General

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CERTIFIED MAIL - RETURN RECEIPT REQUESTED

July 25, 2011

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Michael J. Graham
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RE: APPROVAL WITH MODIFICATIONS
GROUNDWATER BACKGROUND INVESTIGATION REPORT, REVISION 4
LOS ALAMOS NATIONAL LABORATORY
EPA ID#NM0890010515
HWB-LANL-10-074

Dear Messrs Rael and Graham:

The New Mexico Environment Department (NMED) is in receipt of the United States Department of Energy (DOE) and the Los Alamos National Security (LANS), L.L.C.'s (collectively, the Permittees) document entitled *Groundwater Background Investigation Report, Revision 4* (Report) dated August 2010 and referenced by EP2010-0308. NMED has reviewed the Report, and hereby issues this approval with the following modifications and comments.

1. **Section 2.1, Geologic Framework, page 6, last paragraph:**
   Correct the eruption ages for Tshirege and Otowi Members of Bandelier Tuff.

2. **Section 2.2, Hydrogeologic Framework and Groundwater Occurrence, page 7, next to the last paragraph:**
   The Permittees' statement that "[t]he regional water table occurs within the Puye Formation and Santa Fe Group beneath the Plateau" does not fully describe the geology at the water table. Provide an expanded description of the occurrence of the regional water table.

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3. **Section 2.3.2, General Compositional Trends, page 10, second paragraph of the section:**
In the third sentence of the paragraph, the Permittees state that the concentrations of sodium increase from west to east in groundwater beneath the Pajarito Plateau. The fifth sentence of the paragraph states the opposite. Reconcile the discrepancy.

4. **Section 3.1, Overall Steps in Process, page 12, third paragraph of the section:**
The Permittees state that data preparation steps are listed in Table 3.1-1 and summarized in Table B-1 of Appendix B. However, although certain steps in these tables are the same (for example, removal of duplicates), it appears that these tables represent different stages of data preparation. Clarify the relationship between Table 3.1-1 and Table B-1, and clearly specify data preparation steps that are already reflected by the data sets in Tables B-4 through B-42, and those that were performed on these data sets in subsequent steps.

5. **Section 3.1, Overall Steps in Process, page 12, third paragraph of the section:**
Perform the following additional data-preparation steps (after completing the data preparation steps that are already listed in Tables 3.1-1 and B-1), in accordance with Chapter 5 and Section 15.1 of the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance,* EPA 530-R-09-007 (EPA Guidance):

    1. For wells R-2, R-6, R-17-P1A, R-17-P2A, R-24, and R-34, remove the early, post-installation data for manganese and other constituents with elevated and decreasing concentration trends, which indicate lingering impacts from drilling and lack of well stabilization.
    2. Remove all results for samples collected at Sandia Spring from September 25, 2000 through September 13, 2004. During that time, the spring was sampled from alluvial deposits located approximately 200 meters downstream of the actual spring source. Starting in 2005, samples were collected from the spring source. As noted in the time-series plots for Sandia Spring in Appendix C, the change in the sampling location had a significant impact on the chemistry of collected samples.
    3. If a data set for any location, analyte and sample type (filtered or unfiltered) includes both quantified values and non-detects, remove all non-detect values higher that the highest quantified value that is not an outlier.
    4. If both filtered and unfiltered samples were collected for any location and analyte during the same sampling event, and the filtered result is higher than the unfiltered result, remove both filtered and unfiltered values that meet one of the following conditions:
        a. Both filtered or unfiltered values exceed five times (5x) the quantitation limit, and the relative percent difference between filtered and unfiltered values exceeds 20%, or
        b. Either filtered or unfiltered value is lower than five times (5x) the quantitation limit, and the difference between filtered and unfiltered

values is greater than the quantitation limit. If a quantitation limit is not available, a value equal to three times (3x) the lowest method detection limit must be used in its place. For radionuclides, the minimum detectable activity (MDA) must be considered equivalent to a quantitation limit.

6. **Section 3.4, Analytical Methods, page 15:**
According to information in Table 3.1-1, low-level tritium results submitted by ARSL were screened-out before performing statistical analyses of the data. Add a statement to that effect.

7. **Section 3.4.1, Methods, page 15, second paragraph of the section:**
In the second sentence of the paragraph, the Permittees state that perchlorate was analyzed by EPA Method 300, Revision 2.1. In the next sentence, they state that it was analyzed by EPA Method 314.0, Revision 1. Resolve the discrepancy.

8. **Section 3.7, Statistical Methods, *Outlier evaluation*, page 19:**
The methodology used by the Permittees to identify outliers was inadequate to properly perform this task. Numerous apparent outliers were not identified. For example, in the data set for manganese in G-1A production well, the value of 220 μg/L was not identified as an outlier, despite all other concentrations ranging from 0.382 to 16 μg/L. Perform outlier screening separately for each location, analyte and sample type using the box plot procedure described in Section 12.2 of the EPA Guidance. If a box plot for raw data shows highly asymmetric distribution, the outlier screening must be performed on transformed data that is roughly symmetrically distributed (mean and median approximately equal) in a box plot. Non-detects or negative radionuclide data must be plotted as reported by the laboratory. Values greater than 1.5 x IQR (where IQR is the interquartile range) above the upper edge of the box plot, or lower than 1.5 x IQR below the lower edge of the box plot must be identified as outliers. All box plots used for outlier screening must be included in the report.

