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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
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L-01214

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REPLY TO THE ATTENTION OF: SRF-5J

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

Subject: Technical Review Comments on "User Guidelines, Measurement Strategies, and Operational Factors for Development of In-Situ Gamma Spectrometry at the Fernald Site"

Dear Mr. Reising:

The United States Environmental Protection Agency (U.S. EPA) has performed an expedited informal review of the above-referenced document as part of its oversight activities for the Fernald Environmental Management Project (FEMP). The document, dated February 1998, was prepared by Fluor Daniel Fernald for the U.S. Department of Energy and provided to U.S. EPA for informal review in preparation for the March 25, 1998 Real-Time Workgroup meeting. The document provides information, guidelines, and requirements for conducting in situ gamma spectrometry at the FEMP.

U.S. EPA's review of the document focused on assessing its technical adequacy and completeness. U.S. EPA found numerous deficiencies in the document. In particular, the document discusses use of the high-purity germanium system as the primary analytical instrument for certification of primary radionuclides as meeting final remediation levels, a procedure that has not been reviewed or approved by the regulatory agencies. U.S. EPA's general and specific review comments are enclosed. U.S. EPA's comments are provided for informational purposes and do not constitute a complete review of the document. Recent meetings between U.S. DOE and the regulatory agencies suggest that these comments will be addressed in the next version of this document.

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

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ENCLOSURE

TECHNICAL REVIEW COMMENTS ON
"USER GUIDELINES, MEASUREMENT STRATEGIES, AND
OPERATIONAL FACTORS FOR DEVELOPMENT OF IN SITU
GAMMA SPECTROMETRY AT THE FERNALD SITE"

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

(Seven Pages)

TECHNICAL REVIEW COMMENTS ON
"USER GUIDELINES, MEASUREMENT STRATEGIES, AND OPERATIONAL FACTORS FOR DEVELOPMENT OF IN SITU GAMMA SPECTROMETRY AT THE FERNALD SITE"

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: Not Applicable (NA) Page #: NA Line #: NA
Original General Comment #: 1
Comment: The term "aggregation" is used at various points in the document in connection with reduction of radiation tracking system (RTRAK) data, but the meaning of the term is not clear. As used in the document, the term could include rolling averages, averages of nonoverlapping data subsets, and more complicated manipulations such as kriging. The text should be revised to explain the physical and mathematical aspects of the term as it relates to reduction of RTRAK data.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 2
Comment: The text includes many cross-references. However, in some portions of the document, such as the Definitions section (Pages ix through xii) and Bullet 2 of Section 2.1.1, the number of the section being cited is not included. The text should be revised to include the number of the section being cited in each cross-reference.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 3
Comment: Some parts of the document, such as Table 2.1-2 and Page 3.2-1, use the term "gross" activity, while others, including the title of Section 4.8, use the term "total" activity. One of these terms should be consistently used throughout the document.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 4
Comment: The text in Section 2.5 and elsewhere discusses future use of the high-purity germanium (HPGe) system for certification of primary radionuclides as meeting final remediation levels (FRL). Such discussion is premature, as regulatory approval of the use of the system for this purpose has not occurred. These discussions should be deleted.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 5
Comment: With regard to reporting RTRAK measurements, the text discusses overlapping surveys and interpretation of RTRAK data through "aggregation." However, little discussion is provided with regard

to interpretation of HPGe system measurements. The text implies that the HPGe system will be used in an overlapping manner in some cases. The text should be revised to explain how overlapping HPGe system measurements will be interpreted.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 6
Comment: The text discusses delineating hot spots using both the RTRAK and the HPGe system. However, neither system may be able to detect small hot spots that exceed 30 times the FRL. Although detecting and delineating extremely small hot spots (less than 1 inch in size) may be unrealistic, slightly larger ones present a concern. The text should be revised to include information on delineation of hot spots as a function of their size. It would be useful if this information were presented in graphic form; one axis could represent hot spot activity in picocuries per gram, while the other axis could represent hot spot size in meters.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 7
Comment: The text addresses interpretation of in situ measurements that may be influenced by factors such as shine and contamination at depth. Both of these factors will result in a larger percentage of high-energy photons being detected than lower-energy photons. For this reason, interpretations of in situ measurements influenced by shine or contamination at depth may be inaccurate. In the event that these interpretations are inaccurate, unnecessary excavation might be performed, or actual contamination at depth might be missed. The text should be revised to provide a more comprehensive method for distinguishing between shine and contamination at depth in terms of their effects on in situ measurements.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 8
Comment: Before development of the document, all documentation pertaining to HPGe system use and data focused on detector heights of 1 foot and 1 meter. The document introduces a third detector height of 6 inches that may aid in delineating hot spots, soils exceeding waste acceptance criteria (WAC), and the horizontal extent of contamination. However, the circumstances under which the individual detector heights will be used are unclear. Also, it is not clear whether the methodology for determining measurement height is consistent for all units. The document should be revised to clarify these matters.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 9
Comment: Measurement and quantification of radium-226 using in situ methods have not yet been fully addressed. Based on previous documentation, many issues involving HPGe system measurement of

