TA-16

Rec'd 8/16

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

AUG 1 5 2002

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

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

Dear Mr. Will:

Subject: Response to Second Notice of Deficiency
Review of DOE/UC Response to Notice of Deficiency
TA-16 Part B Permit Application Revision 3.0
January 31, 2000 (LA-UR-02-0890)
Los Alamos National Laboratory (LANL)
EPA ID #NM0890010515
HWB-LANL-00-002

The purpose of this letter is to provide the Department of Energy (DOE) and University of California (UC) response to the subject Notice of Deficiency (NOD) issued by the Hazardous Waste Bureau (HWB) of the New Mexico Environment Department (NMED) on July 2, 2002. The NOD required that DOE and UC provide additional information regarding a Resource Conservation and Recovery Act (RCRA) Part B permit application and previous related NOD responses submitted to support the renewal of the Hazardous Waste Facility Permit originally issued on November 8, 1989. The permit application describes waste management activities at Technical Area (TA)-16 and is titled "*Los Alamos National Laboratory Technical Area 16 Part B Permit Renewal Document*," Revision 3.0, January 2000. The NOD referenced was received December 24, 2001 and was titled *"Notice of Deficiency: Technical Review of the January 31, 2000, TA-16 Part B RCRA Permit Application, Revision 3.0, Los Alamos National Laboratory EPA ID# NM 0890010515, HWB-LANL-00-002."*

DOE received the second NOD on July 3, 2002. The NOD stated that a response was due within 45 days and the scheduled submittal date for this response is August 16, 2002.

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This submittal consists of a response to each of the 40 comments contained in Enclosure A of this NOD. It includes five enclosures containing proposed revised portions of the permit application and supplemental information addressing issues raised in the comments. A certification statement is also provided for this document as a revision of the original permit application. Appendix F and a copy of the response document are included as electronic files.

Please note that some responses to the NOD comments propose further meetings to present the subject matter. We believe that the technical issues for those responses are complex and would be most easily explained in an open forum where subsequent questions could be readily addressed.

If you wish to make arrangements for such a meeting or should have any questions regarding this submittal, please feel free to contact Gene Turner, DOE, at (505) 667-5794 or Gian Bacigalupa, UC at (505) 667-1579.

Sincerely,

Joseph C. Vozella
Associate Director for Facility Operations
Office of Los Alamos Site Operations

OFO:1GT-006

Enclosures

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LA-UR-02-5002
August 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

Prepared by:

Los Alamos National Laboratory
Solid Waste and Regulatory Compliance Group (SWRC)
Los Alamos, New Mexico 87545

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 EPA ID# NM0890010515

LA-UR-02-5002
August 2002

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

ATTACHMENT A
NOTICE OF DEFICIENCY:

RCRA PART B PERMIT APPLICATION
TA-16, JANUARY 2000, REVISION 3.0

LOS ALAMOS NATIONAL LABORATORY
EPA ID NO. NM0890010515

July 2, 2002

Introduction

The following information is the response by Los Alamos National Laboratory (LANL) to the Notice of Deficiency (NOD) issued by the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) on July 2, 2002. The full title of the NOD is *"Second Notice of Deficiency: Review of LANL Response to Notice of Deficiency; TA-16 Part B Permit Application Revision 3.0, January 31, 2000 (LA-UR-02-0890), Los Alamos National Laboratory (LANL), EPA ID# NM0890010515."* The NOD states that the NMED reviewed LANL's response to a previous NOD issued by the NMED on December 24, 2001, for the Technical Area (TA) 16 permit application. LANL's response to that document was submitted on February 19, 2002. The letter also indicates that the NMED reviewed a document submitted by LANL on April 15, 2002, that discussed meteorological input to the CALPUFF modeling system for TA-16. In addition, the NOD includes a review and comment on the closure plan submitted to the HWB in June 2000 as Attachment E.2 in the draft *"Los Alamos National Laboratory Hazardous Waste Facility Permit, Chapter 5, Technical Area 16 Conditions,"* which was requested by the HWB. The NOD states that the above-referenced documents were reviewed for technical adequacy and were found to be deficient, and that the requested information must be submitted to the NMED within 45 days of receipt of the NOD letter.

This document consists of responses to the comments contained in the NOD. It includes appendices with additional information, as referenced in the individual responses to the comments. NMED's original comments are included in this document as italicized text for ease of review. A copy of the original NOD is also included as Appendix A.

NMED December 24, 2001, NOD comment 1.a. and Permittee's February 2002 response

1. *Currently, TA-16 uses propane burners to ignite waste, but diesel and wood were used in the past. Burning with diesel and wood occurred at lower temperatures potentially causing higher emissions than present practices. Revise the Closure Plan to specify that at closure the soil surrounding the open burn (OB) units shall be sampled for dioxins; furans; volatile organic compounds; semivolatile organic compounds, including PCBs; metals, including barium and cadmium; high explosives (HE), including degredation products such as toluene, xylene, nitrotoluenes, and nitrobenzenes; hydrocarbons; and perchlorate (EPA method 314.0).*

Response: The closure plan has been revised to indicate that unit-specific closure sampling and analysis plans (SAP) will be prepared and submitted to the NMED for approval 90 days before actual closure activities begin for each open burning (OB) unit. This approach was discussed with Carl Will of the NMED HWB on April 23 and June 7, 2002. In response to that communication, LANL included a discussion of the development of SAPs with a revised closure plan for TA-54 submitted to the NMED on July 17, 2002. The basis for preparing a SAP at the time of actual closure is that most of the TA-16 OB units may not undergo closure for a relatively long time, and it probable that sampling and analytical methods will be revised and improved before closure. Each unit-specific SAP will provide specific details for closure and include a listing of the analytes for which soil samples will be analyzed. The revised closure plan is included herein as Appendix B.

It should be noted that soils will not be analyzed for polychlorinated biphenyls (PCB) as part of this closure plan, as they are regulated under the Toxic Substances Control Act. It should also be noted that perchlorates are not currently regulated under the resource Conservation and Recovery Act (RCRA).

2. *In the last paragraph of page five of the NOD response, the Permittees state that the EPA report concluded in Chapter 7 that it would be prudent to assume that all the chlorine in aluminized propellant (AP)-based explosives will be released to the environment as hydrochloric acid (HCl). However the study states that 98% to 99% of the chlorine in the test Burns was found to convert to HCl. Submit information recalculating the emission factors for halogens to account for the study's concentrations and revise Appendix B, Table 10, and the comparison of 2000 emissions with screening action levels (SAL's) and ecological screening levels (ESL's) if necessary.*

Response: The U.S. Environmental Protection Agency (EPA) Open Burning and Open Detonation (OB/OD) Database concluded that the "high reactivity of chlorine is a likely explanation for the low recoveries. The reasons for the low recoveries for sulfur and the metals still need to be determined to more fully characterize the environmental safety of OB and OD practices." They make the following assumption: "Generally, less than 20% of the Cl and F in the energetics detonated in the bomb calorimeter were recovered, but all of the Cl and F recovered was in the form of HCl and HF. The missing Cl and F were assumed to have reacted with the steel walls of the calorimeter, because they were not found in the rinse of the calorimeter."

It does not appear that the Cl and F were converted to other toxics such as dioxins and furans. This is supported by the report's findings that no dioxins or furans were found in the emissions from any bulk explosives tests, including the bulk ammonium perchlorate tests. These are the explosives summarized in LANL's response to Comment No. 19 herein. LANL made the conservative estimate that all of the Cl and F were emitted as HCl and HF rather than reacting with the treatment structures. Therefore, the tables were not changed. LANL would appreciate the opportunity to discuss other possible fates of these materials with the NMED.

3. *Submit the evaluation requested in Comment No. 2 above for 2001 emissions data.*

Response: Using the same methods as shown in Table 9 of Appendix B of the original NOD response, the amount of Cl emitted in 2001 from the bulk burning of HE was 5.7 pounds, and the amount of F emitted in 2001 was 11 pounds.

4. *Submit revised information for pages 10 through 12 of the NOD response, the list entitled Detonation Potential by Waste Stream, to specifically specify the HE components, for example RDX and HMX, and all other constituents present in each specified waste stream and include the percentages of each constituent in each waste stream.*

Response: The year 2000 waste data have been reviewed and used to address this comment. The data used were taken from Waste Profile Forms (WPF). Because the composition of a single process can vary, WPFs usually indicate a range of concentrations for each waste type. For instance, analytical chemistry solvent wastes may contain several commonly used solvents. The exact concentration of the solvents varies during each accumulation period, depending on the types and numbers of analyses performed. The WPF covers the presence of all of the solvents and lists the minimum to maximum concentrations. Similarly, a filter may have been used for removing HE from wastewater. Different types of HE are typically processed during the period the filter is in use. Therefore, the WPF for that waste filter will show the resulting range of HE used in the filtration process. WPFs are reevaluated annually or whenever a process changes to ensure that all of the appropriate EPA Hazardous Waste Numbers and underlying hazardous constituents are properly assigned. Based on the ranges of contaminants possible under a single WPF, it is not possible to provide the exact percentage of each constituent. Therefore, we have summarized the total amount of HE and HE-contaminated waste treated under each WPF during 2000 in Tables 1 through 9 of Appendix C of this NOD response, including any additional information supplied on the TA-16 Burn Ground treatment request forms. Year 2000 data were used for the original NOD response. The data were intended to provide a snapshot of the compositions because the composition of each of the wastes may change from year to year if operations (including the types of HE) change. Some waste streams may disappear entirely in the future (e.g., HE-contaminated ER soil and debris). Others will change (e.g., the types of HE treated) with changes in the Laboratory's mission and with disposition of older weapons systems. The composition of each HE was provided in the response to the original NOD, but is also included as a table in Appendix D herein for ease of reference. As described below, four waste streams are not included in the tables because:

- **HE-Contaminated Commercial Chemical Products** waste stream covers the spills of commercial chemical products (i.e., listed hazardous wastes as defined by 20.4.1 NMAC § 261.33) in HE-processing areas. No such wastes were treated in 2000, and future quantities would be expected to be small.

- **HE-Contaminated Rags, Wipes, and Other Combustibles** waste streams are already described under HE-Contaminated Solid Wastes.

- **Liquid Process Explosive Waste.** Liquid wastes are generated from the pilot plant-scale production of explosives. These wastes are treated as solvents at TA-16-388 and are already covered under HE-Contaminated Spent Solvent Waste.

- **HE-Contaminated Used Oil.** In 2000, the only oil treated was contaminated solvents. Therefore, it is described under the HE-Contaminated Solvent Waste Stream.

Examples of year 2000 data provided on WPFs are provided on Tables 1 through 9 in Appendix C herein.

December 24, 2001, NOD comment 1.b. and Permittee's February 2002 response

5. *Page six, paragraph two, of the NOD response states, "If decontamination to these cleanup levels is not achievable, LANL may propose an alternate demonstration of decontamination as circumstances indicate." If Permittee proposes an alternate demonstration of decontamination, Permittees must submit a permit modification request.*

Response: As indicated in Section E.2.2.5 (Decontamination Verification) of the closure plan included as Attachment E.2 of the draft *"Los Alamos National Laboratory Hazardous Waste Facility Permit, Chapter 5, Technical Area 16 Conditions,"* which was submitted in June 2000 at NMED's request, decontamination activities will be performed until at least one of the decontamination criteria listed in the bulleted items in that section has been met. One of the listed criteria is to perform decontamination activities until "Detectable concentrations of RCRA-regulated constituents that cannot be removed or decontaminated to acceptable levels as described above will be allowed to remain, provided that these RCRA-regulated constituents do not pose an unacceptable risk when combined with technical or administrative control measures agreed upon with the NMED." LANL will propose alternate closure conditions for NMED approval to meet this closure criterion, if needed.

This constitutes the alternate demonstration of decontamination. Because this criterion was listed in that closure plan for the OB units and is also listed in the revised closure plan, included herein as Appendix B, a permit modification request will not be required because there will be no change to the closure plan once it is approved and included in LANL's renewed Hazardous Waste Facility Permit, in accordance with 20.4.1 NMAC §264.112(a)(1), 20.4.1 NMAC § 270.14(b)(13), and 20.4.1 NMAC, Part 124.

6. *Page six, paragraph two, of response l.b, the NOD response states, "If the TA-16 Burn Ground Unit (or portion thereof) cannot be clean closed, LANL will provide a written post-closure plan." Permittees shall remove or decontaminate all hazardous waste and hazardous waste residues at closure of OB units. Post-closure care is not an option.*

Response: If, in the unlikely circumstance that LANL cannot remove or decontaminate all hazardous waste and hazardous waste residues at closure of an OB unit and cannot meet the alternate demonstration of decontamination discussed in LANL's response to Comment No. 5 above, an OB unit (i.e., 20.4.1 NMAC, Subpart V, Part 264, Subpart X miscellaneous unit) may be subject to post-closure care as described by 20.4.1 NMAC § 264.603. Thus, post-closure care may need to be an option.

December 24, 2001, NOD comment 1.c. and Permittee's February 2002 response

7. *Regarding explosive-bearing liquid waste streams, page ten, paragraph one of the NOD response states, "Through pre-filtering HE-contaminated water prior to treatment at the HE Wastewater Treatment Facility (HEWTF) at TA-16, suspended Class A HE Particles can be captured and removed." OB is a treatment of last resort, to be used only when all other options are unavailable and only for wastes that cannot be diverted to other technologies. Submit an assessment of other treatment methods to minimize amounts of all solvents that are open burned, for example options for pre-filtering the HE-contaminated spent solvent waste and replacing the solvent with some other nonhazardous liquid.*

Response: LANL has the mission of stewardship of nuclear weapons which use HE. These currently used explosives must be available and used in experiments to understand HEs for the safety and reliability of nuclear weapons. New explosives are also studied at LANL in cooperation with the Department of Defense to avoid technological surprise that could threaten US national security.

HE experiments and materials must be made and analyzed at LANL with either the exact or nearly exact processes and materials as have been used historically to understand the aging of the US stockpile. Therefore, for the bulk of LANL processes and waste streams, the solvents, quantities, and processes cannot be changed.

For a commonly-generated waste stream, the HE Science and Technology Group (DX-2) is purchasing a double distillation column, which will assist in reducing MEK solvent usage. For new or developmental processes or materials, DX-2 has also evaluated the use of supercritical CO_2 and is increasing the capacity of this process to re-crystallize PETN. In addition, DX-2 is using water-based latex polymers instead of solvent-containing coatings.

DX-2 needs to continue to treat HE-contaminated solvents on site because of the potential explosives hazard associated with HE waste management and transportation. Many of the HEs used at DX-2 are soluble in solvent-containing waste streams. Because the explosives are in solution, filtering only removes insoluble explosives. For explosive saturated liquids, solid explosives such as PETN, HMX, RDX, and TNT can form with lower temperatures or the evaporation of liquids. One waste stream is THF with HMX, and the solubility of HMX is 0.46 grams (g) /100 g solvent. So, for example, in a 20 liter carboy of waste, there is potentially as much as 92 g of HMX. Evaporation of spills or temperature changes can form solid powders of HMX in the base of containers or, worse, in the metal threads of drum closures. Another sensitive explosive is PETN, which is soluble in several DX-2 liquid waste streams. Based on solubility measurements in acetone/water mixtures, the minimum concentration of PETN in one waste stream is 0.005 g/100 g solvent for a 7.7% acetone in water solution. This product is made in bulk, and the waste stream is placed in double-lined 200 liter drums. This gives a minimum of 10 g of PETN dissolved in a drum of this waste. Again, precipitation or evaporation into a solid is a serious potential hazard in the extensive shipping and handling to get this waste off site.

