TA16

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May 14, 2002

Mr. James Bearzi
Mr. David Cobrain
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building One
Santa Fe, New Mexico 87505-6303

Reference: Work Assignment No. Y513, 06082.350; State of New Mexico Environment Department, Santa Fe, New Mexico; General Permit Support Contract; Research and Permitting Support for the Los Alamos National Laboratory, Discussion and Review of Documents Describing the Application of the CALPUFF Air Dispersion Model to the TA-16 Burning Ground; Task 14 Deliverable

Dear Mr. Bearzi and Mr. Cobrain:

Enclosed please find the deliverable for the above-referenced work assignment. This deliverable consists of discussion and review of information related to the modeling of atmospheric deposition from the open burning operations at the Technical Area 16 (TA-16) Burning Ground of the Department of Energy's Los Alamos National Laboratory, Los Alamos, New Mexico. The deliverable was e-mailed to Ms. Lee Winn on Tuesday, May 14, 2002, at lee_winn@nmenv.state.nm.us. The deliverable is formatted in Microsoft Word 2000.

The following information was reviewed:

- LANL's responses to previous NMED comments 6a, 6b, and 6c;
- Appendix G of the LANL Response;
- Tables 1 through 14 of the LANL Response; and
- The CALPUFF input files submitted to NMED on April 15, 2002.

In general, LANL has not provided sufficient information to determine that the air dispersion modeling and subsequent risk-based screening calculations adequately characterize the potential

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risks from open burn operations at TA-16. During the review, TechLaw noted deviations from expected approaches in the application of the CALPUFF model and in the screening methodology employed by LANL. LANL provided little information in support of the approach described in Appendix G. The attached general and specific comments request that LANL provide additional information so that the validity and applicability of the analyses can be determined.

Below is a summary of the results of the TechLaw review.

Responses to NMED Comment 6a, 6b, and 6c

As part of NMED comment 6a, LANL was asked to assess the potential risk from ash deposition to the soil. LANL did not assess the risks due to ash deposition to soil, rather, they screened modeled air concentrations and dry deposition fluxes against soil actions levels. LANL claimed that when the concentrations and fluxes were converted to equivalent soil concentrations, soil action levels were not exceeded. However, TechLaw identified some issues in the approach taken by LANL that bring into question the results of the screening analysis.

In NMED comment 6b, LANL was instructed to provide an analysis of the potential risk from the degradation products of HE (not defined, but assumed to be high explosives) likely to be found in the soil around the burn areas at TA-16. LANL did not provide such an analysis, rather they cited a previous analysis performed by the NMED Air Quality Bureau and EPA report EPA/600/R-98/103 from 1998 [the title of the EPA report is not given, however, it is Emission Factors for the Disposal of Energetic Materials by Open Burning and Open Detonation (OB/OD), a report describing a data base of validated OB/OD emission factors taken from the Bang Box tests]. The NMED Air Quality Bureau report was not reviewed as part of this work assignment. However, no discussion of the potential risks posed by the current operation was presented in the response. Further, as part of the response, LANL listed the possible degradation products from the burning of HE in Table 10 of Appendix B. However, the source of the information in the table was not given so the validity of the information could not be determined.

NMED comment 6c asked LANL to provide information on the potential quantities of volatile organic compounds released during open burning operations. LANL's response to NMED comment 6c referred to the response for comment number 1. The response to comment number 1 was not provided for review, however, some information on volatile organic compounds was provided in the Tables in Appendix B of the response. The source of the information provided in Appendix B was not provided so its validity could not be determined.

The general and specific comments attached to this letter request information that should address the concerns identified during the response review.

Appendix B

In reviewing Appendix B, TechLaw noted that no reference source was cited for the emission factors presented in Tables 3, 4, and 10. A general comment has been drafted asking LANL to identify the source(s) of these values.

Appendix G

In reviewing the material presented in Appendix G, the following concerns were identified:

· LANL used the CALPUFF air dispersion model to generate deposition fluxes for use in the screening analysis. The CALPUFF model employs relatively sophisticated algorithms for calculating dry deposition flux and for estimating impacts in areas of complex terrain and complex wind fields. LANL configured the CALPUFF model to model emissions from the open burn operation as a point source (i.e., as a stack). No discussion was provided in support of this approach. LANL has been asked to justify this approach by showing that it adequately represents the actual open burning process at TA-16 and that the modeling results are conservative compared to the use of the area source algorithm in CALPUFF or other models for open burning operations.[1]

· LANL has used 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. For calculating dry deposition fluxes for gases, Appendix B, Table B-1-1 of EPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) recommends a value 3 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. A specific comment addressing this issue is included in the attached document.

· Conversion values presented in Table 2 of Appendix G could not be reproduced. It is suggested that LANL provide a sample calculation to illustrate how these values were calculated. A specific comment to this effect is included in the attached document. The comments also note that algorithms for converting air modeling results to equivalent impacts in the soil are available in EPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities and that these algorithms are preferable to the method used by LANL.

[1] TechLaw believes that LANL should have used the area source algorithm available in CALPUFF to more accurately model the source characteristics of the open burning operation. An inquiry has been sent to Earth Tech, the developers of CALPUFF, to confirm that the area source algorithm should be used when modeling open burn operations such as those at TA-16. A response has not yet been received from Earth Tech although receipt of the request has been acknowledged.

