

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

**NUCLEAR WASTE TECHNICAL REVIEW BOARD  
FULL BOARD MEETING**

**SUBJECT: SOURCE TERM FOR THE SANDIA  
NATIONAL LABORATORIES (SNL)  
TOTAL SYSTEM PERFORMANCE  
ASSESSMENT**

**PRESENTER: DR. MICHAEL L. WILSON**

**PRESENTER'S TITLE  
AND ORGANIZATION: SENIOR TECHNICAL STAFF MEMBER  
SANDIA NATIONAL LABORATORIES  
ALBUQUERQUE, NEW MEXICO**

**PRESENTER'S  
TELEPHONE NUMBER: (505) 844-9337**

**PLAZA SUITE HOTEL • LAS VEGAS, NEVADA  
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# **Radionuclides Included in Aqueous- and Gaseous-Release Calculations**

- **Alteration-limited: C-14, Se-79, Tc-99, I-129, Cs-135**
- **Solubility-limited: Sn-126, U-234, Np-237, Pu-239, Am-243**
- **Assumed 60% PWR, 40% BWR spent fuel**

# **Application of Source Model to Composite-Porosity Aqueous Releases**

- **As received from LLNL**

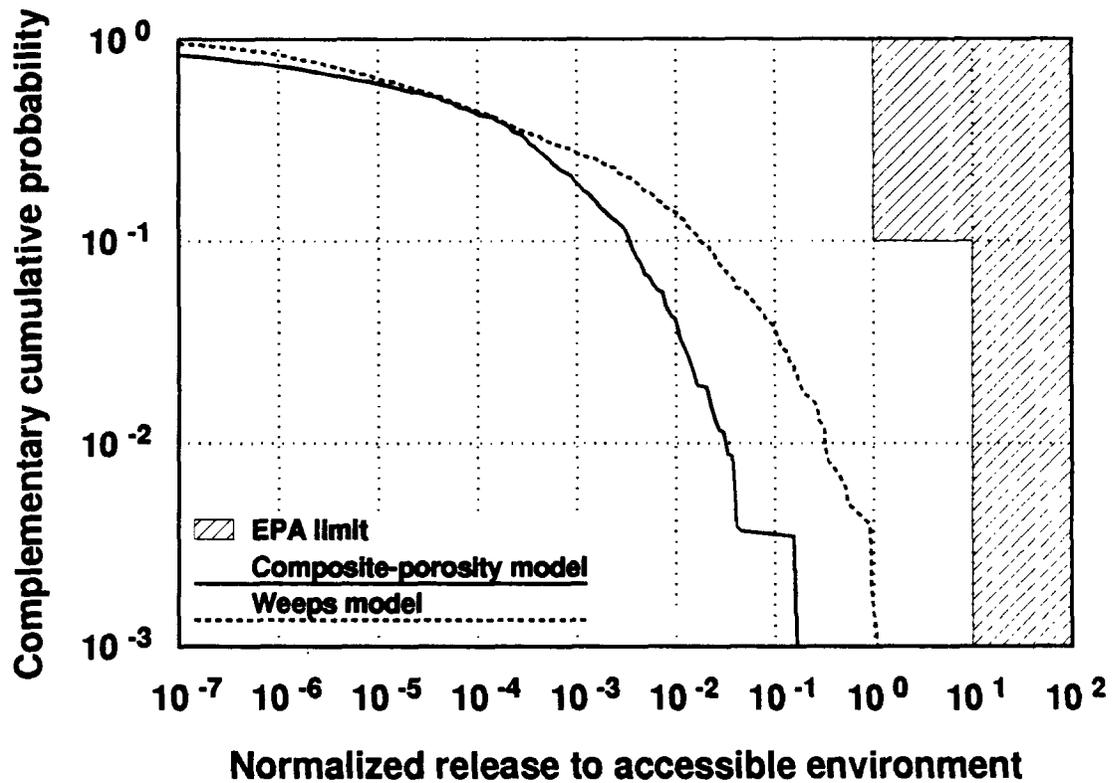
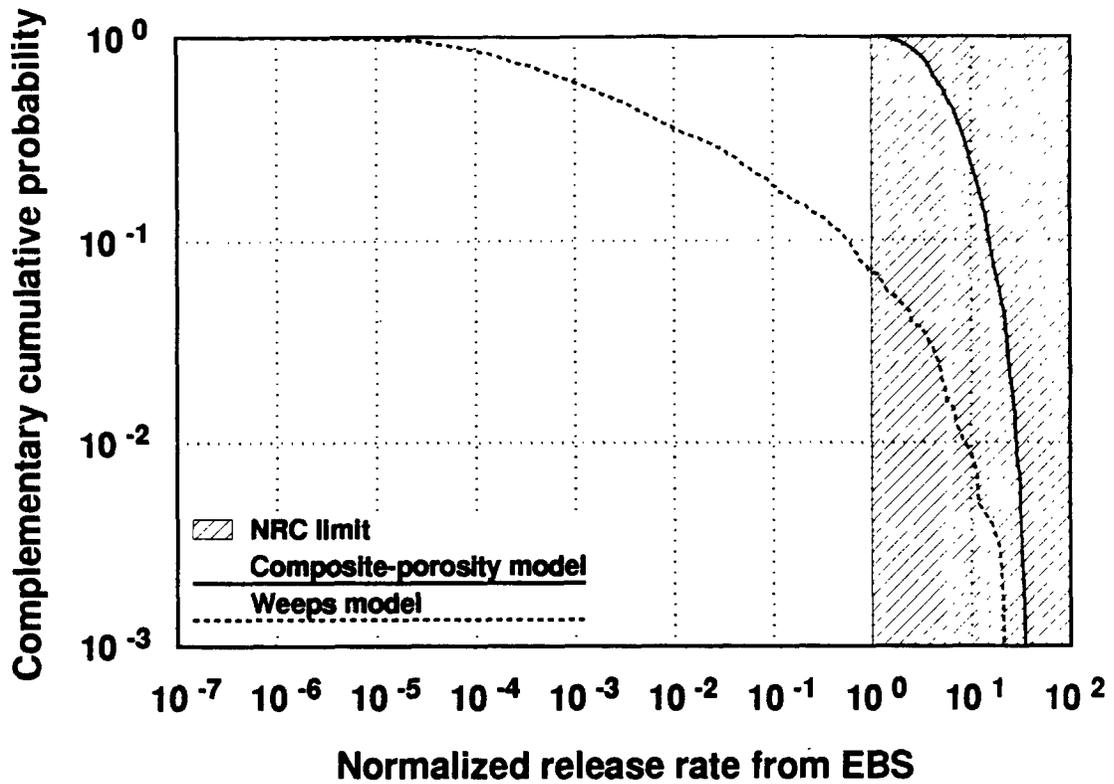
# **Application of Source Model to “Weeps” Aqueous Releases**

