TA 16

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April 18, 2007

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RE: NOTICE OF DEFICIENCY
TECHNICAL REVIEW OF THE MARCH 29, 2007 PROTOCOL FOR AIR DISPERSION MODELING AT TA-16
HWB-LANL-01-006

Dear Messrs. Glenn and Watkins:

The New Mexico Environment Department (NMED) has reviewed the above-referenced document submitted by Los Alamos National Security, LLC (LANS) and the U.S. Department of Energy (the Permittees) for technical adequacy, and hereby issue this Notice of Deficiency (NOD). The comments below specify information that must be submitted and adequately addressed before the Permittees can proceed with the air dispersion modeling. The Permittees shall revise the air dispersion modeling protocol document (Document) for Technical Area (TA)-16-388 and TA-16-399 as well as run the model based on the information NMED has identified in this NOD.

Deficiencies in Permittee's March 29, 2007 Air Dispersion Model Protocol

General Comments:

1. Due to the differences in the two types of wastes streams treated by open burning at the Los Alamos National Laboratory (LANL) TA-16 Burn Ground, the combined worst case

12707

emission factor approach proposed by the Permittees in Section 3.3 must be applied independently to the two waste streams. Their differing energy contents make it likely that the characteristics of the two types of burns conducted at TA-16 are quite different. This must be reflected in the air modeling analysis.

Two lists of the worst-case emission factors must therefore be developed and form the basis of the model to run. A list, similar to Table 3-1 in the Document, shall be submitted for the open burning of bulk or pure High Explosives (HE) at TA-16-399 and TA-16-388. Another list similar to Table 3-6 shall be submitted for the open burning of wastes contaminated by HE at TA-16-388.

2. Additional information regarding the input parameters and the setting of modeling options for the air dispersion modeling runs is needed. Revise the Document to provide this information in sufficient detail to:

- determine the types of air quality impacts that will be modeled (e.g., air concentrations and/or deposition);
- identify the source algorithm(s) used in modeling each process; and
- convey the characteristics of the processes being modeled.

3. The Permittees shall submit in their air dispersion modeling report electronic versions of all air dispersion modeling input and output files and all model-ready ancillary files (e.g., meteorological, terrain) necessary to re-create the air dispersion modeling runs.

4. Based on the information provided to NMED, it is not clear how the Permittees will relate the air modeling analysis described in the Document to the deposition modeling submitted to NMED in Supplement H-1 (from the LANL TA-16 Part B Application, June 2003). In its letter of February 28, 2007, NMED required that the Permittees ensure that the input parameters are consistent between the dispersion and the deposition models. If no additional deposition modeling and/or screening of the impacts due to deposition of emitted constituents is performed, the Permittees must demonstrate that the previous deposition analysis (June 2003) is compatible with the analysis described in the Document. This demonstration must show that:

- similar waste streams and quantities of wastes are addressed in both analyses;
- similar emission profiles (and emission factors) are used in both analyses;
- essentially identical meteorological datasets are used in all air dispersion modeling runs across both analyses; and
- modeled input parameter values for each type of process modeled are essentially identical for both analyses.

5. The input parameter list appearing at the top of page 4 of Supplement H-1, Deposition Modeling, suggests that the open burn processes at TA-16 were modeled as point sources (i.e., stacks) in the 2003 air deposition analysis. No rationale supporting this approach was provided. Use of the point source algorithm in CALPUFF may be appropriate if it can be shown that the buoyant rise of the plume was modeled appropriately. If this same approach is envisioned for the air modeling analysis described in the Document, it must be thoroughly discussed and justified. Depending on the process parameters and appropriate specification of model inputs, other possible approaches for the application of CALPUFF to the open burning processes at the TA-16 Burn Ground could include the use of the area source algorithm or modeling plume rise with another source model and providing that plume rise as a "plug-in" to the dispersion and deposition algorithms in CALPUFF (Strimaitis, 2007) (see also comment 14 below).