The concern with even small amounts of explosive, especially PETN, is the potential to initiate even milligram (mg) quantities with sufficient energy to cause harm. DX-2 and LANL protect workers with blast shielding when testing 40 mg samples of explosives, including HMX and PETN. The minimum diameter or critical diameter of PETN is ≤ 0.3 millimeters (mm), and the impact height for a 2.5 kilogram (kg) metal weight striking a 40 mg sample of PETN is between 13 and 16 centimeters (cm). There is experience at LANL with PETN initiating in the threads of a set screw with sufficient energy to send a wrench flying around a processing bay. The sensitivity of HMX is 24 cm in the LANL impact test.

This demonstrates that there is a hazard with mg quantities of explosives and that tens of grams of explosives, such as PETN, would remain in waste streams that would be handled and transported by non-explosives-trained operators.

The alternative for the eventual destruction of HE-contaminated solvents would be through an off-site RCRA-permitted incinerator. The risk of additional handling and transportation and the potential of an explosives accident with mg quantities of explosives make on-site LANL treatment of this waste stream by OB prudent. LANL is also working to reduce this waste stream, where possible.

Further discussion of treatment options is included in LANL's response to Comment No. 8.

December 24, 2001, NOD comment 2 and Permittee's February 2002 response

8. *The NOD response does not conclusively demonstrate that there are no better treatment methods with less risk of deposition than OB. Permittees' discussions with other waste management personnel and the citation of the 1994 Radian study is not an adequate response. NMED believes there are other more recent sources. Submit an assessment of literature on alternative technologies and on the feasibility of each method related to relevant waste streams. Include an assessment of Permittees' own literature, for example Stephen J. Buelow, Research and Development for Alternatives to Open Burning/Open Detonation of Waste Propellants, Explosives and Pyrotechnics: Alkaline Hydrolysis and Supercritical Water Oxidation of M31A1E1 (Los Alamos National Laboratory for CERL, undated).*

Response: LANL has aggressively pursued alternatives to OB, including base hydrolysis for pure HE, and composting, supercritical water oxidation, and zero-valent iron for HE-contaminated soil. Certain waste streams, such as HE-contaminated equipment, do not appear to have effective alternatives (e.g., they cannot be composted or subjected to base hydrolysis). Other waste streams, such as HE-contaminated oils and solvents, are problematic in that the oils and solvents interfere with the treatment technology (e.g., oils and solvents would likely kill composting bacteria). Therefore, even if certain effective alternative treatments were found for some waste streams, other waste streams will remain that require OB treatment at the TA-16 Burn Ground. The LANL studies that have been conducted are:

- DX Division and DOE's Pantex Plant have conducted studies to determine whether base hydrolysis effectively destroys the types of HE used at LANL. If so, this would be an effective alternative for treating bulk HE. Base hydrolysis was able to destroy RDX and

HMX, but was not able to as effectively destroy TNT and TATB. In addition, some of the intermediate explosive byproducts that resulted were more sensitive than the types of explosive that were originally treated, which increased safety concerns. Base hydrolysis would not be applicable to HE-contaminated equipment and HE-contaminated solid waste. Finally, the HE-contaminated base hydrolysis waste stream needed further treatment at the TA-16 Burn Ground. The DOE is also evaluating the use of microbial treatment for the base hydrolysis byproducts in a pilot-scale research project at the Hawthorne Army Depot in Nevada. Other chemical treatment methods with which LANL is familiar (e.g., solvated electrons, molten salt) suffer most of the same problems as base hydrolysis.

- Composting was evaluated on a small pilot scale for the TA-16-260 HE-contaminated soil from SWMU No. 16-021(c). This study showed that composting was effective for HMX, RDX, and TNT at below the 5 percent level in soil. However, scaling up this project would have required constructing a building to house the treatment process in order to control temperature and humidity, and would also have required a RCRA permit. In addition, even after composting, the waste would have had to be disposed of in an industrial landfill to meet land disposal requirements. Because of the amendments that had to be added to compost, the amount of waste LANL would generate would have increased, running counter to waste minimization goals. Composting would not be effective for the bulk HE, HE-contaminated solid waste, HE-contaminated equipment, or for the waste streams containing oils, solvents, or acids/bases.

- Supercritical Water Oxidation was also considered for the SWMU No. 16-021(c) waste stream. A proposal to conduct on-site testing was rejected because of 1) the safety hazards in working with HE in pressurized systems, 2) the byproduct waste streams (such as ammonia in waste water and air), and 3) the need to provide alternative waste water treatment. A successful test on a very small amount of HE-contaminated soil was conducted off-site; however, no large-scale tests have been conducted. This technology would have limited use for most of the waste streams treated at the TA-16 Burn Ground.

- A zero-valent iron pilot-scale project was also conducted on the SWMU No. 16-021(c) soil. This technology was effective for RDX and TNT; however, it was not effective for HMX, probably because of its low solubility.

The studies referenced in *"Research and Development for Alternatives to Open Burning/Open Detonation of Waste Propellants, Explosives and Pyrotechnics: Alkaline Hydrolysis and Supercritical Water Oxidation of M31A1E1"* include Base Hydrolysis, Supercritical Water Oxidation, and Calcium Carbonate Cook-off for Treating High Explosives and High Explosives Waste. They were performed using only small batch processes (a few grams to a few pounds). In addition, all three processes use significant amounts of water and produce liquid waste streams that must be further processed. All require large amounts of energy for heating and, in the case of supercritical water oxidation, very high pressures. All three have relatively long batch or processing times (between 2 and 20 hours per batch) and produce liquid waste streams that are corrosive to the process equipment. In the case of base hydrolysis using ammonium hydroxide, significant amounts of binder could not be oxidized, thus requiring additional solvent extraction and further processing. All of these processes also require additional handling of HE, which is an additional safety concern.

LANL is unaware of any full-scale processing operations currently using these methods with the exception of composting for low HE-content soils. Furthermore, the treatment required on the additional volumes of liquid wastes produced during alternative treatment and the significant amount of air emissions produced from the additional electrical and heating demands could exceed those produced during OB.

December 24, 2001, NOD comment 3 and Permittee's February 2002 response

9. *The HE that accumulates in the sandfilter and treated there is not discharged through the NPDES-permitted outfall and therefore is not subject to the 20.4.1 NMAC §§ 264.1(g)(6) and 270.1(c)(2)(v) exemption. Therefore, these units may not be removed from the Application.*

Response: LANL will no longer treat the HE that accumulates in the TA-16-401 and TA-16-406 sand filters by OB in place. The accumulated material will be collected and treated in the TA-16-388 OB unit. Therefore, the TA-16-401 and TA-16-406 OB units will not require RCRA-permitted status and will be removed from the TA-16 Part B permit renewal document. LANL intends to close these units under interim status standards and proposes to meet with HWB staff members to discuss closure conditions. The closure of these units will be complicated by the fact that the units will remain active as pre-treatment filters for the TA-16 HE Wastewater Treatment Facility (HEWTF) and the knowledge that NMED closure concerns may require the development of the closure plan in a timely manner.

The sand filters meet the conditions for the 20.4.1 NMAC § 264.1(g)(6) and 20.4.1 NMAC § 270.1(c)(2)(v) permitting exemption if the waste stream being accepted is accumulated for treatment elsewhere. The EPA clarified the federal position regarding the extent of the wastewater treatment unit exemption (53 *FR* 34080, September 2, 1988) as appropriate for a unit when storing or treating hazardous wastewater as a dedicated part of an on-site wastewater treatment facility. 20.4.1 NMAC § 260.10 defines a wastewater treatment unit as "...a device which: (1) Is part of a wastewater treatment facility that is subject to regulation under either Section 402 or 307(b) of the Clean Water Act; and (2) Receives or treats or stores an influent wastewater that is a hazardous waste as defined in § 261.3 of this chapter, or that generates and accumulates a wastewater treatment sludge that is a hazardous waste as defined in § 261.3 of this chapter, or treats or stores a wastewater treatment sludge which is a hazardous waste as defined in § 261.3 of this chapter; and (3) Meets the definition of tank or tank system in § 260.10 of this chapter." The sand filters are directly connected to the TA-16 HEWTF as described in Section H.1.3 of the TA-16 Part B permit renewal document. The HEWTF is subject to regulation under Section 402 of the Clean Water Act, and the sand filters are included under LANL's National Pollutant Discharge Elimination System (NPDES) Permit Number NM0028355, as described in the LANL 1998 NPDES Permit Re-Application.

As all the conditions for the wastewater treatment unit exemption are met and no OB of the accumulated waste will occur in the units, LANL sees no regulatory basis for continuing to attempt to permit the sand filters as RCRA treatment units under 20.4.1 NMAC, Subpart V, Part 264, Subpart X standards for miscellaneous units.

December 24, 2001, NOD comment 4 and Permittee's February 2002 response

10. *Update the Storm Water Pollution Prevention Plan (SWPPP) map (Merrick Site Plan, 1/7/00) to indicate the location of the E257 stormwater monitoring station.*

Response: The SWPPP was modified in September 2001, and the location of E257 is indicated on Figure 2-1 in the plan. A copy of that revision of the SWPPP was provided as Appendix E in LANL's NOD Response submitted in February 2002. The location is also shown on a color drawing in Appendix F of that same NOD response. Gauging station E257, which is now constructed, instrumented, and operational, is located in a representative location for storm water monitoring.

It should be noted that the Clean Water Act (CWA) is the regulatory authority for storm water monitoring.

11. *The stormwater monitoring requirements under the SWPPP are quarterly grab samples for ammonia, Mg, COD, total recoverable Cd, Pb, Hg, Se, Ag and free CN. In addition, based on review of the included solid waste management unit (SWMU) data, stormwater monitoring under the Watershed Monitoring Program should also include total Ba, Zn, Cu, and a complete HE suite. Existing stormwater data should be included as an appendix to the SWPPP and updated annually as more stormwater data becomes available.*

Response: Existing storm water data are available upon request and are posted on the LANL website. In the interest of keeping the SWPPP a manageable size, the data are not included as an appendix to the SWPPP. Storm water monitoring under the Watershed Monitoring Program includes the analytes listed in this comment. In addition, these data will be submitted in the Discharge Monitoring Reports (DMR) submitted to the EPA as required by the "Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activity." The next submittal for the DMRs is scheduled for January 28, 2003.

It should be noted that the CWA is the regulatory authority for storm water monitoring.

12. *To aid in determining potential releases from the Burn Ground, Permittees should install a stormwater gaging station upgradient of the Burn Ground (one already exists below the Burn Ground) and determine the concentration of contaminants from the Burn Ground.*

Response: The TA-16 Burn Ground discharges into a side canyon of Cañon de Valle. The side canyon originates in the vicinity of the Burn Ground and connects with Cañon de Valle approximately one mile downstream. The TA-16 Burn Ground is located on the top of a mesa. Therefore, there is no "upgradient" location to monitor on the mesa top in the region of the OB operations. Surface water flow through the TA-16 Burn Ground occurs as sheet flow. Upstream monitoring is not a requirement of LANL's "Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activity."

Again, it should be noted that the CWA is the regulatory authority for storm water monitoring.

December 24, 2001, NOD comment 5 and Permittee's February 2002 response

The following four comments are given for clarification:

13. *The Permittees indicate in the response that the most likely source of groundwater contamination is from the TA-16-260 outfall. However, the RCRA Facility Investigation (RFI) Report for the 260 Outfall, Potential Release Site 16-021(c) (September 1998, LA-UR-98-4101), indicates that there is an increasing involvement of alluvial waters with the surface water system downgradient from the Burn Ground. This conclusion is based on the increase in barium and RDX contamination levels downgradient from the Burn Ground. Volatile organic compounds, barium (at 5-10,000 ppm), and HE have been detected in the Canyon de Valle alluvial system downgradient from the Burn Ground. Permittees have not demonstrated that the Burn Ground is not contributing to groundwater contamination.*

Response: Based on analyses performed during investigations in the RCRA Facility Investigation (RFI) and corrective measures study (CMS) for the 260 Outfall [SWMU No. 16-021(c)-99] and during the Material Disposal Area (MDA) P closure, LANL believes that the vast majority of water contamination in Cañon de Valle, both upgradient and downgradent of the Burn Ground, is due to releases from the 260 Outfall. Highlights of these data are provided below. The vast majority of the contamination in the canyon appears to be from the 260 Outfall, and cleanup for water in all of Cañon de Valle is being addressed accordingly. LANL is working closely with the NMED on this effort under the auspices of a high performing team (HPT).

The 1998 TA-16-260 Outfall RFI Report does indicate the possibility of increased mixing of alluvial water with surface water in Cañon de Valle down canyon from the Burn Ground. As a point of clarification to this comment, the barium concentration increases in surface water, but RDX decreases (not increases as stated in this comment). The mixing calculations done in support of the RFI show that a simultaneous increase in barium and a decrease in RDX in surface water can be achieved using the same percentage of alluvial to surface water mixing. Thus, the conclusion is that the increase in barium (and decrease in RDX) may be from increased alluvial water mixing. However, this result in no way suggests that the Burn Ground is the source of increased barium. Instead, it is related to a change in hydrology that alters the mixing ratio between surface and alluvial water. To further show that the Burn Ground is not responsible for the barium increase, the alluvial well data in the 1998 RFI report show that barium substantially decreases in alluvial water from well 2658 (up canyon from the Burn Ground) to well 2659 (below the Burn Ground, at the location with the high surface water barium concentration). There are other factors that also suggest that the Burn Ground is not a significant contributor of contaminants to Cañon de Valle. These include:

- Recent drilling near old Burn Pad 387 and at MDA P does not show any saturated zones that would lead to a subsurface pathway from the Burn Ground to the canyon.

- Sampling in the vicinity of old Burn Pad 387 and at MDA P does not show any significant contamination below the near surface. Thus, if any contaminants were mobilized from the Burn Ground or MDA P to the canyon, it would have been via surface pathways. Given the relatively small inventories that may have been available at the burn pad and the fact that the area around the burn pad and at MDA P was wet only during precipitation events, contaminants entering the canyon from the Burn Ground and MDA P would be dwarfed (and basically insignificant) when compared to that from up-gradient sources. For example, the 260 Outfall discharged in excess of 1 million gallons per year of HE- and barium-contaminated water for over 40 years. Any impacts from surface water contaminant mobilization from MDA P have been eliminated by the recent RCRA closure activities at that site.

- Flash Pad/Burn Tray 388 and Burn Tray 399 are located in the Fish Ladder drainage; this limits impacts to Cañon de Valle to zones at or downgradient of the confluence. In addition, Flash Pad/Burn Tray 388 handles less HE as a result of waste minimization approaches, has more efficient burners, and has better containment than the older OB structures.

14. *Possible historic Burn Ground surface contamination may be mobilizing and impacting Fish Ladder Seep surface and subsurface systems. Contaminants detected at the Fish Ladder Seep include HMX, at a maximum of 7.6 µg/L; RDX, at a maximum of 2.7 µg/L; and TCE, at a maximum of 0.3 µg/L. The extent of surface and subsurface contamination from the Burn Ground is not known.*

Response: Based on investigations during the 1995 RFI at the 340 Outfall (Fish Ladder) and at the TA-16 Burn Ground, LANL believes that the majority of water contamination in Fish Ladder seep is due to the historic discharges at the 340 Outfall (Fish Ladder). A brief discussion of information supporting this conclusion is provided below. Further investigations and cleanup for the Fish Ladder, including its drainage, are planned and will likely occur in FY 03 and FY 04.

The Fish Ladder drainage has been impacted by two sources, the 340 Outfall and Burn Ground activities. Like the 260 Outfall, Building 340 discharged over a million gallons per year of HE- and VOC-contaminated waters for over 40 years. Because the Burn Ground activities had drastically smaller releasable inventories and limited water, historical Burn Ground contaminants in Fish Ladder seep are likely to be small compared to those from the 340 Outfall. Because the sources are in close proximity and had similar contaminants, it is unlikely that there will ever be a definitive assessment of Burn Ground contamination compared to that from the Fish Ladder. With regard to current mobilization of historic contaminants, Burn Ground facilities are contributing small amounts of water to the drainage. However, this additional water is not likely to be greatly impacting the drainage or seep because 1) soil contamination levels in the south drainage from the Burn Ground are low; and 2) the Fish Ladder seep has been dry since the spring of 2000, suggesting minimal recent water input to that site from any source. In addition, both barium and RDX show lower concentrations in the spring 2000 sampling round than the previous round in the spring of 1998.

