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'83 DEC -2 A9:27

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November 28, 1983

WM Record File 102.3
WM Project 11
Docket No.
PDR ✓
LPDR ✓
Distribution:
SCoplan
(Return to WM, 623-SS)

Mr. Seth Coplan, Project Manager
High-Level Waste Technical Development Branch
Division of Waste Management
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Coplan:

We have reviewed NRC draft Site Technical Position documents relative to geology/geologic stability and groundwater issues. From our review, the comments are found to be comprehensive and, for the most part, satisfactory. A majority of the issues are similar to issues we have already defined. Our analysis of the Yucca Mountain site and the NNWSI Program suggests additional issues which are important to the State. Our comments mainly address these additional issues and are submitted for your consideration.

SPECIFIC COMMENTS

A. Performance Issues

The performance issues identified in both documents appear to be generic in nature, applicable to all sites in all media. We wonder if there are any unique performance issues for a repository sited in the unsaturated zone. We so far have not identified any unqiue issues, but we would request the NRC rereview performance issues relative to an unsaturated zone repository.

GEOLOGY/GEOLOGIC STABILITY ISSUES

A. Additional Technical Issues

1. What is the stratigraphic variability or discontinuity at the Yucca Mountain Site?

Investigations to date suggest that on a gross scale the stratigraphy is continuous across the site. However, on a small scale lithology and mineralogy of individual tuff units may be variable or discontinuous. Lateral variability in tuff mineralogy, phenocryst composition, or frequency and/or size of lithophysae are possibilities. It is important to characterize these variations or discontinuities in order to properly assess fluid pathways, radionuclide migration and radionuclide sorption.

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2. What is the probability and nature of undetected faulting in the controlled area?

Surface geologic mapping has located both large and small displacement faults in the site area, particularly a swarm of small faults adjacent to the southeast portion of the proposed repository block. Faults have also been encountered in drill holes. It would be expected that based upon the number of faults observed to date that faults not detected by any investigative technique are likely to be present, especially in the subsurface. It is important to consider what might be the frequency, displacement, and character of these faults and their relation to known faults both locally and regionally. It is also important to assess how characteristics of these faults might impact excavations, fluid movement, and repository performance.

3. What is the relation of joint/fracture sets to faults in the site area, to the regional tectonic regime, and to tuff emplacement?

Surface geologic mapping has identified a number of joint or fracture sets within the proposed repository block. It is necessary to define the origin, characteristics and geometric interrelationship of these sets and how sets relate to observed faults. It is also important to define the compatibility of these sets with in-situ stress conditions and regional stress fields. The stress analysis must consider both cooling and tectonic origins.

4. What are the expected effects over time on host rock mineralogy and lithology resulting from repository-induced changes (including underground facility construction, thermal effects, borehole and/or shaft seals)?

During the process of developing the repository, physical changes will be made to the repository block. In addition, during and after waste emplacement, thermal effects will begin to affect rock chemistry and may induce mineral or lithologic instability. Considerations such as these should be assessed with respect to the effect on repository performance.

5. What are the expected effects over time on geologic stability resulting from human-induced changes (including man-induced explosions, exploratory drilling, mine development for resource extraction)?

The expected effects of plausible human-induced changes over time on mineralogy/lithology of host rock, faults or fracture systems, or rates of erosion relates directly to the calculation of repository performance.

GROUNDWATER ISSUES

A. Use of Term "Hydrogeologic Unit"

We recommend the NRC follow accepted terminology and replace the word "Hydrologeologic Unit" with "Hydrostratigraphic Unit" throughout the document.

B. Additional Technical Issue

1. What simplifying assumptions are required for mathematical model application?

A certain amount of simplification is usually necessary when constructing a mathematical flow model. In this regard, the area to be modeled is generally represented as a matrix or grid within which each cell has fixed hydrologic properties. These properties represent the "average" of those properties actually in existence. Of particular interest when applying a mathematical model is the size of the grid cells. For example, does the grid size allow the model to accurately represent the effects of heterogeneities in the real world flow system? A certain cell size may be required based on the representative elementary volume (REV) for most of the model. However, in some cases, large faults may require a much smaller cell size to accurately assess their effect on the flow system. In a heterogeneous site such as Yucca Mountain, the REV may have to be quite small since hydraulic properties may vary greatly from rock unit to rock unit, as well as within the rock units themselves. In this event, a very large number of grid cells would be required.

There are several other simplifying assumptions which could be made in addition to grid size. One or two dimensional models are frequently used versus three dimensional models. Steady state models are used to approximate transient flow. Various assumptions are also made about boundary conditions in order to simplify mathematical models of groundwater flow systems. In all such cases it will be necessary to justify the assumptions made to simplify the model. (It is acknowledged computer costs and memory limitations can also influence the selection and size of a mathematical model.)

In closing, I would like to comment on a procedural matter. Insufficient time has been allotted for a thorough staff review of these issues,and we understand copies of these documents have been available to the NRC since September. In the future, the NRC should recognize the constraints on the State and allow at least 30 days for comment.

We are available if you have any questions or would like to discuss our comments in more detail.

Sincerely,

Robert R. Loux
Nuclear Waste Evaluation
Program

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