.91(a)(1)), either background concentrations, maximum concentration limits or alternate concentration limits (ACLs) (or the intent to demonstrate ACLs) will be proposed.	
§264.98(g)(5)	Within 180 days, submit to the Secretary:	Within the specified time frame of 180 days, unless an alternative approach is more appropriate, submit to the Secretary the following:	
§264.98(g)(5)(i)	All data necessary to justify an alternate concentration limit sought under §264.94(b); and	Consideration of geologic and hydrologic conditions, waste inventory, receptor location(s), travel time, and degradation mechanisms may be included in the justification.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(5)(ii)	An engineering feasibility plan for a corrective action program necessary to meet the requirement of §264.100, unless:	A feasibility plan for a groundwater corrective action program will be developed during the CMS/CMI process unless:	
§264.98(g)(5)(ii)(A)	All hazardous constituents identified under paragraph (g)(2) of this section are listed in Table 1 of §264.94 and their concentrations do not exceed the respective values given in that Table; or	Concentrations of hazardous constituents are not greater than MCLs; or	
§264.98(g)(5)(ii)(B)	The owner or operator has sought an alternate concentration limit under §264.94(b) for every hazardous constituent identified under paragraph (g)(2) of this section.	An ACL demonstration has been submitted for all constituents found.	
§264.98(g)(6)	If the owner/operator determines that, pursuant to paragraph (f) of this section, there is a statistically significant difference for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he/she demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. The owner/operator may make a demonstration under this paragraph in addition to, or in lieu of, submitting a permit modification application under paragraph (g)(4) of this section; however, owner/operator is not relieved of the requirement to submit a permit modification application within the time specified in paragraph (g)(4) of this section unless the demonstration made under this paragraph successfully shows that a source other than a regulated unit caused the increase, or that the increase resulted from error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.98(g)(6) and monitoring will continue.	
§264.98(g)(6)(i)	Notify the Secretary in writing within seven days of determining statistically significant evidence of contamination at the compliance point that he intends to make a demonstration under this paragraph;	See above.	
§264.98(g)(6)(ii)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation;	See above.	
§264.98(g)(6)(iii)	Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the detection monitoring program facility; and	See above.	
§264.98(g)(6)(iv)	Continue to monitor in accordance with the detection monitoring program established under this section.	See above.	
§264.98(h)	If the owner/operator determines that the detection monitoring program no longer satisfies the requirements of this section, he/she must within 90 days submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99	An owner/operator required to establish a compliance monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituents be "detected" (consistent with §264.91(a)(1)) resulting in the subsequent development of concentration limits consistent with §264.93 and §264.94, a more comprehensive monitoring program will be established that determines compliance with these limits. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	
§264.99(a)	The owner/operator must monitor the ground water to determine whether regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above.	
§264.99(a)(1)	A list of the hazardous constituents identified under §264.93;	See above.	
§264.99(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above.	
§264.99(a)(3)	The compliance point under §264.95;	See above.	
§264.99(a)(4)	The compliance period under §264.96.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(b)	The owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Installation of a more comprehensive monitoring system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary.	
§264.99(c)	The Secretary will specify the sampling procedures and statistical methods appropriate for the constituents and the facility, consistent with §264.97 (g) and (h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance using appropriate sampling procedures and statistical methods.	
§264.99(c)(1)	The owner/operator must conduct a sampling program for each chemical parameter or hazardous constituent in accordance with §264.97(g).	See above.	
§264.99(c)(2)	The owner/operator must record ground-water analytical data as measured and in form necessary for the determination of statistical significance under §264.97(h) for the compliance period of the facility.	See above.	
§264.99(d)	The owner/operator must determine whether there is statistically significant evidence of increased contamination for any chemical parameter or hazardous constituent specified in the permit, pursuant to paragraph (a) of this section, at a frequency specified under paragraph (f) under this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of increased contamination exists within a reasonable timeframe.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(d)(1)	In determining whether statistically significant evidence of increased contamination exists, owner/operator must use the method(s) specified in the permit under §264.97(h). The methods(s) must compare data collected at the compliance point(s) to a concentration limit developed in accordance with §264.94.	See above.	
§264.99(d)(2)	The owner/operator must determine whether there is statistically significant evidence of increased contamination at each monitoring well at the compliance point within a reasonable time period after completion of sampling. The Secretary will specify that time period in the facility permit, after considering the complexity of the statistical test and the availability of analytical laboratories to perform the analysis of ground-water samples.	See above.	
§264.99(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the uppermost aquifer will be determined and reevaluated annually.	
§264.99(f)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine statistically significant evidence of increased contamination in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during the compliance period of the facility.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of increased contamination as described in §264.99(f).	
§264.99(g)	The owner/operator must analyze samples from all monitoring wells at the compliance point for all constituents contained in Appendix IX of part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to procedures in §264.98(f). If the owner/operator finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the owner/operator may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the owner/operator must report the concentration of these additional constituents to the Secretary within seven days after the completion of the second analysis and add them to the monitoring list. If the owner/operator chooses not to resample, then he or she must report the concentrations of these additional constituents to the Secretary within seven days after completion of the initial analysis and add them to the monitoring list.	If annual sampling for all Appendix IX constituents indicates new constituents that are not already addressed statistically exceed background, and resampling within one month confirms this, the Secretary will be notified and the new constituents will be added to the monitoring list.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(h)	If the owner/operator determines pursuant to paragraph (d) of this section that any concentration limits under §264.94 are being exceeded at any monitoring well at the point of compliance, must:	If it has been determined that a statistically significant increase in contamination due to an exceedance of the previously established concentration limits has occurred at the downgradient aggregate boundary, the Secretary will be notified and a modification to the enforceable document requested to establish a corrective action program. It will include the actions necessary to correct the increase in contamination and a plan for a groundwater monitoring program to demonstrate the effectiveness of the action. An analysis of applicable remedial technologies will be performed through the CMS process, and the capabilities of the existing groundwater monitoring system will be assessed. Modifications/enhancements to the existing system will be proposed if necessary.	
§264.99(h)(1)	Notify the Secretary of finding in writing within seven days. The notification must indicate what concentration limits have been exceeded.	See above.	
§264.99(h)(2)	Submit to the Secretary an application for a permit modification to establish a corrective action program meeting the requirements of §264.100 within 180 days, or within 90 days if an engineering feasibility study has been previously submitted to the Secretary under §264.98(h)(5). The application must at a minimum include the following information:	See above.	
§264.99(h)(2)(i)	A detailed description of corrective actions that will achieve compliance with the ground-water protection standard specified in the permit under paragraph (a) of this section; and	See above.	
§264.99(h)(2)(ii)	A plan for a ground-water monitoring program that will demonstrate the effectiveness of the corrective action. Such a ground-water monitoring program may be based on a compliance monitoring program developed to meet the requirements of this section.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(i)	If the owner/operator determines, pursuant to paragraph (d) of this section, that the ground-water concentration limits under this section are being exceeded at any monitoring well at the point of compliance, may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. In making a demonstration under this paragraph, the owner/operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.99(i) and monitoring will continue.	
§264.99(i)(1)	Notify the Secretary in writing within seven days that he intends to make a demonstration under this paragraph;	See above.	
§264.99(i)(2)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the standard to be exceeded or that the apparent noncompliance with the standards resulted from error in sampling, analysis, or evaluation;	See above.	
§264.99(i)(3)	Within 90 days, submit an application for a permit modification to the Secretary to make any appropriate changes to the compliance monitoring program at the facility; and	See above.	
§264.99(i)(4)	Continue to monitor in accord with the compliance monitoring program established under this section.	See above.	
§264.99(j)	If the owner/operator determines that the compliance monitoring program no longer satisfies the requirements of this section, must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	
§264.100	An owner/operator required to establish a corrective action program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituent concentration levels be exceeded, a program that takes action to address the statistically significant increase identified will be established. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(a)	Owner/operator must take corrective action to ensure that regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above.	
§264.100(a)(1)	A list of the hazardous constituents identified under §264.93;	See above.	
§264.100(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above.	
§264.100(a)(3)	The compliance point under §264.95; and	See above.	
§264.100(a)(4)	The compliance period under §264.96.	See above.	
§264.100(b)	The owner/operator must implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance point by removing the hazardous waste constituents or treating them in place. The permit will specify the specific measures that will be taken.	A program will be implemented to prevent hazardous constituent concentration exceedances at the downgradient aggregate boundary that considers: contaminant distribution and mobility, additional characterization and/or monitoring needs (including vadose zone investigation), source term removal, and applicable remedial techniques.	
§264.100(c)	The owner/operator must begin corrective action within a reasonable time period after the ground-water protection standard is exceeded. The Secretary will specify that time period in the facility permit. If a facility permit includes a corrective action program in addition to a compliance monitoring program, the permit will specify when the corrective action will begin and such a requirement will operate in lieu of §264.99(i)(2).	Corrective action will begin within a reasonable time period after hazardous constituent concentration limits have been exceeded and will be conducted pursuant to the requirements established in the above-referenced corrective action program.	
§264.100(d)	In conjunction with a corrective action program, owner/operator must establish and implement a ground-water monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under §264.99 and must be as effective as that program in determining compliance with the ground-water protection standard under §264.92 and in determining the success of a corrective action program under paragraph (e) of this section, where appropriate.	A groundwater monitoring program to demonstrate the effectiveness of the corrective action will be established and implemented. It will be based on considerations identified in the corrective action program and capable of detecting statistically significant exceedances in previously established hazardous constituent concentration limits. Additional monitoring wells may be installed and sampled if necessary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(e)	In addition to the other requirements of this section, owner/operator must conduct a corrective action program to remove or treat in place any hazardous constituents under §264.93 that exceed concentration limits under §264.94 in groundwater:	The corrective action will also address hazardous constituents that exceed the concentration limits between the downgradient aggregate boundary and the downgradient property boundary, and off-site. Removal or in situ treatment of such constituents will occur in a reasonable time period, and, if off site, where necessary to protect human health and the environment. Corrective action can cease once limits are no longer exceeded.	
§264.100(e)(1)	Between the compliance point under §264.95 and the downgradient property boundary; and	See above.	
§264.100(e)(2)	Beyond the facility boundary, where necessary to protect human health and the environment, owner/operator demonstrates to the satisfaction of the Secretary that, despite the owner's or operator's best efforts, the owner or operator was unable to obtain the necessary permission to undertake such action. The owner/operator is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis.	See above.	
§264.100(e)(3)	Corrective action measures under this paragraph must be initiated and completed within a reasonable period of time considering the extent of contamination.	See above.	
§264.100(e)(4)	Corrective action measures under this paragraph may be terminated once the concentration of hazardous constituents under §264.93 is reduced to levels below their respective concentration limits under §264.94.	See above.	
§264.100(f)	The owner/operator must continue corrective action measures during the compliance period to the extent necessary to ensure that the ground-water protection standard is not exceeded. If the owner or operator is conducting corrective action at the end of the compliance period, he must continue that corrective action for as long as necessary to achieve compliance with the ground-water protection standard. Owner/operator may terminate corrective action measures taken beyond the period equal to the active life of the waste management area (including the closure period) if he can demonstrate, based on data from the ground-water monitoring program under paragraph (d) of this section, that the ground-water protection standard of §264.92 has not been exceeded for a period of three consecutive years.	Corrective action measures will continue until hazardous constituent concentration limits are no longer exceeded during the period equivalent to the remaining active life of the waste management area (including closure period). If corrective action is still occurring at the end of this period, it will continue until concentration limits are no longer exceeded for 3 consecutive years.	
§264.100(g)	The owner/operator must report in writing to the Secretary on the effectiveness of the corrective action program. The owner/operator must submit these reports semi-annually.	Semi-annual reports on the effectiveness of the corrective action will be provided to the Secretary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(h)	The owner/operator determines that the corrective action program no longer satisfies the requirements of this section, he must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if it is determined that this program is no longer appropriate.	
§264.110(a)	Sections 264.111 through 264.115 apply to owners/operators of all hazardous waste management facilities.		Sections 1.0 and 2.0
§264.110(b)	Sections 264.116 through 264.120 apply to the owners/operators of:		Sections 3.0 and 4.0
§264.110(b)(1)	All hazardous waste disposal facilities;		Sections 3.0 and 4.0
§264.110(b)(2)	Waste piles and surface impoundments from which the owner/operator intends to remove wastes at closure . . .;		
§264.110(b)(3)	Tank systems that are required . . . to meet the requirements for landfills; and		
§264.110(b)(4)	Containment buildings that are required . . . To meet closure requirements for landfills.		
§264.110(c)	The Secretary may replace all or part of the requirements of this subpart (and the unit-specific standards referenced in §264.111(c) applying to a regulated unit), with alternative requirements set out in a permit or enforceable document, where the Secretary determines that:	The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the closure and post-closure care requirements of 264.111 - 264.120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet closure/post-closure care requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA L once they are approved .	Sections 1.0, 2.0, 3.0, and 4.0
§264.110(c)(1)	The regulated unit is situated among SWMUs or AOCs, a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	MDA L meets the criteria for alternative requirements because the existing land-based unit (Shafts 1, 13-17, and 19-34 and Impoundments B and D) is situated among SWMUs, a release has occurred, and the origin of the release is uncertain.	Sections 1.0 and 3.0, Attachment C
§264.110(c)(2)	It is not necessary to apply the closure requirements of this subpart (and those referenced herein) because the alternative requirements will protect human health and the environment and will satisfy the closure performance standard of §264.111(a) and (b).	The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet applicable closure and post-closure care requirements of §264.111 - 264.120; details will be provided in the CMI Plan.	Sections 1.0 and 3.0

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.111	Closure Performance Standard: Owner/operator must close the facility in a manner that:	For MDA L, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Section 1.2
§264.111(a)	Minimizes the need for further maintenance; and	For MDA L, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Sections 1.0, 2.0, and 3.0
§264.111(b)	Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.	For MDA L, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Sections 1.0, 2.0, and 3.0
§264.111(c)	Complies with the closure requirements of this subpart, including . . . the requirements of . . . 264.310 . . .	See 264.310 regulatory requirement in this table.	
§264.112(a)(1)	Owner/operator of a hazardous waste management facility must have a written closure plan. . . . The plan must be submitted with the permit application . . . and approved by the Secretary as part of the permit issuance procedures . . . In accordance with 270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit.	A closure plan for MDA L is included in this submittal. The closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the closure requirements of 264.111-264.115. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet the closure requirements.	Sections 1.0 and 2.0
§264.112(a)(2)	The Secretary's approval of the plan must ensure that the approved closure plan is consistent with 264.111 through 264.115 and the applicable requirements of Subpart F of this Part, . . . 264.310 . . .. Until final closure is completed and certified in accordance with 264.115, a copy of the approved plan and all approved revisions must be furnished to the Secretary upon request, including requests by mail.	NA	Introduction
§264.112(b)	Closure plan must identify steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least:	NA	Section 1.0
§264.112(b)(1)	A description of how each hazardous waste management unit at the facility will be closed in accordance with §264.111;	NA	Section 2.3

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(2)	A description of how final closure of the facility will be conducted in accordance with §264.111. The description must identify the maximum extent of the operations which will be unclosed during the active life of the facility; and	NA	Section 1.1
§264.112(b)(3)	An estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the type(s) of the off-site hazardous waste management units to be used, if applicable; and	NA	Sections 2.2 and 2.3
§264.112(b)(4)	A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard; and	NA	Section 2.3
§264.112(b)(5)	A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control; and	NA	Section 2.3
§264.112(b)(6)	A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover must be included.)	NA	Section 1.4
§264.112(b)(7)	For facilities that use trust funds to establish financial assurance under §264.143 or §264.145 and that are expected to close prior to the expiration of the permit, an estimate of the expected year of final closure.	NA	Section 1.6

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(8)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d), either the alternative requirements applying to the regulated unit, or a reference to the enforceable document containing those alternative requirements.	The closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet closure requirements. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet closure requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA L once they are approved.	Section 1.3
§264.112(c)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan in accordance with the applicable procedures in Parts 124 and 270. The written notification or request must include a copy of the amended closure plan for review or approval by the Secretary.	NA	Section 1.5
§264.112(c)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the closure plan at any time prior to the notification of partial or final closure of the facility.	NA	Section 1.5
§264.112(c)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:	NA	Section 1.5
§264.112(c)(2)(i)	Changes in operating plans or facility design affect the closure plan, or	NA	Section 1.5
§264.112(c)(2)(ii)	There is a change in the expected year of closure, if applicable, or	NA	Section 1.5
§264.112(c)(2)(iii)	In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan.	NA	Section 1.5
§264.112(c)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or § 264.140(d).	NA	Section 1.5

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(c)(3)	The owner/operator must submit a written request for a permit modification including a copy of the amended closure plan for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the owner or operator must request a permit modification no later than 30 days after the unexpected event. . . . . the Secretary will approve, disapprove, or modify this amended plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit issued.	NA	Section 1.5
§264.112(c)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.112(c)(2). The owner/operator must submit the modified plan within 60 days of the Secretary's request, or within 30 days if the change in facility conditions occurs during partial or final closure. Any modifications requested by the Secretary will be approved in accordance with the procedures in parts 124 and 270.	NA	Section 1.5
§264.112(d)	Notification of partial closure and final closure.		
§264.112(d)(1)	Owner/operator must notify the Secretary in writing at least 60 days prior to the date on which he expects to begin closure of a surface impoundment, waste pile, land treatment or landfill unit, or final closure of a facility with such a unit. . . .	NA	Section 1.4
§264.112(d)(2)	The date when it "expects to begin closure" must be either:		
§264.112(d)(2)(i)	No later than 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional hazardous wastes, no later than one year after the date on which the unit received the most recent volume of hazardous wastes. If the owner/operator of a hazardous waste management unit can demonstrate to the Secretary that the hazardous waste management unit or facility has the capacity to receive additional hazardous wastes and it has taken all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit; or	NA	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(d)(2)(ii)	For units meeting the requirements of §264.113(d), no later than 30 days after the date on which the hazardous waste management unit receives the known final volume of non-hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional non-hazardous wastes, no later than one year after the date on which the unit received the most recent volume of non-hazardous wastes. If the owner/operator can demonstrate to the Secretary that the hazardous waste management unit has the capacity to receive additional non-hazardous wastes and it has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit.	NA	
§264.112(d)(3)	If the facility's permit is terminated, or if the facility is otherwise ordered, by judicial decree or final order under section 3008 of RCRA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the owner/operator must close the facility in accordance with the deadlines established in §264.113.	NA	
§264.112(e)	Nothing in this section shall preclude the owner/operator from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure.	NA	NA
§264.113	Closure; Time allowed for closure		
§264.113(a)	Within 90 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner/operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at a hazardous waste management unit or facility, the owner/operator must treat, remove from the unit or facility, or dispose of on-site, all hazardous wastes in accordance with the approved closure plan. The Secretary may approve a longer period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	NA	NA
§264.113(a)(1)(i)	The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; or	NA	NA
§264.113(a)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	NA	NA
§264.113(a)(1)(ii)(B)	There is a reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	NA	NA
§264.113(a)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(a)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements.	NA	NA
§264.113(b)	The owner/operator must complete partial and final closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner or operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at the hazardous waste management unit or facility. The Secretary may approve an extension to the closure period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	NA	NA
§264.113(b)(1)(i)	The partial or final closure activities will, of necessity, take longer than 180 days to complete; or	NA	NA
§264.113(b)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	NA	NA
§264.113(b)(1)(ii)(B)	There is reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	NA	NA
§264.113(b)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	NA	NA
§264.113(b)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit or facility, including compliance with all applicable permit requirements.	NA	NA
§264.113(c)	The demonstrations referred to in paragraphs (a)(1) and (b)(1) of this section must be made as follows:		
§264.113(c)(1)	The demonstrations in paragraph (a)(1) of this section must be made at least 30 days prior to the expiration of the 90-day period in paragraph (a) of this section; and	NA	NA
§264.113(c)(2)	The demonstration in paragraph (b)(1) of this section must be made at least 30 days prior to the expiration of the 180-day period in paragraph (b) of this section, unless the owner/operator is otherwise subject to the deadlines in paragraph (d) of this section.	NA	NA
§264.113(d)	The Secretary may allow an owner/operator to receive only non-hazardous wastes in a landfill, land treatment, or surface impoundment unit after the final receipt of hazardous wastes at that unit if:	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(d)(1)	The owner or operator requests a permit modification in compliance with all applicable requirements in parts 270 and 124 of this title and in the permit modification request demonstrates that:	NA	NA
§264.113(d)(1)(i)	The unit has the existing design capacity as indicated on the part A application to receive non-hazardous wastes; and	NA	NA
§264.113(d)(1)(ii)	There is a reasonable likelihood that the owner or operator or another person will receive non-hazardous wastes in the unit within one year after the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(1)(iii)	The non-hazardous wastes will not be incompatible with any remaining wastes in the unit, or with the facility design and operating requirements of the unit or facility under this part; and	NA	NA
§264.113(d)(1)(iv)	Closure of the hazardous waste management unit would be incompatible with continued operation of the unit or facility; and	NA	NA
§264.113(d)(1)(v)	The owner or operator is operating and will continue to operate in compliance with all applicable permit requirements; and	NA	NA
§264.113(d)(2)	The request to modify the permit includes an amended waste analysis plan, ground-water monitoring and response program, human exposure assessment required under RCRA section 3019, and closure and post-closure plans, and updated cost estimates and demonstrations of financial assurance for closure and post-closure care as necessary and appropriate, to reflect any changes due to the presence of hazardous constituents in the non-hazardous wastes, and changes in closure activities, including the expected year of closure if applicable under § 264.112(b)(7), as a result of the receipt of non-hazardous wastes following the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(3)	The request to modify the permit includes revisions, as necessary and appropriate, to affected conditions of the permit to account for the receipt of non-hazardous wastes following receipt of the final volume of hazardous wastes; and	NA	NA
§264.113(d)(4)	The request to modify the permit and the demonstrations referred to in paragraphs (d)(1) and (d)(2) of this section are submitted to the Secretary no later than 120 days prior to the date on which the owner/operator of the facility receives the known final volume of hazardous wastes at the unit, or no later than 90 days after the effective date of this rule in the state in which the unit is located, whichever is later.	NA	NA
§264.113(e)	Requirements for the owner/operator of a hazardous waste surface impoundment that is not in compliance with the liner and leachate collection system requirements.	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.114	During the partial and final closure periods, all contaminated equipment, structures and soils must be properly disposed of or decontaminated unless otherwise specified in §§ 264.197, 264.228, 264.258, 264.280 or § 264.310. By removing any hazardous wastes or hazardous constituents during partial and final closure, the owner/operator may become a generator of hazardous waste and must handle that waste in accordance with all applicable requirements of part 262 of this chapter.	NA	NA
§264.115	Within 60 days of completion of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill unit, and within 60 days of the completion of final closure, the owner/operator must submit to the Secretary, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for closure under §264.143(i).	NA	Section 1.7
§264.116	No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary, a survey plat indicating the location and dimensions of landfills cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable Subpart G regulations.	NA	Section 1.10
§264.117	Post-closure care and use of property		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(a)(1)	Post-closure care for each hazardous waste management unit subject to the requirements of §§ 264.117 through 264.120 must begin after completion of closure of the unit and continue for 30 years after that date and must consist of at least the following:	A post-closure plan for MDA L is included in this submittal. The post-closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	Section 3.2
§264.117(a)(1)(i)	Monitoring and reporting in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	Sections 4.1 and 4.3
§264.117(a)(1)(ii)	Maintenance and monitoring of waste containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part.	See above.	Sections 4.1 and 4.2
§264.117(a)(2)	Any time preceding partial closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period for a particular unit, the Secretary may, in accordance with the permit modification procedures in parts 124 and 270:		
§264.117(a)(2)(i)	Shorten the post-closure care period applicable to the hazardous waste management unit, or facility, if all disposal units have been closed, if he finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or ground-water monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit or facility is secure); or	NA	Section 3.2
§264.117(a)(2)(ii)	Extend the post-closure care period applicable to the hazardous waste management unit or facility if he finds that the extended period is necessary to protect human health and the environment (e.g., leachate or ground-water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment).	NA	Section 3.2

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(b)	The Secretary may require, at partial and final closure, continuation of any of the security requirements of §264.14 during part or all of the post-closure period when:	NA	Section 3.6
§264.117(b)(1)	Hazardous wastes may remain exposed after completion of partial or final closure; or	NA	Section 3.6
§264.117(b)(2)	Access by the public or domestic livestock may pose a hazard to human health.	NA	Section 3.6
§264.117(c)	Post-closure use of property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the facility's monitoring systems, unless the Secretary finds that the disturbance:	NA	Section 4.4
§264.117(c)(1)	Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or	NA	Section 4.4
§264.117(c)(2)	Is necessary to reduce a threat to human health or the environment.	NA	Section 4.4
§264.117(d)	All post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in §264.118.	The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	Section 3.2
§264.118	Post-Closure Plan, Amendment of Plan		
§264.118(a)	The owner/operator of a hazardous waste disposal unit must have a written post-closure plan. . . . The plan must be submitted with the permit application, . . . , and approved by the Secretary as part of the permit issuance procedures under Part 124 of this chapter. In accordance with §270.32 of this chapter, the approved post-closure plan will become a condition of any RCRA permit issued.	A post-closure plan for MDA L is included in this submittal. The post-closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	Introduction, Sections 3.0 and 4.0
§264.118(b)	For each hazardous waste management unit subject to the requirements of this section, the post-closure plan must identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least:	See above.	Section 4.0

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(b)(1)	A description of the planned monitoring activities and frequencies at which they will be performed to comply with subparts F, K, L, M, N, and X of this part during the post-closure care period; and	See above.	Section 4.1
§264.118(b)(2)	A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure:	See above.	Section 4.2
§264.118(b)(2)(i)	The integrity of the cap and final cover or other containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	See above.	Section 4.2.1
§264.118(b)(2)(ii)	The function of the monitoring equipment in accordance with the requirements of subparts, F, K, L, M, N, and X of this part; and	See above.	Section 4.2.2
§264.118(b)(3)	The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure care period.		Section 4.5
§264.118(b)(4)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §§264.90(f), 264.110(c), and/or §§264.140(d), either the alternative requirements that apply to the regulated unit, or a reference to the enforceable document containing those requirements.		Section 3.2
§264.118(c)	Until final closure of the facility, a copy of the approved post-closure plan must be furnished to the Secretary upon request, including request by mail. After final closure has been certified, the person or office specified in §264.188(b)(3) must keep the approved post-closure plan during the remainder of the post-closure period.		Introduction
§264.118(d)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan in accordance with the applicable requirements in parts 124 and 270. The written notification or request must include a copy of the amended post-closure plan for review or approval by the Secretary.		Section 3.3
§264.118(d)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period.		Section 3.3
§264.118(d)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:		Section 3.3
§264.118(d)(2)(i)	Changes in operating plans or facility design affect the approved post-closure plan, or		Section 3.3
§264.118(d)(2)(ii)	There is a change in the expected year of final closure, if applicable, or		Section 3.3
§264.118(d)(2)(iii)	Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan.		Section 3.3
§264.118(d)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d).		Section 3.3

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(d)(3)	The owner/operator must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan. An owner/operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to submit a contingent post-closure plan under § 264.228(c)(1)(ii) and §264.258(c)(1)(ii) must submit a post-closure plan to the Secretary no later than 90 days after the date that the owner or operator or the Secretary determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §264.310. The Secretary will approve, disapprove or modify this plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved post-closure plan will become a permit condition.		Section 3.3
§264.118(d)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.118(d)(2). The owner/operator must submit the modified plan no later than 60 days after the Secretary's request, or no later than 90 days if the unit is a surface impoundment or waste pile not previously required to prepare a contingent post-closure plan. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in parts 124 and 270.		Section 3.3
§264.119(a)	No later than 60 days after certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the owner/operator must identify the type, location, and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records it has kept.		Section 3.7
§264.119(b)	Within 60 days of certification of closure of the first hazardous waste disposal unit and within 60 days of certification of closure of the last hazardous waste disposal unit, the owner/operator must:		Section 3.7
§264.119(b)(1)	Record, in accordance with State law, a notation on the deed to the facility property -- or on some other instrument which is normally examined during title search -- that will in perpetuity notify any potential purchaser of the property that:		Section 3.7
§264.119(b)(1)(i)	The land has been used to manage hazardous wastes; and		Section 3.7
§264.119(b)(1)(ii)	Its use is restricted under 40 CFR subpart G regulations; and		Section 3.7

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.119(b)(1)(iii)	The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the facility required by §264.116 and §264.119(a) have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Secretary; and		Section 3.7
§264.119(b)(2)	Submit a certification, signed by the owner/operator, that he has recorded the notation specified in paragraph (b)(1) of this section, including a copy of the document in which the notation has been placed, to the Secretary.		Section 3.7
§264.119(c)	If the owner/operator or any subsequent owner/operator of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes and hazardous waste residues, the liner, if any, or contaminated soils, it must request a modification to the post-closure permit in accordance with the applicable requirements in parts 124 and 270. The owner/operator must demonstrate that the removal of hazardous wastes will satisfy the criteria of §264.117(c). By removing hazardous waste, the owner/operator may become a generator of hazardous waste and must manage it in accordance with all applicable requirements of this chapter. If it is granted a permit modification or otherwise granted approval to conduct such removal activities, the owner/operator may request that the Secretary approve either:		Section 3.3
§264.119(c)(1)	The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or		Section 3.3
§264.119(c)(2)	The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.		Section 3.3
§264.120	No later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the owner/operator must submit to the Secretary, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification must be signed by the owner/operator and an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for post-closure care under §264.145(i).		Section 3.5

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310	Closure and post-closure care for landfills.	A post-closure plan for MDA L is included in this submittal. The post-closure of MDA L will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA L will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA L will describe in detail how the selected corrective measure will meet post-closure care requirements.	
§264.310(a)	At final closure of the landfill or upon closure of any cell, the owner/operator must cover the landfill or cell with a final cover designed and constructed to:	See above.	Section 2.3
§264.310(a)(1)	Provide long-term minimization of migration of liquids through the closed landfill;	See above.	Section 2.3
§264.310(a)(2)	Function with minimum maintenance;		Section 2.3
§264.310(a)(3)	Promote drainage and minimize erosion or abrasion of the cover;		Section 2.3
§264.310(a)(4)	Accommodate settling and subsidence so that the cover's integrity is maintained; and		Section 2.3
§264.310(a)(5)	Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	See above.	Section 2.3
§264.310(b)	After final closure, the owner/operator must comply with all post-closure requirements contained in §264.117 through §264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under §264.117). The owner/operator must:	See above.	Section 4.0
§264.310(b)(1)	Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;	See above.	Sections 3.2 and 4.2.1
§264.310(b)(2)	Continue to operate the leachate collection and removal system until leachate is no longer detected;	See above.	Section 4.2.2
§264.310(b)(3)	Maintain and monitor the leak detection system in accordance with § 264.301(c)(3)(iv) and (4) and §264.303(c), and comply with all other applicable leak detection system requirements of this part;	See above.	Sections 4.1 and 4.2
§264.310(b)(4)	Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of subpart F of this part;	See above.	Sections 4.1 and 4.2
§264.310(b)(5)	Prevent run-on and run-off from eroding or otherwise damaging the final cover; and	See above.	Sections 3.2 and 4.2
§264.310(b)(6)	Protect and maintain surveyed benchmarks used in complying with §264.309.	See above.	Section 4.2.2

ATTACHMENT B

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA L

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA L

April 2002

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LIST OF ABBREVIATIONS/ACRONYMS

bgs	below ground surface
CA	composite analysis
cm	centimeter(s)
cm^2	square centimeters
cm/hr	centimeters per hour
cm/sec	centimeters per second
cm/yr	centimeters per year
DQO	Data Quality Objective
EP	Extraction Procedure
ER	Environmental Restoration
FEHM	Finite Element Heat and Mass
ft	feet (foot)
ft/d	feet per day
ft/yr	feet per year
FY	Fiscal Year
HE	high explosives
in.	inch(es)
in./yr	inches per year
LANL	Los Alamos National Laboratory
m	meter(s)
MCL	maximum concentration level
MDA	material disposal area
µg/L	micrograms per liter
mg/L	milligrams per liter

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

mm	millimeter(s)
mm/yr	millimeters per year
NMED	New Mexico Environment Department
PA	performance assessment
pCi/L	picocuries per liter
ppm	parts per million
R	regional aquifer
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
TA	technical area
VOC	volatile organic compound

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA L

1.0 GEOLOGY AND HYDROLOGY AT TECHNICAL AREA 54, AREA L

Numerous investigations of the geology and hydrology at Technical Area (TA) 54 have been conducted at Los Alamos National Laboratory (LANL). The following sections describe the extensive studies conducted at TA-54 in the past, and present information on future characterization activities and hydrologic modeling. LANL's TA-54, Area L, is located on Mesita del Buey, an east-west trending mesa bordered on the north by Cañada del Buey and on the south by Pajarito Canyon.

1.1 Geology and Stratigraphy

The following information on the geology and stratigraphy at TA-54 was obtained from borehole core logs. Unit 2 of the Tshirege Member of the Bandelier Tuff is at the surface of Mesita del Buey. This moderately welded ash-flow tuff forms nearly vertical cliffs on the sides of mesas, and at Area L is approximately 45 to 50 feet (ft) thick. A series of thin, discontinuous surge beds mark the base of Unit 2. Tshirege Member Unit 1v underlies Unit 2. This vapor-phase altered cooling unit forms sloping outcrops, and is further divided into Units 1vu and 1vc. Unit 1vu is a poorly welded ash-flow tuff. At TA-54, the thickness of Unit 1vu ranges from about 90 ft near Material Disposal Area (MDA) H to about 46 ft near MDA G. Unit 1vc is a moderately to poorly welded ash-flow tuff and ranges from 49 ft thick at the western end of Mesita del Buey to 23-26 ft thick at the eastern end. At the base of Unit 1v is Tshirege Member Unit 1g, which is a vitric, pumiceous, nonwelded ash-flow tuff. This unit is about 150 ft thick at MDA H, and thins to about 49 ft thick at the eastern end of MDA G. A distinctive pumice-poor surge deposit forms the base of Unit 1g. Beneath Unit 1g is the Tsankawi Pumice Bed, which at Area L is a thin (about 3-ft-thick) bed of gravel-sized pumice. It is the basal air fall deposit of the Tshirege Member. The Cerro Toledo interval is stratigraphically beneath the Tsankawi Pumice Bed; it separates the Tshirege and Otowi Members of the Bandelier Tuff, and averages about 40 ft thick at Area L. The Otowi Member is a massive, nonwelded, pumice-rich ash-flow tuff. At Area L, it ranges from about 64 to 109 ft thick. At the base of the Otowi Member is the Guaje Pumice Bed. At Area L, this basal air fall deposit averages about 9 ft thick. Beneath the Guaje Pumice Bed are the Cerros del Rio basalts. It is inferred that these basalts exist beneath Mesita del Buey, based on borehole data at Area L, and the thickness beneath TA-54 was extrapolated to be between 262 and 492 ft. Although the depth to and thickness of the Puye Formation

beneath the Cerros del Rio basalts at TA-54 were not determined as a result of borehole investigations, they were encountered beneath the basalts at a water-supply well in Pajarito Canyon, approximately one mile west of Mesita del Buey.

1.2 Soils

Mesa-top soils at TA-54 form from weathering of the Tshirege Member of the Bandelier Tuff and from aeolian deposits. These soils are primarily Hackroy sandy loams that typically range from a brown sandy loam in the top 8 centimeters (cm) to a reddish brown from 8 to 30 cm in depth. Where present, the native soils are thickest near the mesa's center and thinner near the edges. Generally, the mesa surface soils are thin and poorly developed. Near the surface, their texture is sandy; beneath the surface, they exhibit a more clay-like texture. Permeability rates range from 5 to 15 cm per hour (cm/hr) in the top layers down to 0.15 to 0.50 cm/hr in the lower layers. In addition to Hackroy sandy loams, soil types at TA-54 include Nyjack loam, Totavi gravelly loamy sand, Hackroy-Rock outcrop complex, Servilleta loam, Penistaja sandy loam, and Prieta silt loam (Nyhan et al., 1978).

1.3 Surface Water

Mesita del Buey is one of the drier mesas at LANL and there are no streams on the mesa. Surface water flows only as storm water and snowmelt runoff. South of Mesita del Buey, Pajarito Canyon is one of the wetter canyons at LANL; north of Mesita del Buey, Cañada del Buey is one of the driest. Streams in these canyons are intermittent.

1.4 Perched Water

To meet a May 7, 1985 Compliance Order/Schedule, test wells were installed in the canyons north and south of TA-54 to determine if perched water existed within canyon alluvium, to determine if perched water extended beneath Mesita del Buey, and to sample/monitor perched water, if present (IT Corporation, 1987). In 1985, three test wells were installed in a tributary to Cañada del Buey; they include CDBO-1 (to a depth of 15 ft), CDBO-2 (30 ft), and CDBO-3 (20 ft); test well CDBO-4 (to a depth of 21 ft) was installed further to the east in Cañada del Buey. All 4 wells were dry; however, they were completed as observation wells to monitor the alluvium for possible water in the future (Purtymun, 1995). The 1985 investigation indicated that the alluvium in Cañada del Buey contained no perched water (Devaurs and Purtymun, 1985).

Three test wells were also installed in Pajarito Canyon in 1985; they are PCO-1, PCO-2, and PCO-3 (Purtymun, 1995). These 3 wells are sampled for radionuclides, metals, general inorganics, and organics. Sampling results are compiled annually in environmental surveillance reports and submitted to the New Mexico Environment Department (NMED). To ensure that the alluvial aquifer in Pajarito Canyon did not extend northward beneath Mesita del Buey, 4 test holes were drilled in the canyon floor north of the intermittent stream channel in 1985 (Devaurs and Purtymun, 1985). These 4 test holes, designated PCM-1, PCM-2, PCM-3, and PCM-4, were dry. They were completed for use as moisture-access holes (Purtymun, 1995). It was concluded that perched water in Pajarito Canyon is confined to the alluvium in the stream channel and does not extend to the flank of the canyon (Purtymun, 1995). As stated in the "Hydrogeologic Workplan" (LANL, 1998), no perched groundwater has been identified beneath Mesita del Buey.

In addition to the seven test holes drilled in Pajarito Canyon in 1985, two test holes were drilled in 1950 as part of a water-supply study (Griggs, 1964; Purtymun, 1975). These holes are identified as T-5 and T-6; they were drilled to depths of 263 ft and 300 ft, respectively, and completely penetrated the Bandelier Tuff beneath the floor of Pajarito Canyon. No water was encountered. The same holes were dry when measured in 1985 (Devaurs and Purtymun, 1985).

Two mesa-top test holes at Area G were drilled to depths that were equivalent to up to 40 ft beneath the base of the alluvium in Pajarito Canyon, and three mesa-top test holes at Area L were drilled to depths that were equivalent to up to 48 ft beneath the Pajarito Canyon allluvium. None of these test holes encountered perched water (IT Corporation, 1987).

Five observation wells were installed in Cañada del Buey, mostly up-gradient from Area L, as part of a 1992 investigation for a proposed sanitary wastewater treatment plant. These wells, installed to study the effect of effluent release on the environment in the canyon, are CDBO-5, CDBO-6, CDBO-7, CDBO-8, and CDBO-9. In addition, two moisture-access holes (CDBM-1 and CDBM-2) were drilled north of Area L in 1992. Perched water was encountered in the canyon alluvium at wells CDBO-6 and CDBO-7. It was determined that the perched water at these locations is likely only the result of operational discharges from well PM-4 (Purtymun, 1995).

1.5 Vadose Zone

A summary of the hydrogeology of Areas G and L and additional data and discussions relevant to the potential for migration of hazardous waste from MDAs G and L is presented in the "Hydrogeologic Assessment of Technical Area 54, Areas G and L, Los Alamos National Laboratory" (IT Corporation, 1987). The assessment was prepared in response to a May 7, 1985 Compliance Order/Schedule issued to LANL by the New Mexico Environmental Improvement Division. The Order mandated specific tests and investigations be performed at Areas G and L to obtain information on the hydrologic characteristics of the waste disposal areas relevant to the potential for hazardous waste or hazardous constituent migration into the groundwater. The discussion that follows is extracted from the assessment (IT Corporation, 1987) prepared using numerous reports by Bendix Field Engineering Corporation and LANL on the results of individual tests or groups of tests.

In late 1985 and 1986, an investigation was initiated to fulfill the testing requirements of the Order, which included characterizing the vadose zone in and around MDA L. Eighteen (18) boreholes were drilled to a depth ranging from 60 to 145 ft into the Bandelier Tuff from the top of Mesita del Buey. Nearly 1,700 ft of core was obtained from 16 of these holes. An additional 60-ft deep borehole was drilled near a surface impoundment at Area L. Hydrologic testing and geophysical logging were performed in the boreholes, and selected core samples were analyzed for numerous parameters. A number of boreholes were completed for pore-gas sampling, neutron moisture monitoring, and psychrometer installation. As discussed in Section 1.4, holes were also drilled in Cañada del Buey and Pajarito Canyon, adjacent to Mesita del Buey, to investigate possible alluvial aquifers.

To provide a quantitative analysis of moisture movement in the Bandelier Tuff, vadose zone characterization studies were conducted at Areas G and L. The quantitative analyses would help to determine the likelihood of contaminant migration from Areas G and L through the vadose zone and into groundwater beneath the sites. To quantify moisture movement in the tuff, a two-tiered approach was utilized. First, hydrologic characteristics of the tuff and hydraulic head were measured to calculate seepage velocity and rates of moisture flux. Second, the moisture content of the tuff was measured after precipitation events to determine changes in moisture content with depth.

Hydrologic testing was performed in the boreholes and on borehole core samples in the laboratory to allow calculation of seepage velocity and moisture flux rates in the tuff. Intrinsic permeability was measured in boreholes through air injection and vacuum tests. Laboratory tests included the Dynamic Method to measure gas-water relative permeability, and gas injection with correction for slippage. Intrinsic permeability ranged from about 10^{-8} to 10^{-9} square centimeters (cm^2) for fractured and unfractured intervals. Similar results were obtained from a water injection test performed to verify the results of the air injection tests. Vacuum tests performed in the same boreholes yielded slightly lower permeability values; however, they also averaged in the 10^{-8} to 10^{-9} cm^2 range. In the laboratory tests, intrinsic permeability yielded values in the low 10^{-9} cm^2 range. Because discontinuities that occur in the rock intersected by the borehole are not typically present in laboratory-tested cores, lower intrinsic permeability values are expected for laboratory tests.

Laboratory measurements were conducted for gravimetric moisture content, soil-moisture characteristic curves, and unsaturated hydraulic conductivity of borehole tuff samples. The gravimetric moisture content generally ranged from 2 to 4%, with isolated intervals that ranged up to 10 to 28%. Soil moisture characteristic curves were determined for 20 tuff samples, and moisture content was determined for capillary pressures in the range of -0.03 to -0.34 bar. Attempts to measure moisture contents at lower capillary pressures were not successful because samples disaggregated. Hence, moisture characteristic curves could only be determined for volumetric moisture contents above 22%, which is considerably higher than the values observed from testing core samples of field measurements. From the characteristic curve data, it was concluded that moisture retention values of the tuff are extremely high, and ranged up to 80% (60% volumetric moisture). The moisture retention value of 80% indicates that no liquid transport can occur at moisture content below this value. Because all of the moisture content measurements for the tuff were significantly below 80%, it was concluded that capillary transport of liquids does not contribute to moisture movement and vapor transport is clearly the major mechanism of water transport. Unsaturated flow is not likely to be a major factor in liquid transport at these moisture content levels.

This conclusion was supported by actual measurements of moisture content in the tuff at depth. Neutron logging was performed every two weeks at one borehole each in Areas G and L for approximately eight months. In addition, neutron logging was performed daily for a period after three major precipitation events. Moisture profiles measured with neutron logging showed the

upper 10 to 20 ft of tuff to be affected by precipitation events and subject to seasonal fluctuations. However, below 20 ft, the moisture content is extremely low and in the range of the gravimetric moisture values (2 to 4%).

The 1986 moisture profiles were consistent with moisture measurements conducted previously on the Bandelier Tuff. Neutron-moisture data of the tuff at various locations at LANL were measured between 1960 and 1980 (Abeele et al., 1981). Those data showed that moisture conditions ranged from 10 to 40% by volume in the upper 10 to 15 ft of tuff, and that below 15 ft, moisture rarely exceeded 5 to 10%. In addition, those data showed that in the uppermost four meters of disturbed areas at Area G, significant seasonal fluctuations in moisture content exist. Those findings are consistent with the 1986 data. Overall, the moisture data reported in Abeele et al. (1981) and in the hydrogeological assessment (IT Corporation, 1987) are consistent and show the following:

- Throughout the area, moisture content of the tuff is low (typically between 2 to 5% with intervals ranging up to 10 to 28%)
- In the upper 10 to 20 ft of tuff, seasonal variation of moisture content occurs; however, below ~20 ft, seasonal variations are not measurable
- Precipitation from monitored autumn storms does not infiltrate below ~10 ft.

From these studies, the following conclusions were made: 1) the tuff is not saturated and is in fact very dry; and 2) moisture from precipitation does not infiltrate to a significant depth. Therefore, meteoric water infiltration is not a viable process for transport of hazardous waste or hazardous constituents through the vadose zone at Areas G and L.

Thermocouple psychrometers were installed at numerous depths in one borehole each in Areas G and L to measure capillary potential. The psychrometer data were highly variable, but indicated that soil moisture tensions ranged from 1 to 15 bars. Moisture flux calculations were performed using measured hydraulic conductivity values for the tuff and hydraulic head data from the psychrometers to determine maximum rates of moisture movement in the tuff. A maximum downward flux (using average measured hydraulic conductivity) of 0.254 ft per year (ft/yr) and a maximum upward flux of 0.198 ft/yr were calculated using average measured hydraulic conductivity for Area L. Because only hydraulic conductivity values at higher percentages of saturation than those actually observed in the field were available, the

calculated flux rates very likely overestimate the moisture flux values. Because hydraulic conductivity in the vadose zone typically increases with increases in percent saturation, the measured hydraulic conductivity values are greater than the actual field conditions. If calculated (rather than measured) hydraulic conductivity values are used, lower flux rate values (by approximately an order of magnitude) are predicted. The moisture flux values, though highly conservative, show that very long periods of time would be required for water and contaminants to move by unsaturated flow from the MDAs to the groundwater. In summary, there is no evidence to suggest that saturation of the tuff and subsequent transport of contaminants by saturated flow is likely.

Based on the data collected in the 1985/1986 investigation, the following conclusions were made regarding the hydrologic characterization of the vadose zone and potential aqueous phase migration of contaminants:

- The Bandelier Tuff is characterized by very low moisture content (typically in the range of 2 to 5%). This value is well below the porosity; thus, moisture movement by unsaturated flow processes predominate over saturated flow.

- The tuff has high moisture retention properties and is very porous, averaging 50% porosity.

- Intrinsic permeability tests (both field and laboratory) indicate average permeability of the tuff to be 10^{-8} to 10^{-9} cm^2.

- Permeability tests conducted in the field do not indicate increased permeability in zones adjacent to fractures in boreholes. Aperture, trace, and degree of fracture filling is variable, however, and permeability along fractures may vary significantly.

- The tuff's unsaturated hydraulic conductivity was determined to be approximately 10^{-8} centimeters per second at approximately 20 to 40% moisture content, determined by measured effective permeability and using van Genuchten's model. Actual moisture conditions and unsaturated hydraulic conductivity are likely lower than these values.

- Due to the low moisture content in the tuff and the low degree of consolidation within the sampled tuff, soil-characteristic curves for intact cores could not be determined for the range of moisture/tension conditions present in the field.

- Soil water tension measured by thermocouple psychrometers range from 1 to 15 bars. Monthly averages typically ranged from 2 to 7 bars.

- Seasonal variation of moisture occurs in the upper 10 to 15 ft of the vadose zone, as indicated by neutron measurements of vadose zone moisture. Below 15 ft, moisture content does not appear to change with time. Neutron measurements of moisture following precipitation events indicate the maximum depth of wetting to be approximately 10 ft. At a

depth of 22 ft, no influence of precipitation on moisture content was observed; moisture is assumed to be returned to the surface by evapotranspiration.

- The maximum flux rate using average measured hydraulic conductivity at Area L ranged from a downward rate of 0.254 ft/yr to a maximum upward rate of 0.198 ft/yr. These moisture flux values show that very long periods of time would be required for water and contaminants to move by unsaturated flow.

Chemical characterization of the Bandelier Tuff vadose zone was also conducted at Areas G and L to fulfill the requirements of the May 7, 1985 Compliance Order. The data were obtained from core sample analysis and pore-gas sampling and analysis. A total of 70 core samples were collected from seven boreholes at Areas G and L (Devaurs, 1985). In addition, three test hole locations adjacent to Impoundment B at Area L were selected for coring, together with one shallow test hole location selected within the impoundment. All cores except two had Extraction Procedure (EP) Toxic metals below detection limit concentrations, which are well below EP Toxicity concentrations. An Area L core sample, collected from the 10- to 20-ft depth near Impoundment B, slightly exceeded the EP Toxic regulatory limit for chromium. Chromium and cadmium concentrations above EP Toxic levels were also present in the 8 to 29-inch depth samples from Impoundment B. No EP Toxic metals were detected in any boreholes at Area L below a depth of 30 ft. It was noted that the lower detection limit for most of the volatile organic compounds (VOC) was in the parts per million (ppm) range, which did not allow detection for possible trace concentrations present. At Area L, VOCs were detected in core samples from various depths in five of the boreholes from which samples were collected. The detected compounds included a suite of common solvents and ketones (e.g., methylene chloride, acetone, tetrahydrofuran, and methyl ethyl ketone). The concentrations of these compounds ranged from parts per billion to ppm at depths up to 100 ft, the approximate depths of the holes.

Twenty-three sampling ports were installed in seven boreholes to allow collection of pore-gas at various depths (Devaurs and Bell, 1986). The pore-gas samples were collected by pumping air from the sampling port through charcoal adsorption tubes. The volatile organics were then extracted from the charcoal for analysis. The analytical results indicated that VOCs in the pore gas were present in ppm concentrations at depths up to approximately 100 ft, the approximate depths of the holes.

The core analyses and the pore-gas data suggested that volatile organic constituents from the wastes disposed of at MDA L have migrated into the tuff. It was determined that, based on the

vadose zone characterization studies, vapor diffusion is the predominant mechanism for migration.

As noted in the hydrogeologic assessment prepared in 1987 (IT Corporation), the regional aquifer was encountered at a depth of approximately 875 ft just west of Areas G and L. Calculations using the hydraulic gradient of the Tesuque Formation (0.015) predicted depths to the regional aquifer beneath Area L as 950 ft.

Water samples collected from the wells in Pajarito Canyon (described in Section 1.4) were analyzed for VOCs, selected metals, and radionuclides. No VOCs were detected in these samples, and metal and radionuclide concentrations were found to be below drinking water standards. It was concluded that there appears to be no discernable effect on water quality in Pajarito Canyon from disposal operations at Area L.

Based on the hydrogeologic investigations performed at Mesita del Buey in 1985 and 1986 and on other previous work, several specific conclusions were reached regarding the characteristics of Areas G and L and the potential for contaminant migration from the waste disposal units there. These conclusions are:

- The stratigraphy of the Bandelier Tuff at Areas G and L is similar to that throughout the western portion of the Pajarito Plateau.
- Vertical and near-vertical cooling fractures are common in the tuff at Mesita del Buey.
- No major fault zones are known to exist at or near Areas G and L that could serve as conduits from the shallow subsurface to the regional groundwater.
- Together, the very low moisture content in the tuff, the empirical determination that moisture from precipitation does not infiltrate below a depth of 10 to 22 ft, and the very low calculated flux rates all suggest that aqueous transport of contaminants is not a viable mechanism for contaminant migration at Areas G and L.
- Based on the results of core and pore-gas analyses, volatile organic constituents have migrated (predominantly in the vapor phase) from the MDAs into the tuff.
- At Area L, elevated levels of metals were detected in samples from only two locations (within and adjacent to Impoundment B) at shallow depths (30 ft or less).
- Based on the presence of volatile organic vapors at depths of up to 100 ft, core and pore-gas data support vapor phase migration as the dominant transport mechanism at TA-54.

- No perched water bodies that could be connected hydraulically to the regional aquifer were detected beneath Areas G and L.

- No perched water was detected in Cañada del Buey. Perched water in Pajarito Canyon is confined to the alluvium within the canyon and does not extend vertically or horizontally into the Bandelier Tuff that forms Mesita del Buey.

- There is no evidence of liquid migration from Areas G and L into the alluvial perched water in Pajarito Canyon.

Hydrogeologic conditions at TA-54 were also investigated as part of the performance assessment (PA) and composite analysis (CA) for the low-level radioactive waste disposal facility at MDA G, which is only 0.5 miles east of Area L. The following discussion summarizes the hydrogeologic conditions reported in the "Performance Assessment and Composite Analysis for Los Alamos National Laboratory Material Disposal Area G" (LANL, 1997), which presents the most recent vadose zone information available. This information is indicative of the condition at Area L because of its close proximity to Area G. Overall, the report was generally in agreement with previous investigations and stated that when combined with the semiarid climate, the Bandelier Tuff is typically very dry and that the volumetric moisture content averages about 5%, although it is quite variable depending on location. Moisture variations due to near-surface climatic influences, influences of fractures, and textural differences between tuff units and interbeds are suggested by routine moisture measurements taken from boreholes at numerous locations around MDA G. Evaporation and transpiration from the mesa's surface (i.e., evapotranspiration) remove much of the moisture from precipitation absorbed by the tuff. This investigation also found that evapotranspiration is effective to depths of 1 to 2 meters (m) (3 to 7 ft), where plant roots are abundant. In addition to the near-surface drying, evaporation appears to occur along the sides of the mesa and in fractures and surge beds, which are layers within the mesa that appear to allow air flow. The relative absence of moisture nearly eliminates the possibility that contaminants will be transported through the tuff to the regional aquifer (LANL, 1997).

The PA/CA was supported by a fairly complete set of data and observations to characterize the uppermost 60 m (200 ft) of the Tshirege Member of the Bandelier Tuff beneath MDA G. Unit 2 of the Bandelier Tuff is the caprock that forms the top of Mesita del Buey. This unit is extensively fractured as a result of contraction upon post-depositional cooling. The cooling-joint fractures, which are mostly vertical, generally dissipate at the bottom of Unit 2, which at Area G is about 12 m (39 ft) thick. Mean spacing between fractures is about 1 m (3.3 ft), and fracture

widths range from less than 1 millimeter (mm) to 13 mm (<0.03 to 0.51 inches [in.]) with a median of 3 mm (0.12 in.). Typically, fractures are filled with smectite clays to a depth of about 3 m (10 ft). Smectite clays (e.g., montmorillonite) are known for their tendency to swell when water is present and for their ability to strongly bind certain elements. Both of these properties have implications for transport of contaminants in fractures (LANL, 1997). Typically, fractures in Unit 2 do not extend into Unit 1vu. Only the more prominent cooling fractures originating in Unit 2 continue into the more welded upper section of Unit 1 vu; however, they die out in the less consolidated lower section.

The degree of welding and devitrification are two properties of the tuff that influence fluid flow. In welded, devitrified tuff, there are several competing effects that determine moisture content and fluid flux. Welded tuffs tend to be more fractured than non-welded tuffs. Although water moves slowly through an unsaturated tuff matrix, it can move relatively rapidly through fractures only if nearly saturated conditions exist (LANL, 1997). As indicated by modeling studies, moisture is absorbed into the matrix when fractures disappear at contacts between stratigraphic subunits, when fracture fills are encountered, or when coatings are interrupted. Because fractures are open to the passage of both air and water, they can have both wetting and drying effects, depending on the relative abundance of water in the fractures and matrix (LANL, 1997).

As a rule, the Tshirege Member of the Bandelier Tuff is very dry and does not readily transmit moisture. Most of the pore spaces in the tuff are small enough to be of capillary size and have a strong tendency to hold water against gravity by surface-tension forces. Moisture content is generally more variable near the top of the mesa than in the central portions as a result of variations in temperature, humidity, and evapotranspiration. Vegetation is very effective at removing moisture near the surface by transpiration. During the summer rainy season when rainfall is highest, near-surface moisture content is variable due to the effects of higher rates of evaporation and of transpiration by vegetation, which flourishes during this time (LANL, 1997).

For the PA/CA, a great deal of information was needed to first conceptualize and then model moisture flow and contaminant transport in the vadose zone. The necessary information included the basic properties of the tuff (e.g., porosity, density, fracture patterns, and mineralogy); these can be measured accurately. It also included the complicated relationships describing how fluids move through the tuff (e.g., moisture content, matric suction, and hydraulic conductivity), which are more difficult to establish with a great deal of certainty in a matrix with

very low moisture content. A number of field, laboratory, and analytical studies were performed to support the development of conceptual and mathematical models for flow and transport in the vadose zone (LANL, 1997).

Characteristic curves are relationships used to model unsaturated liquid flow through rock, and include moisture retention and hydraulic conductivity curves. The moisture retention of a material is controlled by the relationship between the suction within the matrix and the water content for a porous material. Hydraulic conductivity is the rate at which water can travel through a rock or soil sample under the influence of gravity. Generally, rocks and soils have higher hydraulic conductivities when more moisture is present, with the maximum hydraulic conductivity occurring when the material is fully saturated with water. This condition is the saturated hydraulic conductivity. Texture has a large impact on moisture retention and hydraulic conductivity as well, where low surface area materials (e.g., sand) have a higher hydraulic conductivity than high surface area materials (e.g., clays).

The volumetric moisture content for the units beneath MDA G range between 2 and 14% by volume, and the unsaturated hydraulic conductivity curves prepared for the PA/CA are very steep at such low moisture contents. This indicates that for a unit increase in water, there is a large increase in hydraulic conductivity. For example, in Unit 2 the unsaturated hydraulic conductivity changes from 10^{-12} cm per second (cm/sec) at 3% volumetric moisture content to 10^{-10} cm/sec at 5% volumetric moisture content. This also illustrates the effects of the physical characteristics discussed above. The slopes of the conductivity curves generally level out when the moisture content reaches 7% and indicate that the hydraulic conductivity remains relatively constant over a wide range of moisture content (between 10 and 30%). The conductivity curves steepen again when the moisture content exceeded 34%; however, the high moisture contents were obtained under experimental conditions and are not expected *in situ* except under very localized conditions (LANL, 1997).

The rate of moisture movement beneath Mesita del Buey is perhaps the most important parameter in modeling the subsurface transport of contaminants (LANL, 1997). Moisture movement largely controls the minimum time required for contaminants to potentially be transported from MDA G through the vadose zone into the regional aquifer. The moisture movement through the undisturbed vadose zone is complex and is further complicated at MDA G by man-made disturbances associated with waste management activities.

Three moisture-content zones are consistently shown within the subsurface at MDA G (LANL, 1997). The volumetric moisture content in the top few meters varies between about 3 and 12% and reflects the seasonal effects of precipitation and evapotranspiration. Between mid-mesa depths of about 8 and 23 m (25 and 75 ft), volumetric moisture content is quite low, from 0.5 to 2%. Below 25 m (80 ft), moisture content increases to between 9 and 19%. The mid-mesa dry zone occurs consistently near the surge beds at the base of Unit 2 of the Tshirege Member. Based on unsaturated hydraulic conductivity estimates, estimates of flux rates through the low moisture content region are negligible (LANL, 1997). Water-pressure profiles estimated beneath the mesa, using hydraulic properties from cores, suggest that moisture moves toward the base of Unit 2 from above and below. These observations are consistent with a hypothesis that the mesa is dried out to a significant extent by evaporation and air movement along surge beds and fractures that are prevalent near this horizon (LANL, 1997).

Different rates of moisture movement corresponding to the three moisture-content zones are inferred by several independent analyses. Although the analyses invoke simplifying assumptions, they provide consistent qualitative evidence of variable rates of moisture movement within and across Mesita del Buey (LANL, 1997). The inferred zones include:

- A near-surface zone with an apparent rate of moisture movement on the order of several mm per year (mm/yr);
- An intermediate zone through the mid-depths of the mesa with rates of moisture movement on the order of tenths or hundredths of mm/yr; and
- A deeper zone in which the apparent rate of moisture movement may be several centimeters per year (cm/yr).

The analyses corroborating the apparent variable rates of moisture movement include natural tracer analyses, unit hydraulic gradient assumption, moisture profile analysis, and vapor flux studies. Details of these studies are presented in Section 2.1.5.6 of the PA/CA (LANL, 1997) and are summarized below.

Natural tracers used to infer information about moisture in the vadose zone include chloride, ^{18}O, and ^{2}H (deuterium). These constituents are present in precipitation in relatively constant amounts and, thus, are present in vadose-zone pore water, which is derived from precipitation. Results of the chloride tracer analysis showed the near-surface and deep-mesa fluxes are high

relative to the mid-mesa flux. In the shallow and deep zones, the inferred flux rates are on the order of 2 to 3 mm/yr (0.08 to 0.1 in. per year [in./yr]). In the intermediate zone, the inferred flux rates are between 0.03 to 0.8 mm/yr (0.001 to 0.03 in./yr). The steep slope on the cumulative water/cumulative chloride plot for the mid-mesa region indicates that cumulative chloride increases faster than cumulative water (i.e., water is being lost from the system at that location). Estimated chloride accumulation ages also suggest that water movement through Mesita del Buey is very slow (LANL, 1997).

The naturally occurring stable isotopes of oxygen and hydrogen (^{18}O and ^{2}H) are useful indicators of evaporation. The results of the stable isotope study were compared to the chloride profiles to test the deep evaporation hypothesis. It was concluded that surface evaporation effects are limited to the shallowest 1 to 2 m (3.3 to 6.6 ft), and that at depths of 5 m (16 ft) and deeper, there is strong evidence that there is an evaporative sink at intermediate depths in the mesa (LANL, 1997).

The average van Genuchten parameters may be used to estimate rates of moisture movement through the stratigraphic units using the unit hydraulic gradient assumption. Different rates are necessary to match the moisture conditions measured in the various units of the Bandelier Tuff. It was found that near the surface, the best fit to the field moisture data to a depth of approximately 5 m (15 ft) corresponds to a moisture movement rate between 0.01 and 10 mm/yr (0.0004 and 0.4 in./yr). In Unit 2 and Unit 1vu, the apparent moisture movement rate that matches the field moisture data is between 0 and 0.1 mm/yr (0 and 0.004 in./yr). In Units 1vc and 1g, a moisture movement rate of 1 mm/yr (0.04 in./yr) best matches the field data. The Tsankawi-Cerro Toledo and Otowi Member stratigraphic layers match field moisture data with a much larger apparent moisture movement rate on the order of 10 mm/yr (0.4 in./yr). These estimated rates support the hypothesis that moisture movement is not steady state, or that significant changes in movement of moisture occur at depths (LANL, 1997). One explanation that accounts for the results of this analysis is that water may be removed at intermediate depths by evaporation and vapor-phase diffusion.

The unit-gradient approximation was also used to identify depths within Mesita del Buey where moisture may be lost to evaporation or vapor-phase diffusion (LANL, 1997). A moisture profile analysis was performed, and the rates of moisture movement calculated as the gradient of moisture were plotted, as was the gradient of the vertical flux. The results suggest a downward

flux and a source of moisture to depths of about 7 m (23 ft). Below this, to depths near 28 m (92 ft), the average vertical flux is small but downward and the source is very small. The average local flux in this low-moisture zone is -0.017 mm/yr (-0.0007 in./yr) and the average moisture source is -0.0013 mm/yr (-0.005 in./yr). A moisture peak at 30 m (100 ft) occurs at the vapor-phase notch (the base of Unit 1vc). Overall, the average rate of moisture movement near the surface is about 10 mm/yr (0.4 in./yr), with a large standard deviation suggesting high variability. The average rate of moisture movement through the middle depths of the mesa is very small, and in the vapor-phase notch portion is relatively large (0.73 mm/yr). Although increased moisture at the vapor-phase notch at MDA G may be interpreted as a moisture source from the relatively wet canyons, this hypothesis does not explain high moisture content values (10 to 20% volumetric) observed at the vapor-phase notch at other locations across the Laboratory where the notch is not coincident with a canyon bottom or other moisture source.

Another study to understand the potential influence of water moving within and out of the mesa in the vapor phase was conducted by analyzing the vapor flux through the mesa (LANL, 1997). Analyses were performed on neutron-probe moisture measurements from several boreholes at MDA G. The results of the study indicated that water moves predominantly in the vapor phase at depths between 12 and 23 m (40 and 75 ft). The results also indicate that a fairly wide region within the mesa is dominated by vapor-flux and that this region corresponds to the region of low liquid flux, discussed above. The vapor-flux analysis also suggests that vapor flux dominates rates of moisture movement in regions of the mesa where volumetric moisture is below 5%, and the magnitude of the vapor flux in the low moisture region of the mesa is about 1 mm/yr (0.04 in./yr). In addition, there is no apparent direction associated with the vapor movement; instead, vapor appears to move in different directions throughout the dry region (LANL, 1997).

Water-balance components through covers resembling the operational pit cover used at MDA G have been measured during studies of test plots at LANL. The data show that 87% of precipitation is lost to evapotranspiration, approximately 6% remains as infiltration below the root zone, and the remainder is retained in the surface soil. The data also indicate that moisture movement through a conventional vegetated crushed-tuff cover was greatest in the late winter and early spring when snowmelt occurred and evapotranspiration was low because vegetation was not active (LANL, 1997). In 1973, volumetric moisture measurements were made in holes augered into the covers over Pits 1 and 2 at MDA G. These pits were covered in 1961 and 1963, respectively. The measured volumetric moisture content was quite variable, with

measurements of 12% and 17% by volume in Pit 1 and 4% and 8% by volume in Pit 2. Peak water concentrations occurred at depths of 2 m (6.6 ft) and decreased between 2 and 3 m (6.6 and 10 ft). The variation was tentatively attributed to differences in soil conductivity of surface slope (LANL, 1997). Using the unit-gradient assumption, these moisture measurements indicate infiltration rates between several mm/yr and several cm/yr within the covers at Pits 1 and 2.

The moisture content within Pit 37, which was open for several years, was measured periodically over a three-year period in the 1990s to better understand infiltration through disposal units at MDA G. This pit, while open, was expected to have moisture contents in excess of most of the covered pits at MDA G, since it was open longer than the average disposal pit. The pits are assumed to have, while open, higher infiltration rates than the surrounding mesa top, due to the lack of vegetation (transpiration). A maximum moisture content of about 11% by volume was measured at Pit 37, with a mean moisture content of approximately 8%. Using the unit approximation, the average rate of moisture movement through Pit 37 is 5 mm/yr (0.2 in./yr) at the average (mean) pit moisture content (LANL, 1997).

In 1976, horizontal boreholes were drilled approximately 1 m (3.3 ft) beneath a pit at MDA G that was closed in 1966. Moisture measurements at the same boreholes were made in 1992 with a neutron probe. The volumetric moisture content values beneath the pit were in the range of 1 to 4%, and were generally 1 to 2% higher beneath the pit than moisture content values away from the pit. These data suggest that pit excavation has a small effect on moisture contents beneath the pits (LANL, 1997).

1.6 Groundwater

The most recent projected depth to groundwater at Area L, based on currently available data, is approximately 1,000 ft (LANL, 2001a). Additional information on groundwater at TA-54 is provided in the “Characterization Well R-22 Completion Report” (LANL, 2002); the “Supplement to Quarterly Technical Report April-June 2001” (ER Project, 2001); and the “Quarterly Technical Report October-December 2001” (ER Project, 2002). The following are summaries of the information in those reports.

Well R-22 is located on Mesita del Buey, east of TA-54, and was funded and installed by LANL’s Environmental Restoration (ER) Project. This well is one of the 11 regional aquifer (R)

wells drilled to date as part of the “Hydrogeologic Workplan” (LANL, 1998) in support of the “Groundwater Protection Management Program Plan” (LANL, 1996). Well R-22 is the first of five planned regional aquifer wells at or in the vicinity of TA-54. This well was designed primarily to provide water-quality and water-level data for potential intermediate-depth perched zones and for the regional aquifer downgradient of TA-54. In addition, it was designed to collect geologic, hydrologic, and geochemical data that will contribute to the understanding of the vadose zone and regional aquifer in this area of LANL. Although the location of well R-22 was originally proposed for installation in Pajarito Canyon, just south of Mesita del Buey, its final location was changed to the mesa top in order to be in closer proximity to and more directly downgradient of TA-54 and to be better suited for a future monitoring well.

Well R-22 was drilled to a total depth of 1,489 ft in 2000. A multiscreen well containing five screened intervals that can be sampled individually was installed. In descending order, the geologic units encountered during drilling consisted of ash flows of the Tshirege and Otowi Members of the Bandelier Tuff (including the basal Guaje Pumice Bed); lavas, cinder units, interflow units, and subflow deposits of the Cerros del Rio volcanic field; an upper sequence of fanglomerate deposits of the Puye Formation; an older basalt; and a lower sequence of fanglomerate deposits of the Puye Formation. Depths and elevations of the contacts between these units are shown in the “Characterization Well R-22 Completion Report” (LANL, 2002). Notable differences between the predicted and as-found stratigraphy at this well was the greater thickness of the Cerros del Rio volcanic sequence, the absence of Puye Formation axial river gravels, and the absence of Santa Fe Group sediments within the drilled depth.

Two potential perched zones and one regional zone of saturation were originally predicted at well R-22. Two zones that could potentially support perched water were predicted at a depth of 148 ft in the Cerros del Rio basalt and at a depth of 487 ft in the Puye Formation. The regional water table was anticipated to be at a depth of 922 ft in the Puye Formation at the well R-22 location. No water was encountered, however, until the drillers first noted water at a depth of approximately 890 to 900 ft. After 30 minutes, the water-level depth was measured at 883.05 ft. The water is believed to be associated with the regional zone of saturation because the regional water table was projected to be at a similar depth, no obvious perching horizon was encountered, and saturation continued to the total depth drilled.

Both a direction and a rate are required to characterize groundwater movement. Although the

data from this single well do not allow a determination of horizontal flow direction, vertical direction can be evaluated by analysis of head distribution along the borehole. In addition, the hydraulic properties of the saturated materials (determined from analysis of field testing data) provide a general idea of potential flow rate. During drilling, hydraulic heads obtained during testing clearly indicated a downward vertical gradient at well R-22. The downward vertical gradient at well R-22 was supported after testing by a piezometric profile constructed using a pressure-measurement system.

Field tests at depth targeting for screened intervals were performed during drilling to determine hydraulic properties at well R-22. The five screened intervals were distributed through the zone of saturation. Hydraulic conductivities ranged from 0.27 ft/day (ft/d) to 2.32 ft/d at four screened intervals, based on straddle-packer/slug-injection tests performed.

Extensive borehole geophysical data were collected during drilling. Borehole video and natural gamma radiation surveys were conducted, and a suite of borehole geophysical logs was obtained. The surveys were conducted in cased hole from the surface to a depth of 1,330 ft. Below 1,330 ft, the surveys were conducted in open hole. Geophysical logging in open hole included caliper, resistivity, natural gamma radiation, spontaneous potential, lithodensity, magnetic resonance, borehole color video, epithermal neutron, neutron porosity, and spectral natural radiation. Volumetric water content beyond the casing in the vadose zone was measured using a Compensated Neutron Tool as a means to evaluate moist/porous zones and to estimate porosity in the saturated zone. Overall and spectral natural gamma ray activity was measured using a Hostile Natural Gamma Spectroscopy tool as a means to evaluate geology and lithology and the presence of clay versus sand. As a means to characterize mineralogy, lithology, and water content of the formation, concentrations of hydrogen, silicon, calcium, sulfur, iron, potassium, titanium, and gadolinium were measured using an Elemental Capture Spectroscopy tool. To measure bulk density and photoelectric effect as a means to estimate total porosity and characterize lithology, a Litho-Density Tool was used. Calibrated gross gamma ray readings were recorded to match the depth of the logging runs. The log results indicated that at the time of logging, a well-water level of 995 ft below ground surface (bgs) was recorded and that the probable regional groundwater level was 886 ft bgs. The log results also showed increased vadose zone moisture content (an average of 5%) in the intervals between 50 and 180 ft bgs, and 10% or greater between 350 and 715 ft bgs. In addition, in the interval from 1,405 to 1,478 ft (the total log depth), log data indicated an increased saturated zone

porosity (greater than 40%) corresponding to the Lower Puye Formation. Clearly defined stratigraphic/lithologic boundaries were also indicated from the spectral gamma and geochemical logs.

During drilling, samples of groundwater were collected from depths of 883 ft and 1,489 ft. The potential contaminants of concern at the well R-22 location include VOCs, perchloric acid, tritium, and other radionuclides (LANL, 2002). The samples were analyzed for major anions, VOCs, semivolatile organic compounds, high explosives (HE), radionuclides, and stable isotopes. Samples collected for major anions analysis were filtered; nonfiltered samples were collected for the remainder of the analyses. Due to the presence of drilling fluids, the borehole water samples are not representative of groundwater.

While the following compounds are not subject to regulation under the hazardous waste program, data are provided herein for informational purposes only. Upper zone borehole water showed concentrations of bicarbonate (120 milligrams per liter [mg/L]), chloride (21 mg/L), fluoride (1.19 mg/L), oxalate (1.05 mg/L), and sulfate (19.9 mg/L). Oxalate may be produced by the breakdown of one of the drilling fluids used, and can occur naturally at very low concentrations in groundwater and surface water around LANL and elsewhere (Broxton et al., 2001).

Methylene chloride was also detected at a level above the instrument detection limit but less than the practical quantitation limit. This chemical is used in analytical laboratories for extraction during gas chromatography/mass spectrometry analyses and may provide a source of laboratory contamination. Concentrations of bromide, phosphate, and perchlorate were less than detection. Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) was detected at a concentration of 90 micrograms per liter (µg/L). Based on similar chemical structures between RDX and one of the drilling fluids used, this result is believed to be a false positive. The HE compound 2-A-4,6-DNT was also detected above the instrument detection limit but below the practical quantitation limit. The U.S. Environmental Protection Agency *SW-846* Method 8330, which uses high-performance liquid chromatography, is susceptible to false positives for HE compounds and degradation products. Consequently, an alternative and more accurate analytical method using diode array was used when the analytical laboratory reran the sample; the results using this analytical method showed that HE compounds and degradation products were less than detection (0.25 µg/L). A further discussion about the investigation of false positives for HE

compounds and associated degradation products is presented in Section 13.2 of the "Characterization Well R-22 Completion Report" (LANL, 2002). During characterization in the completed well, additional groundwater samples will be collected to evaluate the presence or absence of HE compounds at well R-22. Acetone at a concentration of 0.820 mg/L was detected at the regional water table during drilling at well R-22. An investigation was conducted to determine the source of this organic compound, which may be present due to oxidation of one of the drilling fluids that contains isopropyl alcohol. Based on this investigation, the mass spectra from the initial analysis demonstrated high concentrations of isopropyl alcohol in the injection water used during drilling at well R-22. The isopropyl alcohol had in fact been misidentified as acetone by the analytical laboratory.

As previously mentioned, the following compounds are not subject to regulation under the hazardous waste program; however, data are provided herein for informational purposes only. Tritium was present at an activity of 109 picocuries per liter (pCi/L); this screening value suggests that the age of the tritium is less than 60 years old. More recent sampling shows lower tritium levels. During the first round of groundwater sampling in March 2001, tritium levels ranged from 2 to 77 pCi/L. During the second round of sampling in June 2001, tritium levels continued to decrease and ranged from 1 to 14 pCi/L. (The Drinking Water maximum concentration level [MCL] for tritium is 20,000 pCi/L.) Activities of americium-241, plutonium-238, plutonium-239/-240, and strontium-90 were less than detection. Activities of uranium-234, uranium-235, and uranium-238 were at levels of 1.48, 0.126, and 1.41 pCi/L, respectively. Nitrogen isotopes were analyzed for the water sample collected at 1,489 ft to evaluate the source(s) of nitrate at well R-22. The $\delta^{15}N(NO_3)$ value was +9.6 permil, which suggests that the water sample is enriched with nitrogen-15.

The Cerros del Rio lavas at well R-22 were nearly three times thicker than predicted (983 ft vs. 339 ft). The most significant hydrogeologic impact of this thick set of lavas is that the regional water table is within these lavas rather than within Puye Formation fanglomerates. Therefore, all flow and transport within the upper ~300 ft of the regional aquifer is within basaltic fractures and interflow rubble rather than through Puye Formation pore spaces. This difference in stratigraphy implies different flow rates and pathways, and the lavas provide an environment in which certain constituents (e.g., ferrous iron) can influence water chemistry.

Several features contribute to the peculiarities of the as-drilled stratigraphy at well R-22. It is

believed that the exceptional thickness of the Cerros del Rio lavas and cinder indicate fill within a paleocanyon. The absence of axial river gravels at the base of the Cerros del Rio volcanics suggests that the paleocanyon was not a through-going drainage ancestral to the modern Rio Grande. Because cuttings were not returned from some key intervals beneath the Cerros del Rio lavas, it is possible that axial river gravels may have been present within 5 ft of the base of the lavas but were not sampled. Therefore, the orientation of the paleocanyon (east-west vs. north-south) is uncertain.

The first round of groundwater sampling at well R-22 was conducted in March 2001 and the available data were reported in the supplement to the "Quarterly Technical Report April-June 2001" (ER Project, 2001). As noted in that supplement, because of a delay in analytical services, the $^{15}N/^{14}N$ isotopic suite was not available and would be reported at a later date. In addition, the supplement noted that because of an ongoing focused validation effort by the contract analytical laboratories, HE data were not available for reporting. No organics were found to exceed Drinking Water MCLs or NMED Groundwater Standards.

As indicated in the "Quarterly Technical Report October-December 2001" (ER Project, 2002), the second round of sampling at well R-22 was completed in June 2001. The data reported include field parameters and organic, inorganic, and radiological constituents. Because of analytical laboratory backlog, stable isotopes of nitrogen ($^{15}N/^{14}N$) were not available for inclusion in that report. In addition, because of an ongoing focused validation effort by the contract analytical laboratories, HE data were not available for reporting. Lead was found in Screen 3 (1,273 ft in depth) at a concentration of 19.7 µg/L. The Drinking Water MCL for lead is 15 µg/L; the NMED Groundwater Standard of 50 µg/L was not exceeded. No organics were found to exceed Drinking Water MCLs or NMED Groundwater Standards.

The third groundwater sampling round for well R-22 was conducted in November 2001; results of this sampling effort will be included in a quarterly report once the data are validated. The fourth groundwater sampling round was scheduled for March 2002, and the results will be provided in a subsequent quarterly report upon completion of data validation.

2.0 HYDROGEOLOGIC WORKPLAN CHARACTERIZATION ACTIVITIES

Pursuant to U.S. Department of Energy Order 5400.1, the LANL "Groundwater Protection

Management Plan" was developed in 1995, which identified the need for site-wide hydrogeologic characterization. In the same year, NMED denied LANL's previously submitted groundwater monitoring waiver demonstrations. In a letter dated August 17, 1995, the NMED requested that LANL prepare a "Hydrogeologic Workplan." Hence, LANL began developing the "Hydrogeologic Workplan" (LANL, 1998) that, upon implementation, would collect data on the hydrogeologic setting. These data would be useful for making decisions regarding monitoring and environmental restoration using the Data Quality Objective (DQO) process. The workplan was approved by the NMED in March 1998.

The primary purpose of the "Hydrogeologic Workplan" is to gain an understanding of the hydrogeologic setting that is adequate to design a detection monitoring network capable of detecting water quality threats to the regional aquifer. As stated in the Executive Summary of the workplan, the expected outcomes of implementing the plan's activities are:

- A "refined understanding of the hydrogeologic framework at the Laboratory, including recharge areas, hydraulic interconnections, flow paths, and flow rates, synthesized by modeling simulations;
- Information sufficient either to design and implement a detection monitoring program that meets applicable requirements and/or to demonstrate that groundwater monitoring requirements can be waived; and
- Defined areas of existing or potential groundwater contamination, and the potential pathways of contaminant transport from the surface to the regional aquifer, with predictions of directions and rates of movement and risk based on modeling simulations."

A series of decisions established in the plan were intended to focus data collection activities on information important to a better understanding of the hydrogeologic regime as well as monitoring design. Areas with the highest potential for contaminant impacts are where hydrogeologic data collection is more focused. The potential pathways and rates of contaminant migration can be determined using the resulting data and analyses. One workplan objective is to identify areas of groundwater contamination. Determining the extent of contamination and risk posed by that contamination is conducted by LANL's ER Project because investigation of contaminant plumes is not within the scope of the "Hydrogeologic Workplan" (LANL, 1998).

The "Hydrogeologic Workplan" provides for an iterative process of gaining understanding from each activity, especially from installed wells. This iterative process is then used in guiding the

succeeding DQOs and the location and data collection of subsequent wells. Although the interpretive process is not as highly visible as data collection, it is equally as important as the well installation and data collection. A primary tool used to interpret data collected from drilling and testing in the wells is numerical modeling. When sufficient new data and data interpretation have been accomplished to change the conceptual understanding, the iteration process is conducted. The data collection and modeling reached a level of maturity in Fiscal Year (FY) 01 to allow iteration of the DQOs. The FY 01 DQO iteration process began with a comprehensive evaluation of all groundwater-related data collected, analyzed, and interpreted in the program at that time. This process resulted in a determination of what is known and what data are required to complete the scope of the workplan. The comprehensive evaluation and the FY 01 DQO process iteration resulted in proposed amendments to the scope of the workplan (LANL, 2001b).

Initially, 32 regional aquifer wells were proposed in the “Hydrogeologic Workplan”. As of April 2002, 11 R wells have been installed. LANL’s Groundwater Integration Team worked together to determine which of the remaining wells and other studies are still necessary to complete the scope of the workplan, and added new studies as appropriate to provide the data. The current proposed amendments to the “Hydrogeologic Workplan” scope include installing 15 more R wells, and eliminating 6 R wells. The proposed scope also includes 13 field-based activities, 11 analytical activities, and three project management activities.

In the “Hydrogeologic Workplan”, the activities proposed to characterize the hydrogeologic setting beneath LANL and to enhance LANL’s groundwater monitoring program are summarized by “aggregates”. The aggregate boundaries were drawn to focus discussions and attention on specific areas of LANL that collectively contain numerous sources of potential contamination. However, the hydrogeologic characterization activities relevant to a particular aggregate are proposed within as well as outside the aggregate boundaries.

Aggregate 2, located in the east-central portion of LANL, is bounded on the north by Cañada del Buey, on the south by Pajarito Canyon, on the west by TAs 18 and 51, and on the east by the LANL boundary. Essentially, the boundary of Aggregate 2 was drawn to encompass the solid waste management units associated with TA-54. It includes Cañada del Buey, the middle reach of Pajarito Canyon, and Mesita del Buey, where TA-54 is located.

In the initial workplan, one R well (well R-16) was planned for installation in Cañada del Buey east of the Aggregate 2 boundary. The purpose of this proposed well was to provide stratigraphic and hydrologic control off site near the Rio Grande and to provide an off-site detection monitoring point downgradient of LANL activities. In addition, two R wells (well R-20 and well R-22) in Pajarito Canyon were proposed for Aggregate 2 to identify the presence of intermediate perched zones, measure the thickness of the zones, and analyze for the presence of contaminants within the zones that could indicate actively occurring contaminant transport. As noted in Section 1.6, well R-22 was installed in 2000 on the mesa top just east of the TA-54 disposal areas. The location of this well was changed from its original siting in Pajarito Canyon to determine if perched zones are present beneath Mesita del Buey and to better understand the hydrogeologic conditions just east of the disposal areas at TA-54. Other proposed R wells for Pajarito Canyon included wells R-17, R-18, and R-19, which would provide information about sources in other aggregates upgradient of Aggregate 2; they are not discussed further in this attachment. Also in the initial workplan, one R well (R-21) was proposed for installation on Mesita del Buey near MDA L. The purpose of this proposed well is to evaluate and monitor hydrologic and geochemical conditions in the regional aquifer beneath MDA L. Data from well R-21 will be compared to data from well R-20, just northwest of Aggregate 2, to evaluate migration of organic contaminants, potential pathway behavior, and potential contaminant movement toward supply well PM-2. Recently, it was determined that an additional well (well R-23) be included in Aggregate 2. Well R-23 is proposed to be located in Potrillo Canyon, approximately 3,700 ft south of Area G. This well will provide water-quality and water-level data for potential intermediate perched zones and the regional aquifer. It will also provide data that may be used to calibrate the potential for a southeasterly groundwater flow direction, evaluate recharge, and determine the presence of perched zones and the influence of the regional aquifer in the area of a hydrologic sink. It should be noted that the locations of the four additional R wells associated with Aggregate 2 (wells R-16, R-20, R-21, and R-23) are subject to change as the DQO iteration process continues.

3.0 REGIONAL AQUIFER HYDROLOGIC MODELING

A hydrologic model for the Pajarito Plateau beneath LANL is an important tool for protecting groundwater that could potentially be impacted by past Laboratory operations. The purpose of modeling the regional aquifer is two-fold. First, the model can be used to synthesize hydrologic, geochemical, and geologic data relevant to the regional aquifer. Second, the model can be

used to predict flow directions and velocities as well as technically defensible estimates of uncertainty in the predictions.

A numerical groundwater model for the Pajarito Plateau beneath LANL was developed in 1998 and has been refined continuously as new groundwater data are collected. From the detailed technical descriptions of the modeling efforts, a simplified description is presented in the following. The simplified description addresses the purpose of modeling, why the model code was selected, the elements of the conceptual model, and modeling calibration and results.

3.1 Introduction

In the dictionary, a "model" is defined as a "small representation of a planned or existing object". A numerical groundwater model has flow equations that represent the physical processes of water flowing through the subsurface. From the earth's surface, groundwater movement cannot be observed directly; therefore, numerical groundwater modeling is used as a tool to understand groundwater flow. In a simple sandy aquifer, it is possible to derive groundwater flow directions and velocities using water level data, pump test data, and pencil-and-paper calculations. In a geologically complex aquifer such as that which exists beneath the Laboratory, however, is it not feasible to derive flow directions and velocities from hydrologic data without the assistance of a computer model. In addition, models are useful in that they provide a range of plausible answers, using the available hydrologic data set and understanding of the varied character of the aquifer.

Development of a numerical groundwater model for the regional aquifer beneath the Laboratory was initiated in 1998 and has been continuously refined as new groundwater data are collected. The description presented herein of the modeling efforts has been greatly simplified from the detailed technical descriptions of the modeling efforts found in the reports in Keating et al. (1998, 1999, 2000, and 2001). The following sections describe the model code, conceptual model, flow model development, calibration, and sensitivity analyses. Accordingly, LANL intends to use groundwater models to aid in many decisions, such as where monitoring wells are best placed and what additional data are needed.

3.2 Purpose of Modeling

A hydrologic model for the Pajarito Plateau beneath the Laboratory is an important tool for protecting groundwater that could be impacted by past Laboratory operations. The purpose of modeling the regional aquifer is two-fold: (1) to synthesize hydrologic, geochemical, and

geologic data relevant to the regional aquifer; and (2) to predict flow directions and velocities, along with technically defensible estimates of uncertainty in those predictions.

There are at least three modes of groundwater beneath the Pajarito Plateau: (1) groundwater in alluvium in some canyons; (2) perched intermediate groundwater (groundwater above a less permeable layer that is separated from the underlying groundwater by an unsaturated zone at intermediate depths (150-400 ft); and (3) the regional aquifer, which is separated from the upper groundwater by hundreds of ft of tuff, basalts, and volcanic sediments in the western portion of the Laboratory, with the vadose zone becoming thinner to the east. The regional aquifer beneath the Pajarito Plateau provides the community and Laboratory water supply.

Hydrologic models have two parts that work together: the conceptual model and the numeric model. The conceptual model is the synthesis of all the known geologic and hydrologic data, which provides the estimated input parameters for the numeric model. The numeric model uses mathematical equations to translate the rock and water properties to numbers. A model is "calibrated" when the numbers that result from the numeric model match reasonably well to actual observations (e.g., water levels in wells). The process of calibrating a model involves revising the conceptual and numeric models consistent with the known data until there is reasonable match between model outputs and observed data. After calibration, the regional aquifer model is used for sensitivity analyses. Sensitivity analyses are a tool to evaluate the uncertainty of the model by testing how much each of the inputs affects the outcome of the model. Those inputs that have a big effect on the model outcome are considered "sensitive" and the input values should be based on appropriate site-specific data. Those inputs that do not affect model outcomes are "insensitive" and are not as important to site-specific data.

3.3 Model Code Selection

The numeric model is the computer code that runs calculations with the input parameters provided. The numeric model selected by the Laboratory is the Finite Element Heat and Mass (FEHM) computer code. It was developed at the Laboratory for the High-Level Radioactive Waste Repository Program. It simulates the flow of water and air and the transport of heat or substances in water through saturated or partially saturated rock. It can simulate flow or transport in either 2-dimensions or 3-dimensions. It was selected because it has been rigorously tested and certified for use in radioactive waste disposal and because its capabilities match the specific investigation needs at the Laboratory. For example, FEHM can be used for both unsaturated and saturated flow modeling, both of which are important at the Laboratory. This

computer code is publicly available from LANL.

At the outset of the modeling effort, the decision was made to develop a regional-scale model of the Española Basin. Modeling the Española Basin was selected as a platform for the Pajarito Plateau model as it would incorporate all the existing hydrogeologic information and aquifer stress data in terms of water supply wells and streams. The large areal extent of an Española Basin model also allowed use of simulated data for boundary conditions that were needed for the Pajarito Plateau model. Obtaining distant, but accurate, boundary conditions improves the overall accuracy and reliability of the model.

The Pajarito Plateau-scale model grid was developed using the Octree Mesh Refinement methods to embed a high-resolution zone within the relatively coarse Española Basin grid. The grid is better suited to capture site-scale flow and transport processes in areas of interest, while allowing boundary conditions from the Española Basin-scale model to be applicable without adversely affecting the computation time or the computer memory required to run the model. The smaller-scale model uses calculated values of head and flux from the large model to define boundary conditions in the smaller-scale model. The grid spacing in the Pajarito Plateau portion of the model is finer grid spacing than the Española Basin-scale model (Table 1).

3.4 Conceptual Model of Flow

The conceptual model that is the basis of the regional aquifer modeling efforts extends throughout the Española Basin. Elements of the conceptual model are the **boundaries** of the model, the **hydraulic gradient**, **aquifer properties**, **recharge**, and **discharge**.

The **boundaries** of the model are based on the physical boundaries of the regional aquifer within the Española Basin. The basement rocks and surrounding uplifts and mountains that define the Española Basin also define the aquifer boundaries in the model. In the model, the aquifer boundaries are areas where there is expected to be little flow because the aquifer material does not extend beyond the boundary. The exception is the La Bajada Fault, which forms the southern boundary of the model area. Others (Kernodle et al., 1995) have estimated the flow across the La Bajada fault. The Española Basin is a low area bounded by high areas:

- Sangre de Cristo Mountains on the east
- Nacimento uplift to the west
- La Bajada Fault on the south

- To the north, the Brazos uplift and Picuris Range
- Lower boundary is the basement rocks of the Española Basin, which are metamorphic rocks that can also be seen in the Sangre de Cristo Mountains
- The upper boundary is the water table of the regional aquifer.

Of the boundary conditions, the upper boundary is considered the most important because that is where all the recharge occurs. The other boundaries represent hydrologic divides, where little water enters or exits the basin. The upper boundary surface is the water table of the regional aquifer. The grid nodes on the upper boundary surface are assigned one of three kinds of boundary conditions. The first kind of boundary condition is for nodes that occur in one of the major rivers (Rio Grande or Rio Chama). The boundary condition for the nodes in the rivers allows water to either flow into or out of the river, depending on if the water table is higher than (water flows out of the aquifer into the river) or lower than (water flows out of the river and into the aquifer) the river. The elevation of the river grid nodes was set at the elevation of the river.

The second kind of boundary condition for the upper model boundary is the higher elevation where recharge occurs. These grid nodes are set to allow a specific amount of water into the regional aquifer. The amount of water at each grid node was calculated based on the elevation of the land surface. This approach was taken because a graph of actual precipitation measurements at stations of different elevation in the Española Basin shows a linear relationship - the higher the elevation, the higher the precipitation. It was also assumed that the percent of precipitation reaching the water table increases with increasing elevation. This assumption is based on the observation that at higher elevations, the temperature and vegetation cover are both less, so the evaporation and transpiration (use of water by plants) are both expected to be lower; thus, more water is available to infiltrate the ground surface. In the numerical model, for every node above the threshold elevation of 6,000 ft (the elevation at which evaporation is greater than precipitation, so no water recharges), the amount of precipitation assumed was based on the linear trends of increasing precipitation and infiltration with elevation.

The third type of boundary condition on the upper boundary of the 1998 model were assigned to nodes that had elevation of less than 6,000 ft and were not in the river channels. These nodes were assigned a no-flow condition, because water is not expected to enter or exit the regional

aquifer in these areas.

The northern and southern lateral model boundary conditions near the rivers are set to allow flow into or out of the model and the water levels are specified values. The values that are specified for these boundary grid nodes are based on the elevation of the water table at the surface for surface grid nodes; for the grid nodes beneath the surface, the value assigned is calculated assuming a hydrostatic pressure gradient. The amount of water flowing in along the northern boundary of the model is initially taken from estimates of water from the San Luis basin to the north (Coon and Kelly, 1984). Along the southern boundary, the amount of water exiting the Española Basin to the south was based on estimates by Kernodle et al. (1995) and Frenzel (1995).

The majority of the remaining boundaries were assigned no-flow boundary conditions:

- The crest of the Sangre de Cristo Mountains on the eastern model edge
- The top of the Sierra de los Valles (east of the Jemez Mountains geothermal field and west of the Pajarito Fault zone) on the western model edge
- Top of the Brazos and Picuris ranges
- The Española Basin basement at the base of the model.

The topographic divides (Sangre de Cristo, northern ranges, and Sierra de los Valles) are assumed to approximate the hydrologic divides. However, the actual location of the groundwater divide on the western edge of the Española Basin is unknown and must be evaluated further. The grid nodes are assigned no-flow boundary conditions. Although some water may flow through the basement, the contrast between the overlying sediments filling the basin and the metamorphic rocks is expected to be big enough that water will not enter the materials below the basement.

There are two components of **hydraulic gradient**: horizontal and vertical. The horizontal hydraulic gradient is determined by the water levels that have been measured in wells throughout the basin. The vertical gradient is determined by measuring the water levels at different depths in the aquifer. The horizontal hydraulic gradients at the Española Basin scale are fairly well known and show that the flow of water is generally from the high areas on the east and west of the basin toward the Rio Grande in the center of the basin. The horizontal gradients for the Pajarito Plateau are shown in Table 2. On the Española Basin scale, vertical upward gradients have been reported in several wells fields near the Rio Grande (Buckman,

lower Los Alamos, and Santa Clara Pueblo, Tesuque Pueblo). On the Pajarito Plateau, vertical gradients have been measured in a number of wells. The measured vertical gradients are shown in Table 3.

The **aquifer properties**, primarily permeability, are assumed to be controlled by the geologic characteristics of the rocks. The Española Basin gradually accumulated sedimentary rocks formed by sediments eroded from surrounding high areas and volcanic rocks erupted from different volcanic centers. The sedimentary rocks generally contain the regional aquifer within the Española Basin. For the regional aquifer model, 20 layers representing different types of rock units (hydrostratigraphic zones) were used (Table 4). In addition, vertically-oriented hydrostratigraphic units representing fault zones were included in the model. Each layer was assigned hydraulic properties based largely on hydrologic data that have been collected and the geologic character of the layer where no data are available.

Aquifer **recharge**, the amount of water entering the aquifer, is a generalized recharge model, assuming that the first order control on recharge rates is elevation. The conceptual model of recharge is that most water recharging the aquifer originates in stream channel bottoms. For major channels in the basin, this is modeled explicitly. However, for most of the model domain, recharge is applied uniformly within any given elevation range ("diffuse" recharge), making no distinction between canyons and mesas. This effectively "spreads" the focused recharge occurring in canyon bottoms over a larger area. This approximation is appropriate for estimating the total amount of water recharging the system in various elevation ranges, for estimating baseflow discharge to rivers, and for estimating hydraulic gradients in the regional aquifer at scales of kilometers.

Groundwater **discharge** to rivers is an extremely important constraint on the regional aquifer model. Surface water flow data from twelve rivers in the basin are used to determine the baseflow. Quantified downstream increases in baseflow are attributed to regional aquifer discharge.

3.5 Regional Aquifer Modeling Calibration and Results

The regional aquifer model has been calibrated in two modes: steady-state and transient. Since 1945, the water levels in the Pajarito Plateau area have declined due to extensive development of the aquifer. The steady-state mode is calibrated using "pre-development" data, prior to 1945. There are pre-development data from 93 wells basin-wide, 34 of which fall within the Pajarito

Plateau sub-model. The transient mode is calibrated using transient drawdown due to pumping in 14 wells. The transient data are available for every year since 1945. The transient simulations were done in 10-year time steps, so the 10-year average pumping rates were derived from the annual pumping data for all the wells in the Pajarito Plateau sub-model.

Both the steady-state Española Basin model and the Pajarito Plateau sub-model provided reasonable simulation of head and flux measurements. The calibrated steady-state model was used for inverse calculations to estimate model parameters. The steady-state Española Basin inverse model was used to estimate 37 model parameters: 3 recharge and 34 permeability. This process suggested that the permeabilities of the two largest hydrostratigraphic units in the basin are well constrained. However, estimates for several smaller units are poorly constrained. The steady state Pajarito Plateau inverse sub-model estimated 20 model parameters: 3 recharge and 17 permeability. The sub-model and basin-scale model results were very similar; the largest discrepancies are for two relatively small hydrostratigraphic units. For one of these, the sub-model estimate was closest to pump test data; for the other, the sub-model estimate was farthest from the pump test data.

The addition of transient observations in the inverse process greatly decreased the uncertainty of estimated parameters. For the sub-model, the transient observations allowed an improved steady-state flux and water level matches. A comparison of the steady-state to the steady-state plus transient estimates shows that the major changes are associated with the permeability of the two potentially important hydrostratigraphic units. The uniform specific storage estimated by the transient inverse model is close to the independent estimates derived from hydraulic testing.

The results of the regional aquifer model are a refined water level map and estimates of flux across the boundaries, as presented in Keating et al. (2000). Vadose zone modeling at TA-54 will be used as inputs into the regional aquifer modeling (e.g., recharge estimates) to determine the fate of contaminants from a source at TA-54, if any, in the regional aquifer.

Table 1: Grid Spacing in Española Basin-scale Model and the Pajarito Plateau Portion of the Model				
Model	**North- South (X)**	**East-West (Y)**	**Vertical (Z)**	**# Nodes**
Española Basin-scale model	1000 m	1055 m	50 m above 1300 m depth	277,951
	1000 m	1055 m	500 m below 1300 m depth	
Pajarito Plateau portion	250 m	264 m	12.5 m above 1550 m elevation	172,741
	250 m	264 m	50 m above 1100 m depth	
	250 m	264 m	500 m below 1100 m depth	

Table 2: Horizontal Gradients on the Pajarito Plateau

Upgradient Well	Water Level Elevation (m)	Down-gradient Well	Water Level Elevation (m)	E-W Distance (m)	Gradient (m/m)
R-25	1836	CdV-15-3	1833	2189	0.02884
CdV-15-3	1833	R-19	1795	4710	0.02149
DT-10	1805	R-22	1747	5195	0.01121
R-15	1785	R-12	1738	3684	0.01283

Table 3: Vertical Gradients on the Pajarito Plateau

Well	Vertical Gradient	Comment
R-19, screen 6	0.08	weakly upward
R-19, screen 7	0.28	weakly downward
R-25, screen 3	1.72	strongly downward
R-25, screen 4	0.86	weakly downward
R-25, screen 5	1.10	downward
R-25, screen 6	0.15	weakly downward
R-25, screen 7	0.13	weakly downward
R-25, screen 8	0.13	weakly downward
CdV-15-3, screen 6	0.02	weakly upward
R-31, screen 3	0.01	nearly neutral
R-31, screen 4	0.01	nearly neutral
R-31, screen 5	0.02	nearly neutral
R-22, screen 2	0.07	nearly neutral
R-22, screen 3	0.14	weakly downward
R-22, screen 4	0.11	weakly downward
R-9/PM-1	0.05	weakly upward
R-9/O-1	0.03	weakly upward
TW-3/O-4	0.05	weakly upward
TW-1/O-1	0.10	weakly downward

Table 4:	**Hydrostratigraphic Units**		
Rock Type	**Hydrostratigraphic Layer**	**Volume (10^{10} m^3)**	**Permeability (m^2)**
Crystalline Rock	Deep Basement (Precambrian	400.8	5.00×10^{-16}
	Fractured Paleozoic/Mesozoic	214.2	
	Paleozoic/Mesozoic	181.7	2.00×10^{-17}
	Cerros del Rio Basalts	0.4	1.00×10^{-15}
	Cerros del Rio Basalts - southern	2.2	1.00×10^{-16}
	Tschicoma Formation	57.1	7.10×10^{-16}
Fault Zones	Pajarito	17.6	2.13×10^{-15}
	Agua Fria	0.1	4.49×10^{-15}
Sedimentary Rocks	Santa Fe Group east	47.4	2.07×10^{-13} horizontal 2.07×10^{-15} Vertical
	Santa Fe Group west	171.2	1.4×10^{-13} horizontal 1.4×10^{-15} Vertical
	Ancha Formation	3.4	1.34×10^{-13} horizontal 1.34×10^{-15} Vertical
	Santa Fe Group north	90.3	1.50×10^{-14}
	Ojo Caliente sandstone	61	2.20×10^{-14}
	Peñasco Embayment	38.5	4.67×10^{-13}
	Santa Fe Group - deep	162.4	1.21×10^{-14}
	Santa Fe Group- near airport	8.2	1.00×10^{-11} horizontal 1.00×10^{-13} Vertical
	Santa Fe Group - Chaquehui Formation	2.6	1.00×10^{-13}
	Puye - fanglomerate	0.4	2.38×10^{-13}
	Puye - totavi lentil	0.5	1.00×10^{-13}
	Bandelier Tuff	0.1	3.95×10^{-14}
Total Model Volume		**1620**	

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ATTACHMENT C

NATURE AND EXTENT OF RELEASES AND PRESENT-DAY RISK ASSESSMENT FOR TECHNICAL AREA 54, MATERIAL DISPOSAL AREA L

NATURE AND EXTENT OF RELEASES AND PRESENT-DAY RISK ASSESSMENT FOR TECHNICAL AREA 54, MATERIAL DISPOSAL AREA L

A Resource Conservation and Recovery Act Facility Investigation was conducted at Technical Area 54, Area L, from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases. The most recent information on the nature and extent of contamination at Material Disposal Area L is summarized in this attachment. The report also addresses the assessment of present-day risks. The information in this attachment is submitted as a portion of the response to the December 21, 2001, letter from James P. Bearzi (Chief, New Mexico Environment Department Hazardous Waste Bureau) to Dr. John C. Browne (Director, Los Alamos National Laboratory) and Mr. David A Gurulé (Area Manager, Department of Energy Los Alamos Area Office).

SWMU 54-006	Material Disposal Area (MDA L) (all subsurface units such as Pit A, SI B,C,D, Shafts 1-28, 29-34)
Administrative Authority NMED	Former Operable Unit OU 1148
Technical Area TA-54	Dates of Operation 1959-1986
Has ER Sampled the Site? Yes	ER Remedial Action Conducted? No
Structure Number N/A	Other Remedial Action Conducted? No

Unit Description

SWMU 54-006 (also called MDA L) is included in Module VIII of LANL's Hazardous Waste Facility Permit. Area L is a 2.5-acre fenced area that includes MDA L, which consists of 1 subsurface disposal pit (pit A); 3 subsurface treatment and disposal impoundments (impoundments B, C, and D); and 34 disposal shafts (shafts 1 through 34). Only impoundments B and D and shafts 1, 13-17, and 19-34 (although no longer in use) are considered active impoundments until RCRA closure is certified and approved. The entire fenced surface area of Area L is an active RCRA-permitted hazardous waste management unit.

Disposal pit A is located in the eastern portion of Area L beneath Dome 54-215. The pit is 200 ft long x 12 ft wide x 12 ft deep. It received chemical waste from the late 1950s until December 1978. Initial waste disposal practices included disposal of uncontainerized chemical wastes and liquids in drums without added sorbents. The pit also was used as an evaporative pit. Pit A was filled with waste to within approximately three feet of the surface between 1964 and 1978, and then was covered with crushed, consolidated tuff.

The three surface impoundments (impoundments B, C, and D) are located northwest of pit A. Impoundment B was excavated in 1978 and is 60 ft long x 18 ft wide x 10 ft deep. It had a capacity of 7,560 ft^3 and operated from January 1979 to June 1985 to evaporate treated salt solutions and electroplating wastes. Impoundment C was closed in 1978. This impoundment, which is 35 ft long x 12 ft wide x 10 ft deep, was used for the same disposal purposes as impoundment B. Impoundment C had a capacity of 2,940 ft^3. Impoundment D is approximately 75 ft long x 18 ft wide x 10 ft deep and had a capacity of 9,450 ft^3. It was used to treat small quantities of lithium hydride by reaction with water. This practice began in 1972 and was discontinued in 1984. Impoundment D later was used as secondary containment for used oil storage tanks (see SWMU 54-021). The capacities of the impoundments were calculated assuming they were filled to within three feet of the surface. All three impoundments are covered with crushed tuff followed by asphalt.

The 34 disposal shafts at MDA L were drilled directly into the subsurface tuff. Shafts 1 through 28 are located south of pit A. Shafts 29 through 34 are located northwest of impoundments B, C and D. Three feet of crushed tuff were placed in the bottom of each shaft to fill cracks and joints. The shafts range from 15 ft to 65 ft deep and vary in diameter from 3 ft to 8 ft. Groups of shafts were constructed as needed. When in use, the shafts were covered with a steel cap that could be opened or removed, depending on design, to allow placement of waste. The operational dates of the shafts vary, but collectively the shafts were operated from February 1975 to December 1985. The shafts were used to

dispose of containerized and bulk liquid chemical wastes. Before 1982, containerized liquids were disposed of without adding absorbents to the containers. Space around the drums was filled with crushed tuff and a 6-in. layer of crushed tuff was placed between each layer of drums. After 1981, uncontainerized waste was no longer disposed of in the shafts. From 1982 to 1985, wastes were accumulated on the site and packaged in drums until a sufficient quantity had accumulated to put the drums in a shaft. When filled, the shafts were covered with a concrete plug, approximately 3 ft thick.

Early disposal practices at MDA L resulted in a subsurface volatile organic vapor plume that extends beneath the facility and beyond its boundary. Several previous investigations have taken place at MDA L. Since 1982, channel sediments have been collected from permanent stations in the main drainages surrounding TA-54 to monitor the potential transport of radionuclides by stormwater run-off. In 1985, NMED issued a compliance order to LANL that required pore-gas characterization at MDAs G and L. Nine boreholes were drilled between 1985 and 1988 to monitor the subsurface VOC plume. Analytical data from the pore-gas monitoring shows that 1,1,1-trichloroethane is the primary plume constituent; it is present to at least 200 ft below the mesa surface; and concentrations vary across the plume. In 1986, additional boreholes were drilled to measure air permeability in the tuff. The data were used to evaluate the nature and extent and fate and transport of subsurface contamination at MDA L.

The ER Project conducted RFI fieldwork at MDA L from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases.

The RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport and, if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment run-off from the four MDAs. Fourteen drainage channels originate near MDA G, and the other three MDAs each have only one significant drainage channel. Sample locations were selected within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for alpha, beta, and gamma radiation. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that had no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape

condition for potential receptor access. Each MDA-related drainage was determined not to be an ecological concern because there was little receptor access. The channel sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

An RFI report for MDAs G, H, and L was issued in 2000 to: (1) document the fieldwork and evaluate the potential human health and ecological risks posed by known and projected releases and exposures; (2) recommend (as necessary) additional investigation at TA-54 to reduce uncertainties associated with potential human health and ecological impacts; and (3) evaluate the need for near- and/or long-term corrective measures to reduce present-day and/or potential future risk. The RFI focused on identifying COPCs and developing a conceptual model for their fate and transport. In identifying COPCs, data of sufficient quality were compared with applicable thresholds (i.e., BVs) for inorganic chemicals, BVs and/or FVs for radionuclides, and instrument DLs for organic chemicals. Where data were not clearly less than the applicable threshold, analytes were retained as COPCs. Information used to develop the conceptual model for MDA L includes both non-ER and ER Project RFI data. RFI fieldwork at MDA L included the collection and analysis of 4 drainage sediment samples, 172 core samples from 16 boreholes, 268 VOC surface flux samples, 239 tritium surface flux samples, and 16 ambient air samples. The sediment samples were analyzed for inorganic chemicals, cyanide, PCBs/pesticides, radionuclides, and tritium. The ambient air samples were analyzed for VOCs. The core samples were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs/pesticides, cyanide, and radionuclides. The RFI data were supplemented by environmental surveillance surface water data, VOC emissions data from passive extraction tests, and quarterly VOC pore-gas monitoring samples. Analytical results showed the presence of tritium at elevated levels in the ambient air flux samples and the subsurface tuff samples and organic chemicals in the subsurface and ambient air samples, which indicated a subsurface release. The primary VOCs identified are 1,1,1-trichloroethane and trichloroethene. Barium, copper, chromium, nickel, uranium, and zinc were detected at concentrations greater than BVs in subsurface tuff samples. The pesticide methoxychlor is present at concentrations below SAL in site sediments.

Evaluation of site data indicates that the known sources of environmental contamination at MDA L are vapor-phase tritium and VOC releases from the subsurface units and releases of metals dissolved in liquid solvents into the tuff below the subsurface units. Environmental transport pathways supported by data analysis are resuspension and dispersion in air and sediment transport in surface water for surface soil and sediment contaminated with methoxychlor (source unknown); diffusion in pore gas and dispersion in air for vapor-phase tritium and VOCs; and transport of dissolved metals, followed by sorption onto minerals and solid phases in tuff.

Present-day risks posed by MDA L to human and ecological receptors were characterized using a human health risk assessment and an ecological screening assessment. The risk assessment presented in the preliminary RFI report concluded that surface contamination at the site posed no unacceptable present-day risk to human health. No radionuclides or

inorganic chemicals were detected in sediment samples collected at the site. Methoxychlor was detected but at concentrations similar to those found to pose no unacceptable present-day risk at MDA G. Results of ambient air risk assessment for VOCs indicated carcinogenic risks that were about equal to or below the lower end of EPA's acceptable risk range. Potential doses from tritium are below those shown to pose an acceptable risk in the MDA G risk assessment. The ecological screening assessment found that chemicals did not have the potential to cause adverse ecological impacts to receptors at MDA L. The results of the present-day risk assessment indicate that no action is necessary to address exposure of on-site workers to VOCs or tritium in air at MDA L. The risks, dose, and hazards associated with exposure to soil contaminants at MDA L were lower than those from exposure to VOCs and tritium in air and were below acceptable limits. The present-day ecological risk screening assessment at MDA L indicated no COPECs.

Quarterly pore-gas sampling of the vapor phase VOC plume at MDA L is ongoing; sampling results are reported in the ER quarterly reports. At the request of NMED, the RFI report for MDA L is being rewritten to incorporate additional recent information on the nature and extent of contamination.

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RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) LA-UR Number: 96-0110

Proposed Action Plan Drilling Near Area [MDA] L, TA-54, OU 1148 LA-UR Number: No LA-UR

RFI Work Plan for Operable Unit 1148 LA-UR Number: 92-0855

CERTIFICATION

I certify under penalty of law that this document 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
Operator

4/25/02
Date Signed

E. Dennis Martinez
Acting Director
U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
Owner/Operator

4/25/02
Date Signed

ATTACHMENT I

CLOSURE/POST-CLOSURE PLAN
FOR THE TECHNICAL AREA 54
AREA G LANDFILLS
(PIT 29 AND SHAFT 124)

CLOSURE/POST-CLOSURE PLAN
FOR THE TECHNICAL AREA 54
AREA G LANDFILLS
(PIT 29 AND SHAFT 124)

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ATTACHMENT	TITLE
A	MDA G: Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities
B	Geology, Hydrology, and Groundwater Characterization at Technical Area 54, Area G
C	Nature and Extent of Releases and Present-Day Risk Assessment for Technical Area 54, Material Disposal Area G

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
40 CFR	Code of Federal Regulations, Title 40
cm	centimeter(s)
CMS	RCRA Corrective Measures Study
COC	contaminant(s) of concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ET	evapotranspiration
ft	feet (foot)
ft^3	cubic foot/feet
FY	Fiscal Year
LANL	Los Alamos National Laboratory
m	meter(s)
MDA	material disposal area
NMED	New Mexico Environment Department
OLASO	Office of Los Alamos Site Operations
R	regional aquifer
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	solid waste management unit
SWRC	Solid Waste and Regulatory Compliance Group
TA	technical area
TRU	transuranic

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

VOC	volatile organic compound
yd^3	cubic yard(s)

CLOSURE/POST-CLOSURE PLAN FOR THE TECHNICAL AREA 54 AREA G LANDFILLS (PIT 29 AND SHAFT 124)

This closure/post-closure plan describes the activities necessary to achieve closure and post-closure of the Area G landfills at Los Alamos National Laboratory (LANL) Technical Area (TA) 54. The Area G landfills are comprised of two "active units," identified as Pit 29 and Shaft 124, which received hazardous waste after November 19, 1980. Hereinafter, the phrase "Area G landfills" is used to denote these active units. The Area G landfills are also "regulated units," as defined by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 264.90(a)(2), revised June 14, 2000 [6-14-00]. The information provided in this plan is submitted to address the applicable closure and post-closure requirements specified in 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts F and G; and 20.4.1 NMAC § 264.310 [6-14-00].

The Area G landfills are located within the TA-54 Area G waste storage facility, which will continue to operate. The Area G landfills will be closed in place without removing the waste and is co-located with solid waste management units (SWMU) managed under the LANL corrective action program. The closure and post-closure activities for the Area G landfills will be addressed as allowed by the alternative requirements of 20.4.1 NMAC § 264.110(c) to meet closure and post-closure care requirements. Alternative requirements are discussed further in Sections 1.3 and 3.2. Closure of the landfills will ensure that the wastes and/or waste residues that remain in place are stabilized, and will include constructing landfill covers, as described in Section 2.0 of this plan. The covers will minimize the need for further maintenance and be protective of human health. Post-closure care will include monitoring, maintenance, and reporting, as described in Section 4.0 of this plan. These activities will occur in conjunction with and subject to the investigation and potential remediation efforts of the LANL corrective action program, as allowed by the alternative requirements process. Therefore, the final remedy for the Area G landfills will be part of the corrective measure for Area G as a whole when operations cease and will be implemented in accordance with the Corrective Action Chapter of this permit. An aid in demonstrating the proposed corrective action activities that will meet the applicable post-closure requirements for the regulated units at Material Disposal Area (MDA) G is presented in Attachment A (MDA G: Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities) of this plan.

A document titled "Closure and Post-Closure Plans for TA 54-Area G Landfill at Los Alamos National Laboratory" was submitted to the New Mexico Environmental Improvement Division

(precursor to the New Mexico Environment Department [NMED]) in September 1985 (LANL, 1985). This closure/post-closure plan is a revision to the previous plan.

This plan for the Area G landfills is organized as follows:

- General closure information (Section 1.0).
- Specific closure information (Section 2.0).
- General post-closure information (Section 3.0)
- Specific post-closure information (Section 4.0)

Until closure is complete and has been certified in accordance with 20.4.1 NMAC § 264.115 [6-14-00], as discussed in Section 1.7, a copy of the approved closure/post-closure plan and any approved revisions will be on file at LANL's Solid Waste and Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy (DOE) Office of Los Alamos Site Operations (OLASO). Until final closure of the entire LANL facility, a copy of the approved plan will be furnished to the Secretary of the NMED, upon request, in accordance with 20.4.1 NMAC § 264.118(c) [6-14-00].

1.0 GENERAL CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC § 270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H; and 20.4.1 NMAC § 264.310 [6-14-00], as applicable.

1.1 Partial and Final Closure Activities [20.4.1 NMAC § 264.112(d)]

Partial Resource Conservation and Recovery Act (RCRA) closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. This partial closure will consist of closing the Area G landfills, while leaving the other units at LANL in operation. Partial closure (hereinafter referred to as closure) will be deemed complete when closure in place has been verified, alternative requirements to meet post-closure care requirements have been implemented, the closure certification has been submitted to the NMED, and the NMED has approved the closure.

As described in the proposed General Closure Plan submitted to the NMED in November 2001, final RCRA closure of the entire LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of

assembling documentation on the closure status of each unit, including all previous partial clean closures as well as land-based units that have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED and the NMED has approved the final closure.

1.2 Closure Performance Standard [20.4.1 NMAC § 264.111]

The Area G landfills (Pit 29 and Shaft 124) will be closed to meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G and 20.4.1 NMAC § 264.310 [6-14-00].

To meet the above closure performance standards and the closure requirements in 20.4.1 NMAC § 264.310(a), the planned covers on the specified pit and shaft that comprise the Area G landfills will be designed and constructed to:

- Provide long-term minimization of migration of liquids through the closed units
- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the covers
- Accommodate settling and subsidence so that the integrity of the covers is maintained, and
- Have a permeability that is less than or equal to the permeability of the natural subsoils present.

1.3 Closure Activities and Alternative Requirements

Closure activities for the Area G landfills will be addressed under alternative requirements, pursuant to 20.4.1 NMAC §264.118(b)(4). This allowable option is defined in 20.4.1 NMAC § 264.110(c) when a regulated unit is located among other SWMUs, releases potentially originating from both the regulated unit and the SWMUs have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. At Area G, the pit and shaft identified as the regulated units are in close proximity to (i.e., co-located with) similar disposal units (consolidated as SWMU No. 54-013[b]-99) to be addressed under the LANL

corrective action program. A subsurface volatile organic compound (VOC) vapor-phase plume was detected in the vadose zone and has been monitored at MDA G since the mid-1980s. U.S. Environmental Protection Agency (EPA) guidance for the rule (EPA, 1998) discusses the transfer of the closure and post-closure process to the facility corrective action process (contained in the Corrective Action Chapter of this permit) as an appropriate mechanism to address this situation.

Closure of the Area G landfills will ensure that the existing covers and wastes and/or waste residues that remain in place are stabilized, and will include constructing covers, as described in Section 2.0. The covers will minimize the need for further maintenance and be protective of human health. The covers will be constructed to be consistent with the corrective action process for TA-54, Area G, pending completion of the RCRA Facility Investigation (RFI).

If the RFI indicates that further corrective measures at MDA G (including modification to the covers) are deemed necessary to protect human health and the environment, they will be analyzed, selected, and implemented according to the requirements of the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility Permit and the most current and approved Installation Work Plan for the Environmental Restoration (ER) Project.

1.4 Closure Schedule [20.4.1 NMAC § 264.112(b)(6)]

Written closure plans are required for owners and operators of a hazardous waste management facility, pursuant to 20.4.1 NMAC § 264.112(a)(1). In addition, the plan must be submitted with the permit application and approved by the Secretary of the NMED as part of the permit issuance procedures under the Code of Federal Regulations, Title 40 (40 CFR), Part 124.

In accordance with 20.4.1 NMAC § 264.112(d)(1), written notification must be provided to the Secretary of the NMED at least 60 days prior to the date on which final closure of the landfills is expected to begin. Closure will be conducted in accordance with the schedule presented in Table 1. In the event that the closure of the Area G landfills is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC § 264.113(b) [6-14-00].

1.5 Amendment of the Closure Plan [20.4.1 NMAC § 264.112(c)]

In accordance with 20.4.1 NMAC § 264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan
- There is a change in the expected year of closure
- Unexpected events occur during closure that require modification of the approved closure plan
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC §§ 264.90(f) and/or 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

1.6 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00] to provide a cost estimate, financial assurance mechanism, and liability insurance for closure actions.

1.7 Closure Certification [20.4.1 NMAC § 264.115]

Within 60 days after completion of closure activities for the Area G landfills, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC § 264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both the DOE/OLASO and the SWRC Group.

1.8 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the Area G landfills will be maintained by the DOE or another authorized federal agency for as long as necessary to prohibit public access. The security fence at TA-54 will be maintained to ensure that public access into Area G is prevented.

1.9 Closure Report

Upon completion of the closure activities at the Area G landfills, a closure report will be prepared and, upon request, provided to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section 1.7 of this plan
- A general summary of closure activities
- Any significant variance from the approved activities and the reason for the variance
- A summary of any sampling data associated with closure
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory sample analysis data)
- Storage or disposal location of hazardous/mixed waste resulting from closure activities
- A certification of accuracy of the report.

1.10 Survey Plat [20.4.1 NMAC § 264.116]

LANL intends to meet closure/post-closure requirements by implementing alternative requirements allowable under 20.4.1 NMAC § 264.110(c): leaving waste in place; ensuring waste/waste residues are stabilized; and performing the activities described in Sections 3.0 and 4.0. A survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. A survey plat indicating the location and dimensions of Pit 29 and Shaft 124 at MDA G with respect to permanently surveyed benchmarks will be submitted to the local zoning authority (i.e., Los Alamos County) and to the NMED at the time of submission of the certification of closure. The plat will be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority will contain a prominently displayed note, which states the obligation of LANL and DOE to restrict disturbance of the unit in accordance with the applicable regulations in 20.4.1 NMAC, Subpart V, Part 264, Subpart G.

2.0 SPECIFIC CLOSURE INFORMATION

This section provides a general description of TA-54, Area G, and MDA G. It also presents a more detailed description of the Area G regulated units, as defined in 20.4.1 NMAC § 264.90(a)(2), and includes a discussion of the wastes in and the maximum capacities of the specified pit and shaft. In addition, specific closure information for the pit and shaft is presented herein. LANL does not currently intend to reduce the areal extent or the design capacities of the container storage units at Area G during the active life of those units. The most recent estimated annual quantities for the waste storage units at Area G are provided in the "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0/0.1/1.0/2.0 (LANL, 2001). A description of the geology, hydrology, and groundwater characterization at TA-54, Area G, is presented in Attachment B of this plan. Attachment C of this plan presents information on the nature and extent of releases at MDA G, as well as a brief assessment of present-day risk.

2.1 TA-54 Description

TA-54 is located on top of Mesita del Buey, an east-west trending mesa that is bordered on the north by Cañada del Buey and on the south by Pajarito Canyon. The elevation at TA-54 is approximately 6,800 feet (ft). TA-54 is used primarily for waste management. It includes four MDAs (one each at Areas G, H, J, and L) (Figure 1), hazardous/mixed waste storage and treatment areas, and numerous supporting offices. The Radioassay and Nondestructive Testing Facility is located in the western part of TA-54 (TA-54 West).

2.2 Area G and MDA G Description

Area G is an approximately 100-acre site in the east-central portion of TA-54. It is surrounded by an 8-ft-high chain-link security fence with razor wire at the top. The fence is inspected weekly and repairs made, if necessary. Access to Area G is controlled with a gate, with entrance to the area restricted to authorized and/or escorted personnel. In 1957, MDA G was developed as a radioactive waste landfill. This waste disposal site was selected due to the favorable hydrogeological characteristics, and is the only currently operating site for solid radioactive waste disposal at LANL. MDA G at Area G occupies approximately 63 acres (Figure 2). Land disposal in Pit 29 and Shaft 124 at MDA G was conducted in the mid-1980s. Pit 29 was designated as SWMU No. 54-018, and Shaft 124 was designated as SWMU No. 54-020. Both have been consolidated as SWMU No. 54-013(b)-99. Disposal of RCRA hazardous waste no longer occurs at MDA G. It is anticipated that radioactive waste disposal operations will continue at MDA G while LANL proceeds to meet its current mission. Area G is also presently used for radioactive and mixed waste storage in surface structures.

Near Area G, Cañada del Buey and Pajarito Canyon are roughly 100 ft below the mesa rim. Runoff to the north of Area G into minor drainages of Cañada del Buey is primarily from sheet flow. As a result of waste management activities, the natural drainage pattern is locally disturbed. Erosion controls at Area G divert water away from MDA G; these include asphalt drainage channels, a weir, riprap-lined channels, berms, silt fences, and culverts.

The following are descriptions of the subsurface pits, shafts, and trenches at MDA G. The descriptions were taken from the “RFI Work Plan for Operable Unit 1148" (LANL, 1992) and the “Closure and Post-Closure Plans for TA 54-Area G Landfill at Los Alamos National Laboratory” (LANL, 1985).

The pits at MDA G were excavated into the Bandelier Tuff. The pits vary in size, and are set back at least 50 ft from the mesa edge. Excavation began at MDA G in 1957, and disposal of radioactive waste began in Pit 1 in 1959. After a pit was filled, it was covered with approximately three ft of consolidated crushed tuff and a nominal four inches of topsoil. Native grasses were seeded in the topsoil. Until 1996, the pits were filled to within approximately three ft of the spill point (i.e., the lowest point along the surface perimeter of the pit). As a result, the cap thickness over most areas of a pit may exceed the approximately 3-ft cover. Only Pit 29 (Figure 2) received hazardous waste after November 19, 1980, making it subject to regulation under RCRA as an active disposal pit. Therefore, this pit is subject to RCRA closure standards and is addressed in this plan.

The shafts at MDA G are typically three to six ft in diameter and up to 65 ft deep. Like the pits, they are set back at least 50 ft from the mesa edge. The shafts are used for disposal of wastes that require special packaging, special handling, or segregation. Disposal of radioactive waste began in Shaft 1 in 1966. Shafts are lined or unlined, depending on the type of waste they contain. Typically, after a shaft was filled with waste to within three ft of the ground surface or it was determined that a shaft would no longer receive waste, it was backfilled with crushed tuff and plugged with approximately 3 ft. of concrete, slightly rounded at the surface to form a dome. Only Shaft 124 (Figure 2) received hazardous waste after November 19, 1980. Hence, it is subject to RCRA closure standards and is addressed in this plan. Until RCRA closure is complete, this shaft is considered an active disposal shaft.

The four disposal trenches as MDA G vary in size from approximately 60 to 260 ft long, 13 ft wide, and 6 to 8 ft deep. The trenches (identified as Trenches A, B, C, and D) were used for retrievable

placement of transuranic (TRU) waste. The wastes placed in the trenches were contained in 30-gallon drums inside concrete casks. Like the pits, after a trench was filled, it was covered with approximately three ft of consolidated crushed tuff and a nominal four inches of topsoil. Native grasses were seeded in the topsoil. The trenches became inactive prior to November 19, 1980, and are therefore subject to the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility Permit, but not closure standards. They are currently included in an investigation of Area G by LANL's ER Project.

Temporary structures and materials have been placed over many of the older disposal sites at MDA G to support ongoing waste management activities. Typically, the structures are sprung-dome facilities on asphalt pads.

2.2.1 Pit 29

Pit 29 is located in the west-central portion of Area G (Figure 2). This pit was used for disposal of solid-form waste from 1984 to 1986. Pit 29 is approximately 600 ft long and 30 ft deep. At its eastern end, it is approximately 70 to 75 ft wide; at its western end, it is approximately 40 ft wide. The pit has a capacity of approximately 45,795 cubic yards (yd^3), and reportedly contains a waste volume of 9,784 yd^3 (LANL, 1990). The waste contents include laboratory waste, glove boxes, plywood boxes, contaminated soil, and decontamination and decommissioning waste (LANL, 1990). The pit may also contain empty waste acid, pesticide, and herbicide containers (LANL, 1985), as well as asbestos and polychlorinated biphenyls-contaminated waste (LANL, 1992). A layer of retrievable TRU waste in cement-filled sections of corrugated pipe is located within a mound of fill material above Pit 29.

Crushed tuff removed during excavation of the pit was used to line the bottom of the pit to fill cracks and joints in the tuff. Equipment was used to place waste in the pit by lifts, and crushed tuff was placed within each lift to fill void spaces. A layer of crushed tuff was also used to separate lifts of waste. When the pit was filled to within approximately 3 ft of the spill point, it was covered with approximately 3 ft of crushed tuff and 4 inches of topsoil.

2.2.2 Shaft 124

Shaft 124 is located in the northeast portion of Area G (Figure 2). This unlined shaft was used from 1984 to 1987. Shaft 124 is 6 ft in diameter. Although there is no recorded depth of this shaft, the surrounding shafts are typically 65 ft deep (LANL, 1992). Assuming a depth of 65 ft, Shaft 124 has a capacity of 1,753 cubic ft (ft^3). The shaft capacity was calculated assuming it was to be filled to within 3 ft of the surface. The shaft was used for disposal of solid radioactive wastes and

approximately one ft^3 of hazardous wastes, including vials and organics (LANL, 1990). It is estimated that this shaft contains a total waste volume of approximately 378 ft^3 (LANL, 1992). When it was determined that Shaft 124 would no longer receive waste, it was backfilled with crushed tuff and the shaft was plugged with approximately 3 ft of concrete, which was slightly rounded at the surface to form a dome.

2.3 Closure Procedures

The Area G landfills (Pit 29 and Shaft 124) will be covered, as described in Sections 2.3.1 and 2.3.2. The wastes and/or waste residues in Pit 29 and Shaft 124 will be closed in place as landfills. No wastes will be removed from Shaft 124 at the end of active operations. At this time, there are no plans to remove waste from Pit 29 during the 30-year post-closure care period. In the event that DOE directives indicate waste retrieval is necessary, this plan will be revised, as described in Section 3.3.

As discussed in Sections 2.3.1 and 2.3.2 below, closure activities will include installation of an evapotranspiration (ET) cover over each regulated unit. ET covers consist of a single, vegetated soil layer constructed to represent an optimum mix of soil texture, soil thickness, and vegetation cover. ET covers consist of a monolithic soil layer designed to enhance soil water storage capacity to retain any infiltrated water until it can be evaporated by solar radiation and transpired by shallow-rooting plants. A schematic of an ET cover is presented in Figure 3.

The vegetated ET cover was developed explicitly for landfills located in arid and semi-arid environments like Los Alamos. The earliest research in this area was conducted at LANL at a test site not far from MDA G.

2.3.1 Pit 29 Closure Procedures

When the pit was filled to within approximately 3 ft of the spill point, it was backfilled with crushed tuff and compacted. The cover was graded to reflect the original ground surface, 4 inches of topsoil was added, and native grasses were seeded in the topsoil.

The following measures will be taken to provide additional stabilization of Pit 29 for closure; however, the actual design details are subject to change as additional planning information is obtained. As currently planned, a nominal 2 meters (m) of clean crushed tuff will be placed over Pit 29 and extend beyond the boundary of the pit. The additional fill will be applied in lifts and compacted. A biological barrier(s) will be incorporated into the design to discourage biotic intrusion.

Topsoil will be placed to a depth of between 15 and 20 centimeters (cm), and a gravel layer may be placed over the topsoil. The surface of the cover will be seeded with a native mix, including grasses and forbes. Fertilizer will be used on the seeded area to eliminate deficiencies in topsoil, and the seeded area will be stabilized. A temporary watering system will be provided and maintained until adequate vegetative growth has been established. Storm water run-on and runoff controls will be installed as part of the cover. The controls will be designed to reduce storm water run-on to the area of the stabilized pit. Controls will also be designed to convey storm water run-off away from the pit towards one of the storm water monitoring stations operating at Area G.

As described above, the backfill will help to stabilize the wastes in the pit and the cover will help to provide long-term minimization of precipitation infiltration. The cover will function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and have a permeability less than or equal to that of the natural surrounding geologic materials, in accordance with 20.4.1 NMAC § 264.310(a). In addition, the cover will provide run-on and runoff control, pursuant to 20.4.1 NMAC § 264.112(b)(5).

2.3.2 Shaft 124 Closure Procedures

When it was determined that the shaft would no longer receive waste, it was backfilled with crushed tuff. The existing cover of Shaft 124 consists of a concrete plug, approximately 3 ft thick, which was slightly rounded at the surface to form a dome. The concrete dome extends approximately 1 to 2 ft above the ground surface. A brass marker was placed during the final pour of seal concrete. Information on the concrete dome includes the wording “Buried Radioactive Wastes,” and identifies the shaft number, the radionuclides buried, total curies, and dates of use (LANL, 1985). The backfill in the shaft helps to stabilize the wastes in the shaft and accommodate settling and subsidence so that the concrete dome’s integrity is maintained, and the existing concrete dome has helped to minimize infiltration of precipitation to the shaft.

The following measures will be taken to provide additional stabilization of Shaft 124 for closure; however, the actual design details are subject to change as additional planning information is obtained. It has been determined that the entire shaft field that includes Shaft 124 will be covered, as discussed in the following. Addressing the entire shaft field will reduce the potential for preferential flow paths and potential infiltration of water. As currently planned, the concrete domes will be removed from all of the shafts and managed appropriately, and clean crushed tuff will be used to fill the voids created by removing the concrete domes. The entire shaft field area will then be compacted. A nominal 2 m of clean crushed tuff will be placed over the entire shaft field and

extend beyond the boundary of the shaft field. The additional fill will be applied in lifts and compacted. A biological barrier(s) will be incorporated into the design to discourage biotic intrusion. Topsoil will be placed to a depth of between 15 and 20 cm, and a gravel layer may be placed over the topsoil. The surface of the cover will be seeded with a native mix, including grasses and forbes. Fertilizer will be used on the seeded area to eliminate deficiencies in topsoil, and the seeded area will be stabilized. A temporary watering system will be provided and maintained until adequate vegetative growth has been established. Storm water run-on and runoff controls will be installed as part of the cover. The controls will be designed to reduce storm water run-on to the area of the shaft field. Controls will also be designed to convey storm water run-off away from the shaft field towards one of the storm water monitoring stations operating at Area G.

The additional backfill will help to stabilize the waste residues in Shaft 124 and the cover will provide long-term minimization of precipitation infiltration. The cover will function with minimum maintenance, promote drainage and minimize erosion or abrasion of the cover, and have a permeability less than or equal to that of the natural surrounding geologic materials, in accordance with 20.4.1 NMAC § 264.310(a). In addition, the cover will provide run-on and runoff control, pursuant to 20.4.1 NMAC § 264.112(b)(5).

3.0 GENERAL POST-CLOSURE INFORMATION

This section is prepared in accordance with the requirements of 20.4.1 NMAC §270.14(b)(13); 20.4.1 NMAC, Subpart V, Part 264, Subparts G and H; and 20.4.1 NMAC § 264.310 [6-14-00], as applicable.

3.1 Closure Performance Standard

Post-closure of the Area G landfills (Pit 29 and Shaft 124) will meet the following performance standards:

- Minimize the need for further maintenance
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere
- Comply with the applicable closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and N [6-14-00].

After closure, the measures by which LANL will meet the applicable 20.4.1 NMAC § 264.310(b) requirements (or equivalents thereof) are presented in Sections 4.1 and 4.2 of this plan. Post-closure of the landfills will be accomplished under alternative closure requirements, as allowed by 20.4.1 NMAC § 264.110(c) and as discussed in Section 3.2 below, to meet post-closure care requirements.

3.2 Post-Closure Care and Alternative Requirements

In accordance with 20.4.1 NMAC § 264.117(a)(1), post-closure care for the Area G landfills will begin after completion of closure of the unit and will continue for 30 years. Post-closure care of the regulated units under alternative requirements will begin after closure is complete, as described in Section 2.3 of this plan, and closure is certified by LANL and approved by the NMED. The Secretary of the NMED may shorten the post-closure care period at any time preceding partial closure or during the post-closure period if all disposal units at the facility are closed and it is determined that the reduced period is sufficient to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(i). Alternatively, the Secretary of the NMED may extend the post-closure care period if it is determined that the extended period is necessary to protect human health and the environment, in accordance with 20.4.1 NMAC § 264.117(a)(2)(ii).

Post-closure activities for the Area G landfills will be addressed under alternative requirements, as allowed by 20.4.1 NMAC § 264.118(b)(4). This allowable option is defined in 20.4.1 NMAC § 264.110(c) when a regulated unit is located among other SWMUs, releases potentially originating from both the regulated unit and the SWMUs have or are likely to have occurred, and the alternative requirements will meet the closure performance standards set forth in 20.4.1 NMAC § 264.111. At the Area G landfills, the pit and shaft identified as the regulated units are in close proximity to (i.e., co-located with) similar disposal units (SWMUs) to be addressed under the LANL corrective action program. A subsurface VOC vapor-phase plume was detected in the vadose zone and has been monitored at MDA G since the mid-1980s. EPA guidance for the rule (EPA, 1998) discusses the transfer of the post-closure process to the facility corrective action process (contained in the Corrective Action Chapter of this permit) as an appropriate mechanism to address this situation. Therefore, some post-closure procedures for the Area G regulated units will be established as part of the corrective measures to be identified for the ongoing corrective action program at TA-54.

