TA-16

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

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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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Technical Area 16 (TA-16) RCRA Part B Permit Application: Subject Matter Clarification (September 2000), Notice of Deficiency (January 2000), and Notice of Deficiency (August 2002)

Technical Area 16 (TA-16) RCRA Permit Application Documents Chronology	
Document Title	**Date**
"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	June 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 2.1	April 1996
"Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Document," Revision 3.0	January 2000
"Subject Matter Clarification: Technical Area (TA) 16 Part B Permit Renewal Document, Revision 3.0, Los Alamos National Laboratory," Draft	September 2000[a]
"Response to Notice of Deficiency; TA-16 Part B Application Revision 3.0, January 31, 2000," LA-UR-02-0890	February 2002
"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	August 2002
"Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Application," Revision 4.0, LA-UR-03-3903	June 2003

NMED Comment	Location of Response or Rationale for Not Incorporating in Application
September 2000 Subject Matter Clarification (SMC)[a]	
1. Ash management	Incorporated into G.2.3
2. Number of treatment devices that could operate simultaneously	Incorporated into G.2.1
3. Temperature levels/time to achieve HE degradation	Incorporated into G.2.1
4. Wetting of the burn area	Incorporated into G.2.3
5. Known soil contamination	Sources of soil contamination from legacy operations are discussed in Section 4 of the application. A surface water monitor was installed just downgradient of the TA-16 Burn Ground and the data included in Section H.2.4.

Technical Area 16 (TA-16) RCRA Part B Permit Application: Subject Matter Clarification (September 2000), Notice of Deficiency (January 2000), and Notice of Deficiency (August 2002)

NMED Comment	Location of Response or Rationale for Not Incorporating in Application
6. Air, surface and groundwater quality	The air modeling data has been incorporated into Supplement H-1. The surface water sampling has been incorporated into Attachment H, Section H.2.5. Groundwater has been covered in Attachment H, Section H.2.4.
7. Flora, fauna, and physical structure	Addressed in General Part B
8. Floodplain standard	Addressed in Section A.3.2.
9. Location of contingency plan	The contingency plan is kept at the facility.
10. Closure – sampling of media other than soil Will be addressed if post-closure is required.	
11. Waste staging	Addressed in revised Section G.2.2
January 2000 Notice of Deficiency	
1(a) Quantify and provide physical and chemical characteristics of waste	Year 2000 waste quantities, characteristics and emissions were provided. Emissions will be added to the modeling write up provided in the NOD and the write up will be included in Attachment H of the application.
1(b) Remove all hazardous waste and waste residue at closure	Incorporated into the closure plan – Attachment F of the application.
1(c) All waste burned must have the potential to detonate	Justification provided by waste stream. A statement was added in Section G.2.3 that only high explosives (detonation rate > speed of sound) are burned.
1(d) Document distance from open burning to property of others	Covered in Attachment G.2.1 and Map 5 in Attachment A of the application.
2. Alternatives to open burning	None of the alternatives studied have proven effective. If alternatives are found in the future, certain waste streams could be treated by other methods. It would be appropriate to cover them at the time a RCRA permit application for alternative treatment is submitted.
3. Why the sand filters do/do not meet the definition of a tank	This is no longer an issue with the closure of the sand filters.
4. Submit the Stormwater Pollution Prevention Plan (SWPPP).	The plan was submitted in the NOD. The location of the storm water monitoring and the data are addressed in revised Section H.4.
5. Proposal for remediating ground water, specifically the barium and HE detected at R-25 This will be addressed by corrective action/compliance order.	
6. Demonstrate compliance with §§264.601 performance standards for deposition of ash or entrained particles	Include the modeling analysis with emissions and comparison to soil screening levels (SSLs) and ecological screening levels (ESLs) in Attachment H of application.
7. Combine TSDF information in Attachments G (TA-16-88) and H (TA-16 Burn Ground) with Section 2	Rationale was given for not combining the sections.

Technical Area 16 (TA-16) RCRA Part B Permit Application: Subject Matter Clarification (September 2000), Notice of Deficiency (January 2000), and Notice of Deficiency (August 2002)

NMED Comment	Location of Response or Rationale for Not Incorporating in Application
8. Combine/revise Tables 1-1 and H-1 to identify the exact section where each requirement is addressed The tables have been revised but not combined. Rationale was provided for leaving them separate.	
9. Incorporate the revised closure plan from the September 2000 SMC into the application	The revised closure plan was incorporated into Attachment F of the current application.
10. Provide a sampling and analysis plan (SAP) in the closure plan	NMED is addressing this in the permit.
11. Describe measures if a closed open burning unit is impacted by an active OB unit	The air modeling analysis showed that deposition is not an issue.
12. Revise the closure plan for TA-16-88 to include swipe sampling rather than sampling the rinse water	TA-16-88 is no longer in the application and no action is necessary.
August 2002 Notice of Deficiency	
1. Add additional constituents of concern to the closure plan	NMED is addressing this in the permit.
2. Change the halogen emission factors	LANL provided a justification for the emission factor used.
3. Provide a halogen estimate for 2001	The estimate was provided (5.7 pounds of chlorine and 11 pounds of fluorine. This estimate is less than half of the 2000 estimate used for modeling.
4. Specify constituents for each waste steam treated at the TA-16 Burn Ground	Tables were provided summing data by waste profile form for 2000, the same year used for the first NOD. Waste profiles change each year and are not appropriate for inclusion in a permit application.
5. If an alternate demonstration is proposed for closure, a permit modification must be requested	NMED is addressing this in the permit.
6. Post closure care is not an option	NMED is addressing this in the permit.
7. Provide additional information on why solvents need to be burned.	At this time, there is no alternative to burning. DX and ESA are looking for alternatives to burning solvents (e.g., distillation and reuse).
8. Provide more information for why there are not viable alternatives for burning explosives	Information was provided. If a method is found, a permit application for alternative treatment will be submitted.
9. The sand filters cannot be removed from the application	The application no longer includes 401/406.
10. Indicate the location of E257 stormwater monitoring stations	The figure showing the location of the monitoring station in the current SWPPP will be added to Attachment H (Figure H-1).
11. Additional requirements for stormwater	This will be addressed by water quality/compliance order.

NMED Comment	Location of Response or Rationale for Not Incorporating in Application
monitoring	
12. Install a run-on stormwater station upgradient of the Burn Ground	This will be addressed by to water quality/compliance order.
13. Clarify the Canon de Valle data	LANL clarified that the Burn Ground does not discharge directly into Canon de Valle at the Burn Ground location, etc. The clarification was incorporated into Section H.4 of the application.
14. Legacy contaminants from the Burn Ground may be affecting the Fish Ladder seep	A description of legacy contamination contributed by the Burn Ground and the TA-16-340 operations are addressed in Section 4.
15. R-25 data are not acceptable due to defective installation of the well	The application does not use post well installation data from R-25.
16. NMED believes that the Burn Ground is contributing to the contamination of the uppermost aquifer	The stormwater data will be added in Attachment H.2.4 to show surface water impacts. The limited data show that the impact on surface water is very small and the impact on groundwater should be even smaller. The corrective action for legacy contamination will be addressed in the corrective action portion of the LANL permit.
17. Justify emission factors used for combustibles	LANL provided justification.
18. Clarify 95% efficiency for the propane burners	Best technical judgment was used. A lower efficiency does not affect the soil screening level/ecological screening level (SSL/ESL) impact analysis.
19. Clarify why the M31A1E1 emission factor was used	LANL provided the justification.
20. Clarify why the conversion factor for converting total metal data to TCLP was not consistent	There was a typographical error in the table. It was corrected. The change did not affect the SSL/ESL analysis.
21. Submit an example of the calculation for metals emitted	The calculation was provided.
22. Submit a topographical map or plot of the modeling domain used for the first NOD response	A map was provided and will be incorporated into the modeling write up.
23. Explain the hand calculations used to bound the modeling provided in the first NOD response	The conservative hand screening was intended to provide an upper bound (orders of magnitude overestimate) for comparison purposes with the EPA model's results. The discussion of the hand screening should be deleted from the modeling write up to avoid future confusion.
24. Clarify text regarding the screening value 0.01	Clarification was provided. This was another check used and should be deleted from the modeling write up to avoid confusion.
25. Explain why a 3 km by 3 km rather than a larger modeling domain was used	The 3 km by 3 km grid was based on air quality modeling that showed that the highest impacts occurred within 0.5 km of the Burn Ground.

Technical Area 16 (TA-16) RCRA Part B Permit Application: Subject Matter Clarification (September 2000), Notice of Deficiency (January 2000), and Notice of Deficiency (August 2002)

NMED Comment	Location of Response or Rationale for Not Incorporating in Application
26. Provide a reference to CALPUFF	The reference was provided and will be incorporated into the modeling analysis.
27. NMED questioned why a limited number of constituents were used in the CALPUFF analysis	CALPUFF does not provide deposition rates for all pollutants. Therefore, particulate matter was used to represent particles, oxides of nitrogen were used to represent the inorganic acids/bases that would volatilize, and toluene was used to represent the organic solvents. Incorporate this response into the modeling write up.
28. Why was a 0.02 meter per second deposition velocity used instead of a 0.03 velocity	The 0.02 figure is a published quantity (as is the 0.03 velocity) that was used as a reality check for the model. Delete the reality check from the modeling write up to avoid confusion.
29. Correct a typographical error from grams per cubic centimeter to grams per meter	The typographical error will be changed and incorporated into the modeling write up.
30. Provide a sample calculation	The calculation was provided and will be incorporated into the modeling write up.
31. Provide a reference for SSLs and ESLs	The reference was provided and will be incorporated into the modeling write up.
32-35 Provide additional information on input to modeling	The additional information was provided and will be incorporated into the modeling write up, except for the extensive modeling input/output files. The input/output files have already been provided to NMED.
36. Include an estimate of the waste to be treated during the active life of the unit	LANL incorporated the waste data into Attachment F of the application.
37. Revise the application to show in the closure plan to which off-site facility each waste type would be sent	Facilities used to dispose wastes change with time and will be dependent on the characteristics of the waste.
38. Revise the application to provide a less detailed SAP. The detailed SAP will be completed just before closure	LANL made this change in Attachment F of the application.
39-40. NMED requested a number of changes to the closure plan	The closure plan (Attachment F in the application) has been revised to incorporate these changes.

[a] The SMC issued by the New Mexico Environment Department Hazardous Waste Bureau was never finalized and, thus, a copy is not included in this package. However, the issues contained therein were addressed, as appropriate, in subsequent revisions to the TA-16 Part B permit application.

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for Ralph E. Erickson
Manager

OFO:1GT-020

Enclosure

cc w/enclosure:
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Permits Management Program
Hazardous Waste Bureau
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Laurie King (6PD-N)
New Mexico/Federal Facilities Section
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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:
Los Alamos National Laboratory
Risk Reduction and Environmental Stewardship Division
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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.

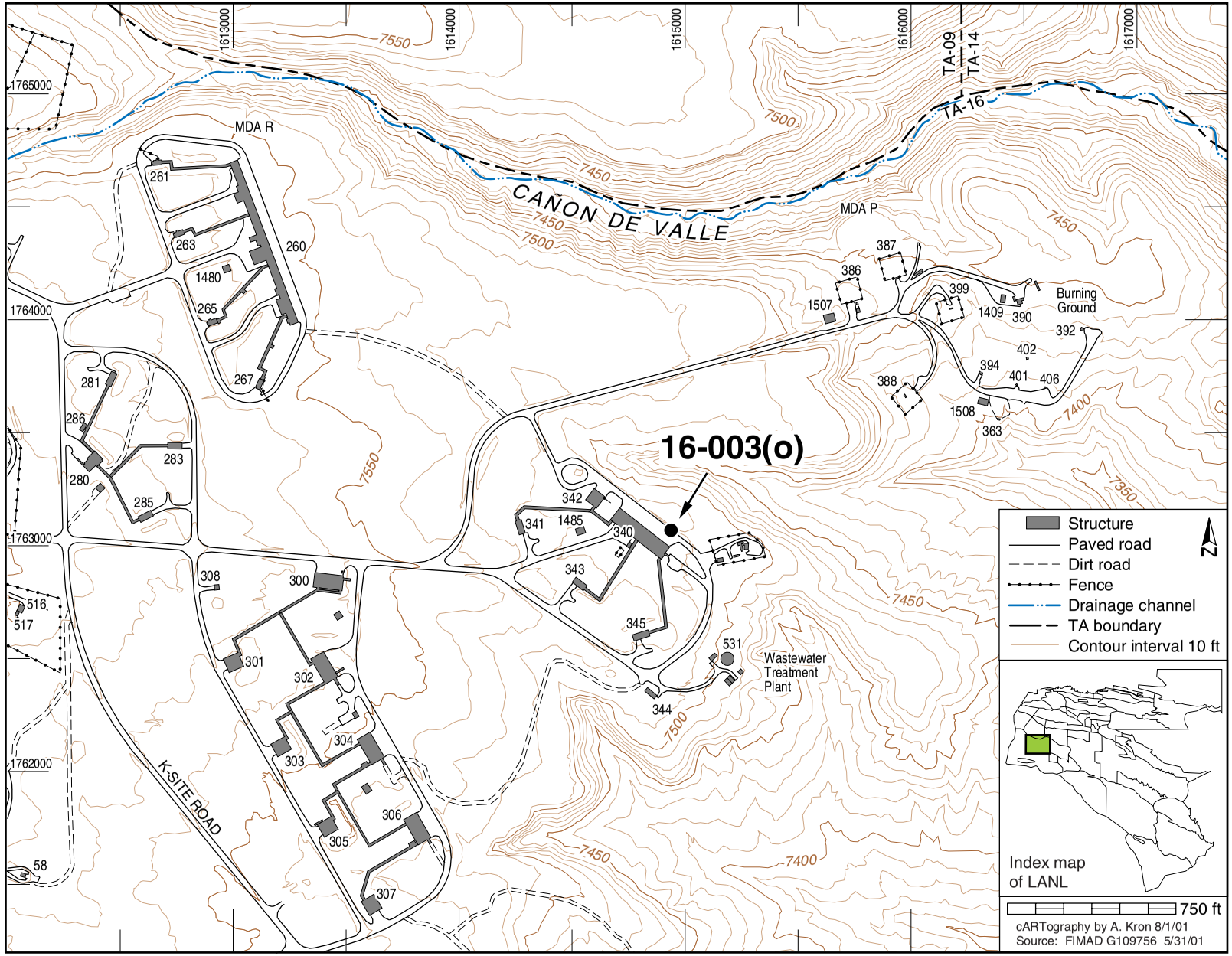
Analytical Suite	Analyte	Maximum Concentration	CY2002 SAL (Residential)
HEs	Amino-2,6-dinitrotoluene[4-]	1.07 mg/kg	N/A
	RDX	40.7 mg/kg	4.4 mg/kg
Inorganic chemicals	Arsenic	68.3 mg/kg	0.39 mg/kg
	Iron	44,400 mg/kg	23,000 mg/kg
SVOCs	Benzo(a)anthracene	26 mg/kg	0.62 mg/kg
	Benzo(a)pyrene	26 mg/kg	0.062 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).

