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Department of Energy

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JUN 0 5 1998

Mr. James A. Saric, Remedial Project Manager
U.S. Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Dear Mr. Saric:

RESPONSES TO THE U.S. ENVIRONMENTAL PROTECTION AGENCY TECHNICAL REVIEW COMMENTS ON THE USER GUIDELINES, MEASUREMENT STRATEGIES, AND OPERATIONAL FACTORS FOR DEPLOYMENT OF IN-SITU GAMMA SPECTROMETRY AT THE FERNALD SITE

The purpose of this letter is to transmit, for your review and approval, responses to U.S. Environmental Protection Agency (U.S.EPA) comments on the above referenced document. The U.S.EPA comments seem to represent four major issues. These major issues include the following: (1) determining the detectability of very small hot spots by the Radiation Tracking System (RTRAK) and the High Purity Germanium system (HPGe); (2) determining the effects of shine on in-situ measurements; (3) correcting radium-226 data; and, (4) incorporating the use of the Radiation Scanning System (RSS) into the User's Manual. The discussion below and the enclosed comment responses outline the Department of Energy's (DOE) proposed approach for completing the next round of improvements to the User's Manual.

As indicated within the comment response document, DOE proposes two revisions (July 31, 1998, and September 30, 1998) to the User's Manual based on U.S. EPA comments. For the first revision (July 31, 1998), the revisions are partly a matter of implementing the changes proposed in the draft, redline version of the document previously transmitted to U.S. EPA on April 14, 1998, and adding minor, clarifying text changes. In a few instances, major revisions of a few sections are necessary. For some of the more major issues (Items 1, 3, and 4 above), DOE proposes to resolve and incorporate the necessary changes into the next revision of the User's Manual scheduled for July 31, 1998 (recognizing that the receipt and resolution of Ohio Environmental Protection Agency (OEPA) comments may affect the planned schedule). Further, the DOE is proposing that

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the remaining issue (Item 2) be resolved through the planned additional studies outlined in the responses and the results from these studies incorporated into a later revision and/or amendment to the User's Manual, planned for September 30, 1998.

Clearly, the refinement of the User's Manual is an ongoing process which will not be completed prior to the start of excavation activities in Area 2, Phase I (A2PI). Improvements to the real-time systems must be recognized as an ongoing activity throughout the remediation process. The issues of radium-226 corrections, hot spot detectability and interference effects known as radiological shine should not affect the efforts of applying the real-time gamma spectrometry equipment to guide the excavation control activities in A2PI. Incorporation of the RSS unit into the User's Manual would be advantageous, but not necessarily a requirement for initiation of excavation in A2PI. Similarly, the development of a data review and reporting procedure will clearly be a program quality assurance improvement. However, the implementation of such an improvement should best be phased into the real-time field implementation process. Starting the excavation in A2PI will only help to expedite this and other real-time improvements. Therefore, DOE requests your conditional approval of the User's Manual to support the start of excavation in A2PI. DOE will be working closely with the U.S. EPA and OEPA toward the goal of continuous improvement of the real-time instruments.

If you have any questions regarding this matter, please contact Robert Janke at (513) 648-3124.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

Enclosure: As Stated

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cc w/enc:

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RESPONSES TO U.S. EPA TECHNICAL REVIEW COMMENTS ON "USER GUIDELINES, MEASUREMENT STRATEGIES, AND OPERATIONAL FACTORS FOR DEPLOYMENT OF *IN-SITU* GAMMA SPECTROMETRY AT THE FERNALD SITE"

GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 1
(Original General Comment 6 in U.S. EPA's April 13, 1998, Letter)

Comment: The text discusses delineating hot spots using both the radiation tracking system (RTRAK) and the high-purity germanium (HPGe) system. However, neither system may be able to detect small hot spots that exceed 30 times the final remediation level (FRL). Although detecting and delineating extremely small hot spots (less than 1 inch in size) may be unrealistic, slightly higher 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, and the other axis could represent hot spot size in meters.

Response: DOE agrees that the User's Manual should include information on delineation of hot spots as a function of their size. Accordingly, this information will be presented in graphical format (see Figures 1 and 2) in a later revision of the User's Manual. Figure 1 shows the concentration (x FRL) of hot spots plotted as a function of hot spot area for the RTRAK. The line represents the estimated hot spot concentration necessary for RTRAK to measure a concentration of at least 3 times the FRL for a given size hot spot. Two points are particularly salient. First, RTRAK can easily measure concentrations of hot spots at 3 times the FRL having areas less than 10 square meters, in accordance with the SEP. Second, 30 times the FRL corresponds to an approximate hot spot detectability area of 0.4 square meters.