As required by 20.4.1 NMAC § 264.117(a)(1)(i and ii), post-closure care of the Area G landfills will include maintenance, monitoring, and reporting as appropriate and in accordance with the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310. As

described in Section 2.3 of this plan, the closures will include addition of covers. The integrity and effectiveness of the covers will be maintained, including conducting inspections and making necessary repairs to correct the effects of settling, erosion, water damage, or other events.

An RFI is currently ongoing at MDA G. NMED will determine whether a RCRA Corrective Measures Study (CMS) is required, based on the findings of the RFI. Vadose zone monitoring of the Area G landfills will be performed in accordance with the findings of the RFI regarding the current monitoring system. Groundwater monitoring will be developed for TA-54 as an aggregate under the LANL "Hydrogeologic Workplan" (LANL, 1998) and implemented as appropriate by LANL's Groundwater Protection Program, as described in Section 4.1.2.

If further corrective measures at the Area G landfills are deemed necessary to protect human health and the environment (including modification to the covers), they will be analyzed, selected, and implemented during the CMS process according to the requirements of the Corrective Action Chapter of LANL's renewed Hazardous Waste Facility Permit and the most current and approved Installation Work Plan for the ER Project. The selected corrective measure will include alternative requirements for post-closure care of the Area G landfills in a manner that complies with the requirements of 20.4.1 NMAC § 264.110(c)(2), and the selection and implementation must be approved by the NMED as a permit modification.

3.3 Amendment of the Post-Closure Plan

In accordance with 20.4.1 NMAC §264.118(d)(1) [6-14-00], LANL may submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan at any time during the active life of the facility or during the post-closure care period. In accordance with 20.4.1 NMAC §264.118(d)(2) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:

- There are changes in operating plans or facility design that affect the approved post-closure plan
- There is a change in the expected year of final closure, if applicable
- Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan
- LANL requests the Secretary of the NMED to apply alternative requirements (e.g., if corrective action necessitates changes to the closure configuration or the post-closure care requirements) to a regulated unit under 20.4.1 NMAC § 264.90(f) and/or § 264.110(c).

The written notification or request will include a copy of the amended post-closure plan for review or approval by the NMED, in accordance with 20.4.1 NMAC § 264.118(d).

LANL will submit a written request for a permit modification at least 60 days prior to the proposed change in unit design or operation, or no later than 60 days after an occurrence of an unexpected event that affects the post-closure plan. The Secretary of the NMED will approve, disapprove, or modify this plan in accordance with the procedures in 40 CFR, Part 124 and 20.4.1 NMAC, Subpart IX, Part 270. The approved post-closure plan will become a permit condition, in accordance with 20.4.1 NMAC § 270.32.

The Secretary of the NMED may request modifications to the plan under the conditions presented in the bulleted items above. LANL will submit the modified plan no later than 60 days after the Secretary's request. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in 40 CFR, Part 124 and 20.4.1 NMAC, Subpart IX, Part 270.

In accordance with 20.4.1 NMAC § 264.119(c), LANL or a subsequent owner or operator may request a modification to the approved post-closure plan to authorize the removal of hazardous wastes and hazardous waste residues or contaminated soils. If a permit modification to conduct such removal activities is granted, the owner or operator may request that the Secretary of the NMED approve the removal of the post-closure notice filed with the County of Los Alamos, other authorized agencies, or the Secretary of the NMED. Alternatively, the owner or operator may provide an additional post-closure notice indicating the removal of the hazardous waste, with approval from the Secretary of the NMED.

3.4 Post-Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC § 264.140(c)]

In accordance with 20.4.1 NMAC § 264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00] to provide a cost estimate, financial assurance mechanisms, and liability insurance for post-closure actions.

3.5 Post-Closure Certification [20.4.1 NMAC § 264.120]

Within 60 days after completion of the established post-closure care period for the Area G landfills, LANL will submit to the Secretary of the NMED, by registered mail, a certification that the post-closure care period for the unit was performed in accordance with the approved post-closure plan. The certification will be signed by the appropriate DOE and LANL officials and by an independent,

registered professional engineer. Documentation supporting the independent, registered professional engineer's certification will be furnished to the Secretary of the NMED upon request. A copy of the certification and supporting documentation will be maintained by DOE/OLASO. The supporting documentation may include, for example, the following:

- Any significant variance from the approved activities and the reason for the variance
- A summary of all sampling results
- A quality assurance/quality control statement on analytical data validation
- The location of the file of supporting documentation
- Storage or disposal location of hazardous/mixed waste resulting from post-closure activities.

3.6 Security

Because of the ongoing nature of waste management operations at TA-54, security and administrative controls for the Area G landfills will be under the care of the DOE or another authorized federal agency during the post-closure care period. The security fence at TA-54 will be maintained during that period to prohibit public access into Area G.

3.7 Survey Plat and Post-Closure Requirements [20.4.1 NMAC § 264.116 and § 264.117 through § 264.120]

As stated in Section 1.10, a survey plat prepared in accordance with 20.4.1 NMAC § 264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure. No later than 60 days after certification of closure of the Area G landfills, LANL will submit to the County of Los Alamos and other authorized agencies and to the Secretary of the NMED a record of the type, location, and quantity of hazardous wastes disposed of within the unit. For hazardous wastes disposed of before January 12, 1981, LANL will identify the type, location, and quantity of the hazardous wastes to the best of their knowledge and in accordance with any records that have been kept.

Post-closure care pursuant to 20.4.1 NMAC § 264.117 through § 264.120 [6-14-00] will begin after closure of the disposal units. Post-closure notices will be filed with appropriate authorities within 60 days of certification of closure of the first disposal unit and within 60 days of certification of closure of the last disposal unit, as described in 20.4.1 NMAC § 264.119 [6-14-00]. To meet that requirement, DOE will file a "Land Use Restriction Notice" or equivalent document with the County of Los Alamos and other authorized agencies. The "Land Use Restriction Notice" will indicate that the land has been used to manage hazardous wastes and that its use is restricted under 20.4.1

NMAC, Subpart V, Part 264, Subpart G regulations. It will also indicate that the survey plat and record of the type, location, and quantity of hazardous wastes disposed of have been filed with the County of Los Alamos and other authorized agencies and with the Secretary of the NMED. LANL will also submit a certification, signed by DOE and LANL, that they have recorded the notation specified in 20.4.1 NMAC § 264.119(b)(1), including a copy of the document in which the notation has been placed, to the Secretary of the NMED.

Within 60 days after completion of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC § 264.120 [6-14-00]. Certification of completion of post-closure care is described in Section 3.5.

4.0 SPECIFIC POST-CLOSURE INFORMATION

Pursuant to 20.4.1 NMAC § 264.118(b), the post-closure portion of this plan identifies the activities that will be conducted after closure of the Area G landfills and the frequency of these activities. Post-closure activities for the Area G landfills will be addressed under alternative requirements, pursuant to 20.4.1 NMAC § 264.118(b)(4). These post-closure activities are described below in Sections 4.1 and 4.2, and include activities that are planned as well as those that may be conducted as a result of the corrective action process.

This section describes these activities, which include monitoring activities and the frequencies at which they will be performed to be consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F, as appropriate, and 20.4.1 NMAC § 264.310 during the post-closure care period, in accordance with 20.4.1 NMAC § 264.118(b)(1). The activities also include maintenance activities and the frequencies at which they will be performed, as required in 20.4.1 NMAC § 264.118(b)(2).

4.1 Monitoring and Frequency

The monitoring activities and the frequencies at which they will be performed, pursuant to 20.4.1 NMAC § 264.118(b)(1), are described to the extent known in the following sections. Monitoring of the vadose zone and groundwater will be conducted as appropriate according to currently existing schedules, pending potential modifications as determined by the RFI/CMS process and/or implementation of LANL's Groundwater Protection Program. The frequency of monitoring for each medium is also discussed.

4.1.1 Vadose Zone

Vadose zone monitoring at MDA G has been ongoing since the mid-1980s. The pore-gas monitoring program has been successful in defining the nature of the vapor plume at MDA G. Figures included in Appendix C of the "Quarterly Technical Report July-September 2001" (ER Project, 2001) visually depict the results for 12 quarters of monitoring at MDA G (Fiscal Year [FY] 99 through FY 01). A 3-dimensional visualization was initiated to evaluate the extent of the VOC plume at MDA G; to date, however, insufficient data exist spatially and over time to show a meaningful 3-dimensional interpretation (ER Project, 2001). It is anticipated that additional monitoring of the available MDA G boreholes will fill this data need.

Although the actual frequency of monitoring is not precisely known at this time, the "RFI Report for Material Disposal Area G at Technical Area 54", which will be submitted to the NMED in 2002, may recommend quarterly pore-gas monitoring for a prescribed period, followed by semi-annual pore-gas monitoring for a 2-year period, and annual pore-gas monitoring thereafter. Monitoring and monitoring frequency of the vadose zone will also be addressed under the remaining portions of the corrective action process (e.g., CMS, Corrective Measures Implementation).

4.1.2 Regional Aquifer Groundwater

Five regional aquifer (R) wells are planned for installation in the vicinity of TA-54. These wells include R-16, R-20, R-21, R-22, and R-23. The five wells are included in or associated with Aggregate 2, the boundaries of which were drawn to encompass the SWMUs at TA-54. Well R-22 was installed in the fall of 2000. Currently, well R-21 is planned for completion in FY 02. The remaining wells (R-16, R-20, and R-23) are also planned for completion in FY 02, contingent upon the approval of additional funding requested in April 2002.

The groundwater analytical strategy being implemented at LANL is described herein. The first step in the strategy is installation of a characterization well, followed by collection of water samples from each well screen upon well completion. For single-completion wells, there is no activity for a 3-month period after borehole sampling while the well equilibrates. For multiple-completion wells, no activity occurs for a 6-month period after borehole sampling while the well equilibrates. The second step is collection of initial characterization samples (i.e., the first sampling round) from each well screen and analysis for a full suite of analytes, provided the yield at any screened interval is a sufficient volume for a full analytical suite. Otherwise, the analyses will be prioritized according to suspected contaminants of concern (COC). For each well screen, if compounds and/or radionuclides are not detected in the first sampling round, they will be deleted from the analyte list

for the second and third sampling rounds unless the compound or radionuclide is a COC. If compounds and/or radionuclides are detected in the first sampling round, the appropriate well screens will be selected for subsequent sampling based on data needs; the plans for subsequent sampling and analysis will be discussed with the NMED. The third step is conducting the second and third sampling and analysis rounds. The final step is collection of the fourth round of samples from each well screen and analysis for a full suite of analytes.

Upon completion of four sampling rounds at each well installed pursuant to the "Hydrogeologic Workplan" (LANL, 1998), the well will be incorporated into LANL's Groundwater Protection Program. These wells will be used to enhance the program by serving as monitoring wells and/or providing information to determine potential future locations for additional monitoring wells. The well data will be entered into the well inventory module of the Water Quality Database. This database will be available to LANL and external stakeholders. Data customers (e.g., regulators, LANL personnel, or other stakeholders) can then examine the information and, if appropriate and necessary, request samples, measurements, or other data to be collected from any well. Under the Groundwater Protection Program, all water sampling, water-level measurements, and other testing will be implemented consistent with laws, regulations, and DOE orders, and in consultation with the data customers.

Consistent with the site characterization and following a determination of the need for monitoring, the detection-type monitoring prescribed in 20.4.1 NMAC § 264.98 will be initiated. Detection is defined in 20.4.1 NMAC § 264.91(a)(1) as statistically significant evidence of contamination, as described in 20.4.1 NMAC § 264.98(f). A monitoring system and compliance period as described in Attachment A consistent with 20.4.1 NMAC §§ 264.96 and 264.97 will be utilized. In accordance with 20.4.1 NMAC § 264.98(f), LANL will determine whether there is statistically significant evidence of contamination for any chemical parameter or hazardous constituent. An appropriate frequency for sample collection and statistical analysis will be proposed to the NMED that will be capable of determining statistically significant evidence of contamination, as required by 20.4.1 NMAC § 264.98(d). Data will be collected that are appropriate for the statistical methodology applied, sufficient in sample size, and utilizing sampling procedures and frequencies of sample collection established by the Groundwater Protection Program to ensure that potential contaminant release(s) from the regulated units can be detected, in accordance with 20.4.1 NMAC § 264.97. For TA-54, the point of compliance is the boundary of Aggregate 2. If a more comprehensive monitoring program is established as described in Attachment A consistent with 20.4.1 NMAC § 264.99 and an increase in contamination is indicated, a program that takes action to address the increase will be

implemented. Descriptions of each proposed activity equivalent to operating unit regulations for groundwater are presented in Attachment A.

4.2 Maintenance and Frequency

Pursuant to 20.4.1 NMAC § 264.118(b)(2), the planned maintenance activities and the frequencies at which they will be performed are discussed in the following sections. Planned maintenance will include inspections at prescribed frequencies and potential resulting maintenance activities consistent with 20.4.1 NMAC § 264.310. The planned maintenance will also ensure the function of the monitoring equipment consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310.

4.2.1 Integrity of Cap/Covers

The covers at the Area G regulated units will be maintained during post-closure to preserve their integrity and effectiveness in accordance with 20.4.1 NMAC § 264.310(b)(1). Inspections will be conducted quarterly, unless changes are necessitated by the outcome of investigations currently being conducted, and repairs will be made to the covers, if necessary, to correct the effects of settling, subsidence, erosion, or other events. Inspection results and subsequent repairs will be noted in the facility record. The final selected corrective measure will be maintained to prevent run-on and runoff from eroding or otherwise damaging the selected measure if waste remains in place, consistent with 20.4.1 NMAC § 264.310(b)(5).

4.2.2 Monitoring Equipment

As discussed in Section 4.1.1, LANL will continue to conduct vadose zone monitoring at MDA G and may modify the existing vadose zone monitoring program based on the results of groundwater transport modeling. Continued vadose zone monitoring will allow early detection of potential contaminant transport toward the regional aquifer. The continued vadose zone monitoring will be conducted in lieu of 20.4.1 NMAC § 264.310(b)(2) and (3) requirements, as allowed by the alternative requirements in 20.4.1 NMAC § 264.110(c). Prior to each sampling event, the protective surface casing of each selected borehole will be inspected to ensure that it has not been damaged. The locking mechanisms at each borehole will be checked to verify that they have not been compromised. Vapor ports will also be inspected to ensure that they are not obstructed and have not degraded or lost their plugs. In addition, vapor port depth tags will be inspected for legibility, as will the identification number on the inside of the borehole. Sampling equipment will also be inspected and tested, as necessary, prior to each sampling event. Over time, the monitoring systems that contain the sampling membranes (e.g., socks) within a borehole may require

replacement. If the borehole is in an area where vehicle traffic might pose a hazard, the guard or bumper posts will be inspected to ensure their integrity is maintained. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

The groundwater monitoring system, discussed in Section 4.1.2, will also be maintained to ensure maximum operating conditions, consistent with 20.4.1 NMAC § 264.310(b)(4). Prior to each sampling event, the protective steel casing and locking mechanism(s) will be inspected to ensure that they have not been compromised. The well identification number on the inside and/or outside of the cover will also be inspected for legibility. In addition, the brass monument on the concrete protective pad, placed around the well casing to ensure long-term structural integrity of the well, will be inspected to verify that the location identification number remains clearly imprinted on the monument. If the well is in an area where vehicle traffic might pose a hazard, the guard or bumper posts will be inspected to ensure their integrity is maintained. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

Surveyed benchmarks used in accordance with 20.4.1 NMAC § 264.309 will be protected and maintained throughout the post-closure period, pursuant to 20.4.1 NMAC § 264.310(b)(6). If a benchmark is in an area where vehicle traffic might pose a hazard, guard or bumper posts will be installed to provide protection. The condition of the surveyed benchmarks will be inspected for legibility and to identify any potential maintenance needs. Maintenance will be performed on an as-needed basis when the necessity is indicated as a result of inspections.

4.3 Reporting

Post-closure care will also include reporting consistent with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and 20.4.1 NMAC § 264.310, as appropriate.

As described in Attachment A consistent with 20.4.1 NMAC § 264.98, LANL will notify the Secretary of the NMED if, under the detection monitoring program, it is determined [in accordance with 20.4.1 NMAC § 264.98(f)] that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents at any of the Aggregate 2 monitoring wells. This notification will be provided in writing within seven days of the determination. The notification will indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination.

If a more comprehensive monitoring program is established as described in Attachment A consistent with 20.4.1 NMAC § 264.99, LANL will analyze samples from the Aggregate 2 monitoring wells for all 20.4.1 NMAC, Subpart V, Part 264, Appendix IX constituents at least annually, in accordance with 20.4.1 NMAC § 264.99(g). This analysis will be used to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to the procedures in 20.4.1 NMAC § 264.98(f). If LANL finds Appendix IX constituents in the groundwater that are not identified as monitoring constituents in the permit, LANL may resample within one month and repeat the Appendix IX analysis. If the presence of new constituents is confirmed by the second analysis, LANL will report the concentration of these additional constituents to the Secretary of the NMED within seven days after completion of the second analysis. If LANL decides not to resample, the concentrations of the additional constituents will be reported to the Secretary of the NMED within seven days after completion of the initial analysis. In either event, these constituents will be added to the monitoring list.

If a compliance monitoring program is established in accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and LANL determines, pursuant to 20.4.1 NMAC § 264.99(d), that any concentration limits under 20.4.1 NMAC § 264.94 are being exceeded at any of the Aggregate 2 monitoring wells, notification to the Secretary of the NMED will be submitted in writing within seven days. Pursuant to 20.4.1 NMAC § 264.99(h)(1), the notification will indicate which concentration limits have been exceeded.

If a compliance monitoring program is established in accordance with 20.4.1 NMAC, Subpart V, Part 264, Subpart F and LANL determines, pursuant to 20.4.1 NMAC § 264.99(d), that the groundwater concentration limits are being exceeded at any of the Aggregate 2 monitoring wells, LANL may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the groundwater. In this case, LANL will notify the Secretary of the NMED within seven days that a demonstration will be made, in accordance with 20.4.1 NMAC § 264.99(i).

If a groundwater corrective action program is established pursuant to 20.4.1 NMAC, Subpart V, Part 264, Subpart F, LANL will report in writing to the Secretary of the NMED on the effectiveness of the program. LANL will submit these reports semiannually, in accordance with 20.4.1 NMAC § 264.100(g).

4.4 Post-Closure Use of Property

In accordance with 20.4.1 NMAC § 264.117(c), post-closure use of property on or in which hazardous waste remains after partial or final closure will not be allowed to disturb the integrity of the final cover or any other components of the containment system, if present. In addition, post-closure use of property will not be allowed to disturb the function of the monitoring systems unless the Secretary of the NMED finds that the disturbance is necessary to the proposed use of the property and will not increase the potential hazard to human health or the environment, or it is necessary to reduce a threat to human health or the environment.

4.5 Post-Closure Care Period Contact Office

As required by 20.4.1 NMAC § 264.118(b)(3), the name, address, and phone number of the office to contact about the Area G landfills during the post-closure care period is:

U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
528 35th Street
Los Alamos, New Mexico
87544
505-667-5105

5.0 REFERENCES

EPA, 1998, "Standards Applicable to Owners and Operators of Closed and Closing Hazardous Waste Management Facilities: Post-Closure Permit Requirement and Closure Process; Final Rule," *Federal Register*, pp. 56710-56735.

ER Project, 2001, "Quarterly Technical Report July-September 2001," LA-UR-01-6148, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002, "RFI Report for Material Disposal Area G at Technical Area 54," in preparation, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2001, "Los Alamos National Laboratory General Part A Permit Application," Revision 0.0/0.1/1.0/2.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998, "Hydrogeologic Workplan," May 1998, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1992, "RFI Work Plan for Operable Unit 1148," LA-UR-92-855, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1990, “Solid Waste Management Units Report,” Volume IV of IV, Los Alamos National Laboratory Report LA-UR-90-3400, revised November 1990, Los Alamos, New Mexico.

LANL, 1985, “Closure and Post-Closure Plans for TA 54-Area G Landfill at Los Alamos National Laboratory,” September 1985, Los Alamos National Laboratory, Los Alamos, New Mexico.

Table 1

Schedule for Closure Activities at Technical Area 54 Area G Landfills

Activity	Maximum Time Required[a]
Let contract request for proposals	-90 Days
Notify the New Mexico Environment Department (NMED)	-45 Days
Receive proposals	-30 Days
Select contractor and award contract	-10 Days
Approval of closure plan	Day 0
Conduct closure activities	Day 10
Submit closure certification to the NMED	Day 180

[a] The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously, may not require the maximum time listed, or may require more time than indicated above. Extensions to the schedule may be requested, as needed.

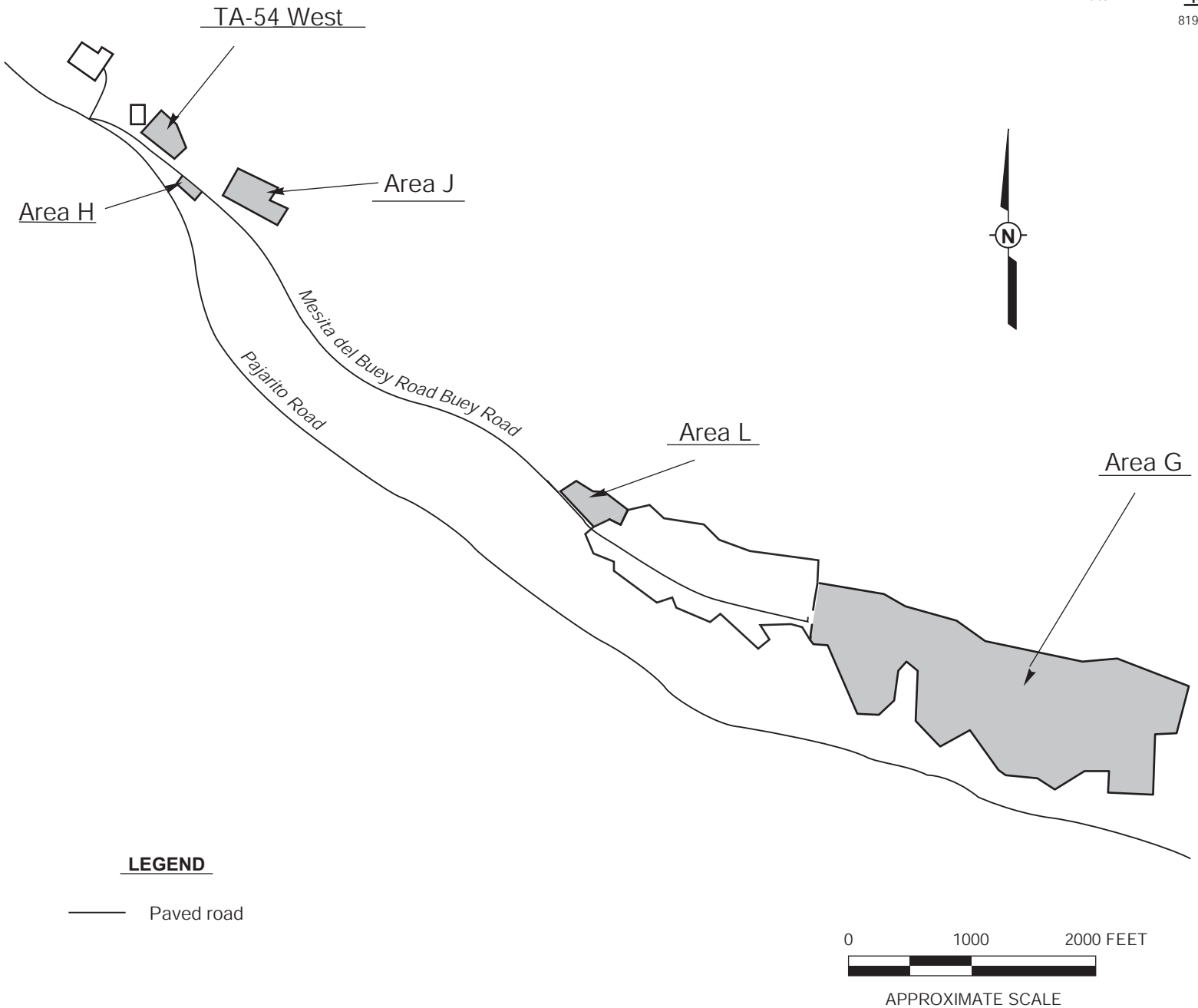


Figure 1
Technical Area (TA) 54 Site Location Map

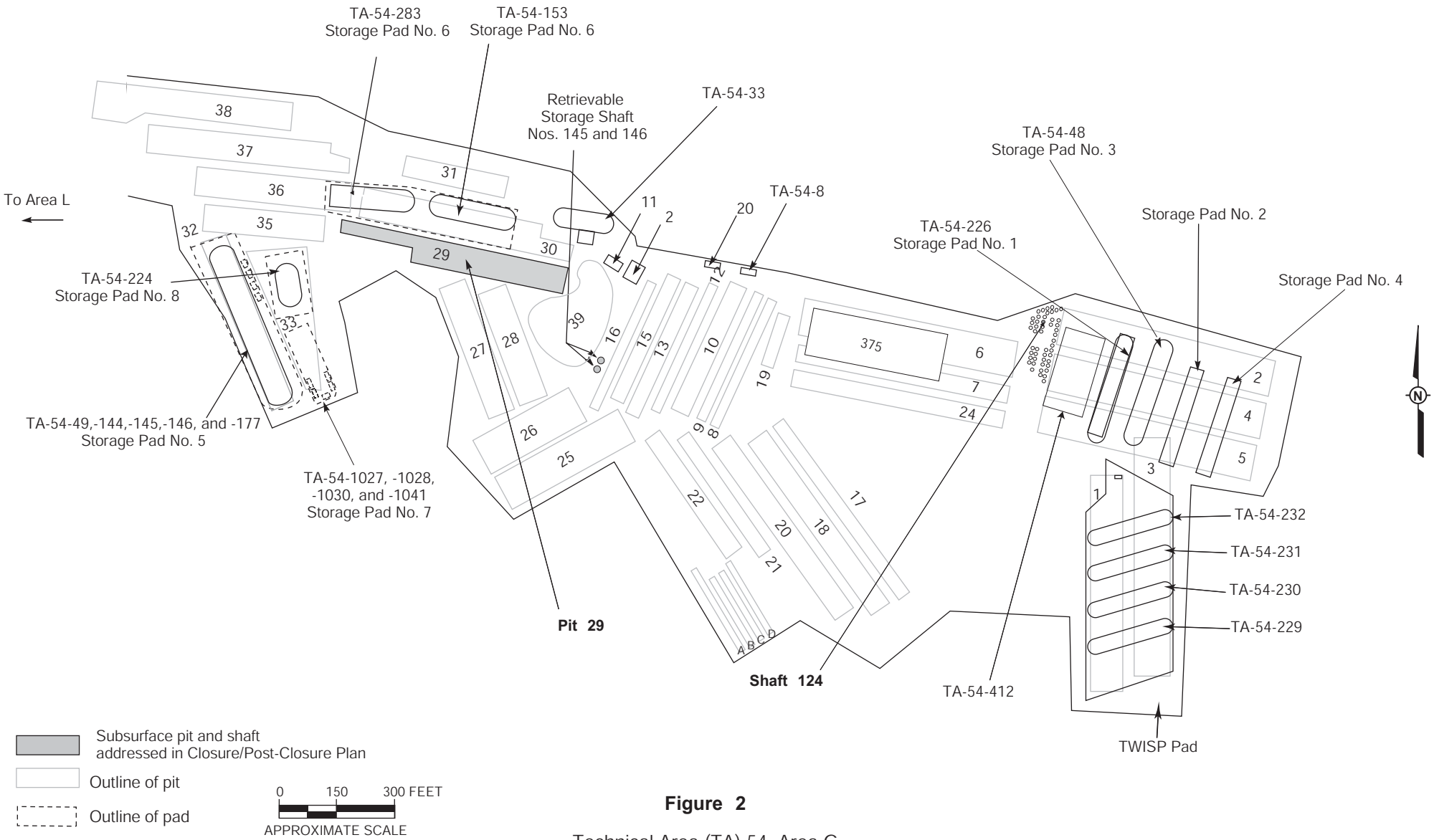
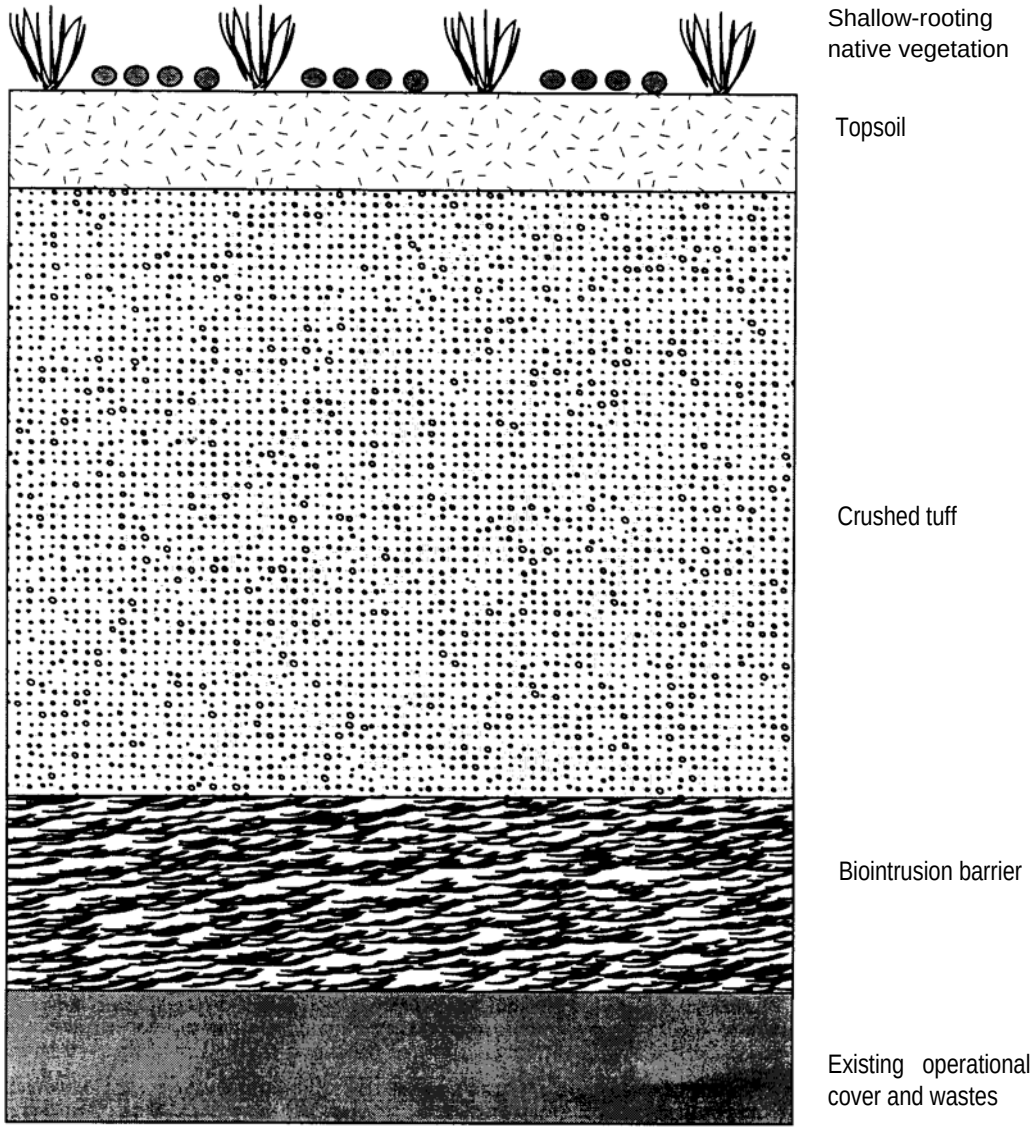


Figure 2

Technical Area (TA) 54, Area G



Not to Scale

Figure 3

Example of an Evapotranspiration Cover

ATTACHMENT A

MDA G

OPERATING UNIT REGULATIONS FOR GROUND WATER/CLOSURE/POST-CLOSURE CARE AND CORRESPONDING HSWA ACTIVITIES

Operating Unit Regulations for Ground Water/Closure/Post-Closure Care and Corresponding HSWA Activities

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90	Applicability		
§264.90(a)(1)	Except as provided in paragraph (b) of this section, the regulations in this subpart apply to owners or operators of facilities that treat, store or dispose of hazardous waste. The owner/operator must satisfy the requirements identified in paragraph (a)(2) of this section for all wastes (or constituents thereof) contained in solid waste management units at the facility, regardless of the time at which waste was placed in such units.		
§264.90(a)(2)	All solid waste management units must comply with the requirements in §264.101. A surface impoundment, waste pile, and land treatment unit or landfill that receives hazardous waste after July 26, 1982 (hereinafter referred to as a "regulated unit") must comply with the requirements of §§264.91 through 264.100 in lieu of §264.101 for purposes of detecting, characterizing and responding to releases to the uppermost aquifer. The financial responsibility requirements of §264.101 apply to regulated units.		
§264.90(b)	The owner/operator's regulated unit or units are not subject to regulation for releases into the uppermost aquifer under this subpart if:		
§264.90(b)(1)	The owner/operator is exempted under §264.1; or	NA	NA
§264.90(b)(2)	He operates a unit which the Secretary finds:	NA	NA
§264.90(b)(2)(i)	Is an engineered structure,	NA	NA
§264.90(b)(2)(ii)	Does not receive or contain liquid waste or waste containing free liquids,	NA	NA
§264.90(b)(2)(iii)	Designed and operated to exclude liquid, precipitation, and other run-on and run-off,	NA	NA
§264.90(b)(2)(iv)	Has inner and outer layers of containment enclosing the waste,	NA	NA
§264.90(b)(2)(v)	Has a leak detection system built into each containment layer,	NA	NA
§264.90(b)(2)(vi)	Continuing operation and maintenance of leak detection systems will be provided during active life and during closure/post-closure care periods, and	NA	NA
§264.90(b)(2)(vii)	To reasonable degree of certainty, will not allow hazardous constituents to migrate beyond outer containment layer prior to end of post-closure care period.	NA	NA
§264.90(b)(3)	The Secretary finds, pursuant to §264.280(d), that the treatment zone of a land treatment unit that qualifies as a regulated unit does not contain levels of hazardous constituents that are above background levels of those constituents by an amount that is statistically significant, and if an unsaturated zone monitoring program meeting the requirements of §264.278 has not shown a statistically significant increase in hazardous constituents below the treatment zone during the operating life of the unit. An exemption under this paragraph can only relieve an owner or operator of responsibility to meet the requirements of this subpart during the post-closure care period; or	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(b)(4)	The Secretary finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and the post-closure care period specified under §264.117. This demonstration must be certified by a qualified geologist or geotechnical engineer. In order to provide an adequate margin of safety in the prediction of potential migration of liquid, the owner or operator must base any predictions made under this paragraph on assumptions that maximize the rate of liquid migration.	Should sufficient information support this exemption for a regulated unit in the future, the HSWA activity would be equivalent to that prescribed by the exemption.	
§264.90(b)(5)	He designs and operates a pile in compliance with §264.250(c).	NA	NA
§264.90(c)	The regulations under this subpart apply during the active life of the regulated unit (including the closure period). After closure of the regulated unit, the regulations in this subpart:		NA
§264.90(c)(1)	Do not apply if all waste, waste residues, contaminated containment system components, and contaminated subsurface soils removed or decontaminated at closure;	For MDA G, a CMS report will be developed and will address this issue. If appropriate, the report will include a general description of an excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure is selected, details will be provided in the approved CMI Plan following permit modification.	
§264.90(c)(2)	Apply during post-closure care period if owner/operator is conducting a detection monitoring program under §264.98; or	The probable corrective measure to be implemented at MDA G will include monitoring in the vadose zone beneath MDA G. The LANL hydrogeologic characterization program (as implemented through the LANL Hydrogeologic Workplan) proposes the locations for characterization wells for TA-54 that after four sampling events will be included in LANL Environmental Surveillance Program, and may, if appropriate, be used as repetitive monitoring wells for TA-54 as a whole.	
§264.90(c)(3)	Apply during compliance period under §264.96 if the owner/operator is conducting a compliance monitoring program under §264.99 or a corrective action program under §264.100.	If monitoring indicates a more comprehensive program is needed to adequately comply with ground water protection standards in 264.91 and 264.92, additional characterization and/or well installation will occur, if appropriate.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(d)	Regulations in this subpart may apply to miscellaneous units when necessary to comply with §§264.601-603.	NA	NA
§264.90(e)	The regulations of this subpart apply to all owners and operators subject to the requirements of 40 CFR 270.1(c)(7), when the Bureau issues either a post-closure permit or an enforceable document (as defined in 40 CFR 270.1(c)(7)) at the facility. When the Bureau issues an enforceable document, references in this subpart to "in the permit" mean "in the enforceable document."	CMS and CMI plans and resulting CMS and CMI reports describing activities equivalent to post-closure permit requirements will be "enforceable documents" consistent with 265.121.	
§264.90(f)	The Secretary may replace all or part of the requirements of §§ 264.91 through 264.100 applying to a regulated unit with alternative requirements for groundwater monitoring and corrective action for releases to groundwater set out in the permit (or in an enforceable document) (as defined in 40 CFR 270.1(c)(7)) where the Secretary determines that:	Activities proposed and implemented in the above referenced plans will be effectively equivalent to the cited Subpart F requirements.	
§264.90(f)(1)	The regulated unit is situated among SWMUs or areas of concern (AOC), a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	As the possibility for this situation exists, alternative activities may appropriately replace all or part of the above cited Subpart F requirements.	
§264.90(f)(2)	It is not necessary to apply the groundwater monitoring and corrective action requirements of §§264.91-100 because alternative requirements will protect human health and the environment.	Should the above situation exist, §264.90(f)(1), alternative activities protective of human health and the environment and proposed in lieu of §264.91-264.100 will preclude the need for application of Subpart F requirements.	
§264.91	Required programs		
§264.91(a)	Owner/operators subject to this subpart must conduct a monitoring and response program as follows:		
§264.91(a)(1)	Whenever hazardous constituents under §264.93 from a regulated unit are detected at a compliance point under §264.95, owner/operator must institute a compliance monitoring program under §264.99. Detection is defined as statistically significant evidence of contamination as described in §264.98(f);	If detection is indicated, additional characterization and/or well installation will occur if appropriate - 264.90(c)(3)	
§264.91(a)(2)	Whenever the groundwater protection standard under §264.92 is exceeded, owner/operator must institute a corrective action program under §264.100. Exceedance is defined as statistically significant evidence of increased contamination as described in §264.99(d);	If detection is indicated, concentrations protective of human health and the environment will be established similar to ground water protection standards in §264.92. Actions necessary to correct any exceedances of such concentrations will be taken as necessary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.91(a)(3)	Whenever hazardous constituents under §264.93 from a regulated unit exceed concentration limits under §264.94 in groundwater between the compliance point under §264.95 and the downgradient facility property boundary, owner/operator must institute a corrective action program under §264.100; or	Should established concentration limits be exceeded between the point of compliance and the downgradient boundary, actions to correct such exceedances will be taken as necessary.	
§264.91(a)(4)	In all other cases, owner/operator must institute a detection monitoring program under §264.98.	TA-54 characterization wells will be sampled and analyzed as repetitive monitoring wells as appropriate through the LANL Environmental Surveillance Program.	
§264.91(b)	The Secretary will specify in the facility permit the specific elements of the monitoring and response program. The Secretary may include one or more of the programs identified in paragraph (a) of this section in the facility permit as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs will be required. In deciding whether to require the owner or operator to be prepared to institute a particular program, the Secretary will consider the potential adverse effects on human health and the environment that might occur before final administrative action on a permit modification application to incorporate such a program could be taken.	See above.	
§264.92	The owner/operator must comply with conditions specified in the facility permit that are designed to ensure that hazardous constituents under §264.93 detected in the ground water from a regulated unit do not exceed the concentration limits under §264.94 in the uppermost aquifer underlying the waste management area beyond the point of compliance under §264.95 during the compliance period under §264.96. The Secretary will establish this ground-water protection standard in the facility permit when hazardous constituents have been detected in the ground water.	Should "detection" consistent with the definition in §264.91(a)(1) occur, LANL will comply with concentration limits established through a process similar to that described in §264.94.	
§264.93	Hazardous constituents		
§264.93(a)	The Secretary will specify in the facility permit the hazardous constituents to which the ground-water protection standard of §264.92 applies. Hazardous constituents are constituents identified in appendix VIII of part 261 of this chapter that have been detected in ground water in the uppermost aquifer underlying a regulated unit and that are reasonably expected to be in or derived from waste contained in a regulated unit, unless the Secretary has excluded them under paragraph (b) of this section.	For any of the following information that is not already available or developed, it will be prepared and included in a manner consistent with §264.93 in corresponding corrective action/HSWA activity documents.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)	The Secretary will exclude an Appendix VIII constituent from the list of hazardous constituents specified in the facility permit if he finds that the constituent is not capable of posing a substantial present or potential hazard to human health or the environment. In deciding whether to grant an exemption, the Secretary will consider the following:	Concentration limits established for hazardous constituents following "detection" will not include those incapable of posing a substantial present or potential hazard to human health or the environment considering the following:	
§264.93(b)(1)	Potential adverse effects on groundwater quality, considering:	Potential adverse effects on groundwater quality considering:	
§264.93(b)(1)(i)	Physical and chemical characteristics of waste in the regulated unit, including its potential for migration;	Detailed information on waste inventory and chemical characteristics for Pit 29 and Shaft 124 will be presented in the MDA G RFI Report and CMS Report including potential for migration and site conceptual model.	
§264.93(b)(1)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site specific information for MDA G will be presented in the MDA G RFI Report and MDA G CMS Report.	
§264.93(b)(1)(iii)	Quantity of groundwater and the direction of groundwater flow;	Information regarding quantity and direction of flow of groundwater can be obtained through the LANL Hydrogeologic Work Plan.	
§264.93(b)(1)(iv)	Proximity and withdrawal rates of groundwater users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	
§264.93(b)(1)(v)	Current and future uses of groundwater in the area;	Information regarding current and future users of groundwater in the area will be developed.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(1)(vi)	Existing quality of groundwater, including other sources of contamination and their cumulative impact on groundwater quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Workplan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER site characterization efforts.	
§264.93(b)(1)(vii)	Potential health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA G will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Attachment C
§264.93(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA G will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Attachment C
§264.93(b)(1)(ix)	Persistence and permanence of the potential adverse effects; and	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	
§264.93(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	RFI and CMS Reports for MDA G will be developed and will address this issue.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(2)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA G can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, and will be presented in the MDA G RFI and CMS Reports.	
§264.93(b)(2)(iii)	Quantity and quality of groundwater, and the direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	
§264.93(b)(2)(iv)	Rainfall patterns in the region;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)(v)	Proximity of regulated unit to surface waters;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described, will be developed.	
§264.93(b)(2)(vii)	Existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program multi-sector CWA permit, as well as through ER Project characterization activities.	
§264.93(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(b)(2)(x)	Persistence and permanence of potential adverse effects.	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.93(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility, the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	
§264.94	Concentration limits		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(a)	The Secretary will specify in the facility permit the concentration limits in the groundwater for hazardous constituents established under §264.93. The concentration of a hazardous constituent:	Proposed concentration limits of detected hazardous constituents will be consistent with evaluation of parameters set forth in 264.94. To the extent that information necessary to establish provisions of this section do not already exist, they will be developed. Otherwise this information will be found in the previously identified documents.	
§264.94(a)(1)	Must not exceed background level of that constituent in the groundwater at the time that limit is specified in the permit; or	See above.	
§264.94(a)(2)	For any constituent listed in §264.94, Table 1, must not exceed the respective value given in that table if the background level of the constituent is below the value given in Table 1; or	See above.	
§264.94(a)(3)	Must not exceed an alternate limit established by the Secretary under paragraph (b) of this section.	See above.	
§264.94(b)	The Secretary will establish an alternate concentration limit for a hazardous constituent if he finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In establishing alternate concentration limits, the Secretary will consider the following factors:	See above.	
§264.94(b)(1)	Potential adverse effects on groundwater quality, considering:		
§264.94(b)(1)(i)	Physical and chemical characteristics of the waste in the regulated unit, including its potential for migration;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(b)(1)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization in facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site-specific information for MDA G will be found in the MDA G RFI Report and CMS Report.	
§264.94(b)(1)(iii)	Quantity of groundwater and direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(1)(iv)	Proximity and withdrawal rates of groundwater users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	
§264.94(b)(1)(v)	Current and future uses of groundwater in the area;	Information regarding current and future users of groundwater in the area will be developed.	
§264.94(b)(1)(vi)	Existing quality of groundwater, including other sources of contamination and their cumulative impact on groundwater quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Workplan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER Project site characterization efforts.	
§264.94(b)(1)(vii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA G will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA G will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(1)(ix)	Persistence and permanence of potential adverse effects; and	RFI and CMS Reports for MDA G will be developed and will address this issue.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	
§264.94(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(b)(2)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While this information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Workplan, site-specific information for MDA G will be presented in the MDA G RFI Report and CMS Report.	
§264.94(b)(2)(iii)	Quantity and quality of groundwater and direction of groundwater flow;	Information to be obtained through implementation of the LANL Hydrogeologic Workplan.	
§264.94(b)(2)(iv)	Patterns of rainfall in the region;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(b)(2)(v)	Proximity of regulated unit to surface waters;	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described, will be developed.	
§264.94(b)(2)(vii)	Existing surface water quality, including other sources of contamination and their cumulative impact on surface water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program multi-sector CWA permit, as well as through ER Project characterization activities.	
§264.94(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to human receptors. The CMS Report for MDA G will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	A present day ecological risk screening assessment was completed and is presented in Attachment C of the Area G closure/post-closure plan. Results indicate no unacceptable risk to ecological receptors. The CMS Report for MDA G will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	
§264.94(b)(2)(x)	Persistence and permanence of potential adverse effects.	RFI and CMS Reports for MDA G will be developed and will address this issue.	
§264.94(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	
§264.95	Point of compliance	In establishing a point of compliance, the limits of the waste management area can be delineated by circumscribing an imaginary line around more than one unit. The aggregate approach used in the Hydrogeologic Workplan was intended to be consistent with this concept. As characterization efforts progress, the appropriateness of the aggregate boundary for TA-54 will be assessed.	
§264.95(a)	The Secretary will specify in the facility permit the point of compliance at which the groundwater protection standard of §264.92 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.	See above. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the aggregate that extends down into the uppermost aquifer underlying the regulated units.	
§264.95(b)	The waste management area is the limit projected in horizontal plane of the area on which waste will be placed during active life of regulated unit.	See above.	
§264.95(b)(1)	The waste management area includes horizontal space taken up by any liner, dike, or other barrier designed to contain waste in a regulated unit.	NA	
§264.95(b)(2)	If facility contains more than one regulated unit, the waste management area is described by an imaginary line circumscribing the several regulated units.	See above.	
§264.96	Compliance period		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.96(a)	The Secretary will specify in the facility permit the compliance period during which the ground-water protection standard of §264.92 applies. The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting, and the closure period.)	The implementing document for these alternative activities will specify the period during which concentration limits similar groundwater protection standards and will be equivalent to the remaining active life (including closure period) of the waste management area.	
§264.96(b)	The compliance period begins when the owner/operator initiates a compliance monitoring program meeting requirements of §264.99.	This period will begin upon detection as defined in 264.91, and, if a more comprehensive program is needed to adequately address concentration limits, additional characterization and/or monitoring well installation will occur if appropriate.	
§264.96(c)	If the owner/operator is engaged in a corrective action program at the end of the compliance period specified in paragraph (a) of this section, the compliance period is extended until the owner/operator can demonstrate that the ground-water protection standard of § 264.92 has not been exceeded for a period of three consecutive years.	This period will be established for a period of 3 years if, at the end of the active life and closure period, the concentration limits described above continue to be exceeded.	
§264.97	The owner/operator must comply with following requirements for any groundwater monitoring program developed to satisfy §264.98, §264.99, or §264.100:	Alternative requirements will be met there.	
§264.97(a)	The groundwater monitoring system must consist of sufficient number of wells, installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that:	All groundwater monitoring wells will be sufficient in number and placed at appropriate locations and depths in the uppermost aquifer as determined by characterization efforts performed during implementation of the Hydrogeologic Workplan.	
§264.97(a)(1)	Represent the quality of background water that has not been affected by leakage from a regulated unit;	Background wells will be placed in an upgradient locations determined to be unaffected by potential releases from the waste management area.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(a)(1)(i)	A determination of background quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:	Should existing conditions preclude the location of background wells upgradient, other wells will be used. These wells will be capable of determining background quality passing the aggregate boundary. This determination will be made in part by ongoing characterization efforts establishing groundwater gradient, flow directions, potential transport mechanisms, and waste-specific migration characteristics.	
§264.97(a)(1)(i)(A)	Hydrogeologic conditions do not allow the owner/operator to determine what wells are hydraulically upgradient; and	See above.	
§264.97(a)(1)(i)(B)	Sampling at other wells will provide an indication of background groundwater quality that is representative or more representative than that provided by the upgradient wells; and	See above.	
§264.97(a)(2)	Represent the quality of groundwater passing the point of compliance.	The above-mentioned geologic, hydrologic, and waste characteristics will be considered in determining the representativeness of the groundwater passing the downgradient aggregate boundary and the monitoring system's capability of detecting contamination if hazardous waste or hazardous constituents migrate from the aggregate to the uppermost aquifer.	
§264.97(a)(3)	Allow for the detection of contamination when hazardous waste or hazardous constituents have migrated from the waste management area to the uppermost aquifer.	See above.	
§264.97(b)	If a facility contains more than one regulated unit, separate groundwater monitoring systems are not required for each unit provided that provisions for sampling the groundwater in the uppermost aquifer will enable detection and measurement at the compliance point of hazardous constituents from the regulated units that have entered groundwater in the uppermost aquifer.	Consistent with establishing a point of compliance by circumscribing an imaginary line around more than one unit, a groundwater monitoring system capable of detecting and measuring hazardous constituents at the aggregate boundary will meet the intent of this requirement.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(c)	All monitoring wells must be cased in a manner that maintains the integrity of the monitoring-well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.	The integrity of the monitoring well borehole will be maintained by casing in a manner most appropriate for the use and surrounding subsurface environment. Screen materials should be selected based on compatibility with geochemistry and long-term structural integrity. Well casing size should be determined based on the size of purging and equipment necessary to sample the well and the depth of the well. Filter pack material should be inert (i.e., silica sand). Gravel filters are acceptable pending sieve analysis. Annular space should be sealed with materials chemically compatiable with the anticipated contaminants and have a permeability one to two orders of magnitude less than the surrounding formation. A cement and bentonite mixture, bentonite chips, or antishrink cement mixtures can be used in the unsaturated zone and below the frost line. The cap should consist of concrete blending into an apron extending at least three feet from the outer edge of the borehole. Remaining annular space should be sealed with expanding cement. A suitable threaded or flanged cap or compression seal should then be placed and locked. A quarter-inch vent hole pipe will allow gas to escape, and bumper guards should be placed around the well to prevent damage by vehicles.	
§264.97(d)	The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results provide a reliable indication of groundwater quality below the waste management area. At a minimum, the program must include procedures and techniques for:	Groundwater sampling and analysis procedures will be in written form and will address the following:	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(d)(1)	Sample collection;	1) Groundwater level measurements will be determined prior to collection of sample in accordance with a written procedure describing level of accuracy, measurement reference points, required equipment decontamination, and time period measured. 2) Water collection will occur in accordance with a written procedure describing sampling devices and procedures for use and decontamination, well evacuation volumes and procedures, field measurements, and appropriate sample container types.	
§264.97(d)(2)	Sample preservation and shipment;	*SW-846* requirements will be followed to ensure appropriate preservation and temperature controls are utilized.	
§264.97(d)(3)	Analytical procedures; and	*SW-846* or other approved analytical methods, holding times, and approved QA/QC analytical procedures will be used.	
§264.97(d)(4)	Chain-of-Custody control.	Chain-of-custody will include: sample number, time, and date; collector's signature; sample type; well identification; number of containers; parameters to be analyzed; signatures of subsequent handlers; inclusive dates of possession; storage temperature at shipment and receipt; and verification of temperature control upon receipt at analytical laboratory.	
§264.97(e)	The groundwater monitoring program must include sampling and analytical methods appropriate for groundwater sampling and that accurately measure hazardous constituents in groundwater samples.	See above.	
§264.97(f)	The groundwater monitoring program must include determination of the groundwater surface elevation each time the water is sampled.	Groundwater levels will be determined each time water is sampled.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(g)	In detection monitoring or where appropriate in compliance monitoring, data on each hazardous constituent specified in the permit will be collected from background wells and wells at the compliance point(s). The number and kinds of samples collected to establish background shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. Sample size shall be as large as necessary to ensure with reasonable confidence that a contaminant release to ground water from a facility will be detected. The owner or operator will determine an appropriate sampling procedure and interval for each hazardous constituent listed in the facility permit which shall be specified in the unit permit upon approval by the Secretary. The sampling procedure shall be:	Data will be collected that are appropriate for the statistical methodology applied, sufficient in sample size, and utilizing sampling procedures and frequencies of sample collection to ensure that potential contaminant release(s) to groundwater from the waste management unit(s) can be detected.	
§264.97(g)(1)	A sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained, by reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants, or	An adequate number of samples will be collected at appropriate frequencies to ensure representativeness considering aquifer and potential contaminant characteristics. Information such as retardation potential for metals and organics and transport time based on groundwater velocity and constituent mobility will be considered in developing the sampling procedure.	
§264.97(g)(2)	An alternate sampling procedure proposed by the owner/operator and approved by the Secretary.	Should an alternative to the sampling procedure described above be more appropriate, it will be proposed.	
§264.97(h)	Owner/operator will specify one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent which will be specified in the unit permit. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. Where practical quantification limits (pql's) are used in any of the following statistical procedures to comply with §264.97(i)(5), the pql must be proposed by the owner or operator and approved by the Secretary. Use of any of the following statistical methods must be protective of human health and the environment and must comply with the performance standards outlined in paragraph (i) of this section.	One of the statistical methods described in §264.97(h) or an alternative approved by the Secretary will be chosen to evaluate groundwater monitoring data. It is premature at this time to prescribe a specific method until adequate characterization has been performed.	
§264.97(h)(1)	A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(h)(2)	An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.	See above.	
§264.97(h)(3)	A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.	See above.	
§264.97(h)(4)	A control chart approach that gives control limits for each constituent.	See above.	
§264.97(h)(5)	Another statistical test method submitted by the owner or operator and approved by the Secretary.	See above.	
§264.97(i)	Any statistical method chosen under §264.97(h) for specification in the unit permit shall comply with the following performance standards, as appropriate:	The appropriate performance standard used for the statistical method applied will be consistent with those prescribed in §264.97(i).	
§264.97(i)(1)	The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.	See above.	
§264.97(i)(2)	If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experimentwise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts.	See above.	
§264.97(i)(3)	If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be proposed by the owner or operator and approved by the Secretary if he or she finds it to be protective of human health and the environment.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(i)(4)	If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be proposed by the owner or operator and approved by the Secretary if it finds these parameters to be protective of human health and the environment. These parameters will be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.	See above.	
§264.97(i)(5)	The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantification limit (pql) approved by the Secretary under §264.97(h) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.	See above.	
§264.97(i)(6)	If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.	See above.	
§264.97(j)	Ground-water monitoring data collected in accordance with paragraph (g) of this section including actual levels of constituents must be maintained in the facility operating record. The Secretary will specify in the permit when the data must be submitted for review.	Groundwater monitoring data obtained will be maintained in the facility records.	
§264.98	An owner/operator required to establish a detection monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Upon completion of adequate characterization through the Hydrogeologic Workplan, and a determination that monitoring would be appropriate, the detection-type monitoring prescribed in §264.98 would be initiated.	
§264.98(a)	The owner/operator must monitor for indicator parameters (e.g., specific conductance, total organic carbon, or total organic halogen), waste constituents, or reaction products that provide a reliable indication of the presence of hazardous constituents in ground water. The Secretary will specify the parameters or constituents to be monitored in the facility permit, after considering the following factors:	As a result of sampling performed during the four events following well installation under the Hydrogeologic Workplan, indicator parameters, waste constituents, or reaction products will be prescribed that consider the following:	
§264.98(a)(1)	The types, quantities, and concentrations of constituents in wastes managed at the regulated unit;	Waste information has been obtained and reviewed, identifying hazardous constituents, concentrations, and waste volumes during the RFI/CMS process.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(a)(2)	The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;	Further refinement of the hydrogeologic regime at TA-54 and the behavior of hazardous constituents in the unsaturated zone will be developed and reported through the Hydrogeologic Workplan activities and the RFI/CMS process. Substantial information regarding these issues has already been provided in the "Hydrogeologic Assessment of Technical Area 54, Areas G and L", the "Performance Assessment and Composite Analysis for Los Alamos National Laboratory Material Disposal Area G", and the "RFI Report for Material Disposal Areas G, H and L at Technical Area 54".	
§264.98(a)(3)	The detectability of indicator parameters, waste constituents, and reaction products in ground water; and	Based on data collected during the four sampling events following well installation under the Hydrogeologic Workplan, detectability of indicator parameters, waste constituents, and reaction products will be established using *SW-846* or Secretary-approved methodologies and detection limits.	
§264.98(a)(4)	The concentrations or values and coefficients of variation of proposed monitoring parameters or constituents in ground-water background values.	Considerations for establishing concentrations and coefficients of varience of background parameters or constituents include: location of the unit, groundwater flow direction, depth to groundwater, appropriate number and location of background wells, available geologic and hydrologic information, drilling methods, well installation details, and sampling data.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(b)	Owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Should it be determined that a groundwater monitoring system will be necessary, installation of this system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary. Vadose zone investigation including delineation of contaminant movement and potential impact can be used to enhance and/or supplement monitoring efforts as an early detection mechanism.	
§264.98(c)	The owner/operator must conduct ground-water monitoring for each chemical parameter and hazardous constituent specified in the permit pursuant to paragraph (a) of this section in accordance with §264.97(g), and maintain a record of ground-water analytical data as measured and in a form necessary for the determination of statistical significance under §264.97(h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance.	
§264.98(d)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine whether there is statistically significant evidence of contamination for any parameter or hazardous constituent specified in the permit under paragraph (a) of this section in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during detection monitoring.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of contamination as described in §264.98(d).	
§264.98(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the upper-most aquifer will be determined and reevaluated annually.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(f)	The owner/operator must determine whether there is statistically significant evidence of contamination for any chemical parameter of hazardous constituent specified in the permit pursuant to paragraph (a) of this section at a frequency specified under paragraph (d) of this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of contamination exists within a reasonable timeframe.	
§264.98(f)(1)	In determining whether statistically significant evidence of contamination exists, the owner/operator must use the method(s) specified in the permit under §264.97(h). These method(s) must compare data collected at the compliance point(s) to the background ground-water quality data.	See above.	
§264.98(f)(2)	The owner/operator must determine whether there is statistically significant evidence of contamination at each monitoring well as the compliance point within a reasonable period of time after completion of sampling. The facility permit will specify what period of time is reasonable, based on the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of ground-water samples.	See above.	
§264.98(g)	If the owner/operator determines pursuant to paragraph (f) of this section that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she must:	If statistically significant evidence of contamination for established chemical parameters or hazardous constituents exists, notification will be made and ground water wells will be sampled for Appendix IX constituents. If present and confirmed with a second analysis within the timeframes described in §264.98(g), these constituents will be used in a more comprehensive monitoring program.	
§264.98(g)(1)	Notify the Secretary of this finding in writing within seven days. The notification must indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination;	See above.	
§264.98(g)(2)	Immediately sample the ground water in all monitoring wells and determine whether constituents in the list of Appendix IX of part 264 are present, and if so, in what concentration.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(3)	For any Appendix IX compounds found in the analysis pursuant to paragraph (g)(2) of this section, resample within one month and repeat the analysis for those compounds detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If groundwater is not resampled for the compounds found pursuant to paragraph (g)(2) of this section, the hazardous constituents found during this initial Appendix IX analysis will form the basis for compliance monitoring.	See above.	
§264.98(g)(4)	Within 90 days, submit to the Secretary an application for a permit modification to establish a compliance monitoring program meeting the requirements of §264.99. The application must include the following information:	Within 90 days, a request for modification of an enforceable document will be submitted to establish a more comprehensive monitoring program. It will include:	
§264.98(g)(4)(i)	An identification of the concentration or any Appendix IX constituent detected in the ground water at each monitoring well at the compliance point;	Appendix IX constituents and associated concentrations confirmed in downgradient aggregate boundary wells;	
§264.98(g)(4)(ii)	Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of §264.99;	Any proposed modifications/enhancements to the existing groundwater monitoring system if necessary:	
§264.98(g)(4)(iii)	Any proposed additions or changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical methods used at the facility necessary to meet the requirements of §264.99;	Any proposed changes to monitoring frequency, sampling and analysis procedures or statistical methods, if necessary to address provisions of the more comprehensive monitoring program.	
§264.98(g)(4)(iv)	For each hazardous constituent detected at the compliance point, a proposed concentration limit under §264.94(a)(1) or (2), or a notice of intent to seek an alternate concentration limit under §264.94(b); and	For hazardous constituents detected (as defined in §264.91(a)(1)), either background concentrations, maximum concentration limits or alternate concentration limits (ACLs) (or the intent to demonstrate ACLs) will be proposed.	
§264.98(g)(5)	Within 180 days, submit to the Secretary:	Within the specified time frame of 180 days, unless an alternative approach is more appropriate, submit to the Secretary the following:	
§264.98(g)(5)(i)	All data necessary to justify an alternate concentration limit sought under §264.94(b); and	Consideration of geologic and hydrologic conditions, waste inventory, receptor location(s), travel time, and degradation mechanisms may be included in the justification.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(5)(ii)	An engineering feasibility plan for a corrective action program necessary to meet the requirement of §264.100, unless:	A feasibility plan for a groundwater corrective action program will be developed during the CMS/CMI process unless:	
§264.98(g)(5)(ii)(A)	All hazardous constituents identified under paragraph (g)(2) of this section are listed in Table 1 of §264.94 and their concentrations do not exceed the respective values given in that Table; or	Concentrations of hazardous constituents are not greater than MCLs; or	
§264.98(g)(5)(ii)(B)	The owner or operator has sought an alternate concentration limit under §264.94(b) for every hazardous constituent identified under paragraph (g)(2) of this section.	An ACL demonstration has been submitted for all constituents found.	
§264.98(g)(6)	If the owner/operator determines that, pursuant to paragraph (f) of this section, there is a statistically significant difference for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he/she demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. The owner/operator may make a demonstration under this paragraph in addition to, or in lieu of, submitting a permit modification application under paragraph (g)(4) of this section; however, owner/operator is not relieved of the requirement to submit a permit modification application within the time specified in paragraph (g)(4) of this section unless the demonstration made under this paragraph successfully shows that a source other than a regulated unit caused the increase, or that the increase resulted from error in sampling, analysis, or evaluation. In making a demonstration under this paragraph, the owner or operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.98(g)(6) and monitoring will continue.	
§264.98(g)(6)(i)	Notify the Secretary in writing within seven days of determining statistically significant evidence of contamination at the compliance point that he intends to make a demonstration under this paragraph;	See above.	
§264.98(g)(6)(ii)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation;	See above.	
§264.98(g)(6)(iii)	Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the detection monitoring program facility; and	See above.	
§264.98(g)(6)(iv)	Continue to monitor in accordance with the detection monitoring program established under this section.	See above.	
§264.98(h)	If the owner/operator determines that the detection monitoring program no longer satisfies the requirements of this section, he/she must within 90 days submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99	An owner/operator required to establish a compliance monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituents be "detected" (consistent with §264.91(a)(1)) resulting in the subsequent development of concentration limits consistent with §264.93 and §264.94, a more comprehensive monitoring program will be established that determines compliance with these limits. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	
§264.99(a)	The owner/operator must monitor the ground water to determine whether regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above.	
§264.99(a)(1)	A list of the hazardous constituents identified under §264.93;	See above.	
§264.99(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above.	
§264.99(a)(3)	The compliance point under §264.95;	See above.	
§264.99(a)(4)	The compliance period under §264.96.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(b)	The owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Installation of a more comprehensive monitoring system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary.	
§264.99(c)	The Secretary will specify the sampling procedures and statistical methods appropriate for the constituents and the facility, consistent with §264.97 (g) and (h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance using appropriate sampling procedures and statistical methods.	
§264.99(c)(1)	The owner/operator must conduct a sampling program for each chemical parameter or hazardous constituent in accordance with §264.97(g).	See above.	
§264.99(c)(2)	The owner/operator must record ground-water analytical data as measured and in form necessary for the determination of statistical significance under §264.97(h) for the compliance period of the facility.	See above.	
§264.99(d)	The owner/operator must determine whether there is statistically significant evidence of increased contamination for any chemical parameter or hazardous constituent specified in the permit, pursuant to paragraph (a) of this section, at a frequency specified under paragraph (f) under this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of increased contamination exists within a reasonable timeframe.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(d)(1)	In determining whether statistically significant evidence of increased contamination exists, owner/operator must use the method(s) specified in the permit under §264.97(h). The methods(s) must compare data collected at the compliance point(s) to a concentration limit developed in accordance with §264.94.	See above.	
§264.99(d)(2)	The owner/operator must determine whether there is statistically significant evidence of increased contamination at each monitoring well at the compliance point within a reasonable time period after completion of sampling. The Secretary will specify that time period in the facility permit, after considering the complexity of the statistical test and the availability of analytical laboratories to perform the analysis of ground-water samples.	See above.	
§264.99(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the uppermost aquifer will be determined and reevaluated annually.	
§264.99(f)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine statistically significant evidence of increased contamination in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during the compliance period of the facility.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of increased contamination as described in §264.99(f).	
§264.99(g)	The owner/operator must analyze samples from all monitoring wells at the compliance point for all constituents contained in Appendix IX of part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to procedures in §264.98(f). If the owner/operator finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the owner/operator may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the owner/operator must report the concentration of these additional constituents to the Secretary within seven days after the completion of the second analysis and add them to the monitoring list. If the owner/operator chooses not to resample, then he or she must report the concentrations of these additional constituents to the Secretary within seven days after completion of the initial analysis and add them to the monitoring list.	If annual sampling for all Appendix IX constituents indicates new constituents that are not already addressed statistically exceed background, and resampling within one month confirms this, the Secretary will be notified and the new constituents will be added to the monitoring list.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(h)	If the owner/operator determines pursuant to paragraph (d) of this section that any concentration limits under §264.94 are being exceeded at any monitoring well at the point of compliance, must:	If it has been determined that a statistically significant increase in contamination due to an exceedance of the previously established concentration limits has occurred at the downgradient aggregate boundary, the Secretary will be notified and a modification to the enforceable document requested to establish a corrective action program. It will include the actions necessary to correct the increase in contamination and a plan for a groundwater monitoring program to demonstrate the effectiveness of the action. An analysis of applicable remedial technologies will be performed through the CMS process, and the capabilities of the existing groundwater monitoring system will be assessed. Modifications/enhancements to the existing system will be proposed if necessary.	
§264.99(h)(1)	Notify the Secretary of finding in writing within seven days. The notification must indicate what concentration limits have been exceeded.	See above.	
§264.99(h)(2)	Submit to the Secretary an application for a permit modification to establish a corrective action program meeting the requirements of §264.100 within 180 days, or within 90 days if an engineering feasibility study has been previously submitted to the Secretary under §264.98(h)(5). The application must at a minimum include the following information:	See above.	
§264.99(h)(2)(i)	A detailed description of corrective actions that will achieve compliance with the ground-water protection standard specified in the permit under paragraph (a) of this section; and	See above.	
§264.99(h)(2)(ii)	A plan for a ground-water monitoring program that will demonstrate the effectiveness of the corrective action. Such a ground-water monitoring program may be based on a compliance monitoring program developed to meet the requirements of this section.	See above.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(i)	If the owner/operator determines, pursuant to paragraph (d) of this section, that the ground-water concentration limits under this section are being exceeded at any monitoring well at the point of compliance, may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. In making a demonstration under this paragraph, the owner/operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.99(i) and monitoring will continue.	
§264.99(i)(1)	Notify the Secretary in writing within seven days that he intends to make a demonstration under this paragraph;	See above.	
§264.99(i)(2)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the standard to be exceeded or that the apparent noncompliance with the standards resulted from error in sampling, analysis, or evaluation;	See above.	
§264.99(i)(3)	Within 90 days, submit an application for a permit modification to the Secretary to make any appropriate changes to the compliance monitoring program at the facility; and	See above.	
§264.99(i)(4)	Continue to monitor in accord with the compliance monitoring program established under this section.	See above.	
§264.99(j)	If the owner/operator determines that the compliance monitoring program no longer satisfies the requirements of this section, must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	
§264.100	An owner/operator required to establish a corrective action program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituent concentration levels be exceeded, a program that takes action to address the statistically significant increase identified will be established. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(a)	Owner/operator must take corrective action to ensure that regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above.	
§264.100(a)(1)	A list of the hazardous constituents identified under §264.93;	See above.	
§264.100(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above.	
§264.100(a)(3)	The compliance point under §264.95; and	See above.	
§264.100(a)(4)	The compliance period under §264.96.	See above.	
§264.100(b)	The owner/operator must implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance point by removing the hazardous waste constituents or treating them in place. The permit will specify the specific measures that will be taken.	A program will be implemented to prevent hazardous constituent concentration exceedances at the downgradient aggregate boundary that considers: contaminant distribution and mobility, additional characterization and/or monitoring needs (including vadose zone investigation), source term removal, and applicable remedial techniques.	
§264.100(c)	The owner/operator must begin corrective action within a reasonable time period after the ground-water protection standard is exceeded. The Secretary will specify that time period in the facility permit. If a facility permit includes a corrective action program in addition to a compliance monitoring program, the permit will specify when the corrective action will begin and such a requirement will operate in lieu of §264.99(i)(2).	Corrective action will begin within a reasonable time period after hazardous constituent concentration limits have been exceeded and will be conducted pursuant to the requirements established in the above-referenced corrective action program.	
§264.100(d)	In conjunction with a corrective action program, owner/operator must establish and implement a ground-water monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under §264.99 and must be as effective as that program in determining compliance with the ground-water protection standard under §264.92 and in determining the success of a corrective action program under paragraph (e) of this section, where appropriate.	A groundwater monitoring program to demonstrate the effectiveness of the corrective action will be established and implemented. It will be based on considerations identified in the corrective action program and capable of detecting statistically significant exceedances in previously established hazardous constituent concentration limits. Additional monitoring wells may be installed and sampled if necessary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(e)	In addition to the other requirements of this section, owner/operator must conduct a corrective action program to remove or treat in place any hazardous constituents under §264.93 that exceed concentration limits under §264.94 in groundwater:	The corrective action will also address hazardous constituents that exceed the concentration limits between the downgradient aggregate boundary and the downgradient property boundary, and off-site. Removal or in situ treatment of such constituents will occur in a reasonable time period, and, if off site, where necessary to protect human health and the environment. Corrective action can cease once limits are no longer exceeded.	
§264.100(e)(1)	Between the compliance point under §264.95 and the downgradient property boundary; and	See above.	
§264.100(e)(2)	Beyond the facility boundary, where necessary to protect human health and the environment, owner/operator demonstrates to the satisfaction of the Secretary that, despite the owner's or operator's best efforts, the owner or operator was unable to obtain the necessary permission to undertake such action. The owner/operator is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis.	See above.	
§264.100(e)(3)	Corrective action measures under this paragraph must be initiated and completed within a reasonable period of time considering the extent of contamination.	See above.	
§264.100(e)(4)	Corrective action measures under this paragraph may be terminated once the concentration of hazardous constituents under §264.93 is reduced to levels below their respective concentration limits under §264.94.	See above.	
§264.100(f)	The owner/operator must continue corrective action measures during the compliance period to the extent necessary to ensure that the ground-water protection standard is not exceeded. If the owner or operator is conducting corrective action at the end of the compliance period, he must continue that corrective action for as long as necessary to achieve compliance with the ground-water protection standard. Owner/operator may terminate corrective action measures taken beyond the period equal to the active life of the waste management area (including the closure period) if he can demonstrate, based on data from the ground-water monitoring program under paragraph (d) of this section, that the ground-water protection standard of §264.92 has not been exceeded for a period of three consecutive years.	Corrective action measures will continue until hazardous constituent concentration limits are no longer exceeded during the period equivalent to the remaining active life of the waste management area (including closure period). If corrective action is still occurring at the end of this period, it will continue until concentration limits are no longer exceeded for 3 consecutive years.	
§264.100(g)	The owner/operator must report in writing to the Secretary on the effectiveness of the corrective action program. The owner/operator must submit these reports semi-annually.	Semi-annual reports on the effectiveness of the corrective action will be provided to the Secretary.	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(h)	The owner/operator determines that the corrective action program no longer satisfies the requirements of this section, he must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if it is determined that this program is no longer appropriate.	
§264.110(a)	Sections 264.111 through 264.115 apply to owners/operators of all hazardous waste management facilities.		Sections 1.0 and 2.0
§264.110(b)	Sections 264.116 through 264.120 apply to the owners/operators of:		Sections 3.0 and 4.0
§264.110(b)(1)	All hazardous waste disposal facilities;		Sections 3.0 and 4.0
§264.110(b)(2)	Waste piles and surface impoundments from which the owner/operator intends to remove wastes at closure . . .;		
§264.110(b)(3)	Tank systems that are required . . . to meet the requirements for landfills; and		
§264.110(b)(4)	Containment buildings that are required . . . To meet closure requirements for landfills.		
§264.110(c)	The Secretary may replace all or part of the requirements of this subpart (and the unit-specific standards referenced in §264.111(c) applying to a regulated unit), with alternative requirements set out in a permit or enforceable document, where the Secretary determines that:	The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the closure and post-closure care requirements of 264.111 - 264.120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet closure/post-closure care requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA G once they are approved .	Sections 1.0, 2.0, 3.0, and 4.0
§264.110(c)(1)	The regulated unit is situated among SWMUs or AOCs, a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	MDA G meets the criteria for alternative requirements because the existing land-based units (Pit 29 and Shaft 124) are situated among SWMUs, a release has occurred, and the origin of the release is uncertain.	Sections 1.0 and 3.0, Attachment C
§264.110(c)(2)	It is not necessary to apply the closure requirements of this subpart (and those referenced herein) because the alternative requirements will protect human health and the environment and will satisfy the closure performance standard of §264.111(a) and (b).	The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet applicable closure and post-closure care requirements of §264.111 - 264.120; details will be provided in the CMI Plan.	Sections 1.0 and 3.0

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.111	Closure Performance Standard: Owner/operator must close the facility in a manner that:	For MDA G, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Section 1.2
§264.111(a)	Minimizes the need for further maintenance; and	For MDA G, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Sections 1.0, 2.0, and 3.0
§264.111(b)	Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.	For MDA G, the alternative requirements specified in the CMS report and ultimately detailed in the CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Sections 1.0, 2.0, and 3.0
§264.111(c)	Complies with the closure requirements of this subpart, including . . . the requirements of . . . 264.310 . . .	See 264.310 regulatory requirement in this table.	
§264.112(a)(1)	Owner/operator of a hazardous waste management facility must have a written closure plan. . . . The plan must be submitted with the permit application . . . and approved by the Secretary as part of the permit issuance procedures . . . In accordance with 270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit.	A closure plan for MDA G is included in this submittal. The closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the closure requirements of 264.111-264.115. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet the closure requirements.	Sections 1.0 and 2.0
§264.112(a)(2)	The Secretary's approval of the plan must ensure that the approved closure plan is consistent with 264.111 through 264.115 and the applicable requirements of Subpart F of this Part, . . . 264.310 . . .. Until final closure is completed and certified in accordance with 264.115, a copy of the approved plan and all approved revisions must be furnished to the Secretary upon request, including requests by mail.	NA	Introduction
§264.112(b)	Closure plan must identify steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least:	NA	Section 1.0
§264.112(b)(1)	A description of how each hazardous waste management unit at the facility will be closed in accordance with §264.111;	NA	Section 2.3

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(2)	A description of how final closure of the facility will be conducted in accordance with §264.111. The description must identify the maximum extent of the operations which will be unclosed during the active life of the facility; and	NA	Section 1.1
§264.112(b)(3)	An estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the type(s) of the off-site hazardous waste management units to be used, if applicable; and	NA	Sections 2.2 and 2.3
§264.112(b)(4)	A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard; and	NA	Section 2.3
§264.112(b)(5)	A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control; and	NA	Section 2.3
§264.112(b)(6)	A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover must be included.)	NA	Section 1.4
§264.112(b)(7)	For facilities that use trust funds to establish financial assurance under §264.143 or §264.145 and that are expected to close prior to the expiration of the permit, an estimate of the expected year of final closure.	NA	Section 1.6

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(8)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d), either the alternative requirements applying to the regulated unit, or a reference to the enforceable document containing those alternative requirements.	The closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet closure requirements. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet closure requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA G once they are approved.	Section 1.3
§264.112(c)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan in accordance with the applicable procedures in Parts 124 and 270. The written notification or request must include a copy of the amended closure plan for review or approval by the Secretary.	NA	Section 1.5
§264.112(c)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the closure plan at any time prior to the notification of partial or final closure of the facility.	NA	Section 1.5
§264.112(c)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:	NA	Section 1.5
§264.112(c)(2)(i)	Changes in operating plans or facility design affect the closure plan, or	NA	Section 1.5
§264.112(c)(2)(ii)	There is a change in the expected year of closure, if applicable, or	NA	Section 1.5
§264.112(c)(2)(iii)	In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan.	NA	Section 1.5
§264.112(c)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or § 264.140(d).	NA	Section 1.5

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(c)(3)	The owner/operator must submit a written request for a permit modification including a copy of the amended closure plan for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the owner or operator must request a permit modification no later than 30 days after the unexpected event. . . . . the Secretary will approve, disapprove, or modify this amended plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit issued.	NA	Section 1.5
§264.112(c)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.112(c)(2). The owner/operator must submit the modified plan within 60 days of the Secretary's request, or within 30 days if the change in facility conditions occurs during partial or final closure. Any modifications requested by the Secretary will be approved in accordance with the procedures in parts 124 and 270.	NA	Section 1.5
§264.112(d)	Notification of partial closure and final closure.		
§264.112(d)(1)	Owner/operator must notify the Secretary in writing at least 60 days prior to the date on which he expects to begin closure of a surface impoundment, waste pile, land treatment or landfill unit, or final closure of a facility with such a unit. . . .	NA	Section 1.4
§264.112(d)(2)	The date when it "expects to begin closure" must be either:		
§264.112(d)(2)(i)	No later than 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional hazardous wastes, no later than one year after the date on which the unit received the most recent volume of hazardous wastes. If the owner/operator of a hazardous waste management unit can demonstrate to the Secretary that the hazardous waste management unit or facility has the capacity to receive additional hazardous wastes and it has taken all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit; or	NA	

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(d)(2)(ii)	For units meeting the requirements of §264.113(d), no later than 30 days after the date on which the hazardous waste management unit receives the known final volume of non-hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional non-hazardous wastes, no later than one year after the date on which the unit received the most recent volume of non-hazardous wastes. If the owner/operator can demonstrate to the Secretary that the hazardous waste management unit has the capacity to receive additional non-hazardous wastes and it has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit.	NA	
§264.112(d)(3)	If the facility's permit is terminated, or if the facility is otherwise ordered, by judicial decree or final order under section 3008 of RCRA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the owner/operator must close the facility in accordance with the deadlines established in §264.113.	NA	
§264.112(e)	Nothing in this section shall preclude the owner/operator from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure.	NA	NA
§264.113	Closure; Time allowed for closure		
§264.113(a)	Within 90 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner/operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at a hazardous waste management unit or facility, the owner/operator must treat, remove from the unit or facility, or dispose of on-site, all hazardous wastes in accordance with the approved closure plan. The Secretary may approve a longer period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	NA	NA
§264.113(a)(1)(i)	The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; or	NA	NA
§264.113(a)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	NA	NA
§264.113(a)(1)(ii)(B)	There is a reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	NA	NA
§264.113(a)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(a)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements.	NA	NA
§264.113(b)	The owner/operator must complete partial and final closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner or operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at the hazardous waste management unit or facility. The Secretary may approve an extension to the closure period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	NA	NA
§264.113(b)(1)(i)	The partial or final closure activities will, of necessity, take longer than 180 days to complete; or	NA	NA
§264.113(b)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	NA	NA
§264.113(b)(1)(ii)(B)	There is reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	NA	NA
§264.113(b)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	NA	NA
§264.113(b)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit or facility, including compliance with all applicable permit requirements.	NA	NA
§264.113(c)	The demonstrations referred to in paragraphs (a)(1) and (b)(1) of this section must be made as follows:		
§264.113(c)(1)	The demonstrations in paragraph (a)(1) of this section must be made at least 30 days prior to the expiration of the 90-day period in paragraph (a) of this section; and	NA	NA
§264.113(c)(2)	The demonstration in paragraph (b)(1) of this section must be made at least 30 days prior to the expiration of the 180-day period in paragraph (b) of this section, unless the owner/operator is otherwise subject to the deadlines in paragraph (d) of this section.	NA	NA
§264.113(d)	The Secretary may allow an owner/operator to receive only non-hazardous wastes in a landfill, land treatment, or surface impoundment unit after the final receipt of hazardous wastes at that unit if:	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(d)(1)	The owner or operator requests a permit modification in compliance with all applicable requirements in parts 270 and 124 of this title and in the permit modification request demonstrates that:	NA	NA
§264.113(d)(1)(i)	The unit has the existing design capacity as indicated on the part A application to receive non-hazardous wastes; and	NA	NA
§264.113(d)(1)(ii)	There is a reasonable likelihood that the owner or operator or another person will receive non-hazardous wastes in the unit within one year after the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(1)(iii)	The non-hazardous wastes will not be incompatible with any remaining wastes in the unit, or with the facility design and operating requirements of the unit or facility under this part; and	NA	NA
§264.113(d)(1)(iv)	Closure of the hazardous waste management unit would be incompatible with continued operation of the unit or facility; and	NA	NA
§264.113(d)(1)(v)	The owner or operator is operating and will continue to operate in compliance with all applicable permit requirements; and	NA	NA
§264.113(d)(2)	The request to modify the permit includes an amended waste analysis plan, ground-water monitoring and response program, human exposure assessment required under RCRA section 3019, and closure and post-closure plans, and updated cost estimates and demonstrations of financial assurance for closure and post-closure care as necessary and appropriate, to reflect any changes due to the presence of hazardous constituents in the non-hazardous wastes, and changes in closure activities, including the expected year of closure if applicable under § 264.112(b)(7), as a result of the receipt of non-hazardous wastes following the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(3)	The request to modify the permit includes revisions, as necessary and appropriate, to affected conditions of the permit to account for the receipt of non-hazardous wastes following receipt of the final volume of hazardous wastes; and	NA	NA
§264.113(d)(4)	The request to modify the permit and the demonstrations referred to in paragraphs (d)(1) and (d)(2) of this section are submitted to the Secretary no later than 120 days prior to the date on which the owner/operator of the facility receives the known final volume of hazardous wastes at the unit, or no later than 90 days after the effective date of this rule in the state in which the unit is located, whichever is later.	NA	NA
§264.113(e)	Requirements for the owner/operator of a hazardous waste surface impoundment that is not in compliance with the liner and leachate collection system requirements.	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.114	During the partial and final closure periods, all contaminated equipment, structures and soils must be properly disposed of or decontaminated unless otherwise specified in §§ 264.197, 264.228, 264.258, 264.280 or § 264.310. By removing any hazardous wastes or hazardous constituents during partial and final closure, the owner/operator may become a generator of hazardous waste and must handle that waste in accordance with all applicable requirements of part 262 of this chapter.	NA	NA
§264.115	Within 60 days of completion of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill unit, and within 60 days of the completion of final closure, the owner/operator must submit to the Secretary, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for closure under §264.143(i).	NA	Section 1.7
§264.116	No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary, a survey plat indicating the location and dimensions of landfills cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable Subpart G regulations.	NA	Section 1.10
§264.117	Post-closure care and use of property		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(a)(1)	Post-closure care for each hazardous waste management unit subject to the requirements of §§ 264.117 through 264.120 must begin after completion of closure of the unit and continue for 30 years after that date and must consist of at least the following:	A post-closure plan for MDA G is included in this submittal. The post-closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	Section 3.2
§264.117(a)(1)(i)	Monitoring and reporting in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	Sections 4.1 and 4.3
§264.117(a)(1)(ii)	Maintenance and monitoring of waste containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part.	See above.	Sections 4.1 and 4.2
§264.117(a)(2)	Any time preceding partial closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period for a particular unit, the Secretary may, in accordance with the permit modification procedures in parts 124 and 270:		
§264.117(a)(2)(i)	Shorten the post-closure care period applicable to the hazardous waste management unit, or facility, if all disposal units have been closed, if he finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or ground-water monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit or facility is secure); or	NA	Section 3.2
§264.117(a)(2)(ii)	Extend the post-closure care period applicable to the hazardous waste management unit or facility if he finds that the extended period is necessary to protect human health and the environment (e.g., leachate or ground-water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment).	NA	Section 3.2

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(b)	The Secretary may require, at partial and final closure, continuation of any of the security requirements of §264.14 during part or all of the post-closure period when:	NA	Section 3.6
§264.117(b)(1)	Hazardous wastes may remain exposed after completion of partial or final closure; or	NA	Section 3.6
§264.117(b)(2)	Access by the public or domestic livestock may pose a hazard to human health.	NA	Section 3.6
§264.117(c)	Post-closure use of property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the facility's monitoring systems, unless the Secretary finds that the disturbance:	NA	Section 4.4
§264.117(c)(1)	Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or	NA	Section 4.4
§264.117(c)(2)	Is necessary to reduce a threat to human health or the environment.	NA	Section 4.4
§264.117(d)	All post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in §264.118.	The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	Section 3.2
§264.118	Post-Closure Plan, Amendment of Plan		
§264.118(a)	The owner/operator of a hazardous waste disposal unit must have a written post-closure plan. . . . The plan must be submitted with the permit application, . . . , and approved by the Secretary as part of the permit issuance procedures under Part 124 of this chapter. In accordance with §270.32 of this chapter, the approved post-closure plan will become a condition of any RCRA permit issued.	A post-closure plan for MDA G is included in this submittal. The post-closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	Introduction, Sections 3.0 and 4.0
§264.118(b)	For each hazardous waste management unit subject to the requirements of this section, the post-closure plan must identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least:	See above.	Section 4.0

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(b)(1)	A description of the planned monitoring activities and frequencies at which they will be performed to comply with subparts F, K, L, M, N, and X of this part during the post-closure care period; and	See above.	Section 4.1
§264.118(b)(2)	A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure:	See above.	Section 4.2
§264.118(b)(2)(i)	The integrity of the cap and final cover or other containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	See above.	Section 4.2.1
§264.118(b)(2)(ii)	The function of the monitoring equipment in accordance with the requirements of subparts, F, K, L, M, N, and X of this part; and	See above.	Section 4.2.2
§264.118(b)(3)	The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure care period.		Section 4.5
§264.118(b)(4)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §§264.90(f), 264.110(c), and/or §§264.140(d), either the alternative requirements that apply to the regulated unit, or a reference to the enforceable document containing those requirements.		Section 3.2
§264.118(c)	Until final closure of the facility, a copy of the approved post-closure plan must be furnished to the Secretary upon request, including request by mail. After final closure has been certified, the person or office specified in §264.188(b)(3) must keep the approved post-closure plan during the remainder of the post-closure period.		Introduction
§264.118(d)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan in accordance with the applicable requirements in parts 124 and 270. The written notification or request must include a copy of the amended post-closure plan for review or approval by the Secretary.		Section 3.3
§264.118(d)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period.		Section 3.3
§264.118(d)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:		Section 3.3
§264.118(d)(2)(i)	Changes in operating plans or facility design affect the approved post-closure plan, or		Section 3.3
§264.118(d)(2)(ii)	There is a change in the expected year of final closure, if applicable, or		Section 3.3
§264.118(d)(2)(iii)	Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan.		Section 3.3
§264.118(d)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d).		Section 3.3

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(d)(3)	The owner/operator must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan. An owner/operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to submit a contingent post-closure plan under § 264.228(c)(1)(ii) and §264.258(c)(1)(ii) must submit a post-closure plan to the Secretary no later than 90 days after the date that the owner or operator or the Secretary determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §264.310. The Secretary will approve, disapprove or modify this plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved post-closure plan will become a permit condition.		Section 3.3
§264.118(d)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.118(d)(2). The owner/operator must submit the modified plan no later than 60 days after the Secretary's request, or no later than 90 days if the unit is a surface impoundment or waste pile not previously required to prepare a contingent post-closure plan. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in parts 124 and 270.		Section 3.3
§264.119(a)	No later than 60 days after certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the owner/operator must identify the type, location, and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records it has kept.		Section 3.7
§264.119(b)	Within 60 days of certification of closure of the first hazardous waste disposal unit and within 60 days of certification of closure of the last hazardous waste disposal unit, the owner/operator must:		Section 3.7
§264.119(b)(1)	Record, in accordance with State law, a notation on the deed to the facility property -- or on some other instrument which is normally examined during title search -- that will in perpetuity notify any potential purchaser of the property that:		Section 3.7
§264.119(b)(1)(i)	The land has been used to manage hazardous wastes; and		Section 3.7
§264.119(b)(1)(ii)	Its use is restricted under 40 CFR subpart G regulations; and		Section 3.7

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.119(b)(1)(iii)	The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the facility required by §264.116 and §264.119(a) have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Secretary; and		Section 3.7
§264.119(b)(2)	Submit a certification, signed by the owner/operator, that he has recorded the notation specified in paragraph (b)(1) of this section, including a copy of the document in which the notation has been placed, to the Secretary.		Section 3.7
§264.119(c)	If the owner/operator or any subsequent owner/operator of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes and hazardous waste residues, the liner, if any, or contaminated soils, it must request a modification to the post-closure permit in accordance with the applicable requirements in parts 124 and 270. The owner/operator must demonstrate that the removal of hazardous wastes will satisfy the criteria of §264.117(c). By removing hazardous waste, the owner/operator may become a generator of hazardous waste and must manage it in accordance with all applicable requirements of this chapter. If it is granted a permit modification or otherwise granted approval to conduct such removal activities, the owner/operator may request that the Secretary approve either:		Section 3.3
§264.119(c)(1)	The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or		Section 3.3
§264.119(c)(2)	The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.		Section 3.3
§264.120	No later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the owner/operator must submit to the Secretary, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification must be signed by the owner/operator and an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for post-closure care under §264.145(i).		Section 3.5

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310	Closure and post-closure care for landfills.	A post-closure plan for MDA G is included in this submittal. The post-closure of MDA G will utilize alternative requirements, which allows transfer of closure activities to the corrective action process. The CMS report to be prepared for MDA G will provide a general description of how the proposed corrective measure will meet the post-closure care requirements of 264.117-120. The CMI plan to also be prepared for MDA G will describe in detail how the selected corrective measure will meet post-closure care requirements.	
§264.310(a)	At final closure of the landfill or upon closure of any cell, the owner/operator must cover the landfill or cell with a final cover designed and constructed to:	See above.	Section 2.3
§264.310(a)(1)	Provide long-term minimization of migration of liquids through the closed landfill;	See above.	Section 2.3
§264.310(a)(2)	Function with minimum maintenance;		Section 2.3
§264.310(a)(3)	Promote drainage and minimize erosion or abrasion of the cover;		Section 2.3
§264.310(a)(4)	Accommodate settling and subsidence so that the cover's integrity is maintained; and		Section 2.3
§264.310(a)(5)	Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	See above.	Section 2.3
§264.310(b)	After final closure, the owner/operator must comply with all post-closure requirements contained in §264.117 through §264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under §264.117). The owner/operator must:	See above.	Section 4.0
§264.310(b)(1)	Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;	See above.	Sections 3.2 and 4.2.1
§264.310(b)(2)	Continue to operate the leachate collection and removal system until leachate is no longer detected;	See above.	Section 4.2.2
§264.310(b)(3)	Maintain and monitor the leak detection system in accordance with § 264.301(c)(3)(iv) and (4) and §264.303(c), and comply with all other applicable leak detection system requirements of this part;	See above.	Sections 4.1 and 4.2
§264.310(b)(4)	Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of subpart F of this part;	See above.	Sections 4.1 and 4.2
§264.310(b)(5)	Prevent run-on and run-off from eroding or otherwise damaging the final cover; and	See above.	Sections 3.2 and 4.2
§264.310(b)(6)	Protect and maintain surveyed benchmarks used in complying with §264.309.	See above.	Section 4.2.2

ATTACHMENT B

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA G

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA G

April 2002

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LIST OF ABBREVIATIONS/ACRONYMS

bgs	below ground surface
CA	composite analysis
cm	centimeter(s)
cm^2	square centimeters
cm/hr	centimeters per hour
cm/sec	centimeters per second
cm/yr	centimeters per year
DQO	Data Quality Objective
EP	Extraction Procedure
ER	Environmental Restoration
FEHM	Finite Element Heat and Mass
ft	feet (foot)
ft/d	feet per day
ft/yr	feet per year
FY	Fiscal Year
HE	high explosives
in.	inch(es)
in./yr	inches per year
LANL	Los Alamos National Laboratory
m	meter(s)
MCL	maximum concentration level
MDA	material disposal area
µg/L	micrograms per liter
mg/L	milligrams per liter

LIST OF ABBREVIATIONS/ACRONYMS
(Continued)

mm	millimeter(s)
mm/yr	millimeters per year
NMED	New Mexico Environment Department
PA	performance assessment
pCi/L	picocuries per liter
R	regional aquifer
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
TA	technical area
VOC	volatile organic compound

GEOLOGY, HYDROLOGY, AND GROUNDWATER CHARACTERIZATION AT TECHNICAL AREA 54, AREA G

1.0 GEOLOGY AND HYDROLOGY AT TECHNICAL AREA 54, AREA G

Numerous investigations of the geology and hydrology at Technical Area (TA) 54 have been conducted at Los Alamos National Laboratory (LANL). The following sections describe the extensive studies conducted at TA-54 in the past, and present information on future characterization activities and hydrologic modeling. LANL's TA-54, Area G, is located on Mesita del Buey, an east-west trending mesa bordered on the north by Cañada del Buey and on the south by Pajarito Canyon.

1.1 Geology and Stratigraphy

The following information on the geology and stratigraphy at TA-54 was obtained from borehole core logs. Unit 2 of the Tshirege Member of the Bandelier Tuff is at the surface of Mesita del Buey. This moderately welded ash-flow tuff forms nearly vertical cliffs on the sides of mesas, and at Area G is approximately 39 feet (ft) thick. A series of thin, discontinuous surge beds mark the base of Unit 2. Tshirege Member Unit 1v underlies Unit 2. This vapor-phase altered cooling unit forms sloping outcrops, and is further divided into Units 1vu and 1vc. Unit 1vu is a poorly welded ash-flow tuff. At TA-54, the thickness of Unit 1vu ranges from about 90 ft near Material Disposal Area (MDA) H to about 46 ft near MDA G. Unit 1vc is a moderately to poorly welded ash-flow tuff and ranges from 49 ft thick at the western end of Mesita del Buey to 23-26 ft thick at the eastern end. At the base of Unit 1v is Tshirege Member Unit 1g, which is a vitric, pumiceous, nonwelded ash-flow tuff. This unit is about 150 ft thick at MDA H, and thins to about 49 ft thick at the eastern end of MDA G. A distinctive pumice-poor surge deposit forms the base of Unit 1g. Beneath Unit 1g is the Tsankawi Pumice Bed, which is a thin (about 3-ft-thick) bed of gravel-sized pumice at Area L and about 2 ft thick at the eastern terminus. It is the basal air fall deposit of the Tshirege Member. The Cerro Toledo interval is stratigraphically beneath the Tsankawi Pumice Bed; it separates the Tshirege and Otowi Members of the Bandelier Tuff, and averages about 40 ft thick at Area L. The Otowi Member is a massive, nonwelded, pumice-rich ash-flow tuff. At Area L, it ranges from about 64 to 109 ft thick. At the base of the Otowi Member is the Guaje Pumice Bed. At Area L, this basal air fall deposit averages about 9 ft thick. Beneath the Guaje Pumice Bed are the Cerros del Rio basalts. It is inferred that these basalts exist beneath Mesita del Buey, based on borehole data at Area L, and the thickness beneath TA-54 was extrapolated to be between 262 and 492 ft. Although the

depth to and thickness of the Puye Formation beneath the Cerros del Rio basalts at TA-54 were not determined as a result of borehole investigations, they were encountered beneath the basalts at a water-supply well in Pajarito Canyon, approximately one mile west of Mesita del Buey.

1.2 Soils

Mesa-top soils at TA-54 form from weathering of the Tshirege Member of the Bandelier Tuff and from aeolian deposits. These soils are primarily Hackroy sandy loams that typically range from a brown sandy loam in the top 8 centimeters (cm) to a reddish brown from 8 to 30 cm in depth. Where present, the native soils are thickest near the mesa's center and thinner near the edges. Generally, the mesa surface soils are thin and poorly developed. Near the surface, their texture is sandy; beneath the surface, they exhibit a more clay-like texture. Permeability rates range from 5 to 15 cm per hour (cm/hr) in the top layers down to 0.15 to 0.50 cm/hr in the lower layers. In addition to Hackroy sandy loams, soil types at TA-54 include Nyjack loam, Totavi gravelly loamy sand, Hackroy-Rock outcrop complex, Servilleta loam, Penistaja sandy loam, and Prieta silt loam (Nyhan et al., 1978).

1.3 Surface Water

Mesita del Buey is one of the drier mesas at LANL and there are no streams on the mesa. Surface water flows only as storm water and snowmelt runoff. South of Mesita del Buey, Pajarito Canyon is one of the wetter canyons at LANL; north of Mesita del Buey, Cañada del Buey is one of the driest. Streams in these canyons are intermittent.

1.4 Perched Water

To meet a May 7, 1985 Compliance Order/Schedule, test wells were installed in the canyons north and south of TA-54 to determine if perched water existed within canyon alluvium, to determine if perched water extended beneath Mesita del Buey, and to sample/monitor perched water, if present (IT Corporation, 1987). In 1985, three test wells were installed in a tributary to Cañada del Buey; they include CDBO-1 (to a depth of 15 ft), CDBO-2 (30 ft), and CDBO-3 (20 ft); test well CDBO-4 (to a depth of 21 ft) was installed further to the east in Cañada del Buey. All 4 wells were dry; however, they were completed as observation wells to monitor the alluvium for possible water in the future (Purtymun, 1995). The 1985 investigation indicated that the alluvium in Cañada del Buey contained no perched water (Devaurs and Purtymun, 1985).

Three test wells were also installed in Pajarito Canyon in 1985; they are PCO-1, PCO-2, and PCO-3 (Purtymun, 1995). These 3 wells are sampled for radionuclides, metals, general inorganics, and organics. Sampling results are compiled annually in environmental surveillance reports and submitted to the New Mexico Environment Department (NMED). To ensure that the alluvial aquifer in Pajarito Canyon did not extend northward beneath Mesita del Buey, 4 test holes were drilled in the canyon floor north of the intermittent stream channel in 1985 (Devaurs and Purtymun, 1985). These 4 test holes, designated PCM-1, PCM-2, PCM-3, and PCM-4, were dry. They were completed for use as moisture-access holes (Purtymun, 1995). It was concluded that perched water in Pajarito Canyon is confined to the alluvium in the stream channel and does not extend to the flank of the canyon (Purtymun, 1995). As stated in the "Hydrogeologic Workplan" (LANL, 1998), no perched groundwater has been identified beneath Mesita del Buey.

In addition to the seven test holes drilled in Pajarito Canyon in 1985, two test holes were drilled in 1950 as part of a water-supply study (Griggs, 1964; Purtymun, 1975). These holes are identified as T-5 and T-6; they were drilled to depths of 263 ft and 300 ft, respectively, and completely penetrated the Bandelier Tuff beneath the floor of Pajarito Canyon. No water was encountered. The same holes were dry when measured in 1985 (Devaurs and Purtymun, 1985).

Two mesa-top test holes at Area G were drilled to depths that were equivalent to up to 40 ft beneath the base of the alluvium in Pajarito Canyon, and three mesa-top test holes at Area L were drilled to depths that were equivalent to up to 48 ft beneath the Pajarito Canyon allluvium. None of these test holes encountered perched water (IT Corporation, 1987).

Five observation wells were installed in Cañada del Buey, mostly up-gradient from Area L, as part of a 1992 investigation for a proposed sanitary wastewater treatment plant. These wells, installed to study the effect of effluent release on the environment in the canyon, are CDBO-5, CDBO-6, CDBO-7, CDBO-8, and CDBO-9. In addition, two moisture-access holes (CDBM-1 and CDBM-2) were drilled north of Area L in 1992. Perched water was encountered in the canyon alluvium at wells CDBO-6 and CDBO-7. It was determined that the perched water at these locations is likely only the result of operational discharges from well PM-4 (Purtymun, 1995).

1.5 Vadose Zone

A summary of the hydrogeology of Areas G and L and additional data and discussions relevant to the potential for migration of hazardous waste from MDAs G and L is presented in the "Hydrogeologic Assessment of Technical Area 54, Areas G and L, Los Alamos National Laboratory" (IT Corporation, 1987). The assessment was prepared in response to a May 7, 1985 Compliance Order/Schedule issued to LANL by the New Mexico Environmental Improvement Division. The Order mandated specific tests and investigations be performed at Areas G and L to obtain information on the hydrologic characteristics of the waste disposal areas relevant to the potential for hazardous waste or hazardous constituent migration into the groundwater. The discussion that follows is extracted from the assessment (IT Corporation, 1987) prepared using numerous reports by Bendix Field Engineering Corporation and LANL on the results of individual tests or groups of tests.

In late 1985 and 1986, an investigation was initiated to fulfill the testing requirements of the Order, which included characterizing the vadose zone in and around MDA G. Eighteen (18) boreholes were drilled to a depth ranging from 60 to 145 ft into the Bandelier Tuff from the top of Mesita del Buey. Nearly 1,700 ft of core was obtained from 16 of these holes. Hydrologic testing and geophysical logging were performed in the boreholes, and selected core samples were analyzed for numerous parameters. A number of boreholes were completed for pore-gas sampling, neutron moisture monitoring, and psychrometer installation. As discussed in Section 1.4, holes were also drilled in Cañada del Buey and Pajarito Canyon, adjacent to Mesita del Buey, to investigate possible alluvial aquifers.

To provide a quantitative analysis of moisture movement in the Bandelier Tuff, vadose zone characterization studies were conducted at Areas G and L. The quantitative analyses would help to determine the likelihood of contaminant migration from Areas G and L through the vadose zone and into groundwater beneath the sites. To quantify moisture movement in the tuff, a two-tiered approach was utilized. First, hydrologic characteristics of the tuff and hydraulic head were measured to calculate seepage velocity and rates of moisture flux. Second, the moisture content of the tuff was measured after precipitation events to determine changes in moisture content with depth.

Hydrologic testing was performed in the boreholes and on borehole core samples in the laboratory to allow calculation of seepage velocity and moisture flux rates in the tuff. Intrinsic

permeability was measured in boreholes through air injection and vacuum tests. Laboratory tests included the Dynamic Method to measure gas-water relative permeability, and gas injection with correction for slippage. Intrinsic permeability ranged from about 10^{-8} to 10^{-9} square centimeters (cm^2) for fractured and unfractured intervals. Similar results were obtained from a water injection test performed to verify the results of the air injection tests. Vacuum tests performed in the same boreholes yielded slightly lower permeability values; however, they also averaged in the 10^{-8} to 10^{-9} cm^2 range. In the laboratory tests, intrinsic permeability yielded values in the low 10^{-9} cm^2 range. Because discontinuities that occur in the rock intersected by the borehole are not typically present in laboratory-tested cores, lower intrinsic permeability values are expected for laboratory tests.

Laboratory measurements were conducted for gravimetric moisture content, soil-moisture characteristic curves, and unsaturated hydraulic conductivity of borehole tuff samples. The gravimetric moisture content generally ranged from 2 to 4%, with isolated intervals that ranged up to 10 to 28%. Soil moisture characteristic curves were determined for 20 tuff samples, and moisture content was determined for capillary pressures in the range of -0.03 to -0.34 bar. Attempts to measure moisture contents at lower capillary pressures were not successful because samples disaggregated. Hence, moisture characteristic curves could only be determined for volumetric moisture contents above 22%, which is considerably higher than the values observed from testing core samples of field measurements. From the characteristic curve data, it was concluded that moisture retention values of the tuff are extremely high, and ranged up to 80% (60% volumetric moisture). The moisture retention value of 80% indicates that no liquid transport can occur at moisture content below this value. Because all of the moisture content measurements for the tuff were significantly below 80%, it was concluded that capillary transport of liquids does not contribute to moisture movement and vapor transport is clearly the major mechanism of water transport. Unsaturated flow is not likely to be a major factor in liquid transport at these moisture content levels.

This conclusion was supported by actual measurements of moisture content in the tuff at depth. Neutron logging was performed every two weeks at one borehole each in Areas G and L for approximately eight months. In addition, neutron logging was performed daily for a period after three major precipitation events. Moisture profiles measured with neutron logging showed the upper 10 to 20 ft of tuff to be affected by precipitation events and subject to seasonal

fluctuations. However, below 20 ft, the moisture content is extremely low and in the range of the gravimetric moisture values (2 to 4%).

The 1986 moisture profiles were consistent with moisture measurements conducted previously on the Bandelier Tuff. Neutron-moisture data of the tuff at various locations at LANL were measured between 1960 and 1980 (Abeele et al., 1981). Those data showed that moisture conditions ranged from 10 to 40% by volume in the upper 10 to 15 ft of tuff, and that below 15 ft, moisture rarely exceeded 5 to 10%. In addition, those data showed that in the uppermost four meters of disturbed areas at Area G, significant seasonal fluctuations in moisture content exist. Those findings are consistent with the 1986 data. Overall, the moisture data reported in Abeele et al. (1981) and in the hydrogeological assessment (IT Corporation, 1987) are consistent and show the following:

- Throughout the area, moisture content of the tuff is low (typically between 2 to 5% with intervals ranging up to 10 to 28%)
- In the upper 10 to 20 ft of tuff, seasonal variation of moisture content occurs; however, below ~20 ft, seasonal variations are not measurable
- Precipitation from monitored autumn storms does not infiltrate below ~10 ft.

From these studies, the following conclusions were made: 1) the tuff is not saturated and is in fact very dry; and 2) moisture from precipitation does not infiltrate to a significant depth. Therefore, meteoric water infiltration is not a viable process for transport of hazardous waste or hazardous constituents through the vadose zone at Areas G and L.

Thermocouple psychrometers were installed at numerous depths in one borehole each in Areas G and L to measure capillary potential. The psychrometer data were highly variable, but indicated that soil moisture tensions ranged from 1 to 15 bars. Moisture flux calculations were performed using measured hydraulic conductivity values for the tuff and hydraulic head data from the psychrometers to determine maximum rates of moisture movement in the tuff. For Area G, a calculated maximum downward flux of 0.491 ft per year (ft/yr) and a maximum upward flux of 0.041 ft/yr were calculated using average measured hydraulic conductivity. Because only hydraulic conductivity values at higher percentages of saturation than those actually observed in the field were available, the calculated flux rates very likely overestimate the moisture flux values. Because hydraulic conductivity in the vadose zone typically increases with increases in

percent saturation, the measured hydraulic conductivity values are greater than the actual field conditions. If calculated (rather than measured) hydraulic conductivity values are used, lower flux rate values (by approximately an order of magnitude) are predicted. The moisture flux values, though highly conservative, show that very long periods of time would be required for water and contaminants to move by unsaturated flow from the MDAs to the groundwater. In summary, there is no evidence to suggest that saturation of the tuff and subsequent transport of contaminants by saturated flow is likely.

Based on the data collected in the 1985/1986 investigation, the following conclusions were made regarding the hydrologic characterization of the vadose zone and potential aqueous phase migration of contaminants:

- The Bandelier Tuff is characterized by very low moisture content (typically in the range of 2 to 5%). This value is well below the porosity; thus, moisture movement by unsaturated flow processes predominate over saturated flow.

- The tuff has high moisture retention properties and is very porous, averaging 50% porosity.

- Intrinsic permeability tests (both field and laboratory) indicate average permeability of the tuff to be 10^{-8} to 10^{-9} cm^2.

- Permeability tests conducted in the field do not indicate increased permeability in zones adjacent to fractures in boreholes. Aperture, trace, and degree of fracture filling is variable, however, and permeability along fractures may vary significantly.

- The tuff's unsaturated hydraulic conductivity was determined to be approximately 10^{-8} centimeters per second at approximately 20 to 40% moisture content, determined by measured effective permeability and using van Genuchten's model. Actual moisture conditions and unsaturated hydraulic conductivity are likely lower than these values.

- Due to the low moisture content in the tuff and the low degree of consolidation within the sampled tuff, soil-characteristic curves for intact cores could not be determined for the range of moisture/tension conditions present in the field.

- Soil water tension measured by thermocouple psychrometers range from 1 to 15 bars. Monthly averages typically ranged from 2 to 7 bars.

- Seasonal variation of moisture occurs in the upper 10 to 15 ft of the vadose zone, as indicated by neutron measurements of vadose zone moisture. Below 15 ft, moisture content does not appear to change with time. Neutron measurements of moisture following precipitation events indicate the maximum depth of wetting to be approximately 10 ft. At a depth of 22 ft, no influence of precipitation on moisture content was observed; moisture is assumed to be returned to the surface by evapotranspiration.

- The maximum flux rate using average measured hydraulic conductivity at Area G ranged from a downward rate of 0.491 ft/yr to a maximum upward rate of 0.041 ft/yr. These moisture flux values show that very long periods of time would be required for water and contaminants to move by unsaturated flow.

Chemical characterization of the Bandelier Tuff vadose zone was also conducted at Areas G and L to fulfill the requirements of the May 7, 1985 Compliance Order. The data were obtained from core sample analysis and pore-gas sampling and analysis. A total of 70 core samples were collected from seven boreholes at Areas G and L (Devaurs, 1985). All cores except two had Extraction Procedure (EP) Toxic metals below detection limit concentrations, which are well below EP Toxicity concentrations. The Area G core sample that exceeded detection limits was collected from the zero- to ten-ft depth interval and had a detectable EP concentration of barium; however, the concentration was below the EP regulatory limit. No EP Toxic metals were detected in any boreholes at Area G below a depth of 20 ft. At Area G, no volatile organic compounds (VOC) were detected in core samples. It was noted that the lower detection limit for most of the VOCs was in the parts per million range, which did not allow detection for possible trace concentrations present.

Twenty-three sampling ports were installed in seven boreholes to allow collection of pore-gas at various depths (Devaurs and Bell, 1986). The pore-gas samples were collected by pumping air from the sampling port through charcoal adsorption tubes. The volatile organics were then extracted from the charcoal for analysis. The analytical results indicated that VOCs in the pore gas were present in part per billion concentrations in Area G.

The core analyses and the pore-gas data suggested that volatile organic constituents from the wastes disposed of at MDA G have migrated into the tuff. It was determined that, based on the vadose zone characterization studies, vapor diffusion is the predominant mechanism for migration.

As noted in the hydrogeologic assessment prepared in 1987 (IT Corporation), the regional aquifer was encountered at a depth of approximately 875 ft just west of Areas G and L. Calculations using the hydraulic gradient of the Tesuque Formation (0.015) predicted depths to the regional aquifer beneath Area G as 850 ft.

Water samples collected from the wells in Pajarito Canyon (described in Section 1.4) were analyzed for VOCs, selected metals, and radionuclides. No VOCs were detected in these

samples, and metal and radionuclide concentrations were found to be below drinking water standards. It was concluded that there appears to be no discernable effect on water quality in Pajarito Canyon from disposal operations at Area G.

Based on the hydrogeologic investigations performed at Mesita del Buey in 1985 and 1986 and on other previous work, several specific conclusions were reached regarding the characteristics of Areas G and L and the potential for contaminant migration from the waste disposal units there. These conclusions are:

- The stratigraphy of the Bandelier Tuff at Areas G and L is similar to that throughout the western portion of the Pajarito Plateau.
- Vertical and near-vertical cooling fractures are common in the tuff at Mesita del Buey.
- No major fault zones are known to exist at or near Areas G and L that could serve as conduits from the shallow subsurface to the regional groundwater.
- Together, the very low moisture content in the tuff, the empirical determination that moisture from precipitation does not infiltrate below a depth of 10 to 22 ft, and the very low calculated flux rates all suggest that aqueous transport of contaminants is not a viable mechanism for contaminant migration at Areas G and L.
- Based on the results of core and pore-gas analyses, volatile organic constituents have migrated (predominantly in the vapor phase) from the MDAs into the tuff.
- Based on the presence of volatile organic vapors at depths of up to 100 ft at Area L, core and pore-gas data support vapor phase migration as the dominant transport mechanism at TA-54.
- No perched water bodies that could be connected hydraulically to the regional aquifer were detected beneath Areas G and L.
- No perched water was detected in Cañada del Buey. Perched water in Pajarito Canyon is confined to the alluvium within the canyon and does not extend vertically or horizontally into the Bandelier Tuff that forms Mesita del Buey.
- There is no evidence of liquid migration from Areas G and L into the alluvial perched water in Pajarito Canyon.

Hydrogeologic conditions at TA-54 were also investigated as part of the performance assessment (PA) and composite analysis (CA) for the low-level radioactive waste disposal facility at MDA G. The following discussion summarizes the hydrogeologic conditions reported in the “Performance Assessment and Composite Analysis for Los Alamos National Laboratory

Material Disposal Area G" (LANL, 1997), which presents the most recent vadose zone information available. Overall, the report was generally in agreement with previous investigations and stated that when combined with the semiarid climate, the Bandelier Tuff is typically very dry and that the volumetric moisture content averages about 5%, although it is quite variable depending on location. Moisture variations due to near-surface climatic influences, influences of fractures, and textural differences between tuff units and interbeds are suggested by routine moisture measurements taken from boreholes at numerous locations around MDA G. Evaporation and transpiration from the mesa's surface (i.e., evapotranspiration) remove much of the moisture from precipitation absorbed by the tuff. This investigation also found that evapotranspiration is effective to depths of 1 to 2 meters (m) (3 to 7 ft), where plant roots are abundant. In addition to the near-surface drying, evaporation appears to occur along the sides of the mesa and in fractures and surge beds, which are layers within the mesa that appear to allow air flow. The relative absence of moisture nearly eliminates the possibility that contaminants will be transported through the tuff to the regional aquifer (LANL, 1997).

The PA/CA was supported by a fairly complete set of data and observations to characterize the uppermost 60 m (200 ft) of the Tshirege Member of the Bandelier Tuff beneath MDA G. Unit 2 of the Bandelier Tuff is the caprock that forms the top of Mesita del Buey. This unit is extensively fractured as a result of contraction upon post-depositional cooling. The cooling-joint fractures, which are mostly vertical, generally dissipate at the bottom of Unit 2, which at Area G is about 12 m (39 ft) thick. Mean spacing between fractures is about 1 m (3.3 ft), and fracture widths range from less than 1 millimeter (mm) to 13 mm (<0.03 to 0.51 inches [in.]) with a median of 3 mm (0.12 in.). Typically, fractures are filled with smectite clays to a depth of about 3 m (10 ft). Smectite clays (e.g., montmorillonite) are known for their tendency to swell when water is present and for their ability to strongly bind certain elements. Both of these properties have implications for transport of contaminants in fractures (LANL, 1997). Typically, fractures in Unit 2 do not extend into Unit 1vu. Only the more prominent cooling fractures originating in Unit 2 continue into the more welded upper section of Unit 1vu; however, they die out in the less consolidated lower section.

The degree of welding and devitrification are two properties of the tuff that influence fluid flow. In welded, devitrified tuff, there are several competing effects that determine moisture content and fluid flux. Welded tuffs tend to be more fractured than non-welded tuffs. Although water

moves slowly through an unsaturated tuff matrix, it can move relatively rapidly through fractures only if nearly saturated conditions exist (LANL, 1997). As indicated by modeling studies, moisture is absorbed into the matrix when fractures disappear at contacts between stratigraphic subunits, when fracture fills are encountered, or when coatings are interrupted. Because fractures are open to the passage of both air and water, they can have both wetting and drying effects, depending on the relative abundance of water in the fractures and matrix (LANL, 1997).

As a rule, the Tshirege Member of the Bandelier Tuff is very dry and does not readily transmit moisture. Most of the pore spaces in the tuff are small enough to be of capillary size and have a strong tendency to hold water against gravity by surface-tension forces. Moisture content is generally more variable near the top of the mesa than in the central portions as a result of variations in temperature, humidity, and evapotranspiration. Vegetation is very effective at removing moisture near the surface by transpiration. During the summer rainy season when rainfall is highest, near-surface moisture content is variable due to the effects of higher rates of evaporation and of transpiration by vegetation, which flourishes during this time (LANL, 1997).

For the PA/CA, a great deal of information was needed to first conceptualize and then model moisture flow and contaminant transport in the vadose zone. The necessary information included the basic properties of the tuff (e.g., porosity, density, fracture patterns, and mineralogy); these can be measured accurately. It also included the complicated relationships describing how fluids move through the tuff (e.g., moisture content, matric suction, and hydraulic conductivity), which are more difficult to establish with a great deal of certainty in a matrix with very low moisture content. A number of field, laboratory, and analytical studies were performed to support the development of conceptual and mathematical models for flow and transport in the vadose zone (LANL, 1997).

Characteristic curves are relationships used to model unsaturated liquid flow through rock, and include moisture retention and hydraulic conductivity curves. The moisture retention of a material is controlled by the relationship between the suction within the matrix and the water content for a porous material. Hydraulic conductivity is the rate at which water can travel through a rock or soil sample under the influence of gravity. Generally, rocks and soils have higher hydraulic conductivities when more moisture is present, with the maximum hydraulic conductivity occurring when the material is fully saturated with water. This condition is the saturated hydraulic conductivity. Texture has a large impact on moisture retention and hydraulic

conductivity as well, where low surface area materials (e.g., sand) have a higher hydraulic conductivity than high surface area materials (e.g., clays).

The volumetric moisture content for the units beneath MDA G range between 2 and 14% by volume, and the unsaturated hydraulic conductivity curves prepared for the PA/CA are very steep at such low moisture contents. This indicates that for a unit increase in water, there is a large increase in hydraulic conductivity. For example, in Unit 2 the unsaturated hydraulic conductivity changes from 10^{-12} cm per second (cm/sec) at 3% volumetric moisture content to 10^{-10} cm/sec at approximately 5% volumetric moisture content. This also illustrates the effects of the physical characteristics discussed above. The slopes of the conductivity curves generally level out when the moisture content reaches 7% and indicate that the hydraulic conductivity remains relatively constant over a wide range of moisture content (between 10 and 30%). The conductivity curves steepen again when the moisture content exceeded 34%; however, the high moisture contents were obtained under experimental conditions and are not expected *in situ* except under very localized conditions (LANL, 1997).

The rate of moisture movement beneath Mesita del Buey is perhaps the most important parameter in modeling the subsurface transport of contaminants (LANL, 1997). Moisture movement largely controls the minimum time required for contaminants to potentially be transported from MDA G through the vadose zone into the regional aquifer. The moisture movement through the undisturbed vadose zone is complex and is further complicated at MDA G by man-made disturbances associated with waste management activities.

Three moisture-content zones are consistently shown within the subsurface at MDA G (LANL, 1997). The volumetric moisture content in the top few meters varies between about 3 and 12% and reflects the seasonal effects of precipitation and evapotranspiration. Between mid-mesa depths of about 8 and 23 m (25 and 75 ft), volumetric moisture content is quite low, from 0.5 to 2%. Below 25 m (80 ft), moisture content increases to between 9 and 19%. The mid-mesa dry zone occurs consistently near the surge beds at the base of Unit 2 of the Tshirege Member. Based on unsaturated hydraulic conductivity estimates, estimates of flux rates through the low moisture content region are negligible (LANL, 1997). Water-pressure profiles estimated beneath the mesa, using hydraulic properties from cores, suggest that moisture moves toward the base of Unit 2 from above and below. These observations are consistent with a hypothesis

that the mesa is dried out to a significant extent by evaporation and air movement along surge beds and fractures that are prevalent near this horizon (LANL, 1997).

Different rates of moisture movement corresponding to the three moisture-content zones are inferred by several independent analyses. Although the analyses invoke simplifying assumptions, they provide consistent qualitative evidence of variable rates of moisture movement within and across Mesita del Buey (LANL, 1997). The inferred zones include:

- A near-surface zone with an apparent rate of moisture movement on the order of several mm per year (mm/yr);
- An intermediate zone through the mid-depths of the mesa with rates of moisture movement on the order of tenths or hundredths of mm/yr; and
- A deeper zone in which the apparent rate of moisture movement may be several centimeters per year (cm/yr).

The analyses corroborating the apparent variable rates of moisture movement include natural tracer analyses, unit hydraulic gradient assumption, moisture profile analysis, and vapor flux studies. Details of these studies are presented in Section 2.1.5.6 of the PA/CA (LANL, 1997) and are summarized below.

Natural tracers used to infer information about moisture in the vadose zone include chloride, ^{18}O, and ^{2}H (deuterium). These constituents are present in precipitation in relatively constant amounts and, thus, are present in vadose-zone pore water, which is derived from precipitation. Results of the chloride tracer analysis showed the near-surface and deep-mesa fluxes are high relative to the mid-mesa flux. In the shallow and deep zones, the inferred flux rates are on the order of 2 to 3 mm/yr (0.08 to 0.1 in. per year [in./yr]). In the intermediate zone, the inferred flux rates are between 0.03 to 0.8 mm/yr (0.001 to 0.03 in./yr). The steep slope on the cumulative water/cumulative chloride plot for the mid-mesa region indicates that cumulative chloride increases faster than cumulative water (i.e., water is being lost from the system at that location). Estimated chloride accumulation ages also suggest that water movement through Mesita del Buey is very slow (LANL, 1997).

The naturally occurring stable isotopes of oxygen and hydrogen (^{18}O and ^{2}H) are useful indicators of evaporation. The results of the stable isotope study were compared to the chloride profiles to test the deep evaporation hypothesis. It was concluded that surface evaporation

effects are limited to the shallowest 1 to 2 m (3.3 to 6.6 ft), and that at depths of 5 m (16 ft) and deeper, there is strong evidence that there is an evaporative sink at intermediate depths in the mesa (LANL, 1997).

The average van Genuchten parameters may be used to estimate rates of moisture movement through the stratigraphic units using the unit hydraulic gradient assumption. Different rates are necessary to match the moisture conditions measured in the various units of the Bandelier Tuff. It was found that near the surface, the best fit to the field moisture data to a depth of approximately 5 m (15 ft) corresponds to a moisture movement rate between 0.01 and 10 mm/yr (0.0004 and 0.4 in./yr). In Unit 2 and Unit 1vu, the apparent moisture movement rate that matches the field moisture data is between 0 and 0.1 mm/yr (0 and 0.004 in./yr). In Units 1vc and 1g, a moisture movement rate of 1 mm/yr (0.04 in./yr) best matches the field data. The Tsankawi-Cerro Toledo and Otowi Member stratigraphic layers match field moisture data with a much larger apparent moisture movement rate on the order of 10 mm/yr (0.4 in./yr). These estimated rates support the hypothesis that moisture movement is not steady state, or that significant changes in movement of moisture occur at depths (LANL, 1997). One explanation that accounts for the results of this analysis is that water may be removed at intermediate depths by evaporation and vapor-phase diffusion.

The unit-gradient approximation was also used to identify depths within Mesita del Buey where moisture may be lost to evaporation or vapor-phase diffusion (LANL, 1997). A moisture profile analysis was performed, and the rates of moisture movement calculated as the gradient of moisture were plotted, as was the gradient of the vertical flux. The results suggest a downward flux and a source of moisture to depths of about 7 m (23 ft). Below this, to depths near 28 m (92 ft), the average vertical flux is small but downward and the source is very small. The average local flux in this low-moisture zone is -0.017 mm/yr (-0.0007 in./yr) and the average moisture source is -0.0013 mm/yr (-0.005 in./yr). A moisture peak at 30 m (100 ft) occurs at the vapor-phase notch (the base of Unit 1vc). Overall, the average rate of moisture movement near the surface is about 10 mm/yr (0.4 in./yr), with a large standard deviation suggesting high variability. The average rate of moisture movement through the middle depths of the mesa is very small, and in the vapor-phase notch portion is relatively large (0.73 mm/yr). Although increased moisture at the vapor-phase notch at MDA G may be interpreted as a moisture source from the relatively wet canyons, this hypothesis does not explain high moisture content values (10 to

20% volumetric) observed at the vapor-phase notch at other locations across the Laboratory where the notch is not coincident with a canyon bottom or other moisture source.

Another study to understand the potential influence of water moving within and out of the mesa in the vapor phase was conducted by analyzing the vapor flux through the mesa (LANL, 1997). Analyses were performed on neutron-probe moisture measurements from several boreholes at MDA G. The results of the study indicated that water moves predominantly in the vapor phase at depths between 12 and 23 m (40 and 75 ft). The results also indicate that a fairly wide region within the mesa is dominated by vapor-flux and that this region corresponds to the region of low liquid flux, discussed above. The vapor-flux analysis also suggests that vapor flux dominates the rate of moisture movement in regions of the mesa where volumetric moisture is below 5%, and the magnitude of the vapor flux in the low moisture region of the mesa is about 1 mm/yr (0.04 in./yr). In addition, there is no apparent direction associated with the vapor movement; instead, vapor appears to move in different directions throughout the dry region (LANL, 1997).

Water-balance components through covers resembling the operational pit cover used at MDA G have been measured during studies of test plots at LANL. The data show that 87% of precipitation is lost to evapotranspiration, approximately 6% remains as infiltration below the root zone, and the remainder is retained in the surface soil. The data also indicate that moisture movement through a conventional vegetated crushed-tuff cover was greatest in the late winter and early spring when snowmelt occurred and evapotranspiration was low because vegetation was not active (LANL, 1997). In 1973, volumetric moisture measurements were made in holes augered into the covers over Pits 1 and 2 at MDA G. These pits were covered in 1961 and 1963, respectively. The measured volumetric moisture content was quite variable, with measurements of 12% and 17% by volume in Pit 1 and 4% and 8% by volume in Pit 2. Peak water concentrations occurred at depths of 2 m (6.6 ft) and decreased between 2 and 3 m (6.6 and 10 ft). The variation was tentatively attributed to differences in soil conductivity of surface slope (LANL, 1997). Using the unit-gradient assumption, these moisture measurements indicate infiltration rates between several mm/yr and several cm/yr within the covers at Pits 1 and 2.

The moisture content within Pit 37, which was open for several years, was measured periodically over a three-year period in the 1990s to better understand infiltration through disposal units at MDA G. This pit, while open, was expected to have moisture contents in

excess of most of the covered pits at MDA G, since it was open longer than the average disposal pit. The pits are assumed to have, while open, higher infiltration rates than the surrounding mesa top, due to the lack of vegetation (transpiration). A maximum moisture content of about 11% by volume was measured at Pit 37, with a mean moisture content of approximately 8%. Using the unit approximation, the average rate of moisture movement through Pit 37 is 5 mm/yr (0.2 in./yr) at the average (mean) pit moisture content (LANL, 1997).

In 1976, horizontal boreholes were drilled approximately 1 m (3.3 ft) beneath a pit at MDA G that was closed in 1966. Moisture measurements at the same boreholes were made in 1992 with a neutron probe. The volumetric moisture content values beneath the pit were in the range of 1 to 4%, and were generally 1 to 2% higher beneath the pit than moisture content values away from the pit. These data suggest that pit excavation has a small effect on moisture contents beneath the pits (LANL, 1997).

1.6 Groundwater

The depth to groundwater at Area G is approximately 885 ft (LANL, 2002). Additional information on groundwater at TA-54 is provided in the "Characterization Well R-22 Completion Report" (LANL, 2002); the "Supplement to Quarterly Technical Report April-June 2001" (ER Project, 2001); and the "Quarterly Technical Report October-December 2001" (ER Project, 2002). The following are summaries of the information in those reports.

Well R-22 is located on Mesita del Buey, east of TA-54, and was funded and installed by LANL's Environmental Restoration (ER) Project. This well is one of the 11 regional aquifer (R) wells drilled to date as part of the "Hydrogeologic Workplan" (LANL, 1998) in support of the "Groundwater Protection Management Program Plan" (LANL, 1996). Well R-22 is the first of five planned regional aquifer wells at or in the vicinity of TA-54. This well was designed primarily to provide water-quality and water-level data for potential intermediate-depth perched zones and for the regional aquifer downgradient of TA-54. In addition, it was designed to collect geologic, hydrologic, and geochemical data that will contribute to the understanding of the vadose zone and regional aquifer in this area of LANL. Although the location of well R-22 was originally proposed for installation in Pajarito Canyon, just south of Mesita del Buey, its final location was changed to the mesa top in order to be in closer proximity to and more directly downgradient of TA-54 and to be better suited for a future monitoring well.

Well R-22 was drilled to a total depth of 1,489 ft in 2000. A multiscreen well containing five screened intervals that can be sampled individually was installed. In descending order, the geologic units encountered during drilling consisted of ash flows of the Tshirege and Otowi Members of the Bandelier Tuff (including the basal Guaje Pumice Bed); lavas, cinder units, interflow units, and subflow deposits of the Cerros del Rio volcanic field; an upper sequence of fanglomerate deposits of the Puye Formation; an older basalt; and a lower sequence of fanglomerate deposits of the Puye Formation. Depths and elevations of the contacts between these units are shown in the "Characterization Well R-22 Completion Report" (LANL, 2002). Notable differences between the predicted and as-found stratigraphy at this well was the greater thickness of the Cerros del Rio volcanic sequence, the absence of Puye Formation axial river gravels, and the absence of Santa Fe Group sediments within the drilled depth.

Two potential perched zones and one regional zone of saturation were originally predicted at well R-22. Two zones that could potentially support perched water were predicted at a depth of 148 ft in the Cerros del Rio basalt and at a depth of 487 ft in the Puye Formation. The regional water table was anticipated to be at a depth of 922 ft in the Puye Formation at the well R-22 location. No water was encountered, however, until the drillers first noted water at a depth of approximately 890 to 900 ft. After 30 minutes, the water-level depth was measured at 883.05 ft. The water is believed to be associated with the regional zone of saturation because the regional water table was projected to be at a similar depth, no obvious perching horizon was encountered, and saturation continued to the total depth drilled.

Both a direction and a rate are required to characterize groundwater movement. Although the data from this single well do not allow a determination of horizontal flow direction, vertical direction can be evaluated by analysis of head distribution along the borehole. In addition, the hydraulic properties of the saturated materials (determined from analysis of field testing data) provide a general idea of potential flow rate. During drilling, hydraulic heads obtained during testing clearly indicated a downward vertical gradient at well R-22. The downward vertical gradient at well R-22 was supported after testing by a piezometric profile constructed using a pressure-measurement system.

Field tests at depth targeting for screened intervals were performed during drilling to determine hydraulic properties at well R-22. The five screened intervals were distributed through the zone of saturation. Hydraulic conductivities ranged from 0.27 ft/day (ft/d) to 2.32 ft/d at four screened

intervals, based on straddle-packer/slug-injection tests performed.

Extensive borehole geophysical data were collected during drilling. Borehole video and natural gamma radiation surveys were conducted, and a suite of borehole geophysical logs was obtained. The surveys were conducted in cased hole from the surface to a depth of 1,330 ft. Below 1,330 ft, the surveys were conducted in open hole. Geophysical logging in open hole included caliper, resistivity, natural gamma radiation, spontaneous potential, lithodensity, magnetic resonance, borehole color video, epithermal neutron, neutron porosity, and spectral natural radiation. Volumetric water content beyond the casing in the vadose zone was measured using a Compensated Neutron Tool as a means to evaluate moist/porous zones and to estimate porosity in the saturated zone. Overall and spectral natural gamma ray activity was measured using a Hostile Natural Gamma Spectroscopy tool as a means to evaluate geology and lithology and the presence of clay versus sand. As a means to characterize mineralogy, lithology, and water content of the formation, concentrations of hydrogen, silicon, calcium, sulfur, iron, potassium, titanium, and gadolinium were measured using an Elemental Capture Spectroscopy tool. To measure bulk density and photoelectric effect as a means to estimate total porosity and characterize lithology, a Litho-Density Tool was used. Calibrated gross gamma ray readings were recorded to match the depth of the logging runs. The log results indicated that at the time of logging, a well-water level of 995 ft below ground surface (bgs) was recorded and that the probable regional groundwater level was 886 ft bgs. The log results also showed increased vadose zone moisture content (an average of 5%) in the intervals between 50 and 180 ft bgs, and 10% or greater between 350 and 715 ft bgs. In addition, in the interval from 1,405 to 1,478 ft (the total log depth), log data indicated an increased saturated zone porosity (greater than 40%) corresponding to the Lower Puye Formation. Clearly defined stratigraphic/lithologic boundaries were also indicated from the spectral gamma and geochemical logs.

During drilling, samples of groundwater were collected from depths of 883 ft and 1,489 ft. The potential contaminants of concern at the well R-22 location include VOCs, perchloric acid, tritium, and other radionuclides (LANL, 2002). The samples were analyzed for major anions, VOCs, semivolatile organic compounds, high explosives (HE), radionuclides, and stable isotopes. Samples collected for major anions analysis were filtered; nonfiltered samples were collected for the remainder of the analyses. Due to the presence of drilling fluids, the borehole water samples are not representative of groundwater.

While the following compounds are not subject to regulation under the hazardous waste program, data are provided herein for informational purposes only. Upper zone borehole water showed concentrations of bicarbonate (120 milligrams per liter [mg/L]), chloride (21 mg/L), fluoride (1.19 mg/L), oxalate (1.05 mg/L), and sulfate (19.9 mg/L). Oxalate may be produced by the breakdown of one of the drilling fluids used, and can occur naturally at very low concentrations in groundwater and surface water around LANL and elsewhere (Broxton et al., 2001).

Methylene chloride was also detected at a level above the instrument detection limit but less than the practical quantitation limit. This chemical is used in analytical laboratories for extraction during gas chromatography/mass spectrometry analyses and may provide a source of laboratory contamination. Concentrations of bromide, phosphate, and perchlorate were less than detection. Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) was detected at a concentration of 90 micrograms per liter (µg/L). Based on similar chemical structures between RDX and one of the drilling fluids used, this result is believed to be a false positive. The HE compound 2-A-4,6-DNT was also detected above the instrument detection limit but below the practical quantitation limit. The U.S. Environmental Protection Agency *SW-846* Method 8330, which uses high-performance liquid chromatography, is susceptible to false positives for HE compounds and degradation products. Consequently, an alternative and more accurate analytical method using diode array was used when the analytical laboratory reran the sample; the results using this analytical method showed that HE compounds and degradation products were less than detection (0.25 µg/L). A further discussion about the investigation of false positives for HE compounds and associated degradation products is presented in Section 13.2 of the "Characterization Well R-22 Completion Report" (LANL, 2002). During characterization in the completed well, additional groundwater samples will be collected to evaluate the presence or absence of HE compounds at well R-22. Acetone at a concentration of 0.820 mg/L was detected at the regional water table during drilling at well R-22. An investigation was conducted to determine the source of this organic compound, which may be present due to oxidation of one of the drilling fluids that contains isopropyl alcohol. Based on this investigation, the mass spectra from the initial analysis demonstrated high concentrations of isopropyl alcohol in the injection water used during drilling at well R-22. The isopropyl alcohol had in fact been misidentified as acetone by the analytical laboratory.

