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Subject: Waste Container-Scale Variability and DRSPALL in response to C-23-10, Rev 1.

This revision of the results reflects the changes introduced by correcting an error in the spallings releases. An error in the input control files for SUMMARIZE used for the CRA incorrectly listed the variable representing spallings area where the variable representing spallings volume was required. This problem is documented in Kirchner and Vugrin (2004).

In response to EPA's request in a letter dated May 20, 2004 (C-23-10, EPA 2004), a study was conducted to analyze the impact of container-scale variability on the current spallings model. In the CRA, spallings releases were calculated using the average radioactivity in all CH-TRU waste streams. The spallings model uses the repository -average radioactivity because the impact of container-scale variability on mean releases was considered negligible. The current spallings model predicts lower release volumes than the spallings model for the CCA. To evaluate the impact of heterogeneity in the waste on the spallings model, three waste streams were randomly sampled for each spallings event, and the release was calculated using the average of these three waste streams. Three waste streams were chosen to be sampled because waste containers are typically stacked three high in the repository.

Figure 1 shows the 100 complementary cumulative distribution functions (CCDFs) for CRA Replicate 1 spallings releases that were computed using the average radioactivity across all CH waste streams. Fifty-eight of the 100 vectors fall off-scale with values too low to plot. Figure 2 shows the 100 CCDFs for CRA Replicate 1 spallings releases that were computed using the randomly sampled waste streams. Fifty-seven of the 100 vectors fall off-scale.

Figure 3 shows the mean and 90th percentile curves for both the spallings releases calculated using the average radioactivity of all the waste streams and the spallings releases calculated using the radioactivity of the randomly selected waste streams. The two mean CCDFs are nearly identical everywhere except at very low probabilities. The 90th percentile curve calculated using

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the randomly selected waste streams shows higher releases than the 90th percentile curve calculated using the total average radioactivity, but the largest deviations occur at low probabilities. It is not surprising that the 90th percentile curves differ somewhat because the second method of computing spallings releases introduces greater variability. Thus, we expect the 90th percentile curve for the random sampling method to show higher releases than the 90th percentile curve for the average radioactivity method shows.

Therefore, this analysis concludes that calculation of spallings releases is not significantly affected by waste-scale variability.

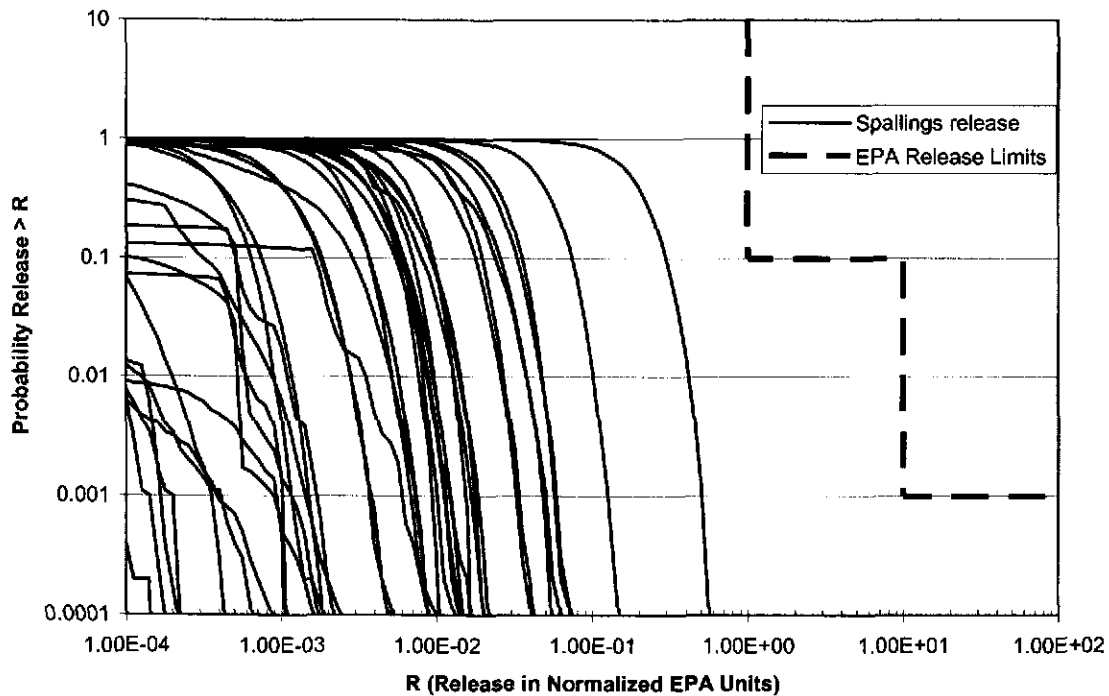


Figure 1. Spallings Releases Calculated Using the Average Radioactivity Over All CH-TRU Waste Streams