15. *The well number R-25 is upgradient from the Burn Ground. Furthermore, NMED notified the Permittees by letter dated September 9, 2000, that NMED will not accept sampling results from R-25 because of defective installation of the well. Therefore, the Permittees shall not depend on sampling data from this well to support their conclusions.*

Response: LANL recognizes that the NMED will not accept sampling results from R-25. However, LANL believes that useful data were derived during drilling, prior to the well installation, and continues to be derived from the well, even if the NMED does not believe that sampling results are adequate for regulatory decisions. The presence of HE in well R-25 determined for the upper saturated zone during drilling and prior to well installation is not in question.

Despite construction problems that affected two of nine well screens, R-25 continues to provide valuable characterization data for the TA-16 area. R-25 has achieved its primary characterization goals of determining hydrogeologic conditions in the previously unstudied southwest part of the Laboratory and determining if groundwater contamination exists downgradient of HE release sites at TA-16. Characterization of HE in groundwater and determination of vertical gradients continues in the completed well. Continued sampling at R-25 enables the Laboratory to qualitatively determine temporal trends in HE concentrations and to investigate whether pressure heads in groundwater are responding to seasonal fluctuations in surface water availability. The R-25 casing is screened and packed with sand around the screens to enable the representative collection of groundwater samples. This characterization well has been sampled four times for HE compounds (HEC), tritium, stable isotopes, anions, metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), radionuclides, total organic carbon, and dissolved organic carbon fractionation. Contaminants of concern at well R-25 include HECs and VOCs associated with TA-16 operations. RDX and TNT are the contaminants of most concern found at well R-25 because of the low EPA health advisory limits for RDX and TNT. Concentrations of HECs and tritium have decreased in the regional aquifer during the four sampling events conducted at well R-25. This suggests that the HECs probably introduced to the regional aquifer during drilling and well construction at well R-25 are re-equilibrating with regional groundwater. Concentrations of HECs within the upper saturated zone at well R-25 remain elevated, which is consistent with the past long-term discharge of these contaminants from the 260 Outfall and other sources at TA-16. Groundwater samples collected from screen #3, however, are compromised because of grout contamination, which results in alkaline pH (>10) conditions. Such conditions enhance degradation of RDX through hydrolysis reactions. Screens #1, #2, #4, #5, #6, #7, and #8 are considered reliable by LANL for groundwater sampling. In summary, well R-25 should not be plugged and abandoned because reasonable and technically defensible groundwater samples and analytical results have been collected from the well (excluding screen #3). Useful hydrologic and geochemical information and data are being collected from well R-25 to evaluate trends in contaminant mobility and pressure gradients. Finally, the location of the well is upgradient from the Burn Ground facilities; thus, it is unlikely that historic or current Burn Ground activities are responsible for the HE in R-25 (especially because of the upgradient contamination from the 260 Outfall).

16. *The response is not accurate because there is evidence that the Burn Ground is contributing to contamination of the uppermost aquifer (see Comment No. 13 above). RDX and TNT are not the only constituents detected.*

Response: LANL acknowledges that other constituents besides RDX and TNT are present in the uppermost aquifer. From a health perspective, LANL believes that RDX and TNT are of greatest environmental concern. There is no evidence that historic Burn Ground facility contamination is making any significant impact on the uppermost aquifer. Clearly, LANL cannot rule out small historic impacts from the Burn Ground and MDA P. Existing data suggest that contamination in Cañon de Valle and the Fish Ladder drainage is dominated by releases from Outfalls 260 and 340 (see LANL's responses to Comment Nos. 13 and 14 above). No contaminants have been identified downgradient from the Burn Ground that are unique to Burn Ground activities. Given the similarity in contaminants present at TA-16-260, TA-16-340, and the Burn Ground, it is unlikely that such a determination could be made. In addition, process and physical improvements to the newer Burn Ground facilities make it highly unlikely that there is any significant current contribution to either drainage from current operations. Other contaminants detected in the uppermost aquifer are likely from the 260 and 340 Outfalls. This is why LANL is investigating and cleaning up the contamination in Cañon de Valle and the Fish Ladder drainage associated with the 260 Outfall and the 340 Outfall (Fish Ladder).

APPENDIX B -TECHNICAL AREA 16 BURN GROUND DATA AND SUMMARY TABLES

17. *Provide additional information in support of using Table 2.1-1 and Table 2.5-8 from the U.S. Environmental Protection Agency (EPA) AP-42, Chapter 2, as the source for emission factors for the open burning of solids contaminated with HE. The information provided should demonstrate why the emission factors from this source are preferred over those provided in Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD) (EPA OBOD Database) and other sources. If metals are present in the actual waste streams flashed at TA-16, they should be identified and addressed as recommended in the EPA OBOD Database. The amount of metals in the waste streams should equal the amount emitted plus that found in the ash.*

Response: The decision on which emission factors to use was made in a stepwise fashion. First, all of the emission factors for detonation tests in the EPA OBOD Database were excluded from consideration because burning and detonation are not similar processes. Next, the burning data were reviewed to select the burns that contained combustible matter most similar to those conducted on TA-16-388. The burns composed of explosives and binders were considered for the burning of bulk HE (see LANL's response to Comment No. 19), but not for the burning of HE-contaminated combustibles. The composition of the materials in the only two burns that were not eliminated by this process is described in Table 1 below. Percentages of components are given; however, the components listed in the OBOD Database did not always add up to 100%. They are reported as provided in the database.

Table 1. EPA OBOD Database – Combustible Materials Burned

Material Tested	Composition	Comparison to TA-16 Burn Ground HE-combustible Material
Manufacturer's Ammonium Perchlorate (AP) Waste	• 65% aluminized AP • 20% plastic material (polyethylene gloves) • 11% paper/ wood/cloth • 4% diesel fuel	TA-16-388 combustibles contain only very low levels have only low chlorine content, unlike the AP used in this test. Diesel is not a typical constituent at TA-16-388. Metals flashed on TA-16-388 are present in monolithic solids, not dispersed aluminum in direct contact with chlorine as was the case in this burn.
Diesel Fuel and Dunnage Surrogate	• 12.5% plastic/diesel fuel • 87.5% cellulose from wood and pasteboard	Wastes composed of cellulose are frequently burned at TA-16-388, but not with diesel.

Neither of these burns was typical of the types of combustible materials burned at TA-16-388. Therefore, the AP-42 emission factors were consulted. The AP-42 Table 2.1-1 emission factors were used to represent the burning of wipes, cardboard, and rags, etc. These emissions factors would be conservative because the municipal solid waste contains wet garbage, which would create a "dirtier" burn than at TA-16-388. The agricultural plastic burning data in Table 2.5-8 of AP-42 were used to simulate the types of plastics usually present at TA-16-388 (e.g., gloves, plastic bags used to store HE, plastic packing material). At the TA-16 Burn Ground, this plastic is not in contact with dispersed metal or diesel fuel, as was the case with the EPA OBOD Manufacturer's AP Waste. Therefore, the AP-42 emission factors, although imperfect, were considered the best available.

The EPA OBOD Database recommendation to assume that the amount of metals in the waste stream should equal the amount of metals in the ash plus the amount emitted has already been applied to the metals that would be expected to volatilize during burning (i.e., those with a melting point lower than the burn temperature). These are the metals that have an emission factor of 1.0 (100%) in Table 4 of Appendix B in the original NOD response. However, EPA's recommendation is not applicable to the monolithic metals treated at the TA-16 Burn Ground. Their recommendation was applied to metals, mainly low melting point metals such as aluminum, which were ingredients of the explosive. Most of the metals treated at the TA-16 Burn Ground are pieces of HE-contaminated equipment or building components. They are flashed, then removed and usually recycled. There is no practical way to detect the tiny changes in weight that would occur. The only explosive treated at TA-16 with metal as a component is Baratol, which contains 76% barium nitrate and 24% TNT. The TNT is destroyed by the burn, but the barium nitrate (which has a high melting point) is not. The pieces of barium nitrate are removed after the burn and disposed as hazardous waste. Therefore, we believe the analysis provided in the original NOD response is appropriate.

18. *Based on the information furnished in the response to December 24 NOD Comment 1.a, it is not clear that assuming a 95% efficiency for the propane burners results in the best estimates for emission factors from burning HE-contaminated oils or solvents. Address the problems specific to using the EPA OBOD Database and submit information that demonstrates that the alternate techniques and information sources result in the best estimates for assessing human health and environmental risks from the open burning of HE-contaminated oils or solvents. If metals are present in the actual waste streams flashed at TA-16, they should be addressed as recommended in the EPA OBOD Database. The amount of metals in the waste streams should equal the amount emitted plus that found in the ash.*

Response: The difficultly in using the EPA OBOD Database was that it did not contain oil/solvent waste streams or a source of emission factors for the OB of oils or solvents. The same is true for AP-42. The 95% destruction efficiency for oil/solvent burns was applied only to the organics in the waste. The solvents in the oil/solvent waste stream have a high heating value and should burn efficiently; 95% would be a reasonable estimate. The acids and bases do not have a high heating value and were assumed to be emitted as the parent acid/base. Metals, such as mercury, in the solvents were assumed to be totally emitted in accordance with Table 4 of Appendix B in the original NOD response because of their low melting points.

The 95% efficiency represents our best professional technical judgment. Furthermore, an order of magnitude decrease in efficiency would not result in deposition quantities that would be near the SALs and ESLs in Table 14 of Appendix B in the original NOD response.

19. *It is not clear that the M31A1E1 triple-based propellant included in the EPA OBOD Database is suitable to represent all bulk HE listed in Appendix B, Table 7. Submit additional information in support of using this triple-based propellant as a surrogate. Some of the explosives listed in Table 7 were treated by detonation in the studies included in the EPA OBOD Database.*

Response: The EPA OBOD Database contains information for military explosives. While some of them contain the types of explosives historically treated at the TA-16 Burn Ground, others do not. The types of explosives used at LANL are typically those with carbon-carbon or carbon-nitrogen bonds. They may be either cyclic or straight-chained compounds. Each of the EPA OBOD Database explosives burned (not detonated) was evaluated to determine which would be most typical of the wide range of explosives that could be treated at the TA-16 Burn Ground over the 10-year duration of the Hazardous Waste Facility Permit.

The composition for each of the bulk explosives burned is summarized in Table 2 below. The rationale for using or not using them for the purposes of estimating emissions for the TA-16 Burn Ground is also summarized. As described in the table, the M31A1E1 explosive was chosen because it had the widest range of both cyclic and straight-chained carbon/nitrogen/hydrogen explosives.

Table 2. EPA OBOD Database - Energetic Materials Burned

Material Tested	Approximate Composition	Comparison to TA-16 Burn Ground HE-combustible Material
Double-based propellant NOSIH-AA2	• 51% nitrocellulose • 39% nitroglycerine • 6% ethyl cellulose • 3% triacetin • 2% di-npropyl adipate • 1% lead	Nitrocellulose and nitroglycerine are typical of the LANL carbon/hydrogen/nitrogen-based explosives. However, the other constituents were not typical, and the M31A1E1 burn had a wider range of these types of explosives.
Composite Propellant MK-6 and 88 P-217	• 81% AP • 8% hydroxy-terminated polybutadiene • 4% dioctyl sebacate • 1% aluminum oxide	The ammonium perchlorate composition of this explosive is not typical of LANL bulk explosives.
PBXN-110 Propellant	• 87% HMX • 5% hydroxyl-terminated polybutadiene • 5% isodecyl pelargonate • 1% smokeless powder.	HMX is a component of LANL explosives. These factors could be used to estimate emissions from HMX-only explosives. However, the M31A1E1 burn had a wider range of this type of explosives.
MK-23 CTBN Propellant	• 78% AP • 14% carboxyl-terminated polybutadiene • 3% smokeless powder • 2% aluminum	High chlorine with aluminum and polybutadiene are not typical of TA-16 Burn Ground explosives.
M-43 Propellant	• 73% RDX • 4% nitrocellulose • 12% cellulose acetate butyrate • 7% BDNPA/F binder • 4% smokeless powder	RDX is a component of PBX 9407. This HE is not currently used in large quantities. Therefore, this propellant's emission factors were not used.
Smokeless Powder	• 95% nitrocellulose • 5% nitroglycerine	These are types of HE burned at TA-16. However, the M31A1E1 propellant had a wider range of explosives and was preferred.
Smoky Sam Burn	• 40% AP • 37% zinc • 11% hydroxyl-terminated polybutadiene • 3% dioctyl adipate • 8% smokeless powder	The high chlorine, high zinc compounds are not typical of HE treated at TA-16.
M-9 Propellant	• 58% nitrocellulose	These are types of HE burned at TA-16.

Material Tested	Approximate Composition	Comparison to TA-16 Burn Ground HE-combustible Material
	• 40% nitroglycerine • 2% potassium nitrate • 1% diphenylamine • 0.2% smokeless powder	However, the M31A1E1 propellant had a wider range of explosives and was preferred.
M-1 Propellant	• 80% nitrocellulose • 9% dinitrotoluene • 5% dibutypthalate • 1% diphenylamine • 0.2% smokeless powder • 5% reducer charge	Nitrocellulose is one type of HE burned at TA-16, although dinitrotoluene is only present in small amounts as a component of TNT. However, the M31A1E1 propellant had a wider range of explosives and was preferred.
M31A1E1 Triple Based Propellant	• 22% nitrocellulose • 18% nitroglycerine • 55% nitroguanadine • 2% ethyl centralite • 0.2% smokeless powder and charcoal	This propellant had the widest range of carbon, nitrogen, and hydrogen-based explosives. It was used to represent the large range of explosives that could be burned.
Double-Based Propellant	• 20% carbon • 3% hydrogen • 29% nitrogen • 46% oxygen • 1 % lead • 1% zirconium • 0.2% smokeless powder	The chemical structure of this compound is unknown; therefore, it was not considered for use.
AP	• 86% AP • 13 % $C_{21}H_{32}$ • 0.2% nitrocellulose • 0% nitroglycerine • 1% zirconium and tin • 0.2% smokeless powder	This material was not considered because of the high levels of AP, the zirconium, and the unknown nature of 13% of the mixture.
Aluminized AP	• 69% AP • 19% aluminum • 12% $C_{20}H_{34}O$ • 0.3% nitrocellulose and nitroglycerine • 0.3% smokeless powder	This material was not considered because of the high levels of AP, the zirconium, and the unknown nature of 12% of the mixture.

20. *Permittees' response to December 24 NOD Comment 6.a states that total metal concentrations (background concentrations) were divided by 20 for comparison to TCLP values for ash. The results are presented in Table 12. In Table 12, the total (background) metal concentration for chromium is divided by 276 and the concentration for mercury is divided by 10. Submit an explanation of why chromium and mercury were treated differently.*

Response: The spreadsheet for the conversion of metals from mg/kg to mg per liter (L) was consulted to determine the source of these errors. The spreadsheet showed two decimal points for each metal; therefore, the mercury concentration calculated by the spreadsheet was 0.005, but was rounded to 0.01. This would not affect later calculations because all of the mercury in the waste streams was already assumed to be emitted. The chromium conversion in the original spreadsheet shows a TCLP of 0.96. Therefore, the 0.07 figure provided in Table 12 was an incorrect entry (via typographical error) from the spreadsheet into the table. The analysis would not be affected because there was no detectable chromium in the ash.