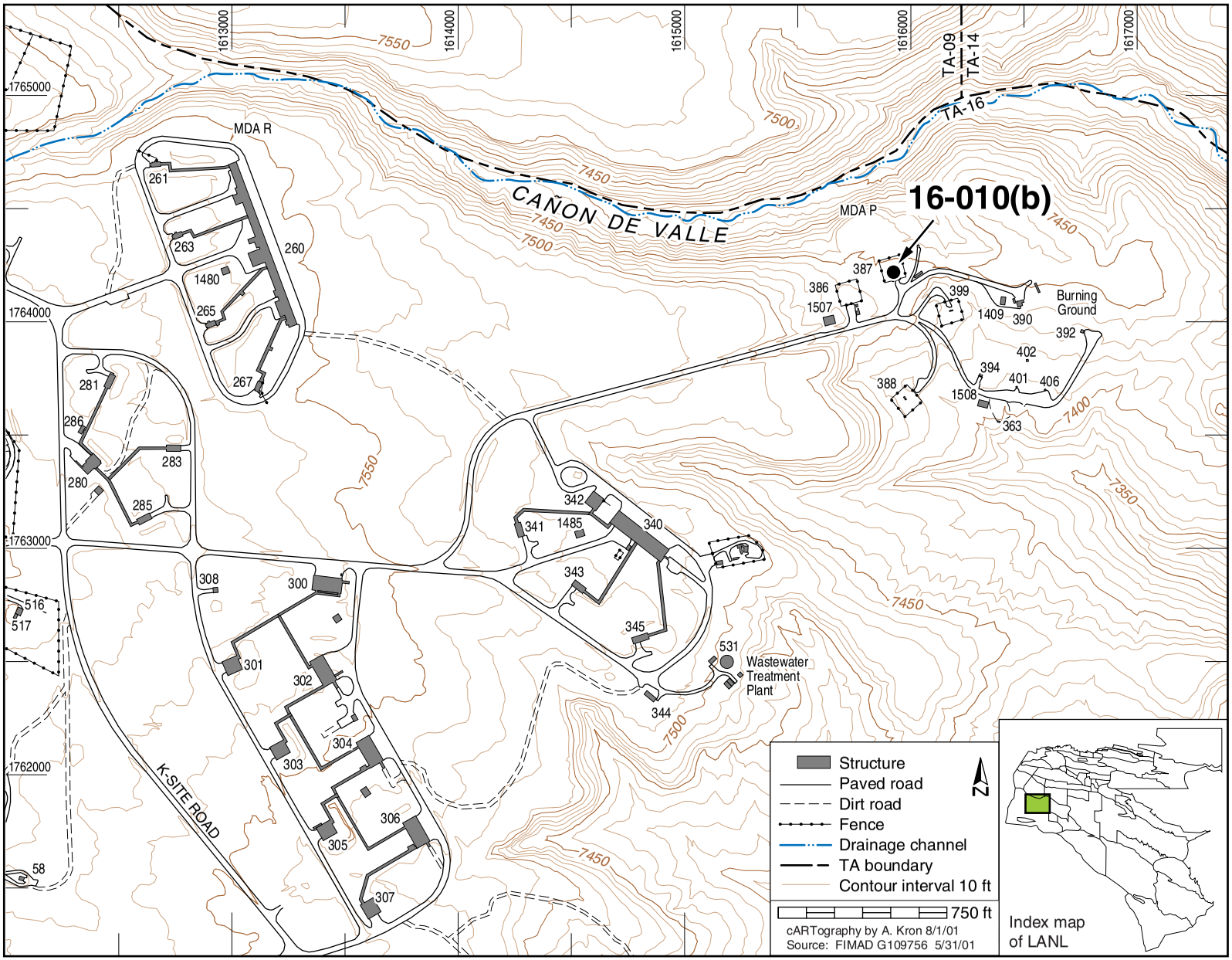
References

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
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308
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302
303
304
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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.

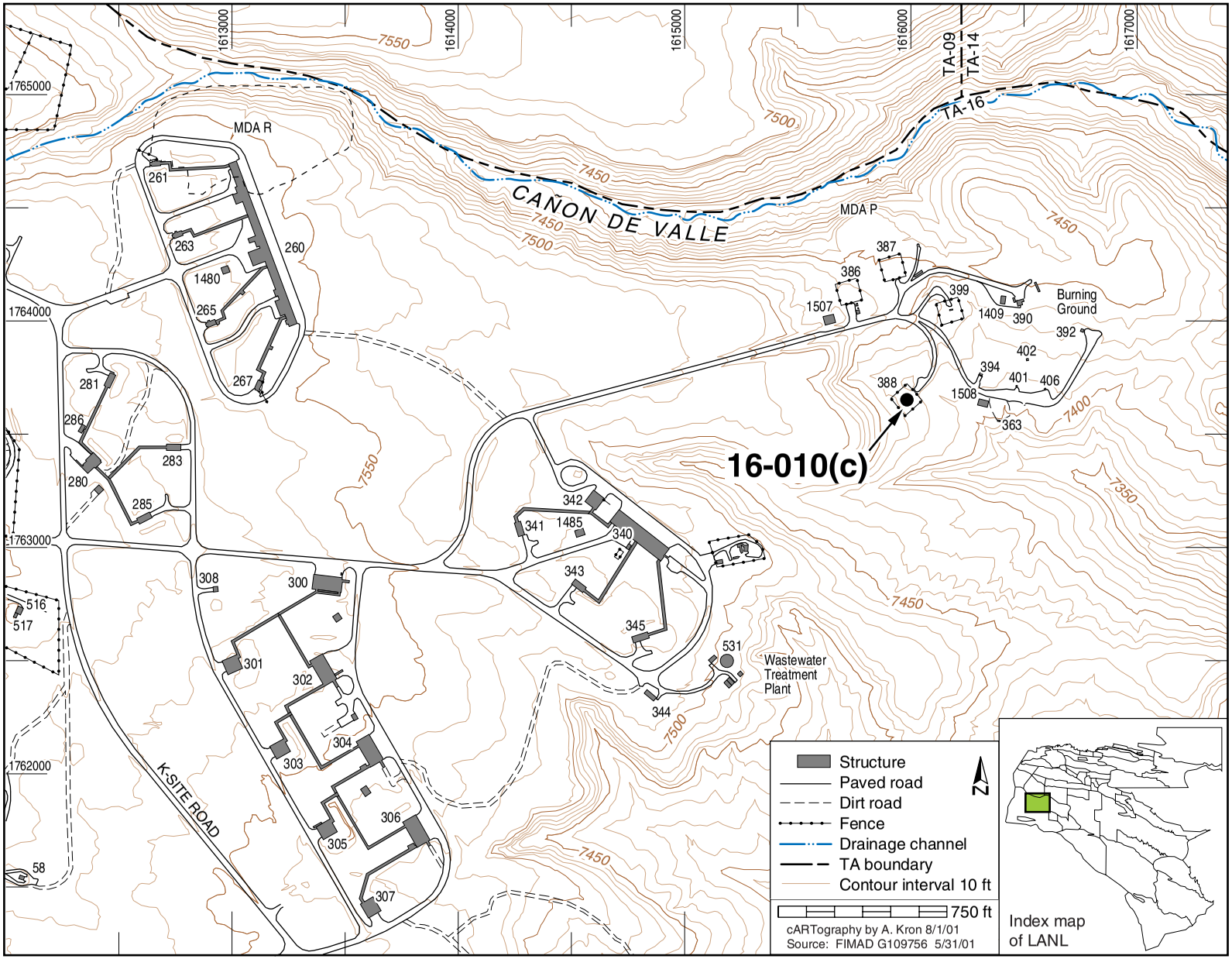
ER Project Sampling Summary

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
263
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1480
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286
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1485
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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

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.

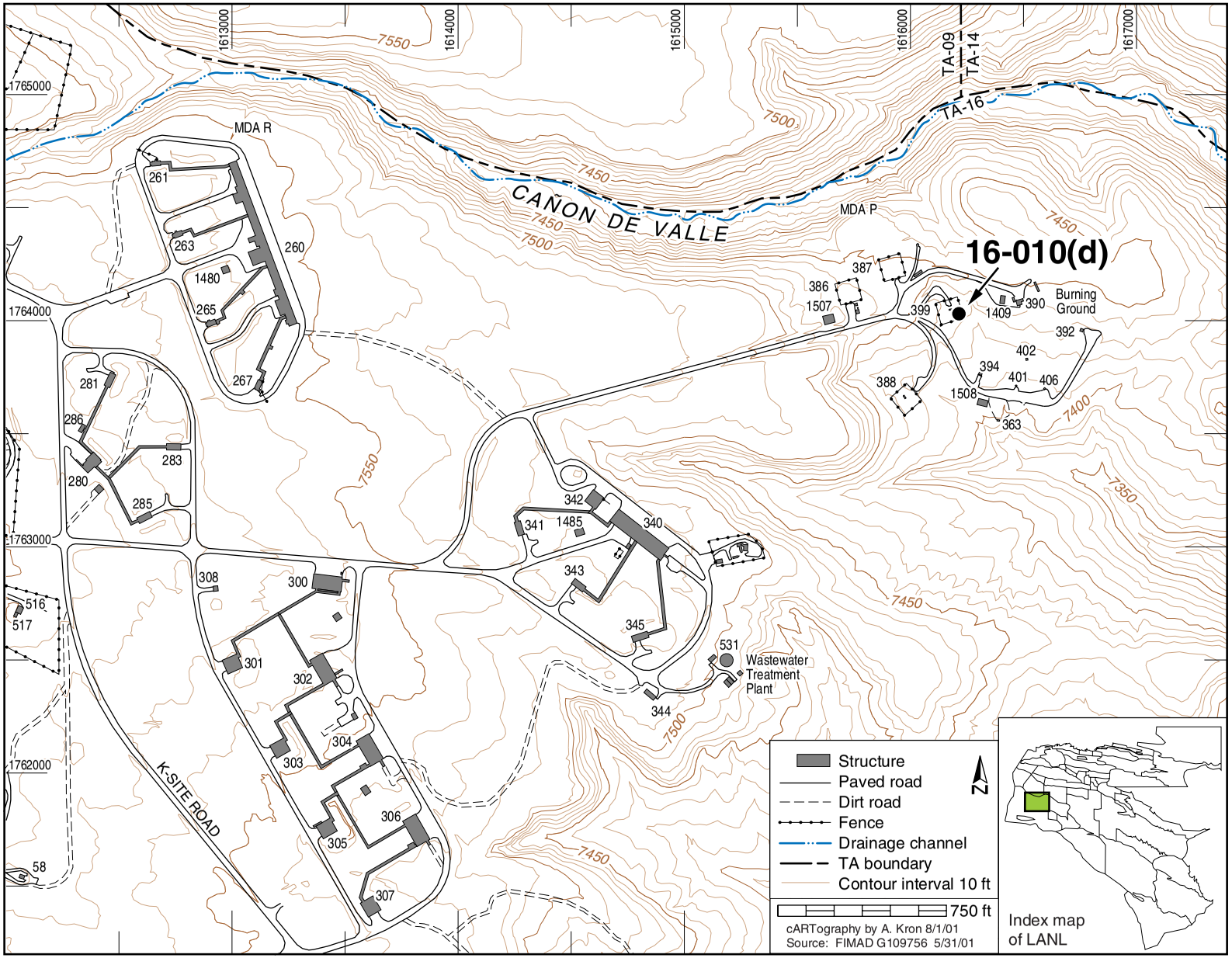
ER Project Sampling Summary

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
261
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1480
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531
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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
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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.

