

January 9, 1995

MEMORANDUM TO: Joseph J. Holonich, Chief  
HLUR/DWM/NMSS  
FROM: Michael J. Bell, Chief  
ENGB/DWM/NMSS  
SUBJECT: EVALUATION OF PAGE CHANGES TO THE HAT/MON REMEDIAL  
ACTION PLAN IN RESPONSE TO RADIOLOGICAL ISSUES

The attached evaluation is submitted to document the status of radiological issues related to the Uranium Mill Tailings Remedial Action Project Remedial Action Plan for the codisposal and stabilization of the Monument Valley and Mexican Hat uranium mill tailings at Mexican Hat, Utah. A telephone conference was held with DOE staff on September 9, 1994, to resolve the remaining issues. It is our understanding that additional information and page changes will be provided by DOE.

The page changes evaluated were submitted by letter dated July 20, 1994, and were in response to NRC staff comments and discussions of May 13, April 14, September 20, and November 29, 1993. DOE also provided supplemental radiological data as part of the response to issue 32. One issue remains open (requires additional page changes), and two others require information that could appear in the Completion Report.

If you have any questions on the evaluation, please call Elaine Brummett at 415-6606.

Attachment: As stated

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STAFF TECHNICAL REVIEW OF THE  
REMEDIAL ACTION PLAN PAGE CHANGES FOR  
MONUMENT VALLEY AND MEXICAN HAT, UTAH  
IN RESPONSE TO RADIOLOGICAL ISSUES

By letter dated July 20, 1994, the Department of Energy (DOE) provided page changes for the Remedial Action Plan (RAP) for the codisposal and stabilization of the Monument Valley and Mexican Hat uranium mill tailings at Mexican Hat, Utah. DOE also provided supplemental radiological data as part of the response to issue 32. A brief summary of the radiological and geotechnical issues and responses, and the evaluation of responses follow.

OPEN ISSUE 29

*Discuss site cleanup standards and verification procedures, including Th-230. Pages C-3, C-6, and C-7 of Appendix C should be revised:*

- a. *Page C-3 should have a summary of the radiological characterization data, and a discussion of how the data supports the conclusion of Section 3.2.*
- b. *Page C-6 should be revised to reflect DOE's new generic thorium policy.*

DOE provided revised page C-3 that states that characterization indicated elevated levels of thorium in some areas at the Mexican Hat site, and that some samples would be analyzed for Th-232. Page C-6 was apparently not changed, but revised page C-7 contains the excavation and verification protocol for Th-230 that reflects the generic policy.

NRC staff determined:

The main cleanup and verification items have been incorporated into the revised pages and this issue is closed.

OPEN ISSUE 30

*DOE is inconsistent on the volume of contaminated material to be placed in the cell. The Executive Summary of the Text, Text pages 16 and 17, and page 5 of the Information for Reviewers should agree on the estimated volume.*

DOE provided a revised volume in the new Executive Summary, but a revised page 5 for the Information for Reviewers was not provided. Also, DOE had stated in a response to issues dated July 1993, that the cell capacity is 4.3 million cubic yards which leaves a reserve capacity of about 0.5 million cubic yards. Thus, minor variations in the estimated volume of material to be placed will not affect the cell design.

Attachment

NRC staff determined:

This is no longer an issue because the differences in volume estimates will not impact the design. To provide consistency in the RAP, DOE should provide a revised page 5 of the Information for Reviewers with the appropriate volume estimate, or explain why the page change was not provided.