Specific Comments

1. It is not clear why only a single set of UTM coordinates is provided for TA-16-399 and TA-16-388 (Section 1.0, p. 1 of 14). The two open burn areas are located at a significant distance apart and therefore should be modeled as separate locations. Provide additional information on the locations of TA-16-399 and TA-16-388 using their individual location coordinates. The Permittees shall use these two separate sets of coordinates in the air dispersion modeling of both processes.

2. In Section 2.1 (p.2 of 14), the Permittees comment that only SO_2 Ambient Air Quality Standards were used in this analysis because hydrogen sulfide and total reduced sulfur are not emitted by open burning.

In the bang box tests, no emission factors were developed for H_2S or other reduced sulfur compounds. Hydrogen sulfide (and other reduced sulfur compounds) is not expected, but its presence or absence in the emission products has not been confirmed. The authors of *Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD)* (Mitchell and Suggs, 1998) note that sulfur recovery was low, but variable in all tests and state on page 31 that:

> "The low and variable recoveries for S…should be investigated further. It is possible that the S was converted to compounds, such as SO_3, H_2SO_4, H_2S, metallic sulfates, or even free S (S_8); none of which were target analytes."

Similar statements are found in related documents describing the current state-of-the-art and future research needs in developing emission factors for Open Burn/Open Detonation (OB/OD) (Mitchell, 1999; Anderson 1999).

Because the presence or absence of reduced sulfur compounds has not been confirmed in emissions testing for open burn processes, the Permittees must provide reference citations from the scientific literature to support the statement that hydrogen sulfide and/or other total reduced sulfur are not emitted during open burning.

3. In Section 3.1 (p.3 of 14) the Permittees identify the primary types of HE treated as HMX, TATB, TNT, and RDX and that the types of materials addressed in the *Open Burn/Open Detonation Dispersion Model (OBODM) User's Guide* (Bjorklund *et al*, 1998) that would be most similar to those treated at LANL are:

- M-43, which contains RDX;
- PBXN-110, which contains HMX; and
- M31A1E1, a mixture of explosives.

The listed surrogates (M-43, PBXN-110, and M31A1E1) do not contain TATB or TNT, although in the second paragraph of Section 3.1 it is noted that emission factors for a limited number of emitted constituents from the open burning of TNT are specified as described.

Further, based on the primary types of HE listed (HMX, TATB, TNT, and RDX) it is not clear why emission factors from the M31A1E1 open burn tests were selected. The Permittees must revise the Document to include additional information on the constituents and/or components included in the pure HE burned at TA-16-399 and TA-16-388 and the selection of appropriate emission factors for the HE treated at TA-16. This information should be focused on demonstrating that:

- M31A1E1 is an appropriate surrogate for the pure HE burned at TA-16-399 and TA-16-388; and
- The group of proposed surrogates adequately and conservatively represent the actual emissions from open burns of the types of HE treated at TA-16.

This information should be presented in a format similar to the information presented in Table 7 of Appendix B, Response to Notice of Deficiency; TA-16 Part B Application Revision 3.0, January 31, 2000: February 2002. LANL may utilize the information from Table 7 only if the information provided is still applicable.

4. It is noted in Section 3.1 (p.3 of 14) that the TNT emission factor for Particulate Matter has been included in Table 3-1, Emission Factors for Burning HE. However, no information on how this factor will be used in the screening analysis is provided. Revise the Document to indicate the compounds or constituents that will be characterized using this emission factor (e.g., total suspended particulate (TSP), PM_{10}, $PM_{2.5}$).

5. Section 3.2 (p.4 of 14) indicates that materials burned at TA-16-388 may consist of pure HE or HE-contaminated combustible solids, liquids, or non-combustibles. The Document suggests that three unique open burning operations occur at TA-16:

- burning of large quantities of pure HE at TA-16-399;
- burning of smaller quantities of pure HE at TA-16-388; and
- burning of HE-contaminated combustible solids, liquids, or non-combustibles at TA-16-388.