radium-226 have been raised that have not been adequately addressed. Furthermore, no information is provided with regard to correcting RTRAK data in order to accurately define radium-226 concentrations in soil. The document should be revised to include further information regarding HPGe system measurement of radium-226 as well as additional guidance for RTRAK measurement of radium-226 and RTRAK data correction.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: NA Page #: NA Line #: NA
Original General Comment #: 10
Comment: The document addresses only the RTRAK and HPGe system. However, based on discussions with Fernald Environmental Management Project personnel and review of previous documentation, it appears that the radiological scanning system (RSS) will also be used for conducting in situ measurements. The RTRAK will be used in most cases, but where the terrain is too rough for RTRAK measurements, the RSS will probably be used. Therefore, the document should be revised to include guidance for use of the RSS and interpretation of RSS data.

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 2.5.1 Page #: 2.5-2 Line #: 10
Original Specific Comment #: 1
Comment: The text states that data validation will be performed for at least 10 percent of the data for certification purposes. However, it is not clear what protocol has been developed for validating in situ data. The text further discusses evaluation of low- and high-energy photons to identify shine and contamination at depth. However, it is not clear whether this evaluation is intended to be part of the validation process. The text should be revised to provide further discussion of in situ data validation or to cite separately issued validation procedures.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 3.3 Page #: 3.3-1 Line #: 35
Original Specific Comment #: 2
Comment: The last sentence on Page 3.3-1 is confusing. The phrase "and is based upon the FRL for uranium-238" on Line 35 should be deleted.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 3.5.1 Page #: 3.5-1 Line #: 16 to 18
Original Specific Comment #: 3
Comment: The logic of the guidance bullet is unclear. The bullet should be reworded or deleted.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 3.7.1 Page #: 3.7-1 Line #: 35
Original Specific Comment #: 4
Comment: Line 35 refers to a 1-meter height. This height is irrelevant to the guidance bullet in which the line appears. The line should be revised to refer to a height of either 1 foot or 31 centimeters.

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Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: Table 4.1-1 Page #: 4.1-1 Line #: NA
Original Specific Comment #: 5
Comment: As discussed in the associated text, Table 4.1-1 is based on the average energy of all photons. However, it is not clear what impact the low-energy photons would have on the overall field of view. As discussed in the Real-Time Workgroup meeting on March 25, 1998, fields of view that reflect both the low- and high-energy photons involved should be included in the table.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 4.3 Page #: 4.3-1 Line #: 13
Original Specific Comment #: 6
Comment: As part of the U.S. Environmental Protection Agency technical review, Equation 1 was run using a speed of 0.5 mile per hour with an 8-second data acquisition time and 0.4 meter of overlap. A value of about 36,300 square meters (m^2) resulted, but Table 4.3-4 displays a value of about 18,300 m^2 that was presumably derived using the same parameters. This discrepancy should be further evaluated.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 4.5.2 Page #: 4.5-2 Line #: NA
Original Specific Comment #: 7
Comment: The HPGe system trigger levels are based in part on standard deviations from field quality control measurements. Although these standard deviations could be analogous to total system uncertainty, it is not clear whether standard deviations for RTRAK measurements are analogous to total system uncertainty for RTRAK trigger levels. Knowledge of the total propagated uncertainty is important for determining the overall precision of a given measurement. Additional evaluation should be conducted to determine the total system uncertainty for RTRAK measurements.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Table #: 4.5-2 Page #: 4.5-6 Line #: NA
Original Specific Comment #: 8
Comment: The limit provided for WAC application should be changed to 1,030 parts per million.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 4.6 Page #: 4.6-1 Line #: 26
Original Specific Comment #: 9
Comment: Section 4.6 and other parts of the document address use of handheld detectors for identifying anomalous areas. However, use of these detectors to identify areas that require further delineation using in situ methods is questionable. Typically, handheld detectors are used for health and safety purposes in the field. If these detectors are to be used to identify potential hot spots for RTRAK or HPGe system delineation, further discussion and guidance regarding use of handheld detectors should be provided in the document.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 4.8.1 Page #: 4.8-2 Line #: NA