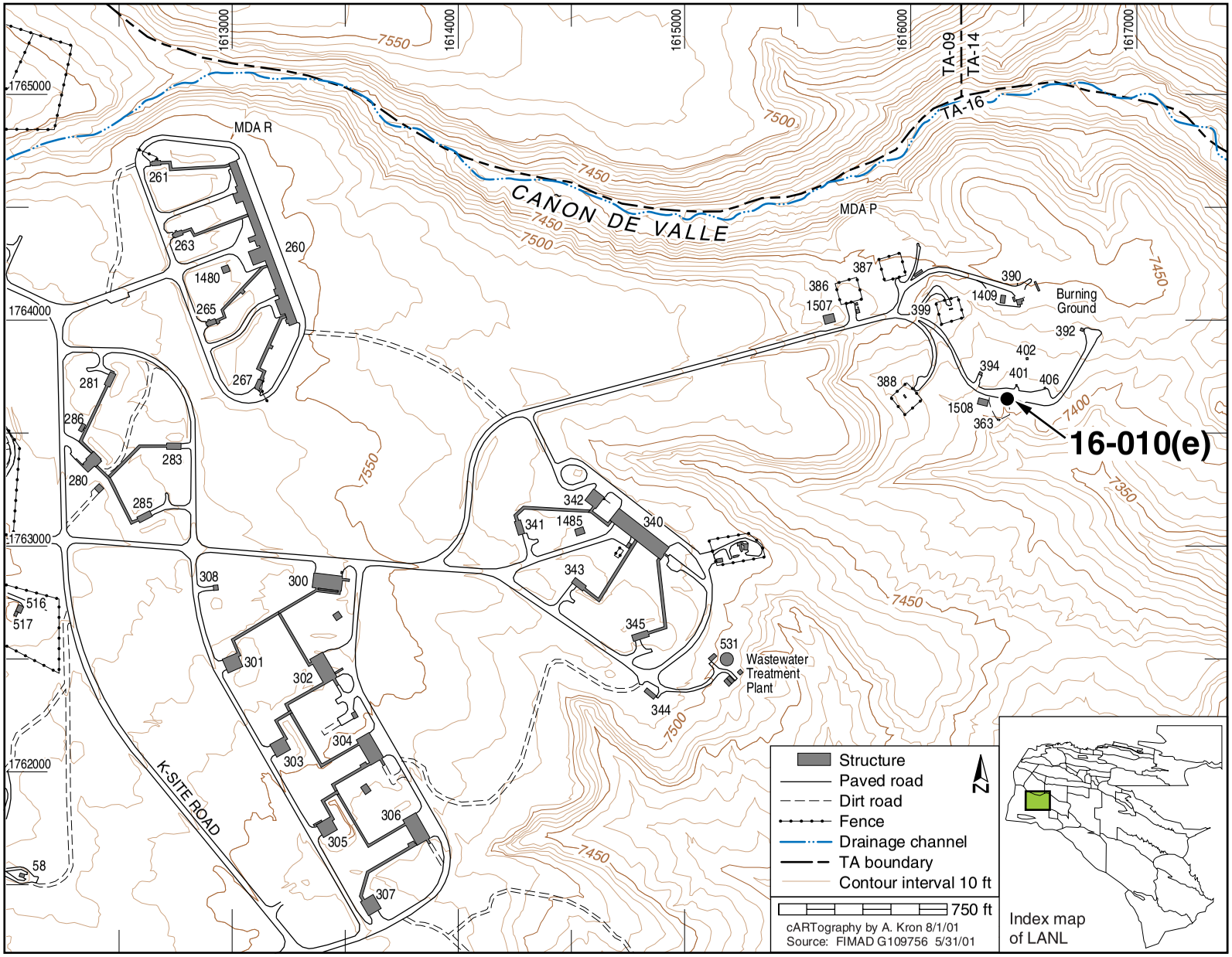
ER Project Sampling Summary

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
1616000
1617000
1765000
1764000
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1762000
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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
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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.

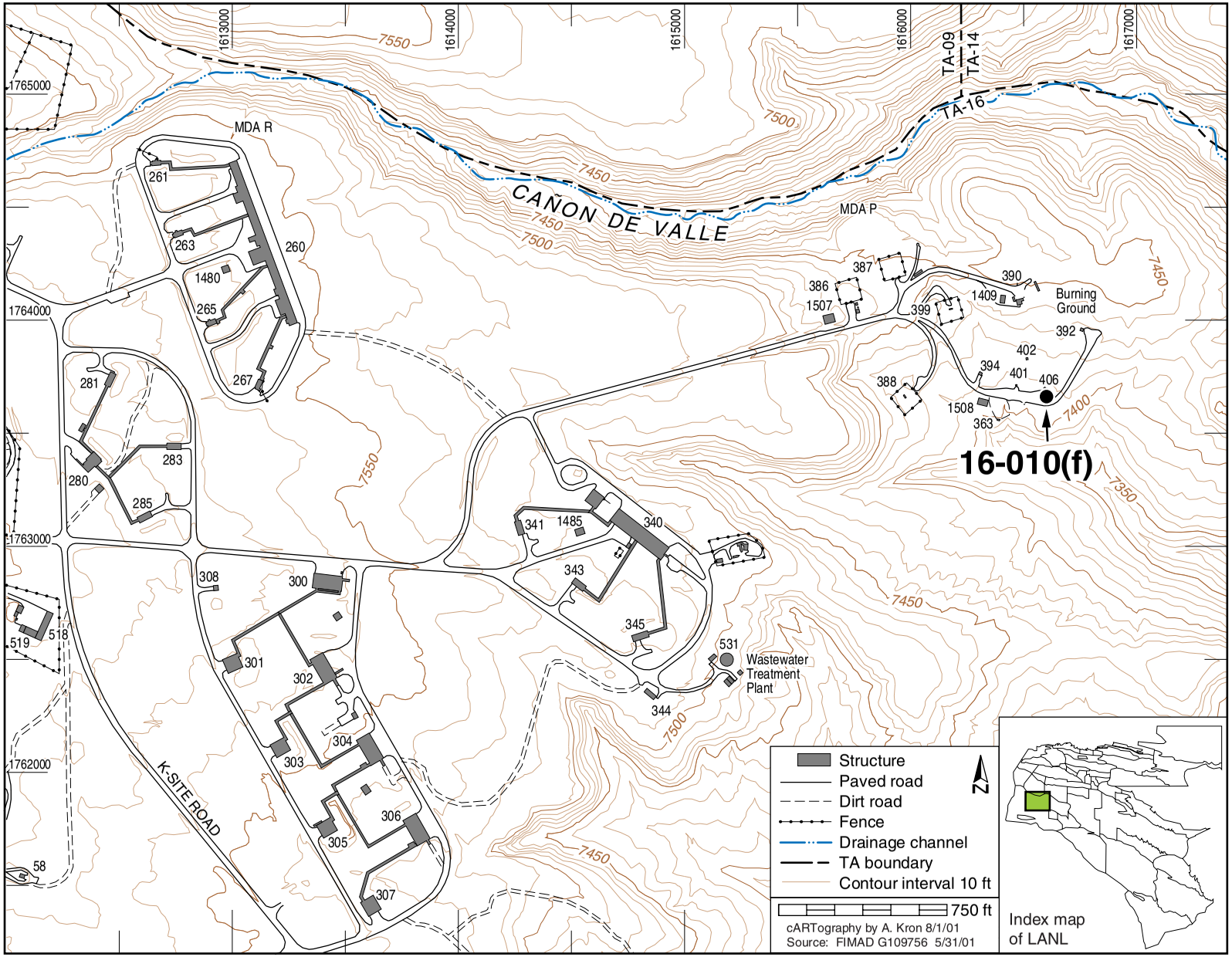
ER Project Sampling Summary

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
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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

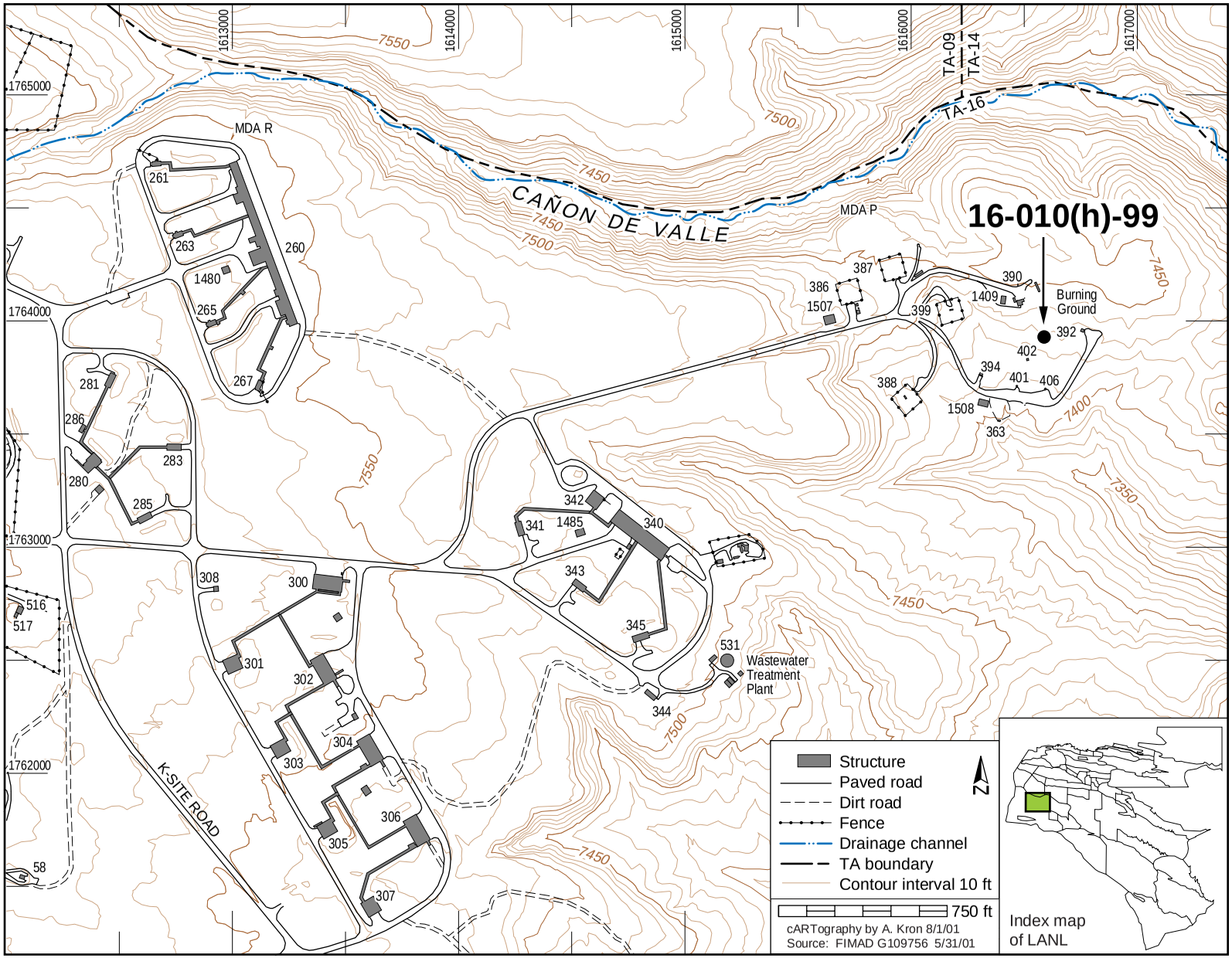
RFI Work Plan for Operable Unit 1082 — LA-UR Number: 93-1196

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
1617000
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1764000
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1762000
7550
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7400
7350
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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
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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

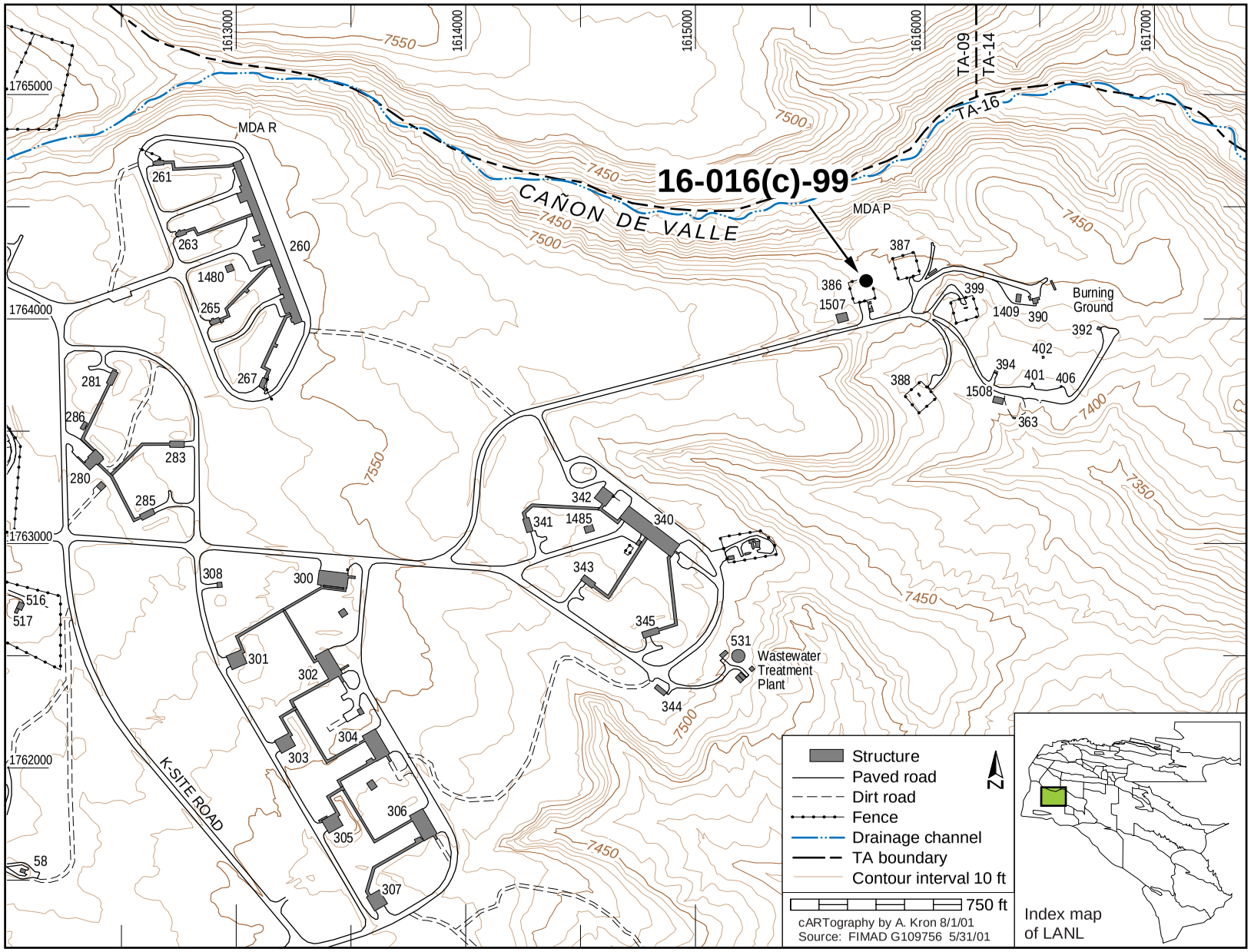
Results from analytical samples collected at this site are reported with SWMU 16-018 (MDA P).

