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Mr. David Tiktinsky
U.S. Nuclear Regulatory Commission
Engineering Branch
Division of Waste Management, NMSS
Washington, DC 20555

Dear Mr. Tiktinsky:

Attached are our review comments for the draft NNWSI Environmental Assessment.

If you have any comments please call either me or Lindsay Mundell at FTS 776-0737.

Sincerely,

Edward E. Hollop
Research Supervisor
Ground Control Division

Enclosure

Review Comments on NNWSI Environmental Assessment Draft Report Dated 6/1/84

3-1 Section 3.1.2.1, Stratigraphy and Volcanic History of the Yucca Mountain Area, pages 3-12 to 3-14 - Lack of support for Topopah Spring formation site selection.

Although the Topopah Spring formation was chosen because it is welded tuff of considerable thickness, it has also been described as containing extensive fracturing, lithophysae (air bubbles), and possible physical property variations due to differential cooling. On the other hand, the Calico Hills formation, located at a minable depth directly beneath the Topopah Spring unit, contains zeolites which retard radionuclide movement. The Calico Hills formation appears to be the better candidate for waste storage. Specifically, why was the Topopah Spring formation chosen?

3-2 Section 3.1.2.2, Structure, page 3-16, paragraph 2 - Time measured effects of continued underground explosion testing.

Recently, it has been proposed before Congress that the maximum size of an underground nuclear blast be increased to a value several times what it is now. Surface displacements have already occurred near Yucca Mountain due to previous blasts. More information will be needed to evaluate the effects of blasting on the stability of the storage site, especially if larger detonations are approved. Of primary concern is the displacement occurring along the many small-scale faults intersecting the site.

3-3 Section 3.1.2.2, Structure, page 3-18, paragraph 1 - Probability of structure instability due to renewed seismic activity.

The lithology of the proposed Yucca Mountain site is primarily the result of volcanic activity, identified today by a complex system of calderas extending to the north. It has been suggested that the volcanic activity in this area is related to both the Walker Lane fault system and Las Vegas Valley shear zone. Considering the proximity of the site to the high seismic area surrounding the San Andreas fault, the issue of renewed activity at Yucca Mountain has become very important. Earthquakes could trigger catastrophic fault displacements at the site. Probabilities of occurrence have been presented, but degrees of confidence have not been included in the discussion. The specifics of determining the likelihood of large-scale seismic events need to be discussed in detail, and means for monitoring potentially hazardous crustal conditions need to be identified.

3-4 3.1.3.2, Groundwater, page 3-34, Table 3-3 - Preferable hydraulic conductivity in the Calico Hills formation.

As presented in Table 3-3, the hydraulic conductivity of the Calico Hills formation is one-fifth that of the Topopah Spring formation. This supports the Calico Hills formation as being the better unit for the waste emplacement horizon. More information is necessary to assess the adequacy of the Topopah Spring formation.

3-5 3.1.3.2, Groundwater, page 3-35, paragraph 3 - Gas permeability.

Travel times of contaminated water have been determined, based on area permeability measurement; however, no mention is made of gas migration. Explosive conditions can develop when radioactive waste is sealed within a canister. The possibility of radioactive gas liberated after a canister explosion, and the following consequences, needs further discussion, especially since significant rock fracturing is present in the current waste storage horizon.

4-1 Section 4.1.1.1, Borehole Drilling, page 4-2, paragraph 2 - Selection of borehole logging techniques.

As part of the drilling program, geophysical logging techniques will be employed to help characterize the geology surrounding the emplacement horizon. Quite a large variety of logging methods exist, some more suitable than others. What types of subsurface structures and material properties need to be identified by a geophysical borehole logging program?

4-1 4.1.1.1, Borehole Drilling, page 4-3, paragraph 1 - Future borehole site selection.

This section describes the basics of the proposed drilling program and impact on the Yucca Mountain area. Why was available information concerning the location, depth, and findings of previous boreholes drilled by DOE not presented? Also, there is no description of the location, depth, etc., of the twenty boreholes proposed for the future drilling program. Why has this information not been made available?

4-3 Section 4.1.1.4, Field Experiments in Pre-existing G-Tunnel Facilities, page 4-7, paragraph 1 - Methods of determining in situ physical properties.

In situ tests are presently being conducted to determine the physical properties of tuff under simulated repository conditions. The accuracy of such measurements is very important so that repository properties are appropriately characterized prior to waste emplacement. What types of measurements are being made and why were they chosen? What is considered "repository conditions?"

4-4 Section 4.1.2, Exploratory Shaft, page 4-10 - Exploratory shaft site selection.

Figure4-2 shows the location of the proposed exploratory shaft. The location is very important since information gathered during shaft sinking will be used to develop mine design criteria. The important variables need to be identified, and the shaft located based on the findings. At this point it is difficult to determine how the shaft location shown was determined.

4-5 Section 4.1.2.1, Exploratory Shaft Construction, page 4-19, paragraph 2 - Selection

Three breakout levels are being considered at depths of 160, 370, and 450 meters. Since the mine design will be based on the data collected from tests at these three levels, the depth of breakout is very important. What items were considered when the three levels were chosen? Why are only three levels being evaluated?