21. *For clarity, submit an example calculation illustrating how the emitted quantities of barium and cadmium listed in Table 13 were determined.*

Response: Using waste profile form number (WPF) 32054 as an example, the barium (Ba) emitted was calculated as follows:

The concentration of Ba in the ash = 10.6 mg/L

This was converted to g of metal per g of ash as follows:

$$\frac{10.6 \text{ mg Ba}}{\text{L solution}} \times \frac{2 \text{ L solution}}{100 \text{ g ash}} \times \frac{\text{g Ba}}{1000 \text{ mg Ba}} = \frac{2.12\text{E-4 g Ba}}{\text{g ash}}$$

Total amount of ash disposed under WPF 32054 = 1,100 pounds (lbs)

$$1100 \text{ lbs ash} \times \frac{2.12\text{E-4 g Ba}}{\text{g ash}} \times \frac{454 \text{ g ash/lb ash}}{454 \text{ g Ba/lb Ba}} = 0.2332 \text{ lb Ba}$$

APPENDIX G- DEPOSITION MODELING FOR THE TA-16 BURN GROUND

22. *Submit a topographic map or plot of the modeling domain in Appendix G.*

Response: A topographic map showing the modeling domain is provided in Appendix E herein.

Methods

23. *Methods section, first paragraph, states that the hand calculation performed for screening purposes assumed that deposition occurred over a circle with a radius of one kilometer (km) centered on the source. No support is provided for this assumption. Revise Appendix G to show that all significant deposition from OB operations at TA-16 occurs within a one km radius of the source. Show that the point of maximum deposition occurs within a one km radius of the source by including the one km radius circle and labeling the overall maximum impact points on Figures 1 and 2.*

Response: CALPUFF is the EPA-approved model used for the calculation of deposition rates to support the estimates made in Table 14 of the original NOD response; the results of that modeling are shown on Figures 1 and 2 of Appendix G in the original response. However, LANL performed two checks to ensure that the estimates made by CALPUFF were reasonable. The first of those checks is the hand calculation performed for screening purposes. The other is discussed in LANL's response to Comment No. 28. Both checks were designed to ensure that they would provide considerably higher estimates of deposition than would be calculated by CALPUFF and were included in Appendix G of the original response for informational purposes. The hand calculation was a conservative analysis assuming that all emissions were deposited within 1 km of the TA-16 Burn Ground. This is clearly an oversimplification intended to result in an overestimate or upper bound to compare with the CALPUFF model results. As expected, the CALPUFF results were many orders of magnitude lower than the conservative deposition rates resulting from the hand calculation.

It is not appropriate to revise Figures 1 and 2 because they reflect the EPA-approved method of calculating deposition. As the figures show, the highest impacts occurred in the predominant wind direction fields. The maximum impacts in Figures 1 and 2 are already shown as the most heavily shaded areas. However, if NMED wishes a frame of reference, the entire area shown in the figures is 3 km x 3 km. The red dot representing the TA-16 Burn Ground lies approximately in the middle of the figure. The figure represents the same area outlined on the topographic map provided as Appendix E herein.

Because the hand calculation has created confusion, LANL recommends removing it from the text in Appendix G.

24. *Methods section, first paragraph, last sentence, states "This value will serve as a screening value to compare to the final results of the modeling." It is not clear what value this sentence refers to, for example whether the sentence refers to the value of 0.01 mg/kg or to a value calculated as described in the first paragraph. Submit information to clearly identify the value that will serve as a screening value. Furthermore, revise the Application to describe how the amount of toxic pollutants released per year that was used in calculating the screening value was determined.*

Response: The sentence refers to the value of 0.01 mg/kg, which is our conservative test value to ensure the CALPUFF modeling results are reasonable. It is based on only a hypothetical release of 1000 g; that is, 1000 g of material released would result in a maximum soil activity level of 0.01 mg/kg for our stated methodology. We would expect the results from an air-dispersion model to be many orders of magnitude below this test value. This calculation was not applied to the amount of toxic pollutants released per year and it does not in any way affect the results of CALPUFF, which is an EPA-approved method of calculating deposition.

25. *Methods section, second paragraph, states that the Permittees performed the air modeling analysis over a three km by three km domain. It is not clear why the modeling domain was limited to a three km by three km square rather than a larger area as suggested in EPA's Human Health Risk Assessment Protocol for Hazardous Waste*

Combustion Facilities (HHRAP). Revise Appendix G to support the use of the three km by three km grid. Show that significant impacts did not occur at points located above the source elevation and beyond the three km by three km grid. Furthermore, demonstrate that the maximum impact locations for all existing and potential receptor populations occurred within the modeled area.

Response: To be conservative in the derivation of the emissions-to-soil-concentration conversion factor, we elected to use the highest overall value calculated by CALPUFF, even if that valued occurred on site. The 3 km by 3 km modeling domain was selected because air dispersion modeling with SCREEN 3, another EPA-approved model, had shown that the maximum impact point was at 500m. Thus, in our best professional judgment, the 3 km x 3 km modeling domain was used in the CALPUFF model to capture the highest concentration that would be used later used to calculate soil activity levels. The dispersion pattern shown in Figures 1 and 2 of Appendix G of the original NOD response are consistent with other air quality analysis performed at LANL.

26. *Methods section, third paragraph, states that the air concentration and deposition are directly proportional to the emission rate and thus a unit emission rate can be used in the air modeling analysis. This information is referenced to EPA's Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, which describes dispersion modeling using the ISCST3 model. Because Permittees used the CALPUFF model in the deposition analysis of the Burn Ground, the reference should be changed to the appropriate section of the CALPUFF User's Guide.*

Response: The reference is: Section 2.1 of Scire, J.S., Stimanitis, D. G., and Yamartino, R.J., "A Users Guide for the CALPUFF Dispersion Model," Earth Tech. Inc., January 2000.

27. *Methods section, last paragraph, states that PM_{10}, toluene, and NO were used to represent all the constituents emitted from OB operations at TA-16. No support for this approach is provided. In addressing the impacts from OB units, EPA and NMED require that that all emitted constituents be considered rather than a limited number of surrogates. Revise the screening analysis presented in Appendix G to address all emitted constituents and to compare the resulting soil concentrations to the appropriate constituent-specific soil action levels.*

Response: The CALPUFF model does not have species-specific deposition parameters for the majority of the constituents evaluated for the OB operations. It does provide deposition rates for PM_{10}, NOx, SOx, CO, toluene, and xylene. Therefore, pollutants were chosen that best fit TA-16 Burn Ground emissions. The following were chosen as most representative:

- PM_{10} was used to represent metal particles, such as mercury;
- NO_x was used to represent all inorganics, such as the acids and bases that would volatilize during treatment; and
- Toluene was chosen to represent the organic solvents.

These deposition factors were applied to each type of pollutant emitted and included in Table 14 of Appendix B in the original NOD response. Therefore, it is believed that all constituents have been addressed and compared to the appropriate constituent-specific soil action levels.

Results

28. *Permittees use a default value of 0.02 meters per second (m/s) for a deposition velocity that can be applied in converting air concentrations to dry deposition fluxes. The value is referenced to two documents authored by the California Air Resources Board (CARB). For calculating dry deposition fluxes for gases, EPA's HHRAP Appendix B, Table B-1-1, recommends a value three centimeters per second (0.03 m/s). The value recommended in the HHRAP should be used in lieu of the value suggested in the CARB documents.*

Response: The hand calculation using the 0.02 m/s calculation was designed to provide an estimate based on deposition rates published in the literature. As is shown in Table 2 of Appendix G in the original NOD response, the published literature values resulted in an emission-to-soil-concentration factor of 3.8×10^{-8}. This is very close to the factors calculated by CALPUFF, giving credence to the modeling results. Using the 0.03 HJRAP value instead of 0.02 would result in an emissions-to-soil-concentration factor of 5.7×10^{-08} for this screening analysis. Again, this is very close to CALPUFF results. As discussed above, the use of these hand calculations are not intended to replace the CALPUFF calculations; they are simply a "reality check." In this case, either of the deposition rates found in the literature show that the CALPUFF results are reasonable.

29. *According to the air concentration output file, concentration.out, the overall maximum air concentration calculated by CALPUFF was 4.5×10^{-8} grams per cubic meter (g/m^3), not 4.5×10^{-8} grams per cubic centimeter (g/cm^3) reported in the text. Revise the text to correct the typographic error and to indicate that this value represents an average over the entire modeled time period (i.e., an annual average) and to identify the location where it occurred in relation to the location of the Burn Ground units.*

Response: The units in the sentence "The overall maximum air concentration calculated by CALPUFF was about 4.5×10^{-08} g/cm^3 (for a unit release rate of 1 g/s) for all pollutant types" should have been stated in grams per cubic meter. This maximum annual average value occurred at about 850 m to the NNE, as calculated by CALPUFF.

Estimating Soil Concentrations

30. *Revise the Application to include a sample calculation detailing how the conversion values presented in Table 2 for CALPUFF modeling results were calculated.*

Response: A sample calculation for soil activity concentration is provided below:

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) * 1000 mg/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 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
(Note: this is the first soil conversion factor listed in Table 2)

31. *The screening analysis states that CALPUFF-derived values for the maximum soil concentration could be compared to soil screening action levels. While identified in other sections of text, the source of the soil screening action levels is not identified in Appendix G (or in Appendix B). For clarity, revise Appendix G and Appendix B to identify the source of the soil action levels used in the screening analysis.*

Response: The source of the soil action levels used in the screening analysis is Table A-1 of the NMED Soil Screening Levels, December 18, 2000, Revision 1.0. The ecological screening levels used for Appendix B of the original NOD response are from the LANL ER Ecorisk Data Base, Version 1.3, September 2002.

32. *The Permittees use the CALPUFF air dispersion model to generate deposition fluxes for use in the screening analysis. As noted in Appendix G, the CALPUFF model employs sophisticated algorithms for calculating dry deposition flux and for estimating impacts in areas of complex terrain and complex wind fields. According to the input file, calpuff.inp, the Permittees configured the CALPUFF model to model emissions from the OB operations at TA-16 as a point source (i.e., as a stack). No discussion is provided in support of this approach. Revise Appendix G to justify the use of the CALPUFF point source algorithm in the analysis of deposition from the OB operations at TA-16. Demonstrate that this approach adequately represents the actual burning process, for example similarity in plume rise and fireball temperature, and guarantees conservative results compared to the results that would be achieved from use of CALPUFF's area source algorithm or other air dispersion models suitable for application to OB operations, for example OBODM.*

Response: The EPA guideline on Air Quality Models suggests the use of buoyancy-induced dispersion (BID) for the modeling of sources involving combustion; this is a regulatory default option in CALPUFF. To utilize the BID feature of the model, however, a point source type must be used. Although the area or size of each individual source is less than 5 meters (m) in diameter, a source diameter of 7 m was used for the modeling. To predict the buoyant plume rise, both the CALPUFF and the OBODM models use a derivation of the same plume rise algorithm originally developed by Briggs in the early 1970s. It should be noted that the material is being burned, not detonated. Thus, by specifying the burn temperature, the source is more accurately represented by the modeling. The results of this exercise show that the maximum estimated soil concentration levels are multiple orders of magnitude below the applicable levels and that revising the model parameters will simply not change this important fact.

33. *While electronic and hard copies of the CALMET and CALPUFF input files (calmet.inp and calpuff.inp), were provided, no discussion of the input values or the settings of the flags in the input files was included. Such information is needed to determine if the input files adequately reflect conditions and OB operations at TA-16, including the characteristics of the constituents emitted as a result of treatment. Revise the material describing the air modeling analysis to include a discussion of the input values used in both calmet.inp and calpuff.inp. In addition, describe why the input flags were set as shown in the copies of these files. For example, the description provided for calpuff.inp should address:*

- *Group 2 flags;*
- *Chemical parameter values from Group 7;*
- *Use of the default values for the resistances in Group 9; and*
- *Use of the default value specified for surface roughness in Group 12.*

Response: The CALMET and CALPUFF models have a large number of parameters and flags, which the user can set or change; however, for the majority, we did not change these values from the regulatory default values pre-set in the code. Those values that we set or input to perform the OB analysis are given below.

<u>CALMET input variables (of significance) set or changed:</u>

NUSTA = 1, number of upper air stations used, CALPUFF requires at least one upper air station.
IRTYPE = 1, set to compute all micrometeorological variables, required to complete the dispersion analysis.
LCALGRD = T, this was 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, most common valued used for fine-scale modeling.
NZ = 4, this is the number of additional horizontal wind field layers used in the modeling; heights set at 20 m, 40 m, 80 m, and 160 m (values suggested in CALPUFF training course for near field analysis).
NSSTA = 4, number of surface stations; we used the four main surface stations at LANL.
IWFCOD = 1, diagnostic wind field module; needed to complete the dispersion analysis.

BIAS = -1, -.8, -.5, -.2, 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; these were determined (previously) by conducting a large number trial runs of CALPUFF along with the topography of the Pajarito Plateau.

CALPUFF input variables (of significance) set or changed:
METRUN = 1, this causes CALPUFF to use the entire set of meteorological data.
NSPEC = 3, we modeled three different species of pollutant with CALPUFF.
MCATDJ = 2, this was set to utilize of the CALPUFF terrain adjustment method; provides for a more complete handling of terrain adjustments.
MTRANS = 0, transitional plume rise set to zero since there are no building wake effects for the source.
MTIP = 0, no stack tip downwash selected because the release site has minimal physical height.
MCHEM = 0, no chemical transformation selected; we lack sufficient data to support chemical transformation of the emitted pollutants.
MDISP = 1, set to use the most advanced method to calculate the dispersion coefficients (as suggested in the CALPUFF training course).
MPARTL = 0, no partial plume penetration; setting to zero should maximize ground-level concentrations (under certain dispersion conditions).
MREG = 0, required to be set to zero since MCHEM, MTRANS, and MPARTL were set to their non-regulatory default value.
X = 379.74, Y=3967.73, UTM coordinates of the source in km.
Z = 2270 m, base elevation of the source.
Source release height = 1.0 m, this value best approximates the given sources.
Source diameter = 7.0 m, this value best approximates the given sources.
Gas exit velocity = 1.7 m/s, a typical/conservative value.
Source temperature = 1200 deg. K; we performed a number of trial runs at the various temperatures given for the burn operations and found that this value provided us with the more conservative dispersion results.

34. *Submit information to include discussions of the environmental setting, surrounding land use, potential exposure pathways, and the complex wind field in support of the modeling input values.*

Response: The Burn Ground is located in moderately vegetated Ponderosa Pine forest, and is surrounded by DOE/LANL property that has light to moderate use. 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.

35. *Provide electronic copies of all input and ancillary files needed to repeat the air modeling analysis performed for the TA-16 Burn Ground units. These should include all model-ready meteorological and terrain files.*

Response: Enclosed in Appendix F of this response are two CDs with the input and output files used in the air dispersion analysis and model-ready meteorological and terrain files.

Chapter 5 -Technical Area 16 Conditions, June 2000 Draft
Attachment E.2 - DRAFT Closure Plan for the
Technical Area 16 Burn Ground Unit

Permittees directed that the above-referenced Closure Plan replaces the Closure Plan in Attachment F.2 of the Application. NMED provides the following comments on the substituted closure plan:

36. ***Attachment E.2.2.1, Estimate of Maximum Waste in Storage***

Revise the Application to include an estimate of the maximum inventory for each type of waste to be treated during the active life of the unit.

Response: The revised closure plan, included herein as Appendix B, provides an estimate of the maximum inventory for the hazardous waste treated during the active life of the each OB unit, to date.

37. ***Attachment E.2.2.2, Removal of Waste***

According to 20.4.1.500 NMAC (incorporating 40 C.F.R. § 264.112(b)(3)), the types of off-site hazardous waste management facilities to be used must be identified. Revise the Application to discuss what types of waste will go to which specific off-site facility.