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
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
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281
286
283
280
285
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301
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307
516
517
58
342
341
1485
340
343
345
344
531
386
1507
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
750 ft
N
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

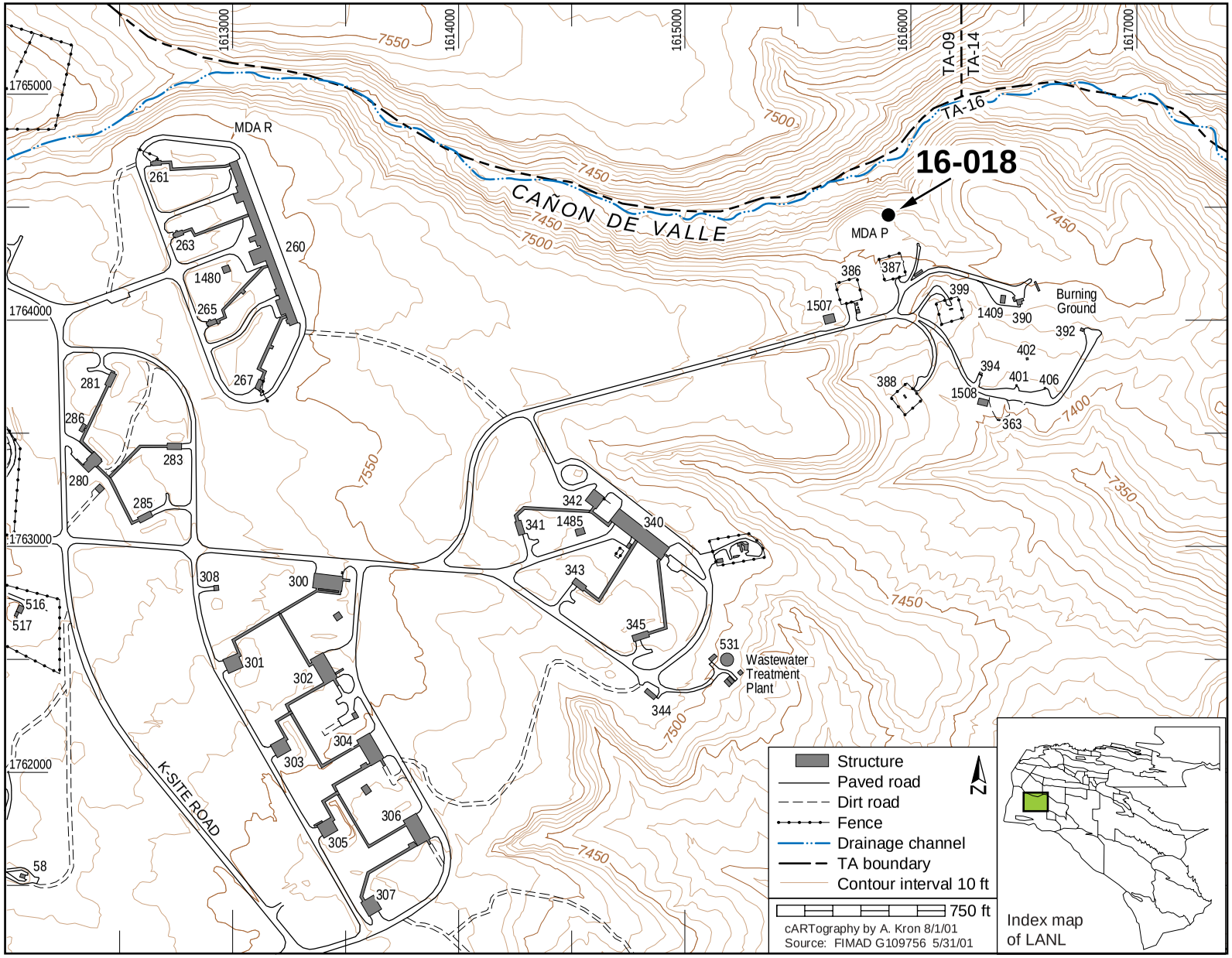
Preparing staging areas (SWMU 16-018)

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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A-9	Drainage Control Features for 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
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.

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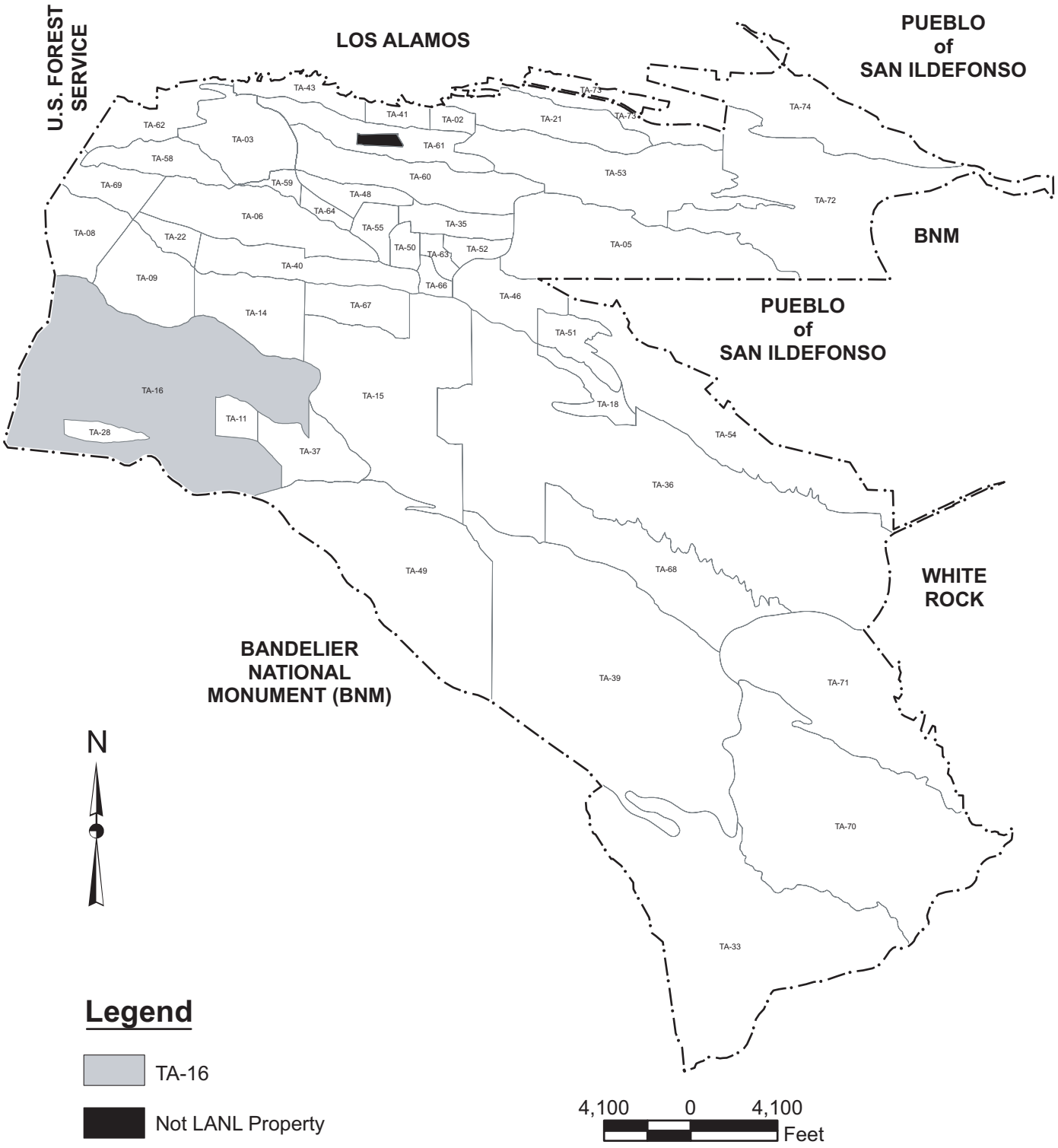

Figure A-1

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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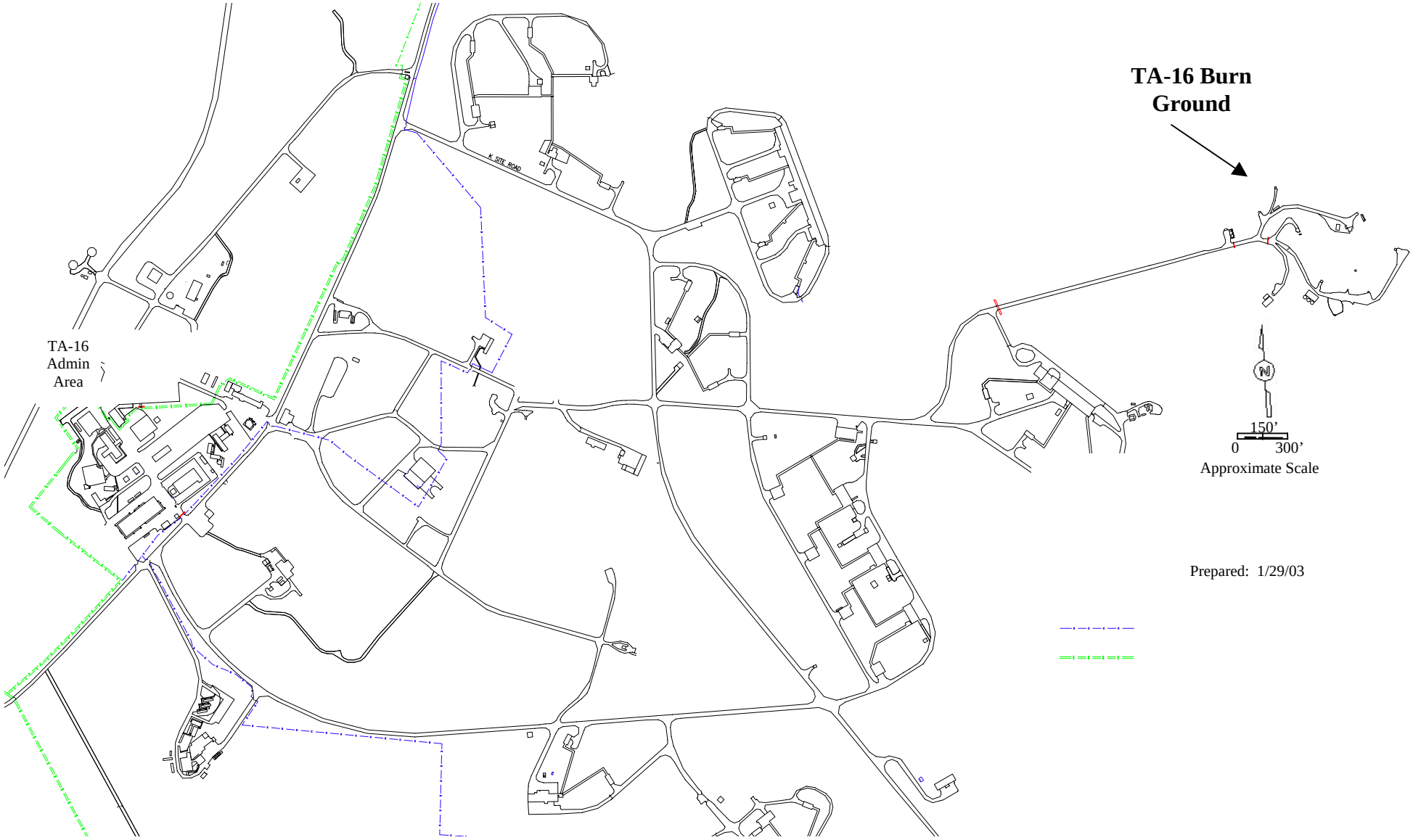
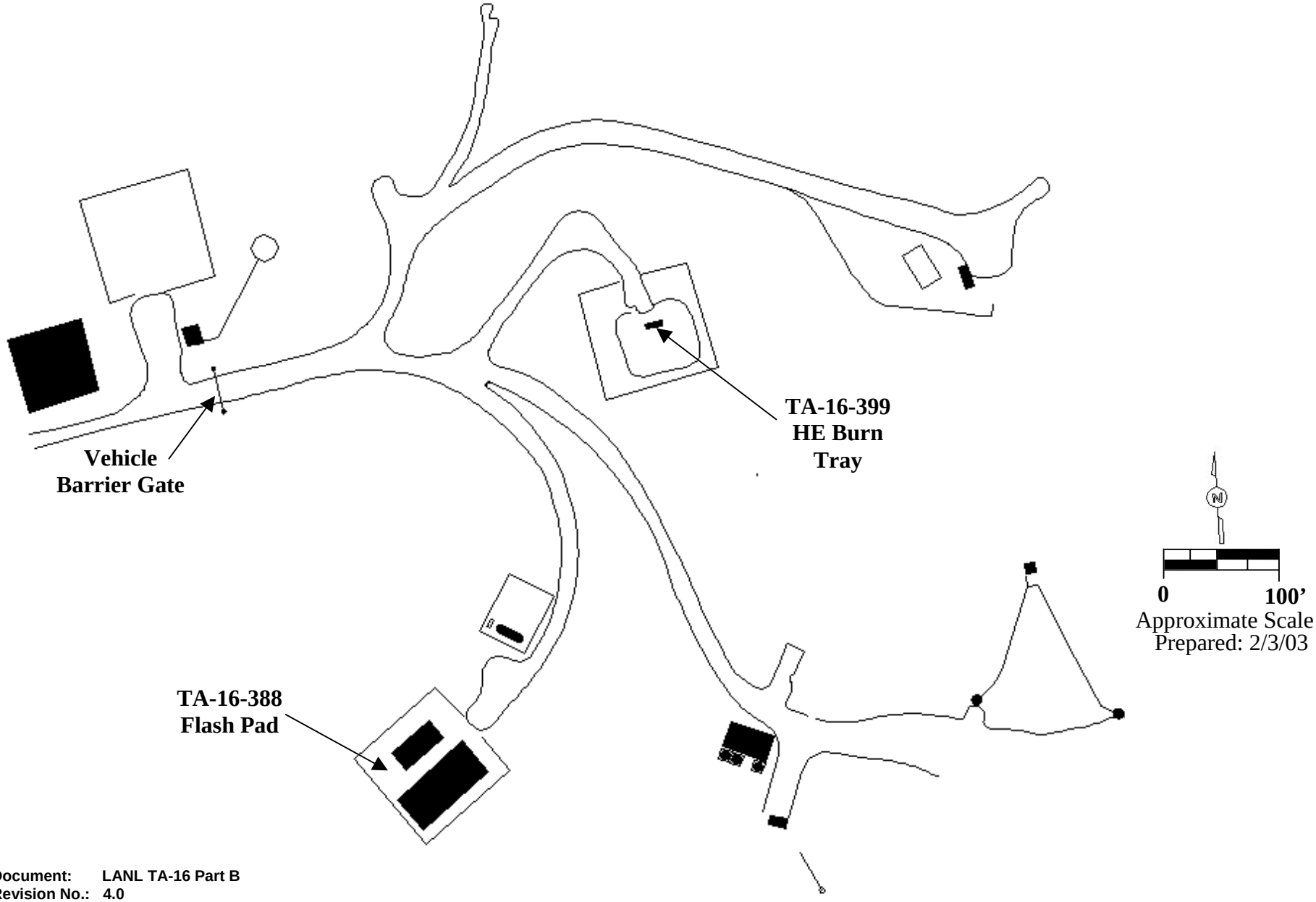


