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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

February 23, 2007

David Gregory, Federal Project Director
Department of Energy
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David McInroy
Remediation Services Deputy Project Director
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Los Alamos, New Mexico 87545

RE: APPROVAL WITH DIRECTION
MORTANDAD CANYON INVESTIGATION REPORT
EPA ID# NM0890010515
HWB-LANL-06-022

Dear Messrs. Gregory and McInroy:

The New Mexico Environment Department (NMED) is in receipt of the Department of Energy and Los Alamos National Security, LLC (collectively, the Permittees) document entitled *Mortandad Canyon Investigation Report* (Report) dated October 2006 and referenced by LA-UR-06-6752 and EP2006-0843. The NMED has reviewed the Report and issues this approval that includes the following comments and direction to the Permittees pursuant to section III.M.2 of the March 1, 2005 Order on Consent (Consent Order). Direction and required actions follow the comments.

Comments:

Executive Summary, p. vii
NMED Comment:
1. The second paragraph summarizes the results of the human health risk assessment. However, this discussion lacks a summary of residential risks. According to Appendix E, the radiation dose associated with exposure to sediments in eight of the reaches far exceeds the target dose limit of 15 millirems per year (mrem/yr). These results indicate that human health risk exceeds residential risk levels and that there is a need for land use controls in order to restrict future land use.

Section 1.4 Current Land Use, p. 4
NMED Comment:
2. The Permittees describe that there are no "active" laboratory operations in Mortandad Canyon. However, the TA-50 radioactive liquid waste treatment facility discharges on a continual basis into the canyon. In addition, laboratory personnel utilize the canyon for "recreational" uses, constituting "public" access to the canyon with respect to exposure. More restricted access and more visible and stronger warnings (e.g., fences and appropriate postings as may be required by DOE Orders) should be placed in the canyon to warn of the possible dangers associated with the contamination.

Section 2.1.7 Runoff from Developed Areas, p. 8
NMED Comment:
3. This section identifies runoff from developed areas as a source of a variety of contaminants. Although contaminants such as cadmium, copper, lead, nickel, pesticides and polynuclear aromatic hydrocarbons (PAHs) are associated with urban runoff, the Permittees have generated and discharged these and other contaminants to the canyon via various outfalls and other operations. Not all detections of these contaminants can be attributed to runoff from "urban" areas.

Section 5.4 Water Standards and Screening Levels, pp. 25-26
NMED Comment:
4. Section VIII.C of the Consent Order requires that the Permittees comply with the surface water quality standards outlined in the Clean Water Act (33 U.S.C. §§ 1251 to 1387), the New Mexico Water Quality Control Commission Regulations (20.6.2, the State of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC) and the procedures for alternative abatement standards (20.6.2.4103 NMAC).

Section 7.1.1.7 Future Fate and Transport of Radionuclides in Sediment, p. 42
5. Although redistribution and dilution of contaminant inventory over time results in a continuing decline in concentration and activities, dilution is not an acceptable means to reduce risk or dose to the public without other safeguards, such as increased monitoring, removal, and stabilization of contaminated sediment packages.

Section 7.1.2 Inorganic Chemicals in Sediments, p.44
NMED Comment:
6. The Permittees state that "most of the chromium associated with the sediment has therefore been retained within sediment deposits near the source." As we have learned from the chromium interim measures investigation in Sandia Canyon, the hexavalent chromium discharged from cooling towers likely remained in the mobile, hexavalent form rather than reducing to the immobile trivalent form. Thus, the chromium may have migrated a considerable distance from

the source, because much of the chromium found in Effluent Canyon likely originated from cooling tower discharges.

Section 7.1.3 Organic Chemicals in Sediments, p. 49
NMED Comment:
7. The Permittees indicate that several PAH compounds detected during the investigation are possibly associated with runoff from urban areas. However, some of these compounds are used by the facility or generated from facility operations. Therefore, the possibility that these compounds were released by the facility must be considered.

Section 7.1.3.5 VOCs, p. 51
NMED Comment:
8. The Permittees describe several organic compounds (e.g., methylene chloride and acetone) as "common" laboratory contaminants. While true, Los Alamos National Laboratory consists of many different laboratories and operations working on a variety of research topics and production processes. Therefore, the Permittees cannot attribute these or similar detections to analytical laboratory cross-contamination in any investigation unless supporting quality control data are provided in the associated laboratory report.