As previously mentioned, the following compounds are not subject to regulation under the hazardous waste program; however, data are provided herein for informational purposes only. Tritium was present at an activity of 109 picocuries per liter (pCi/L); this screening value suggests that the age of the tritium is less than 60 years old. More recent sampling shows lower tritium levels. During the first round of groundwater sampling in March 2001, tritium levels ranged from 2 to 77 pCi/L. During the second round of sampling in June 2001, tritium levels continued to decrease and ranged from 1 to 14 pCi/L. (The Drinking Water maximum concentration level [MCL] for tritium is 20,000 pCi/L.) Activities of americium-241, plutonium-238, plutonium-239/-240, and strontium-90 were less than detection. Activities of uranium-234, uranium-235, and uranium-238 were at levels of 1.48, 0.126, and 1.41 pCi/L, respectively. Nitrogen isotopes were analyzed for the water sample collected at 1,489 ft to evaluate the source(s) of nitrate at well R-22. The $\delta^{15}N(NO_3)$ value was +9.6 permil, which suggests that the water sample is enriched with nitrogen-15.

The Cerros del Rio lavas at well R-22 were nearly three times thicker than predicted (983 ft vs. 339 ft). The most significant hydrogeologic impact of this thick set of lavas is that the regional water table is within these lavas rather than within Puye Formation fanglomerates. Therefore, all flow and transport within the upper ~300 ft of the regional aquifer is within basaltic fractures and interflow rubble rather than through Puye Formation pore spaces. This difference in stratigraphy implies different flow rates and pathways, and the lavas provide an environment in which certain constituents (e.g., ferrous iron) can influence water chemistry.

Several features contribute to the peculiarities of the as-drilled stratigraphy at well R-22. It is believed that the exceptional thickness of the Cerros del Rio lavas and cinder indicate fill within a paleocanyon. The absence of axial river gravels at the base of the Cerros del Rio volcanics suggests that the paleocanyon was not a through-going drainage ancestral to the modern Rio Grande. Because cuttings were not returned from some key intervals beneath the Cerros del Rio lavas, it is possible that axial river gravels may have been present within 5 ft of the base of the lavas but were not sampled. Therefore, the orientation of the paleocanyon (east-west vs. north-south) is uncertain.

The first round of groundwater sampling at well R-22 was conducted in March 2001 and the available data were reported in the supplement to the “Quarterly Technical Report April-June 2001” (ER Project, 2001). As noted in that supplement, because of a delay in analytical

services, the $^{15}N/^{14}N$ isotopic suite was not available and would be reported at a later date. In addition, the supplement noted that because of an ongoing focused validation effort by the contract analytical laboratories, HE data were not available for reporting. No organics were found to exceed Drinking Water MCLs or NMED Groundwater Standards.

As indicated in the "Quarterly Technical Report October-December 2001" (ER Project, 2002), the second round of sampling at well R-22 was completed in June 2001. The data reported include field parameters and organic, inorganic, and radiological constituents. Because of analytical laboratory backlog, stable isotopes of nitrogen ($^{15}N/^{14}N$) were not available for inclusion in that report. In addition, because of an ongoing focused validation effort by the contract analytical laboratories, HE data were not available for reporting. Lead was found in Screen 3 (1,273 ft in depth) at a concentration of 19.7 µg/L. The Drinking Water MCL for lead is 15 µg/L; the NMED Groundwater Standard of 50 µg/L was not exceeded. No organics were found to exceed Drinking Water MCLs or NMED Groundwater Standards.

The third groundwater sampling round for well R-22 was conducted in November 2001; results of this sampling effort will be included in a quarterly report once the data are validated. The fourth groundwater sampling round was scheduled for March 2002, and the results will be provided in a subsequent quarterly report upon completion of data validation.

2.0 HYDROGEOLOGIC WORKPLAN CHARACTERIZATION ACTIVITIES

Pursuant to U.S. Department of Energy Order 5400.1, the LANL "Groundwater Protection Management Plan" was developed in 1995, which identified the need for site-wide hydrogeologic characterization. In the same year, NMED denied LANL's previously submitted groundwater monitoring waiver demonstrations. In a letter dated August 17, 1995, the NMED requested that LANL prepare a "Hydrogeologic Workplan." Hence, LANL began developing the "Hydrogeologic Workplan" (LANL, 1998) that, upon implementation, would collect data on the hydrogeologic setting. These data would be useful for making decisions regarding monitoring and environmental restoration using the Data Quality Objective (DQO) process. The workplan was approved by the NMED in March 1998.

The primary purpose of the "Hydrogeologic Workplan" is to gain an understanding of the hydrogeologic setting that is adequate to design a detection monitoring network capable of detecting water quality threats to the regional aquifer. As stated in the Executive Summary of

the workplan, the expected outcomes of implementing the plan's activities are:

- A "refined understanding of the hydrogeologic framework at the Laboratory, including recharge areas, hydraulic interconnections, flow paths, and flow rates, synthesized by modeling simulations;
- Information sufficient either to design and implement a detection monitoring program that meets applicable requirements and/or to demonstrate that groundwater monitoring requirements can be waived; and
- Defined areas of existing or potential groundwater contamination, and the potential pathways of contaminant transport from the surface to the regional aquifer, with predictions of directions and rates of movement and risk based on modeling simulations."

A series of decisions established in the plan were intended to focus data collection activities on information important to a better understanding of the hydrologic regime as well as monitoring design. Areas with the highest potential for contaminant impacts are where hydrogeologic data collection is more focused. The potential pathways and rates of contaminant migration can be determined using the resulting data and analyses. One workplan objective is to identify areas of groundwater contamination. Determining the extent of contamination and risk posed by that contamination is conducted by LANL's ER Project because investigation of contaminant plumes is not within the scope of the "Hydrogeologic Workplan" (LANL, 1998).

The "Hydrogeologic Workplan" provides for an iterative process of gaining understanding from each activity, especially from installed wells. This iterative process is then used in guiding the succeeding DQOs and the location and data collection of subsequent wells. Although the interpretive process is not as highly visible as data collection, it is equally as important as the well installation and data collection. A primary tool used to interpret data collected from drilling and testing in the wells is numerical modeling. When sufficient new data and data interpretation have been accomplished to change the conceptual understanding, the iteration process is conducted. The data collection and modeling reached a level of maturity in Fiscal Year (FY) 01 to allow iteration of the DQOs. The FY 01 DQO iteration process began with a comprehensive evaluation of all groundwater-related data collected, analyzed, and interpreted in the program at that time. This process resulted in a determination of what is known and what data are required to complete the scope of the workplan. The comprehensive evaluation and the FY 01 DQO process iteration resulted in proposed amendments to the scope of the workplan (LANL, 2001).

Initially, 32 regional aquifer wells were proposed in the "Hydrogeologic Workplan". As of April

2002, 11 R wells have been installed. LANL's Groundwater Integration Team worked together to determine which of the remaining wells and other studies are still necessary to complete the scope of the workplan, and added new studies as appropriate to provide the data. The current proposed amendments to the "Hydrogeologic Workplan" scope include installing 15 more R wells, and eliminating 6 R wells. The proposed scope also includes 13 field-based activities, 11 analytical activities, and three project management activities.

In the "Hydrogeologic Workplan", the activities proposed to characterize the hydrogeologic setting beneath LANL and to enhance LANL's groundwater monitoring program are summarized by "aggregates". The aggregate boundaries were drawn to focus discussions and attention on specific areas of LANL that collectively contain numerous sources of potential contamination. However, the hydrogeologic characterization activities relevant to a particular aggregate are proposed within as well as outside the aggregate boundaries.

Aggregate 2, located in the east-central portion of LANL, is bounded on the north by Cañada del Buey, on the south by Pajarito Canyon, on the west by TAs 18 and 51, and on the east by the LANL boundary. Essentially, the boundary of Aggregate 2 was drawn to encompass the solid waste management units associated with TA-54. It includes Cañada del Buey, the middle reach of Pajarito Canyon, and Mesita del Buey, where TA-54 is located.

In the initial workplan, one R well (well R-16) was planned for installation in Cañada del Buey east of the Aggregate 2 boundary. The purpose of this proposed well was to provide stratigraphic and hydrologic control off site near the Rio Grande and to provide an off-site detection monitoring point downgradient of LANL activities. In addition, two R wells (well R-20 and well R-22) in Pajarito Canyon were proposed for Aggregate 2 to identify the presence of intermediate perched zones, measure the thickness of the zones, and analyze for the presence of contaminants within the zones that could indicate actively occurring contaminant transport. As noted in Section 1.6, well R-22 was installed in 2000 on the mesa top just east of the TA-54 disposal areas. The location of this well was changed from its original siting in Pajarito Canyon to determine if perched zones are present beneath Mesita del Buey and to better understand the hydrogeologic conditions just east of the disposal areas at TA-54. Other proposed R wells for Pajarito Canyon included wells R-17, R-18, and R-19, which would provide information about sources in other aggregates upgradient of Aggregate 2; they are not discussed further in this attachment. Also in the initial workplan, one R well (R-21) was proposed for installation on

Mesita del Buey near MDA L. The purpose of this proposed well is to evaluate and monitor hydrologic and geochemical conditions in the regional aquifer beneath MDA L. Data from well R-21 will be compared to data from well R-20, just northwest of Aggregate 2, to evaluate migration of organic contaminants, potential pathway behavior, and potential contaminant movement toward supply well PM-2. Recently, it was determined that an additional well (well R-23) be included in Aggregate 2. Well R-23 is proposed to be located in Potrillo Canyon, approximately 3,700 ft south of Area G. This well will provide water-quality and water-level data for potential intermediate perched zones and the regional aquifer. It will also provide data that may be used to calibrate the potential for a southeasterly groundwater flow direction, evaluate recharge, and determine the presence of perched zones and the influence of the regional aquifer in the area of a hydrologic sink. It should be noted that the locations of the four additional R wells associated with Aggregate 2 (wells R-16, R-20, R-21, and R-23) are subject to change as the DQO iteration process continues.

3.0 REGIONAL AQUIFER HYDROLOGIC MODELING

A hydrologic model for the Pajarito Plateau beneath LANL is an important tool for protecting groundwater that could potentially be impacted by past Laboratory operations. The purpose of modeling the regional aquifer is two-fold. First, the model can be used to synthesize hydrologic, geochemical, and geologic data relevant to the regional aquifer. Second, the model can be used to predict flow directions and velocities as well as technically defensible estimates of uncertainty in the predictions.

A numerical groundwater model for the Pajarito Plateau beneath LANL was developed in 1998 and has been refined continuously as new groundwater data are collected. From the detailed technical descriptions of the modeling efforts, a simplified description is presented in the following. The simplified description addresses the purpose of modeling, why the model code was selected, the elements of the conceptual model, and modeling calibration and results.

3.1 Introduction

In the dictionary, a "model" is defined as a "small representation of a planned or existing object". A numerical groundwater model has flow equations that represent the physical processes of water flowing through the subsurface. From the earth's surface, groundwater movement cannot be observed directly; therefore, numerical groundwater modeling is used as a tool to understand groundwater flow. In a simple sandy aquifer, it is possible to derive groundwater flow directions

and velocities using water level data, pump test data, and pencil-and-paper calculations. In a geologically complex aquifer such as that which exists beneath the Laboratory, however, is it not feasible to derive flow directions and velocities from hydrologic data without the assistance of a computer model. In addition, models are useful in that they provide a range of plausible answers, using the available hydrologic data set and understanding of the varied character of the aquifer.

Development of a numerical groundwater model for the regional aquifer beneath the Laboratory was initiated in 1998 and has been continuously refined as new groundwater data are collected. The description presented herein of the modeling efforts has been greatly simplified from the detailed technical descriptions of the modeling efforts found in the reports in Keating et al. (1998, 1999, 2000, and 2001). The following sections describe the model code, conceptual model, flow model development, calibration, and sensitivity analyses. Accordingly, LANL intends to use groundwater models to aid in many decisions, such as where monitoring wells are best placed and what additional data are needed.

3.2 Purpose of Modeling

A hydrologic model for the Pajarito Plateau beneath the Laboratory is an important tool for protecting groundwater that could be impacted by past Laboratory operations. The purpose of modeling the regional aquifer is two-fold: (1) to synthesize hydrologic, geochemical, and geologic data relevant to the regional aquifer; and (2) to predict flow directions and velocities, along with technically defensible estimates of uncertainty in those predictions.

There are at least three modes of groundwater beneath the Pajarito Plateau: (1) groundwater in alluvium in some canyons; (2) perched intermediate groundwater (groundwater above a less permeable layer that is separated from the underlying groundwater by an unsaturated zone at intermediate depths (150-400 ft); and (3) the regional aquifer, which is separated from the upper groundwater by hundreds of ft of tuff, basalts, and volcanic sediments in the western

portion of the Laboratory, with the vadose zone becoming thinner to the east. The regional aquifer beneath the Pajarito Plateau provides the community and Laboratory water supply.

Hydrologic models have two parts that work together: the conceptual model and the numeric model. The conceptual model is the synthesis of all the known geologic and hydrologic data, which provides the estimated input parameters for the numeric model. The numeric model uses mathematical equations to translate the rock and water properties to numbers. A model is "calibrated" when the numbers that result from the numeric model match reasonably well to actual observations (e.g., water levels in wells). The process of calibrating a model involves revising the conceptual and numeric models consistent with the known data until there is reasonable match between model outputs and observed data. After calibration, the regional aquifer model is used for sensitivity analyses. Sensitivity analyses are a tool to evaluate the uncertainty of the model by testing how much each of the inputs affects the outcome of the model. Those inputs that have a big effect on the model outcome are considered "sensitive" and the input values should be based on appropriate site-specific data. Those inputs that do not affect model outcomes are "insensitive" and are not as important to site-specific data.

3.3 Model Code Selection

The numeric model is the computer code that runs calculations with the input parameters provided. The numeric model selected by the Laboratory is the Finite Element Heat and Mass (FEHM) computer code. It was developed at the Laboratory for the High-Level Radioactive Waste Repository Program. It simulates the flow of water and air and the transport of heat or substances in water through saturated or partially saturated rock. It can simulate flow or transport in either 2-dimensions or 3-dimensions. It was selected because it has been rigorously tested and certified for use in radioactive waste disposal and because its capabilities match the specific investigation needs at the Laboratory. For example, FEHM can be used for both unsaturated and saturated flow modeling, both of which are important at the Laboratory. This computer code is publicly available from LANL.

At the outset of the modeling effort, the decision was made to develop a regional-scale model of the Española Basin. Modeling the Española Basin was selected as a platform for the Pajarito Plateau model as it would incorporate all the existing hydrogeologic information and aquifer stress data in terms of water supply wells and streams. The large areal extent of an Española Basin model also allowed use of simulated data for boundary conditions that were needed for the Pajarito Plateau model. Obtaining distant, but accurate, boundary conditions improves the

overall accuracy and reliability of the model.

The Pajarito Plateau-scale model grid was developed using the Octree Mesh Refinement methods to embed a high-resolution zone within the relatively coarse Española Basin grid. The grid is better suited to capture site-scale flow and transport processes in areas of interest, while allowing boundary conditions from the Española Basin-scale model to be applicable without adversely affecting the computation time or the computer memory required to run the model. The smaller-scale model uses calculated values of head and flux from the large model to define boundary conditions in the smaller-scale model. The grid spacing in the Pajarito Plateau portion of the model is finer grid spacing than the Española Basin-scale model (Table 1).

3.4 Conceptual Model of Flow

The conceptual model that is the basis of the regional aquifer modeling efforts extends throughout the Española Basin. Elements of the conceptual model are the **boundaries** of the model, the **hydraulic gradient**, **aquifer properties**, **recharge**, and **discharge**.

The **boundaries** of the model are based on the physical boundaries of the regional aquifer within the Española Basin. The basement rocks and surrounding uplifts and mountains that define the Española Basin also define the aquifer boundaries in the model. In the model, the aquifer boundaries are areas where there is expected to be little flow because the aquifer material does not extend beyond the boundary. The exception is the La Bajada Fault, which forms the southern boundary of the model area. Others (Kernodle et al., 1995) have estimated the flow across the La Bajada fault. The Española Basin is a low area bounded by high areas:

- Sangre de Cristo Mountains on the east
- Nacimento uplift to the west
- La Bajada Fault on the south
- To the north, the Brazos uplift and Picuris Range
- Lower boundary is the basement rocks of the Española Basin, which are metamorphic rocks that can also be seen in the Sangre de Cristo Mountains
- The upper boundary is the water table of the regional aquifer.

Of the boundary conditions, the upper boundary is considered the most important because that is where all the recharge occurs. The other boundaries represent hydrologic divides, where little water enters or exits the basin. The upper boundary surface is the water table of the

regional aquifer. The grid nodes on the upper boundary surface are assigned one of three kinds of boundary conditions. The first kind of boundary condition is for nodes that occur in one of the major rivers (Rio Grande or Rio Chama). The boundary condition for the nodes in the rivers allows water to either flow into or out of the river, depending on if the water table is higher than (water flows out of the aquifer into the river) or lower than (water flows out of the river and into the aquifer) the river. The elevation of the river grid nodes was set at the elevation of the river.

The second kind of boundary condition for the upper model boundary is the higher elevation where recharge occurs. These grid nodes are set to allow a specific amount of water into the regional aquifer. The amount of water at each grid node was calculated based on the elevation of the land surface. This approach was taken because a graph of actual precipitation measurements at stations of different elevation in the Española Basin shows a linear relationship - the higher the elevation, the higher the precipitation. It was also assumed that the percent of precipitation reaching the water table increases with increasing elevation. This assumption is based on the observation that at higher elevations, the temperature and vegetation cover are both less, so the evaporation and transpiration (use of water by plants) are both expected to be lower; thus, more water is available to infiltrate the ground surface. In the numerical model, for every node above the threshold elevation of 6,000 ft (the elevation at which evaporation is greater than precipitation, so no water recharges), the amount of precipitation assumed was based on the linear trends of increasing precipitation and infiltration with elevation.

The third type of boundary condition on the upper boundary of the 1998 model were assigned to nodes that had elevation of less than 6,000 ft and were not in the river channels. These nodes were assigned a no-flow condition, because water is not expected to enter or exit the regional aquifer in these areas.

The northern and southern lateral model boundary conditions near the rivers are set to allow flow into or out of the model and the water levels are specified values. The values that are specified for these boundary grid nodes are based on the elevation of the water table at the surface for surface grid nodes; for the grid nodes beneath the surface, the value assigned is calculated assuming a hydrostatic pressure gradient. The amount of water flowing in along the northern boundary of the model is initially taken from estimates of water from the San Luis basin

to the north (Coon and Kelly, 1984). Along the southern boundary, the amount of water exiting the Española Basin to the south was based on estimates by Kernodle et al. (1995) and Frenzel (1995).

The majority of the remaining boundaries were assigned no-flow boundary conditions:

- The crest of the Sangre de Cristo Mountains on the eastern model edge
- The top of the Sierra de los Valles (east of the Jemez Mountains geothermal field and west of the Pajarito Fault zone) on the western model edge
- Top of the Brazos and Picuris ranges
- The Española Basin basement at the base of the model.

The topographic divides (Sangre de Cristo, northern ranges, and Sierra de los Valles) are assumed to approximate the hydrologic divides. However, the actual location of the groundwater divide on the western edge of the Española Basin is unknown and must be evaluated further. The grid nodes are assigned no-flow boundary conditions. Although some water may flow through the basement, the contrast between the overlying sediments filling the basin and the metamorphic rocks is expected to be big enough that water will not enter the materials below the basement.

There are two components of **hydraulic gradient**: horizontal and vertical. The horizontal hydraulic gradient is determined by the water levels that have been measured in wells throughout the basin. The vertical gradient is determined by measuring the water levels at different depths in the aquifer. The horizontal hydraulic gradients at the Española Basin scale are fairly well known and show that the flow of water is generally from the high areas on the east and west of the basin toward the Rio Grande in the center of the basin. The horizontal gradients for the Pajarito Plateau are shown in Table 2. On the Española Basin scale, vertical upward gradients have been reported in several wells fields near the Rio Grande (Buckman, lower Los Alamos, and Santa Clara Pueblo, Tesuque Pueblo). On the Pajarito Plateau, vertical gradients have been measured in a number of wells. The measured vertical gradients are shown in Table 3.

The **aquifer properties**, primarily permeability, are assumed to be controlled by the geologic characteristics of the rocks. The Española Basin gradually accumulated sedimentary rocks formed by sediments eroded from surrounding high areas and volcanic rocks erupted from different volcanic centers. The sedimentary rocks generally contain the regional aquifer within

the Española Basin. For the regional aquifer model, 20 layers representing different types of rock units (hydrostratigraphic zones) were used (Table 4). In addition, vertically-oriented hydrostratigraphic units representing fault zones were included in the model. Each layer was assigned hydraulic properties based largely on hydrologic data that have been collected and the geologic character of the layer where no data are available.

Aquifer **recharge**, the amount of water entering the aquifer, is a generalized recharge model, assuming that the first order control on recharge rates is elevation. The conceptual model of recharge is that most water recharging the aquifer originates in stream channel bottoms. For major channels in the basin, this is modeled explicitly. However, for most of the model domain, recharge is applied uniformly within any given elevation range ("diffuse" recharge), making no distinction between canyons and mesas. This effectively "spreads" the focused recharge occurring in canyon bottoms over a larger area. This approximation is appropriate for estimating the total amount of water recharging the system in various elevation ranges, for estimating baseflow discharge to rivers, and for estimating hydraulic gradients in the regional aquifer at scales of kilometers.

Groundwater **discharge** to rivers is an extremely important constraint on the regional aquifer model. Surface water flow data from twelve rivers in the basin are used to determine the baseflow. Quantified downstream increases in baseflow are attributed to regional aquifer discharge.

3.5 Regional Aquifer Modeling Calibration and Results

The regional aquifer model has been calibrated in two modes: steady-state and transient. Since 1945, the water levels in the Pajarito Plateau area have declined due to extensive development of the aquifer. The steady-state mode is calibrated using "pre-development" data, prior to 1945. There are pre-development data from 93 wells basin-wide, 34 of which fall within the Pajarito Plateau sub-model. The transient mode is calibrated using transient drawdown due to pumping in 14 wells. The transient data are available for every year since 1945. The transient simulations were done in 10-year time steps, so the 10-year average pumping rates were derived from the annual pumping data for all the wells in the Pajarito Plateau sub-model.

Both the steady-state Española Basin model and the Pajarito Plateau sub-model provided reasonable simulation of head and flux measurements. The calibrated steady-state model was

used for inverse calculations to estimate model parameters. The steady-state Española Basin inverse model was used to estimate 37 model parameters: 3 recharge and 34 permeability. This process suggested that the permeabilities of the two largest hydrostratigraphic units in the basin are well constrained. However, estimates for several smaller units are poorly constrained. The steady state Pajarito Plateau inverse sub-model estimated 20 model parameters: 3 recharge and 17 permeability. The sub-model and basin-scale model results were very similar; the largest discrepancies are for two relatively small hydrostratigraphic units. For one of these, the sub-model estimate was closest to pump test data; for the other, the sub-model estimate was farthest from the pump test data.

The addition of transient observations in the inverse process greatly decreased the uncertainty of estimated parameters. For the sub-model, the transient observations allowed an improved steady-state flux and water level matches. A comparison of the steady-state to the steady-state plus transient estimates shows that the major changes are associated with the permeability of the two potentially important hydrostratigraphic units. The uniform specific storage estimated by the transient inverse model is close to the independent estimates derived from hydraulic testing.

The results of the regional aquifer model are a refined water level map and estimates of flux across the boundaries, as presented in Keating et al. (2000). Vadose zone modeling at TA-54 will be used as inputs into the regional aquifer modeling (e.g., recharge estimates) to determine the fate of contaminants from a source at TA-54, if any, in the regional aquifer.

Table 1: Grid Spacing in Española Basin-scale Model and the Pajarito Plateau Portion of the Model				
Model	**North- South (X)**	**East-West (Y)**	**Vertical (Z)**	**# Nodes**
Española Basin-scale model	1000 m	1055 m	50 m above 1300 m depth	277,951
	1000 m	1055 m	500 m below 1300 m depth	
Pajarito Plateau portion	250 m	264 m	12.5 m above 1550 m elevation	172,741
	250 m	264 m	50 m above 1100 m depth	
	250 m	264 m	500 m below 1100 m depth	

Table 2: Horizontal Gradients on the Pajarito Plateau

Upgradient Well	Water Level Elevation (m)	Down-gradient Well	Water Level Elevation (m)	E-W Distance (m)	Gradient (m/m)
R-25	1836	CdV-15-3	1833	2189	0.02884
CdV-15-3	1833	R-19	1795	4710	0.02149
DT-10	1805	R-22	1747	5195	0.01121
R-15	1785	R-12	1738	3684	0.01283

Table 3: Vertical Gradients on the Pajarito Plateau

Well	Vertical Gradient	Comment
R-19, screen 6	0.08	weakly upward
R-19, screen 7	0.28	weakly downward
R-25, screen 3	1.72	strongly downward
R-25, screen 4	0.86	weakly downward
R-25, screen 5	1.10	downward
R-25, screen 6	0.15	weakly downward
R-25, screen 7	0.13	weakly downward
R-25, screen 8	0.13	weakly downward
CdV-15-3, screen 6	0.02	weakly upward
R-31, screen 3	0.01	nearly neutral
R-31, screen 4	0.01	nearly neutral
R-31, screen 5	0.02	nearly neutral
R-22, screen 2	0.07	nearly neutral
R-22, screen 3	0.14	weakly downward
R-22, screen 4	0.11	weakly downward
R-9/PM-1	0.05	weakly upward
R-9/O-1	0.03	weakly upward
TW-3/O-4	0.05	weakly upward
TW-1/O-1	0.10	weakly downward

Table 4:	**Hydrostratigraphic Units**		
Rock Type	**Hydrostratigraphic Layer**	**Volume (10^{10} m^3)**	**Permeability (m^2)**
Crystalline Rock	Deep Basement (Precambrian	400.8	5.00×10^{-16}
	Fractured Paleozoic/Mesozoic	214.2	
	Paleozoic/Mesozoic	181.7	2.00×10^{-17}
	Cerros del Rio Basalts	0.4	1.00×10^{-15}
	Cerros del Rio Basalts - southern	2.2	1.00×10^{-16}
	Tschicoma Formation	57.1	7.10×10^{-16}
Fault Zones	Pajarito	17.6	2.13×10^{-15}
	Agua Fria	0.1	4.49×10^{-15}
Sedimentary Rocks	Santa Fe Group east	47.4	2.07×10^{-13} horizontal 2.07×10^{-15} Vertical
	Santa Fe Group west	171.2	1.4×10^{-13} horizontal 1.4×10^{-15} Vertical
	Ancha Formation	3.4	1.34×10^{-13} horizontal 1.34×10^{-15} Vertical
	Santa Fe Group north	90.3	1.50×10^{-14}
	Ojo Caliente sandstone	61	2.20×10^{-14}
	Peñasco Embayment	38.5	4.67×10^{-13}
	Santa Fe Group - deep	162.4	1.21×10^{-14}
	Santa Fe Group- near airport	8.2	1.00×10^{-11} horizontal 1.00×10^{-13} Vertical
	Santa Fe Group - Chaquehui Formation	2.6	1.00×10^{-13}
	Puye - fanglomerate	0.4	2.38×10^{-13}
	Puye - totavi lentil	0.5	1.00×10^{-13}
	Bandelier Tuff	0.1	3.95×10^{-14}
Total Model Volume		**1620**	

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ATTACHMENT C

NATURE AND EXTENT OF RELEASES AND PRESENT-DAY RISK ASSESSMENT FOR TECHNICAL AREA 54, MATERIAL DISPOSAL AREA G

NATURE AND EXTENT OF RELEASES AND PRESENT-DAY RISK ASSESSMENT FOR TECHNICAL AREA 54, MATERIAL DISPOSAL AREA L

A Resource Conservation and Recovery Act Facility Investigation was conducted at Technical Area 54, Area L, from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases. The most recent information on the nature and extent of contamination at Material Disposal Area L is summarized in this attachment. The report also addresses the assessment of present-day risks. The information in this attachment is submitted as a portion of the response to the December 21, 2001, letter from James P. Bearzi (Chief, New Mexico Environment Department Hazardous Waste Bureau) to Dr. John C. Browne (Director, Los Alamos National Laboratory) and Mr. David A Gurulé (Area Manager, Department of Energy Los Alamos Area Office).

SWMU 54-006	Material Disposal Area (MDA L) (all subsurface units such as Pit A, SI B,C,D, Shafts 1-28, 29-34)
Administrative Authority NMED	Former Operable Unit OU 1148
Technical Area TA-54	Dates of Operation 1959-1986
Has ER Sampled the Site? Yes	ER Remedial Action Conducted? No
Structure Number N/A	Other Remedial Action Conducted? No

Unit Description

SWMU 54-006 (also called MDA L) is included in Module VIII of LANL's Hazardous Waste Facility Permit. Area L is a 2.5-acre fenced area that includes MDA L, which consists of 1 subsurface disposal pit (pit A); 3 subsurface treatment and disposal impoundments (impoundments B, C, and D); and 34 disposal shafts (shafts 1 through 34). Only impoundments B and D and shafts 1, 13-17, and 19-34 (although no longer in use) are considered active impoundments until RCRA closure is certified and approved. The entire fenced surface area of Area L is an active RCRA-permitted hazardous waste management unit.

Disposal pit A is located in the eastern portion of Area L beneath Dome 54-215. The pit is 200 ft long x 12 ft wide x 12 ft deep. It received chemical waste from the late 1950s until December 1978. Initial waste disposal practices included disposal of uncontainerized chemical wastes and liquids in drums without added sorbents. The pit also was used as an evaporative pit. Pit A was filled with waste to within approximately three feet of the surface between 1964 and 1978, and then was covered with crushed, consolidated tuff.

The three surface impoundments (impoundments B, C, and D) are located northwest of pit A. Impoundment B was excavated in 1978 and is 60 ft long x 18 ft wide x 10 ft deep. It had a capacity of 7,560 ft^3 and operated from January 1979 to June 1985 to evaporate treated salt solutions and electroplating wastes. Impoundment C was closed in 1978. This impoundment, which is 35 ft long x 12 ft wide x 10 ft deep, was used for the same disposal purposes as impoundment B. Impoundment C had a capacity of 2,940 ft^3. Impoundment D is approximately 75 ft long x 18 ft wide x 10 ft deep and had a capacity of 9,450 ft^3. It was used to treat small quantities of lithium hydride by reaction with water. This practice began in 1972 and was discontinued in 1984. Impoundment D later was used as secondary containment for used oil storage tanks (see SWMU 54-021). The capacities of the impoundments were calculated assuming they were filled to within three feet of the surface. All three impoundments are covered with crushed tuff followed by asphalt.

The 34 disposal shafts at MDA L were drilled directly into the subsurface tuff. Shafts 1 through 28 are located south of pit A. Shafts 29 through 34 are located northwest of impoundments B, C and D. Three feet of crushed tuff were placed in the bottom of each shaft to fill cracks and joints. The shafts range from 15 ft to 65 ft deep and vary in diameter from 3 ft to 8 ft. Groups of shafts were constructed as needed. When in use, the shafts were covered with a steel cap that could be opened or removed, depending on design, to allow placement of waste. The operational dates of the shafts vary, but collectively the shafts were operated from February 1975 to December 1985. The shafts were used to

dispose of containerized and bulk liquid chemical wastes. Before 1982, containerized liquids were disposed of without adding absorbents to the containers. Space around the drums was filled with crushed tuff and a 6-in. layer of crushed tuff was placed between each layer of drums. After 1981, uncontainerized waste was no longer disposed of in the shafts. From 1982 to 1985, wastes were accumulated on the site and packaged in drums until a sufficient quantity had accumulated to put the drums in a shaft. When filled, the shafts were covered with a concrete plug, approximately 3 ft thick.

Early disposal practices at MDA L resulted in a subsurface volatile organic vapor plume that extends beneath the facility and beyond its boundary. Several previous investigations have taken place at MDA L. Since 1982, channel sediments have been collected from permanent stations in the main drainages surrounding TA-54 to monitor the potential transport of radionuclides by stormwater run-off. In 1985, NMED issued a compliance order to LANL that required pore-gas characterization at MDAs G and L. Nine boreholes were drilled between 1985 and 1988 to monitor the subsurface VOC plume. Analytical data from the pore-gas monitoring shows that 1,1,1-trichloroethane is the primary plume constituent; it is present to at least 200 ft below the mesa surface; and concentrations vary across the plume. In 1986, additional boreholes were drilled to measure air permeability in the tuff. The data were used to evaluate the nature and extent and fate and transport of subsurface contamination at MDA L.

The ER Project conducted RFI fieldwork at MDA L from 1993 to 2001 to determine if releases had occurred and to characterize the nature and extent of the releases.

The RFI report for channel sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport and, if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling based on their potential for having collected sediment run-off from the four MDAs. Fourteen drainage channels originate near MDA G, and the other three MDAs each have only one significant drainage channel. Sample locations were selected within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for alpha, beta, and gamma radiation. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL metals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that had no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape

condition for potential receptor access. Each MDA-related drainage was determined not to be an ecological concern because there was little receptor access. The channel sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

An RFI report for MDAs G, H, and L was issued in 2000 to: (1) document the fieldwork and evaluate the potential human health and ecological risks posed by known and projected releases and exposures; (2) recommend (as necessary) additional investigation at TA-54 to reduce uncertainties associated with potential human health and ecological impacts; and (3) evaluate the need for near- and/or long-term corrective measures to reduce present-day and/or potential future risk. The RFI focused on identifying COPCs and developing a conceptual model for their fate and transport. In identifying COPCs, data of sufficient quality were compared with applicable thresholds (i.e., BVs) for inorganic chemicals, BVs and/or FVs for radionuclides, and instrument DLs for organic chemicals. Where data were not clearly less than the applicable threshold, analytes were retained as COPCs. Information used to develop the conceptual model for MDA L includes both non-ER and ER Project RFI data. RFI fieldwork at MDA L included the collection and analysis of 4 drainage sediment samples, 172 core samples from 16 boreholes, 268 VOC surface flux samples, 239 tritium surface flux samples, and 16 ambient air samples. The sediment samples were analyzed for inorganic chemicals, cyanide, PCBs/pesticides, radionuclides, and tritium. The ambient air samples were analyzed for VOCs. The core samples were analyzed for VOCs, SVOCs, inorganic chemicals, PCBs/pesticides, cyanide, and radionuclides. The RFI data were supplemented by environmental surveillance surface water data, VOC emissions data from passive extraction tests, and quarterly VOC pore-gas monitoring samples. Analytical results showed the presence of tritium at elevated levels in the ambient air flux samples and the subsurface tuff samples and organic chemicals in the subsurface and ambient air samples, which indicated a subsurface release. The primary VOCs identified are 1,1,1-trichloroethane and trichloroethene. Barium, copper, chromium, nickel, uranium, and zinc were detected at concentrations greater than BVs in subsurface tuff samples. The pesticide methoxychlor is present at concentrations below SAL in site sediments.

Evaluation of site data indicates that the known sources of environmental contamination at MDA L are vapor-phase tritium and VOC releases from the subsurface units and releases of metals dissolved in liquid solvents into the tuff below the subsurface units. Environmental transport pathways supported by data analysis are resuspension and dispersion in air and sediment transport in surface water for surface soil and sediment contaminated with methoxychlor (source unknown); diffusion in pore gas and dispersion in air for vapor-phase tritium and VOCs; and transport of dissolved metals, followed by sorption onto minerals and solid phases in tuff.

Present-day risks posed by MDA L to human and ecological receptors were characterized using a human health risk assessment and an ecological screening assessment. The risk assessment presented in the preliminary RFI report concluded that surface contamination at the site posed no unacceptable present-day risk to human health. No radionuclides or

inorganic chemicals were detected in sediment samples collected at the site. Methoxychlor was detected but at concentrations similar to those found to pose no unacceptable present-day risk at MDA G. Results of ambient air risk assessment for VOCs indicated carcinogenic risks that were about equal to or below the lower end of EPA's acceptable risk range. Potential doses from tritium are below those shown to pose an acceptable risk in the MDA G risk assessment. The ecological screening assessment found that chemicals did not have the potential to cause adverse ecological impacts to receptors at MDA L. The results of the present-day risk assessment indicate that no action is necessary to address exposure of on-site workers to VOCs or tritium in air at MDA L. The risks, dose, and hazards associated with exposure to soil contaminants at MDA L were lower than those from exposure to VOCs and tritium in air and were below acceptable limits. The present-day ecological risk screening assessment at MDA L indicated no COPECs.

Quarterly pore-gas sampling of the vapor phase VOC plume at MDA L is ongoing; sampling results are reported in the ER quarterly reports. At the request of NMED, the RFI report for MDA L is being rewritten to incorporate additional recent information on the nature and extent of contamination.

References

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RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) LA-UR Number: 96-0110

Proposed Action Plan Drilling Near Area [MDA] L, TA-54, OU 1148 LA-UR Number: No LA-UR

RFI Work Plan for Operable Unit 1148 LA-UR Number: 92-0855

CERTIFICATION

I certify under penalty of law that this document 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
Operator

4/25/02
Date Signed

E. Dennis Martinez
Acting Director
U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
Owner/Operator

4/25/02
Date Signed

ATTACHMENT J

COMPLIANCE DEMONSTRATION WITH 40 CFR 264, SUBPARTS G AND F UNDER CORRECTIVE ACTION PROCEDURES FOR MATERIAL DISPOSAL AREA H AT TECHNICAL AREA 54

Compliance Demonstration with 40 CFR Part 264, Subparts G and F under Corrective Action Procedures for Material Disposal Area H at Technical Area 54

LA-UR-02-2174
April 2002

Prepared by:
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Introduction

This section of the TA-54 closure and post-closure care plans was prepared in accordance with the December 21, 2001, New Mexico Environment Department Hazardous Waste Bureau (NMED-HWB) letter (HWB-LANL-99-050) "Determination of Incompleteness for: ... 4) Closure Plan for Technical Area 54, Material Disposal Area H, (Revision 1), March 1998, and the March 20, 2002 NMED-HWB letter (HWB-Facility-99-050) "Closure and Post-Closure Plan Requirements, Technical Area 54, Material Disposal Area H." The information provided below includes discussion of the applicability of alternative mechanisms and corrective action to address groundwater monitoring, closure and post-closure care requirements at MDA H, and a brief description of MDA H with a summary of investigation and remediation activities completed to date as requested by the NMED-HWB.

In accordance with the December 21, 2001 NMED-HWB letter, compliance with closure and post-closure care requirements in 40 CFR Part 264, Subparts F and G for MDA H may be demonstrated under 40 CFR 264.101 corrective action procedures. This approach is based on 40 CFR §§ 264.90(f), 264.110(c), 264.112(b)(8), and 264.118(b)(4) which state that the Secretary may replace all or part of the requirements of §§ 264.91 through 264.100 (Subpart F) and the requirements of Subpart G with alternative requirements for groundwater monitoring and corrective action for releases to groundwater and closure/post-closure care requirements set out in a permit or enforceable document where the Secretary determines that: 1) a regulated unit (shaft 9 at MDA H) is situated among solid waste management units (SWMUs) (shafts 1-8 at MDA H), a release has occurred, and both the regulated unit and one or more of the SWMUs are likely to have contributed to the release (documented in the MDA H RFI Report); and 2) it is not necessary to apply the groundwater monitoring and corrective action requirements of 40 CFR §§ 264.91 through 264.100 (Subpart F) or the closure and post-closure care requirements (Subpart G) because alternative requirements will protect human health and the environment and will satisfy the closure performance standard of § 264.111(a) and (b). EPA promulgated the alternative requirements rule in 1998 (adopted by NMED in 2000), to reduce the confusion and inefficiency caused by the application of two different regulatory requirements – closure/post-closure care for regulated units and corrective action for SWMUs that are collocated. The rule allows for the integration of cleanup requirements for a regulated unit into the requirements for SWMUs developed under approved remediation authorities protective of human health and the environment. The procedures established in Part 264, Subparts F and G were not designed to address the complexity and variety of issues involved in remediation of complex sites, while the corrective action process provides flexibility to the regulator to decide on remedies that reflect the conditions and complexities of different facilities while meeting the substantive groundwater monitoring, closure and post-closure care requirements of Part 264, Subparts F and G.

For MDA H, the specific means of compliance with the substantive requirements of Part 264, Subparts F and G have not yet been determined but they will be defined in future corrective action documents including the MDA H Corrective Measures Study (CMS) report currently under preparation, and the subsequent Corrective Measure Implementation (CMI) plan for MDA H. A "crosswalk" demonstrating how planned corrective actions to be implemented at MDA H will be compliant with applicable groundwater monitoring, closure and post-closure requirements and the document(s) where compliance is and/or will be documented is provided as Attachment A. As the corrective action process continues at MDA H, the specific means for ensuring compliance with substantive requirements of Part 264, Subparts G and F will be documented in updated versions of the "crosswalk" to be provided as an attachment to the future corrective action documents.

Waste Management Area Description

Material Disposal Area (MDA) H, designated Solid Waste Management Unit (SWMU) 54-004, is a 0.3-acre site on Mesita del Buey consisting of nine shafts used from 1960 to 1986 for the disposal of LANL-classified waste such as weapon-component mock-up shapes, detonators, papers, and tritium-contaminated items. Much of the classified waste was nonhazardous; however, scraps and shapes were contaminated with depleted uranium, fuel elements, residual plutonium, and HE. Each shaft is 6 ft in diameter and 60 ft deep. The shafts were capped when waste came to within 6 ft of the surface. Shafts 1 through 8 are capped with 3 ft of crushed tuff followed by 3-ft-thick concrete caps; shaft 9 is capped solely by a 6-ft-thick layer of concrete. The surface area of MDA H has been reseeded.

Pre-RFI Investigations

Tritiated water was encountered at a depth of 40 ft in shaft 8 in 1969 during a LANL-wide effort to determine the background value for tritium in tuff. To determine the extent of tritium at MDA H, the investigation was expanded to include sampling and analysis of air and soil in and around the disposal shafts. The highest tritium concentrations were measured around shaft 8. Additional soil and flora samples were collected in 1973 and analyzed for tritium. Plants growing in the area were found to have concentrations of tritium 3 orders of magnitude higher than species in uncontaminated areas. Surface soils near the shafts had measured concentrations of tritium two to three times the concentration measured in background samples outside the area. Data from the historic tritium investigation were used to support the conceptual model for fate and transport of tritium at MDA H.

RFI Results – Nature and Extent of Contamination

The RFI report for sediment pathways from MDAs G, H, J, and L describes the Phase I RFI of drainage channels associated with those MDAs. This RFI was part of the Phase I characterization of TA-54. Complete characterization of the MDAs includes analysis of samples from surface water and sediment, air, and subsurface vapor. This investigation focused on the MDAs collectively rather than on individual disposal cells, shafts, or pits. The objective of this RFI was to determine if chemicals were migrating from the MDAs through the drainage channels by way of surface sediment transport, and if so, to determine if concentrations likely would adversely impact human health or the environment. Seventeen drainage channels were selected for sediment sampling, based on their potential for having collected sediment run-off from the four MDAs. Fourteen drainage channels originate near MDA G; the other three MDAs each have only one significant drainage channel. Sample locations were selected within depositional areas as determined by an on-site geomorphic analysis of each channel. Samples were screened for radioactivity. Samples with gross gamma levels greater than three standard deviations above the mean value of a set of background sediment samples were sent for off-site laboratory analysis of TAL inorganic chemicals, PCBs, pesticides, cyanides, and radionuclides. Analytical results first were compared to background sediment concentrations from TA-39 and sediment concentrations from TA-54 drainage channels that have no history of receiving contaminated run-off. Chemicals with concentrations greater than background and chemicals with no background levels then were compared to SALs. All chemicals detected in MDA-related drainages were below their respective SALs. An ecological assessment of each MDA-related drainage consisted of an evaluation of the landscape condition for potential receptor access. The drainage channels associated with each MDA were determined not to be of ecological concern because there was little receptor access.

The sediment pathway RFI report stated that the ecological risk assessment process would be undertaken for the area when regulators approved the ecological exposure unit approach and recommended NFA for the drainage channels from MDAs G, H, J, and L.

The preliminary RFI report for MDAs G, H, and L was issued by the ER Project in 2000, based on the RFI fieldwork conducted in 1994 and 1995, supplemented by other historic TA-54 and LANL environmental-surveillance data. The purpose of the 2000 RFI was to determine contaminant nature and extent in air, surface water, channel sediments, and subsurface media. The RFI focused on identifying COPCs and developing a conceptual model for their fate and transport. In identifying COPCs, data of sufficient quality were compared with applicable thresholds (i.e., BVs for inorganic chemicals, BVs and/or FVs for radionuclides, and instrument detection limits for organic chemicals). When data were not clearly less than the applicable threshold, analytes were retained as COPCs. Information used to develop the site conceptual model includes both non-ER Project and ER Project RFI data. With the exception of source characterization, much of the information needed to develop the conceptual model for MDA H was available from sources outside the ER Project. The RFI for MDA H included collecting additional field data, integrating newly obtained data with available information, and using the integrated data to identify COPCs and develop a site conceptual model. In January 2000, NMED, DOE, and LANL formed the MDA High Performing Team (HPT) to work on the TA-54 RFI report. In September 2000, the HPT were directed to expedite implementation of a corrective measure alternative at one MDA. The HPT selected MDA H and narrowed the scope of its effort to accommodate the change. The RFI for MDA H subsequently was separated from the RFI reports for MDAs G and L to expedite the evaluation and implementation of a corrective measure at MDA H. The ER Project reissued the RFI report for just MDA H in May 2001.

The RFI fieldwork included the collection of 4 storm drainage sediment samples and 33 core samples from 4 boreholes. Channel sediment samples were analyzed for inorganic chemicals, cyanides, PCBs, pesticides, tritium, and radionuclides. Core samples were analyzed for TAL metals, cyanide, VOCs, SVOCs, PCBs, pesticides, tritium, and radionuclides. Background comparisons (inorganic chemicals and radionuclides) and data evaluations (organic chemicals) identified methoxychlor and tritium in channel sediments and copper, selenium, several organic chemicals, and tritium in subsurface tuff as COPCs. None of the VOCs or inorganic chemicals was detected above its SALs. The maximum reported tritium concentration of 777,000 pCi/mL at a depth of 52.5 ft bgs is equivalent to approximately 1543 pCi/g based on the sample soil moisture of 0.2%. This concentration is an order of magnitude greater than the SAL of 880 pCi/g. The maximum concentration of tritium at 10 ft bgs was 5890 pCi/mL, which is equivalent to 182 pCi/g based on the sample soil moisture of 3%. Methoxychlor was not disposed of at MDA H and its presence most likely is due to routine surface application. Copper and selenium do not appear to be related to a release from the PRS. Tritium and VOCs are related to a release from MDA H. Tritium is in the form of water vapor. Data gathered during the RFI identified the nature and partial extent of contamination in the surface and subsurface media. Analytical results from the RFI were used to assess the present-day impacts to ecological and human health receptors. The present day-risk assessment concluded that existing contamination does not exceed applicable EPA risk thresholds.

To address the remaining data gaps regarding the extent of tritium and VOC contamination and at the request of NMED, the ER Project prepared and implemented a supplemental RFI SAP in 2001. Supplemental RFI activities completed during 2001 included collecting additional subsurface samples to further define the lateral extent of tritium and organic chemical contamination from

borehole 54-1023 and from two newly drilled boreholes, installing an air-monitoring station adjacent to the southeastern boundary of MDA H to monitor for tritium in air at the MDA H fence line, and collecting a sediment sample near sample location 54-5132 at the interface of the alluvial sediments and bedrock to collect data where all the sediment accumulated over time. An RFI addendum will be issued in May 2002. The report will summarize the 2001 data and assess whether there are changes to the present day-risk assessment presented in the MDA H RFI report.

RCRA Corrective Measures Study

In December 2000, NMED directed LANL to prepare a CMS plan for MDA H because NMED believes that hazardous wastes at MDA H may present a future threat to human health and the environment over the life of the buried wastes. LANL also agreed to proceed with a CMS to address the potential for adverse impacts from future releases of radionuclides (tritium). The CMS plan identified corrective action objectives, preliminary corrective measure alternatives that address potential unacceptable future risks, and the methodology to be followed in evaluating the alternatives during the CMS. The CMS plan was approved by NMED in December 2001. The CMS is being conducted in accordance with RCRA requirements and will meet the intent of DOE Order 5400.5, “Radiation Protection of the Public and the Environment.” The CMS report for MDA H will be issued during the summer of 2002.

References

Monthly Progress Report for Corrective Measures Study for Material Disposal Area H, Potential Release Site 54-004, at Technical Area 54, February 2002 LA-UR Number: 02-1454

Monthly Progress Report for Corrective Measures Study for Material Disposal Area H, Potential Release Site 54-004, at Technical Area -54, January 2002 LA-UR Number: 02-1345

Plan for Supplemental Sampling for the RCRA Facility Investigation at Material Disposal Area H LA-UR Number: 01-2516

RFI Report for Material Disposal Area H at Technical Area -54 LA-UR Number: 01-1208

Corrective Measures Study (CMS) Plan for Material Disposal Area (MDA) H at Technical Area 54 LA-UR Number: 01-1629

RFI Report for Material Disposal Areas G, H, and L at Technical Area -54 LA-UR Number: 00-1140

Modification to Resource Conservation and Recovery Act Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1148, Field Unit 5 LA-UR Number: No LA-UR

RFI Report for Channel Sediment Pathways from MDAs G, H, J and L, at TA-54 (located in former Operable Unit 1148) LA-UR Number: 96-0110

RFI Work Plan for Operable Unit 1148 LA-UR Number: 92-0855

ATTACHMENT A

MDA H

OPERATING UNIT REGULATIONS FOR GROUND WATER/CLOSURE/POST-CLOSURE CARE AND CORRESPONDING HSWA ACTIVITIES

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90	Applicability		
§264.90(a)(1)	Except as provided in paragraph (b) of this section, the regulations in this subpart apply to owners or operators of facilities that treat, store or dispose of hazardous waste. The owner/operator must satisfy the requirements identified in paragraph (a)(2) of this section for all wastes (or constituents thereof) contained in solid waste management units at the facility, regardless of the time at which waste was placed in such units.	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies the requirements identified in §264.90(a)(2) through the implemention of alternative requirements (§264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets these requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(a)(2)	All solid waste management units must comply with the requirements in §264.101. A surface impoundment, waste pile, and land treatment unit or landfill that receives hazardous waste after July 26, 1982 (hereinafter referred to as a "regulated unit") must comply with the requirements of §§264.91 through 264.100 in lieu of §264.101 for purposes of detecting, characterizing and responding to releases to the uppermost aquifer. The financial responsibility requirements of §264.101 apply to regulated units.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(b)	The owner/operator's regulated unit or units are not subject to regulation for releases into the uppermost aquifer under this subpart if:	NA	NA
§264.90(b)(1)	The owner/operator is exempted under §264.1; or	NA	NA
§264.90(b)(2)	He operates a unit which the Secretary finds:	NA	NA
§264.90(b)(2)(i)	Is an engineered structure,	NA	NA
§264.90(b)(2)(ii)	Does not receive or contain liquid waste or waste containing free liquids,	NA	NA
§264.90(b)(2)(iii)	Designed and operated to exclude liquid, precipitation, and other run-on and run-off,	NA	NA
§264.90(b)(2)(iv)	Has inner and outer layers of containment enclosing the waste,	NA	NA
§264.90(b)(2)(v)	Has a leak detection system built into each containment layer,	NA	NA
§264.90(b)(2)(vi)	Continuing operation and maintenance of leak detection systems will be provided during active life and during closure/post-closure care periods, and	NA	NA
§264.90(b)(2)(vii)	To reasonable degree of certainty, will not allow hazardous constituents to migrate beyond out containment layer prior to end of post-closure care period.	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(b)(3)	The Secretary finds, pursuant to §264.280(d), that the treatment zone of a land treatment unit that qualifies as a regulated unit does not contain levels of hazardous constituents that are above background levels of those constituents by an amount that is statistically significant, and if an unsaturated zone monitoring program meeting the requirements of §264.278 has not shown a statistically significant increase in hazardous constituents below the treatment zone during the operating life of the unit. An exemption under this paragraph can only relieve an owner or operator of responsibility to meet the requirements of this subpart during the post-closure care period; or	NA	NA
§264.90(b)(4)	The Secretary finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and the post-closure care period specified under §264.117. This demonstration must be certified by a qualified geologist or geotechnical engineer. In order to provide an adequate margin of safety in the prediction of potential migration of liquid, the owner or operator must base any predictions made under this paragraph on assumptions that maximize the rate of liquid migration.	Should sufficient information support this exemption for a regulated unit in the future, the HSWA activity would be equivalent to that prescribed by the exemption.	NA
§264.90(b)(5)	He designs and operates a pile in compliance with §264.250(c).	NA	NA
§264.90(c)	The regulations under this subpart apply during the active life of the regulated unit (including the closure period). After closure of the regulated unit, the regulations in this subpart:	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies the requirements identified in §264.90(c) through the implemention of alternative requirements (§264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets these requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(c)(1)	Do not apply if all waste, waste residues, contaminated containment system components, and contaminated subsurface soils removed or decontaminated at closure;	For MDA H, see the CMS report for a general description of the excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure is selected, details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.90(c)(2)	Apply during post-closure care period if owner/operator is conducting a detection monitoring program under §264.98; or	The probable corrective measure to be implemented at MDA H will include monitoring in the vadose zone beneath MDA H. The LANL hydrogeologic characterization program (as implemented through the LANL Hydrogeologic Work Plan) proposes the locations for characterization wells for TA-54 that after four sampling events will be included in LANL Environmental Surveillance Program, and may, if appropriate, be used as repetitive monitoring wells for TA-54 as a whole.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(c)(3)	Apply during the compliance period under §264.96 if the owner/operator is conducting a compliance monitoring program under §264.99 or a corrective action program under §264.100.	If monitoring indicates a more comprehensive program is needed to adequately comply with standards developed consistent with §264.92, additional characterization and/or well installation will occur, if appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(d)	Regulations in this subpart may apply to miscellaneous units when necessary to comply with §§264.601-603.	NA	NA
§264.90(e)	The regulations of this subpart apply to all owners and operators subject to the requirements of 40 CFR 270.1(c)(7), when the Bureau issues either a post-closure permit or an enforceable document (as defined in 40 CFR 270.1(c)(7)) at the facility. When the Bureau issues an enforceable document, references in this subpart to "in the permit" mean "in the enforceable document."	CMS and CMI plans and resulting CMS and CMI reports for MDA H describing activities equivalent to post-closure permit requirements will be "enforceable documents" consistent with 265.121.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(f)	The Secretary may replace all or part of the requirements of §§ 264.91 through 264.100 applying to a regulated unit with alternative requirements for groundwater monitoring and corrective action for releases to groundwater set out in the permit (or in an enforceable document) (as defined in 40 CFR 270.1(c)(7)) where the Secretary determines that:	Activities proposed and implemented in the above referenced plans will be effectively equivalent to the cited Subpart F requirements.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(f)(1)	The regulated unit is situated among SWMUs or areas of concern (AOC), a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	If the possibility for this situation exists, alternative activities may appropriately replace all or part of the above cited Subpart F requirements.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.90(f)(2)	It is not necessary to apply the groundwater monitoring and corrective action requirements of §§264.91-100 because alternative requirements will protect human health and the environment.	Should the above situation exist, §264.90(f)(1), alternative activities protective of human health and the environment and proposed in lieu of §264.91-264.100 will preclude the need for application of Subpart F requirements.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.91	Required programs		
§264.91(a)	Owner/operators subject to this subpart must conduct a monitoring and response program as follows:		
§264.91(a)(1)	Whenever hazardous constituents under §264.93 from a regulated unit are detected at a compliance point under §264.95, owner/operator must institute a compliance monitoring program under §264.99. Detected is defined as statistically significant evidence of contamination as described in §264.98(f);	If "detection" at the aggregate boundary is indicated, additional characterization and/or well installation will occur if appropriate through a more comprehensive monitoring program. The definition of "detected" in §264.91(a)(1) will be used. Concentration limits protective of human health and the environment will be established similar to ground water protection standards in §264.92.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.91(a)(2)	Whenever the ground-water protection standard under §264.92 is exceeded, owner/operator must institute a corrective action program under §264.100. Exceedance is defined as statistically significant evidence of increased contamination as described in §264.99(d);	Actions to correct any exceedances of concentrations established when hazardous constituents area "detected" will be taken as necessary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.91(a)(3)	Whenever hazardous constituents under §264.93 from a regulated unit exceed concentration limits under §264.94 in groundwater between the compliance point under §264.95 and the downgradient facility property boundary, owner/operator must institute a corrective action program under §264.100, or	Should established concentration limits be exceeded between the point of compliance and the downgradient boundary, actions to correct such exceedances will be taken as necessary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.91(a)(4)	In all other cases, owner/operator must institute a detection monitoring program under §264.98.	TA-54 characterization wells will be sampled and analyzed as repetitive monitoring wells as appropriate through the LANL Environmental Surveillance Program.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.91(b)	The Secretary will specify in the facility permit the specific elements of the monitoring and response program. The Secretary may include one or more of the programs identified in paragraph (a) of this section in the facility permit as may be necessary to protect human health and the environment and will specify the circumstances under which each of the programs will be required. In deciding whether to require the owner or operator to be prepared to institute a particular program, the Secretary will consider the potential adverse effects on human health and the environment that might occur before final administrative action on a permit modification application to incorporate such a program could be taken.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.92	The owner/operator must comply with conditions specified in the facility permit that are designed to ensure that hazardous constituents under §264.93 detected in the ground water from a regulated unit do not exceed the concentration limits under §264.94 in the uppermost aquifer underlying the waste management area beyond the point of compliance under §264.95 during the compliance period under §264.96. The Secretary will establish this ground-water protection standard in the facility permit when hazardous constituents have been detected in the ground water.	Should "detection" consistent with the definition in §264.91(a)(1) occur, LANL will comply with concentration limits established through a process similar to that described in §264.94.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.93	Hazardous constituents		
§264.93(a)	The Secretary will specify in the facility permit the hazardous constituents to which the ground-water protection standard of §264.92 applies. Hazardous constituents are constituents identified in appendix VIII of part 261 of this chapter that have been detected in ground water in the uppermost aquifer underlying a regulated unit and that are reasonably expected to be in or derived from waste contained in a regulated unit, unless the Secretary has excluded them under paragraph (b) of this section.	For any of the following information that is not already available or developed, it will be prepared and included in a manner consistent with §264.93 in corresponding corrective action/HSWA activity documents.	Section 5.0 of the MDA H CMS Report and future CMI Plan
§264.93(b)	The Secretary will exclude an Appendix VIII constituent from the list of hazardous constituents specified in the facility permit if he finds that the constituent is not capable of posing a substantial present or potential hazard to human health or the environment. In deciding whether to grant an exemption, the Secretary will consider the following:	Concentration limits established for hazardous constituents following "detection" will not include those incapable of posing a substantial present or potential hazard to human health or the environment considering the following:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.93(b)(1)	Potential adverse effects on ground-water quality, considering:	Potential adverse effects on groundwater quality considering:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.93(b)(1)(i)	Physical and chemical characteristics of waste in the regulated unit, including its potential for migration;	Detailed information on waste inventory and chemical characteristics for shaft 9 and shafts 1-8 presented in MDA H RFI Report, RFI Addendum, and CMS Report including potential for migration and site conceptual model.	Section 2.0 of the MDA H RFI and Sections 2.0 and 3.0 of the MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(1)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA H can also be found in the Performance Assessment, Hydrogeologic Assessment of TA-54, Areas G and L, MDA H RFI Report, RFI Addendum, and MDA H CMS Report.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.93(b)(1)(iii)	Quantity of ground water and the direction of ground-water flow;	Information regarding quantity and direction of flow of groundwater can be obtained through the LANL Hydrogeologic Work Plan.	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.93(b)(1)(iv)	Proximity and withdrawal rates of ground-water users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	Future MDA H CMI Plan
§264.93(b)(1)(v)	Current and future uses of ground-water in the area;	Information regarding current and future users of groundwater in the area will be developed.	Future MDA H CMI Plan
§264.93(b)(1)(vi)	Existing quality of ground water, including other sources of contamination and their cumulative impact on ground-water quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Work Plan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER site characterization efforts.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.93(b)(1)(vii)	Potential health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to human receptors. The CMS Report for MDA H will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to ecological receptors. The CMS Report for MDA H will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(1)(ix)	Persistence and permanence of the potential adverse effects; and	See RFI and CMS Reports for MDA H.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.93(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	See RFI and CMS Reports for MDA H.	Section 2.0 of the MDA H RFI and Sections 2.0 and 3.0 of the MDA H CMS Report
§264.93(b)(2)(ii)	Hydrogeologic characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA H can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, MDA H RFI Report, RFI Addendum, and MDA H CMS Report.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.93(b)(2)(iii)	Quantity and quality of ground water, and the direction of ground-water flow;	Information to be obtained through implementation of the LANL Hydrogeologic Work Plan.	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.93(b)(2)(iv)	Rainfall patterns in the region;	See MDA H RFI Report.	Appendix B-2.0 of MDA H RFI Report
§264.93(b)(2)(v)	Proximity of regulated unit to surface waters;	See RFI and CMS Reports for MDA H.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.93(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described will be developed.	Future MDA H CMI Plan
§264.93(b)(2)(vii)	Existing quality of surface water, including other sources of contamination and the cumulative impact on surface-water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program, the multisector CWA permit, as well as through ER Project characterization activities.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.93(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	See RFI and CMS Reports for MDA H.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	See RFI and CMS Reports for MDA H.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(b)(2)(x)	Persistence and permanence of potential adverse effects.	See results of risk assessment in MDA H CMS Report	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.93(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility, the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	NA
§264.94	Concentration limits		
§264.94(a)	The Secretary will specify in the facility permit concentration limits in the ground water for hazardous constituents established under §264.93. The concentration of a hazardous constituent:	Proposed concentration limits of detected hazardous constituents will be consistent with evaluation of parameters set forth in §264.94. To the extent that information necessary to establish provisions of this section do not already exist, they will be developed. Otherwise this information can be found in the previously identified documents.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(a)(1)	Must not exceed the background level of that constituent in the ground water at the time that limit is specified in the permit; or	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(a)(2)	For any constituent listed in §264.94, Table 1, must not exceed the respective value given in that table if the background level of the constituent is below the value given in Table 1; or	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(a)(3)	Must not exceed an alternate limit established by the Secretary under paragraph (b) of this section.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(b)	The Secretary will establish an alternate concentration limit for a hazardous constituent if he finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In establishing alternate concentration limits, the Secretary will consider the following factors:	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(b)(1)	Potential adverse effects on groundwater quality, considering:	Potential adverse effects on groundwater quality, considering:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(b)(1)(i)	Physical and chemical characteristics of the waste in the regulated unit, including its potential for migration;	See RFI and CMS Reports for MDA H.	Section 2.0 of the MDA H RFI and Sections 2.0 and 3.0 of the MDA H CMS Report
§264.94(b)(1)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA H can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, MDA H RFI Report, RFI Addendum, and MDA H CMS Report.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(1)(iii)	Quantity of ground water and the direction of ground-water flow;	Information to be obtained through implementation of the LANL Hydrogeologic Work Plan.	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.94(b)(1)(iv)	Proximity and withdrawal rates of ground-water users;	Information regarding the proximity and withdrawal rates of ground-water users can be obtained in the annual water supply reports (with location maps) published by ESH-18, in sections 270.14(e), 264(b)(1)(iv) and 264.601(a)(5) of the LANL permit, or in previous LANL waiver documentation.	Future MDA H CMI Plan
§264.94(b)(1)(v)	Current and future uses of ground water in the area;	Information regarding current and future users of groundwater in the area will be developed.	Future MDA H CMI Plan
§264.94(b)(1)(vi)	Existing quality of ground water, including other sources of contamination and their cumulative impact on ground-water quality;	Four sampling events for each well installed in the vicinity of TA-54 pursuant to the Hydrogeologic Work Plan will occur in addition to ongoing monitoring of Environmental Surveillance Program wells and ER Project site characterization efforts.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.94(b)(1)(vii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to human receptors. The CMS Report for MDA H will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(1)(viii)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;	A present day ecological risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to ecological receptors. The CMS Report for MDA H will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(1)(ix)	Persistence and permanence of potential adverse effects; and	See results of risk assessment in MDA H CMS Report	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(2)	Potential adverse effects on hydraulically-connected surface water quality, considering:	Potential adverse effects on hydraulically-connected surface water quality, considering:	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)(i)	Volume and physical and chemical characteristics of the waste in the regulated unit;	See RFI and CMS Reports for MDA H.	Section 2.0 of the MDA H RFI and Sections 2.0 and 3.0 of the MDA H CMS Report
§264.94(b)(2)(ii)	Hydrogeological characteristics of the facility and surrounding land;	While additional information regarding the hydrogeologic characterization of the facility and surrounding land is being developed through the implementation of the Hydrogeologic Work Plan, information for MDA H can also be found in the Performance Assessment, the Hydrogeologic Assessment of TA-54, Areas G and L, MDA H RFI Report, RFI Addendum, and MDA H CMS Report.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.94(b)(2)(iii)	Quantity and quality of ground water and direction of ground-water flow;	Information to be obtained through implementation of the LANL Hydrogeologic Work Plan.	Future Hydrogeologic Work Plan reports and future MDA H CMI Plan
§264.94(b)(2)(iv)	Patterns of rainfall in the region;	See appendices in RFI and CMS Reports for MDA H.	Appendix B-2.0 of MDA H RFI Report
§264.94(b)(2)(v)	Proximity of regulated unit to surface waters;	See RFI and CMS Reports for MDA H.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report
§264.94(b)(2)(vi)	Current and future uses of surface waters in the area and any water quality standards established for those surface waters;	Information regarding surface water use, if not already described will be developed.	Future MDA H CMI Plan
§264.94(b)(2)(vii)	Existing surface water quality, including other sources of contamination and their cumulative impact on surface-water quality;	The evaluation of LANL's surface water quality standards are considered in the evaluation of surface water and springs by the LANL Environmental Surveillance Program, the multisector CWA permit, as well as through ER Project characterization activities.	Section 3.0 and Appendices B-3.0 and B-4.0 of the MDA H RFI Report, and Section 2.0 of MDA H CMS Report

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.94(b)(2)(viii)	Potential for health risks caused by human exposure to waste constituents;	A present day human health risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to human receptors. The CMS Report for MDA H will provide results of a future human health risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(2)(ix)	Potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and	A present day ecological risk screening assessment was completed and presented in the MDA H RFI Report. Results showed no unacceptable risk to ecological receptors. The CMS Report for MDA H will provide results of a future ecological risk assessment, including potential for contaminant migration and the site conceptual model.	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(b)(2)(x)	Persistence and permanence of potential adverse effects.	See results of risk assessment in MDA H CMS Report	Section 4.0 of the MDA H RFI and Section 3.0 of the MDA H CMS Report
§264.94(c)	In making any determination under paragraph (b) of this section about the use of ground water in the area around the facility the Secretary will consider any identification of underground sources of drinking water and exempted aquifers made under §144.8 of this chapter.	NA	NA
§264.95	Point of compliance	In establishing a point of compliance, the limits of the waste management area can be delineated by circumscribing an imaginary line around more than one unit. The aggregate approach used in the Hydrogeologic Work Plan was intended to be consistent with this concept. As characterization efforts progress, the appropriateness of the aggregate boundary for TA-54 will be assessed.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.95(a)	The Secretary will specify in the facility permit the point of compliance at which the ground-water protection standard of §264.92 applies and at which monitoring must be conducted. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.	See above. The point of compliance is a vertical surface located at the hydraulically downgradient limit of the aggregate that extends down into the uppermost aquifer underlying the regulated units.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.95(b)	The waste management area is the limit projected in horizontal plane of the area on which waste will be placed during active life of a regulated unit.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.95(b)(1)	The waste management area includes horizontal space taken up by any liner, dike, or other barrier designed to contain waste in a regulated unit.	NA	NA
§264.95(b)(2)	If the facility contains more than one regulated unit, the waste management area is described by an imaginary line circumscribing the several regulated units.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.96	Compliance period		Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.96(a)	The Secretary will specify in the facility permit the compliance period during which the ground-water protection standard of §264.92 applies. The compliance period is the number of years equal to the active life of the waste management area (including any waste management activity prior to permitting, and the closure period.)	The implementing document for these alternative activities will specify the period during which concentration limits similar to groundwater protection standards and will be equivalent to the remaining active life of (including closure period) the waste management area.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.96(b)	The compliance period begins when the owner/operator initiates a compliance monitoring program meeting the requirements of §264.99.	This period would begin upon detection as defined in §264.91, and, if a more comprehensive program is needed to adequately address hazardous constituent concentration limits that have been prescribed, additional characterization and/or monitoring well installation will occur if appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.96(c)	If the owner/operator is engaged in a corrective action program at the end of the compliance period specified in paragraph (a) of this section, the compliance period is extended until the owner/operator can demonstrate that the ground-water protection standard of § 264.92 has not been exceeded for a period of three consecutive years.	This period will be extended for a period of 3 years, if at the end of the active life and closure period the concentration limits described above continue to be exceeded.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97	The owner/operator must comply with following requirements for any ground-water monitoring program developed to satisfy §264.98, §264.99, or §264.100:	Alternative requirements will be met there.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)	The ground-water monitoring system must consist of sufficient number of wells, installed at appropriate locations and depths to yield ground-water samples from the uppermost aquifer that:	All groundwater monitoring wells will be sufficient in number and placed at appropriate locations and depths in the uppermost aquifer as determined by characterization efforts performed during implementation of the Hydrogeologic Work Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(1)	Represent the quality of background water that has not been affected by leakage from a regulated unit;	Background wells will be placed in an upgradient location determined to be unaffected by potential releases from the waste management area.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(a)(1)(i)	A determination of background quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:	Should existing conditions preclude the location of background wells upgradient, other wells will be used. These wells will be capable of determining background quality passing the aggregate boundary. This determination will be made in part by ongoing characterization efforts establishing groundwater gradient, flow directions, potential transport mechanisms, and waste-specific migration characteristics.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(1)(i)(A)	Hydrogeologic conditions do not allow the owner/operator to determine what wells are hydraulically upgradient; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(1)(i)(B)	Sampling at other wells will provide an indication of background ground-water quality that is representative or more representative than that provided by the upgradient wells; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(2)	Represent the quality of groundwater passing the point of compliance.	The above-mentioned geologic, hydrologic, and waste characteristics will be considered in determining the representativeness of the groundwater passing the downgradient aggregate boundary and the monitoring system's capability of detecting contamination if hazardous waste or hazardous constituents migrate from the aggregate to the uppermost aquifer.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(a)(3)	Allow for the detection of contamination when hazardous waste or hazardous constituents have migrated from the waste management area to the uppermost aquifer.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(b)	If a facility contains more than one regulated unit, separate ground-water monitoring systems are not required for each unit provided that provisions for sampling the ground water in the uppermost aquifer will enable detection and measurement at the compliance point of hazardous constituents from the regulated units that have entered the ground water in the uppermost aquifer.	Consistent with establishing a point of compliance by circumscribing an imaginary line around more than one unit, a groundwater monitoring system capable of detecting and measuring hazardous constituents at the aggregate boundary will meet the intent of this requirement.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(c)	All monitoring wells must be cased in a manner that maintains the integrity of the monitoring-well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (i.e., the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the ground water.	The integrity of the monitoring well borehole will be maintained by casing in a manner most appropriate for the use and surrounding subsurface environment. Screen materials should be selected based on compatibility w geochemistry and long-term structural integrity. Well casing size should be determined based on the size of purging and equipment necessary to sample the well and the depth of the well. Filter pack material should be inert (i.e., silica sand). Gravel filters are compatible with screen and subsurface. Annular space should be sealed with materials compatible with the subsurface and have a permeability one to two orders of magnitude less than the surrounding formation. A cement and bentonite mixture, bentonite chips or antishrink cement mixtures can be used in the unsaturated zone and below the frost line. The cap should consist of concrete blending into an apron extending at least three feet from the outer edge of the borehole. Remaining annular space should be sealed with expanding cement. A suitable threaded or flanged cap or compression seal should then be placed and locked.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(d)	The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide a reliable indication of ground-water quality below the waste management area. At a minimum, the program must include procedures and techniques for:	Groundwater sampling and analysis procedures will be in written form and will address the following:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(d)(1)	Sample collection;	1) Groundwater level measurements will be determined prior to collection of sample in accordance with a written procedure describing level of accuracy, measurement reference points, required equipment decontamination, and time period measured. 2) Water collection will occur in accordance with a written procedure describing sampling devices and procedures for use and decontamination, well evacuation volumes and procedures, field measurements and appropriate sample container types.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(d)(2)	Sample preservation and shipment;	SW 846 requirements will be followed to ensure appropriate preservation and temperature controls are utilized.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(d)(3)	Analytical procedures; and	SW 846 or other approved analytical methods, holding times and approved QA/QC analytical procedures will be used.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(d)(4)	Chain-of-Custody control.	Chain-of-custody will include: sample number, time and date; collector's signature; sample type; well identification; number of containers; parameters to be analyzed; signatures of subsequent handlers; inclusive dates of possession; storage temperature at shipment and receipt; and verification of temperature control upon receipt at analytical laboratory.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(e)	The ground-water monitoring program must include sampling and analytical methods appropriate for ground-water sampling and that accurately measure hazardous constituents in ground-water samples.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(f)	The ground-water monitoring program must include determination of the ground-water surface elevation each time ground water is sampled.	Groundwater levels will be determined each time water is sampled.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(g)	In detection monitoring or where appropriate in compliance monitoring, data on each hazardous constituent specified in the permit will be collected from background wells and wells at the compliance point(s). The number and kinds of samples collected to establish background shall be appropriate for the form of statistical test employed, following generally accepted statistical principles. Sample size shall be as large as necessary to ensure with reasonable confidence that a contaminant release to ground water from a facility will be detected. The owner or operator will determine an appropriate sampling procedure and interval for each hazardous constituent listed in the facility permit which shall be specified in the unit permit upon approval by the Secretary. The sampling procedure shall be:	Data will be collected that is appropriate for the statistical methodology applied, sufficient in sample size and utilizes sampling procedures and frequencies of sample collection to ensure that potential contaminant release(s) to groundwater from the waste management unit(s) can be detected.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(g)(1)	A sequence of at least four samples, taken at an interval that assures, to the greatest extent technically feasible, that an independent sample is obtained, by reference to the uppermost aquifer's effective porosity, hydraulic conductivity, and hydraulic gradient, and the fate and transport characteristics of the potential contaminants, or	An adequate number of samples will be collected at appropriate frequencies to ensure representativeness considering aquifer and potential contaminant characteristics. Information such as retardation potential for metals and organics, and transport time based on groundwater velocity and constituent mobility will be considered in developing the sampling procedure.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(g)(2)	An alternate sampling procedure proposed by the owner/operator and approved by the Secretary.	Should an alternative to the sampling procedure described above be more appropriate, it will be proposed.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(h)	The owner/operator will specify one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent which will be specified in the unit permit. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. Where practical quantification limits (pql's) are used in any of the following statistical procedures to comply with §264.97(i)(5), the pql must be proposed by the owner or operator and approved by the Secretary. Use of any of the following statistical methods must be protective of human health and the environment and must comply with the performance standards outlined in paragraph (i) of this section.	One of the statistical methods described in §264.97(h) or an alternative approved by the Secretary will be chosen to evaluate groundwater monitoring data. It is premature at this time to prescribe a specific method until adequate characterization has been performed.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(1)	A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(2)	An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(3)	A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(4)	A control chart approach that gives control limits for each constituent.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(h)(5)	Another statistical test method submitted by the owner or operator and approved by the Secretary.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)	Any statistical method chosen under §264.97(h) for specification in the unit permit shall comply with the following performance standards, as appropriate:	The appropriate performance standard used for the statistical method applied will be consistent with those prescribed in §264.97(i).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(i)(1)	The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)(2)	If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experimentwise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)(3)	If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be proposed by the owner or operator and approved by the Secretary if he or she finds it to be protective of human health and the environment.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)(4)	If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be proposed by the owner or operator and approved by the Secretary if it finds these parameters to be protective of human health and the environment. These parameters will be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.97(i)(5)	The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantification limit (pql) approved by the Secretary under §264.97(h) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(i)(6)	If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.97(j)	Ground-water monitoring data collected in accordance with paragraph (g) of this section including actual levels of constituents must be maintained in the facility operating record. The Secretary will specify in the permit when the data must be submitted for review.	Groundwater monitoring data obtained will be maintained in the facility records.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98	An owner/operator required to establish a detection monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Upon completion of adequate characterization through the Hydrogeologic Work Plan, and a determination that monitoring would be appropriate, the detection-type monitoring prescribed in §264.98 would be initiated.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(a)	The owner/operator must monitor for indicator parameters (e.g., specific conductance, total organic carbon, or total organic halogen), waste constituents, or reaction products that provide a reliable indication of the presence of hazardous constituents in ground water. The Secretary will specify the parameters or constituents to be monitored in the facility permit, after considering the following factors:	As a result of sampling performed during the four events following well installation under the Hydrogeologic Work Plan, indicator parameters, waste constituents or reaction products will be prescribed that consider the following:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(a)(1)	The types, quantities, and concentrations of constituents in wastes managed at the regulated unit;	Waste information has been obtained and reviewed, identifying hazardous constituents, concentrations, and waste volumes during the RFI/CMS process.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(a)(2)	The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the waste management area;	Further refinement of the hydrogeologic regime at TA-54, and the behavior of hazardous constituents in the unsaturated zone will be developed and reported through the Hydrogeologic Work Plan activities and the RFI/CMS process. Substantial information regarding these issues has already been provided in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(a)(3)	The detectability of indicator parameters, waste constituents, and reaction products in ground water; and	Based on data collected during the four sampling events following well installation under the Hydrogeologic Work Plan, detectability of indicator parameters, waste constituents and reaction products will be established using SW 846 or Secretary approved methodologies and detection limits.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(a)(4)	The concentrations or values and coefficients of variation of proposed monitoring parameters or constituents in ground-water background values.	Considerations for establishing concentrations and coefficients of variance of background parameters or constituents include: location of the unit, groundwater flow direction, depth to groundwater, appropriate number and location of background wells, available geologic and hydrologic information, drilling methods, well installation details, and sampling data.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(b)	Owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Should it be determined that a groundwater monitoring system will be necessary, installation of this system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary. Vadose zone investigation including delineation of contaminant movement and potential impact can be used to enhance and/or supplement monitoring efforts as an early detection mechanism.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(c)	The owner/operator must conduct ground-water monitoring for each chemical parameter and hazardous constituent specified in the permit pursuant to paragraph (a) of this section in accordance with §264.97(g), and maintain a record of ground-water analytical data as measured and in a form necessary for the determination of statistical significance under §264.97(h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(d)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine whether there is statistically significant evidence of contamination for any parameter or hazardous constituent specified in the permit under paragraph (a) of this section in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during detection monitoring.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of contamination as described in §264.98(d).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer must be determined at least annually.	Groundwater flow rate and direction in the upper-most aquifer will be determined and reevaluated annually.	Future MDA H CMI Plan
§264.98(f)	The owner/operator must determine whether there is statistically significant evidence of contamination for any chemical parameter of hazardous constituent specified in the permit pursuant to paragraph (a) of this section at a frequency specified under paragraph (d) of this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of contamination exists within a reasonable timeframe.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(f)(1)	In determining whether statistically significant evidence of contamination exists, the owner/operator must use the method(s) specified in the permit under §264.97(h). These method(s) must compare data collected at the compliance point(s) to the background ground-water quality data.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(f)(2)	The owner/operator must determine whether there is statistically significant evidence of contamination at each monitoring well as the compliance point within a reasonable period of time after completion of sampling. The facility permit will specify what period of time is reasonable, based on the complexity of the statistical test and the availability of laboratory facilities to perform the analysis of ground-water samples.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)	If the owner/operator determines pursuant to paragraph (f) of this section that there is statistically significant evidence of contamination for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he or she must:	If statistically significant evidence of contamination for established chemical parameters or hazardous constituents exists, notification will be made and ground water wells will be sampled for Appendix IX constituents. If present and confirmed with a second analysis within the timeframes described in §264.98(g), these constituents will be used in a more comprehensive monitoring program.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(1)	Notify the Secretary of this finding in writing within seven days. The notification must indicate what chemical parameters or hazardous constituents have shown statistically significant evidence of contamination;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(2)	Immediately sample the ground water in all monitoring wells and determine whether constituents in the list of Appendix IX of part 264 are present, and if so, in what concentration.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(3)	For any Appendix IX compounds found in the analysis pursuant to paragraph (g)(2) of this section, resample within one month and repeat the analysis for those compounds detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If groundwater is not resampled for the compounds found pursuant to paragraph (g)(2) of this section, the hazardous constituents found during this initial Appendix IX analysis will form the basis for compliance monitoring.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)	Within 90 days, submit to the Secretary an application for a permit modification to establish a compliance monitoring program meeting the requirements of §264.99. The application must include the following information:	Within 90 days, a request for modification of an enforceable document will be submitted to establish a more comprehensive monitoring program. It will include:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)(i)	An identification of the concentration or any Appendix IX constituent detected in the ground water at each monitoring well at the compliance point;	Appendix IX constituents and associated concentrations confirmed in downgradient aggregate boundary wells;	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)(ii)	Any proposed changes to the ground-water monitoring system at the facility necessary to meet the requirements of §264.99;	Any proposed modifications/enhancements to the existing groundwater monitoring system if necessary:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)(iii)	Any proposed additions or changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical methods used at the facility necessary to meet the requirements of §264.99;	Any proposed changes to monitoring frequency, sampling and analysis procedures or statistical methods, if necessary to address provisions of the more comprehensive monitoring program.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(4)(iv)	For each hazardous constituent detected at the compliance point, a proposed concentration limit under §264.94(a) (1) or (2), or a notice of intent to seek an alternate concentration limit under §264.94(b); and	For hazardous constituents detected (as defined in §264.91(a)(1)), either background concentrations, maximum concentration limits or alternate concentration limits (ACLs) (or the intent to demonstrate ACLs) will be proposed.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(5)	Within 180 days, submit to the Secretary:	Within the specified time frame of 180 days, unless an alternative approach is more appropriate, submit to the Secretary the following:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(5)(i)	All data necessary to justify an alternate concentration limit sought under §264.94(b); and	Consideration of geologic and hydrologic conditions, waste inventory, receptor location(s), travel time, and degradation mechanisms may be included in the justification.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(5)(ii)	An engineering feasibility plan for a corrective action program necessary to meet the requirement of §264.100, unless:	A feasibility plan for a groundwater corrective action program will be developed during the CMS/CMI process unless:	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(5)(ii)(A)	All hazardous constituents identified under paragraph (g)(2) of this section are listed in Table 1 of §264.94 and their concentrations do not exceed the respective values given in that Table; or	Concentrations of hazardous constituents are not greater than MCLs; or	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(5)(ii)(B)	The owner or operator has sought an alternate concentration limit under §264.94(b) for every hazardous constituent identified under paragraph (g)(2) of this section.	An ACL demonstration has been submitted for all constituents found.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(6)	If the owner/operator determines that, pursuant to paragraph (f) of this section, there is a statistically significant difference for chemical parameters or hazardous constituents specified pursuant to paragraph (a) of this section at any monitoring well at the compliance point, he/she demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. The owner/operator may make a demonstration under this paragraph in addition to, or in lieu of, submitting a permit modification application under paragraph (g)(4) of this section; however, owner/operator is still required to submit a permit modification application within the time specified in paragraph (g)(4) of this section unless the demonstration made under this paragraph successfully shows that a source other than a regulated unit caused the increase, or that the increase resulted from error in sampling, analysis, or evaluation. In making this demonstration, the owner/operator, must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.98(g)(6) and monitoring will continue.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.98(g)(6)(i)	Notify the Secretary in writing within seven days of determining statistically significant evidence of contamination at the compliance point that he intends to make a demonstration under this paragraph;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(6)(ii)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(6)(iii)	Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the detection monitoring program facility; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(g)(6)(iv)	Continue to monitor in accordance with the detection monitoring program established under this section.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.98(h)	If the owner/operator determines that the detection monitoring program no longer satisfies the requirements of this section, he/she must within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99	An owner/operator required to establish a compliance monitoring program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituents be "detected" (consistent with §264.91(a)(1)) resulting in the subsequent development of concentration limits consistent with §264.93 and §264.94, a more comprehensive monitoring program will be established that determines compliance with these limits. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(a)	The owner/operator must monitor the ground water to determine whether regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(a)(1)	A list of the hazardous constituents identified under §264.93;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(a)(3)	The compliance point under §264.95; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(a)(4)	The compliance period under §264.96.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(b)	The owner/operator must install a ground-water monitoring system at the compliance point as specified under §264.95. The ground-water monitoring system must comply with §264.97(a)(2), (b), and (c).	Installation of a more comprehensive monitoring system will consider: location data, geology and hydrology, drilling methods, flow direction and velocity, potential contaminant behavior, and well completion and development details. Much of this information for TA-54 has been developed already in the Hydrogeologic Assessment of TA-54, Areas L and G, the Performance Assessment, and the RFI Reports for MDAs G, H and L and will continue through ongoing efforts of the Hydrogeologic Work Plan and the CMS/CMI process. The system will be capable of collecting groundwater samples from wells constructed and located in such a manner so as to be representative of the quality of groundwater passing beneath TA-54 at the aggregate boundary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(c)	The Secretary will specify the sampling procedures and statistical methods appropriate for the constituents and the facility, consistent with §264.97(g) and (h).	Samples will be collected and analyzed for all relevant chemical parameters and hazardous constituents in such form as is appropriate for determination of statistical significance using appropriate sampling procedures and statistical methods.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(c)(1)	The owner/operator must conduct a sampling program for each chemical parameter or hazardous constituent in accordance with §264.97(g).	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(c)(2)	The owner/operator must record ground-water analytical data as measured and in form necessary for the determination of statistical significance under §264.97(h) for the compliance period of the facility.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(d)	The owner/operator must determine whether there is statistically significant evidence of increased contamination for any chemical parameter or hazardous constituent specified in the permit, pursuant to paragraph (a) of this section, at a frequency specified under paragraph (f) under this section.	Collect and analyze samples, evaluate data using appropriate statistical methodology and compare groundwater quality between the upgradient and downgradient wells at the aggregate boundary to determine whether statistically significant evidence of increased contamination exists within a reasonable timeframe.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(d)(1)	In determining whether statistically significant evidence of increased contamination exists, owner/operator must use the method(s) specified in the permit under §264.97(h). The methods(s) must compare data collected at the compliance point(s) to a concentration limit developed in accordance with §264.94.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(d)(2)	The owner/operator must determine whether there is statistically significant evidence of increased contamination at each monitoring well at the compliance point within a reasonable time period after completion of sampling. The Secretary will specify that time period in the facility permit, after considering the complexity of the statistical test and the availability of analytical laboratories to perform the analysis of ground-water samples.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(e)	The owner/operator must determine the ground-water flow rate and direction in the uppermost aquifer at least annually.	Groundwater flow rate and direction in the uppermost aquifer will be determined and reevaluated annually.	Future MDA H CMI Report
§264.99(f)	The Secretary will specify the frequencies for collecting samples and conducting statistical tests to determine statistically significant evidence of increased contamination in accordance with §264.97(g). A sequence of at least four samples from each well (background and compliance wells) must be collected at least semi-annually during the compliance period of the facility.	An appropriate frequency for sample collection and statistical analysis will be proposed that will be capable of determining statistically significant evidence of increased contamination as described in §264.99(f).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(g)	Owner/operator must analyze samples from all monitoring wells at the compliance point for all constituents contained in Appendix IX of Part 264 at least annually to determine whether additional hazardous constituents are present in the uppermost aquifer and, if so, at what concentration, pursuant to procedures in §264.98(f). If the owner/operator finds Appendix IX constituents in the ground water that are not already identified in the permit as monitoring constituents, the owner/operator may resample within one month and repeat the Appendix IX analysis. If the second analysis confirms the presence of new constituents, the owner/operator must report the concentration of these additional constituents to the Secretary within seven days after the completion of the second analysis and add them to the monitoring list. If the owner/operator chooses not to resample, then he or she must report the concentrations of these additional constituents to the Secretary within seven days after completion of the initial analysis and add them to the monitoring list.	If annual sampling for all Appendix IX constituents indicates new constituents that are not already addressed statistically exceed background, and resampling within one month confirms this, the Secretary will be notified and the new constituents will be added to the monitoring list.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(h)	If the owner/operator determines pursuant to paragraph (d) of this section that any concentration limits under §264.94 are being exceeded at any monitoring well at the point of compliance, must:	If it has been determined that a statistically significant increase in contamination due to an exceedance of the previously established concentration limits has occurred at the downgradient aggregate boundary, the Secretary will be notified and a modification to the enforceable document requested to establish a corrective action program. It will include the actions necessary to correct the increase in contamination and a plan for a groundwater monitoring program to demonstrate the effectiveness of the action. An analysis of applicable remedial technologies will be performed through the CMS process, and the capabilities of the existing groundwater monitoring system will be assessed. Modifications/enhancements to the existing system will be proposed if necessary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(h)(1)	Notify the Secretary of this finding in writing within seven days. The notification must indicate what concentration limits have been exceeded.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(h)(2)	Submit to the Secretary an application for a permit modification to establish a corrective action program meeting the requirements of §264.100 within 180 days, or within 90 days if an engineering feasibility study has been previously submitted to the Secretary under §264.98(h)(5). The application must at a minimum include the following information:	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(h)(2)(i)	A detailed description of corrective actions that will achieve compliance with the ground-water protection standard specified in the permit under paragraph (a) of this section; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(h)(2)(ii)	A plan for a ground-water monitoring program that will demonstrate the effectiveness of the corrective action. Such a ground-water monitoring program may be based on a compliance monitoring program developed to meet the requirements of this section.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(i)	If the owner/operator determines, pursuant to paragraph (d) of this section, that the ground-water concentration limits under this section are being exceeded at any monitoring well at the point of compliance, may demonstrate that a source other than a regulated unit caused the contamination or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the ground water. In making a demonstration under this paragraph, the owner/operator must:	If contamination is detected but thought to have migrated from somewhere other than the TA-54 aggregate, was caused by sampling and analysis and/or statistical artifacts, or natural variations in groundwater, notification will be provided to the Secretary that a demonstration will be made, a demonstration report submitted, and any necessary modifications to the enforceable document requested to address appropriate changes to the monitoring program. Timeframes for submittals will be consistent with those established in §264.99(i) and monitoring will continue.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(i)(1)	Notify the Secretary in writing within seven days that he intends to make a demonstration under this paragraph;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(i)(2)	Within 90 days, submit a report to the Secretary which demonstrates that a source other than a regulated unit caused the standard to be exceeded or that the apparent noncompliance with the standards resulted from error in sampling, analysis, or evaluation;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(i)(3)	Within 90 days, submit an application for a permit modification to the Secretary to make any appropriate changes to the compliance monitoring program at the facility; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.99(i)(4)	Continue to monitor in accord with the compliance monitoring program established under this section.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.99(j)	If the owner/operator determines that the compliance monitoring program no longer satisfies the requirements of this section, must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if the monitoring prescribed in this program is no longer appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100	An owner/operator required to establish a corrective action program under this subpart must, at a minimum, discharge the following responsibilities:	Should hazardous constituent concentration levels be exceeded, a program that takes action to address the statistically significant increase identified will be established. Concentrations will be measured at the aggregate boundary for the period of time equivalent to the remaining active life of the waste management area (including closure period).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)	Owner/operator must take corrective action to ensure that regulated units are in compliance with the ground-water protection standard under §264.92. The Secretary will specify the ground-water protection standard in the facility permit, including:	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)(1)	A list of the hazardous constituents identified under §264.93;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)(2)	Concentration limits under §264.94 for each of those hazardous constituents;	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)(3)	The compliance point under §264.95; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(a)(4)	The compliance period under §264.96.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(b)	The owner/operator must implement a corrective action program that prevents hazardous constituents from exceeding their respective concentration limits at the compliance point by removing the hazardous waste constituents or treating them in place. The permit will specify the specific measures that will be taken.	A program will be implemented to prevent hazardous constituent concentration exceedances at the downgradient aggregate boundary that considers: contaminant distribution and mobility, additional characterization and/or monitoring needs (including vadose zone investigation), source term removal, and applicable remedial techniques.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(c)	The owner/operator must begin corrective action within a reasonable time period after the ground-water protection standard is exceeded. The Secretary will specify that time period in the facility permit. If a facility permit includes a corrective action program in addition to a compliance monitoring program, the permit will specify when the corrective action will begin and such a requirement will operate in lieu of §264.99(i)(2).	Corrective action will begin within a reasonable time period after hazardous constituent concentration limits have been exceeded and will be conducted pursuant to the requirements established in the above-referenced corrective action program.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(d)	In conjunction with a corrective action program, owner/operator must establish and implement a ground-water monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under §264.99 and must be as effective as that program in determining compliance with the ground-water protection standard under §264.92 and in determining the success of a corrective action program under paragraph (e) of this section, where appropriate.	A groundwater monitoring program to demonstrate the effectiveness of the corrective action will be established and implemented. It will be based on considerations identified in the corrective action program and capable of detecting statistically significant exceedances in previously established hazardous constituent concentration limits. Additional monitoring wells may be installed and sampled if necessary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(e)	In addition to the other requirements of this section, owner/operator must conduct a corrective action program to remove or treat in place any hazardous constituents under §264.93 that exceed concentration limits under §264.94 in groundwater:	The corrective action will also address hazardous constituents that exceed the concentration limits between the downgradient aggregate boundary and the downgradient property boundary, and off-site. Removal or in situ treatment of such constituents will occur in a reasonable time period, and, if off site, where necessary to protect human health and the environment. Corrective action can cease once limits are no longer exceeded.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(e)(1)	Between the compliance point under §264.95 and the downgradient property boundary; and	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(e)(2)	Beyond the facility boundary, where necessary to protect human health and the environment, owner/operator demonstrates to the satisfaction of the Secretary that, despite the owner's or operator's best efforts, the owner or operator was unable to obtain the necessary permission to undertake such action. The owner/operator is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(e)(3)	Corrective action measures under this paragraph must be initiated and completed within a reasonable period of time considering the extent of contamination.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(e)(4)	Corrective action measures under this paragraph may be terminated once the concentration of hazardous constituents under §264.93 is reduced to levels below their respective concentration limits under §264.94.	See above	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(f)	The owner/operator must continue corrective action measures during the compliance period to the extent necessary to ensure that the ground-water protection standard is not exceeded. If the owner or operator is conducting corrective action at the end of the compliance period, he must continue that corrective action for as long as necessary to achieve compliance with the ground-water protection standard. The owner/operator may terminate corrective action measures taken beyond the period equal to the active life of the waste management area (including the closure period) if he can demonstrate, based on data from the ground-water monitoring program under paragraph (d) of this section, that the ground-water protection standard of §264.92 has not been exceeded for a period of three consecutive years.	Corrective action measures will continue until hazardous constituent concentration limits are no longer exceeded during the period equivalent to the remaining active life of the waste management area (including closure period). If corrective action is still occurring at the end of this period, it will continue until concentration limits are no longer exceeded for 3 consecutive years.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.100(g)	The owner/operator must report in writing to the Secretary on the effectiveness of the corrective action program. The owner/operator must submit these reports semi-annually.	Semi-annual reports on the effectiveness of the corrective action will be provided to the Secretary.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.100(h)	The owner/operator determines that the corrective action program no longer satisfies the requirements of this section, he must, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.	A modification to the enforceable document will be requested if it is determined that this program is no longer appropriate.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.110(c)	The Secretary may replace all or part of the requirements of this subpart (and the unit-specific standards referenced in §264.111(c) applying to a regulated unit), with alternative requirements set out in a permit or enforceable document where the Secretary determines that:	See the CMS report for a general description of how the proposed corrective measure meets the closure and post-closure care requirements of 264.111 - 264.120. The approved CMI plan will describe in detail how the selected corrective measure meets closure/post-care requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA H once they are approved.	Section 5.0 of the MDA H CMS Report
§264.110(c)(1)	The regulated unit is situated among SWMUs or AOCs, a release has occurred, and both the regulated unit and one or more SWMUs or AOCs are likely to have contributed to the release; and	MDA H meets the criteria for alternative requirements because the existing land-based unit (shaft 9) is situated among SWMUs (disposal shafts 1 - 8), a release has occurred, and the origin of the release is uncertain (details provided in RFI report).	Section 2.0 of the MDA H RFI Report and Section 1.0 of the MDA H CMS Report
§264.110(c)(2)	It is not necessary to apply the closure requirements of this subpart (and those referenced herein) because the alternative requirements will protect human health and the environment and will satisfy the closure performance standard of §264.111(a) and (b).	See the CMS report for a general description of how the proposed corrective measure meets applicable closure and post-closure care requirements of §264.111 - 264.120; details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report
§264.111	Closure Performance Standard. Owner/operator must close the facility in a manner that:	This requirement refers to closure the entire facility - LANL. For MDA H only: alternative requirements specified in the CMS report and ultimately detailed in the approved CMI plan will protect human health and the environment by meeting the intent of closure performance standards.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.111(a)	Minimizes the need for further maintenance; and	For MDA H, see the CMS report for a general description of how the proposed corrective measure meets this closure requirement; details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.111(b)	Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.	For MDA H, see the CMS report for a general description of how the proposed corrective measure meets this closure requirement; details will be provided in the approved CMI Plan. Leachate is defined as any liquid including suspended components in the liquid, that has percolated through or drained from hazardous waste.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)	Closure plan must identify steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least:	The proposed corrective measure will be equivalent to a "partial closure" as defined in §260.10 for MDA H only (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.112(b)(8)).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(1)	A description of how each hazardous waste management unit at the facility will be closed in accordance with §264.111;	For MDA H, see the CMS report for a general description of how the proposed corrective measure meets this closure requirement (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.112(b)(8)); details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(2)	A description of how final closure of the facility will be conducted in accordance with §264.111. The description must identify the maximum extent of the operations which will be unclosed during the active life of the facility; and	This requirement refers to closure the entire facility - LANL. Not applicable to MDA H.	NA
§264.112(b)(3)	An estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous wastes, and identification of the type(s) of the off-site hazardous waste management units to be used, if applicable; and	For MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies this closure requirement (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.112(b)(8)); details will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(4)	A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard; and	For MDA H, see the CMS report for a general description of the excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure is selected, details will be provided in the approved CMI Plan following permit modification. Not applicable for containment corrective measure alternatives.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(5)	A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control; and	Final closure refers to the entire facility - LANL. For MDA H only (partial closure): alternative requirements specified in the CMS report and ultimately detailed in the approved CMI plan will satisfy closure performance standards in accordance with alternative requirements of §264.90(f), 264.110(c) and 264.112(b)(8).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(b)(6)	A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover must be included.)	For MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies this closure requirement. A schedule for implementing the selected corrective measure (that meets the intent of this closure requirement in accordance with alternative requirements §264.90(f), 264.110(c) and 264.112(b)(8)) will be included in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(b)(7)	For facilities that use trust funds to establish financial assurance under §264.143 or §264.145 and that are expected to close prior to the expiration of the permit, an estimate of the expected year of final closure.	NA	NA
§264.112(b)(8)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §264.90(f), §264.110(d), and/or §264.140(d), either the alternative requirements applying to the regulated unit, or a reference to the enforceable document containing those alternative requirements.	For MDA H, see the CMS report for a general description of how the proposed corrective measure meets closure and post-closure care requirements. The approved CMI plan will describe in detail how the selected corrective measure meets closure/post-care requirements. Enforceable documents include Module VIII of LANL's Hazardous Waste Facility Permit and the CMS report and CMI plan for MDA H once they are approved.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(c)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan in accordance with the applicable procedures in parts 124 and 270. The written notification or request must include a copy of the amended closure plan for review or approval by the Secretary.	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the closure plan at any time prior to the notification of partial or final closure of the facility.	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(2)(i)	Changes in operating plans or facility design affect the closure plan, or	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(c)(2)(ii)	There is a change in the expected year of closure, if applicable, or	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(2)(iii)	In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or § 264.140(d)	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(c)(3)	The owner/operator must submit a written request for a permit modification including a copy of the amended closure plan for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the owner/operator must request a permit modification no later than 30 days after the unexpected event. An owner/operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to prepare a contingent closure plan under §264.228(c)(1)(i) or §264.258(c)(1)(i), must submit an amended closure plan to the Secretary no later than 60 days from the date that the owner/operator or the Secretary determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §264.310, or no later than 30 days from that date if the determination is made during partial or final closure. The Secretary will approve, disapprove, or mo	This requirement refers to closure the entire facility - LANL. Not applicable to MDA H.	NA
§264.112(c)(4)	The Secretary may request modifications to the plan under the conditions described in § 264.112(c)(2). The owner/operator must submit the modified plan within 60 days of the Secretary's request, or within 30 days if the change in facility conditions occurs during partial or final closure. Any modifications requested by the Secretary will be approved in accordance with the procedures in parts 124 and 270	For MDA H, any significant change to the approved selected corrective measure will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.112(c)(2)(iv).	Future request for mod. of enforceable document
§264.112(d)	Notification of partial closure and final closure.		

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(d)(1)	Owner/operator must notify Secretary in writing at least 60 days prior to the date on which he expects to begin closure of a surface impoundment, waste pile, land treatment or landfill unit, or final closure of a facility with such a unit. Owner/operator must notify the Secretary in writing at least 45 days prior to the date on which he expects to begin final closure of a facility with only treatment or storage tanks, container storage, or incinerator units to be closed. Owner/operator must notify the Secretary in writing at least 45 days prior to the date on which he expects to begin partial or final closure of a boiler or industrial furnace, whichever is earlier	For MDA H, the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(d)(2)	The date when it "expects to begin closure" must be either:	For MDA H, the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.112(d)(2)(i)	No later than 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional hazardous wastes, no later than one year after the date on which the unit received the most recent volume of hazardous wastes. If the owner/operator of a hazardous waste management unit can demonstrate to the Secretary that the hazardous waste management unit or facility has the capacity to receive additional hazardous wastes and it has taken all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit; or	For MDA H, the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.112(d)(2)(ii)	For units meeting the requirements of §264.113(d), no later than 30 days after the date on which the hazardous waste management unit receives the known final volume of non-hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional non-hazardous wastes, no later than one year after the date on which the unit received the most recent volume of non-hazardous wastes. If the owner/operator can demonstrate to the Secretary that the hazardous waste management unit has the capacity to receive additional non-hazardous wastes and it has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Secretary may approve an extension to this one-year limit.	NA	NA
§264.112(d)(3)	If the facility's permit is terminated, or if the facility is otherwise ordered, by judicial decree or final order under section 3008 of RCRA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the owner/operator must close the facility in accordance with the deadlines established in §264.113	NA	NA
§264.112(e)	Nothing in this section shall preclude the owner/operator from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure	NA	NA
§264.113	Closure; Time allowed for closure		
§264.113(a)	Within 90 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner/operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at a hazardous waste management unit or facility, the owner/operator must treat, remove from the unit or facility, or dispose of on-site, all hazardous wastes in accordance with the approved closure plan. The Secretary may approve a longer period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(a)(1)(i)	The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; or	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(a)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(a)(1)(ii)(B)	There is a reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(a)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(a)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements.	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)	The owner/operator must complete partial and final closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner or operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at the hazardous waste management unit or facility. The Secretary may approve an extension to the closure period if the owner/operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)(1)(i)	The partial or final closure activities will, of necessity, take longer than 180 days to complete; or	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)(1)(ii)(A)	The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner/operator complies with paragraphs (d) and (e) of this section; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)(1)(ii)(B)	There is reasonable likelihood that the owner/operator or another person will recommence operation of the hazardous waste management unit or the facility within one year; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(b)(1)(ii)(C)	Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(b)(2)	The owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit or facility, including compliance with all applicable permit requirements	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(c)	The demonstrations referred to in paragraphs (a)(1) and (b)(1) of this section must be made as follows:	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(c)(1)	The demonstrations in paragraph (a)(1) of this section must be made at least 30 days prior to the expiration of the 90-day period in paragraph (a) of this section; and	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(c)(2)	The demonstration in paragraph (b)(1) of this section must be made at least 30 days prior to the expiration of the 180-day period in paragraph (b) of this section, unless the owner/operator is otherwise subject to the deadlines in paragraph (d) of this section.	For MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.113(d)	The Secretary may allow an owner/operator to receive only non-hazardous wastes in a landfill, land treatment, or surface impoundment unit after the final receipt of hazardous wastes at that unit if:	NA	NA
§264.113(d)(1)	The owner/operator requests a permit modification in compliance with all applicable requirements in parts 270 and 124 of this title and in the permit modification request demonstrates that:	NA	NA
§264.113(d)(1)(i)	The unit has the existing design capacity as indicated on the part A application to receive non-hazardous wastes; and	NA	NA
§264.113(d)(1)(ii)	There is a reasonable likelihood that the owner or operator or another person will receive non-hazardous wastes in the unit within one year after the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(1)(iii)	The non-hazardous wastes will not be incompatible with any remaining wastes in the unit, or with the facility design and operating requirements of the unit or facility under this part; and	NA	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.113(d)(1)(iv)	Closure of the hazardous waste management unit would be incompatible with continued operation of the unit or facility; and	NA	NA
§264.113(d)(1)(v)	The owner/operator is operating and will continue to operate in compliance with all applicable permit requirements; and	NA	NA
§264.113(d)(2)	The request to modify the permit includes an amended waste analysis plan, ground-water monitoring and response program, human exposure assessment required under RCRA section 3019, and closure and post-closure plans, and updated cost estimates and demonstrations of financial assurance for closure and post-closure care as necessary and appropriate, to reflect any changes due to the presence of hazardous constituents in the non-hazardous wastes, and changes in closure activities, including the expected year of closure if applicable under § 264.112(b)(7), as a result of the receipt of non-hazardous wastes following the final receipt of hazardous wastes; and	NA	NA
§264.113(d)(3)	The request to modify the permit includes revisions, as necessary and appropriate, to affected conditions of the permit to account for the receipt of non-hazardous wastes following receipt of the final volume of hazardous wastes; and	NA	NA
§264.113(d)(4)	The request to modify the permit and the demonstrations referred to in paragraphs (d)(1) and (d)(2) of this section are submitted to the Secretary no later than 120 days prior to the date on which the owner/operator of the facility receives the known final volume of hazardous wastes at the unit, or no later than 90 days after the effective date of this rule in the state in which the unit is located, whichever is later.	NA	NA
§264.113(e)	Requirements for the owner/operator of a hazardous waste surface impoundment that is not in compliance with the liner and leachate collection system requirements.	NA	NA
§264.114	During the partial and final closure periods, all contaminated equipment, structures and soils must be properly disposed of or decontaminated unless otherwise specified in §§ 264.197, 264.228, 264.258, 264.280 or § 264.310. By removing any hazardous wastes or hazardous constituents during partial and final closure, the owner/operator may become a generator of hazardous waste and must handle that waste in accordance with all applicable requirements of part 262 of this chapter	For MDA H, see the CMS report for a general description of the excavation alternative corrective measure (equivalent to clean closure). If the excavation corrective measure alternative is selected, details will be provided in the approved CMI Plan following permit modification. Not applicable for the containment corrective measure alternatives.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.115	Within 60 days of completion of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill unit, and within 60 days of the completion of final closure, the owner/operator must submit to the Secretary, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for closure under §264.143(i).	Final closure refers to the entire facility - LANL. For MDA H only (partial closure): alternative requirements specified in the CMS report and ultimately detailed in the approved CMI plan will satisfy closure performance standards. Corrective measure implementation requirements specify that the owner/operator conduct inspections, reviews and acceptance testing in accordance with the construction quality assurance plan and submit routine progress reports to the Secretary. Corrective measure implementation requirements also dictate that the owner/operator prepare a corrective measure completion report that includes all supporting documentation confirming that the corrective measure was successfully implemented. This report must be certified by an independent professional(s) skilled in the appropriate discipline(s) and submitted to the Secretary See the CMS report for a general description of the how the corrective measure certification meets the intent of this closure requirement. The approved CMI plan will contain a detailed description of the certification process and criteria.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.116	No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary, a survey plat indicating the location and dimensions of landfills cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable subpart G regulations.	For MDA H - this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable). A survey plat prepared in accordance with 264.116 will be provided in the CMI completion report.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117	Post-closure care and use of property		Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117(a)(1)	Post-closure care for each hazardous waste management unit subject to the requirements of §§ 264.117 through 264.120 must begin after completion of closure of the unit and continue for 30 years after that date and must consist of at least the following:	This requirement applies to the containment corrective measure alternatives for MDA H. Activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(a)(1)(i)	Monitoring and reporting in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	This requirement applies to the containment corrective measure alternatives for MDA H. Activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117(a)(1)(ii)	Maintenance and monitoring of waste containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part.	For the containment corrective measure alternatives for MDA H, maintenance activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.) A description of the waste containment system monitoring systems are provided above in the Comment/Implementation of HSWA Activities column for Subpart F (§264.90 - 264.100 implemented through alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117(a)(2)	Any time preceding partial closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period for a particular unit, the Secretary may, in accordance with the permit modification procedures in parts 124 and 270:	This requirement applies to the containment corrective measure alternatives for MDA H. Activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.117(a)(2)(i)	Shorten the post-closure care period applicable to the hazardous waste management unit, or facility, if all disposal units have been closed, if he finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or ground-water monitoring results, characteristics of the hazardous wastes, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit or facility is secure); or	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(a)(2)(ii)	Extend the post-closure care period applicable to the hazardous waste management unit or facility if he finds that the extended period is necessary to protect human health and the environment (e.g., leachate or ground-water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment).	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(b)	The Secretary may require, at partial and final closure, continuation of any of the security requirements of §264.14 during part or all of the post-closure period when:	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(b)(1)	Hazardous wastes may remain exposed after completion of partial or final closure; or	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(b)(2)	Access by the public or domestic livestock may pose a hazard to human health.	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(c)	Post-closure use of property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the facility's monitoring systems, unless the Secretary finds that the disturbance:	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(c)(1)	Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.117(c)(2)	Is necessary to reduce a threat to human health or the environment.	This requirement applies to the containment corrective measure alternatives for MDA H. The Secretary will always have the authority to change CMI plan requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.117(d)	All post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in §264.118.	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f) and 264.110(c)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved MDA H CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118	Post-Closure Plan, Amendment of Plan	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)	For each hazardous waste management unit subject to the requirements of this section, the post-closure plan must identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least:	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(1)	A description of the planned monitoring activities and frequencies at which they will be performed to comply with subparts F, K, L, M, N, and X of this part during the post-closure care period; and	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan. (See CMS plan for general description.) A description of the planned monitoring activities and frequencies at which they will be performed is provided above in the Comment/Implementation of HSWA Activities column for Subpart F (264.90 - 264.100 implemented through alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)).	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(2)	A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure:	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(b)(2)(i)	The integrity of the cap and final cover or other containment systems in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(2)(ii)	The function of the monitoring equipment in accordance with the requirements of subparts, F, K, L, M, N, and X of this part; and	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(3)	The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure care period.	The name, address, and phone number of the office to contact about MDA H during the CMS/CMI period is: the U.S. Department of Energy, National Nuclear Security Administration, Office of Los Alamos Site Operations, 528 35th Street, Los Alamos, NM, 87544, (505) 667-5105.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(b)(4)	For facilities where the Secretary has applied alternative requirements at a regulated unit under §§264.90(f), 264.110(c), and/or §264.140(d), either the alternative requirements that apply to the regulated unit, or a reference to the enforceable document containing those requirements.	For the containment corrective measure alternatives for MDA H, activities and the implementation schedule for the selected corrective measure will be determined in the approved CMI plan (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). (See CMS plan for general description.)	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(c)	Until final closure of the facility, a copy of the approved post-closure plan must be furnished to the Secretary upon request, including request by mail. After final closure has been certified, the person or office specified in §264.188(b)(3) must keep the approved post-closure plan during the remainder of the post-closure period.	For MDA H, this requirement will be completed as part of the CMS/CMI corrective action process, (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). See CMS the report for a general description of how these requirements will met; details will be provided in the approved CMI plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.118(d)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan in accordance with the applicable requirements in parts 124 and 270. The written notification or request must include a copy of the amended post-closure plan for review or approval by the Secretary.	Any significant change to the approved selected corrective measure, including post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv). See CMS the report for a general description of how these requirements will met; details will be provided in the approved CMI plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(d)(1)	The owner/operator may submit a written notification or request to the Secretary for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period.	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)	The owner/operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever:	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)(i)	Changes in operating plans or facility design affect the approved post-closure plan, or	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)(ii)	There is a change in the expected year of final closure, if applicable, or	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)(iii)	Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan.	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document
§264.118(d)(2)(iv)	The owner/operator requests the Secretary to apply alternative requirements to a regulated unit under §264.90(f), §264.110(c), and/or §264.140(d).	LANL can petition to change post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) at any time, which will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv).	Future request for mod. of enforceable document

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.118(d)(3)	The owner/operator must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan. An owner/operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to submit a contingent post-closure plan under §264.228(c)(1)(ii) and §264.258(c)(1)(ii) must submit a post-closure plan to the Secretary no later than 90 days after the date that the owner or operator or the Secretary determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §264.310. The Secretary will approve, disapprove or modify this plan in accordance with the procedures in parts 124 and 270. In accordance with §270.32 of this chapter, the approved post-closure plan will become a permit condition.	Any significant change to the approved selected corrective measure, including post-CMI monitoring and maintenance requirements (applicable to the containment corrective measure alternatives) will require Secretary approval of a modification to the enforceable document prior to implementation in accordance with §264.118(d)(2)(iv). See CMS the report for a general description of how these requirements will met; details will be provided in the approved CMI plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan and future request for mod. of enforceable document
§264.118(d)(4)	The Secretary may request modifications to the plan under the conditions described in §264.118(d)(2). The owner/operator must submit the modified plan no later than 60 days after the Secretary's request, or no later than 90 days if the unit is a surface impoundment or waste pile not previously required to prepare a contingent post-closure plan. Any modifications requested by the Secretary will be approved, disapproved, or modified in accordance with the procedures in parts 124 and 270.	The Secretary will always have the authority to change the approved CMI plan and post-CMI requirements by modification of the enforceable document at any time, and will perform formal program-wide performance review every ten years at permit renewal.	Future request for mod. of enforceable document
§264.119(a)	No later than 60 days after certification of closure of each hazardous waste disposal unit, the owner/operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous wastes disposed of before January 12, 1981, the owner/operator must identify the type, location, and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records it has kept	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)	Within 60 days of certification of closure of the first hazardous waste disposal unit and within 60 days of certification of closure of the last hazardous waste disposal unit, the owner/operator must:	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.119(b)(1)	Record, in accordance with State law, a notation on the deed to the facility property -- or on some other instrument which is normally examined during title search -- that will in perpetuity notify any potential purchaser of the property that:	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)(1)(i)	The land has been used to manage hazardous wastes; and	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)(1)(ii)	Its use is restricted under 40 CFR subpart G regulations; and	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)(1)(iii)	The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the facility required by §264.116 and §264.119(a) have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Secretary; and	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(b)(2)	Submit a certification, signed by the owner/operator, that he has recorded the notation specified in paragraph (b)(1) of this section, including a copy of the document in which the notation has been placed, to the Secretary.	Upon completion of the CMI for MDA H, this information will be provided to the land use authority, either DOE/LANL or a subsequent owner (if applicable).	NA
§264.119(c)	If the owner/operator or any subsequent owner/operator of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes and hazardous waste residues, the liner, if any, or contaminated soils, it must request a modification to the post-closure permit in accordance with the applicable requirements in parts 124 and 270. The owner/operator must demonstrate that the removal of hazardous wastes will satisfy the criteria of §264.117(c). By removing hazardous waste, the owner/operator may become a generator of hazardous waste and must manage it in accordance with all applicable requirements of this chapter. If it is granted a permit modification or otherwise granted approval to conduct such removal activities, the owner/operator may request that the Secretary approve either:	This is a facility-wide permit requirement not specifically addressed in a CMS report or CMI plan for a specific site at the facility.	NA
§264.119(c)(1)	The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or	This is a facility-wide permit requirement not specifically addressed in a CMS report or CMI plan for a specific site at the facility.	NA
§264.119(c)(2)	The addition of a notation to the deed or instrument indicating the removal of the hazardous waste	This is a facility-wide permit requirement not specifically addressed in a CMS report or CMI plan for a specific site at the facility.	NA

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.120	No later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the owner/operator must submit to the Secretary, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification must be signed by the owner/operator and an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification must be furnished to the Secretary upon request until he releases the owner or operator from the financial assurance requirements for post-closure care under §264.145(i).	This is a facility-wide permit requirement not specifically addressed in a CMS report or CMI plan for a specific site at the facility.	NA
§264.310	Closure and post-closure care for landfills/landfill cells	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)	At final closure of the landfill or upon closure of any cell, the owner/operator must cover the landfill or cell with a final cover designed and constructed to:	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)(1)	Provide long-term minimization of migration of liquids through the closed landfill;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310(a)(2)	Function with minimum maintenance;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)(3)	Promote drainage and minimize erosion or abrasion of the cover;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)(4)	Accommodate settling and subsidence so that the cover's integrity is maintained; and	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(a)(5)	Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(b)	After final closure, the owner/operator must comply with all post-closure requirements contained in §264.117 through §264.120, including maintenance and monitoring throughout the post-closure care period (specified in the permit under §264.117). The owner/operator must:	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310(b)(1)	Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(b)(2)	Continue to operate the leachate collection and removal system until leachate is no longer detected;	NA - construction of all shafts at MDA commenced well before July 29, 1992 per 264.301(a) and (c) and 265.301(a).	NA
§264.310(b)(3)	Maintain and monitor the leak detection system in accordance with § 264.301(c)(3)(iv) and (4) and §264.303(c), and comply with all other applicable leak detection system requirements of this part;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(b)(4)	Maintain and monitor the ground-water monitoring system and comply with all other applicable requirements of subpart F of this part;	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan
§264.310(b)(5)	Prevent run-on and run-off from eroding or otherwise damaging the final cover; and	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

Regulatory Citation(s)	Regulatory Requirements	Comments/Implementation of HSWA Activities	Location in Document
§264.310(b)(6)	Protect and maintain surveyed benchmarks used in complying with §264.309.	For the containment corrective measure alternatives evaluated for MDA H, see the CMS report for a general description of how the proposed corrective measure satisfies post-closure care requirements (in accordance with alternative requirements §264.90(f), 264.110(c) and 264.118(b)(4)). A detailed description of how the selected corrective meets the intent of post-closure requirements will be provided in the approved CMI Plan.	Section 5.0 of the MDA H CMS Report and future MDA H CMI Plan

CERTIFICATION

I certify under penalty of law that this document and attachment 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 violations.

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
Operator

4/25/02
Date Signed

E. Dennis Martinez
Acting Director
U.S. Department of Energy
National Nuclear Security Administration
Office of Los Alamos Site Operations
Owner/Operator

4/25/02
Date Signed

Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

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NMED Hazardous
Waste Bureau

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Sandra Martin, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Dear Ms. Martin:

Subject: Resource Conservation and Recovery Act (RCRA), Technical Area 55 (TA-55) Part B Permit Application Submittal – Los Alamos National Laboratory (LANL), EPA ID No. NM 890010515

The purpose of this letter is to submit and request approval for the most recent version of the RCRA permit application for TA-55, entitled, "Los Alamos National Laboratory, Technical Area 55 Part B Permit Application, Revision 2.0 (LA-UR-03-6303)." This application supports the renewal of the LANL hazardous waste facility permit. The original RCRA Hazardous Waste Facility Permit was issued to the U.S. Department of Energy (DOE) and the University of California (UC) by the New Mexico Environmental Improvement Division on November 8, 1989.

This submittal contains one permit application, one manila envelope, and one supporting document designed to aid final review of the application. The permit application has a Laboratory-issued unrestricted release (LA-UR) number. This means that it is acceptable to make the information contained within the binder available to those in the public that may wish to review it. The manila envelope within the front pocket of the binder is labeled UCNI (Unclassified Controlled Nuclear Information). Its contents consist of LA-CP-03-0680. This information, while not classified, is sensitive and is not to be distributed for review with the rest of the application. It is now the responsibility of the New Mexico Environment Department (NMED) to maintain control of that information and keep it secured during times when it is not being used. The supporting document is a table that outlines briefly the changes that have taken place since the last revision of the TA-55 application.

This revised permit application incorporates the text and information indicated in DOE/UC's response to NMED's, "Notice of Deficiency, TA-55 Part B RCRA Permit Application, January 2002, Revision 1.0, Los Alamos National Laboratory, EPA ID# NM0890010515, HWB-LANL-99-051." This revision was also modified to include

additional information regarding various waste management programs or procedures that have changed since the response.

If you should have any questions or comments concerning this permit application submittal, please contact Gene Turner, DOE, of my staff at (505) 667-5794 or Jack Ellvinger, UC, at (505) 667-0633.

Sincerely,

Ralph E. Erickson
Manager

FO:8GT-004

Enclosure

cc w/enclosure:
Carl Will
Permits Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Laurie King (6PD-N)
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LA-UR-03-6303
September 2003

Los Alamos National Laboratory

Technical Area 55 Part B Permit Application

Revision 2.0

Prepared by:

Los Alamos National Laboratory
Solid Waste Regulatory Compliance
Los Alamos, New Mexico 87545

Los Alamos National Laboratory
Technical Area 55 Part B
Permit Application

Revision 2.0
LA-UR-03-6303

September 2003

Prepared by:

Los Alamos National Laboratory
Solid Waste Regulatory Compliance Group (SWRC)
Los Alamos, New Mexico 87545

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LIST OF SUPPLEMENTS

SUPPLEMENT	TITLE
4.1	Solid Waste Management Units at Technical Area 55 [Information Extracted from the 2003 “Solid Waste Management Unit Report”]

LIST OF ACRONYMS/ABBREVIATIONS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ALARA	as low as reasonably achievable
CFR	Code of Federal Regulations
CSU	container storage unit(s)
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ft	foot/feet
gal	gallon(s)
HEPA	high-efficiency particulate air
HRMB	Hazardous and Radioactive Materials Bureau
in.	inch(es)
L	liter(s)
LANL	Los Alamos National Laboratory
NMED	New Mexico Environment Department
NRC	Nuclear Regulatory Commission
SUP	Supply Chain Management Division
SWB	standard waste box
SWMU	solid waste management unit
TA	technical area

1.0 INTRODUCTION

This "Los Alamos National Laboratory Technical Area 55 Part B Permit Application" is submitted to address the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00], specific to hazardous and mixed waste operations at Los Alamos National Laboratory (LANL) Technical Area (TA) 55. Additional information is provided in this permit application beyond that necessary for regulatory compliance to demonstrate how LANL meets regulatory standards. This information is not intended for inclusion in LANL's hazardous waste permit. Waste management units to be permitted include seven container storage units (CSU), a storage tank system, and one Subpart X treatment unit (a cementation unit). This document serves as Revision 2.0 to "Technical Area 55 Part B Permit Application," Revisions 0.0 and 1.0, submitted to the New Mexico Environment Department (NMED) in June 1996 and January 2002, respectively.

This document has been formatted to meet the permitting strategy outlined by the NMED Hazardous and Radioactive Materials Bureau (HRMB) in correspondence dated February 5, 1998 (NMED, 1998a). As presented in the 1998 correspondence, TA-specific permit applications, permit modification requests, and permit renewal applications would include any details and/or requirements not addressed in the "Los Alamos National Laboratory General Part B Permit Application." The most recent version of that document, hereinafter referred to as the LANL General Part B, complements this permit application. Certain portions of the LANL General Part B will serve in the operating permit as an "umbrella" document, covering the requirements of the New Mexico Hazardous Waste Act and implementing regulations, specifically 20.4.1 NMAC [6-14-00], common to all waste management units. Together, information provided in this permit application and in the LANL General Part B will meet the applicable requirements specified in 20.4.1 NMAC, Subparts V and IX [6-14-00].

This revised document also addresses the following:

- Revisions agreed upon in the "Response to Notice of Deficiency; TA-55 Part B RCRA Permit Application, January 2002, Revision 1.0, May 16, 2002," LA-UR-02-5041 (LANL, 2002a).

- Permitting requirements for a modification to the existing storage tank system. The two storage tank systems identified in Revision 0.0 of the TA-55 Permit Application as the evaporator glovebox storage tank system and the cementation unit storage tank system have been combined and modified into a single storage tank system. The storage tank system, as presented in this document, is comprised of two existing components and one new component. The two existing components include the evaporator glovebox tank component (formerly identified as the evaporator glovebox storage tank system) and the cementation unit pencil tanks component (formerly identified as the cementation unit storage tank system). The one new component includes additional pencil tanks.

- Permitting requirements for a new CSU to be located at TA-55-185.

In accordance with HRMB's 1998 permitting strategy, LANL submitted the "Los Alamos National Laboratory General Part A Permit Application." The most recent version of this document, hereinafter referred to as the LANL General Part A, consolidates information from previous site-wide and TA-specific Part A submittals into one comprehensive document, identifying all hazardous and mixed waste treatment, storage, and disposal facilities at LANL subject to 20.4.1 NMAC, Subparts V, VI, and IX [6-14-00] at that time. The LANL General Part A serves as a companion document to the LANL General Part B and TA-specific permit applications, permit modification requests, and permit renewal applications, including this revised permit application.

In the LANL General Part A, the LANL General Part B, and this revised permit application, a unit to be permitted may sometimes be referred to as a facility. The term "facility," as it appears in this context, is used only to denote building or area names and does not imply the regulatory meaning of "facility" as defined in 20.4.1 NMAC §260.1 [6-14-00]. However, pursuant to 20.4.1 NMAC §260.1 [6-14-00], the "LANL facility" as a whole does meet the regulatory definition of a facility.

Table 1-1 provides a list of regulatory references and the corresponding location in this permit application, as appropriate. Where applicable, regulatory citations in this document reference 20.4.1 NMAC, which adopts, with a few exceptions, all of the Code of Federal Regulations, Title 40, Parts 260 to 266, Part 268, and Part 270.

Table 1-1
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(b)(1)	General facility description	Attachment A
§270.14(b)(2)	Chemical and physical analyses of hazardous waste	Attachment B[a]
§270.14(b)(3)	Waste analysis plan	Attachment B[a]
§264.13(b)	Development and implementation of a written waste analysis plan	Attachment B[a]
§264.13(c)	Off-site waste analysis requirements	Attachment B[a]
§270.14(b)(4)	Security procedures and equipment	Attachment J
§264.14	Security procedures and equipment	Attachment J
§270.14(b)(5)	General inspection schedule	Attachment C[a]
§264.15(b)	General inspection schedule	Attachment C[a]
§264.174	Inspections/containers	Attachment C[a]
§264.193(i)	Tank system inspections pending provision of adequate secondary containment	NA
§264.195	Overfill control inspections	Attachments C[a], H, and I
§264.226	Surface impoundment monitoring and inspection	NA
§264.254	Waste pile monitoring and inspection	NA
§264.273	Land treatment and operating requirements	NA
§264.303	Landfill monitoring and inspection	NA
§264.602	Miscellaneous units	Attachment I
§264.1033	Process vent standards	Attachments H and I
§264.1052	Equipment leak air emission standards	Attachments H and I
§264.1053	Compressor standards	NA

See footnotes at end of table.

Table 1-1 (continued)
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§264.1058	Standards for pumps, valves, pressure relief devices, flanges, and connections	Attachments H and I
§270.14(b)(6)	Request for waiver from preparedness and prevention requirements of 264 Subpart C	NA
§264.30-37	Preparedness and prevention: applicability, design and operation, required equipment, testing and maintenance of equipment, access to communications or alarm systems, required aisle space, and arrangements with local authorities	NA
§264.227	Surface impoundment emergency repairs	NA
§270.14(b)(7)	Contingency Plan	Attachment E[a]
§264.50-56	Contingency plan and emergency procedures: applicability, purpose/implementation of contingency plan, content of contingency plan, copies of contingency plan, amendment to contingency, emergency coordinator, and emergency procedures	Attachment E[a]
§270.14(b)(8)	Description of preparedness and prevention	Attachment J
§270.14(b)(8)(i)	Hazard prevention in unloading operations	Attachment J
§270.14(b)(8)(ii)	Runoff prevention	Attachment J
§270.14(b)(8)(iii)	Contamination prevention of water supplies	Attachment J
§270.14(b)(8)(iv)	Mitigation of equipment failure and power outages	Attachment J
§270.14(b)(8)(v)	Prevention of undue exposure of personnel to hazardous waste	Attachment J
§270.14(b)(8)(vi)	Prevention of releases to the atmosphere	Attachment J
§270.14(b)(9)	Prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes	Attachments G, H and I
§264.17	Procedures to prevent accidental ignition, reaction of ignitables, reaction of reactives, reaction of incompatibles, and documentation of compliance with 264.17 (general requirements for ignitable, reactive, or incompatible wastes)	Attachments G, H and I

Table 1-1 (continued)
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(b)(10)	Traffic pattern: volume, controls, and access	Attachment A
264.18(a)	Seismic considerations	
§270.14(b)(11)	Facility/unit identification and location information	Attachment A
§270.14(b)(11)(i)	Seismic standard applicability [264.18(a)]	Attachment A
§270.14(b)(11)(ii)	Seismic standard requirements	Attachment A
§270.14(b)(11)(ii)(A)	No fault within 3,000 feet (ft) with displacement in Holocene time	Attachment A
§270.14(b)(11)(ii)(B)	If faults which have displacement in Holocene time are present within 3,000 ft, no faults pass within 200 ft of portions of the facility where treatment, storage, or disposal will be conducted	NA
§270.14(b)(11)(iii)	100-year floodplain standard	Attachment A[a]
§270.14(b)(11)(iv)(A-C)	Facilities located within the 100-year floodplain	NA
§270.14(b)(11)(v)	Compliance schedule for 264.18(b)	NA
§270.14(b)(12)	Personnel training program	Attachment D[a]
§270.14(b)(13)	Closure and post-closure plans	Attachments F.1, F.2, and F.3
§264, Subpart G	Closure and post-closure	Attachments F.1, F.2, and F.3
§264.178	Closure/containers	Attachment F.1
§264.197	Closure and post-closure care/tanks	Attachment F.2
§264.228	Surface impoundments	NA
§264.258	Waste piles	NA
§264.280	Land treatment	NA

See footnotes at end of table

Table 1-1 (continued)
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§264.310	Landfills	NA
§264.351	Incinerators	NA
§264.601	Closure/miscellaneous units	Attachment F.3
§264.603	Requirements by the Secretary	Attachment F.3
§270.14(b)(14)	Deed restrictions/post-closure notices (264.119)	Attachments F.1, F.2, and F.3
§270.14(b)(15)	Closure cost estimate (264.142)	Attachments F.1, F.2, and F.3
§270.14(b)(16)	Post-closure cost estimate (264.144)	Attachments F.1, F.2, and F.3
§270.14(b)(17)	Liability insurance (264.147)	Attachments F.1, F.2, and F.3
§270.14(b)(18)	Proof of financial coverage (264.149-150)	Attachments F.1, F.2, and F.3
§270.14(b)(19)	Topographic map requirements	Attachment A[b]
§270.14(b)(19)(i)	Map scale and date	Attachment A[b]
§270.14(b)(19)(ii)	100-year floodplain area	Attachment A[b]
§270.14(b)(19)(iii)	Surface waters	Attachment A
§270.14(b)(19)(iv)	Surrounding land uses	Attachment A
§270.14(b)(19)(v)	Wind rose	Attachment A
§270.14(b)(19)(vi)	Map orientation	Attachment A[b]
§270.14(b)(19)(vii)	Legal boundaries	Attachment A[b]

See footnotes at end of table.

Table 1-1 (continued)
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(b)(19)(viii)	Access control	Attachment A
§270.14(b)(19)(ix)	Wells	Attachment A
§270.14(b)(19)(x)	Buildings	Attachment A
§270.14(b)(19)(xi)	Drainage barriers or flood control	Attachment A
§270.14(b)(19)(xii)	Location of operational units	Attachment A
§270.3(b)(20)	Other federal laws	3.0[a]
§270.3(a)	Wild and Scenic Rivers Act	3.0[a]
§270.3(b)	National Historic Preservation Act	3.0[a]
§270.3(c)	Endangered Species Act	3.0[a]
§270.3(d)	Coastal Zone Management	3.0[a]
§270.3(e)	Fish and Wildlife Coordination Act	3.0[a]
§270.3(f)	Executive Orders	3.0[a]
§270.14(b)(21)	Notice of extension approval for land disposal facilities	NA
§270.14(c)	Groundwater monitoring requirements	Attachment A[a]
§270.14(c)(3)	Topographic map with points of compliance	NA
§270.14(c)(3)	Proposed location of groundwater monitoring wells	NA
§270.14(c)(4)	Description of plume of contamination that has entered the groundwater from a regulated unit at the time the application was submitted	NA
§270.14(c)(4)(i)	Extent of plume indicated on topographic map	NA
§270.14(c)(4)(ii)	Identification of constituents and concentration	NA
§270.14(c)(5)	Detailed plan and engineering report describing proposed groundwater monitoring program	

See footnotes at end of table.

Table 1-1 (continued)
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.14(c)(6)	If no release detected at date of submitted, then submit following	
§270.14(c)(6)(i)	List of proposed indicator parameters, waste constituents, and reaction products	NA
§270.14(c)(16)(ii)	Proposed groundwater monitoring system	NA
§270.14(c)(16)(iii)	Background values for each proposed monitoring parameter	NA
§270.14(c)(16)(iv)	Description of proposed sampling, analysis, and statistic comparisons to be used	NA
§270.14(c)(7)	If a release is detected at the point of compliance, then corrective actions	NA
§270.14(d)	Information requirements for solid waste management units (SWMU)	4.0
§270.14(d)(1)(i)	Location of SWMUs on topographic map	4.0
§270.14(d)(1)(ii)	Types of SWMUs	4.0
§270.14(d)(1)(iii)	Dimensions and descriptions of SWMUs	4.0
§270.14(d)(1)(iv)	Dates of SWMU operations	4.0
§270.14(d)(1)(v)	Waste types managed at SWMUs	4.0
§270.14(d)(2)	Information on releases from SWMUs	4.0
§270.14(d)(3)	RCRA Facility Assessment sampling and analysis results	NA
§270.15	Information requirements for containers	Attachment G
§270.16	Information requirements for tank systems	Attachment H
§270.16(a)	Written assessment of tank, structural integrity and suitability submitted by an independent, certified, registered professional engineer	Attachment H

See footnotes at end of table.

Table 1-1 (continued)
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.16(b)	Dimensions and capacity of each tank	Attachment H
§270.16(c)	Feed system description	Attachment H
§270.16(d)	Piping diagram	Attachment H
§270.16(e)	External corrosion protection description	Attachment H
§270.16(f)	New tank installation	NA
§270.16(g)	Detailed description of secondary containment	Attachment H
§270.16(h)	Request for variance	Attachment H
§270.16(i)	Description of procedures and controls to prevent spills and overflows	Attachment H
§270.23	Information requirements for miscellaneous units	Attachment I

a Requirement or information is also addressed in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," as appropriate.
b Some of the topographic map requirements are addressed in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application," as appropriate.

ft = feet
NA = not applicable
SWMU = Solid Waste Management Unit

2.0 WASTE MANAGEMENT UNITS

The waste management units described in this permit application are located at Technical Area (TA) 55 in the central portion of the Los Alamos National Laboratory (LANL) as shown in Attachment A on Figure A-1. These units include:

- Seven Container Storage Units (CSU) - B45, B40, B05, K13, and the Vault located at TA-55-4; a container storage pad located northwest of TA-55-4; and TA-55-185.
- One Storage Tank System – consisting of 3 tank components, a total of 16 tanks located in Room 401 at TA-55-4.
- One Cementation Unit – including a pH column, vacuum trap, two motor-driven mixers, four impellers, piping and a glovebox, located in Room 401 at TA-55-4.

The general location of the each waste management unit is shown in Attachment A of this permit application on Figure A-2. Detailed information on and design drawings for each are presented in Attachments G, H and I, respectively. Attachment J of this permit application contains detailed information on general facility operations and management practices.

2.1 CONTAINER STORAGE

The information provided in this section is submitted to address the applicable container storage requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.15, and 20.4.1 NMAC §264, Subpart I, revised June 14, 2000 [6-14-00]. Container storage at TA-55 consists of seven CSUs that provide storage for hazardous and mixed wastes. Table 2-1 identifies each of the CSUs to be permitted, including the location and maximum storage capacity.

Table 2-1
Container Storage Unit Locations and Maximum Capacities at Technical Area 55

CSU Name	Location	Capacity[a] (gallons)
B40	TA-55-4, Basement	21,500
B05	TA-55-4, Basement	3,600
K13	TA-55-4, Basement	2,500
B45	TA-55-4. Basement	11,000
Vault	TA-55-4, Basement	4,000
Storage Pad	Northwest of TA-55-4	135,000
TA-55-185	West of TA-55-4	30,000

a Reflects the calculation of maximum capacities with a minimum aisle space of 2 feet.