Response: The requirements of 20.4.1 NMAC § 264.112(b)(3) state that the closure plan must include "identification of the type(s) of the off-site hazardous waste management units to be used, if applicable." The anticipated types of off-site hazardous waste management units to be used for LANL's waste upon closure of the OB units at TA-16 include treatment, storage, and disposal facilities. The requirements do not call for a facility to identify the types of waste that will be shipped to which specific off-site facility or to identify the specific off-site facilities in the closure plan. Because these OB units are anticipated to remain active for a long period, it is difficult to predict what options for final waste disposition will be available.

Based on the above, Section F.4 of the revised closure plan for the TA-16 OB units included as Appendix B herein includes an item indicating that the off-site hazardous waste management facilities (i.e., treatment, storage, and disposal facilities) to be used will be identified in the TA-16 OB unit-specific SAP to be developed prior to actual closure activities.

38. *Attachment E.2.2.3, Closure Procedure and Decontamination*

a) *As outlined in 20.4.1.500 NMAC (incorporating 40 C.F.R. § 264.112(b)(4)) a detailed description for the closure must include the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard. The Application does not address methods for sampling and testing surrounding soils and removing contaminated soils during either closure of the unit or closure of the TA. Permittees shall revise the Application to provide a less detailed sampling and analysis plan (SAP) with an emphasis on the overall goals and approaches for site characterization. A more detailed SAP shall be provided at the time of closure. Permittees shall include the following information, at a minimum, in the SAP submitted at the time of closure:*

Response: The closure plan included herein as Appendix B has been revised to delete the detailed sampling and analytical procedures and to provide the overall goals and approaches for site characterization and unit decontamination. It has also been revised to indicate that a detailed OB unit-specific SAP will be provided 90 days prior to closure. The elements of the SAP, which will include methods for sampling and analysis, are addressed in Section F.4 of the revised closure plan.

a. ***Unit history and description, identifying, at a minimum, the following:***

i *constituents of concern, determined by all hazardous and radioactive constituents stored or treated at the unit, by category of constituent subject to the same sampling methodology;*

Response: As indicated in Section F.4 of the revised closure plan, the OB unit-specific SAP will include the operational history of the OB unit to be closed and the applicable contaminants of potential concern. The TA-16 OB units treat only hazardous waste; therefore, radioactive constituents are not applicable in the SAP. Hazardous waste is not stored at the OB units. These units are used for treatment of hazardous waste.

ii *spills or other releases of hazardous and radioactive constituents during operation of the unit; and*

Response: As indicated in Section F.4 of the revised closure plan, the OB unit-specific SAP will include the operational history of the OB unit to be closed. The operational history will include descriptions of known spills or other releases of hazardous wastes. The TA-16 OB units treat only hazardous waste; therefore, radioactive constituents are not applicable in the SAP.

iii visible staining, cracks, sumps, and other unit-specific conditions indicating potential release locations.

Response: As indicated in Section F.4 of the revised closure plan, the OB unit-specific SAP will include descriptions of evidence of potential problems (e.g., visual stains, dead vegetation, solid waste management units). It should be noted that there are no sumps associated with the OB units at TA-16.

b. Proposed decontamination procedures;

Response: As indicated in Section F.4 of the revised closure plan, the OB unit-specific SAP will include detailed procedures for decontamination methods for equipment, structures, and media.

c. Proposed sample locations, including indoor surfaces, outdoor surfaces, for example asphalt or concrete pads, and soils;

Response: As indicated in Section F.4 of the revised closure plan, the OB unit-specific SAP will include methods for sampling and analysis of contaminated media. These methods will include proposed sample locations for outdoor surfaces (e.g., concrete pads) and soils. It should be noted that there are no indoor surfaces associated with the TA-16 OB units.

d. Sample methods and procedures;

Response: As indicated in Section F.4 of the revised closure plan, the OB unit-specific SAP will include sampling methods for hazardous waste determination and decontamination of media.

e. Analytes; and

Response: As indicated in Section F.4 of the revised closure plan, the OB unit-specific SAP will include analytical methods (including detection limits) and the rationale for their determination.

f. Detection limits.

Response: See LANL's response to Comment No. 38(e).

b) The schedule for closure activities for the Burn Ground Unit is presented in Table E.1-1. It is not apparent that the schedule allows time for proper data validation, time to treat wastes, or adequate time for transporting wastes to disposal sites, if warranted.

Response: The time allowed for completing partial or final closure activities is 180 days after receiving the final volume of hazardous wastes, per the requirements of 20.4.1 NMAC § 264.113(b). Table E.1-1 referenced in this comment is the "Schedule for Closure Activities at Technical Area 16, Building 88, Container Storage Unit." The container storage unit is being withdrawn administratively. As indicated in NMED's notation preceding Comment No. 36, the

comments in this NOD are applicable to Attachment E.2 of the draft Closure Plan for the Technical Area 16 Burn Ground Unit that was included in the draft *"Los Alamos National Laboratory Hazardous Waste Facility Permit, Chapter 5, Technical Area 16 Conditions."* Table E-2.1 of that plan reflected the allowed time, and included a footnote to indicate that "Extensions to this schedule may be requested, as necessary".

In the revised closure plan included herein as Appendix B, a closure schedule table (Table F-1) is incorporated and includes the activities of sampling and analysis. The table also includes a footnote indicating "Extensions to this schedule may be requested, as necessary". Extensions to the closure period are allowed by 20.4.1 NMAC § 264.113(b), and are likely to be necessary if soil removal activities are required for closures of the OB units. The OB unit-specific closure SAP discussed in LANL's responses to Comment No. 38 will also include a more detailed closure schedule.

c) *The Application states that all workers will have proper training and medical monitoring. Reference where in the Application the training requirements and medical monitoring requirements for workers are discussed.*

Response: As indicated in Attachment D of the TA-16 permit renewal document, training requirements are addressed in Appendix D, the Personnel Training Plan, of the LANL General Part B. Section D.2 (titled "Training Content, Frequency, and Techniques") of that plan describes the training program instituted at LANL. Table D-1 of the same plan presents a training program outline for LANL employees. General Site Workers is the category most applicable for personnel engaged in closure activities. One of the courses listed in the table for General Site Workers is Hazardous Waste Operations and Emergency Response, which provides general information on hazardous waste operations for general site workers engaged in corrective action, remediation, or decontamination and decommissioning activities (e.g., closure activities).

The following information is provided to address the medical monitoring issue but is not intended for inclusion in the application. The reference to monitoring should not have been made in the application as it is not required by 20.4.1 NMAC §§ 270.14 and 264.16. LANL's General Employee Training (GET) must be taken by all new workers who will be at LANL for 10 workdays or more during the 12 months following their date of hire. One of the topics described in GET is the Occupational Medicine Program, which is managed by HSR-2, the Occupational Medicine Group. A full medical evaluation at the Occupational Medicine building (TA-3-409) is required for all new employees to provide baseline occupational medical information. Some job assignments (e.g., those who work with identified carcinogens) require medical surveillance every year to monitor for early signs of health effects, and some job assignments require certification evaluations every year (e.g., respirator users) to ensure their health meets job-performance standards before they are certified for their particular jobs. Before leaving LANL employment, an employee is required to schedule an appointment with HSR-2 to review his or her health status. All LANL employees must comply with all health evaluation requirements. HSR-2 maintains an occupational medical record on each LANL employee; these confidential medical records are released to others only with the employee's written consent, except as required by law.

Section F.3.3 of the revised closure plan for the TA-16 OB units, included herein as Appendix B, includes a reference to Attachment D of the application and Appendix D of the General Part B to demonstrate compliance with the training requirements.

d) *The Application discusses how a baseline (or background) level for the wash water solutions will be determined. However, there is no discussion of how background levels for soils will be determined. As part of closure, it must be demonstrated that all hazardous waste and hazardous waste residues be removed or decontaminated from soils surrounding the Burn Ground Units. Revise the Application to include a discussion of where background soil samples will be taken, how many samples will be taken, and the analytical methods.*

Response: As indicated in LANL's response to Comment No. 38, a detailed closure SAP discussing this issue will be prepared prior to initiation of closure activities. A general discussion of background determination is included in Section F.3.3 of the revised closure plan included herein as Appendix B.

e) *The Application states that a wash water solution will be used in the decontamination of any equipment and structures. Revise the Application to discuss what will comprise the wash solution and discuss the appropriateness of this solution for organics, inorganics, and radionuclides.*

Response: As indicated in LANL's response to Comment No. 38, a detailed closure SAP will be prepared prior to initiation of closure activities. A general discussion of wash water solutions is included in Section F.3.4 of the revised closure plan included herein as Appendix B. The TA-16 OB units treat only hazardous waste; therefore, radioactive constituents are not applicable in the SAP.

f) *The use of a wash water solution may be appropriate for loose contamination, but will not remove fixed contamination. Revise the Application to discuss how portable equipment, storage structure walls, and floors will be decontaminated for fixed contamination.*

Response: Section F.3.4 of the revised closure plan included as Appendix B of this response states that if any portion of an OB unit cannot or will not be decontaminated, the contaminated portion will be disposed of in accordance with appropriate waste management regulations. As indicated in LANL's response to Comment No. 38, a detailed closure SAP addressing this issue will be prepared prior to initiation of closure activities.

It should be noted that there are no storage structure walls and floors associated with the TA-16 OB units. In addition, only hazardous wastes are treated at the TA-16 OB units; therefore, loose and/or fixed radionuclide contamination is not an issue.

39. ***Attachment E.2.2.4, Decontamination Equipment***

a) The Application states that a wash water solution will be used in the decontamination of equipment. Revise the Application to discuss what will comprise the wash solution and discuss the appropriateness of this solution for organics and inorganics.

Response: See LANL's response to Comment No. 38(e).

b) The Application states that equipment rinsate blanks will be collected and analyzed in accordance with ER SOPs. Revise the Application to include what specific SOPs will be used.

Response: As indicated in LANL's response to Comment No. 38, a detailed closure SAP will be prepared prior to initiation of closure activities and will address field and laboratory quality assurance and quality control procedures. Reference to ER standard operating procedures has been deleted from the revised closure plan included herein as Appendix B.

c) The Application discusses cleaning of equipment, but neither this section of the Application nor Section E.2.2.5, discusses how the decontamination of equipment used during decontamination procedures of other equipment will be verified. Revise the Application to include procedures for the verification of decontamination of equipment and how levels of residual contamination will be determined.

Response: Section F.3.4 of the revised closure plan included herein as Appendix B presents a general description of decontamination equipment, and Section F.3.5 discusses decontamination verification procedures. As indicated in LANL's response to Comment No. 38, a detailed closure SAP will be prepared prior to initiation of closure activities and will include a description of sampling equipment decontamination and disposition procedures.

40. ***Attachment E.2.2.5, Decontamination Verification***

a) The Application states that a "sufficient sampling and analysis will be required to demonstrate" decontamination. The Application should provide the method for determining how "sufficient" numbers of samples will be determined. Revise the Application to include a discussion of how the number of verification samples for the Burn Ground Units will be determined.

Response: As indicated in LANL's response to Comment No. 38, a detailed closure SAP will be prepared prior to initiation of closure activities. The SAP will include a discussion of the statistical or judgmental basis for determining the number of verification samples needed.

b) The Application should provide a listing of expected contaminants (parameters) that may be present at the Burn Ground Units. Revise the Application to include a listing of potential contaminants at the Burn Ground Units.

Response: As indicated in LANL's response to Comment No. 38, a detailed closure SAP will be prepared prior to initiation of closure activities. The SAP will include a discussion of the contaminants of potential concern.

c) *The Application states that methods from SW-846 will be used for the confirmation testing. At a minimum, for constituents not included in SW-846 methods, the sample method for each type of constituent (e.g., organics, and metals) must be provided in the Application. Revise the Application to include a listing of the sample methods to be used for each type/group of constituent present and for each medium to be sampled at the Burn Ground Units not included in SW-846.*

Response: As indicated in LANL's response to Comment No. 38, a detailed closure SAP will be prepared prior to initiation of closure activities. The SAP will include a discussion of the sample methods to be used.

d) *The use of testing wash water for determination of decontamination can result in significant dilution of constituents. This method also does not allow for the detection of potential hot spots. Revise the Application to discuss the potential uncertainties associated with this method of decontamination verification and should also discuss how hot spots will have been detected and verified decontaminated to acceptable levels.*

Response: Wash water will likely be used only to decontaminate retractable covers, burners, and concrete pads and walls. Other components of the OB units will be decontaminated by flashing (treatment). As indicated in LANL's response to Comment No. 38, a detailed closure SAP will be prepared prior to initiation of closure activities. The SAP will present information on how significant dilution of constituents will be avoided for the concrete pads by conducting decontamination on separate sections rather than on the entire pad during one wash down cycle. Potential hot spots will be detected using the DX-2 HE Spot Test. The SAP will also discuss any additional detailed methods for contamination detection and decontamination verification.

e) *Decontamination verification for hazardous waste residues may require swipe analysis and will be determined at the time of closure.*

Response: Swipe analysis will be done using the DX-2 HE Spot Test. These results of these analyses will be used to verify decontamination for HE.

f) *The Application does not discuss how surrounding soils will be sampled to ensure that no cross contamination as a result of decontamination activities have occurred. Revise the Application to include a discussion of how soils around areas to be decontaminated will be sampled and verified for potential cross contamination as a result of decontamination procedures.*

Response: Section F.3.4 of the revised closure plan included herein as Appendix B discusses soil sampling. As indicated in LANL's response to Comment No. 38, a detailed closure SAP will be prepared prior to initiation of closure activities. The SAP will include detailed procedures for sampling and analysis of contaminated soil and decontamination methods for

media (e.g., soil), and removal procedures for contaminated media, if necessary. It will also provide information on sampling methods and procedures for decontamination verification.

Because most of the components of the OB units will be decontaminated by treatment (flashing) rather than by wash downs, the likelihood of cross contamination as a result of decontamination procedures will be minimized.

APPENDIX A

COPY OF "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"

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
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GARY E. JOHNSON
GOVERNOR

PETER MAGGIORE
SECRETARY

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

July 2, 2002

Dr. John C. Browne, Director
Los Alamos National Laboratory
P.O. Box 1663, Mail Stop A100
Los Alamos, New Mexico 87545

Mr. Ralph Erickson, Area Manager
Department of Energy
Office of Los Alamos Site Operations
528 35th Street, Mail Stop A316
Los Alamos, New Mexico 87544

SUBJECT: 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# NM 0890010515
HWB-LANL-00-002

Dear Dr. Browne and Mr. Erickson:

The New Mexico Environment Department (NMED) has reviewed the U. S. Department of Energy and Los Alamos National Laboratory's (Permittees) February 19, 2002 response to NMED's December 24, 2001 Notice of Deficiency (NOD) for the above-referenced Application (Application). This second NOD also includes review of the April 15, 2002 (SWRC:02-028) document regarding meteorological input to the CALPUFF modeling system (LANL, TA-16) submitted by Permittees.

Permittees informed NMED that the closure plan in the Draft Los Alamos National Laboratory Hazardous Waste Facility Permit Chapter 5, Technical Area 16 Conditions Attachment E.2, *Closure Plan for the Technical Area 16 Burn Ground Unit* dated June 2000 will be substituted for the closure plan in the Application. This second NOD therefore includes review and comment on the revised closure plan.

The above referenced documents have been reviewed for technical adequacy as required under NMAC 20.4.2.201.3.2, which includes, 40 CFR part 264, Subpart X, and are found to be

deficient. The list of additional information required by NMED is included as Attachment A of this NOD.

Permittees shall respond to this NOD within 45 days of receipt of this letter. If the receipt is not signed, Permittees shall respond within 45 days of the date of this letter. Permittees' response shall consist of an electronic version in Microsoft Word 2000 or earlier version and three hard copies.

