

From: Pallagi, Kenneth E.
To: [Smith, James](#)
Cc: [Evers, William C.](#)
Subject: [External_Sender] Response to NRC HQ question on Uniform SOF weighting
Date: Tuesday, January 09, 2018 2:58:53 PM
Attachments: [ATT00001.txt](#)
[ATT00002.txt](#)
[oledata.mso](#)
[image006.png](#)
[image008.png](#)

Jim,

Below is the forwarded email from Clark in which we committed to providing clarification on the weighted average SOF for survey units in which the Uniform criteria is used.

Any question please let me know.

Thanks,


ken

From: Evers, William C.
Sent: Tuesday, January 09, 2018 1:48 PM
To: Pallagi, Kenneth E.
Subject: Response to NRC HQ question on Uniform SOF weighting

On the last publicly noticed NRC teleconference, NRC HQ raised the question of how we were determining the weighted average SOF in Uniform SU's. It is first helpful to refer to a section of the FSS procedures that provides the calculation.

The following excerpt is from HDP-PR-FSS-721, Final Status Survey Data Evaluation, Step 8.4.5b:

For soil survey units, a weighted average SOF for the survey unit is calculated using the following equation:



where: n = Number of measured ROCs;

$$\begin{aligned} f_{SS} &= \text{Fraction of the survey unit area at the surface stratum depth;} \\ f_{RS} &= \text{Fraction of survey unit area at the root stratum depth;} \\ f_{DS} &= \text{Fraction of survey unit area at the deep stratum depth;} \\ i_{SS} &= \text{Average concentration for the } i^{\text{th}} \text{ ROC in the surface stratum;} \\ i_{RS} &= \text{Average concentration for the } i^{\text{th}} \text{ ROC in the root stratum;} \\ i_{DS} &= \text{Average concentration for the } i^{\text{th}} \text{ ROC in the deep stratum.} \end{aligned}$$

$$\begin{aligned}
 D_{i,SS} &= \text{DCGL for the } i^{\text{th}} \text{ ROC in the surface stratum} \\
 D_{i,RS} &= \text{DCGL for the } i^{\text{th}} \text{ ROC in the root stratum} \\
 D_{i,DS} &= \text{DCGL for the } i^{\text{th}} \text{ ROC in the deep stratum}
 \end{aligned}$$

Note: When the Uniform $DCGL_w$ is utilized only one layer exists within the survey unit and the equation above reduces to the following:



The DP and FSS procedures specify that all soil sampling be performed unique to each remaining layer present within the particular SU. So even when the Uniform approach is utilized, any remaining Surface, Root, and Excavation layers are sampled separately by stratum. In order to clearly adhere the way sampling was performed in the field, the decision was made to structure the FSS data evaluation spreadsheets to reflect the way the samples were physically collected. This also meant that we could follow the same data evaluation process for both Uniform, and Three-layer SU's.

So in the FSS Data Evaluation spreadsheets, the Uniform soil sample results are still "weighted", but the way the math works out, the sum of the fraction of each remaining layer in the SU always equals 1 for Uniform SUs, therefore the weighted average SOF will always equal the average SOF for all systematic samples collected in the SU. Furthermore, the sum of the fraction of each remaining layer in the SU when the Three-layer approach is used can never be less than 1, only equal to 1 or greater. Therefore any potential errors in applying the weighting factor are inherently conservative, since a higher remaining fraction means higher final dose estimates.

The original question was brought up regarding LSA 05-01, it was identified on the call that there was a minor error in the spreadsheet that was causing the weighted average SOF (0.14 Uniform SOF) for the SU to be higher than the average SOF for all of the systematically collected samples (0.13 Uniform SOF). This error was identified and corrected in the recently submitted letter HEM-18-2.

Please let me know if there is anything we need to discuss further. Thank you.

W. Clark Evers, CHP

Radiation Safety Officer

Hematite Decommissioning Project

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