· LANL has taken air concentrations and dry deposition fluxes obtained from the CALPUFF model, converted them to equivalent soil concentrations through the use of the conversion values discussed above, and compared them directly to soil screening action levels. The source of the screening action levels was not identified in the material submitted for review. A specific comment has been drafted asking LANL to identify the screening levels presented in Table 14 of Appendix B.

· In the screening analysis, LANL used three surrogate species to represent all constituents emitted from the open burning process. The choice of the three surrogates was not adequately justified in the material submitted for review. LANL has been asked to demonstrate that use of the three surrogates guarantees a conservative risk analysis or to revise the methodology presented in Appendix G to address all constituents emitted during open burning operations at TA-16.

If desired, a conference can be arranged between the TechLaw reviewers and yourself to discuss these and other issues related to the deposition analysis.

If you have any questions, please feel free to contact Ms. Paige Walton at (801) 451-2978.

Sincerely,

Paige Walton
for

June K. Dreith
Project Manager

Enclosure
cc: Ms. Lee Winn, NMED
Mr. John Keiling, NMED
Ms. Paige Walton, TechLaw
Mr. B. Jordan, TechLaw Central Files
Denver TechLaw Files

TASK 14 DELIVERABLE

DISCUSSION AND REVIEW OF THE APPLICATION OF THE CALPUFF AIR DISPERSION MODEL TO THE TECHNICAL AREA 16 BURNING GROUND AT THE DEPARTMENT OF ENERGY'S LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NEW MEXICO

General Permit Support Contract;
Research and Permitting Support for the Los Alamos National Laboratory

Submitted by:

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Submitted to:

Mr. David Cobrain
Mr. James Bearzi
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building One
Santa Fe, New Mexico 87505

In response to:

Work Assignment No. Y513, 06082.350

May 2002

Review of the Application of the CALPUFF Air Dispersion Model to the Technical Area 16 Burning Ground at the Department of Energy's Los Alamos National Laboratory Los Alamos, New Mexico

GENERAL COMMENTS

1. LANL used 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. In reviewing the input file, calpuff.inp, it was noted that LANL configured the CALPUFF model to model emissions from the open burn operation at TA-16 as a point source (i.e., as a stack). No discussion was 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 open burn operation at TA-16. Demonstrate that this approach adequately represents the actual burning process (e.g., similarity in plume rise, 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 open burning operations (e.g., OBODM).

2. The source of the emission factors listed in Tables 3, 4, and 10 of Appendix B was not identified. Appendix B should be revised to identify the source. If the values were extracted from a bang box test, the title of the report from which the values were taken should be provided. In addition, the munition that was burned to generate the bang box value should be identified. If the munition differs from the material actually burned at TA-16, LANL should provide a discussion justifying the use of the surrogate emission factor in the screening analysis.

3. While electronic and hard copies of the CALMET and CALPUFF input files, (calmet.imp 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 open burn 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.

Discussions of the environmental setting, surrounding land use, potential exposure pathways, and the complex wind field should also be provided in support of the modeling input values.

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

Review of the Application of the CALPUFF Air Dispersion Model to the Technical Area 16 Burning Ground at the Department of Energy's Los Alamos National Laboratory Los Alamos, New Mexico

SPECIFIC COMMENTS

Appendix G Deposition Modeling for the TA-16 Burn Ground

1. A better understanding of the environmental setting would be conveying if LANL included a topographic map or plot of the modeling domain in Appendix G.

Methods

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

3. The last sentence in the first paragraph of this section states that: "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. Does the sentence refer to the value of 0.01 mg/kg or to a value calculated as described in the first paragraph? The text should be revised to clearly identify the value that will serve as a screening value. Further, the text should be revised to describe how the amount of toxic pollutant released per year that was used in calculating the screening value was determined.

4. The second paragraph states that LANL performed the air modeling analysis over a 3 km by 3 km domain. It is not clear why the modeling domain was limited to a 3 km by 3 km square rather than a larger area as suggested in EPA's HHRAP. Revise Appendix G to support the use of the 3 km by 3 km grid. Show that significant impacts did not occur at points located above the source elevation and beyond the 3 km by 3 km grid. Further, show that the maximum impact locations for all existing and potential receptor populations occurred within the modeled area.

5. In the third paragraph of this section, LANL describes how 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: a document that describes dispersion modeling using the ISCST3 model. Because LANL has used the CALPUFF model in the deposition analysis of the TA-16 Burn Ground, the reference should be changed to the appropriate section of the CALPUFF User's Guide.

6. The last paragraph of this section states that PM_{10}, toluene, and NO were used to represent all the constituents emitted from open burn operations at TA-16. No support for this approach is provided. Revise Appendix G to demonstrate that use of the three surrogate constituents guarantees that the screening analysis is conservative or revise the methodology to determine air concentrations and dry deposition fluxes for all constituents emitted during open burn operations.

Results

7. LANL has used 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. For calculating dry deposition fluxes for gases, Appendix B, Table B-1-1 of EPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) recommends a value 3 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.

8. According to the air concentration output file, concentration.out, the overall maximum air concentration calculated by CALPUFF was 4.5×10^{-8} g/m^3, not 4.5×10^{-8} g/cm^3 as reported in the text. The typographical error should be corrected. Further, the text should be revised 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 units.

Estimating Soil Concentrations

9. For clarity, LANL should revise the text to include a sample calculation detailing how the conversion values presented in Table 2 for CALPUFF modeling results were calculated.

10. LANL stated that CALPUFF derived values for the maximum soil concentration could be compared to soil screening action levels. The source of the action levels is not identified. Revise Appendix G to identify the source of the soil action levels used in the screening analysis.