OPEN ISSUE 31

Provide a summary of parameter data and use conservative values for estimated parameters in a revised RAECOM analysis, as follows:

- a. For each parameter based on test results, the summary should indicate: (1) sample number and locations; (2) sample characteristics; (3) test conditions; and (4) range, average, and standard deviation or standard error of the mean (SEM). For estimated parameters, include the justification for assumptions made.
- b. Revise the sensitivity analysis using the appropriate SEM values, if there is a significant difference between the SEM used and the recalculated value.
- c. Provide additional diffusion coefficient data for the Monument Valley (MON) materials (only one sample each for the heap leach and new pile), or use suitably conservative values in the RAECOM analysis.
- d. The RAECOM analysis should reflect the current model for contaminated materials placement, and conservative thicknesses.
- e. The RAECOM analysis should model, or DOE otherwise address, the effects of frost (freeze-thaw) damage to the radon barrier layer on the side slopes.
- f. The sensitivity analysis indicates that the side slopes require 25.3 inches of amended radon barrier. NRC staff does not agree with the DOE procedure that allows this result to be ignored because it is within 40 percent of the result from the model using all average values. The basis for this procedure should be provided.
- g. Correct the discrepancy in the Mexican Hat (HAT) background radon concentration input (0.3 versus 0.6 pCi/l), even though it is not a significant parameter.

DOE provided a summary of RAECOM parameters, RAECOM analyses, and discussion of the above subissues in the July 1993 response to issues. RAP page changes related to this issue were not provided, apparently because most of the information will be presented in the Completion Report.

NRC staff determined:

- a. Data or justification for some parameters were not provided in the summary. This is acceptable at this point because conservative or as-built values were used for important RAECOM model parameters.
- b. DOE stated (July 1993) that NRC had agreed to the SEM methodology described in DOE's Technical Approach Document (TAD). NRC staff did not concur in the TAD, but the SEM issue is minor and does not warrant further discussion.
- c. DOE did not provide additional MON diffusion coefficient data. The justification is that the side slope is conservatively modeled with only HAT material (slightly higher Ra-226 concentration), and the side slope model is critical to the radon barrier thickness design, not the top slope. DOE did use a conservative value for the MON diffusion coefficient in the sensitivity analysis, and the resulting flux required less barrier thickness than is to be placed. This part of the issue is closed.
- d. DOE indicated that the model used in the original RAECOM code for the top slope is still valid for contaminated materials placement. The top slope will have at least 20 feet of less-contaminated MON materials next to the radon barrier (see issue 32). This part of the issue is closed, and the final model and analysis will be provided in the Completion Report.
- e. DOE modeled maximum freeze-thaw damage, assuming 14 percent increase in porosity and diffusion coefficient, for the top 5 inches (maximum frost penetration) of the radon barrier. The required barrier thickness to meet the radon flux for this model is 22 inches, which is less than the 24 inches of barrier material in the design. NRC staff analyzed a different model (conservative emanation fraction for the HAT material with 11 percent increase in barrier porosity with code-calculated density and diffusion coefficient) and concludes that some areas of the side slopes could exceed a radon flux of 20 pCi/m<sup>2</sup>/s after freeze-thaw damage. However, the average cell cover radon flux will not exceed the limit, so this part of the issue is closed.
- f. NRC staff cannot substantiate DOE's statement (July 1993) that NRC has agreed to the protocol for radon barrier design described in the TAD. Staff does agree with the statement in the TAD that "... the average radioactivity and other parameters for the mixed material may be used; however, sufficient characterization is necessary to ensure that the average values are adequately known." DOE and NRC staff apparently differ on interpretation of "adequately known" for the average values of the RAECOM analysis. This part of the issue is considered closed, since the end result, the required radon barrier thickness, is acceptable (provides reasonable assurance of meeting the radon flux standard) to both agencies.

- g. DOE said (July 1993) that the 0.6 pCi/l background Rn-222 concentration would be used in the final RAP. DOE apparently meant to indicate the value would be used in the final RAECOM analysis in the Completion Report. If so, this part of the issue is closed.

NRC staff will discuss aspects of Issue 31 in more detail in the Technical Evaluation Report for the final RAP. In summary, NRC staff has determined that some parameters of the DOE radon attenuation model are conservative or representative of the long-term condition of the material/layer modeled, but some estimated values used by DOE are not conservative. However, considering as-built conditions, there is reasonable assurance that the design radon barrier thickness will limit the long-term radon flux to meet the standard. Therefore, this issue is closed.

