

May 9, 2001

Louis Carson
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive
Region IV: DNMS/FSDB
Suite 400
Arlington, TX 76011

SUBJECT: ANALYTICAL RESULTS FOR SOIL SAMPLES FROM KAISER ALUMINUM, TULSA, OKLAHOMA (DOCKET NUMBER 40-2377)[RFTA NO. 01-002]

Dear Mr. Carson:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) received a total of 46 soil samples collected at Kaiser Aluminum and arriving at ORISE on three different dates. The original RFTA requested alpha isotopic analysis for thorium on all soil samples. After reviewing the alpha isotopic data, ten percent of the samples were to be analyzed by gamma spectroscopy. It is ESSAP's practice to analyze all samples, when possible, by gamma spectroscopy. This process identifies gamma contamination that is not suspected of being present. In addition, the gamma spectroscopy data is used to determine the size of the aliquot needed for any alpha isotopic analyses. The gamma spectroscopy data and the alpha isotopic data for 39 of the 46 samples are reported in Tables 1 and 2, respectively. Data for the other seven samples are in Tables 3 and 4. Table 3 contains two sets of gamma spectroscopy data and alpha spectroscopy data for three samples where there was a discrepancy between the original gamma and alpha isotopic results. Table 4 contains two sets of gamma spectroscopy data and alpha spectroscopy data for four randomly selected samples to demonstrate that there was no need to reanalyze the remaining samples by alpha spectroscopy.

A case narrative is included to describe the laboratory work performed on this set of samples.

ESSAP's Quality Control (QC) procedures were followed for these analyses. The daily QC and detector background for the counting instrumentation used in the analyses were within acceptable limits. The QC files are available for your review upon request.

Please contact me at (865) 241-3242 or Wade Ivey at (865) 576-9184 with any questions or comments.

Sincerely,

Dale Condra
Laboratory Manager
Environmental Survey and
Site Assessment Program

RDC/WPI/dkh

cc: R. Clement, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN T8A23
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File 782

W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
W. Ivey, ORISE/ESSAP

CASE NARRATIVE

The original RFTA (01-002) requested that all samples be analyzed by alpha spectroscopy (alpha spec) for natural thorium. After reviewing the alpha spec data, ten percent of the samples were to be analyzed by gamma spectroscopy (gamma spec). Louis Carson was informed that it was standard operating procedure for ESSAP to perform gamma spec counts on all incoming samples, when possible. The two main purposes for performing gamma spec counts are: 1) to determine if any other identifiable photopeaks other than the ones requested are present in the samples, and, 2) to use the gamma spec data to determine the sample size needed for alpha spec to achieve adequate MDC's without contaminating the solid state surface barrier detectors used for alpha spec.

All samples were placed into 0.5 L Marinelli beakers and gamma counted. After the gamma spec data was reviewed, it was determined that a one gram aliquot was appropriate for all the samples for alpha isotopic analysis. Each one gram aliquot was then processed through the chemical separation procedure in preparation for alpha counting.

After the alpha isotopic analyses were completed, the data were compared to the gamma spec data. There were three samples (ESSAP IDs 782S024, 782S041, and 782S044) for which the alpha spec and gamma spec data did not statistically agree. This indicated a possible homogeneity problem for these samples. After inspecting these samples and determining that the percentage of large gravel particles was significantly more than in the other 43 samples, the decision was made to process these three samples through a 0.25 inch sieve. This decision supports the NRC's definition of "soil" as any material passing through a 0.25 inch sieve. This process provided information from which a correlation between the gravel content in the samples and the inconsistent data from the gamma spec and alpha spec analyses could be made. The sieved portion of these three samples was reanalyzed by both gamma spec and alpha spec. A comparison of the data for the non-sieved and sieved portions are presented in Table 3. An "S" at the end of ESSAP's ID indicates the sample was sieved. The data demonstrates that there can be a significant difference in the reported radionuclide concentrations, dependent upon the sample particle sizes used for the gamma spec count.

After the data for the above three samples were reviewed, it was decided that all samples would be processed through a 0.25 inch sieve. All the samples were gamma counted and four samples were randomly selected for additional alpha isotopic analysis to determine if there was a measurable difference. These four samples (ESSAP IDs 782S006, 782S012, 782S025, and 782S035) have two gamma spec data points and two alpha isotopic data points in Table 4. An "S" at the end of ESSAP's ID indicates the sample was sieved. The alpha spec and gamma spec data were compared for these four samples and there was agreement within the statistical deviation of the procedures. After reviewing the data comparisons with Mr. Carson, it was determined that it was not necessary to reanalyze the remaining samples by the alpha isotopic method as the rest of the samples did not have large particles in them.

A general conclusion can be made from evaluating all of the data. All samples should be processed through a 0.25 inch sieve prior to gamma spec. This procedure allows for a more representative sample if alpha spec is to be performed as well. From the data presented, the first three samples (782S024, 782S041, and 782S044) demonstrate this hypothesis well. The first gamma count in which the samples had not been sieved did not agree well with the alpha spec data. However, after sieving the samples, the data from the gamma spec and alpha spec analyses correlate much better. The analytical results for 782S041 indicate that even with sieving there can still be some problems producing a homogeneous sample. Finally, the data also indicate that for samples with more smaller particle sizes present, the better the correlation between gamma spec and alpha spec data.