

General

INTERIM

Statistical Analysis of Background Soil and Bandelier Tuff Data
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LANC/ER / FRAME WORK

ABSTRACT

The statistical analysis was performed to compile technically-defensible data for ER Project decision-making. Background data were analyzed by soil horizon and geological strata, and outliers from these data were eliminated to increase the defensibility of the background data. A weight-of-evidence approach, which considered geochemistry and statistics, was used to eliminate outliers from the soil background data. Fewer outliers were identified in the Bandelier tuff data, and geological information was used to eliminate outliers in the "vapor phase notch" samples. After outliers were removed, statistical distributions were estimated and upper tolerance levels (UTLs) were calculated for normal, lognormal, or square root-transformed normal distributions. The maximum reported value is used in lieu of the UTL where there were fewer than 10 background samples or more than 20% non-detects for an analyte.

RECOMMENDATIONS

A summary of the revised background comparison approach follows (changes to previous approach are *italicized*):

- 1) *Data analysts will use the appropriate subset of the Laboratory-wide data, except where soil horizon is neither known nor relevant (e.g., fill of unknown origin was sampled).*
Background data include:
 - a) *soil data by horizon,*
 - b) *geological data by stratigraphic layer, and*
 - c) *sediment data from Ancho and Indio Canyons.*
- 2) The initial comparison for all analytes will be to background screening values for all inorganics and naturally-occurring radionuclides (by background data subsets as described above). Background screening values are based on the following sources:
 - a) maximum reported value for fallout-related radionuclides from the Laboratory environmental surveillance reports,
 - b) maximum reported value for inorganics with more than 20% non-detects in the background data,
 - c) maximum reported value for inorganics where the background statistical distribution could not be estimated, and
 - d) Upper tolerance levels (UTLs) calculated for normal, lognormal, or square root-transformed normal distributions. The $UTL_{95,95}$ (95th confidence level of the 95th percentile of the distribution) is the statistic used to describe the data.
- 3) Additional background analyses are required for the following cases:
 - a) background screening values are exceeded and screening action levels are exceeded, or
 - b) *Al, As, Be, or Mn* are known (or suspected) to have been released at the PRS.
- 4) Additional analyses include:
 - a) graphical comparisons of background and PRS data,
 - b) statistical "distribution shift" tests,
 - c) *regression analysis of trace elements and major elements (soil and sediment only), or*
 - d) *regression analysis of uranium and thorium (any solid media).*