#### OPEN ISSUE 32

*DOE should demonstrate that there will be a minimum of 10 feet of lower-level Ra-226 material on all sides and on the top of the disposal cell. DOE should explain or correct the material thickness discrepancies indicated below:*

- a. *Sheet 6 of calculation 9-421-03-00 versus sheets 5 and 6 of calculation 9-239-05-03 (HAT off-pile material);*
- b. *Sheet 11 of calculation 9-421-03-00 versus calculation 9-420-01-00 (MON material on top);*
- c. *Sheet 6 of calculation 9-239-05-03 says that 0 to 25 feet of relocated contaminated materials will be placed on the side slopes. DOE should demonstrate that the lower-level contaminated material will be greater than 10-feet-thick on the side slopes without clean fill dike material, as well as on the top; and*
- d. *Construction drawing DS-10-0215 should indicate that at least 10 feet of low-level contaminated material will be on the side slopes between the radon barrier and the HAT lower pile tailings. In addition, this drawing should reflect the current design for relocated contaminated material thickness.*

DOE did not provide RAP page changes for this issue but did submit revised cross-section sketches of the disposal cell that indicate the approximate layer thickness and general type of material. DOE's response to subissues (c) and (d) was partially provided in the supplemental radiological data (July 20, 1994) indicating that conservative Ra-226 values for the side slopes were used in the model. DOE used a value of 58.7 pCi/g while 14 measurements at 5 locations on the west side slope (to depths of 6 feet) averaged 30.5 pCi/g. DOE also provided radon flux measurements on the west side slope to demonstrate that the area meets the flux limit without barrier material. For four locations on the contaminated material, the highest value was 13.7 pCi/m<sup>2</sup>/s. For five locations on the 2-foot-thick radon barrier, the highest value was 0.23 pCi/m<sup>2</sup>/s.

NRC staff determined:

Subissues a, b, and c are clarified by the cell cross-section sketches, but the RAP does not contain a clear, complete discussion of the placement and layer thickness of the various relocated materials. Since some statements in the various RAP calculations related to the radon attenuation design are confusing or contradictory, and there is no discussion of the radon barrier in the RAP Text, DOE should add an appendix to the Text volume of the RAP to incorporate details of the radon attenuation design and a comprehensive summary of the radon model parameters.

Related to subissue d, DOE modeled all HAT material on the side slopes, indicating that the model was more conservative than one incorporating MON material. NRC staff determined that modeling MON material on the side slopes is more conservative. Also, Ra-226 values were provided for the west side slope but only had two measurements at the 6-foot level and none deeper. The limited data provide an indication of the radium content of the upper contaminated material. The radon flux measurements are also limited but provide some additional basis for determining that the west slope will not adversely impact the average cell long-term radon flux.

All the subissues will be resolved by the as-built drawings in the Completion Report, but DOE should consider providing sketches of disposal cell cross-sections in the RAP to clarify the radon attenuation design.

This issue is closed with the condition that DOE consider the high-lighted suggestions above.

#### OPEN ISSUE 33

*The Text Executive Summary and page 9 indicate that all the mill buildings have been demolished, but pages 13, 17, and C-3, and the site drawing indicate two buildings remain. DOE should be consistent in describing the structures remaining on the HAT site.*

DOE provided a revised Text Executive Summary, but it did not indicate (as proposed July 1993) that the sheet metal shop and a mill building used as a health clinic were still on the site. Pages 9 and 13 were also to be revised with a similar statement to be consistent with information on page 17 of the Text. Revised page 9 no longer mentions the buildings, and revised page 13 indicates all buildings were demolished. Revised page 17 indicates that the health clinic building is on a vicinity property, and that the building was not contaminated and was excluded from the program. Page 17 still indicates that the sheet metal shop will be decontaminated and left intact, which reflects the statement on page C-3 (Appendix C).

NRC staff determined:

THIS IS STILL AN OPEN ISSUE. DOE should provide RAP pages changes so that the Text Executive Summary, pages 9, 13, 17, and C-3 are consistent in describing the mill buildings that will remain and those that will be decontaminated and verified under the RAP.