Response to the Notice of Disapproval for the Investigation/Remediation Report for Material Disposal Area B, Solid Waste Management Unit 21-015, Revision 1, Los Alamos National Laboratory, EPA ID No. NM0890010515, HWB-LANL-11-078, Dated March 18, 2013

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. Los Alamos National Laboratory's (LANL's or the Laboratory's) responses follow each NMED comment. This response contains data on radioactive materials, including source, special nuclear, and byproduct material. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy policy.

COMMENTS

NMED Comment

1. *Provide a detailed description of the procedures followed for confirmation sidewall sampling. Specifically, detail the protocol followed upon detection of contaminants at concentrations greater than applicable screening levels in a sidewall sample, including a description of how the excavation limits were altered based on the detections and how confirmation that sufficient removal of contaminated materials was conducted. Provide figures and photo-documentation illustrating implementation of these procedures.*

LANL Response

1. The confirmation sampling protocol used during the investigation and remediation of Material Disposal Area (MDA) B is described in detail in section 5.0 of the investigation/remediation report (I/R report). Specific details of the implementation of this protocol at each of the enclosures or excavation areas are provided in sections 5.1 through 5.7 of the I/R report.

   The goal of the remediation activities conducted at MDA B was to achieve residential soil screening levels (SSLs) for hazardous constituents and residential screening action levels (SALs) for radionuclides. As described in the I/R report, a tiered approach was used to confirm removal of all waste and contaminated media above SSLs and SALs. The tiers in this approach are (1) visual evidence of waste removal, (2) field radiation screening, (3) field laboratory analysis, and (4) off-site laboratory analysis.

   The first tier was visual confirmation that all waste material had been removed and that the excavation sidewalls and floor had been advanced into native tuff. The next tier was real-time field screening using a Field Instrument for Detection of Low-Energy Radiation (FIDLER) mounted on the excavator boom. The FIDLER was used to determine whether cleanup levels had been met on the sidewalls and floor of each excavation grid cell.

If FIDLER results indicated all contamination had been removed, confirmation samples were collected. Based on a statistical analysis of sampling frequency, it was determined that confirmation samples should be collected every 50 ft. The next tier of cleanup verification was analyzing confirmation samples using a field laboratory. Confirmation samples were collected from locations on each sidewall and the floor and were analyzed in a field laboratory for americium-241 by gamma spectroscopy using a high-purity germanium detector. Although plutonium was the principal contaminant of concern at MDA B, americium-241 was used as the indicator of site contamination because of its lower detectable activity in a field laboratory and its copresence with plutonium in TA-21 wastes. Sample results were compared with a screening level based on a scaling factor used to estimate plutonium activities. If the field laboratory results indicated americium-241 above the screening level, additional material was excavated from the trench floor and/or sidewalls. Table 5.0-1 of the I/R report presents the field-screening results and documents the grid cells requiring additional excavation based on the field laboratory results.

If the field laboratory results showed no detectable activity or were below the field-screening level, the confirmation samples were submitted to an off-site laboratory for analysis of target analyte list (TAL) metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), dioxins/furans, polychlorinated biphenyls (PCBs), perchlorate, nitrate, total cyanide, total uranium, americium-241, tritium, isotopic uranium, isotopic plutonium, strontium-90, and gamma-emitting radionuclides. If off-site laboratory results indicated inorganic chemical or organic chemical concentrations above SSLs or radionuclide activities above SALs, additional material was excavated from the trench floor and/or sidewalls. If no results were above SALs or SSLs, the excavation of the trench segment associated with that sample was deemed complete. As described in the I/R report, in several instances radionuclides were detected above SALs at depths greater than the residential exposure scenario depth range (0–10 ft), and additional excavation was not performed. All inorganic and organic chemical concentrations in confirmation samples were below residential SSLs or not statistically different from background if the residential SSL is below background.

The text in section 5.0 of the I/R report has been revised to provide additional details and clarifying language.

Evidence of the implementation of the above process to achieve sufficient removal of contaminated materials is found in the plates provided in the I/R report. Plates 2 through 8 show the areal extents and depths of the excavations within each enclosure and excavation area. These plates clearly show where the excavations were extended laterally and vertically on the basis of field screening and laboratory analysis results to meet cleanup levels. The plates also show locations where confirmation sampling results exceeded cleanup screening levels and additional excavation was required. Representative photographs of confirmation sampling activities have been added to the I/R report as Appendix M.