Due to their unique nature (e.g., different locations, different amounts of waste processed per event, different heat contents, and different process temperatures) it is anticipated that these three operations will be modeled separately. This is not, however, clearly stated in the Document. The Permittees must revise the Document to indicate that these three operations will be modeled separately.

6. The Permittees state in Section 3.2 (p.4 of 14) that the maximum amount of burnable material that can be treated at TA-16-388 is 250 lb/burn. For burns of HE-contaminated combustible solids and liquids, it is not clear if the 250 lb/burn specification applies to the amount of HE treated during the burn event or to the total weight of the waste in the burn pan. Revise section 3.2 to clarify whether or not the 250 lb/burn is the maximum amount of HE that can be burned at this unit per event. In addition, ensure that any altered application language is submitted with the model report.

7. There is a reference to "dry waste" in the discussion at the top of page 5 (of 14) in Section 3.2.1:

> "These emission factors, shown in Table 3-2, should be much higher than for LANL combustibles, which in contrast are characterized by dry waste..."

This statement is confusing because the Permit application states that the HE-contaminated solids treated at TA-16-388 could be wet or dry (see TA-16 Part B Application, Attachment G, Section G.1.1, Revision 4.0, June 2003). The Permittees must revise the Document to eliminate any confusion regarding the physical characteristics of the HE-contaminated solid waste streams burned at TA-16-388.

8. To determine if the approach in Section 3.2.3 (p.5 and 6 of 14) is adequate, the organics present in the Permittees' contaminated solvent waste stream must be compared to those present in the materials for which emission factors were derived in the cited references. If there is agreement, the proposed emission factors from these references will suffice. If not, applicable emission factors must be applied. Revise the Document to include a list of the organic

constituents associated with the oils and solvents in the liquids contaminated with HE that are treated at TA-16-388.

This information must be presented in a format similar to the information presented in Table 5 of Appendix B, "Response to Notice of Deficiency; TA-16 Part B Application Revision 3.0, January 31, 2000: February 2002." The Permittees may utilize the information from Table 5 only if the information provided is still applicable. The Permittees must also review Table 6 from Appendix B of the above-referenced document in order to determine if additional emission factors identified in Table 6 and excluded from Table 3.3 of the Document (e.g., methylene chloride) should be added to Table 3.3.

9. The reference in Section 3.2.3 (p.6 of 14) to section 2.1 appears to be a typographical error. The reference should be made to Section 3.1. Review the text and revise the section reference.

10. Based on NMED's present level of knowledge of the solid waste stream contaminated by HE, it is not clear why emission factors for the burning of aluminized ammonium perchlorate propellant were proposed as surrogates for the dioxin/furan emissions for the burning of wastes contaminated by HE at TA-16-388 (Section 3.2.4, p.6 of 14). The dioxin/furan emission factors cited in Appendix D of *Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD)* (Mitchell & Suggs, 1998) for aluminized propellant manufacturing waste are more conservative and may be more applicable to burning solids contaminated by HE at TA-16-388. Some of the constituents of the manufacturing waste stream (e.g., plastic gloves, anti-static polyethylene, paper/wood/cloth) are believed to be components of the contaminated solids burned at TA-16-388. The application of the dioxin/furan emission factors for the aluminized propellant manufacturing waste will result in more conservative estimates of the dioxin/furan emissions from the process to be modeled. The Permittees stated in their February 2002 "Response to Notice of Deficiency; TA-16 Part B Application Revision 3.0, January 31, 2000" that "the most similar waste stream [for polyethelene plastics] was the Aluminized Propellant Manufacturing Waste Surrogate (AP Waste) Burn)." The Permittees shall therefore utilize the dioxin/furan emission factors for the aluminized propellant manufacturing waste in the air dispersion modeling analysis.