TA = Technical Area
CSU = container storage unit

The following sections provide a brief description of the waste management practices associated with the TA-55 CSUs. General dimensions, containment features, and materials of construction for each CSU are provided in Attachment G of this permit application to satisfy the requirements of 20.4.1 NMAC §270.15(a)(1) and (2) [6-14-00].

2.1.1 Storage Containers

Waste containers stored in the TA-55 CSUs include: 0.25, 0.5, 0.75, 1, 2, 4, and 6 liter (L)/quart containers; 5, 10, 12, and 15 gallon (gal) containers, 30-, 55-, and 85-gal drums; special order waste boxes; large waste boxes; and standard waste boxes (SWB). Additional information regarding typical storage containers utilized at the TA-55 CSUs is provided in Tables 2-2 and 2-3. These tables do not contain information on all of the possible containers to be used and each container is identified by size without limiting the materials of construction.

Table 2-2
Typical Storage Containers Used at the Technical Area 55 Container Storage Units

Container Type	Description	Requirements
Non-Bulk Performance-Oriented Packaging [a]	Steel drums	• 49 CFR §178.504. • Maximum capacity not to exceed 119 gal. • Maximum net mass not to exceed 882 lbs.
	Aluminum drums	• 49 CFR §178.505. • Maximum capacity will not exceed 119 gal. • Maximum net mass will not exceed 882 lbs.
	Metal drums other than steel or aluminum	• 49 CFR §178.506. • Maximum capacity will not exceed 119 gal. • Maximum net mass will not exceed 882 lbs.
	Fiber drums	• 49 CFR §178.508. • Maximum capacity will not exceed 119 gal. • Maximum net mass will not exceed 882 lbs.
	Plastic drums	• 49 CFR §178.509. • Maximum capacity will not exceed 119 gal. • Maximum net mass will not exceed 882 lbs.
	Plastic Jerricans	• 49 CFR §178.509. • Maximum capacity will not exceed 16 gal. • Maximum net mass will not exceed 265 lbs.
	Steel or aluminum boxes	• 49 CFR §178.512. • Maximum net mass will not exceed 882 lbs.
	Aluminum or steel Jerricans	• 49 CFR §178.511. • Maximum capacity will not exceed 16 gal. • Maximum net mass will not exceed 265 lbs.
	Plywood boxes	• 49 CFR §178.514. • Maximum net mass will not exceed 882 lbs.
	Fiberboard boxes	• 49 CFR §178.516. • Maximum net mass will not exceed 882 lbs.
	Composite packaging with inner receptacles	• 49 CFR §178.522. • Maximum capacity will not exceed 66 gallons. • Maximum net mass will not exceed 882 lbs.

Table 2-2 (continued)
Typical Storage Containers Used at the Technical Area 55 Container Storage Units

Container Type	Description	Requirements
Non-Bulk Performance-Oriented Packaging [a] (continued)	Composite packaging with inner glass, porcelain, or stone receptacles	• 49 CFR §178.523. • Maximum net capacity for liquids is 16 gal. • Maximum net mass for solids is 165 lbs.
Intermediate Bulk Performance-Oriented Packaging [b]	Metal intermediate bulk containers	49 CFR §178.705.
	Rigid plastic intermediate bulk containers	49 CFR §178.706.
	Composite intermediate bulk containers	49 CFR §178.707.
	Fiberboard intermediate bulk containers	49 CFR §178.708.
	Wooden intermediate bulk containers	49 CFR §178.709.
	Flexible intermediate bulk containers	49 CFR §178.710.
Cylinders [c]	Seamless steel cylinders	DOT Specification 3A, 3AX, 3AA, 3AAX, 3B, 3E, or 3T in 49 CFR, Part 178, Subpart C.
	Welded or brazed steel cylinders	DOT Specification 4B, 4BA, 4B240ET, 4AA480, 4L, or 4BW in 49 CFR, Part 178, Subpart C.
	Seamless or welded aluminum cylinders	DOT Specification 3AL or 4E in 49 CFR, Part 178, Subpart C.
	Seamless nickel cylinders	DOT Specification 3BN in 49 CFR, Part 178, Subpart C.
Containers Used for Transport of Radioactive Materials	DOT Containers	DOT Specification 7A in 49 CFR §178.350.
	IP Containers	Industrial Packaging IP-1, IP-2, or IP-3 in 49 CFR §173.411.
	Exceptions	49 CFR §173.410.

a Manufacturer has provided the required UN marking in accordance with 49 CFR §178.503.
b Marked by the manufacturer in accordance with 49 CFR §178.703.
c Marked with the applicable DOT specification number in accordance with 49 CFR §178.35.

CFR = Code of Federal Regulations
DOT = U.S. Department of Transportation
IP = Industrial Packaging
gal = gallons
lbs = pounds

Table 2-3
Storage Containers Used at Technical Area 55 for Mixed Transuranic Waste

Container Type	Description	Requirements	Filter Vents [a]
Standard 55-gallon Drum	• Gross internal volume of 7.3 ft^3 (0.21 m^3). • Constructed of mild steel. • May also contain ridge, molded polyethylene (or other compatible material) liner.	DOT Specification 7A in 49 CFR §178.350.	One or more filter vents installed on top of the container.
Standard Waste Box	Gross internal volume of 66 ft^3 (1.88 m^3).	DOT Specification 7A in 49 CFR §178.350.	
Standard 85-gallon Drum Over Pack	• Gross internal volume of 11.3 ft^3 (0.32 m^3). • Used for overpacking contaminated 55-gallon drums.	Not Applicable	
Oversized Waste Box	• Gross internal volume greater than 11.3 ft^3 (0.32 m^3). • Used for oversized waste.	Not Applicable	Two or more filter vents installed on sides of container.

a Vents are high-efficiency particulate air grade filters to preclude container pressurization caused by gas generation and to prevent particulate material from escaping. Vents have an orifice approximately 0.375 inches (9.53 millimeters [mm]) in diameter through which internally generated gas may pass. Filter media can be any material (e.g., composite carbon, sintered metal).

CFR = Code of Federal Regulations
DOT = U.S. Department of Transportation
ft^3 = cubic feet
m^3 = cubic meters

2.1.2 Minimum Aisle Space and Storage Configuration

Waste containers at the TA-55 CSUs are arranged in rows with a minimum aisle space of 24 inches (in.). Storage configuration within a row depends upon the type of container, its size, and its weight restrictions. Containers will be stacked to a maximum of two high unless they are too large or heavy to be supported by the container(s) to be located underneath and/or maneuvered with available forklift/crane/hoist. Fifty-five-gal drums, SWBs, and large waste boxes are arranged in rows and can be stacked to a maximum of 10 feet (ft) high, based on the Code of Federal Regulations (CFR) requirements in 49 CFR 178.606(c), “Performance-Oriented Stack Test”.

2.1.3 Authorized Waste

The TA-55 CSUs are used to store hazardous and mixed waste containers bearing one or more of the U.S. Environmental Protection Agency (EPA) Hazardous Waste Numbers presented in the most recent version of the “Los Alamos National Laboratory General Part A,“ hereinafter referred to as the General Part A.

2.1.4 Condition of Containers [20.4.1 NMAC §264.171]

Any container at the TA-55 CSUs that is not in good condition either during or prior to storage (e.g., severe rusting, apparent structural defects) is overpacked or the wastes are repackaged in containers that are in good condition. Containers must be without severe rust, dents, deep scratches, bulges, or other structural defects. Any waste container that is not in good condition (e.g., severe rusting, apparent structural defects) is overpacked, or the waste is repackaged in a container that is in good condition and is compatible with the waste materials, packaging materials, and/or other container. Overpacked and/or new containers must also be compatible with and resistant to environmental conditions. This meets the requirements of 20.4.1 NMAC §264.171 [6-14-00].

TA-55 uses the LANL procurement system, administered by the Supply Chain Management Division (SUP), for procurement of waste container components. Suppliers of waste container components are audited by SUP for qualification prior to conducting business transactions. SUP also uses approved procurement product specifications that include quality assurance requirements and ensure that container package specifications meet U.S. Department of Transportation (DOT) (49 CFR 173.410) requirements for Type A/7A packages.

Containers procured by SUP include liners if required for the container to pass the manufacturer's tests for Type A/7A compliance. When liners are procured individually a representative sample of the purchased liners is inspected for compliance with appropriate specifications using an approved inspection procedure. It is the generator's responsibility to ensure the container and pedigree is inspected for compliance with the specification provided to the supplier. Containers that do not pass inspection are segregated from those that are acceptable to prevent inadvertent use.

2.1.5 Compatibility of Waste with Containers [20.4.1 NMAC §264.172]

The TA-55 CSUs will only store containers made of or lined with materials that will not react with and are otherwise compatible with the wastes stored in them. Prior to filling the container with waste, all container components (e.g., lid, liner, and interior/exterior surface) are inspected to ensure container integrity as well as compatibility with the type of waste to be placed into the container. The "Los Alamos National Laboratory Waste Acceptance Criteria" (LANL, 2003a) requires that compatibility of the waste container, including liners, and the waste to be containerized is ensured. Information regarding the liner's compatibility with the waste components can be obtained from the container/liner manufacturer. This fulfills the requirements of 20.4.1 NMAC §264.172 [6-14-00].

2.1.6 Management of Containers [20.4.1 NMAC §264.173(a) and (b)]

Waste containers stored at the TA-55 CSUs are handled in a manner that will not cause them to rupture or leak, as required in 20.4.1 NMAC §264.173(b) [6-14-00]. All containers are kept closed during storage in accordance with 20.4.1 NMAC §264.173(a) [6-14-00], except when waste is added to or removed from the container or when a container's contents need to be repackaged. In addition to the containers being closed, the closing devices will be secured in a manner that provides no visible holes, gaps, or other open spaces into the interior of the container, in accordance with 20.4.1 NMAC §264.1086(c)(1)(iii)[6-14-00].

Five of the CSUs are provided with ventilation from the TA-55-4 facility ventilation system. This ventilation system is designed to monitor air pressure and ambient air for personnel working in areas where hazardous or mixed waste is managed. It creates zones within TA-55-4 that are at a lower pressure than the outside air (negative pressure) to prevent the movement of contaminants from the building. Air flows from the zones of highest pressure to those of lowest pressure (i.e., highest potential contamination areas). The airflow through the different zones is carefully balanced and controlled to provide the greatest protection to personnel as well as to the environment. If negative air pressure exceeds designed limits, a ventilation alarm (a slow, repeating chime sound) is activated.

Detailed information on general facility operations and container management practices are contained in Attachments G and J of this permit application.

2.1.6.1 Packaging and Overpacking

Waste packaging/repackaging at TA-55 is conducted at the K13 and B40 CSUs. It includes the addition of waste received from generators into secondary containers or movement of waste from one secondary container to another. Waste received into the K13 CSU consists of small waste items that are eventually packed into secondary containers to maximize storage and shipping efficiency. The B40 CSU receives large waste items that need to be packaged into an SWB or ST45/ST90 shipping container. The following procedures are used to package and repackage waste:

- "Packing TRU Waste Containers," NMT7-WI3-SOP-TA55-013 (LANL, 2002b).
- "Managing Solid Low-Level Waste at TA-55," NMT7-HCP-TA55-DP-02L (LANL, 2002c).
- "Certification and Disposal of Low-Level, Oversize Waste," NMT7-WI3-TA55-HCP-DP-02L (LANL, 1999).

Overpacking will occur at all of the TA-55 CSUs when a primary container fails to provide adequate containment. The overpack container will then be considered the primary container.

2.1.6.2 Labeling

Each container of waste will be labeled with a "Hazardous Waste" label bearing the following information:

- Generator name and address
- EPA Identification Number
- The accumulation start date
- The applicable EPA Hazardous Waste Number(s)

A "Radioactive Material/Radioactive Waste" label is applied, if appropriate. LANL will follow all applicable U.S. Department of Energy (DOE) and Nuclear Regulatory Commission (NRC) procedures, requirements and guidelines as they apply to storage, treatment, and radioactive decontamination of the TA-55 waste management units. The DOE and NRC regulations are not preempted by federal or state regulations governing the handling of hazardous waste. Compliance with all available DOE and NRC requirements is protective of human health and the environment.

2.1.6.3 Transportation of Containers

Flatbed trucks, trailers, and/or forklifts may be used to transport waste containers to and from the waste management units at TA-55. Forklift operations may use a boom, if necessary, to improve handling capabilities. Small containers may be handled manually or with a dolly. The use of proper handling equipment, appropriate to a container's size and weight, helps to prevent hazards while moving containers.

2.1.7 Containment Systems [20.4.1 NMAC §270.15(a)(1-5) and 270.15(b)(1-2)]

In accordance with 20.4.1 NMAC §270.15(b)(1) [6-14-00], information contained in LANL's waste databases or waste characterization records can be used initially to verify the absence of free liquids in containers. In addition to records, visual examination can be used to verify the absence of free liquids. Potential liquids that might accumulate at the TA-55 CSUs are contained within containment systems (e.g., self-containment pallets) at each storage location until the liquid is removed. All secondary containment systems are designed to contain at least 10 percent of the volume of potential liquid-bearing containers or the volume of the largest container, whichever is greater, pursuant to the requirements of 20.4.1 NMAC §264.175(b)(3) [6-14-00]. Table 2-4 summarizes the capacity associated with the containment systems provided for each CSU at TA-55.

Table 2-4
Containment System Capacities for Container Storage at Technical Area 55

Container Storage Unit	Location	Waste Types	Maximum Capacity (gallons)	Containment System(s)	Containment Capacity (gallons)
B40	TA-55-4, Basement	Solid and Liquid	21,500	Self-Containment Pallets Covered Self-Containment Pallets Single-drum Containment Pallets Cabinets Basement	112[a] 112[a] 55 10 46,258
K13		Solid and Liquid	2,500		
Vault	TA-55-4, Basement	Solid and Liquid	4,000	Self-Containment Pallets Basement	112[a] 46,258
B05	TA-55-4, Basement	Solid	3,600	NA	NA
B45	TA-55-4, Basement	Solid	11,000	NA	NA
TA-55-185	West of TA-55-4	Solid	30,000	NA	NA
Storage Pad	Northwest of TA-55-4	Solid and Liquid	135,000	Covered Self-Containment Pallets	112[a]

a No more than 110 gallons (i.e., two 55-gal drums) of free liquids will be stored on an individual self-containment pallet.

TA = technical area
NA = not applicable because this CSU stores waste that is in the solid form only.

Any accumulated liquids are removed in a timely manner to prevent overflow of the containment system. The collected liquids are then transferred to appropriate containers and sampled, as necessary. If the accumulated liquids are from an identifiable source, or from water generated during fire-suppression activities, the resulting material may be characterized as a newly-generated waste and analyzed for constituents known to be components of the source. If the accumulated liquids are from other than an identifiable source, the resulting material will be analyzed for the appropriate potential parameters listed in Appendix E of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. Containers of collected liquids are stored with secondary containment, pending analytical results, which determine how the waste liquids will be managed. This method of removal and analysis of accumulated liquids fulfills the requirements of 20.4.1 NMAC §270.15(a)(5) [6-14-00], for prevention of overflow.

2.1.8 Inspection Schedules and Procedures

The purpose of inspections is to identify leaking containers, deterioration of containers, and/or loss of integrity of the containment system, as required by 20.4.1 NMAC §264.174 [6-14-00]. The inspections include checking the structural integrity of the containers (e.g., for bulging or warping). Inspections will follow the Inspection Plan in Attachment C of this permit application.

Inspections of the containers while they are in storage will be used to verify that there are no visible holes, gaps, or other open spaces into the interior of containers while they are in storage. These inspections will be conducted in accordance with "Storage Area Inspections," NMT7-WI1S–HCP-TA-55-011 (LANL, 2001).

All containers are regularly inspected for evidence (e.g., corrosion, visible staining, bulges, rupture, dents, and leaks) that may indicate surface contamination. If any evidence of surface contamination is detected, the waste container is either overpacked in an appropriate container or the waste is repackaged in a new container as discussed in Section 2.1.4.

2.1.9 Special Requirements for Ignitable, Reactive, and Incompatible Wastes [20.4.1 NMAC §264.17 and 20.4.1 NMAC §§270.15(c) and 270.15(d)]

Ignitable or reactive waste is stored at the K13 and B40 CSUs and on the container storage pad. Pursuant to 20.4.1 NMAC §264.17 [6-14-00], LANL will adhere to the following specific waste management procedures for ignitable and reactive waste. Containers with ignitable or reactive wastes are located at least 50 ft from the facility property line (Figure A-5) at all times and are protected from sources of ignition or reaction. Waste management practices at the TA-55 CSUs minimize the possibility of accidental ignition. There are no sources of open flames allowed at the CSUs, and smoking is prohibited. Cutting and welding activities are never conducted in the vicinity of waste containers without proper controls and only non-sparking tools are used to handle waste containers, and lightning rods are located on all storage structures. "No Smoking" signs are conspicuously placed wherever there is a potential hazard from ignitable or reactive waste.

Precautions are taken to prevent reactions that may produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment or produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions. These precautions include keeping containers closed during storage and venting containers of mixed transuranic waste. Together, these measures meet the requirements of 20.4.1 NMAC §§264.17(a) and (b) and 264.176[6-14-00].

Incompatible wastes are separated and segregated from other wastes and materials by means of berm, dike, wall, or other specific means (e.g., secondary containment pallets, cabinets, distance). Incompatible waste is also stored at TA-55 in accordance with the following DOT compatibility groups:

- Flammables (Class 3)
- Oxidizers (Class 5.1)
- Combustible/Noncombustible Miscellaneous Hazardous Material (Class 9)
- Corrosives (Class 8)
- Poisons (Class 6)
- Radioactive (Class 7)
- Acids (Class 8)
- Reactive (Class 4)
- Non-regulated materials.

In addition, no incompatible wastes will be mixed, and no waste will be placed in a container that previously held an incompatible waste, as required by 20.4.1 NMAC §264.177(a) and (b), and 20.4.1 NMAC §270.15(d).

Ignitable, reactive, and incompatible wastes will not be stored at the B05, B45, Vault, and TA-55-185 CSUs; therefore, the requirements of 20.4.1 NMAC §264.17, and 20.4.1 NMAC §270.15(c) and (d) [6-14-00] do not apply.

2.1.10 Closure

Closure will consist of partial closure of one or more of the CSUs at TA-55 while leaving the other hazardous and mixed waste management units in service. Partial closure activities will be accomplished by removal of hazardous wastes and residues from the surfaces and/or equipment associated with the CSU to be closed and that may have come into contact with the waste. Detailed closure procedures for the TA-55 CSUs are addressed in Attachment F.1 of this permit application. This information is provided to meet the requirements of 20.4.1 NMAC §§264.111 and 264.178 [6-14-00].

2.1.11 Control of Run-On/Runoff

Run-on into the CSUs at TA-55-4 and TA-55-185 will not occur due to their location inside buildings. The slopes surrounding these buildings direct potential run-on away from each building. The container storage pad is located above grade, has positive surface drainage, and has a culvert beneath it that will direct potential run-on away from this storage location. In addition, containers stored on the pad are covered. Special order waste boxes, large waste boxes, and SWBs will not be covered. Figures A-5 and A-9 in Attachment A of this permit application show the contours and surface drainage around the storage pad, TA-55-4, and TA-55-185. This information is provided to meet the requirements of 20.4.1 NMAC §264.175(b)(4), and 20.4.1 NMAC §270.14(b)(8)(ii) [6-14-00].

Runoff to the environment of liquids resulting from precipitation, fire-suppression activities, leaks, and/ or spills is controlled at each of the TA-55 CSUs by secondary containment. Potential liquids that might accumulate are contained within secondary containment (e.g., self-containment pallets) until the liquid is removed using a portable pump, a high-efficiency particulate air (HEPA) vacuum, and/or sorbents, depending on the volume. In the event of a hazardous and/or mixed waste spill that results in the accumulation of free liquids in the secondary containment system, all free liquids will be removed within 24 hours of discovery, unless "as low as reasonably achievable" (ALARA) concerns prevent accessibility. This information is provided to meet the requirements of 20.4.1 NMAC §270.14(b)(8)(ii) [6-14-00].

2.2 STORAGE TANK SYSTEM

The information provided in this section is submitted to address the applicable tank storage requirements of 20.4.1 NMAC §270.16, and 20.4.1 NMAC, Subpart V, Part 264, Subpart J [6-14-00]. There is one storage tank system at TA-55. This tank system is comprised of 3 tank components and consists of a total of 16 tanks with a maximum storage capacity of 1,020 L or approximately 266 gal. Table 2-5 identifies each tank component, its location, the number of tanks, and capacity of each tank.

Table 2-5
Storage Tank System at Technical Area 55[a]

Tank Component	Location	Number of Tanks	Tank Capacity[b,c] (liters)	Tank Capacity[b,c] (gallons)
Evaporator Glovebox Tank	TA-55-4, Room 401	1	270	71
Cementation Unit Pencil Tanks	TA-55-4, Room 401	5	50	13
Pencil Tanks	TA-55-4, Room 401	10	50	13

a The storage tank system consists of 3 components that store the same type of waste and share a common piping network.
b The overall capacity of the unit is 1,020 liters [~266 gallons].
c The tank capacity listed is for each individual tank associated with that component.

TA = technical area

The following sections provide a brief description of the waste management practices associated with the TA-55 storage tank system. Detailed descriptions of each tank component are proved in Attachment H of this permit application.

2.2.1 Authorized Waste

The TA-55 storage tank system is used to store mixed waste solutions bearing one or more of the EPA Hazardous Waste Numbers presented in the most recent version of the LANL General Part A.

2.2.2 Containment Systems [20.4.1 NMAC §270.16(g) and 20.4.1 NMAC §264.193 (a-d) and (e)(1)]

The storage tank system is located at TA-55-4 inside Room 401. This room has a floor and walls that completely surround the tank system (i.e., tanks, ancillary equipment, and piping) and serve as secondary containment, therefore, the secondary containment meets the requirements of 20.4.1 NMAC §264.193(e)(1) for an external liner system.

The walls and floor of Room 401 will prevent the migration of wastes or accumulated liquids to any soil, groundwater, or surface water and are capable of collecting releases and accumulated liquids until the material is removed. The concrete in Room 401 is sealed with an epoxy or similar coating to aid in decontamination should a spill occur. Secondary containment is primarily provided by the floor, which consists of 10 in. of concrete. In addition, tertiary containment is provided by the floor of the basement level of TA-55-4, which also consists of 10 in. of concrete. The construction joints in the floor slab and exterior walls of Room 401 are all constructed with chemical-resistant water stops in place. The conduit piping penetrating the floor of the room is secured with rubber boots, bushings, and flanges. All penetrations (e.g., holes for conduit) in the floor have been sealed to prevent liquids from entering the penetrations.

The secondary containment is sized to contain 100 percent of the volume of the largest tank, pursuant to the requirements of 20.4.1 NMAC §264.193(e)(1)(i) [6-14-00]. Table 2-6 identifies the secondary containment storage capacity as compared to the tank capacity for each component of the storage tank system.

Table 2-6
Secondary Containment Capacities for the Storage Tank System

Storage Tank System Component	No. of Tanks	Tank Capacity (gallons)[a]	Location	Secondary Containment	Secondary Containment Capacity (gallons)
Evaporator Glovebox Tank	1	71	TA-55-4, Room 401	TA-55-4, Room 401	10,773[b]
Cementation Unit Pencil Tanks	5	13			
Pencil Tanks	10	13			

a The tank capacity listed is for each individual tank associated with the component.
b Secondary containment capacity is based on Room 401 which is recessed 2.5 inches and has dimensions measuring 60 feet long by 75 feet wide.

TA = technical area

2.2.3 Inspection Schedules and Procedures

The purpose of inspections is to identify leaking, deteriorating, or corroding tanks, or components of the storage tank system and identify the loss of integrity of the containment system, as required by 20.4.1 NMAC §§264.15, and 264.195 [6-14-00]. Inspections of the storage tank system will follow the Inspection Plan in Attachment C of this permit application.

2.2.4 Special Requirements for Ignitable, Reactive, and Incompatible Wastes

No ignitable, reactive, or incompatible mixed wastes will be stored in the storage tank system.

2.2.5 Closure

Closure will consist of partial closure of the storage tank system at TA-55 while leaving the other waste management units in service. Partial closure will be accomplished by the removal of mixed wastes and residues from the surfaces and/or the equipment that may have come in contact with the wastes. Closure will include decontamination and disposal activities that will ensure removal of mixed wastes and residues to established cleanup levels. Detailed closure procedures for the storage tank system are addressed in Attachment F.2 of this permit application. This information is provided to meet the requirements of 20.4.1 NMAC §264.111 [6-14-00].

2.2.6 Control of Run-On/Runoff

The storage tank system is located inside a building that prevents it from exposure to precipitation and prevents contaminant mobility out of the containment system. The slope surrounding the building directs potential run-on away from the building and prevents flooding of the secondary containment area provided for the tanks.

Runoff to the environment of liquids resulting from fire-suppression activities, leaks, and/or spills is prevented by the secondary containment in Room 401, as described in Section 2.2.2. Potential liquids that might accumulate are contained within secondary containment (e.g., self-containment pallets) until the liquid is removed using a portable pump, a HEPA vacuum, and/or sorbents, depending on the volume. In the event of a hazardous and/or mixed waste spill that results in the accumulation of free liquids in the secondary containment system, all free liquids will be removed within 24 hours of discovery, unless ALARA concerns prevent accessibility. This information is provided to meet the requirements of 20.4.1 NMAC §270.14(b)(8)(ii) [6-14-00].

2.3 MISCELLANEOUS UNIT – CEMENTATION UNIT

The information provided in this section is submitted to address the applicable miscellaneous unit requirements of 20.4.1 NMAC §270.23, and 20.4.1 NMAC, Subpart V, Part 264, Subpart X [6-14-00].

The cementation unit is located in glovebox GB-454 along the west wall of TA-55-4, Room 401. The unit has been in operation since 1987 and has a maximum capacity of 568 L (approximately 150 gal). It consists of a pH adjustment column, vacuum trap, two motor-driven mixers, four impellers, associated support structures, a glovebox, and piping.

2.3.1 Authorized Waste

The TA-55 cementation unit is used to treat solid and liquid mixed wastes bearing one or more of the EPA Hazardous Waste Numbers presented in the most recent version of the LANL General Part A.

2.3.2 Containment Systems

The cementation unit shares secondary containment with the storage tank system. Room 401 has a floor and walls that completely surrounds the unit and serve as secondary containment, therefore, the secondary containment requirements of 20.4.1 NMAC §264.193 (1)(iv) are met. A detailed description of the containment features for Room 401 is provided in Section 2.2.2.

Table 2-7 identifies the secondary containment storage capacity for Room 401 as compared to the total capacity of the cementation unit and storage tank system.

Table 2-7
Containment System Capacity Compared to the Capacity of the Storage Tank System and Cementation Unit

Location	Containment System Capacity (gallons)	Waste Management Units	
		Unit	Total Capacity (gallons)
TA-55-4, Room 401	10,773[a]	Storage Tank System *(Evaporator Storage Tanks, Cementation Unit Pencil Tanks, Pencil Tanks)*	266
		Cementation Unit	150

a Containment capacity is based on Room 401, which is recessed 2.5 inches and has dimensions measuring 60 feet long by 75 feet wide.

TA = technical area

Secondary containment for the cementation unit will easily contain 100 percent of the volume of the cementation unit and the largest tank of the storage tank system (Section 2.2.2) pursuant to the requirements of 20.4.1 NMAC §246.193(1)(iv).

2.3.3 Inspection Schedules and Procedures

The purpose of inspections is to identify leaking, deteriorating, or corroding components of the cementation unit and identify the loss of integrity of the containment system, as required by 20.4.1

NMAC §§264.15 and 264.602 [6-14-00]. Inspections of the cementation unit will follow the Inspection Plan in Attachment C of this permit application.

2.3.4 Special Requirements for Ignitable, Reactive, and Incompatible Wastes

No ignitable, reactive, or incompatible mixed wastes will be treated in the cementation unit.

2.3.5 Closure

Closure will consist of partial closure of the cementation unit while leaving the other regulated hazardous and mixed waste management units at TA-55 in service. Partial closure will be accomplished by the removal of mixed wastes and residues from the surfaces and/or the equipment associated with the cementation unit that may have come in contact with the wastes. Closure will include decontamination and disposal activities that will ensure removal of mixed wastes and residues to established cleanup levels. Detailed closure procedures for the cementation unit are addressed in Attachment F.3 of this permit application. This information is provided to meet the requirements of 20.4.1 NMAC §264.111 [6-14-00].

2.3.6 Control of Run-On/Runoff

The cementation unit is located inside a building that prevents them from exposure to precipitation and prevents contaminant mobility out of the containment system. The slope surrounding the building directs potential run-on away from the building and prevents flooding of the secondary containment area provided for the unit.

Runoff to the environment of liquids resulting from fire-suppression activities, leaks, and/or spills is prevented by the secondary containment in Room 401, as described in Section 2.3.2. Potential liquids that might accumulate are contained within secondary containment (e.g., self-containment pallets) until the liquid is removed using a portable pump, a HEPA vacuum, and/or sorbents, depending on the volume. In the event of a hazardous and/or mixed waste spill that results in the accumulation of free liquids in the secondary containment system, all free liquids will be removed within 24 hours of discovery, unless ALARA concerns prevent accessibility. This information is provided to meet the requirements of 20.4.1 NMAC §270.14(b)(8)(ii) [6-14-00].

3.0 OTHER FEDERAL LAWS

A discussion of federal laws, as required by the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, §§270.3 and 270.14(b)(20), revised June 14, 2000, is provided in Section 3.0 of the most recent version of the LANL General Part B.

4.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

The information provided in this section is submitted to address the requirements for solid waste management units (SWMU) in accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 §270.14(d), revised June 14, 2000 [6-14-00]. This section provides the SWMUs identified for Technical Area (TA) 55 at the Los Alamos National Laboratory (LANL).

LANL uses the definition of a SWMU presented in "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515" (U.S. Environmental Protection Agency, 1994), hereinafter referred to as Module VIII. This definition states that SWMUs are "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

Table 4-1 lists the SWMUs at TA-55. Supplement 4-1, which has been extracted from the 2003 “Solid Waste Management Unit Report” (LANL, 2003b) provides descriptions of the SWMUs listed in Table 4-1. These descriptions include, to the extent available, the unit type, general dimensions and structural descriptions, the dates of operation, and the waste managed at the unit. Supplement 4-1 also includes the most current information available pertaining to releases of hazardous wastes or hazardous constituents from the units and results of sampling analyses conducted to date. In addition, the location of each SWMU is presented on topographic maps included with Supplement 4-1.

Table 4-1
Technical Area (TA) 55 Solid Waste Management Units

SWMU No./Former SWMU No.	Consolidated SWMU No.	Location	Description	Status
42-001(a)	42-001(a)-99	Site of former TA-42-1 within TA-55	Incinerator	Inactive; to undergo corrective action.
42-001(b-c)			Holding Tanks	
42-002(b)			Decontamination Area	
42-003			Septic System	
55-008	55-008	TA-55-4, Basement	Sumps, Pumps and Tanks	Active; recommended for no further action (NFA). To be permitted.
55-009	55-009	TA-55-263	Concrete Enclosure	Inactive; recommended for NFA

SWMU = Solid Waste Management Unit
TA = technical area

Supplement 4.1

Solid Waste Management Units at Technical Area 55
[Information Extracted from the 2003 "Solid Waste Management Unit Report"]

The 2003 “Solid Waste Management Unit Report” has been reviewed by an ADC and S-7 to be assigned its own unique LA-UR number.

It will not be provided for security review with this permit application.

TA-42, Operations and Environmental Setting

Former TA-42 was designed and built in 1951 as an incinerator site for radionuclide-contaminated waste. It was never fully operational, and all buildings were removed in 1978. In the interim, the area was used for storage and decontamination work. The former site of TA-42 lies within the current boundaries of TA-55, on the narrow mesa formed between Mortandad Canyon on the north and Twomile Canyon, a branch of Pajarito Canyon, on the south. The former site is near the north edge of the mesa.

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SWMU 42-001(a)-99 — Aboveground storage tanks - facility/equipment - incinerators/thermal treatment units - outfall/effluent discharge

Administrative Authority	NMED	**Former Operable Unit**	N/A
Technical Area	TA-42	**Dates of Operation**	1951-1970
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	42-1, 42-2, 42-3, 42-4	**Other Remedial Action Conducted?**	Yes

Unit Description

Consolidated SWMU 42-001(a)-99 consists of former SWMUs 42-001(a), 42-001(b), 42-001(c), 42-002(b), and 42-003 and former AOC 42-002(a). TA-42 was the site of a radioactive waste incinerator that operated in 1951 and 1952. The incinerator facility was used to store and decontaminate radioactively contaminated equipment from 1957 to 1969. In 1969, an unsuccessful attempt was made to reactivate the incinerator so it could burn uncontaminated classified wastes. By 1970, all operations were discontinued, and all combustibles were removed from the building. The facilities were decommissioned in 1977, and the site was decontaminated in 1978. Contamination remaining after the 1978 D&D of this consolidated SWMU is believed to be associated with radionuclide decontamination operations from 1957 to 1969. Former TA-42 is located within the boundaries of TA-55.

Former SWMU 42-001(a) is the historical location of the incinerator and control building (Building 42-1). The complex was built to reduce the amount of radionuclide-contaminated waste produced at LANL. The incinerator, which was never fully operational and was shut down about a year after it was built, was a steel-frame structure covered with corrugated metal. The facility consisted of a 2000-sq-ft floor area control building, incinerator, cyclone dust collector, spray cooler, Venturi scrubber, filter bank, and ash separator. Combustion products passed through an off-gas cleanup system before discharge through an exhaust stack. The off-gas system consisted of a Venturi scrubber, a filter bank, and an ash separator. Ash trapped in the off-gas system and incinerator was transported by underground drainlines to two holding tanks [former SWMUs 42-001(b) and 42-001(c)] located immediately north of the incinerator.

Former SWMUs 42-001(b) and 42-001(c) are the locations of two former ash holding tanks (structures 42-2 and 42-3) at the incinerator complex. They were each 22 ft in diameter and approximately 13 ft high, with a volume of 37,000 gal. The tanks were built in 1951 and removed in 1978. Some ash from the incinerator reportedly was discharged to Mortandad Canyon in 1952; the contaminant was thought to be lanthanum-140. Samples taken in the canyon downstream from TA-42 after the discharge showed radioactive contamination. When the tanks were decommissioned in 1978, the contents were assayed and measured for plutonium. Contaminated sludge was removed, mixed with cement, and taken to MDA G for storage. The tanks were excavated and taken to TA-54 for disposal. The drainlines were filled with hot asphalt to contain radioactive contamination. It is not known if the drainlines were removed.

Former AOC 42-002(a) is the historical location of an indoor storage and decontamination area, and SWMU 42-002(b) is the location of a historical outdoor decontamination area. Between 1956 and 1969, the main floor of Building 42-1 was used to store and decontaminate equipment. During decontamination, a “vacublaster” removed radionuclides and other contaminants from various pieces of equipment. The process generated wastes that are believed to have been discharged to the building’s septic system (former SWMU 42-003). It is believed that fine solid residues were bagged and disposed of at an MDA. Objects that were too large to take inside the building (such as vehicles) were cleaned at the end of the asphalt driveway located west and north of Building 42-1. Wash water flowed down an embankment on the northwest side of the parking lot. Contaminated soils in that area were not sampled or removed during the 1978 D&D activities.

Former SWMU 42-003 is the historical location of a septic system that served the incinerator complex. The system was composed of a 565-gal. septic tank (structure 42-4), a drainline from Building 42-1 to the tank, a filter trench, a tile leach field, and an outfall to Mortandad Canyon. The septic tank received radioactive liquid wastes from Building 42-1. According to the OU 1129 work plan, the system probably also received solvents, acids, and grease. Radioactively contaminated liquids periodically were removed from the septic tank and disposed of at pit 4 at MDA L. Samples taken downstream from TA-42 in Mortandad Canyon in 1952 showed radioactive contamination in the canyon. The septic tank was observed to contain water and possibly to have overflowed in 1973. At that time, the tank slurry was sampled and was found to be radioactively contaminated. The system was installed in 1951 and the system and associated contaminated soils were removed as part of the 1978 D&D activities. When it was decommissioned, liquid in the tank was pumped and treated at Building 50-1, the radioactive liquid waste treatment facility [SWMU 50-001(a)]. The tank sludge was solidified by adding cement, and the tank and sludge were taken to MDA G. Contaminated soils around the tank also were taken to MDA G, and the excavated area was backfilled. Contaminated soils in the drainfield were excavated.

In 1978, following D&D, the Environmental Surveillance Group collected soil samples and analyzed them for radionuclides. Low levels of contamination were found but were considered to meet ALARA standards. After concurrence from DOE-LAAO, the area was contoured and revegetated to minimize erosion. In 1991, LANL's Environmental Protection Group performed a reconnaissance

survey. Soil samples were collected and analyzed for radionuclides, PCBs, organic chemicals, and inorganic chemicals. Results from the analyses, which showed elevated concentrations of plutonium and lead, were used by the ER Project to design its SAP for the 1992 RFI.

ER Project Activities

Information presented in this section was derived from previously published documents. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

In 1992, the ER Project conducted an RFI at the former sites that make up consolidated SWMU 42-001(a)-99. The purpose of the RFI was to determine whether potential contamination at the site would be exposed during construction of a new facility. Sampling was conducted to detect and to quantify contaminants and to estimate the extent of contamination at former TA-42. The DOE-Albuquerque Operations Office used the RFI results for construction validation of the NSTL that was to be constructed at the site of former TA-42. Sample locations were selected to bound the extent of contaminants detected during the 1991 reconnaissance study and to include locations where construction activities might adversely affect residual contamination around the NSTL structures or utility lines. Fifty-one surface and subsurface soil samples were collected from 19 locations around the location of the former incinerator complex. Samples were field-screened for organic chemicals and radionuclides. No elevated chemical concentrations were detected during field-screening. Samples were analyzed for radionuclides and lead because the analytical suite was based on the results of the 1991 reconnaissance study. Elevated levels of plutonium-238, plutonium-239/-240, and uranium-235 were found. Data indicated that the levels of radionuclides did not pose an unacceptable risk to human health. The RFI report recommended NFA at the former sites in this consolidated unit. NMED determined the report to be insufficient in the characterization of the site, and LANL formally withdrew the RFI report in 1997.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	1	1	0
Radionuclides	6	4	1

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Radionuclides	Thorium-228	2.59 pCi/g	2 pCi/g

References

RFI Report for TA-42: PRSs 42-001(a,b,c), 42-002(a,b), 42-003 — LA-UR Number: 95-2881

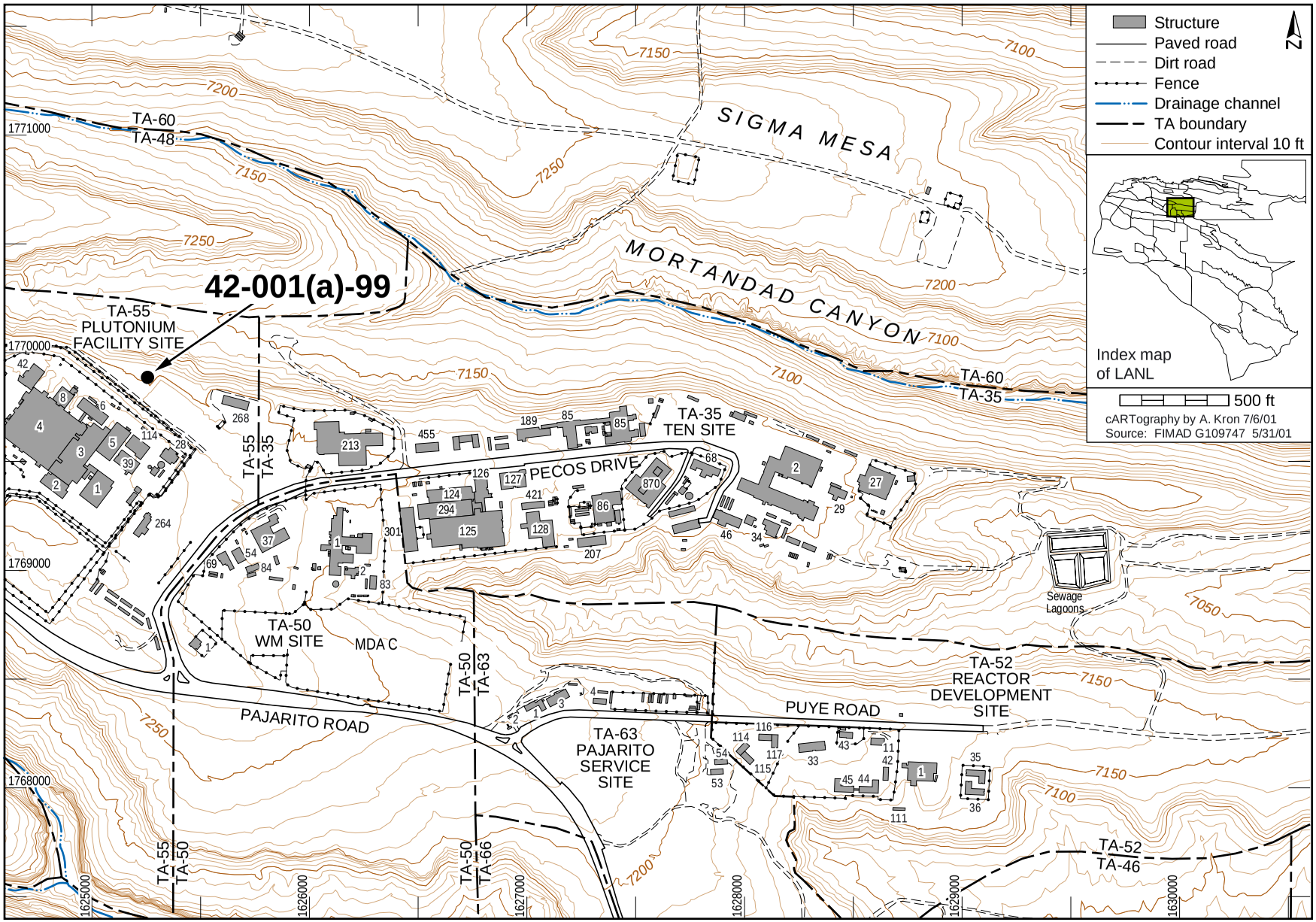
Preliminary Draft of OU 1129 Accelerated Characterization at Former TA-42 in Support of Construction Validation Project at Los Alamos National Laboratory (LANL) — LA-UR Number: N/A

Revised Sampling and Analysis Plan for OU 1129 Aggregate J — LA-UR Number: 92-2120

RFI Work Plan for Operable Unit 1129 — LA-UR Number: 92-0800

View of SWMU 42-001(a)-99

View of SWMU 42-001(a)-99


42-001(a)-99
TA-55
PLUTONIUM
FACILITY SITE
TA-60
TA-48
SIGMA MESA
MORTANDAD CANYON
TA-60
TA-35
TA-35
TEN SITE
PECOS DRIVE
TA-55
TA-35
TA-50
WM SITE
MDA C
TA-50
TA-63
PAJARITO ROAD
TA-63
PAJARITO
SERVICE
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PUYE ROAD
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REACTOR
DEVELOPMENT
SITE
Sewage
Lagoons
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
500 ft
cARTography by A. Kron 7/6/01
Source: FIMAD G109747 5/31/01

AOC 42-004 — Surface disposal

Administrative Authority	DOE	**Former Operable Unit**	OU 1129
Technical Area	TA-42	**Dates of Operation**	1950s
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

AOC 42-004 is the location where building debris was discarded over the canyon edge north of former TA-42, which is located within the boundaries of TA-55. It is not known if the debris contained hazardous or radioactive constituents. Sampling conducted in 1991 during a reconnaissance study indicated background radioactivity levels and no organic or inorganic chemicals or PCBs.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

The results of the 1991 sampling were used to propose AOC 42-004 for NFA, because contaminants were not present in concentrations that would pose a threat to human health or the environment.

ER Project Sampling Summary

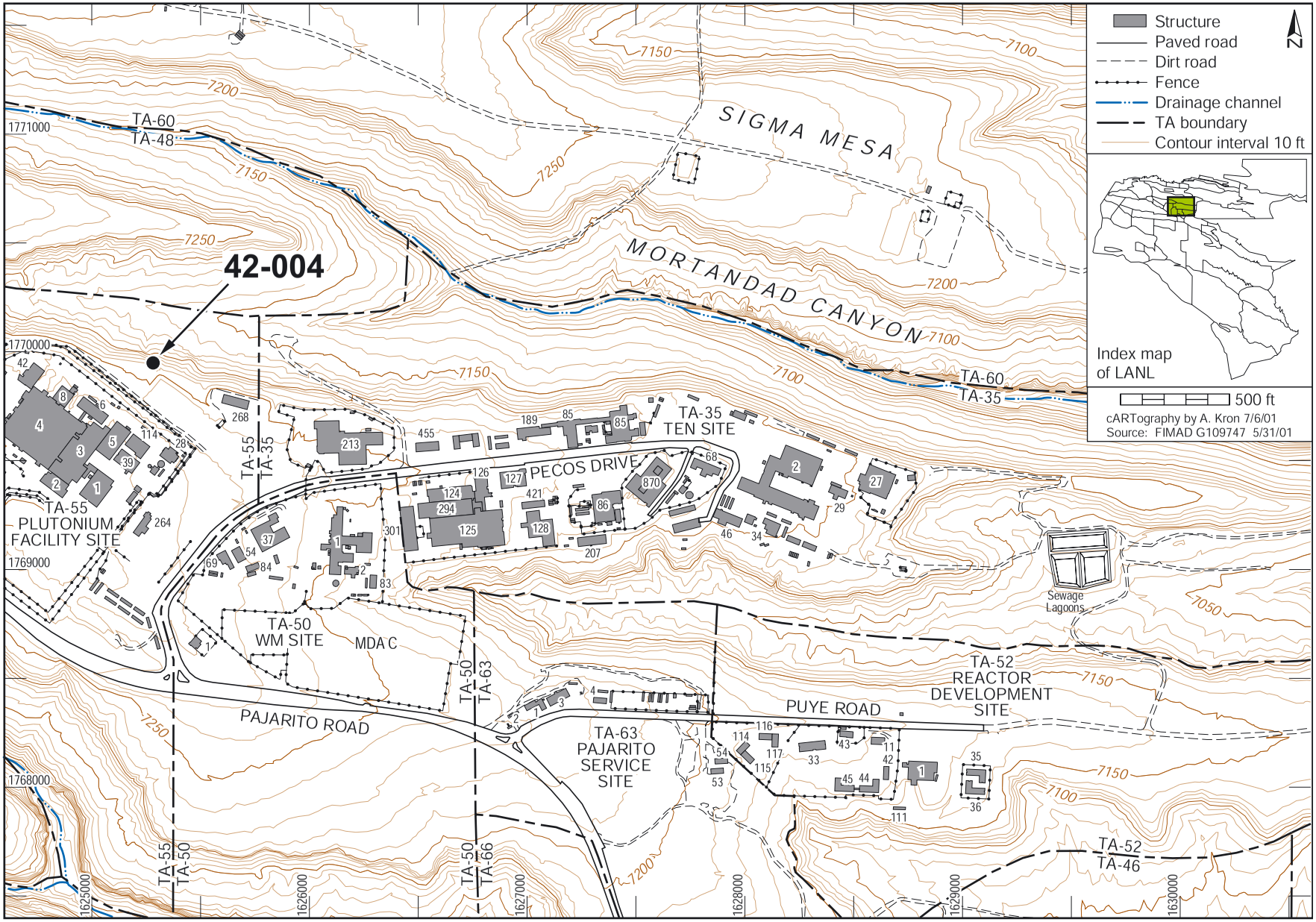
No analytical samples were collected at this site.

References

Request for Permit Modification, Units Proposed for NFA, March 1995	LA-UR Number: 95-0767
Addendum to RFI Work Plan for Operable Unit 1129	LA-UR Number: 92-0800
Preliminary Draft of OU 1129 Accelerated Characterization at Former TA-42 in Support of Construction Validation Project at Los Alamos National Laboratory (LANL)	LA-UR Number: N/A
Revised Sampling and Analysis Plan for OU 1129 Aggregate J	LA-UR Number: 92-2120
RFI Work Plan for Operable Unit 1129	LA-UR Number: 92-0800

View of AOC 42-004

View of AOC 42-004


Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map of LANL
500 ft
cARTography by A. Kron 7/6/01
Source: FIMAD G109747 5/31/01
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PECOS DRIVE
TA-55 PLUTONIUM FACILITY SITE
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PAJARITO ROAD
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TA-55, Plutonium Facility Site

The Plutonium Facility at TA-55 occupies about 40 acres of the total 90 acres at TA-55 approximately 1 mi southeast of the central technical area (TA-03). The Plutonium Facility is situated inside a restricted zone surrounded by a double security fence. The main complex has five connected buildings: the Administration Building (Building 1), the Support Office Building (Building 2), the Support Building (Building 3), the Plutonium Building (Building 4), and the Warehouse (Building 5). The Nuclear Materials Storage Facility (Building 41) is separate from the main complex but shares an underground transfer tunnel with Building 4. Various support, storage, security, and training structures are located throughout the main complex.

To meet the varied needs of research and development and plutonium-processing programs at the Laboratory, TA-55 provides chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides into many compounds and forms. Additional capabilities include the means to safely and securely ship, receive, handle, and store nuclear materials, as well as manage the wastes and residues produced by TA-55 operations. A core capability is basic and applied research in plutonium and actinide chemistry.

Core competencies are maintained in the Plutonium Facility for each type of plutonium processing activity. Extensive plutonium recovery processes are maintained, as well as the ability to convert the recovered material into plutonium metal. A separate portion of the facility is dedicated to fabricating ceramic-based reactor fuels and to processing plutonium-238 used to produce radioisotope heat sources. In addition, analytical capabilities, materials control and accountability techniques, and a substantial research and development base are available to support these core capabilities.

A sophisticated nuclear materials measurement and accountability system is used at TA-55. The system includes nuclear materials accounting, nuclear materials management and modeling, a measurement support operation, operation of a nondestructive assay laboratory, nuclear materials packaging and transfer, and nuclear materials storage. All nuclear materials that are in process or are stored on-site are monitored to ensure that material balances are properly maintained and inventoried on a real-time basis. The nuclear materials packaging and transfer operation receives nuclear material into the facility and transfers shipments out of the facility. The nuclear materials storage operation provides a safe storage location for the actinide materials at the Plutonium Facility.

The Plutonium Facility has extensive capabilities for treating, packaging, storing, and transporting the radioactive waste produced by TA-55 operations. Liquid wastes are converted to solids or are piped to the RLWTF at TA-50. Some solid transuranic wastes are immobilized in cement in 55-gal. drums. Other transuranic waste is consolidated in 15-gal. or 30-gal. drums or is packaged in waste boxes. Low-level wastes are also packaged at this facility. Solid wastes of all types are stored at TA-55 until they are shipped to Laboratory waste storage or disposal locations, primarily at TA-54.

TA-55 — Plutonium Facility Site

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SWMU 55-008 — Aboveground storage tanks

Administrative Authority	NMED	**Former Operable Unit**	OU 1129
Technical Area	TA-55	**Dates of Operation**	1973-Present
Has ER Sampled the Site?	No	**ER Remedial Action Conducted?**	No
Structure Number	N/A	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 55-008 consists of sumps, tanks, and pumps in the basement of the plutonium building (Building 55-4), which is the primary site for plutonium processing, fabrication, and research at LANL. Six sumps/pumps collect spills and mop-water generated in the building; the sump/pump capacity of each is 3 cubic feet. Four 8-in.-diameter x 4-ft-long condensate tank pumps receive condensate from cooling coils. Eight 8-in.-diameter x 4-ft-long blowdown tanks receive condensate from cooling coils. The liquids discharged to these units may have contained small amounts of hazardous and/or radioactive constituents. All liquids collected and contained within these units are transferred via direct pipeline to the radioactive liquid waste treatment facility at TA-50, and none of these units release liquids to the environment.

ER Project Activities

RFI activities conducted at this site are described in detail in the documents listed in the reference section below. No additional RFI activities have been conducted at this site.

SWMU 55-008 was recommended for NFA in the RFI work plan. The site design of Building 55-4 precludes contaminant migration. Any contamination that may exist beneath the building is considered to be under institutional control and will be addressed when Building 55-4 undergoes decontamination and decommissioning.

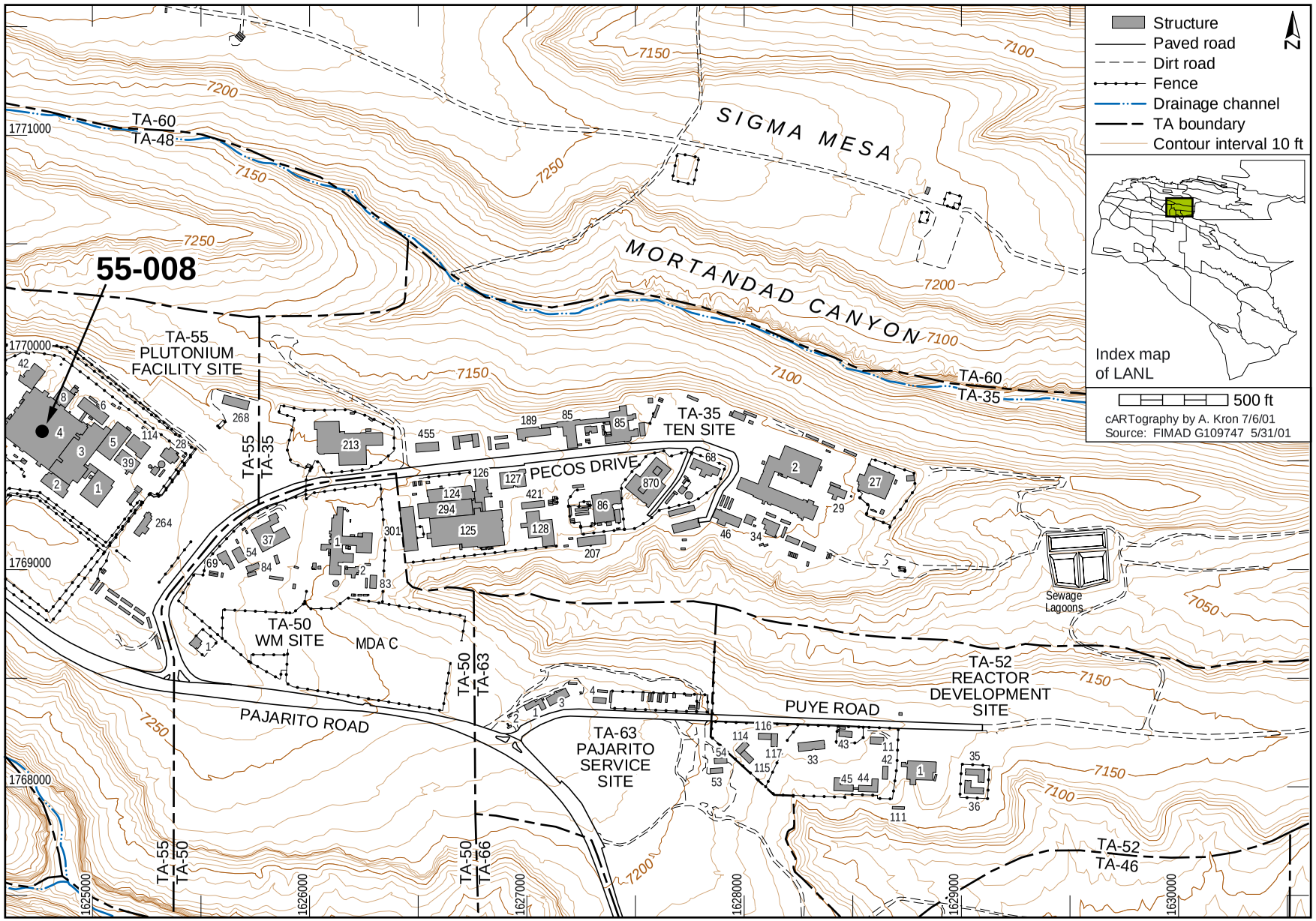
ER Project Sampling Summary

No analytical samples were collected at this site.

References

Withdrawal of [51] Solid Waste Management Units (SWMUs) from the March 1995, September 1995, and September 1996 Requests for Permit Modification (LA-UR-95-767, LA-UR-95-3319, and LA-UR-96-3357, respectively)	LA-UR Number: N/A
Request for Permit Modification, Units Proposed for NFA, March 1995	LA-UR Number: 95-0767
Class III Permit Modification for Removal of 90 Solid Waste Management Units (SWMUs)	LA-UR Number: N/A
Addendum to RFI Work Plan for Operable Unit 1129	LA-UR Number: 92-0800
RFI Work Plan for Operable Unit 1129	LA-UR Number: 92-0800

View of SWMU 55-008


55-008
TA-55
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FACILITY SITE
TA-60
TA-48
SIGMA MESA
MORTANDAD CANYON
TA-60
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TA-35
TEN SITE
PECOS DRIVE
TA-50
WM SITE
MDA C
PAJARITO ROAD
TA-63
PAJARITO
SERVICE
SITE
PUYE ROAD
TA-52
REACTOR
DEVELOPMENT
SITE
TA-52
TA-46
Sewage
Lagoons
TA-55
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1770000
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
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Index map
of LANL
500 ft
cARTography by A. Kron 7/6/01
Source: FIMAD G109747 5/31/01

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SWMU 55-009 — Wastewater treatment plant/waste lines

Administrative Authority	NMED	**Former Operable Unit**	OU 1129
Technical Area	TA-55	**Dates of Operation**	1973-Unknown
Has ER Sampled the Site?	Yes	**ER Remedial Action Conducted?**	No
Structure Number	55-263	**Other Remedial Action Conducted?**	No

Unit Description

SWMU 55-009 is an inactive sanitary sewer monitoring station (structure 55-263) consisting of a concrete-lined pit (9 ft x 9 ft x 6 ft deep) located in the LANL high-security, highly access-controlled TA-55 plutonium complex. The walls and floor of the monitoring station consist of 6-in.-thick reinforced concrete. The TA-55 sanitary waste line runs through this structure and carries sanitary wastewater from Buildings 55-3 and 55-4 to the LANL sanitary wastewater treatment facility located at TA-46. The TA-55 Operations Center (Building 55-3) functions as a general support facility and contains a chemical laboratory. Building 55-4 is the main plutonium-processing facility at TA-55. The 1990 SWMU report identified SWMU 55-009 as an inactive monitoring "sump." The term "sump" denotes an engineered, below-ground-level containment reservoir that receives liquid before it is pumped (or drained) to another location. However, this unit not only has never contained a drain, it has never served as a reservoir to manage liquids of any type; therefore, the SWMU report's identification of this unit as a sump is incorrect. In actuality, this unit was designed and installed solely as a station to house radiological monitoring equipment and to shield the equipment from adverse weather conditions. The monitoring equipment and surrounding concrete structure were installed in approximately 1975, when the TA-55 complex was originally constructed. The monitoring equipment was installed at this portion of the sanitary waste line solely as a security measure to prevent the theft of valuable radioactive materials (such as plutonium) from the TA-55 complex. This equipment was intended to detect any stolen radioactive materials covertly targeted to leave the TA-55 complex by flushing them down sanitary drains such as sinks or toilets. Should any stolen radiological materials be detected in the sewer pipe, the monitoring device was designed to activate a compressor (housed within the concrete structure) that controlled a cut-off valve within the pipe. The activated valve was intended to immediately block passage of the stolen materials further through the pipe, thus thwarting the attempted theft. However, the monitoring equipment never functioned as originally intended. It failed because of high humidity caused by moisture condensation in the concrete structure in which it was housed. After several failed attempts to make the detection equipment perform properly, in May 1983, DOE and TA-55 personnel agreed to discontinue further attempts to monitor the waste line. The monitoring equipment was removed later that year, but the concrete-lined pit was left in place. The structure was used solely for security monitoring purposes and it is not known or thought to have received contaminants or released contaminants to the environment.

ER Project Activities

Information presented in this section was derived from previously published documents. Any discussion of BVs, FVs, and SALs is taken from the referenced documents and reflects the values in use at the time the documents were written. RFI activities conducted at this site are described in detail in the documents listed in the reference section below.

In 1997, 13 soil samples were collected from six locations in the vicinity of PRS 55-009 and submitted to an off-site laboratory for analysis for inorganic chemicals, organic chemicals, and radionuclides. Analytical results were used to provide supplemental information to support FSS-6 construction activities.

After a site visit by the NMED in 2001 and review of the radiological screening data collected at this site, this SWMU was recommended for NFA. Hazardous wastes were not generated, treated, stored, or disposed at the site, and radioactivity was never detected in the waste stream. In 2002, NMED concurred with NFA determination.

ER Project Sampling Summary

The following table shows the number of analytes that exceeded BVs, FVs, and SALs that were in use in calendar year 2002. These data reflect site conditions before any remedial activities may have occurred, as discussed in the ER Project activities section above. BVs are naturally occurring concentrations of inorganic chemicals and radionuclides in soil, sediment, or tuff before any influence from LANL operations. FVs are concentrations of radionuclides in soil, sediment, or tuff that resulted from global atmospheric deposition unrelated to LANL releases. SALs are concentrations of chemicals or radionuclides based on a residential exposure, below which there is no potential unacceptable risk to human health.

Analytical Suite Sampled	No. of Chemicals Detected	No. of Chemicals >CY2002 BV/FV (If Applicable)	No. of Chemicals >CY2002 SAL (Residential)
Inorganic chemicals	19	0	1
Radionuclides	4	1	0
SVOCs	0	N/A	0
VOCs	2	N/A	0

The following table provides the maximum concentrations of analytes that exceeded CY2002 SALs.

Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
Inorganic chemicals	Arsenic	4.1 mg/kg	0.39 mg/kg

References

Withdrawal of [51] Solid Waste Management Units (SWMUs) from the March 1995, September 1995, and September 1996 Requests for Permit Modification (LA-UR-95-767, LA-UR-95-3319, and LA-UR-96-3357, respectively) — LA-UR Number: N/A

Request for Permit Modification, Units Proposed for NFA, March 1995 — LA-UR Number: 95-0767

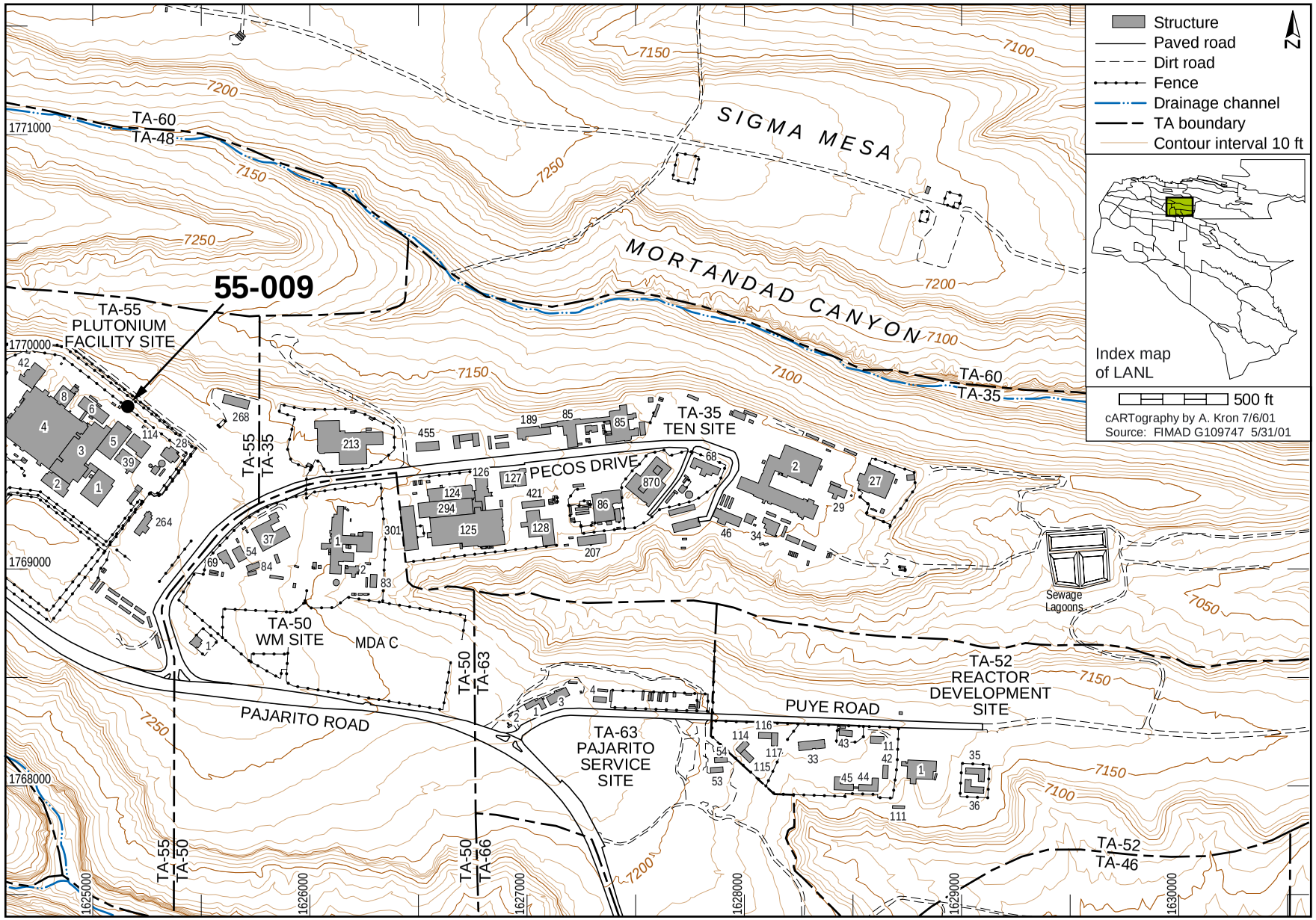
Class III Permit Modification for Removal of 90 Solid Waste Management Units (SWMUs) — LA-UR Number: N/A

Addendum to RFI Work Plan for Operable Unit 1129 — LA-UR Number: 92-0800

RFI Work Plan for Operable Unit 1129 — LA-UR Number: 92-0800

Monitoring station with cover removed (SWMU 55-009)

Valve (SWMU 55-009)


55-009
TA-55
PLUTONIUM
FACILITY SITE
TA-60
TA-48
SIGMA MESA
MORTANDAD CANYON
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TEN SITE
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Structure
Paved road
Dirt road
Fence
Drainage channel
TA boundary
Contour interval 10 ft
N
Index map
of LANL
500 ft
cARTography by A. Kron 7/6/01
Source: FIMAD G109747 5/31/01

5.0 CERTIFICATION

I certify under penalty of law that this document 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 violations.

9/10/03

James L. Holt
Associate Director, Operations
Los Alamos National Laboratory
University of California Operator

Date Signed

9/15/03

Ralph E. Erickson
Manager, Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy
Owner/Operator

Date Signed

6.0 REFERENCES

EPA, 1994, "Module VIII: Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA I.D. NM0890010515," effective date May 19, 1994, U.S. Environmental Protection Agency, Region 6, Hazardous Waste Management Division, Dallas, Texas.

LANL, 2003a and all recent revisions, "Los Alamos National Laboratory Waste Acceptance Criteria," PLAN-WASTEMGMT-002, Revision 3.8, Los Alamos National Laboratory, Los Alamos, New México, February 5, 2003.

LANL, 2003b and all recent revisions, "Solid Waste Management Unit Report," LA-UR-03-6000, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002a, "Response to Notice of Deficiency; TA-55 Part B RCRA Permit Application January 2002, Revision 1.0, May 16, 2002," LA-UR-02-5041, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002b and all recent revisions, "Packing TRU Waste Containers," NMT7-WI3-SOP-TA55-013, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2002c and all recent revisions, "Managing Solid Low-Level Waste at TA-55," NMT7-HCP-TA55-DP-02L, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 2001 and all recent revisions, "Storage Area Inspections," NMT 7-WI1S-HCP-TA-55-011 Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1999 and all recent revisions, "Certification and Disposal of Low-Level, Oversize Waste," NMT7-WI3-TA55-HCP-DP-02L, Los Alamos National Laboratory, Los Alamos, New Mexico.

NMED, 1998a, Dinwiddie, Robert S. (Stu), New Mexico Environment Department, Letter to T. Taylor and J. Browne, February 5, 1998.

ATTACHMENT A

FACILITY DESCRIPTION

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A.2.2 Traffic Volumes A-2
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A-8	Location Map Showing Security Fences, Entry Gates, and Entry Station at Technical Area (TA) 55
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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
AASHTO	American Association of State Highway and Transportation Officials
ft	feet/foot
in.	inch(es)
LANL	Los Alamos National Laboratory
TA	technical area

ATTACHMENT A
FACILITY DESCRIPTION

The information provided in this section is submitted in accordance with the applicable requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), revised June 14, 2000 [6-14-00]. The following subject areas are addressed:

- A general description of Technical Area (TA) 55 at Los Alamos National Laboratory (LANL) [20.4.1 NMAC §270.14(b)(1)];
- Site-specific traffic patterns, volume, and control [20.4.1 NMAC §270.14(b)(10)];
- Site-specific location information for compliance with the seismic standard and floodplain requirements [20.4.1 NMAC §270.14(b)(11) and 20.4.1 NMAC §264.18(a) and (b)];
- Site-specific topographic map requirements [20.4.1 NMAC §270.14(b)(19)]; and
- Site-specific groundwater monitoring and protection information [20.4.1 NMAC §270.14(c) and 20.4.1 NMAC §264.90(a)].

A LANL-wide facility description addressing additional regulatory requirements is provided in Appendix A of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B.

A.1 TA-55 GENERAL DESCRIPTION [20.4.1 NMAC §270.14(b)(1)]

TA-55 is located in the north central portion of LANL (Figure A-1) on a mesa between a branch of Mortandad Canyon on the north and Two Mile Canyon on the south. Mesa-top elevations at TA-55 range from approximately 7,100 to 7,300 feet (ft) above mean sea level. The locations of the waste management units at TA-55 are shown on Figure A-2.

TA-55 began operating in 1978 and is the location of research and development activities, including a plutonium-processing facility. The waste management units addressed in this permit application include seven container storage units, a storage tank system, and a cementation unit. Detailed descriptions of the waste management units at TA-55 are provided in Attachments G, H and I, respectively.

A.2 TRAFFIC PATTERNS [20.4.1 NMAC §270.14(b)(10)]

General traffic pattern information, traffic volumes, and traffic control signals for the LANL-wide facility are provided in Appendix A of the LANL General Part B.

A.2.1 Routes of Travel

Hazardous and/or mixed waste stored and treated at TA-55 is generated at TA-3 and TA-55. Hazardous and/or mixed waste is occasionally transported from TA-55 to other areas at LANL (e.g., TA-54). The primary traffic routes that may be used to transport hazardous and mixed waste to and from TA-55 include Diamond Drive, Pajarito Road, and Pecos Drive as shown on Figure A-3.

A.2.2 Traffic Volumes

The buildings at TA-55 are located northwest of the intersection of Pajarito Road and Pecos Drive, as shown on Figure A-4. According to a traffic study conducted by Johnson Controls World Services, Inc. (JCI) (JCI, 1999), Pajarito Road has an average daily traffic volume of 12,000 vehicles. This includes vehicles traveling both northwest and southeast. Pecos Drive has an average daily traffic volume of 5,000 vehicles per day. This includes vehicles traveling both north and south. These values are based on a 24-hour period. Vehicle types include cars, light- and medium-duty trucks, and vans.

A.2.3 Traffic Control Signals

Traffic control signals surrounding and within TA-55 include stop signs, posted speed limits, a traffic light, and other traffic and pedestrian control signs. The locations of existing traffic control signals at TA-55 are shown on Figure A-4.

A.2.4 Road Load-Bearing Capacity

Roads within TA-55 are generally two lane roads with asphaltic-concrete surfaces. Load-bearing capacity for these roads is 32,000 pounds per axle. These roads are typically constructed with a 6-inch (in.)-thick base with a 3-in.-thick asphaltic-concrete surface. These roads were designed and constructed to meet the American Association of State Highway and Transportation Officials (AASHTO) specification HS-20 (AASHTO, 1996).

A.3 LOCATION INFORMATION [20.4.1 NMAC §270.14(b)(11)]

A.3.1 Seismic Standard [20.4.1 NMAC §270.14(b)(11)(i - ii) and 20.4.1 NMAC §264.18(a)]

General seismic information for the LANL-wide facility is provided in Appendix A of the LANL General Part B. TA-55 is in compliance with the seismic standards of 20.4.1 NMAC §270.14(b)(11) and 20.4.1

NMAC §264.18(a) [6-14-00]. A geologic field investigation, which consisted of exploratory trenching, was conducted within 3,000 ft of TA-55-4 and TA-55-185 during the fall of 1992 and summer of 1993. Based on trench stratigraphy, no evidence of Holocene faulting was observed (Woodward-Clyde Federal Services, 1995).

A.3.2 Floodplain Standard [20.4.1 NMAC §270.14(b)(11)(iii - v) and 270.14(b)(19)(ii); 20.4.1 NMAC §264.18(b)]

The hazardous and mixed waste management units at TA-55 are located on a mesa top. In accordance with 20.4.1 NMAC §270.14(b)(11)(iii) [6-14-00], the hazardous and mixed waste management units addressed in this permit application are not located within the 100-year floodplain boundary. Additional floodplain information is provided in Appendix A of the LANL General Part B.

A.4 TOPOGRAPHIC MAPS [20.4.1 NMAC §270.14(b)(19)]

Topographic maps and figures are provided herein or referenced to meet the requirements of 20.4.1 NMAC §270.14(b)(19) [6-14-00]. All maps clearly show the map scale, the date of preparation, and a north arrow. The maps and figures used to fulfill these regulatory requirements include the following:

- LANL-wide 100-year floodplain maps are provided as Appendix C of the "Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application; General Part A," April 1998, Revision 0.0; and "Los Alamos National Laboratory General Part B," October 1998, Revision 1.0; Los Alamos National Laboratory, EPA ID No. NM 0890010515" (LANL, 2001).
- A map showing surface waters, including intermittent streams, near TA-55 is included as Figure A-5.
- Surrounding land uses are shown on Figure A-1.
- Wind roses for TA-6, the TA directly west of TA-55, are shown on Figures A-6 and A-7.
- A map showing the boundaries of LANL (including TA-55) is provided as Figure A-2 in the LANL General Part B.
- Access control features at TA-55 (e.g., fences, gates) are shown on Figure A-8.
- A map showing supply wells, monitoring wells, test wells, springs, and surface-water sampling stations near TA-55 is included as Figure A-5.
- The locations of buildings, hazardous and/or mixed waste management units, and loading and unloading areas at TA-55 are shown on Figure A-5.

- A map showing National Pollutant Discharge Elimination System discharge structure locations is included in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application," herein after referred to as the LANL General Part A.

- Storm, sanitary, and process sewer systems at LANL are shown on Map A-1 of the LANL General Part B.

- Drainage control features (e.g., run-on/runoff) are shown on Figure A-9.

- Fire stations serving LANL and the County of Los Alamos are shown on Figure E-2 of Appendix E in the LANL General Part B.

- The equipment cleanup area for LANL is located at TA-50-1. The location of TA-50-1 is shown on Figure 50-1 in the LANL General Part A.

Contour lines on the topographic map (Figure A-5) are in intervals sufficient to detail natural drainage at LANL and in the vicinity of the waste management units at TA-55. As provided in 20.4.1 NMAC §270.14(b)(19) [6-14-00], LANL has submitted the maps to the New Mexico Environment Department at these scales and contour intervals due to the size of the waste management units, the extent of the LANL facility, and the topographic relief in the area.

A.5 GROUNDWATER MONITORING [20.4.1 NMAC, Subpart IX, 270.14(c) and 20.4.1 NMAC, Subpart V, 264.90(a)]

Groundwater monitoring information is provided in Appendix A of the LANL General Part B.

A.6 OTHER PERMIT ACTIVITIES

Other types of Resource Conservation and Recovery Act permits include, but are not limited to, the following:

- Permits by Rule
- Emergency Permits
- Hazardous Waste Incinerator Permits
- Permits for Land Treatment Demonstrations Using Field Test or Laboratory Analyses
- Interim Permits for Underground Injection Control Program Wells
- Research, Development, and Demonstration Permits
- Permits for Boilers and Industrial Furnaces Burning Hazardous Waste

Currently, none of these permit types are in effect for operations at TA-55.

A.7 REFERENCES

AASHTO, 1996 and all approved updates, "Standard Specifications for Highway Bridges," 16th Edition, American Association of State Highway and Transportation Officials.

JCI, 1999, Telecon from John Bradley, Johnson Controls World Services, Inc. to Jessica Moseley, IT Corporation, on February 10, 1999, Los Alamos, New Mexico.

LANL, 2001, “Response to Request for Supplemental Information: Technical Adequacy Review, RCRA Permit Application; General Part A,” April 1998, Revision 0.0; “Los Alamos National Laboratory General Part B,” October 1998, Revision 1.0, Los Alamos National Laboratory, EPA ID No. NM0890010515,” Los Alamos National Laboratory, Los Alamos, New Mexico.

Woodward-Clyde Federal Services, 1995, “Evaluation of the Potential for Surface Faulting at TA-63,” prepared for Los Alamos National Laboratory, Los Alamos, New Mexico.

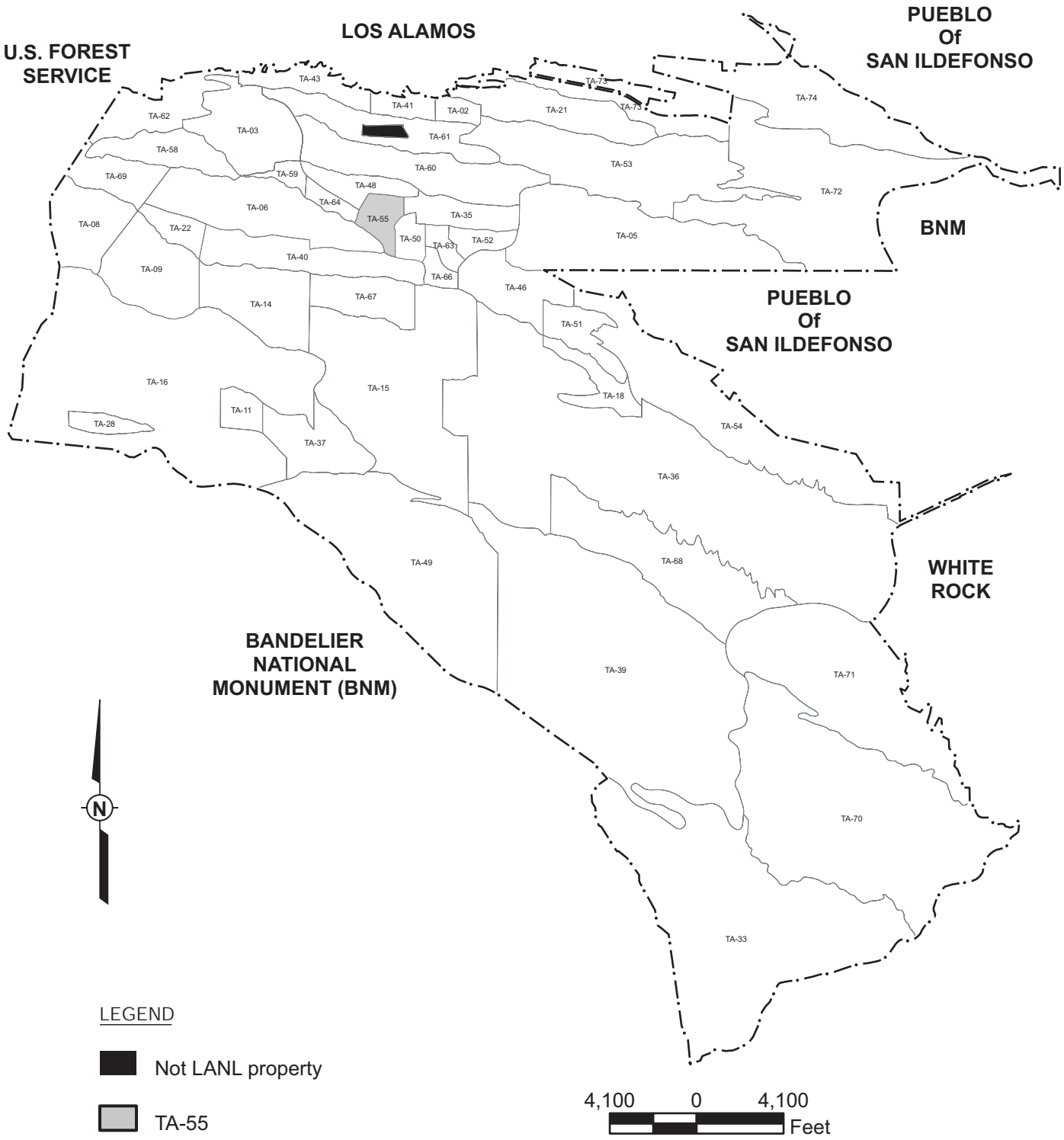

Figure A-1
Location Map of Technical Area (TA) 55 at Los Alamos National Laboratory (LANL)

State Plane Coordinate System New Mexico Central Zone North American Datum 1983 (ft)

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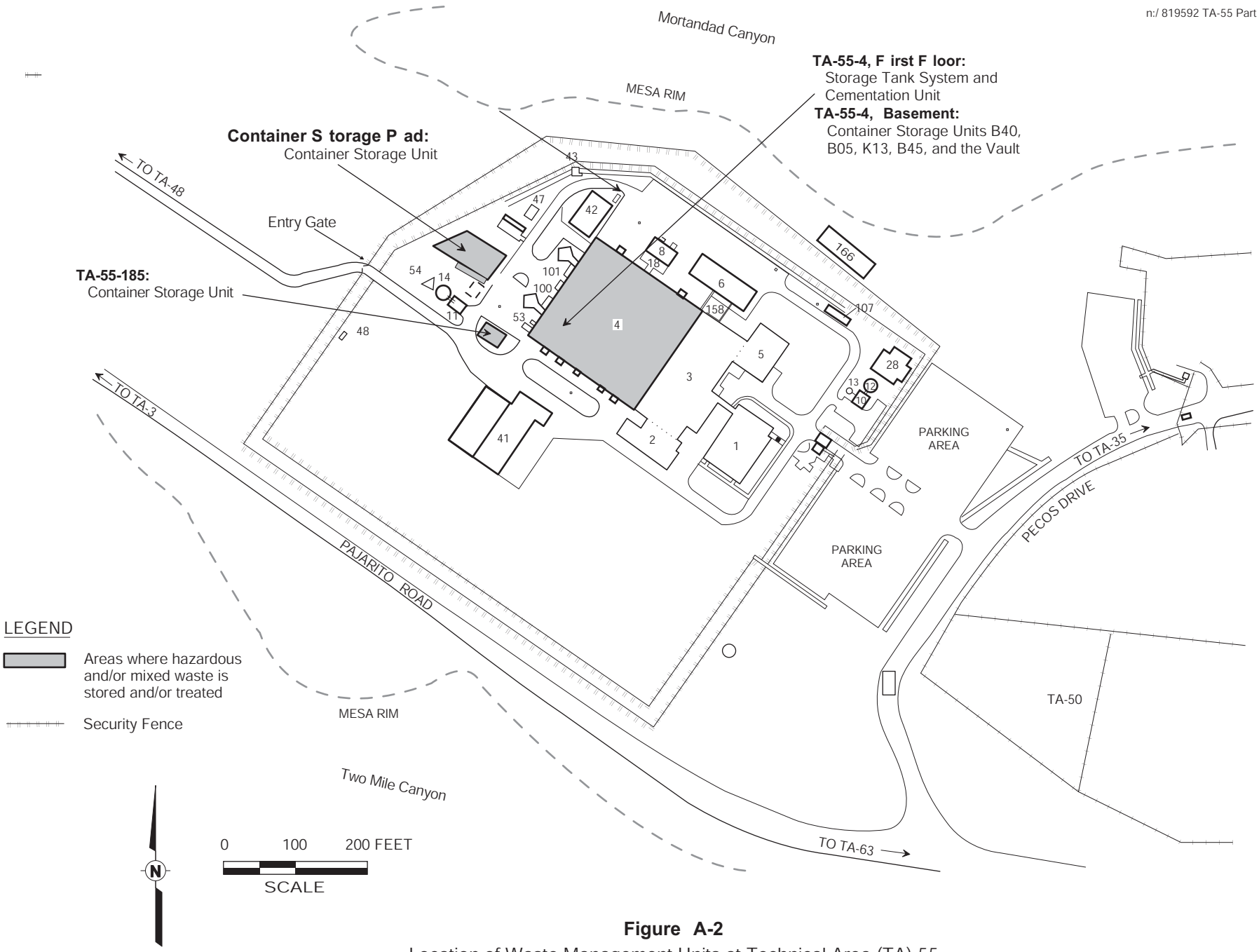


Figure A-2
Location of Waste Management Units at Technical Area (TA) 55

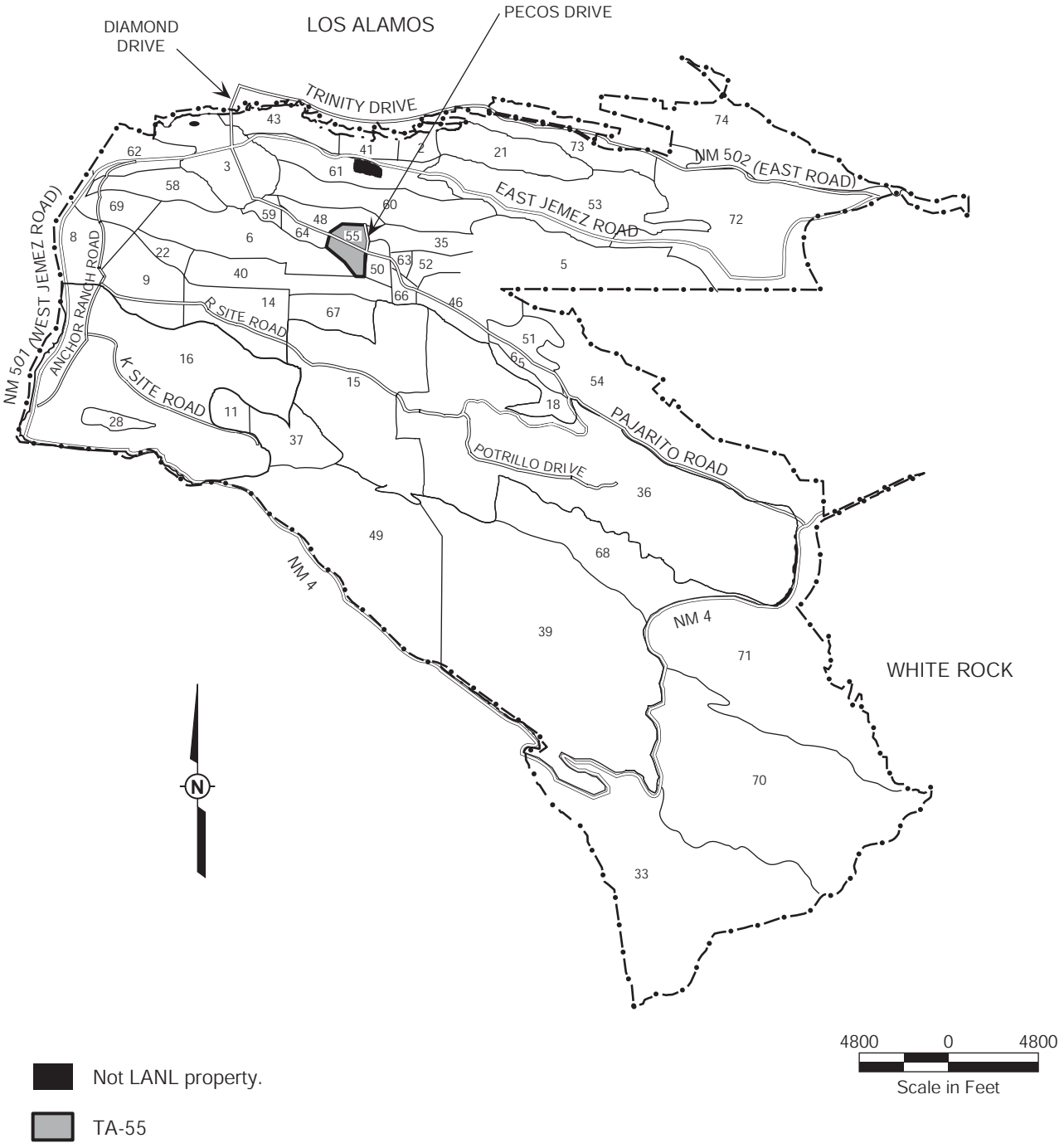


Figure A-3
Major Roads and Primary Traffic Routes at Los Alamos National Laboratory (LANL)

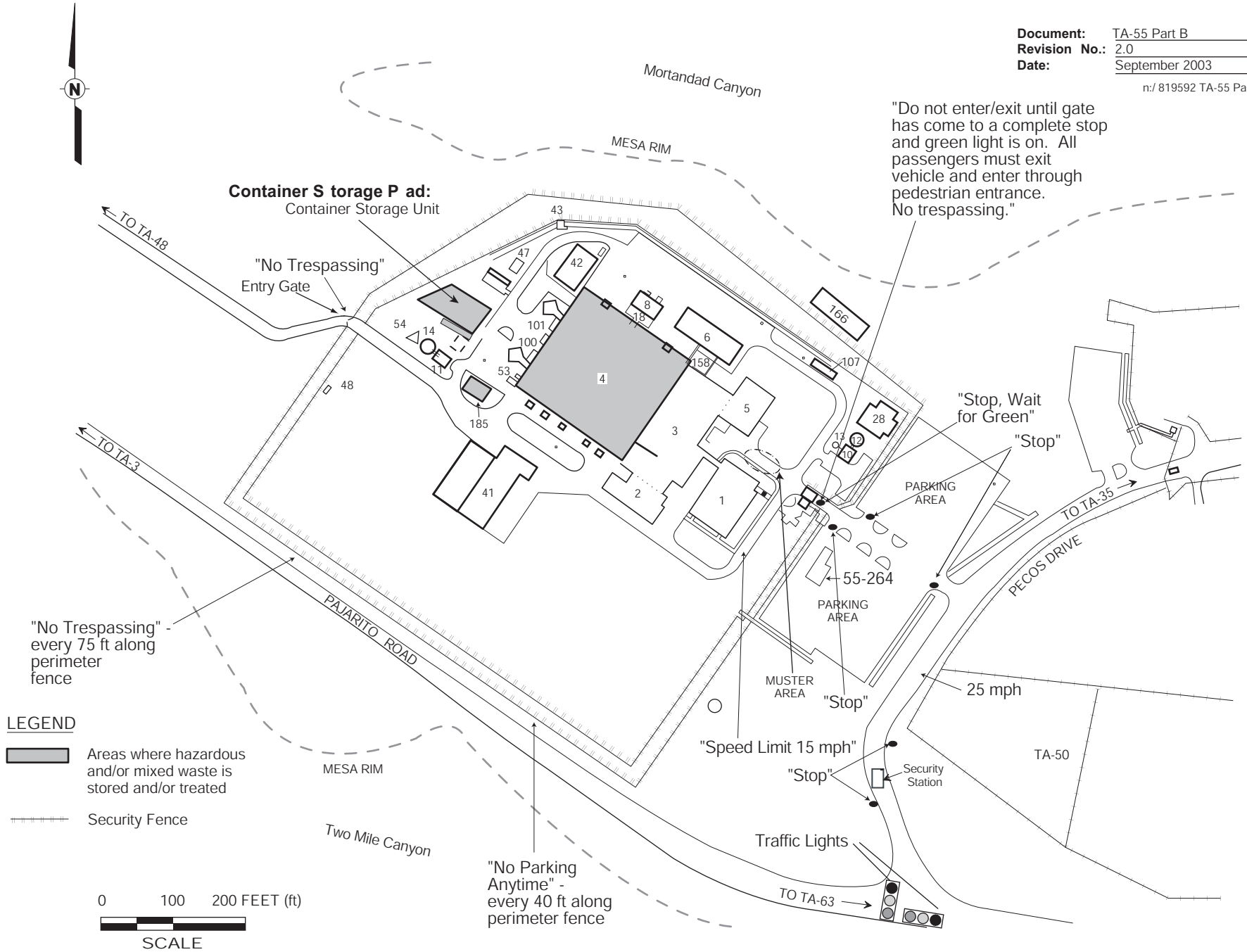
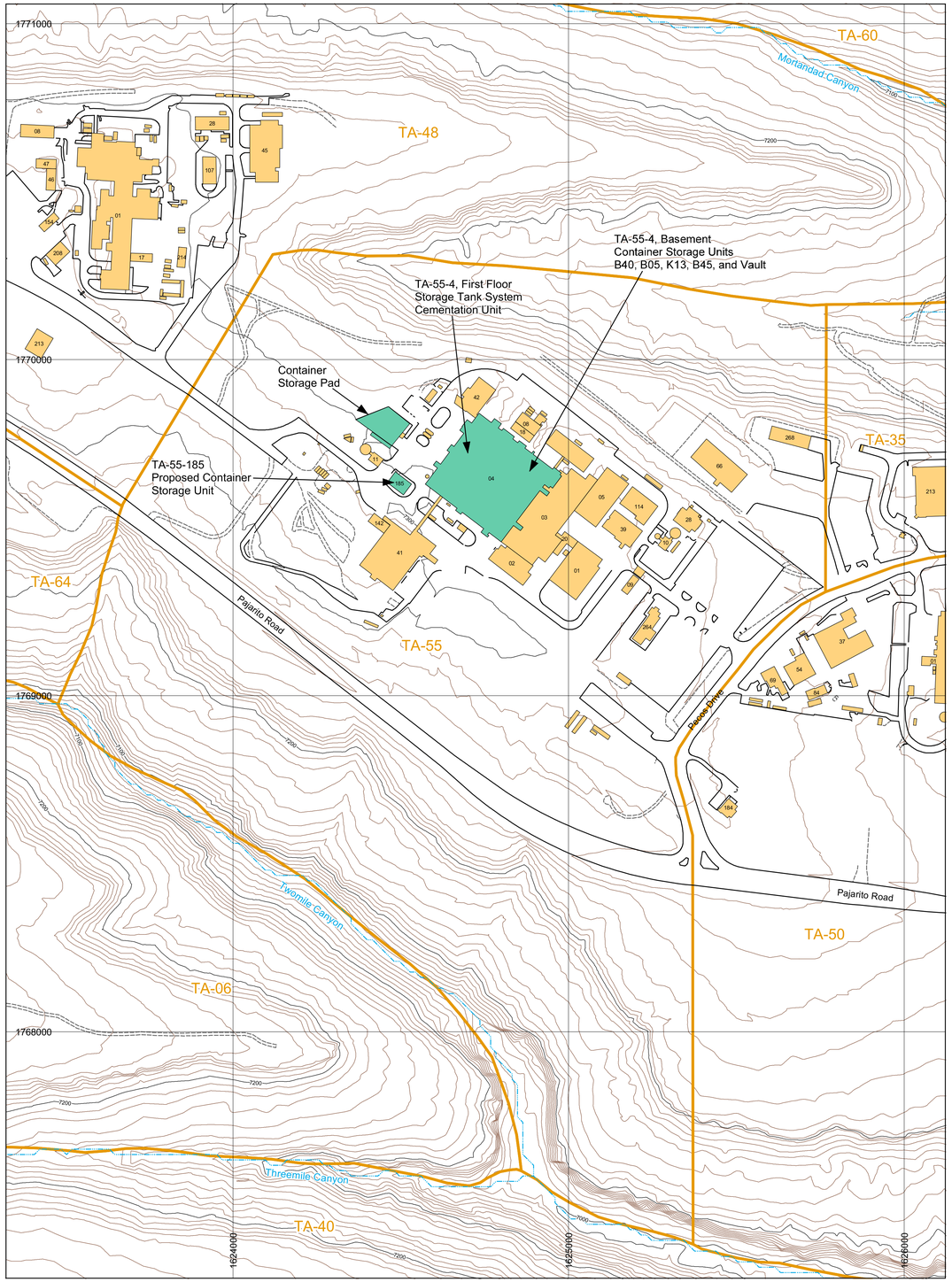


Figure A-4

Location Map of Access Roads and Traffic Control Signs in the Vicinity of Technical Area (TA) 55



LEGEND

- Boundary, TA
- Contour, 10 Foot
- Contour, 100 Foot
- Road, Paved
- Road, Dirt
- Stream, Intermittent
- Structure
- Treatment and/or Storage Locations for Hazardous and/or Mixed Waste

DATA SOURCES FOR PLOT: 200733

Title; Owner, ID; Intended Scale; Pub Date; Comments

Drainage; Los Alamos National Laboratory, RRES-R; ER2002-0591; 1:24000; Unknown; Provided by ER's SDE server, sde.DBO.drainage_dem_arc.

Hypsography, 10 Foot Contour Interval; Los Alamos National Laboratory, RRES-R; NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_010_arc

Hypsography, 100 Foot Contour Interval; Los Alamos National Laboratory, RRES-R; NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_100_arc

Hypsography, 20 Foot Contour Interval; Los Alamos National Laboratory, RRES-R; NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_020_arc

Roads, Dirt; Los Alamos National Laboratory, FWO Utilities and Infrastructure; NA; Unknown; 12 September 2002; Provided by RRES-R SDE server, sde.DBO.paved_rds_arc

Roads, Paved; Los Alamos National Laboratory, FWO Utilities and Infrastructure; NA; Unknown; Unknown; Provided by RRES-R SDE server, sde.DBO.paved_rds_arc

Structure; Los Alamos National Laboratory, FWO Utilities and Infrastructure; NA; Unknown; 12 August 2002; Provided by RRES-R SDE server, sde.DBO.structures_ply

Technical Area Boundary; Los Alamos National Laboratory, FWO Utilities and Infrastructure; NA; Unknown; 12 August 2002; Provided by RRES-R SDE server, sde.DBO.tabndy_ply

Figure A-5. Contour Map Showing the Locations of the Hazardous and Mixed Waste Management Units at Technical Area (TA) 55

Cartography by: Doug Walther
Date: July 22, 2003
GISLab M#: 200733
Request#: 13218

GISLab
Los Alamos National Laboratory

N

State Plane Coordinate System, New Mexico Central Zone, 1983 North American Datum. Units Feet.

Grid displays New Mexico State Plane coordinates in feet.

1:2,400

0 200 400 600 800
Feet

0 60 120 180 240
Meters

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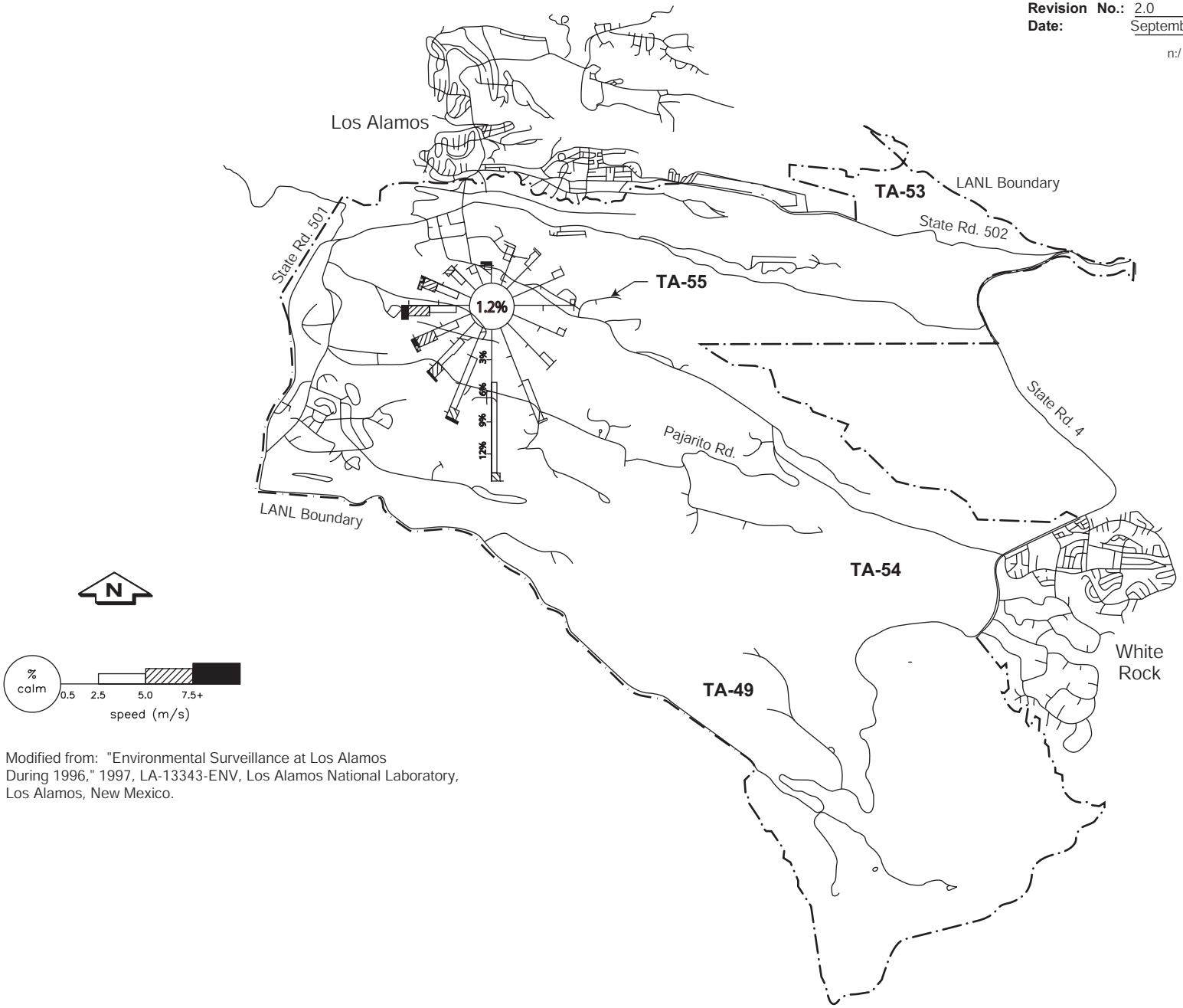
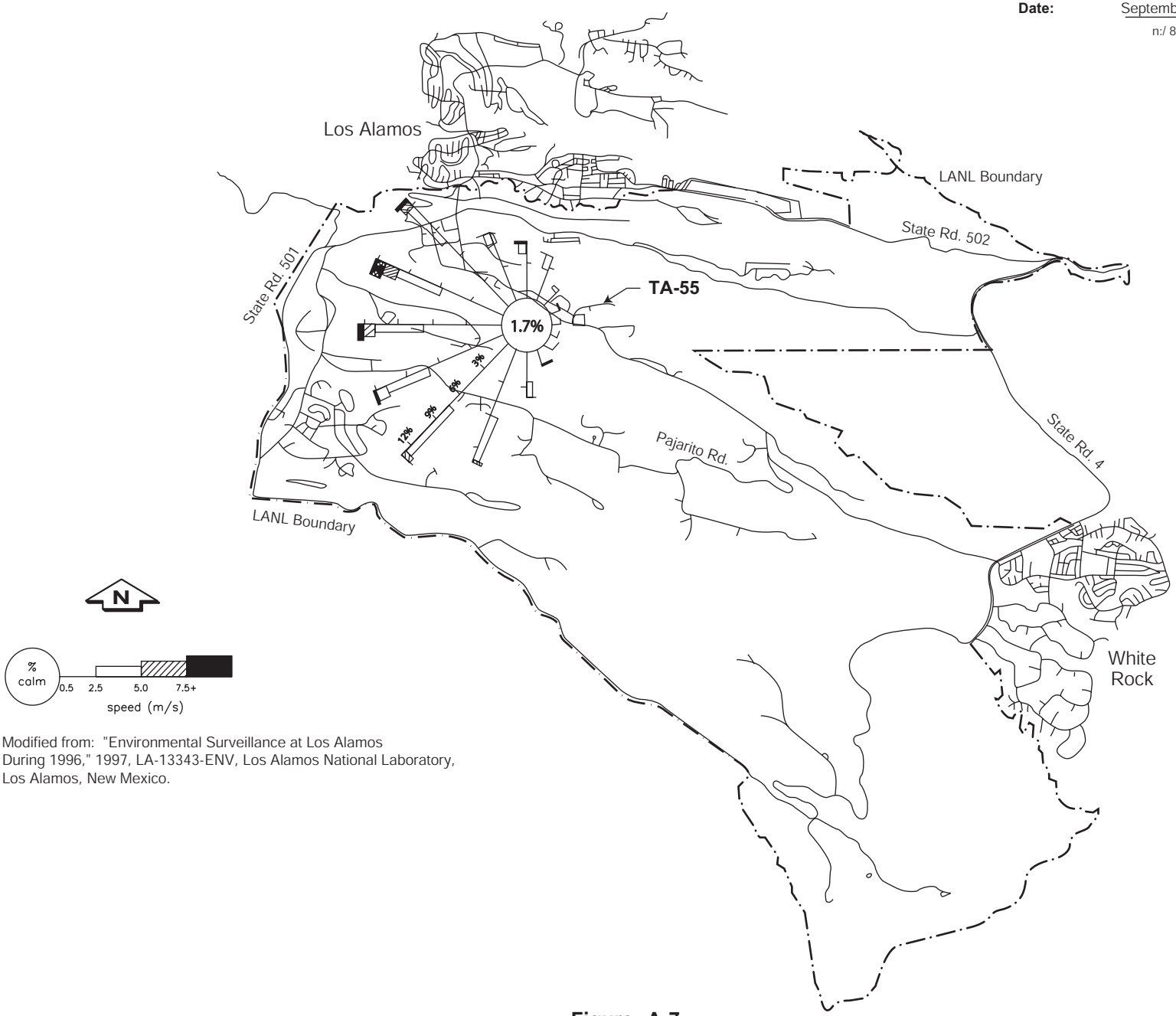


Modified from: "Environmental Surveillance at Los Alamos During 1996," 1997, LA-13343-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure A-6

Annual Wind Roses for Technical Area (TA) 6 at Los Alamos National Laboratory (LANL)—Day



Modified from: "Environmental Surveillance at Los Alamos During 1996," 1997, LA-13343-ENV, Los Alamos National Laboratory, Los Alamos, New Mexico.

Figure A-7

Annual Wind Roses for Technical Area (TA) 6 at Los Alamos National Laboratory (LANL)—Night

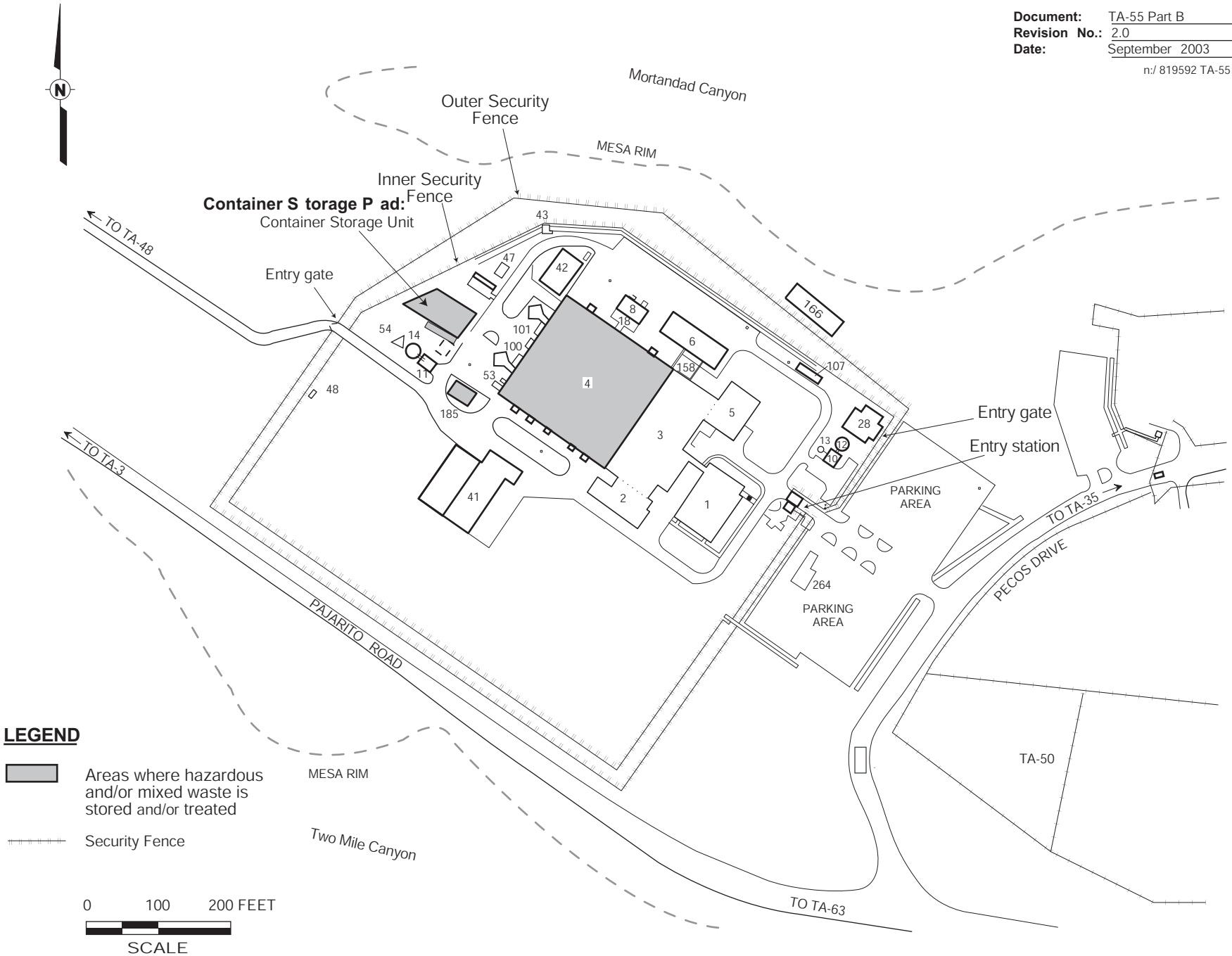
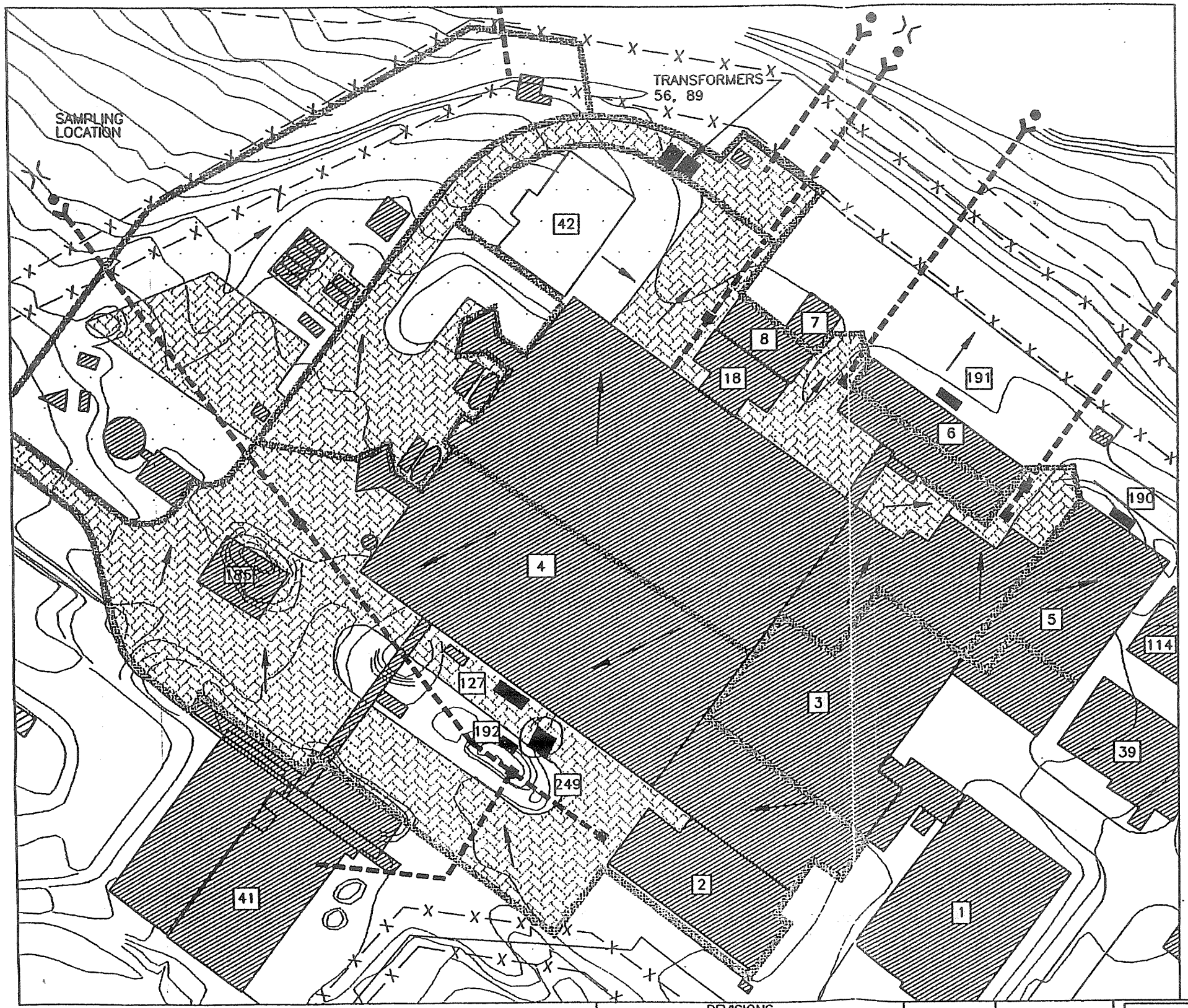


Figure A-8

Location Map Showing Security Fences, Entry Gates, and Entry Station at Technical Area (TA) 55



NOTE:

1. CONTOURS 10-FT INTERVALS

SYMBOLS LEGEND

	DIRECTION OF STORM WATER FLOW
	DIRT ROAD
	PAVED ROAD
	EXISTING BUILDING
	DRAINAGE BOUNDARY
	CULVERT
	FENCE
	CENTER LINE OF DRAINAGE
	ASPHALT COVERED
	GSIP LOCATION
	AREA OF CONCERN
	SUMP
	STORM WATER DISCHARGE POINT

REVISIONS

NO.	BY	DATE	REMARKS
		01/96	GSIP DEVELOPMENT

DRAWN	JSI	SCALE:	1"=90'-0"
DESIGNED	SJV	PLOT DATE	01/24/96
CHECKED	SJV	CREATION DATE	12/12/95
APPROVED		DRAWING FILE NAME	55-PLUT.DWG

Santa Fe Engineering Limited
1429 Second St. Santa Fe, NM 87505
(505) 988-7438 fax (505)983-5608

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

REQUESTING GROUP ESH-18
LAB JOB NO. –

Figure A-9
Drainage Control Features at Technical Area (TA) 55

DRAWING NUMBER –

SHEET 1 OF 1
REV 0

ATTACHMENT B

WASTE ANALYSIS PLAN

ATTACHMENT B
WASTE ANALYSIS PLAN

Waste analysis requirements are specified in New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.14(b)(2), 20.4.1 NMAC §264.13, and 20.4.1 NMAC §268.7, revised June 14, 2000 [6-14-00]. The waste analysis requirements for the Technical Area 55 container storage units, storage tank system, and cementation unit at Los Alamos National Laboratory are described in the facility-wide Waste Analysis Plan in Appendix B of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT C

INSPECTION PLAN

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CAM	continuous air monitor
CFR	Code of Federal Regulations
CSU	container storage unit(s)
FMU-7	Facility and Waste Operations Division
IRF	Inspection Record Form
LANL	Los Alamos National Laboratory
m^3	cubic meters
ppmw	parts per million by weight
rem	Roentgen equivalent man
TA	technical area

ATTACHMENT C
INSPECTION PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.14(b)(5) and 20.4.1 NMAC §264.15, revised June 14, 2000 [6-14-00], inspection requirements for all hazardous and/or mixed waste management units at Los Alamos National Laboratory (LANL) are addressed in Appendix C of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. This attachment presents additional inspection requirements applicable to the waste management units at Technical Area (TA) 55. These requirements have been developed to identify equipment malfunctions and deterioration, operator errors, and discharges that might cause or lead to a release of hazardous or mixed waste to the environment or a threat to human health. Inspections will be conducted often enough to identify problems in time to correct them before they harm human health or the environment.

C.1 TA-55 VAULT [20.4.1 NMAC §264.15(b) and 264.174]

The Vault is a container storage unit (CSU) located in the basement at TA-55-4. The CSU consists of a completely enclosed area consisting of 13 rooms located along a central corridor. Because of high levels of radioactivity, the Vault must have specialized inspection procedures to adhere to "as low as reasonably achievable" principles established by the Atomic Energy Act. Performance of a weekly inspection of the storage rooms pursuant to the requirements of 20.4.1 NMAC §264.174 [6-14-00], would result in an annual employee exposure of 2.7 Roentgen equivalent man (rem) of neutron radiation. This exceeds the annual allowable employee exposure rate of 2 rems. Therefore, the following alternative inspection procedures have been implemented. These inspection requirements are applicable only to those rooms in the Vault that store mixed waste regulated pursuant to 20.4.1 NMAC Subpart V, Part 264 [6-14-00].

C.1.1 Non-Intrusive Inspection Systems

Continuous air monitors (CAM) are located in each individual storage room within the Vault to continuously monitor airborne radioactivity levels. If the concentration of an airborne material reaches a preset level, an alarm will sound. All of the containers in the Vault contain radioactive material. If container integrity is compromised and the material inside the container becomes airborne, the CAM will detect the release and sound an alarm. CAM air intakes have been placed near the negative air exhaust vent for each room. Placing CAM air intakes near room-exhaust points provides the most beneficial location within the room to detect a release because air vented from each room must pass

by the CAM intake prior to exhausting from the room. Each room has a single exhaust vent. If a problem with a container is identified, it is removed from the Vault and inspected in an open-front hood.

Information obtained during inspections and all container transfers are noted on the Vault Traffic Log Book maintained at TA-55. The Vault Traffic Log Book will be inspected weekly by Nuclear Materials Technology staff as a quality assurance measure to verify receipt or transfer of mixed waste from the Vault. If mixed waste is not currently being stored in the Vault and the weekly inspection indicates that no mixed waste has been received, the Inspection Record Form (IRF) will be marked “No Use” and completed according to the IRF instructions.

The Vault has extremely strict security and safeguards. Therefore, there is no significant potential for container breaches through inadvertent and uncontrolled access to the Vault.

C.1.2 Intrusive Inspection Procedures

The central hallway of the Vault will be inspected weekly when mixed waste is in storage and will address the following items:

- Vault Traffic Log Book inspected for receipt or transfer of waste
- Communications equipment
- Warning signs
- Security
- Work surfaces/floors in central corridor
- Spill/fire equipment
- Secondary containment
- (Un)loading area
- Visual inspection of storage rooms from hallway
- Nuclear Materials Custodian contacted to verify no alarms or problems

When containers are placed into or removed from a storage room within the Vault, the following items will be inspected in that storage room, as appropriate:

- Vault Traffic Log Book inspected for receipt or transfer of waste
- Communication equipment
- Warning signs
- Security
- Work surfaces/floors
- Spill/fire equipment
- Secondary containment
- (Un)loading area
- Nuclear Materials Custodian contacted to verify no alarms or problems

- Emergency equipment/lighting
- Covers/lids of containers
- Labels
- Accumulation start date
- Compatibility
- Structural integrity of containers
- Aisle spacing/stacking
- Pallets/raised containers

Inspection results are recorded on the IRF maintained at TA-55.

C.2 STORAGE TANK SYSTEM [20.4.1 NMAC §264.15(b), 264.193(i), and 264.195]

The storage tank system components located at TA-55-4, Room 401, are inspected according to the schedule provided below. The inspection frequency is based on the deterioration rate of equipment/systems and the probability of adverse impact to human health or the environment if failure of the equipment/systems or any operator error goes undetected between inspections.

C.2.1 Daily (During Operation)

The storage tank system components (including ancillary equipment) will be inspected at least once each operating day. An operating day includes when mixed waste is added to or emptied from a tank. For daily inspections, the following items will be inspected, as appropriate, and recorded on the IRF:

- Work surfaces/floors
- Secondary containment structure
- Structural integrity of tanks and ancillary equipment
- Labels
- (Un)loading areas
- All portions of tank systems to detect corrosion or releases of waste and to detect any possible malfunctions to overfill/spill control equipment, tank monitoring, and leak detection systems and data from these systems
- Proper operating condition of tank

C.2.2 Weekly

Weekly inspection of the storage tank system components will be conducted and will include the following items, as appropriate, and recorded on the IRF:

- Warning signs
- Work surfaces/floors
- Secondary containment structures
- Covers/lids of tanks

- Labels
- Structural integrity of tanks and ancillary equipment
- (Un)loading areas
- All portions of tank systems to detect corrosion or releases of waste and to detect any possible malfunctions to overfill/spill control equipment, tank monitoring, and leak detection systems and data from these systems
- Proper operating condition of tank

C.2.3 Annually

An annual assessment, as required by 20.4.1 NMAC §264.193 (i) [6-14-00], is not necessary for the TA-55 storage tank system and ancillary equipment because the storage tank system and the ancillary equipment have secondary containment.

C.3 CEMENTATION UNIT [20.4.1 NMAC §§264.15(b) and 264.602]

The cementation unit is located at TA-55-4, Room 401, and is inspected according to the schedule provided below. The inspection frequency is based on the deterioration rate of equipment/systems and the probability of adverse impact to human health or the environment if failure of the equipment/systems or any operator error goes undetected between inspections.

C.3.1 Daily (During Operation)

The cementation unit is inspected each operating day (i.e., when mixed waste is treated in the unit). For the daily inspection of the cementation unit, the following items will be inspected, as appropriate, and recorded on the IRF:

- Work surfaces/floors
- Secondary containment structures
- Labels
- Structural integrity of cementation unit
- (Un)loading area

C.3.2 Weekly

Weekly inspection of the cementation unit will be conducted and will address the following items, as appropriate and recorded on the IRF:

- Warning signs
- Work surfaces/floors
- Secondary containment structure
- Labels
- Structural integrity of cementation unit
- (Un)loading area

C.4 ADDITIONAL INSPECTION ITEMS

The items listed below are inspected monthly and documented by the Facility and Waste Operations Division (FMU-7) on a separate form:

- Evacuation alarms
- Ventilation alarms
- Fire alarms
- Fire pumps
- Fire extinguishers
- Communication equipment
- Eyewashes/safety showers

These inspection items may be changed at the discretion of FMU-7 to ensure consistency with the inspection items and frequencies specified in the most current version of the "TA-55 Final Safety Analysis Report" (LANL, 1996) and the "TA-55 Technical Safety Requirements" (LANL, 2000).

Additionally, security inspections of the fences and TA-55 access controls are conducted daily.

C.5 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPARTS AA AND BB REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subparts AA and BB]

The TA-55 CSUs are not subject to the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts AA and BB because they do not operate applicable process vents or equipment.

C.6 INSPECTION AND MONITORING FOR UNITS SUBJECT TO SUBPART CC REQUIREMENTS [20.4.1 NMAC, Subpart V, Part 264, Subpart CC]

The hazardous wastes stored in containers at the TA-55 CSUs may be subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart CC (incorporating the Code of Federal Regulations [CFR], Title 40, Part 264, Subpart CC, "Air Emission Standards for Tanks, Surface Impoundments, and Containers") based on the applicability criteria specified in 40 CFR §264.1080. Subpart CC standards for containers, as currently set forth by the U.S. Environmental Protection Agency, require that containers of hazardous waste be covered so that there are no detectable emissions of volatile organic compounds to the air. Inspection and monitoring requirements are also specified.

As indicated in 40 CFR §264.1080(b)(6), these standards are not currently applicable to containers that are used solely for management of radioactive mixed waste in accordance with all regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act. The standards are also not applicable to containers of hazardous waste with less than 500 parts per million by weight

(ppmw) volatile organics, containers of less than 0.1 cubic meters (m^3) (approximately 26 gallons) capacity, or that have received waste prior to the effective date of the regulation (December 6, 1996). The following management standards apply for hazardous waste managed at LANL that do not meet any of the exemption listed in 40 CFR §264.1080(b).

LANL requires that Subpart CC requirements be evaluated by the generator as part of the waste characterization process. Generator information is used to determine whether the concentration of volatile organics in a waste stream at the point of generation is less than 500 ppmw or is equal to or greater than 500 ppmw, which is the threshold concentration for Subpart CC requirements. The generator documents this determination for that waste stream. In the event that this information is not available, the waste will be characterized in accordance with Appendix B of the most recent version of the LANL General Part B. Any hazardous waste that is newly-generated through the treatment or re-characterization of mixed waste at TA-55 will be characterized for the volatile organic content in accordance with Appendix B.

Three levels of air emission controls based on container design capacity are established in 40 CFR §264.1086(b). TA-55 hazardous waste storage procedures require Level 1 controls based upon container design capacities. Containers of greater than 0.1 m^3 and less than 0.46 m^3 (approximately 119 gallons) capacity and that meet U.S. Department of Transportation specifications under 49 CFR, Part 178, are kept closed during storage pursuant to 40 CFR §264.1086 (c)(3). Containers undergoing waste characterization activities may be opened for access for the purposes described in 40 CFR §264.1086(c)(3). As required by 40 CFR §264.1086(c)(4), these containers are subject to a visual inspection and monitoring program. On or before acceptance of the waste container, the container is inspected to check for visible cracks, holes, gaps, or other open spaces into the interior of the container when the cover and closure devices are secured in the closed position, in accordance with 40 CFR §264.1086(c)(1)(ii). This inspection is documented in uniform hazardous waste manifests. Pursuant to the Inspection Plan in Appendix C of the most recent version of the LANL General Part B, containers are inspected weekly at TA-55 to ensure that the containers remain closed during storage, thereby exceeding the requirements of 40 CFR §264.1086(c)(4)(ii).

C.7 REFERENCES

LANL, 2000 and all recent revisions, “TA-55 Technical Safety Requirements,” Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1996 and all recent revisions, “TA-55 Final Safety Analysis Report,” Los Alamos National Laboratory, Los Alamos, New Mexico.

ATTACHMENT D

PERSONNEL TRAINING PLAN

ATTACHMENT D
PERSONNEL TRAINING PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.14(b)(12) and 20.4.1 NMAC Subpart V, Part 264.16, revised June 14, 2000 [6-14-00], training requirements for workers who manage hazardous and/or mixed waste at Technical Area 55 are addressed in Appendix D of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

ATTACHMENT E

CONTINGENCY PLAN

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CONTINGENCY PLAN E-1

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E-2	Emergency Equipment at Technical Area (TA) 55, Building 4 (TA-55-4), Basement
E-3	Emergency Equipment at Technical Area (TA) 55 Container Storage Pad
E-4	Emergency Equipment at Technical Area (TA) 55, Building 185 (TA-55-185)

LIST OF FIGURES

FIGURE NO.	TITLE
E-1	Evacuation Routes and Muster Areas at Technical Area (TA) 55

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
LANL	Los Alamos National Laboratory
TA	technical area

ATTACHMENT E
CONTINGENCY PLAN

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) Subpart V, Part 264, Subpart D and 20.4.1 NMAC §270.14(b)(7), revised June 14, 2000, contingency measures applicable to the hazardous and mixed waste management units at Technical Area (TA) 55 are provided in Appendix E of the most recent version of the "Los Alamos National Laboratory General Part B," hereinafter referred to as the LANL General Part B.

Figure E-1 shows evacuation routes and muster areas that may be used at TA-55 in the event of an emergency. In addition, lists of emergency equipment currently available for use at TA-55 are included as Tables E-1 through E-4. A list of emergency equipment (including spill control equipment) available from the Hazardous Materials Response Group is presented in Table E-2 of Appendix E in the most recent version of the LANL General Part B. Evacuation routes, muster area locations, and emergency equipment are subject to change. Emergency equipment discussed in this plan may be replaced and/or upgraded with functionally equivalent components and equipment as necessary for routine maintenance and repairs.

Hazardous waste spills are managed by type and severity of the incident. If a hazardous waste spill occurs, the Incident Command evaluates the type and severity of the spill and determines if assistance from LANL's Emergency Management and Response Group is required. If not, the spill is managed internally by TA-55 personnel.

Table E-1 [a]
Emergency Equipment at
Technical Area (TA) 55, Building 4 (TA-55-4), First Floor

FIRE CONTROL EQUIPMENT:

Dry-chemical fire extinguishers are located in Room 401.

Description of General Capabilities:

The fire extinguishers are portable, manually-operated units and can be used by any employee in case of fire. The fire extinguishers in Room 401 are for use only in case of fire outside the gloveboxes.

Fire alarm pull boxes and push button stations are available in Room 401.

Description of General Capabilities:

Fire alarms can be activated by any employee in the event of fire to notify the Central Alarm Station.

An automatic fire suppression sprinkler system is located in Room 401.

Automatic thermal alarms are located in the gloveboxes in Room 401.

Fire hydrants are located outdoors on the north, south, and west sides of TA-55-4.

SPILL CONTROL EQUIPMENT:

Room 401 provides secondary containment for the storage tank system and cementation unit.

COMMUNICATION EQUIPMENT:

Telephones are located in Room 401. The telephones are capable of handling incoming/outgoing calls and paging.

A telephone is located at each of the two west exit doors of TA-55-4.

Two-way radios are available from the Nuclear Materials Technology Facility Incident Command located at TA-55-3, Room 179, for personnel working in Room 401.

Alarms at TA-55-4:

The fire alarm is a zone-wide whooping sound.

If a drop-box pushbutton station is used, a zone-wide, high-pitched constant tone will be activated and then switch to the standard whooping sound.

Refer to footnote at end of table.

Table E-1 [a] (continued)
Emergency Equipment at
Technical Area (TA) 55, Building 4 (TA-55-4), First Floor

COMMUNICATION EQUIPMENT, continued:

The evacuation alarm is a facility-wide mid-range pulsating tone.

The continuous air monitor alarm is a local high-pitched pulsating tone.

The ventilation alarm is a local slow, repeating chime tone.

The public address system may also be used to announce an evacuation.

DECONTAMINATION EQUIPMENT:

Safety showers and eyewash stations are located in Room 401.
Description of General Capabilities:
Safety showers and eyewashes are available for decontamination of personnel who receive a chemical splash to the skin or eyes.

Material Safety Data Sheets (MSDS) are available in Room 401 and at TA-55-4.
Specific MSDSs may be obtained prior to working with any hazardous waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Self-contained breathing apparatus (SCBA) are located in the southside hallway outside of Room 401, in the northside hallway of TA-55-4, and in TA-55-3, Room 179. The SCBAs are available for personnel working in or near Room 401.

Change/decontamination rooms with protective clothing available are located on the first floor of TA-55-4 and in TA-55-3. Protective clothing is also available in a locker located in the hallway near Room 401 for use by personnel working in or near Room 401.

Respirators located in TA-55-3 (Room 107) and in TA-55-4 (Room 515) are available for all personnel working in or near TA-55-4. Respirators are re-issued on a regular basis to TA-55-4 personnel for radiation work. These respirators are stored in the personnel's individual lockers. Combination gas canisters (particulate, organic, and acid) are available in TA-55-4 (Room 515).

OTHER:

If transportation is needed for evacuation, vehicles may be obtained through the Emergency Management and Response Group.

[a] Equipment types and locations are subject to change.

Table E-2 [a]
Emergency Equipment at
Technical Area (TA) 55, Building 4 (TA-55-4), Basement

FIRE CONTROL EQUIPMENT:

Halon, dry chemical, and/or carbon dioxide fire extinguishers are available near B40, B05, K13, B45, and the Vault.

Description of General Capabilities:

The fire extinguishers are portable, manually-operated units and can be used by any employee in case of fire.

Fire alarm pull boxes are located at B05, K13, B45, the Vault, and on each side of the fire door.

Description of General Capabilities:

Fire alarms can be activated by any employee in the event of fire to notify the Central Alarm System.

An automatic fire suppression sprinkler system is located throughout the basement at TA-55-4, including the Vault and the office and corridor associated with the Vault.

Fire hydrants are located outdoors on the north, south, and west sides of TA-55-4.

SPILL CONTROL EQUIPMENT:

Self-containment pallets or cabinets are provided for containers of liquid and/or potentially liquid-bearing wastes stored at B40, K13, and the Vault.

COMMUNICATION EQUIPMENT:

Telephones and intercom stations are located throughout the basement of TA-55-4. The telephones are capable of handling both incoming and outgoing calls. The intercom system is connected to the TA-55-3 Operations Center and allows the Operations Center to easily mobilize emergency response support.

Two-way radios are available from the Nuclear Materials Technology Facility Incident Command located at TA-55-3, Room 179, for personnel working in the basement at TA-55-4.

Personal pagers are issued to and carried by assigned personnel working in the basement of TA-55-4. These pagers are accessed by telephone.

Alarms at TA-55-4:

The fire alarm is an area-wide whooping sound.

The evacuation alarm is a facility-wide mid-range pulsating tone.

Refer to footnote at end of table.

Table E-2 [a] (continued)
Emergency Equipment at
Technical Area (TA) 55, Building 4 (TA-55-4), Basement

COMMUNICATION EQUIPMENT, continued:

The continuous air monitor alarm is a local high-pitched pulsating tone.
The ventilation alarm is a local slow, repeating chime tone.

The public address system activated from the TA-55-3 Operations Center may be used to announce an evacuation.

A site-wide paging system activated from the TA-55-3 Operations Center can be heard throughout TA-55-4.

DECONTAMINATION EQUIPMENT:

Eyewashes are located throughout the basement of TA-55-4.
Description of General Capabilities:
The eyewash stations are available for decontamination of personnel who receive a chemical splash to the eyes.

Safety showers are located near B40, K13 and in the office for the Vault.
Description of General Capabilities:
The safety showers are available for decontamination of personnel who receive a chemical splash to the skin.

Material Safety Data Sheets (MSDSs) are available at TA-55-41. Specific MSDSs may be obtained prior to working with any hazardous waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Change/decontamination rooms with protective clothing available are located on the first floor of TA-55-4 and in TA-55-3.

Respirators located in TA-55-4 and in TA-55-3 are available for all personnel working in or near TA-55-4. Particulate and toxic gas canisters are available in TA-55-4.

Self-contained breathing apparatus are located in the TA-55, Basement.

OTHER:

If transportation is needed for evacuation, vehicles may be obtained through the Emergency Management and Response Group.

Forklifts stored in the basement are available for use in the basement and are stored near the north basement doorway.

[a] Equipment types and locations are subject to change.

Table E-3 [a]
Emergency Equipment at
Technical Area (TA) 55 Container Storage Pad

FIRE CONTROL EQUIPMENT:

A dry chemical fire extinguisher is located on the Container Storage Pad.
Description of General Capabilities:
The fire extinguishers are portable, manually-operated units and can be used by any employee in case of fire.

Fire hydrants are located along the north, south, and west sides of TA-55-4.

One fire hydrant is located just south of the Container Storage Pad.

Fire alarm pull boxes are located in TA-55-42 at the northwest corner of TA-55-4.

One fire alarm pull box is located outside on the south side of TA-55-4.

COMMUNICATION EQUIPMENT:

A telephone is located on the east side of TA-55-11, and additional phones are located in TA-55-185 and on the south side of TA-55-4.

Two-way radios are available from the Nuclear Materials Technology (NMT) Facility Incident Command located at TA-55-3, Room 179, for personnel working at the Container Storage Pad.

Personal pagers are issued to and carried by assigned personnel working at the Container Storage Pad. These pagers are accessed by telephone.

Alarms at TA-55:
The fire alarm is an area-wide whooping sound.
The evacuation alarm is a facility-wide mid-range pulsating tone.

The public address (PA) system activated from the TA-55-3 Operations Center may be used to announce an evacuation. PA speakers are located on the west side of TA-55-4.

Two intercom systems to the TA-55-3 Operations Center are located on the south and north sides of TA-55-4.

DECONTAMINATION EQUIPMENT:

A safety shower and eyewash station are located outdoors on the Container Storage Pad.

Refer to footnote at end of table.

Table E-3 [a] (continued)
Emergency Equipment at
Technical Area (TA) 55 Container Storage Pad

DECONTAMINATION EQUIPMENT, continued:

Description of General Capabilities:
The safety shower and eyewash are available for personnel who receive a chemical splash to the skin or eyes.