Figure 2 shows hot spot detectability information analogous to that in Figure 1, only for HPGe at a 31 cm detector height. Because HPGe with a 31 cm detector height is used to confirm and delineate hot spots detected by RTRAK, it is important that the HPGe be able to resolve smaller hot spots. Thus, for example, as shown in Figure 2, HPGe can detect a hot spot 30 times the FRL having an area of approximately 0.04 square meters. Figure 1 assumes that the hot spot could be randomly distributed anywhere within the RTRAK field of view; this is a worst-case scenario. Conversely, Figure 2 optimizes the detectability of hot spots by HPGe by assuming the hot spot is centered directly below the detector, as would happen in the confirmation and delineation of data objectives.

Incorporating Figures 1 and 2 as well as supporting explanatory text in a future revision of the User's Manual (as opposed to immediately incorporating the figures) will have no impact on upcoming Area 2 Phase I operations as hot spot detection and delineation is not a data quality objective. Section 4.6 of the User's Manual already addresses WAC exceedance detection of small hot spots.

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Action: Incorporate information into the User's Manual by July 31, showing graphically the relationship between hot spot concentration and hot spot detection size for HPGe and RTRAK.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 2
(Original General Comment 7 in U.S. EPA's April 13, 1998, Letter)

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.

Response: DOE agrees that a more comprehensive method of distinguishing between shine and contamination at depth is necessary. At this time, however, data upon which to base such a comprehensive differentiation is lacking. Accordingly, DOE proposes to carry out another in its series of *in-situ* gamma spectrometry mini-studies to acquire such data. The study will occur in the production area, where known sources of shine occur, and the results will be incorporated into a future revision of Section 4.12 ("Shine") of the User's Manual. This study will take place in July or August, so that shine can be definitively recognized by the time *in-situ* gamma spectrometry measurements for Area 3 pre-design investigations take place in Fall 1998. The schedule for this study is not expected to impact Area 2 Phase I operations, because buildings, silos, drums, etc. do not exist to contribute shine in Area 2 Phase I.

Action: Perform a study to recognize and compensate for the effects of shine. The results are to be incorporated into a revision of Section 4.12 in the User's Manual by September 30, 1998.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 3
(Original General Comment 9 in U.S. EPA's April 13, 1998, Letter)

Comment: Measurement and quantification of radium-226 using *in situ* methods have not been fully addressed in the document. 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.

Response: The issues regarding quantification of radium-226 data with HPGe have primarily dealt with ASL D data. DOE believes, for the reasons presented below, that current radium-226 measurements and quantification methodologies delineated in Sections 5.3-1 and

5.3-2 of the User's Manual are adequate for ASL B data. The QC criteria for ASL B data are given in Attachment A of QC Procedure ADM-16, which is a part of the *In-Situ* Gamma Spectrometry addendum to the SCQ. As stated in the July 1997 Comparability Study, page 5-13, radium-226 measurements meet all QC data quality criteria except accuracy. Subsequent to that report, correction factors were developed to compensate for radon-222 disequilibrium in soils. A rigorous test of those correction factors was contained in the third addendum to the July 1997 Comparability Study entitled "Effect of Environmental Variables Upon *In-Situ* Gamma Spectrometry Data."

As shown in Table 5-B of the third addendum, when correction factors were applied to six months' worth of afternoon data from the field quality control station, the average radium-226 concentration (1.55 pCi/g) was almost in perfect agreement with the laboratory measured value of 1.60 pCi/g, based upon the weighted mean of 10 soil samples. Just as important is the fact that such good agreement occurred at concentration levels close to the value of the FRL (1.7 pCi/g) of radium-226. Such good agreement demonstrates the validity of the correction factors for radium-226 concentrations in the vicinity of the FRL and also indicates that the HPGe accuracy for radium-226 meets ASL B data quality criteria.

DOE agrees with the comment concerning the necessity for including in the User's Manual guidance for radium-226 correction of RTRAK data.

Action: When the new section of the User's Manual addressing RSS is added on July 31, 1998 (see response to General Comment #4), Section 5.3 of the User's Manual will be revised to address guidance for radium-226 corrections to both RTRAK and RSS data.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 4
(Original General Comment 10 in U.S. EPA's April 13, 1998, Letter)

Comment: The document addresses only the RTRAK and the 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. At a minimum, a new section should be added that outlines the general plans for RSS use and that, if possible, identifies a date when more detailed information on RSS use will be added to the document.

