A High Level Waste Repository Performance Assessment

Presentation to the TRB's Panel on
Risk & Performance Analysis

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Robert A. Shaw, Electric Power Research Institute
Robin McGuire, Risk Engineering
J. Carl Stepp, Electric Power Research Institute
Robert F. Williams, Electric Power Research Institute

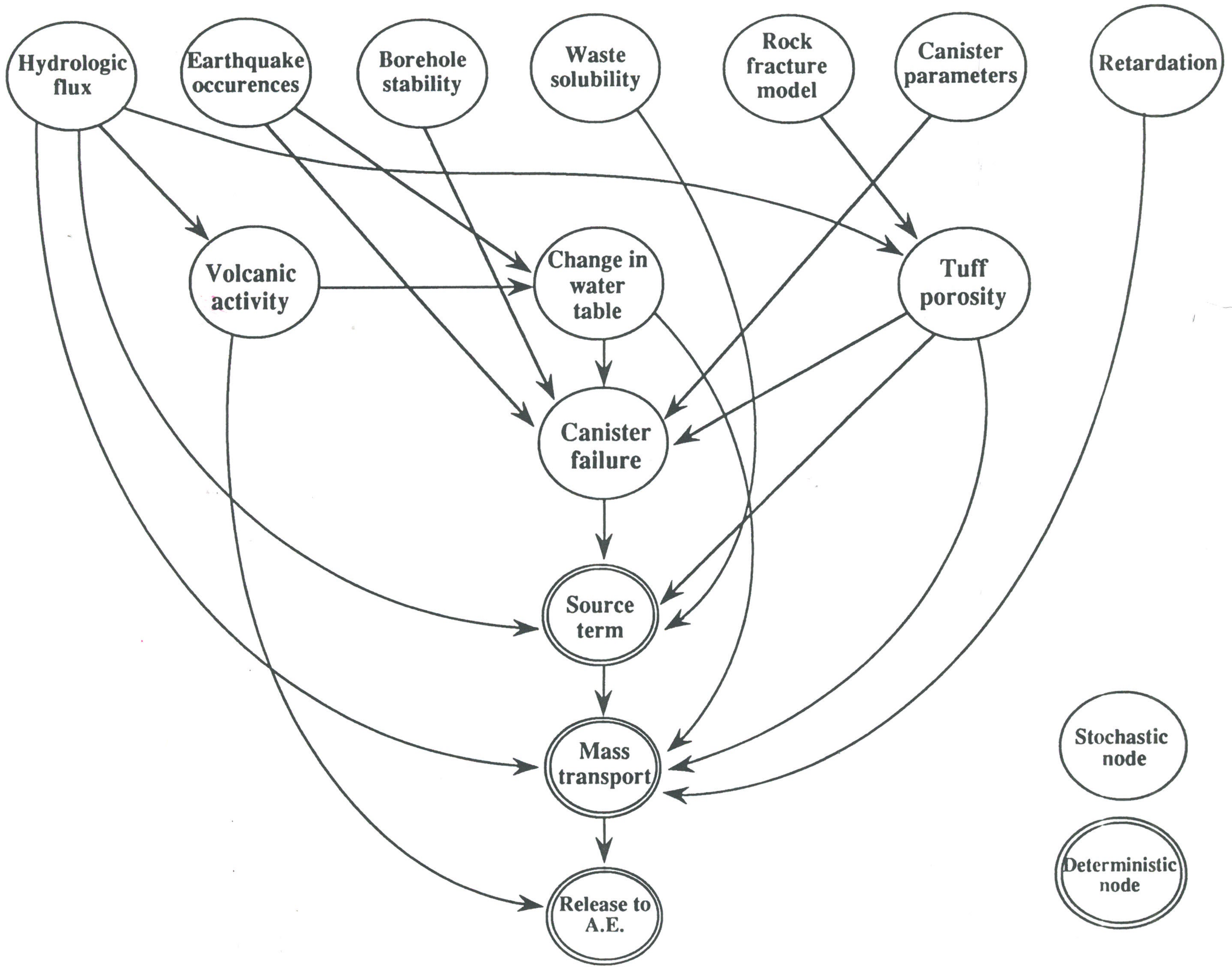
EPRI HLW Project Objectives

- To develop an integrated methodology for early site performance assessment and to identify and prioritize crucial issues