Material Safety Data Sheets (MSDSs) are available at TA-55-2. Specific MSDSs may be obtained prior to working with any hazardous waste to determine if the application of water is indicated for decontamination.

PERSONAL PROTECTIVE EQUIPMENT:

Change rooms with protective clothing available are located on the first floor of TA-55-4 and in TA-55-3.

Respirators are located in TA-55-4 and in TA-55-3 for all personnel working in or near TA-55-4.

OTHER:

If transportation is needed for evacuation, vehicles may be obtained through the Emergency Management and Response Group.

Two forklifts are available for NMT-7 use.

[a] Equipment types and locations are subject to change.

Table E-4 [a]
Emergency Equipment at
Technical Area (TA) 55, Building 185 (TA-55-185)

FIRE CONTROL EQUIPMENT:

Fire hydrants are located along the north, south, and west sides of TA-55, Building 4 (TA-55-4).

One fire alarm pull box is located inside TA-55-185.

Fire alarm pull boxes are located in TA-55, Building 42, at the northwest corner of TA-55-4.

One fire alarm pull box is located outside on the south side of TA-55-4.

COMMUNICATION EQUIPMENT:

One telephone is located inside TA-55-185.

A telephone is located on the east side of TA-55-11 and additional phones are located in TA-55-185 and on the south side of TA-55-4.

Two-way radios are available from the Nuclear Materials Technology (NMT) Facility Incident Command located at TA-55-3, Room 179, for personnel working at TA-55-185.

Personal pagers are issued to and carried by assigned personnel working at TA-55-185. These pagers are accessed by telephone.

Alarms at TA-55-4:
The fire alarm is an area-wide whooping sound.
The evacuation alarm is a facility-wide mid-range pulsating tone.

The pubic address (PA) system activated from the TA-55-3 Operations Center may be used to announce an evacuation.

PA speakers are located on the west side of TA-55-4 near TA-55-185. Intercom systems to the TA-55-3 Operations Center are located on the south and north sides of TA-55-4.

DECONTAMINATION EQUIPMENT:

TA-55-185 will be equipped with a portable safety shower and eyewash station before wastes are managed there.

Refer to footnote at end of table.

Table E-4 [a] (continued)
Emergency Equipment at
Technical Area (TA) 55, Building 185 (TA-55-185)

PERSONAL PROTECTIVE EQUIPMENT:

Change rooms with protective clothing available are located in TA-55-3.

Respirators located in TA-55-4 and in TA-55-3 are available for all personnel working in or near TA-55-185.

OTHER:

If transportation is needed for evacuation, vehicles may be obtained through the Emergency Management and Response Group.

A forklift is available inside of TA-55-185.

Two forklifts are available to NMT-7.

[a] Equipment types and locations are subject to change.

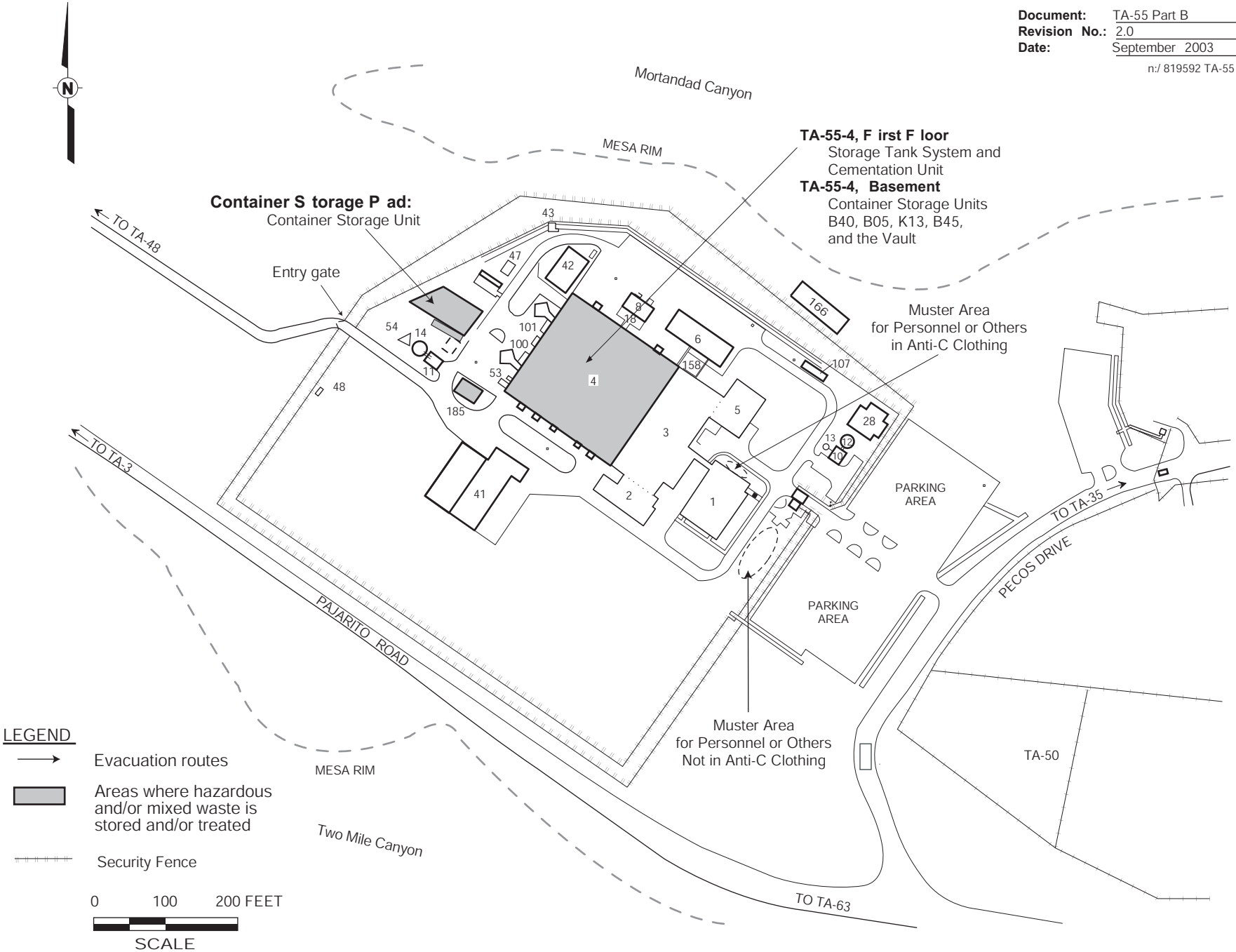

Figure E -1

Evacuation Routes and Muster Areas at Technical Area (TA) 55

ATTACHMENT F.1

CLOSURE PLAN FOR THE TECHNICAL AREA 55 CONTAINER STORAGE UNITS

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ALARA	as low as reasonably achievable
COPC	constituents of potential concern
CSU	container storage unit(s)
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
PPE	personal protective equipment
QA	quality assurance
QC	quality control
R&D	research and development
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SWRC	Solid Waste Regulatory Compliance Group
TA	technical area

ATTACHMENT F.1
CLOSURE PLAN FOR THE TECHNICAL AREA 55 CONTAINER STORAGE UNITS

The information provided in this closure plan is submitted to address the applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.14(b)(13), and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and I, revised June 14, 2000 [6-14-00]. This closure plan describes the activities necessary to perform Resource Conservation and Recovery Act (RCRA) closure for the container storage units (CSU) at Los Alamos National Laboratory (LANL) Technical Area (TA) 55. Closure will include removal of any remaining waste, decontamination or removal of contaminated equipment/structures, and verification that all residues have been removed. Closure activities will minimize the need for further maintenance, preclude the release of hazardous waste or hazardous constituents to environmental media, and be protective of human health in accordance with the closure performance standards in 20.4.1 NMAC § 264.111 [6-14-00].

Container storage at TA-55 consists of seven CSUs including B40, B05, K13, B45, and the Vault located at TA-55-4; a container storage pad located northwest of TA-55-4; and TA-55-185 (Figure F.1-1). This closure plan will be used to provide guidance and permit conditions for the partial closure of these TA-55 CSUs. Closure will occur separately and over the active life of the TA-55 facility, which is not anticipated to end before 2050.

This closure plan describes general closure activities and establishes the procedure of submitting a separate detailed CSU-specific sampling and analysis plan (SAP) to the New Mexico Environment Department (NMED) for approval at the time of closure. The CSU-specific SAPs will alleviate the need for future closure plan and permit modifications until the actual closure activities for each CSU are scheduled. Each SAP will provide the required level of detail to assure that closure performance standards are met and will be consistent with the appropriate decontamination and verification requirements existing at the time of closure.

This plan is organized as follows:

- Section F.1.1 - General Closure Information
- Section F.1.2 - Description of the TA-55 CSUs
- Section F.1.3 - Closure Procedures
- Section F.1.4 - Sampling and Analysis Plan

- Section F.1.5 - References

Until closure is complete and has been certified in accordance with 20.4.1 NMAC §264.115 [6-14-00], as discussed in Section F.1.1.6, a copy of the approved closure plan and any approved revisions will be on file with the Risk Reduction and Environmental Stewardship Division Solid Waste Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA) Los Alamos Site Office (LASO).

F.1.1 GENERAL CLOSURE INFORMATION

F.1.1.1 Closure Performance Standard [20.4.1 NMAC §264.111]

The CSUs addressed in this closure plan will be closed to meet the following performance standards:

- Minimize the need for further maintenance,
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere, and
- Comply with the closure and post-closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart G and I [6-14-00].

This will be accomplished by removal of waste from each TA-55 CSU and decontamination, if necessary, of the areas that may have come into contact with wastes. Decontamination activities will ensure the removal of hazardous waste residues from each TA-55 CSU to established cleanup levels.

F.1.1.2 Partial and Final Closure Activities [20.4.1 NMAC §264.112(d)]

This closure plan has been written for partial closure rather than final closure of the entire LANL facility. Partial RCRA closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. Partial closure at TA-55 will consist of closing one or more of the CSUs, while leaving the other units at LANL in operation. Partial closure (hereinafter referred to as closure) will be deemed complete when the waste has been removed from the CSU; the CSU all related surfaces and equipment have been decontaminated, if necessary, or otherwise properly disposed; closure has been verified; and the closure certification has been submitted to and approved by the NMED.

Final RCRA closure of the LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each waste management unit, including all pervious closures as well as land-based units where closures have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED, and the NMED has approved the final closure.

F.1.1.3 General Closure Schedule [20.4.1 NMAC §§264.112(b)(6), 264.112(e), and 264.113]

Written notification will be provided to the NMED 45 days before the start of closure activities at any TA-55 CSU. However, pursuant to 20.4.1 NMAC §264.112(e) [6-14-00], removing hazardous and/or mixed wastes and decontaminating or dismantling equipment in accordance with an approved closure plan may be conducted at any time before or after notification of closure. Closure activities will begin according to the requirements of 20.4.1 NMAC §264.112(d)(2) [6-14-00]. Treatment, removal, or disposal of hazardous wastes will begin in accordance with the approved closure plan, as required by 20.4.1 NMAC §264.113(a) [6-14-00], within 90 days after final receipt of waste at the CSU to be closed. This timeframe will be met as long as facilities are available for treatment or disposal of these wastes. In the event that closure activities cannot begin within 90 days, LANL will notify the Secretary of the NMED in accordance with the extension requirements in 20.4.1 NMAC §264.113(a) [6-14-00]. Closure activities and reporting requirements will then be completed within 180 days of the receipt of the final volume of waste at the CSU to be closed. Closure will be conducted in accordance with the schedule presented in Table F.1-1 of this closure plan.

Table F.1-1

Closure Schedule

Activity	Maximum Time Required [a]
Submit CSU-specific SAP	-90 Days
Notify the NMED of intent to close.	-45 Days
Final receipt of waste.	Day 0
Remove waste.	Day 5
Decontaminate surfaces and equipment.	Day 20
Sample excess used decontamination water for disposal.	Day 20
Perform verification sampling.	Day 30
Evaluate analytical data from verification sampling.	Day 50
Perform additional decontamination, if necessary.	Day 55
Perform additional verification sampling, if necessary.	Day 60
Evaluate additional analytical data.	Day 75
Perform final cleanup and disposal (i.e., removal of decontaminated equipment and decontamination waste).	Day 140
Certify closure.	Day 175
Submit closure certification to NMED.	Day 180

a The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously and/or may not require the maximum time listed. Extensions to this schedule may be requested, as needed.

NMED = New Mexico Environment Department

SAP = Sampling and Analysis Plan

Further details regarding the schedule of closure activities on a CSU-specific basis will be included with the CSU-specific SAP as discussed in Section F.1.4 of this closure plan. In the event that closure is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC §264.113(b) [6-14-00]. In addition, the demonstrations in 20.4.1 NMAC §264.113(a)(1) and (b)(1) [6-14-00], will be made in accordance with 20.4.1 NMAC §264.113(c) [6-14-00].

F.1.1.4 Amendment of the Closure Plan [20.4.1 NMAC §264.112(c)]

In accordance with 20.4.1 NMAC §264.112(c) [6-14-00], LANL will submit a written notification or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan.
- There is a change in the expected year of closure.
- Unexpected events occur during closure that requires modification of the approved closure plan.
- The owner or operator requests the Secretary of the NMED to apply alternative requirements to a regulated unit under 20.4.1 NMAC §§ 264.90(f) and/or 264.110(c).

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

F.1.1.5 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC §264.140(c)]

In accordance with 20.4.1 NMAC §264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for closure actions.

F.1.1.6 Closure Certification [20.4.1 NMAC §264.115]

Within 60 days after completion of closure activities at any TA-55 CSU or final closure of the facility, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit or facility has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE/NNSA and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC §264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC §264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both DOE/NNSA LASO and SWRC.

F.1.1.7 Security

Because of the ongoing nature of waste management operations at TA-55, security and administrative controls at the TA-55 waste management units will be maintained by the DOE/NNSA or another authorized federal agency for as long as necessary to prohibit public access. The security fence at TA-55 will be maintained to ensure that public access into TA-55 is prevented.

F.1.1.8 Closure Reports

Upon completion of the RCRA closure activities at any TA-55 CSU, a closure report will be prepared and submitted to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section F.1.1.6 of this closure plan.
- A general summary of closure activities.
- Any significant variance from the approved activities and the reason for the variance.
- A summary of any sampling data associated with the closure
- Storage or disposal location of hazardous/mixed waste resulting from closure activities.
- A certification of accuracy of the report.

F.1.1.9 Survey Plat and Post-Closure Requirements [20.4.1 NMAC §264.116 and 264.117 through 264.120]

LANL intends to remove hazardous/mixed waste and associated constituents from the CSU to be closed and decontaminate all surfaces and equipment to established cleanup levels or, if the cleanup levels approved in the CSU-specific closure SAP cannot be achieved, to dispose of the contaminated surfaces and equipment. If decontamination to established cleanup levels approved in the CSU-specific closure SAP cannot be achieved, LANL may propose an alternate demonstration of decontamination, as circumstances indicate.

If a CSU cannot be closed as described above, LANL will conduct post-closure or equivalent activities in accordance with Appendix G in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. A survey plat prepared in accordance with 20.4.1 NMAC §264.116 [6-14-00] will be filed with the appropriate authorities at certification of closure, as described in that regulation. A survey plat indicating the location and dimensions of the CSU with respect to permanently surveyed benchmarks will be submitted to the local zoning authority (i.e., Los Alamos County) and to the NMED at the time of submission of the certification of closure. The plat filed with the local zoning authority will contain a prominently displayed note, which states the obligation of LANL and DOE/NNSA to restrict disturbance of the unit in accordance with the applicable regulations in 20.4.1 NMAC, Subpart V, Part 264, Subpart G. Post-closure notices will be filed with appropriate authorities, as described in 20.4.1 NMAC §264.119 [6-14-00]. To meet that requirement, DOE/NNSA will file a "Land Use Restriction Notice" or equivalent document with the County of Los Alamos and other authorized agencies. Within 60 days after completions of the established post-closure care period for the unit, LANL will submit to the Secretary of the NMED, via certified mail, a certification of completion of post-closure care in accordance with the requirements of 20.4.1 NMAC §264.120 [6-14-00].

F.1.2 DESCRIPTION OF THE TA-55 CSUs

TA-55 is located on a mesa between a branch of Mortandad Canyon to the north and Two Mile Canyon to the south. Mesa-top elevations at TA-55 range from approximately 7,100 to 7,300 feet above mean sea level. TA-55 began operating in 1978 and is the location of research and development activities including a plutonium processing facility. Container storage at TA-55 consists of seven CSUs including B40, B05, K13, B45, and the Vault located at TA-55-4; a container storage pad located northwest of TA-55-4; and TA-55-185. Table F.1-2 provides the location and dimensions of each CSU.

Table F.1-2
Container Storage Units at Technical Area 55

Container Storage Unit	Location	Dimensions
B40	TA-55-4, Basement	L-shaped, long dimensions of 61.5 ft x 55 ft
B05	TA-55-4, Basement	26 ft x10 ft
K13	TA-55-4, Basement	16 ft x 13 ft
B45	TA-55-4, Basement	45 ft x 17.5 ft
Vault	TA-55-4, Basement	79.5 ft x 50.5 ft
Storage Pad	Northwest of TA-55-4	Trapezoid that is 102 ft x 86 ft x 156 ft x 105 ft and a 70 ft x 10 ft rectangle on the side.
TA-55-185	West of TA-55-4	60 ft x 40 ft

TA = Technical Area
ft = feet/foot

LANL does not currently intend to reduce the design capacities of the CSUs at TA-55 during the active life of the units. Estimated annual quantities for the CSUs at TA-55 are provided in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application," hereinafter referred to as the LANL General Part A.

F.1.2.1 Estimate of Maximum Waste in Storage

The maximum total inventory of waste that can be in storage at any time in the TA-55 CSUs is provided in Table F.1-3.

Table F.1-3
Maximum Container Storage Unit Capacities at Technical Area 55

CSU	Capacity[a] (gallons)
B40	21,500
B05	3,600
K13	2,500
B45	11,000
Vault	4,000
Storage Pad	135,000
TA-55-185	30,000

a Reflects the calculation of maximum capacities with a minimum aisle space of 2 feet.

TA = Technical Area
CSU = container storage unit

Table F.1-4 provides the date storage began at each CSU and estimates the maximum amount of hazardous and/or mixed waste in storage over the life of the unit.

Table F.1-4
Estimated Total Storage Capacity at the Technical Area 55 Container Storage Units

CSU	Approximate Storage Dates	Estimated Total Storage Capacity[a] (gallons)
B40	1980 - 2050	3,010,000
B05	1980 - 2050	504,000
K13	1980 - 2050	350,000
B45	1980 - 2050	1,540,000
Vault	1980 - 2050	560,000
Storage Pad	1980 - 2050	18,900,000
TA-55-185[b]	2005 - 2050	2,700,000

[a] Calculated based upon turn over of the maximum storage capacity twice a year
[b] Assumed that 2005 is the year storage at the unit will begin

F.1.2.2 Description of Stored Waste

The hazardous waste that may be stored at TA-55 is generated during research and development (R&D) activities, decontamination and decommissioning (D&D) projects, and general facility operations. A waste is considered hazardous if it meets the definition of a solid waste described in 20.4.1 NMAC §261.2 [6-14-00]; is not exempt from regulation as a hazardous waste under 20.4.1 NMAC §261.2 [6-14-00]; and exhibits any of the characteristics of hazardous waste identified in 20.4.1 NMAC, Subpart II, Part 261, Subpart C, or is listed in 20.4.1 NMAC, Subpart II, Part 261, Subpart D [6-14-00]. Mixed wastes currently stored at TA-55 are generated during R&D activities, processing and recovery operations, D&D projects, and general facility operations. Mixed waste is any solid waste that has both a hazardous component (as defined by 20.4.1 NMAC, Subpart II, Part 261) and a radioactive component. Information on the hazardous components of all wastes that can be stored at the TA-55 CSUs is provided in the most recent version of the LANL General Part A. Additional information on waste generating activities at LANL is available in the waste analysis plan in Appendix B of the most recent version of the LANL General Part B.

The estimated annual quantities of waste in storage at the TA-55 CSUs are provided in the most recent version of the LANL General Part A.

F.1.3 CLOSURE PROCEDURES

Closure will be conducted in accordance with the schedule presented in Table F.1-1, as amended by the CSU-specific SAPs submitted at the time of closure. Closure will generally be conducted as follows:

- **Removal of Waste** - Includes the transportation of all waste containers remaining in storage at the time of closure.
- **Preliminary Closure** – Determination of safety precautions and background contaminant

levels for the CSU to be closed. Includes the inspection of the CSU by the engineer observing the closure to ensure adequate containment and conditions for closure.

- **Decontamination** – Includes the removal of potential hazardous and/or mixed waste constituents from equipment used during waste management activities (e.g., pallets, drum dollies) and all structures, surfaces, walls, and secondary containment features (e.g., surfaces, sumps, berms, and/or recessed drains). Removal can include sweeping, vacuuming, moping, and/or wiping as appropriate at the time of closure and will be based upon the contaminant levels determined by the operating record of the unit.
- **Verification** – Sampling to verify that residual hazardous waste constituents have been decontaminated to appropriate levels. Sample media can include swipes, solutions, and/or soil as appropriate to the CSU being closed and will be determined at the time of closure based upon the operating record of the unit.
- **Closure Certification –** Certification by a professional engineer that the procedures and requirements provided in this closure plan and the CSU-specific SAPs were followed.

The following sections provide additional information for the closure procedures described above. The CSU-specific SAPs provided at the time of closure will provide detailed information regarding the preliminary closure procedures, decontamination methods, and verifications procedures as applicable at the time of closure.

F.1.3.1 Removal of Waste

Prior to initiation of closure activities, all wastes will be removed from the CSU scheduled for closure. Containers may be removed from each location with forklifts. Small containers may be handled manually or with dollies. Containers will be placed onto flatbed trucks, or trailers, or other appropriate vehicles for transport. Appropriate shipping papers will accompany the wastes during transport. Containers holding hazardous or mixed wastes will be moved to an approved on-site CSU or permitted off-site treatment, storage, or disposal facility.

F.1.3.2 Preliminary Closure Procedures

F.1.3.2.1 Safety Precautions

Job hazards associated with closure activities will be identified, controls developed, and workers briefed before closure activities are conducted, in accordance with LANL safety procedures. Personnel involved in closure activities will wear appropriate personal protective equipment (PPE), specified by the Health Physics Group and the Industrial Hygiene and Safety Group, and will follow good hygiene practices to protect themselves from exposure to hazardous and/or mixed waste. The level of PPE that will be required will depend upon the physical hazards present and the levels of contamination that are detected, if any. All workers involved in closure activities will be required to have appropriate training (as identified in Attachment D of this permit application and Appendix D in

the most recent version of the LANL General Part B. Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

F.1.3.2.2 Background Determination

Prior to the commencement of decontamination, the operating record of the CSU to be closed will be evaluated to determine the constituents of potential concern (COPCs) during closure. In addition, background samples and/or concentrations derived from LANL studies developed under the LANL corrective action or other programs can be used to determine COPC background/baseline levels applicable at the time of closure. The COPCs, appropriate background levels, and/or necessary sample collection techniques will be determined at the time of closure and included in the CSU-specific SAP at the time of closure, as discussed in Section F.1.4 of this closure plan.

F.1.3.2.3 Structural Assessment

Prior to beginning decontamination activities, the CSU to be closed will be inspected for any cracks or conditions that would potentially lead to the loss of decontamination wash water containment, as applicable. Preventative maintenance inspections are conducted routinely (i.e., weekly) at each CSU. If any defects, deterioration, damage, or hazards affecting containment are discovered during inspection, appropriate remedial actions (including repairs, maintenance, or replacement) will be completed before decontamination activities begin. If a crack or gap is present, a swipe sample or a representative sample of the media will be taken (e.g., asphalt or concrete) to determine the presence of contamination. The sample will be analyzed for the COPCs identified based upon the operating history of the unit, as discussed in Section F.1.3.2.2. If contamination is detected, the surface flaw will be decontaminated prior to repairing the crack/gap. Complete or partial removal (e.g., cold milling) of the material may be performed until contamination is no longer detected. If partial removal is successful in eliminating the contamination, it will be assumed that the remaining material, including the underlying soil, is clean.

F.1.3.3 Decontamination Procedures

To the extent possible, all contaminated surfaces and equipment (if present) will be decontaminated. Surfaces, items, materials, and equipment that cannot be decontaminated will be containerized and managed in compliance with appropriate waste management regulations.

An appropriate surfactant/solvent to be used in wash water solutions will be determined based upon the COPCs identified in the CSU-specific SAP. Alconox®, a surfactant, will be used to decontaminate

the CSUs. Specialized solvents will be used for more focused decontamination/removal purposes, as appropriate.

F.1.3.3.1 Equipment Located in the CSUs

The TA-55 CSUs have a variety of equipment that will be removed, decontaminated, and/or disposed of prior to decontamination of the surfaces associated with the unit. This includes all portable equipment such as grating/supports, pallets, drum dollies, and carts that are used to manage waste at the CSU. This equipment will be removed, decontaminated and/or disposed based upon the level of contamination and future use.

F.1.3.3.2 Indoor Storage Locations

Decontamination will be conducted using mops, cloths, and/or other absorbent materials to remove any potential hazardous constituents. These materials will be submerged in a wash water solution (e.g., Alconox, water) and used to wipe down the surfaces associated with the CSU being closed. After decontamination of the surfaces, the containment system (e.g., recessed areas, sumps, berms) will be wiped down. Used wash water will be collected, removed, and transferred to an appropriate container for storage pending the results of analysis and disposal.

Verification of decontamination will be conducted as indicated in Section F.1.3.4. If the analysis from the verification sampling indicates that hazardous constituents are present, decontamination wash cycles and analyses will continue until the structure and surfaces have been decontaminated or the decision is made to manage it appropriately as contaminated waste. Upon determination that it is contaminated waste, the material/structure/surface may be removed, transported to, and stored at other CSUs to facilitate the closure process.

F.1.3.3.3 Vault

It is anticipated that the Vault will remain an active mixed waste management unit until the LANL facility closure and that the area will be decontaminated in the manner described above. If “as low as reasonably achievable” (ALARA) considerations preclude decontaminating the area in the aforementioned manner, alternative measures will be initiated, as necessary, to ensure that the area is closed in a manner consistent with ALARA requirements and the intent of the closure regulations contained herein.

F.1.3.3.4 Container Storage Pad

Closure activities at the outdoor asphaltic-concrete container storage pad will include decontamination, and/or removal. To decontaminate the surface of the container storage pad, procedures similar to those described in Section F.1.3.3.2 of this closure plan can be used. If the decision is made to decontaminate, portable berms or other devices designed to collect and provide containment for used wash water will be used to control runoff from the CSU.

Used wash water samples from the container storage pad may exhibit contamination due to leaching of the asphalt during washdown. If this is the case, record reviews (e.g. manufacturer's specifications, Material Safety Data Sheets) and additional analyses may be performed to determine if leaching from the asphalt contributed to the contaminant concentration in the used wash water. If this additional evaluation confirms the asphalt as the source of contamination, baseline concentrations for clean wash water will be adjusted accordingly.

If decontamination verification, as discussed in Section F.1.3.4 cannot be demonstrated after two wash cycles, the asphaltic-concrete pad will be removed from the site and managed as appropriate for the waste type.

F.1.3.3.5 Soil Sampling

At the TA-55 container storage pad CSU soil removal can also be used to meet the closure performance standards if the operating records for the unit indicate that a release of hazardous waste to the surrounding soil has occurred. If records indicate that no release of hazardous waste to soils has occurred, soil sampling will not be conducted.

If collection of soil samples is determined to be necessary to demonstrate decontamination, appropriate background sample and/or concentrations derived from LANL studies (Section F.1.3.2.2) will be used to determine background/baseline levels for decontamination verification. Sampling locations to determine the extent of contamination will be based upon a biased random sampling approach, including historical evidence or releases, physical evidence of distressed vegetation or visual staining, and any other information that indicates a potential contamination pathway. The number of samples, locations, depths, and sampling will be determined before closure and will be included in the TA-55 CSU-specific closure SAP, as discussed in Section F.1.4. Results from sampling will be compared to the background samples and/or baseline concentration levels included in the closure SAP. If analysis shows that the soil at the outdoor container storage pad is contaminated, soil sampling results that are above the background/baseline levels will be used to identify the extent of

soil contamination. Contaminated soils will either be treated in place or removed in layers and sampling conducted following removal of each layer. This procedure will be used to minimize the amount of soil removed.

F.1.3.3.6 Equipment Used During Closure

Reusable protective clothing, tools, and equipment used during decontamination activities at the CSU will be cleaned with a wash water solution. If reusable sampling equipment is used, sampling equipment rinsate blanks will be collected and analyzed in accordance with the quality assurance (QA)/quality control (QC) procedures to be described in the closure SAP. Reusable decontamination equipment, including protective clothing and tools used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash water solution. Residue, disposable equipment and reusable equipment that cannot be decontaminated will be containerized and managed as waste in accordance with LANL waste management procedures, depending on the regulated constituents present.

F.1.3.4 Verification of Decontamination

Verification of decontamination will be conducted using sampling and analysis to demonstrate that hazardous and/or mixed waste residues are not present on the surfaces of the CSU. Sample media can include wash water solutions, swipes, and/or solid media samples (e.g., soil, concrete) as determined in the CSU-specific SAP at the time of closure and the operating record of the unit. The sampling methodology will be based on factors such as COPCs and the CSU materials of construction. All sampling conducted during closure will be done in accordance with the QA/QC procedures defined by “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods” (U.S. Environmental Protection Agency [EPA], 1986). The CSU-specific SAP will establish the minimum number of verification samples to be collected for the CSU being closed. The sample number will be based on the total surface area associated with the unit. Verification sampling will use a biased random approach for the determination of sample locations for the equipment, structures, and/or surfaces of the CSU and will include known or likely areas of contamination (e.g., low areas, sumps, and known spill locations) as determined by the operating record of the unit at the time of closure.

Decontamination will be verified if the analytical data from the collected samples meets at least one of the decontamination criteria listed in Section F.1.3.5 of this closure plan. If the data cannot meet at least one of the criteria, additional sampling can be performed to establish the boundaries of the contamination. Decontamination, as discussed in Section F.1.3.3, will be repeated within those boundaries, using portable berms or other appropriate materials to limit the potential for runoff from the

affected area. An additional round of verification sampling will be performed for all of the areas previously determined to be contaminated. After each decontamination/verification sequence, a decision will be made to repeat or remove the contaminated materials and dispose of them properly.

F.1.3.5 Decontamination Criteria

Successful decontamination will consist of sampling as specified in the TA-55 CSU-specific SAP and meet one of the following four criteria:

- No detectable hazardous waste or hazardous waste constituents from container storage activities are identified in the verification sample.
- Detectable hazardous waste or hazardous waste constituents from container storage activities in the verification solution sample are removed to statistically significant levels based on baseline concentrations in the clean verification sample.
- Detectable hazardous waste or hazardous waste constituents from container storage activities in the verification solution sample are at or below levels agreed upon with the NMED.
- Detectable hazardous waste or hazardous waste constituent concentrations from container storage activities do not significantly decrease after several wash downs. In such an event, hazardous constituents that pose an acceptable risk will be allowed to remain, as mutually agreed upon with the NMED.

An alternative demonstration of decontamination may be proposed and justified at the time of closure as circumstances dictate. The NMED will evaluate the proposed alternative in accordance with the standards and guidance then in effect and, if approved, LANL will incorporate the alternative into the SAP at the time of closure.

F.1.4 SAMPLING AND ANALYSIS PLAN

Sampling and analysis will be performed using standard approved methods (e.g., *SW-846*, American Society for Technology and Materials), as appropriate, for making closure decontamination verification determinations. LANL will submit a TA-55 CSU-specific closure SAP to the NMED at the time of each CSU closure notification for review and approval. Each SAP will provide a detailed description of the CSU to be closed and propose a closure methodology that assures the closure performance standards in Section F.1.1.1 are met.

The TA-55 CSU-specific SAPs will include the following information:

- A detailed discussion of site characteristics.
- The CSU operational history, to include descriptions of known spills, releases, and/or evidence of potential problems (e.g., visual stains, dead vegetation, solid waste management units).

- Chemical properties of the waste stored at the CSU.
- Determination of applicable COPCs.
- A hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures describing decontamination methods for equipment , structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the specific CSU.
- Methods for sampling and analysis of contaminated media.
- Removal procedures for contaminated media, if necessary.
- Sampling methods for decontamination media and hazardous waste determination. The discussion should include the rationale for using wash water samples, swipe samples, soil samples, and/or other sampling methodology.
- Sampling methods for decontamination verification procedures. The discussion should include the statistical or judgmental basis for determining the number of verification samples needed and the constituents to be analyzed.
- Sampling equipment decontamination and disposition procedures.
- Sample handling and documentation procedures.
- Analytical methods (including detection limits) and the rationale for their determination.
- Disposition of removed waste, decontamination media, or contaminated soils. This discussion should include an identification of proposed on- or off-site hazardous waste management facilities that may be used for final disposition and the types of wastes anticipated to be shipped.
- Decontamination criteria.
- Statistical basis for verification of decontamination, if applicable. The discussion should include information on determination of statistical increases in analytical parameters and numerical values for significant increases.
- Risk assessment procedures to be used, if necessary.
- Field and laboratory QA/QC procedures.
- Schedule of closure activities, including decontamination, sampling, analysis, potential removal of soils, and closure certification submittal.
- Identification of contact person or office.

F.1.5 REFERENCES

EPA, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *EPA-SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

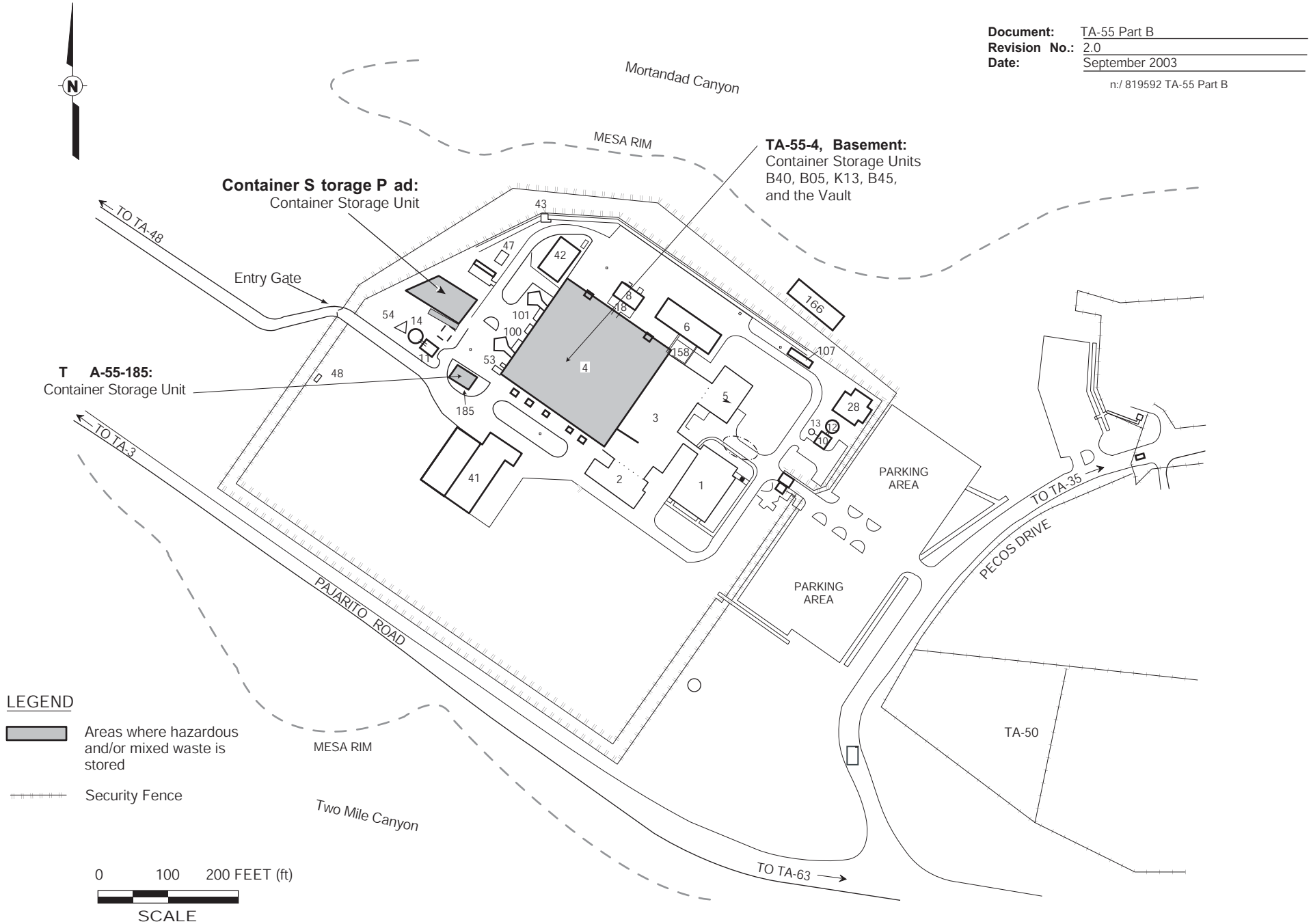

Figure F. 1-1

Location Map-Technical Area (TA) 55 Container Storage Units

ATTACHMENT F.2

CLOSURE PLAN FOR THE TECHNICAL AREA 55 STORAGE TANK SYSTEM

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
COPC	constituents of potential concern
CSU	container storage unit
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SWRC	Solid Waste Regulatory Compliance
TA	technical area

ATTACHMENT F.2
CLOSURE PLAN FOR THE TECHNICAL AREA 55 STORAGE TANK SYSTEM

The information provided in this closure plan is submitted to address the applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.14(b)(13), and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and J, revised June 14, 2000 [6-14-00]. This closure plan describes the activities necessary to perform Resource Conservation and Recovery Act (RCRA) closure for the storage tank system located at Los Alamos National Laboratory (LANL) Technical Area (TA) 55. Closure activities will include removal of any remaining waste, decontamination or removal of contaminated equipment/structures, and verification that all residues have been removed. Closure will minimize the need for further maintenance, preclude the release of hazardous waste or hazardous constituents to environmental media, and be protective of human health in accordance with the closure performance standards specified in 20.4.1 NMAC §264.111 [6-14-00].

There is one storage tank system at TA-55. This tank system is composed of 3 tank components and consists of a total of 16 tanks located at TA-55-4, Room 401 (Figure F.2-1). This closure plan will be used to provide guidance and permit conditions for the partial closure of the storage tank system at TA-55. Closure will occur separately from the other waste management units at TA-55 and over the active life of the TA-55 facility, which is not anticipated to end before 2050.

This closure plan describes general closure and establishes the procedure of submitting a separate detailed sampling and analysis plan (SAP) to the New Mexico Environment Department (NMED) for approval at the time of closure. The SAP will alleviate the need for future closure plan and permit modifications until the actual closure activities for the storage tank system are scheduled. The SAP will provide the required level of detail to assure that closure performance standards are met, consistent with the appropriate decontamination and verification requirements existing at the time of closure.

This plan is organized as follows:

- Section F.2.1 - General Closure Information.
- Section F.2.2 - Description of the Storage Tank System.
- Section F.2.3 - Closure Procedures.
- Section F.2.4 - Sampling and Analysis Plan.
- Section F.2.5 – References.

Until closure is complete and has been certified in accordance with 20.4.1 NMAC §264.115 [6-14-00], as discussed in Section F.2.1.6, a copy of the approved closure plan and any approved revisions will be on file with the Risk Reduction and Environmental Stewardship Division Solid Waste Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA) Los Alamos Site Office (LASO).

F.2.1 GENERAL CLOSURE INFORMATION

F.2.1.1 Closure Performance Standard [20.4.1 NMAC §264.111]

The storage tank system addressed in this closure plan will be closed to meet the following performance standards:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere.
- Comply with the closure and post closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and J [6-14-00].

This will be accomplished by removal of waste from the storage tank system and decontamination, if necessary, of the areas that may have come into contact with wastes. Decontamination activities will ensure the removal of hazardous waste residues to established cleanup levels.

F.2.1.2 Partial and Final Closure Activities [20.4.1 NMAC §264.112(d)]

This closure plan has been written for partial closure rather than final closure of the entire LANL facility. Partial RCRA closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. Partial closure at TA-55 can consist of closing the storage tank system, while leaving the other units in operation. Partial closure (hereinafter referred to as closure) will be deemed complete when the waste has been removed from the storage tank system; all related secondary containment surfaces and equipment have been decontaminated, if necessary, or otherwise properly disposed; closure has been verified; and the closure certification has been submitted to and approved by the NMED.

Final RCRA closure of the LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each waste management unit, including all pervious closures

as well as land-based units where closures have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED, and the NMED has approved the final closure.

F.2.1.3 General Closure Schedule [20.4.1 NMAC §§264.112(b)(6), 264.112(e), and 264.113]

Written notification will be provided to the NMED 45 days before the start of closure activities for the TA-55 storage tank system. However, pursuant to 20.4.1 NMAC §264.112(e) [6-14-00], removing hazardous wastes and decontaminating or dismantling equipment in accordance with an approved closure plan may be conducted at any time before or after notification of closure. Closure activities will begin according to the requirements of 20.4.1 NMAC §264.112(d)(2) [6-14-00]. Treatment, removal, or disposal of hazardous wastes will begin in accordance with the approved closure plan, as required by 20.4.1 NMAC §264.113(a) [6-14-00], within 90 days after final receipt of waste at the storage tank system. In the event that closure activities cannot begin within 90 days, LANL will notify the Secretary of the NMED in accordance with the extension requirements in 20.4.1 NMAC §264.113(a) [6-14-00]. Closure activities and reporting requirements will then be completed within 180 days of the receipt of the final volume of waste at the storage tank system. Closure will be conducted in accordance with the schedule presented in Table F.2-1 of this closure plan.

Table F.2-1
Closure Schedule

Activity	Maximum Time Required [a]
Submit SAP.	-90 Days
Notify the NMED of intent to close.	-45 Days
Final receipt of waste.	Day 0
Remove waste.	Day 5
Decontaminate surfaces and equipment.	Day 20
Sample excess used decontamination water for disposal.	Day 20
Perform verification sampling.	Day 30
Evaluate analytical data from verification sampling.	Day 50
Perform additional decontamination, if necessary.	Day 55
Perform additional verification sampling, if necessary.	Day 60
Evaluate additional analytical data.	Day 75
Perform final clean up and disposal (i.e., removal of decontaminated equipment and decontamination waste).	Day 140
Certify closure.	Day 175
Submit closure certification to NMED.	Day 180

a The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously and/or may not require the maximum time listed.

NMED = New Mexico Environment Department
SAP = sampling and analysis plan

Further details regarding the schedule of closure activities will be included with the SAP as discussed in Section F.2.4 of this closure plan. In the event that closure is prevented from proceeding according to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC §264.113(b) [6-14-00]. In addition, the demonstrations in 20.4.1 NMAC §264.113(a)(1) and (b)(1) [6-14-00], will be made in accordance with 20.4.1 NMAC §264.113(c) [6-14-00].

F.2.1.4 Amendment of the Closure Plan [20.4.1 NMAC §264.112(c)]

In accordance with 20.4.1 NMAC §264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan.
- There is a change in the expected year of closure.
- Unexpected events occur during closure that require modification of the approved closure plan.

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit the modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

F.2.1.5 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC §264.140(c)]

In accordance with 20.4.1 NMAC §264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for closure actions.

F.2.1.6 Closure Certification [20.4.1 NMAC §264.115]

Within 60 days after completion of closure activities for the storage tank systemor final closure of the facility, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit or facility has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE/NNSA and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC §264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC §264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both the DOE/NNSA LASO and SWRC.

F.2.1.7 Security

Because of the ongoing nature of waste management operations at TA-55, site security and administrative controls at the TA-55 waste management units will be maintained by the DOE/NNSA or another authorized federal agency for as long as necessary to prohibit public access. The security fence at TA-55 will be maintained to ensure that public access into TA-55 is prevented.

F.2.1.8 Closure Report

Upon completion of RCRA closure activities at the storage tank system , a closure report will be prepared and submitted to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section F.2.1.6 of this closure plan.
- A general summary of closure activities.
- Any significant variance from the approved activities and the reason for the variance.
- A summary of any sampling data associated with the closure.
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory data).
- Storage or disposal location of regulated hazardous/mixed waste resulting from closure activities.
- A certification of accuracy of the report.

F.2.1.9 Survey Plat and Post-Closure Requirements [20.4.1 NMAC §264.116 and 264.117 through 264.120]

LANL intends to remove hazardous/mixed waste and associated constituents from the storage tank system and decontaminate all surfaces and equipment to established cleanup levels or, if the cleanup levels cannot be achieved, to dispose of the contaminated surfaces and equipment. LANL will amend this closure plan, as necessary, to address changes to closure procedures or post-closure care

pursuant to 20.4.1 NMAC §§264.117 through 264.120 [6-14-00]. A survey plat, post-closure certification, and post-closure notices will not be required for the permitted unit because all wastes will be removed, the storage tank system components will be disposed, and any surfaces and equipment will be decontaminated at closure, or closure equivalency will be demonstrated. Therefore, these requirements are not applicable.

F.2.2 DESCRIPTION OF THE STORAGE TANK SYSTEM

TA-55 is located on a mesa between a branch of Mortandad Canyon to the north and Two Mile Canyon to the south. Mesa-top elevations at TA-55 range from approximately 7,100 to 7,300 feet above mean sea level. TA-55 began operating in 1978 and is the location of research and development activities including a plutonium processing facility. The storage tank system is composed of 3 tank components and consists of a total of 16 tanks located at TA-55-4, Room 401. Table F.2-2 identifies each tank component, its location, and the number of tanks.

Table F.2-2
Storage Tank System at Technical Area 55[a]

Tank Component	Location	Number of Tanks
Evaporator Glovebox Tank	TA-55-4, Room 401	1
Cementation Unit Pencil Tanks	TA-55-4, Room 401	5
Pencil Tanks	TA-55-4, Room 401	10

a. The storage tank system consists of 3 components that store the same waste type and share a common piping network.

TA = technical area

LANL does not currently intend to reduce the design capacities of the storage tank system at TA-55 during the active life of the unit. Estimated annual quantities for the storage tank system at TA-55 are provided in the most recent version of the "Los Alamos National Laboratory General Part A Permit Application," hereinafter referred to as the LANL General Part A.

F.2.2.1 Estimate of Maximum Waste in Storage

The storage tank system has a maximum storage capacity of 1,020 liters or approximately 266 gallons. Table F.2-3 identifies each tank component, the number of tanks, and capacity of each tank.

Table F.2-3
Storage Tank System Component Capacities

Tank Component	Number of Tanks	Tank capacity (gallons)	Maximum Capacity (gallons)
Evaporator Glovebox Tank	1	71	71
Cementation Unit Pencil Tanks	5	13	65

Pencil Tanks	10	13	130

Table F.1-4 provides the date storage began at the storage tank system and estimates the maximum amount of hazardous and/or mixed waste in storage over the life of the unit.

Table F.2-4
Estimated Total Lifetime Storage Capacity at the Storage Tank System

Storage Tank System Component	Approximate Operation Dates	Estimated Lifetime Storage Capacity (gallons) [a]
Evaporator Glovebox Tank	1987-2050	107,352
Cementation Unit Pencil Tanks	1987-2050	98,280
Pencil Tanks [b]	2005-2050	140,400

a Calculated based upon turn over of the maximum storage capacity twice every month.
b Assumed that 2005 would be the date that storage would begin in this unit.

F.2.2.2 Description of Waste

The storage tank system is used to store evaporator bottoms solutions, a mixed transuranic waste, generated primarily from research and development activities and processing and recovery operations at TA-55 and at the Chemistry and Metallurgy Research Building at TA-3. These waste solutions generally consist of concentrated nitric acid saturated with salts and metals. Evaporator bottoms solution waste is classified as mixed waste. Mixed waste has both a hazardous component (as defined by 20.4.1 NMAC, Subpart II, Part 261) and a radioactive component. Information on the hazardous components of the wastes that can be stored in the TA-55 storage tank system is provided in the most recent version of the LANL General Part A. Additional information on waste generating activities at LANL is available in the waste analysis plan in Appendix B of the most recent version of the LANL General Part B.

The estimated annual quantities of waste in storage at the storage tank system are provided in the most recent version of the LANL General Part A.

F.2.3 CLOSURE PROCEDURES [20.4.1 NMAC §264.112(b)(4) and (5), and 264.114]

Closure will be conducted in accordance with the schedule presented in Table F.2-1, as amended by the SAP submitted at the time of closure. Closure will generally be conducted as follows:

- **Removal of Waste** - Pumping of any remaining solutions in storage at the time of closure.
- **Preliminary Closure** - Safety precautions and background contaminant levels for the storage tank system will be assessed. Inspection of the secondary containment surfaces by the engineer observing the closure to ensure adequate containment and conditions for closure.

- **Decontamination** – Removal of potential hazardous waste constituents from equipment used during waste management activities; and all surfaces, walls, and secondary containment features (e.g., surfaces, sumps, berms, and/or recessed drains). Removal can include dismantling, sweeping, vacuuming, moping, and/or wiping as appropriate at the time of closure and based upon the contaminant levels determined by the operating record of the unit.
- **Verification** – Sampling to verify that residual hazardous waste constituents have been decontaminated to appropriate levels. Sample media can include swipes, solutions, and/or solid samples as appropriate and will be determined at the time of closure based upon the operating record of the unit.
- **Closure Certification** – Certification by a professional engineer that the procedures and requirements provided in this closure plan and the SAP were followed.

The following sections provide additional information for the closure procedures described above. The SAP provided at the time of closure will provide detailed information regarding the preliminary closure procedures, decontamination methods, and verifications procedures as applicable at the time of closure.

F.2.3.1 Removal of Waste

Prior to the initiation of closure activities, any waste remaining in the storage tank system (or portion thereof) will be discharged for storage in an appropriate container or treatment in the cementation unit according to current waste-specific standard operating procedures.

F.2.3.2 Preliminary Closure Procedures

F.2.3.2.1 Safety Precautions

Job hazards associated with closure activities will be identified, controls developed, and workers briefed before closure activities are conducted, in accordance with LANL safety procedures. Personnel involved in closure activities will wear appropriate personal protective equipment (PPE), specified by the Health Physics Group and the Industrial Hygiene and Safety Group, and will follow good hygiene practices to protect themselves from exposure to mixed waste. The level of PPE that will be required will depend upon the physical hazards present and the levels of contamination that are detected, if any. All workers involved in closure activities will be required to have appropriate training (as identified in Attachment D of this permit application and Appendix D in the most recent version of the LANL General Part B. Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

F.2.3.2.2 Background Determination

Prior to the commencement of decontamination, the operating record will be evaluated to determine the constituents of potential concern (COPCs) during closure. In addition, background samples and/or

concentrations derived from LANL studies developed under the LANL corrective action or other programs can be used to determine COPC background/baseline levels applicable at the time of closure. The COPCs, appropriate background levels, and/or necessary sample collection techniques will be determined at the time of closure and included in the SAP at the time of closure, as discussed in Section F.1.4 of this closure plan.

F.2.3.2.3 Structural Assessment

Prior to beginning decontamination activities, the secondary containment associated with the storage tank system will be inspected for any cracks or conditions that would potentially lead to the loss of decontamination wash water containment. Preventative maintenance inspections are conducted routinely (i.e., weekly) at each storage tank location. If any defects, deterioration, damage, or hazards affecting containment are discovered during inspection, appropriate remedial actions (including repairs, maintenance, or replacement) will be completed before decontamination activities begin. If a crack or gap is present, a swipe sample or a representative sample of the media will be taken (e.g., concrete) to determine the presence of contamination. The sample will be analyzed for the COPCs identified based upon the operating history of the unit, as discussed in Section F.2.3.2.2. If contamination is detected, the surface flaw will be decontaminated prior to repairing the crack/gap. Complete or partial removal (e.g., cold milling) of the material may be performed until contamination is no longer detected. If partial removal is successful in eliminating the contamination, it will be assumed that the remaining material, including the underlying soil, is clean.

F.2.3.3 Decontamination Procedures

To the extent possible, all contaminated surfaces and equipment (if present) will be decontaminated. Surfaces, items, materials, and equipment that cannot be decontaminated will be containerized and managed in compliance with appropriate waste management regulations.

An appropriate surfactant/solvent to be used in wash water solutions will be determined based upon the COPCs identified in the SAP. Alconox®, a surfactant, will be used to decontaminate the cementation unit. Specialized solvents will be used for more focused decontamination/removal purposes, as appropriate.

F.2.3.3.1 Storage Tank System Components

Storage tank system components will be decommissioned at closure. Due to the design of the storage tank components, decontamination is not possible. The decommissioned storage tank system components will be containerized and managed in compliance with appropriate regulations.

F.2.3.3.2 Ancillary Equipment

The storage tank system ancillary equipment (e.g., piping, pumps) will either be decontaminated, decommissioned, or dismantled, depending on the extent of contamination and anticipated disposition or use after closure. Closure of the will include removal of all of the tank components and ancillary equipment, including the shared portions of the piping system. The facility headers for ventilation, the wet vacuum system, and the radioactive liquid waste collection system will be left in place for other uses. If any of the ancillary equipment is to be decommissioned or dismantled, the resulting components will be containerized and managed in compliance with appropriate regulations. If the ancillary equipment is to be decontaminated, the following procedures will be used.

The interior surfaces of the ancillary equipment will be flushed with a decontamination solution to be specified in the SAP at the time of closure. The exterior surfaces will be decontaminated using mops, cloths, and/or other absorbent materials to remove any potential hazardous constituents. These materials will be rinsed in the decontamination solution (e.g., Alconox and water) and used to wipe down the exterior surfaces of the component being closed. Used wash water will be collected, removed, and transferred to an appropriate container for storage pending the results of analysis and disposal.

Verification of decontamination will be conducted as indicated in Section F.2.3.4. If the analysis from the verification indicates that mixed waste constituents are present, decontamination wash cycles and analyses will continue until the ancillary equipment has been decontaminated or the decision is made to manage it appropriately as contaminated waste. Upon determination that it is contaminated waste, the material/structure/surface may be removed, transported to, and stored at an appropriate container storage unit (CSU) to facilitate the closure process.

F.2.3.3.3 Areas Adjacent to the Storage Tank System

Random swipe samples from the areas adjacent to the storage tank system (e.g., walls, floors, sumps, and drains) will be collected and analyzed for the COPCs expected to be present, based on the operating record. If decontamination measures are deemed necessary based on the analytical results, the following procedures will be used.

Decontamination will be conducted using mops, cloths, and/or other absorbent materials to remove any potential mixed waste constituents. These materials will be submerged in a wash water solution (e.g., Alconox, water) and used to wipe down the surfaces associated with the storage tank system.

After decontamination of the surfaces, the containment system (e.g., recessed areas, sumps, berms) will be wiped down. Used wash water will be collected, removed, and transferred to an appropriate container for storage pending the results of analysis and disposal.

Verification of decontamination will be conducted as indicated in Section F.2.3.4. If the analysis from the verification indicates that mixed waste constituents are present, decontamination wash cycles and analyses will continue until the structure and surfaces have been decontaminated or the decision is made to manage it appropriately as contaminated waste. Upon determination that it is contaminated waste, the material/structure/surface may be removed, transported to, and stored at an appropriate CSU to facilitate the closure process.

F.2.3.3.4 Equipment Used During Closure

Reusable protective clothing, tools, and equipment used during decontamination activities at the storage tank system will be cleaned with a wash water solution. If reusable sampling equipment is used, sampling equipment rinsate blanks will be collected and analyzed in accordance with the quality assurance (QA)/quality control (QC) procedures described in the closure SAP. Reusable decontamination equipment, including protective clothing and tools used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash water solution (the closure SAP will include a discussion of wash water solutions). Residue, disposable equipment and reusable equipment that cannot be decontaminated will be containerized and managed as waste in accordance with LANL waste management procedures, depending on the regulated constituents present.

F.2.3.4 Verification of Decontamination

Verification of decontamination will be conducted using sampling and analysis to demonstrate that mixed waste residues are not present on the equipment and/or surfaces associated with the storage tank system (as applicable). Sample media can include wash water solutions, swipes, and/or solid media samples (e.g., soil, concrete) as determined in the SAP at the time of closure and the operating record of the unit. The sampling methodology will be based on factors such as COPCs and the materials of construction. All sampling conducted during closure will be done in accordance with the QA/QC procedures defined by “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods” (U.S. Environmental Protection Agency [EPA], 1986). The SAP will establish the minimum number of verification samples to be collected based on the total surface area associated with the unit. Verification sampling will use a biased random approach for the determination of sample locations for the equipment, structures, and/or surfaces and will include known or likely areas of contamination (e.g., low areas, sumps, and known spill locations) as determined by the operating record of the unit at

the time of closure.

Decontamination will be verified if the analytical data from the collected samples meets at least one of the decontamination criteria listed in Section F.2.3.5 of this closure plan. If the data cannot meet at least one of the criteria, additional sampling can be performed to establish the boundaries of the contamination. Decontamination, as discussed in Section F.2.3.3, will be repeated within those boundaries, using portable berms or other appropriate materials to limit the potential for runoff from the affected area. An additional round of verification sampling will be performed for all of the areas previously determined to be contaminated. After each decontamination/verification sequence, a decision will be made to repeat or remove the contaminated materials and dispose of them properly.

F.2.3.5 Decontamination Criteria

Successful decontamination will consist of sampling as specified in the component-specific SAP and meet one of the following criteria:

- No detectable hazardous waste or hazardous waste constituents from storage tank system activities are identified in the verification sample.
- Detectable hazardous waste or hazardous waste constituents from storage tank system activities in the verification sample are removed to statistically significant levels based on concentrations in the background/baseline samples.
- Detectable hazardous waste or hazardous waste constituents from storage tank system activities in the verification sample are at or below levels agreed upon with the NMED.
- Detectable hazardous waste or hazardous waste constituent concentrations from storage tank system activities do not significantly decrease after several wash downs. In such an event, hazardous constituents that pose an acceptable risk will be allowed to remain, as mutually agreed upon with the NMED.

An alternative demonstration of decontamination may be proposed and justified at the time of closure as circumstances dictate. The NMED will evaluate the proposed alternative in accordance with the standards and guidance then in effect and, if approved, LANL will incorporate the alternative into the SAP at the time of closure.

F.2.4 SAMPLING AND ANALYTICAL PLAN [20.4.1 NMAC §264.112(b)(4)]

Sampling and analysis will be performed using standard approved methods (e.g., *SW-846*, American Society for Technology and Materials), as appropriate, for making closure decontamination verification determinations. LANL will submit a SAP to the NMED at the time of closure notification for review and

approval. The SAP will provide a detailed description of the storage tank system and propose a closure methodology that assures the closure performance standards in Section F.2.1.1 are met.

The SAP will include the following information:

- A detailed discussion of site characteristics.
- Operational history, including descriptions of known spills, releases, and/or evidence of potential problems (e.g., visual stains, dead vegetation, solid waste management units).
- Chemical properties of the waste stored.
- List of COPCs.
- A hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures describing decontamination methods for equipment, structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the specific storage tank system.
- Methods for sampling and analysis of contaminated media.
- Removal procedures for contaminated media, if necessary.
- Sampling methods for decontamination media and hazardous waste determination. The discussion should include the rationale for using wash water samples, swipe samples, soil samples, and/or other sampling methodology.
- Sampling methods for decontamination verification procedures. The discussion should include the statistical or judgmental basis for determining the number of verification samples needed and the constituents to be analyzed.
- Sampling equipment decontamination and disposition procedures.
- Sample handling and documentation procedures.
- Analytical methods (including detection limits) and the rationale for their determination.
- Disposition of removed waste, decontamination media, or contaminated soils. This discussion should include an identification of proposed on- or off-site hazardous waste management facilities that may be used for final disposition and the types of wastes anticipated to be shipped.
- Decontamination criteria.
- Statistical basis for verification of decontamination, if applicable. The discussion should include information on determination of statistical increases in analytical parameters and numerical values for significant increases.
- Risk assessment procedures to be used, if necessary.
- Field and laboratory QA/QC procedures.

- Schedule of closure activities, including decontamination, sampling, analysis, potential removal of soils, and closure certification submittal.
- Identification of contact person or office.

F.2.5 REFERENCES

EPA, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *EPA-SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

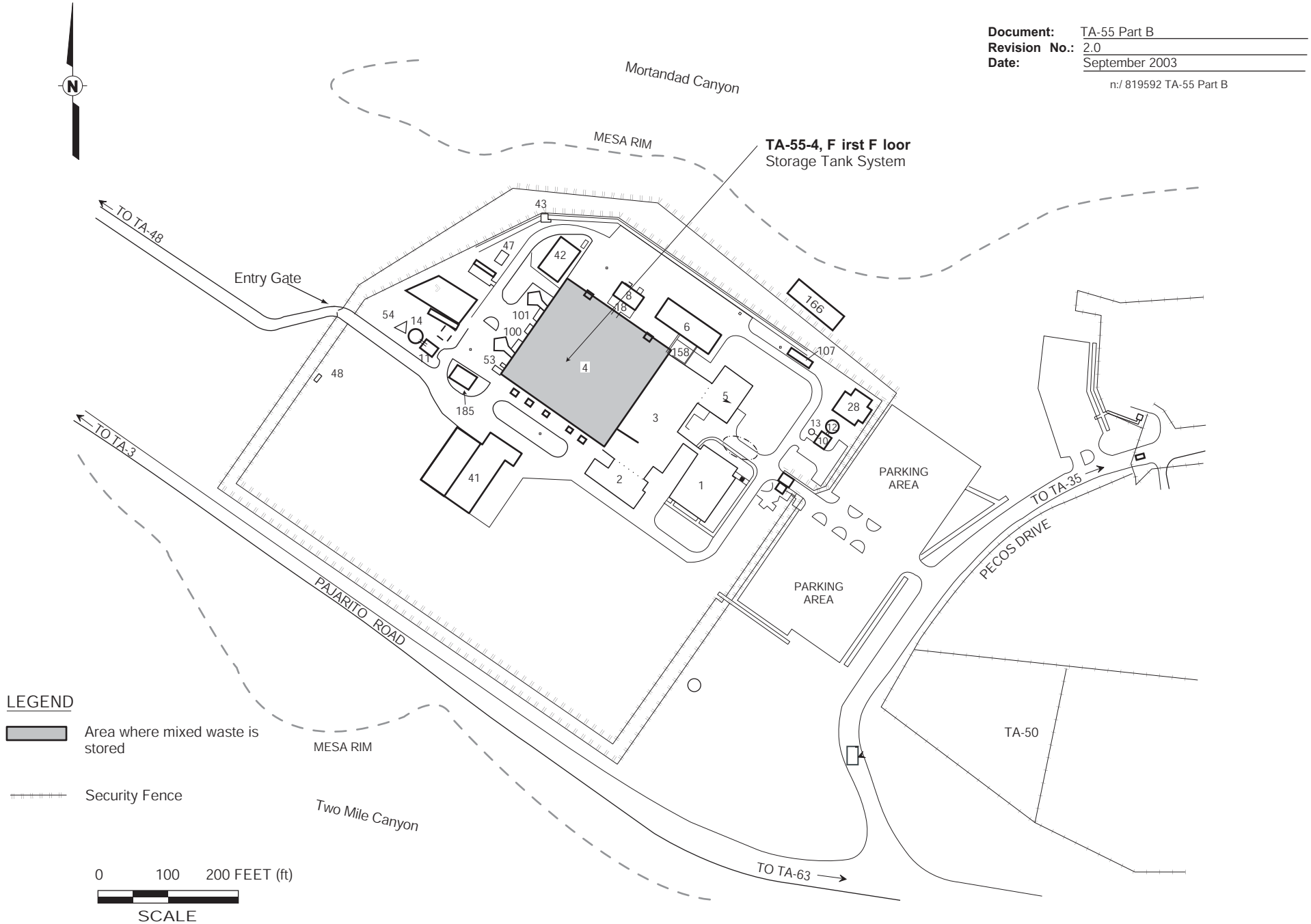

Figure F. 2-1
Storage Tank System at Technical Area (TA) 55

ATTACHMENT F.3

CLOSURE PLAN FOR THE TECHNICAL AREA 55 CEMENTATION UNIT

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F.3-1	Technical Area (TA) 55 Cementation Unit Location

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
COPC	constituents of potential concern
CSU	container storage unit
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
LANL	Los Alamos National Laboratory
LASO	Los Alamos Site Office
NMED	New Mexico Environment Department
NMT	Nuclear Materials Technology
NNSA	National Nuclear Security Administration
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SWRC	Solid Waste Regulatory Compliance
TA	technical area

ATTACHMENT F.3
CLOSURE PLAN FOR THE TECHNICAL AREA 55 CEMENTATION UNIT

The information provided in this closure plan is submitted to address the applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.14(b)(13), and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and X, revised June 14, 2000. This closure plan describes the activities necessary to perform Resource Conservation and Recovery Act (RCRA) closure for the cementation unit at Los Alamos National Laboratory (LANL) Technical Area (TA) 55. Closure activities will include removal of any remaining waste, decontamination or removal of contaminated equipment/structures, and verification that all residues have been removed. Closure will minimize the need for further maintenance, preclude the release of hazardous constituents to environmental medial, and be protective of human health in accordance with the closure performance standards specified in 20.4.1 NMAC §264.111 [6-14-00].

The cementation unit is located at TA-55-4, Room 401. It consists of a pH column, vacuum trap, two motor-driven mixers, four impellers, and piping inside of a glove box. Figure F.3-1 shows the location of the cementation unit. This closure plan will be used to provide guidance and permit conditions for the partial closure of the cementation unit. Closure will occur separately from the other waste management units at TA-55 and over the active life of the TA-55 facility, which is not anticipated to end before 2050.

This closure plan describes general closure and establishes the procedure of submitting a separate detailed sampling and analysis plan (SAP) to the New Mexico Environment Department (NMED) for approval at the time of closure. The SAP will alleviate the need for future closure plan and permit modification until the actual closure activities for the cementation unit are scheduled. The SAP will provide the required level of detail to assure that closure performance standards are met, consistent with the appropriate decontamination and verification requirements existing at the time of closure.

This plan is organized as follows:

- Section F.3.1 - General Closure Information.
- Section F.3.2 - Description of the Cementation Unit.
- Section F.3.3 - Closure Procedures.
- Section F.3.4 - Sampling and Analysis Plan.
- Section F.3.5 – References.

Until closure is complete and has been certified in accordance with 20.4.1 NMAC §264.115 [6-14-00], as discussed in Section F.3.1.6, a copy of the approved closure plan and any approved revisions will be on file at with Risk Reduction and Environmental Stewardship Division Solid Waste Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA) Los Alamos Site Office (LASO).

F.3.1 GENERAL CLOSURE INFORMATION

F.3.1.1 Closure Performance Standard [20.4.1 NMAC §264.111]

The cementation unit addressed in this closure plan will be closed to meet the following performance standards:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or atmosphere.
- Comply with the closure and post closure requirements of 20.4.1 NMAC, Subpart V, Part 264, Subparts G and X [6-14-00].

This will be accomplished by removal of waste from the cementation unit and decontamination, if necessary, of the areas that may have come into contact with wastes. Decontamination activities will ensure the removal of hazardous waste residues from the cementation unit to established cleanup levels.

F.3.1.2 Partial and Final Closure Activities [20.4.1 NMAC §§264.112 (b)(2) and 264.112(d)]

This closure plan has been written for partial closure rather than final closure of the entire LANL facility. Partial RCRA closure is the closure of a hazardous waste management unit at a facility that contains other active hazardous waste management units. Partial closure at TA-55 can consist of closing the cementation unit, while leaving the other units in operation. Partial closure (hereinafter referred to as closure) will be deemed complete when the waste has been removed from the cementation unit; all related secondary containment surfaces and equipment have been decontaminated, if necessary, or otherwise properly disposed; closure has been verified; and the closure certification has been submitted to and approved by the NMED.

Final RCRA closure of the LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each waste management unit, including all pervious closures

as well as land-based units where closures have been or are being addressed via alternative closure requirements. Final closure will be deemed complete when the closure certification has been submitted to the NMED, and the NMED has approved the final closure.

F.3.1.3 General Closure Schedule [20.4.1 NMAC §§264.112(b)(6), 264.112(e), and 264.113]

Written notification will be provided to the NMED 45 days before the start of closure activities for the TA-55 cementation unit. However, pursuant to 20.4.1 NMAC §264.112(e) [6-14-00], removing hazardous wastes and decontaminating or dismantling equipment in accordance with an approved closure plan may be conducted at any time before or after notification of closure. Closure activities will begin according to the requirements of 20.4.1 NMAC §264.112(d)(2) [6-14-00]. Treatment, removal, or disposal of hazardous wastes will begin in accordance with the approved closure plan, as required by 20.4.1 NMAC §264.113(a) [6-14-00], within 90 days after final receipt of waste at the cementation unit. In the event that closure activities cannot begin within 90 days, LANL will notify the Secretary of the NMED in accordance with the extension requirements in 20.4.1 NMAC §264.113(a) [6-14-00]. Closure activities and reporting requirements will then be completed within 180 days of the receipt of the final volume of waste at the cementation unit. Closure will be conducted in accordance with the schedule presented in Table F.3-1 of this closure plan.

Table F.3-1
Closure Schedule

Activity	Maximum Time Required [a]
Submit SAP.	-90 Days
Notify the NMED of intent to close.	-45 Days
Final receipt of waste.	Day 0
Remove waste.	Day 5
Decontaminate surfaces and equipment.	Day 20
Sample excess used decontamination water for disposal.	Day 20
Perform verification sampling.	Day 30
Evaluate analytical data from verification sampling.	Day 50
Perform additional decontamination, if necessary.	Day 55
Perform additional verification sampling, if necessary.	Day 60
Evaluate additional analytical data.	Day 75
Perform final clean up and disposal (i.e., removal of decontaminated equipment and decontamination waste).	Day 140
Certify closure.	Day 175
Submit closure certification to NMED.	Day 180

a The schedule above indicates calendar days from the beginning by which activities will be completed. Some activities may be conducted simultaneously and/or may not require the maximum time listed.

NMED = New Mexico Environment Department
SAP = sampling and analysis plan

Further details regarding the schedule of closure activities will be included with the SAP as discussed in Section F.3.4 of this closure plan. In the event that closure is prevented from proceeding according

to schedule, LANL will notify the Secretary of the NMED in accordance with extension request requirements in 20.4.1 NMAC §264.113(b) [6-14-00]. In addition, the demonstrations in 20.4.1 NMAC §264.113(a)(1) and (b)(1) [6-14-00], will be made in accordance with 20.4.1 NMAC §264.113(c) [6-14-00].

F.3.1.4 Amendment of the Closure Plan [20.4.1 NMAC §264.112(c)]

In accordance with 20.4.1 NMAC §264.112(c) [6-14-00], LANL will submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever:

- There are changes in operating plans or facility design that affect the closure plan.
- There is a change in the expected year of closure.
- Unexpected events occur during closure that require modification of the approved closure plan.

The written notification or request will include a copy of the amended closure plan for approval by the NMED.

LANL will submit a written request for a permit modification with a copy of the amended closure plan at least 60 days prior to the proposed change in unit design or operation or no later than 60 days after an occurrence of an unexpected event that affects the closure plan. If the unexpected event occurs during closure, the permit modification will be requested within 30 days of the occurrence. The Secretary of the NMED may request a modification of the closure plan under the conditions presented in the bulleted items above. LANL will submit a modified plan in accordance with the request within 60 days of notification, or within 30 days of notification if a change in facility condition occurs during the closure process.

F.3.1.5 Closure Cost Estimate, Financial Assurance, and Liability Requirements [20.4.1 NMAC §264.140(c)]

In accordance with 20.4.1 NMAC §264.140(c) [6-14-00], LANL, as a federal facility, is exempt from the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart H [6-14-00], to provide a cost estimate, financial assurance mechanisms, and liability insurance for closure actions.

F.3.1.6 Closure Certification [20.4.1 NMAC §264.115]

Within 60 days after completion of closure activities for the cementation unit or final closure of the facility, LANL will submit to the Secretary of the NMED, via certified mail, a certification that the unit or facility has been closed in accordance with the approved closure plan. The certification will be signed by the appropriate DOE/NNSA and LANL officials and by an independent, registered professional

engineer, in accordance with 20.4.1 NMAC §264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED upon request, as specified in 20.4.1 NMAC §264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both the DOE/NNSA LASO and SWRC.

F.3.1.7 Security

Because of the ongoing nature of waste management operations at TA-55, site security and administrative controls at the TA-55 waste management units will be maintained by the DOE/NNSA or another authorized federal agency for as long as necessary to prohibit public access. The security fence at TA-55 will be maintained to ensure that public access into TA-55 is prevented.

F.3.1.8 Closure Report

Upon completion of RCRA closure activities at the cementation unit, a closure report will be prepared and provided to the Secretary of the NMED. The report will document the closure and contain, for example, the following:

- A copy of the certification described in Section F.3.1.6 of this closure plan.
- A general summary of closure activities.
- Any variance from the approved activities and the reason for the variance.
- A summary of any sampling data associated with the closure.
- The location of the file of supporting documentation (e.g., memos, logbooks, laboratory data).
- Storage or disposal location of regulated hazardous/mixed waste resulting from closure activities.
- A certification of accuracy of the report.

F.3.1.9 Survey Plat and Post-Closure Requirements [20.4.1 NMAC §§264.116 and 264.117 through 264.120]

LANL intends to remove the /mixed waste and associated constituents from the cementation unit and decontaminate all surfaces and equipment to established cleanup levels or, if the cleanup levels cannot be achieved, to dispose of the contaminated surfaces and equipment. If decontamination to established cleanup levels is not achievable, LANL may propose an alternate demonstration of decontamination, as circumstances indicate. A survey plat, post-closure certification, and post-closure notices will not be required because all wastes will be removed and any surfaces and equipment will be decontaminated or disposed of at closure. Therefore, these requirements are not applicable for clean-closed units.

F.3.2 DESCRIPTION OF THE CEMENTATION UNIT

TA-55 is located on a mesa between a branch of Mortandad Canyon to the north and Two Mile Canyon to the south. Mesa-top elevations at TA-55 range from approximately 7,100 to 7,300 feet above mean sea level. TA-55 began operating in 1978 and is the location of research and development activities including a plutonium processing facility. The cementation unit is located at TA-55 in glovebox GB-454 along the west wall of TA-55-4, Room 401. The unit is used to stabilize mixed waste solutions into a cement matrix. It consists of a pH column, vacuum trap, two motor-driven mixers, four impellers, piping and glovebox.

LANL does not currently intend to reduce the design capacity of the cementation unit at TA-55 during the active life of the unit. Estimated annual quantities for the cementation unit at TA-55 are provided in the most recent version of the “Los Alamos National Laboratory General Part A Permit Application,” hereinafter referred to as the LANL General Part A.

F.3.2.1 Estimate of Maximum Waste Treated

The maximum total volume of mixed waste that may be in inventory in the cementation unit at any time is estimated at 150 gallons. Treatment at TA-55 using the cementation unit commenced in 1987 and is projected to continue until the facility is decommissioned in 2050. The estimated lifetime treatment capacity for the unit is approximately 226,800 gallons.

F.3.2.2 Description of Stored Waste

The cementation unit is used to treat liquid and solid mixed waste generated primarily from research and development activities and processing and recovery operations at TA-55 and at the Chemistry and Metallurgy Research Building at TA-3. The liquid wastes consist of evaporator bottoms solutions and laboratory solutions that exhibit the hazardous characteristics of corrosivity and toxicity (for metals) as

defined in 20.4.1 NMAC §261.22 and 261.24 [6-14-00], respectively. The solid process wastes consist of process residue from the evaporator, process leached solids, and filter cake. These waste streams exhibit the hazardous characteristics of toxicity (for metals) and corrosivity and are classified as mixed waste. Mixed waste has both a hazardous component (as defined by 20.4.1 NMAC, Subpart II, Part 261) and a radioactive component. Information on the hazardous components of the wastes that can be treated by cementation unit is provided in the most recent version of the LANL General Part A. Additional information on waste generating activities at LANL is available in the waste analysis plan in Appendix B of the most recent version of the LANL General Part B.

The estimated annual quantities of waste treated in the cementation unit are provided in the most recent version of the LANL General Part A.

F.3.3 CLOSURE PROCEDURES [20.4.1 NMAC §264.112(b)(4) and (5), and 264.114]

Closure will be conducted in accordance with the schedule presented in Table F.2-1, as amended by the SAP submitted at the time of closure. Closure will generally be conducted as follows:

- **Removal of Waste** – Treatment of any remaining solutions in the unit at the time of closure.
- **Preliminary Closure** - Safety precautions and background contaminant levels for the cementation unit will be assessed. Inspection of the secondary containment surfaces by the engineer observing the closure to ensure adequate containment and conditions for closure.
- **Decontamination** – Removal of potential hazardous waste constituents from equipment used during waste management activities; and all surfaces, walls, and secondary containment features (e.g., surfaces, sumps, berms, and/or recessed drains). Removal can include dismantling, sweeping, vacuuming, moping, and/or wiping as appropriate at the time of closure and based upon the contaminant levels determined by the operating record of the unit.
- **Verification** – Sampling to verify that residual hazardous waste constituents have been decontaminated to appropriate levels. Sample media can include swipes, solutions, and/or solid samples as appropriate and will be determined at the time of closure based upon the operating record of the unit.
- **Closure Certification** – Certification by a professional engineer that the procedures and requirements provided in this closure plan and the SAP were followed.

The following sections provide additional information for the closure procedures described above. The SAP provided at the time of closure will provide detailed information regarding the preliminary closure procedures, decontamination methods, and verifications procedures as applicable at the time of closure.

F.3.3.1 Removal of Waste

Prior to the initiation of closure activities, any waste remaining in the cementation unit will be removed or treated according to current waste-specific standard operating procedures. Once the waste has been removed or treated, the drum(s) of solidified waste will be removed and transported to an approved on-site facility or a permitted off-site treatment, storage, and disposal facility.

F.3.3.2 Preliminary Closure Procedures

F.3.3.2.1 Safety Precautions

Job hazards associated with closure activities will be identified, controls developed, and workers briefed before closure activities are conducted, in accordance with LANL safety procedures. Personnel involved in closure activities will wear appropriate personal protective equipment (PPE), specified by the Health Physics Group and the Industrial Hygiene and Safety Group, and will follow good hygiene practices to protect themselves from exposure to mixed waste. The level of PPE that will be required will depend upon the physical hazards present and the levels of contamination that are detected, if any. All workers involved in closure activities will be required to have appropriate training (as identified in Attachment D of this permit application and Appendix D in the most recent version of the LANL General Part B. Contaminated PPE will either be decontaminated or managed in compliance with appropriate waste management regulations.

F.3.3.2.2 Background Determination

Prior to the commencement of decontamination, the operating record will be evaluated to determine the constituents of potential concern (COPCs) during closure. In addition, background samples and/or concentrations derived from LANL studies developed under the LANL corrective action or other programs can be used to determine COPC background/baseline levels applicable at the time of closure. The COPCs, appropriate background levels, and/or necessary sample collection techniques will be determined at the time of closure and included in the SAP at the time of closure, as discussed in Section F.3.4 of this closure plan.

F.3.3.2.3 Structural Assessment

Prior to beginning decontamination activities, the glovebox and secondary containment associated with the cementation unit will be inspected for any cracks or conditions that would potentially lead to the loss of decontamination-liquid containment. Preventative maintenance inspections are conducted routinely (i.e., weekly). If any defects, deterioration, damage, or hazards affecting containment are discovered during inspection, appropriate remedial actions (including repairs, maintenance, or replacement) will be completed before decontamination activities begin. If a crack or gap is present, a

swipe sample or a representative sample of the media will be taken (e.g., concrete) to determine the presence of contamination. The sample will be analyzed for the COPCs identified based upon the operating history of the unit, as discussed in Section F.3.3.2.2. If contamination is detected, the surface flaw will be decontaminated prior to repairing the crack/gap. Complete or partial removal (e.g., cold milling) of the material may be performed until contamination is no longer detected. If partial removal is successful in eliminating the contamination, it will be assumed that the remaining material, including the underlying soil, is clean.

F.3.3.3 Decontamination Procedures

To the extent possible, all contaminated surfaces and equipment (if present) will be decontaminated. Surfaces, items, materials, and equipment that cannot be decontaminated will be containerized and managed in compliance with appropriate waste management regulations.

An appropriate surfactant/solvent to be used in wash water solutions will be determined based upon the COPCs identified in the SAP. Alconox®, a surfactant, will be used to decontaminate the cementation unit. Specialized solvents will be used for more focused decontamination/removal purposes, as appropriate.

F.3.3.3.1 Cementation Unit and Glovebox

The cementation unit equipment (e.g., pH column, vacuum trap, motor-driven mixers, impellers) and glovebox will either be decontaminated, decommissioned, or dismantled, depending on the extent of contamination and anticipated disposition or use after closure. If the cementation unit equipment and/or the glovebox is to be decommissioned or dismantled, the resulting components will be containerized and managed appropriately at an approved on-site facility, depending on the regulated constituents present. If the cementation unit equipment and/or the glovebox is to be decontaminated, Nuclear Materials Technology (NMT) personnel will use the following procedures.

Prior to decontamination of any of the cementation unit equipment, any visible material located inside the glovebox will be removed to the extent possible and managed in compliance with appropriate regulations. The cementation unit equipment (while located inside the glovebox) and interior surfaces of the glovebox will be rinsed or flushed with wash water or wiped down with cloths and/or other absorbent materials. Used wash water will be collected, removed, and transferred to an appropriate container for storage pending the results of analysis and disposal.

Verification of decontamination will be conducted as indicated in Section F.3.3.4. If the analysis from the verification indicates that mixed waste constituents are present, decontamination wash cycles and analyses will continue until the ancillary equipment has been decontaminated or the decision is made to manage it appropriately as contaminated waste. Upon determination that it is contaminated waste, the material/structure/surface may be removed, transported to, and stored at an appropriate container storage unit (CSU) to facilitate the closure process.

F.3.3.3.2 Ancillary Equipment

The cementation unit ancillary equipment located inside Room 401 (outside the glovebox) will either be decontaminated, decommissioned, or dismantled, depending on the extent of contamination and anticipated disposition or use after closure. If any of the cementation unit ancillary equipment is to be decommissioned or dismantled, the resulting components will be containerized and managed appropriately at an approved on-site facility, depending on the regulated constituents present. If decontamination measures are deemed appropriate, NMT personnel will use the following procedures for surface decontamination of the cementation unit ancillary equipment.

Random swipe samples from the areas adjacent to the cementation unit ancillary equipment (e.g., walls, floors, sumps, and drains) will be collected and analyzed for the COPCs expected to be present, based on the operating record. If decontamination measures are deemed necessary based on the analytical results, the following procedures will be used.

Decontamination will be conducted using mops, cloths, and/or other absorbent materials to remove any potential mixed waste constituents. These materials will be submerged in a wash water solution (e.g., Alconox, water) and used to wipe down the surfaces associated with the cementation unit. After decontamination of the surfaces, the containment system (e.g., recessed areas, sumps, berms) will be wiped down. Used wash water will be collected, removed, and transferred to an appropriate container for storage pending the results of analysis and disposal.

Verification of decontamination will be conducted as indicated in Section F.3.3.4. If the analysis from the verification indicates that mixed waste constituents are present, decontamination wash cycles and analyses will continue until the structure and surfaces have been decontaminated or the decision is made to manage it appropriately as contaminated waste. Upon determination that it is contaminated waste, the material/structure/surface may be removed, transported to, and stored at an appropriate CSU to facilitate the closure process.

F.3.3.3.3 Areas Adjacent to the Cementation Unit Glovebox

Random swipe samples from the areas adjacent to the cementation unit glovebox (e.g., walls, floors, sumps, and drains) will be collected and analyzed for the COPCs expected to be present, based on the operating record. If decontamination measures are deemed necessary based on the analytical results, the following procedures will be used.

Decontamination will be conducted using mops, cloths, and/or other absorbent materials to remove any potential mixed waste constituents. These materials will be submerged in a wash water solution (e.g., Alconox, water) and used to wipe down the surfaces associated with the areas adjacent to the cementation unit glovebox. After decontamination of the surfaces, the containment system (e.g., recessed areas, sumps, berms) will be wiped down. Used wash water will be collected, removed, and transferred to an appropriate container for storage pending the results of analysis and disposal.

Verification of decontamination will be conducted as indicated in Section F.3.3.4. If the analysis from the verification indicates that mixed waste constituents are present, decontamination wash cycles and analyses will continue until the structure and surfaces have been decontaminated or the decision is made to manage it appropriately as contaminated waste. Upon determination that it is contaminated waste, the material/structure/surface may be removed, transported to, and stored at an appropriate CSU to facilitate the closure process.

F.3.3.3.4 Equipment Used During Closure

Reusable protective clothing, tools, and equipment used during decontamination activities will be cleaned with a wash water solution. If reusable sampling equipment is used, sampling equipment rinsate blanks will be collected and analyzed in accordance with the quality assurance (QA)/quality control (QC) procedures to be described in the closure SAP. Reusable decontamination equipment, including protective clothing and tools used during closure activities will be scraped as necessary to remove any residue and cleaned with a wash water solution. Residue, disposable equipment and reusable equipment that cannot be decontaminated will be containerized and managed as waste in accordance with LANL waste management procedures, depending on the regulated constituents present.

F.3.3.4 Verification of Decontamination

Verification of decontamination will be conducted using sampling and analysis to demonstrate that hazardous waste residues are not present on the equipment and/or surfaces associated with the cementation unit (as applicable). Sample media can include wash water solutions, swipes, and/or

solid media samples (e.g., soil, concrete) as determined in the SAP at the time of closure and the operating record of the unit. The sampling methodology will be based on factors such as COPCs and the materials of construction. All sampling conducted during closure will be done in accordance with QA/QC procedures defined by "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (*SW-846)* (U.S. Environmental Protection Agency [EPA], 1986). The SAP will establish the minimum number of verification samples to be collected based on the total surface area associated with the unit. Verification sampling will use a biased random approach for the determination of sample locations for the equipment, structures, and/or surfaces and will include known or likely areas of contamination (e.g., low areas, sumps, and known spill locations) as determined by the operating record of the unit at the time of closure.

Decontamination will be verified if the analytical data from the collected samples meets at least one of the decontamination criteria listed in Section F.3.3.5 of this closure plan. If the data cannot meet at least one of the criteria, additional sampling can be performed to establish the boundaries of the contamination. Decontamination, as discussed in Section F.3.3.3, will be repeated within those boundaries, using portable berms or other appropriate materials to limit the potential for runoff from the affected area. An additional round of verification sampling will be performed for all of the areas previously determined to be contaminated. After each decontamination/verification sequence, a decision will be made to repeat or remove the contaminated materials and dispose of them properly.

F.3.3.5 Decontamination Criteria

Successful decontamination will consist of sampling as specified in the component-specific SAP and meet one of the following criteria:

- No detectable hazardous waste or hazardous waste constituents from cementation unit activities are identified in the verification sample.
- Detectable hazardous waste or hazardous waste constituents from cementation unit in the verification sample are removed to statistically significant levels based on concentrations in the background/baseline samples.
- Detectable hazardous waste or hazardous waste constituents from cementation unit in the verification sample are at or below levels agreed upon with the NMED.
- Detectable hazardous waste or hazardous waste constituent concentrations from cementation unit activities do not significantly decrease after several wash downs. In such an event, hazardous constituents that pose an acceptable risk will be allowed to remain, as mutually agreed upon with the NMED.

An alternative demonstration of decontamination may be proposed and justified at the time of closure as circumstances dictate. The NMED will evaluate the proposed alternative in accordance with the

standards and guidance then in effect and, if approved, LANL will incorporate the alternative into the SAP at the time of closure.

F.3.4 SAMPLING AND ANALYTICAL PROCEDURES [20.4.1 NMAC §264.112(b)(4)]

Sampling and analysis will be performed using standard approved methods (e.g., *SW-846*, American Society for Technology and Materials), as appropriate, for making closure decontamination verification determinations. LANL will submit a SAP to the NMED at the time of closure notification for review and approval. The SAP will provide a detailed description of the cementation unit and propose a closure methodology that assures the closure performance standards in Section F.3.1.1 are met.

The SAP will include at a minimum the following information:

- A detailed discussion of site characteristics.
- The cementation unit, ancillary equipment and/or associated glovebox operational history, to include descriptions of known spills, releases, and/or evidence of potential problems (e.g., visual stains, dead vegetation, solid waste management units).
- Chemical properties of the waste stored and processed at the unit and/or glovebox.
- Determination of applicable COPCs.
- A hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures describing decontamination methods for equipment, structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the unit and/or glovebox.
- Methods for sampling and analysis of contaminated media.
- Removal procedures for contaminated media, if necessary.
- Sampling methods for decontamination media and hazardous waste determination. The discussion should include the rationale for using wash water samples, swipe samples, soil samples, and/or other sampling methodology.
- Sampling methods for decontamination verification procedures. The discussion should include the statistical or judgmental basis for determining the number of verification samples needed and the constituents to be analyzed.
- Sampling equipment decontamination and disposition procedures.
- Sample handling and documentation procedures.
- Analytical methods (including detection limits) and the rationale for their determination.
- Disposition of removed waste, decontamination media, or contaminated soils. This discussion should include an identification of proposed on- or off-site hazardous waste management

facilities that may be used for final disposition and the types of wastes anticipated to be shipped.

- Decontamination criteria.
- Statistical basis for verification of decontamination, if applicable. The discussion should include information on determination of statistical increases in analytical parameters and numerical values for significant increases.
- Risk assessment procedures to be used, if necessary.
- Field and laboratory QA/QC procedures.
- Schedule of closure activities, including decontamination, sampling, analysis, potential removal of soils, and closure certification submittal.
- Identification of contact person or office.

F.3.5 REFERENCES

EPA, 1986 and all approved updates, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *EPA-SW-846*, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

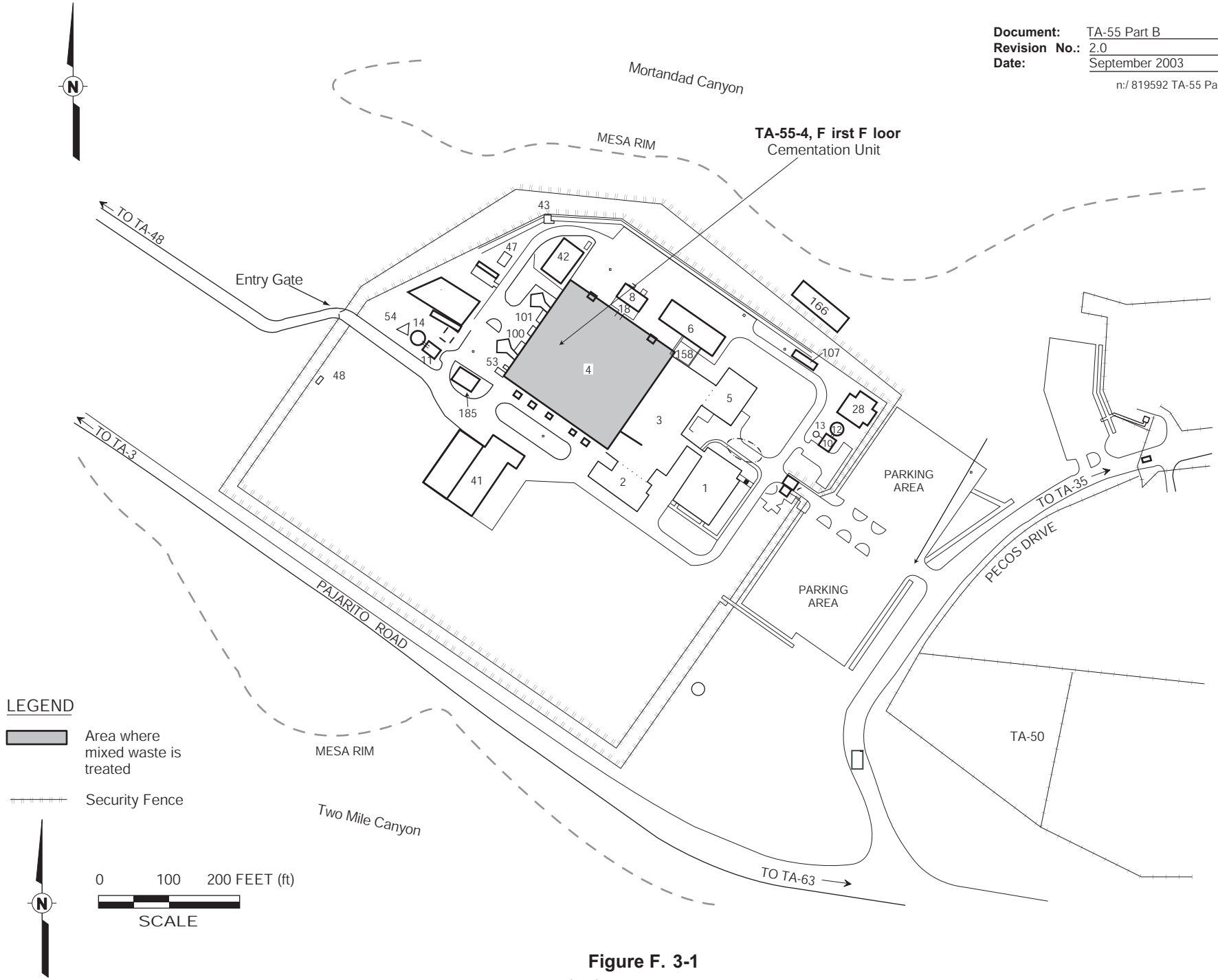

Figure F. 3-1
Technical Area (TA) 55 Cementation Unit Location

ATTACHMENT G

CONTAINER STORAGE

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LIST OF SUPPLEMENTS

SUPPLEMENT NO.	TITLE
G.1	Manufacturer's Information on Waste Containers and Containment Units

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CSU	container storage unit(s)
DOT	U.S. Department of Transportation
ft	feet/foot
gal	gallon
in.	inches
LANL	Los Alamos National Laboratory
m^3	cubic meters
ppmw	parts per million by weight
SWB	standard waste box
TA	technical area

ATTACHMENT G
CONTAINER STORAGE

The information provided in this section is submitted to address the applicable container storage requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.15 and 20.4.1 NMAC, Subpart V, Part 264, Subpart I, revised June 14, 2000 [6-14-00]. This section provides detailed descriptions of the seven container storage units (CSU) located at Technical Area (TA) 55. Detailed engineering drawings are provided as Figures G-1 through G-3 and are provided for informational purposes only. Table G-1 summarizes applicable regulatory references for container storage and the corresponding location where the requirement is addressed in this document.

G.1 CONTAINER STORAGE AT TA-55

TA-55 is located in the north central portion of Los Alamos National Laboratory on a mesa between a branch of Mortandad Canyon on the north and Two Mile Canyon on the south. TA-55 is a plutonium processing facility, which began operating in 1978. Hazardous and mixed waste container storage at TA-55 is conducted at seven CSUs. These CSUs are identified as B40, B05, K13, B45, the Vault, the Container Storage Pad, and TA-55-185. The following sections provide general dimensions, containment features, and materials of construction for each CSU to satisfy the requirements of 20.4.1 NMAC §270.15(a)(1) and (2) [6-14-00].

G.1.1 B40

The B40 CSU is used to store containers of hazardous and mixed waste that may contain liquids. (B40 was described as Area 1 in previous permitting applications.) B40 is located in the southwest section of the TA-55-4 basement, as shown on Figure G-1. The CSU is L-shaped and has long dimensions of 61.5 by 55 feet (ft). The maximum storage capacity of this unit is 21,500 gallons (gal), the equivalent of 391 55-gal drums. The types of waste containers holding hazardous or mixed waste that are stored in B40 include 5-, 10-, 12-, 15-, 30-, 55-, and 85-gal drums; large waste boxes; special order waste boxes; and standard waste boxes (SWB).

G.1.2 B05

The B05 CSU is used to store containers of hazardous and mixed waste that do not contain liquids. (B05 was described as Area 3 in previous permitting applications.) B05 is located in the southwest section of the TA-55-4 basement, as shown in Figure G-1. The CSU is rectangular shaped and is 26 ft long by 10 ft wide. The maximum storage capacity of this unit is 3,600 gal, the equivalent of 66

55-gal drums. The types of waste containers holding hazardous or mixed waste that will be stored in B05 include 30-, 55-, and 85-gal drums, large waste boxes; and SWBs.

G.1.3 K13

The K13 CSU is used to store containers of hazardous and mixed waste that may contain liquids. (K13 was described as Area 4 in previous permitting applications.) K13 is located in the northwest section of the TA-55-4 basement, as shown on Figure G-1. The CSU is rectangular shaped and is 16 ft long by 13 ft wide. The maximum storage capacity of this unit is 2,500 gal, the equivalent of 46 55-gal drums. The types of waste containers holding hazardous or mixed waste that will be stored in K13 include 0.25-, 0.5-, 0.75-, 1-, 2-, 4-, and 6-liter/quart containers; 5-, 10-, 12-, and 15-gal containers; 30-, 55-, and 85-gal drums; and large waste boxes.

G.1.4 B45

The B45 CSU is used to store containers of hazardous and mixed waste that do not contain liquids. (B45 was described as Area 5 in previous permitting applications.) B45 is located in the northeast section of the TA-55-4 basement, as shown on Figure G-1. The CSU is rectangular shaped and is 45 ft long by 17.5 ft wide. The maximum storage capacity of this unit is 11,000 gal, the equivalent of 200 55-gal drums. The types of waste containers holding hazardous or mixed waste that will be stored in B45 include 5-, 10-, 12-, and 15-gal containers; 55- and 85-gal drums; large waste boxes; and SWBs.

G.1.5 Vault

The Vault CSU is used to store containers of mixed waste that may contain liquids. (The Vault was described as Area 6 in previous permitting applications.) The Vault is located along the eastern wall of the basement at TA-55-4, as shown on Figure G-1, and is approximately 79.5 ft long by 50.5 ft wide. The maximum storage capacity of this unit is 4,000 gal, the equivalent of approximately 73 55-gal drums. The types of waste containers holding mixed waste that will be stored in the Vault include 0.25-, 0.5-, 0.75-, 1-, 2-, 4-, and 6-liter/quart containers; and 5-, 10-, 12-, 15-, 30- and 55-gal drums.

G.1.6 Container Storage Pad

The Container Storage Pad is used to store containers of hazardous and mixed waste that may contain liquids. The pad is located outside and northwest of TA-55-4, as shown on Figure G-2. It was installed in the mid-1980s and is constructed of asphaltic-concrete with a variable thickness of 4 to 6 inches (in.). The Container Storage Pad CSU is shaped like a trapezoid and measures 102 ft, 86 ft,

156 ft, and 105 ft. It also includes a rectangular strip measuring 70 ft by 10 ft on the southeast side. The pad is sloped, is elevated 2 to 4 in. above ground level, and has a culvert beneath the pad running from the northwest side to the southeast corner to minimize run-on of precipitation. The storage capacity of this area is 135,000 gal, the equivalent of approximately 2,455 55-gal drums. The types of waste containers holding hazardous or mixed waste that will be stored on the container storage pad include 0.25-, 0.5-, 0.75-, 1-, 2-, 4-, and 6-liter/quart containers; 30-, 55-, and 85-gal drums; SWBs; large waste boxes; and 5-, 10-, 12-, and 15-gal containers.

G.1.7 TA-55-185

TA-55-185 will be used to store containers of hazardous and mixed waste that do not contain liquids. TA-55-185 is located west of TA-55-4, as shown on Figure G-3. The building was constructed in 1991 and consists of a steel frame with fiberglass insulation, metal walls, and a concrete floor. The TA-55-185 CSU will be approximately 60 ft long by 40 ft wide, and will have a maximum storage capacity of 30,000 gal, the equivalent of 546 55-gal drums. The types of waste containers holding hazardous or mixed waste that will be stored at TA-55-185 include 30-, 55-, and 85-gal drums; large waste boxes; and SWBs.

G.2 CONTAINMENT SYSTEMS [20.4.1 NMAC §§270.15(a)(1-5) and 270.15(b)(1-2)]

The B40, K13, Vault, and Container Storage Pad CSUs will be used to store liquid and/or potentially liquid-bearing wastes; therefore, the requirements of 20.4.1 NMAC §264.175(b) [6-14-00] are applicable for these CSUs. Table G-2 provides the secondary capacity associated with each of these CSUs.

Secondary containment at B40, K13, and the Vault CSUs is primarily provided by self-containment pallets, covered self-containment pallet, single-drum pallets, or storage cabinets. Secondary containment at the Container Storage Pad CSU is provided by covered self-containment pallets. Each containment system is described below.

- Self-Containment Pallet: Molded high-density polyethylene base with a fiberglass grating that elevates the containers over a reservoir that is capable of containing leaks and spills from the containers.
- Covered Self-Containment Pallet: Molded, chemical-resistant, high density polyethylene with a removable polyethylene grating and a hinged two-part cover, which is impervious to precipitation. Supplement G-1 provides detailed information on the covered self-containment pallets.

- Single-Drum Containment Pallet: An 85-gal container made of heavy-duty polyethylene designed to hold one 55-gal drum.

- Cabinet: An epoxy-enamel-coated steel frame with a base that has a raised, leakproof sill. Each shelf is lined with a high-density polyethylene tray that is capable of containing leaks and spills from containers.

The B40, K13, and Vault CSUs are located in the basement of TA-55-4. This basement has a recessed floor that provides another level of containment for the liquid wastes stored there. The floor consists of a 10-in.-thick reinforced concrete slab that is free of cracks and gaps, is compatible with the wastes stored in the area, will effectively prevent the migration of waste to the environment, and is capable of collecting releases and accumulated liquids until the material is removed. Each of these containment systems will hold, at a minimum, 10 percent of the volume of the potential liquid-bearing containers or the volume of the largest potential liquid-bearing container stored, whichever is greater, pursuant to the requirements of 20.4.1 NMAC §264.175(b)(3) [6-14-00]. Containers holding hazardous or mixed waste in each CSU will be protected from potential contact with accumulated liquids by either being elevated or stored in an area that is designed and operated to remove accumulated liquids.

The B05, B45, and TA-55-185 CSUs will be used to store containers with only non-liquid bearing waste (i.e., solid form). These CSUs all reside in a building; therefore, run-on and run-off from storm events are not applicable. In the event of a water leak from facility systems, the TA-55-4 basement has sumps to contain the liquid. Drummed waste containers are placed on pallets or stored in self-containment structures. SWBs will be placed on pallets. Large waste boxes are elevated by design. All waste items in TA-55-185 will either be placed on pallets or are elevated by design.

G.3 SPECIAL REQUIREMENTS FOR IGNITIBLE, REACTIVE, AND INCOMPATIBLE WASTES [20.4.1 NMAC §270.14(b)(9), §270.15(c) and (d) and 20.4.1 NMAC §§264.17, 264.176, and 264.177]

Ignitable or reactive waste is stored at the K13 and B40 CSUs and on the Container Storage Pad. Pursuant to 20.4.1 NMAC §264.17 [6-14-00], LANL will follow specific waste management procedures for ignitable and reactive waste as discussed in Section 2.1.9 of this permit application.

Ignitable, reactive, and incompatible wastes will not be stored at B05, B45, and the Vault or at TA-55-185; therefore, the requirements of 20.4.1 NMAC §264.17, and 20.4.1 NMAC §270.15(c) and (d) [6-14-00] do not apply at these CSUs.

G.4 AIR EMISSION STANDARDS FOR CONTAINERS

This section addresses potential applicability of 20.4.1 NMAC, Subpart V, Part 264, Subpart CC [6-14-00], "Air Emission Standards for Tanks, Surface Impoundments, and Containers" to containers at TA-55, based on applicability criteria specified in 20.4.1 NMAC §264.1080 [6-14-00]. Subpart CC standards for containers require that containers of hazardous waste be covered or controlled so that there are no detectable emissions. These standards are not applicable to containers of radioactive mixed waste. The standards are also not applicable to containers of hazardous waste with less than 500 parts per million by weight (ppmw) volatile organics, containers that have received waste prior to the effective date of regulation (December 6, 1996), or containers of less than 0.1 cubic meters (m^3) (approximately 26 gal) capacity. LANL requires that Subpart CC requirements be met by the generator as part of the waste characterization process. The generator determines the concentration of volatile organics in a waste stream at the point of generation. The generator documents this determination for that waste stream, as described in Appendix B of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

Containers of less than 0.46 m^3 (approximately 119 gal) capacity and that meet U.S. Department of Transportation (DOT) specifications under the Code of Federal Regulations, Title 49, Part 178, will be kept closed during storage pursuant to 20.4.1 NMAC §264.1086(b)(1)(ii) [6-14-00]. Containers undergoing waste characterization activities may be open for access for the purposes described in 20.4.1 NMAC §264.1086(c) [6-14-00]. Containers of greater than 0.46 m^3 capacity that contain waste with greater than 500 ppmw volatile organics or those that are greater than 0.1 m^3 capacity, do not meet DOT specifications, and contain wastes of greater than 500 ppmw volatile organics will be subject to a visual inspection and monitoring program as required by 20.4.1 NMAC §264.1088(b) [6-14-00].

Table G-1
Use and Management of Containers
Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.15	Specific information requirements for containers:	G.0
§270.15(a)	A description of the containment system to demonstrate compliance with §264.175 including at a minimum:	G.2
§270.15(a)(1)	Basic design parameters, dimensions, and materials of construction	G.1
§270.15(a)(2)	How the design promotes drainage or how containers are kept from contact with standing liquids in the containment system	G.2
§270.15(a)(3)	Capacity of the containment system relative to the number and volume of containers to be stored	G.2
§270.15(a)(4)	Provisions for preventing or managing run-on	G.2
§270.15(a)(5)	How accumulated liquids can be analyzed and removed to prevent overflow	G.2
§270.15(b)	For storage areas that store containers holding wastes that do not contain free liquids, a demonstration of compliance with §264.175(c) including:	G.2
§270.15(b)(1)	Test procedures and results or other documentation or information to show that the wastes do not contain free liquids	G.2
§270.15(b)(2)	A description of how the storage area is designed or operated to drain and remove liquids or how containers are kept from contact with standing liquids	G.2
§270.15(c)	Sketches, drawings, or data demonstrating compliance with §264.176 (location of buffer zone and containers holding ignitable or reactive wastes) and §264.177(c) (location of incompatible wastes), where applicable	G.3
§270.15(d)	Where incompatible wastes are stored or otherwise managed in containers, a description of the procedures used to ensure compliance with §264.177(a) and (b) and §264.17(b) and (c)	G.3
§270.15(e)	Information on air emission control equipment as required in §270.27	G.4
§270.27(a)	Specific information requirements for air emission controls	G.4
§270.27(a)(2)	Identification of each container area subject to the requirements of §264, Subpart CC and certification by the owner or operator that the requirements are met	G.4
§270.27(a)(3)	Documentation that each enclosure used to control air emissions from containers are in accordance with the requirements of §264.1086(b)(2)(I) includes information prepared by the owner or operator or manufacturer or vendor describing the enclosure design and certification that the enclosure meets the specifications listed in §265.1087(b)(2)(ii)	NA[a]
§270.27(a)(5)	Documentation for each closed-vent system and control device installed in accordance with the requirements of §264.1087 that includes design and performance information as specified in §270.24 (c) and (d)	NA
§270.27(a)(6)	An emission monitoring plan for both Method 21 and control device monitoring methods. The plan must include:	NA
§270.27(a)(7)	Implementation schedule	NA

a NA = not applicable

Table G-2
Container Storage Unit Maximum Storage and Containment Capacities

Container Storage Unit	Maximum Capacity (gallons)	Containment Systems	Containment Capacity (gallons)
B40	21,500	Self-Containment Pallets	112 [a]
		Single-drum Containment Pallets	55
		TA-55-4, Basement	46,258
		Covered Self-Containment Pallets	112[a]
K13	3,400	Self-Containment Pallets	112 [a]
		Single-drum Containment Pallets	55
		TA-55-4, Basement	46,258
		Cabinets	20
		Covered Self-Containment Pallets	112[a]
Vault	4,000	Self-Containment Pallets	112 [a]
		TA-55-4, Basement	46,258
B05	3,600	NA	NA
B45	11,000	NA	NA
TA-55-185	30,000	NA	NA
Container Storage Pad	135,000	Covered Self-Containment Pallets	112[a]

[a] No more than 110 gallons (i.e., two 55-gallon drums) of free liquid will be stored on an individual containment pallet.

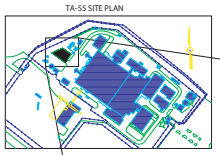
NA = Not Applicable because this CSU is used to store solid waste only.

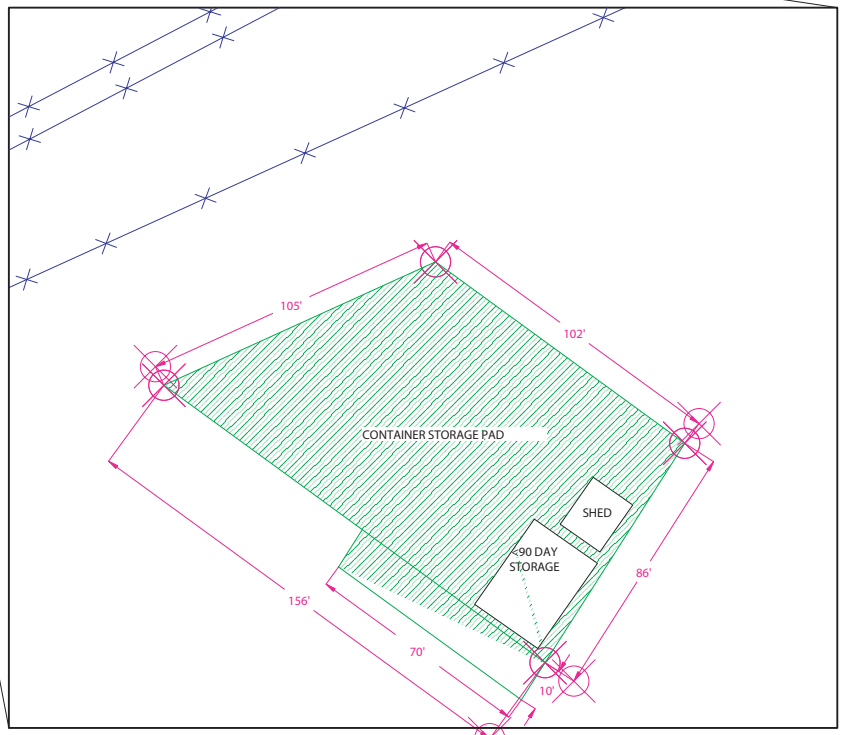
Table G-3
Capacity Calculations for Containment Systems

Containment System	Length (feet)	Width (feet)	Depth (inches)	Capacity (cubic feet)	Capacity (gallons)
Self-Containment Pallet and Covered Self-Containment Pallet	4.3	2.1	20	15	112[a]
TA-55-4, Basement	280	265	1	6,183	46,258
Cabinet	1.5	3.6	6	2.7	20

[a] No more than 110 gallons (i.e., two 55-gallon drums) of free liquid will be stored on an individual containment pallet.

Figure G-1 has been provided confidentially under separate cover.





GENERAL NOTES

1. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST FOOT.
2. TA-55-4 LOCATED APPROXIMATELY 140 FEET EAST OF CONTAINER STORAGE PAD.
3. SEE THE TABLE BELOW FOR DETAILS ABOUT THE MAXIMUM CAPACITY, WASTE TYPES AND CONTAINER TYPES FOR THE CSU.

CSU	MAXIMUM CAPACITY	WASTE TYPES	CONTAINER TYPE
CONTAINER STORAGE PAD	135,000	SOLID/LIQUID HAZARDOUS AND MIXED	0.25-, 0.50-, 0.75-, 1-, 2-, 4-, 6-LITER/QUART CONTAINERS; 5-, 10-, 12-, AND 15-GALLON CONTAINERS; 30-, 55-, AND 85-GALLON DRUMS; LARGE WASTE BOXES; AND STANDARD WASTE BOXES

LEGEND

CONTAINER STORAGE UNIT

CHAIN LINK SECURITY FENCE

Figure G-2
Technical Area 55
Container Storage Pad

NOT FOR CONSTRUCTION

N

TECHNICAL AREA 55, CONTAINER STORAGE PAD

SCALE: 1/16"=1'-0"

0 2' 4' 8' 16'

1/16"=1'-0"

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™ Environmental & Infrastructure, Inc.

LOS ALAMOS

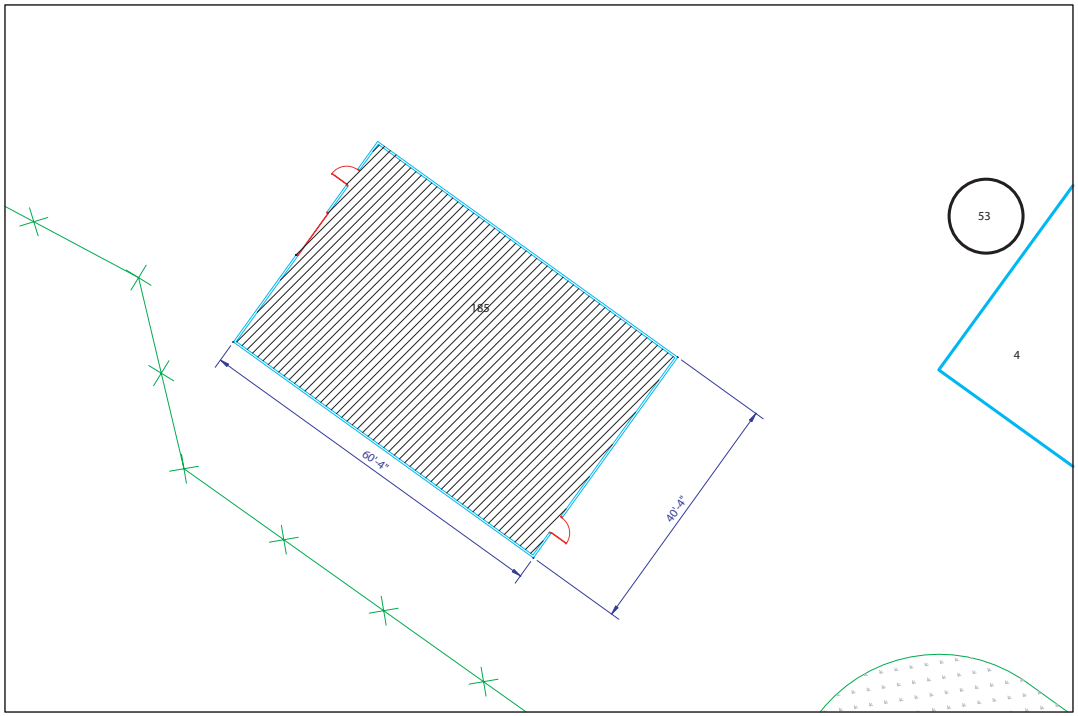
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO 87545

TECHNICAL AREA 55
CONTAINER STORAGE UNITS

TECHNICAL AREA 55
CONTAINER STORAGE PAD

BLDG. TA- 55-

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/03	APPROVED	J. GRIFFIN 7/24/03
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/03	SHEET NO. G-2	2 OF 3
PROJECT ID 819592.29			DRAWING NO.				REVISION NO. 2



GENERAL NOTES:

1. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST INCH.
2. SEE TABLE BELOW FOR THE MAXIMUM CAPACITY, WASTE TYPES, AND CONTAINER TYPES FOR THE CSU.

CSU	MAXIMUM CAPACITY	WASTE TYPES	CONTAINER TYPES
TA-55-185	30,000	SOLID HAZARDOUS AND MIXED	30-, 55-, AND 85-GALLON DRUMS; LARGE WASTE BOXES; AND STANDARD WASTE BOXES

LEGEND

CONTAINER STORAGE UNIT

CHAIN LINK SECURITY FENCE

N

TECHNICAL AREA 55, BUILDING 185, CONTAINER STORAGE UNIT

SCALE: 1/16"=1'-0"

0 4' 8' 16' 32'

1/16"=1'-0"

Figure G-3

Technical Area 55, Building 185, Container Storage Unit

NOT FOR CONSTRUCTION

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™ Environmental & Infrastructure, Inc.

LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TECHNICAL AREA 55
CONTAINER STORAGE UNITS

TECHNICAL AREA 55, BUILDING 185
CONTAINER STORAGE UNIT

BLDG. 185 TA- 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/00	APPROVED	J. GRIFFIN 7/24/00
DRAWN	A. MARTINEZ	7/22/00	SUBMITTED	J. GRIFFIN	7/24/00	SHEET NO. G-3	3 OF 3
PROJECT ID 819592.29			DRAWING NO.				REVISION NO. 2

Supplement G-1

Engineering Details and Technical Specifications for Structures, Coatings, Liners, PermaCon®, Metal Pallets, and Secondary Containment Pallets at the Area L, Area G, and TA-54 West Container Storage Units

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specification for Storage Domes at Technical Area 54

The Construction, Exhibition, Hazardous Waste, Military, Prison and Warehouse Shelter Systems by *SPRUNG* Instant Structures

THE STRUCTURE

Designed and engineered on the principle of the "Membrane Stress Theory" the structure is the result of almost a decade of intensive research and development. The Sprung Instant Structure is constructed from extruded aluminum arches, integrally connected to an all-weather outer membrane of P.V.C. coated polyester scrim. This synthetic fabric is certified flame retardant.

APPLICATION

Sprung Instant Structures are the answer to any need for enclosed space, quickly and economically, especially where transportation is difficult and speed of installation is essential. Aesthetically pleasing, the structures are available in different colours and sizes, and are suited to both the city and country environments.

ENGINEERING

Sprung Structures may be designed to meet special requirements or to comply with local and special usage codes and standards. By design the structures shed snow, however they can be designed to meet any loading requirement. They also withstand high winds and hail. Standard pre-engineered drawings are available upon request.

FLEXIBILITY

The free-span structure can be erected quickly, and needs little or no surface preparation. The modular design allows built-up areas of unlimited length, easy extension of existing structures and quick dismantling and re-location.

TECHNICAL SPECIFICATIONS

Width:	Feet Meters	30 (9.14)	40 (12.19)	50 (15.24)	60 (18.29)	88.6 (27)	120 (36.58)
Module Length:	Feet Meters	9.84 (3)	9.84 (3)	9.84 (3)	9.84 (3)	9.84 (3)	15 (4.57)
Height:	Feet Meters	15.9 (4.8)	18.4 (5.6)	23.6 (7.2)	26.2 (8)	35.9 (10.9)	58 (17.7)
Weight:	lbs./sq. ft. kgs./m²	1.5 (7.3)	1.5 (7.3)	1.5 (7.3)	1.5 (7.3)	2.5 (12.2)	3.6 (17.6)

Sprung Instant Structures Inc.

OFFICES IN: San Francisco, Ca. Fontana, Ca. Houston, Tx. Allentown, Pa. Atlanta, Ga.

Toll Free
1-800-528-9899

MODULAR RELOCATABLE STRUCTURES
Available From Inventory

Doors: A personnel door is provided with each structure. Doors can be placed in virtually any panel to meet your requirements.

Additional doors, double personnel doors, single or double personnel doors complete with panic hardware, vehicle doors and oversize vehicle doors are also available as optional extras.

Drainage: Drainage should be provided around the pad to permit adequate dissipation of rain water.

Asphalt, concrete or gravel pads should be crowned to assist in water runoff.

Equipment: All hand tools required for erection will be provided. It will be the customer's responsibility to provide a crane or cherry picker for a short period of time to erect structures 50 feet (15.24 m) wide to 88.6 feet (27 m) wide.

Scaffolding must also be supplied by the customer.

Erection: Erection, with a normal sized crew, should proceed at the rate of 1200 to 1500 square feet (110 to 140 sq. m.) per day, weather permitting. When necessary, this figure can be increased significantly by increasing the work force or extending the work day past 8 hours, or a combination of both. Dismantling should proceed at double this rate.

An erection consultant will be provided to direct the erection of the structure by the customer's unskilled work force. The consultant's transportation at cost, and living expenses are the customer's responsibility. The consultant will also be provided on the same terms for the dismantling of leased structures.

Fabric: The fabric is a durable P.V.C. coated polyester scrim treated with inhibitors to prevent degeneration from the ultraviolet rays of the sun and it is fire retardant (i.e. self-extinguishing). Normal life expectancy is 10 to 12 years. We provide a five year pro-rata guarantee.

Footings: Reasonably flat and firm ground requires no preparation or foundation for structures up to 60 feet (18.29 m) in width. Anchorage is obtained with two drift pins at each column base plate. Specific anchor systems are used for sand and muskeg. Structures 88.6 feet wide (27 m) should have concrete footings, if a concrete pad is not being installed. Alternative methods are available if ground conditions meet certain criteria.

Freight: Domestic sales are quoted "knocked down" F.O.B. Plant. International sales are quoted C+F Seaport, Country of Destination.

Return freight on all leases, is to the customer's account.

Labour: It is the customer's responsibility to provide a work force of 6-10 unskilled labourers for erection of single structures up to 88.6 feet in width.

Lease: Leases are available in North America for a minimum of one year, with the option to renew semi-annually, as often as required.

Patents: Patents are held in Canada, the United States and throughout the world.

Permits: It is the customer's responsibility to obtain all necessary building and/or development permits, licenses or clearances of any type for erection and use of the structure.

Purchase Option: Leases will have a purchase option exercisable anytime within 12 months from commencement, upon payment of the purchase price in full. Provided that lease payments have been made on time, a credit of 50% of paid lease amounts will be applied to the purchase.

Options to purchase will EXPIRE at the end of the first year of the lease.

Rental: Month to month rentals can be entered into subject to product availability.

Repairs: Fabric and components can be repaired or replaced in a minimum time frame without affecting the stability of the structure.

Taxes: All taxes and fees of any type are payable by the purchaser.

erms:

Sales: 50% with order. Balance due upon erection O.A.C.

Leases: 50% of lease payment plus all options with order. 50% of lease payment payable semi-annually in advance until lease cancelled by lessee. O.A.C.

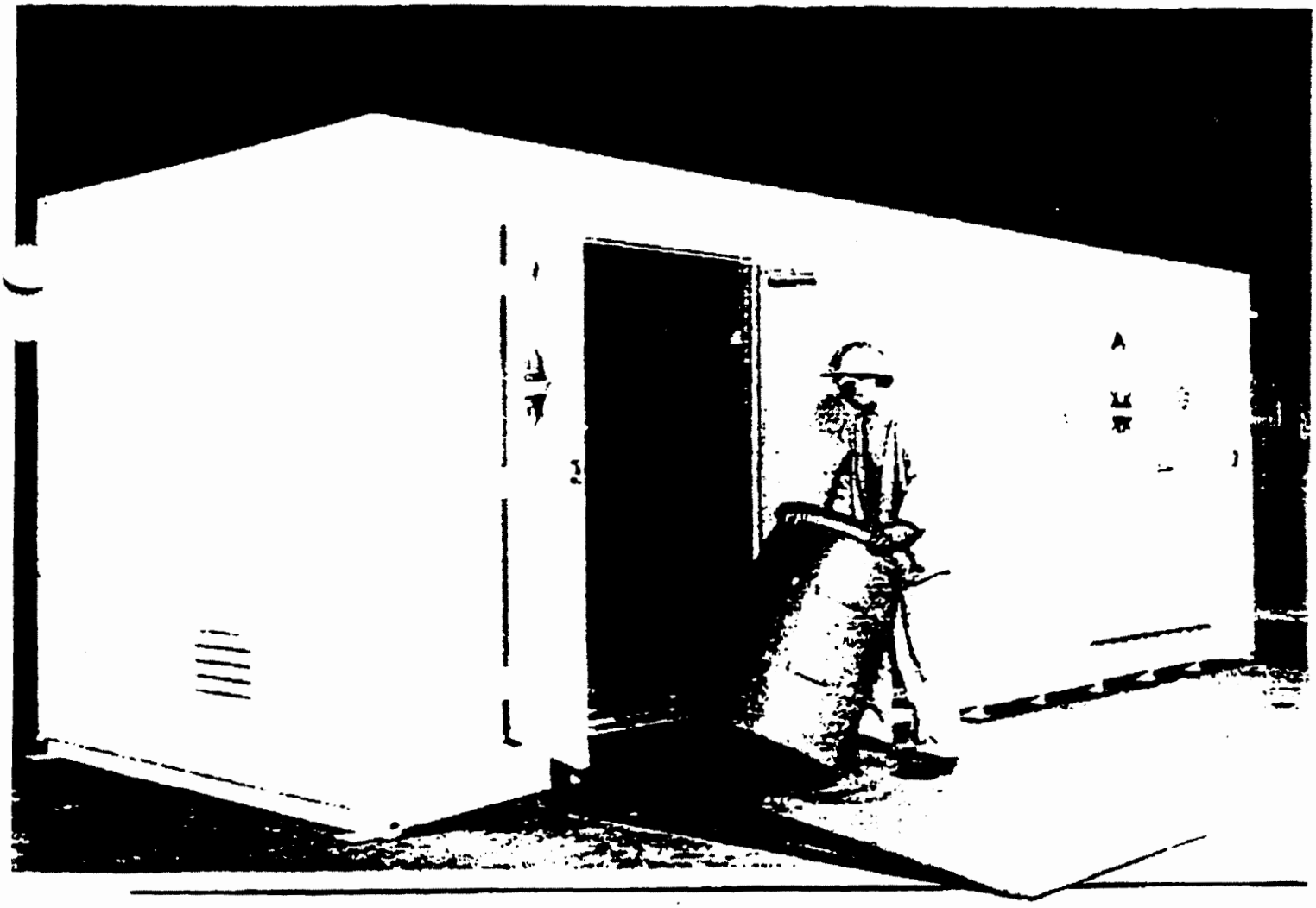
Rentals: 1st month and all extras with order. Additional months in advance, upon receipt of invoice O.A.C.

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specifications for Storage Sheds 68, 69, 70, 1027, 1028, 1030, and 1041 at Technical Area 54

Help Us Help You...

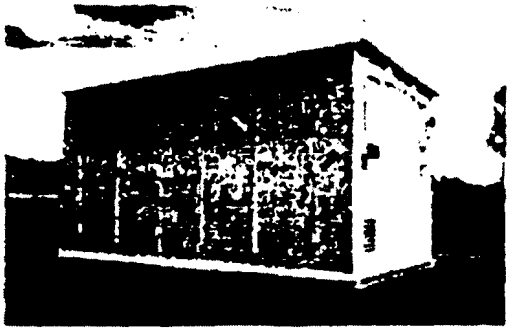
Select the Right Safety Storage™ Building



Achieve regulatory compliance for storage of hazardous materials

SAFETY STORAGE™

SAFETY STORAGE™



Steel and 2-Hour Fire-Rated Prefabricated Storage Buildings

Safety Storage™ prefabricated, weather-proof buildings offer a low cost solution to protect your facility from chemical hazards, provide secondary containment for soil and groundwater protection, minimize liability, meet fire safety needs, and safeguard personnel, while complying with federal, state, and local requirements.

These relocatable, turnkey buildings are available in a wide choice of building sizes and storage capacities, at a potential 60% savings over the cost of permanent structures. They are designed to Factory Mutual System standards and utilize UL listed components throughout.

Safety Storage buildings are designed to comply with all federal, state, and local regulations and can be pre-engineered to meet special structural, electrical, fire, and ventilation requirements.

Safety Storage is the nation's leading manufacturer of prefabricated chemical and hazardous material storage buildings. Custom engineering assistance and special application buildings are offered to meet specific requirements.

FEATURES

Steel Buildings

- Walls and sump walls constructed of 10-gauge welded steel
- Roof/ceiling constructed of 12-gauge steel
- Double-doors

FireShield Buildings

- Two-hour fire-rated walls, roof/ceiling, and sump walls, in accordance with UL 263 and ASTM-E119 requirements.
- Air inlet vents equipped with 1½ hour UL Classified fire dampers
- UL Classified three-hour fire-rated double doors (60"x80") with UL listed frame and hardware. Active door equipped with automatic door closer, security lock, and interior safety release

All Buildings

- Chemical resistant coated surfaces
- Water sprinkler piping assembly
- Secondary containment sump, with fiberglass floor grating
- Open-channel construction for visual inspection and crane/forklift openings
- Security locks with inside safety release
- Static grounding system
- Forklift pockets for ease of relocation
- Hold-down brackets
- Hazard placards and labeling
- One-year limited warranty

OPTIONS

- UL listed interior and exterior lighting (Class I, Division 1)
- Heating and air conditioning systems (Class I, Division 1)
- Thermostatic control switches
- Electromechanical exhaust ventilation systems (Class I, Division 1)
- Liquid level detectors (Class I, Division 1)
- Dry chemical fire suppression system
- Interior separation wall(s), steel and 2-hour fire-rated
- Chemical resistant sump liner
- Explosion relief construction
- Safety eye/face wash units
- Sump overflow pipe fitting with cap
- Shelving
- Loading ramp(s)

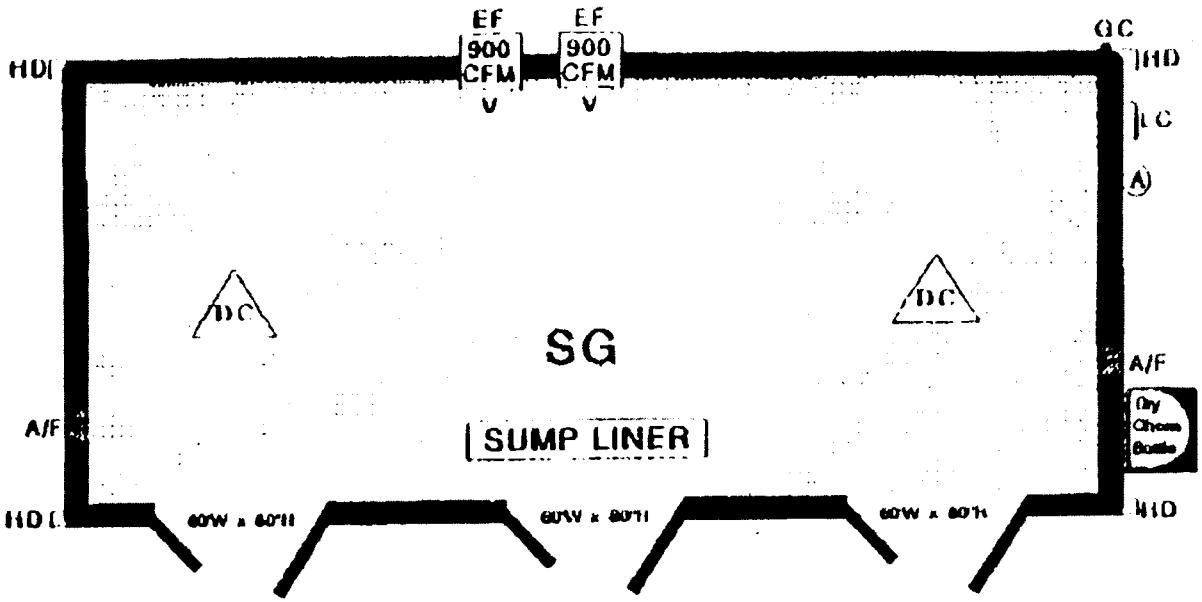
Model	Outside Dimensions			Inside Dimensions			Tare Weight (Lbs.)	Door Openings		Designed Storage Capacity			Sump Capacity (Gallons)
	Length*	Width	Height	Length	Width	Height		Height	Width	Weight (lbs.)	Sq. Ft.	Drums**	
32	33'3¾"	11'5¼"	8'8"	32'7¼"	10'8¼"	7'3¼"	23,325	6'7¾"	4'10¾"	97,125	348	90	1460
24	25'3¾"	11'5¼"	8'8"	24'7½"	10'8¼"	7'3¼"	17,600	6'7¾"	4'10¾"	65,750	263	60	1100
22	23'3¾"	9'3¾"	8'8"	22'7¼"	8'9¼"	7'3¼"	16,750	6'7¾"	4'10¾"	49,500	198	50	330
15	15'11¾"	9'3¾"	8'8"	15'3½"	8'9¼"	7'3¼"	8,775	6'7¾"	4'10¾"	33,500	134	33	560
7	8'7¾"	9'3¾"	8'8"	7'11¾"	8'3¼"	7'3¼"	5,250	6'7¾"	4'10¾"	17,375	69	16	290
10	10'11"	8'5"	8'4"	10'4"	5'9¼"	7'	2,600	5'9¾"	3'1"	14,875	59	14	220
32FS	33'3¾"	11'5¼"	8'8"	32'	10'	7'1"	35,300	6'7¾"	4'10¾"	80,000	320	80	1340
24FS	25'3¾"	11'5¼"	8'8"	24'	10'	7'1"	26,575	6'7¾"	4'10¾"	60,000	240	60	1000
22FS	23'3¾"	9'3¾"	8'8"	21'11½"	8'1¼"	7'1"	24,025	6'7¾"	4'10¾"	44,500	178	44	750
15FS	15'11¾"	9'3¾"	8'8"	14'7½"	8'1¼"	7'1"	13,975	6'7¾"	4'10¾"	29,625	118	28	500
7FS	8'7¾"	9'3¾"	8'8"	7'3¼"	8'1¼"	7'1"	8,125	6'7¾"	4'10¾"	14,750	59	12	250
10FS	10'11"	6'5"	8'4"	9'8"	5'1¼"	6'10"	8,300	5'7¾"	4'10¾"	11,000	44	8	150

*Includes hold-down brackets. **55 gallon drums.

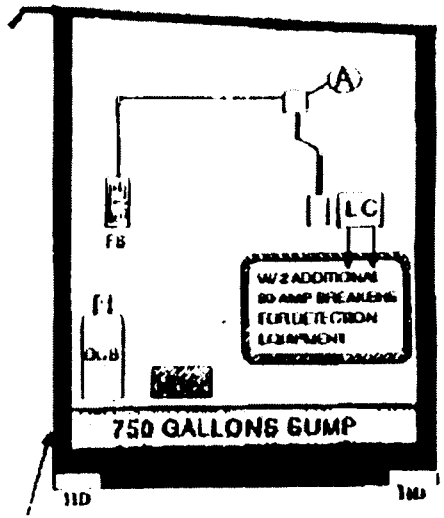
LOS ALAMOS NATIONAL LAB - "2-HOUR FIRE RATED" MODEL SSI-22FS

ONE VENT SYSTEM TO BE INVERTED SO "V" IS TOWARD CEILING

LOCKER "B" HTS
SAFETY STORAGE MODEL 22FS
"LITHIUM HYDRIDE"



"2-HOUR" FIRE RATED
- *Roof
- *Sill
- *Vertical Walls

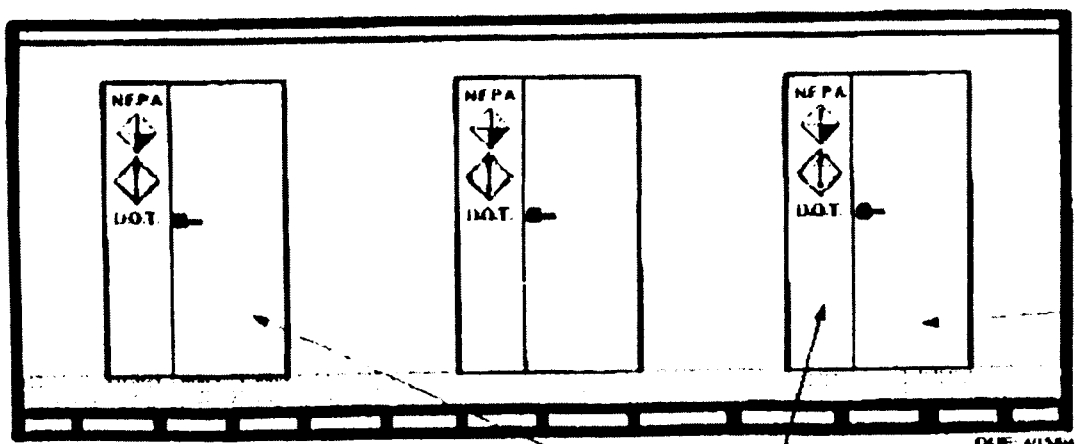


SILL HEIGHT AT SUMP = "2-HOUR" FIRE RATED

23'4" LENGTH x 9'4" WIDTH x 8'8" HEIGHT

"LITHIUM HYDRIDE"

STORAGE



DRAWN BY: EUGENE NAGEL

DATE: 4/15/94

"3-HOUR" FIRE - RATED DOORS

MEETS NATIONAL WHEELCHAIR ACCESS REQUIREMENTS 24" & 36" → 60"

LEGEND

A: AUDIBLE ALARM FOR DRY CHEM
A/F: 1.5 HOUR FIRE RATED VENTS
CFM: CUBIC FEET PER MINUTE
DC: DRY CHEM SPRINKLER
DCB: DRY CHEM BOTTLE INCLOSURE
EF: EXPLOSION PROOF EXHAUST FAN EXIT
FS: FAN SWITCH
FL: FUSIBLE LINKS
GC: GROUNDING CONNECTION (EXT)
HD: HOLD-DOWN BRACKETS
LC: LOAD CENTER W/ TWO 20 AMP BREAKERS
SG: STEEL FLOOR RATING
V: VENT SCREEN FOR FUME REMOVAL
CLASS 1, DIV 1, EXPLOSION PROOF

DRAWN BY: KARLIN BOELLE
12/2/94

Accepted for production

SAFETY STORAGE INC.
8306 Wilshire Boulevard • Suite 9000
Beverly Hills, CA 90211-2344
Tel: (213) 939-5715 • Fax: (213) 939-1646

LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

MODEL: Safety Storage Inc., Model # 22-FS

APPROVAL from TESTING / ENGINEERING LABS: **Factory Mutual Laboratory APPROVED (SEE ATTACHED FM LETTER FOR VERIFICATION)**

DIMENSIONS: 23'3.75" Length x 9'3.75" Width x 8'8" Height

COMPLIANCE: The lockers comply with all present Federal, State, and Local building, electrical, mechanical and fire codes; hazardous materials / waste and Cal/OSHA regulations.