- **Different algorithm used for partitioning containers between “moist” and “wet” environments**
- **Releases only from “wet” containers**
- **Only advective releases (no diffusive releases)**

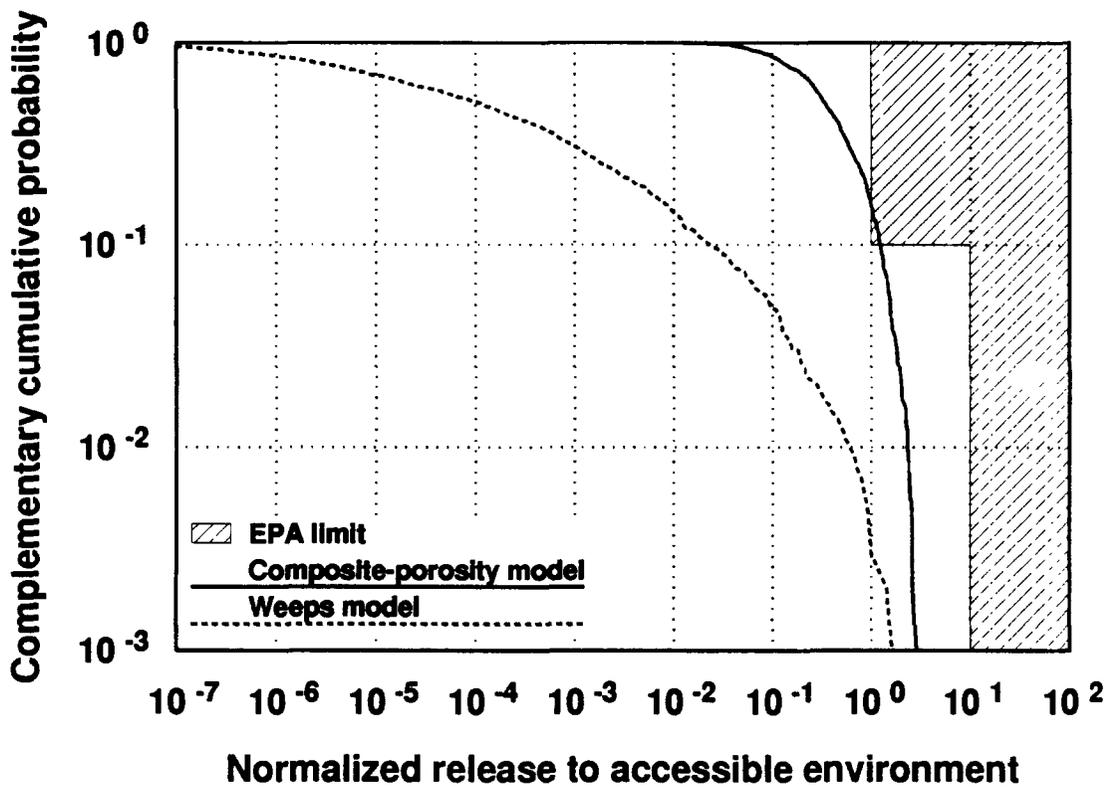
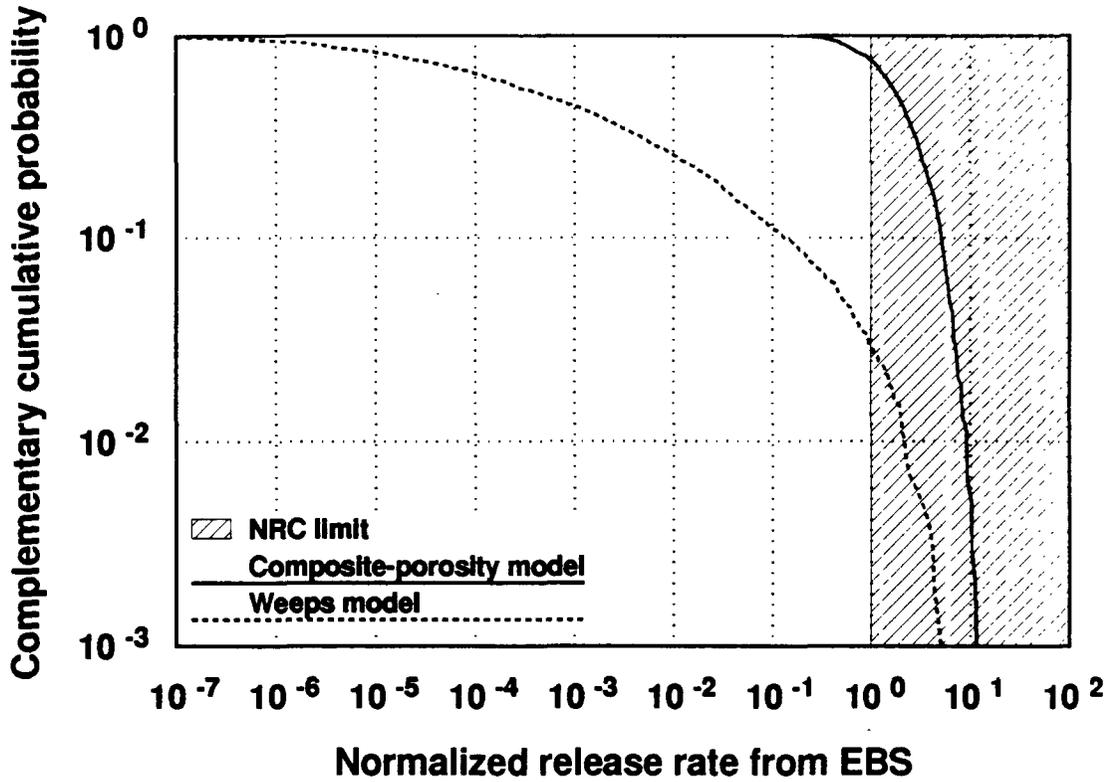
# **Application of Source Model to Gaseous Releases**

- **Only C-14 released as a gas**
- **Quick-release C-14 (from cladding surface) lumped together with gap/grain-boundary fraction**
- **Only 40% of C-14 inventory used (releases from cladding and fuel-assembly hardware not modeled)**
- **C-14 released from container as soon as mobilized**

# Results for Aqueous Releases



# Results for Gaseous Releases



# Possible Extensions for Next Total System Performance Assessment (TSPA)

- **Compare the performance of new container and emplacement concepts with the performance of the old standard (thin-walled containers with vertical borehole emplacement)**
- **Compare performance for different areal power densities**
- **Determine whether additional radionuclides should be included**
- **Include models for releases from cladding and fuel-assembly hardware (primarily for C-14)**

# **Possible Extensions for Next Total System Performance Assessment (TSPA)**

(Continued)

- **Include glass waste in calculations**
- **Investigate the importance of colloid formation and transport**
- **Improve the matrix-alteration model by making the alteration rate depend on temperature (and possibly other factors)**
- **Improve the coupling between the far-field hydrology and the source term**
- **Include temperature dependencies in the source model**

# **Possible Extensions for Next Total System Performance Assessment (TSPA)**

**(Continued)**

- **Include the container and cladding as barriers to transport of radionuclides out of the waste package**
- **Develop probability distributions for parameters that were treated as constants in TSPA-1991**
- **Include cross-correlations among parameters, where information is available**

# Summary

- **The TSPA-1991 source model (together with the input-parameter distributions used) is a good starting point, but it is probably too conservative**
- **For TSPA-1993, we hope to refine the source model to remove some of the overly conservative approximations. In addition, we hope to explore the performance implications of some possible changes in repository design (e.g., changes in thermal loading and container design)**