NMED Comment

2. ***Section 6.3, Post-remediation Fieldwork Summary, pages 35-37, Section F-5.1, Confirmation Sampling Methods, page F-3, and Section F-5.3, Borehole Sampling Methods, page F-4.***

   Permittees' Statements: *"If a particular interval was selected for analytical sampling, samples of the broken tuff were removed from the core barrel and placed into the sampling bowl. The sampler further reduced the sample size using a decontaminated rock hammer or stainless-steel trowel, only to the extent required to containerize the sample. Samples for VOCs were collected first, after which all remaining sample containers were filled to the top to minimize headspace."*

and

"Because samples for VOC analysis were not collected in sleeves and were handled before they were sealed in sample jars, some potential for VOC loss occurred during sample collection, and VOC results may be biased low."

and

"If the sample consisted of broken tuff, the sampler further reduced the size using a decontaminated rock hammer or stainless-steel trowel, only to the extent required to containerize the sample. The material was then passed through a 2-mm sieve into a sample bowl to remove foreign material. The sample material from the bowl was placed in appropriate sampling containers. In an effort to prevent the potential loss of VOCs, the sample container for VOCs was filled first, and then all remaining sample containers were filled."

and

"Borehole samples were collected in accordance with a subcontractor procedure technically equivalent to SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials."

NMED Comment: *The Permittees have clearly indicated in three separate statements that inappropriate sampling methods were used when collecting samples for VOC analysis. Analytical data for samples that were collected inappropriately is not valid. Sufficient evidence that VOCs are not present was not acquired. SOP-06.26 specifically dictates the use of brass sleeves for VOC sampling and it is also a requirement of Consent Order Section IX.B.2.b.i and ii unless another sample collection method is approved by NMED. The Permittees must provide data that meet quality assurance and quality control objectives in order to demonstrate that VOCs are not present in soils or tuff at the site. The Permittees must submit a work plan detailing a sampling and analysis plan including protocol appropriate for evaluating for the presence of VOCs.*

LANL Response

2. NMED's comment indicates VOC data collected by the Laboratory from confirmatory samples and post-remediation boreholes were not valid and additional sampling using appropriate protocols is needed to evaluate for the presence of VOCs. In the response that follows, the Laboratory evaluates whether VOC data collected at the MDA B site are sufficient to meet the project objectives and concludes that additional VOC sampling is not warranted. In addition, the Laboratory describes why alternate methods of sample collection would result in similar concerns with respect to VOC data validity.

   The Laboratory agrees with NMED that the procedures used to collect samples for VOC analysis impacted the validity of the data. Section 5.0 of the I/R report acknowledges that the procedure used to collect confirmatory samples increased the potential for VOC loss during the sampling process. The I/R report, however, describes why the potential for VOC loss should not affect the conclusions of the confirmatory sampling. Specifically, other lines of evidence support the conclusion that VOC contamination is not present above SSLs and that the remediation goal has been met. These lines of evidence are the results of direct-push technology (DPT) sampling, pore-gas sampling, vapor monitoring, and waste characterization sampling. These lines of evidence are discussed in more detail below.

DPT sampling was performed in 2009, before excavation began, to initially characterize material in the trenches. As described in section 3.4 of the I/R report, two phases of DPT sampling were performed within the trench boundaries, resulting in collection of 130 samples from 87 locations. DPT sampling locations are shown in Figure 3.4-1 of the I/R report. Core samples were collected in sleeves, which were capped when brought to the surface to minimize loss of VOCs. DPT samples were submitted for off-site laboratory analysis of TAL metals, toxicity characteristic leaching procedure metals, uranium, VOCs, SVOCs, alpha-emitting radionuclides, gamma-emitting radionuclides, strontium-90, and tritium. DPT sampling results are presented in Appendix B of the I/R report and show that 20 VOCs were detected and that all VOC results were below residential SSLs. The maximum detected VOC concentrations ranged from 0.000018% of the residential SSL for 4-isopropyltoluene to 1.4% of the residential SSL for trichloroethene. Based on the DPT sampling results, the I/R report concluded that a substantial inventory of VOCs was not present in the waste at MDA B.