CONSTRUCTION: The Pre-Fabricated lockers are weather-proof, New prime steel Construction, continuously welded at all four (4) vertical seams and liquid tight. ASTM-graded steel.

RELOCATABLE: The lockers are designed around the premise that they will be relocatable (when empty). The bottom must have four-inch (4") "C" channels for forklift or crane strap access every two-feet the entire length. The "C" channels shall provide a uniform load spread in use or in relocation. The subfloor welds are liquid-tight.

RECESSED SPILL CONTAINMENT: Minimum 750 Gallons of "spill containment" capacity required.

SILL HEIGHT="2-HOUR FIRE RATED" CONSTRUCTION AT THE "RECESSED SPILL CURB AREA": The recessed sump sill height is a crucial element of the entire vertical wall surface area of all four (4) sidewalls and are constructed to the same **"2-Hour Fire Rated"** standards of Gypsum "sandwiched by steel" design used from sump up to and including the ceiling/roof **("UL" approved design)**. This Non-combustible construction is in accordance with ASTM-E119.

SUMP SILL HEIGHT: Minimum seven-Inch (7") recession in the spill containment sump sill height to meet and exceed all code requirements for spill curb heights etc. (including PCB requirements).

ROOF DESIGN: The entire Roof will be **"2-Hour Fire Rated"**. The roof Class-A Flame Spread classification, and I-60 wind uplift rating. This Non-combustible construction is in accordance with ASTM-E119. The manufacturer's product literature must state that the roof is capable of handling 40 psf snow loads plus equipment such as lights and sprinkler system

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Beverly Hills, CA 90211-2344
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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

FLOORING: STEEL GRATING is standard. The Steelgrate has a minimum 500 psf uniform load bearing capacity. The steelgrate installation is designed for ease of access by chemical users for spill clean-up. The Steelgrate installation shall run front-to-back and in approximately four-foot (4') sections. Bowing is eliminated by the uniform load spreads designed throughout the flooring substratum section. The Flooring is of an "open-channel" design for visual inspection of the recessed sump and spill flow control.

SUBFLOOR: The horizontal subfloor shall be constructed of no less than 10-gauge steel. The 10-gauge steel is new, prime steel and welded at all seams. Tests must be done by the manufacturer that shows that the sump created by the sub-floor is liquid-tight as required by code.

SEISMIC HOLD-DOWNS: Each corner of each building has a 4" seismic hold-down bracket installed for end-user finish into the foundation. The hold-downs are calc'd for **"worst case" Zone-4 rating** if installed.

GROUNDING: Each building has three (3) interior bonding lugs, one (1) exterior grounding assembly and an eight-foot (8') copper/clad grounding rod shipped inside for end-user installation into the foundation upon delivery.

DOOR REQUIREMENTS: Two (2) Door Openings per Locker, consisting of one set of dual-doors at least sixty inches (60") wide and eighty inches (80") tall. The passive leaf of each set of dual-doors is equipped with UL-Listed Top and Bottom surface bolts. Each door opening includes weatherstripping. Each door frame and hardware (i.e. keyed lock system) is "UL-Listed" and approved. Each door opening has an inside safety latch for end-users staff to open the doors in the event of an emergency per the building codes. Each door opening exceeds building code requirements with **"3-Hour Fire Rated"** Dual-Doors that are approved and labeled by **Underwriters Laboratory UL-Labeled. "3-Hour FIRE RATED DOORS"**. The doors design shall meet Federal Legal requirements set by the "American Disabilities Act" requirements. Each set of Dual-doors will be customized with automatic door closures that work with fusible links on both sides of each set of dual-doors.

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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

SECURITY:WELDED-ONLY The design and building construction is focused on the SECURITY of the end-users inventory and materials stored. The design shall be of four (4) Vertical Walls welded together and to the Roof and Sub-Floor. Security and integrity of design are primary to the end-users risk and liability reduction with the storage or dispensing of Hazardous Materials. Each dual-door opening will be secured by an exterior single-point dead bolt style key lock. The interior shall be provided with an emergency safety latch to open doors as required by building codes.

VISUAL INSPECTION: The lockers design and construction integrity shall be visually inspected by compliance agencies on a regular basis, so each manufacturer must design in the ability to inspect the secure containment of spills, the flow of spills inside the locker into a recessed sump, seismic load capacity, fire prevention and suppression methods, etc..

SIGNAGE: Each door opening must receive one (1) "D.O.T." all-metal placard on an aluminum rust-proof wall-holder and stainless steel clips which act as a flip-chart type chemical content clarifier sign to meet California "Right-to-Know" laws. Each door opening must receive one (1) pressure sensitive "NFPA" 704M hazardous rating sign for fire professionals .

AIR FLOW: Two (2) Air Inlet Vents with **UL-Classified "1.5 Hour Rated" fire dampers** are required per locker (see diagram). These air inlet vents shall be galvanized steel framed, curtain-type galvanized steel blades, and equipped with UL-Listed 165 degrees Fahrenheit fusible-links to close in the event of a fire and the source is in the interior or on the exterior. These vents are designed to provide "in coming make-up air" only **(no suction devices are to be placed near this equipment).**

DRUM STORAGE CAPACITY:@ Single-Level: FORTY-FOUR (44) Drum single-level storage capacity is required in a packed configuration design with single drum movement and no aisle space. (55-GALLON TYPE)

FINISHES:INTERIOR Finish is primed and painted with a chemically-resistant white epoxy. The interior finish has been tested against a minimum of fifty (50) common industrial chemicals and has stood-up to actual field use for nine (9) years now. *EXTERIOR Finish* is a glossy, heat reflective white colored aliphatic polyurethane (5-mil thick). The surface is also graffiti resistant.

PRESENTATION: Each building shall be shipped after inspection with a heavy-duty industrial"SHRINK-WRAP" to protect the building in route to the end-users site. The buildings are delivered free of diesel exhaust markings, road grime, mud, etc..

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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

WARRANTY: 12 month on components / 10 year structural

MANUALS: A "Manual" explaining the grounding, off-loading, seismic hold-downs, suggested pad creation, fire suppression, and electrical systems shall be sent upon placement of order.

FIRE-RATING: Locker shall be "2-Hour Fire Rated" from sump up to and including the ceiling/roof ("UL" approved design). GYPSUM is the Fire-Retardant utilized to achieve the "2-Hour rating".The VERTICAL WALLS Construction are from the "UL" book of universally accepted DESIGNS (e.g. U-263 design which uses Gypsum, Steel studs, and a sandwich wall design). This Non-combustible construction is in accordance with ASTM-E119.

FIRE SUPPRESSION SYSTEM DESIGN: The Fire Suppression System shall be an "AUTOMATIC" Dry Chemical Fire Suppression System which includes two (2) dump heads with plastic cap covers that blow-off Minimum 1,920 cubic feet of dump upon activation, an audible alarm, activation points both automatic via fusible-links or by manual pull station. Exterior Enclosure of the bottle holding the dry chemical and its "system brains".

ELECTRICAL SYSTEM: The interior electrical components shall all be explosion-proof (wiring, seals, and conduits). One (1) exterior breaker box shall be located on the right side wall and will hold all required breakers. One breaker is for the normal service wired 120 volt / 20 amp for the lights, forced air ventilation system, etc..

FUME REMOVAL: *INTERIOR MOUNTING / DUCTING:* One (1) Electrically Powered, explosion-proof, forced air, mechanical, ventilation system for fume removal. The system is designed with interior ducting to draw fumes up and out to the exterior for removal from within twelve-inches (12") above the flooring surface meeting code requirements (per locker). The system is designed and installed to run with direct control on the exterior from a fan switch for on / off determination. Each system providing 19-57 air changes per hour (Class I, Division 1). System has a minimum 900 cfm motored fume removal rated motor (Class I, Division 1) with a non-sparking aluminum fan blade. One (1) exterior mounted on / off Fan switch is included.

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LOS ALAMOS NATIONAL LAB STORAGE LOCKERS

LOS ALAMOS NATIONAL LAB RESPONSIBILITIES (upon purchase):

1) **FOUNDATION:** The installation site foundation must be completed and well cured prior to shipment of the building. Typical curing time for new concrete foundations can run 14-21 days.

2) **OFF-LOADING:** END-USERS will be responsible for having a 15-ton capacity crane and experienced crane operator with spreader bar and associated cabling at the site prior to delivery for off-loading.

3) **ELECTRICAL:** Power must be brought to the breaker box located on the right side wall of the locker by the end-user. All interior electrical wiring must be completed prior to shipment. Power for the normal electrical features are on the 120 volt / 20 amp breaker. Two (2) additional 20 amp breakers shall be included to detection equipment to be provided by Los Alamos National Lab.

4) **ARMING DRY CHEM SYSTEM:** The END-USER will need to "arm" the dry chemical fire suppression system after delivery to prevent accidental discharge during transportation and off-load. Any special "dump tests" required by local authorities are the sole-responsibility of the chemical user entity and staff.

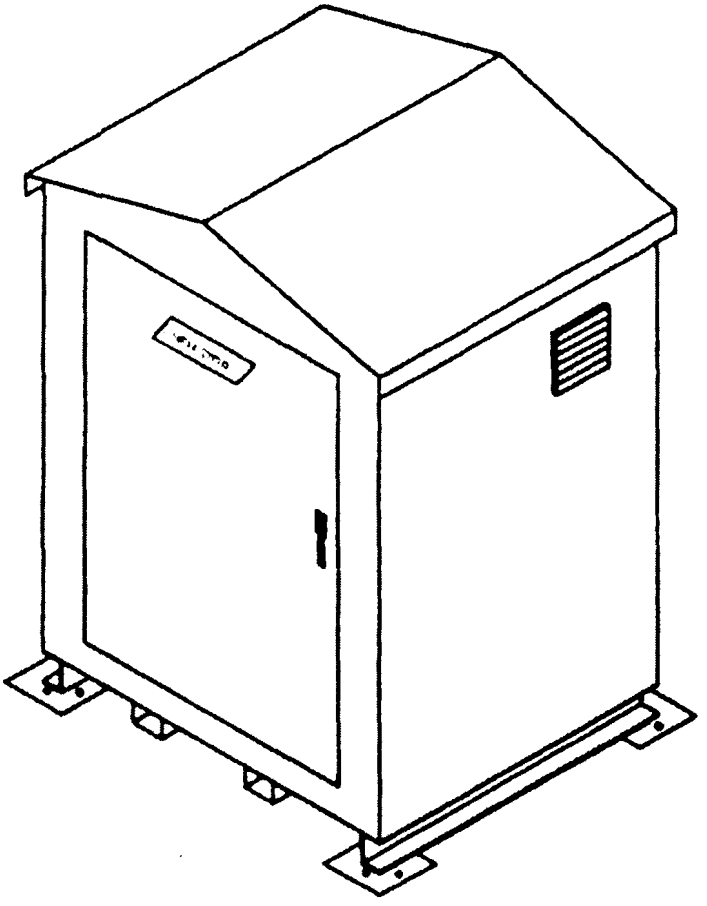
5) **GROUNDING:** The eight-foot (8') grounding rod shipped inside the building must be installed into the foundation and completed to the exterior bonding lug after delivery by END-USER staff.

6) **SEISMIC FINISH WORK:** The enduser site staff is responsible to "TIE-DOWN" the locker to the foundation to achieve the "SEISMIC ZONE-4" Rating.

Document:	LANL TA-54 Renewal
Revision No.:	3.0
Date:	June 2003

Engineering Details and Technical Specifications for Storage Sheds 144, 145, 146, and 177 at Technical Area 54

MODEL D



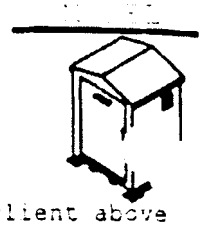
INTERIOR DIMENSION	EXTERIOR DIMENSION	STORAGE CAPACITY	SECONDARY CONTAINMENT	DOOR CONFIGURATION			APPROXIMATE SHIPPING WT
				NO.	RATING	DIMENSION	
6'0" X 5'0" X 7'0"	6'6" X 5'6" X 9'0"	6/55 Gal. Drums	120 Gallons	1 set	None	4'6" X 6'3" Opening	1600 LBS.

Standard Equipment:
Two Part Chemical Resistant Epoxy Paint Interior & Exterior. Polyurethane Top Coat on Exterior
Six air changes per hour natural ventilation Exterior Ground Connection. Corrosion Resistant Epoxy Coated
Steel Grate Flooring. Forklift Pockets, Stainless Steel Hinges Industrial Grade 3 pt. Locking Mechanism
Seismic Tie-Down Pads.

Construction:
10, 12 & 14 Gauge HRS

Dimensions Noted Above are - Length X Width X Height

Specifications for Portable
Hazardous Waste Storage Building
Manufactured by Ideal Environmental Products
CHEM-STOR Model C



The portable hazardous materials storage container is designed to bring the client above compliance levels for hazardous material and waste storage. The container provides secondary spill containment, and security for hazardous materials storage in accordance with federal, state and local regulations. The material, design and workmanship are specified in the following outline.

Product Qualification:
The product has a history of production, sales and service for more than nine years.

Design:
A) Dimensions - Exterior dimensions approximately five feet wide by six feet long by nine feet tall. (5'-0"W x 6'-0"L x 9'-0"H)
The building design exceeds the recommendations of:

The Uniform Building Code	NFPA 30	Factory Mutual
The Uniform Fire Code	OSHA	

B) Spill Containment - Internal spill containment is a major design feature of the storage container. When filled with 55 gallon drums stored upright and unstacked, the container will contain a minimum of the total leakage from one-quarter (25%) of the drums.
C) Floor - The floor of the container is constructed of 10 gauge steel and incorporates a false floor system to prevent the release of hazardous liquids and solids if they are discharged from a primary container.
D) Walls & Roof - The walls and roof are fabricated using 12 and 14 Gauge HRS.
E) Doors - The container has one door opening which is 4'-6" wide by 6'-3" high located on the front of the container. The door is equipped with an industrial grade 3 pt lock and interior safety release.
F) Ventilation - The container is equipped with vents which are sized to allow for a minimum of 6 air changes per hour.
G) Grounding - The container is equipped with one exterior static grounding connection.
H) Seismic Tie Down - The container is equipped with provisions for securing the building to the ground per seismic Zone 4 regulations.

Workmanship:
A) Steel Fabrication - The steel used to fabricate the container is free from kinks, and sharp bends. The manufacturing process does not reduce the strength of the steel to a value less than intended by the design. Each manufacturing process is done neatly and accurately, and all bends are made by controlled means to insure uniformity of size and shape.
B) Welding - The welding procedures employed are in accordance with the filler metal specifications of the American Welding Society and in cooperation with the ASTM. All welds are of sufficient size and shape to develop the full design strength of the parts connected by the welds. These welds transmit the imposed stresses without permanent deformation or failure when subject to proof of storage loads.
C) Painting - After a thorough cleaning process the exterior and interior of the container are painted with a self-priming chemical resistant epoxy paint. All exterior surfaces are then painted with a durable polyurethane paint.

Structural Design:

Wind Load	110 MPH
Floor Load	250 PSF
Snow Load	40 PSF
Seismic Load	Zone 4

Units equipped with explosion relief venting:

Internal Pressure	100 PSF

SEPARATION OF NON-COMPATIBLE MATERIALS
TABLE NO 51.110-A

MATERIAL SEPARATION

	MINIMUM SEPARATION FROM						
	TOXICS	ACIDS	BASES	FLAM-MABLES	OXI-DIZERS	WATER REACTIVE	PYRO-PHORIC
TOXICS		1 HR	1 HR	1 HR	1 HR	1 HR	1 HR
ACIDS	1 HR		S	S 2	S	S	S 2
BASES	1 HR	S		S	S	S	S
FLAMMABLES	1 HR	S 2	S		S	*	S
OXIDIZERS	1 HR	S	S	S		S	S 2
WATER REACTIVE	1 HR	S	S	*	S		S
PYROPHORIC	1 HR	S 2	S	S	S 2	S	

1. FOR SEPARATION OF HAZARDOUS PRODUCTION MATERIAL GASES FROM HAZARDOUS PRODUCTION LIQUIDS AND SOLIDS, SEE SECTION 51.110 (B) 3

2. SEPARATION BY NOT LESS THAN 20 FEET MAY BE USED AS AN ALTERNATIVE TO A NONCOMBUSTIBLE PARTITION.

NOTES:

S = NONCOMBUSTIBLE PARTITION. THE PARTITION SHALL EXTEND NOT LESS THAN 18 INCHES ABOVE AND TO FRONT AND REAR OF STORED MATERIAL

1 HR = ONE-HOUR NONCOMBUSTIBLE FIRE-RESISTIVE OCCUPANCY SEPARATION EXCEPT WHEN APPROVED GAS CABINETS ARE USED.

* = NOT ALLOWED: A SEPARATE STORAGE ROOM IS REQUIRED

ACIDS	CAUSTICS	SOLVENTS	OXIDIZERS

STORAGE AS SMENT

NUMBER & TYPE	GENERIC NAME	HAZARDOUS CLASSIFICATION	STORAGE PERIOD CYCLE TIME
BOXES, PAILS, TUBS BOTTLES, DRUMS BARRELS, PALLETS	FUEL, SULFURIC ACID, WASTE OIL PAINT, PROPANE	FLAMMABLE SOLIDS CORROSIVES, OXI- DIZERS, TOXICS FLAMMABLE LIQUID GASES, ORGANIC PEROXIDES	CONTINUOUS INTERMITTENT 30 DAYS, 90 DAYS INDEFINITE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

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[illegible] COMMENTARY AS APPLIED TO CHEM-STOR LOCKERS

- GENERAL INFORMATION

CODES: Whether or not specific codes, regulations or ordinances apply to the use of Chem-Stor lockers depends on several factors, principally, the type, quantity and physical state of materials to be stored; whether or not dispensing is to take place, the location of the locker at the specific site and of course the interpretations of local code-enforcing authorities.

References used for this commentary include Uniform Fire Code, UFC 1988 Ed.; Uniform Building Code, UBC 1988 Ed.; Santa Clara County, Model Ordinance for Hazardous Materials Storage; Flammable and Combustible Liquids Code, NFPA 30, 1987 Ed.; California Code of Regulations, Title 22 T-22 , Div. 4, Chapter 31, Minimum Standards for Management of Hazardous Waste; Guide for Venting of Deflagrations, NFPA 68, 1988 Ed.; and NFPA Annotated OSHA Regulations, Volume 1 published 1977.

COMMENTS: Chem-Stor lockers are designed specifically for hazardous materials storage, providing sound environmental protection against contamination due to spills or leaks while at the same time providing a high level of security and protection from the elements. The lockers are suitable for storing usable as well as waste materials.

Requirements for separation or isolation as well as the fire-hazard nature of many materials makes safe storage difficult. Chem-Stor lockers offer an easy, safe, and very practical solution to many hazardous materials storage problems. Each locker contains the basic features necessary for a hazardous materials storage facility; spill control, explosion relief (optional on some models), natural ventilation of storage spaces, shelving construction and structural design for heavy storage. In addition, each locker is small enough and strong enough to be picked up with a fork lift for relocation.

- STRUCTURAL APPLICATION AND PERMITS

CODES: The UBC defines a structure as "...an edifice or building of any kind or any piece of work artificially built up or composed of parts joined together in some definite manner." UBC Section 301 regarding building permits required, exempts one-story detached accessory buildings used as tool or storage sheds from permit requirements provided the projected roof are does not exceed 120 sq. ft. The UFC and local Hazardous Materials Storage Ordinances require permits to be obtained to storing hazardous materials.

COMMENTS: Chem-Stor lockers may or may not require a building permit to install. Regardless of permit requirements, however, local jurisdictions may require structural calculations and a site plan. Ideal Environmental will provide structural calculations upon request. Information regarding construction materials and loading is included in the specifications. Regardless of the UBC permit requirements, Chem-Stor lockers must not be installed or used in a manner or location which constitutes a violation of Building or Fire Codes. Hazardous materials storage permits issued under the UFC or local Ordinance generally specify types and quantities of hazardous materials permitted to be stored as well as approved locations and monitoring and

[illegible] that our cabinets satisfy [illegible] property for a complete storage facility with known quantities [illegible] can be relocated from one approved location to another.
Pads or foundations are not necessary for Chem-Stor cabinets [illegible] load distribution design. Some jurisdictions however require anchorage against seismic activity. Upon customer request, IDEAL ENVIRONMENTAL will provide information regarding anchoring methods.

- SPILL CONTROL AND SECONDARY CONTAINMENT

CODES: The UFC, UBC and Model Ordinance, as well as many state and local laws throughout the country, require that hazardous materials, whether stored in a usable state or as a waste, must be stored in an approved storage facility providing spill control so that spills or leakage is prevented from creating fire and health hazards and contaminating the surrounding environment. The model ordinance requires spill control in the form of "secondary containment." The secondary containment construction must be such that it will not be structurally weakened through contact with leaked or spilled material for a period of time equal to the maximum time needed to clean up the leakage or spilled hazardous material. The secondary containment must have capacity to contain 150% of the volume of the largest primary container stored (110% if only one container) or 10% of the aggregate volume of all primary containers stored, whichever is greater. If the storage facility is open to rainfall, the secondary containment must additionally have capacity to accomodate the volume of a 24-hour rainfall based on a 25-year storm history.
UFC, Art. 80 requires that, "..rooms, buildings or areas used for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off the spillage and fire protection water". The spill control must, at minimum, be liquid-tight recessed (4") floors or liquid-tight sills (4") connected to a drainage system to direct the spillage and fire protection water to an approved location. When "secondary containment" is specifically required the spill control and drainage system must be designed as secondary containment OR the building, room or area shall be designed to provide secondary containment through the use of liquid-tight floors or sills. Secondary containment shall have capacity equal to the volume of the largest single container stored plus flow from the automatic fire extinguishing system for a period of 20 minutes.
UFC, Art. 80 specifically requires a liquid-tight floor and secondary containment for the storage of : liquid and solid oxidizers, organic peroxides, pyrophoric materials, unstable (reactive) materials, water reactive materials, highly toxic solids and liquids, radioactive materials, corrosives, other health hazard type materials.
UFC, Art. 79; and NFPA 30 (which includes OSHA requirements in this instance) have similar requirements for containing spills of flammable or combustible liquids in "storage rooms," "inside storage rooms," attached buildings and "cut-off rooms." Methods include liquid-tight sills floors depressed 4" below surrounding floors or grated trenching to direct spills to a safe area. These regulations also require that run-off water from fire suppression be controlled and impounded in a safe location. The UFC and NFPA 30 also requires outside storage areas

[illegible]
so as to [illegible]
T-22, Chapter [illegible], Section [illegible], pertaining to [illegible] Waste, requires that "storage [illegible] minimize the possibility of spills and escape from the area [illegible]
COMMENTS: Chem-Stor lockers are designed specifically to [illegible] Model Hazardous Materials Storage Ordinance and UFC requirements. [illegible] lockers are designed with containment adequate for [illegible] volume based on 55 gallon drums as primary containers.
Chem-Stor locker secondary containment is static-tested for [illegible] tightness using water at the factory before application of any [illegible] material. After the containment has proven to be leak-tight, all surfaces are coated with a chemical resistant epoxy to protect the steel construction from corrosion.
Where local jurisdictions require automatic fire sprinklers and will not accept "approved" alternate systems, provisions for fire flow run-off to a safe location will have to be developed by the user.

- MONITORING
CODES: The Model Ordinances and UFC have similar monitoring requirements for leakage or spills. Both require that: "Monitoring methods shall include at least one system for detecting leakage from the primary container. A monitoring system capable of detecting that the hazardous material stored in the primary containment has entered the secondary containment shall be provided. Visual inspections of the primary containment is the preferred method, however, other means of monitoring may be required..." (Most enforcement authorities will require a monitoring plan wherein the frequency and method of inspection to detect leakage must be specified.)
COMMENTS: Chem-Stor lockers are designed with a 50" minimum, wide door for easy visual inspection of primary containers and a Chemical Resistant Steel Grate Floor or Corrosion Resistant Fiberglass Grate Floor installed in lift out floor panels for quick, easy access and inspection of the secondary containment.

-SECURITY
CODES: UFC, Art. 79 and Art. 80, NFPA 30, OSHA, the Model Ordinance, and T-22 all require security for hazardous materials storage; NFPA 30 and UFC Art. 79, "Storage areas shall be protected against tampering or trespassers..."; Model Ordinance, "Access to storage facilities shall be secured by means of fences and/or locks. The storage facilities shall be securely locked when unattended;" T-22, "Storage of hazardous waste shall be in a secure enclosure, including but not limited to, a building, room or fenced area which shall prevent unauthorized persons from gaining access to the waste..."; UFC, Art. 80, "The storage of hazardous materials shall be safeguarded with such protective facilities as public safety requires."
COMMENTS: Chem-Stor lockers' steel construction, versatile hardware and security bars on the roof hatch provide excellent security against unauthorized entry. The lockers also provide a simple way to isolate materials which may require special security measures while not restricting access to general storage areas.

[illegible] material [illegible] and associated [illegible]. UFC, Art. [illegible] requirements [illegible] principally to inside storage, mixing and handling [illegible]. The general intent is to prevent accumulation of flammable vapors and to that end, six air changes per hour are required; NFPA [illegible] on the same subject does not specify air changes per hour for gravity ventilation but requires mechanical ventilation at 150 cfm if Class I liquids are dispensed. OSHA requires six air changes per hour by either gravity or mechanical exhaust ventilation. In all instances where flammable or combustible liquids are stored and ventilation is required, ventilation must occur within 12" of the floor. Where gases are stored, required ventilation must be designed to provide air outlets near the ceiling or roof and make up air inlets near the floor. Air changes per hour are not specified for gas storage. OSHA requires that openings must be at least 1 sq. ft. for each 1,000 cu. ft. of room volume. An additional information source; Factory Mutual System's "Industrial Loss Prevention Handbook" recommends ventilation in work areas where flammable vapors might be present at 1 sq. ft. of vent opening for each 500 sq. ft. of floor area. UFC Art. 81 generally requires mechanical ventilation for indoor storage areas and storage buildings at 1 cu. ft./m for each 1 sq. ft. of floor area. Exceptions may be made where natural ventilation can be shown to be adequate for the materials stored.

COMMENTS: Chem-Stor lockers standard features provide natural ventilation openings on at least two sides within 12" of the floor, in the doors and at the roof. The internal volume of the standard locker is nominally 450 cu. ft. Assuming an empty locker, 6 air changes per hour (2700 cu. ft.) would require a very slight air movement (less that 1/2mph) through a 1 sq. ft. opening. Where mechanical ventilation is required, the optional forced air system is recommended. This system pushes outside air into the locker to provide ventilation up to 20 air changes per hour.

- DEFLAGRATION VENTING

CODES: The UBC, UFC, NFPA 30 and OSHA all contain some requirement for "explosion venting" where flammable liquids, dusts or gases are stored or handled. UBC, Chapter 9, says, in part that, "when required by the UFC, explosion venting shall be provided to vent the gases resulting from deflagrations of dusts, gases or mists in rooms, buildings or other enclosures. The venting shall be in exterior walls or roof only and shall be designed to prevent serious structural damage and production of lethal projectiles. The venting shall consist of any one or a combination of: walls of lightweight material, lightly fastened hatch covers, lightly fastened outward opening swinging doors or lightly fastened walls or roof. Venting shall discharge vertically or to an unoccupied yard at least 50' in width on the same lot."

UFC, Art. 80 specifically requires "explosion venting" be provided in indoor areas and buildings used for the storage of: highly toxic or flammable gases stored outside of gas cabinets or exhausted enclosures; flammable solids; solid or liquid oxidizers Class 1, 2 or 3; organic peroxides Class II, III, IV or V; unstable (reactive) materials.

UFC, Art. 79 for "inside use, dispensing and mixing rooms" requires

"adequate explosion" vent [illegible] design.
NFPA 30, for container and portable tank storage requires exp[illegible] venting only where dispensing is done, and in areas where [illegible] unstable liquids are processed. Explosion venting is to be through [illegible] of more of the following methods a open air construction; [illegible] lightweight walls and roof; c lightweight wall panels and roof hatches; (d) windows of explosion venting type." NFPA 30 references NFPA 68 "Guide for Venting of Deflagrations." OSHA 1910.106 [illegible] repeats the NFPA 30 requirements but makes no reference to NFPA 68.
NFPA 68 in its "Basic Recommendations for Venting" section says, "Since venting of deflagrations is a complex subject of many variables on which information in limited only general guidelines are provided." In very general terms the required vent area will depend on the size and strength of the enclosure to be vented, the acceptable level of resulting damage, the maximum anticipated rate of pressure rise, the anticipated maximum pressure developed by the fuel mixture and the design of the venting devices. Formulas are provided for calculating required vent areas when the required information is know or can be calculated.
COMMENTS: Chem-Stor standard lockers are designed to comply with the intent of the codes by providing deflagration relief in the form of an 11.6 sq. ft. roof cap constructed of 16 gauge metal securely hinged and tethered. Internal volume of the standard locker is nominally 450 cu. ft.: this places the vent area to locker volume ratio at 1 sq. ft. of vent for each 37.8 cu. ft. of volume. For comparison purposes OSHA 1910.103 (3) (ii) (c) and NFPA 50A require explosion venting for "gaseous hydrogen systems in separate buildings" at the rate of 1 sq. ft. for each 30 cu. ft. of room volume.
The most common method of deflagration venting is the so-called weak roof of wall panel design; however, Chem-Stor's hinged cap design provides more functional certainty because it can be easily maintained and manually exercised from time to time and it is not as likely to become a projectile as would weakly attached or light weight panels.

- FIRE PROTECTION

CODES: Portable fire extinguishers suitable for the type hazard will in all cases be required. Most jurisdictions reference NFPA 10 or UFC Standard 10-1 for the selection and installation of portable fire extinguishers.
UBC 3802(f) and UFC 10.308(f) require automatic fire extinguishing systems in buildings containing Group H Division 1, 2, 3 and 7 occupancies (storing/handling hazardous materials in excess of the exempt quantities listed in UBC Table 9-A and 9-B).
NFPA 30 and OSHA when referring to "inside storage rooms" do not specifically require quantities permitted when such protection is not provided.
It should be noted that all the referenced regulations except UFC require "automatic systems" which could be sprinklers, water spray, CO2, dry chemical, halon, or other approved systems.
UFC, Art. 79 however specifically calls for automatic fire sprinkler systems in "liquid storage rooms" and "inside liquid storage rooms."

[illegible] Art. [illegible] generally calls for automatic fire sprinkler system [illegible] unless permit approved alternate automatic fire extinguishing system.
COMMENTS: The code requirements are obviously intended to protect those areas within the same building which may be exposed to high fire hazard storage, use, handling, mixing, etc. and also takes into consideration fire fighting access to these hazards.
Whether the Chem-Stor locker is considered to be a building or simply enclosed outside storage and where the locker is placed on site is probably the key as to whether or not automatic fire protection is required. For example, if the locker is placed against or inside a sprinklered building, sprinklers will surely be required. In one jurisdiction, if the locker is within 10' of any building it must have a sprinkler.
Most jurisdictions will accept alternative or equivalent protection depending on the specific situation. For that reason, Chem-Stor provides an optional factory-installed u.l. listed dry chemical system.

- FIRE-RESISTIVE CONSTRUCTION
CODES: When the UBC requires fire-resistive construction the reference is to a time rating assigned as a result of having withstood fire exposure as established by a standard test procedure. The requirements for fire-resistive construction are generally based on: the size, use and type of construction of the building; the exposure of one use to another in the same building; the exposure of other buildings on the same property; exposure potential relative to property lines; or the protection of specific situations within buildings, e.g., vertical shafts and exitways (stairs and corridors).
Noncombustible construction simply means the materials will not ignite and burn or will not contribute, within a limited criteria, fuel to a fire. The terms fire-resistive and noncombustible are not interchangeable.
COMMENTS: The standard Chem-Stor lockers are of completely noncombustible construction. Fire-resistive exterior walls rated up to two hours can be easily provided on one or more sides to accommodate locations where distances to property lines or buildings dictate or where storage in two or more lockers side by side require fire separation walls. Locker interiors can be easily divided by either fire-resistive or noncombustible partitions to accommodate requirements for separation or segregation of materials. Chem-Stor, also offers a complete line of Fire Rated units which are built in accordance with Underwriters Laboratories listing #425.

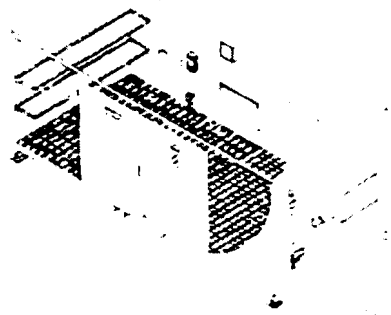

TABLE NO. 9A - EXEMPT AMOUNTS OF HAZARDOUS MATERIALS, LIQUIDS AND CHEMICALS PRESENTING A PHYSICAL HAZARD BASIC QUANTITIES PER CONTROL AREA [1]

When two units are given, values within parentheses are in cubic feet (Cu.Ft.) of pounds (Lbs.)

CONDITION		STORAGE [2]			USE [2] - CLOSED SYSTEMS			USE [2] - OPEN SYSTEMS		
MATERIAL	CLASS	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)	SOLID LBS (CU.FT.)	LIQUID GALLONS (LBS.)	GAS (CU.FT.)
1.1 Combustible liquid [3]	II	—	120 [4,5]	—	—	120 [4,5]	—	—	30 [4]	—
	III-A	—	330 [4,5]	—	—	330 [4,5]	—	—	80 [4]	—
	III-B	—	13,200 [6]	—	—	13,200 [5]	—	—	3300 [5]	—
1.2 Combustible dust lbs./1000 cu. ft		1 [7]	—	—	1 [7]	—	—	1 [7]	—	—
1.3 Combustible fiber (loose)		(100)	—	—	(100)	—	—	(20)	—	—
(baled)		(1,000)	—	—	(1,000)	—	—	(200)	—	—
1.4 Cyrogenic, flammable or oxidizing			45	—	—	45	—	—	10	—
2.1 Explosives		1 [5,8,9]	(1) [5,8,9]	—	1/4 [5]	(1/4) [6]	—	1/4 [5]	(1/4) [4]	—
3.1 Flammable Solid		125 [4,5]	—	—	25 [4]	—	—	25 [4]	—	—
3.2 Flammable gas (gaseous)		—	—	750 [4,5]	—	—	750 [4,5]	—	—	—
(liquefied)		—	15 [4,5]	—	—	15 [4,5]	—	—	—	—
3.3 Flammable liquid [3]	I-A	—	30 [4,5]	—	—	30 [4]	—	—	10 [4]	—
	I-B	—	60 [4,5]	—	—	60 [4]	—	—	15 [4]	—
	I-C	—	90 [4,5]	—	—	90 [4]	—	—	20 [4]	—
Combination 1A, 1B, 1C		—	120 [4,5,10]	—	—	120 [4,10]	—	—	30 [4,10]	—
4.1 Organic Peroxide unclassified detonatable		1 [5,8]	(1) [5,8]	—	1/4 [5]	(1/4) [5]	—	1/4 [5]	(1/4) [5]	—
4.2 Organic Peroxide	I	5 [4,5]	(5) [4,5]	—	(1) [4]	(1) [4]	—	1 [4]	1 [4]	—
	II	50 [4,5]	(50) [4,5]	—	50 [4]	(50) [4]	—	10 [4]	(10) [4]	—
	III	125 [4,5]	(125) [4,5]	—	125 [4]	(125) [4]	—	25 [4]	(25) [4]	—
	IV	500	(500)	—	500 [4]	(500)	—	100	(100)	—
	V	N.L.	N.L.	—	N.L.	N.L.	—	N.L.	N.L.	—
4.3 Oxidizer	4	1 [5,8]	(1) [5,8]	—	1/4 [5]	(1/4) [5]	—	1/4 [5]	(1/4) [5]	—
	3	10 [4,5]	(10) [4,5]	—	2 [4]	(2) [4]	—	2 [4]	(2) [4]	—
	2	250 [4,5]	(250) [4,5]	—	250 [4]	(250) [4]	—	50 [4]	(50) [4]	—
	1	1000 [4,5]	(1000) [4,5]	—	1000 [4]	(1000) [4]	—	200 [4]	(200) [4]	—
4.4 Oxidizer - Gas (gaseous)		—	—	1500 [4,5]	—	—	1500 [4,5]	—	—	—
(liquefied)		—	15 [4,5]	—	—	15 [4,5]	—	—	—	—
5.1 Pyrophoric		4 [5,8]	(4) [5,8]	50 [5,8]	1 [5]	(1) [5]	10 [5,8]	0	0	0
6.1 Unstable (reactive)	4	1 [5,8]	(1) [5,8]	10 [5,8]	1/4 [5]	(1/4) [5]	2 [5,8]	1/4 [5]	(1/4) [5]	0
	3	5 [4,5]	(5) [4,5]	50 [4,5]	1 [4]	(1) [4]	10 [4,5]	1 [4]	(1) [4]	0
	2	50 [4,5]	(50) [4,5]	250 [4,5]	50 [4]	(50) [4]	250 [4,5]	10 [4]	(10) [4]	0
	1	125 [4,5]	(125) [4,5]	750 [4,5]	125 [4]	(125) [4]	750 [4,5]	25 [4]	(25) [4]	0
7.1 Water (reactive)	3	5 [4,5]	(5) [4,5]	—	5 [4]	(5) [4]	—	1 [4]	(1) [4]	—
	2	50 [4,5]	(50) [4,5]	—	50 [4]	(50) [4]	—	10 [4]	(10) [4]	—
	1	125 [5,8]	(125) [5,8]	—	125 [5]	(125) [5,8]	—	25 [4]	(25) [4]	—

N.L. = Not Limited

1. Control area is a space bounded by not less than a one-hour fire-resistive occupancy separation within which the exempted amounts of hazardous materials may be stored dispensed, handled or used. The number of control areas within a building used for retail and wholesale stores shall not exceed two. The number of control areas in buildings with other uses shall not exceed four.
2. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.
3. The quantities of alcoholic beverages in retail sales uses are unlimited provided the liquids are packaged in individual containers not exceeding four liters. The quantities of medicines, foodstuffs and cosmetics containing not more than 50 percent of volume of water-miscible liquids and with the remainder of the solutions not being flammable in retail sales or storage occupancies are unlimited when packaged in individual containers not exceeding four liters.
4. Quantities may be increased 100 percent in sprinklered buildings. When Footnote 5 also applies, the increase for both footnotes may be applied.
5. Quantities may be increased 100 percent when stored in approved storage cabinets or safety cans as specified in the Fire Code. When Footnote 4 also applies, the increase for both footnotes may be applied.
6. The quantities permitted in a sprinklered building are not limited.
7. A dust explosion potential is considered to exist if 1 pound or more of combustible dust per 1,000 cubic feet of volume is normally in suspension or could be put into suspension in all or a portion of an enclosure or inside pieces of equipment. This also includes combustible dust which accumulates on horizontal surfaces inside buildings or equipment and which could be put into suspension by an accident, sudden force or small explosion.
   Permitted in sprinklered buildings only. None is allowed in unsprinklered buildings.
   One pound of black sporting powder and 20 pounds of smokeless powder are permitted in sprinklered or unsprinklered buildings.
10. Containing not more than the exempt amounts of Class I-A, Class I-B or Class I-C flammable liquids.

Manufacturer's Information on Epoxy Filler-Sealer and Protective Coating

PLASITE ®

TECHNICAL BULLETIN

9028
May 1989
(Replaces Jan. 1984)

PLASITE 9028M1 & 9028M2 MASONRY & CONCRETE FILLER-SEALER

TYPE: PLASITE 9028M1—A 100% solids epoxy blended with a properly graded combination of silica fillers and inerts to provide excellent bulking, film strength and working properties.
PLASITE 9028M2—A 100% solids epoxy blended with an inert flaking pigment providing excellent workability and ease of application.
CURING AGENT: Combined Amine.
INTENDED USE: As a filler-sealer for all types of concrete finishes, as well as a repair or grout material. Topcoating with PLASITE Series 700, 4000, 7000 and 9000 coatings should be used to increase chemical resistance and to meet the requirements of the environment. Tank linings, floors, ceilings and walls are common applications.

PLASITE 9028M1 is a general purpose filler-sealer that will fill holes up to ¼" in depth. For larger holes or concrete repair, an addition of a properly graded silica sand may be used to obtain the proper consistency.

PLASITE 9028M2 has less body than PLASITE 9028M1 and will fill holes up to approximately ⅛" in depth and for general thin film surfacing for specifications calling for flush surface up to 40 mils. It is ideal for horizontal surfaces as it is self-leveling and needs no finishing.

FOR INDUSTRIAL USE ONLY!

CHEMICAL RESISTANCE: Good all-around chemical resistance but not as resistant as the PLASITE topcoats. Refer to our laboratory for exposures where topcoats may not be required.
TEMPERATURE RESISTANCE: Dry temperature basis is 300°F continuous or 400°F for short periods of time. Immersion temperatures are based on the topcoat.
SURFACE PREPARATION: Requires hard, dense, clean, uncontaminated prime masonry surface, free of glaze and laitance. For further information refer to SURFACE PREPARATION on Page 2.
APPLICATION: PLASITE 9028M1 may be applied to surface by spray, brush, roller or trowel and requires finishing by squeegee or plastic finishing blade. PLASITE 9028M2 may be applied to surface by spray, brush or roller and requires less finishing than PLASITE 9028M1. For first filling and sealing operation, both materials require working with squeegee to fill voids.
COLORS: PLASITE 9028M1 - Light Green PLASITE 9028M2 - Medium Gray.
COVERAGE: 1604 Mil Ft.²/Gallon theoretical.
COVERAGE & COATS: Severe spillage or immersion service will require two (2) coats. The first coat will normally provide a flush surface; the second coat (applied in the same manner) will fill small leftover voids and assure a completely sealed surface. Field experience indicates a coverage rate of 60 to 80 ft.²/gallon for this 2 coat system.
For less severe service, the second coat may not be required. Coverage rate for a single coat application is approximately 80 to 120 ft.²/gallon.
NOTE: When bulking is required for grouting and plugging large holes, a clean wash silica sand may be used with an approximate U.S. Sieve Size (percent retained on screen): 3% - #40; 31% - #50; 43% - #70; 19% - #100. Bulking factor of specified filler is approximately 80% based on dry volume measure of sand. Example—one gallon of coating plus one-half gallon of recommended filler will yield 1.4 gallons with a coverage of 2245 mil ft.² (1.4x1604) or 1.4 x 232 = 325 Cu. In.
DRYING TIME: Where low temperatures of 50 to 60°F are involved with low humidity the drying time may be 16 hours. At 70°F and relative humidity of 40 to 60%, the drying time may be from 8 to 10 hours. Under conditions of high temperatures and high humidity the drying time may be as low as two hours.
INITIAL SET: 8 to 10 hours at 70°F.
CURING TIME: 5 to 7 days at 70°F or force cure on the same schedule as for topcoat.
OVERCOATING TIME: PLASITE 9028 systems may be overcoated within one hour at 70°F by high solids epoxies in the range of 80 to 100% volume. For a lower solids coating in the range of 40 to 80% by volume the overcoating time is 8 to 10 hours. Lower solids materials, and any coating that is used as topcoat that has not been tried, should be checked for bleed-through if earlier overcoating is required.

PHYSICAL SPECIFICATIONS

PIGMENTS: 9028M1—Inert Fillers Including Silica
9028M2—Inert Fillers Combined with Special Flake Pigments
SOLIDS: 100%
POT LIFE: Approx. 6 hrs. at 70°F
SHELF LIFE: 24 Months at 70°F
SHIPPING WT.: 9028M1—14½ lbs. 9028M2—15½ lbs.

ABRASIVE RESISTANCE: Average loss per 1000 cycles. Taber CS-17 Wheel, 1000 Gram Weight:
9028M1..... 64 milligrams
9028M2.....105 milligrams
THERMAL SHOCK: Unaffected 5 Cycles -70°F to +200°F on concrete substrate.

9028-1
R 7/91

WISCONSIN PROTECTIVE COATINGS CORP.
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414-437-6561

Represented by:

THINNERS

Thinning of the PLASITE 9028 Series is not usually required. Should it be desirable to reduce application air pressure requirements and improve flow-out or workability, the addition of 5% to 10% PLASITE 20 thinner may be used.

SURFACE PREPARATION (For Immersion Service)

1. Inspect for structural failures, cracks, protrusions and fins. Grind surface flush and grind cracks to "V" configuration. Chip all loose concrete to width of ¼" minimum.
2. Repair all large holes, cracks, voids and other imperfections with PLASITE 9028M1 or 9028M2 filler-sealer with addition of specified sand, as required, to provide proper stiffness used as the grout. Mixtures of specified sand up to equal parts of sand to resin may be used. See note in COVERAGE section.
3. Concrete surface must have minimum 30 days cure, be clean, hard, dense and free of laitance, form oil and release agents. Blow holes, pits and cavities must be open in order that they may be properly filled and sealed. To provide the foregoing requirements, it is necessary to prepare the surface using one or more of the methods listed in order of preference.
   a. Whip blast with a fine grade of sand reducing the normal nozzle pressures. Pressure and distance of nozzle from surface depends on characteristic of concrete. CAUTION: Do not overblast as it will result in high consumption of material and labor.
   b. Water blasting at a pressure of approximately 3000 psi may be used to produce similar results.

NOTE: Surface preparation for exposures other than immersion service will require less surface preparation and will depend on environment, condition of concrete surface and other factors. In general, the foregoing Paragraphs 1, 2 and 3 will be a requirement. Satisfactory surface preparation, sanding, grinding, brushing, pressure washing, etching and other methods must be determined on a job-to-job basis. Contact our Sales Engineers or Laboratory for specific information.

EQUIPMENT

Due to heavy viscosity of the material, a fine atomization cannot be obtained. Spray equipment is utilized to apply material to surface prior to working into voids with a squeegee or flexible plastic blade. Suggested application equipment:

SPRAY EQUIPMENT:

Graco—Pump Feed—225 President Heavy Material Air Spray Unit (10:1 ratio); 204-000 Spray Gun; 330 Fluid Tip; 520 Air Cap (slotted type). For 9028M1 only may use 167-331 Fluid Tip; 160-663 Air Cap.

Speeflo—Pump Feed—914-552 Heavy Duty Coatings Pump with Hopper; Heavy Fluid Gun; 701-628 Fluid Tip; 701-618 Air Cap.

Binks No. 98-930 Unit - Pump Feed - Specify a 45 x ¼" E Air Cap and Fluid Nozzle to fit 7E-2 Gun.

NOTE: For Pump Feed equipment, a ½" to ¾" ID fluid hose is recommended depending on length.

Normal solvent flushing of airless pumps may not remove the 9028 material adequately. It is suggested that cleaning by disassembly of the lower unit be performed after each application.

Binks—Pressure Pot Feed—18 Gun; 59ASS Fluid Tip; 251 Air Cap; 59SS Needle and Heavy Duty Spring.

NOTE: For Pressure Pot Feed equipment, PLASITE 20 thinner may be added, as required (not over 20%).

BRUSH: A high quality stiff brush should be used.

ROLLER: Use short nap (½" or less) fiber, resistant to ketone solvents.

READ THIS NOTICE!
SAFETY AND MISCELLANEOUS EQUIPMENT

1. It is recommended that the operator wear clean coveralls, rubber-soled shoes, gloves and maintain a high degree of personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE THINNER FOR THIS COATING, WHEN ADDED, IS FLAMMABLE AND CARE IS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks, and open flame and use necessary safety equipment (such as, air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and clothing and the breathing of vapor or spray mist. When working in tanks, rooms, and other enclosed spaces, adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

MIXING

The PLASITE 9028 Series are shipped in one and five gallon containers. An appropriate amount of curing agent is shipped with each unit. Thoroughly mix resin and pigment (Part 1), add curing agent (Part 2) and continue mixing until fully blended. Always use a mechanical mixer to assure optimum workability. A 15-minute sweat-in period shall be allowed prior to application.

APPLICATION PROCEDURE (For Immersion Service)

1. Apply first coat by spray or hand method and thoroughly work into surface with squeegee or flexible plastic blade to provide a flush uniform surface.
2. Apply second coat in same manner as first coat. This coat may be applied immediately after the first coat or whenever first coat is hard.
3. Damp concrete surfaces may be filled and sealed with PLASITE 9028M1 or 9028M2.
4. Visually inspect all surfaces and repair any voids.

This bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult your local sales representative or PLASITE Technical Service Department for further information.

METRIC COMPARISONS

1 mil = .001" = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. × 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

9028-2
R:7/91

We guarantee our product to be free of defects in material and workmanship and to be in accordance with our company quality control standards. All data, statements and recommendations made herein are based upon information we believe to be reliable, but are made without any representation or guarantee or warranty of accuracy and are made with reservation of all patent rights. Our products are sold on the condition that the user himself will evaluate them, as well as our recommendations, to determine their suitability for his own purpose before adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations. Liability under any condition shall be limited to replacement of material only. No liability is assumed or implied, for injury to personnel, labor costs, product loss or any other expenses incidental to the structure or operation of the plant and equipment where the coating is applied.

PLASITE ®

TECHNICAL BULLETIN

7122
February 1987
(Replaces Jan. 1983)

PLASITE 7122 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy-phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.
INTENDED USE: As a tank lining and for industrial maintenance. May be applied to metal, concrete and wood (Refer to ZONE OF USAGE below.)
FOR INDUSTRIAL USE ONLY!
GOVERNMENT AGENCY ACCEPTANCE: Meets the requirements of the U. S. Food and Drug Administration, 21 CFR 175.300 (NOTE: The color "Green" is not suitable for food service. Special colors may not meet FDA requirements; consult PLASITE Technical Service Department).
PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Department of Agriculture for use in direct food contact areas.
PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Environmental Protection Agency for surfaces which contact potable water.
CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.
TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods. Continuous immersion temperatures depend on particular reagent.
SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.
APPLICATION: PLASITE 7122H is formulated for standard production spray equipment. 7122B is formulated for brush and roller application and should be force cured for immersion service. Refer to page 4 for details on APPLICATION PROCEDURE.
COLORS: Green; Light gray; Medium gray; Black; White; Light blue; Tile red. Special colors are available, but may not be suitable for food service. Consult PLASITE Technical Service Department.
FILM THICKNESS PER COAT: A 6 to 7 mil film is produced in one multi-pass spray coat. A 2 to 4 mil film may be produced by one "flow on" brush coat.
COVERAGE: 898 mil ft²/gallon ± 4% theoretical. For estimating purposes, 50 ft²/gallon will produce a 12 to 15 mil DFT film (20% loss included). Two multi-pass spray coats will produce the 12 to 15 mil DFT film recommended for immersion service.
DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.
CURING TIME: 5 days at 90°F or 7 days at 70°F. Refer to Page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.
SOLIDS: 67% by weight; 56% ± 4% by volume, depending on color and pigmentation.
POT LIFE: Approximately 24 hours at 70°F.
SHELF LIFE: 24 months at 70°F. Material in stock should be turned upside down every 3 months.
SPRAY VISCOSITY: 28 ± 7 seconds - Ford Cup #4 depending on color.
SHIPPING WT.: Approximately 12 lbs./gallon.
ELECTRICAL RESISTANCE: 5.5 × 10¹⁰ ohm-cm Volume Resistivity - ASTM D-257-66.
***ABRASIVE RESISTANCE:** 47 milligrams average loss 1000 cycles TABER CS-17 Wheel - 1000 Gr. Wt., lt. gray color.
***HARDNESS:** Konig Pendulum Hardness of 136 seconds. (Glass Standard = 250 seconds); ASTM METHOD D4366-84.
THERMAL SHOCK: Unaffected 5 cycles -70°F to +200°F
GLOSS: 86 at 60°.
***NOTE:** Above tests were conducted on film cured at 150°F.

VOLATILE ORGANIC COMPOUNDS CONTENT

	COATING AS SUPPLIED (ASTM METHOD D2369)		THINNED 10% BY VOLUME WITH PLASITE 71 THINNER	
Color	Lbs./Gal.	Grams/Liter	*Lbs./Gal.	*Grams/Liter
Lt. Gray	3.09 ±2%	370 ±2%	3.43 ±2%	410 ±2%

NOTE: VOC content varies between colors. Contact PLASITE Technical Service Department for VOC of specific colors.
*Determined theoretically by using ASTM Method test results.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.
B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces are subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.
C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, (primer and topcoat) of 7 to 10 mils required.
D ZONE: Process plant exterior subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, (primer and topcoat) of 6 to 8 mils required.

R 8/89

WISCONSIN PROTECTIVE COATINGS CORP.
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Represented by:

CHEMICAL RESISTANCE

The following list of laboratory tests is an indication of the range of chemical resistance. These tests consisted mild steel test panels [illegible] film thickness of 12 to 15 mils. The panels are one-half immersed in the solution at temperatures of 70° to 100°F for a period of six [illegible] no effect on the coating.

ACIDS	ALKALIES	SOLVENTS	MISCELLANEOUS
[illegible]% Sulfuric*	50% Sodium Hydroxide	Alcohol	Calcium Chloride
50% Oxalic*	Magnesium Hydroxide	Ethyl, Iso-Propyl,	Latex Rubber
30% Phosphoric*	10% Potassium Hydroxide	Butyl, Decyl	Linseed Oil
25% Boric*	Calcium Hydroxide	Gasoline	Brine
50% Citric*	50% Sodium Carbonate	Kerosene	Ferric Chloride*
	Tri-Sodium Phosphate	Iso-Propyl Acetate	Ammonium Nitrate
		Naptha	Sour-Crude Oil — 150°F

***NOTE:** Although the chemical tests indicated may show that PLASITE 7122 is unaffected by immersion as listed, it is not meant to imply an express guarantee in actual service. The service is dependent upon proper application and actual operating conditions and it is generally recommended that users confirm adaptability of the product for a specific use by their own tests.

PLASITE 7122 is classified as a relatively thin film coating and should not be used for total and continuous immersion in certain chemicals such as those acids referred to under CHEMICAL RESISTANCE which have extremely high corrosion rate to mild steel and other substrates. Use in such chemical exposure should be confined to fumes and spills.

THINNERS

The following thinners are recommended:

PLASITE 71 THINNER — is a medium fast thinner to be used under most conditions.

PLASITE 69 THINNER — recommended for airless or conventional spray. A special blend of fast evaporating solvents and containing no hydrocarbons.

It will always be necessary to thin the coating. The applicator must make exact thinner adjustments based on his equipment and air and surface temperatures. The following thinning guidelines are approximate:

Normal application temperatures and conditions will require the addition of approximately 10% thinner by volume with approximately 5% additional thinner added for each 5° of increased temperature.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

PRIMERS

Primers of the inhibitive type must be used when steel surfaces are not blasted to white metal and when finish coatings are below 8 mils in thickness. These primers may be applied by either brush or spray application:

PLASITE 7100 ANTI-CORROSIVE PRIMER described in Bulletin 7100-AC is an epoxy-phenolic catalyzed primer of heavy duty type applicable for B, C and D Zones.

PLASITE 7103 HEAVY DUTY PRIMER described in Bulletin 7103 is an epoxy metal primer with superior bond and water resistance, as well as chemical resistance, for B, C and D Zones.

NOTE: The primers listed above are NOT recommended for food or potable water service, or any service where FDA compliance is required.

CURING

1. Normally polymerization and curing will take place in 5 days at 90°F or 7 days at 70°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied, a minimum substrate temperature of 70°F is required for proper polymerization. Force curing is required for the PLASITE 7122B (brush formulation) when used in immersion service. 7122 should be force cured for all taste sensitive immersion service.
2. Force curing at elevated temperature does increase resistance to certain exposures; therefore, when exposure is severe, force curing is recommended to obtain maximum resistance.
3. Listed below are a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70° to 100°F be allowed. After the air dry period has elapsed, the temperature should be raised by approximately 30°F each 30 minutes until the desired force curing temperatures are reached.

METAL TEMPERATURE °F	°C	CURING TIME	METAL TEMPERATURE °F	°C	CURING TIME
130	54.4	18 Hours	170	76.6	3½ Hours
140	60.0	10 Hours	180	82.2	2½ Hours
150	65.5	6 Hours	190	87.7	2 Hours
160	71.1	4½ Hours	200	93.3	1¾ Hours

4. Final cure may be checked by exposing coated surface to MIBK for ten minutes. If no dissolving and only minor softening of film occurs, the curing can be considered complete. The film should reharden after exposure if cured.

PLASITE ®

TECHNICAL BULLETIN

7122
February 1987
(Replaces Jan. 1983)

PLASITE 7122 HI-RESISTANT PROTECTIVE COATING

TYPE: A cross linked epoxy-phenolic cured with an alkaline curing agent and formulated with particular attention to wide chemical resistance and ease of handling.
INTENDED USE: As a tank lining and for industrial maintenance. May be applied to metal, concrete and wood. (Refer to ZONE OF USAGE below.)
FOR INDUSTRIAL USE ONLY!
GOVERNMENT AGENCY ACCEPTANCE: Meets the requirements of the U. S. Food and Drug Administration, 21 CFR 175.300. (NOTE: The color "Green" is not suitable for food service. Special colors may not meet FDA requirements; consult PLASITE Technical Service Department).
PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Department of Agriculture for use in direct food contact areas.
PLASITE 7122 White, Lt. Gray and Lt. Blue have been accepted by the U. S. Environmental Protection Agency for surfaces which contact potable water.
CHEMICAL RESISTANCE: Excellent chemical resistance to a wide range of acids, alkalies, solvents and water solutions. Refer to CHEMICAL RESISTANCE on Page 2.
TEMPERATURE RESISTANCE: Dry film basis is 400°F for short periods. Continuous immersion temperatures depend on particular reagent.
SURFACE PREPARATION: Steel surfaces shall be prepared by blasting as required by ZONE OF USAGE. Refer to PRIMERS on Page 2.
APPLICATION: PLASITE 7122H is formulated for standard production spray equipment. 7122B is formulated for brush and roller application and should be force cured for immersion service. Refer to page 4 for details on APPLICATION PROCEDURE.
COLORS: Green; Light gray; Medium gray; Black; White; Light blue; Tile red. Special colors are available, but may not be suitable for food service. Consult PLASITE Technical Service Department.
FILM THICKNESS PER COAT: A 6 to 7 mil film is produced in one multi-pass spray coat. A 2 to 4 mil film may be produced by one flow on brush coat.
COVERAGE: 698 mil ft²/gallon ± 4% theoretical. For estimating purposes, 50 ft²/gallon will produce a 12 to 15 mil DFT film (20% loss included). Two multi-pass spray coats will produce the 12 to 15 mil DFT film recommended for immersion service.
DRYING TIME: Surface will normally be tack free in 2 to 3 hours at 70°F.
CURING TIME: 5 days at 90°F or 7 days at 70°F. Refer to Page 2 for force curing.

PHYSICAL SPECIFICATIONS

PIGMENTS: Titanium dioxide, inerts and tinting colors.
SOLIDS: 67% by weight; 56% ± 4% by volume, depending on color and pigmentation.
POT LIFE: Approximately 24 hours at 70°F.
SHELF LIFE: 24 months at 70°F. Material in stock should be turned upside down every 3 months.
SPRAY VISCOSITY: 28 ± 7 seconds - Ford Cup #4 depending on color.
SHIPPING WT.: Approximately 12 lbs./gallon.

ELECTRICAL RESISTANCE: 5.5 × 10¹⁰ ohm-cm Volume Resistivity - ASTM D-257-66.
***ABRASIVE RESISTANCE:** 47 milligrams average loss 1000 cycles TABER CS-17 Wheel - 1000 Gr. Wt., lt. gray color.
***HARDNESS:** Konig Pendulum Hardness of 136 seconds (Glass Standard = 250 seconds); ASTM METHOD D4366-84.
THERMAL SHOCK: Unaffected 5 cycles -70°F to +200°F.
GLOSS: 86 at 60°.
***NOTE:** Above tests were conducted on film cured at 150°F.

VOLATILE ORGANIC COMPOUNDS CONTENT

Color	COATING AS SUPPLIED (ASTM METHOD D2369) Lbs./Gal.	Grams/Liter	THINNED 10% BY VOLUME WITH PLASITE 71 THINNER *Lbs./Gal.	*Grams Liter
Lt. Gray	3.09 ±2%	370 ±2%	3.43 ±2%	410 ±2%

NOTE: VOC content varies between colors. Contact PLASITE Technical Service Department for VOC of specific colors.
*Determined theoretically by using ASTM Method test results.

ZONE OF USAGE

A ZONE: Includes immersion service for process, transportation and storage vessels, as well as exteriors of high temperature equipment, sumps, sewers, exhaust ducts, concrete bases and floors or other surfaces subject to combinations of high temperature and heavy spills of corrosive chemicals. SSPC-SP5 blast and a film thickness of 12 to 15 mils required.
B ZONE: Interior process areas where structural steel, floors, equipment, ducts and other surfaces are subject to attack by strong fumes, occasional spills and splashes at intermediate temperatures. SSPC-SP5 or SSPC-SP10 blast and a film thickness of 12 to 15 mils required. With surface preparation as indicated, the finish coating is considered self-priming although, if desired, a heavy duty primer may be incorporated as part of the system.
C ZONE: Interior and exterior area surfaces subject to fumes of fairly high concentration at ambient temperatures. Heavy or medium duty primer over SSPC-SP6 or SSPC-SP7 blast and a total film thickness, (primer and topcoat) of 7 to 10 mils required.
D ZONE: Process plant exterior subject to chemical atmosphere and weathering. Medium duty primer over SSPC-SP7 or SSPC-SP3 surface preparation and a total film thickness, (primer and topcoat) of 6 to 8 mils required.

R 8/89

WISCONSIN PROTECTIVE COATINGS CORP.
614 Elizabeth Street
P.O. Box 8147
Green Bay, WI 54308-8147
414-437-6561

Represented by:

CHEMICAL RESISTANCE

The following list of laboratory tests is an indication of the range of chemical resistance. These tests consist of mild steel test panels [illegible] film thickness of 12 to 15 mils. The panels are one-half immersed in the solution at temperatures of 70° to 100°F for a period of six [illegible] no effect on the coating.

ACIDS	ALKALIES	SOLVENTS	MISCELLANEOUS
[illegible]% Sulfuric*	50% Sodium Hydroxide	Alcohol	Calcium Chloride
50% Oxalic*	Magnesium Hydroxide	Ethyl, Iso-Propyl,	Latex Rubber
30% Phosphoric*	10% Potassium Hydroxide	Butyl, Decyl	Linseed Oil
25% Boric*	Calcium Hydroxide	Gasoline	Brine
50% Citric*	50% Sodium Carbonate	Kerosene	Ferric Chloride*
	Tri-Sodium Phosphate	Iso-Propyl Acetate	Ammonium Nitrate
		Naptha	Sour-Crude Oil — 150°F

***NOTE:** Although the chemical tests indicated may show that PLASITE 7122 is unaffected by immersion as listed, it is not meant to imply an express guarantee in actual service. The service is dependent upon proper application and actual operating conditions and it is generally recommended that users confirm adaptability of the product for a specific use by their own tests.

PLASITE 7122 is classified as a relatively thin film coating and should not be used for total and continuous immersion in certain chemicals such as those acids referred to under CHEMICAL RESISTANCE which have extremely high corrosion rate to mild steel and other substrates. Use in such chemical exposure should be confined to fumes and spills.

THINNERS

The following thinners are recommended:

PLASITE 71 THINNER — is a medium fast thinner to be used under most conditions.

PLASITE 69 THINNER — recommended for airless or conventional spray. A special blend of fast evaporating solvents and containing no hydrocarbons.

It will always be necessary to thin the coating. The applicator must make exact thinner adjustments based on his equipment and air and surface temperatures. The following thinning guidelines are approximate:

Normal application temperatures and conditions will require the addition of approximately 10% thinner by volume with approximately 5% additional thinner added for each 5° of increased temperature.

It is recommended that the amount of thinner included on each order amount to approximately 20% of the coating order.

PRIMERS

Primers of the inhibitive type must be used when steel surfaces are not blasted to white metal and when finish coatings are below 8 mils in thickness. These primers may be applied by either brush or spray application:

PLASITE 7100 ANTI-CORROSIVE PRIMER described in Bulletin 7100-AC is an epoxy-phenolic catalyzed primer of heavy duty type applicable for B, C and D Zones.

PLASITE 7103 HEAVY DUTY PRIMER described in Bulletin 7103 is an epoxy metal primer with superior bond and water resistance, as well as chemical resistance, for B, C and D Zones.

NOTE: The primers listed above are <u>NOT</u> recommended for food or potable water service, or any service where FDA compliance is required.

CURING

1. Normally polymerization and curing will take place in 5 days at 90°F or 7 days at 70°F. This coating should not be applied when air temperature or temperature of surface to be coated is below 50°F. Within 24 hours after coating is applied, a minimum substrate temperature of 70°F is required for proper polymerization. Force curing is required for the PLASITE 7122B (brush formulation) when used in immersion service. 7122 should be force cured for all taste sensitive immersion service.
2. Force curing at elevated temperature does increase resistance to certain exposures; therefore, when exposure is severe, force curing is recommended to obtain maximum resistance.
3. Listed below are a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70° to 100°F be allowed. After the air dry period has elapsed, the temperature should be raised by approximately 30°F each 30 minutes until the desired force curing temperatures are reached.

METAL TEMPERATURE °F	°C	CURING TIME	METAL TEMPERATURE °F	°C	CURING TIME
130	54.4	18 Hours	170	76.6	3½ Hours
140	60.0	10 Hours	180	82.2	2½ Hours
150	65.5	6 Hours	190	87.7	2 Hours
160	71.1	4½ Hours	200	93.3	1¾ Hours

4. Final cure may be checked by exposing coated surface to MIBK for ten minutes. If no dissolving and only minor softening of film occurs, the curing can be considered complete. The film should reharden after exposure if cured.

SURFACE PREPARATION

STEEL

High Temperature & Immersion Service (A & B Zones are described under ZONE OF USAGE.)

1. All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag shall be corrected prior to abrasive blasting. Skip welds shall be welded solid.
2. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease etc. may be used. Pre-baking of old tanks is recommended.
3. The surface shall be blasted to an SSPC-SP5 or NACE No. 1 white metal surface using a Venturi blast nozzle supplied with 80 to 100 psi. An anchor pattern or "tooth" in the metal shall correspond to approximately 20 to 25% of the total film thickness of the coating.
4. Contaminated grit shall not be used for the finish work.
5. The blasting media used shall be a natural abrasive, or steel grit, or slag grit (similar or equal to BLACK BEAUTY®). These abrasives shall be sharp with a hard-cutting surface, properly graded, dry and of best quality. The media shall be of proper size to obtain the specified anchor pattern and shall be free of objectionable contaminants.
6. The anchor pattern shall be sharp and no evidence of a polished surface is allowed.
7. Remove all traces of grit and dust with a vacuum cleaner or by brushing. Care must be taken to avoid contaminating the surface with fingerprints or from detrimental material on the workers' clothes.
8. The surface temperature shall be maintained at a minimum of 5° above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared.

Service in Corrosive Atmosphere (B, C and D Zones as described under ZONE OF USAGE.)

1. Degrease surface as described in Item 2 under A & B Zones.
2. Remove all loose mill scale, rust scale and old paint scale by one of the following methods:
   a. Near white metal blast cleaning — (B Zone) SSPC-SP10 or NACE No. 2.
   b. Commercial blast cleaning — (C Zones) SSPC-SP6 or NACE No. 3.
   c. Brush-off blast cleaning — (C & D Zones) SSPC-SP7 or NACE No. 4.
   d. Power tool cleaning — (D Zone) SSPC-SP3.

When utilized, inhibitive primer should be applied as soon as possible after surface preparation.

D Zone application surface preparation as in above Paragraph 2 (d) must result in a relatively rough surface. If the steel is new and this type of surface preparation does not leave a reasonably rough surface on the steel, then the heavy film system is not recommended.

NOTE: The above specification numbers are from Steel Structure Painting Council Surface Preparation Specifications, 4400 Fifth Ave., Pittsburgh, PA 15213 and National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218.

CONCRETE

A ZONE: All concrete surfaces require whip blasting for immersion service. Fully cured concrete must be blasted to provide a hard, firm and clean surface for coating. All concrete surfaces must be filled and sealed with PLASITE 9028M1 or PLASITE 9028M2 applied in accordance with PLASITE Bulletin 9028. All surface imperfections, "bug holes," etc. must be completely repaired before application of PLASITE 7122.

PLASITE 9028M1 and 9028M2 are <u>NOT</u> recommended for food or potable water service. (When coating system requires food or potable water service, or any service where FDA acceptance is required, refer to PLASITE Bulletin 9029 Concrete Filler-Sealer.)

B ZONE: Severity of expected service will dictate minimum concrete surface preparation. Severe service (strong fumes, spillage, etc.) will probably require A Zone surface preparation and PLASITE 9028M1 or PLASITE 9028M2 filling and sealing before application of PLASITE 7122.

GALVANIZED SURFACE

The surface shall be clean and grease free and properly etched with a standard solution such as GALVAPREP® 5 (as produced by Parker & Amchem) or a phosphating solution. After the surface is properly etched, it should be thoroughly rinsed with water and thoroughly dried prior to the coating application. No inhibitive primer is required providing the galvanized surface is continuous.

ALUMINUM

Surface shall be clean and grease free with a blast produced anchor pattern or "tooth" as described earlier under "STEEL". In addition, the blasted surface shall be given a chemical treatment such as:

ALODINE® 1200S available from Parker & Amchem 32100 Stephenson Highway Madison Heights, MI 48071 (800) 521-1355	OR	IRIDITE® 14-2 produced by Allied-Kelite Division of Witco Corporation 2701 Lake Street Melrose Park, IL 60160 (800) 323-9784

For immersion, blasting with sharp grit followed by the chemical surface treatment is required.

NOTE: On metallic surfaces prepared only by chemical etching, the total coating film thickness applied should be restricted to only half the film normally applied to blasted surfaces. This reduced film thickness should be considered during selection of the coating for the service and the type of surface preparation performed.

WOOD, TRANSITE, AND SIMILAR SURFACES

Normally these materials need no surface treatment provided they are free of grease, oil and dirt and they are dry. It is generally recommended that the first coat be diluted one part of recommended PLASITE Thinner to one part of material and brush applied.

EQUIPMENT

SPRAY APPLICATION

1. All spray equipment should be thoroughly cleaned and the hose, in particular, should be free of old paint film and other contaminants.
2. Use standard production-type spray guns:

GUN	FLUID	AIR
DeVilbiss JGA-502	E	704
Binks #18	66-SS	63-PB
Graco PS00	04	02

3. When airless spray equipment is used the recommended liquid pressure is 1500 to 1800 psi with the tip size from .013" to .021". Thinning requirements are more than for conventional spray.

BRUSH APPLICATION

Use a high quality brush.

READ THIS NOTICE!
SAFETY AND MISCELLANEOUS EQUIPMENT

1. For tank lining work, it is recommended that the [illegible] provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.
2. THE SOLVENT IN THIS COATING IS FLAMMABLE AND CARE AS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks and open flame and use necessary safety equipment, such as air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms and other enclosed spaces adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

MIXING

The catalyst is in a separate container and measured for the coating unit supplied. Thoroughly mix the pigments. After the pigment and liquid is thoroughly mixed, add the measured liquid catalyst slowly and mix completely with the coating. The coating should stand approximately 30 minutes after the catalyst has been thoroughly mixed.

APPLICATION PROCEDURE

SPRAY GUN

1. Air supply shall be uncontaminated. Adjust air pressure to approximately 50 lbs. at the gun and provide 10 to 15 lbs. of pot pressure. Adjust spray gun first by opening liquid valve and then adjusting air valve to give an 8" to 12" wide spray pattern with best possible atomization.
2. Apply a "mist" bonding pass.
3. Allow to dry approximately one minute but not long enough to allow film to completely dry.
4. Apply crisscross multi-passes, moving gun at fairly rapid rate, maintaining a wet appearing film. Observe the coating surface and, when it appears to be flowing together, you will have an average 4 to 5 mils wet film. By allowing the solvents to flash-off for a few minutes, several more fast multi-passes may be applied until you have a film thickness of approximately 5 to 7 mils (approximately 10 to 12 wet mils).
5. Overcoat Time will vary both with temperature and ventilation. Will require from 8 to 12 hours at 70°F for enclosed spaces. Less time required for exteriors. Remove all overspray by dry brushing or scraping if required.
6. By repeating Step No. 4 a homogeneous film of 12 to 15 mils is obtained.
7. Equipment must be thoroughly cleaned immediately after use with PLASITE thinner to prevent the setting of the coating.

NOTE: Prior to spray application all irregular steel areas, including weld seams should be brush coated with 7122 thinned a minimum of 30% by volume.

BRUSH APPLICATION

1. Apply a very light crisscross brush coat.
2. Allow to dry for approximately 5 minutes.
3. Apply a heavy coat using crisscross brush pattern. "Flow" the coating on rather than try to "brush out."
4. Allow to dry tack free.
5. Repeat Steps 3 and 4 until sufficient film thickness is obtained. Normally a film thickness of 2½ to 3 mils can be obtained per coat by this method.

INSPECTION

Refer to PLASITE Bulletin PA-3, Section 3, for inspection requirements.

PLASITE 7122 SPECIAL FORMULATIONS

7122 HAR: Formulated for added abrasion resistance. Refer to Technical Bulletin 7122 HAR.
7122 TFE: Formulated with fluorocarbon pigments for excellent release and mass flow properties. Same chemical resistance, coverage and application as for standard 7122.

This Bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult with your local sales representative or PLASITE Technical Service Department for further information.

METRIC COMPARISONS

1 mil = .001" = 25.4 microns

1 U.S. gallon = 3.785 liters

1 sq. ft. x 0.0929 = sq. meters

$$°C = \frac{5\,(°F - 32)}{9}$$

We guarantee our product to be free of defects in material and workmanship and to be in accordance with our company quality control standards. All data, statements and recommendations made herein are based upon information we believe to be reliable, but are made without any representation or guarantee or warranty of accuracy and are made with reservation of all patent rights. Our products are sold on the condition that the user himself will evaluate them as well as our recommendations, to determine their suitability for his own purpose and their adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations. Liability under any condition shall be limited to replacement of material only. No liability is assumed or implied, for injury to personnel, [illegible] product loss or any other expenses incidental to the structure or operation of the plant and equipment where this coating is applied.

High-Density Polyethylene Liner Information

SLT

HyperFlex®
Premium Grade HDPE Lining Material

SLT HyperFlex is uniquely produced from a specially formulated virgin HDPE geomembrane resin. **HyperFlex** has outstanding chemical resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. **HyperFlex** contains approximately 97.5% polymer and 2.5% carbon black, anti-oxidants and heat stabilizers, and contains no additives, fillers or extenders. **HyperFlex** has excellent resistance to UV radiation and is suitable for exposed conditions.

SMOOTH HDPE

PROPERTY	TEST METHOD	NOMINAL VALUES					
Thickness, mils	ASTM D751/1593/374	30	40	60	80	100	120
Density (g/cc)	ASTM D792/1505	0.944	0.944	0.944	0.944	0.944	0.944
Melt Flow Index (g/10 minutes)	ASTM D1238-E	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
Tensile Properties Either Direction	ASTM D638 Type IV Dumbell, 2 ipm Gauge length per N.S.F. Std. 54						
Tensile Strength at Break (lbs/in, width)		150	200	300	400	500	600
Tensile Strength at Yield (lbs/in, width)		72	96	144	192	240	288
Elongation at Break (percent)		700	800	800	800	800	800
Elongation at Yield (percent)		15	15	15	15	15	15
Tear Resistance Initiation (lbs)	ASTM D1004	25	33	50	66	83	100
Low Temperature Brittleness °F	ASTM D746 B	<-120	<-120	<-120	<-120	<-120	<-120
Dimensional Stability Each Direction (percent)	ASTM D1204 100°C 1 hr.	±1	±1	±1	±1	±1	±1
Volatile Loss (max. percent)	ASTM D1203 Meth. A	0.10	0.10	0.10	0.10	0.10	0.10
Ozone Resistance	ASTM D1149 7 days 100 ppm 104°F	No Cracks	No Cracks	No Cracks	No Cracks	No Cracks	No Cracks
Environmental Stress Crack Resistance (hrs)	ASTM D1693 Cond. B	>2000	>2000	>2000	>2000	>2000	>1500
Puncture Resistance (lbs)	FTMS 101C Method 2065	45	60	90	120	150	180
Water Absorption (percent weight change)	ASTM D570	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Coef. Linear Thermal Expansion 10⁻⁴/°C	ASTM D696	1.2	1.2	1.2	1.2	1.2	1.2
Moisture Vapor Transmission (g/m²day)	ASTM E96	<0.002	<0.001	<0.001	<0.0009	<0.00085	<0.0008
Oxidative Induction Time (minutes) Pure O_2 at 1 Atmosphere	ASTM D3895 200°C	100	100	100	100	100	100
Tensile Impact Strength (ft-lbs/in²)	ASTM D1822	381	381	381	381	381	381
Carbon Black Content (percent)	ASTM D1603	2.5	2.5	2.5	2.5	2.5	2.5
Carbon Black Dispersion	ASTM D3015	A1	A1	A1	A1	A1	A1

SLT HyperFlex is available in 24-foot widths and up to 8,000 lb. rolls. Special length rolls available upon request.

This data is provided for informational purposes only and is not intended as a warranty or guarantee. SLT assumes no liability in connection with the use of this data.

For environmental lining solutions...the world comes to SLT.®

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SLT

SLT North America Inc

FrictionFlex® Textured HyperFlex® Lining Material

SLT's FrictionFlex patented texturing process provides the industry's leading textured liners. Uniquely produced from a specially formulated virgin HDPE geomembrane resin, FrictionFlex has outstanding chemical resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. HyperFlex, textured with the FrictionFlex process, contains approximately 97.5% polymer and 2.5% carbon black, antioxidants and heat stabilizers, and contains no additives, fillers or extenders. SLT textured liners have excellent resistance to UV radiation and are suitable for exposed conditions.

PROPERTY	TEST METHOD	NOMINAL VALUES			
Thickness, mils	ASTM D751/374/1593	40	60	80	100
Density (g/cc)	ASTM D792/1505	0.944	0.944	0.944	0.944
Melt Flow Index (g/10 minutes)	ASTM D1238-E	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0
Tensile Properties Either Direction	ASTM D638 Type IV Dumbell, 2 ipm				
Tensile Strength at Break (lbs/in. width)	Gauge length per	200	300	400	500
Tensile Strength at Yield (lbs/in. width)	N.S.F. Std. 54	96	144	192	240
Elongation at Break (percent)		600	600	600	600
Elongation at Yield (percent)		15	15	15	15
Tear Resistance Initiation (lbs)	ASTM D1004 Die C	33	50	66	83
Low Temperature Brittleness	ASTM D746 B	<-120°F	<-120°F	<-120°F	<-12
Dimensional Stability Each Direction (percent)	ASTM D1204 248°F 1 hr.	± 1	± 1	± 1	± 1
Volatile Loss (max. percent)	ASTM D1203 Meth. A	0.10	0.10	0.10	0.10
Ozone Resistance	ASTM D1149 7 days 100 pphm 104°F	No Cracks	No Cracks	No Cracks	No Cracks
Environmental Stress Crack Resistance (hrs)	ASTM D1693 Cond. C	>2000	> 2000	> 2000	> 2000
Puncture Resistance (lbs)	FTMS 101C Method 2065	60	90	120	160
Water Absorption (percent weight change)	ASTM D570	<0.01	<0.01	<0.01	<0.01
Coef. Linear Thermal Expansion 10^{-4}/°C	ASTM D696	1.2	1.2	1.2	1.2
Moisture Vapor Transmission (g/m²day)	ASTM E96	<0.001	<0.001	<0.0009	<0.00085
Oxidative Induction Time (minutes) Pure O_2 at 1 Atmosphere	ASTM D3895 200°C	100	100	100	100
Tensile Impact Strength (ft-lbs/in²)	ASTM D1822	381	381	381	381
Carbon Black Content (percent)	ASTM D1603	2.5	2.5	2.5	2.5
Carbon Black Dispersion	ASTM D3015	A1	A1	A1	A1

SLT FrictionFlex is available in 24-foot widths and up to 8,000 lb. rolls. Special length rolls and other material thicknesses are available upon request.

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For environmental lining solutions...the world comes to SLT.®

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10-95, SLT

SLT

SLT PolyLock® Cast-in-Place Component for Embedded Concrete Sealing

SLT PolyLock is an extruded high-density polyethylene profile designed for use as a cast-in-place mechanical anchor for HDPE lining terminations with concrete. In addition to providing a superior juncture, the elimination of anchor bolts, batten strip and gasket materials, PolyLock generally offers a more cost effective assembly. The PolyLock design provides a wide face for lining attachment, ease of installation and rounded corners to reduce stress crack initiation.

Dimensions:	Available in 10-foot lengths Width: 6" Anchor Finger Length: 1-1/2"
Chemical Resistance:	Excellent
Tensile Strength:	> 4,000 lbs/in²
Low Temperature Brittleness:	< -70°F
Resistance to Creep:	Excellent
Puncture Resistance:	Excellent

SLT PolyLock Concrete Embedment Profile

For environmental lining solutions...the world comes to SLT.®

North American Headquarters:
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Conroe, Texas 77385
Phone 713-350-1813
Fax 409-273-2266

European Headquarters:
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24 Regent Crescent
Moorebank, New South Wales
Australia 2170
Phone 61-2-821-2977
Fax 61-2-821-5611

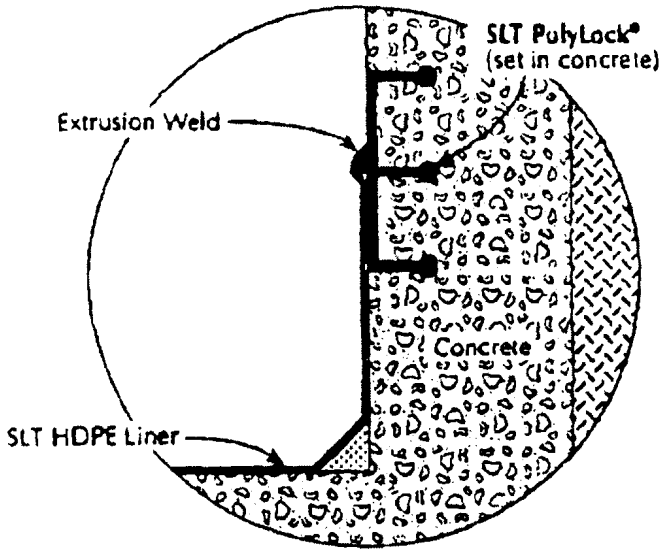
Far East Headquarters:
SLT Lining Technology (Far East) Pte., Ltd.
182 Tagore Ln.
Singapore 2678
Phone 65-459-2466
Fax 65-459-4366

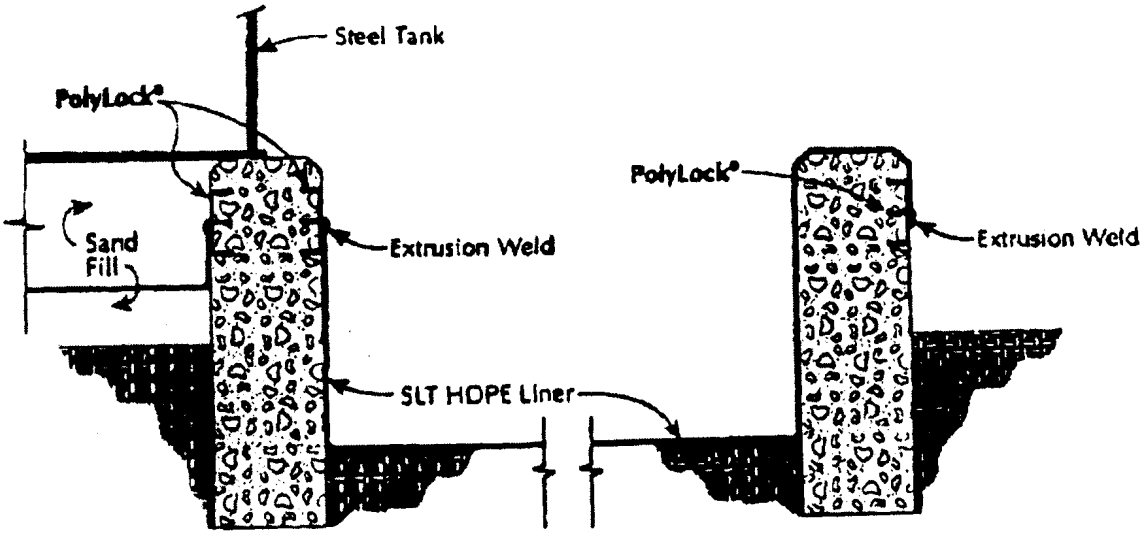
SLT PolyLock®

SLT PolyLock extruded profile is one of a family of geosynthetic products offered by SLT. PolyLock offers a mechanically stable, cost effective attachment to concrete and masonry. The HDPE resin used to manufacture PolyLock exhibits excellent chemical resistance and superior creep resistance. PolyLock can be installed in horizontal or vertical positions for a wide variety of attachments and applications.

SLT is the pioneer in the development and installation of HDPE liners for environmental protection applications. Continuing its tradition of technological leadership, SLT was the first company to develop a concrete embedment for membrane attachment; the first to manufacture the PolyLock extruded profile; and the first to install PolyLock. PolyLock is the first cast-in-place mechanical anchor system for HDPE lining termination with concrete. You can get the original PolyLock technology only from SLT.

Other special products, including extrusions, fabrications and formed items, are available through SLT for specialty applications.





This data is provided for informational purposes only and is not intended as a warranty or guarantee. SLT assumes no liability in connection with the use of this data.

PR0015/06-94

4

POLY-FLEX
POLYETHYLENE GEOMEMBRANES

Quality Control & Quality Assurance

7.1.2
Properties Met By Poly•Flex Geomembrane Rolls

Property	Test Method	Typical Value* 20 mil (0.5mm)	30 mil (0.75mm)	40 mil (1.0mm)	60 mil (1.5mm)	80 mil (2.0mm)	100 mil (2.5mm)
Thickness, mils, minimum	[redacted]	18	27	36	54	72	90
Density (g/cc), minimum	[redacted]	0.94	0.94	0.94	0.94	0.94	0.94
Melt Index (g/10 min., maximum)	[redacted]	0.4	0.4	0.4	0.4	0.4	0.4
Carbon Black content (%)	[redacted]	2-3	2-3	2-3	2-3	2-3	2-3
Carbon Black Dispersion	[redacted]	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1
Tensile Properties	[redacted]						
1. Tensile Strength at Yield (pounds/inch width)	[redacted]	50	75	100	150	200	250
2. Tensile Strength at Break (pounds/inch width)	[redacted]	85	125	165	250	330	400
3. Elongation at Yield (%)	[redacted]	13	13	13	13	13	13
4. Elongation at Break (%)	[redacted]	750	750	750	750	750	750
5. Modulus of Elasticity (1% secant; pounds/square inch)	[redacted]	90,000	90,000	90,000	90,000	90,000	90,000
Tear Strength (lbs.)	[redacted]	15	23	31	47	63	79
Puncture Resistance (lbs.)	[redacted]	100	140	180	260	340	420
	[redacted]	40	53	65	90	120	155
Hydrostatic Resistance (lbs./square inch)	[redacted]	165	245	330	495	660	800
Low Temperature Brittleness (°F)	[redacted]	<-94°	<-94°	<-94°	<-94°	<-94°	<-94°
Dimensional Stability (% change max.)	[redacted]	± 1	± 1	± 1	± 1	± 1	± 1
Volatile Loss (%)	[redacted]	0.1	0.1	0.1	0.1	0.1	0.1
Resistance to Soil Burial (% change max. in orig. value)	[redacted]						
A. Tensile Strength at Yield & Break	[redacted]	10	10	10	10	10	10
B. Elongation at Yield & Break	[redacted]	10	10	10	10	10	10
Ozone Resistance	[redacted]	no cracks	no cracks	no cracks	no cracks	no cracks	no cracks
Environmental Stress Crack (hours)	[redacted]	>2000	>2000	>2000	>2000	>2000	>2000
Water Absorption (% change max in original weight)	[redacted]	0.1	0.1	0.1	0.1	0.1	0.1
Coefficient of Linear Thermal Expansion (cm/cm °c) x 10^{-4}	[redacted]	1.2	1.2	1.2	1.2	1.2	1.2
Moisture Vapor Transmission Rate (g/100 in² day)	[redacted]	0.040	0.030	0.025	0.020	0.018	0.017
Roll Dimensions							
1. Width (feet):		22.5	22.5	22.5	22.5	22.5	22.5
2. Length (feet):		1000	800	600	400	300	250
3. Area (square feet):		22,500	18,000	13,500	9000	6750	5625
4. Weight (pounds), approx.:		2250	2700	2700	2700	2700	2800

* All values, except when specified as minimum or maximum, represent average lot property values.

Trevira® Spunbond nonwoven engineering products are highly needled fabrics with excellent tensile properties, high filtration potential and outstanding permeability.

Trevira® Spunbond Type 11 products are 100% continuous filament polyester nonwoven needlepunched engineering fabrics. They deliver a combination of advantages unmatched by any other spunbonded geotextiles. They're resistant to freeze-thaw, soil chemicals and ultraviolet light exposure.

Trevira® Spunbond nonwoven engineering fabrics offer excellent performance where the requirement is tensile reinforcement, planar flow, filtration, or separation. They are ideal for roadways, railbeds, drainage systems, lining systems, retaining walls. And much more.

TYPICAL PHYSICAL PROPERTIES OF TREVIRA® TYPE 11 PRODUCTS

Fabric Property	Unit	Test Method	011/120	011/140	011/200	011/250	011/280	011/350	011/430	011/450	011/560
Fabric Weight	oz/yd²	ASTM D-5261	3.5	4.2	6.0	7.5	8.5	10.5	12.4	13.5	16.5
Fabric Thickness, t	mils	ASTM D-5199	80	70	90	110	120	140	165	170	210
Grab Strength (MD/CD)*	lbs	ASTM D-4632	120/105	150/125	230/180	300/235	320/260	420/350	475/400	540/450	650/570
Grab Elongation (MD/CD)*	%	ASTM D-4632	75/85	75/85	75/85	75/80	75/80	75/80	75/80	80/80	85/85
Trapezoid Tear Strength (MD/CD)*	lbs	ASTM D-4533	50/40	55/50	80/75	105/86	110/100	140/125	170/145	180/185	225/200
Puncture Resistance	lbs	ASTM D-4833	55	65	95	115	125	155	170	185	225
Mullen Burst Strength	psi	ASTM D-3786	185	225	330	400	435	580	600	700	855
Water Flow Rate	gpm/ft²	ASTM D-4491	195	190	170	150	130	120	105	100	80
Permittivity, Ψ	sec⁻¹	ASTM D-4491	2.61	2.54	2.27	2.01	1.76	1.6	1.47	1.34	1.07
Permeability, k = Ψxt	cm/sec	ASTM D-4491	.40	.45	.52	.58	.53	.57	.62	.58	.57
AOS	Sieve Size mm	ASTM D-4751	70-100 .210-.149	70-100 .210-.149	70-100 .210-.149	70-100 .210-.149	70-120 .210-.125	100-120 .149-.125	100-140 .149-.106	120-140 .125-.106	140-170 .106-.088
Standard Roll Width**	ft		12.5 and 15.0								
Standard Roll Length**	ft		400	400	300	300	300	300	300	300	300

*MD = Machine Direction, CD = Cross Machine Direction.

**Other width and length rolls are available upon request.

MINIMUM† PHYSICAL PROPERTIES OF TREVIRA® TYPE 11 PRODUCTS

Fabric Property	Unit	Test Method	011/120	011/140	011/200	011/250	011/280	011/350	011/430	011/450	011/560
Fabric Weight	oz/yd²	ASTM D-5261	3.3	4.0	5.7	7.1	8.0	10.0	12.0	13.0	16.0
Fabric Thickness, t	mils	ASTM D-5199	50	55	75	95	105	125	145	150	185
Grab Strength	lbs	ASTM D-4632	90	110	160	210	230	305	350	390	500
Grab Elongation	%	ASTM D-4632	60	60	60	60	60	60	60	65	70
Trapezoid Tear Strength	lbs	ASTM D-4533	30	40	60	75	80	100	120	130	150
Puncture Resistance	lbs	ASTM D-4833	46	50	80	95	100	130	150	155	195
Mullen Burst Strength	psi	ASTM D-3786	170	190	285	380	360	510	550	640	780
Water Flow Rate	gpm/ft²	ASTM D-4491	155	150	130	110	90	80	65	60	40
Permittivity, Ψ	sec⁻¹	ASTM D-4491	2.07	2.01	1.74	1.47	1.20	1.07	0.87	0.80	0.53
Permeability, k = Ψxt	cm/sec	ASTM D-4491	.28	.28	.33	.36	.32	.34	.32	.31	.25
AOS	Sieve Size mm	ASTM D-4751	50 .300	50 .300	70 .210	70 .210	70 .210	70 .210	70 .210	100 .149	100 .148

†These minimum values represent minimum test values as determined from Quality Control (Q.C.) testing.

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9/93

P.06

APR-26-95 FRI 6:44

Manufacturer's Information on Perma-Con® Modular Containment System

3.3 All welding shall be performed by welders qualified by the American Welding Society. Welder qualifications shall be submitted with any proposal or supplied material.

3.4 Assembled modular panel containments shall be designed to be sufficiently air-tight and structurally rigid to maintain and withstand a negative pressure of 0.1 inch, water column upon completion of prescribed field erection instructions.

3.5 A seismic strength analysis for the assembled, ordered containment shall be provided using the equivalent static loads prescribed by the Uniform Building Code for the zone that applies to the location where the structure is to be used. Accepted engineering practices supported by test data when appropriate shall be used for this shear strength justification.

3.6 Each stainless steel sheet on a panel shall have the edges offset toward the steel frame. This offset will cause the sheet metal edges to press into the frame when the panel is fastened to the frame. This will preclude the sheathing from exposing raised/sharp edges.

3.7 Each stainless steel sheet panel shall have a 'crossbuck' crease on four foot centers. This crossbuck creasing feature will increase the rigidity of the sheet metal and reduce the possibility of an "oil canning" effect.

3.8 Panel sections shall be secured together using 1/2"dia. x 1" or longer bolted fasteners for primary field erection of modular panels. Fasteners shall comply to ASTM A307-84.

3.9 Carbon steel components shall be factory coated so as to resist rusting and mild acid and caustic wash down. Interior panel joints and seams shall be readily sealed to prevent contamination release after building assembly.

3.10 Materials to be excluded from use in the modular containment design (exclusive of fasteners) include *galvanized materials and other hard to decontaminate materials such as wood, aluminum and polyethylene.*

Large Span Modular Panel Containment Specifications

NFS-Radiation Protection Systems

PERMA-CON TAPE Part No. BA03

Description

Perma-Con Tape is used to cover and seal the small seam that occurs between Perma-Con Panels. The tape provides a smooth air-tight finish to the interior wall and is cosmetically matched to the stainless steel. The tape adhesive is designed to provide secure adhesion yet leave no residue when removed.

Physical Characteristics

Substrate: Poly Vinyl Chloride

Adhesive: Rubber based pressure sensitive

Thickness-- Substrate: .004"--10 mm

Adhesive: .001"--.025 mm

Total: .005"--125 mm

Tensile Strength: 17 lbs., inch width--3.1 kg cm width

Elongation (at break): 140%

Adhesion (to steel): 30 oz. inch width--340 grams cm width

Adhesion (to backing): 30 oz. inch width--340 grams cm width

Moisture Absorption: 1.50%

Moisture Vapor Transmission: 3 grams 100 hrs., (650 cm^2) 24 hrs.

Flame Retardancy: Self-Extinguishing

Tear Resistance: MD.--11 oz. (300 grams) TD--28 oz. (800 grams)

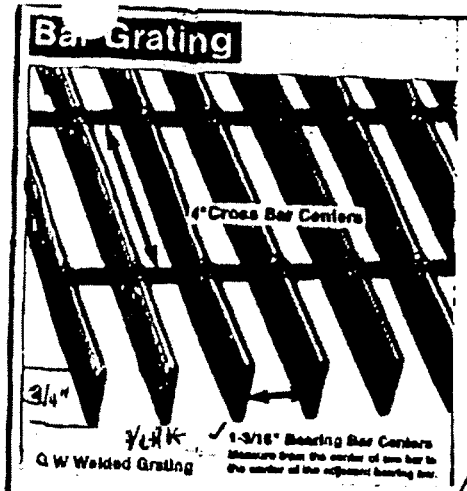
Operating Temperature: 13°F to 176°F--25°C to 80°C

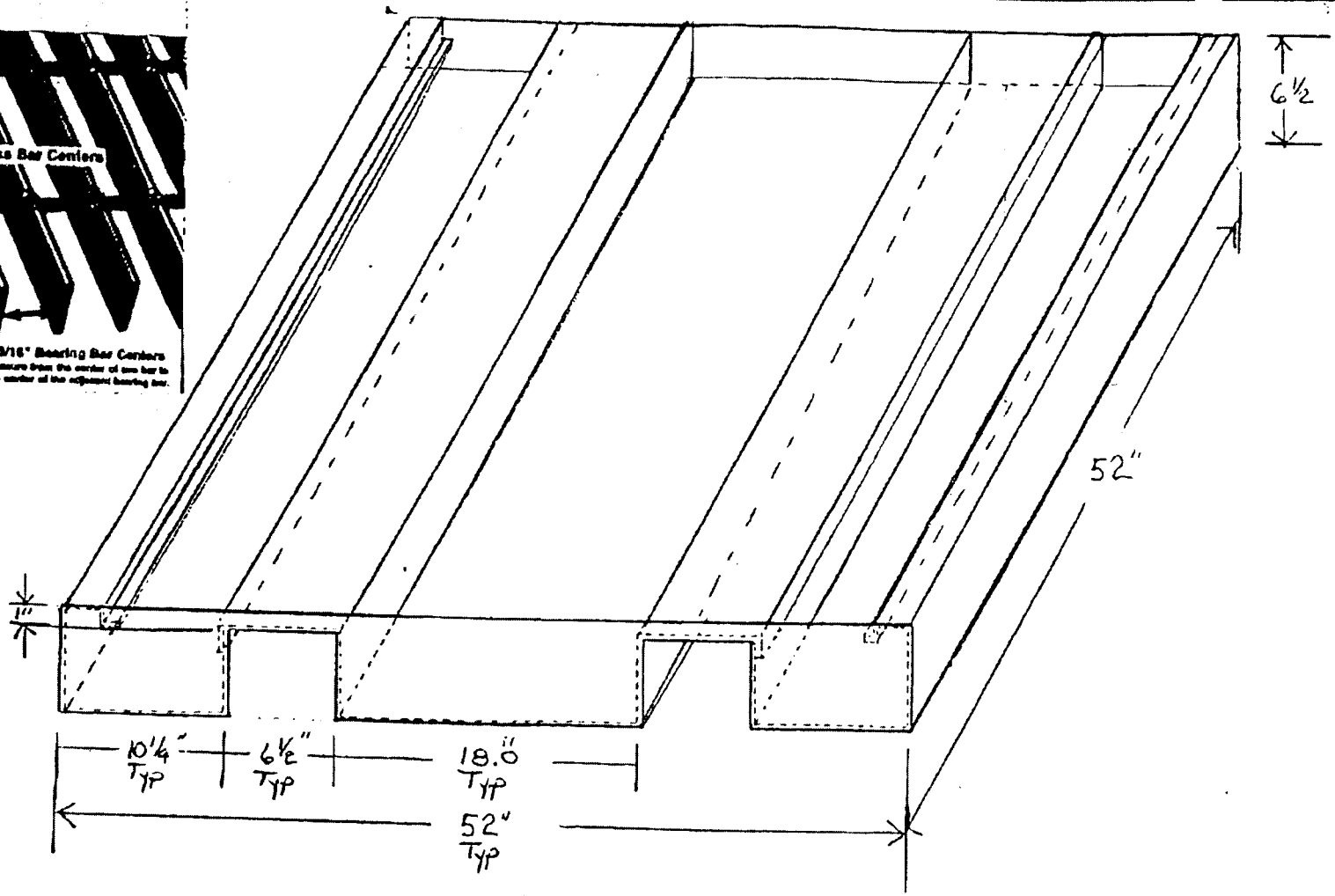
Chemical Characteristics:

Resistance To:

Sunlight--Excellent; Saltwater--Excellent; Alkalies--Excellent; Alcohols, Water Soluble--Good; Acids Organic & Inorganic--Excellent; Animals & Plant Acids--Excellent; Hydrocarbons, Aliphatic--Fair, Hydrocarbons, Aromatic--Poor; Oils--Excellent; Bacteria--Excellent; Fungus--Excellent

Manufacturer's Information on Metal Pallets and Secondary Containment Pallets





Notes:
material: 10ga HRS
Finish: urethane White or Black
Bar Grating Finish: Galvanized
Bar Grating To Be Installed on Top of Containment Pallet
Volume = 57 gallons

International Metal Pallet Co.

SCALE: N/A	APPROVED BY Len L. DIRECTOR	
DATE: May of 98		
TITLE: Containment Pallet		
REVIEWED BY Kevin L	DRAWN BY —	DRAWING NUMBER № 1290

XR-5®, Urethane, Copolymer 2000®, and Polyethylene

CHEMICAL COMPATIBILITY GUIDE*

For Ultra-Containment Berms

According to EPA guidelines, spills must be cleaned up within 24 hours and any secondary containment areas must be inspected once a week. The chart below lists chemical compatibility of XR5, Urethane, Copolymer 2000 and Polyethylene. The information has been developed from industry available data and offers compatibility based on exposure of one week or less.

The rating system is indicated as:

A. Fluid has little or no effect at Room Temperature
B. Fluid has minor to moderate effect at Room
C. Fluid has severe effect at Room Temperature

Chemical	XR-5	Urethane	Copolymer 2000	Polyethylene
Kerosene	A	A	A	A
Diesel Fuel	A	A	A	A
Ohio Crude Oil	A	A	A	A
Hydraulic Fluid- Petroleum Based	A	A	A	A
Naptha	A	A	A	A
Conc. Ammonia Hydroxide	A	C	A	A
50% Acetic Acid	C	C	C	A
50% Phosphoric Acid	A	C	A	A
50% Hydrochloric Acid	A	C	A	A
50% Nitric	C	C	C	B
50% Sulfuric Acid	A	C	A	A
60% Sodium Hydroxide	A	C	A	A
Methyl Alcohol	A	A	A	A
JP-4 Jet Fuel	A	A	A	A
Salt Water 180°F	A	B	A	A
Phtlalate Plasticizers	B	A	B	A
SAE-30 Oil	A	A	A	A
Raw Linseed Oil	A	A	A	A

The above ratings were arrived at by visual and physical examination of the membrane samples after their removal from the test chemical. When considering XR-5Ò, Urethane, Copolymer 2000®, Polyethylene for specific applications, it is important to study the requirements such as permeability, service temperature, concentration, size to be contained, etc. Samples of XR-5Ò, Urethane, Copolymer 2000®, or Polyethylene should be tested close to actual service conditions and also your distributor should be consulted.

***IMPORTANT USER NOTICE FOR**
XR-5Ò, URETHANE, COPOLYMER 2000® & POLYETHYLENE CHEMICAL COMPATIBILITY GUIDE

This listing is offered only as a guide and utilizes information which, to the best of UltraTech's knowledge, is accurate and reliable. Due to variables and conditions of application beyond the control of UltraTech, none of the data shown in this guide is to be construed as a guarantee, expressed or implied. UltraTech International, Inc. assumes no responsibility, obligation or liability in conjunction with the use or misuse of the information herein.

ENPAC CORPORATION

POLY–SPILLPALLET™ 6000

PART NO. 5001
94 GALLON CAPACITY
49.5" X 49.5" X 17" O.D.
40 CFR 264.175

PATENT PENDING

ENPAC CORPORATION
Chardon, Ohio

LIMITED WARRANTY

ENPAC Corporation warrants its products to be free from defects in material and workmanship upon delivery, provided claim is made within 90 days from shipment of product by ENPAC. ENPAC's liability is limited in that ENPAC's sole obligation shall be to repair or replace product that ENPAC determines is defective in material or workmanship. In no event shall ENPAC be liable for indirect, incidental, consequential or special damages arising out of defects in material or workmanship, or arising out of misuse of product, or arising out of delay in or failure of delivery.

* User responsible for chemical compatibility.

FROM: SARA CREEMER
SUBJECT: BRIAN WILLIAMS
PLEASE HAND DELIVER TO EXECUTIVE CONFERENCE ROOM

08-May-2002 08:12 AM

ENPAC CORPORATION Quality Technology Today

POLY-SPILLPALLET™ 6000

Designed to hold the heavy load.

Rated at 6,000 lbs. UDL weight with a 83-gallon sump capacity that meets EPA 40 CFR 264.175. Square 50" x 50" footprint saves space yet easily holds four 55- gallon drums. Includes the same rugged features as the 2000. Optional drain.

- Two removable grates hold up to 6,000 lbs. of UDL wt.
- Forkliftable from all sides

	Poly-spillpallet 6000
Product no.	5001-YE, 5001-YE-D
Dimensions	50"L x 50"W x 17"H
	127 cm x 127 cm x 43 cm
Weight	88 lbs. /40 kg
Load Bearing Capacity UDL	6000 lbs / 2700 kg
Sump	83 gal. / 315.4 liters
Regulations	EPA 40 CFR 264.175

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Polyethylene Chemical Compatibility Guide

Used in determining the compatibility of our polyethylene products with the chemicals you work with.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

KEY

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L Products should be suitable for prolonged or repeated contact with these substances, under the conditions specified.

S These substances may adversely affect the polyethylene.ENPAC products may be suitable for intermittent contact, however, some deterioration in properties may occur. The use should perform qualification tests before or during usage of the container.

N These substances aggressively attack polyethylene or have vapor pressures incompatible with closed containers. Do not use polyethylene containers in these applications.

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Acetaldehyde (40%)	L	Acetaldehyde (40%)	L	Acetamide	L
Acetic Acid (50%)	L	Acetic Acid Anhydride	S	Acetic Ether	S
Acetone	L	Acetylene Tetrabromide	S	Acrylic Emulsions	S
Acrylonitrile	L	Adipic Acid	L	Aliphatic Hydrocarbons (Hexane, Octane, Hexene, Octane, Etc.)	L
Allyl Alcohol (96%)	L	Alum (Aqueous Solutions)	L	Aluminum Chloride (20%)	L
Aluminum Fluoride	L	Aluminum Hydrogen Solution (10%)	L	Aluminum Hydroxide	L
Alums (All Types)	L	Ammonia (Anhydrous)	L	Ammonia (Aqueous)	L
Ammonia (100% Dry Gas)	L	Ammonium Salts	L	Ammonium Acetate	L
Ammonium Bifloride	L	Ammonium Carbonate 50%	L	Ammonium Chloride	L

Ammonium Hydrogen Fluoride (50%)	L	Ammonium Hydroxide	L	Ammonium Metaphosphate Sat'd	L
Ammonium Nitrate (10%)	L	Ammonium Nitrate Sat'd	L	Ammonium Persulfate Sat'd	L
Ammonium Phosphate	L	Ammonium Sulfate (10%)	L	Ammonium Sulfate Sat'd	L
Ammonium sulfide Sat'd	L	Ammonium Thiocyanate Sat'd	L	Amyl Acetate	L
Amyl Alcohol (100%)	L	Amyl Chloride	N	Aniline (100%)	S
Aniline Hydrochloride	S	Animal Fats	L	Anti-Freeze	L
Antimony Salts	L	Antimony Trichloride 90%	L	Aqua Regia	N
Aqueous Salt Solutions (NaCl)	L	Aqueous Alkalies (NaOH)	L	Arsenic Acid	L
Arsenic Salts	L				

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Barium Salts	L	Barium Carbonate	L	Barium Chloride	L
Barium Cyanide	L	Barium Hydroxide	L	Barium Nitrate	L
Barium Sulfate	L	Barium Sulfide	L	Battery Fluid Acid	S
Beef Tallow Emulsion, Sulfonated	L	Beer	L	Benzaldehyde,	L
Benzene	L	Benzene Sulfonic Acid	S	Benzoic Acid	L
Benzyl Alcohol	L	Benzyl Chloroformate	L	Bismuth Salts	L
Bleach Lye (10%)	S	Black Liquor	L	Borax Cold Sat'd	L
Boric Acid Dilute	L	Boric Acid Conc.	L	Bromine, Liquid	N
Bromine, Water	N	Bromobenzene	N	Bromoform	N
Butadiene	L	Butane	L	Butanediol (100%)	L
Butanol	L	Butyl Acetate	L	Butyl Alcohol (100%)	L
Butylene	N	Butylene Glycol	L	Butylene, Liquid	N
Butyl Phenol	N	Butyric Acid	L		

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Calcium Carbonate	L	Calcium Chloride	L	Calcium Hydroxide	L
Calcium Hypochlorite	L	Calcium Nitrate (50%)	L	Calcium Sulfate	L
Camphor Oil	N	Carbon Disulfide	N	Carbonic Acid (Aq CO2)	L
Carbon Monoxide	L	Carbon Tetrachloride	N	Castor Oil Conc.	L
Caustic (Aqueous)	L	Caustic Potash Sol. (50%)	L	Caustic Soda Sol. (10%).	L
Chloral Hydrate	L	Chloroethanol	L	Chloric Acid (10%)	L

Chloroacetic Acid	L	Chlorobenzene	L	Chloroform	N
Chloromethane	N	Chlorosulfonic Acid 100%	N	Chrome Alum Sat'd	L
Chromic Acid (50%)	S	Cider	L	Citric Acid (All Conc.)	L
Clorox Bleach	L	Coconut Oil Alcohols	L	Cola Concentrates	L
Compressed Air Conditioning Oil	L	Copper Salts	L	Copper Cyanide	L
Copper Nitrate (50%)	L	Copper Sulfate	L	Camphor Oil	N
Cottonseed Oil	L	Cresol (90%)	L	Cresylic Acid	L
Crotonic Aldehyde	L	Cuprous Chloride Sat'd	L	Cyclohexane	L
Cyclohexanol	L	Cyclohexanone	S		

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Detergents, General	L	Developer, Photographic	L	Dextrin Sat'd	L
Dextrose Sat'd	L	Dibutyl Ether	N	Dibutylphthalate	S
Dibutyl Sebacate	S	Dichloroacetic Acid	S	Dichloroacetic Acid, Methyl Ester	S
Dichlorobenzene, Liquid	N	Dichloroethylene	N	Diesel Fuel	S
Diesel Oil	S	Diethyl Carbonate	L	Disodium Phosphate	L
Diazo Salts	L	Diethylene Glycol	L	Dithanolamine	S
Diglycolic Acid (30%)	L	Di-Isobutyl Ketone	S	Dimethylamine	S
Dimethyl Formamide	S	Dinonyl Phthalate	N	Dioctyl Phthalate	N
Dioxane	L	Diphenyl Oxide	N		

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Electrolyte	L	Emulsions, Photographic	L	Ethanol	L
Ether	N	Ethyl Acetate (100%)	S	Ethyl Alcohol	L
Ethyl Butyrate	S	Ethyl Chloride	N	Ethyl Ether	N
Ethylene Chloride	N	Ethylene Chlorohydrin	L	Ethylene Diamine	L
Ethylene Dichloride	N	Ethylene Glycol	L	Ethylene Oxide	N

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Fatty Acids	L	Fatty Alcohol Sulfonate	L	Ferric Salts	L
Ferric Sulfate	L	Ferrous Salts	L	Ferrous Sulfate	L
Fertilizer Salts	L	Fish Solubles	L	Fluoboric Acid	L

Fluosilicic Acid (All Conc.)	L	Formaldehyde (40%)	L	Formamide	L
Formic Acid (All Conc.)	L	Fruit Pulp	L	Fuel Oil	L
Furfural (100%)	L	Furfuryl Alcohol	N		

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Gallic Acid Sat'd	L	Gasoline	L	Gasohol	L
Gelatine	L	Gin	L	Gluconic Acid (All Conc.)	L
Glucose	L	Glycerine	L	Glycol	L
Glycol Ethers	L	Glycolic Acid (All Conc.)	L	Grape Sugar Sat'd Aq	L

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Heptane	L	Hexane	L	Hexanol Tert	L
Hydrazine Hydrate	L	Hydrosulfite (10%)	L	Hydroxylamine Sulfate	L
Hydrozine (35%)	L	Hydrazine Hydrochloride	L	Hydroiodic Acid (All Conc.)	L
Hydrobromic Acid (50%)	L	Hydrocyanic Acid Sat'd	L	Hydrochloric Acid (All Conc.)	L
Hydrofluoric Acid (All Conc.)	L	Hydrofluorisilicic Acid (All Conc.).	L	Hydrogen Bromide (10%)	L
Hydrogen Peroxide (90%)	L	Hydrogen Phosphide 100%	L	Hydroquinone	L
Hydrogen Sulfide	L	Hypochlorous Acid	L		

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Inks	L	Iodine (Alc. Sol.) Conc.	L	Iron Salts	L
Iso-Octane	S	Isopropyl Acetate	L	Isopropyl Alcohol	L
Isopropyl Ether	N				

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Jetfuel	S

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Kerosene	S

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Lactic Acid (All Conc.)	L	Lanolin	L	Latex	L
Lead Salts	L	Lead Acetate Sat'd	L	Lime	L
Linseed Oil	L	Lithium Salts	L	Lube Oil	L

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Magnesium Salts	L	Magnesium Carbonate	L	Magnesium Hydroxide	L
Magnesium Nitrate	L	Magnesium Oxide	L	Magnesium Sulfate	L
Maleic Acid	L	Malic Acid (1%)	L	Mercuric Salts	L
Mercurous Salts	L	Mercury	L	Methanol	L
Methyl Acetate	L	Methyl Alcohol (100%)	L	Methyl Amine (32%)	L
Methyl Bromide	N	Methyl Chloride	N	Methylene Chloride	N
Methyl Ethyl Ketone	S	Methyl Isobutyl Ketone	S	Methyl Isopropyl Ketone	S
Methyl Sulfate	L	Methyl Sulfuric Acid (All Conc.)	L	Milk	L
Mineral Oils	L	Molasses	L	Monochloroacetic Acid Ethyl Ester	L
Monochloroacetic Acid Methyl Ester	L	Morphalin	L	Mowilith D	L

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Naptha	S	Napthalene	S	Nickel Salts	L
Nicotine, Dilute	L	Nicotinic Acid	L	Nitric Acid <50%	L
Nitrobenzene	S	Nitrotoluene	S		

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Octyl Cresol	L	Oils and Fats	L	Oleic Acid (All Conc.)	L
Oleum Conc	N	Olive Oil	L	Orange Extract	L
Oxalic Acid (All Conc.)	L				

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Sodium Nitrate	L	Sodium Oxalate	L	Sodium Persulfate	L
Sodium Phosphate	L	Sodium Silicate	L	Sodium Sulfide	L
Sodium Sulfide	L	Sodium Sulfite	L	Sodium Sulfonates	L
Sodium Thiosulfate	L	Spindle Oil	L	Stannic Salts	L
Stannous Salts	L	Starch Solution Sat'd	L	Stearic Acid (All Conc.)	L
Succinic Acid	L	Sugar Solutions, Glucose, Lactose, Sucrose, Etc.	L	Sulfur	L
Sulfuric Acid (98%)	S	Sulfuric Acid, Fuming	N	Sulfurous Acid	L
Sulfuryl Chloride	N				

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Tallow	L	Tannic Acid	L	Tanning Extracts	L
Tartaric Acid Sat'd	L	Tetrachloroethane	L	Tetrachloroethylene	N
Tetraethyl Lead	L	Tetrahydrofuran	N	Tetrahydronapthalene	N
Thionyl Chloride	N	Tin Salts	L	Titanium Salts	S
Toluene	S	Toluene Sulfonic Acid (All Conc.)	S	Transformer Oil	L
Tributylphosphate	L	Trichloroacetic Acid	S	Trichloroethane	N
Trichloroethylene,	N	Tricresyl Phosphate	L	Triethanolamine	L
Trioctyl Phosphate	N	Trisodium Phosphate Sat'd	L	Trichloroethylene	N
Turpentine Oil	N				

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Urea	L	Urine	L

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Vegetable Oil	L	Vinegar	L	Vanilla Extract	L

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Wax Alcohol	N	Wetting Agents	L	Whisky	L
White Acid (75%)	L	Wine	L		

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Xylene	N			

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Yeast	L			

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Zinc Salts	L	Zinc Sulfate	L	

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ATTACHMENT H

STORAGE TANK SYSTEM

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H.3	Written Engineering Assessment/Certification for the Pencil Tanks Component

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
ACI	American Concrete Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
BPVC	Boiler and Pressure Vessel Code
CAM	continuous air monitor
ft	feet/foot
gal	gallon(s)
in.	inch(es)
L	liter(s)
LANL	Los Alamos National Laboratory
TA	technical area

ATTACHMENT H
STORAGE TANK SYSTEM

The information provided in this section is submitted to address the applicable tank system requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §270.16, and 20.4.1 NMAC, Subpart V, Part 264, Subpart J, revised June 14, 2000 [6-14-00]. This section provides a description of the storage tank system that is used to store mixed waste solutions at Los Alamos National Laboratory (LANL) Technical Area (TA) 55. It includes detailed descriptions of the storage tank system components and associated ancillary equipment.

There is one storage tank system at TA-55 that is comprised of 3 tank components that share a common piping and pumping system. The storage tank system consists of both new and existing components as summarized in Table H-1.

The evaporator glovebox tank was constructed in 1986 and is an existing tank; therefore, this component of the tank system is addressed in this permit application in accordance with the requirements of 20.4.1 NMAC §264.191 [6-14-00]. The cementation unit pencil tanks were constructed in 1985 and were considered existing tanks until new components were installed in 1996. These new components were determined to be a major, non-routine modification; therefore, the cementation unit pencil tanks are subject to the new tank system regulations and are addressed in this permit application as new tanks in accordance with the requirements of 20.4.1 NMAC §264.192 [6-14-00]. The pencil tanks will be constructed and, thus, are subject to new tank system regulations in accordance with the requirements of 20.4.1 NMAC §264.192 [6-14-00].

The written engineering assessments and certifications for the tanks, as required by 20.4.1 NMAC §§264.191 and 264.192(a) [6-14-00], are provided in Supplements H.1, H.2A, H.2B, H.2C, and H.3, respectively. Detailed drawings and information are provided as Figures H-1 through H-13 and are provided for informational purposes only. Table H-2 summarizes applicable regulatory references for tank systems and the corresponding location where the requirement is addressed in this permit renewal application.

H.1 DESIGN, CONSTRUCTION, MATERIALS, AND OPERATION [20.4.1 NMAC §270.16(b), (c), (d) and (l); 20.4.1 NMAC §§264.191(b)(1) and (3), and 264.192(a)(1)]

The TA-55 storage tank system is located at TA-55, Building 4, in Room 401 (Figure H-1) and has a maximum capacity of 1,270 Liters (L) (336 gallons [gal]). The storage tank system consists of 3 components, with 16 tanks, that are used to store evaporator bottoms solutions prior to stabilization in the cementation unit.

The evaporator bottoms solutions are initially stored in the evaporator glovebox tank component, where they are sampled for radionuclides, oxides, and metals. They remain in the evaporator glovebox tank component until the radionuclide content is known. If the sampling results show radionuclide concentrations below the discard limit, the solutions are transferred to the cementation unit pencil tanks component or the pencil tanks component for storage pending the remaining analytical results. Upon completion of the remaining analyses, the solutions are transferred directly to the cementation unit for treatment. If the sampling results show concentrations above the discard limit, the solutions are recirculated. Figures H-1 and H-2 provide a general arrangement diagram and a process flow diagram for the TA-55 storage tank system.

The storage tank system is connected to three main piping systems, which include the solution feed, ventilation, and vacuum piping systems. Each tank component has a separate header that connects to each of the piping systems. The wet-vacuum piping system is used for all transfers; and the vent-piping system is used to break vacuum. The wet-vacuum and vent-piping systems use vacuum traps to capture carryover liquid and prevent contamination of the lines downstream. One vacuum pump serves the storage tank system for liquid transfers and for vacuum sparging. The following sections provide descriptions of each of the tank system components and associated ancillary equipment. The information meets the requirements of 20.4.1 NMAC §270.16(b), (c), (d) and (l); 20.4.1 NMAC §§264.191(b)(1) and (3); and 264.192(a)(1) [6-14-00].

H.1.1 Evaporator Glovebox Tank Component

The evaporator glovebox tank component is located in the northwest corner of TA-55-4, Room 401, as shown in Figure H-1. It is approximately 8 feet (ft) high, 4-ft wide, and 13-ft long and consists of two welded-steel trays, eight glass columns, and associated ancillary equipment. The overall capacity of the evaporator glovebox tank component is approximately 270 L (71 gal). The evaporator glovebox tank component is fabricated from 0.1875-inch (in.), 316 stainless steel with a 2B finish conforming to the American Society for Testing and Materials (ASTM) “A240-Standard Specification for Heat-

Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels," hereinafter referred to as ASTM A240 (ASTM, 1998). The lower half of the tank is fabricated with additional layers of materials welded to the outside of the 0.1875-in.-thick stainless-steel enclosure. These materials consist of 0.25-in.-thick lead shielding, conforming to ASTM "B29-Standard Specification for Refined Lead" (ASTM, 1997a), and an outer layer of 0.0625-in. 316 stainless steel cladding. The tank component is of welded construction with all welds blended, ground, and polished to blend with adjacent material. All joints are vacuum tight.

The support frame and legs of the evaporator glovebox tank component are constructed of carbon steel and conform to ASTM "A36-Standard Specification for Structural Steel for Welding" (ASTM, 1987). The support frame is bolted to the base of the tank component for stabilization. In addition, the legs of the tank component are bolted to the support frame and secured to the 10-in.-thick concrete floor of Room 401 with anchor bolts. The 10-in.-thick concrete floor was constructed to conform to the reinforced concrete building code requirements of the American Concrete Institute (ACI) "318-71-Building Code Requirements for Structural Concrete and Commentary," hereinafter referred to as ACI 318-71 (ACI, 1995). The reinforcing steel was detailed and fabricated in accordance with ACI "315-Details and Detailing of Concrete Reinforcement," hereinafter referred to as ACI 315 (ACI, 1992). The design construction and tolerance of the framework around the concrete is in accordance with ACI "347-Guide to Formwork for Concrete," hereinafter referred to as ACI 347 (ACI, 1994). Figure H-3 shows the dimensions of the evaporator glovebox tank component and its support structure.

The window portions of the evaporator glovebox tank component are constructed of 0.25-in. leaded glass, laminated on both sides with 0.125-in. clear glass, and installed with a neoprene gasket. Additionally, each window is backed with 0.25-in. safety glass installed with a neoprene gasket/seal that provides airtight containment. The dual glass configuration is secured to the tank component with a welded frame consisting of a 0.25-in.-thick lead shielding and a 0.0625-in. 316 stainless steel cladding similar to the additional layers of materials welded to the outside of the lower half of the tank component. The welded window frames are bolted to the tank component. Replacement windows and gaskets, if and when needed, will be made of the same or similar materials.

The glove portions of the evaporator glovebox tank component are constructed of neoprene and Hypalon®. Each glove is tested for material continuity by the manufacturer before acceptance and installation in the evaporator glovebox tank component. Each glove is selected for its resistance to nitric acid. Replacement gloves, when needed, will be made of the same or similar materials.

The evaporator bottoms solutions are vacuum-transferred from the steel trays to the glass columns. Each glass column is individually filled and visually monitored during transfer from the steel trays to a glass column. To prevent overfill, the evaporator bottoms are automatically directed to a vacuum trap when the maximum capacity of a column is reached. The maximum capacity of the vacuum trap is approximately 5.5 L. The glass columns and the vacuum trap are constructed of PYREX® glass, manufactured by Corning, with stainless steel end plates. Replacement parts for the columns and vacuum trap will be of the same or similar materials. The glass columns are equipped with an air-sparging system designed to homogeneously mix the evaporator bottoms prior to sampling or transfer.

The piping associated with the evaporator glovebox tank component includes the transfer line from the evaporator, the wet-vacuum line, the lean-residue transfer line, and the ventilation lines entering and exiting the evaporator glovebox tank component. Figures H-4 and H-5 provide a legend and a piping and instrumentation diagram for the evaporator glovebox tank component. All piping and associated valves are constructed of single-walled, 316 stainless steel. The transfer line from the evaporator is 1.0-in. pipe, the wet-vacuum line and the lean-residue transfer line are 0.75-in. pipe, and the ventilation lines are 2.0-in. pipe. Pipe diameters may change in the event that a portion of the piping requires replacement. The evaporator glovebox tank component's ancillary equipment is supported by a steel channel Uni-strut® support frame. The Uni-strut® support frame is secured to the concrete ceiling with anchor bolts and provides the component's ancillary equipment with support and protection against physical damage and excessive stress that could potentially result from settlement, vibration, expansion, or contraction. Replacement supports will be made of the same or similar materials.

The evaporator glovebox tank component does not operate under pressure; therefore, excessive stress due to expansion and contraction is not anticipated. The evaporation glovebox component is not located within a saturated zone or seismic fault zone; therefore, floatation or dislodgment is unlikely. The component is located within a building, so frost effects are not expected.

All of the materials within the evaporator glovebox tank component are corrosion-resistant and are compatible with the evaporator bottoms stored in the tank component. No external portions of the tank component are in contact with soil or water.

H.1.2 Cementation Unit Pencil Tanks Component

The cementation unit pencil tanks component consists of five vertical tanks located perpendicular to the west wall of TA-55-4 in Room 401, as shown on Figure H-1. Each of the pencil tanks has a working capacity of 50 L (13 gal), an outside diameter of 6.625 in., a straight side height of 10 ft, a wall thickness of 0.28 in., and a conical bottom, as shown on Figure H-6. The pencil tanks are constructed of 316 stainless steel. The stainless steel materials are corrosion-resistant and are compatible with the liquid waste stored in the tanks, as confirmed by corrosion testing conducted in 1993 by TA-55 facility engineers. The vent trap and the vacuum trap operating within the cementation unit pencil tanks component have an outside diameter of 6.625 in. The vent trap has a straight side height of 9 in. and a maximum capacity of approximately 4 L. The vacuum trap has a straight side height of 37 in., a conical bottom, and a maximum capacity of approximately 17 L. The vent trap and the vacuum trap are constructed of 316 stainless steel for corrosion resistance and materials compatibility with the waste. All of the pencil tanks were designed in accordance with the latest applicable standards, including American Society of Mechanical Engineers (ASME) “Boiler and Pressure Vessel Code” (BPVC) (ASME, 1998), hereinafter referred to as ASME BPVC, Section VIII, Division 1. The pencil tanks are installed such that, if necessary, they can be replaced.

H.1.2.1 Piping and Ancillary Equipment

The piping associated with the cementation unit pencil tanks component includes the header/manifold, vacuum manifold, and lower manifold for the cementation unit pencil tanks component; the vent trap, vent line, and drain line; the transfer line from the evaporator glovebox tank component to the cementation unit pencil tanks component header/manifold; and the transfer line from the lower manifold to the cementation unit. Figures H-4 and H-7 provide a legend and piping and instrumentation diagram for the cementation unit pencil tanks component. All intertank piping and transfer piping is single-walled 0.75-in., Schedule 40, stainless steel pipe. Pipe diameters may change in the event that a portion of the piping requires replacement. All tank-to-piping connections are flanged.

The cementation unit pencil tanks component is equipped with a vacuum trap that is designed to collect any mists or carryover liquid that might accumulate in the vacuum or vent lines. The vacuum trap is equipped with a sight glass for local level indication and is normally empty. Each cementation unit pencil tank is equipped with three sight glasses located on the side of each tank for overfill protection.

H.1.2.2 Foundation and Support

The cementation unit pencil tanks component is erected upon a 10-in.-thick concrete floor in TA-55-4, Room 401. The 10-in.-thick concrete floor provides a foundation that will maintain the load of the tank component when full. The concrete floor and ceiling were constructed to conform to the building code requirements of ACI 318-71 for reinforced concrete (ACI, 1995). The reinforcing steel was detailed and fabricated in accordance with ACI 315 (ACI, 1992). The design, construction and tolerance of the framework around the concrete is in accordance with ACI 347 (ACI, 1994). The cementation unit pencil tanks component and its ancillary equipment are elevated and supported by a steel channel, Uni-strut® support frame. The Uni-strut® support frame is secured to the concrete floor with anchor bolts and provides the ancillary equipment with support and protection against physical damage and excessive stress due to settlement and vibration.

The cementation unit pencil tanks component does not operate under pressure; therefore, physical damage and excessive stress due to expansion and contraction is not anticipated. Furthermore, the cementation unit pencil tanks component is not within a saturated zone or seismic fault zone; therefore, flotation or dislodgment is not likely. The component is located within a building, so frost heave effects are not expected.

H.1.3 Pencil Tanks Component

The following information for the pencil tanks component is based upon a completed drawing package prepared by Johnson Controls of Northern New Mexico, dated July 2001. The pencil tanks component will consist of ten vertical tanks located perpendicular to the west wall of TA-55-4, Room 401, as shown on Figure H-1. Each pencil tank will have a capacity of 50 L (13 gal), a 6.625-in. outer diameter, a straight side height of 10 ft, a wall thickness of 0.28 in., and a conical bottom, as shown on Figure H-8. The pencil tanks will be constructed of seamless Schedule 40, 316 stainless steel pipe. These materials meet the chemical and physical characteristics given in ASTM “A312-Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes,” hereinafter referred to as ASTM A312 (ASTM, 1995). The tanks will be corrosion-resistant and compatible with the liquid waste to be stored in them. Each tank will be equipped with three sight glasses for local level indication and will have a high-level switch for prevention of spills or overfilling. The primary containment welds for each tank will be vacuum tight in accordance with the ASME BPVC Section VIII, Division 1, Subsection B, Part UW (ASME, 1998). All penetrations into the shells of the tanks will be designed and fabricated to ensure vacuum tightness and will comply with ASME BPVC Section VIII, Division 1 (ASME, 1998). However, an ASME stamp will not be required for the pencil tanks component because they will not be

operated as pressure vessels. Each pencil tank will be installed such that, if necessary, they can be replaced.

H.1.3.1 Piping and Ancillary Equipment

The pencil tanks component will be connected to system headers (for feed, ventilation, and vacuum) by a manifold that will be constructed of seamless stainless steel and that meets the chemical and physical characteristics given in ASTM A312 (ASTM, 1995). Figure H-9 provides a piping and instrumentation diagram for the pencil tanks component. The piping will be connected to the existing tank system intertank and transfer piping of 0.75 in., Schedule 40 pipe. It will meet the requirements of ASME "B31.3-Process Piping," hereinafter referred to as ASME B31.3 (ASME, 1996a), for normal fluid service, with a maximum design pressure of 15 pounds per square inch and design temperature of 10 degrees Fahrenheit. All piping connections will be via flanged and gasketed connections and will be provided in accordance with ASME "B16.5-Pipe Flanges and Flanged Fittings," hereinafter referred to as ASME B16.5 (ASME, 1996b). The flanges will be forged from stainless steel and will meet the Grade F316L requirements of ASTM "A182-Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings and Valves, and Parts for High-Temperature Service," hereinafter referred to as ASTM A182 (ASTM, 1997b).

The pencil tanks component will be equipped with a vacuum trap that will be designed to collect any mists or carryover liquid that might accumulate in the vacuum or vent lines. The vacuum trap will be constructed of 6.25-in. outer diameter, Schedule 40, 316 seamless stainless steel. The vacuum trap will be equipped with a sight glass for local level indication will have a high-level switch for prevention of spills or overflowing and will normally be empty.

H.1.3.2 Foundation and Tank Support

The pencil tanks component and associated ancillary equipment will be integrated within a support stand assembly. The support stand assembly will be approximately 3-ft, 10-in. wide by 7-ft, 8-in. long, as shown on Figures H-10 and H-11, and will be bolted to the 10-in.-thick concrete floor of TA-55-4, Room 401. The floor provides a foundation that will maintain the load of the pencil tanks component when full. The concrete floor and ceiling were constructed to conform to the building code requirements of ACI 318-71 for reinforced concrete (ACI, 1995). The reinforcing steel was detailed and fabricated in accordance with ACI 315 (ACI, 1992). The design construction and tolerance of the framework around the concrete is in accordance with ACI 347 (ACI, 1994).

The support stand assembly superstructure will consist of braced frames that extend approximately 9 ft, 11 in. from the floor. The superstructure will be fabricated entirely from carbon steel. Connections will be welded, except where bolting is required for erection of subassemblies within Room 401. All carbon steel used for the superstructure will be painted in accordance with the Steel Structures Painting Council with a high build-up epoxy primer and finish coat.

The pencil tanks component will not operate under pressure; therefore, excessive stress due to expansion and contraction is not anticipated. The pencil tanks component will not be located within a saturated zone or seismic fault zone; therefore, floatation or dislodgment is unlikely. The component will be located within a building, so frost heave effects are not expected.

H.2 INSTALLATION, TESTING, AND CERTIFICATION [20.4.1 NMAC §270.16(a) and (f); 20.4.1 NMAC §264.191(b); §264.192(a),(b), and (d); and §264.193(I)]

H.2.1 Evaporator Glovebox Tank Component

The evaporator glovebox tank component is considered an existing tank component in accordance with 20.4.1 NMAC §264.191 [6-14-00], and has secondary containment that meets the requirements of 20.4.1 NMAC §264.193 [6-14-00]. Therefore, pursuant to 20.4.1 NMAC §264.191(a) [6-14-00], the requirement that the owner or operator of the tank determine that the tank is not leaking or is unfit for use is not applicable. In addition, the requirement that the owner or operator obtain and keep on file a written assessment attesting to the tank's integrity is also not applicable. However, for the purpose of demonstrating that the evaporator glovebox tank component will function as a completely leak-proof system and would meet the assessment requirements if they were applicable, a written assessment has been prepared in accordance with 20.4.1 NMAC §264.191(b), and 20.4.1 NMAC §270.16(a) [6-14-00], attesting that the tank component is adequately designed and has sufficient structural integrity and compatibility with the waste stored to ensure that it will not collapse, rupture, or fail. The written assessment, reviewed and certified by an independent, qualified, registered professional engineer, is included as Supplement H.1 of this permit application.

A helium leak-test using a mass spectrometer was performed on the evaporator glovebox tank component upon fabrication at Silver Engineering and again after it was installed and made operational at its present location in TA-55-4, Room 401. Because secondary containment (see Section H.3) is provided for this tank, the requirements in 20.4.1 NMAC §264.193(i) [6-14-00], are not applicable.

H.2.2 Cementation Unit Pencil Tanks Component

In accordance with 20.4.1 NMAC §264.192(a) [6-14-00], a written assessment has been prepared attesting that the cementation unit pencil tanks component has sufficient structural integrity and is acceptable for handling mixed waste. The written assessment, reviewed and certified by an independent, qualified, registered professional engineer, is included as Supplement H.2A of this permit application.