Original Specific Comment #: 10
Comment: The guidance for assessing gross counts should be further evaluated. Because uranium appears to be the most difficult isotope to measure with regard to gross counts, minimum total activities should be established for uranium alone. For example, the text states that a value of 3,000 counts per second or less suggests that total uranium, thorium-232, and radium-226 do not exceed their FRLs. However, it is not clear what influence thorium-232 and radium-226 activities have on this value. If gross counts are to be used, a value that depends on uranium activity alone with contribution from thorium-232 and radium-226 activities limited to background levels should be developed. The text should be revised to address this issue.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 4.12.1 Page #: 4.12-1 Line #: 26
Original Specific Comment #: 11
Comment: It is not clear what percentage of the in situ data will be reviewed for comparison of low- and high-energy gamma lines. Furthermore, it is not clear at what point this data will be reviewed. Ideally, a flag should be included in the computer models used to determine soil activity; if the low- and high-energy gamma lines differed by more than 20 percent, the models would instantaneously provide an indication of a potential problem. The review of in situ data for comparison of low- and high-energy gamma lines should be further evaluated, and the text should be revised to clarify the data review and comparison process.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 4.15.1 Page #: 4.15-2 Line #: 1
Original Specific Comment #: 12
Comment: The text mentions two types of grid node spacings to be used in delineating hot spots and determining FRL attainment. However, it is not clear whether different grid node spacings will be calculated for each RTRAK run. Use of grid node spacings should be more clearly explained in the document.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 4.15.2 Page #: 4.15-2 Line #: 22
Original Specific Comment #: 13
Comment: The reason for preparing probability maps is unclear and should be further explained. Also, use of probability mapping should be reconsidered because it will probably raise unnecessary concerns among the regulatory agencies, the public, or both.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Table #: 4.15-1 and 4.15-2 Page #: 4.15-6 Line #: NA
Original Specific Comment #: 14
Comment: The tables present color schemes for mapping RTRAK results. However, all the data points are shown as circles, so the color schemes will not be sufficient for differentiating among data points in black and white reproductions. The tables should be revised to present a series of distinctive shapes for the different levels of activity.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Table #: 5.1-1 Page #: 5.1-2 Line #: NA
Original Specific Comment #: 15
Comment: The table provides minimum detectable concentrations (MDC) for 15-minute counts using the HPGe system. The associated text discusses HPGe system measurements that may last less than 15 minutes. These shorter count times should be used for WAC attainment determinations only. If the shorter count times are proposed for anything but WAC attainment determinations, the associated MDCs should be provided.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 5.3.1.1 Page #: 5.3-2 Line #: 17
Original Specific Comment #: 16
Comment: The equation for correction of radon readings should include the applicable units of measurement.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 5.3.2 Page #: 5.3-3 Line #: NA
Original Specific Comment #: 17
Comment: Section 5.3.2, which discusses "bad radon mornings," should be revised to include some additional information on the reliability of the radium-226 readings. Because morning radium-226 results are subjected to two empirical correction factors rather than the one correction factor used for afternoon readings, the morning readings are inherently less precise and should not be used for measurements of critical areas (that is, areas with concentrations near regulatory limits). The precision of these radium readings depends on many factors, including the correlation coefficient of the second (diurnal) correction. Section 5.3.2 should also be revised to include guidelines for deciding when the uncertainty associated with morning radium-226 readings is too great for such readings to be worthwhile.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 5.4 Page #: 5.4-1 Line #: 25
Original Specific Comment #: 18
Comment: With regard to shine and contamination at depth, the in situ models may underestimate actual radiological doses. The in situ methods rely on an interpretation of an uncollided photon flux that in turn is used to determine soil concentrations. However, doses from external exposures are a combination of collided and uncollided photons. The models used with the in situ systems apparently take an average collided photon flux into account. However, for contaminants at depth or for contribution from areas outside the influence of the field of view, the in situ methods may register doses that are biased low. Section 5.4 should be expanded to discuss total dose as a function of both uncollided and total photon flux from the isotopes of concern.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 5.5 Page #: 5.5-1 Line #: 16
Original Specific Comment #: 19
Comment: On the subject of heterogeneity, the text suggests statistical testing to determine the number of samples or measurements needed

to reach a pass or fail decision for a certification unit. Although the *t* statistic is mentioned in the text as a tool for performing this testing, it is not clear how the test results will be used to determine the number of samples or measurements needed. The text should be revised to clarify this matter.

Commenting Organization: U.S. EPA Commentor: Jablonowski
Section #: 5.5 Page #: 5.5-1 Line #: 31
Original Specific Comment #: 20
Comment: The text discusses the weighing factors inherent in the HPGe system results, namely that higher activity contributions at depth or at the periphery of the field of view could result in underestimation of these problem areas. This aspect of the heterogeneity issue is to be resolved through a measurement strategy whereby the HPGe system would be used in an overlapping fashion. However, specific guidance for conducting overlapping HPGe system measurements and for interpreting the results is not provided in the document. The text should be revised to provide such guidance.