Figure A-2

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

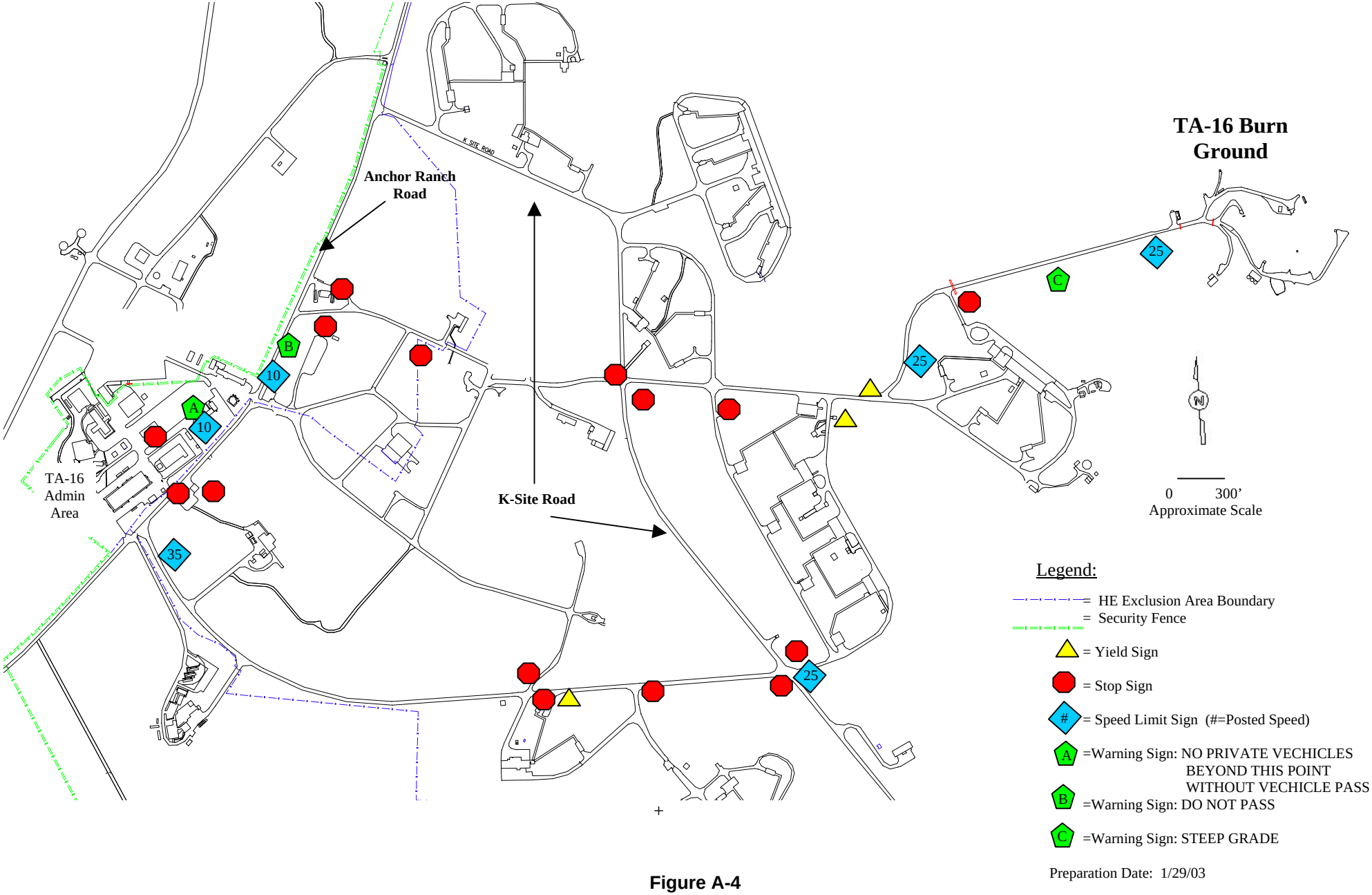
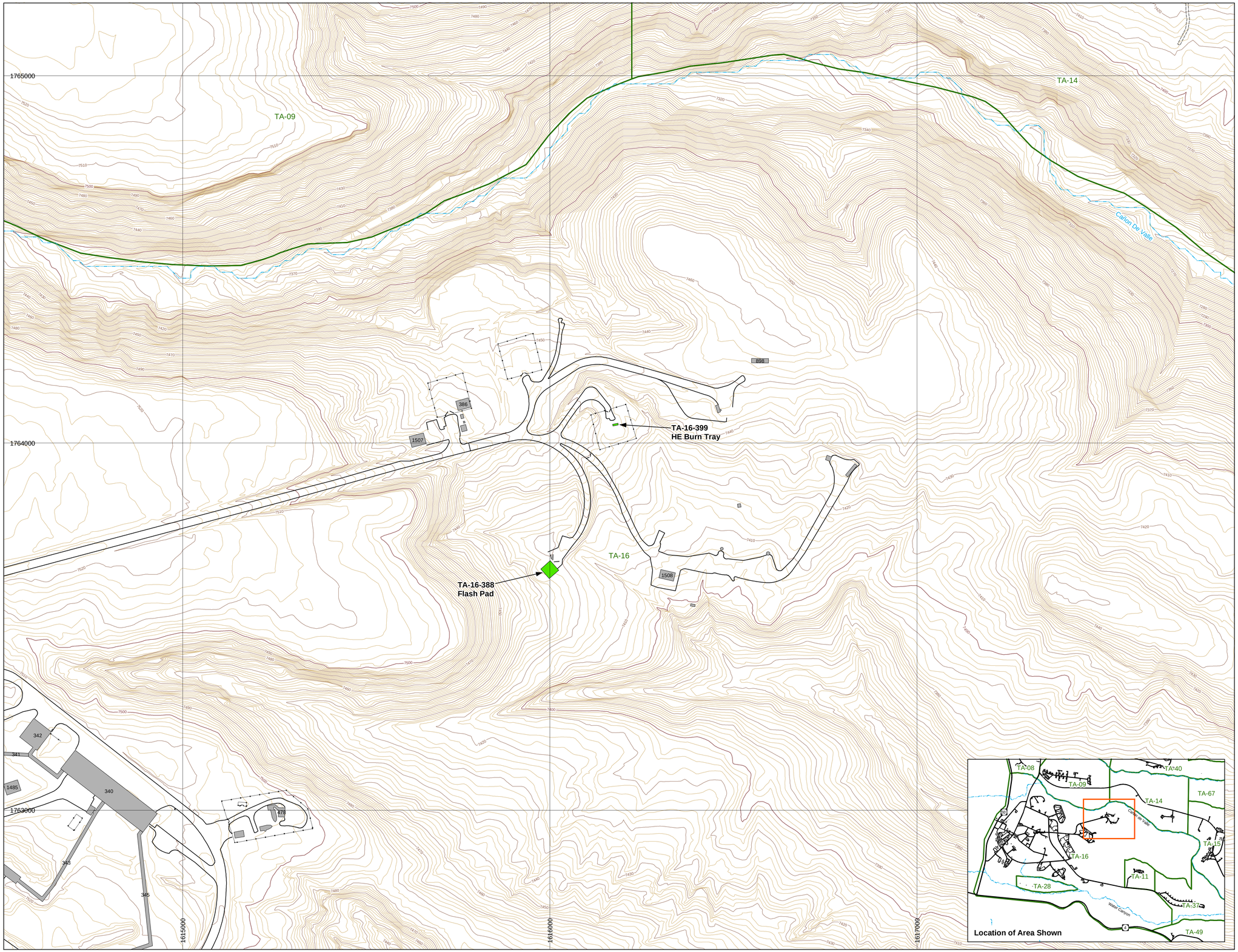


Figure A-4

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

Contours, 10 foot; Los Alamos National Laboratory, RRES-R, NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_010_arc

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Contours, 2 foot; Los Alamos National Laboratory, RRES-R, NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_020_arc

Contours, 20 foot; Los Alamos National Laboratory, RRES-R, NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_002_arc

Fences; Los Alamos National Laboratory, FWO, NA; Unknown; 20020912; Provided by RRES-R SDE server, sde.DBO.fences_arc

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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

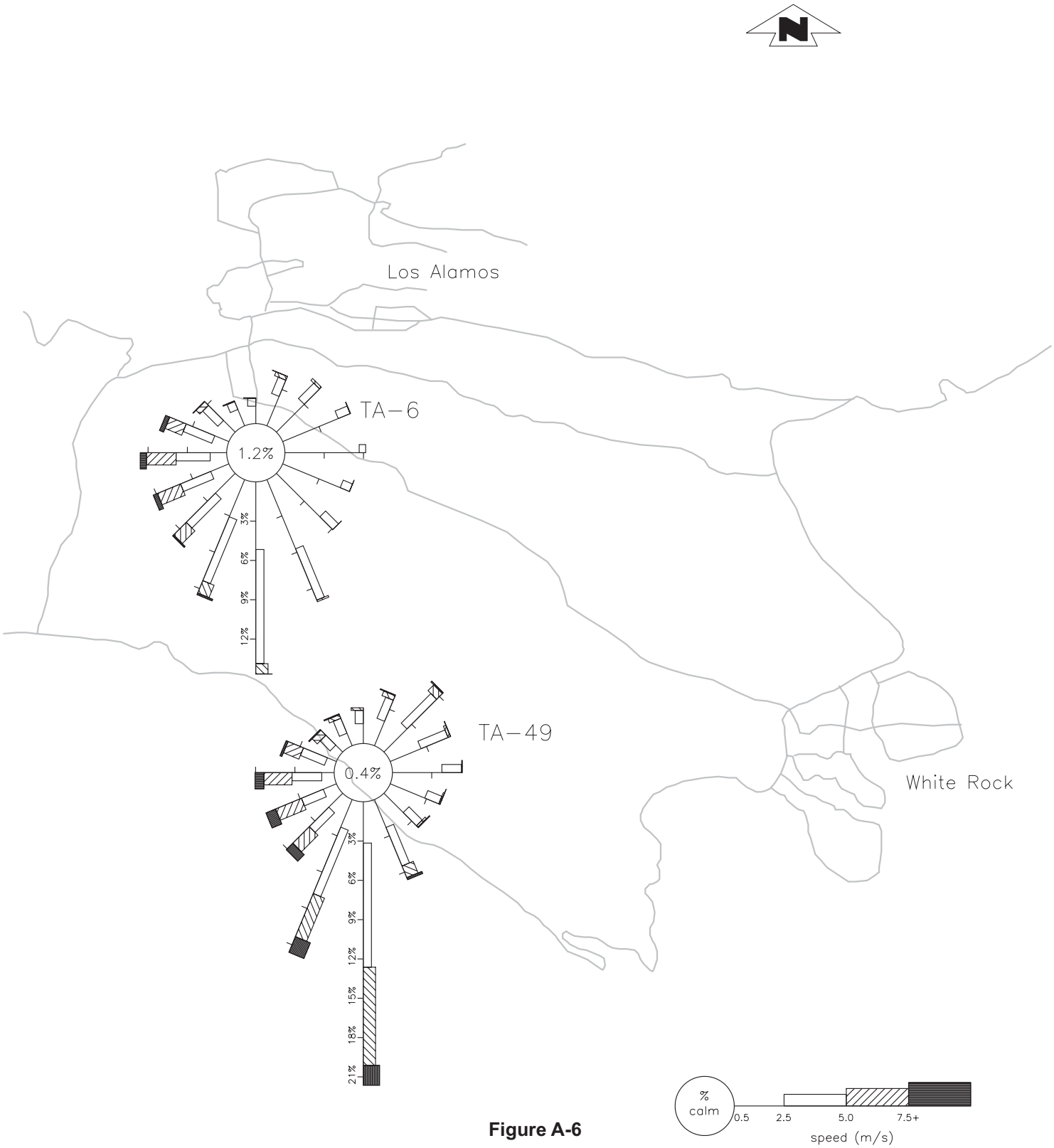

Figure A-6

Annual Wind Roses for Los Alamos National Laboratory -- Daytime (2002)

