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International Radiation Protection Consultant

March 13, 1989

Dr. Dade W. Moeller, Chairman  
Advisory Committee on Nuclear Waste  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

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Dear Dade:

I've received and reviewed the Study Plan for Study 8.3.1.2.2.2, "Water Movement Test". This Study Plan is dated January 19, 1989, and was prepared by the Los Alamos Scientific Laboratory as a part of the construction phase Exploratory Shaft Facility study plan.

The primary purpose of the proposed test is to determine the rate of water movement downward through the unsaturated zone beneath Yucca Mountain. It will be most useful if the rate of such water movement is extremely slow.

The use of measurements of chloride concentrations and chlorine isotopic compositions in samples of soil and tuff collected during the mining of the exploratory shaft is the basis of this proposed method. The method is in the developmental process and should show the best promise if water movements are between  $10^5$  to  $10^6$  years.

I see no adverse effects on the repository from the proposed sampling and analysis program. However, there are several possible circumstances which could make interpretation of results difficult. These circumstances are generally identified and discussed in the Study Plan.

The one item (exception) that is not addressed in sufficient detail is the production of chlorine-36 underground due to neutron capture by chlorine-35. The Study Plan indicates calculations will be done to determine the effect of such production on data interpretation of the major test parameters. There is no mention of an experimental program to collect data to determine the quantities of chlorine-36 produced by in situ neutron capture (chlorine-35).

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Dr. Dade W. Moeller  
Page 2  
March 13, 1989

Therefore, it must be assumed that sufficient information and data are available to make the indicated calculations. If this is the case, such calculations should have been (be) made and their effects, if any, should have been (be) discussed in the Study Plan as to possible constraints on test data interpretation.

With this one reservation, I believe the proposed test should be used as one method to determine water movement downward through the unsaturated zone beneath Yucca Mountain.

It is hoped this information will be of interest and use to you.

Sincerely yours,



Melvin W. Carter

MWC/bc