June 29, 2001

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SUBJECT REPOSITORY DESIGN AND THERMAL-MECHANICAL EFFECTS KEY TECHNICAL ISSUE INTERMEDIATE MILESTONE NO.20-01402.671.110: PROCESS LEVEL ROCKFALL STUDY FOR INPUT TO SEISMO MODULE OF TPA CODE

Dear Dr. Chowdhury,

I have reviewed the Center report entitled: "Assessment of Seismically Induced Rockfall in the emplacement Drifts of the Proposed Repository at Yucca Mountain, Nevada." This report documents the results from two-dimensional (2D) Discontinuous Deformation Analysis (DDA) conducted at the Center to study the effects of seismic ground motions on rock mass surrounding excavations. Based on the review, I conclude that the report fulfills Center's contractual obligations for this Intermediate Milestone. I have the following observations on the contents of the report:

(1) I had made a number of recommendations when I reviewed your previous report on this topic (RDTME IM No. 20-01402.671.060); one of them was to conduct an analysis using site-specific vibratory ground motion at Yucca Mountain. Unfortunately, such data was not available to you at the time of completing this report, therefore you have used the acceleration time history developed for a site in California by the California Department of Transportation. It is my understanding that a site-specific time history has been developed by the Department of Energy for the Yucca Mountain site and should be available to us soon. In view of the uncertainty in interpreting the results generated using a non-site-specific time history, an attempt should soon be made to complete this analysis using the Yucca Mountain time history.

(2) While the 2D- DDA code generates interesting results that can help visualize rockfall within an excavated drift, it is difficult to extrapolate the results to the third dimension. Thus, the estimation of the largest block size to be used for engineered barrier design remains unclear.

(3) DDA code's inability to simulate thermal effects and degradation of rock mass and consequent formation of new blocks due to fracturing raise questions about the possibility of making meaningful interpretations of the results from this study.

(4) There are a few assumptions in the study which are not well supported, for example, what was the basis for reducing the joint friction angle by 23%? Why was the joint

cohesion assumed to be zero in this study? Is there a good explanation for the negative values (-0.3) used for mean bridge length of the joints (as in table 3-2)? Is a maximum acceleration value of 0.75g at the repository level justifiable? It is not clear if the joint normal and shear stiffness values used (50,000 and 20,000 tons/sq.m) come from DOE's data or were simply assumed.

In spite of the several limitations of the 2D-DDA and many questions raised above, I consider the results of the study to be useful in addressing the issue of rockfall and its impacts on the performance of the engineered barrier system. I look forward to including some of the findings of this study and factoring them in resolving issues related to rockfall and engineered barrier system performance. If you have any questions on the contents of this letter, please contact me at (301) 415-6695 or via e-mail (msn1@nrc.gov). No written response to this letter is required and the subject report is considered to fulfill the Center's contractual obligations for this Intermediate Milestone. If there are specific technical comments from other staff reviewers on this report, or any recommendations for future work by other KTI teams, I will forward them to you as and when they become available.

Sincerely.

/RA/

Mysore Nataraja,
Program Element Manager

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Sincerely.

/RA/

Mysore Nataraja,
Program Element Manager

cc: J. Linehan
B. Meehan
B. Sagar, CNWRA

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