



PARTNERS

ENVIRONMENTAL

August 7, 2006

Larry W. Camper, Chief
Decommissioning Branch
Division of Waste Management
Office on Nuclear Materials Safety and Safeguards
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

**RE: Revised Probabilistic Dose Analysis
Former Brooks and Perkins Site, Livonia, Michigan**

Dear Mr. Camper:

Partners Environmental Consulting, Inc. (Partners), on behalf of AAR Corp., is submitting for your review a revised radiation dose assessment and a proposed remedial action plan associated with the thorium contaminated soil at the Former Brooks and Perkins Site located in Livonia, Michigan (Property). Once AAR has your agreement that this revised assessment represents an acceptable basis for resolution of this matter, the agreement can be finalized, necessary approvals obtained, and the contemplated remedial activities undertaken.

DISCUSSION

As a result of licensed operations by Brooks and Perkins, the former owner of the Property, the soil surrounding the AAR Corp. facility in Livonia, Michigan, is contaminated with thorium. In a letter dated November 13, 2002, Partners submitted a probabilistic assessment of the radiation dose from the thorium and requested release of the site in accordance with 10 CFR Part 20. After reviewing the submittal, the NRC requested additional information, which was provided by letter, dated April 15, 2003. On June 1, 2005, following discussions with the NRC, Partners, on behalf of AAR Corp., submitted a revised radiation dose assessment and a proposed remedial plan for the subject site.

In a telephone conference call with AAR on November 22, 2005, the NRC questioned some of the input parameters used in the radiation dose assessment and asked that Partners evaluate the effect of the changes to these parameters on the proposed remedial action.

CONCLUSION

AAR and Partners have evaluated the remedial options for dealing with areas of elevated thorium concentration using parameters discussed in the telephone conference call with the NRC and propose the following actions to permit resolution of this matter:

Partners Environmental Consulting, Inc.

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Offices in Maryland

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- Removal to a depth of one meter and disposal of grids 118 and 210 in the Eastern Parcel,
- Removal to a depth of one meter and disposal of grids 249, 73, 100 and 219 in the Western Parcel.

Enclosed, in digital form are the results of the probabilistic dose analyses of the Eastern and Western Parcels and the RESRAD inputs and outputs. The analyses were performed using the arithmetic averages of the AAR and ORISE survey data after the grids identified above are removed from the site. The results demonstrate that with the removal of these grids, the radiological conditions of the Eastern Parcel comply with the dose limit of 10 CFR 20.1402 for unrestricted release, and the radiological conditions of the Western Parcel comply with the dose limitations of 10 CFR 20.1403 for restricted release.

CLOSING

AAR is prepared to undertake these activities upon receipt of your concurrence. We trust that the information in this letter and the associated attachments adequately address your previous concerns. Thank you in advance for your prompt consideration of this matter.

If you have any questions regarding the analyses, please contact Mr. Barry Koh at 410-252-7498 or Mr. Dan B. Brown at Partners' Corporate Office at (440) 248-6005.

Sincerely;
Partners Environmental Consulting, Inc.



Barry Koh
Senior Engineer



Dan B. Brown, CPG
President

Attachments: Modifications to RESRAD Model (Discussion)
RESRAD Input Files (CD)

cc: Howard Pulsifer, AAR Corp., with attachments
Lisa Stetar, Performance Technology Group, with attachments
Mark Wetterhahn, Winston & Strawn, with attachments
Kristina Banovac, U.S. NRC, with attachments

**Modifications to RESRAD Model for Western and
Eastern Areas of the AAR Site**

Modifications to RESRAD Model for Western and Eastern Areas of the AAR Site
Former Brooks and Perkins Facility
Livonia, Michigan
August 2006

The RESRAD models for the Western Area and Eastern Area (sub-area A) have been modified based on the comments made by the NRC in our telephone conference call on November 22, 2005. The changes that have been made are as follows:

1. Addition of Ra-228 to the source term at secular equilibrium with Th-232;
2. Contaminated fraction for produce ingestion changed from RESRAD default of -1 to 1;
3. Precipitation rate changed from 1.8 m/y to 0.8 m/y (value suggested by NRC based on local meteorological data); and
4. Western and Eastern Area models for the residential scenario have been made consistent with the exception of the source-term concentrations, the parameters for the area of the contaminated zone and the length parallel to aquifer flow (which depends on the area of contaminated zone parameter).

