

U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

**NUCLEAR WASTE TECHNICAL REVIEW BOARD
HYDROLOGY AND GEOCHEMISTRY PANEL MEETING**

**SUBJECT: GROUNDWATER TRAVEL TIME
(GWTT) INTERPRETATION OF
APPLICABLE GUIDELINES AND
REGULATIONS**

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Methodology Basis

- **A methodology for calculating GWTT must be based on interpretation of:**
 - **DOE's guideline/disqualifying condition - 10 CFR 960.4-2-1(d)**
 - **NRC's performance requirement - 10 CFR 60.113(a)(2)**
 - **DOE's and NRC's definitions of the Disturbed Zone (DZ)**

Methodology Basis

(Continued)

- **The interpretations presented are DOE's**
- **Although NRC concurred on DOE's guidelines only written interpretations, by NRC's Office of General Counsel, of the meaning of NRC's regulations are considered binding on NRC**

DOE's GWTT Guideline/Disqualifying Condition - 10 CFR 960.4-2-1(d)

“A site shall be disqualified if the pre-waste-emplacement groundwater travel time from the disturbed zone to the accessible environment is expected to be less than 1,000 years along any pathway of likely and significant radionuclide travel.”

NRC's GWTT Performance Requirement - 10 CFR 60.113(a)(2)

“The geologic repository shall be located so that pre-waste-emplacement groundwater travel time along the fastest path of likely radionuclide travel from the disturbed zone to the accessible environment shall be at least 1,000 years or such other travel time as may be approved or specified by the Commission”

DOE/NRC Definitions of the DZ - 10 CFR 960.2/10 CFR 60.2

- They are almost identical
- DOE/NRC DZ Definitions:

“ . . . that portion of the controlled area the physical or chemical properties of which have changed as a result of underground . . . construction or heat generated . . . such that the resultant change of properties may have a significant effect on the performance of the geologic repository.”

DOE Interpretation of Guidelines, Requirements, and Definitions

- **Use of the word “likely” in DOE’s Disqualifying Condition and NRC’s Requirement implies a distribution of travel times, not a single value**
 - **This use is consistent with the NRC staff recommendation in NUREG-1347, Comment 93, P. 4-73 that DOE**

“Generate, individually, groundwater travel time cumulative distributions . . . so that information from the extremes of the CDFs can be evaluated . . .”

DOE Interpretation of Guidelines, Requirements, and Definitions

- **Use of the word “significant” in DOE’s disqualifying condition implies that some pathways and travel times may not be important to repository performance**
 - **Evaluating the significance of such pathways and travel times would also be consistent with the NRC staff recommendation in NUREG-1347, Comment 93, p. 4-73**
- **The phrase “or such other travel time as may be approved or specified . . .” in NRC’s requirement also implies that repository performance is a consideration**

DOE Interpretation of Guidelines, Requirements, and Definitions

- **The phrase “. . . such that the resultant change of properties may have a significant effect on the performance of the geologic repository” in the definition of the DZ implies that:**
 - **Only disturbances and changes in properties having a significant effect on post-closure performance need to be considered in defining the DZ boundary and affect its extent**

DOE Interpretation of Guidelines, Requirements, and Definitions

- **This interpretation of the definition of the DZ is consistent with the NRC staff recommendation in NUREG-1347, Comment 92, 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.”

DOE's Interpretations Define Its Approach to a GWTT Methodology

- GWTT is a distribution of water particle transport times - It isn't single-valued**
- The methodology involves evaluating the significance of changes in the chemical and physical properties of the controlled area to define the DZ boundary**

DOE's Interpretations Define Its Approach to a GWTT Methodology

(Continued)

- **The methodology involves determining the expected GWTT distribution from the DZ boundary through the unsaturated zone and, in the saturated zone from points below the repository horizon to the accessible environment,**
 - **i.e., GWTT takes into account water particle transport along subsurface flowpaths irrespective of the hydrogeologic regime through which the water is moving**

DOE's Interpretations Define Its Approach to a GWTT Methodology

(Continued)

- **The methodology involves evaluating the significance of short travel times, i.e., those <1,000 years, in the event that they are part of the GWTT distribution**
- **The evaluation of the significance of changes in the properties of the controlled area and the significance of the short travel times will be based on assessment of the performance of the system as a whole**
- **Because the methodology is performance assessment based, DOE's approach to developing the methodology and using it will be iterative**