Section 7.2.1.3 Vadose Zone, p. 62
NMED Comment:
9. The combination of low water contents and the strongly welded nature of the Bandelier Tuff (QBt 2) does not always inhibit development of shallow perched groundwater zones. Fracture flow through joints can develop in unsaturated conditions and may vary over time and with event. In addition, surge beds can significantly influence contaminant transport and have been identified in other locations at the laboratory. Finally, the hydrostratigraphic units beneath the Pajarito Plateau are extremely heterogeneous, making the likelihood of intercepting these flow paths and perched aquifers by drilling low, particularly considering the limited access for drill rigs in much of the area.

Section 7.2.1.5 Regional Aquifer Model, p. 66
NMED Comment:
10. The Permittees statement "[w]ater-supply pumping is performed predominantly in the deep portion of the regional aquifer" may be misleading. A recent spinner log from water supply well Otowi-1 indicates that the upper portion of the regional aquifer contributes a substantial portion of the total water production.

Section 7.2.2.1 Inorganic Chemicals in Water, p. 78
NMED Comment:
11. The Permittees indicate that "comparatively small masses" of chromium have migrated to depths below the Otowi Member. Based on results from the implementation of the *Interim*

Measures Work Plan for Chromium in Groundwater, the Permittees may be underestimating the mass of chromium in the Mortandad Canyon watershed. Historic cooling tower discharges from TA-48 likely contained the mobile, hexavalent form of chromium. It is therefore probable that a significant mass has already migrated and now resides deeper in the system or is being transported downgradient. Chromium levels more than 50 µg/L in intermediate perched groundwater and levels as high as 400µg/L in the regional aquifer at R-28, provide additional evidence that a larger inventory may exist at depth.

Section 7.2.2.2 Organic Chemicals in Water, p. 85
NMED Comment:
12. The Permittees indicate that the possible sources of 1,4 dioxane have not been identified. However, waste codes and process codes reported in the 1987 CEARP (appendix D) from the January 1986 (revised November 1986) RCRA permit application indicate that up to 250 lbs of 1,4 dioxane, with a U108 hazardous waste code, may be used annually. The Permittees should be able to establish historic and current uses and waste generation through a review of existing documentation.

Section 8.1.1 Problem Formulation, p. 96
NMED Comment:
13. This subsection describes the process for evaluation of chemicals of potential concern (COPCs) and identification of chemicals of potential ecological concern (COPECs). It is recognized that the various ecological effects provide a compelling weight-of-evidence risk conclusion. An important line of evidence in identifying COPECs is understanding the fate of each COPEC; however, this has not been included in this section. To provide a clear justification of COPEC selection, the Permittees must summarize, in a table format, the list of COPECs by exposure media and the various lines of evidence used to describe the risk as well as the uncertainties associated with these lines of evidence for each chemical.

Section 8.1.1.3 Conceptual Exposure Model, p. 101:
NMED Comment:
14. This section describes the conceptual pathways associated with the baseline ecological risk assessment (BERA). It appears that the Mortandad Canyon watershed would have minimal connectivity to the down-gradient Rio Grande receiving system. However, this is not clearly described. The Permittees must update the information within the conceptual model to include the potential down-gradient connectivity to the Rio Grande (if it exists) and how this pathway was addressed as part of the BERA.

Section 8.1.2.4 Nest Box Studies, p. 106
NMED Comment:
15. The second paragraph of this section introduces the 'occult little brown myotis bat' receptor as a line of evidence for an avian insectivore pathway analysis. This approach is useful and

provides substantial information for the BERA. As such, the Permittees must integrate it into the appropriate endpoints for the BERA and present it consistently throughout the assessment (rather than introducing it only in this subsection).

Section 8.1.2.10 Rapid Bioassessment Characterization, page 108, and Section 8.1.3.7 Aquatic Community, p. 118
NMED Comment:
16. These sections describe the results of the rapid bioassessment characterization efforts completed throughout the watershed. It is not clear if any information gathered from these efforts was found useful for the purposes of the BERA. If the EPA Rapid Bioassessemnt Protocol (RBP) was followed, the measures of 'habitat characterization' taken, and/or in-field benthic macroinvertebrate biometrics, should be documented and explained. The Permittees must provide additional detail in this section to indicate if any information was gained from this effort and how was it applied as a line of evidence to the BERA.

Section 8.1.3 Baseline Ecological Risk Assessment, p. 109
NMED Comment:
17. This section states that "screening of concentrations of COPCs in sediment and water samples collected in 2005 is also a line of evidence supporting the evaluation of potential ecological risk in Mortandad Canyon watershed." A summary of sample collection activities is also provided in Table 4.2-1. However, the findings from this screening are not presented in any of the risk conclusions. The Permittees must include a summary of this line of evidence in the Report in Section 8.1.3.7 (Pages 118 – 119).