In accordance with 20.4.1 NMAC §264.192(d) [6-14-00], owners or operators of new tanks and ancillary equipment must ensure that the system is tested for tightness. The cementation unit pencil tanks component was tightness tested on May 30, 1996, at operating pressure (i.e., under a vacuum of 10 to 20 in. of mercury) and determined to be tight. The signed certification attesting to the tank's tightness, the detailed tightness-testing procedure adhered to during the tightness tests, and the results of the tightness tests are included as Supplement H.2B of this permit application.

In accordance with 20.4.1 NMAC §264.192(b) [6-14-00], owners or operators of new tank systems or tank components must ensure that proper handling procedures are adhered to during installation in order to prevent damage to the system. The new portions of this component (i.e., the transfer line from the evaporator glovebox tank component to the cementation unit pencil tanks component header/manifold and the cementation unit header/manifold) have been inspected by a qualified inspector for weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction or installation. The signed certification attesting to the proper installation of the new components and a copy of the inspection checklist is included as Supplement H.2C of this permit application. Secondary containment (see Section H.3) for the cementation unit pencil tanks component is provided by Room 401; therefore, the requirements in 20.4.1 NMAC §264.193(i) [6-14-00], are not applicable.

H.2.3 Pencil Tanks Component

In accordance with 20.4.1 NMAC §264.192(a) [6-14-00], a written assessment has been prepared attesting that the pencil tanks component is designed to have sufficient structural integrity and is acceptable for handling mixed waste. The written assessment, reviewed and certified by an independent, qualified, registered professional engineer, is included as Supplement H.3 of this permit application.

In accordance with 20.4.1 NMAC §264.192(d) [6-14-00], owners or operators of new tanks and ancillary equipment must ensure that the system is tested for tightness. The pencil tanks component

will be tightness tested at operating pressure (i.e., under a vacuum of 10 to 20 in. of mercury) upon completion of installation and prior to use. A signed certification will be prepared and will include the tightness-testing procedures adhered to during the tightness tests and the results of the tightness tests.

In accordance with 20.4.1 NMAC §264.192(b) [6-14-00], owners or operators of new tank systems or components must ensure that proper handling procedures are adhered to during installation in order to prevent damage to the system. To ensure proper installation, the pencil tanks component and ancillary equipment (i.e., transfer piping, manifolds) will be inspected by a qualified inspector for weld breaks, punctures, scratches in the protective coatings, cracks, corrosion, and other structural damage or inadequate construction or installation. A signed certification attesting to the proper installation of the pencil tanks component and a copy of the inspection checklist will be prepared. Secondary containment (see Section H.3) for the pencil tanks component will be provided by Room 401; therefore, the requirements in 20.4.1 NMAC §264.193(i) [6-14-00], are not applicable.

H.3 SECONDARY CONTAINMENT [20.4.1 NMAC §270.16(g), 20.4.1 NMAC §264.193]

The following provides a detailed description of the secondary containment provided for the storage tank system in accordance with 20.4.1 NMAC §270.16(g), and 20.4.1 NMAC §264.193(a), (b), (c), (d), and (e)(1) [6-14-00]. The storage tank system is located at TA-55-4, inside Room 401. This room has a floor and walls that completely surround the tank system and serve as secondary containment, therefore, the secondary containment meets the requirements of 20.4.1 NMAC §264.193(1)(iv) for an external liner system. The walls and floor of Room 401 will prevent the migration of wastes or accumulated liquids to any soil, groundwater, or surface water and are capable of collecting releases and accumulated liquids until the material is removed. Because the storage tank system and secondary containment are inside a building, run-on or precipitation will not affect the containment capacity. The capacity of the containment area is sufficient to contain 100 percent of the capacity of the largest liquid-bearing tank within its boundary. The secondary containment capacity for the storage tank system is identified in Table H-3.

The floor of Room 401 consists of 10-in.-thick reinforced concrete slab that is compatible with the wastes stored in the storage tank system and will effectively prevent migration of waste. The concrete in Room 401 is sealed with an epoxy or similar coating to aid in decontamination should a spill occur. In addition, tertiary containment is provided by the floor of the basement level of TA-55-4, which also

consists of 10 in. of concrete. The construction joints in the floor slab and exterior walls are all constructed with chemical-resistant water stops in place. The conduit piping penetrating the floor of the room is secured with rubber boots, bushings, and flanges. All penetrations (i.e., holes for conduit) in the floor have been sealed to prevent liquids from entering the penetrations. Figures H-12 and H-13 provide structural drawings illustrating the first floor construction and the locations of floor penetrations.

The storage tank system components and the secondary containment will be inspected daily (during operation) to detect leaks, in accordance with 20.4.1 NMAC §264.195(b) [6-14-00]. Additional leak detection will be provided by continuous air monitors (CAM) at various locations throughout Room 401. CAMs will detect any airborne alpha contamination that would be present if a leak were to occur at any point in the system. Additionally, radiological control technicians periodically monitor for radioactive contamination and would detect any leaks during monitoring. Leaks or spills would be detected within 24 hours, as required by 20.4.1 NMAC §264.193(c)(3) [6-14-00]. The secondary containment will be operated to remove leaks and spills. In the event of a leak or spill into the secondary containment system, the liquids will be removed as quickly as possible with sorbents or vacuum-transferred, using the existing wet vacuum, into an available storage tank component. The collected materials will then be sampled as necessary. If the accumulated liquids are from an identifiable source, the resulting material can be characterized as a newly-generated waste using acceptable knowledge or may be analyzed, as applicable, for the hazardous waste constituents known to be components of the source. If the accumulated liquids are from other than an identifiable source, the resulting material will be analyzed for the appropriate potential parameters listed in Table E-3 of Appendix E in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application." Containers of collected liquids will be stored with secondary containment, pending analytical results, which determine how the waste liquids will be managed. This method of removal and analysis of accumulated liquids fulfills the requirements of 20.4.1 NMAC §270.15(a)(5) [6-14-00], for responses to leaks or spills.

If it is determined that there has been a leak or spill from any of the storage tank components into the secondary containment, all free liquids will be removed within 24 hours unless "as low as reasonably achievable" concerns prevent accessibility. The affected component or portion thereof will be removed from service immediately and the requirements of 20.4.1 NMAC §264.196 [6-14-00], will be initiated.

H.4 SPECIAL REQUIREMENTS FOR IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTES [20.4.1 NMAC §270.16 (j); 20.4.1 NMAC §§264.17, 264.198, and 264.199(a)]

No ignitable, reactive, or incompatible mixed wastes will be stored in the storage tank system.

H.5 AIR EMISSION STANDARDS FOR EQUIPMENT LEAKS [20.4.1 NMAC §264.1064(k), and 20.4.1 NMAC, Subpart V, Part 264, Subpart BB]

The storage tank system is not subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart BB [6-14-00], "Air Emission Standards for Equipment Leaks," with the exception of the reporting requirements specified in 20.4.1 NMAC §264.1064(k) [6-14-00]. None of the components or ancillary equipment associated with the storage tank system will contain or contact mixed waste with organic concentrations of at least 10 percent by weight.

In accordance with 20.4.1 NMAC §264.1064(k) [6-14-00], TA-55 personnel will use knowledge of the nature of the mixed waste stream(s) or knowledge of the process by which the mixed waste was produced to document exemptions to these standards. Production process information documenting that no organic compounds are contained or contacted by the components and ancillary equipment associated with the storage tank system will be recorded in TA-55's facility operating record.

A new determination will be made whenever there is a change in a process at TA-55 that produces mixed waste that could result in an increase in the total organic content of waste contained in or contacted by equipment currently determined not to be subject to these requirements.

H.6 ORGANIC AIR EMISSION STANDARDS [20.4.1 NMAC, Subpart V, Part 264, Subpart CC]

Tanks which store only mixed waste are not subject to the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart CC [6-14-00], "Air Emission Standards for Tanks, Surface Impoundments, and Containers." Only mixed waste will be managed in the storage tank system; therefore, the storage tank system is not subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart CC [6-14-00].

H.7 REFERENCES

ACI, 1995 and all approved updates, "318-71-Building Code Requirements for Structural Concrete and Commentary," American Concrete Institute, Detroit, Michigan.

ACI, 1994 and all approved updates, "347-Guide to Formwork for Concrete," American Concrete Institute, Detroit, Michigan.

ACI, 1992 and all approved updates, "315-Details and Detailing of Concrete Reinforcement," American Concrete Institute, Detroit, Michigan.

ASME, 1998 and all approved updates, "Boiler and Pressure Vessel Codes, Section VIII," American Society of Mechanical Engineers, New York, New York.

ASME, 1996a and all approved updates, “B31.3-Process Piping,” American Society of Mechanical Engineers, New York, New York.

ASME, 1996b and all approved updates, “B16.5-Pipe Flanges and Flanged Fittings,” American Society of Mechanical Engineers, New York, New York.

ASTM, 1998 and all approved updates, “A240-Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels,“ American Society for Testing and Materials, Philadelphia, Pennsylvania.

ASTM, 1997a and all approved updates, “B29-Standard Specification for Refined Lead,” American Society for Testing and Materials, Philadelphia, Pennsylvania.

ASTM, 1997b and all approved updates, “A182-Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings and Valves, and Parts for High-Temperature Service,” American Society for Testing and Materials, Philadelphia, Pennsylvania.

ASTM, 1995 and all approved updates, “A312-Standard Specification for Seamless and Welded Austentic Stainless Steel Pipes,” American Society for Testing and Materials, Philadelphia, Pennsylvania.

ASTM, 1987 and all approved updates, “A36-Standard Specification for Structural Steel for Welding,” American Society for Testing and Materials, Philadelphia, Pennsylvania.

Table H-1
Storage Tank System Components at Technical Area 55[a]

Tank Component	Location	Number of Tanks	Tank Capacity[b] (liters)	Tank Capacity[b] (gallons)	Tank Component Status
Evaporator Glovebox Tank	TA-55-4, Room 401	1	270	71	Constructed in 1986. Existing tank component.
Cementation Unit Pencil Tanks	TA-55-4, Room 401	5	50	13	Constructed in 1985. New tank component due to an equipment modification in 1996.
Pencil Tanks	TA-55-4, Room 401	10	50	13	To be constructed. New tank component.

a The storage tank system consists of 3 components that store the same waste matrix and share a common piping network. The overall capacity of the unit is 1,020 liters [~266 gallons].
b The tank capacity listed is for each individual tank associated with the component.

TA = technical area

Table H-2
Tank System Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§270.16	Information requirements for tank systems	Attachment H
§264.13	General waste analysis	Attachment B[a]
§264.191	Assessment of existing tank system's integrity	H.1.1, H.2.1
§270.16	Tank systems	Attachment H
§270.16(a)	Written assessment and certification	Supplements H.1, H.2A, H.2B, H.2C, and H.3
§270.16(b)	Dimensions and capacity	H.1
§270.16(c)	Feed systems, safety cutoff, bypass systems, and pressure controls	H.1
§270.16(d)	Piping, instrumentation, and process flow diagrams	Attachment H
§270.16(e)	External corrosion protection	Supplements H.1, H.2A, H.3, and H.4
§270.16(f)	Installation of new tank systems	H.2.2 and H.2.3
§264.191(a)	Existing tank system w/o secondary containment	NA[a]
§264.191(b)	Written assessment of structural integrity	H.2.1, Supplement H.1
§264.191(b)(1)	Design standards	Supplement H.1
§264.191(b)(2)	Hazardous characteristics of waste	Supplement H.1
§264.191(b)(3)	Existing corrosion protection measures	Supplement H.1
§264.191(b)(4)	Documentation of tank age	Supplement H.1
§264.191(b)(5)	Results of leak test, internal inspection, or other tank integrity exam	Supplement H.1
§264.192	Design and installation of new tank systems or components	H.2.2 and H.2.3
§264.191(d)	Assessment reveals leaking	NA
§264.192(a)	Written assessment of structural integrity	Supplements H.2A, H.3, and H.4
§264.192(a)(1)	Design standards	Supplements H.2A, H.3, and H.4
§264.192(a)(2)	Hazardous characteristics of waste	Supplements H.2A, H.3, and H.4
§264.192(a)(3)(i)	Factors affecting the potential for corrosion	Supplements H.2A, H.3, and H.4
§264.192(a)(3)(ii)	Corrosion protection measures	Supplements H.2A, H.3, and H.4
§264.192(a)(4)	Determination of protection measures for underground tank system components	Supplements H.2A, H.3, and H.4
§264.192(a)(5)	Design considerations	H.1.2 and H.1.3
§264.192(b)	Precautions to prevent damage during installation	H.2.2 and H.2.3 Supplement H.2C
§264.192(c)	Backfill requirements	NA

See footnotes at end of table.

Table H-2 (continued)
Tank System Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§264.192(d)	Tightness testing	H.2.2 and H.2.3 Supplement H.2B
§264.192(e)	Protection of ancillary equipment	H.1, Supplement H.2A and H.3
§264.192(f)	Independent corrosion expert recommendations	NA
§264.192(g)	Certification of proper design and installation	H.2, Supplement H.2C
§270.16(g)	Secondary containment systems	H.3
§264.193	Containment and detection of releases	H.3
§264.193(a)	Preventing the release of hazardous constituents to the environment	H.3
§264.193(a)(1)	Secondary containment of new tank systems	H.3
§264.193(a)(2)	Tank systems used to store or treat EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027, within two years after January 12, 1987	NA
§264.193(a)(3)	Existing tank systems of known and documented age, within two years after January 12, 1987 or when the tank system has reached 15 years of age	H.3
§264.193(a)(4)	Existing tank systems for which the age cannot be documented, within eight years of January 12, 1987	NA
§264.193(b)	Secondary containment system requirements	H.3
§264.193(b)(1)	Design, installation, and operation to prevent migration of waste or accumulated liquid out of system to the environment	H.3
§264.193(b)(2)	Detection and collection of releases and accumulated liquids	H.3
§264.193©	Secondary containment construction requirements	H.3
§264.193©(1)	Compatible construction materials of sufficient strength and thickness	H.3
§264.193©(2)	Foundation	H.1
§264.193©(3)	Leak detection system	H.3
§264.193©(4)	Sloped or designed to remove liquids from leaks, spills, or precipitation	H.3
§264.193(d)	Secondary containment devices	H.3
§264.193(e)	Additional construction requirements	H.3
§264.193(e)(1)	External liner	H.3
§264.193(e)(2)	Vault systems	NA
§264.193(e)(3)	Double-walled tanks	NA
§264.193(f)	Ancillary equipment	H.3
§270.16(h)	Tank systems with a variance	NA
§264.193(g)	Variance from the requirements of §264.193	NA
§264.193(h)	Secondary containment variance request procedures	NA

See footnotes at end of table.

Table H-2 (continued)
Tank System Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§264.193(i)	Requirements pending provision of adequate secondary containment	NA
§264.194	General operating requirements	H.1, H.3
§264.194(a)	Prohibition of hazardous waste that could cause the tank or equipment to rupture, leak, corrode, or otherwise fail	H.1, Supplements H.1, H.2A and H.3
§270.16(i)	Description of controls and practices to prevent spills and overflows	H.1
§264.194(b)	Controls and practices to prevent spills and overflows	H.1
§264.194(b)(1)	Spill prevention controls	H.1
§264.194(b)(2)	Overfill prevention controls	H.1
§264.194(b)(3)	Maintenance of sufficient freeboard	NA
§264.195	Inspections	Attachment C[a]
§264.195(a)	Overfill control inspection schedule	Attachment C[a]
§264.195(b)	Inspection of tank system for corrosion or releases, data from monitoring and leak detection equipment, construction materials, and immediately surrounding area	Attachment C[a]
§264.195(c)	Inspection of cathodic protection system	NA
§264.196	Response to leaks or spills and disposition of leaking or unfit-for-use tank systems	H.3
§264.197	Closure and post-closure care	Attachment F.2
§264.197(a)	Removal and decontamination of all hazardous waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment	Attachment F.2
§264.197(b)	Demonstration that not all contaminated soils can be practicably removed or decontaminated	Attachment F.2
§264.197(c)	Tank system not having secondary containment that meets the requirements of §264.193(b) through (f) and has not been granted a variance from the secondary containment requirements	NA
§264.197(c)(1)	Plan for complying with removal and decontamination requirements	Attachment F.2
§264.197(c)(2)	A contingent post-closure plan	Attachment F.2
§264.197(c)(3)	Cost estimates calculated for closure and post-closure care	Attachment F.2
§264.197(c)(4)	Financial assurance based on cost estimates	Attachment F.2
§264.197(c)(5)	Contingent closure and post-closure plans must meet all of the closure, post-closure, and financial responsibility requirements for landfills	Attachment F.2
§270.16(j)	Special requirements for ignitable, reactive, or incompatible wastes	H.4
§264.198	Special requirements for ignitable or reactive wastes.	H.4

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application

See footnotes at end of table.

Table H-2 (continued)
Tank System Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§264.198(a)	Circumstances allowing ignitable or reactive waste in tanks	NA
§264.198(a)(1)	The waste is treated, rendered, or mixed before or immediately after placement in the tank system	NA
§264.198(a)(1)(I)	The resulting waste, mixture, or dissolved material no longer meets the definition of ignitable or reactive waste	NA
§264.198(a)(1)(ii)	Compliance with §264.17(b)	NA
§264.198(a)(2)	The waste is stored or treated in such a way that it is protected from any material or conditions that may cause the waste to ignite or react	H.4
§264.198(a)(3)	The tank system is used solely for emergencies	NA
§264.198(b)	Compliance with the requirements for the maintenance of protective distances between the waste management area and any public ways, streets, alleys, or an adjoining property line	H.4[a]
§264.199	Special requirements for incompatible wastes	H.4[a]
§264.199(a)	Incompatible wastes, or incompatible wastes and materials, must not be placed in the same tank system, unless §264.17(b) is complied with	H.4[a]
§264.199(b)	Hazardous waste must not be placed in a tank system that has not been decontaminated and that previously held an incompatible waste or material, unless §264.17(b) is complied with	H.4[a]
§270.16(k)	Air emission control equipment	H.6
§270.27	Information requirements for air emission controls	H.6
§264.200	Air emission standards	H.5, H.6

[a] Requirement or information is also addressed in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

NA = not applicable.
EPA = U.S. Environmental Protection Agency

Table H-3
Secondary Containment Capacities for the Storage Tank System

Storage Tank System Component	No. of Tanks	Tank Capacity (gallons)	Location	Secondary Containment	Capacity of Secondary Containment (gallons)
Evaporator Glovebox Tank	1	71	TA-55-4, Room 401	TA-55-4, Room 401	10,773[b]
Cementation Unit Pencil Tanks	5	13			
Pencil Tanks	10	13			

a The tank capacity listed is for each individual tank associated with the component.
b Secondary containment capacity based on Room 401, which is recessed 2.5 inches and has dimensions of 60-ft-long by 75-ft-wide

TA = technical area

Figure H-1 has been provided confidentially under separate cover.

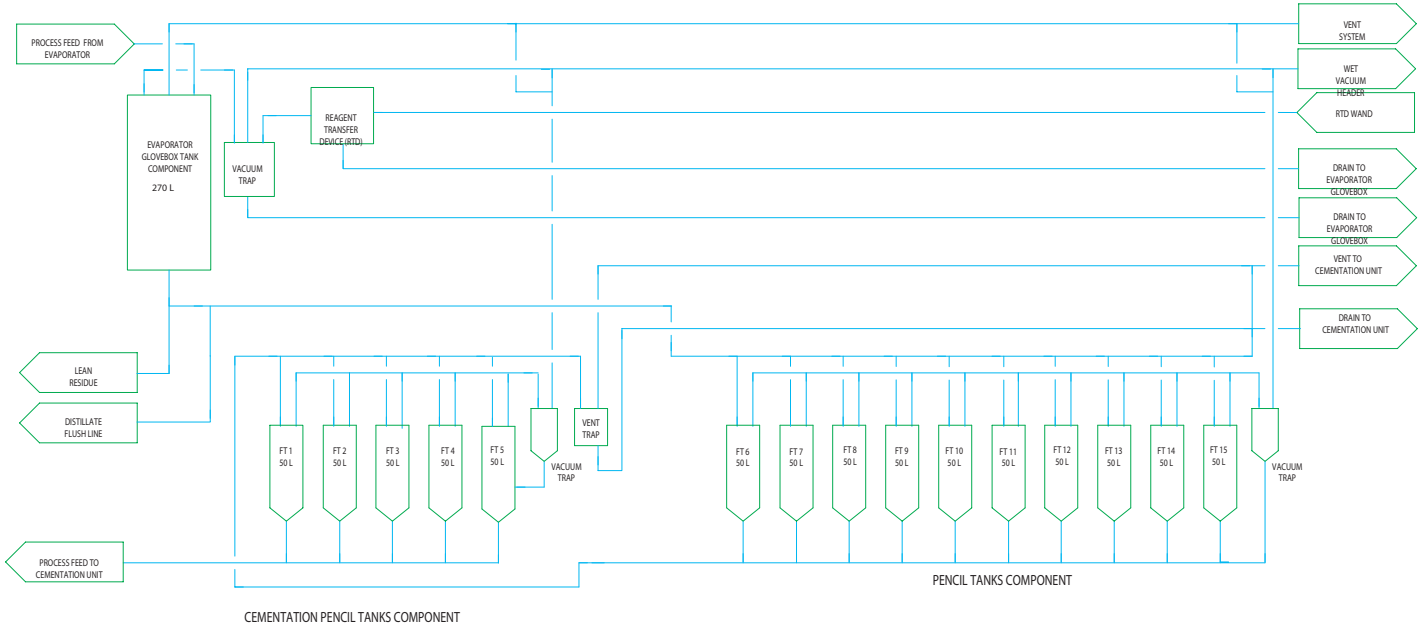


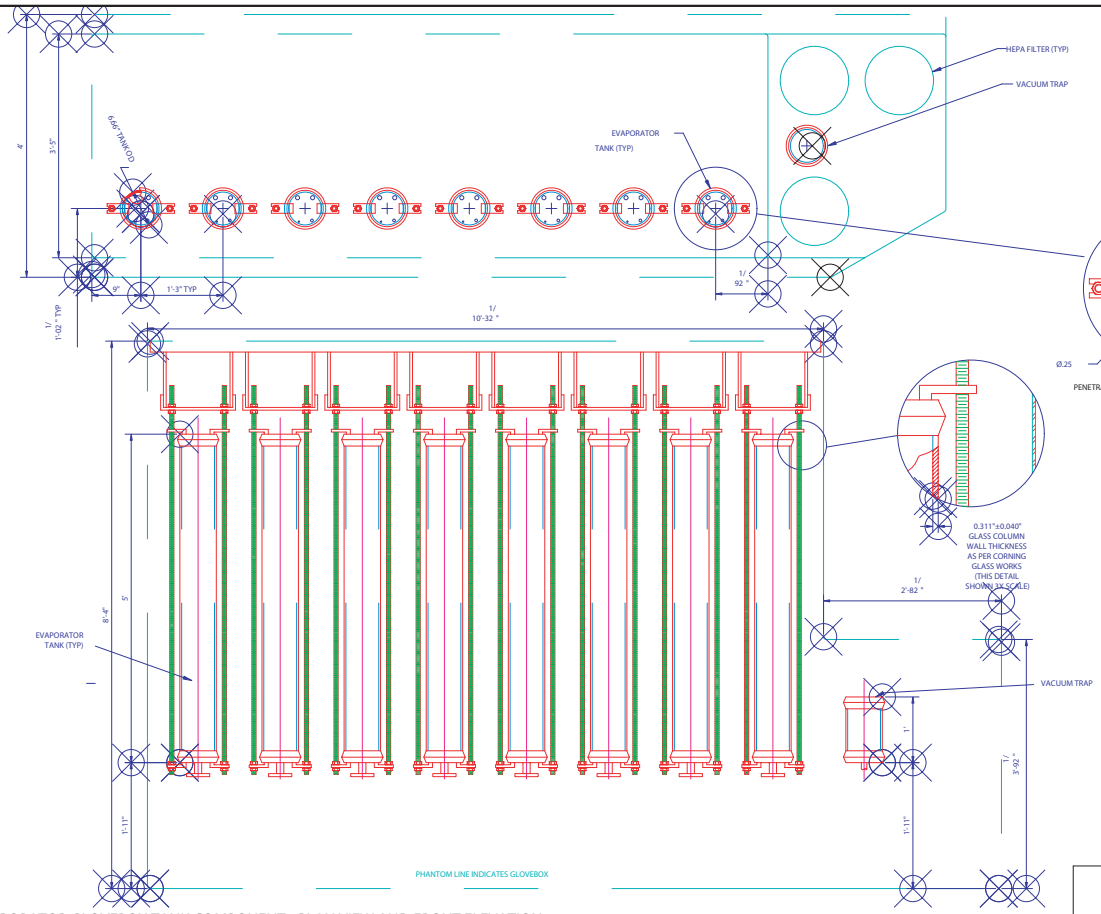
Figure H-2

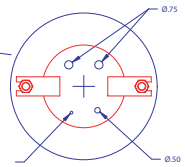
Storage Tank System
Process Flow Diagram

NOT FOR CONSTRUCTION

STORAGE TANK SYSTEM - PROCESS FLOW DIAGRAM

SCALE: NONE





PENETRATION PATTERN FOR PIPING TYP 8X (THIS DETAIL SHOWN 2X SCALE)

NOTES:

1. ALL SUPPORT STRUCTURE DIMENSIONS, NOZZLE AND VESSEL LOCATIONS ARE APPROXIMATE DUE TO LIMITED ACCESS TO THE GLOVEBOX INTERIOR.
2. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST INCH EXCEPT FOR TANK DIAMETER AND WALL THICKNESS.
3. ALL SUPPORT STRUCTURES ARE OMITTED IN THE PLAN VIEW FOR CLARITY.

Figure H-3

Evaporator Glovebox Tank Component Support Structure

NOT FOR CONSTRUCTION

EVAPORATOR GLOVEBOX TANK COMPONENT - PLAN VIEW AND FRONT ELEVATION

SCALE: 1" = 18"

0 1" 3" 6" 1' 18" 3'

1" = 18"

April 26, 2006 11:48:09 a.m. N:\OPPENHEIMER\DELAMETA-55\PART B\DRAFT APRIL 2006\SLIDE H-3.DWG

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™ Environmental & Infrastructure, Inc.

LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TA-55 STORAGE TANK SYSTEM

EVAPORATOR GLOVEBOX TANK COMPONENT PLAN VIEW AND FRONT ELEVATION

BLDG. PF-4 TA- 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/03	APPROVED	J. GRIFFIN 7/24/03
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/03	SHEET NO. H-3	3 OF 7
PROJECT ID 819592.29			DRAWING NO.				REVISION NO. 2

MECHANICAL SYMBOLS (NOT ALL SYMBOLS WILL APPLY TO THIS PROJECT)

VALVES	DESCRIPTION
	BALL VALVE
	BUTTERFLY VALVE
	CHECK VALVE
	CONTROL VALVE, TWO WAY
	CONTROL VALVE, 3-WAY
	DIAPHRAGM VALVE
	GATE VALVE
	GATE VALVE, ANGLE
	GATE VALVE, OS&Y
	GLOBE VALVE
	GLOBE VALVE, ANGLE
	HOSE BIBB W/VAC. BREAKER
	NEEDLE VALVE
	PLUG VALVE
	PRESSURE REDUCING VALVE
	PRESSURE RELIEF VALVE
	RELIEF OR SAFETY VALVE
	SOLENOID VALVE

FITTINGS	DESCRIPTION
	CAP OR PLUG
	FLEXIBLE MECHANICAL COUPLING
	RIGID MECHANICAL COUPLING
	ELBOW, TURNED UP
	ELBOW, TURNED DOWN
	FLANGE CONNECTION
	REDUCER, CONCENTRIC
	REDUCER, ECCENTRIC BOTTOM OF PIPE LEVEL
	REDUCER, ECCENTRIC TOP OF PIPE LEVEL
	TEE, OUTLET UP
	TEE, OUTLET DOWN
	PIPE UNION
	END OF PIPE
	DIRECTION OF FLOW
	PITCH PIPING DOWN

PIPING SPECIALTIES	DESCRIPTION
	AUTOMATIC AIR VENT
	MANUAL AIR VENT
BFP	BACKFLOW PREVENTER
FCO	FLOOR CLEANOUT
WCO	WALL CLEANOUT
CO	END OF PIPE CLEANOUT
	EXPANSION JOINT
	EXPANSION LOOP
	FLEXIBLE CONNECTOR
	PIPE ANCHOR
	PRESSURE GAUGE WITH VALVE
	STEAM TRAP
	STRAINER
	STRAINER WITH BLOW-OFF VALVE
	THERMOMETER OR TEMPERATURE GAUGE
	TYGON CONNECTION

	KEYED NOTE SYMBOL
1	MECHANICAL DESIGNATION
200	NAMEPLATE DESIGNATION
CS	CARBON STEEL
FI	FLOW INDICATOR
FT	FEED TANK
GB	GLOVEBOX
LA	LEVEL ALARM
LI	LEVEL INDICATOR
LSH	LEVEL SWITCH HIGH
LSL	LEVEL SWITCH LOW
OD	OUTSIDE DIAMETER
PI	PRESSURE INDICATOR
RTD	REAGENT TRANSFER DEVICE
SS	STAINLESS STEEL
TK	TANK
TYP	TYPICAL
VAC	VACUUM

Figure H-4
Storage Tank System
Mechanical Legend

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Shaw™ Environmental & Infrastructure, Inc.

LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TA-55 STORAGE TANK SYSTEM

MECHANICAL LEGEND

BLDG. PF-4 TA- 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/01	APPROVED	J. GRIFFIN 7/24/01
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/01	SHEET NO. H-4	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.			4 OF 7	

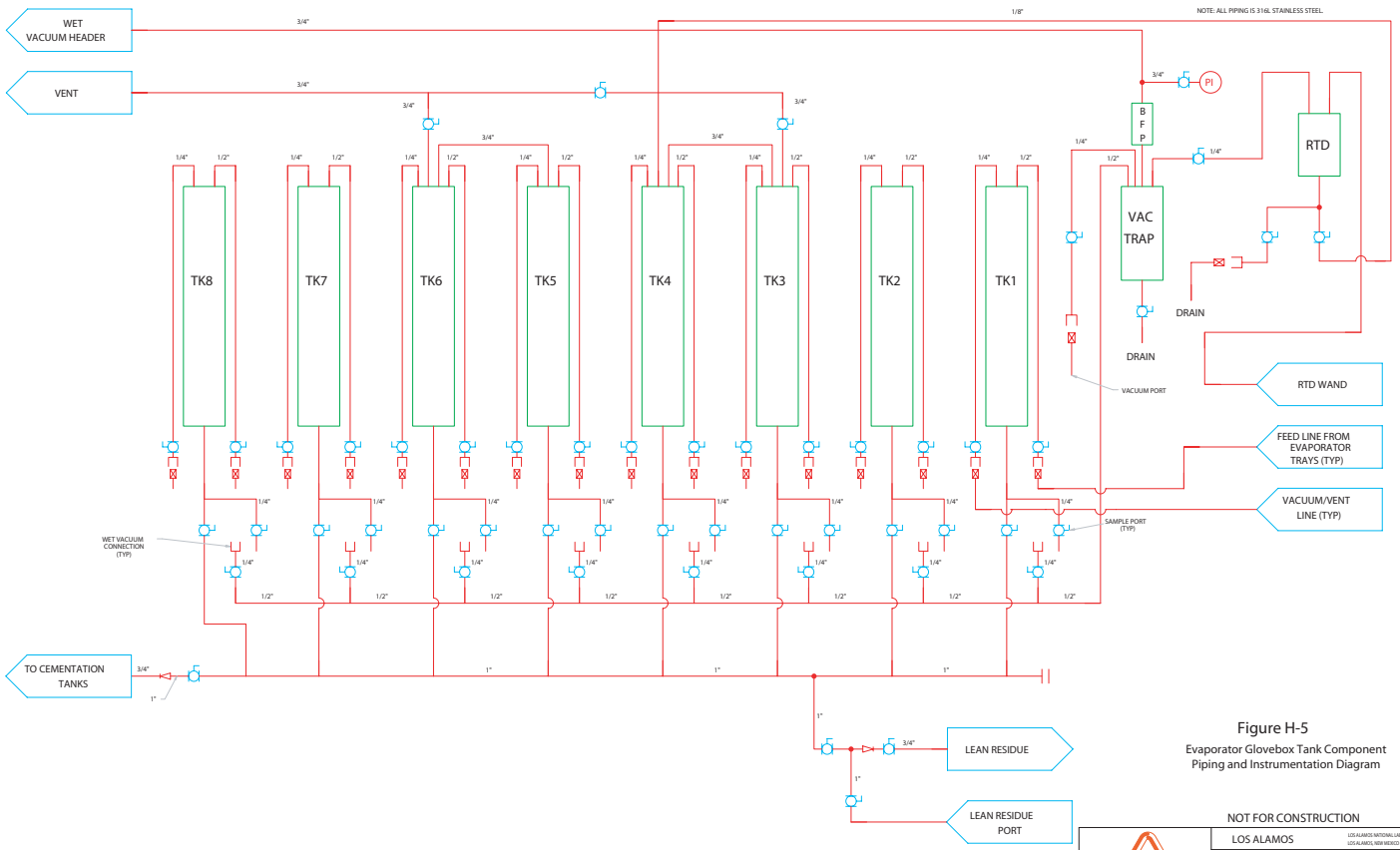

Figure H-5
Evaporator Glovebox Tank Component
Piping and Instrumentation Diagram

NOT FOR CONSTRUCTION

EVAPORATOR GLOVEBOX TANK COMPONENT - PIPING AND INSTRUMENTATION DIAGRAM

SCALE: NONE

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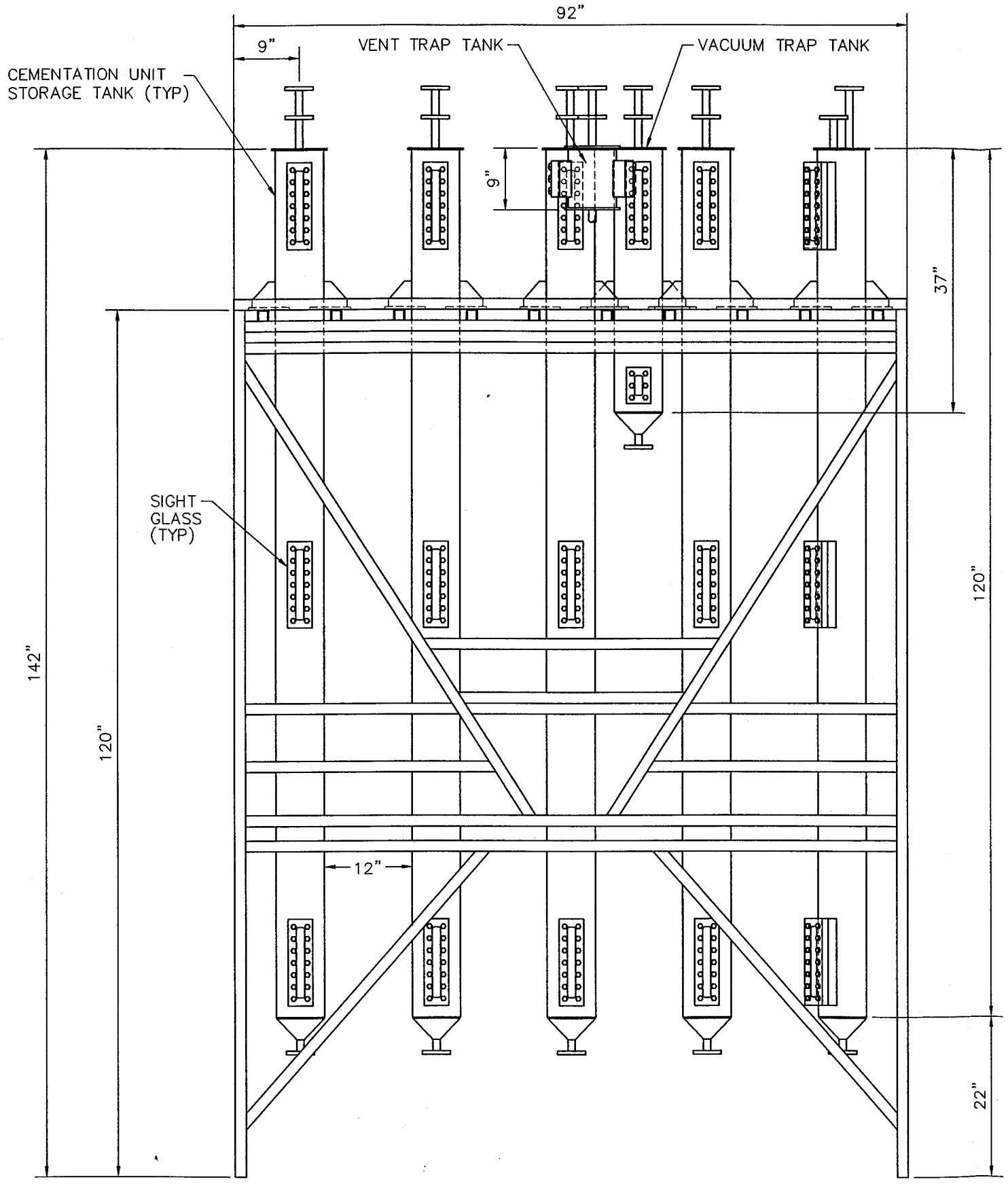
TA-55 STORAGE TANK SYSTEM

EVAPORATOR GLOVEBOX TANK COMPONENT PIPING AND INSTRUMENTATION DIAGRAM

BLDG. PF-4 TA- 55

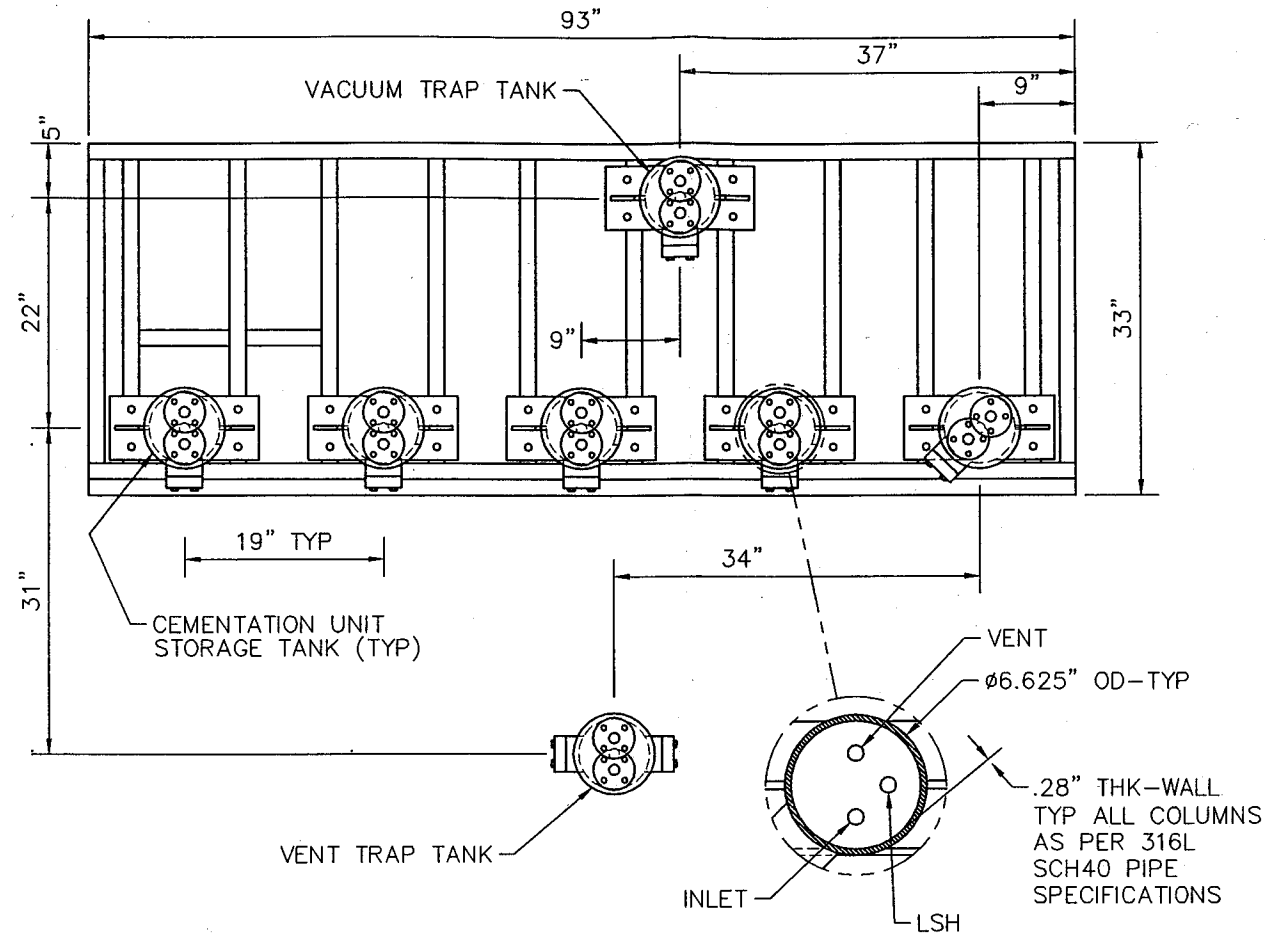
DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/03	APPROVED	J. GRIFFIN	7/24/03
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/03	SHEET NO. H-5	5 OF 7	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.					



CEMENTATION UNIT PENCIL TANKS COMPONENT – FRONT ELEVATION
SCALE: 1" = 18"

NOTES:

DIMENSIONS ARE ROUNDED TO THE NEAREST INCH EXCEPT FOR TANK DIAMETER AND WALL THICKNESS.



SCALE THIS DETAIL: 1" = 4"

CEMENTATION UNIT PENCIL TANKS COMPONENT – PLAN VIEW
SCALE: 1" = 18"

Figure H–6
Cementation Unit Pencil Tanks Component Support Structure

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LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TA–55 STORAGE TANK SYSTEM

CEMENTATION UNIT PENCIL TANKS COMPONENT PLAN VIEW AND FRONT ELEVATION

BLDG. PF–4 TA– 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/03	APPROVED	J. GRIFFIN	7/24/03
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/03	SHEET NO. H–6	6 OF 7	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.					

April 28, 2000 11:47:35 a.m. N:\OPPENHEIMER\801448\TA-55 PART B DRAFT APRIL 2000\CAD\H-6.DWG

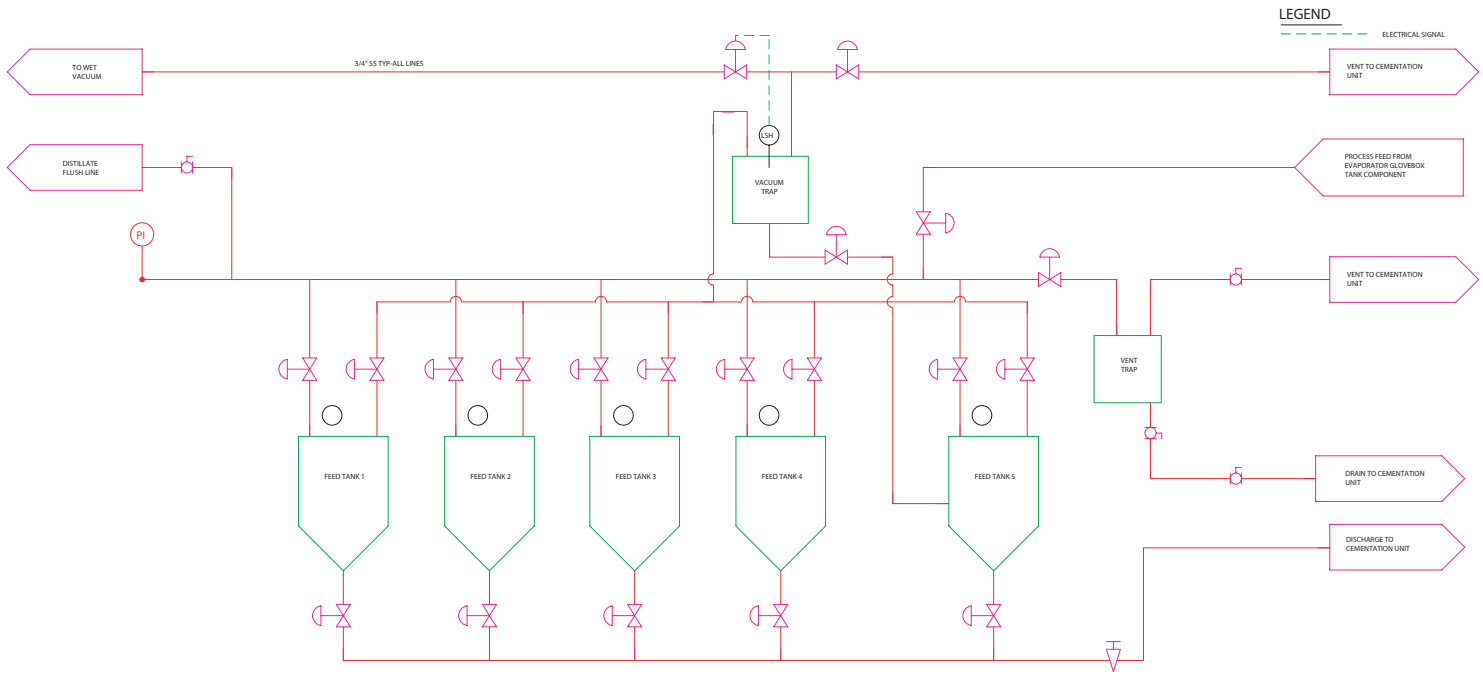


Figure H-7

Cementation Unit Pencil Tanks Component
Piping and Instrumentation Diagram

CEMENTATION UNIT PENCIL TANKS COMPONENT - PIPING AND INSTRUMENTATION DIAGRAM

SCALE: NONE

NOT FOR CONSTRUCTION

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™ Environmental & Infrastructure, Inc.

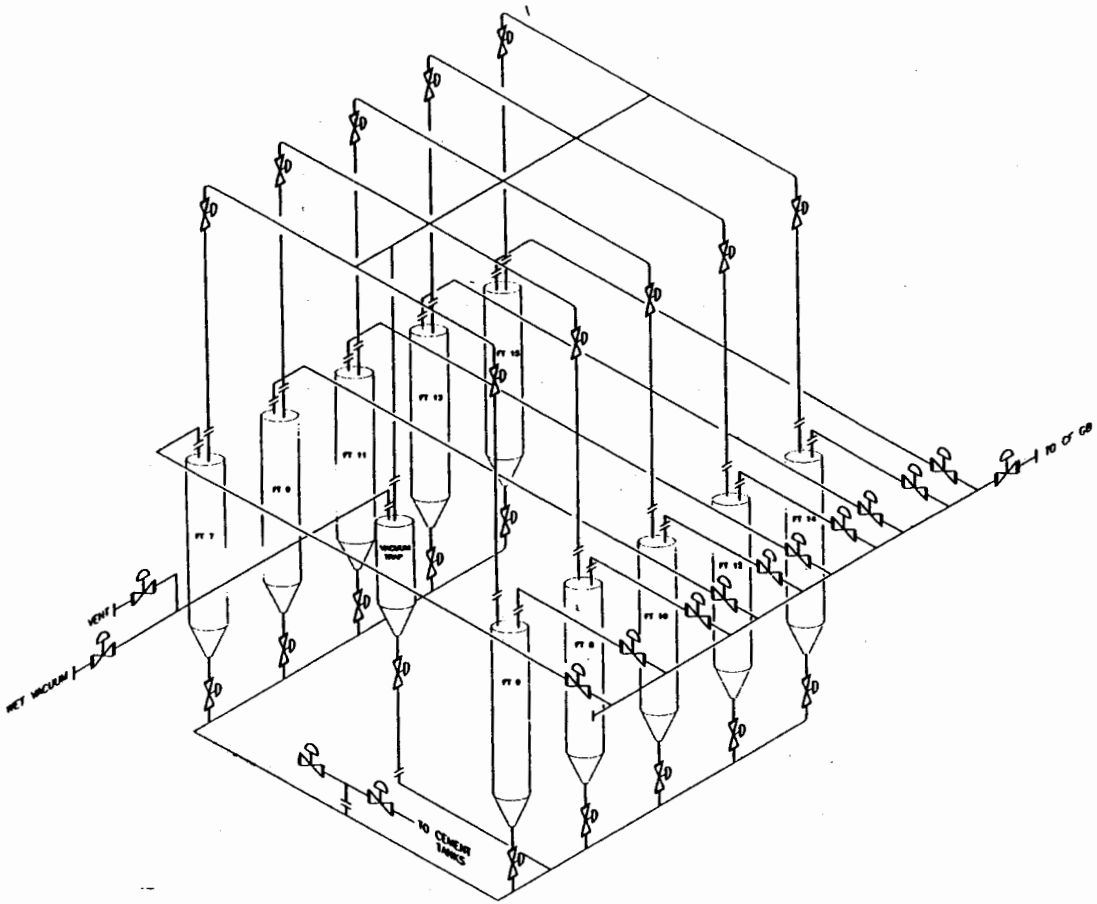
LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TA-55 STORAGE TANK SYSTEM

CEMENTATION UNIT PENCIL TANKS COMPONENT
PIPING AND INSTRUMENTATION DIAGRAM

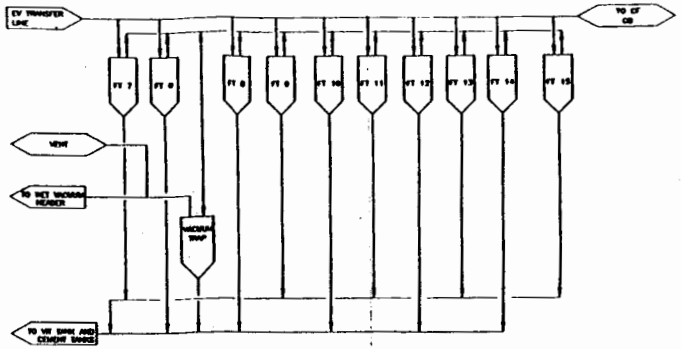
BLDG. PF-4 TA- 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/01	APPROVED	J. GRIFFIN	7/24/01
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/01	SHEET NO. H-7	OF 7	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.					



PENCIL TANKS ISOMETRIC DIAGRAM

SCALE: NONE



PENCIL TANKS FLOW DIAGRAM

SCALE: NONE

Figure H-8
Pencil Tanks Component
Isometric and Flow Diagram

NO	DATE	CLASS REV	DESCRIPTION	DRN	VER	CHKD	DES	APP

Johnson Controls

PENCIL TANKS

ISOMETRIC DIAGRAM AND FLOW DIAGRAM

BLDG. PF-4 TA-55

DRAWN / DESIGN / CHECKED / DATE

SUBMITTED STEVE COX

APPROVED FOR RELEASE RON MANDRA

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET M1 3/4

CLASSIFICATION UNC REVIEWER TOM MINER DATE

PROJECT ID N/A

DRAWING NO 55Y-001787

REV

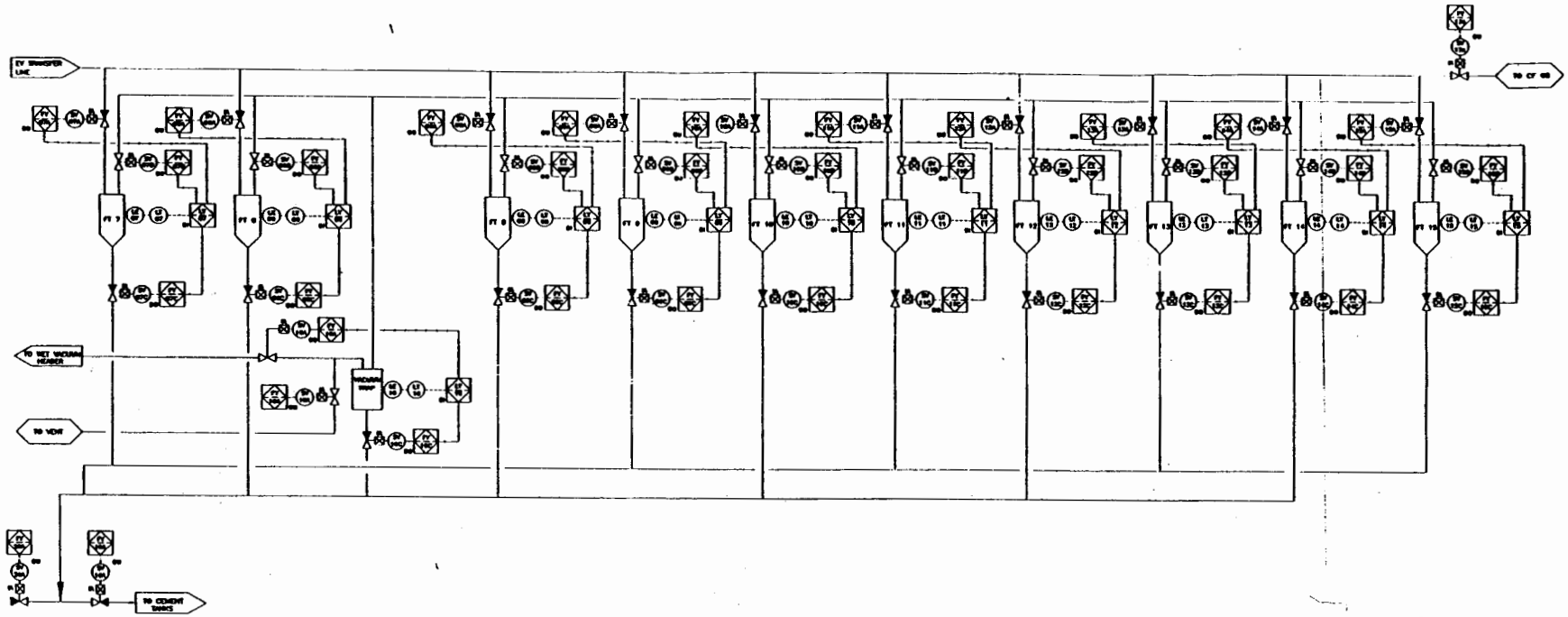


Figure H-9
Pencil Tanks Component
Piping and Instrumentation Diagram

NO	DATE	CLASS REV	DESCRIPTION	DRAWN	VERIFIED	CHECKED	SUPV	APP

Johnson Controls
Barbara Ann Shelley

PENCIL TANKS

DIAGRAM

DRAWN A. REVEST
DESIGN S. COX
CHECKED L. CURRIER
DATE 1/17/95

BLDG. PF-4 TA-55

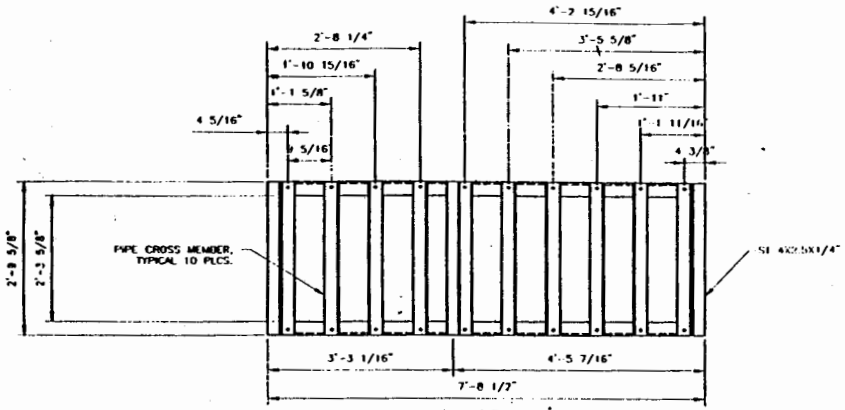
SUBMITTED STEVE COX
APPROVED FOR RELEASE RON MAGANA

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545

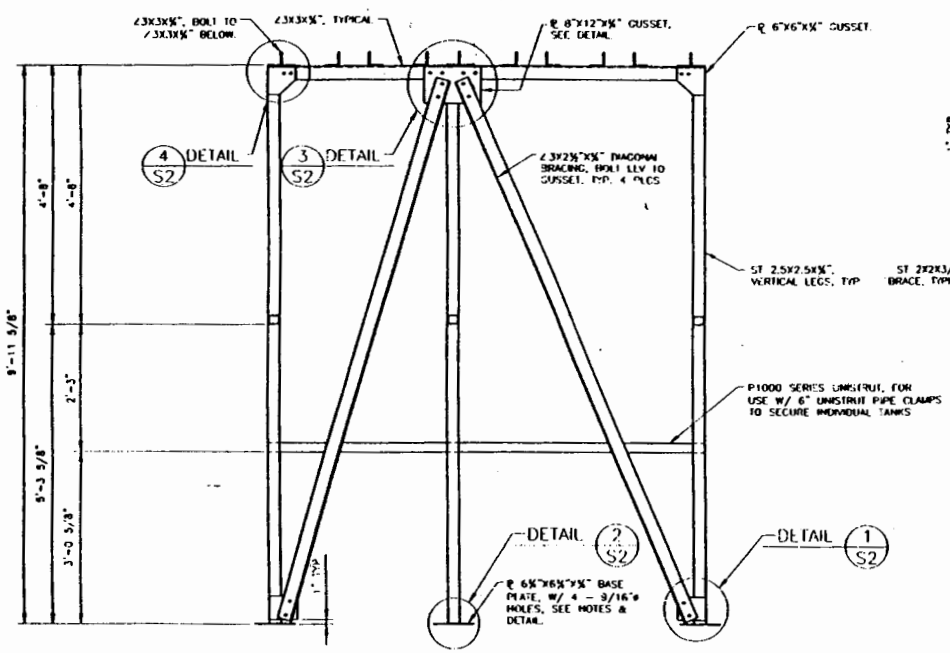
SHEET E1

CLASSIFICATION UNC
REVIEWER NAME AND DATE

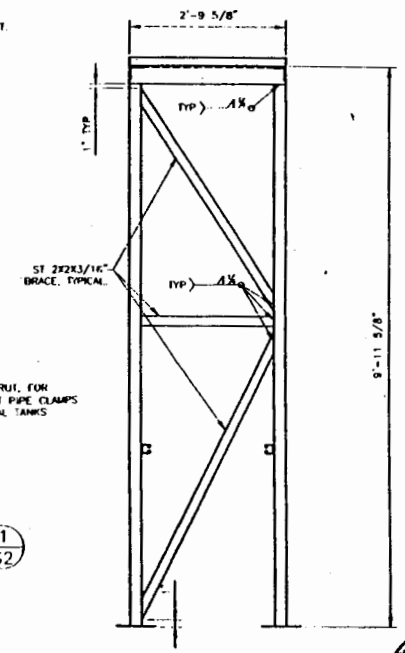
PROJECT ID N/A
DRAWING NO 55Y-001787
REV



TOP VIEW
SCALE: 1"=1'-0"



FRONT VIEW
SCALE: 1"=1'-0"



RIGHT SIDE VIEW, TYP.
SCALE: 1"=1'-0"

STRUCTURAL NOTES

1. STEEL SHAPES & PLATE: ASTM A36
2. STEEL TUBE: ASTM A500, GRADE B
3. WELD METAL: 70KSI FILLER METAL IN ACCORDANCE WITH AWS D1.1-92. IF SMAW PROCESS IS USED, USE E7018 ELECTRODES PER AWS A5.1 OR A5.5.
4. CONFORM TO AISC SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS, AISC CODE OF STANDARD PRACTICE, AND AWS D1.1-92 STRUCTURAL WELDING CODE - STEEL.
5. PAINTED SURFACE PREPARATION: SSPC-SP2 OR SSPC-SP3.
6. FASTENERS: ASTM A325 HIGH STRENGTH (H.S.) BOLTS, ALL BOLT DIAMETERS ARE 1/2" DIAMETER UNLESS NOTED.
7. PIPE CROSS MEMBER SUPPORTS: FIELD VERIFY PIPE FLANGE MOUNTING HOLES AND DRILL MATCHING HOLES IN CROSS MEMBER SUPPORTS.
8. CONCRETE ANCHORS: USE HILTI HVA ADHESIVE ANCHOR SYSTEM. ANCHORS SHALL BE 1/2" DIAMETER WITH 6-3/8" MINIMUM EMBEDMENT. INSTALL/TIGHTEN AS PER MANUFACTURER'S SPECS.
9. CONCRETE DRILLING: CONSULT APPROPRIATE AUTHORITIES FOR LOCATION OF ANY EXISTING ELECTRICAL, MECHANICAL, AND/OR STRUCTURAL STEEL PRIOR TO DRILLING.
10. ASSEMBLY: ALL BRACING MUST BE STAMPED TO ALLOW REQUESTER TO DISASSEMBLE AND REASSEMBLE SUPPORT STAND IN PERMANENT LOCATION. END AND MIDDLE FRAMES TO BE WELDED AND FITTED WITH SHOWN GUSSETS PRIOR TO ASSEMBLY AT PERMANENT LOCATION. BRACING LENGTHS TO BE FIELD ACQUIRED BASED ON HORIZONTAL FRAME SPACING.
11. ALL EXPOSED ENDS OF SQUARE TUBE SHALL BE CAPPED AND WELDED.
12. ALL SHARP EDGES SHALL BE FILED.

Figure H-10
Pencil Tanks Component Support Structure

GRAPHIC SCALE
1'-1'-0"

NO.	DATE	CHANGE REV.	REVISIONS	DRAWN	DES.	INST.	SUBD.	REV.

PARAGON
STRUCTURAL ENGINEERING, L.L.P.

PENCIL TANKS

TA-55 BLDG. PF-4 DATE 7/12/2001

DRAWN BY K. FELLER
APPROVED FOR RELEASE RON HAGADIKA

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET S1 1 OF 4

CLASSIFICATION UNC REVIEWER DATE 7-12-01

PROJECT ID N/A

DRAWING NO. 55Y-001787

REV.

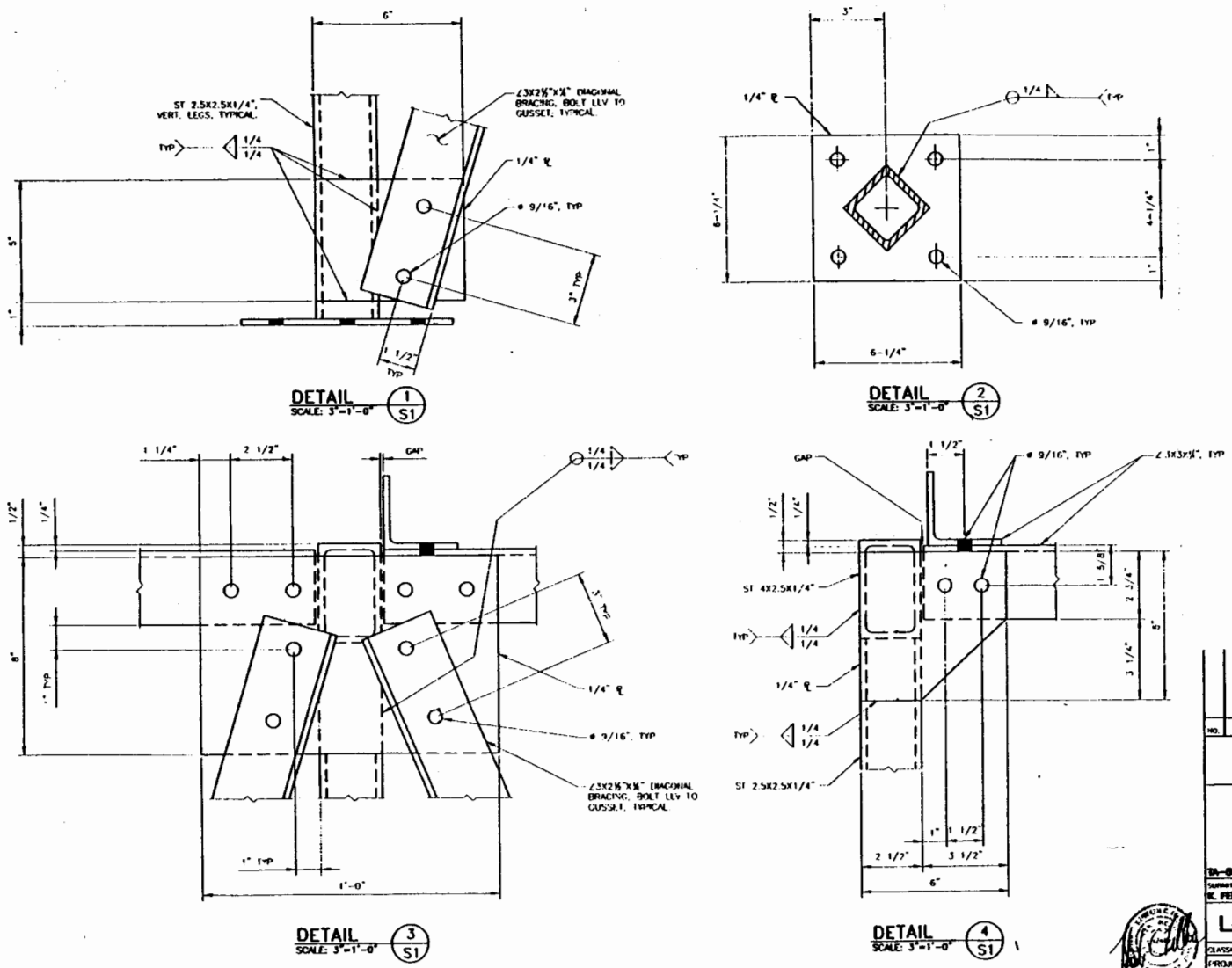


Figure H-11
Pencil Tanks Component
Support Structure (continued)

GRAPHIC SCALE
3" = 1'-0"

NO.	DATE	CLASS REV.	REVISIONS	DRAWN	CHK'D	APP'D	CAD	APP'D

PARAGON
STRUCTURAL ENGINEERING, L.L.P.

PENCIL TANKS

DRAWN GBL
DESIGN GBL
DESIGN BBF KCF
DATE 3/10/2004

TA-05 BLDG. PF-4

SUBMITTED K. FELLER
APPROVED FOR RELEASE: RON HAKAOKA

Los Alamos — Los Alamos National Laboratory, Los Alamos, New Mexico 87545

SHEET S2 2 OF 4

CLASSIFICATION UNC REVIEWER DATE

PROJECT ID N/A

DRAWING NO. 55Y-001787

REV

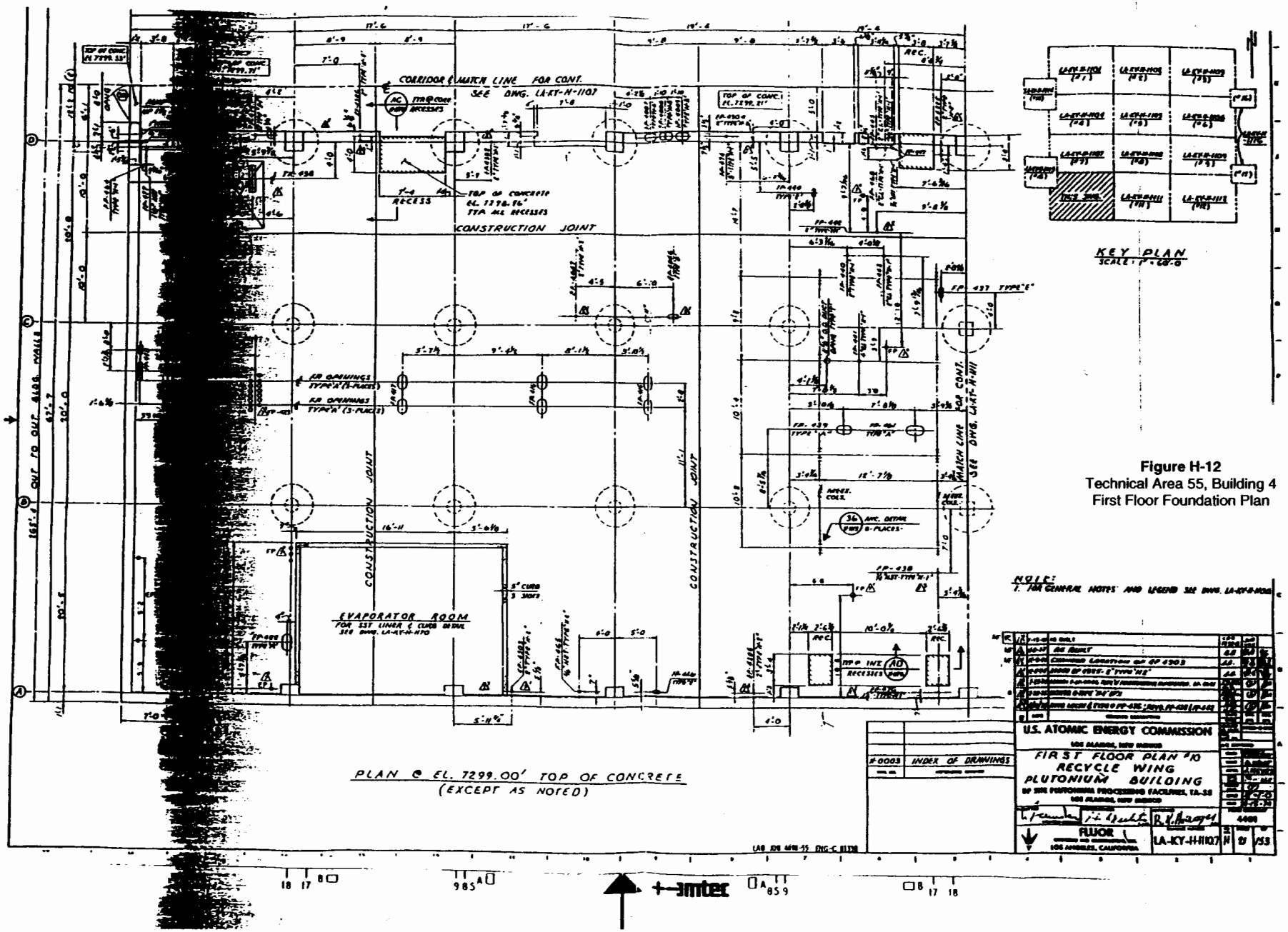


Figure H-12
Technical Area 55, Building 4
First Floor Foundation Plan

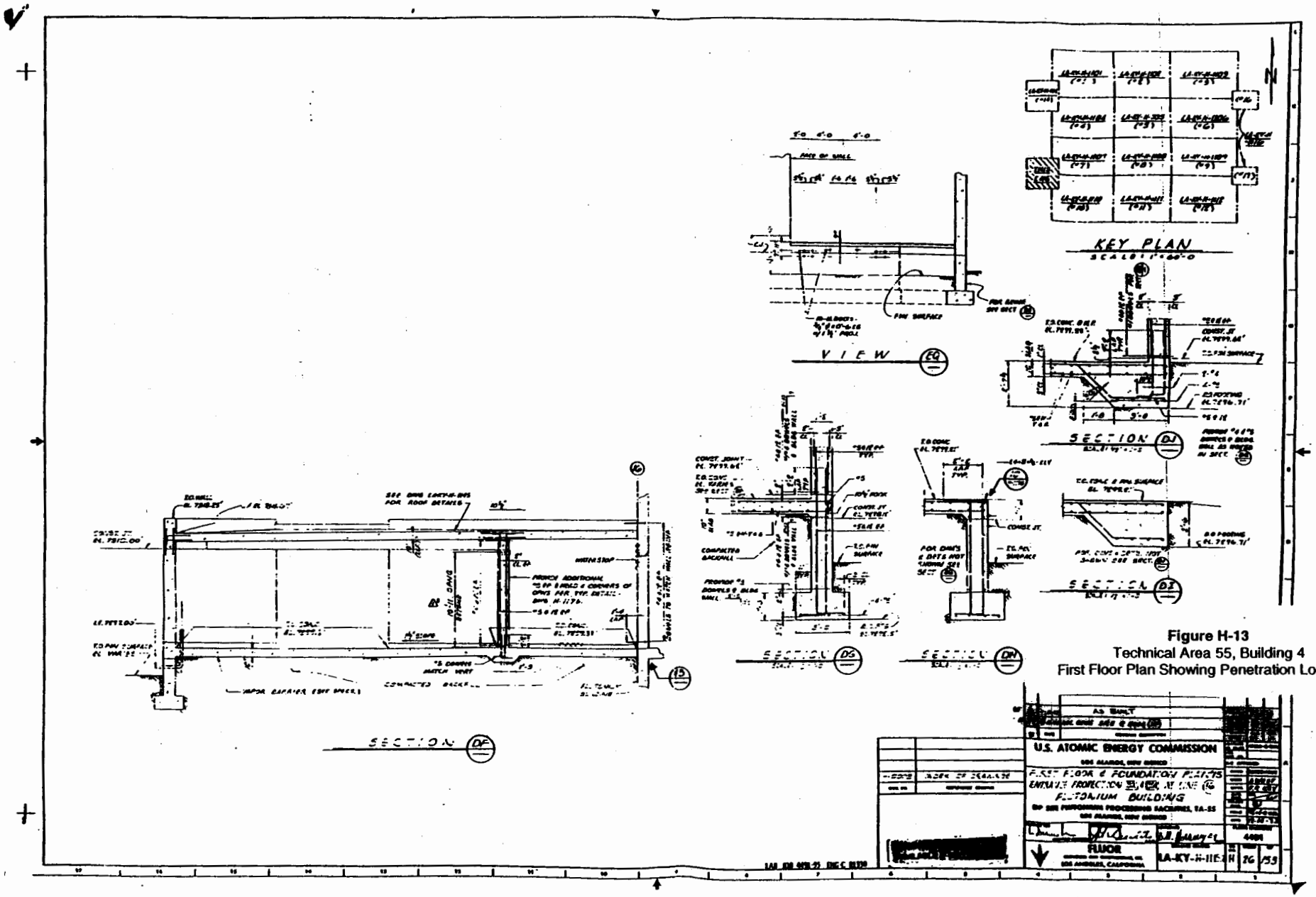


Figure H-13
Technical Area 55, Building 4
First Floor Plan Showing Penetration Locations

Supplement H.1

Written Engineering Assessment/Certification for the Evaporator Glovebox Tank Component

ADDENDUM TO THE REGISTERED PROFESSIONAL ENGINEER WRITTEN ASSESSMENT/CERTIFICATION

EVAPORATOR GLOVEBOX STORAGE TANK SYSTEM TECHNICAL AREA 55 LOS ALAMOS NATIONAL LABORATORY

The purpose of this addendum is to provide updated information for the "Los Alamos National Laboratory Technical Area 55 Part B Permit Application," Revision 2.0. The changes are not related to the design or construction of the tank system for which the assessment was written. They are a result of reformatting and nomenclature revisions and, therefore, recertification is not required.

The evaporator glovebox storage tank system has been renamed "the evaporator glovebox tank component." It is now considered a tank component affiliated with the storage tank system located at Technical Area 55, Building 4.

The certification page of this engineering assessment (page 4 of 9) references the location of the assessment as Attachment 4-2 of the "Los Alamos National Laboratory Technical Area 55 Part B Permit Application," Revision 0.0 submitted to the New Mexico Environment Department in June 1996. This information has changed to Supplement H.1 of this permit application.

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION

EVAPORATOR GLOVEBOX STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

The evaporator glovebox storage tank system (i.e., glovebox GB-438 and ancillary equipment) located at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401) is considered an existing tank system in accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.191. The system was constructed in 1986 and installed at its present location in TA-55-4-401 in 1988 [20 NMAC 4.1, Subpart VI, 265.191(b)(4)]. The evaporator glovebox storage tank system has secondary containment that meets the requirements of 20 NMAC 4.1, Subpart VI, 265.193; therefore, the requirement that the owner or operator of the tank system determine that the tank system is not leaking or is unfit for use is not applicable. In addition, the requirement that the owner or operator obtain and keep on file a written assessment, reviewed and certified by an independent, qualified, registered professional engineer, attesting to the tank system's integrity is also not applicable [20 NMAC 4.1, Subpart VI, 265.191(a)]. However, for the purpose of demonstrating that the evaporator glovebox storage tank system will function as a completely leak-proof system and would meet the assessment requirements if they were applicable, the following written assessment has been prepared in accordance with 20 NMAC 4.1, Subpart VI, 265.191(b), attesting that the tank system is adequately designed and has sufficient structural integrity and compatibility with the waste stored to ensure that it will not collapse, rupture, or fail.

The evaporator glovebox storage tank is fabricated from 3/16-inch, 316 stainless steel with a 2B finish conforming to the American Society for Testing and Materials (ASTM) A240. The lower half of the tank is fabricated with additional layers of materials welded to the outside of the 3/16-inch-thick stainless steel enclosure. These materials consist of 1/4-inch-thick lead shielding, conforming to ASTM B29, and an outer layer of 1/16-inch, 316 stainless steel cladding. The tank system is of welded construction with all welds blended, ground, and polished to blend with adjacent material. Welding procedure qualifications and welder's performance qualifications conform to the requirements of either the American Welding Society B3.0-41 or the American Society of Mechanical Engineers (ASME) Section IX for welding and brazing qualifications. Questionable welds, if any, are liquid penetrant inspected according to ASME Section VIII [20 NMAC 4.1, Subpart VI, 265.191(b)(1)]. All joints are vacuum tight.

The support frame and legs of the evaporator glovebox storage tank are constructed of carbon steel and conform to ASTM A36. The support frame is bolted to the base of the tank for stabilization. In addition, the legs of the tank are bolted to the support frame and secured to the

10-inch-thick concrete floor with anchor bolts. The 10-inch-thick concrete floor was constructed to conform to the building code requirements of the American Concrete Institute (ACI) 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347.

The window components of the evaporator glovebox storage tank are constructed of 1/4-inch leaded glass, laminated on both sides with 1/8-inch clear glass, and installed with a neoprene gasket. Additionally, each window is backed with 1/4-inch safety glass installed with a neoprene gasket/seal that provides air-tight containment. The dual glass configuration is secured to the tank with a welded frame consisting of a 1/4-inch-thick lead shielding and a 1/16-inch, 316 stainless steel cladding similar to the additional layers of materials welded to the outside of the lower half of the tank. The welded window frames are bolted to the tank system.

The glove components of the evaporator glovebox storage tank are constructed of neoprene and Hypalon. Each glove is tested for material continuity by the manufacturer before acceptance and installation within the evaporator glovebox storage tank. Each glove is selected for its resistance to nitric acid as well as its lead equivalent shielding power to gamma radiation.

All of the components within the tank system are corrosion resistant and are compatible with the waste stored in the tank system. No external component of the tank system is in contact with soil or water [20 NMAC 4.1, Subpart VI, 265.191(b)(3)].

The stored waste consists of nitrate-based aqueous mixed waste solutions and waste salts generated from these solutions. The potential hazardous characteristics of the waste include corrosivity and toxicity for cadmium, chromium, and lead (i.e., EPA Hazardous Waste Numbers D002, D006, D007, and D008). Currently, no ignitable, reactive, or incompatible mixed wastes are stored or are anticipated to be stored in this tank system [20 NMAC 4.1, Subpart VI, 265.191(b)(2)].

A helium leak test using a mass spectrometer was performed on the evaporator glovebox storage tank upon fabrication at Silver Engineering and again after the tank was installed and made operational at its present location in TA-55-4-401. During leak testing, in accordance with the standard helium leak testing procedure for gloveboxes, any detectable leak at welds, gasket sealed joints, or any other part of the glovebox is unacceptable. In the event a leak is detected

during initial testing of any glovebox to be utilized at LANL, the glovebox is repaired and retested. Gloveboxes that have been repaired and fail retesting are not accepted for use by LANL. In addition to the initial leak tests performed on the evaporator glovebox storage tank, continuous leak detection is mandatory operating procedure for TA-55-4-401 and thus provides continuous leak detection for the tank system. Eight continuous air monitoring units are installed at various locations throughout TA-55-4-401 to detect any airborne alpha contamination (i.e., the radioactive constituent of the solutions stored in the tank system). Additionally, fixed head air monitors are installed on the outside of the tank system and filter the air as it is pulled through the vacuum vent lines at TA-55-4-401. The filters from these monitors are changed and analyzed weekly for the presence of the radioactive constituent of the stored waste. The above continuous leak detection devices are capable of rapidly detecting leaks in volumes less than 0.03 ounce, far exceeding conventional tank system leak detection devices [20 NMAC 4.1, Subpart VI, 265.191(b)(5)].

(The procedure adhered to during the helium leak test is included in this attachment following the certification. The procedure is referenced from the "Technical Specifications for Glove Boxes, Drop Boxes, Introductory Boxes and Conveyor Tunnels," Specification No. MST-8-S184-R00, Los Alamos National Laboratory, Los Alamos, New Mexico, July 27, 1988. A copy of the checklist documenting operability tests and equipment verification for proper operation of the evaporator glovebox storage tank system is also included in this attachment following the certification.)

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION
(Continued)

CERTIFICATION · JOHN M. PIETZ, P.E.

I, John M. Pietz, have reviewed the design of the evaporator glovebox storage tank system located at LANL, TA-55-4-401. My duties were to assess the structural integrity of the glovebox storage tank system and its compatibility with the waste stored in this system to ensure that it will not collapse, rupture, or fail.

I certify under penalty of law that this document (i.e., Attachment 4-2 of the TA-55 Part B Permit Application) was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted for this assessment and certification. 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 violations.

JOHN M. PIETZ
NEW MEXICO
12833
REGISTERED PROFESSIONAL ENGINEER

6/24/96
Date

John M. Pietz, P.E.
Consulting Engineer
IT Corporation
New Mexico Registered Professional Engineer No. 12833
Expires: December 31, 1997

HELIUM LEAK TEST FOR GLOVE BOXES, DROP BOXES, AND TUNNEL SECTIONS

1.0 Equipment

1.1 Leak Detector: Helium Mass Spectrometer Leak Detector, with Sniffer Probe, University Approved.

1.2 Helium: U.S.B.M. Grade A.

1.3 Calibrated Helium Leak: 10^{-7} - 10^{-8} atm cc/sec leak rate.

1.4 Manometer: water filled, open-ended J tube 1/2" i.d. min., max. pressure head 6" water, operating range 4" water.

1.5 Helium pressure regulating valve: 2,000 psi/0-15 psi, with pressure relief valve set at 1–2 psig.

1.6 Helium flowmeter, range 0–15 $ft.^3$/min.

2.0 Procedure

2.1 Seal glove box openings. Method of sealing of glove box openings shall be at the discretion of the seller.

2.2 Attach helium fill tubing with shut off valve, to a port in the glove box on one end, or preferably on upper corner.

2.3 Attach helium vent with shut off valve on opposite side of the box preferably lower corner diagonally opposite fill port.

2.4 Attach manometer to convenient opening and fill with water.

2.5 Calibrate He leak detector to minimum sensitivity with calibrated leak and determine sensitivity (S) as follows:

$$S = \frac{L_s}{\text{Meter Divisions}} \text{ atm - cc/sec/div}$$

L_s = standard He leak rate (atm - cc/sec)

2.6 Attach helium bottle, regulator, and flow meter to helium inlet on glove box.

2.7 Flush He through box at a convenient rate (Q) so that the internal pressure of the box is always less than 6" H_2O, and determine the rate and pressure to be used.

2.8 Calculate the time required for the He flush as follows: Calculate the volume (V $ft.^3$) of the box to $\pm$ 10%. Using the flow rate Q ($ft.^3$/min.) determined above, the flushing time for 90% helium atmosphere will be (assuming completely mixed flow),

$$T_{min.} = 2.3\ V/Q$$

2.9 Close the helium supply valve and close the helium vent valve. Adjust the helium inlet to get 4" water on the manometer.

2.10 Ventilate the room to eliminate helium contamination in the room, then stop ventilation.

2.11 A 1/8-inch leak test probe will be moved along all joined surfaces (welded or gasketed), with probe not more than 1/4" from area to be checked, and moving probe about 2 ft./min.

2.12 Record location and intensity of all leaks: The leak rate (L) will be determined from meter reading (R_L) from a particular leak and the instrument sensitivity (S) as determined in 2.5.

$$L = S\ (R_L - R_B)$$

Note at 5,000' MSL (Mean Sea Level) the above procedure will give a minimum leak detection capability of about 8×10^{-7} atm cc/sec.

Evaporator Project
Operability Tests and Equipment Verification

Checklist for equipment and instrumentation verified as operating properly and calibrated appropriately.

ITEM VERIFIED	DATE	INITIALS
<u>Evaporator Enclosure</u>		
Control loops		
• EV A Steam		
- Foxboro 761 PID controller	10-4-89	[illegible]
- Control valve		
• EV A Level		
- Foxboro 761 PID controller	10-4-89	[illegible]
- Control valve		
• EV B Steam		
- Foxboro 761 PID controller	10/4/89	dGd
- Control valve		
• EV B Level		
- Foxboro 761 PID controller	10/4/89	dGd
- Control valve		
Pneumatic valves		
• Feed		
- EV A, #6 and #7	10/2/89	dGd
- EV B, #18 and #19	10/2/89	dGd
• Distillate		
- EV A to hot tanks, #23	10/2/89	dGd
- EV A to cold tanks, #21	10/2/89	dGd
- EV B to hot tanks, #24	10/2/89	dGd
- EV B to cold tanks, #22	10/2/89	dGd
Flowmeters (Micromotion)		
- EV A feed	10/3/89	SLY
- EV B feed	10/3/89	SLY
- EV A distillate	10/3/89	SLY
- EV B distillate	10/3/89	SLY
Feed pumps (Wilden diaphragm with air to 25 psig)		
- EV A	10/2/89	dGd
- EV B	10/2/89	dGd
Magnetic level meters		
- EV A	10/2/89	dGd
- EV B	10/2/89	dGd

ITEM VERIFIED	DATE	INITIALS
Visual sightglasses		
- EV A	10/2/89	dbd
- EV B	10/2/89	dbd
Density meters (0.9 to 1.5 SpG)		
- EV A	10/4/89	dbd
- EV B	10/4/89	dbd
Feed storage tanks and vent/vac traps leak tested	1/24/89	dbd
Industrial water lines		
- EV A demistor, sightglass, reboiler	10-4-89	[illegible]
- EV B demistor, sightglass, reboiler	10-4-89	[illegible]
Temperature thermohms and gauge readouts		
- EV A bottoms	10/4/89	dbd
- EV A steam	10/4/89	dbd
- EV B bottoms	10/4/89	dbd
- EV B steam	10/4/89	dbd
Backup pneumatic valve control panel	10/2/89	dbd
Steam systems		
• PRV set to 35 psig		
- Saltbox and steam candles	10-4-89	[illegible]
- Evaporators	10-4-89	[illegible]
• SRV set to 50 psig		
- Saltbox and steam candles	10-4-89	[illegible]
- Evaporators	10-4-89	[illegible]
• Traps on supply lines		
- Saltbox and steam candles	10-4-89	[illegible]
- Evaporators	10-4-89	[illegible]
• Condensate traps		
- EV A	10-4-89	[illegible]
- EV B	10-4-89	[illegible]
Zone 2 exhaust HEPA, DOP tested	10-3-89	JRO by [illegible]
Zone 2 inlet HEPAs		
- South inlet	10/2/89	dbd
- West inlet	10/2/89	dbd
Overhead 1 ton craneS with limit switches. Load tested to 125% of capacity (X2)	12/5/88	DAO by dbd *

* Reference crane test packages.

ITEM VERIFIED	DATE	INITIALS
Saltbox		
Configured glass columns		
- steam candles	10/2/89	dGd
- vent/vac inlets (X2)	10/2/89	dGd
- overhead hoist setup for column replacement	10/2/89	dGd
- (two with thermocouples and wire screen cages)	10/2/89	dGd
Offgas condenser	10/2/89	dGd
Vent/vac trap with drain to feed tanks		
- EV A feed	10/3/89	SLY
- EV B feed	10/3/89	SLY
Heat tape on transfer line	10/3/89	SLY
RTD	10/3/89	SLY
Acid metering valves (X2)	10/3/89	SLY
Shielded salt trays with NPCCW supply/return (X2)	10/3/89	SLY
Filter boats, stainless steel (X2)	10/3/89	SLY
Glovebox services		
- compressed air (X~~1~~) 4 dGd	10-4-89	[illegible]
- industrial water (X4)	10-4-89	[illegible]
- 110/120V outlets (X2)	10-4-89	[illegible]
- NPCCW supply and return (X2)	10-4-89	[illegible]
- house vacuum with trap	10-4-89	[illegible]
12" HEPA filters stacks (X3)	6/22/89	JPO by dGd *
8" inlet filters (X2)	10-4-89	[illegible]
Sample port	10/3/89	SLY * *

* REFERENCE MEMO HSE-5-89-818

** He leaked checked by LANL MACHINE SHOP

* AND IN PURGE

Supplement H.2A

Written Engineering Assessment/Certification for the Cementation Unit Pencil Tanks Component

ADDENDUM TO THE REGISTERED PROFESSIONAL ENGINEER WRITTEN ASSESSMENT/CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM TECHNICAL AREA 55 LOS ALAMOS NATIONAL LABORATORY

The purpose of this addendum is to provide updated information for the "Los Alamos National Laboratory Technical Area 55 Part B Permit Application," Revision 2.0. The changes are not related to the design or construction of the tank system for which the assessment was written. They are a result of reformatting, clarification, and nomenclature revisions and, therefore, recertification is not required.

The cementation unit storage tank system has been renamed "the cementation unit pencil tanks component." It is now considered a tank component affiliated with the storage tank system located at Technical Area 55, Building 4.

The discussion of the Uni-strut support system for the cementation pencil tanks includes the following statement:

> " The entire tank system, including ancillary equipment, is elevated and supported by a steel channel, Uni-strut support system. The Uni-strut support system is secured to the concrete floor and ceiling with anchor bolts and provides the system's ancillary equipment with support and protection against physical damage and excessive stress due to settlement and vibration."

To clarify, the Uni-strut support system to which the tanks are attached is bolted only to the floor. The ancillary equipment (i.e., piping) is also attached to a Uni-strut support system, which is bolted to the ceiling.

The certification page of this engineering assessment (page 4 of 4) references the location of the assessment as Attachment 4-3 of the "Los Alamos National Laboratory Technical Area 55 Part B Permit Application," Revision 0.0, submitted to the New Mexico Environment Department in June 1996. This information has changed to Supplement H.1 of this permit application. The location of this information has changed to Supplement H.2A of this permit application.

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

The cementation unit storage tank system located at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401) was constructed and installed prior to January 1991 and was considered an existing tank system in accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.191. New components (i.e., the header/manifold and the transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold) have recently been installed within the cementation unit storage tank system and may be considered major, nonroutine modifications. In accordance with 20 NMAC 4.1, Subpart VI, 265.192(a), owners or operators of new tank systems or components must obtain and submit to the New Mexico Environment Department a written assessment, reviewed and certified by an independent, qualified, registered professional engineer, attesting that the tank system has sufficient structural integrity and is acceptable for handling hazardous waste.

The cementation tank system consists of:

- Five vertical, 55-liter storage tanks
- Vacuum trap
- Vent trap
- Vent trap vent line and drain line
- Header/manifold
- Vacuum manifold
- Lower manifold
- Transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold
- Transfer line from the lower manifold to the cementation unit.

In accordance with 20 NMAC 4.1, Subpart VI, 265.192(b), an independent, qualified installation inspector has inspected the new components installed within the cementation unit storage tank

system (see Attachment 4-5). These components were constructed and installed to the American National Standards Institute (ANSI) B31.3 standard for chemical plant and petroleum refinery piping [20 NMAC 4.1, Subpart VI, 265.192(a)(1) and 265.192(e)]. This standard prescribes requirements for the materials, design, fabrication, assembly, erection, examination, inspection, and testing of all piping within the property limits of the facility engaged in the processing activities. The new header/manifold and transfer line were inspected for weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction or installation. These inspections were performed on February 28, 1996. No weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage or inadequate construction or installation were observed.

All of the components comprising the cementation unit storage tank system are constructed of 316 stainless steel for corrosion resistance and are compatible with the waste stored in the tanks. The stored waste consists of nitrate-based aqueous mixed waste solutions. The potential hazardous characteristics of the waste include corrosivity and toxicity for cadmium, chromium, and lead (i.e., EPA Hazardous Waste Numbers D002, D006, D007, and D008). Currently, no ignitable, reactive, or incompatible mixed wastes are stored or are anticipated to be stored in this tank system [20 NMAC 4.1, Subpart VI, 265.192(a)(2)].

No external component of the cementation unit storage tank system is in contact with soil or water [20 NMAC 4.1, Subpart VI, 265.192(a)(3) and 265.192(f)] and no part of the tank system is underground [20 NMAC 4.1, Subpart VI, 265.192(a)(4) and 265.192(c)].

The cementation unit storage tank system is erected upon a 10-inch-thick concrete floor within TA-55-4-401. The 10-inch-thick concrete floor provides a foundation that will maintain the load of the tank system when full. The concrete floor and ceiling were constructed to conform to the building code requirements of the American Concrete Institute (ACI) 318-71 for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI 315. The design construction and tolerance of the framework around the concrete is in accordance with ACI 347 [20 NMAC 4.1, Subpart VI, 265.192(5)(i)]. The entire tank system, including ancillary equipment, is elevated and supported by a steel channel, Uni-strut® support system. The Uni-strut® support system is secured to the concrete floor and ceiling with anchor bolts and provides the system's ancillary equipment with support and protection against physical damage and excessive stress due to settlement and vibration [20 NMAC 4.1, Subpart VI, 265.192(e)]. The system stores only

solutions that have been previously cooled to room temperature, and the solutions are transferred utilizing a slight vacuum (i.e., 10 to 20 inches of mercury). The system does not operate under pressure. Because of the moderate operating parameters (i.e., temperature and pressure) of the system, physical damage and excessive stress due to expansion and contraction are not anticipated. Furthermore, the cementation tank system is not within a saturated zone or seismic fault zone [20 NMAC 4.1, Subpart VI, 265.192(a)(5)(ii)], and is within a building so that frost heave effects are not expected [20 NMAC 4.1, Subpart VI, 265.192(a)(5)(iii)].

In accordance with 20 NMAC 4.1, Subpart VI, 265.192(d), all new tanks and ancillary equipment must be tested for tightness. To further ensure that the structural integrity of the cementation unit storage tank system was not jeopardized during the installation of the new components, the entire system was tightness tested on May 30, 1996, at operating pressure (i.e., under vacuum at 10 to 20 inches of mercury), and determined to be tight (see Attachment 4-4).

REGISTERED PROFESSIONAL ENGINEER
WRITTEN ASSESSMENT/CERTIFICATION
(Continued)

CERTIFICATION - JOHN M. PIETZ, P.E.

I, John M. Pietz, have reviewed a portion of the design of the new components installed on the cementation unit storage tank system located at LANL, TA-55-4-401. The new components include the cementation unit storage tank system header/manifold and the transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold. My duties were to assess possible affects the modifications may have had on the system and to ensure that the structural integrity of the system and its ability to handle hazardous waste was not compromised as a result of the modifications.

I certify under penalty of law that this document (i.e., Attachment 4-3 of the TA-55 Part B Permit Application) was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted for this assessment and certification. 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 violations.

JOHN M. PIETZ
NEW MEXICO
12833
REGISTERED PROFESSIONAL ENGINEER

John M. Pietz, P.E.
Consulting Engineer
IT Corporation
New Mexico Registered Professional Engineer No. 12833
Expires: December 31, 1997

6/24/96
Date

Supplement H.2B

Tightness Testing Certification for the Cementation Unit Pencil Tanks Component

ADDENDUM TO THE TIGHTNESS TESTING CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM TECHNICAL AREA 55 LOS ALAMOS NATIONAL LABORATORY

The purpose of this addendum is to provide updated information for the "Los Alamos National Laboratory Technical Area 55 Part B Permit Application," Revision 2.0. The changes are not related to the design or construction of the tank system for which the tightness testing certification was written. They are a result of reformatting and nomenclature revisions and, therefore, recertification is not required.

The cementation storage tank system has been renamed "the cementation unit pencil tanks component." It is now considered a tank component affiliated with the storage tank system located at Technical Area 55, Building 4.

The certification page of this tightness testing certification (page 2 of 6) references the location of the assessment as Attachment 4-4, of the "Los Alamos National Laboratory Technical Area 55 Part B Permit Application," Revision 0.0 submitted to the New Mexico Environment Department in June 1996. This information has changed to Supplement H.1 of this permit application. This information has changed to Supplement H.2B of this permit application.

TIGHTNESS TESTING CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

New components (i.e., the cementation unit storage tank system header/manifold and the transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold) have been installed within the cementation unit storage tank system located at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401) and may be considered major, nonroutine modifications. In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.192(d), owners or operators of new tanks and ancillary equipment must ensure that the system is tested for tightness. The cementation unit storage tank system was tightness tested on May 30, 1996, at operating pressure (i.e., under a vacuum of 10 to 20 inches of mercury), and determined to be tight. Testing was conducted such that pressure changes caused by temperature variances during testing, tank inflection due to increased vacuum in the tank, or trapped air or vapor pockets within the system were accounted for. (The detailed tightness testing procedure adhered to during the tightness tests and the results of the tightness tests are included in this attachment following the certification.)

TIGHTNESS TESTING CERTIFICATION

CERTIFICATION • JOHN M. PIETZ, P.E.

I, John M. Pietz, have supervised the tightness testing of the cementation unit storage tank system located at LANL, TA-55-4-401. The tightness testing was performed on May 30, 1996. My duties were to direct and witness the testing for tightness for the following tank system components:

- Five vertical, 55-liter storage tanks
- Vacuum trap
- Vent trap
- Vent trap vent line and drain line
- Header/manifold
- Vacuum manifold
- Lower manifold
- Transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold
- Transfer line from the lower manifold to the cementation unit.

as required by 20 NMAC 4.1, Subpart VI, 265.192(d).

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document (i.e., Attachment 4-4 of the TA-55 Part B Permit Application). 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 violations.

JOHN M. PIETZ
NEW MEXICO
12833
REGISTERED PROFESSIONAL ENGINEER

6/24/96
Date

John M. Pietz, P.E.
Consulting Engineer
IT Corporation
New Mexico Registered Professional Engineer No. 12833
Expires: December 31, 1997

TIGHTNESS TESTING PROCEDURE

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The following tightness testing procedure has been developed for the cementation unit storage tank system located at Los Alamos National Laboratory, Technical Area 55, Building 4, Room 401.

PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS AND EQUIPMENT

A. Vacuum Pump: The existing house vacuum pump, located in Room 407, shall be used as the vacuum source to establish and maintain the specified vacuum during each test.

B. Vacuum Gauge: The vacuum gauge shall be an ANSI Grade 2A vacuum gauge with an accuracy of 0.5 percent. The gauge shall have a face diameter of 6 inches and graduated in 0.2-inch mercury increments. The gauge shall be calibrated and installed within one month prior to testing the system.

PART 3 - EXECUTION

3.01 TESTING PROCEDURES

The cementation unit storage tank system consists of:

- Five vertical, 55-liter storage tanks (i.e., feed tanks 1 through 5)
- Vacuum trap
- Vent trap
- Vent trap vent line and drain line
- Header/manifold
- Vacuum manifold
- Lower manifold
- Transfer line from glovebox GB-438 to the cementation unit storage tank system header/manifold

- Transfer line from the lower manifold to the cementation unit.

The entire system will be tightness tested by systematically blanking off sections of the tank system. Each section to be tested shall have the solutions emptied prior to testing. The valve on the wet vacuum line between the vacuum pump and the vacuum trap will be closed for the duration of each test to isolate a vacuum within the components being tested. In order to determine the presence of leaks, each tested section will be held under a vacuum of 10 to 20 inches of mercury for 30 minutes.

The following information specifies the sequence of events to be adhered to during the tightness testing:

A. The vacuum gauge shall be installed on the end of the header/manifold near feed tank 1.

B. All tests will include the following piping sections to facilitate the use of the existing vacuum pump and a single vacuum gauge connection:

- the wet vacuum line,
- the vacuum trap,
- the vacuum manifold, and
- the header/manifold.

C. The first test (Test 1) shall be run through the components listed in item B in addition to the following:

- the line from feed tank 1 to the vacuum manifold, feed tank 1, and the inlet line off of the header/manifold into feed tank 1,
- the line from feed tank 2 to the vacuum manifold, feed tank 2, and the inlet line off of the header/manifold into feed tank 2,
- the line from feed tank 3 to the vacuum manifold, feed tank 3, and the inlet line off of the header/manifold into feed tank 3,
- the line from feed tank 4 to the vacuum manifold, feed tank 4, and the inlet line off of header/manifold into feed tank 4,
- the transfer line from glovebox GB-438 to the header/manifold,
- the lower manifold, and
- the transfer line from the lower manifold to the cementation unit.

D. The second test (Test 2) shall be run through the components listed in item B in addition to the following:

- the vacuum trap drain line,
- the line from feed tank 5 to the vacuum manifold,
- feed tank 5, and
- the inlet line off of the header/manifold into feed tank 5.

E. The third test (Test 3) shall be run through the components listed in item D in addition to the following:

- the vent trap inlet line,
- the vent trap,
- the vent line to the cementation unit, and
- the vent trap drain line to the cementation unit.

3.02 FAILED TEST PROCEDURES

A change in vacuum greater than 2 percent of the test vacuum of a given test indicates a failed test. In the event that a test fails, the appropriate repairs shall be made and the failing component(s) retested. No component that has failed the tightness test shall be placed into use until repairs are made and a passing test is achieved.

TIGHTNESS TESTING RESULTS

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

CEMENTATION UNIT STORAGE TANK SYSTEM TIGHTNESS TESTS[1]			
		TIMES	GAUGE READINGS
TEST 1[2]	Start	9:07 A.M.	17.8 inches of mercury
	End	9:37 A.M.	17.8 inches of mercury
TEST 2[2]	Start	9:47 A.M.	17.8 inches of mercury
	End	10:17 A.M.	18.1 inches of mercury
TEST 3[2]	Start	10:30 A.M.	18.0 inches of mercury
	End	11:00 A.M.	18.0 inches of mercury

Note:

(1) Tightness tests were completed on May 30, 1996.

(2) Components tested are as described in the tightness testing procedure for the cementation unit storage tank system.

Supplement H.2C

Installation Inspection Certification for the Cementation Unit Pencil Tanks Component

ADDENDUM TO THE INSTALLATION INSPECTION CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM TECHNICAL AREA 55 LOS ALAMOS NATIONAL LABORATORY

The purpose of this addendum is to provide updated information for the "Los Alamos National Laboratory Technical Area 55 Part B Permit Application", Revision 2.0. The changes are not related to the design or construction of the tank system for which the installation inspection certification was written. They are a result of reformatting and nomenclature revisions and, therefore, recertification is not required.

The cementation storage tank system has been renamed "the cementation unit pencil tanks component." It is now considered a tank component affiliated with the storage tank system located at Technical Area 55, Building 4.

INSTALLATION INSPECTION CERTIFICATION

CEMENTATION UNIT STORAGE TANK SYSTEM
TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

In accordance with the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart VI, 265.192(b), owners or operators of new tank systems or components must ensure that proper handling procedures are adhered to in order to prevent damage to the system during installation. New components (i.e., the transfer line from Glovebox 438 to the cementation unit storage tank system header/manifold and the cementation unit storage tank system header/manifold) have been installed on the cementation unit storage tank system at Los Alamos National Laboratory (LANL), Technical Area 55, Building 4, Room 401 (TA-55-4-401). The cementation unit storage tank system transfer line and header/manifold have been inspected by a qualified inspector for weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction or installation. The weld inspection check list for the new components is included in this attachment following the certification.

INSTALLATION INSPECTION CERTIFICATION
(Continued)

CERTIFICATION · FRANCIS J. FITZGIBBON JR.

I, Francis J. Fitzgibbon Jr., have supervised the installation of the new components for the cementation unit storage tank system located at LANL, TA-55-4-401. My duties were to supervise the installation of the transfer line from Glovebox 438 to the cementation unit storage tank system header/manifold and the installation of the cementation unit storage tank system header/manifold. The new components were inspected for the presence of the following items:

- Weld breaks
- Punctures
- Scrapes of protective coatings
- Cracks
- Corrosion
- Other structure damage or inadequate construction or installation,

as required by 20 NMAC 4.1, Subpart VI, 265.192(b): As a result of this inspection, none of the above items were noted.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document as it relates to my duties at the time of installation of the cementation unit storage tank system transfer line from Glovebox 438 to the cementation unit storage tank system header/manifold and the cementation unit storage tank system header/manifold. 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 violations.

Francis J. Fitzgibbon Jr.
Francis J. Fitzgibbon Jr.
Construction Supervisor
Johnson Controls World Services, Inc.

5 June 96
Date

JOHNSON CONTROLS
WORLD SERVICES INC.

WELD INSPECTION CHECK LIST

PROJECT	WORK ORDER #	DATE
EVAPORATOR MAINTENANCE	WT 61070	FEB. 28, 1996
LOCATION	**CODE OR SPECIFICATION**	**TYPE OF MATERIAL**
TR-55, PF-A, Room 401A	ANSI B31.3 CATEGORY M	STAINLESS STEEL

TEES, HEAT NO. BRW-4

IDENTIFICATION	WELDER IDENTIFICATION	INITIAL INSPECTION	REPAIR WELD INSPEC.	FINAL INSPECTION	WELDING PROCEDURE	WELDER QUALIFICATION	MATERIAL CONTROL	WELD SIZE/PROFILE	WELD LOCATION	CRACKS	INCOMPLETE PENETRATION	INCOMPLETE FUSION	POROSITY	BURN THROUGH	UNDER CUT	ARC STRIKES	COUP RT	COUP UT	COUP MT	COUP PT	SATISFACTORY	UNSATISFACTORY	REMARKS
C1 THROUGH C14	PF 087			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C17 THROUGH C20	PF 087			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C25 AND C29	PF 087			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C35 AND C36	PF 082			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C15, C16, C21, C22, C23	PF 011			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		
C24, C26, C27, C28, C34	PF 011			✓	✓	✓		✓	✓	✓	✓		✓		✓						X		

N/A
2/28/96

N/A
2/28/96

✓: ATTRIBUTE INSPECTED
X: SATISFACTORY/UNSATISFACTORY
ADDITIONAL NOTES:
WELD NUMBERS AND WELDER ID STEEL STAMPED

A.W.S. QC 1
DONALD R. SMITH
92001991
CWI

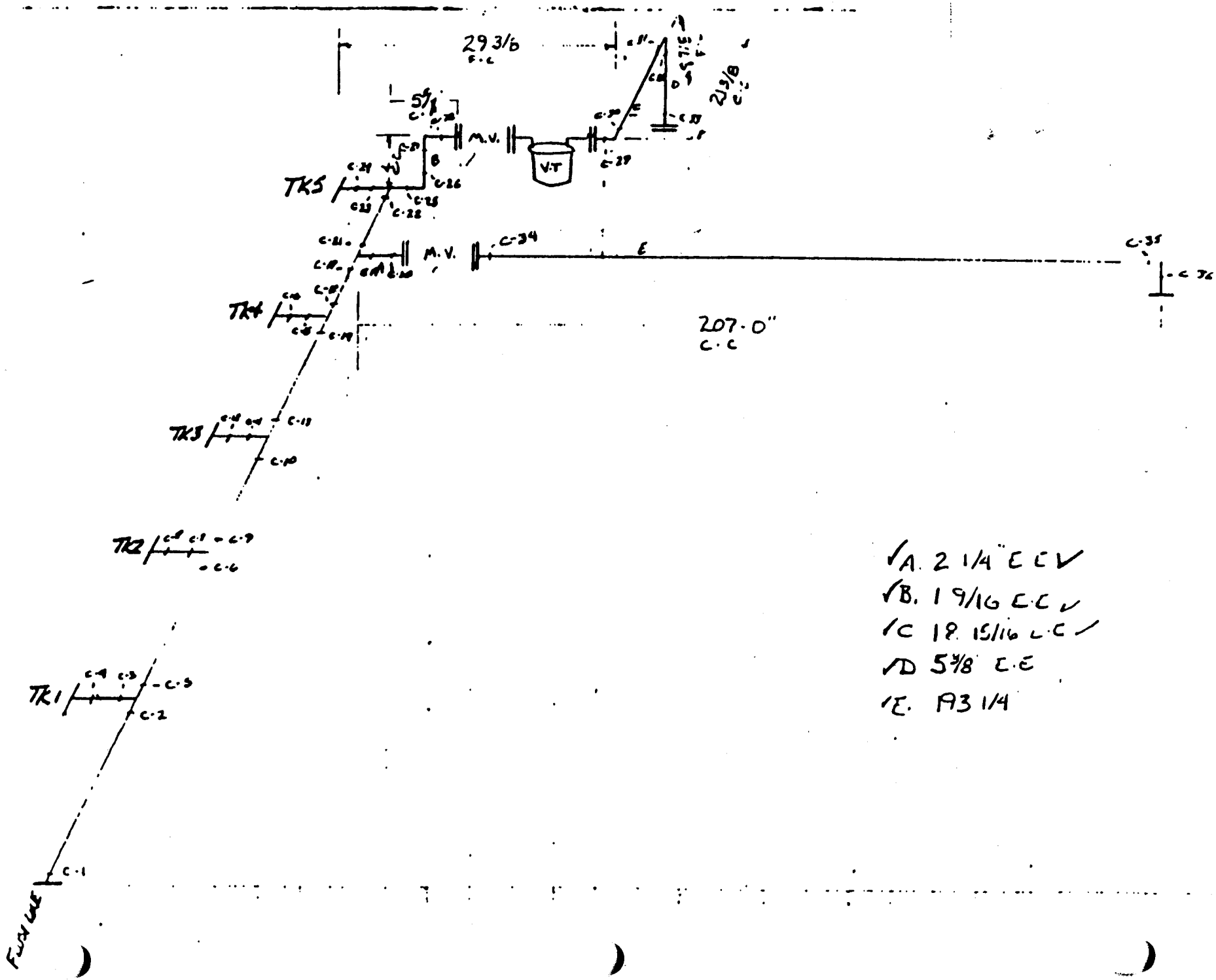
INSPECTOR

LEVEL
CWI ☒
CAWI ☐

FEB. 29, 1996
DATE

FORM 45-20-001.002

OA-REPORTS1 L-9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C.C
5 7/8
21 3/8
C.C
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V.T
TK5
M.V.
C-34
E
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C-36
TK4
207.0"
C.C
TK3
C-13
C-10
TK2
C-9
C-6
TK1
C-3
C-2
C-1
FLOW LINE
A. 2 1/4" E.E
B. 1 9/16 E.E
C 18 15/16 E.E
D 5 3/8 E.E
E. A3 1/4

Supplement H.3

Written Engineering Assessment/Certification for the Pencil Tanks Component

WRITTEN ENGINEERING ASSESSMENT/CERTIFICATION
FOR THE PENCIL TANKS

TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

ASSESSMENT CERTIFICATION

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed 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 for penalties submitting false information, including the possibility of fine and imprisonment for knowing violations.

TYSON C. LANSFORD
NEW MEXICO
9755
1/24/02
REGISTERED PROFESSIONAL ENGINEER

1/24/02
Date

Tyson Lansford
IT Corporation
New Mexico Registered Professional Engineer No.: 9755
Expires: December 31, 2003

WRITTEN ENGINEERING ASSESSMENT/CERTIFICATION
FOR THE PENCIL TANKS

TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

The information in this engineering assessment is provided to meet the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subpart V, 264.192(a) revised June 14, 2000 [6-14-00], attesting that the pencil tanks of the Technical Area (TA) 55 storage tank system is adequately designed and has sufficient structural integrity and compatibility with the waste to be stored to ensure that it will not collapse, rupture, or fail.

This written assessment and certification addresses the following requirements as they pertain to the pencil tanks, and includes the standards which must be complied with by the tank fabricator. These requirements include design standards to which the pencil tanks will be constructed, hazardous characteristics of the waste to be stored, corrosion protection provided, excessive load protection provided to underground tank components, and adequacy of the foundation and support design.

The information for this assessment is based upon a completed drawing package prepared by Johnson Controls of Northern New Mexico and dated July 2001. The drawings provide detailed information regarding the design and construction of the pencil tanks to be installed at TA-55, Building 4 (TA-55-4), Room 401, as a part of the storage tank system. It includes the physical dimensions of the pencil tanks, the materials of construction, the location of ancillary equipment, and definition of the support system.

Pencil Tanks Design Standards

The pencil tanks will consist of ten vertical tanks located on a Uni-strut rack, perpendicular to the west wall of Room 401 at TA-55-4. Each pencil tank will have a capacity of 50 liters, a 6.625-inch (in) outer diameter (O.D.), a straight-side height of 10 feet (ft), a wall thickness of 0.28 in, and a conical bottom. The tanks will be constructed of seamless Schedule 40, 316 stainless steel piping that will meet the chemical and physical characteristics given in American Society for Testing and Materials (ASTM) “A312-Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes,” hereinafter referred to as ASTM A312 (ASTM, 1995). Each tank will be equipped with three sight glasses for local level indication and will have a high-level switch for spill and overfill protection. The primary containment welds for each tank will be vacuum tight in accordance with

the American Society of Mechanical Engineers (ASME) “Boiler and Pressure Vessel Code” (ASME, 1998), hereinafter referred to as ASME BPVC, Section VIII, Division 1, Subsection B, UW . All penetrations into the shells of the tanks will be designed and fabricated to ensure vacuum tightness and will comply with ASME BPVC Section VIII, Division 1 (ASME, 1998). An ASME stamp will not be required for the pencil tanks. Each pencil tanks will be installed such that, if necessary, they can be replaced.

Piping and Ancillary Equipment Design Standards

The pencil tanks will be connected to system headers (for feed, ventilation, and vacuum) by a manifold constructed of seamless stainless steel and that meets the chemical and physical characteristics given in ASTM A312. This piping will match the existing tank system intertank and transfer piping of 0.75-in, Schedule 40 pipe. It will meet the requirements of ASME “B31.3-Process Piping” (ASME, 1996a) for Normal Fluid Service for a maximum design pressure of 15 pounds per square inch and design temperature of 10 degrees Fahrenheit. All piping connections will be via flanged and gasketed connections and will be provided in accordance with ASME “B16.5-Pipe Flanges and Flanged Fittings” (ASME, 1996b). The flanges will be forged from stainless steel and will meet the requirements of ASTM “A182-Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings and Valves, and Parts for High-Temperature Service” (ASTM, 1997) for Grade F316L.

The pencil tanks will be equipped with a vacuum trap that will be designed to collect any mists or carryover liquid that might accumulate in the vacuum or vent lines. The vacuum trap will be constructed of 6.25-in O.D., Schedule 40, 316L seamless stainless steel pipe. The vacuum trap will be equipped with a sight glass for local level indication; will have a high-level switch for prevention of spills or overflowing; and will normally be empty.

Hazardous Characteristics of the Waste

The pencil tanks will be used to store mixed waste solutions while awaiting analytical results for waste characterization. The solutions are generated as evaporator bottoms and typically consist of concentrated nitric acid saturated with salts and metals. These solutions typically exhibit the hazardous characteristics of toxicity (for metals) and corrosivity.

Corrosion Protection Measures

The pencil tanks and its associated ancillary equipment will not be subject to the requirements of 20.4.1 NMAC, Subpart V, 264.192(a)(3) [6-14-00], for new tank components for which the external metal shell will be in contact with soil or water. The pencil tanks and associated ancillary equipment will be located inside TA-55-4 and will not be in contact with soil or water. The pencil tanks and its associated ancillary equipment will be constructed of 316 stainless steel and will meet the chemical and physical characteristics given in ASTM A312 (ASTM, 1995). The tanks will be corrosion-resistant and compatible with the liquid waste to be stored in them.

Underground Storage Tank Requirements

The pencil tanks will not be subject to the requirements of 20.4.1 NMAC, Subpart V, 264.192(a)(4) [6-14-00], which require a determination of the design or operational measures that will protect underground storage tanks from potential damage by vehicular traffic. The pencil tanks and ancillary equipment will be aboveground and located inside TA-55-4 mounted to the concrete floor.

Foundation and Tank Support Design Standards

The pencil tanks and associated ancillary equipment will be integrated within a support stand assembly. The support stand assembly will be approximately 3 ft, 10 in wide by 7 ft, 8 in long and will be bolted to the 10-in-thick concrete floor of TA-55-4, Room 401. The floor provides a foundation that will maintain the load of the pencil tanks when full. The concrete floor and ceiling were constructed to conform to the building code requirements of American Concrete Institute (ACI) “318-71-Building Code Requirements for Structural Concrete and Commentary” (ACI,1995) for reinforced concrete. The reinforcing steel was detailed and fabricated in accordance with the ACI “315-Details and Detailing of Concrete Reinforcement” (ACI, 1992). The design construction and tolerance of the framework around the concrete is in accordance with ACI “347-Guide to Formwork for Concrete” (ACI, 1994).

The support stand assembly superstructure will consist of braced frames that extend approximately 9 ft, 11 in from the floor. The superstructure will be fabricated entirely from carbon steel. Connections will be welded except where bolting is required for erection of subassemblies within Room 401. All carbon steel used for the superstructure will be painted, in accordance with Steel Structures Painting Council, with a high build-up epoxy primer and finish coat.

The pencil tanks will not operate under pressure; therefore, excessive stress due to expansion and contraction is not anticipated. The pencil tanks will not be located within a saturated zone or seismic fault zone; therefore, flotation or dislodgment is unlikely. The pencil tanks will be within a building, so frost heave effects are not expected.

References

ACI, 1995 and all approved updates, “318-Building Code Requirements for Structural Concrete and Commentary,” American Concrete Institute, Detroit, Michigan.

ACI, 1994 and all approved updates, “347-Guide to Formwork for Concrete,” American Concrete Institute, Detroit, Michigan.

ACI, 1992 and all approved updates, “315-Details and Detailing of Concrete Reinforcement,” American Concrete Institute, Detroit, Michigan.

ASME, 1998 and all approved updates, " Boiler and Pressure Vessel Code, Section VIII," American Society of Mechanical Engineers, New York, New York

ASME, 1996a and all approved updates, “B31.3-Process Piping,” American Society of Mechanical Engineers, New York, New York.

ASME, 1996b and all approved updates, “B16.5-Pipe Flanges and Flanged Fittings,” American Society of Mechanical Engineers, New York, New York.

ASTM, 1997 and all approved updates, “A182-Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings and Valves, and Parts for High-Temperature Service,” American Society for Testing and Materials, Philadelphia, Pennsylvania.

ASTM, 1995 and all approved updates, “A312-Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes,” American Society for Testing and Materials, Philadelphia, Pennsylvania.

WRITTEN ENGINEERING ASSESSMENT/CERTIFICATION
FOR THE PENCIL TANKS

TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

TANK DESIGN CERTIFICATION

STATEMENT OF TANK DESIGN ADEQUACY:

I reviewed the design for the pencil tanks to be constructed at TA-55, Building 4, Room 401, and found the design to be adequate and to have sufficient structural integrity and compatibility with the waste to be stored to ensure that the pencil tanks will not collapse, rupture, or fail.

CERTIFICATION:

I certify under penalty of law that I examined and am familiar with the information submitted in the sections entitled "Pencil Tanks Design Standards" and "Piping and Ancillary Equipment Design Standards" of the Written Engineering Assessment/Certification for the Pencil Tanks. 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 violations.

Stephen L Yarbro

Name: STEPHEN L. YARBRO
Occupation: ENGINEER
Company: LOS ALAMOS NATIONAL LABORATORY
New Mexico Registered Professional Engineer No.: 10525
Expires: 12/03

1/28/02
Date

STEPHEN L. YARBRO
NEW MEXICO
10525
REGISTERED PROFESSIONAL ENGINEER

WRITTEN ENGINEERING ASSESSMENT/CERTIFICATION
FOR THE PENCIL TANKS

TECHNICAL AREA 55
LOS ALAMOS NATIONAL LABORATORY

FOUNDATION SUPPORT DESIGN CERTIFICATION

STATEMENT OF TANK SUPPORT DESIGN ADEQUACY:

I reviewed the design of the tank supports for the pencil tanks to be constructed at TA-55, Building 4, Room 401, and found the design to be adequate and to have sufficient structural integrity to ensure that the tanks supports will not collapse or fail.

CERTIFICATION:

I certify under penalty of law that I examined and am familiar with the information submitted in the section entitled "Foundation and Tank Support Design Standards" of the Written Engineering Assessment/Certification for the Pencil Tanks. 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 violations.

KENNETH C. FELLER
NEW MEXICO
12415
REGISTERED PROFESSIONAL ENGINEER

1-24-02
Date

Kenneth C. Feller, P.E.
Structural Engineer
Paragon Structural Engineering
New Mexico Registered Professional Engineer No.: 12415
Expires: December 31, 2003

ATTACHMENT I

CEMENTATION UNIT

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LIST OF SUPPLEMENTS

SUPPLEMENT NO.	TITLE
I.1	Manufacturer's Information on Mixers
I.2	"Waste-Form Development for Conversion to Portland Cement at Los Alamos National Laboratory (LANL) Technical Area 55 (TA-55)"

LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
DOE	U.S. Department of Energy
ft	feet/foot
gal	gallon(s)
in.	inch(es)
L	liter(s)
LANL	Los Alamos National Laboratory
TA	technical area
TC	toxicity characteristic
TCLP	Toxicity Characteristic Leaching Procedure
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant

ATTACHMENT I
CEMENTATION UNIT

The information provided in this attachment is submitted to address the applicable miscellaneous unit requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC), Subparts X and BB, revised June 14, 2000 [6-14-00], for the cementation unit. The attachment provides a description of the cementation unit that is used to cement or stabilize mixed waste generated at Technical Area (TA) 55 and the Chemistry and Metallurgy Research Building at TA-3. It includes detailed descriptions of the cementation unit and associated ancillary equipment. Detailed drawings are provided as Figures I-1 through I-7 and are provided for informational purposes only. Table I-1 summarizes applicable Subpart X miscellaneous unit regulatory references and the corresponding location where the requirement is addressed in this document.

I.1 DESIGN, CONSTRUCTION, MATERIALS, AND OPERATION [20.4.1 NMAC §270.23(a) and 20.4.1 NMAC §264.601]

The cementation unit is located in Glovebox GB-454 along the west wall of TA-55-4, Room 401 (Figure I-1). The unit has been in operation since 1991 and has a maximum capacity of 568 liters (L) (approximately 150 gallons [gal]). It consists of a pH adjustment column, a vacuum trap, two motor-driven mixers, four impellers, associated support structures, a glovebox, and piping (Figure I-2).

The pH column has a straight side height of 5 feet (ft) and an outside diameter of 6.66 inches (in.). The maximum capacity of the column is approximately 27 L. The column is raised above the glovebox floor approximately 3 in. by three steel legs and is secured to one wall of the glovebox with a steel bracket that binds the column approximately 3 ft up from the base of the column. The vacuum trap associated with the column has a straight side height of 2 ft and an inside diameter of 6 in. The maximum capacity of the vacuum trap is approximately 11 L. Both the pH column and the vacuum trap are constructed of PYREX® glass with stainless steel end plates similar to the glass columns in the evaporator glovebox tank component described in Attachment H. The glass and stainless steel materials are corrosion-resistant and compatible with the waste received in the column. The pH column is used to adjust the pH of approximately 5 L of waste to ensure compatibility with the cement used for solidification. A compressed-air line enters the glovebox and is connected to two pressurized air tanks outside of the glovebox. The compressed-air line is used for remote valve operation.

The two mixers within the unit are high-flow, gear-driven, fixed-mount mixers. (Manufacturer's information on the fixed-mount mixers is included in this attachment as Supplement I.1.) All couplings,

shafts, and impellers are constructed of 316 stainless steel. The shafts are 5 ft long. Two impellers are mounted to each shaft. Each impeller has a diameter of approximately 11 in. The mixers are driven by 3.5-horsepower motors encased within the mixer housing. The mixer housing is approximately 2.5 ft long. The maximum weight of each mixer is 225 pounds. Each mixer is mounted on steel plates and supported by two steel guides on either side of each mixer. Each guide is bolted to a 6-in. steel flange at either end and is secured to the glovebox floor and ceiling. Each motor is mounted to a center screw drive that allows the mixers to be independently raised and lowered within the glovebox (Figures I-3 and I-4).

The glovebox is constructed of a section of 0.75 in. lead between two sections of approximately 0.188-in.-thick low-carbon grade, 316 stainless steel. The floor of the glovebox contains two circular openings with removable covers that allow the shafts and impellers of each mixer to be lowered into drums attached beneath the glovebox.

During cementation operations, two 55-gal steel drums are positioned under the glovebox directly under the openings in the floor of the glovebox. A “bag-out” bag extends from the glovebox into each drum between the drum and the drum liner. This liner is fastened at the bottom of the glovebox with an elastic cord and clamped into place to prevent hazardous constituents from escaping the confinement of the glovebox and the drums during treatment operations. The cement and the waste to be solidified are transferred into the drums and homogeneously mixed inside the drums. Each drum is positioned on a steel platform/scale that is secured in a steel track. The platform allows the drums to be safely and easily removed from the unit after the cement has hardened.

The majority of the piping associated with the cementation unit is 316 stainless steel. Tygon® tubing is used to transfer sodium hydroxide and the contents of the pH column to the drums. The cement is transferred into the glovebox and drums from a hopper/screw feeder through rubber tubing. Figures I-5 and I-6 present a legend and piping and instrumentation diagram for the cementation unit.

Waste analysis and inspection procedures for the cementation unit are provided in Attachments B and C of this permit application, respectively. The closure plan for the cementation unit is provided in Attachment F.3 of this permit application. Section 4.0 provides information on corrective actions.

I.2 CEMENTATION UNIT DEMONSTRATION OF TREATMENT EFFECTIVENESS [20.4.1 NMAC §270.23(d)]

The cementation unit at TA-55, Building 4 (TA-55-4), Room 401 is considered a Subpart X miscellaneous unit and, as such, is subject to the miscellaneous unit requirements in 20.4.1 NMAC §270.23(d) [6-14-00] for "a report on the demonstration of treatment effectiveness of the treatment based on laboratory or field data." Supplement I.2 provides a technical paper entitled “Waste Form Development for Conversion to Portland Cement at Los Alamos National Laboratory (LANL) Technical Area 55 (TA-55)” (Veazey et. al., 1996). This technical paper contains detailed information that demonstrates that the cementation unit at TA-55 effectively treats the mixed waste based on the treatment objectives described below:

- Stabilize mixed waste solutions that contain various radionuclides and toxicity characteristic (TC) metals in a cement matrix so that the metals are not leachable as determined by the Toxicity Characteristic Leaching Procedure (TCLP) and thus no longer exhibit the TC following treatment. The TC metals of primary concern are chromium, arsenic, cadmium, mercury, and lead.

- Stabilize mixed waste solids that contain various radionuclides and TC metals in a cement matrix so that metals are not leachable as determined by TCLP.

- Produce solidified cement monoliths that meet Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC), which prohibit free liquids (U.S. Department of Energy [DOE], 1999).

The technical paper in Supplement I.2 describes bench- and full-scale testing that was performed to evaluate the effectiveness of using Portland cement in the cementation unit to stabilize mixed waste. The goal of the project was to develop a Portland cement-based waste form that meets the WIPP WAC and reliably passes TCLP. The results discussed in this technical paper demonstrate that the use of Portland cement in the TA-55 cementation unit under the prescribed conditions produces a cement monolith that meets all of the performance standards devised for the project. These performance standards include no free liquids, passing TCLP, and meeting minimum compressive strength criteria. The use of these results in demonstrating the treatment effectiveness of the cementation unit is appropriate for the following reasons:

- The waste streams used in the testing are very similar or the same as those actually treated in the cementation unit;

- TA-55 uses Portland cement in their cementation process, as was done in the testing; and

- The testing conditions described in the technical paper were modeled to the actual cementation process at TA-55, to the extent practicable.

Additional constituents, in addition to those described in Supplement I.2, may be treated in the cementation unit to meet the physical criteria discussed above.

I.3 ENVIRONMENTAL PERFORMANCE STANDARDS [20.4.1 NMAC, Subpart V, Part 264, Subpart X]

The following information is provided to address the applicable hydrologic, geologic, and meteorological requirements of 20.4.1 NMAC §270.23(b) and (c) and 20.4.1 NMAC §264.601 [6-14-00] for the cementation unit at TA-55. The cementation unit is located within glovebox GB-454 in TA-55-4, Room 401. The location of the unit, the waste management practices outlined in Attachment J of this permit application, and the containment features described in the following sections prevent the deposition or migration of hazardous constituents into the groundwater, surface water, soil surface, or the atmosphere and ensure that the cementation unit is in compliance with the environmental performance standards of 20.4.1 NMAC §264.601 [6-14-00]. Waste analysis requirements for the cementation unit are addressed in Appendix B of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. Contingency measures applicable to the cementation unit are addressed in Appendix E of the LANL General Part B. Attachment F.3 provides closure information for the cementation unit.

I.3.1 Protection of the Groundwater/Vadose Zone [20.4.1 NMAC §264.601(a)]

In accordance with 20.4.1 NMAC §264.601(a) [6-14-00], the cementation unit is operated in a manner that prevents releases that may have adverse effects on human health or the environment due to migration of hazardous waste or hazardous constituents through the vadose zone to the groundwater. The cementation unit is located in a vacuum-pressurized glovebox at TA-55-4 inside Room 401. Room 401 provides secondary containment for the cementation unit. The floor of the room is recessed approximately 2.5 in. The room itself is approximately 60 ft long by 75 ft wide. The capacity of the secondary containment area is greater than 100 percent of the volume of waste that is treated in the cementation unit at any one time. The entire floor is constructed of a 10-in.-thick reinforced concrete slab. Certified operators inspect the cementation unit each working day to detect leaks. Eight continuous air monitors installed at various locations throughout TA-55-4, Room 401 detect any airborne alpha contamination that would be present if a leak were to occur resulting in a release outside of glovebox GB-454. In the event of a release, the materials in question are removed as

quickly as possible and are packaged in an appropriate container.

The cementation unit is located, designed, constructed, operated, and maintained, and will be closed in a manner that ensures protection of human health and the environment. The conditions outlined in 20.4.1 NMAC §264.601(a) [6-14-00] were considered and there is little or no potential for deposition or migration of waste constituents into the groundwater or subsurface environment. The cementation unit is located inside a building, provided with secondary containment, designed and constructed as described in Section I.1, operated and maintained in accordance with waste management procedures described in Attachment J of this document, and will be closed in accordance with the procedures described in Attachment F.3; therefore, adverse effects on human health or the environment due to the treatment operations conducted in the cementation unit are unlikely.

I.3.2 Protection of Surface Water/Wetlands/Soil Surface [20.4.1 NMAC §264.601(b)]

In accordance with 20.4.1 NMAC §264.601(b) [6-14-00], the cementation unit is operated in a manner that prevents releases that may have adverse effects on human health or the environment due to the deposition or migration of waste constituents into surface water, wetlands, or onto the soil surface. Section I.3.1 provides a detailed description of the effectiveness and reliability of the containment features to be utilized by the cementation unit to prevent releases.

The cementation unit is located, designed, constructed, operated, and maintained, and will be closed in a manner that will ensure protection of human health and the environment. The conditions outlined in 20.4.1 NMAC §264.601(b) [6-14-00] were considered and there is little or no potential for deposition or migration of waste constituents into surface water, wetlands, or soil surface. The cementation unit is located inside a building, provided with secondary containment, designed and constructed as described in Section I.1, operated and maintained in accordance with waste management procedures described in Attachment J of this document, and will be closed in accordance with the procedures described in Attachment F.3.

I.3.3 Protection of the Atmosphere [20.4.1 NMAC §264.601(c)]

In accordance with 20.4.1 NMAC §264.601(c) [6-14-00], the cementation unit is operated in a manner that prevents releases that may have adverse effects on human health or the environment due to the deposition or migration of waste constituents into the atmosphere. The cementation unit is located within a negative pressure glovebox that is connected to the TA-55-4 facility ventilation system. The

high-efficiency particulate air filters on the glovebox are on the air intake side of the ventilation and are designed to prevent escape of contamination from the glovebox in the event of a power failure. TA-55-4 is equipped with a backup generator that re-establishes power to all vital systems, providing exhaust to the glovebox. The unit is a batch waste treatment system. If a power failure occurs, all operations cease inside the glovebox until power is restored. In addition, the glovebox is located within three succeedingly greater pressure zones. These zones are (in order of increasing pressure) the glovebox, Room 401, and the main corridor outside of Room 401. These pressure zones are designed to create an airflow into Room 401 and the glovebox and limit the potential for hazardous constituents to migrate to the atmosphere.

Operation of the cementation unit does not impact air quality at LANL. The cementation unit is operated within a negative pressure environment and, therefore, adverse affects on human health or the environment due to migration of hazardous constituents to the atmosphere as a result of treatment operations conducted in the cementation unit are unlikely. The conditions outlined in 20.4.1 NMAC §264.601(c) [6-14-00] were considered and there is little or no potential for health risks caused by human exposure to waste constituents or for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents.

I.4 SPECIAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE [20.4.1 NMAC §270.14(b)(9) and §264.19]

No ignitable, reactive, or incompatible mixed wastes are treated in the cementation unit.

I.5 AIR EMISSIONS STANDARDS FOR EQUIPMENT LEAKS [20.4.1 NMAC, Subpart V, Part 264, Subpart BB]

The cementation unit addressed in this permit application is not subject to 20.4.1 NMAC, Subpart V, Part 264, Subpart BB [6-14-00], “Air Emission Standards for Equipment Leaks,” with the exception of the reporting requirements specified in 20.4.1 NMAC §264.1064(k) [6-14-00]. None of the equipment associated with the cementation unit at TA-55 contains or contacts mixed waste with organic concentrations of at least 10 percent by weight.

In accordance with 20.4.1 NMAC §264.1064(k) [6-14-00], TA-55 uses knowledge of the nature of the mixed waste stream(s) or knowledge of the process by which the mixed waste was produced to document their exemptions to these standards. Production process information documenting that no

organic compounds are contained in or contacted by equipment associated with the cementation unit is recorded in TA-55's facility operating record.

I.6 REFERENCES

Veazey, G.W., Schake, A.R., Shalek, P.D., Romero, D.A., Smith, C.A., 1996, “Waste Form Development for Conversion to Portland Cement at Los Alamos National Laboratory (LANL) Technical Area 55 (TA-55),” Los Alamos National Laboratory, Los Alamos, New Mexico.

DOE, 1999, “Waste Acceptance Criteria for the Waste Isolation Pilot Plant,” DOE/WIPP-069, REV 7, U.S. Department of Energy, Carlsbad Area Office, Carlsbad, New Mexico.

Table I-1
Subpart X Miscellaneous Unit Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§264.601	Environmental performance standards	I.3
§264.601(a)	Prevention of release of contaminants to groundwater	I.3.1
§264.601(a)(1)	Volume and characteristics of waste considering potential for migration through containing structures	I.3.1
§264.601(a)(2)	Hydrologic/geologic characteristics	I.3.1
§264.601(a)(3)	Quality of groundwater including other sources of contamination and their cumulative impact on groundwater	I.3.1
§264.601(a)(4)	Quantity and direction of groundwater flow	I.3.1
§264.601(a)(5)	Proximity to and withdrawal rates of potential groundwater users	I.3.1
§264.601(a)(6)	Regional patterns of land use	I.3.1
§264.601(a)(7)	Potential for deposition and migration of waste constituents	I.3.1
§264.601(a)(8)	Potential for health risks caused by human exposure to waste constituents	I.3.1
§264.601(a)(9)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	I.3.1
§264.601(b)	Prevention of release of contaminants to surface water	I.3.2
§264.601(b)(1)	Volume and characteristics of the waste	I.3.2
§264.601(b)(2)	Effectiveness and reliability of containment, confinement, and collection systems and structures	I.3.2
§264.601(b)(3)	Hydrologic characteristics of the unit and local area	I.3.2
§264.601(b)(4)	Regional precipitation patterns	I.3.2
§264.601(b)(5)	Quantity, quality, and direction of groundwater flow	I.3.1
§264.601(b)(6)	Proximity of the unit to surface water	I.3.2
§264.601(b)(7)	Current and potential uses of nearby surface waters and water quality standards for those waters	I.3.2
§264.601(b)(8)	Quality of surface waters and soils including other sources of contamination and their cumulative impact on surface waters and soils	I.3.2
§264.601(b)(9)	Regional patterns of land use	Attachment A
§264.601(b)(10)	Potential for health risks caused by human exposure to waste constituents	I.3.2
§264.601(b)(11)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	I.3.2

See footnotes at end of table.