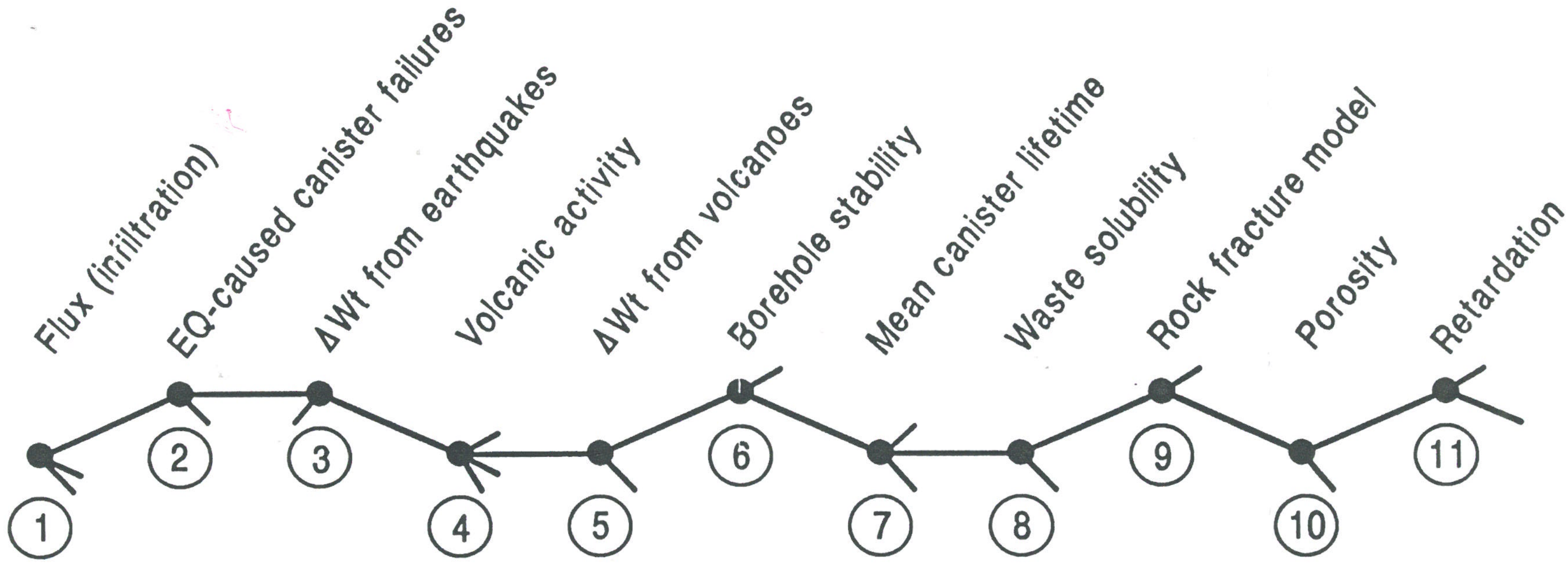
- To involve DOE in this methodology development and its implementation

