



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
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MAY 23 1996

Mr. Benito Garcia, Chief  
Hazardous and Radioactive  
Materials Bureau  
New Mexico Environment Department  
2044A Galisteo Street  
Santa Fe, NM 87505

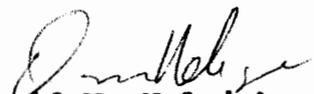
Re: Review of Natural Background Geochemistry and Statistical  
Analysis of Selected Soil Profiles, Sediment and Bandelier  
Tuff, Los Alamos, New Mexico

Dear Mr. Garcia:

The Environmental Protection Agency (EPA) has reviewed and noted the enclosed deficiencies for the document Natural Background Geochemistry and Statistical Analysis of Selected Soil Profiles, Sediment and Bandelier Tuff, Los Alamos, New Mexico. The EPA recommends that Los Alamos National Laboratory (LANL) collect site-specific background data for the three analytes which exceed screening action levels normally in the background soil when these analytes may have been used at that specific site. In addition, as noted in the enclosed General Comments, the upper tolerance limit (UTL) approach used by LANL to calculate natural background concentrations does not appear appropriate, given the data limitations. The EPA recommends LANL use an alternative approach for setting natural background levels for arsenic, beryllium and manganese.

Should you have any questions, please feel free to contact Mr. Michael Morton at (214) 665-8329 or Ms. Barbara Driscoll at (214) 665-7441.

Sincerely,

  
David W. Neleigh, Chief  
New Mexico and Federal  
Facilities Section

Enclosure

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**List of Deficiencies  
Background Document  
Los Alamos National Laboratory**

Following are comments on this document: Natural Background Geochemistry and Statistical Analysis of Selected Soil Profiles, Sediments and Bandelier Tuff, Los Alamos, New Mexico. This report was not reviewed with regards to background concentrations established for radionuclides. Comments are best professional judgement.

**General Comments:**

1. The draft LANL document recommends that additional characterization (sampling) be performed on the A and C horizons. This review concurs with the document's own recommendation. There are several reasons for concurrence. First, the sample size for most analytes in the A and C horizons is small (generally < 25). Also, the A and C horizon Upper Tolerance Limits (UTLs) and the corresponding proposed LANL background soil screening values repeatedly exceed the maximum sampled analyte concentration. These exceedances are found in all three soil horizons, primarily in soil horizons A and C. Additional sampling may be geared towards the three analytes of concern (arsenic, beryllium and manganese)
2. The maximum soil concentrations of numerous analytes listed by horizons A, B, and C do not coincide with the maximum soil concentrations for the same analytes and soil horizons listed in Table 21.
3. A prerequisite of the statistical equation used to calculate LANL UTLs ( $UTL_{0.95,0.95} = \text{mean} + \text{standard deviation} * k_{0.95,0.95}$ ) is that the analyte's data set be normally distributed. The draft report states that the majority of the analytes for which background soil screening values were determined had data that were "approximately" normally distributed either prior to or after transformation. If a data set is not normally distributed (prior to or after transformation), statistical manipulations based on the mean and standard deviation of that data set cannot be appropriately derived.
4. Proposed LANL background soil screening values exceed the screening action levels (SALs), according to the Region III algorithms, for three analytes (arsenic, beryllium and manganese). The proposed background soil screening values for arsenic and beryllium present a carcinogenic risk above the 1E-6 risk level for both residential and industrial exposure scenarios at all three soil horizons. The proposed

arsenic background soil screening value for the B soil horizon (8.12 mg/Kg) represents a residential carcinogenic risk of  $2.2E-5$  and an industrial carcinogenic risk of  $2.5E-6$ . The proposed beryllium background soil screening value for the B soil horizon (1.91 mg/Kg) represents a residential carcinogenic risk of  $1.3E-5$  and an industrial carcinogenic risk of  $1.4E-6$ . The proposed soil screening value for manganese presents a non-carcinogenic hazard quotient of 2.6 for the residential scenario at all three soil horizons.

5. All three of the analytes with proposed background soil screening values in exceedance of SALs (arsenic, beryllium and manganese) show a significant difference in soil sample concentrations within subhorizons. This suggests that the data for these three analytes are variable and that soil concentrations may be site-related (as opposed to natural background).

**Specific Comments:**

1. Page 6. No description or legend is provided with Table 2 to define the various soil horizons listed in the last column of the table.
2. Page 28. The reported maximum soil sample concentrations listed in the "All Data" page of Table 8 do not coincide with the reported maximum soil sample concentrations on Page 53 in Table 21 for the following analytes:

Aluminum	Arsenic	Barium
Beryllium	Cadmium	Calcium
Chromium	Nickel	Potassium -TOTAL
Thorium-TOTAL	Uranium	Uranium-TOTAL

While the maximum reported for calcium (730 mg/Kg) was excluded as an outlier, according to discussions on page 46, many of the other analytes listed above had no outliers which might account for the maximum soil concentration discrepancies observed between Tables 8 and 21.

3. Page 30. This section discusses an analysis of key inorganic elements, major elements and minor elements. What defines an inorganic element as "key", "key major" or "key minor"?
4. Page 41. How is "significant" correlation defined with regards to the correlation reported between major elements and other trace elements. Although the document summarizes the correlations in Table 11, significance is not reported and the correlations are not defined. How does LANL define a significant correlation?

5. Page 51. Item "d" of Step 3 states that the UTLs calculated for normal, lognormal, or square root-transformed distributions were based on a 99th percentile and 95% confidence. Page 23 states that the UTL is determined as the 95% upper confidence limit of the 95th percentile. Which is correct? LANL previously agreed to calculate UTLs at the 95% upper confidence level of the 95th percentile.
6. Page 52. Table 20 summarizes statistical analyses of each analyte's soil sample results. Of the 30 listed analytes in Table 20, 18 analytes are reported as having data which is "approximately" normally distributed or "more" normally distributed than without data transformations. Only four analytes were normally distributed after data transformation (chromium, iron, manganese and sulfate). How does LANL define "approximately normally" distributed data? Has LANL evaluated how this exception to a required assumption for statistical determination of UTLs will compromise the UTL results?
7. Page 55. A summary of the lead soil concentrations and the calculated UTLs are omitted from Table 21.