Table I-1 (continued)
Subpart X Miscellaneous Unit Regulatory References and Corresponding Permit Application Location

Regulatory Citation(s)	Description of Requirement	Location in this Permit Application
§264.601(c)	Prevention of release of contaminants to air	I.3.3
§264.601(c)(1)	Volume and characteristics of waste including its potential for emission	I.3.3
§264.601(c)(2)	Effectiveness and reliability of systems/structures to reduce/prevent emissions of hazardous constituents to the air	I.3.3
§264.601(c)(3)	Operating characteristics of the unit	I.3.3
§264.601(c)(4)	Characteristics of the unit and the surrounding area	I.3.3
§264.601(c)(5)	Existing quality of the air including other sources of contaminants and their cumulative impact on the air	I.3.3
§264.601(c)(6)	Potential health risks caused by human exposure to waste constituents	I.3.3
§264.601(c)(7)	Potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents	I.3.3
§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	Attachment C[a], D[a], J, and I
§264.603	Post-closure care	Attachment F.3
§264.15	General inspection requirements	Attachment C[a]
§264.33	Testing and maintenance of equipment	
§264.75	Biennial report	Attachment J
§264.76	Unmanifested waste report	Attachment J
§264.77	Additional reports	Attachment J
§264.101	Corrective action for solid waste management units	4.0

a Requirement or information is also addressed in the most recent version of the "Los Alamos National Laboratory General Part B Permit Application."

Figure I-1 has been provided confidentially under separate cover.

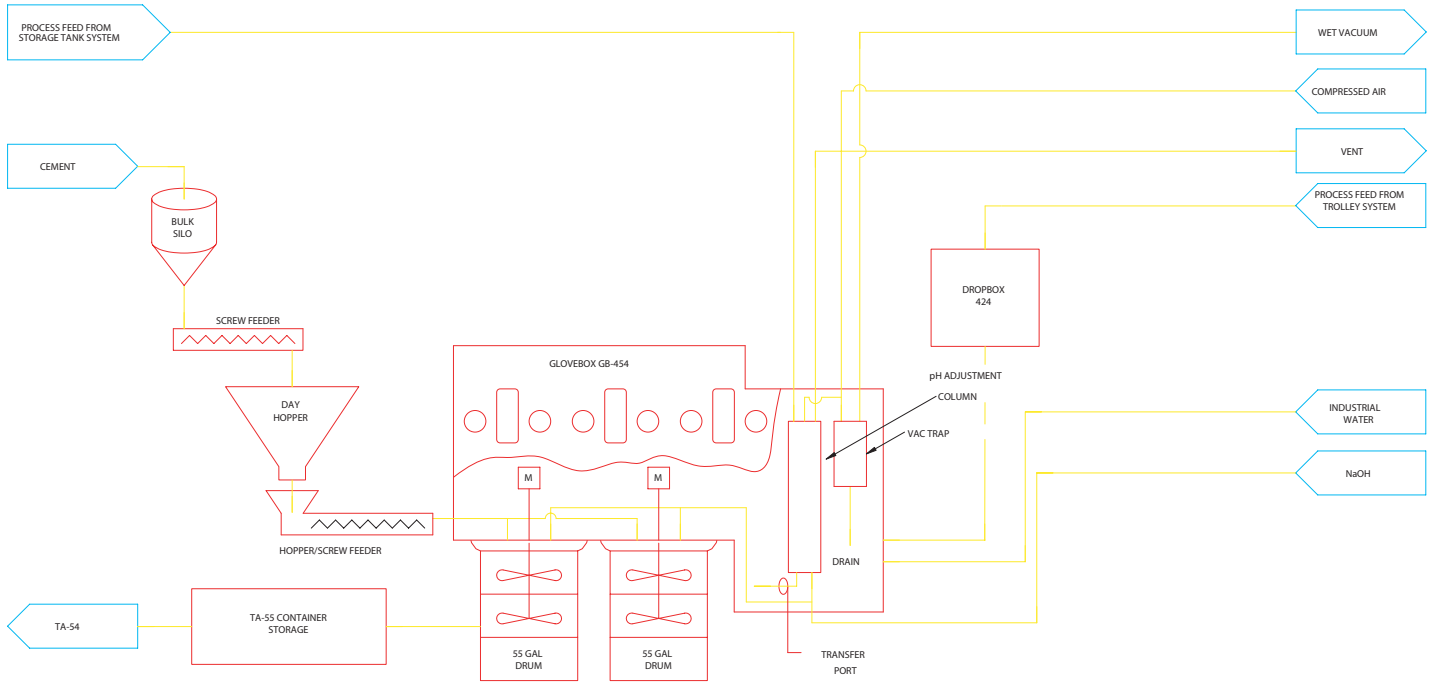


Figure I-2

Cementation Unit
Process Flow Diagram

NOT FOR CONSTRUCTION

CEMENTATION UNIT - PROCESS FLOW DIAGRAM

SCALE: NONE

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™ Environmental & Infrastructure, Inc.

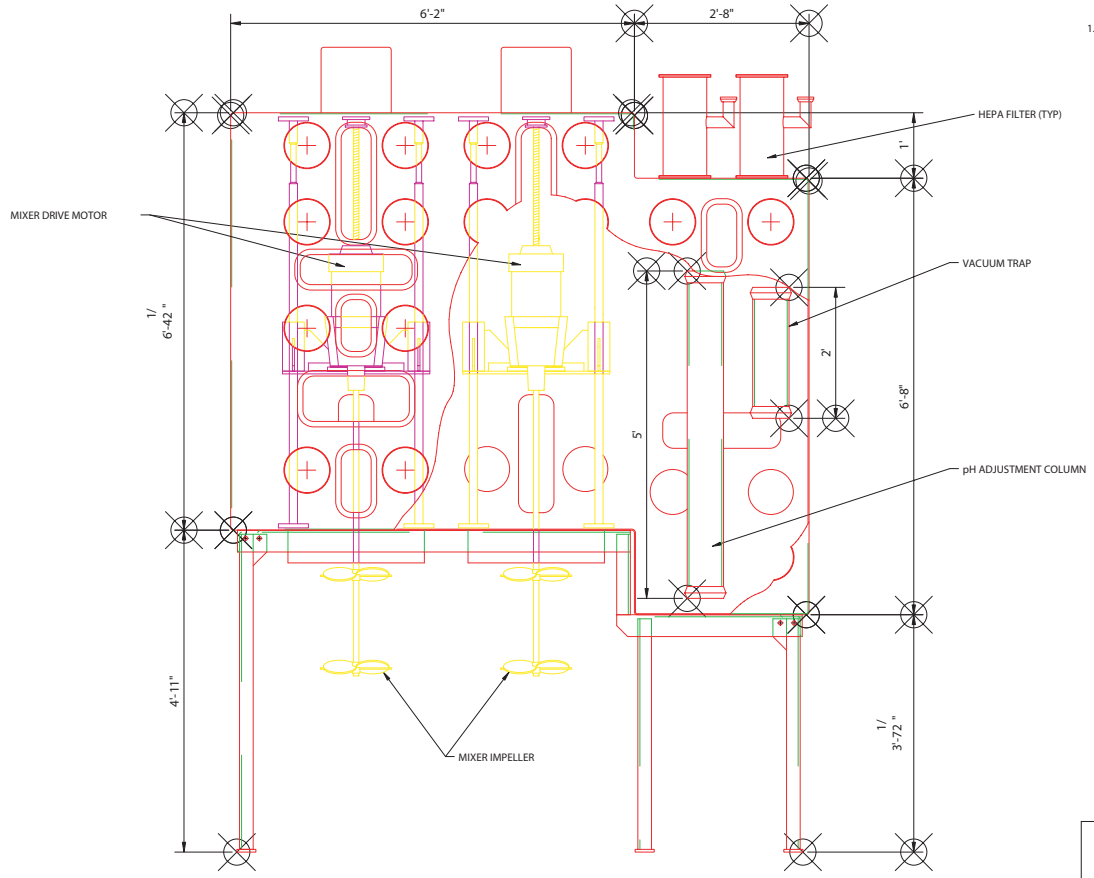
LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TA-55 CEMENTATION UNIT

CEMENTATION UNIT PROCESS FLOW DIAGRAM

BLDG. PF-4 TA- 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/01	APPROVED	J. GRIFFIN	7/24/01
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/01	SHEET NO. I-2	2 OF 6	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.					



NOTE:

1. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST INCH.

Figure I-3
Cementation Unit
Front Elevation

NOT FOR CONSTRUCTION

CEMENTATION UNIT - FRONT ELEVATION

SCALE: 1" = 18"

0 1' 3' 6' 1' 18' 3'

1" = 18"

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™ Environmental & Infrastructure, Inc.

LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TA-55 CEMENTATION UNIT

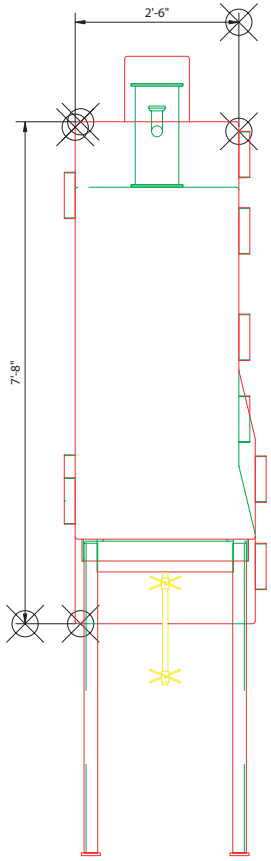
CEMENTATION UNIT FRONT ELEVATION

BLDG. PF-4 TA- 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/03	APPROVED	J. GRIFFIN	7/24/03
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/03	SHEET NO. I-3	3 OF 6	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.					

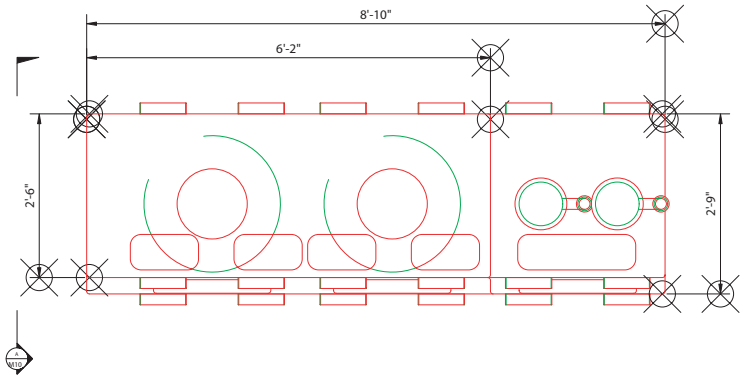
NOTE:

1. DIMENSIONS SHOWN ARE ROUNDED TO THE NEAREST INCH.



ELEVATION

SCALE: 1" = 18"



CEMENTATION UNIT - PLAN VIEW

SCALE: 1" = 18"

1" = 18"

Figure I-4

Cementation Unit
Elevation and Plan View

NOT FOR CONSTRUCTION

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™ Environmental & Infrastructure, Inc.

LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TA-55 CEMENTATION UNIT

CEMENTATION UNIT
ELEVATION AND PLAN VIEW

BLDG. PF-4 TA- 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/02	APPROVED	J. GRIFFIN 7/24/02
DRAWN	A. MARTINEZ	7/23/02	SUBMITTED	J. GRIFFIN	7/24/02	SHEET NO. I-4	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.			4 OF 6	

MECHANICAL SYMBOLS (NOT ALL SYMBOLS WILL APPLY TO THIS PROJECT)

VALVES	DESCRIPTION
	BALL VALVE
	BUTTERFLY VALVE
	CHECK VALVE
	CONTROL VALVE, TWO WAY
	CONTROL VALVE, 3–WAY
	DIAPHRAGM VALVE
	GATE VALVE
	GATE VALVE, ANGLE
	GATE VALVE, OS&Y
	GLOBE VALVE
	GLOBE VALVE, ANGLE
	HOSE BIBB W/VAC. BREAKER
	NEEDLE VALVE
	PLUG VALVE
	PRESSURE REDUCING VALVE
	PRESSURE RELIEF VALVE
	RELIEF OR SAFETY VALVE
	SOLENOID VALVE

FITTINGS	DESCRIPTION
	CAP OR PLUG
	FLEXIBLE MECHANICAL COUPLING
	RIGID MECHANICAL COUPLING
	ELBOW, TURNED UP
	ELBOW, TURNED DOWN
	FLANGE CONNECTION
	REDUCER, CONCENTRIC
	REDUCER, ECCENTRIC BOTTOM OF PIPE LEVEL
	REDUCER, ECCENTRIC TOP OF PIPE LEVEL
	TEE, OUTLET UP
	TEE, OUTLET DOWN
	PIPE UNION
	END OF PIPE
	DIRECTION OF FLOW
	PITCH PIPING DOWN

PIPING SPECIALTIES	DESCRIPTION
	AUTOMATIC AIR VENT
	MANUAL AIR VENT
BFP	BACKFLOW PREVENTER
FCO	FLOOR CLEANOUT
WCO	WALL CLEANOUT
CO	END OF PIPE CLEANOUT
	EXPANSION JOINT
	EXPANSION LOOP
	FLEXIBLE CONNECTOR
	PIPE ANCHOR
	PRESSURE GAUGE WITH VALVE
	STEAM TRAP
	STRAINER
	STRAINER WITH BLOW–OFF VALVE
	THERMOMETER OR TEMPERATURE GAUGE
	TYGON CONNECTION

1	KEYED NOTE SYMBOL
1	MECHANICAL DESIGNATION
1200	NAMEPLATE DESIGNATION
CS	CARBON STEEL
FI	FLOW INDICATOR
FT	FEED TANK
GB	GLOVEBOX
LA	LEVEL ALARM
LI	LEVEL INDICATOR
LSH	LEVEL SWITCH HIGH
LSL	LEVEL SWITCH LOW
OD	OUTSIDE DIAMETER
PI	PRESSURE INDICATOR
RTD	REAGENT TRANSFER DEVICE
SS	STAINLESS STEEL
TK	TANK
TYP	TYPICAL
VAC	VACUUM

Figure I–5
Cementation Unit
Mechanical Legend

NOT FOR CONSTRUCTION

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™ Environmental & Infrastructure, Inc.

LOS ALAMOS — LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO 87545

TA–55 CEMENTATION UNIT

CEMENTATION UNIT MECHANICAL LEGEND

BLDG. PF–4 — TA– 55

DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/03	APPROVED	J. GRIFFIN	7/24/03
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/03	SHEET NO. I–5	5 OF 6	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.					

April 10, 2000 7:03:54 p.m. N:\GPPENHEIMER\801448\TA-55 PART B DRAFT APRIL 2000\CAD\I-6.DWG

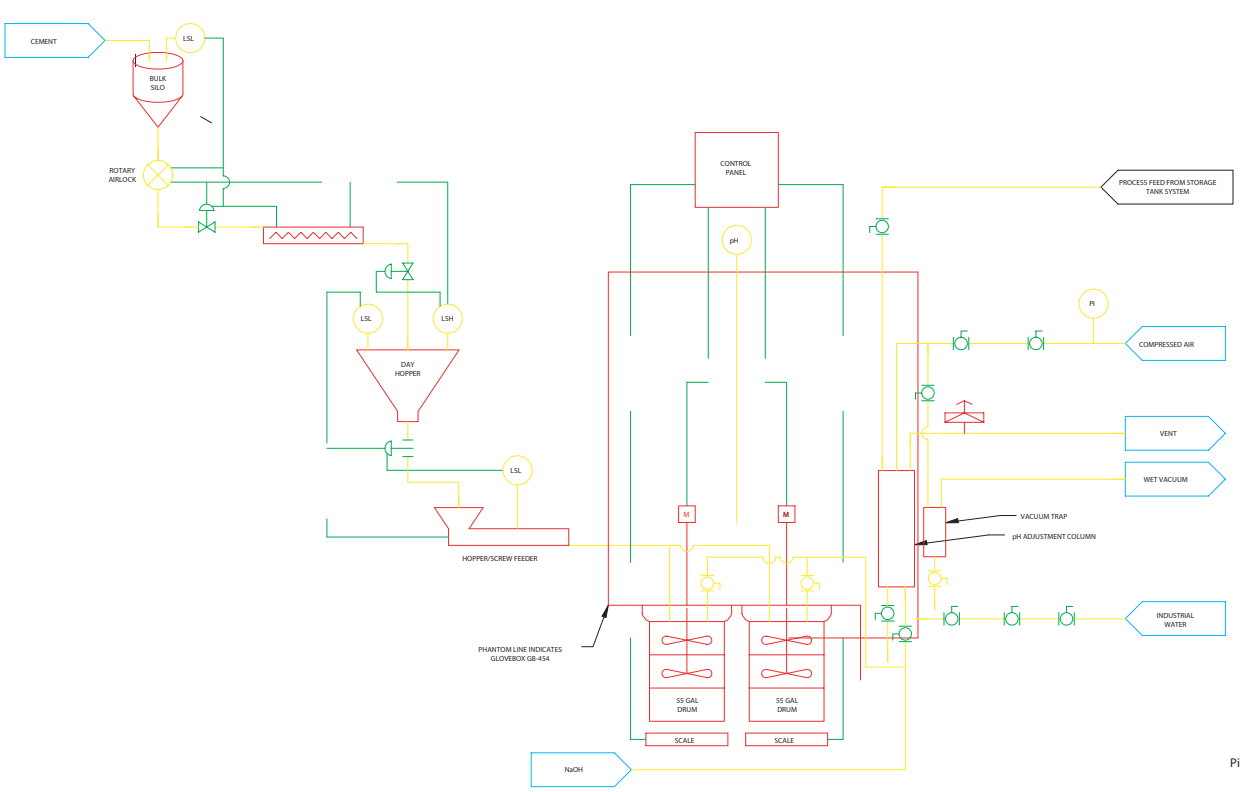


Figure I-6
Cementation Unit
Piping And Instrumentation Diagram

NOT FOR CONSTRUCTION

CEMENTATION UNIT - PIPING & INSTRUMENTATION DIAGRAM
SCALE: NONE

NO.	DATE	DWN	DES	CHKD	APP	REVISIONS

Shaw™
Environmental & Infrastructure, Inc.

LOS ALAMOS
LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO 87545

TA-55 CEMENTATION UNIT

CEMENTATION UNIT
PIPING AND INSTRUMENTATION DIAGRAM

BLDG. PF-4 TA- 55

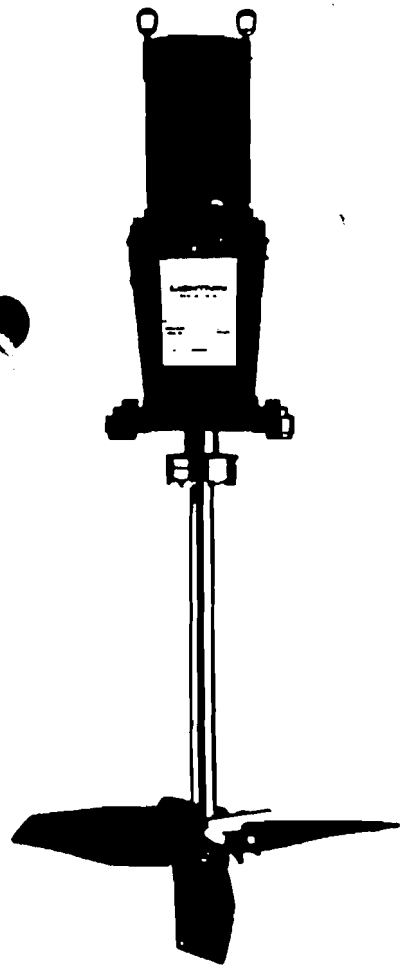
DESIGNED	J. GRIFFIN	4/28/00	CHECKED	J. GRIFFIN	7/24/03	APPROVED	J. GRIFFIN	7/24/03
DRAWN	A. MARTINEZ	7/23/03	SUBMITTED	J. GRIFFIN	7/24/03	SHEET NO. I-6	OF 6	REVISION NO. 2
PROJECT ID 819592.29			DRAWING NO.					

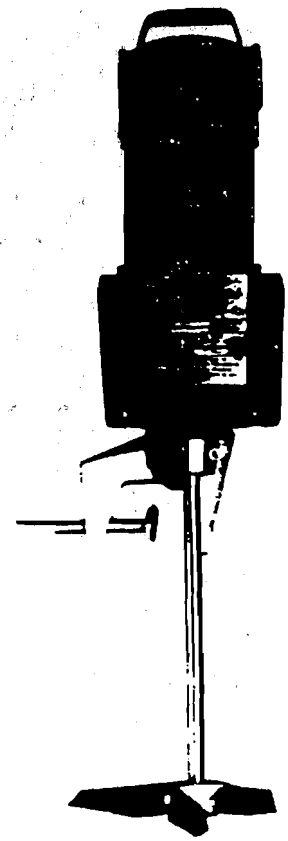
April 30, 2003 12:07:32 p.m. N:\OPPENHEIMER\EIC ABE TA-55 PART B DRAFT APRIL 2003\CAD\I-6.DWG

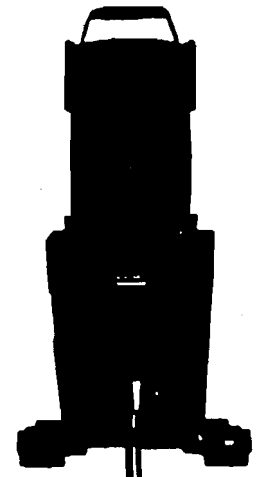
Supplement I.1
Manufacturer's Information on Mixers

Value

Portable, Fixed Mount and Inliner® Mixers







A UNIT OF GENERAL SIGNAL
LIGHTNIN

Mike Byrnes

(303) 757-49
Tlx. 45-7

D.W. DAIGLER COMPANY
5777 E. Evans Avenue-Suite 4
Denver, Colorado 80222

A UNIT OF GENERAL SIGNAL

LIGHTNIN

Catalog B-610

Lightnin heavy duty, high flow mixers

XJ Series

CLAMP MOUNT

EASY POSITIONING.
The handle helps you aim the mixer for best results. Move it on or off the tank.

BUILT-IN DAMPENER.
Pad between housing ball and clamp socket minimizes vibration.

EASY SET-UP.

Figure 20.
Standard clamp securely mounts to tank rim or other support. Mixer adjusts 90° vertically, 360° horizontally for optimal positioning and re-positioning. Indexed ball and socket let you repeat settings exactly.

ONE WRENCH.
Comes with mixer and fits both clamp and chuck. Stores conveniently in the hollow clamp screw.

CUP MOUNT OPTION.

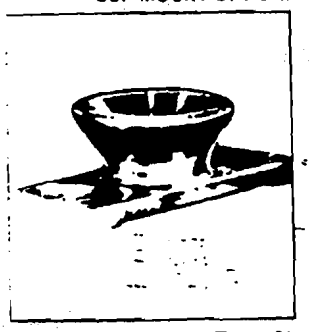


Figure 21.
Lets you permanently mount mixer, yet retain vertical and horizontal movement with indexing feature.

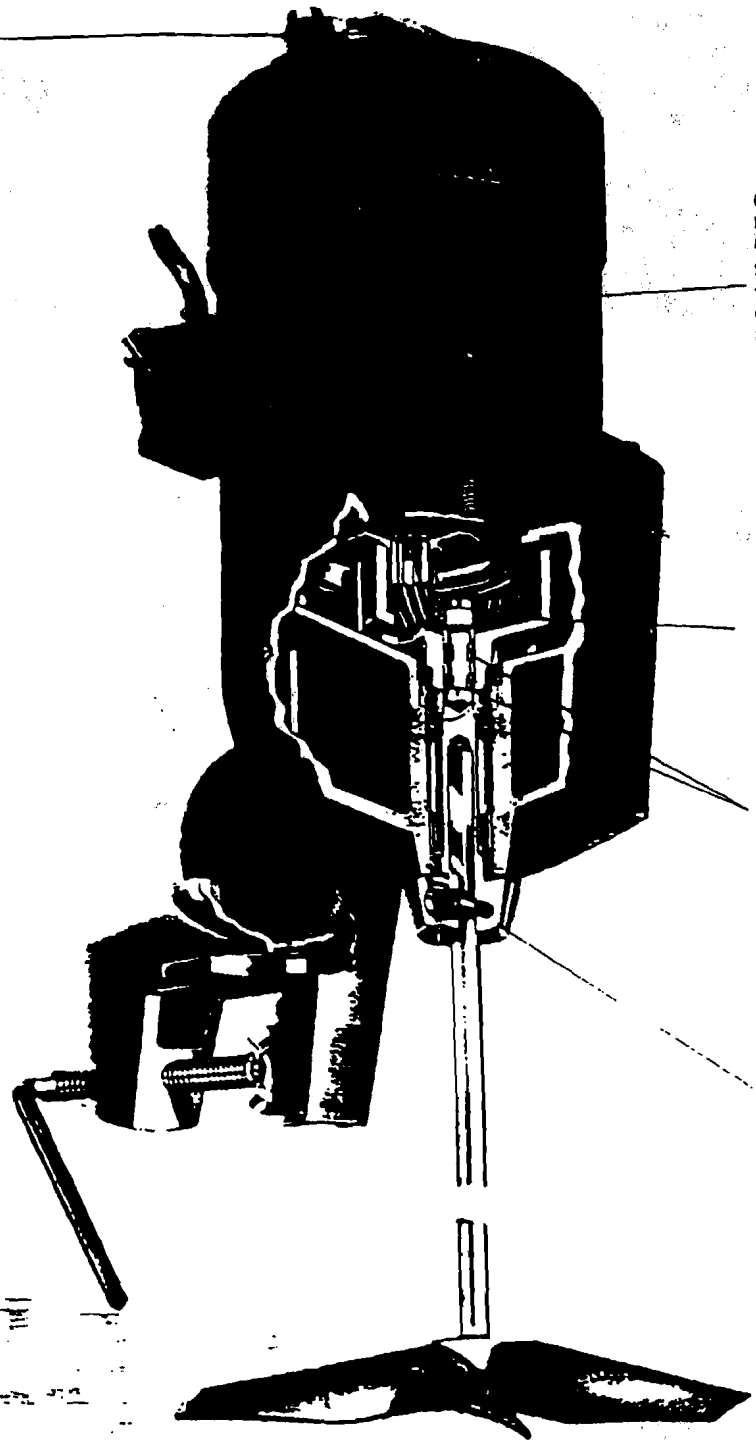


Figure 22.

A310 HIGH EFFICIENCY IMPELLER

PROTECTION AGAINST DUST, FUMES AND MOISTURE.
Standard DURA-MIX motor is totally enclosed or explosion-proof. See page 24.

HIGH TORQUE.
Single reduction, internal helical gears are exceptionally compact and quiet and can handle high loading.

GRIP SPRINGS.
These provide a keyless friction clutch to protect the gears against shock loads.

POSITIVE CHUCK.
A twist of the wrench forces chuck to grip the flat on the mixer shaft. The flat is tapered to prevent the shaft from dropping out unless intentionally released. Chuck also acts as a slinger baffle to keep splash away from the drive shaft seal and bearing. Optional rigid shaft coupling also available for extra long shafts, severe operating conditions.

LIFETIME LUBRICATED.
Shaft, motor bearings and gears are lifetime lubricated for non-stop service. No need to change lubricant.

Our most popular portables

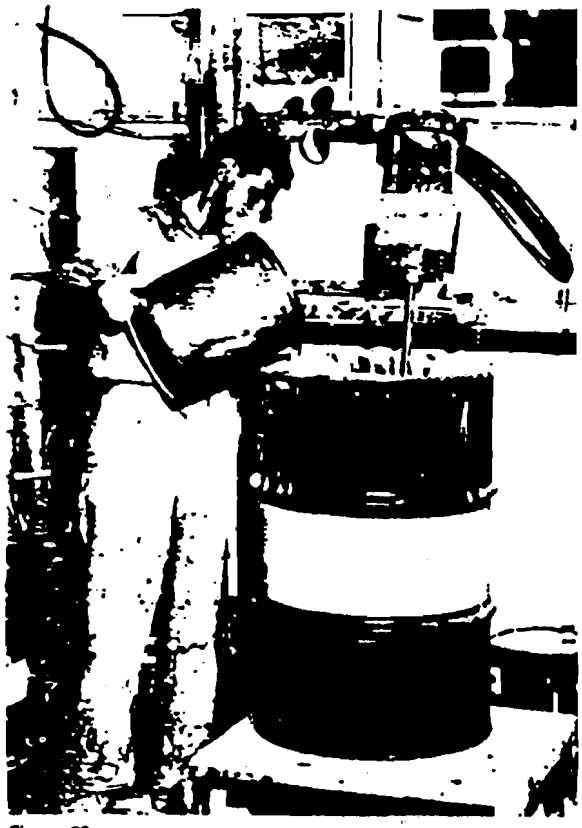


Figure 23.
For mixing ceramic slips and plaster, for preparing sand for foundry cores and molds, for all manner of slurry and high viscosity mixing.

Tens of thousands of these green Lightnin mixers are at work, delivering guaranteed results around the world. Many are original units, first built in 1960.

Gear drive, high flow Lightnin mixers with A310 Impellers produce a powerful action which sweeps the tank bottom and produces rapid top to bottom turnover.

For more jobs than not, the result is lower cost and less horsepower to do the job.

HIGH VISCOSITY.

The high torque delivered by internal gearing is essential for mixing heavy liquids like mayonnaise and molasses and fluids in the 15,000 to 100,000 centipoise range.

Figure 24.
High flow units mix soup and spaghetti sauce, cake and cookie batter, relish and catsup, and the list goes on and on.

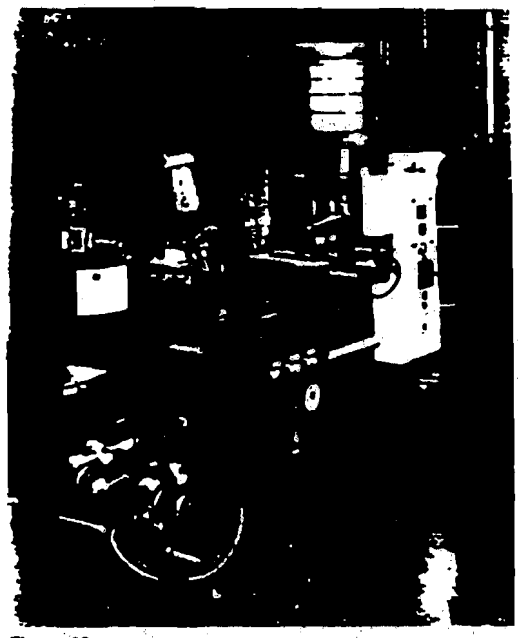


Figure 25.
Manufacturers make Lightnin gear drives a part of packaged unit processes, as in this polymer make-up system.

CLAMP MOUNT

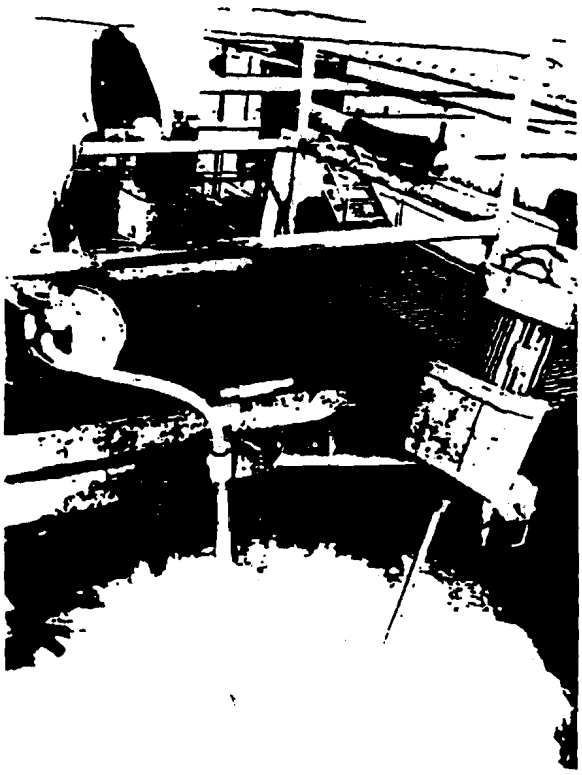


Figure 26.
High flow mixers provide non-stop services in the slurries of mineral processing and other industries.

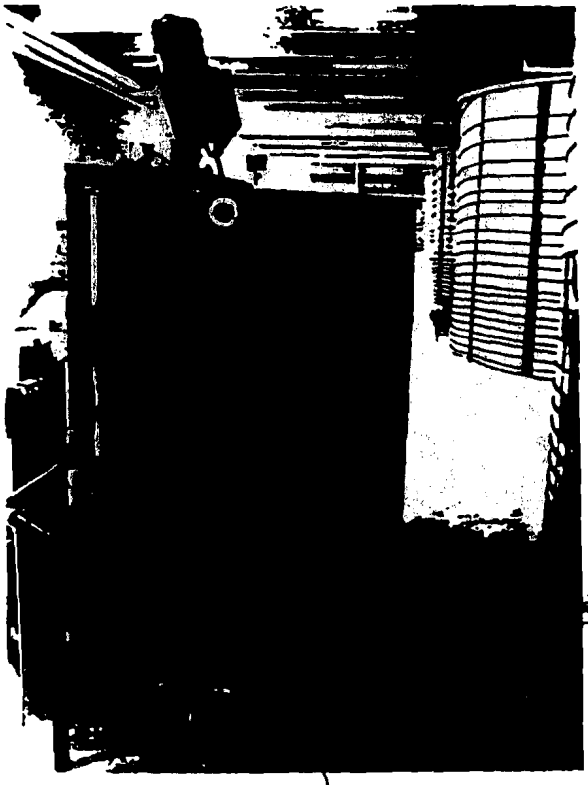


Figure 27.
You'll find Lightnin portables making up solutions as diverse as auto wax and chemicals for wastewater treatment.

LARGE BATCHES.

The high torque is very effective in handling low-viscosity fluids in large batches that are beyond the range of direct drive units. Soft drink bottlers, for example, use Lightnin mixers widely for making up syrup in batches ranging from 300 to 6000 gallons.

FOUNDRIES.

These heavy-duty workhorses prepare sand for cores and molds. They mix various washes. They assist circulation of fluids in metal quenching. You'll even find them working in molten metal to help fluxes remove impurities.

DAIRIES.

Lightnin high flow portables prevent rising of cream in storage tanks. They maintain circulation in pasteurizers. They achieve uniformity in ice cream mix and chocolate drinks, and do all manner of other work in the dairy. Your Lightnin sales representative has a selection table covering both high flow and high shear mixers, especially for dairies. Call for a specification for your tank, your volume and your process.

HIGH TEMPERATURES.

You'll find Lightnin mixers at work in molten metal and in tanks for quenching and heat-treating metal as well as in other high temperature applications.

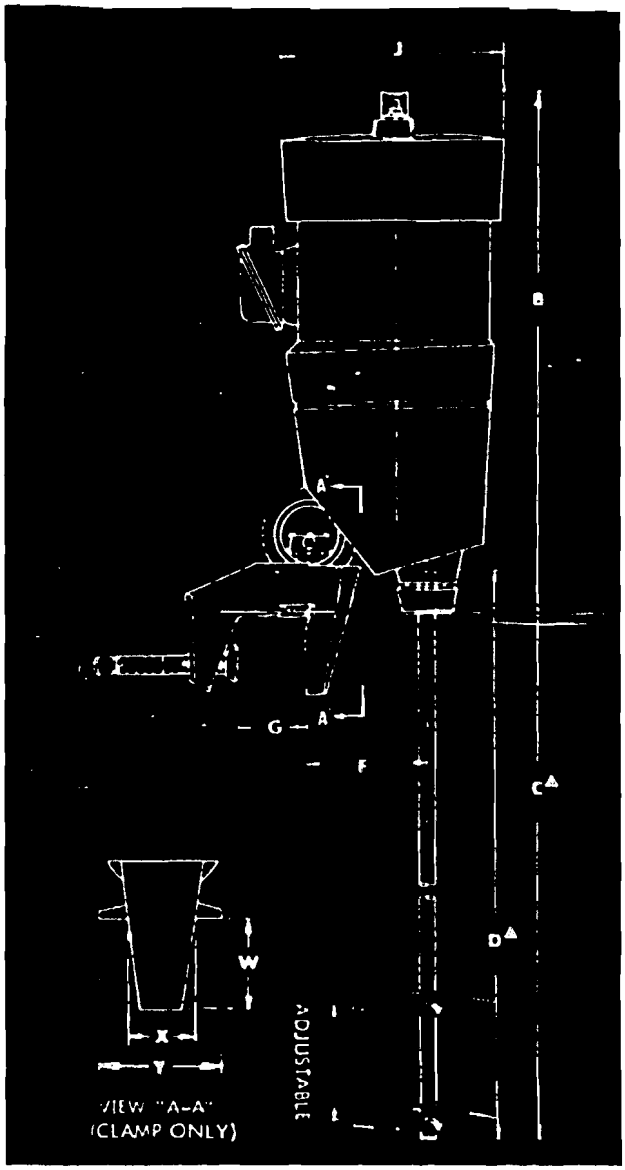
A variety of modifications is available to suit operating temperatures in the tank, and around the mixer motor and housing.

Among them are special grease and bearings, special coupling construction, oversize shafts with impeller welded on, as well as special motor insulation and housing materials.

Call your Lightnin representative for specific recommendations to suit your application.

Figure 28.
Gear drive portables deliver high flow, high pumping action in wash and treatment tanks for metal parts.

Standard materials and equipment



XJ Series

Mixer Housing — Aluminum*

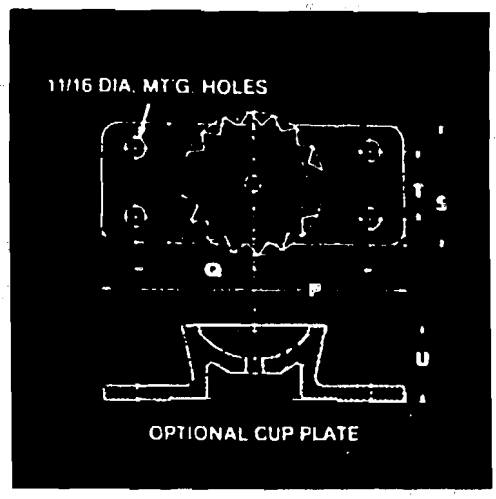
Chuck or Rigid Coupling — Electroless nickel plated steel or Type 316 stainless steel*

Clamp — Aluminum*

Shaft and Impellers — Steel, Type 304 and 316 stainless. Also available in any wrought commercial alloys and with coverings of such materials as rubber, PVC, polymers and fluorocarbons.

Paint — Styrenated alkyd enamel, 400 hours minimum salt spray resistance. Electroless nickel plated finish optional.

*Other materials available



HEAVY DUTY, HIGH FLOW GEAR DRIVES

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	D▲	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	.30	65	21⅞	32⅞	36	5	3	8½	9	7	3⅞	2	2¼	3¼	2⅞	5 7/16
[illegible]	.43	70														
[illegible]	.65	86	22¾	43⅞	48	5½	3¼	8½	10	8⅞	3⅞	2	2 7/16	3½	2⅞	5⅞
[illegible]	.87	94														
[illegible]	1.17	100														
[illegible]	1.74	125	27¼	55⅞	60	6½	3¾	10⅞	10	8½	4	2½	2 11/16	4 7/16	3¼	6⅞
[illegible]	2.30	135	28													

▲Dimensions C and D reflect standard lengths provided unless otherwise specified.

All dimensions in inches

Lightnin fixed-mounts for open tanks

XJQ & XDQ Series

FIXED MOUNT

DRIVES TO MATCH THE WORK.

Gear drive. For high viscosity mixing. For low viscosity work with large batches or where high flow with low shear is desirable. Single reduction helical gears are exceptionally compact, quiet running and carry high loads.

DIRECT DRIVE.

Figure 29.
For small batches or wherever high fluid motion and high shear are needed. Motor and shaft are coupled directly with pilot and keyway for accurate alignment and positive connection.

INTEGRAL ALIGNMENT.

One-piece housing and mixer support assures exact alignment, great mechanical strength.

VIBRATION DAMPENER.

Shock mounts protect drive against high fluid forces to prolong mixer life.

OPTIONAL RISERS.

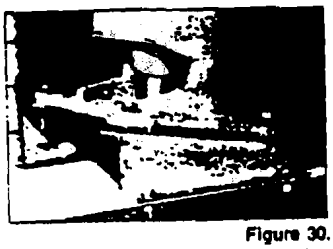


Figure 30.
Spacers give the correct angular, off-center mixer position for most applications, achieving optimum mixing without need for tank baffles.

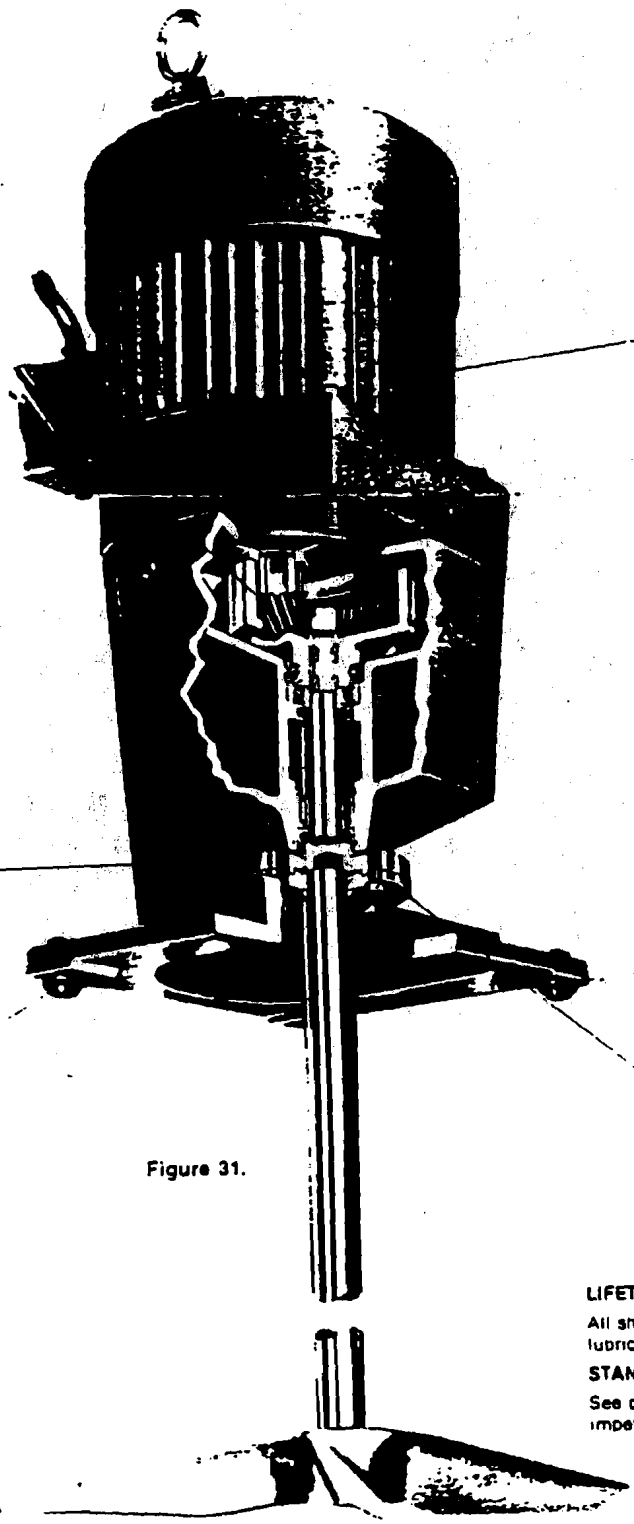


Figure 31.

PROTECTION AGAINST DUST, FUMES AND MOISTURE.

Standard DURA-MIX motor is totally enclosed or explosion-proof. See page 24

POSITIVE CHUCK.

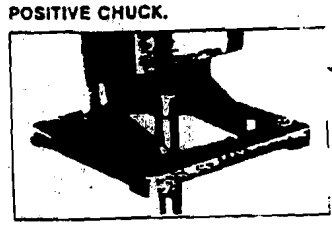


Figure 32.
Same as on clamp mount portables. Exclusive Lightnin reverse tapered flat assures that shaft cannot drop out unless intentionally released.

Rigid coupling. Adds stability for long shafts. Shaft comes with coupling welded on.

LIFETIME LUBRICATED.

All shaft, motor bearings and gears are lifetime lubricated. No need to change lubricant.

STANDARD A310 IMPELLER.

See page 25 for optional special purpose impellers.

Figure 33.
In wastewater treatment, direct driven fixed mounts provide rapid chemical dispersion and dissolving, while gear drives with their low shear aid in polymer make-up and flocculation.

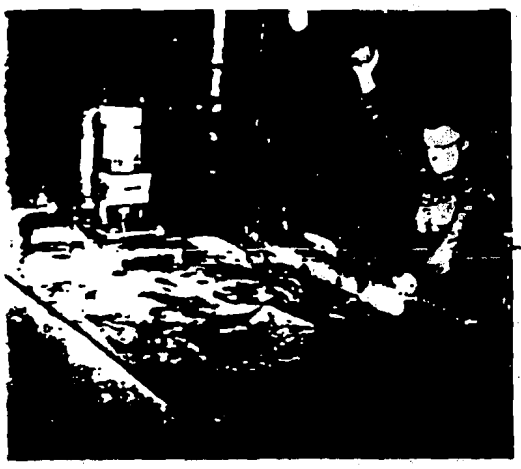


Figure 34.
Gear driven fixed mounts deliver high flow for uniform quenching and to aid cleaning of metal parts.

HIGH CAPACITY MIXERS.

For large tanks and continuous processes, fixed mounted mixers provide extra long shafts and the stability of permanent installation.

Gear drives deliver high flow with low shear, and are preferred, for example, in such applications as food processing and milk pasteurization and storage. Direct drives provide high fluid motion and shear for such work as dissolving sugar and dispersing paint pigment.

Fixed mounts offer most of the same features as standard portables, and then some. Because of the wider options, you are invited to call your Lightnin sales engineer early to assure an optimum match of the mixer to the work.

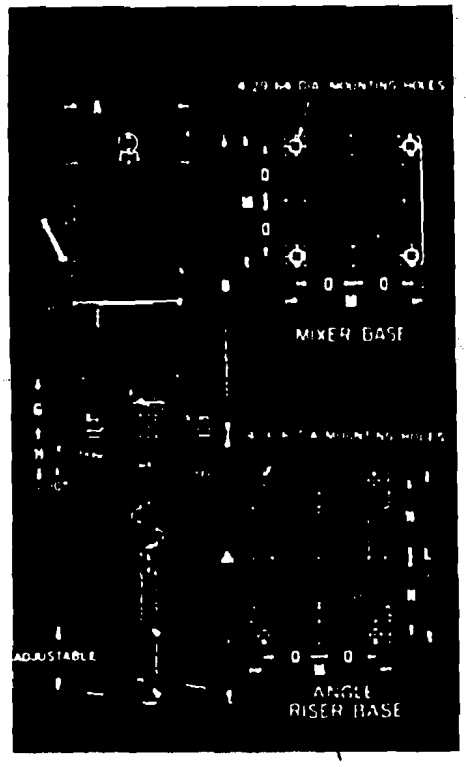
Mixer Housing — Aluminum*

Chuck or Rigid Coupling — Electroless nickel plated steel or Type 316 stainless steel*

Shaft and Impellers — Steel, Type 304 and 316 stainless. Also available in any wrought commercial alloys and with coverings of such materials as rubber, PVC, polymers and fluorocarbons.

Paint — Styrenated alkyd enamel, 400 hours minimum salt spray resistance.

*Other materials available



HIGH FLOW, GEAR DRIVEN FIXED MOUNTS FOR OPEN TANKS

.30	63	8½	24¾	6¼	2¼	12¼	10	5⅞	4	10	4
.43	66	8½	24¾	6¼	2¼	12¼	10	5⅞	4	10	4
.65	69	8½	25⅞	6¼	2¼	13¼	11	5⅞	4½	11	4½
.87	83	8½	25⅞	6¼	2¼	13¼	11	5⅞	4½	11	4½
1.17	89	8½	25⅞	6¼	2¼	13¼	11	5⅞	4½	11	4½
1.74	155	10⅞	28¾	6½	3	16¾	13½	7⅞	5½	13	5½
2.30	204	10⅞	29¾	6½	3	16¾	13½	7⅞	5½	13	5½
3.50	225	10⅞	30½	6½	3	16¾	13½	7⅞	5½	13	5½

HIGH SHEAR, DIRECT DRIVEN FIXED MOUNTS FOR OPEN TANKS

.30	51	8½	22¾	6¼	2¼	12¼	10	5⅞	4	10	4
.43	56	8½	22¾	6¼	2¼	12¼	10	5⅞	4	10	4
.87	60	8½	22¾	6¼	2¼	12¼	10	5⅞	4	10	4
1.17	70	8½	22¾	6¼	2¼	12¼	10	5⅞	4	10	4
1.74	135	10⅞	24¾	6½	3	16¾	13½	7⅞	5½	13	5½
2.30	140	10⅞	25¾	6½	3	16¾	13½	7⅞	5½	13	5½
3.50	155	10⅞	26¾	6½	3	16¾	13½	7⅞	5½	13	5½

▲Length of shaft depends upon the mixer you choose.

All dimensions in inches

Lightnin fixed mounts for closed tanks

XJC & XJDS Series

FIXED MOUNT

LIFETIME LUBRICATED.
All shaft, motor bearings and gears are lifetime lubricated. No need to change lubricant.

MOTORS AND DRIVES TO MATCH THE WORK.
Drive can be through single reduction helical gears as shown. Or it can be direct. Drive design and motors are the same proven performers used on other fixed mounts and standard portables.

POSITIVE CHUCK.
Grip bears against tapered flat on mixer shaft. Unless intentionally released, shaft cannot drop out.

REMOVABLE COUPLING.

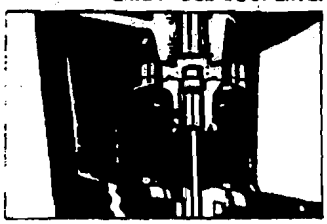


Figure 35.
Adds stability for long overhung shafts. Flange is rabbetted and keyed to assure positive alignment.

STANDARD OR SPECIAL FLANGES.
Standard ASA 150# series flanges are supplied in solid steel or in steel faced with 304 or 316 stainless for corrosion resistance. Other materials and special flanges can be furnished on request to mate with larger openings, or adaptors provided to fit smaller openings.

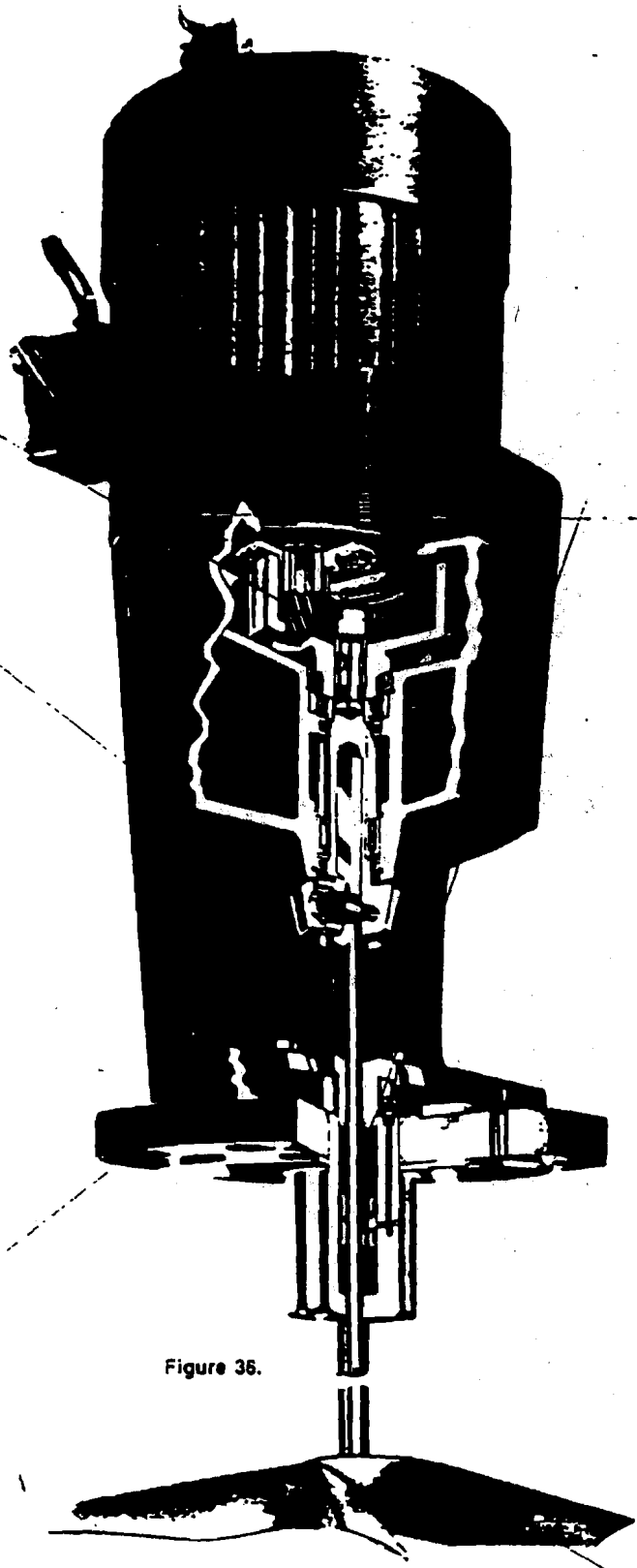


Figure 36.

SEAL OR STUFFING BOXES TO MATCH THE PROCESS.
Standard 150 psig stuffing box. Uses 7 rings of die-molded packing with separators, a lubricant distributing bronze* lantern ring, grease fitting, and adjustable bronze* packing gland. Where needed, we can adapt for pressures to 300 psig. Cooling or heating jacket, lubricant trap and leak detector available as accessories.

*Other materials available to suit process.

OPTIONAL 25 PSIG STUFFING BOX.

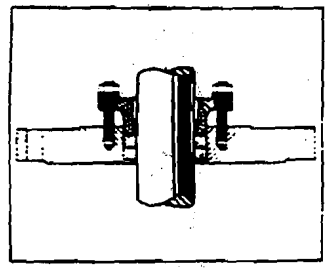


Figure 37.
A simpler design for lower pressures. Uses 2 rings of die-molded packing and a packing gland.

MECHANICAL SEAL.

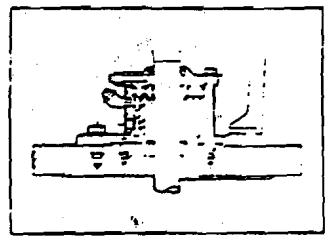


Figure 38.
Provides most positive sealing. Minimizes maintenance.

HIGH EFFICIENCY A310 IMPELLER.
See page 25 for optional, special purpose impellers.

MATCHED TO YOUR TANK.

The tank and the process determine the mixer, and your Lightnin representative has all the ways to match our mixer to your pressurized vessel.

After all, we guarantee process results, so we'll make sure we specify the optimum fixed mount for your tank. Call us early.

HIGH FLOW, GEAR DRIVEN FIXED MOUNTS FOR CLOSED TANKS

Stuffing Box Model	Mechanical Seal Model	HP	Max. Wt. Lbs.	A Max.	B Max.	H	J Std. Mtg. Flange ASA**
XJC30	XJDS30	.30	105	8½	27¾	9½	5
XJC43	XJDS43	.43	120	8½	27¾	9½	5
XJC65	XJDS65	.65	170	8½	28¾	10¼	6
XJC87	XJDS87	.87	180	8½	28¾	10¼	6
XJC117	XJDS117	1.17	190	8½	28¾	10¼	6
XJC174	XJDS174	1.74	215	10⅞	32⅞	10¼	8
XJC230	XJDS230	2.30	225	10⅞	33⅞	10¼	8
XJC350	XJDS350	3.50	235	10⅞	34⅞	10¼	8

HIGH SHEAR, DIRECT DRIVE FIXED MOUNTS FOR CLOSED TANKS

Stuffing Box Model	Mechanical Seal Model	HP	Max. Wt. Lbs.	A Max.	B Max.	H	J Std. Mtg. Flange ASA**
XDC30	XDDS30	.30	102	8½	26	9¾	5
XDC43	XDDS43	.43	120	8½	26	9¾	5
XDC87	XDDS87	.87	130	8½	26	9¾	5
XDC117	XDDS117	1.17	135	8½	26	9¾	5
XDC174	XDDS174	1.74	180	10⅞	28½	10¼	8
XDC230	XDDS230	2.30	186	10⅞	29½	10¼	8
XDC350	XDDS350	3.50	216	10⅞	30¼	10¼	8

▲Length of shaft depends upon the mixer you choose.

**50# flange drilling. Bolt holes straddle centerline. Special flanges available.

All dimensions are in inches

Mixer Housing — Aluminum*

Chuck or Rigid Coupling — Electroless nickel plated steel or Type 316 stainless steel*

Shaft and Impellers — Steel, Type 304 and 316 stainless. Also available in any wrought commercial alloys and with coverings of such materials as rubber, PVC, polymers and fluorocarbons.

Paint — Styrenated alkyd enamel, 400 hours minimum salt spray resistance.

*Other materials available

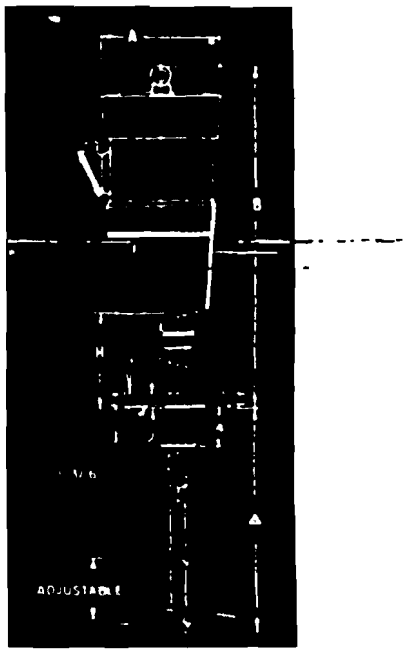


Figure 39.
Fixed mounts with stuffing boxes find wide use on the closed tanks of pharmaceutical processing.

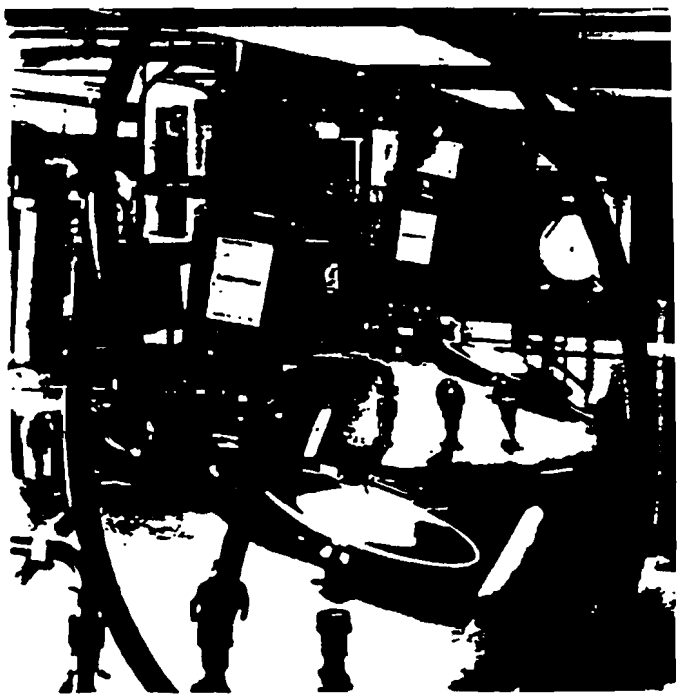
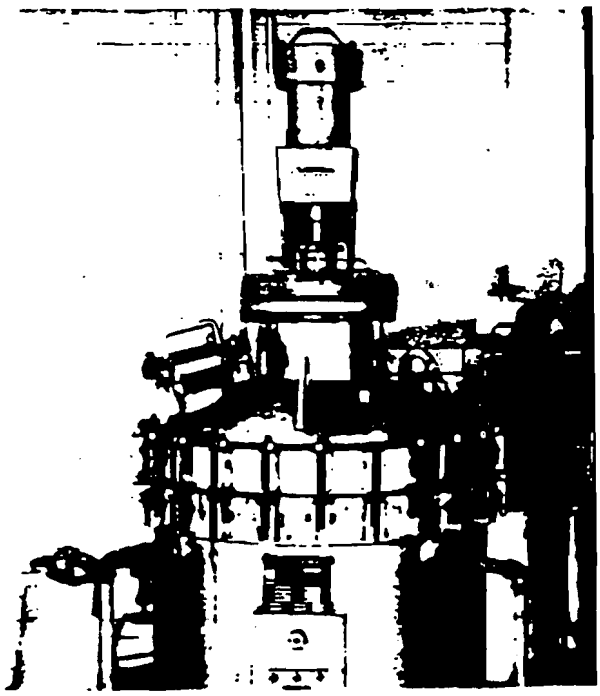


Figure 40.
For gas-liquid contacting, Lightnin fixed-mount, mechanical seal mixers can be adapted for pressures as high as 500 psig.



Supplement I.2

"Waste-Form Development for Conversion to Portland Cement at Los Alamos National Laboratory (LANL) Technical Area 55 (TA-55)"

WASTE-FORM DEVELOPMENT FOR CONVERSION TO PORTLAND CEMENT AT LOS ALAMOS NATIONAL LABORATORY (LANL) TECHNICAL AREA 55 (TA-55)

by

G.W. Veazey, A.R. Schake, P.D. Shalek , D.A. Romero, and C.A. Smith

ABSTRACT

The process used at TA-55 to cement transuranic (TRU) waste has experienced several problems with the gypsum-based cement currently being used. Specifically, the waste form could not reliably pass the Waste Isolation Pilot Plant (WIPP) prohibition for free liquid and the Environmental Protection Agency (EPA)-Toxicity Characteristic Leaching Procedure (TCLP) standard for chromium. This report describes the project to develop a Portland cement-based waste form that ensures compliance to these standards, as well as other performance standards consisting of homogeneous mixing, moderate hydration temperature, initial set within 24 hours, and structural durability. Testing was conducted using the two most prevalent waste streams reporting to the cementation operation of lean residue (LR)- and oxalate filtrate (OX)-based evaporator bottoms (EV). A formulation with a minimum cement-to-liquid (C/L)* ratio of 0.80 kg/l for OX-based EV and 0.94 kg/l for LR-based EV and a pH of 10.3 to 12.1 was found to pass the required performance standards. The Portland process was also found to result in a yearly cost savings for raw materials of more than $30,000.

INTRODUCTION

TA-55 houses a variety of operations related to plutonium purification. The intended destination of the TRU wastes generated from these operations is WIPP, and accordingly, these wastes must be in compliance with the WIPP-Waste Acceptance Criteria (WAC).[1] The majority of the wastes meet the WIPP-WAC in their initial state. However, particulates# and free liquids (aqueous and nonpolar organic) require further treatment to meet the WIPP requirements designed to reduce dispersibility and respirability. The purpose of the TA-55 cementation operation is to convert these particulate and liquid wastes to a solid, cohesive form that meets the WIPP-WAC.

Initially, Portland cement was used as the fixation agent in the TA-55 process, but in 1983 a gypsum/polymer-based cement named Envirostone® was substituted. Envirostone's

*The cement-to-liquid ratio is used in this report to express the quantitative relationship between cement and liquid. The liquid includes the water and ionic components used to prepare the surrogate wastes and NaOH solution. This ratio is used instead of the dimensionless water-to-cement ratio commonly used in the cement industry in order to remain historically consistent with TA-55 operations.

#This work was performed under Revision 4 of the WIPP-WAC, which required the immobilization of particulates. Since this time, Revision 5 of the WIPP-WAC has been issued. Revision 5 does not require the immobilization of particulates, although it does not prohibit immobilization of particulates.

setting reaction involves the hydration of hemihydrated calcium sulfate ($CaSO_4 \cdot 1/2H_2O$) to the dihydrated form ($CaSO_4 \cdot 2H_2O$). There were three reasons for the conversion to Envirostone. First, Envirostone was more compatible with the nonpolar organic liquid waste. Second, while Portland's setting reaction required an alkaline pH, Envirostone's was compatible with an acidic pH. Since the EV waste is highly acidic, less caustic solution was needed with Envirostone for pH adjustment. Third, the lower pH required for Envirostone eliminated the visibility problem that had resulted from generation of ammonia-based fumes at the higher pH of the Portland operation.

Envirostone served TA-55's cementation needs well until the cementation operation came under the jurisdiction of the more stringent WIPP-WAC and the EPA-Resource Conservation and Recovery Act (RCRA) regulation concerning characteristic toxicity.[2] It then became apparent that Envirostone exhibited several deficiencies that outweighed the benefits of its use. These deficiencies related to free-liquid generation in violation of the WIPP-WAC restriction on such and inadequate RCRA-metal leaching resistance. Portland cement was found to be a superior performer in these areas.[3,4] This report will review the investigation into the performance of Portland cement and describe the development of a Portland cement waste form to address the problems associated with Envirostone.

RATIONALE FOR PURSUING PORTLAND CONVERSION

Radiolytic Free-Liquid Generation: The first inadequacy with Envirostone became apparent in 1989 with the discovery that Envirostone cemented waste forms were generating free liquid several weeks after cementation.[5,6] This liquid generation resulted in the decertification of the TA-55 cementation process to produce waste forms acceptable for WIPP. A significant effort was subsequently initiated to find the cause of and arrest the phenomenon.[7,8,9] Several mechanisms capable of producing liquid were investigated and discarded. These included reversal of the calcium sulfate hydration reaction and delayed condensation-type polymerization.[6,10] Dehydration was eliminated when x-ray powder diffraction analysis found no change in the $CaSO_4$ molecule following free-liquid generation.[11] Delayed polymerization was eliminated when Envirostone without the polymerization precursors (plaster of Paris) was found to likewise generate free liquid.[6,11]

The free-liquid mechanism was ultimately shown to be irradiation-induced when it was found cemented surrogate-waste samples subjected to gamma irradiation produced free liquid, while unirradiated samples did not.[6] A mechanism that supported this scenario was radiolysis of the water in the pores of the cement structure.[12,13,14] In this mechanism, the H_2 and O_2 formed by disassociation of the water in the pores builds up sufficient internal pressure to force residual liquid to the surface. This mechanism was investigated at Hanford[15,16,17,18] and LANL for its potential to generate free liquid in cemented waste forms. Hanford workers showed that free-liquid generation is related to the waste form's compressive strength and permeabilty.[17] Work was also done at Hanford to develop a computer model to predict the occurrence of radiolytic free liquid based on a waste form's

*Envirostone is a trademark of the United States Gypsum Company.

permeability, gas generation rate, and internal pressurization.[18] Work at LANL with actual waste showed that increasing either the C/L ratio or mixing time reduced the occurrence and volume of free liquid,[6,8,10] presumably due to a resulting decrease in permeability. Best results were achieved in the full-scale operation at LANL by extending the mix time into the setting stage until the mixer began to lose its ability to generate a surface vortex.[3,6,7,10,19] Very few Envirostone waste forms produced with this technique generated free liquid. However, because some waste forms still generated free liquid,[3,19] the extended-mix technique was not considered to have entirely solved the problem.

To investigate the relative ability of the Portland cemented waste form to resist radiolytic free-liquid generation, surrogate EV waste forms made with Envirostone and Portland cements were subjected to gamma irradiation. Under irradiation by a 590 rad/min. Co^{60} source, the Envirostone sample produced liquid after 2.5×10^6 rads in 3 days. The test was concluded at 8.1×10^7 rads (95 days) without the Portland sample producing free liquid.[20] The superiority of Portland-type cement was further supported when bench-scale Portland samples prepared with actual waste were also found to produce no free liquid, while those prepared with Envirostone did.[21]

Leaching Resistance: The Envirostone waste form was discovered in 1992 to be unable to meet the nonhazardous limit for chromium as defined by the Toxicity Characteristic Leaching Procedure (TCLP). This discovery resulted in a shutdown of the operation during the DOE-imposed moratorium on the production of mixed waste. This inadequacy of Envirostone waste forms was first indicated in leaching studies using surrogate EV waste[22] and later confirmed with actual EV waste studies.[23] Both tests showed Portland waste forms had at least an order of magnitude higher leaching resistance for total chromium (Cr^{+3}/Cr^{+6}) in the TCLP. Portland cement also showed superior leaching resistance for cadmium and lead, two other metals found to have elevated concentrations in the EV waste. The graphical comparison of TCLP performance in the surrogate- and actual waste tests using Envirostone and Portland cement is shown in Figures 1 and 2.

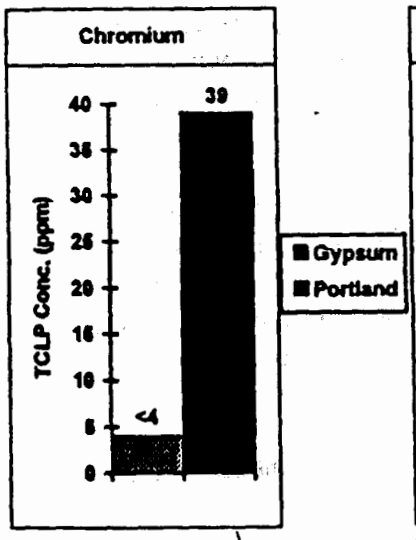


Fig. 1. TCLP performance with surrogate EV waste.

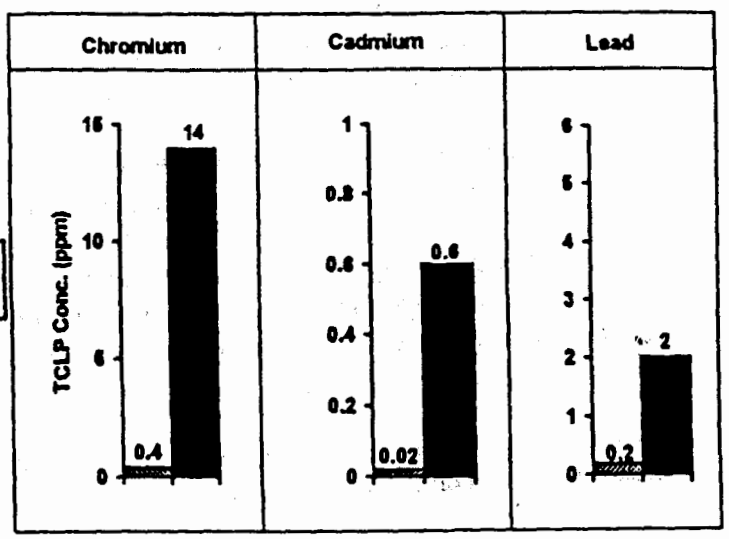


Fig. 2. TCLP performance with actual EV waste. TCLP limits: Cr = 5 ppm, Cd = 1 ppm, Pb = 5 ppm.

DEVELOPMENT OF THE PORTLAND WASTE FORM

Waste stream characterization: The surrogate waste used in this project consisted only of the EV waste stream because of its predominance in TA-55's waste streams requiring cementation. In order to prepare surrogate mixtures that accurately reflect current conditions, a characterization analysis of the EV waste stream was necessary.[24]

All EV wastes produced from April 1992 to February 1994 were analyzed for historically-present cations and anions, RCRA metals, and other components that can interfere with the setting reaction of Portland cement such as Cl^{-1}, SO_4^{-2}, and NO_3^{-1}. The results were sorted into the three major categories of EV waste: lean residue (LR)-based, oxalate filtrate (OX)-based, and hot distillate-based EV streams. The primary difference between the first two categories was the LR-based EV had a high concentration of calcium and magnesium, while the OX-based EV had a high concentration of sodium and oxalate. The composition of the hot distillate-based waste was similar to the LR-based waste composition. Due to this similarity, testing with hot distillate-based surrogate was not included in this project. The analytical data defining each of these waste streams is listed in Appendix 1.

Waste Form Performance Standards: The following standards were devised to define satisfactory performance of the final waste form. These include regulatory-based standards to meet the EPA TCLP limits (to produce a non-mixed waste form) and the WIPP-WAC restrictions on free liquid and particulates. Oerational-based standards were included to ensure homogeneous mixing, efficient throughput, and safe operating temperatures for the drum packaging.

1) Adequate mixability

To ensure that the recommendations of this work will provide consistent results, the mixing must be thorough enough to yield a homogeneous paste. Therefore, the viscosity of the cement paste must not be above the maximum viscosity at which the mixing equipment can provide thorough mixing. This limiting viscosity was defined as the maximum viscosity at which center-to-edge mixing of the cement paste could still occur.* Dilution was necessary for formulations with viscosities above this limit.

2) No free liquid at $\geq$24 hours following cementation

The requirement for absence of free liquid was necessary to meet the WIPP-WAC restriction on accessible free liquid.[25] The 24-hour limit was considered desirable to ensure a reasonable throughput efficiency. Free liquid could result from initial bleed water not reabsorbed or delayed generation of free liquid resulting from radiolysis. Adequate performance related to radiolysis would be defined by no generation of free liquid during gamma irradiation of 10^8 rads.

*Center-to-edge mixing is defined as rotational movement of the cement surface extending to the point of contact with the wall of the mixing container.

3) Moderate hydration temperature

The objective of this standard was to prevent the failure of the vinyl drum bag as a result of excessive heat from the hydration reaction of the cement. The conservative estimate bythe bag manufacturer for the failure temperature was 145 °F.[26] Since the temperature of the cement monolith reached during hydration in the drum-scale test would be higher than in the bench-scale test, an assumption had to be made on what temperature ceiling to select for the bench-scale tests. Using the industry standard of an increase of 15 °F per 100 lb of Portland cement,[27] the assumption was made that an increase of as much as 45 °F could be seen on scale-up to the drum scale. This led to the range of acceptable temperatures being set at ≤100 °F for the bench-scale experiments. All temperatures were taken at the center of the waste form. The actual full-scale temperature rise would be determined later in the full-scale test.

4) Penetration resistance of ≥500 psi at 24 hours following cementation

To ensure a reasonable throughput efficiency, it was considered desirable that indication of a successful setting reaction should be seen within 24 hours after the start of cement addition. The condition used to indicate a successful set was 500 psi penetration resistance. This indicator was adopted from the American Society for Testing and Materials (ASTM) standard for determining the initial set of a cement sample.[28]

5) Sustained compressive strength of ≥ 500 psi at 28 days following cementation

Minimum compressive strength was not needed to meet WIPP or EPA requirements. It was incorporated as a means to ensure the waste form was cohesive enough to resist breakdown to a particulate size prohibited by the WIPP-WAC. A minimum compressive strength of 500 psi was adopted for this study from the Nuclear Regulatory Commission's use of this level of strength as the best indicator of general physical durability for cemented waste.[29] The compressive strength data was collected according to the ASTM standard test method for compressive strength determination.[30] An additional requirement was included after the start of this work that there be no significant decline in compressive strength during the 28-day monitoring period. This was done after an expansive phase phenomenon was discovered that resulted in complete strength failure in a sample after satisfactory early development (*vide infra.*). The objective was to detect and discard any samples undergoing this phenomenon that still had a 28-day compressive strength value above 500 psi.

6) Pass EPA Leaching Standards for RCRA metals

The EPA has jurisdiction over the on-site storage of mixed waste. Since mixed waste is much more costly to store than nonhazardous TRU waste, it is advantageous for a waste form to pass the RCRA leaching standard for nonhazardous waste. This standard is defined by the EPA as passing the TCLP.[31] TCLP testing was performed at LANL according to EPA protocol.

EXPERIMENTAL EVALUATION

The goal of this project was to develop a simple cement formulation using only Type I/II Portland cement. Type I/II is the most readily available type of Portland cement, and its sole use would simplify the procurement of the raw materials. Another advantage to a one-component system would be the prevention of segregation problems that can occur in multicomponent systems in vibrating silos such as the one at TA-55. Other cement types and additives would be investigated only if required to address significant problems in areas such as slow setting, inadequate leaching resistance, or excessive temperature rise.

Surrogate preparation: The surrogates of the LR- and OX-based waste streams were prepared to approximate the median concentrations found in the waste stream characterization study listed in Appendix 1. The OX-based surrogate was prepared with the listed RCRA metals to evaluate the TCLP performance of the cemented waste form. The LR-based surrogate was prepared without RCRA metals. The concentrations of the LR- and OX-based surrogates are listed in Table 1.

Table 1: Composition of Surrogates
(in g/l except as noted)*

	LR-based	OX-based
Fe	9.03	8.56
Ca	58.39	16.88
K	18.51	6.38
Mg	54.77	21.40
Na	6.85	26.98
Al	4.75	1.75
NH_3	0.028	0.09
H+(molar)	1.40	4.55
Cl	1.02	0.27
NO_3	630	398
SO_4	1.55	1.00
C_2O_4	3.2	33.8
F	6.0	1.7
Cd	0	0.0028
Cr	0	2.45
Pb	0	0.056
Ag	0	0.0014
Ba	0	0.0355
Ni	0	1.205

*calculated from weight of dry chemicals

Equipment & Data Acquisition: The bench-scale equipment was assembled to match the design and proportions of the TA-55 full-scale process as much as possible. A programmable laboratory mixer (Lightnin Labmaster TSM2510) was used as the mixing device. The mixing profile was matched to those of the TA-55 process with the rpm being ramped up from 250 rpm to 400 rpm as paste viscosity dictated. The mixer power, mixer rpm, and mixing time were recorded for each test. For the full-scale test, the mixing container consisted of a 1/4-inch thick polyvinyl chloride rigid liner, inside a 12-mil vinyl bag, inside a 55-gal. drum (DOT 17-C). This was identical to the mixing container used in the TA-55 operations minus the lead between the bag and drum. The mixer (Lightnin XJ350), mixer shaft, and propellers (12.4-inch diameter A100) were identical to those used in the TA-55 process. The two propellers were separated on the shaft by one propeller diameter with the lower propeller being one-half diameter above the bottom of the liner. The full-scale test had a mixing rpm of 400 during the entire test. The mixing profile was not recorded during the full-scale test.

The following equipment was used for data acquisition in the bench- and full-scale tests. The bench-scale mixing profiles were recorded by a Compac Model M84 personal computer through an RS-232 interface with the mixer. Temperature was monitored using a Yokogawa Model LR4120 strip chart recorder and a type-K, Omega thermocouple (# 5TC-TT-K-24-36). The thermocouple was Teflon-coated to ease its removal from the hardened cement monoliths. The compressive strength of all waste forms was determined at 7, 14, and 28 days after cementation using a model C, 12-ton hydraulic press from the Carver Laboratory Press Company. The compressive strength data was taken on 2-inch cubes cast in H-2810 cube molds from the Humboldt Company. Penetration resistance was determined using a model H-3143 Acme hydraulic penetrometer from Humboldt. The gamma irradiation data for the bench-scale samples were collected with the use of a 380 rad/sec. gamma source located at Sandia National Laboratories (SNL).

Test Conditions: It was not the intention of this project to establish the failure boundary of all process parameters. Rather, it was to define a region of operability that will provide a confident expectancy for success. In this project, the process parameters of pH, C/L ratio, and dilution were varied to collect data on their influence on meeting the performance standards. Bench-scale testing was completed with LR-based surrogate before OX testing was begun. Conditions found to be unsatisfactory in the LR tests were not included in the OX tests. The pHs evaluated were 8.5, 9.6, 10.5, and 12.1 for the tests involving LR surrogate. The tests with OX-based surrogate were performed at a more limited range of 9.5, 10.5 and 11.5 as a result of pHs 8.5 and 12.1 being eliminated in the LR tests (*vide infra.*). All pH adjustment was accomplished using 10 molar NaOH solution. The C/L ratio was varied from 0.80 kg/l to 0.99 kg/l. The amount of water dilution was varied from 13.0% to 34.3% in the LR samples and 0% to 10% in the OX samples. The pH, C/L ratio, and dilution values used in the bench-scale tests are listed in Table 2.

A full-scale test was performed under conditions similar to a specific bench-scale sample to ascertain how scale-up would affect bench-scale results. A full-scale test was necessary because there are several areas in which bench-scale testing may not predict performance on the full scale. Bench-scale samples often do not show bleed water when full-scale samples

would.[32] Also, larger-scale samples exhibit a higher temperature rise during hydration that can produce cracks in the monolith. This damage can compromise performance in compressive strength development and leaching resistance.[32] In our case, the temperature was also a concern because of its potential to cause thermal damage to the vinyl drum bag.

RESULTS AND DISCUSSION

All bench-scale samples were evaluated for performance in mixability, bleed-water generation, initial set time, setting-temperature characteristics, and compressive strength. Evaluations of TCLP performance and radiolytic free-liquid generation were conducted only on OX samples. The performance in each category is discussed below. The results of the full-scale test follow those of the bench-scale tests.

The LR samples were used for the mixability study in which the pH and dilution values were varied concurrently with each sample. Consequently, pH and dilution must be considered together (i.e., pH/dilution) when determining their influence on LR samples in the following performance categories. The OX tests were conducted with only one process parameter being altered at a time. Subsequently, they are more useful in determining the relative influence of each parameter.

Bench-Scale Experiments: ***Mixability.*** The mixability limit was defined as the paste viscosity above which the mixing equipment lost its ability to achieve center-to-edge mixing. It was found that all LR samples exceeded this limit after the addition of the cement required for a C/L ratio of 0.80 kg/l. Dilution of these samples was required to allow addition of all of the cement. The required amount of dilution of the pre-cement solution was defined by a 0.1-watt power demand by the mixer while mixing the pre-cement solution at 250 rpm. A study was conducted in which the amount of dilution required at each pH was determined. It was found that the final pH of the pre-cement solution had a large effect on viscosity. A higher pH required more dilution as a result of the precipitation of more salts. The pH-dependent dilution values ranged from 13.0% to 34.3% and are reported in Table 2.

The same type of comparison of dilution and pH was not conducted on OX samples. Instead, the dilutions in the OX samples were fixed at 0%, 5%, and 10%. Although, the viscosity of the OX samples with 0% dilution was considered excessive, no difficulty in mixing was observed in any sample at 5% or 10% dilution. This lower dilution requirement for the OX-based samples is due to the lower salt content of the OX-based surrogate. This lower salt content is reflected in the lower total dissolved solids (TDS) value of the OX waste stream reported in Appendix 1.

Free liquid from Bleed-Water Generation. Although several samples initially generated bleed water, all bleed water was reabsorbed prior to the 24-hour limit.

Initial Set Time. The LR tests showed a definite relationship between each sample's initial set time and the pH/dilution values. This can be seen in Figure 3a, which shows the initial set time decreasing as the pH/dilution values increase. The samples prepared at pH 8.5 and pH

9.6 had initial set times exceeding the 24-hour limit. Because the pH 8.5 sample greatly exceeded the 24-hour limit, it was eliminated from further study in the OX tests.

The OX samples presented in Figure 3b show a lesser effect of pH on initial set time. Nevertheless, the results were consistent with the LR tests in that no sample prepared at ≤pH 9.6 met the 24-hour standard. This finding removed pHs ≤9.6 from further consideration. Figure 3b also shows a definite relationship between C/L ratio and initial set time in that the set time increased as the C/L ratio decreased. This increase was enough to prevent all 0.80 kg/l OX samples from meeting the 24-hour standard. Figure 3c shows the relationship of dilution to initial set time. As the dilution increased, the initial set time decreased. This decrease is presumably due to the decrease in the concentrations of set-retarding constituents of the waste. This may indicate that the decrease in initial set time of the LR samples with higher pH/dilution values (Figure 3a) was due primarily to the influence of dilution.

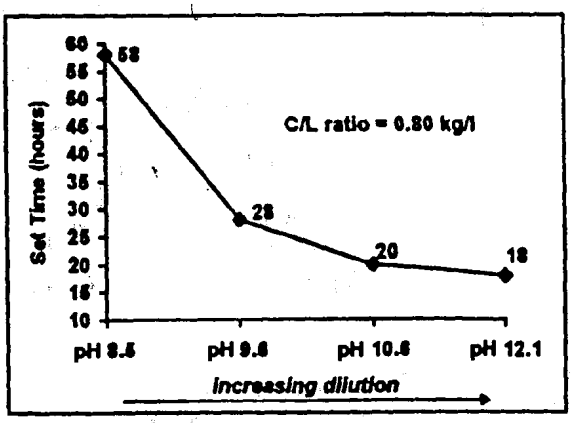


Fig. 3a. Effect of pH/dilution on initial set time for LR samples. (see Table 2 for dilution values).

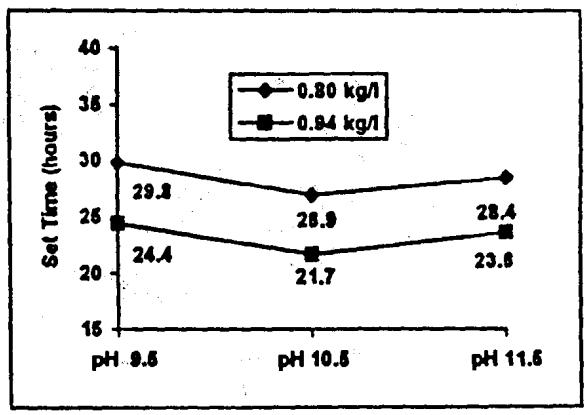


Fig. 3b. Effect of pH and C/L ratio on initial set time for OX samples. (avg. of samples w/ 10% dil.).

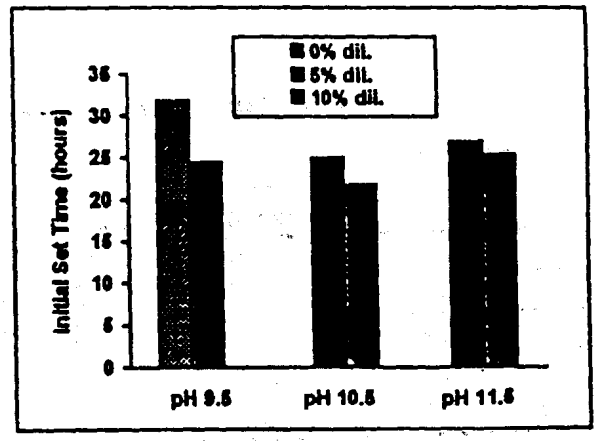


Fig. 3c. Effect of dilution on initial set time for OX samples (averages).

Temperature. The LR tests showed a definite relationship between each sample's pH/dilution values and the maximum hydration temperature and the elapsed time to maximum temperature. As the pH/dilution values increased, the maximum temperature increased and the elapsed time generally decreased. This can be seen in Figure 4a. The maximum temperature of 107 °F reached by the sample with pH 12.1 and 34.3% dilution exceeded the 100 °F temperature ceiling, thus causing a failure of this sample to meet the bench-scale temperature standard.

The OX samples presented in Figure 4b showed no significant change in temperature behavior as the pH was varied. The temperature profile of all OX pHs looked similar, with a peak temperature of approximately 86 °F at 24 hours. The dilution values for these samples were held constant at 10%. Since no effect was seen due to pH, this may indicate that the changing temperature profiles of the LR samples in Figure 4a were due to the effect of dilution.

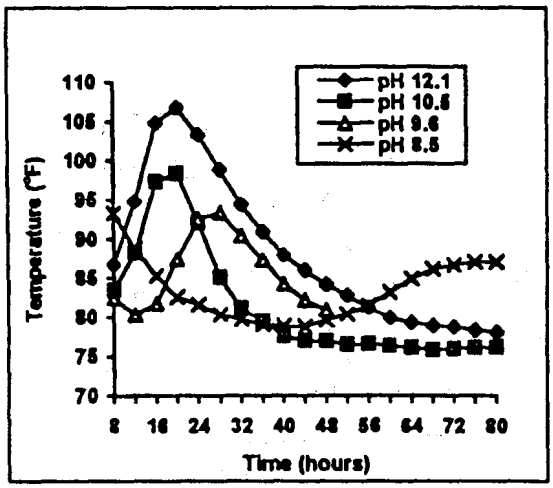


Fig. 4a. Temperature profile for LR samples LR14, LR15, LR16, & LR18. (C/L = 0.80 kg/l, see Table 2 for dilution values).

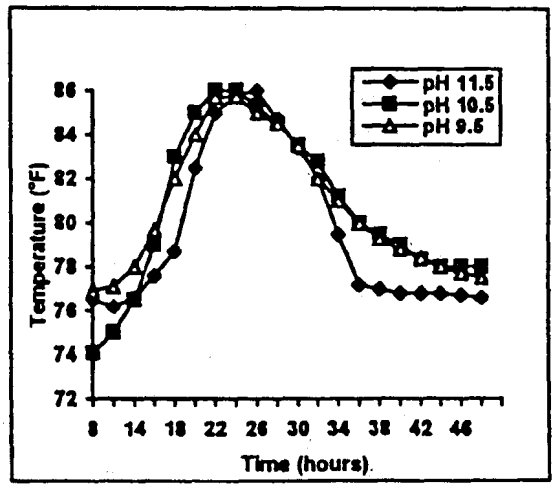


Fig. 4b. Temperature profile for OX samples OX4, OX8, & OX19. (C/L = 0.94 kg/l, dilution = 10%).

Table 2: Parameters and Results

Sample #	pH	C/L Ratio (kg/l)	Dilution[1] (vol%)	Initial Set Time (hr.)	Compressive Strength (psi) 7-day	14-day	28-day
LR15	8.5	0.80	13.0	58	450	0	0
LR11	9.6	0.94	ND[2]	26	1200	1550	1775
LR18	9.6	0.80	23.2	28	650	825	750
LR16	10.5	0.80	30.8	20	750	700	850
LR14	12.1	0.80	34.3	18	688	925	1075
OX1	9.5	0.94	0	30.6	687	775	975
OX2	9.5	0.94	0	33	650	825	950
OX9	9.5	0.94	5	ND[2]	875	1100	1250

OX12	9.5	0.94	10	24.6	1525	1000	1250
OX19	9.5	0.94	10	24.2	600	875	1000
OX16	9.5	0.80	10	29.8	375	450	650
OX3	10.5	0.84	0	<24	650	800	1100
OX14	10.5	0.80	10	26.9	300	500	700
OX5	10.5	0.99	0	ND(2)	975	1150	1325
OX6	10.5	0.94	5	23.1	800	2125	1300
OX17	10.5	0.94	5	26.7	700	825	1100
OX4	10.5	0.94	10	21.8	725	925	1150
OX10	10.5	0.94	10	25.4	750	850	1100
OX13	10.5	0.94	10	17.7	800	1000	1150
OX18	10.5	0.94	10	22	875	1000	1150
OX7	11.5	0.94	5	26.8	850	1100	1275
OX8	11.5	0.94	10	22.6	825	950	1275
OX11	11.5	0.94	10	24.6	950	1025	1150
OX15	11.5	0.80	10	28.4	375	525	675
OX20(3)	4	1.80	0	<24	1000	925	800
OX21(4)	4	1.80	0	<24	1200	1175	1000

(1)Dilution from water only (2)Not determined (3)Envirostone short mix (4)Envirostone long mix

Compressive Strength. As expected, the compressive strength increased as the C/L ratio was increased. This relationship is shown for selected LR and OX samples in Figures 5a and 5b, respectively. The effect of dilution on compressive strength was inconclusive as seen in the data presented in Table 2 for OX samples prepared at pH 9.6 and 0.94 kg/l. Although the 28-day compressive strength values for these samples at 5% dilution were greater than those at 10% dilution, the value for the sample at 0% dilution was less. The relationship of pH to compressive strength is shown for selected OX and LR samples in Figures 6a and 6b, respectively. This data shows the compressive strength increased with time and a higher pH produced a higher 28-day compressive strength.

An exception to the above trend occurred in the pH 8.5 LR sample (see Table 2 and Figure 6b). Here a phenomenon was observed that allowed satisfactory early strength development, but resulted in cube expansion and complete structural failure (strength = 0 psi) at the 14- and 28-day strength determinations. It is possible that the LR sample prepared at pH 9.6 and 0.80 kg/l (see Figure 5a) also exhibited some effects of this phenomenon. Although this sample did not technically fail because it had a strength above 500 psig at 28 days, the compressive strength at 28 days was lower than at 14 days. This may indicate that the waste form would have self destructed at a later time. The OX samples did not experience this delayed expansion phenomenon at the tested pHs of 9.5, 10.5, and 11.5. The explanation for this phenomenon in the LR samples is not certain. Since this occurred only in the LR samples with the lowest dilutions, the effect may be linked to a high concentration of one or more of the ions that are present in lower concentrations in the OX surrogate.

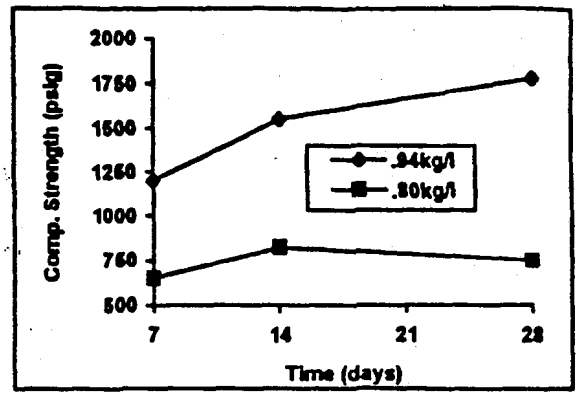


Fig. 5a. Effect of C/L ratio on compressive strength of LR samples LR11 & LR18. (pH = 9.6)

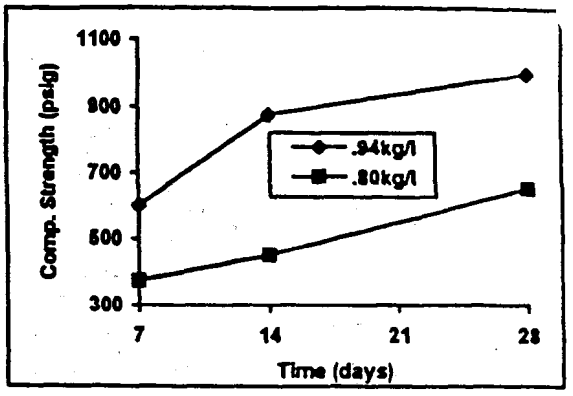


Fig. 5b. Effect of C/L ratio on compressive strength of OX samples OX16 & OX19. (pH = 9.5).

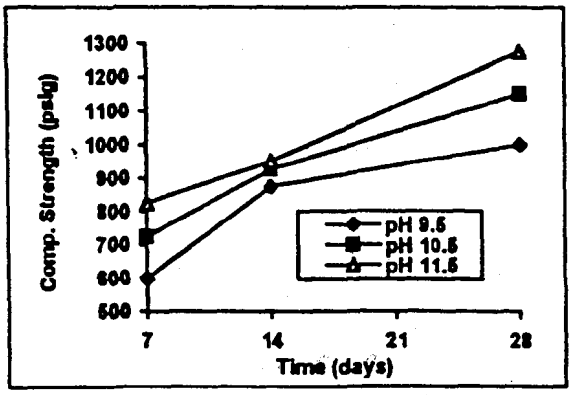


Fig. 6a. Compressive strength of OX samples OX4, OX8, & OX19. (C/L = 0.94 kg/l, dilution = 10%).

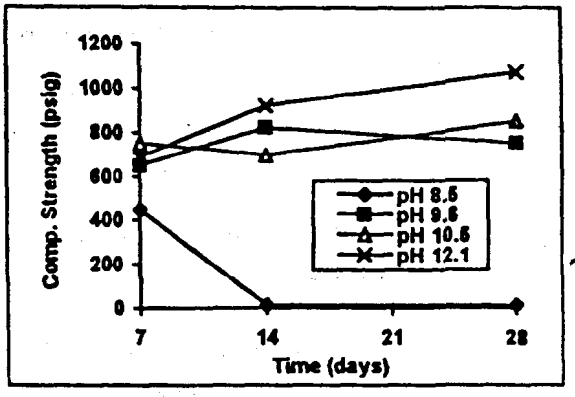


Fig. 6b. Compressive strength of LR samples LR14, LR15, LR16, & LR18. (C/L = 0.80 kg/l, see Table 2 for dilution values).

TCLP Results. TCLP testing was done only on OX samples. The OX samples were analyzed for the RCRA metals Cd, Cr, Pb, Ba, and Ni. The RCRA metals not included in the TCLP testing were present in concentrations that would be well below the TCLP limit even if 100% of each metal leached out in the TCLP extraction procedure. The samples for TCLP analysis were taken from the pH categories of 9.5, 10.5, and 11.5 and included the sample with the lowest compressive strength in each category. The sample with the lowest compressive strength was considered the worst-case condition for leaching resistance because of the connection of compressive strength to leaching resistance through a common dependency on permeability. The analytical results in Table 3 show that all samples passed the TCLP standards for nonhazardous waste.

Table 3: TCLP Results for Oxalate Surrogate Samples
(all concentrations in ppm)

Sample ID	Cd	Cr	Pb	Ba	Ni
TCLP limit	1	5	5	100	100
OX7	<0.003	0.11	<0.011	2.6	0.01
OX8	<0.003	0.12	<0.011	2.4	0.01
OX9	<0.003	0.12	<0.011	3.0	<0.01
OX14	<0.003	0.10	<0.011	2.7	0.01
OX15	<0.003	0.13	<0.011	2.6	<0.01
OX16	<0.003	0.11	<0.011	2.7	<0.01
OX17	<0.003	0.14	<0.011	2.7	0.01
OX18	<0.003	0.11	<0.011	2.9	0.01
OX19	<0.003	0.17	<0.011	2.8	0.05

Radiolytic Free-Liquid Generation. The testing for suppression of radiolytic free-liquid generation was conducted with OX samples. Gamma irradiation was used to simulate the radiolytic degradation caused by alpha irradiation in the actual wastes. It should be noted that gamma irradiation is less efficient than alpha irradiation due to the smaller size of the nuclear particle. To achieve 10^8 rads quickly, the test was conducted at SNL using a 380 rad/sec. gamma source. The samples were taken from the pH categories of 9.5, 10.5, and 11.5 and included the sample with the lowest compressive strength in each category. Compressive strength was again used as the worst-case indicator because of its connection to free-liquid generation through permeability. The test results, presented in Table 4, show that no Portland cement samples produced free liquid during the 10^8 rad irradiation test.

Two Envirostone-cemented samples were also included in this test, a short-mixed (OX20) and a long-mixed (OX21) sample. These were included to investigate a correlation found in previous work between longer mixes and suppression of radiolytic free-liquid generation in Envirostone cemented waste forms.[3,6,7,10,19] During the irradiation test, free liquid was found in both samples, the short-mix sample at 1.7×10^7 rads and the long-mix sample at 4.4×10^7 rads. The liquid generated by the long-mix sample was actually greater in volume than that by the short-mix sample. Based on these results, it can be concluded that the long-mix technique can not be consistently relied upon to suppress radiolytic free-liquid generation in Envirostone cemented waste forms.

Table 4: Gamma Irradiation

Cumulative Dose: (rad)	8.3×10^6	1.7×10^7	4.4×10^7	5.3×10^7	7.2×10^7	9.8×10^7
Sample ID	Liquid?	Liquid?	Liquid?	Liquid?	Liquid?	Liquid?
OX14	no	no	no	no	no	no
OX15	no	no	no	no	no	no

OX16	no	no	no	no	no	no
OX17	no	no	no	no	no	no
OX18	no	no	no	no	no	no
OX19	no	no	no	no	no	no
OX20 short-mix Envirostone	no	Yes (damp*)	Yes (1.55g)	Yes (3.35g)	no	no
OX21 long-mix Envirostone	no	no	Yes (3.59g)	Yes (4.91g)	no	no

*weights in parentheses are totals since start of free-liquid generation.

Full-Scale Testing: The full-scale test was conducted with LR-based surrogate and was designed to approximate the bench-scale sample LR16. The full-scale sample had a pre-cement pH of 10.3 and a C/L ratio of 0.80 kg/l, which corresponded to 220 lb of Portland cement. The EV, NaOH, and water volume percentages in the full-scale sample were 41%, 28%, and 31%, respectively. The full-scale test monitored all performance standards except RCRA-metal leaching resistance and radiolytic generation of free liquid. Compressive strength was used as an indicator of performance in these nonmonitored areas because of its common dependence with them on permeability. The results relative to each performance standard are reported below.

Mixability. The mixing equipment had no difficulty in providing center-to-edge mixing of the cement paste.

Free Liquid. No bleed water was present at any time after cementation.

Initial Set Time. Initial set occurred at 20.1 hours after cementation. This matched the 20-hour initial set time of LR16. The profile of the penetration resistance is shown in Figure 7.

Temperature. The full-scale test was especially useful in illuminating several areas of uncertainty concerning temperature behavior. The temperature was monitored at the center and edge (1 inch in) of the cement monolith and between the rigid liner and bag. The temperature reached a maximum of 163 °F at the center, 150 °F at the edge, and 103 °F at the bag. The full-scale temperature profile is shown in Figure 8.

The maximum center temperature of the full-scale sample was 66 °F higher than that of LR16. This corresponds to an increase of 30 °F per 100 lb of Portland cement ([66 °F/220 lb] x 100). This is twice as high as the industry standard of 15 °F per 100 lb used to establish the temperature ceiling for the bench-scale tests. This difference is likely due to the industry standard being based on concrete in which the aggregate would act as a heat sink. Another meaningful finding was that the temperature at the bag location was 60 °F lower than at the center of the monolith. This resulted in a temperature significantly below the 145 °F bag failure temperature. This data can now be used to back-calculate a revised temperature ceiling for the bench-scale tests. Starting with 145 °F, adding the 60 °F lower temperature at the bag and subtracting the 66 °F higher center temperature yields a revised ceiling of 13

°F. At this higher ceiling, the pH-12.1 LR sample, previously rejected as a result of having a maximum temperature of 107 °F, falls within in the acceptable temperature range.

Compressive strength. The compressive strength values of the full-scale sample equaled or exceeded that of LR16 at all times. This indicates no damage of the monolith occurred as a result of increased hydration temperature from scale-up. The compressive strength profiles of the full-scale sample and LR16 are shown in Figure 9. It can be seen that strength development occurred at a similar rate in both samples.

TCLP. TCLP analysis was not performed on the full-scale sample, but the several considerations indicate TCLP performance would be as good or better than that of the OX-based samples, which easily passed the TCLP standards. First, the higher compressive strength of the full-scale sample indicates the permeability should be less than that shown by the OX-based samples. Since leachability is dependent on permeability, the resistance to TCLP leaching should therefore be greater for the full-scale sample than for the OX-based samples. Second, because the dilution percentage of the full-scale sample was greater than the OX-based samples, the concentration of the RCRA metals would be less in the full-scale sample.

Radiolytic Free-Liquid Generation. Testing for radiolytic free-liquid generation was not performed on the full-scale sample, but a conclusion can be drawn from compressive strength data. The work at Hanford showed that the susceptibility of a waste form to radiolytic free-liquid generation decreased as the compressive strength increased, presumably as a result of a corresponding decrease in permeability.[17,18] Since the compressive strength of the full-scale sample was higher than the OX-based samples, resistance to radiolytic free-liquid generation should also be greater.

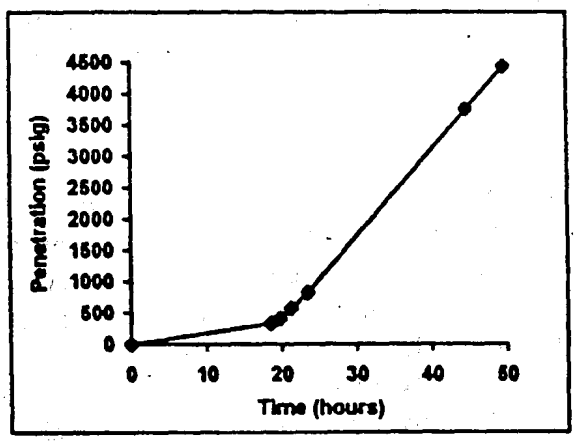


Fig. 7. Penetration resistance of full-scale test.

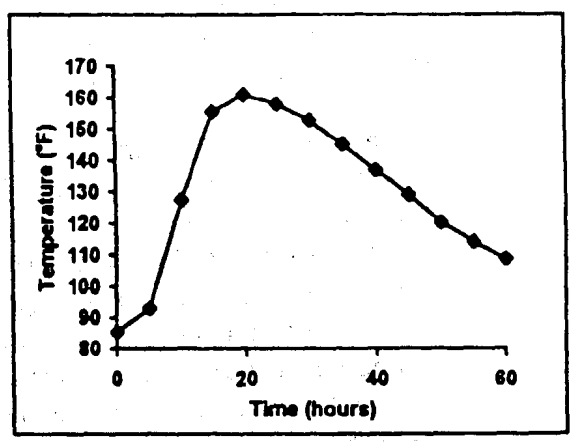


Fig. 8. Temperature profile of full-scale test (center).

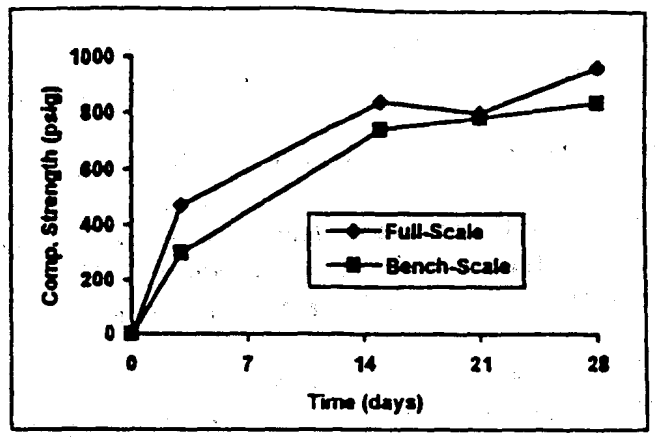


Fig. 9. Compressive strength comparison of full- and bench-scale (LR16) tests.

CONCLUSIONS

The above results define a range of operability that can be used to produce a Portland-based waste form meeting the performance standards identified in this project. The performance standards of principal importance were those addressing the inadequacies of Envirostone cement regarding free-liquid generation and failure to meet the TCLP limit for chromium. The Portland waste form was shown to be superior to both the short-mix and long-mix Envirostone waste forms in resisting gamma-induced free-liquid generation. The 9.8×10^7-rad dose at which the Portland sample still suppressed free liquid exceeds the dose at which the short-mix and long-mix Envirostone samples began to generate free liquid by 5.8 and 2.2 times, receptively (Table 4). The earlier work presented in Figures 1 and 2 had demonstrated that the Portland waste form was superior to Envirostone waste forms in chromium TCLP performance by at least an order of magnitude. The TCLP evaluation of the OX-based Portland samples in the present work showed TCLP performance similar to these earlier tests (see Table 3).

The bench-scale results established the minimum C/L ratio as 0.80 kg of Type I/II Portland cement per liter of liquid for LR-based EV surrogate and 0.94 kg/l for OX-based EV surrogate. The OX-based EV waste required a C/L ratio of 0.94 kg/l solely due to a failure to meet the 24-hour initial set standard at 0.80 kg/l. The bench-scale tests established the acceptable pH range for the liquid (EV, NaOH, and dilution water) at 10.5 to 11.5. The full-scale test, conducted with LR surrogate at pH 10.3 and 0.80 kg/l, served as a confirmation of bench-scale results and demonstrated the pH range could be lowered to 10.3. The full-scale test also provided revised temperature data that allowed inclusion of the pH 12.1 sample.

Actual operations will present some areas for flexibility. One, the C/L ratio may be increased to the limit of the mixing equipment's ability to achieve adequate mixability. An increased C/L ratio will improve performance in leaching resistance, set time, and compressive strength performance. However, no improvements in these areas should be necessary with EV wastes similar to those used as surrogates in this project. Two, to

simplify operations, it is highly recommended that the dilution percentage not be based on the viscosity of each waste batch. Instead, a fixed dilution percentage should be chosen that will be adequate for the viscosity of all EV batches. If EV compositions remain similar to those in this project, this will result in the worst-case dilution being based on LR-based EV waste. Due to the effect of decreasing initial set time with increasing dilution (see Figure 3c), this may result in waste forms with OX-based EV waste meeting the 24-hour standard for initial set time at 0.80 kg/l. Additionally, 24 hours was established as a *desired* standard to achieve a reasonable process throughput and it may be extended without jeopardizing the physical integrity to the waste form.

Waste loading will depend on how much drum volume is required by the other components making up the final waste form. In actual operations, the highest waste loading will be achieved by operating at the lowest acceptable C/L ratio and pH. A waste loading of 33.5 vol% was achieved in this project's full-scale sample. This waste loading is approximately equivalent to that of the Envirostone-based operation. The lower C/L ratio of the Portland system did not result in a higher waste loading than for the Envirostone system because it was offset by the higher water and NaOH dilution required by Portland's higher pH. However, increased waste loading can be expected in actual operations if the EV waste contains less salts than the LR surrogate used in this project.

The cement addition rate should be as high as possible in the TA-55 operation. Mixing should be continuous during the time of addition and ramped up to maximum rpm as the paste viscosity requires to maintain adequate mixing. To prevent overmixing, the paste should be mixed for only 4 minutes after the end of cement addition. Overmixing is to be avoided because it is known to interfere with an initial stage of the setting reaction, causing delayed set, slow curing, and even loss of final physical properties.[32] The presence of bleed water after completion of mixing is acceptable as long as reabsorption occurs within a reasonable time frame. The 24-hour standard for free-liquid reabsorption was selected as a *desired* standard to ensure a reasonable throughput for the cementation operation. An occasional extension of this time limit should not significantly impact process throughput.

Quality Assurance: Some care must be taken in procuring the Type I/II cement for the TA-55 cementation operation. Type I/II Portland cement is defined by a range for each of its mineralogical and physical properties. The ranges are broad enough that variations in setting characteristics and sensitivity to chemical interferants are sometimes observed between Type I/II cements from different sources. It is recommended therefore that the QA program for this operation assure that procurement be from a source offering a Type I/II cement with similar composition to that used in this development project. The particular cement used in this project is a low-alkali Type I/II cement. The source of the cement was Rio Grande Portland Cement Corporation in Tijeras, New Mexico. The mineralogical composition and other pertinent physical characteristics for this cement are listed in Appendix 2. The composition from this source has been very consistent throughout the 2-year period presented in this appendix.

This work was performed according to the LANL/TA-55 Quality Management Plan: Documents and Records Control Section, procedure number SS-TA-55-110-0-03.1-1.

Costs: For a production rate of 3 cement drums per week, the Portland cement required for operating the TA-55 cement process will be approximately 20.6 tons per year.* The current delivered cost from Rio Grande Portland Cement Corporation is approximately $80 per bulk ton,[33] resulting in a yearly cost of $1,648. This compares to $1,300 per ton and $40,225 per year for Envirostone cement, which equates to an overall reduction in cement cost of $38,577 per year.[34] The cost for delivery from Rio Grande Portland Cement Corporation is for bulk powder cement. Bulk delivery is less costly and has the advantage of allowing pneumatic delivery into the TA-55 cement silo. Pneumatic delivery will also reduce the number of person-hours required to load the silo from approximately 20 hours to 1 hour per year. The increased volume of NaOH solution should result in an increased cost of less than $5,000 per year.

Other Wastes: The recommendations of this report should be compatible with the addition of dry, non-reactive particulate wastes. In the present TA-55 operation, this type of waste is added to a pre-established cement paste to prevent the solids from settling during mixing. Using this technique, the primary effect will be an increase in paste viscosity, which may require additional dilution to maintain adequate mixing. Slurries (wet particulates) with a pH outside the range recommended in this report should be pretreated to properly adjust the pH prior to addition to the cement paste. Low-density slurries that do not require addition to a pre-established paste can be combined and pH adjusted with the waste liquid prior to cement addition. Ion-exchange resins present an additional concern in that they have been reported to cause setting and free-liquid problems under certain conditions not related to pH.[35,36] Non-EV aqueous wastes may also cause chemical interferences with the Portland setting reaction. It is recommended additional studies be conducted before incorporation of ion-exchange resins or non-EV aqueous wastes into the cementation operation.

No testing was done with organic wastes in this development project. Portland cement is not as efficient as Envirostone in treating nonpolar organics, but methods exist that permit satisfactory treatment of some organics with Portland cement.[37] It generally is adequate for limited volumes of nonpolar organics if they are prepared in a well-dispersed oil-in-water emulsion. It does not perform well with inverse emulsions (water in oil) or pure solvents.[32] Organics with high solubility (polar) generally are not immobilized well by Portland cement.[32] It is recommended additional development be conducted before incorporation of organic wastes into the cementation operation.

ACKNOWLEDGMENTS

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- Rio Grande Portland Cement Corporation in Tijeras, New Mexico, for supplying the cement for all test work.
- Earl McDaniel of Oak Ridge National Laboratory for technical support.
- NMT-7 Cement Process personnel for assistance in conducting the full-scale test.

*Calculated at 150 drums per year at 275 lb of Portland cement per drum.

Appendix 1

Analysis of Evaporator Bottoms*
(in g/l except as noted)

	Lean Residue	Oxalate Filtrate	Hot Distillate
Fe	17.0	7.9	16.9
Ca	61	10.5	39.1
K	17.6	4.8	14.6
Mg	58.7	13.3	41.9
Na	7.4	23.9	9.4
Al	4.6	2.3	4.7
NH_3	.025	.090	.035
Cl	1.1	.265	1.35
NO_3	457	398	419
SO_4	1.6	<1	1.57
C_2O_4	3.3	33.8	11.3
F	5.4	1.7	5.1
H+ (molar)	1.0	4.6	1.75
TDS**	629	330	600
Ag	<.005	<.001	<.002
As	<.015	<.005	.010
Ba	.035	.018	.029
Cd	.014	.003	.014
Cr	3.0	1.94	2.35
Hg	<.025	<.005	.010
Ni	1.8	1.205	1.60
Pb	.19	.056	.125
Se	<.008	<.008	.009
Tl	<.060	<.020	<0.60

*median values of all analyzed EV samples
**total dissolved solids

Appendix 2

Composition of Type I/II Portland Cement Used in Tests
(in %, except where noted)

	#1 1/1/93 - 12/12/93 Average	(Std. Dev.)	#2 5/13/94 Bin 9 - Test 114	#3 7/1/94 - 10/3/94 Average	#4 9/1/94 - 1/18/95 Average
SiO_2	20.9	(0.22)	20.9	21.1	21.1
Al_2O_3	4.3	(0.087)	4.3	4.3	4.3
Fe_2O_3	3.1	(0.082)	3.1	3.0	3.1
CaO	63.3	(0.55)	63.3	63.6	63.6
MgO	2.8	(0.51)	2.4	2.5	2.6
SO_3	2.9	(0.08)	3.0	3.0	2.0
Na_2O	0.18	(0.023)	0.21	0.19	0.21
K_2O	0.52	(0.029)	052	0.55	.052
Loss On Ignition	1.5	(0.12)	1.2	1.4	1.40
Insoluble residue	0.24	(0.022)	0.22	0.23	0.24
C_3S*	57.8	(2.48)	57	57	57
C_2S*	16.3	(2.1)	17	17	18
C_3A*	6.1	(0.24)	6.3	6.3	6.0
C_4AF*	9.5	(0.24)	9	8	10
Alkalies (Na_2O equiv.)	0.52	(0.033)	0.57	0.55	0.55
Blaine, (sq. M / kg.)	353	(8.0)	349	359	361
-325 mesh fineness	93.3	(1.19)	92.7	93.3	95.2
Autoclave expansion	0.05		0.03	0.05	0.05
Air content	8.5		8.9	8.2	8.1

*C = CaO; S = SiO_2; A = Al_2O_3; F = Fe_2O_3

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ATTACHMENT J

GENERAL FACILITY OPERATIONS AND WASTE MANAGEMENT PRACTICES

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LIST OF ABBREVIATIONS/ACRONYMS

20.4.1 NMAC	New Mexico Administrative Code, Title 20, Chapter 4, Part 1
CAM	continuous air monitor
CAS	Central Alarm Station
cm	centimeters
cm/hr	centimeters per hour
CSU	container storage unit
FMCS	facility motor/control system
ft	feet/foot
HEPA	high-efficiency particulate air
LACFD	Los Alamos County Fire Department
LANL	Los Alamos National Laboratory
MSDS	Material Safety Data Sheets
PA	public address
S-10	Hazardous Materials Response Group
TA	technical area

ATTACHMENT J
GENERAL FACILITY OPERATIONS AND WASTE MANAGEMENT PRACTICES

This attachment provides an overview of current facility operations and waste management practices for the hazardous and mixed waste management units at Los Alamos National Laboratory (LANL) Technical Area (TA) 55.

J.1 SECURITY AND ACCESS CONTROL [20.4.1 NMAC §270.14(b)(4) and §270.14(b)(19)(viii) and 20.4.1 NMAC §264.14]

Security at TA-55 is maintained with both manmade and natural barriers. These barriers prevent the unknowing entry and minimize the possibility for unauthorized entry of persons or livestock into TA-55, and thus satisfy the requirements of the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) §264.14, revised June 14, 2000 [6-14-00]. Two 12-foot (ft) high chain-link security fences with razor wire at the top surround the entire perimeter of TA-55, as shown on Figure J-1.

Three entry gates allow access to TA-55. One entry gate is located at the main entrance to TA-55 on the southeast side of the facility, one entry gate is located on the road to TA-48 at the northwest end of TA-55, and one entry gate is located at the northeast corner of TA-55 (for access to TA-55, Building 28 [TA-55-28] only). An entry station is located adjacent to the entry gate at the main entrance to the facility. The entry station is manned 24 hours a day by security personnel. Unescorted access to TA-55 is granted only to persons possessing appropriate security clearance and meeting specific training requirements.

TA-55 is patrolled by security personnel during both operational and nonoperational hours to ensure that the gates are locked and that unauthorized entry has not occurred. The entire length of both security fences is also inspected several times each day by on-site security personnel. In accordance with 20.4.1 NMAC §270.14(b)(19)(viii) [6-14-00], the locations of the security fences, entry gates, and entry stations are shown on Figure J-1. In addition to the fence and entry gates, cliffs and canyons surrounding TA-55 provide natural barriers to discourage unauthorized entry.

Warning signs are posted on the perimeter fences at approximately 40 to 110-ft intervals and can be seen from any approach to TA-55. Warning signs are also posted at each access to the waste management units in sufficient numbers to be seen from any approach. The legends on the signs are bilingual (i.e., English and Spanish) and indicate “No Trespassing By Order of the United States Department of Energy.” The signs are legible from a distance of 25 ft. The only exceptions are in

confined areas where space is limited. Signs for confined areas may be reduced in size, but are legible to personnel who require access to these areas.

J.2 PREPAREDNESS AND PREVENTION [20.4.1 NMAC, Subpart V, Part 264, Subpart C]

The following sections present how operations at TA-55 comply with the preparedness and prevention requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C [6-14-00]. Additional information on the communication and alarm equipment available at LANL is presented in Appendix E of the most recent version of the "Los Alamos National Laboratory General Part B Permit Application," hereinafter referred to as the LANL General Part B. A list of the emergency equipment available for use at the hazardous and mixed waste management units at TA-55 is provided in Tables E-1 through E-4 of Attachment E of this document and in Table E-2 of the LANL General Part B. A videotape explaining the alarms and evacuation procedures at TA-55 must be viewed by new visitors prior to entering TA-55.

J.2.1 Required Equipment [20.4.1 NMAC §264.32]

Buildings at TA-55 are equipped with multiple audible and visual safety-alarm systems to alert personnel in the event of an emergency and to evacuate the area. These alarm systems are located both inside and outside buildings at TA-55 and are monitored and controlled by the facility monitor/control system (FMCS). The FMCS is in operation 24 hours a day and is located in the Operations Center at TA-55-4 with access through TA-55-3. Specific FMCS alarm systems at TA-55 are discussed below.

A TA-55 computer system monitors the smoke and heat sensors, fire-alarm pull boxes, and drop box push-button alarms located throughout TA-55. Fire-alarm pull boxes and/or drop box push-button alarms are located in the vicinity of the waste management units addressed in this permit application. Fire-alarm pull boxes may be used by personnel to activate a local fire alarm when a fire or other emergency is discovered. Fire-alarm pull boxes are located in TA-55-4, Room 401, and throughout the basement in the vicinity of the container storage units (CSU), storage tank system, and cementation unit. A fire-alarm pull box is readily available at TA-55-185 and on the outer west side of TA-55-4 (for personnel working at the container storage pad). Once manually activated, an alarm (a steady high-pitched tone) sounds in the TA-55-4 Operations Center and at the Los Alamos County Fire Department (LACFD). Automatic thermal alarms are also located in active gloveboxes at TA-55-4.

Buildings at TA-55 are equipped with fire-suppression alarm systems and/or smoke detectors. The fire-suppression alarms are activated when water flow is detected in the sprinkler pipes of the fire-suppression system. The smoke detectors, once activated, also sound an alarm. Both types of alarms

are area-specific and sound only in the affected area. Red lights are mounted both inside and outside of rooms and at strategic locations throughout TA-55. Upon activation of the fire-alarm system, the alarm sounds and the red lights flash to alert personnel of emergency conditions. All fire-alarm pull boxes, heat and smoke detection systems, and automatic fire-suppression systems at TA-55 are connected to the LACFD through LANL's Central Alarm Station (CAS).

A general evacuation alarm (a loud mid-range pulsating tone) is activated by gamma sensors on the ceilings of rooms on the first floor of TA-55-4 and in other areas of the basement. This evacuation alarm sounds throughout TA-55 and serves to alert personnel to evacuate. It may also be activated by the TA-55-4 Operations Center for other emergencies requiring evacuation.

Continuous air monitors (CAM) are located at various locations throughout TA-55. CAMs will be used as additional leak detection for the waste management units addressed in this permit application by detecting any airborne alpha contamination that would be present if a spill or leak of mixed waste were to occur.

TA-55-4 is also equipped with a ventilation alarm system designed to monitor air pressure and ambient air for personnel working in areas where hazardous or mixed waste is managed. The ventilation system creates zones within TA-55-4 which are at a lower pressure than the outside air. Air flows from the zones of highest pressure to the zones of lowest pressure (highest potential contamination areas). The airflow through the different zones is carefully balanced and controlled to provide the greatest protection to personnel as well as to the environment. If negative air pressure exceeds designated limits, a ventilation alarm (a slow, repeating chime sound) is activated.

In addition to the alarms described above, the public address (PA) system may also be used to announce an evacuation at TA-55. The PA system can be heard throughout TA-55 and is activated by the TA-55-4 Operations Center.

TA-55 is equipped with both local paging and conventional telephones to provide adequate communication and to summon external emergency assistance, if necessary. Local paging telephones and speakers and/or conventional telephones are located at or near the hazardous and mixed waste management units addressed in this permit application. Local paging telephones are used to page on-site personnel within the local paging area and may be used in the event of an emergency to communicate the location and nature of hazardous conditions to personnel in the area. The general evacuation alarm system at TA-55 is interrupted when the TA-55 PA system is activated through the

TA-55-4 Operations Center. Personnel working at any of the waste management units at TA-55 may also use conventional telephones to call the Operations Center to summon emergency assistance from the Hazardous Materials Response Group (S-10), local police and fire departments, and state emergency response teams, if necessary.

Fire control equipment is readily available for the waste management units addressed in this permit application. Depending on the size of the fire and the fuel source, portable fire extinguishers may be used by on-site personnel. However, LANL policy encourages immediate evacuation of the area and notification of appropriate emergency personnel. All buildings at TA-55 are equipped with heat and smoke detection systems and/or automatic, heat-activated fire-suppression systems to aid in the timely response in the event of fires in these buildings.

Fire hydrants are located on the north, south, and west sides of TA-55-4. Water is supplied to the fire hydrants by a municipal water system which provides adequate volume and pressure (i.e., greater than 1,000 gallons per minute and 90 pounds per square inch static pressure) to multiple water hoses in the event of a fire. The LACFD will supply all water hoses needed in the event of a fire at TA-55.

Spill control at TA-55-4, Room 401, and the Vault is provided by recessed floors. Self-containment pallets or cabinets provide spill control at the B40 and K13 CSUs. Additional spill control equipment is available, as needed, from S-10.

Decontamination equipment is available at TA-55 for personnel working at any of the waste management units included in this permit application. The equipment includes portable eyewash stations and safety showers. Eyewash stations and safety showers are located in Room 401 and throughout the basement of TA-55-4. Eyewash stations are also located on the Container Storage Pad and outside on the south side of TA-55-4 near TA-55-185. TA-55-185 will be equipped with an eyewash station prior to wastes being managed there. Safety showers are readily available in the following locations: TA-55-4, Room 401; in the basement of TA-55-4; on the Container Storage Pad; and outside on the south side of TA-55-4. TA-55-185 will be equipped with a portable safety shower prior to wastes being managed there. Additional decontamination equipment may be provided by S-10 personnel. Material Safety Data Sheets (MSDS) provide useful exposure information and are available in Room 401 and in the basement of TA-55-4. MSDSs will also be located in TA-55-185 prior to wastes being managed there.

J.2.2 Testing and Maintenance of Equipment [20.4.1 NMAC §264.33]

All TA-55 communications and alarm systems, fire protection, and decontamination equipment are inspected, tested, and/or maintained as provided in Attachment D of this document. The frequency of inspection is adequate to ensure proper operation in the event of an emergency. Repair and replacement of emergency equipment are performed as required.

J.2.3 Access to Communications or Alarm Systems [20.4.1 NMAC §264.34]

Whenever waste is being handled at any of the TA-55 waste management units addressed in this permit application, all personnel involved have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another individual. In the event of an emergency, communication equipment at TA-55 allows personnel to contact the TA-55-4 Operations Center, the operating group management, S-10, and/or the CAS operator. In addition to communications and alarm systems, TA-55 personnel may carry pagers so that they can be contacted by TA-55 and other LANL emergency support personnel at all times.

J.2.4 Aisle Space Requirements [20.4.1 NMAC §264.35]

Waste containers in the TA-55 CSUs are arranged in rows with a minimum aisle space of 24 inches. Storage configuration within a row depends upon the type of container, its size, and its weight restrictions. Fifty-five-gallon drums and standard waste boxes are arranged in rows and may be stacked to a maximum of ten ft high. The 85-gallon drums are not stacked. Large waste boxes may also be stacked to a maximum of two high, unless size and weight restrictions prohibit stacking due to safety concerns.

J.2.5 Support Agreements with Outside Agencies [20.4.1 NMAC §264.37(a)]

LANL maintains support agreements with outside agencies for emergency response assistance. Information regarding these support agreements is provided in Section 2.1.2.4 of the LANL General Part B.

J.3 HAZARDS PREVENTION [20.4.1 NMAC, Subpart V, Part 264, Subpart C; 20.4.1 NMAC §270.14(b)(8)]

A description of the preventive procedures, structures, and equipment at TA-55 is presented below. This information is provided in accordance with the requirements of 20.4.1 NMAC, Subpart V, Part 264, Subpart C, and 20.4.1 NMAC §270.14(b)(8) [6-14-00]. Adherence to the procedures and proper use of the structures and equipment will help to prevent hazards, undue exposure of personnel to hazardous and mixed waste, and releases to the environment.

J.3.1 Preventing Hazards in Unloading [20.4.1 NMAC §270.14(b)(8)(i)]

Flatbed trucks, trailers, forklifts, or other appropriate vehicles may be used to transport waste containers to and from the waste management units at TA-55. Forklift operators may use a boom, if necessary, to improve handling capabilities. Small containers may be handled manually or with a dolly. The use of proper handling equipment, appropriate to a container's size and weight, helps to prevent hazards while moving containers.

J.3.2 Preventing Run-On/Runoff [20.4.1 NMAC §270.14(b)(8)(ii)]

Runoff from the waste management units at TA-55 to other areas of the facility or to the environment is and will be prevented. Secondary containment is provided at each waste management unit included in this permit application where potential liquid-bearing containers are stored. Self-containment systems will be utilized at each CSU, as needed, and will be sufficient to contain at least 10 percent of the volume of potential liquid-bearing containers or the volume of the largest container, whichever is greater, pursuant to the requirements of 20.4.1 NMAC §264.175(b)(3) [6-14-00]. TA-55-4, Room 401 serves as secondary containment for the storage tank system and the cementation unit. The storage tank system and the cementation unit will have adequate secondary containment as required in 20.4.1 NMAC §264.193 [6-14-00]. Runoff control of liquids resulting from fire-suppression activities and from leaks or spills will be accomplished by using a vacuum truck, a portable pump, a high-efficiency particulate air (HEPA) vacuum, and/or sorbents, depending on the volume and location of accumulated liquid. Accumulated liquids will be removed as soon as possible.

Run-on (e.g., sheet flooding) to any of the TA-55 waste management units addressed in this permit application is and will be prevented. With the exception of the Container Storage Pad, all of the CSUs are located indoors. The container storage pad is sloped, is elevated 2 to 4 inches above ground level, and has a culvert located beneath the pad running from the northwest side to the southeast corner to provide drainage and direct potential run-on away from the pad. In addition, containers stored on the pad are covered. Pursuant to the requirements of 20.4.1 NMAC §270.14(b)(19)(xi) [6-14-00], contours and surface drainage around the Container Storage Pad, TA-55-4, and TA-55-185 are shown on Figure A-9 in Attachment A of this document. These features will prevent run-on to the waste management units at TA-55.

J.3.3 Preventing Water Supply Contamination [20.4.1 NMAC §270.14(b)(8)(iii)]

The waste management units at TA-55 are located, designed, constructed, operated, and maintained in a manner that will ensure the prevention of water supply contamination. Each unit is either located

inside a building or provided with secondary containment. In the event of a release, the materials in question will be removed as quickly as possible and packaged in an appropriate container. Given these conditions, there is little or no potential for deposition or migration of waste constituents into the groundwater or other water supplies as a result of waste-handling operations at TA-55. In addition, the depth to groundwater at TA-55 is approximately 1,200 ft (LANL, 1998) and the average annual precipitation in the Los Alamos area (including both rain and water equivalent or frozen precipitation) is 48 centimeters (cm). The evaporation of freestanding water exceeds the annual precipitation. Permeability rates for soils at TA-55 range from 1.5 to 5.0 cm per hour (cm/hr) in the top layers to 0.15 to 5.0 cm/hr in the lower layers. Available water-holding capacity ranges from 0.14 to 0.21 percent (Nyhan et al., 1978). Collectively, the depth to the regional aquifer and the annual moisture deficit significantly limit the potential for contaminants to migrate to the groundwater in the unlikely event that contaminants reach the ground surface surrounding TA-55. In addition, all water supply lines are under pressure and are equipped with backflow prevention devices. Pursuant to the requirements of 20.4.1 NMAC §270.14(b)(8)(iii) [6-14-00], no impact to water supplies is expected.

J.3.4 Mitigating Effects of Power Outages [20.4.1 NMAC §270.14(b)(8)(iv)]

Electrical power is supplied to operate ventilation systems, the PA system, various instruments, and other electrical equipment at TA-55. In the event of a power failure, portable generators are available from the Facility and Waste Operations Division support office and at TA-55-3. These generators may be used as temporary power sources at any of the waste management units within TA-55. Evacuation alarms located throughout TA-55 are equipped with a battery back up and will continue to operate for eight hours during a power failure. Operations at any of the waste management units would be discontinued temporarily if electrical power was not restored quickly or if container-handling equipment failed. Neither a power nor an equipment failure would affect containment at any of the waste management units at TA-55.

J.3.5 Preventing Undue Exposure [20.4.1 NMAC §270.14(b)(8)(v)]

To prevent undue exposure of personnel to hazardous or mixed waste, personal protective equipment appropriate for the waste being handled is worn by all on-site personnel at TA-55 involved in waste management activities at any of the waste management units. Workers involved in waste handling at TA-55 are required to wear protective work uniforms and steel-toed/composite-toed shoes, as appropriate. Hard hats and gloves may also be worn while equipment is being operated and when containers are being loaded or unloaded.

J.3.6 Preventing Releases to the Atmosphere [20.4.1 NMAC §270.14(b)(8)(vi)]

Releases to the atmosphere are not anticipated from any of the TA-55 waste management units addressed in this permit application. Containers are kept closed during handling and storage except when, upon inspection, it is determined that containers need to be overpacked or the contents repackaged in new containers or when it is necessary to add or remove waste. Inspections are conducted to ensure the integrity of all stored containers. The cementation unit, located in TA-55-4, Room 401, is operated within a vacuum-pressured glovebox equipped with HEPA filters. This system prevents the release of any airborne contaminants from TA-55. The ventilation alarm system and/or other air monitoring equipment are located in the vicinity of the waste management units located in TA-55-4. In the event of an unexpected release, all personnel working within or near the area would be notified immediately to evacuate.

J.4 RECORDKEEPING REQUIREMENTS

Recordkeeping requirements applicable to the TA-55 CSUs, the storage tank system, and the cementation unit consist of the biennial report, unmanifested waste report, and additional reports. These reports are discussed in Section 2.6 of the LANL General Part B.

J.5 REFERENCES

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Nyhan, J.W., L.W. Hacker, T.E. Calhoun, and D.L. Young, 1978, “Soil Survey of Los Alamos County, New Mexico,” LA-G779-MS, Los Alamos National Laboratory, Los Alamos, New Mexico.

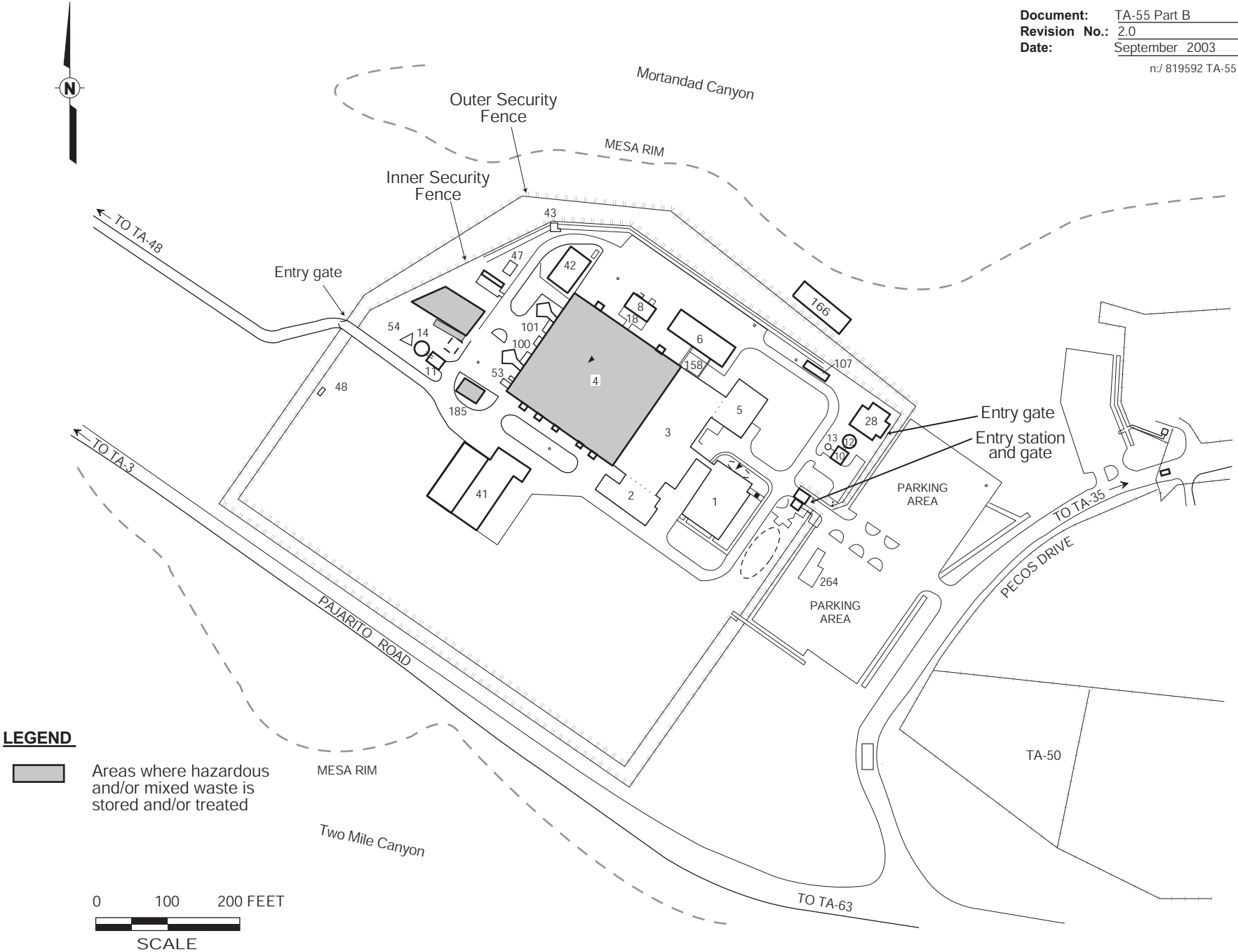

Figure J-1

Location Map Showing Security Fences, Entry Gates, and Entry Station at Technical Area (TA) 55