This NOD does not include comment on the building 88 (TA-16-88) container storage unit (CSU) because Permittees submitted notification to NMED by letter from the U. S. Department of Energy to NMED dated June 24, 2002 requesting the CSU not be included in the TA-16 Permit Chapter. Permittee will submit a revised application reflecting this change. The CSU will be closed prior to issuance of the Permit.

Closure of the CSU will be achieved by submitting affidavits to NMED, signed by the responsible parties, stating this unit was never used to store hazardous or mixed waste.

If you have questions regarding this letter, please contact Lee Winn of my staff at 505-428-2541.

Sincerely,

James P. Bearzi
Chief
Hazardous Waste Bureau

JPB:lw
cc: J. Kieling, NMED HWB
D. Cobrain, NMED HWB
C. Will, NMED HWB
P. Allen, NMED HWB
L. Winn, NMED HWB
A. Ortiz, NMED OGC
L. King, EPA, 6PD-N
J. Ellvinger, LANL ESH-19, MS K490
G. Bacigalupa, LANL ESH-19, MS K490
G. Turner, DOE LAAO, MS A316

File: Reading and LANL TA-16 2002

ATTACHMENT A
NOTICE OF DEFICIENCY:

RCRA PART B PERMIT APPLICATION
TA-16, JANUARY 2000, REVISION 3.0

LOS ALAMOS NATIONAL LABORATORY
EPA ID NO. NM0890010515

July 2, 2002

NMED December 24, 2001, NOD comment 1.a. and Permittee's February 2002 response

1. Currently, TA-16 uses propane burners to ignite waste, but diesel and wood were used in the past. Burning with diesel and wood occurred at lower temperatures potentially causing higher emissions than present practices. Revise the Closure Plan to specify that at closure the soil surrounding the open burn (OB) units shall be sampled for dioxins; furans; volatile organic compounds; semivolatile organic compounds, including PCBs; metals, including barium and cadmium; high explosives (HE), including degredation products such as toluene, xylene, nitrotoluenes, and nitrobenzenes; hydrocarbons; and perchlorate (EPA method 314.0).

2. In the last paragraph of page five of the NOD response, the Permittees state that the EPA report concluded in Chapter 7 that it would be prudent to assume that all the chlorine in aluminized propellant (AP)-based explosives will be released to the environment as hydrochloric acid (HCl). However the study states that 98% to 99% of the chlorine in the test burns was found to convert to HCl. Submit information recalculating the emission factors for halogens to account for the study's concentrations and revise Appendix B, Table 10, and the comparison of 2000 emissions with screening action levels (SAL's) and ecological screening levels (ESL's) if necessary.

3. Submit the evaluation requested in Comment No. 2 above for 2001 emissions data.

4. Submit revised information for pages 10 through 12 of the NOD response, the list entitled Detonation Potential by Waste Stream, to specifically specify the HE components, for example RDX and HMX, and all other constituents present in each specified waste stream and include the percentages of each constituent in each waste stream.

December 24, 2001, NOD comment 1.b. and Permittee's February 2002 response

5. Page six, paragraph two, of the NOD response states, "If decontamination to these cleanup levels is not achievable, LANL may propose an alternate demonstration of decontamination as circumstances indicate." If Permittee proposes an alternate

demonstration of decontamination, Permittees must submit a permit modification request.

6. Page six, paragraph two, of response 1.b, the NOD response states, "If the TA-16 Burn Ground Unit (or portion thereof) cannot be clean closed, LANL will provide a written post-closure plan." Permittees shall remove or decontaminate all hazardous waste and hazardous waste residues at closure of OB units. Post-closure care is not an option.

December 24, 2001, NOD comment 1.c. and Permittee's February 2002 response

7. Regarding explosive-bearing liquid waste streams, page ten, paragraph one of the NOD response states, "Through pre-filtering HE-contaminated water prior to treatment at the HE Wastewater Treatment Facility (HEWTF) at TA-16, suspended Class A HE Particles can be captured and removed." OB is a treatment of last resort, to be used only when all other options are unavailable and only for wastes that cannot be diverted to other technologies. Submit an assessment of other treatment methods to minimize amounts of all solvents that are open burned, for example options for pre-filtering the HE-contaminated spent solvent waste and replacing the solvent with some other nonhazardous liquid.

December 24, 2001, NOD comment 2 and Permittee's February 2002 response

8. The NOD response does not conclusively demonstrate that there are no better treatment methods with less risk of deposition than OB. Permittees' discussions with other waste management personnel and the citation of the 1994 Radian study is not an adequate response. NMED believes there are other more recent sources. Submit an assessment of literature on alternative technologies and on the feasibility of each method related to relevant waste streams. Include an assessment of Permittees' own literature, for example Stephen J. Buelow, *Research and Development for Alternatives to Open Burning/Open Detonation of Waste Propellants, Explosives and Pyrotechnics: Alkaline Hydrolysis and Supercritical Water Oxidation of M31A1E1* (Los Alamos National Laboratory for CERL, undated).

December 24, 2001, NOD comment 3 and Permittee's February 2002 response

9. The HE that accumulates in the sandfilter and treated there is not discharged through the NPDES-permitted outfall and therefore is not subject to the 20.4.1 NMAC §§ 264.1(g)(6) and 270.1(c)(2)(v) exemption. Therefore, these units may not be removed from the Application.

December 24, 2001, NOD comment 4 and Permittee's February 2002 response

10. Update the Storm Water Pollution Prevention Plan (SWPPP) map (Merrick Site Plan, 1/7/00) to indicate the location of the E257 stormwater monitoring station.

11. The stormwater monitoring requirements under the SWPPP are quarterly grab samples for ammonia, Mg, COD, total recoverable Cd, Pb, Hg, Se, Ag and free CN. In addition, based on review of the included solid waste management unit (SWMU) data, stormwater monitoring under the Watershed Monitoring Program should also include total Ba, Zn, Cu, and a complete HE suite. Existing stormwater data should be included as an appendix to the SWPPP and updated annually as more stormwater data becomes available.

12. To aid in determining potential releases from the Burn Ground, Permittees should install a stormwater gaging station upgradient of the Burn Ground (one already exists below the Burn Ground) and determine the concentration of contaminants from the Burn Ground.

December 24, 2001, NOD comment 5 and Permittee's February 2002 response

The following four comments are given for clarification:

13. The Permittees indicate in the response that the most likely source of groundwater contamination is from the TA-16-260 outfall. However, the RCRA Facility Investigation (RFI) Report for the 260 Outfall, Potential Release Site 16-021(c) (September 1998, LA-UR-98-4101), indicates that there is an increasing involvement of alluvial waters with the surface water system downgradient from the Burn Ground. This conclusion is based on the increase in barium and RDX contamination levels downgradient from the Burn Ground. Volatile organic compounds, barium (at 5-10,000 ppm), and HE have been detected in the Canyon de Valle alluvial system downgradient from the Burn Ground. Permittees have not demonstrated that the Burn Ground is not contributing to groundwater contamination.

14. Possible historic Burn Ground surface contamination may be mobilizing and impacting Fish Ladder Seep surface and subsurface systems. Contaminants detected at the Fish Ladder Seep include HMX, at a maximum of 7.6 μg/L; RDX, at a maximum of 2.7 μg/L; and TCE, at a maximum of 0.3 μg/L. The extent of surface and subsurface contamination from the Burn Ground is not known.

15. The well number R-25 is upgradient from the Burn Ground. Furthermore, NMED notified the Permittees by letter dated September 9, 2000, that NMED will not accept sampling results from R-25 because of defective installation of the well. Therefore, the Permittees shall not depend on sampling data from this well to support their conclusions.

16. The response is not accurate because there is evidence that the Burn Ground is contributing to contamination of the uppermost aquifer (see Comment No. 13 above). RDX and TNT are not the only constituents detected.

APPENDIX B - TECHNICAL AREA 16 BURN GROUND DATA AND SUMMARY TABLES

17. Provide additional information in support of using Table 2.1-1 and Table 2.5-8 from the U.S. Environmental Protection Agency (EPA) AP-42, Chapter 2, as the source for emission factors for the open burning of solids contaminated with HE. The information provided should demonstrate why the emission factors from this source are preferred over those provided in *Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD)* (EPA OBOD Database) and other sources. If metals are present in the actual waste streams flashed at TA-16, they should be identified and addressed as recommended in the EPA OBOD Database. The amount of metals in the waste streams should equal the amount emitted plus that found in the ash.

18. Based on the information furnished in the response to December 24 NOD Comment 1.a, it is not clear that assuming a 95% efficiency for the propane burners results in the best estimates for emission factors from burning HE-contaminated oils or solvents. Address the problems specific to using the EPA OBOD Database and submit information that demonstrates that the alternate techniques and information sources result in the best estimates for assessing human health and environmental risks from the open burning of HE-contaminated oils or solvents. If metals are present in the actual waste streams flashed at TA-16, they should be addressed as recommended in the EPA OBOD Database. The amount of metals in the waste streams should equal the amount emitted plus that found in the ash.

19. It is not clear that the M31A1E1 triple-based propellant included in the EPA OBOD Database is suitable to represent all bulk HE listed in Appendix B, Table 7. Submit additional information in support of using this triple-based propellant as a surrogate. Some of the explosives listed in Table 7 were treated by detonation in the studies included in the EPA OBOD Database.

20. Permittees' response to December 24 NOD Comment 6.a states that total metal concentrations (background concentrations) were divided by 20 for comparison to TCLP values for ash. The results are presented in Table 12. In Table 12, the total (background) metal concentration for chromium is divided by 276 and the concentration for mercury is divided by 10. Submit an explanation of why chromium and mercury were treated differently.

21. For clarity, submit an example calculation illustrating how the emitted quantities of barium and cadmium listed in Table 13 were determined.

APPENDIX G - DEPOSITION MODELING FOR THE TA-16 BURN GROUND

22. Submit a topographic map or plot of the modeling domain in Appendix G.

Methods

23. Methods section, first paragraph, states that the hand calculation performed for screening purposes assumed that deposition occurred over a circle with a radius of one kilometer (km) centered on the source. No support is provided for this assumption. Revise Appendix G to show that all significant deposition from OB operations at TA-16 occurs within a one km radius of the source. Show that the point of maximum deposition occurs within a one km radius of the source by including the one km radius circle and labeling the overall maximum impact points on Figures 1 and 2.

24. Methods section, first paragraph, last sentence, states "This value will serve as a screening value to compare to the final results of the modeling." It is not clear what value this sentence refers to, for example whether the sentence refers to the value of 0.01 mg/kg or to a value calculated as described in the first paragraph. Submit information to clearly identify the value that will serve as a screening value. Furthermore, revise the Application to describe how the amount of toxic pollutants released per year that was used in calculating the screening value was determined.

25. Methods section, second paragraph, states that the Permittees performed the air modeling analysis over a three km by three km domain. It is not clear why the modeling domain was limited to a three km by three km square rather than a larger area as suggested in EPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP). Revise Appendix G to support the use of the three km by three km grid. Show that significant impacts did not occur at points located above the source elevation and beyond the three km by three km grid. Furthermore, demonstrate that the maximum impact locations for all existing and potential receptor populations occurred within the modeled area.

26. Methods section, third paragraph, states that the air concentration and deposition are directly proportional to the emission rate and thus a unit emission rate can be used in the air modeling analysis. This information is referenced to EPA's *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities*, which describes dispersion modeling using the ISCST3 model. Because Permittees used the CALPUFF model in the deposition analysis of the Burn Ground, the reference should be changed to the appropriate section of the CALPUFF User's Guide.

27. Methods section, last paragraph, states that PM_{10}, toluene, and NO were used to represent all the constituents emitted from OB operations at TA-16. No support for this approach is provided. In addressing the impacts from OB units, EPA and NMED require that that all emitted constituents be considered rather than a limited number of surrogates. Revise the screening analysis presented in Appendix G to address all emitted constituents and to compare the resulting soil concentrations to the appropriate constituent-specific soil action levels.

Results

28. Permittees use a default value of 0.02 meters per second (m/s) for a deposition velocity that can be applied in converting air concentrations to dry deposition fluxes. The value is referenced to two documents authored by the California Air Resources Board (CARB). For calculating dry deposition fluxes for gases, EPA's HHRAP Appendix B, Table B-1-1, recommends a value three centimeters per second (0.03 m/s). The value recommended in the HHRAP should be used in lieu of the value suggested in the CARB documents.

29. According to the air concentration output file, concentration.out, the overall maximum air concentration calculated by CALPUFF was 4.5×10^{-8} grams per cubic meter (g/m^3), not 4.5×10^{-8} grams per cubic centimeter (g/cm^3) reported in the text. Revise the text to correct the typographic error and to indicate that this value represents an average over the entire modeled time period (i.e., an annual average) and to identify the location where it occurred in relation to the location of the Burn Ground units.

Estimating Soil Concentrations

30. Revise the Application to include a sample calculation detailing how the conversion values presented in Table 2 for CALPUFF modeling results were calculated.

31. The screening analysis states that CALPUFF-derived values for the maximum soil concentration could be compared to soil screening action levels. While identified in other sections of text, the source of the soil screening action levels is not identified in Appendix G (or in Appendix B). For clarity, revise Appendix G and Appendix B to identify the source of the soil action levels used in the screening analysis.

32. The Permittees use the CALPUFF air dispersion model to generate deposition fluxes for use in the screening analysis. As noted in Appendix G, the CALPUFF model employs sophisticated algorithms for calculating dry deposition flux and for estimating impacts in areas of complex terrain and complex wind fields. According to the input file, calpuff.inp, the Permittees configured the CALPUFF model to model emissions from the OB operations at TA-16 as a point source (i.e., as a stack). No

discussion is provided in support of this approach. Revise Appendix G to justify the use of the CALPUFF point source algorithm in the analysis of deposition from the OB operations at TA-16. Demonstrate that this approach adequately represents the actual burning process, for example similarity in plume rise and fireball temperature, and guarantees conservative results compared to the results that would be achieved from use of CALPUFF's area source algorithm or other air dispersion models suitable for application to OB operations, for example OBODM.

33. While electronic and hard copies of the CALMET and CALPUFF input files (calmet.inp and calpuff.inp), were provided, no discussion of the input values or the settings of the flags in the input files was included. Such information is needed to determine if the input files adequately reflect conditions and OB operations at TA-16, including the characteristics of the constituents emitted as a result of treatment. Revise the material describing the air modeling analysis to include a discussion of the input values used in both calmet.inp and calpuff.inp. In addition, describe why the input flags were set as shown in the copies of these files. For example, the description provided for calpuff.inp should address:

- Group 2 flags;
- Chemical parameter values from Group 7;
- Use of the default values for the resistances in Group 9; and
- Use of the default value specified for surface roughness in Group 12.

34. Submit information to include discussions of the environmental setting, surrounding land use, potential exposure pathways, and the complex wind field in support of the modeling input values.

35. Provide electronic copies of all input and ancillary files needed to repeat the air modeling analysis performed for the TA-16 Burn Ground units. These should include all model-ready meteorological and terrain files.

Chapter 5 - Technical Area 16 Conditions, June 2000 Draft
Attachment E.2 - DRAFT Closure Plan for the Technical Area 16 Burn Ground Unit

Permittees directed that the above-referenced Closure Plan replaces the Closure Plan in Attachment F.2 of the Application. NMED provides the following comments on the substituted closure plan:

36. Attachment E.2.2.1, Estimate of Maximum Waste in Storage

Revise the Application to include an estimate of the maximum inventory for each type of waste to be treated during the active life of the unit.

37. Attachment E.2.2.2, Removal of Waste

According to 20.4.1.500 NMAC (incorporating 40 C.F.R. § 264.112(b)(3)), the types of off-site hazardous waste management facilities to be used must be identified. Revise the Application to discuss what types of waste will go to which specific off-site facility.