Response: DOE agrees with the comment. Currently, calibration equations for the RSS are being finalized, and verification of the accuracy of the equations is being initiated. When the calibration equations have been verified, a new section will be added to the User's Manual that includes guidance for the usage of the RSS, guidance for data acquisition, strengths and limitations, and guidance for data interpretation. This new section of the User's Manual will be added by July 31, 1998.

Action: Add a new section to the User's Manual addressing the use of RSS by July 31, 1998.

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.1 Page #: 2.1-1 Line #: 21
Original Specific Comment #: 1
Comment: Remove reference that HPGe data may have an associated data quality level of D; this has not yet been determined at Fernald.

Response: The reference to ASL D data quality level will be removed.

Action: The reference to ASL data quality level D will be removed.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.1 Page #: 2.1-2 Line #: 1
Original Specific Comment #: 2
Comment: Delete "certification/verification" and replace with "support" instead.

Response: The words "certification/verification" will be replaced with the word "support."

Action: The words "certification/verification" will be replaced with the word "support."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.1.1 Page #: 2.1-2 Line #: 23 and 24
Original Specific Comment #: 3
Comment: The text discusses the possibility of using the HPGe system for measurement of thorium-230. However, this isotope has not been previously considered with respect to *in situ* gamma spectrometry. Based on the low-energy gamma emissions associated with this isotope, it is questionable whether *in situ* gamma spectrometry could reliably detect thorium-230 concentrations in soil. The text should be revised to address this issue.

Response: Although comparability measurements have not been carried out at the FEMP, thorium-230 should be capable of being directly measured in soil with the HPGe system at a MDC of about 30 pCi/g. This value can be inferred by calculational analogy. At concentrations above background, the 63 keV line from thorium-234 (uranium-238 decay chain) is measurable. This line is used routinely to determine uranium concentrations. For a 15 minute count, the MDC is on the order of 3 pCi/g in typical background environments. The gamma emission intensity is 3.8% for this line (ICRP Report 38). For thorium-230, there is a gamma emission at 68 keV at an intensity of 0.375% (one tenth that of the thorium-234), resulting in a MDC of about 30 pCi/g. This compares quite favorably with the FEMP FRL of 280 pCi/g for this nuclide.

With an HPGe detector, the 68 keV thorium-230 line should be easily resolvable. It must be pointed out, however, that analysis using a low energy gamma such as this means that it is only the first cm or two of soil that is being measured. Despite this limitation in viewing depth, direct measurements in the field would be a valuable technique to employ.

In summary, although quantitative comparability studies have not been performed for the detection of thorium-230 by HPGe, HPGe spectra will still be examined for the

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presence of the 68 keV gamma photon. Hits would only be expected in very highly contaminated thorium areas, and the results would be considered as qualitative (monitoring). The guidance bullet will be revised to address these issues.

Action: The portion of the guidance bullet in Section 2.1.1 addressing thorium-230 detection will be revised to read: "For soils in which thorium-230 concentrations exceeding 30 pCi/g are possible, HPGe measurements may be used to qualitatively detect thorium-230. Consult with the *in-situ* gamma spectrometry group in this regard."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.3.2 Page #: 3.3-2 Line #: 31
Original Specific Comment #: 4
Comment: The text discusses use of three HPGe detector heights (15 centimeters, 31 centimeters, and 1 meter) for hot spot confirmation. However, the circumstances under which each detector height would be used for hot spot confirmation is unclear. The text should be revised to provide clear guidance on detector height selection for hot spot delineation.

Response: Only two detector heights (31 cm and 1.0 m) will be used for hot spot confirmation, not three detector heights. The 15 cm detector height in line 26 of Section 3.3.2 is in error and will be changed to 31 cm detector height. This should alleviate confusion concerning detector heights for hot spot confirmation.

Action: Line 26 in Section 3.3.2 will be changed to indicate that detector heights of 31 cm and 1 m will be used for hot spot confirmation.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.5 Page #: 2.5-1 Line #: NA
Original Specific Comment #: 5
Comment: Delete entire section and any references to it that exist in the document.

Response: DOE has already agreed to delete the text in Section 2.5 as indicated by the red-line notations. However, the section and title will be retained along with the phrase "to be added at a later date when regulatory approval for use of HPGe for certification is granted." References to this section will be deleted from other sections in the meantime.