11. While NMED acknowledges that propane is a relatively clean burning fuel, a reference to the scientific literature supporting the statement that "...propane is a very clean-burning fuel and products of incomplete combustion should be minimal" (section 3.2.5, p.6 of 14) should be provided. Revise the Document to include references to the scientific literature that support this statement.

12. The statement that "emissions from burning the propane are additive to the emissions from burning the waste", Section 3.2.5, p.6 and 8 of 14, suggests that the propane emission

factors must be added to the emissions from waste burning. For a more complete and transparent description of the emission factor analyses, the Permittees must revise the air modeling protocol to describe how the proposed emission factors for propane are incorporated into the emission factors listed in Table 3-6, Worst-Case Emission Factors for Combined Wastes.

13. According to the Permittees, "the highest emission factor for each contaminant was selected from all of the wastes burned. Table 3-6 shows the contaminant, the waste type that had the highest emission factor, and the emission factor from the tables above" (Section 3.3 and Table 3-6, p.7 and 8 of 14). Based on the information contained in the Document, it is not clear to NMED how the worst-case emission factors listed in Table 3-6 will be applied in the air modeling analysis. The Permittees must clarify this.

Due to the differences in the open burning processes at LANL, the combined worst case emission factor approach proposed by the Permittees in Section 3.3 should be applied only to the waste streams burned at TA-16-388 that are contaminated with HE. The burning of pure HE at TA-16-399 and TA-16-388 should be analyzed using emission factors developed for the open burning of pure HE. NMED notes that emission factors for burning pure HE are listed in Table 3-1 of the Document.

The Permittees must revise the Document to eliminate confusion regarding the application of the emission factors listed in Table 3-6 and indicate which processes will be analyzed using the emission factors listed in Table 3-6. The Permittees must also revise the text to specifically state that the open burning of pure HE at TA-16-399 and TA-16-388 will be analyzed using emission factors developed for the open burning of pure HE. The Permittees must ensure that the air dispersion modeling analysis employs two separate lists of worst case emission factors as stated above and submit the results to NMED as part of the response to this NOD.

14. Within Section 4.1, (p.9 and 10 of 14), the Permittees have provided a discussion supporting the use of CALPUFF for modeling air quality impacts from open burning operations at the TA-16 Burn Ground. The text describes the limitations of applying OBODM in the complex terrain at and surrounding the TA-16 Burn Ground and provides an overview of the treatment of complex terrain by the CALPUFF model. The discussion notes that the buoyant plume rise is addressed by the Briggs formulation in the two different air dispersion models.

NMED acknowledges that CALPUFF provides a more rigorous treatment of surrounding terrain and can offer a more thorough treatment of meteorological conditions in the modeling domain. However, NMED remains concerned that, as previously discussed with the Permittees, the application of CALPUFF to the sources being modeled at the TA-16 Burn Ground, especially open burns of pure HE at TA-16-399 and TA-16-388, has not been adequately justified. No new information addressing NMED's concern has been furnished in the Document.

The Permittees must include the heat content of the charge to be burned, as this influences burn time, and the reactions that occur in the plume during initial plume rise. If the heat content is high and burn times are short, the buoyant plume rise may not be modeled adequately (Bjorklund et al, 1996 and Strimaitis, 2007). Based on the process temperatures provided by the Permittees (Section 4.2 of the Document), it is clear that the heat content of a pure HE burn is higher than the heat content when burning waste streams contaminated by HE.

The Permittees must revise the Document to provide additional information justifying the use of CALPUFF in modeling the open burning of pure HE and waste streams contaminated with HE at the TA-16 Burn Grounds. At a minimum, this information must provide estimates of the heat content and burn time for these two unique waste streams and demonstrate that the application of the CALPUFF model will result in an adequate representation of initial mixing, air entrainment, and buoyant plume rise of the processes to be modeled.