2002 Windroses, Nighttime

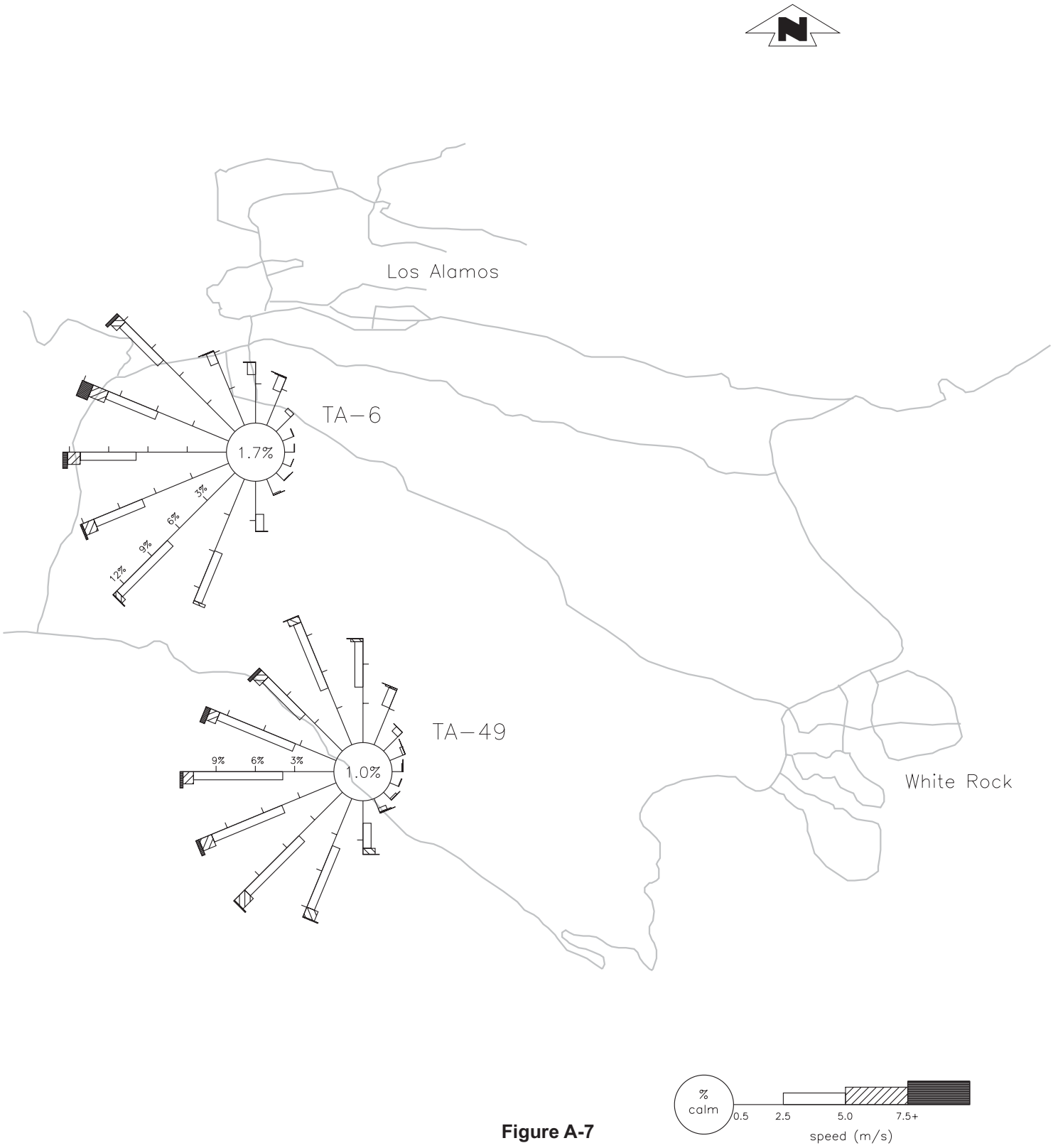

Figure A-7

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

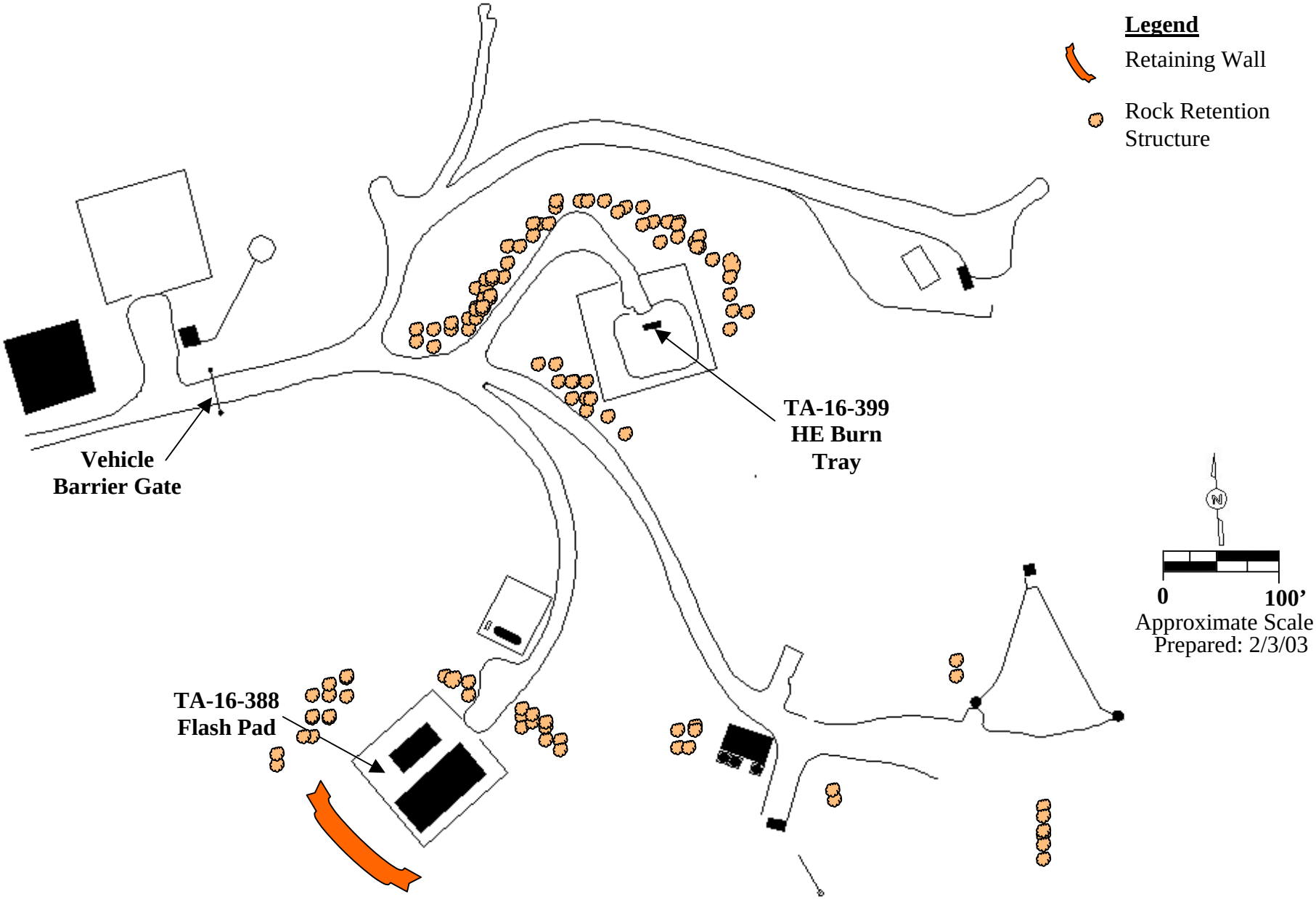

Figure A-9

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	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.

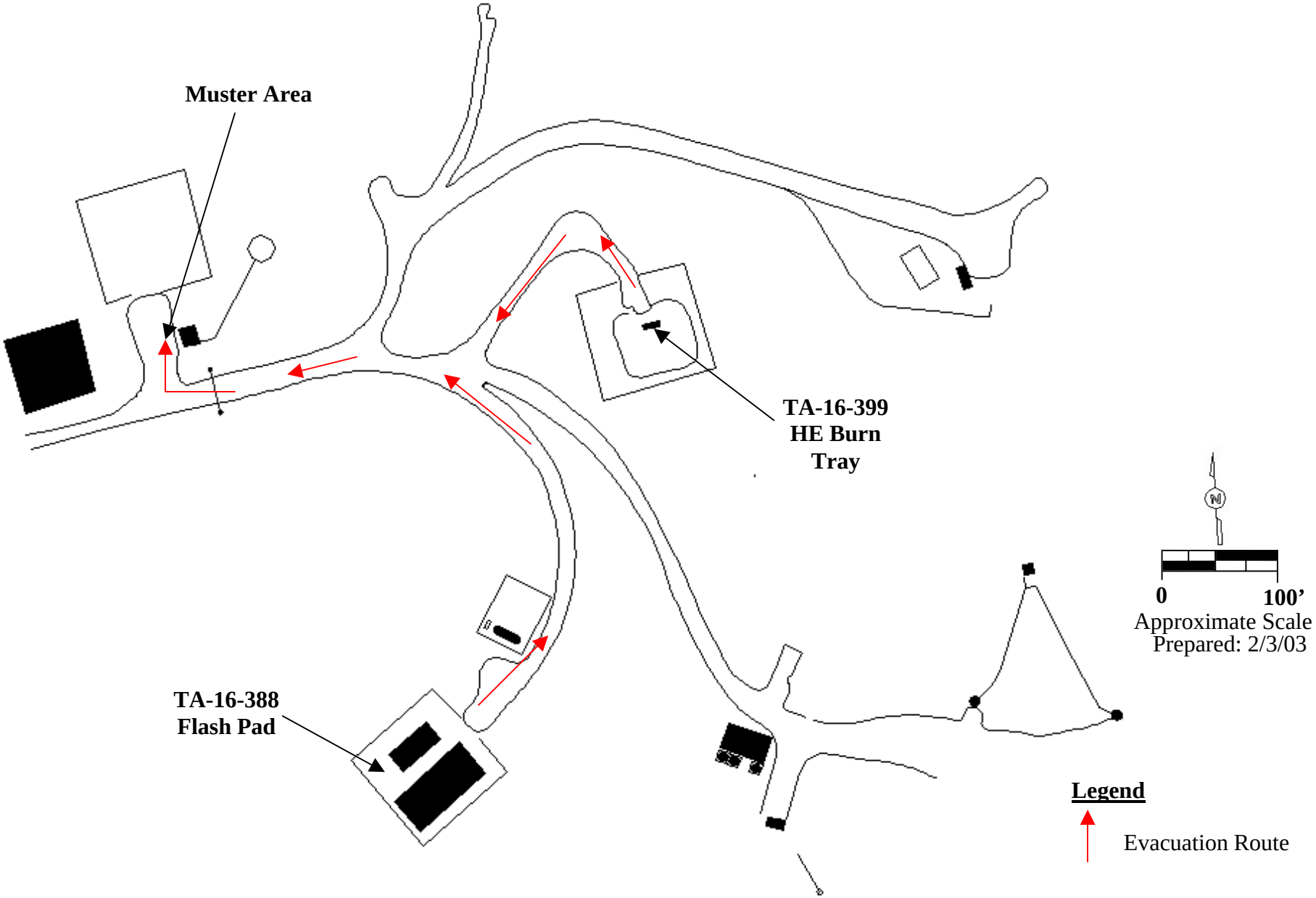

Figure E-1

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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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.