The revised I/R report evaluates whether VOC vapor data, such as pore-gas samples or vapor-monitoring results, can be used as an indication of soil and tuff contamination at levels approaching SSLs. This evaluation, which is presented in Appendix L of the revised I/R report, considers the partitioning of VOCs into various phases. VOCs in soil or tuff will partition between three phases: a vapor phase, a liquid phase in equilibrium with the vapor phase, and a solid phase in equilibrium with the liquid phase. Equations showing the relationship between the bulk concentration in soil or tuff (i.e., the concentration that would be measured in a soil or tuff sample analyzed in a laboratory) and the associated pore-gas concentration were presented in Appendix F of the approved Phase III investigation report for MDA C (LANL 2011, 204370; NMED 2011, 208797). These equations and the physical tuff properties discussed in Appendix F of the Phase III investigation report for MDA C were used to calculate the bulk soil or tuff concentration that would be in equilibrium with a vapor concentration easily detectable using field vapor monitoring (i.e., 10 ppmv). This evaluation, which has been added to the I/R report as Appendix L, indicates the resulting bulk soil/tuff concentrations are much less than residential SSLs. Therefore, soil/tuff contamination at or above residential SSLs would be accompanied by VOC vapor concentrations in excess of 10 ppmv.

Pore-gas sampling was performed during the 1998 Resource Conservation and Recovery Act facility investigation (RFI) at MDA B (LANL 2004, 087290). Three pore-gas samples were collected from each of seven boreholes angled beneath the MDA B trenches. Angled borehole locations are shown in Figure 3.3-1 of the I/R report. Eighteen VOCs were detected in concentrations ranging from 1.7 $\mu g/m^3$ (0.00053 ppmv) to 1037 $\mu g/m^3$ (0.19 ppmv). Based on the evaluation of VOC partitioning presented in Appendix L of the revised I/R report, VOC vapors at these low concentrations are not indicative of soil/tuff contamination above residential SSLs.

Pore-gas samples were also collected from two vertical boreholes (MDAB-612802 and MDAB-614478), drilled after excavation of MDA B was complete. These boreholes were advanced at locations where elevated radionuclides were detected at the bottom of the excavations to characterize the vertical distribution of contaminants at these locations. Borehole locations are shown in Plate 1 of the I/R report. Two pore-gas samples were collected from each borehole. Eleven VOCs were detected at concentrations ranging from 35 $\mu g/m^3$ (0.011 ppmv) to 2800 $\mu g/m^3$ (0.52 ppmv). As noted above, VOC vapors at these low concentrations are not indicative of soil/tuff contamination above residential SSLs.

Real-time continuous air monitoring was performed during excavation activities at MDA B. Air monitoring included use of VOC monitors with sample tubes located on the excavator buckets. The instruments were set to alarm at low part per million VOC concentrations. Although this monitoring was conducted for industrial hygiene purposes, as discussed below, it was also capable of detecting the presence of VOCs above SSLs in the material being excavated.

Thus, if VOCs were present in soil or tuff at concentrations greater than residential SSLs during confirmation sampling, they would have been detected by the real-time organic vapor monitoring being performed during sampling. As described in section 4.6.4 of the I/R report, the air-monitoring system alarm was set off when the excavator breached a container of waste containing the VOC naphthalene. This indicates the effectiveness of the air-monitoring system.

Samples of the soil and debris excavated from the trenches were also analyzed for VOCs as part of waste characterization activities. The VOC results were similar to the other results described above. Twenty-four VOCs were detected in waste samples. The frequency of detection was less than 14%, with the exception of naphthalene, which had a frequency of detection of 33%. All VOC results were below residential SSLs, with the exception of naphthalene.

Based on information presented above, the Laboratory concludes that no VOC contamination above residential SSLs is present at the site. Because the purpose of the confirmatory sampling was to verify cleanup to residential SSLs, no further sampling is warranted and submittal of a sampling and analysis plan is not necessary. Sections 3.3.1, 3.4, 4.3.2, and 6.4.3 of the I/R report have been revised to provide additional information on DPT, waste, and pore-gas sampling to support the conclusion that VOCs are not present above residential SSLs. Section 4.3.1 of the I/R report has been revised, and Appendix L has been added to provide additional information concerning the ability of VOC air monitoring to detect contamination above residential SSLs. Section 7.0 of the I/R report has been revised to provide information on the additional lines of evidence supporting the conclusions that VOCs are not present above residential SSLs.

Since NMED initially identified the issue of collecting representative VOC samples for analysis (NMED 2011, 204629), the Laboratory has conducted research into potential VOC sampling procedures and is in the process of revising its sampling standard operating procedures (SOPs). The research found no methods of obtaining samples from tuff bedrock that do not disturb the samples and do not result in VOC loss. As a result, the revised SOP will specify that tuff samples not be collected for VOC analysis. If characterization of potential subsurface VOC contamination in tuff is necessary, pore-gas sampling will be recommended.

