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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
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CHICAGO, IL 60604-3590

JAN 27 1998

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Mr. Johnny W. Reising
United States Department of Energy
Feed Materials Production Center
P.O. Box 398705
Cincinnati, Ohio 45239-8705

REPLY TO THE ATTENTION OF: SRF-5J

Subject: **Technical Review Comments on "Effect of Environmental Variables Upon In-Situ Gamma Spectrometry Data"**

Dear Mr. Reising:

The United States Environmental Protection Agency (U.S. EPA) has reviewed the above-referenced document as part of its oversight activities for the Fernald Environmental Management Project. The document, dated December 1997, was prepared by Fluor Daniel Fernald for the U.S. Department of Energy as the third addendum to the July 1997 "Comparability of In-Situ Gamma Spectrometry and Laboratory Data." The document assesses the environmental effects on high-purity germanium (HPGe) detector measurements based on repeated HPGe detector measurements at a specific field location.

U.S. EPA's review of the document focused on its technical adequacy as part of an effort to demonstrate the comparability of laboratory and HPGe detector measurements and revealed some issues that require clarification. U.S. EPA's general and specific review comments are enclosed. Please contact me at (312) 886-4591 if you have any questions.

Sincerely,

E Jablonowski

Gene Jablonowski
Remedial Project Manager
Federal Facilities Section
SFD Remedial Response Branch #2

Enclosure

cc: Tom Schneider, OEPA-SWDO
Bill Murphie, U.S. DOE-HDQ
John Bradburne, FERMCO
Terry Hagen, FERMCO
Tom Walsh, FERMCO

ENCLOSURE

TECHNICAL REVIEW COMMENTS ON
"EFFECT OF ENVIRONMENTAL VARIABLES UPON
IN-SITU GAMMA SPECTROMETRY DATA"

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

(Four Pages)

TECHNICAL REVIEW COMMENTS ON "EFFECT OF ENVIRONMENTAL VARIABLES UPON IN-SITU GAMMA SPECTROMETRY DATA"

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Not Applicable (NA) Page #: NA Line #: NA
Original General Comment #: 1
Comment: The report appears to include enough data to define the limitations of the high-purity germanium (HPGe) detector during the warmer months of the year as a result of environmental variables. However, the report should be revised to include data collected during the colder months in order to fully assess the apparent temperature effects on HPGe detector performance.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 2
Comment: The discussion of soil moisture demonstrates that it has a significant impact on HPGe detector measurements. Therefore, the wet-weight data should be omitted from the discussions of other environmental variables.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 3
Comment: The report provides an adequate exploratory statistical evaluation based on spreadsheet functions. However, no hypothesis testing is discussed. Various hypotheses are raised, but evidently they have not been tested. Such testing will require some spreadsheet programming or use of a statistical program. Original Specific Comments 1 through 3 and 5 through 7 cite report locations where the results of such statistical testing should have been presented. This report need not be resubmitted with these test results included, but the final comparability report should discuss the statistical testing and its results in detail.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 4
Comment: Overall, a correlation appears to exist between in situ HPGe detector measurements and laboratory data obtained for the field quality control station (FCS) from April 8 through October 14, 1997, for most isotopes. However, in some cases

the text provides corrections to data that raise concerns and that should be further explained. In particular, corrections to soil moisture data and HPGe detector measurements of radium-226 should be clarified.

According to the text, some of the soil moisture data was modified when inconsistencies existed among soil moisture measurements made on the same day, immediately preceding days, or immediately following days or when soil moisture measurements were not made. Although the methodology for calculating revised soil moisture may be appropriate, it is not clear whether the revised values are valid. According to Appendix A, roughly 13 percent of the soil moisture data was revised to reflect consistent information. However, except for one data point that is based on no soil moisture measurement being made on May 8, 1997, no explanations for anomalous soil moisture values are provided. It is possible that the soil moisture measurement equipment was faulty, that the equipment operator was not adequately trained, that the anomalous soil moistures truly existed, or that some combination of these explanations applies. Further discussion of the discrepancies among anomalous soil measurement values should be provided.