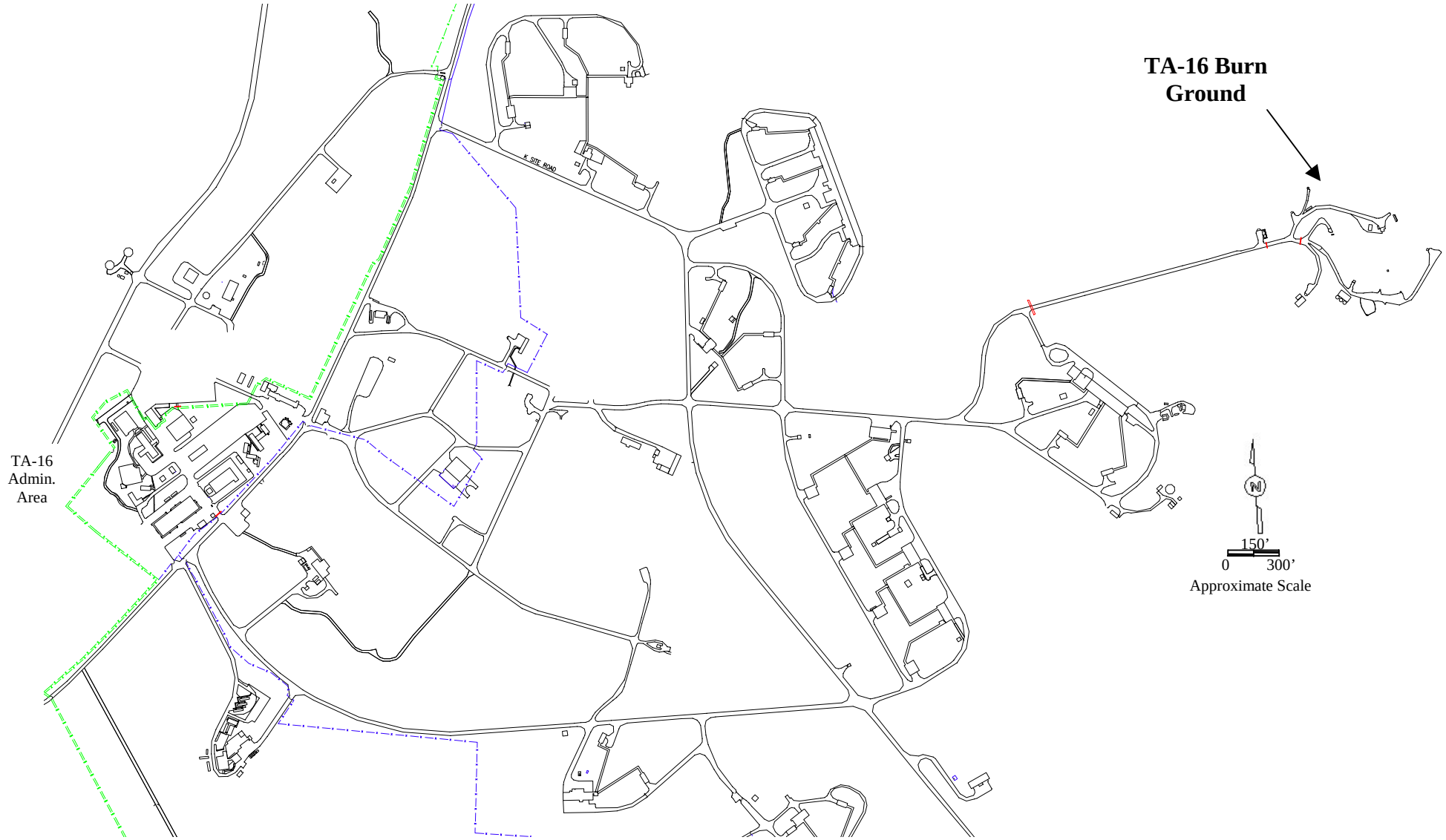

Figure G-1

Site Location Map of Technical Area (TA) 16 Burn Ground

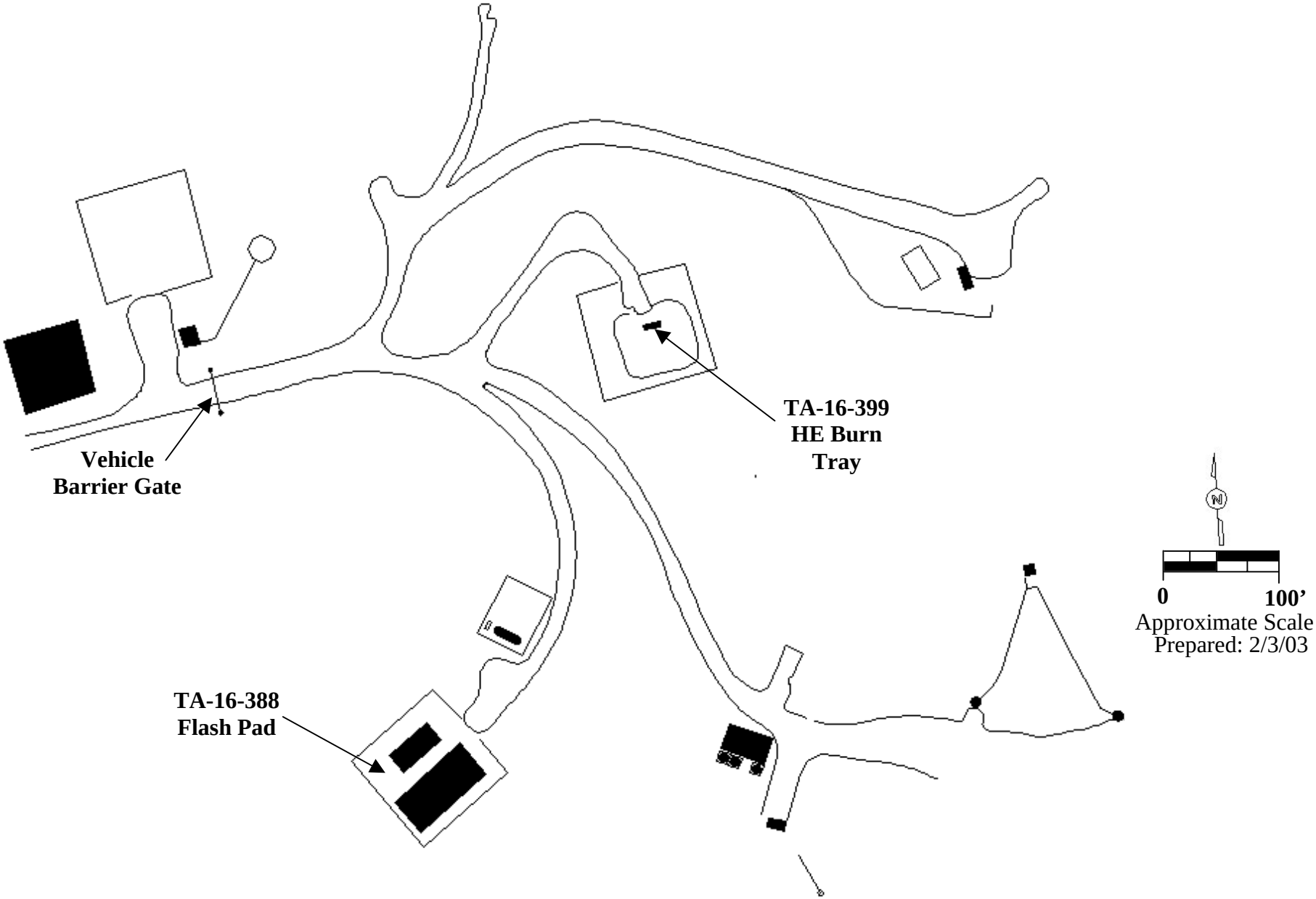

Figure G-2

Technical Area (TA) 16 Open Burning Units

Figure G-3

Technical Area (TA) 16-388 Flash Pad, Plan View

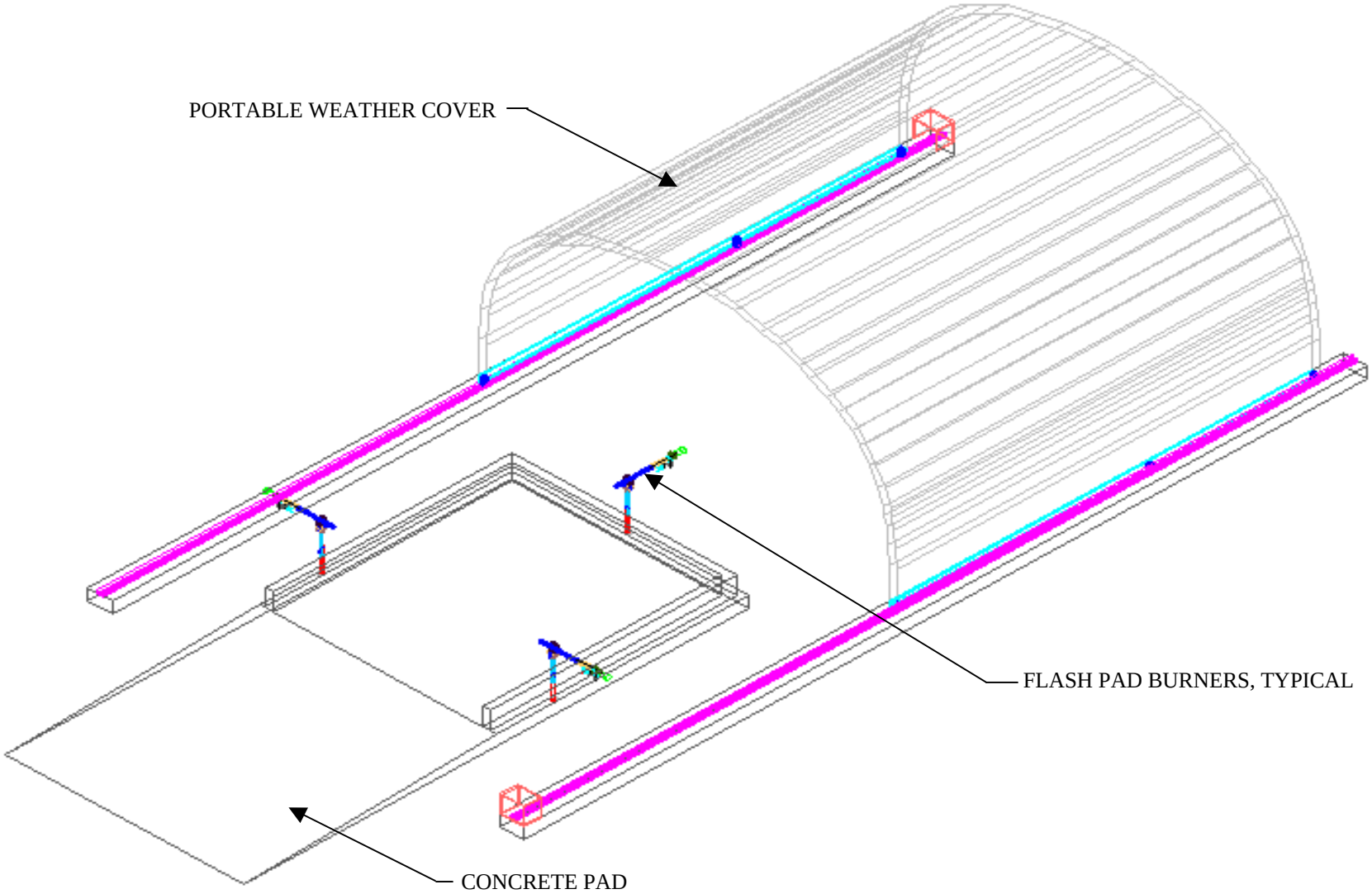

Figure G-4

Technical Area (TA) 16-388 Flash Pad

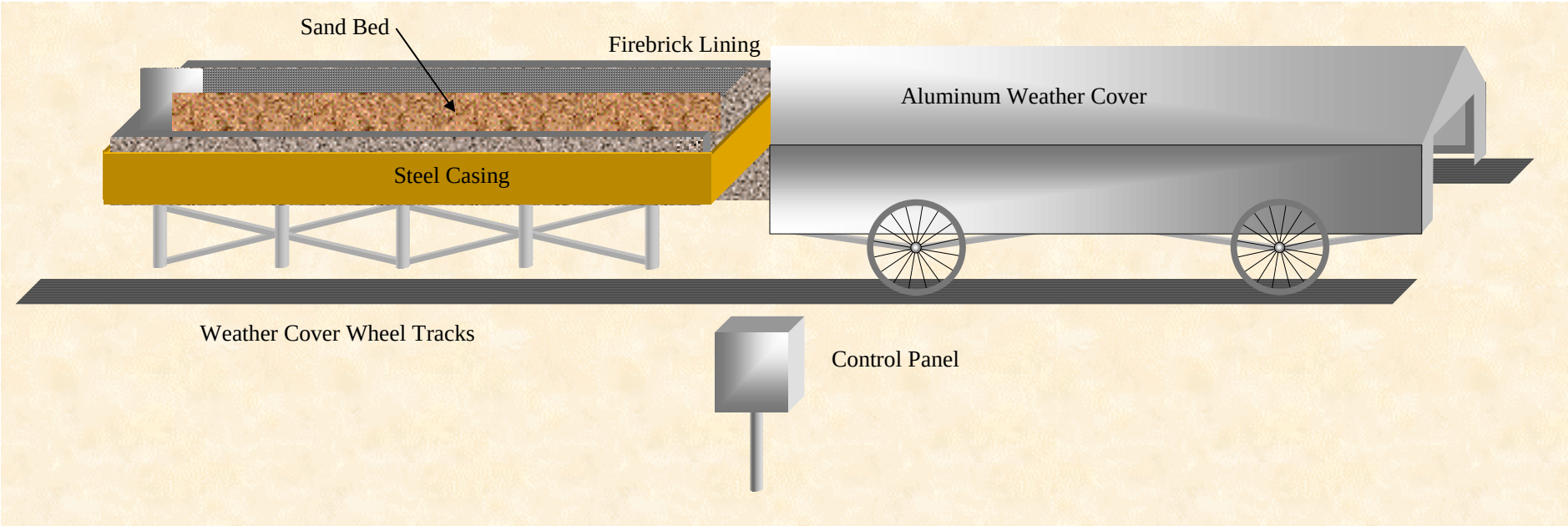

Figure G-5

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.

H.7 REFERENCES

Broxton, D., R. Warren, P. Longmire, R. Gilkeson, S. Johnson, D. Rogers, W. Stone, B. Newman, M. Everett, D. Vaniman, S. McLin, J. Skalski, and D. Larssen, 2002, "Characterization Well R-25 Completion Report," Los Alamos National Laboratory Report LA-13909-MS, Los Alamos, New Mexico.

Broxton, D., A. Crowder, M. Everett, R. Gilkeson, P. Longmire, J. Marin, D. Rogers, W. Stone, and R. Warren, 1999, "Interim Completion Report for Characterization Well R-25," draft Los Alamos National Laboratory document, Los Alamos, New Mexico.

Gardner, J.N., Reneau, S.L., Lewis, C.J., Lavine, A., Krier, D.J., WoldeGabrial, G., and Guthrie, G.D., 2001, "Geology of the Pajarito Fault Zone in the Vicinity of S-Site (TA-16), Los Alamos National Laboratory, Rio Grande Rift, New Mexico," Los Alamos National Laboratory Report LA-13831-MS, Los Alamos, New Mexico.

EPA, 1992, "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised;" U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

Hickmott, D., 1993, "Mapping South of S-Site," Los Alamos National Laboratory Memorandum CLS-ER/BM-93:001, Los Alamos, New Mexico.

LANL, 2002, "Material Disposal Area P Area Closure Certification Report: Material Disposal Area P, 387 Flash Pad, and SWMU 16-016(c)-99," Los Alamos National Laboratory Report LA-UR-02-7819, Los Alamos, New Mexico.

LANL, 2000, "Groundwater Annual Status Report for Fiscal Year 1999," Los Alamos National Laboratory Status Report LA-13710-SR, Los Alamos, New Mexico.

LANL, 1999, "Voluntary Corrective Measures Completion Report for Potential Release Sites 16-006(g), Drum Storage Area Aggregate—[16-029(g2) and C-16-074], 16-005(d), 16-034(p)," Los Alamos National Laboratory Report LA-UR-99-3001, Los Alamos, New Mexico.

LANL, 1998a, "RFI Report for Potential Release Site 16-021(c)," Los Alamos National Laboratory Report LA-UR-98-4101, Los Alamos, New Mexico.

LANL, 1998b, "Hydrogeologic Workplan," Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1993, "RFI Work Plan for Operable Unit 1082," Los Alamos National Laboratory Report LA-UR-93-1196, Los Alamos, New Mexico.

LANL, 1988, "Site Geology and Hydrology of Technical Area 16, Area P," Los Alamos National Laboratory Report LA-11209-MS, Los Alamos, New Mexico.

Lewis, C.J., A. Lavine, S.L. Reneau, J.N. Gardner, R. Channell, and C.W. Criswell, 2002, "Geology of the Western Part of Los Alamos National Laboratory (TA-3 to TA-16), Rio Grande Rift, New Mexico," Los Alamos National Laboratory Report LA-13960-MS, Los Alamos, New Mexico.