As previously indicated, we have continued to use the RESRAD default distribution for the gamma shielding factor. The NRC questioned the use of the default distribution because it is based on several radionuclides with a wide range of energies. We were asked by the NRC to provide justification for the use of this distribution or to select a deterministic value based on the tables in NUREG-5512.

Selecting a single value from the NUREG-5512 tables is not straightforward because the shielding factor depends on the gamma energies present and the type of building construction assumed. Our source term includes a number of gammas, each with different yields. Our source term emits low energy x-rays and a variety of gammas, ranging in energy from 0.068 to 0.96 MeV (Ac-228, 20%).

The RESRAD default distribution was estimated based on values obtained for five radionuclides, Cs-137, Co-60, Mn-54, U-238, and Ra-226, and four different home construction types using the RESRAD Building code. It was assumed that the exposed individual spent 50% of their time shielded by the walls and 50% of their time in front of a window, essentially unshielded.

The radionuclides used for the estimation of the RESRAD default distribution include the energies emitted by our source term as well as higher energy gammas, such as those emitted by Co-60 (>1 MeV). Because higher energy gammas are more penetrating (i.e., would result in a higher gamma shielding factor), the RESRAD default distribution should result in a conservative determination for our source term. Therefore, the decision was made to continue using the RESRAD default distribution, because it is a conservative approach relative to the gamma energies present and because it takes into consideration the different types of housing construction that can be used.

The input files for this update are attached. The RESRAD input files used for this update are AAREASTRES1 and AAREASTRES2 (East residential 0 to 1 m and 1 to 2 m, respectively), AARWESTRES1 and AARWESTRES2 (West residential 0 to 1 m and 1 to 2 m, respectively), AARWESTIND1 and AARWESTIND2 (West industrial 0 to 1 m and 1 to 2 m, respectively).

RESULTS

Western Area: With the removal of 4 grids (grid 249, which was previously identified as exceeding the NRC calculated 100-square meter DCGL, and grids 219, 100, and 73), the arithmetic average for the Western Area 0 to 1 m layer is 43.6 pCi/g of total Th (see AAR WEST Soil Removal 12-12-05.xls). There is no change in the average for the 1 to 2 m soil layer (12.8

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pCi/g total Th), because only the top 1 m of soil is assumed to be removed. With the removal of these 4 grids, the dose criteria for restricted release are met (see WEST Total Dose 12-05 update.xls).

To determine the number of grids to be removed, a compliance point for the residential farmer scenario of 94 mrem/y was used, instead of 100 mrem/y, to calculate the dose source ratio for the 0 to 1 m layer. This reduction was necessary because the 1 to 2 m layer contributes approximately 6 mrem/y to the dose at the time of the peak mean dose for the 0 to 1 m layer. At the average total Th concentration of 58.2 pCi/g (i.e., the value used previously based on the removal of grid 249 only), a peak of the mean dose of 121 mrem/y was obtained, resulting in a dose source ratio of 2.08 mrem/y per pCi/g. Based on this dose source ratio, the average total Th for the 0 to 1 m layer must be ≤ 45 pCi/g for the Western Area to meet the 100 mrem/y dose criteria for the residential farmer scenario.

Eastern Area: The evaluation was limited to sub-area A of the Eastern Area, because it has the highest concentrations of the 4 sub-areas. For sub-area A, an arithmetic average was calculated for the 1 to 2 m soil layer (3 pCi/g total Th, see AAR EAST DATA 12-05.xls). The average for the 0 to 1 m soil layer, assuming the removal of grids 118 and 210, which exceed the 100-square meter DCGL, is 9.5 pCi/g total Th. The doses were calculated for the 0 to 1 m layer and the 1 to 2 m layer separately and then combined to determine compliance with the 25 mrem/y dose limit (see EAST A Total Dose.xls). With the removal of grids 118 and 210, the Eastern Area meets the criteria for unrestricted release.

TABLE OF CONTENTS FOR ATTACHED CD

1. AAR EAST DATA 12-05
2. AAREASTRES1
3. AAREASTRES2
4. AARWESTRES1
5. AARWESTRES2
6. EAST A Total Dose
7. WEST Soil Removal 12-12-05
8. WEST Total Dose 12-05 Update
9. WESTAARIND1
10. WESTAARIND2