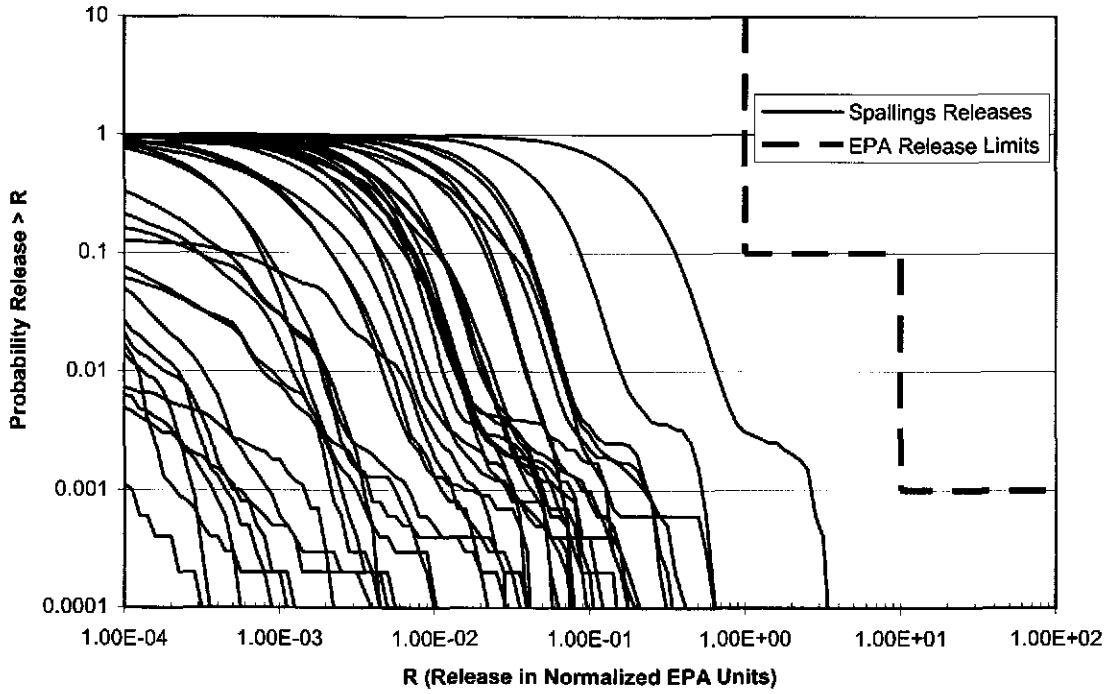


Figure 2. Spallings Releases Calculated Using the Average Radioactivity of 3 Randomly Sampled CH-TRU Waste Streams

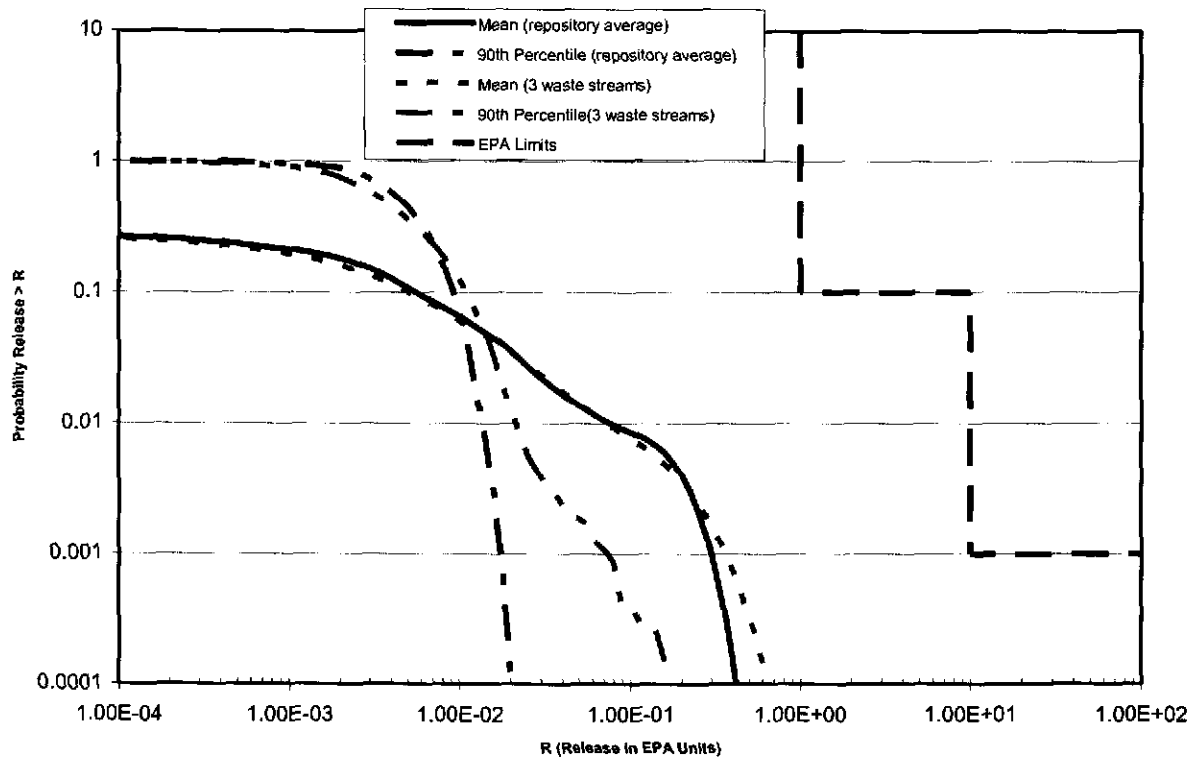


Figure 3. Sensitivity of Spallings Releases to Assumptions About Container-Scale Variability: mean spallings release calculated using the repository average activity vs. mean spallings release calculated using three waste streams

References:

Kirchner, T. and E. Vugrin. 2004. Errors affecting spallings releases, Rev. 0. Sandia National Laboratories, Carlsbad, NM. ERMS #537852.

U. S. Environmental Protection Agency (EPA). Letter from Elizabeth Cotsworth to Dr. R. Paul Detwiler. May 20, 2004. ERMS# 535554.