4-6 Section 4.1.2.2, Exploratory Shaft Testing Program, page 4-21, paragraph 2 - Geomechanical property testing.

Many large-block lab tests will be conducted on samples taken from the shaft during excavation. What is the purpose of these tests? What geomechanical properties need to be determined? Will the work be state-of-the-art, requiring additional effort to perfect the method and facilities? How valid are the test results? Again, the accuracy of such tests is vital is stable mine designs are to be developed.

5-1 Section 5.1.1.2, Access to the Subsurface, page 5-9, paragraph 2 - Selection of design parameters.

Future studies will establish the number, function, type, and size of each opening. What are the design parameters considered important in opening development? These parameters will be determined during the drilling and shaft-sinking programs, and many should be known already, e.g., rock strength, stratigraphy, depth, stress orientation, etc.

6-1 Section 6.3.1.2, Geochemistry, page 6-164, Canister leakage.

In the event of canister leakage, will any chemical reaction occur which that might adversely affect the stability of the surrounding rocks? Would contact with leakage adversely affect the integrity of artificial supports?

6-2 Section 6.3.1.3, Rock Characteristics, page 6-169, paragraph 1, and page 6-273, paragraph 2 - Strength properties of weakness planes.

Have weakness planes been investigated for strength properties? Since the overall stability of the repository openings will be dependent upon the behavior of the entire rock mass, the properties of the weakness planes should be known in addition to the properties of the rock matrix. The investigation should include the effects of different fluids (groundwater and canister leakage), fracture fillings, varying stress fields, and seismic events. The possibility of lithophysal cavities, vitric zones and clay layers acting as weakness planes should be considered, particularly the dehydration of the smectite clay layer.

6-3 Section 6.3.1.3, Rock Characteristics, page 6-180, paragraphs 1 through 3 - Rock creep after waste emplacement.

Has the creep behavior of the selected site horizon(s) been investigated under the anticipated temperature and stress conditions? The ductility and thermal expansion of the rock are discussed on pages 6-177 through 6-180 as a means to close fractures and joints. The action of creep may also provide this same effect as well as the potential to cause failure of surface shotcrete coatings or other supports.

6-4 Section 6.3.1.7, Tectonics, page 6-230, paragraph 2 - Seismic effects on opening stability.

What is the anticipated response of the repository to the expected seismic effects from earthquakes and nuclear testing? Have seismic effects been considered in the design of openings and artificial supports?

6-5 Section 6.3.1.7, Tectonics, page 6-232, paragraphs 1 and 2 - Potential for fault movement.

On page 6-232 the possibility of fault movement is discussed, based upon: the tectonically active zone of north- to northeast-trending faults, evidence of stress relief caused by nuclear testing, and measurements that indicate nearby faults are approaching failure. Since the repository is surrounded by faults and may include some minor faults, the effects of any potential fault movement should be investigated in greater detail.

6-6 Section 6.3.1.8, Human Interference, page 6-244, paragraph 3 - Effects of subsidence.

The extent and effect of subsidence should be discussed. Subsidence may arise from a collapse of the underground openings or from excessive groundwater withdrawal. This may provide a pathway to the surface for introduction of infiltrating water or for the escape of radionuclides to the surface environment. In addition, surface structures may be damaged and surface drainages may be diverted, resulting in increased rates of erosion.

6-7 Section 6.3.3.2, Rock Characteristics, page 6-268, paragraph 3 - Environmental considerations.

Atmospheric (or ventilation) temperature, pressure, and humidity may have adverse effects on roof and pillar stability. These effects are probably minor, but may create enough change in surface displacement to crack or deform concrete linings or other artificial supports.

6-8 Section 6.3.3.2, Rock Characteristics, page 6-273, paragraph 2 - Effects of inclining repository.

How does the angle of inclination affect the stability of the openings? Is any benefit gained from inclining the repository from horizontal?

6-9 Section 6.3.3.2, Rock Characteristics, page 6-274 - Need for a monitoring system.

It would be beneficial to install a structural monitoring system to record changes in displacements and stresses (magnitude and direction), and to monitor seismic events. In this manner, corrective actions may be taken before serious failures occur.

6-10 Section 6.3.3.2, Rock Characteristics, page 6-275, paragraph 2 - Artificial support stability with time.

Since the stability of the repository must be maintained over a long period of time, the effective life of various artificial supports used, as well as maintenance and replacement techniques, should be determined. Heat may accelerate deterioration of the supports or otherwise affect their performance.

6-11 Section 6.3.3.2, Rock Characteristics, page 6-285, paragraph 2 - Potential for stress redirection.

The potential for faulting is high; faulting may cause the stress field surrounding the repository to change significantly. The design of underground openings should consider a wide range of magnitude and direction of the stress field and varied ratios between principal stresses.

6-12 Section 6.3.3.2, Rock Characteristics, page 6-287, paragraph 2 - Deviation from design.

No mine is excavated precisely to design dimensions. Regardless of the mining technique employed, some type of near surface damage will occur. Have the effects of overbreak and blast damage been considered in the design? How sensitive is the design to dimensional changes?