McDonald, E.V., Ryti, R.T., Longmire, P.A., and Reneau, S.L., 1996, "Background Geochemistry of Soils and Colluvium at MDA-P, Los Alamos National Laboratory," LA-UR-96-1092, March 1996.

Newman, B. D., 1999, "An Examination of a Semiarid Mesa with High Explosives Contamination at Los Alamos, New Mexico, USA," in 1999 Geological Society of America Annual Meeting, Abstracts with Programs, pg. A-352.

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

Purtymun, W.D., 1995, "Geologic and Hydrologic Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface Water in the Los Alamos Area," Los Alamos National Laboratory Report LA-12883-MS, Los Alamos, New Mexico.

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.

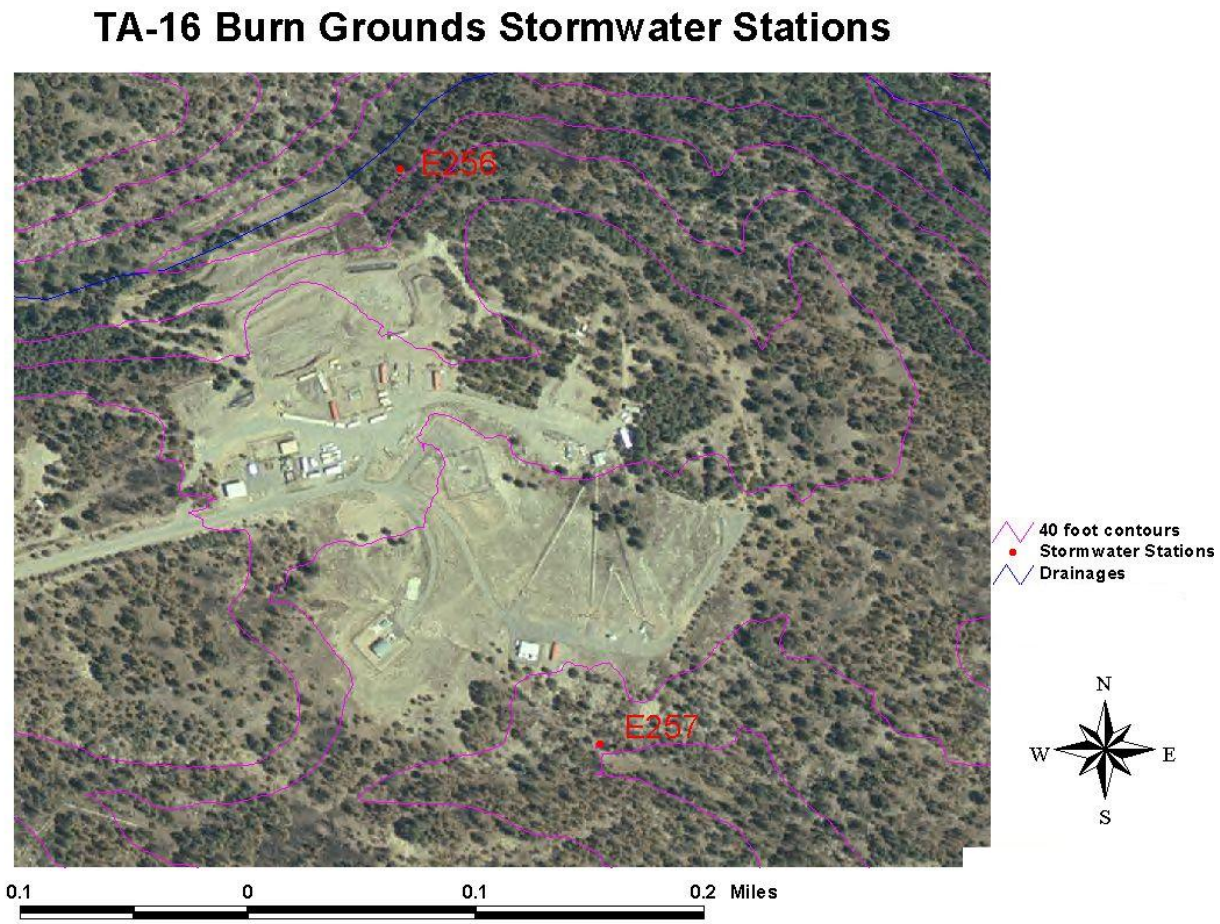


Figure H-1

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

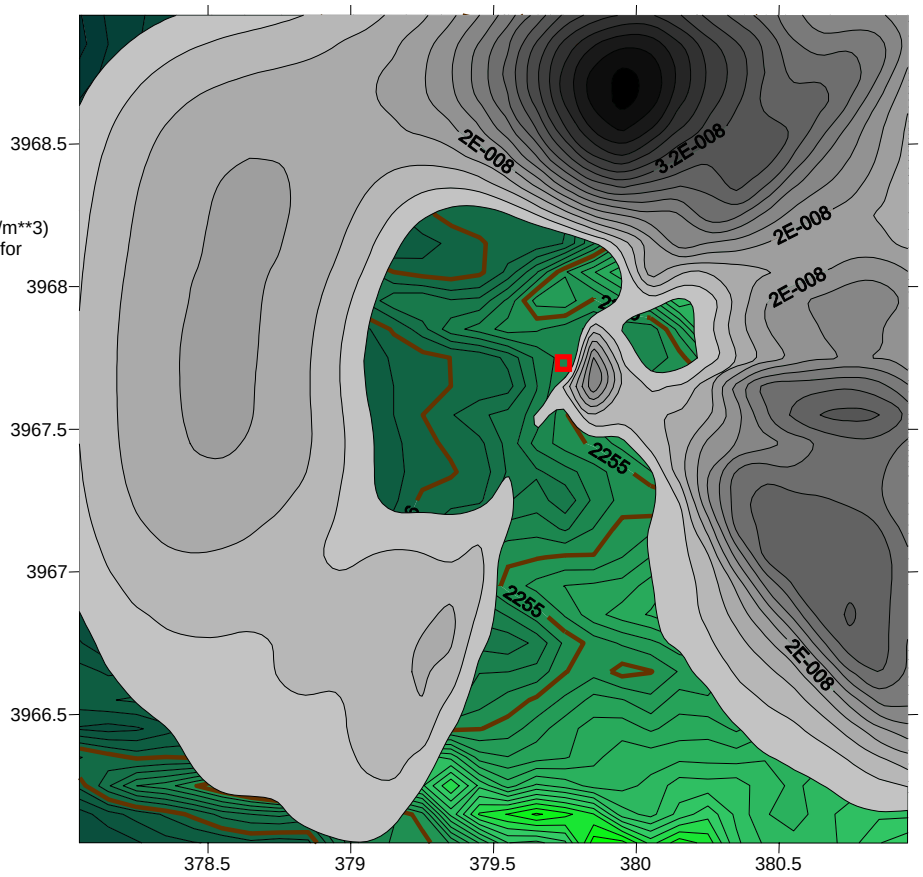
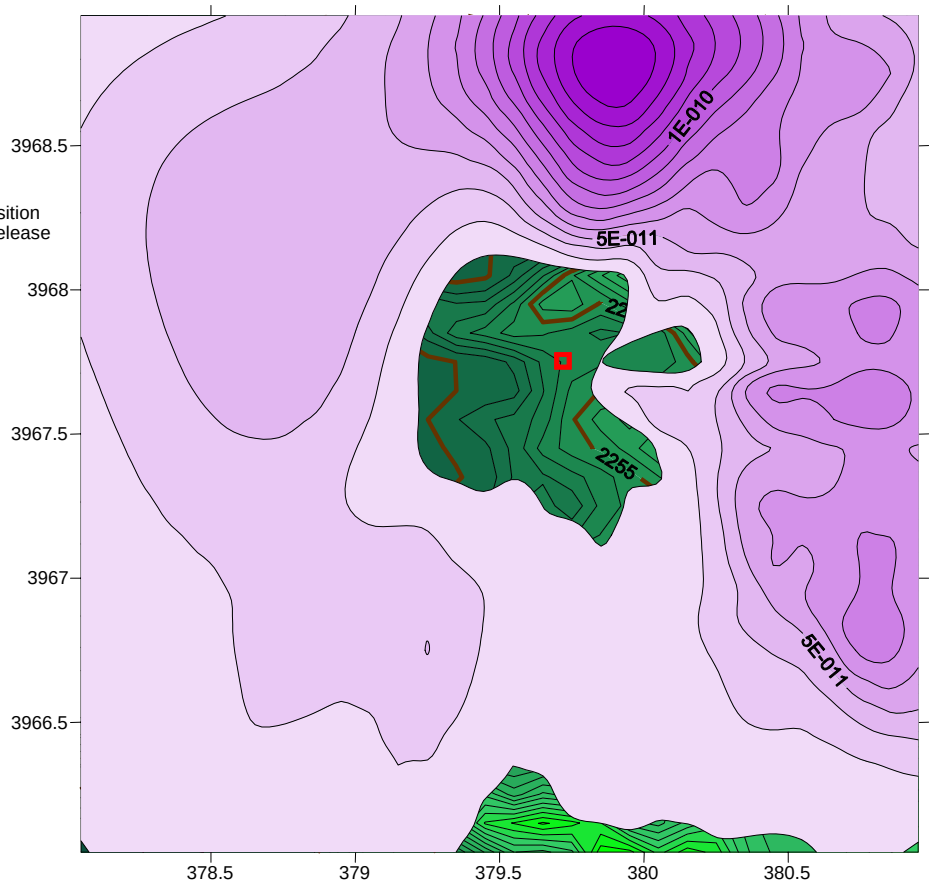
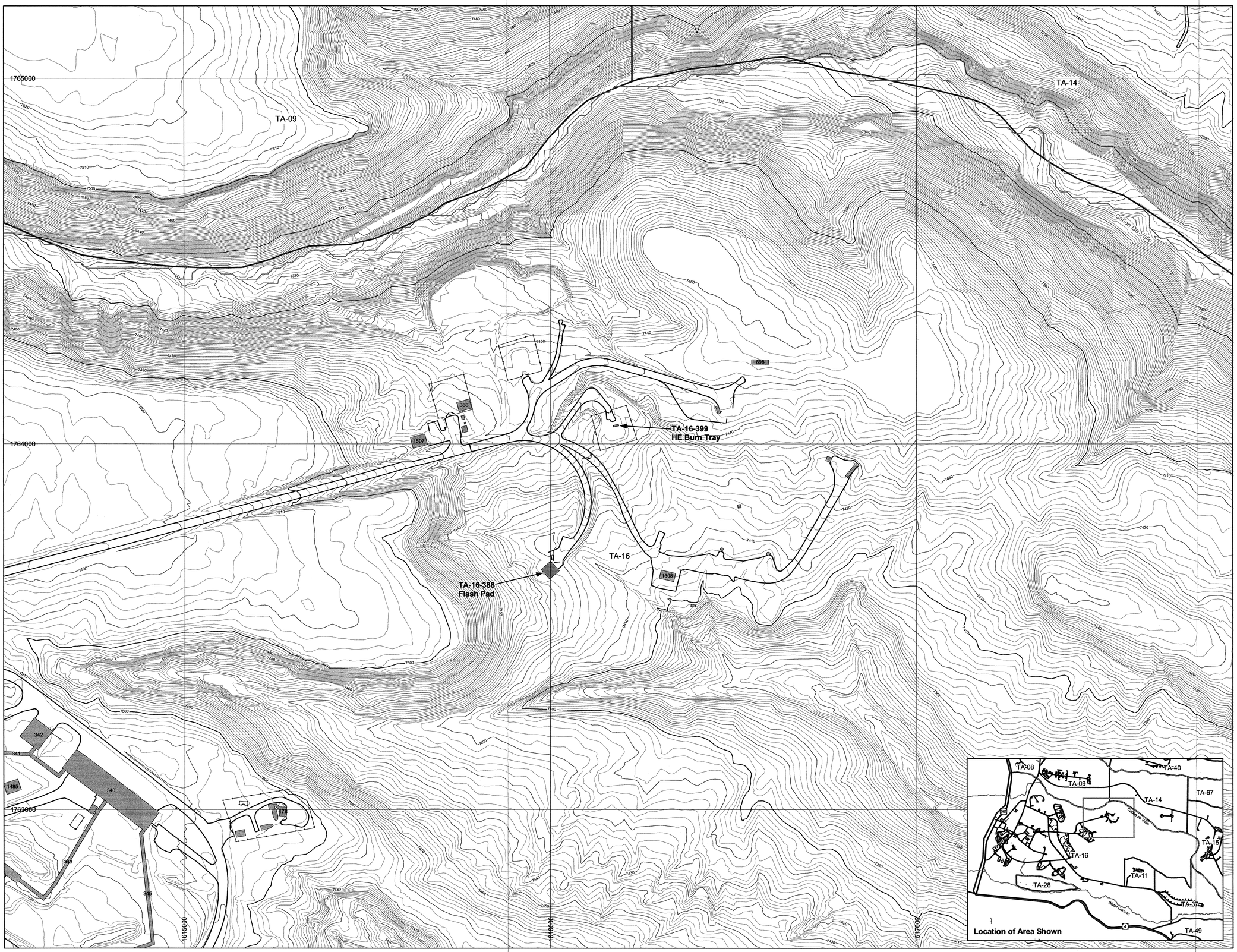


Figure 3. CALPUFF Deposition Flux (g/m**2/s) per Unit Release Rate (g/s) for Toluene TA16 Open Burning Site



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

TA-16
- Part B, 2003
- Put in older of theories.

6437

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.labndy_ply

Contours, 10 foot; Los Alamos National Laboratory, RRES-R, NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_010_arc

Contours, 100 foot; Los Alamos National Laboratory, RRES-R, NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_100_arc

Contours, 2 foot; Los Alamos National Laboratory, RRES-R, NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_020_arc

Contours, 20 foot; Los Alamos National Laboratory, RRES-R, NA; Unknown; 1991; Provided by RRES-R SDE server, sde.DBO.contour1991_002_arc

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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