

ACNWC-0032

DARRELL L LEAP, Ph.D.

Certified Professional Geologist (IN)
Registered Professional Hydrogeologist (AIH)

5932 Lookout Drive; West Lafayette, Indiana 47906-5709
 Office (317) 494-3699 - FAX (317) 496-1210 - Home (317) 567-2578

March 20, 1995

ACNWC
U.S.H.R.C.

Dr. William J. Hinze
 ACNW

JUL 11 1995

AM PM
 7,8,9,10,11,12,1,2,3,4,5,6

Dear Bill:

Pursuant to your request last week, I have listed below some salient points which I believe should be addressed in the letter which you and the ACNW plan to write to the Commissioners of the NRC. These points incorporate my impressions of certain items of discussion in the meeting at the NRC headquarters in Bethesda last week.

- The approach by NRC of integrated travel times, at least at this point, seems like witchcraft to me. I hope it is not taken seriously until more physical knowledge is obtained of the flow system because I cannot determine how the approach will actually replace the original concept of travel time. The new method appears to be very general in scope, and does not appear to take into account the effects of specific paths of escape of the water from Yucca Mountain. I might not have so much difficulty with the approach if we knew *a-priori* the "boundary conditions", which I have been stressing.

For example, we may never know the truly exact paths of ground water movement, but if we know the locations and hydraulics of the major fracture and fault zones, we can certainly estimate the directions of flow and the flux much better than we can today. In addition, such information may improve the usefulness of the NRC integrated approach, which at present seems to be limited to rather simple and probably unrealistic situations.

At present, not enough is known about the travel paths and times to place a quantifiable degree of uncertainty on the integrated travel-time method as the NRC wants to do. This quantity can only be determined with better knowledge of the pathways or "boundary conditions". Additionally, we might then even be able to use artificial tracers to determine travel times along these paths under the right conditions.

9603130197 950320
 PDR ADVCM NACNUCLE
 C-0032 PDR

409.55

1 311, 2
 1 122

RS02
 110

- Concurrent with the above, more work is in order in the elucidation of the proper "conceptual model" of Yucca Mountain. At present, it appears that neither the Flint nor the Montazer-Wilson concepts are entirely accurate. It will be necessary to more fully understand this concept before meaningful numerical modeling results can be expected. A better understanding of the proper conceptual model is important in the addressing of the following points.
- In keeping with the two above points, the problem of continued perched water as encountered by the exploratory tunnel should be addressed. It is perched water or what?
- Once the major pathways are determined, for a worst-possible-case analysis, perhaps tracer techniques and results will make more sense. I do not rule out tracer methods, but additional work will have to be done on CI-36 in order to determine the sources of the isotope.
- Until a better way is found to address the problem of ground-water travel time, I do not believe that the concept should be thrown out.
- I would feel better if the anticipated change in climate with increasing recharge were taken more seriously. I would anticipate that cooler temperatures with increased recharge would cause not only drastic increases in flux through the unsaturated zone, but would increase the level of the water table and therefore, would decrease the thickness of the unsaturated zone. It would also be expected that the moisture content of the unsaturated rocks would increase, thus increasing their hydraulic conductivity.

An additional factor to be considered is the likely solution of calcitic cement from fractures and faults with resulting increases in their permeability.

Porc-pressure increases in both saturated and unsaturated rocks will change permeability and also dispersivity. The latter is a very difficult parameter to measure and model on a large scale, but it will change with increasing recharge.

Please let me know if you want additional comments.

