



Department of Energy
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MAY 19 1994

Mr. Joseph Holonich
Chief, Uranium Recovery Branch
Division of Low-Level Waste
Management and Decommissioning
Office of Nuclear Materials Safety
and Safeguards
Mail Stop 5E-4 OWFN
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Holonich:

Enclosed for your information is one copy of the document entitled, "Analysis of Cobbly Soils for Cobbles-to-Fines Corrections to Radionuclide Concentrations at the New Rifle, Colorado, Processing Site," dated May 1994. This document outlines the activities and results of the testing that was performed at the New Rifle processing site in December 1993. This testing was performed to implement the procedure developed by the Uranium Mill Tailings Remedial Action (UMTRA) Project Office, and approved by the Nuclear Regulatory Commission, for determining bulk radionuclide concentrations in soils containing cobbles.

The UMTRA Project Office has reviewed the data from this and from previous studies for determining estimates of the site average mass partition function and cobble concentrations, along with the basis for the protocol's requirement to use approximately 30 sampling locations. Based on our evaluation it is felt that the 22 test locations adequately represent the cobbles-to-fines ratio and average radioactivity concentration of the cobbly material at the New Rifle processing site. Therefore, we do not believe it is necessary to perform an additional eleven test locations to comply with the requirement for sampling 30 locations within the subpile area, plus three background. This assessment is based on the following:

- o Conservatism mandated by the protocol requires that the cobbles-to-fines adjustments be based on the lower 95 percent confidence limit for the site average ratio and the upper 95 percent confidence limit for the site average cobble concentrations.
- o Observed consistency in the mass partition functions and low radionuclide concentrations in the cobbles.
- o Spatial representativeness of pit locations.
- o Uniformity of the geological conditions of the cobbly soil.

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Mr. Joseph Holonich

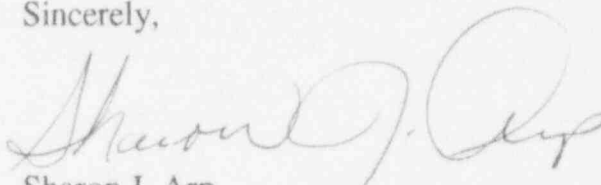
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The enclosed statistical evaluation provides further justification for not performing additional test locations.

This document is provided for your information only. It is my understanding that formal agency approval of this information will be gained at the completion of site construction activities through agency approval of the Rifle Completion Report. However, should your office have any major concerns regarding the information presented in the document or regarding our basis for performing less than the 33 test locations, we would like to discuss these concerns as soon as possible. At the New Rifle processing site, the tailings pile is scheduled to be completely removed by mid-June, with subpile excavation scheduled to begin in late August 1994. Therefore, should your office require eleven additional test locations, they would have to be completed by early July 1994 in order for the analytical and technical evaluation to be complete by late August.

Should you have any question please contact me at (505) 845-5668.

Sincerely,



Sharon J. Arp
Site Manager
Uranium Mill Tailings Remedial Action
Project Office

2 Enclosures

cc w/enclosures:
A. Mullins, NRC

cc w/o enclosures:
D. Rom, NRC
C. Smythe, UMTRA
R. Cornish, UMTRA
D. Bierley, TAC
S. Cox, TAC
N. Abramiuk, RAC

EVALUATION OF REQUIRED AMOUNT OF TEST PITS FOR SITE COBBLES-TO-FINES STUDIES

The procedure, OP-003-4, *Soil Verification Using Cobbles-To-Fines Correction* (derived from the procedure submitted for NRC approval, RAC-OP-003, *Bulk Radionuclide Determination, Excavation Control, and Site Verification For Cobbly Soils*) describes the method for determining and verifying average bulk radionuclide concentrations of Radium-226 and Thorium-230 in cobbly soils on UMTRA sites. Section 5 of the procedure provides guidance for estimating the average cobbles-to-fines mass ratio and the average radionuclide concentration of the cobbly fraction of subsoil on a site. The guidance specifies that measurements of these variables are to be obtained from approximately 30 test pits that are uniformly distributed over the site. The measurements are then combined to produce conservative estimates of the site averages.

The procedure does not provide a justification for the required sample size of 30 test pits. However, it is assumed that the proposed number was based on a "rule of thumb" presented in most introductory statistics textbooks. There are, in fact, two different statistical "rules of thumb" that invoke the number "30". The first rule is that the probability distribution of the average of n independent random quantities approaches a normal distribution as n gets large -- say approximately $n = 30$ or more. A second application is the approximation of Student's "t" distribution by the normal distribution. Many texts suggest that the approximation is "good enough" if the sample size is 30 or more.

The rules reflect sound theoretical principles, but are often misunderstood and misapplied. In particular, neither rule is intended for sample size determination. No single number, 30 or otherwise, is adequate for every sampling application. Heterogeneous populations require larger sample sizes than do relatively homogenous populations. Since UMTRA sites differ among themselves in subsoil homogeneity, both with respect to cobbles composition and radionuclide concentration in the cobbles, the cobbles-to-fines adjustment procedure could be improved if the number of test pits used on a site was based on site-specific characteristics.

Conservatism is mandated by the operating procedure. The procedure requires that the cobbles-to-fines adjustment be based on the **lower** 95 percent confidence limit for the site average ratio, calculated from the sample test pit data. That is, with approximately 95 percent probability the lower limit will **underestimate** the actual average cobbles-to-fines ratio at a site. At the same time, the radionuclide concentration in cobbles is based on the **upper** 95 percent confidence limit for the site average concentration. There is 95 percent probability that the upper limit will **overestimate** the average radionuclide concentration in the cobbles fraction.

It is possible to maintain approximately 95 percent level of confidence using data from fewer than 30 test pits, as the computational formula adjusts for the number of data values. Confidence limits based on smaller data sets (e.g., 20 test pits rather than 30) will typically be more conservative than would be achieved from larger data sets, reflecting greater uncertainty, and will probably result in removal of more subsurface cobbly soil at a site than may otherwise be necessary. Therefore, the use of data obtained from less than 30 test pits can provide reasonable assurance that the cobbles-to-fines adjustments will be used conservatively to ensure that the cleanup standards are met.