



Department of Energy
Washington, DC 20585

June 10, 1994

*Susan:
Pls enter. Thanks.
Pauline Brooke
6/13/94*

Mr. Joseph J. Holonich, Chief
High-Level Waste and Uranium
Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Holonich:

As a part of U.S. Department of Energy (DOE) efforts toward early resolution of regulatory and technical issues, DOE is proceeding with a general approach for evaluating compliance with 10 CFR Part 60.113(a)(2), the performance objective for the geologic setting. DOE believes the approach is consistent with comments received from U.S. Nuclear Regulatory Commission (NRC) staff in NUREG-1347, and will also serve as a sound basis for evaluating compliance with the ground water travel time disqualifying condition in DOE's general siting criteria (10 CFR Part 960). This approach was outlined to the Nuclear Waste Technical Review Board at its spring meeting in Reno, Nevada on April 12, 1994.

In this approach, pre-waste emplacement ground-water travel time is considered to be a distribution that defines the likelihood of each water particle reaching the accessible environment at a specific time. This ground water travel time distribution is a distribution of water particle transport times, i.e., radionuclide transport times in which the effects of chemical retardation are neglected. The distribution is affected by particle starting locations which, in the unsaturated zone, are dependent on the lateral and vertical extent of the boundary of the disturbed zone, and by the particle ending locations at the accessible environment. It is also affected by dispersion and matrix diffusion because water particle transport will proceed along different flow paths through both the heterogeneous rock matrix and fractures. The approach, therefore, takes into account the transport processes of dispersion and matrix diffusion. The approach includes developing separate distributions for transport from the boundary of the disturbed zone through the unsaturated zone and, in the saturated zone, from points below the repository horizon to the accessible environment. It involves conducting sensitivity analyses to evaluate and provide the basis for

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taking into account the effects of uncertainty in hydraulic properties, boundary conditions, alternate conceptual flow models, matrix diffusion, and dispersion on these distributions. Finally, it involves summing the resultant distributions and evaluating the significance of travel times less than 1000 years on the performance of the system as a whole.

Feedback as to whether this approach is consistent with NRC's intent with regard to the subsystem performance requirement in 10 CFR Part 60.113(a)(2) is requested. Given NRC's well-defined concurrence role in connection with DOE's siting guidelines, feedback is particularly timely because DOE is considering use of this approach in the Technical Site Suitability Evaluation scheduled for completion in 1998 as part of our new "Proposed Program Approach" as we discussed with you at the May 19, 1994 DOE/NRC Management Meeting. We would later use the same approach in preparing a license application if the site is found suitable for development as a repository. We therefore request that NRC provide such feedback.

We believe that the approach is consistent with current understanding of relevant physical phenomena, with DOE's disqualifying condition, and with NRC's subsystem performance requirement for the following reasons:

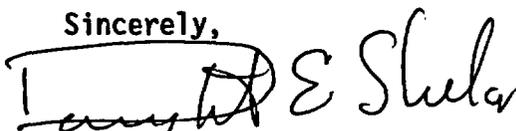
1. The essence of the approach is that ground water travel time is a distribution of water particle transport times whose dimensions are in units of time. It is not single-valued. In this regard, therefore, the approach, which involves determining the desired distribution, is consistent with the NRC staff recommendation in NUREG-1347, Comment 93, at P. 4-73, in which the staff recommended that DOE "Generate, individually, ground water travel time cumulative distributions... so that information from the extremes of the CDFs can be evaluated..." That ground water travel time as a distribution is implied by and, therefore, also consistent with the inclusion of the word "likely" in NRC's requirement and DOE's disqualifying condition.
2. Consistent with that staff recommendation, the approach involves evaluating the significance of short travel times, e.g., those less than 1000 years, in the event that they are part of the distribution. That evaluation of significance will be based on assessment of the performance of the system as a whole.
3. The approach requires evaluation of the significance of changes in the properties of the controlled area and subsequent definition of the disturbed zone boundary in order to provide a basis for determining the ground water travel time distribution in the unsaturated zone. That definition will therefore be consistent with the definition set forth in 10 CFR Part 60.2 which provides that the "*Disturbed zone* means that portion of the controlled area the physical or chemical properties of which may have changed . . . such that the resultant change in properties may have a significant effect on the performance of the geologic repository" (emphasis added). The approach will also be consistent with the NRC staff recommendation in NUREG-1347, Comment 92, at P. 4-72, that "... The significance of these changes on repository performance should be ascertained and the delineation of the disturbed

zone boundary based on those changes significant to repository performance." Future discussion with NRC staff may be necessary to establish those physical and chemical properties that should be considered when defining the disturbed zone.

4. The approach involves determining the expected distribution of ground water travel times from the boundary of the disturbed zone through the unsaturated zone and, in the saturated zone, from points below the repository horizon to the accessible environment. This approach is consistent with the definition of groundwater set forth in 10 CFR Part 60.2 and in the Supplementary Information provided with the amendment of 10 CFR Part 60 in which the Commission stated that "...the Commission has concluded further that the definition of the term "groundwater" set forth at §60.2 will allow travel time along subsurface flowpaths to be considered regardless of the hydrogeologic regime through which the water is moving." 50 FR 29643, July 22, 1985.
5. The approach involves determining and evaluating the effects of uncertainties in the many factors relevant to the distribution of ground water travel times and the effects of these uncertainties on that determination. This aspect of the approach is consistent with the intent of the DOE's siting guidelines, and should be consistent with the intent of the NRC staff comments in NUREG-1347 on the DOE's Site Characterization Plan, NRC's concurrence on the DOE's siting guidelines, and NRC's regulations.
6. The approach should not require changes in the text of either 10 CFR Part 60 or Part 960.

In summary, DOE requests that NRC provide feedback on whether it believes that the general approach outlined above is consistent with the intent of NRC's subsystem performance requirement in 10 CFR Part 60.113(a)(2), and with NRC's basis for concurrence with 10 CFR Part 960. We recognize that further discussion may be needed on the approach to disturbed zone definition. However, we request your feedback prior to that discussion so that we can factor your input into our approach for addressing this important regulatory topic. Based upon the DOE/NRC technical exchanges scheduled for November and December 1994, saturated zone hydrology studies and ground water travel time methodology and the need to incorporate your feedback into DOE's plans prior to these interactions, DOE requests that you provide your feedback prior to July 15, 1994. We look forward to your feedback and the opportunity to interact with you and the staff on this important topic.

Sincerely,



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