Action: Delete references to Section 2.5 in other sections of the manual.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.1 Page #: 3.1-1 Line #: 3
Original Specific Comment #: 6
Comment: Delete "certification" and replace with "pre-certification" instead.

Response: The word "certification" will be replaced with "pre-certification."

Action: The word "certification" will be replaced with "pre-certification."

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.1 Page #: 3.1-1 Line #: 16
Original Specific Comment #: 7
Comment: Delete sentence "For certification, it will be specified in the Certification Design Letter."

Response: The sentence "For certification, it will be specified in the Certification Design Letter" will be deleted.

Action: The sentence "For certification, it will be specified in the Certification Design Letter" will be deleted.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.7 Page #: 3.7-1 Line #: NA
Original Specific Comment #: 8
Comment: Delete entire section and any reference to it that exists in the document.

Response: DOE has already agreed to delete the text in Section 3.7 as indicated by the red-line notations. However, the section number and section title will be retained along with the phrase "to be added at a later date when regulatory approval for use of HPGe for certification is granted." References to this section will be deleted from other sections in the meantime.

Action: Delete references to Section 3.7 in other sections of the manual.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.1 Page #: 4.1-1 Line #: NA
Original Specific Comment #: 9
Comment: Original Specific Comment 5 in U.S. EPA's April 13, 1998, letter requests that Table 4.1.1 include fields of view that reflect both the low- and high-energy photons involved. Although the text in Section 4.1 has been revised and Figure 4.1-1 has been added to include fluence from low- and high-energy photons, it is not clear what type of fluence is included. The text should specify whether Figure 4.1-1 includes total (collided and uncollided) flux or uncollided flux only. Because the HPGe system interprets uncollided flux only, this figure should at least include uncollided flux.

Response: Figure 4.1-1 represents the cumulative uncollided photon fluence. The text will be revised accordingly.

Action: The text of Section 4.1 will be revised to indicate that the cumulative photon fluence in Figure 4.1-1 is uncollided photon fluence.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.3 Page #: 4.3-1 Line #: 13
Original Specific Comment #: 10
Comment: Original Specific Comment 6 in U.S. EPA's April 13, 1998, letter requests that the discrepancy between the following values be evaluated: (1) the value of about 36,300 square meters (m^2) that the reviewer obtained from equation 1 using a speed of 0.5 mile per hour with an 8-second data acquisition time and 0.4 meter of overlap and (2) the value of about 18,300 m^2 presented in the text. It appears that the equation and some

of the values in Tables 4.3-1 through 4.3-4 have been revised. However, the reviewer's application of the revised equation using the input data still results in values different from those in the tables. The document should be revised to address this issue.

Response: Table 4.3-4 was originally constructed with a 4.0 second data acquisition time instead of with an 8.0 second data acquisition time. When the table heading was changed to 8.0 seconds as a result of various internal review comments, the values in the table were not recalculated to reflect the new data acquisition time. Accordingly, new values have been recalculated for Table 4.3-4, as shown in the attached table. The total field of view for 100 measurements per pass and 100 passes equals 36,271 m^2. This is what the reviewer calculated as noted in the comment above.

Action: Replace the calculated values in Table 4.3-4 in the User's Manual with those in the attached table, and make appropriate corrections to the text of Section 4.3 and column 5 of Table 4.3-5. These corrections and revisions will be incorporated into the next revision of the User's Manual, planned for July 31, 1998.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.5.3 Page #: 4.5-4 Line #: NA
Original Specific Comment #: 11

Comment: The discussion in the first guidance bullet appears to contradict the text in Section 3.4.1. According to the first guidance bullet, at a 1-meter detector height, the HPGe system will be able to detect 1,500 parts per million (ppm) of uranium if the waste acceptance criteria (WAC) exceedance area is larger than 74.5 m^2 (66 percent of the detector field of view). However, Section 3.4.1 states that WAC exceedance areas greater than 7.1 m2 can be detected at a 1-meter detector height if the uranium concentration is greater than 400 ppm. This apparent inconsistency should be explained or resolved.