38. Attachment E.2.2.3, Closure Procedure and Decontamination

a) As outlined in 20.4.1.500 NMAC (incorporating 40 C.F.R. § 264.112(b)(4)) a detailed description for the closure must include the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard. The Application does not address methods for sampling and testing surrounding soils and removing contaminated soils during either closure of the unit or closure of the TA. Permittees shall revise the Application to provide a less detailed sampling and analysis plan (SAP) with an emphasis on the overall goals and approaches for site characterization. A more detailed SAP shall be provided at the time of closure. Permittees shall include the following information, at a minimum, in the SAP submitted at the time of closure:

   a. Unit history and description, identifying, at a minimum, the following:

      i. constituents of concern, determined by all hazardous and radioactive constituents stored or treated at the unit, by category of constituent subject to the same sampling methodology;

      ii. spills or other releases of hazardous and radioactive constituents during operation of the unit; and

      iii. visible staining, cracks, sumps, and other unit-specific conditions indicating potential release locations.

   b. Proposed decontamination procedures;

   c. Proposed sample locations, including indoor surfaces, outdoor surfaces, for example asphalt or concrete pads, and soils;

   d. Sample methods and procedures;

   e. Analytes; and

f. Detection limits.

b) The schedule for closure activities for the Burn Ground Unit is presented in Table E.1-1. It is not apparent that the schedule allows time for proper data validation, time to treat wastes, or adequate time for transporting wastes to disposal sites, if warranted.

c) The Application states that all workers will have proper training and medical monitoring. Reference where in the Application the training requirements and medical monitoring requirements for workers are discussed.

d) The Application discusses how a baseline (or background) level for the wash water solutions will be determined. However, there is no discussion of how background levels for soils will be determined. As part of closure, it must be demonstrated that all hazardous waste and hazardous waste residues be removed or decontaminated from soils surrounding the Burn Ground Units. Revise the Application to include a discussion of where background soil samples will be taken, how many samples will be taken, and the analytical methods.

e) The Application states that a wash water solution will be used in the decontamination of any equipment and structures. Revise the Application to discuss what will comprise the wash solution and discuss the appropriateness of this solution for organics, inorganics, and radionuclides.

f) The use of a wash water solution may be appropriate for loose contamination, but will not remove fixed contamination. Revise the Application to discuss how portable equipment, storage structure walls, and floors will be decontaminated for fixed contamination.

39. Attachment E.2.2.4, Decontamination Equipment

a) The Application states that a wash water solution will be used in the decontamination of equipment. Revise the Application to discuss what will comprise the wash solution and discuss the appropriateness of this solution for organics and inorganics.

b) The Application states that equipment rinsate blanks will be collected and analyzed in accordance with ER SOPs. Revise the Application to include what specific SOPs will be used.

c) The Application discusses cleaning of equipment, but neither this section of the Application nor Section E.2.2.5, discusses how the decontamination of equipment used during decontamination procedures of other equipment will be verified. Revise the Application to include procedures for the verification of decontamination of equipment and how levels of residual contamination will be determined.

40. Attachment E.2.2.5, Decontamination Verification

a) The Application states that a "sufficient sampling and analysis will be required to demonstrate" decontamination. The Application should provide the method for determining how "sufficient" numbers of samples will be determined. Revise the Application to include a discussion of how the number of verification samples for the Burn Ground Units will be determined.

b) The Application should provide a listing of expected contaminants (parameters) that may be present at the Burn Ground Units. Revise the Application to include a listing of potential contaminants at the Burn Ground Units.

c) The Application states that methods from SW-846 will be used for the confirmation testing. At a minimum, for constituents not included in SW-846 methods, the sample method for each type of constituent (e.g., organics, and metals) must be provided in the Application. Revise the Application to include a listing of the sample methods to be used for each type/group of constituent present and for each medium to be sampled at the Burn Ground Units not included in SW-846.

d) The use of testing wash water for determination of decontamination can result in significant dilution of constituents. This method also does not allow for the detection of potential hot spots. Revise the Application to discuss the potential uncertainties associated with this method of decontamination verification and should also discuss how hot spots will have been detected and verified decontaminated to acceptable levels.

e) Decontamination verification for hazardous waste residues may require swipe analysis and will be determined at the time of closure.

f) The Application does not discuss how surrounding soils will be sampled to ensure that no cross contamination as a result of decontamination activities have occurred. Revise the Application to include a discussion of how soils around areas to be decontaminated will be sampled and verified for potential cross contamination as a result of decontamination procedures.

APPENDIX B

REVISED ATTACHMENT F

"CLOSURE PLAN FOR THE TECHNICAL AREA 16 OPEN BURNING UNITS"

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	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
HE	high explosives
HSR-5	Industrial Hygiene and Safety Group
LANL	Los Alamos National Laboratory
lb(s)	pound(s)
NMED	New Mexico Environment Department
OB	open burning
OLASO	Office of Los Alamos Site Operations
PPE	personal protection equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SW-846	EPA's "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
SWRC	Solid Waste and Regulatory Compliance Group
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 is submitted to address the applicable closure requirements specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20.4.1 NMAC) § 270.14(b)(13), and 20.4.1 NMAC, Subpart V, Part 264, Subparts G and X, revised June 14, 2000 [6-14-00].

Closure of each OB unit will include removal of wastes and/or waste residues after the active treatment period for each OB unit. Closure activities will involve treatment and/or removal of any remaining waste or contaminated equipment, decontamination of structures associated with each unit, and verification that residues have been removed to acceptable levels. In the event that removal of wastes and/or waste residues or alternative demonstrations of decontamination cannot be achieved, this closure plan will 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 all 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 New Mexico Environment Department (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 Solid Waste and Regulatory Compliance Group (SWRC) and at the U.S. Department of Energy (DOE) Office of Los Alamos Site Operations (OLASO).

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 waste has been treated at and/or removed from the OB unit; the OB unit and related equipment, structures, and areas have been decontaminated, if necessary; the removal and decontamination have been verified; the closure certification has been submitted to the NMED; and the NMED has approved the closure.

Final RCRA closure of the LANL hazardous waste management facility will occur when all of LANL's hazardous/mixed waste management units are closed. Final closure will consist of assembling documentation on the closure status of each waste management unit, including all previous partial 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, partial closure of any 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], within 90 days after final receipt of waste at the TA-16 OB unit to be closed. This timeframe will be met as long as facilities are available for treatment or disposal of these wastes. In the event that closure activities cannot begin 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 and LANL officials and by an independent, registered professional engineer, in accordance with 20.4.1 NMAC § 264.115 [6-14-00]. Documentation supporting the independent, registered engineer's certification will be furnished to the Secretary of the NMED, upon request, as specified in 20.4.1 NMAC § 264.115 [6-14-00]. A copy of the certification and supporting documentation will be maintained by both DOE/OLASO and 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 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, upon request, 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 partial closure, LANL intends to treat and/or remove hazardous waste and associated hazardous constituents from the TA-16 OB unit undergoing closure, decontaminate structures and equipment associated with the unit, and remove soil contaminated with hazardous wastes or hazardous waste residues resulting from treatment operations, if necessary. 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 not be required for the closed OB units because all wastes

will be removed and the unit(s) will be decontaminated, recycled, or disposed of at closure, or an alternate demonstration of decontamination will be performed.

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 *"Los Alamos National Laboratory General Part B Permit Application,"* Revision 1.0 (LANL, 1998), 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 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 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 *"Los Alamos National Laboratory General Part A Permit Application,"* Revision 3.0 (LANL, 2002), 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/Burn Tray, 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 treated at the TA-16-388 Flash Pad at any time is 40,000 pounds (lb) per burn. The maximum total capacity of hazardous waste that may be treated at the TA-16-388 and TA-16-399 Burn Trays is 100 gallons and 1,000 lb, respectively.

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
- TA-16-388 Burn Tray = 666 gallons
- TA-16-399 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, 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 and/or removal of hazardous wastes and/or residues, decontamination of the structures and equipment associated with the OB unit and subsequent appropriate disposition, and verification of decontamination.

F.3.1 Removal of Waste

After wastes are treated at each OB unit, ash residues are removed promptly and analyzed. Therefore, removal of waste residues prior to the initiation of closure activities is not anticipated. Appropriate shipping papers will accompany the ash residue wastes during transport to a permitted treatment, storage, or disposal facility.

F.3.2 Closure Procedure and Decontamination

To the extent possible, contaminated OB unit structures and associated equipment and pads will be decontaminated, if necessary. Structures and associated equipment and pads that cannot be decontaminated will be removed, containerized, and managed in compliance with appropriate waste management regulations. Decontamination procedures 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 activities may include the removal, treatment, segregation, and/or disposition of structures, associated equipment, concrete pads, and/or soil. After removal and segregation, management of the structures, associated equipment, concrete pads, and/or soil will include treatment by OB at TA-16 and/or characterization by analytical samples prior to recycling or disposal. 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 (HSR-5), 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 levels of chemical contamination that are detected, if any. If the HSR-5 surveys do not indicate health and safety issues, minimum PPE requirements will consist of coveralls, steel-toed footwear, and safety glasses or face shields. If an overhead danger is present, a hard hat will be worn. 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 developed by the time of closure. A minimum of two background samples will be obtained from clean water, cleaning equipment, and detergent solutions if wash water methods are used to decontaminate structures and equipment at the TA-16 OB units. 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

Before decontamination activities begin, 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. Inspections are conducted routinely (i.e., at least weekly) at each OB unit. If any defects, deterioration, damage, or hazards affecting containment have developed after the most recent inspection was conducted, appropriate remedial actions (e.g., sampling, repairs, maintenance, or replacement) will be completed before decontamination activities begin. If a crack or gap is present, a swipe sample or a representative sample of the media will be collected (e.g., concrete) to determine the presence of contamination. The sample 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.

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 units 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 be closed by removal or decontamination of hazardous waste or hazardous waste residues will be managed under post-closure care requirements contained in 20.4.1 NMAC, Subpart V, Part 264, Subpart G. In the case of OB units that are co-located with solid waste management units and that cannot be closed by removal or decontamination of hazardous waste and hazardous waste residues, partial closure will be accomplished by stabilizing, as necessary, the wastes and/or waste residues that remain in place and requesting NMED approval to address such units under alternative requirements, as allowed by 20.4.1 NMAC § 264.110(c), to meet post-closure care requirements.

F.3.4.3 Decontamination 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

Sufficient sampling and analysis will be required to demonstrate that hazardous waste residue is not present above the decontamination criteria levels at the OB unit after closure. 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), the samples of clean wash water solution squeezed from mops and/or sponges prior to use or from the fresh water tank in a 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. Wash down solutions will be considered contaminated if the used wash water solution shows a significant increase (i.e., determined using statistical methods defined in *SW-846*) in the analytical parameters over those in the clean wash water solution. If subsequent wash downs are deemed necessary, an additional sample of clean wash water solution squeezed from mops and/or sponges prior to use or from the fresh water tank in a 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 during the decontamination and verification activities associated with the partial 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 detailed hazard control plan, including a review of chemical hazards present at the site, control and monitoring methods and procedures, and required PPE.
- Determination of wash water solution composition, if necessary.
- Detailed procedures for decontamination methods for equipment, structures, and media.
- Discussion of background levels determined through sampling or use of published data and their relevance to the specific 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 on- or off-site hazardous waste management facilities used for final disposition and the types of wastes shipped.
- Decontamination criteria.
- Statistical basis for verification of decontamination, if applicable. The discussion 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 final report 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.

LANL, 2002, *"Los Alamos National Laboratory General Part A Permit Application,"* Revision 3.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

LANL, 1998, *"Los Alamos National Laboratory General Part B Permit Application,"* Revision 1.0, Los Alamos National Laboratory, Los Alamos, New Mexico.

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 final report to NMED	Day 180

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

APPENDIX C

TABLES SHOWING TOTAL AMOUNT OF HE AND HE-CONTAMINATED WASTE TREATED AT THE TECHNICAL AREA 16 OPEN BURNING UNITS IN 2000

Table 1

Composition of HE-Contaminated Solvent Waste by WPF for 2000

WPF Number	Gallons Treated	Constituents	Quantity (%)
20661	1	Bis(2,2-Dinitropropyl) Formal (BDNPA-F)	95
		HMX	5
22776	15	Water	30-40
		Methanol	15-30
		Acetonitrile	10-20
		1,2-Dichloroethane	5-15
		Tetrahydrafuran	0-5
		Isopropyl Alcohol	5-15
		Methylene Chloride	0-3
		HMX, RDX, PETN, TATB, Nitrocellulose, TNT	1-5
25278	15	Chloroform	0-5
		1,2-Dichloroethane	0-15
		2,4 DNT	1E-4
		Methanol	80-90
		HMX, RDX, PETN, TATB, Nitrocellulose, TNT	1-5
30280	15	Water	10-60
		TATB	1-2
		HMX	1-2
		Ethanol	10-50
30508	15	Water	10-45
		Methanol	10-55
		Acetonitrile	5-10
		Acetone	0.1-5
		Tetrahydrafuran	0.1-15
		1,2-Dichloroethane	5-15
		Methylene Chloride	0.1-5
		Isopropyl Alcohol	0.5-1
		Trichloroethylene	0.5-1
		HMX, RDX, PETN, TATB, Nitrocellulose	1-5
30824	6	Water	75-100
		Toluene	30-60
		Acetone	5-20
		BDNPA/F	0-5
		Exon 461	1-5
		RDX	1-5
		PBX 9407	1-5

Table 1 (continued)

Composition of HE-Contaminated Solvent Waste by WPF for 2000

WPF Number	Gallons Treated	Constituents	Quantity (%)
31709	0.5	Water	0-1
		Toluene	0-1
		Methyl Ethyl Ketone	< 0.1
		Estanes	0-1
		BDNPA/F	0-1
		Exon 461	0-1
		HMX	0-1
		RDX	0-1
		PBX 9407	0-1
		PBX 9501	0-1
		Vacuum Pump Oil	90-100
31722	10	Water	50-75
		Ethyl Acetate	0-10
		Butyl Acetate	0-10
		Acetone	10-20
		Ethyl Alcohol	5-10
		Methyl Ethyl Ketone	< 0.1
		HMX	5-10
		PBX 9501	5-10
31845	1	Water	80-90
		DMSO	10-20
		DAAF	0-5
31846	2.5	Water	1-10
		Acetone	25-50
		Methanol	50-60
		DAAF	1-2
32117	0.003	1-Butyl Nitrite	100
32124	25	Water	50-75
		Acetone	0-5
		Ethyl Acetate	10-20
		KEL-F 800	0-5
		TATB	0-5
		PBX 9502	0-5

Table 2

Composition of HE-Contaminated Water with Trace Solvents by WPF for 2000

WPF Number	Gallons Treated	Constituents	Quantity (%)
30547	3464	Water	≥ 99
		DAZF, DAAF, PBX 9501, PBX 9502, PETN, XTX 8003, 9407, 9404, COMP-B, TNT, Mock Inert, X-0211, LX-07	≤ 0.025
		Barium, 1,2,-Dichloroethane, Mercury, MEK	Trace (<UHC[1] limits)

[1] UHC = Underlying Hazardous Constituent

Table 3

Composition of HE-Contaminated Water by WPF for 2000

WPF Number	Gallons Treated	Constituents	Quantity (%)
27831	1000	Water	≥ 98
		PBX 9501, PBX 9502, PETN, XTX 8003, 9407, 9404, COMP-B, TNT, Mock Inert, X-0211, LX-07	≤ 2
		2.4, DNT	1.5 E-4
27835	2200	Water	≥ 98
		PBX 9501, PBX 9502, PETN, XTX 8003, 9407, 9404, COMP-B, TNT, Mock Inert, X-0211, LX-07	≤ 2
		2.4-Dinitrotoluene (2,4-DNT)	1.5 E-4
28456	500	Water	≥ 98.9
		PETN	≤ 1.1
32933	0.125	Water	95-100
		PETN	≤ 1
		Polysaccharide	1-2
32934	12	Water	95-99
		Soap	0-1
		HMX	0-1
		RDX	0-1
		TNT	0-1
		TETRYL	0-1