The correction of HPGe detector measurements for radium-226 was originally presented in an addendum entitled "Comparability of In-Situ Gamma Spectrometry and Laboratory Measurements of Radium-226." However, critical concerns and comments arising from review of the radium-226 addendum have not been addressed. Considering that some of the comments involved development and application of the radium-226 correction algorithm, its use in the environmental variables report is questionable.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 5
Comment: The text states that weather conditions at the Fernald Environmental Management Project often result in "bad radon days." HPGe detector measurements of radium-226 on "bad radon days" provide potentially useful information. If only the "bad radon days" are considered, the concentration averages of radium-226 measurements are still less than the weighted average laboratory values of 1.2 picocuries per gram (pCi/g) for wet weight and 1.6 pCi/g for dry weight. According to Appendixes B and C of the report, if all HPGe detector measurements of radium-226 above the upper control limits for wet weight (1.07 pCi/g) and dry weight (1.26 pCi/g) are considered, the average concentrations are similar to those measured in the laboratory. These average concentrations were calculated to be 1.37 pCi/g wet weight

and 1.58 pCi/g dry weight. Based on the closeness of these averages to average laboratory values, percent relative deviations can be calculated as -13.23 percent (for wet-weight data) and 1.26 percent (for dry-weight data). Considering this information, "bad radon days" may provide useful data for the development of control charts for determining radium-226 concentrations. Use of "bad radon days" data to develop control charts should be further evaluated.

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: 5 Line #: 19
Original Specific Comment #: 1
Comment: The text refers to the low correlation coefficients in Figures 2B and 2D as evidence of a minimal or negligible trend in the dry-weight concentration versus soil moisture curves. This hypothesis should be statistically tested. The simplest way to do so would be to determine whether the slope of the curve is significantly different from zero.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: 13 Line #: 31
Original Specific Comment #: 2
Comment: The text states that ambient temperature is shown in Figures 3C and 3E to have an insignificant effect on HPGe detector results. The slopes of the temperature versus concentration curves should be statistically tested to confirm this hypothesis. If temperature affects detector results, an appropriate correction will need to be included in calculations in order to make the detector results comparable to laboratory results. If, however, the slopes cannot be distinguished from zero, no such correction will be needed.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: 18 Line #: 12
Original Specific Comment #: 3
Comment: The text states that the slopes near zero and the low correlation coefficients of the curves in Figures 4C and 4E demonstrate that humidity has no effect on HPGe detector measurements. This hypothesis should be statistically tested as noted in Original Specific Comment 1.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Figure 5B Page #: 27 Line #: NA
Original Specific Comment #: 4
Comment: In this figure, the HPGe detector measurement from the afternoon of April 23, 1997, is the only one outside the

control limits. During a November 1997 meeting, the U.S. Department of Energy indicated that the HPGe detector's battery was near failure at the time of this measurement. This observation should be discussed in the text and should be used as the basis for a procedure to check the battery as part of routine operation of the detector. Outliers resulting from such identifiable problems should be deleted from the data sets used to create control charts for routine use.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: 32 Line #: 20
Original Specific Comment #: 5
Comment: The text states that the means and standard deviations of the morning and afternoon HPGe detector measurements of radium-226 are different. This hypothesis should be statistically tested. Assuming that the two subsets differ, then the subset (morning or afternoon) that better represents "true" conditions as determined by standard laboratory tests should be used to recalculate HPGe detector results, including the associated control charts.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: 40 Line #: 20
Original Specific Comment #: 6
Comment: The text states that the five HPGe detectors used to collect measurements at the FCS generated essentially identical results. This hypothesis should be statistically tested by performing an analysis of variance and a multiple comparisons procedure.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: 43 Line #: 4
Original Specific Comment #: 7
Comment: The text states that "very good agreement" exists between HPGe detector and laboratory results. This hypothesis should be statistically tested.