Response: There is no inconsistency in the two statements; both reflect the trade-off between concentration of a WAC exceedance area and the size of the area which can be detected. However, the two statements are phrased differently. The first statement actually says that a WAC exceedance with a diameter of 4 meters (66% of the radius of the field of view) and a concentration of 1500 pm total uranium will result in an HPGe measurement of 1030 ppm (the trigger level for 1030 ppm is 947 ppm per Table 4.5-1) for total uranium. The second statement says that a WAC exceedance having a radius of 1.5 m and a concentration of 1030 ppm total uranium will result in a HPGe measurement of 400 ppm total uranium. Thus, if one is searching for WAC exceedances with a minimum radius of 1.5 meters (7.1 m^2), an action level of 400 ppm at a 1.0 m detector height is required to detect such a WAC exceedance (Table 4.6-1). However, if one is searching for WAC exceedances on the order of the field of view, then an action level of 947 ppm is required (Table 4.5-1). This action level will ensure detectability of all WAC exceedances with a radius larger than 6.0 meters (diameter of the field of view), as well as detectability of WAC exceedances down to a radius of 4 meters (66% of the radius of the field of view at a 1.0 meter detector height) with a concentration of 1500 ppm. The first two guidance bullets in Section 3.4.5 put these two statements in the proper perspective.

Action: The first guidance bullet in Section 3.4.5 and the first guidance bullet in Section 4.5.3 will be changed to indicate that the 66% refers to a radius of 4.0 meters, which is 66% of the radius of the field of view (6.0 meters at a 1.0 meter detector height.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.7.3 Page #: 4.7-2 and 4.7-3 Line #: NA
Original Specific Comment #: 12

Comment: The text discussed the 450/1,000 corrected counts per minute (ccpm) rule of thumb. However, it is not clear how radium-226 and thorium-232 specifically impact this rule with regard to uranium. Based on the discussion of gross count data, elevated levels of radium-226 and thorium-232 could have a profound impact on uranium detection. Furthermore, it appears that the 450/1,000 ccpm rule was developed based on screening of soil cores. Therefore, it is not clear how other geometries (for example, flat ground surfaces) would impact the rule values. The text should be revised to clarify these matters.

Response: The 450/1,000 corrected counts per minute rule of thumb was derived from a comparison of total uranium concentrations with corrected counts per minute for approximately 260 soil samples. These soil samples were obtained from cores collected in the SWU-5 area of Area 2 Phase I, an area known to contain WAC material. Of these 260 samples, 198 had corrected counts per minute as measured by the GM that were less than 450 ccpm. None of the samples contained above WAC material. Of the 34 samples with ccpm greater than 1,000, 30 also had total uranium concentrations greater than the WAC.

None of these samples were analyzed for radium-226 or thorium-232. If other radionuclides such as radium-226 or thorium-232 are above background levels, the result will be GM readings that are higher than what would be expected if total uranium were the only contaminant of concern above background. There were three historical soil samples from the SWU-5 area that contained above-WAC material. For these three samples, thorium-232 concentrations were around the FRL, but radium-226 was elevated with concentrations ranging from 10 to 42 pCi/g. Consequently, the 450/1,000 rule defined from recent SWU-5 sampling probably reflects the presence of both radium-226 and total uranium. The presence of radium-226 is probably one of the principal reasons for the fact that WAC material starts appearing in some samples at 450 ccpm (radium-226 is likely at background), but does not consistently appear at SWU-5 until above 1,000 ccpm (radium-226 is elevated and is contributing to total activity).

The GM meter is only used as a scanning technique to indicate which samples should be further analyzed by more rigorous techniques. Elevated levels of radium-226 and thorium-232 not reflected in the 450/1,000 limits are not a problem since they would result in more elevated GM meter readings. At worst, then, elevated thorium and radium could result in an increased false positive rate for WAC exceedances, thereby causing a sample to be analyzed in the laboratory or by HPGe for total uranium when the total uranium actually did not exceed WAC.

As noted above, the correlation between corrected counts per minute and total uranium is based upon samples from Area 2 Phase I. As other data are acquired in future sampling operations, they will be added to the correlation. In this way, the

450/1,000 limits may be modified to reflect a broader, and more representative, sample base.

The difference between using the 450/1,000 correlation derived from scans of cores to the flat surface of the ground is not believed to be significant. Since scans are done at about ½ inch from a surface, the meter will not effectively discriminate between a curved core surface and a flat surface.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.8.1 Page #: 4.8-2 Line #: NA
Original Specific Comment #: 13
(Original Specific Comment 10 in U.S. EPA's April 13, 1998, Letter)

Comment: The guidance provided in the text for assessing total activity should be further evaluated. Because uranium appears to be the most difficult isotope to measure with regard to total activity, 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 concentrations do not exceed their FRLs. However, it is not clear how thorium-232 and radium-226 activities influence this value. If total activity is to be assessed, a value should be developed hat depends largely on uranium activity, with the contribution from thorium-232 and radium-226 activities limited to background levels. The text should be revised to address this issue.