Section 8.1.3.1 Mexican Spotted Owl, p. 110:
NMED Comment:
18. The first paragraph on Page 110 provides compelling information from the pellet analysis for incorporation into the diet modeling approaches. However, the results of the pellet analysis are not presented. It is useful to have the data results from the pellet analysis in order to understand portion of diet comprised by individual species. The Permittees must provide the pellet analysis results in a tabular format.

Section 8.1.3.1 Mexican Spotted Owl, p. 110:
NMED Comment:
19. The last paragraph on Page 110 indicates that conservative assumptions regarding methyl mercury content were applied for the tissue (diet) evaluation. It is not clear if it was assumed whether the methyl mercury content was equivalent to the inorganic mercury content. The Permittees must clarify in all appropriate sections (e.g. page 113, COPEC Concentration in Worms and Table 8.1-5) and tables what conservative assumptions regarding methyl mercury content were applied.

Section 8.1.3.4 Mammalian Invertevore Feeding Guild, pp. 114 and 115
NMED Comment:
20. The last paragraph on page 114 and the first four paragraphs on page 115 describe the 'statistical significance' of pelt and/or carcass tissue content as compared to sediment COPEC concentrations. However, statistical significance is not clearly defined for each comparison ($p = 0.07$ for regression for selenium, but is not described for the other COPECs demonstrating a trend in the data). The Permittees must update this section to define the level of significance for each parameter.

Section 8.2.1 Problem Formulation, page 126
NMED Comment:
21. This section indicates that a residential exposure scenario was evaluated as a supplemental exposure scenario for comparison purposes only. Similar statements are made throughout the human health risk assessment. The reason a residential scenario is included as a hypothetical future land use is to determine the need for land use controls or other types of institutional controls, in the event land use were to change from current uses. The Permittees must clarify that the residential scenario is evaluated to determine the need for land use controls or institutional controls for preventing unrestricted use of the property.

Section 8.2.2 Data Collection and Evaluation, page 126
NMED Comment:
22. This section refers the reader to Section 6 for a description on how sediment data were separated into reaches and how sediment data within reaches were combined for the comparison of contaminant data maxima with background values. However, this information could not be located in this section. The Permittees must include a reference to the appropriate locations in the Report that describe how the sediment data were separated into reaches as well as combined within reaches as a basis for selecting COPCs.

Section 8.2.5 Risk Characterization, pages 131-132
NMED Comment:
23. Sections 8.2.5.1 Noncarcinogenic Effects, 8.2.5.2 Carcinogenic Effects, and 8.2.5.3 Radiation Dose do not include a discussion of the noncarcinogenic effects, carcinogenic effects, or radiation dose associated with the residential scenario that was evaluated throughout the human health risk assessment in Appendix E. It is understood that the residential scenario is not a decision scenario for the determination of further investigation or corrective action. However, this scenario is evaluated to determine the need for land use restrictions. Based on a review of Appendix E, the cumulative cancer risks are at or below the NMED target risk level of 10^{-5} and the cumulative noncancer hazard indices (HIs) are close to the NMED target of 1.0. However, the radionuclide dose in eight of the reaches exceeds the target dose limit of 15 mrem/yr. In addition, the doses ranged from 16 to 1017 mrem/yr, with seven of the eight reaches significantly above the target dose limit. Based on these results, the reaches present an unacceptable risk

under an unrestricted land use scenario. The unacceptable risk justifies the need for land use controls at these areas. The Permittees must summarize the results of the residential scenario to accurately reflect the results of the risk assessment presented in Appendix E.

Table 8.1-2 Number of Each Species Collected for Analysis in Each Reach in the Mortandad Watershed, page 287, Figure 8.1-15 Mean Percent Daily Capture Rate for Small Mammals and Figure 8.1-16 Small Mammals Species Diversity, page 220
NMED Comment:
24. The information provided in Table 8.1-2 appears to conflict with the bar graphs provided in Figures 8.1-15 and 8.1-16. It stands to reason that the diversity for reach E-1W would yield the highest value having 22 individuals and 5 species. However, the diversity for the LA-BKG reach should be comparable with 31 individuals and 4 species (as compared to M-2W and M-3E with 31 individuals and 3 species, and 37 individuals and 3 species respectively). Yet the diversity measure for the background reach is shown to be much less than E-1W. The Permittees must revisit the Shannon-Weaver diversity calculations to determine if there is an error in the values presented and ensure the text, tables, and figures are consistent.

