



U.S. Department of Energy  
Office of Civilian Radioactive Waste Management



# Expected Travel Time of a Water Molecule

Presented to:

**U.S. Nuclear Waste Technical Review Board Panel  
on the Natural System**

Presented by:

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**March 9-10, 2004**

**Las Vegas, Nevada**

# Expected Travel Times of a Water Molecule - I

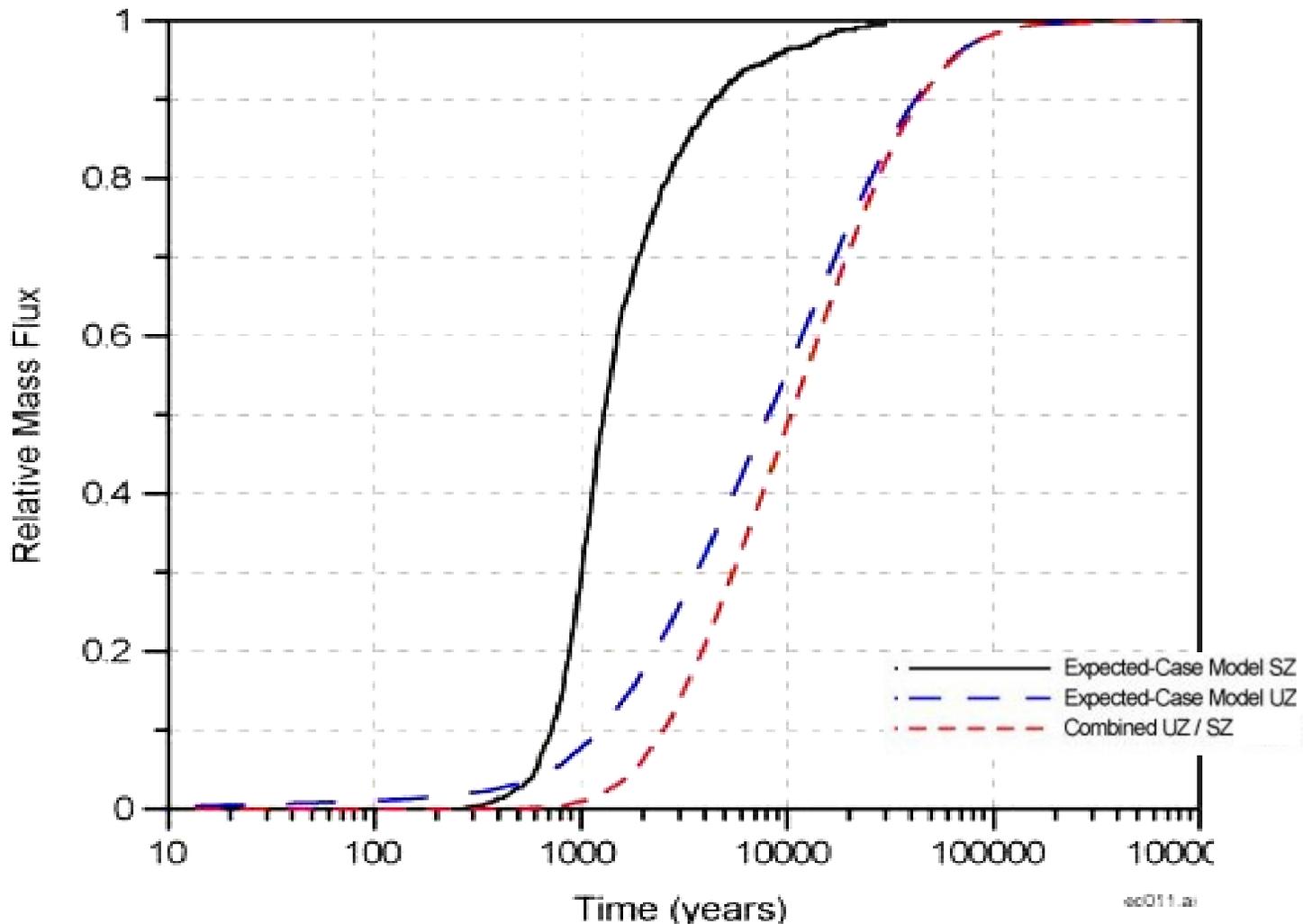
- **Session organizers requested information about expected values of travel times for a molecule of water in the Saturated Zone (SZ) and Unsaturated Zone (UZ)**
- **Such a travel time calculation is neither a meaningful parameter in the risk assessment calculations done by the Project nor a part of the regulatory basis for assessing health and safety of a repository or performance of barriers**
- **Several presenters address radionuclide transport models and abstractions that support the Total System Performance Assessment-License Application (TSPA-LA)**
  - **These presentations do not address the expected travel time of water molecules either in the UZ or SZ**



# Expected Travel Times of a Water Molecule - II

- **A non-sorbing, diffusing radionuclide could be used to approximate the expected travel time of a Water Molecule**
- **The project has in the past examined the expected travel time of water molecules in both the UZ and SZ by such an approximation**
- **While the project has not redone these calculations recently, examination of current information suggests that results using this information would not be significantly different from those developed several years ago**





**Breakthrough Curves Used To Approximate Expected Value of Travel Time of a Water Molecule for the UZ, SZ, and Both Zones Combined.**



# Unsaturated Zone Breakthrough Curves

- **The following presentations use radionuclide breakthrough curves to illustrate predicted transport behavior of calibrated of UZ models and abstractions**
- **These radionuclide breakthrough curves do not represent expected travel time of water molecules**
  - **The breakthrough curves portray a range of input parameters**
  - **The breakthrough curves are often developed with conservative inputs to fully assess the impacts of uncertainty**



# Saturated Zone Breakthrough Curves

- **The following presentations use radionuclide breakthrough curves to illustrate predicted transport behavior of calibrated saturated zone models and abstractions**
- **These radionuclide breakthrough curves do not represent expected travel time of water molecules**
  - **The breakthrough curves portray full probabilistic sampling of input parameters**
  - **The breakthrough curves are often developed with conservative inputs to fully assess the impacts of uncertainty**