Note that CALPUFF provides "plug in" capabilities, allowing the plume rise to be modeled by another source model (e.g., OBODM, POLU); the result is then used as an input to the CALPUFF dispersion and deposition routines (Strimaitis, 2007). This type of "hybrid" application may offer an approach that reflects the inherent strengths of a source model developed specifically for open burn processes similar to those conducted at LANL and the air dispersion and deposition algorithms in CALPUFF.

15. To provide a more complete and transparent air modeling analysis, the Permittees must run the model utilizing the most recent meteorological data set for Los Alamos. NMED is concerned that the proposed 1995 meterological data set in Section 4.2 (p.10 of 14) is outdated and should be replaced with the most current data available. If the 1995 meterological data set is used, this application should be fully justified in the air dispersion modeling protocol. If it is not used, the Permittees must submit the new model ready complete data set to NMED.

As NMED's February 28, 2007 letter noted, "the Permittees must ensure that the input parameters are consistent between the dispersion and the deposition models." The Permittees must indicate whether the meteorological dataset used in the deposition analysis (TA-16 Part B Application, Supplement H-1 (June 2003)) is the same as the one being used in the air dispersion modeling analysis. If this is not the case, the Permittees must re-run the deposition model with the same input data as the dispersion model. This includes, but is not limited to, the meteorological data set.

16. Note that simulating a one hour burn in the air modeling analysis, as mentioned in section 4.2 (p.10 of 14), will result in a permit condition that limits burn times to one hour. If burns are anticipated to last longer than one hour, the anticipated maximum longer burn time must be modeled.

17. It is not clear whether the Permittees are proposing to use 750 °C as the sole burn temperature to be modeled or only as the temperature achieved when the propane burners are utilized (i.e., the open burning of wastes contaminated with HE at TA-16-388). The Permittees must revise Section 4.2 (p.10 of 14) to specify a temperature for each process to be modeled. Based on NMED's current understanding of the open burning processes at the TA-16 Burn Ground, three temperatures should be proposed: one for modeling burns of pure HE at TA-16-399, one for modeling burns of pure HE at TA-16-388, and one for modeling burns of wastes contaminated by HE at TA-16-388.

Further, it is not clear how the modeling results achieved using the lowest temperature in the cited ranges will be applied in the air modeling analysis. Use of a lower temperature in defining the emission source generally results in overall maximum impacts of higher numerical value closer to the source; increasing the source temperature will move the overall maximum impact further from the source but will also reduce its numerical value. If the Permittees are proposing to use the overall maximum modeled concentration for both on-site and off-site receptors, use of the lowest temperature in the cited ranges is likely to be appropriate for this type of screening analysis. Therefore, Section 4.2 must be revised to specifically state this.

If unique modeling results will be used for screening on-site and off-site receptors, it is not clear how the use of the lowest temperature cited will result in the most conservative analysis for both receptor locations. Revise the Document to provide additional information on the specification of source definition temperatures for the air modeling analysis. The Permittees must demonstrate that the chosen temperatures will result in a conservative analysis of health impacts for on-site and off-site receptors. If such a demonstration cannot be provided, each process at the TA-16 Burn Ground must be modeled using the lowest cited temperature for the process and the overall modeled maximum impact must be used in screening both on-site and off-site receptors.

The revised Document and the model's input/output parameters, results, and analysis must be submitted to the NMED no later than June 1, 2007. The Permittees must submit the results of the model applications with the revised Document and input parameters.

As stated in NMED's February 28, 2007 letter, NMED expects the Permittees to model emissions using the maximum amount of energetic material per period provided in the Permit application. Any altered application language must be specifically identified in the response submitted with the model report.

If you have any questions or comments regarding this letter, please contact Rebecca Kay at (505) 476-6052.

Sincerely,

James P. Bearzi
Chief
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File: Reading and LANL-01-006

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Personal Communication with David Strimaitis, TRC Corporation. March 14, 2007.