Response: DOE believes that no further revision to the text is necessary. Unlike the GM survey meter, the RTRAK is capable of making isotopic measurements as well as total activity measurements. Thus, if there is any doubt as to what total activity data means, the user needs only to evaluate the isotopic data. The last bullet item in the guidance section, which is given below, puts the entire issue into perspective.

- Total activity data are primarily designed for field use to guide additional RTRAK or HPGe measurements. Total uranium, thorium-232, and radium-226 data should be used for final interpretation of contamination patterns.

Action: None.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.10.1 Page #: 4.10-1 Line #: NA
Original Specific Comment #: 14

Comment: The text provides guidance for establishing measurement grid configurations using the HPGe system. Although Figure 4.10-1 specifies three types of configurations, only two types are specified for field use; in no case is the 100 percent coverage method specified. If the 100 percent coverage method is not to be used, it should be deleted from the discussion in the text. If this configuration might be used, an explanation of the special circumstances that would make its use advantageous should be included in the discussion.

Response: There is no discussion of the 100% coverage method in the text; the 100% coverage method only appears as part of Figure 4.10-1. The following sentences will be added to the text for clarification:

"As indicated in the guidance section below, the 100% coverage configuration is not utilized for HPGe measurements. It is included in Figure 4.10-1 only for completeness' sake and only to indicate the increase in the number of measurements relative to the 99.1 and 90.6% coverage configurations."

Action: Add clarifying sentences to the text of Section 4.0 as indicated above.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.12.1 Page #: 4.12-1 Line #: 26
Original Specific Comment #: 15
(Original Specific Comment 11 in U.S. EPA's April 13, 1998, Letter)
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.

Response: The FEMP *In-Situ* Gamma Spectrometry Group is currently writing a procedure entitled "Data Review and Reporting of *In-Situ* Gamma Spectrometry Data." The procedure will delineate all aspects of data review, data flags, and data qualifiers. When this procedure is completed, relevant sections can either be incorporated into the User's Manual, or the User's Manual can reference relevant sections of this document. This procedure is scheduled to be completed by July 15, 1998 with necessary revisions to the User's Manual completed by the July 31, 1998 submittal.

Action: A procedure entitled "Data Review and Reporting of In-Situ Gamma Spectrometry Data" will be completed by July 31, 1998 with any necessary revisions to the User's Manual completed by the July 31, 1998 submittal.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 5.4 Page #: 5.4-1 Line #: NA
Original Specific Comment #: 16
Comment: Delete entire section and any references to it that exist in the document.

Response: DOE has already agreed to delete the text in Section 5.4 as indicated by the red-line notations. However, the section and title will be retained along with the phrase "to be added at a later date when regulatory approval for use of HPGe for certification is granted." References to this section will be deleted from other sections in the meantime.

Action: Delete references to Section 5.4 in other sections of the manual.

Commenting Organization: U.S. EPA
Commentor: Saric
Section #: 5.5
Page #: 5.5-1
Line #: NA
Original Specific Comment #: 17

Comment: The text defines heterogeneity as it applies to the Fernald Environmental Management Project site. However, it is not clear whether the degree of heterogeneity will be determined based on laboratory analysis of physical samples or *in situ* measurements. The text should be revised to explain whether the degree of heterogeneity will be determined based on laboratory analysis of physical samples, *in situ* measurements, or both.

Response: The degree of heterogeneity will be assessed both *a priori* and *a posteriori* relative to remediation operations. Before (*a priori*) remediation operations in a given area, the degree of heterogeneity will be estimated based upon RI/FS data and by process knowledge. After (*a posteriori*) remediation operations in a given area, the degree of heterogeneity can be assessed based upon *in-situ* gamma spectrometry data as well as upon any physical sample data.