Table 4

Composition of Solid and Scrap HE by WPF for 2000

WPF Number	Pounds Treated	Constituents	Quantity (%)
27836	1416.9	PBX 9501, PBX 9502, PBX 9404, ANFO, TNT XTX 8003, XTX 8004	≥ 99
		(2,4-DNT = 1%TNT),	≤ 1
29116	2907	PBX 9501, PBX 9502, TNT	≥ 99
		(2,4-DNT = 1%TNT)	≤ 1
29124	290	PBX 9501, PBX 9502	100
29124	148	PBX 9501	92.6
		PBX 9404	6.7
		LX-2	0.7
29343 29344 29364	1043	PBX 9501, PBX 9502, PBX 9404	100
29446	0.5	PETN	100
29559	200	Baratol	100
32436	80	TNT	99
		2.4-DNT	1

Table 5

Composition of ER Soil and Debris by WPF for 2000

WPF Number	Amount of Waste Treated	Constituents	Quantity (percent)
31189	223 lbs	Water	40
		HMX, RDX, TNT, Boracitol, Baratol	60
31193	17 lbs	Water	40
		HMX, RDX	60
31155	15 gal	Soil w/ >5% HE (PBX 9501, PBX 9502, etc,)	> 99.5
		Purple PVC Primer 212 (Adsorbed) – contained 200-400 ppm MEK and other trace contaminants)	< 0.5

Table 6

Composition of Wastewater Treatment Residues by WPF for 2000

WPF Number	Pounds Treated	Constituents	Quantity (%)
27830	337	Cloth and Paper Filter Socks	95-100
		9501, 9502, TNT	≤ 5
		2,4-DNT (1% o < 5%)	≤ 0.05
27615	10	Cloth and Paper Filter Socks	95-100
		9501, 9502, COMPB	≤ 5
		2,4-DNT (1% of < 5%)	≤ 0.05

Table 7

Composition of HE-Contaminated Solid Waste by WPF for 2000

WPF Number	Pounds Treated	Constituent	Quantity (%)
27828	150	Oily Rags	95-100
		PBX 9501, PBX 9502, PBX 9404, PBX 9707, TNT, COMP-B, PETN, Inert HE, X-0211, LX-07, PETN, X-0211, and XTX 8003	<5
27832	270	Rags, plastic, paper, cardboard, etc	98-100
		PBX 9501, PBX 9502, PBX 9404, PBX 9707, TNT, COMP-B, PETN, Inert HE, X-0211, LX-07, PETN, X-0211, and XTX 8003	<5
		Hydraulic Oil	0-2
		2,4-DNT	1.5 E-4
28345	1	Wipes	99
		PETN	1
29586	50	Scrap Metal	0-5
		Paper, cardboard, etc.	80-90
		Plastics	0-5
		PBX 9501, PBX 9502	<2
30373	14.5	Film	35-45
		Copper wire	35-45
		Wood	1-5
		Paper	1-5
		Plastic	1-5
		Aluminum	0-5
		PETN	1-5
31787	50	Burlap Bags	40-60
		Scrap Metal	40-60
		PBX 9501	<5
32216	35	Rags, wipes, gloves	95-100
		PBX 9501, PBX 9502, TNT, LX007	5-10
32294	150	Cellulose (paper cardboard, etc.)	80-90
		Plastics	0-5
		Metal	0-5
		9501, PBX 9502	<5
33011	80	Wooden Boxes	98-99
		Felt Pads	1-2
		STEEL HINGES	1-2
		PBX 9501, PBX 9502, PBX 9407, PBX 9404, Baratol	0.5-1

Table 8

Composition of HE-Contaminated Equipment by WPF for 2000

WPF Number	Pounds Treated	Constituents	Quantity (%)
31825	350	NON-COMB (VACUUM PUMP, ETC.)	99.9
		PBX 9501, PBX 9502, PBX 9404, PBX 9707, TNT, COMP-B, PETN, Inert HE, X-0211, LX-07, PETN, X-0211, and XTX 8003	0.1
30373	5	Metal	99
		PETN	1
32115	2	Ignitors	40-50
		Barium	50-60

Table 9

Composition of HE-Contaminated Liquid Acids/Bases by WPF for 2000

WPF Number	Pounds Treated	Constituents	Quantity (percent)
24158	5	Water	0-55
		Sulfuric Acid	0-12
		Hydrochloric Acid	0-3
		Mercury Sulfate	0-1
		Nitric Acid	0-5
		$Kr_2Cr_4O_2/Na.Cr_20_2$	0-2
		Potassium Hydroxide	0-5
		Sodium Hydroxide	0-15
		PBX 9501, PBX 9502	<2
29515	1	Water	85-99
		Ammonium Hydroxide	0-15
		Carbonate Salts	0-15
		Sodium Hydroxide	0-15
		HMX, RDX, NQ, NC, PETN, TATB, NTO, TNT	<1

APPENDIX D

TABLE SHOWING COMPOSITIONS OF HIGH EXPLOSIVES

Composition of HE

Explosive	Explosive Name and Compositions	Chemical Formula
Baratol	24 wt% TNT, 76 wt% barium nitrate	$C_{0.74}H_{0.53}N_{0.90}O_{2.38}Ba_{0.29}$
Boracitol	46 wt% TNT, 60 wt% boric acid	$C1_{1.23}H_{3.79}N_{0.53}O_{3.97}B_{0.97}$
Bromonitromethane	Bromonitromethane	CH_2BrNO_2
C129	PBXC-129 (89 wt% HMX, 9.694 wt% Lauryl Methacrylate, 1.8 wt% T-Butyl Peroxy, 0.27 wt% Triethylene Glycol Dimethacrylate, 0.09 wt% Cobaltous Acetylacetonate, 0.9 wt% Lecithin)	
C-1 Detasheet	63 wt% PETN, 8 wt% NC, 29 wt% elastomer binder* (C-1 designation represents 0.042" thick sheet)	
C-4	91 wt % RDX, 2.1 wt % polyisobutylene, 1.6 wt% motor oil, 5.3 wt % di-(2-ethylhexly)sebacate	
C-4 Detasheet	63 wt% PETN, 8 wt% NC, 29 wt% elastomer binder* (C-4 designation represents 0.16" thick sheet)	
Comp B	Comp B, Grade A (36 wt% TNT, 63 wt% RDX, 1 wt% wax)	$C_{2.03}H_{2.64}N_{2.18}O_{2.67}$
Comp B	Comp B-3 (40 wt% TNT, 60 wt% RDX)	$C_{2.05}H_{2.51}N_{2.15}O_{2.67}$
DAAF	Diaminofurazan	
Detasheet	PETN + Binders (Binders are usually ATBC (organic plastisizer), Cab-O-Sil, and Rubber)	
D Detasheet	75 wt% PETN, 25 wt% elastomeric binder*	
HMX	Cyclotetramethylenetetranitramine (Octohydro-1,3,5,7 tetranitro-1,3,5,7 tetrazocine)	$C_4H_8N_8O_8$
HNS	Hexanitrostilbene (1,1'-(1,2-ethenebiyl)Bis-(2,4,6-trinitrobenzene))	$C_{14}H_6N_6O_{12}$
LX07	90 wt% HMX, 10 wt% Viton A	$C_{1.48}H_{2.62}N_{2.43}O_{2.43}F_{0.35}$
NC	Nitrocellulose with 13.35 wt% N	$C_6H_{7.29}N_{2.71}O_{10.41}$
NG	Nitroglycerine (1,2,3- Propanetriol trinitrate)	$C_3H_5N_3O_9$

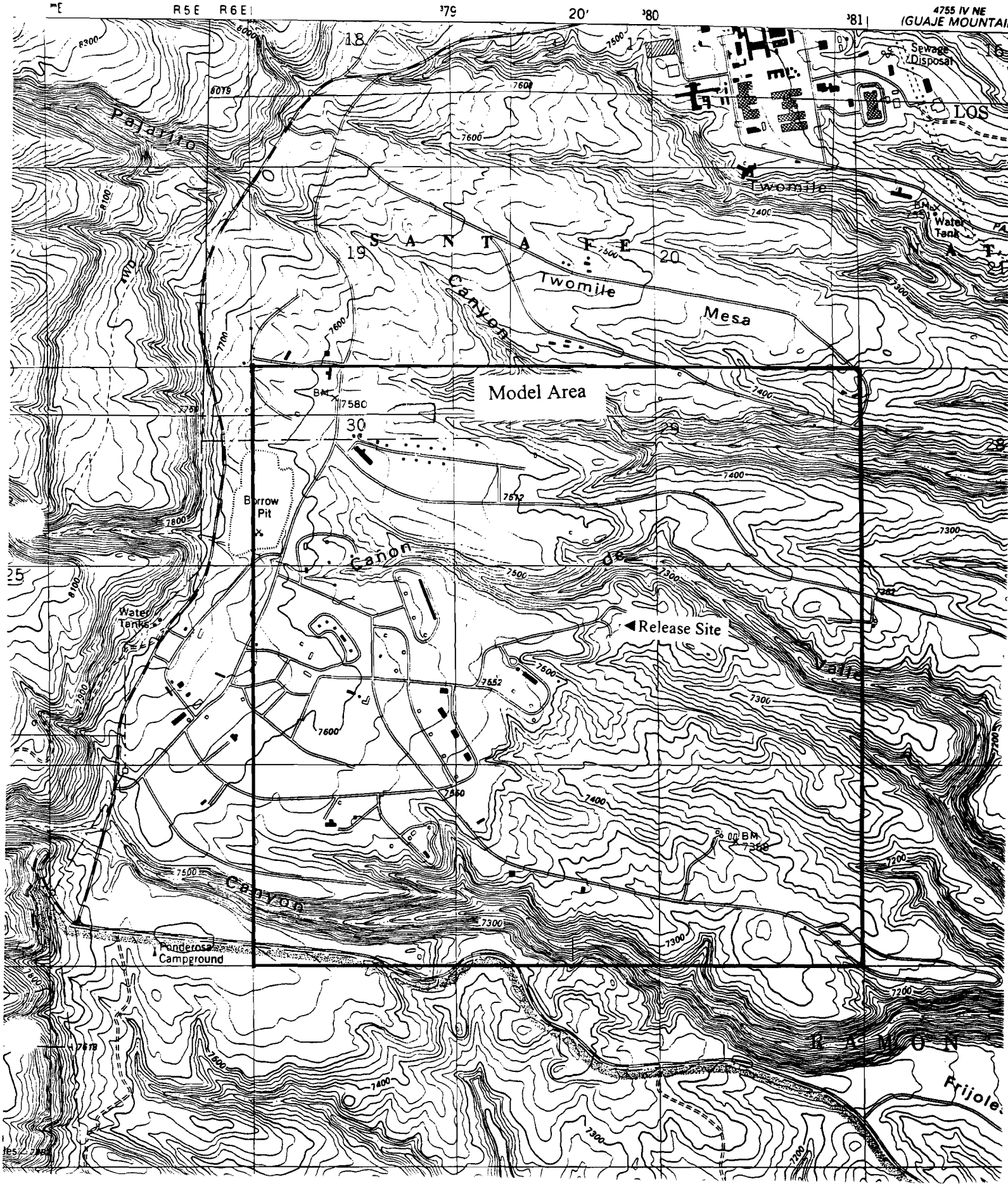
Explosive	Explosive Name and Compositions	Chemical Formula
N110	PBXN-110 (88 wt% HMX, 5.378 wt% Polybutadiene, and 5.378 wt% Isodecyl pelargonate, 4,4-Methylene Bis (2,6-Di-Tert-Butylphenol), Lecithin, Polymethylene Polyphenolisocyanate)	
N5	PBXN-5 (95 wt% HMX, 5 wt% Viton A)	
NQ	Nitroguanidine	$CH_4N_4O_2$
P-056	P56 plane wave lenses, 56 mm diameter (PBX 9501 and TNT)	
PETN	Pentaerythrioltetranitrate (2,2-Bis[(nitroxy)methyl]-1,3-propanediol dinitrate)	$C_5H_8N_4O_{12}$
PBX 9007	PBX 9007 (RDX 90%, Polystyrene 9.1%, Di-2-ethylhexl phthalate (DOP) 0.5%,	$C_{1.97}H_{3.22}N_{2.43}O_{2.44}$
PBX 9205	PBX 9205 (RDX 92%, Poystyrene 6%, DOP 2%)	$C_{1.83}H_{3.14}N_{2.49}O_{2.51}$
PBX 9404	PBX 9404 (94 wt% HMX, 3 wt% Nitrocellulose, 3 wt% Chloroethylphosphate (CEF))	$C_{1.4}H_{2.75}N_{2.57}O_{2.69}Cl_{0.03}P_{0.01}$
PBX 9407	PBX 9407 (RDX 94%, FPC 461 6%)	$C_{1.41}H_{2.66}N_{2.54}O_{2.54}Cl_{0.07}F_{0.09}$
PBX-9501	PBX-9501(95 wt% HMX, 2.5 wt% Estane, 2.5 wt% BDNPA-F)	$C_{1.47}H_{2.86}N_{2.60}O_{2.69}$
PBX-9502	PBX-9502 (95 wt% TATB, 5 wt% Kel-F 800)	$C_{2.30}H_{2.23}N_{2.21}O_{2.21}Cl_{0.038}F_{0.13}$
PBX-9503	PBX-9503 (15 wt% HMX, 80 wt% TATB, 5 wt% Kel-F 800)	$C_{2.16}H_{2.28}N_{2.26}O_{2.26}Cl_{0.038}$
PBX-9010	PBX-9010 (90 wt% RDX, 10 wt% Kel-F 3700)	$C_{1.39}H_{2.43}N_{2.43}O_{2.43}Cl_{0.09}F_{0.026}$
RDX	Cyclonite (Hexahydro-1,3,5-Trinitro-1,3,5-triazine)	$C_3H_6N_6O_6$
Rocket Propellant	52.15 wt% NC, 43.54 wt% nitorglycerine (NG), 3.29 wt% diethylphthalate, 1.02 wt% Centralit I (C17H20ON2)	$C_{19.25}H_{25.96}O_{36.99}N_{10.76}$
TATB	1,3,5 Triamino 2,4,6 Trinitrobenzene	$C_6H_6N_6O_6$
Tetryl	Trinitro 2,4,6 Phenylmethylnitramine	$C_7H_5N_5O_8$
TNT	2,4,6, Trinitrotoluene (aka 2-Methly-1,3,5-Trinitrobenzene)	$C_7H_5N_3O_6$
X0534	X0534 (50 wt% TNT, 16-24 wt% CaCO3, 1-2 wt% microbaloons, and 25-33 wt% talc)	
XTX 8003	XTX 8003 (80 wt% PETN, 20 wt% Silicone Rubber)	$C_{1.8}H_{3.64}N_{1.01}O_{3.31}Si_{0.27}$
XTX 8004	XTX 8004 (80 wt% RDX, 20 wt% SYLGARD182)	$C_{1.62}H_{3.78}N_{2.16}O_{2.43}Si_{0.27}$

APPENDIX E

TOPOGRAPHIC MAP SHOWING THE MODELING DOMAIN

'ATES
'HE INTERIOR
SURVEY

USGS 7.5 Minute Contour Map and CALPUFF Modeling Domain for TA-16 Open Burns



APPENDIX F

CDs with INPUT/OUTPUT FILES USED IN AIR DISPERSION ANALYSIS AND MODEL-READY METEOROLOGICAL AND TERRAIN FILES

TO VIEW THE DATA FILE ASSOCIATED WITH THIS DOCUMENT PLEASE CALL THE HAZARDOUS WASTE BUREAU AT 505-476-6000 TO MAKE AN APPOINTMENT

CERTIFICATION

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

August 2002

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.

Barbara A. Stone

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

8/14/02
Date Signed

for Ralph E. Erickson
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