9. **Section 3.7, Statistical Methods, *UTL Calculation methods*, page 20:**
If the statistical criteria for UTL calculations are not met for a constituent, establish the screening value for that constituent in the following manner, in accordance with Section 17.2.2 and Table 17.4 in Appendix D of the EPA Guidance:
    1. Set the second largest measurement in the data set as the screening value if the total number of observations, including non-detects, is at least 94 (in order to achieve at least 95% coverage at 95% confidence level). Otherwise, set the largest measurement in the data set as the screening value.
    2. If the largest or second largest measurement, as set above, is a non-detect, the lowest quantitation limit for the data set must be used as the screening value. If a quantitation limit is not available, a value equal to three times (3x) the lowest method detection limit for the data set must be used in its place. For radionuclides, the MDA must be considered equivalent to a quantitation limit.

10. **Section 4.2.1, Spatial Trends in Water Chemistry, page 24, top paragraph, last sentence:**
The reference to Figure 2.3-1b, regarding TDS concentrations, is incorrect. Change the reference to Figure 2.3-1a.

11. **Section 4.2.1, Spatial Trends in Water Chemistry, page 25, second paragraph, fourth sentence:**
The measurement unit for uranium-234 is incorrectly listed as μg/L. Correct the measurement unit to pCi/L.

12. **Section 4.4, Recommended Background Screening Values, page 28, third paragraph:**
The Permittees mention EPA secondary standards for nickel, tin, strontium, and vanadium. However, EPA secondary standards do not exist for these metals. Make the appropriate correction.

13. **Section 4.4, Recommended Background Screening Values, page 28, last paragraph:**
The Permittees' incorrectly state that "[f]or radionuclides, the screening value is the highest minimum detectable activity." In fact, UTLs have been calculated for some radionuclides, and these UTLs are their screening values. Make the appropriate corrections.

14. **Figures 2.3-1a through 2.3-3b, pages 45-47:**
Provide information on the data set used to create the figures.

15. **Table 1.2-1, page 59, right column, second row:**
The wording ". . . they cluster into a separate group . . ." is erroneous. Correct the wording to state ". . . they do not cluster into a separate group . . . ."

16. **Table 3.1-1, page 62:**
    1. According to the table, tritium results from laboratories other than UMTL should have been eliminated before performing statistical analyses of the data. However, information in Tables 4.2.1 and 4.2.2 indicates that results from ARSL, with detection limits higher than those from UMTL, were also included in statistical analyses. Remove all tritium data submitted by ARSL before performing the statistical analyses.
    2. According to the table, cesium-137 results obtained by EPA:901.1 should have been eliminated before performing statistical analyses of the data. However, information in Tables 4.2.1 and 4.2.2 indicates that cesium-137 data obtained by EPA:901.1 were included in the statistical analyses. Furthermore, based on information in Table 3.4-2, EPA:901.1 was the only method used to analyze cesium-137. Remove the limitation on cesium-137 data from Table 3.1-1.

3. According to the table, perchlorate results should have been limited to those obtained by methods with lower detection limits. However, information in Table 4.2.1 indicates that perchlorate results obtained by methods with high detection limits were included in the statistical analyses. Furthermore, the analytical method code 'SW846 6850 Modified', which is listed in Table 3.1-1 to identify perchlorate results with low detection limits, does not appear in the data sets in Tables B-4 through B-42. Instead, low detection limit results for perchlorate in Tables B-4 through B-42 were obtained by a method with codes 'SW846 6850' and 'SW-846:6850'. Resolve the discrepancy between analytical method codes for perchlorate in Tables 3.1-1 and B-4 through B-42. Remove perchlorate results with high detection limits before performing the statistical analyses.

17. Tables 4.2-1 and 4.2-2, pages 71 - 77:
Provide units of measurement for all analytical data.

18. Table 4.3-1, pages 79 - 81:

1. Several arithmetical and typographical errors are present in the table. Correct cadmium, thallium and TDS column 8 values to negative; correct TOC column 5 value to negative; recalculate incorrect specific conductance-field value in column 5; correct uranium-234 column 7 value to 1.00 and recalculate its value in column 8.
2. Recalculate percent differences in screening levels to make them relative to the Revision 3 screening levels.

19. Tables 4.4-1 and 4.4-2, pages 87- 90:

1. Make the table titles more descriptive.
2. EPA Primary MCLs for radium-226, strontium-90 and tritium do not exist. Change the wording 'EPA Primary MCL' in the 'Standard Type' column to 'EPA Ra-226+228 Primary MCL' for radium-226, and to 'EPA 4 mrem Primary MCL' for strontium-90 and tritium.

20. Appendix B, Table B-1, page B-3:
Information in the 'Laboratory' row implies that all analytical data from EES6 had been removed from the original data set. However, based on information in Sections 3.1, 3.4 and 3.5, data from EES6 for Barbara and Campsite Springs were included in the data set. Reconcile the discrepancy.

21. Appendix B, Tables B-4 through B-42, pages B-9 to B-608:
Mark (by using italics, gray shading or other means) data that were removed from the data sets during data preparation and outlier screening before performing statistical analyses.

22. Appendix C, page C-1:

The description of figures in the Appendix is incorrect. For example, Figures C-1 to C-64 are described as box plots by location, although they are time-series plots. Other figures are also mischaracterized. Make the appropriate corrections.

23. Appendix E, Tables E-1 and E-2, pages E-3 to E-8:

1. Provide units of measurement for the UTL data.
2. The 'Note' under the tables incorrectly states that UTLs were calculated for constituents with more than 10 detections. Correct the wording to '10 observations'.

The Permittees must submit replacement pages for all portions of the Report affected by the modifications and comments by **November 4, 2011**. In addition to the replacement pages, provide an electronic copy that identifies where all changes have been made in redline-strikeout format. Should you have any questions or comments, please contact Jerzy Kulis at (505) 476-6039.

Sincerely,

John E. Kieling
Acting Chief
Hazardous Waste Bureau

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