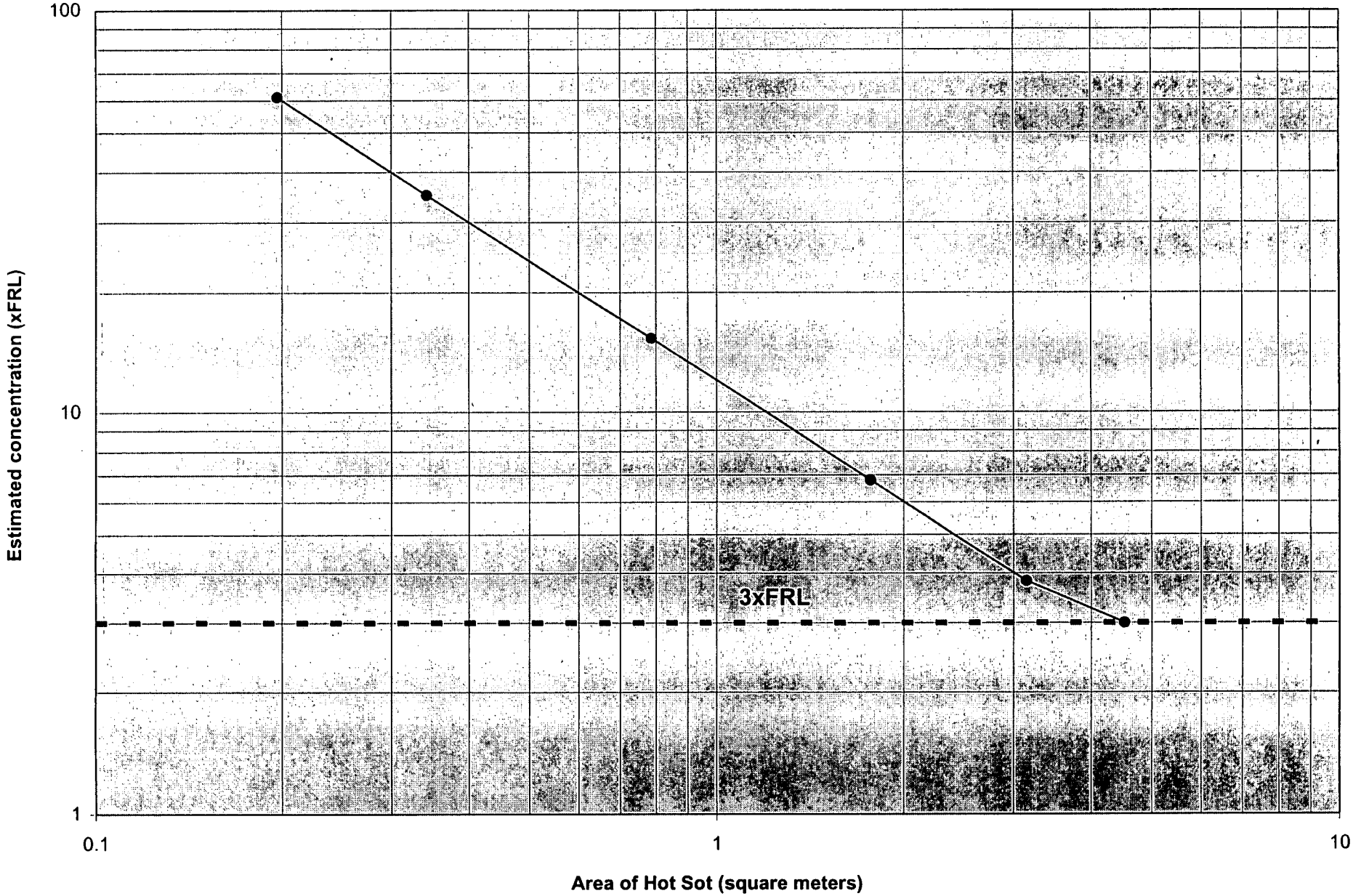
Action: The above clarifying statements will be added following line 19 in Section 5.5.

TABLE 4.3-4
RTRAK FIELD OF VIEW AT 0.5 MPH, 8.0 SECOND DATA ACQUISITION TIME, AND 0.4 METER OVERLAP BETWEEN PASSES

Number of RTRAK Passes	Number of Measurements per RTRAK Pass									
	1		2		4		10		100	
	Total Field of View (m^2)	Field of View per Measure-ment (m^2)	Total Field of View (m^2)	Field of View per Measure-ment (m^2)	Total Field of View (m^2)	Field of View per Measure-ment (m^2)	Total Field of View (m^2)	Field of View per Measure-ment (m^2)	Total Field of View (m^2)	Field of View per Measure-ment (m^2)
1	8.82	8.82	13.1	6.55	21.7	5.42	47.4	4.74	434	4.34
2	16.8	8.38	24.6	6.16	40.4	5.04	87.6	4.38	796	3.98
4	32.6	8.16	47.7	5.96	77.7	4.86	168	4.20	1520	3.80
10	80.3	8.03	117	5.84	190	4.74	409	4.09	3692	3.69
100	795	7.95	1153	5.77	1870	4.67	4020	4.02	36,271	3.63