NMED Comment:
25. This table indicates that the radionuclide dose associated with sediment and surface water at reach E1-1 is 43.7 mrem/yr and 0.25 mrem/yr, respectively, for a total dose of 44 mrem/yr for the reach. The text in Section 8.2.5.3 Radiation Dose also cites 44 mrem/yr for the reach as a total dose. However, Table 8.2-12 indicates that the radionuclide dose associated with sediment at reach E1-1 is 51.2 mrem/year. The Executive Summary and Section 9.0 Conclusions and Recommendations (second paragraph on page 137) indicates the calculated dose for reach E-1E is 52 mrem/yr (corresponding to a radiological risk of approximately 2×10^{-4}). The Permittees must correct the tables and/or text to ensure consistency throughout the Report with respect to communicating the total dose calculations for reach E1-1.

Table 8.2-11 Summary of Trail User Risk Assessment Results, page 311
NMED Comment:
26. This table indicates that the radionuclide dose associated with sediment and surface water at reach E1-1 is 43.7 mrem/yr and 0.25 mrem/yr, respectively, for a total dose of 44 mrem/yr for the reach. The text in Section 8.2.5.3 Radiation Dose also cites 44 mrem/yr for the reach as a total dose. However, Table 8.2-12 indicates that the radionuclide dose associated with sediment at reach E1-1 is 51.2 mrem/year. The Executive Summary and Section 9.0 Conclusions and Recommendations (second paragraph on page 137) indicates the calculated dose for reach E-1E is 52 mrem/yr (corresponding to a radiological risk of approximately 2×10^{-4}). The Permittees must correct the tables and/or text to ensure consistency throughout the Report with respect to communicating the total dose calculations for reach E1-1.

Required Actions:

- Within 30 days of receipt of this approval, the Permittees must provide the information requested for comments related to Chapter 8.

- Within 120 days of receipt of this approval the Permittees must:

  Complete and submit to NMED, a comprehensive assessment and evaluation of each well and well screen intersecting intermediate and regional groundwater in the Mortandad Canyon watershed. The evaluation must incorporate the results of the most recent and approved *Well Screen Analysis Report*. The Permittees must consider factors related to well construction (e.g., excessive filter pack lengths, misplaced screened intervals, seal integrity, leaching of well materials), well location, well coverage (spatially), pumping impacts from municipal supply wells, contaminant sources, hydrostratigraphic unit(s) monitored, effects of fractures and faulting, and the influence of other geologic structures on groundwater flow. Emphasis should be on the ability of screened intervals to yield samples that will detect contaminant releases to intermediate and regional groundwater.

  The evaluation must utilize both historic and the most recent groundwater monitoring and water level information. Justification must be provided if the most recent data used in the well assessment is older than six months from the date of receipt of this approval, or if there are intervals of greater than six months between the Permittees' acquisition of data sets used. The primary purpose of the evaluation is to identify the adequacy of available wells and identification of optimal locations for data collection points for the purpose of long-term compliance monitoring. The evaluation shall provide recommendations concerning well rehabilitation, well replacement and installation of additional wells.

- Within 180 days of receipt of this approval, the Permittees must perform the following activities:

  Replace gage station E202 to ensure that it is capable of measuring flood events. Currently, storm water bypasses the gage because the position of the channel has changed.

- Within 360 days of receipt of this approval, the Permittees must:

a. Remove the damaged permeable reactive barrier (PRB) located in Mortandad Canyon and return the canyon to pre-PRB conditions to the extent practicable. Moreover, the sheet piles and barrier material used in construction of the PRB may adversely impact surface and alluvial groundwater flow. The Permittees may in the alternative provide documentation to the NMED showing the current condition (working/non-working) of the PRB and

justification for leaving it in place. If removal of the PRB is required, all waste generated during the removal must be tested and managed according to all applicable regulations.

b. Collect a minimum of four rounds of reliable groundwater monitoring data from wells used to support any proposed actions identified in an upcoming corrective measures evaluation, including wells requiring rehabilitation.

Based on the results of the well evaluation, NMED may require additional actions (e.g., well rehabilitation, completion of additional or well replacement wells) to address any identified deficiencies and to ultimately establish an adequate long-term groundwater monitoring network. Until the Permittees complete the required tasks, the development of a CME for Mortandad Canyon is premature. Until otherwise directed, the Permittees must continue to sample the intermediate and regional wells identified in this report in accordance with the approved *Interim Facility Wide Ground Water Monitoring Plan*.

Should you have any questions please call me at (505) 476-6016 or John Young at (505) 476-6038.

Sincerely,

James Bearzi
Chief
Hazardous Waste Bureau

JPB:jry

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File: Reading and [redacted])