It should be noted that the brass sleeve method referred to in NMED’s comment, while preferable to the method that was used at MDA B, still has serious limitations. Specifically, the brass sleeve method is designed to be used with unconsolidated materials so the sample material can be trimmed even with the edge of the sleeve, resulting in zero head space. Consolidated materials such as tuff cannot be trimmed cleanly and must be broken, resulting in headspace and sample disturbance. Additionally, the seals at the ends of the sleeve will only reduce, not eliminate, loss of VOCs during transport to the analytical laboratory and storage before analysis. Most importantly, the sample within the sleeve must still be disturbed and size-reduced to be placed into a vial that can be introduced into the analytical instrument. This will result in potential loss of VOCs similar to size reduction in the field and will also present the potential for introducing laboratory contaminants.

NMED Comment

3. Table 5.02, Confirmation Samples Collected during Excavation Activities

The Permittees provided no indication of the analyses requested for the samples collected. The standard Investigation Reports submitted by the Permittees include a table titled, "Samples Collected and Analyses Requested" which satisfies the requirements of Consent Order Section XI.C.12 for identifying the analytical methods. This section of the Consent Order also requires that detection limits be included in the tables. NMED is unable to complete its review of the IRR without this required information. The Permittees must revise Table 5.02, as well as tables for all other samples collected, to include the analyses requested and analyte detection limits or provide this information in new tables.

LANL Response

3. At the time that the I/R report was being prepared, the Laboratory was transitioning to the cloud-based environmental data management system that supports Intellus NM. As a result, some data reporting capabilities were not yet available, including the ability to generate the "Samples Collected and Analyses Requested" tables noted in NMED's comment. These tables have now been generated and are included in the revised I/R report as Table 5.0-3 for confirmation samples, Table 6.4-1 for post-remediation borehole samples, and Table B-1 for DPT samples. Information on detection limits is included in the revised Appendix C tables (see response to Comment 5).

NMED Comment

4. Appendix C, Analytical Suites and Result and Analytical Reports

The Permittees provided no method to locate the appropriate laboratory requests and subsequent data reports for specific samples. NMED is unable to complete its review of the IRR without this information. In the Appendix C Tables, the Permittees must provide columns correlating each specific sample-to the laboratory request PDFs, data package PDFs, and all other PDF documents included in Appendix C.

LANL Response

4. As noted in the response to Comment 3, the "Samples Collected and Analyses Requested" tables for confirmation samples, post-remediation borehole samples, and DPT samples are provided in the revised I/R report. These tables provide the analytical request number for each analysis for each sample. The pdfs in Appendix C are labeled by analytical request number. The "Samples Collected and Analyses Requested" tables, therefore, can be used to identify which pdf files contain information related to specific samples.

NMED Comment

5. Appendix C, Analytical Suites and Result and Analytical Reports

The Microsoft Excel data tables provided in Appendix C are missing essential information. For example, Table C-2. Confirmation_ORGANICS_040212.xls contains columns for sample depth which all indicate that samples were collected at a depth of zero. In addition, many samples have a Media designation of "na" and many cells for various contaminant constituents are left blank. NMED is *unable to complete its review of the IRR without this information. The Permittees must revise the tables in Appendix C to include sample depths, media designations, and identification of non-detects and not analyzed samples for a particular constituent.*

LANL Response

5. The zero depths in the tables in Appendix C indicate that depth values are missing. Sample depths are provided in Table 5.0-2 and this information has now been incorporated into the Appendix C tables in the revised I/R report.

   The Laboratory has prepared narrative describing the format and content of the Appendix C data tables, and this writeup has been added to Appendix C of the revised I/R report. The narrative includes an explanation of media codes, locations of detection limits, identification of samples other than environmental investigation samples (e.g., quality assurance samples), and so forth. This information is intended to make the tables easier to use and to address the concerns noted in NMED's comment.

REFERENCES

LANL (Los Alamos National Laboratory), June 2004. "Investigation Work Plan for Material Disposal Area B at Technical Area 21, Solid Waste Management Unit 21-015," Los Alamos National Laboratory document LA-UR-04-3713, Los Alamos, New Mexico. (LANL 2004, 087290)

LANL (Los Alamos National Laboratory), June 2011. "Phase III Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," Los Alamos National Laboratory document LA-UR-11-3429, Los Alamos, New Mexico. (LANL 2011, 204370)

NMED (New Mexico Environment Department), July 15, 2011. "Notice of Disapproval, Investigation Report for Lower Sandia Canyon Aggregate Area," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 204629)

NMED (New Mexico Environment Department), December 8, 2011. "Approval, Phase III Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 208797)