Figure 1

Estimated Concentration of Hot Spot for RTRAK to Measure at Least Three Times FRL



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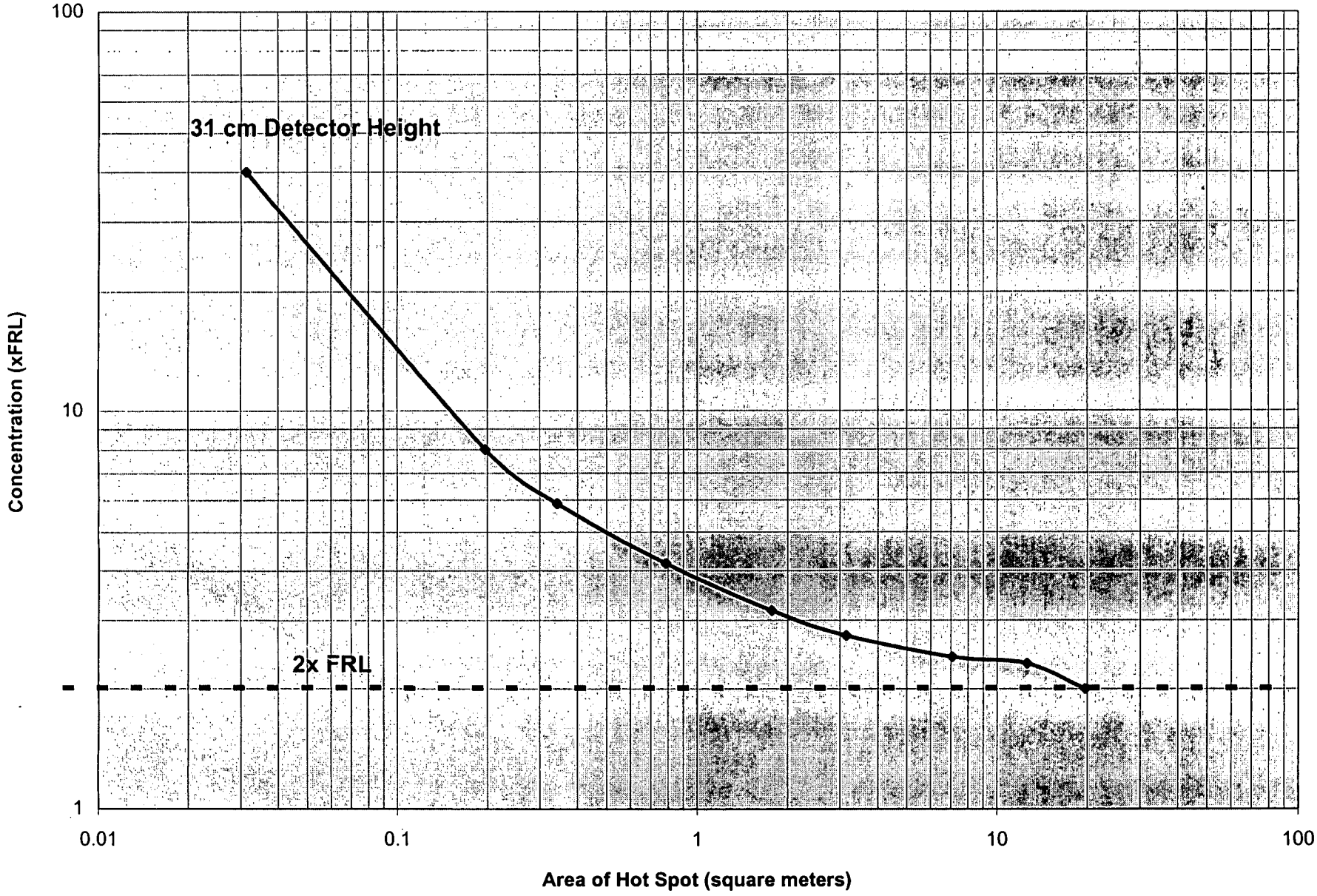
HOTSPOT2.XLS

Figure 2

Estimated Concentration of Hot Spot Necessary for HPGe (31 cm Detector Height) to Measure at Least Two Times FRL



6/4/98

HOTSPOT2.XLS