EPRI High Level Waste Project
Methodology Development Team

Name	Affiliation	Expertise
Michael J. Apted	Intera Sciences	Near-Field Environment
Daniel B. Bullen	Georgia Tech	Waste Package
Stuart Childs	Cascade Earth Sciences, Ltd.	Infiltration
Neville Cook	Univ. of Calif, Berkeley	Rock Mechanics
Kevin Coppersmith	Geomatrix Consultants	Seismic Geology
Ralph L. Keeney	Univ. of Southern California	Risk/Decision Analysis
John M. Kemeny	University of Arizona	Rock Mechanics
Austin Long	University of Arizona	Climatology
Robin K. McGuire	Risk Engineering	Risk Analysis
F. Joseph Pearson, Jr.	Consultant	Geochemistry
Benjamin Ross	Disposal Safety, Inc.	Gaseous Transport
Frank W. Schwartz	Ohio State University	Hydrology
Michael Sheridan	State Univ. of NY, Buffalo	Volcanology
Robert A. Shaw	EPRI	Project Manager
J. Carl Stepp	EPRI	Seismology & Geophysics
Robert F. Williams	EPRI	HLW Sciences
Robert Youngs	Geomatrix Consultants	Geotechnical Engineering
Delbert S. Barth	UNLV/ERC	Observer
Russ Dyer	Department of Energy	Observer


Hydrologic flux
Earthquake occurences
Borehole stability
Waste solubility
Rock fracture model
Canister parameters
Retardation
Volcanic activity
Change in water table
Tuff porosity
Canister failure
Source term
Mass transport
Release to A.E.
Stochastic node
Deterministic node

MASTER LOGIC TREE FOR DEMONSTRATION CALCULATIONS



EQ = Earthquake

Δ Wt = Change in water table

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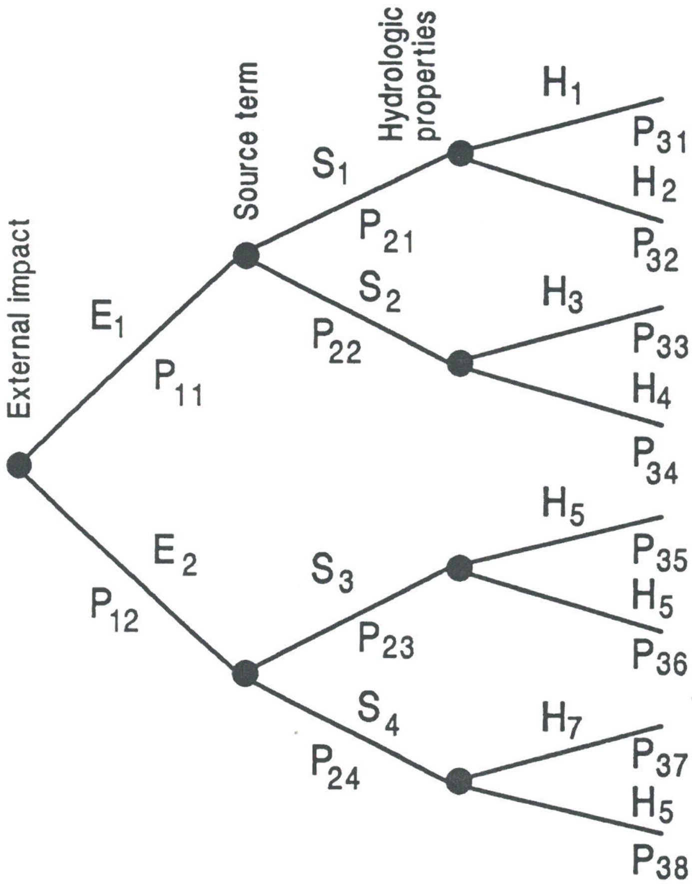
EXAMPLE LOGIC TREE



End Branch				
Number	Problem	Parameters		
1	$P_{31} = P_{11} \times P_{21} \times P_{31}$	E_1	S_1	H_1
2	$P_{32} = P_{11} \times P_{21} \times P_{32}$	E_1	S_1	H_2
⋮	⋮	E_1	S_2	H_3
		E_1	S_2	H_4
		E_2	S_3	H_5
		E_2	S_3	H_6
		E_2	S_4	H_7
		E_2	S_1	H_8
$\Sigma = 1$				

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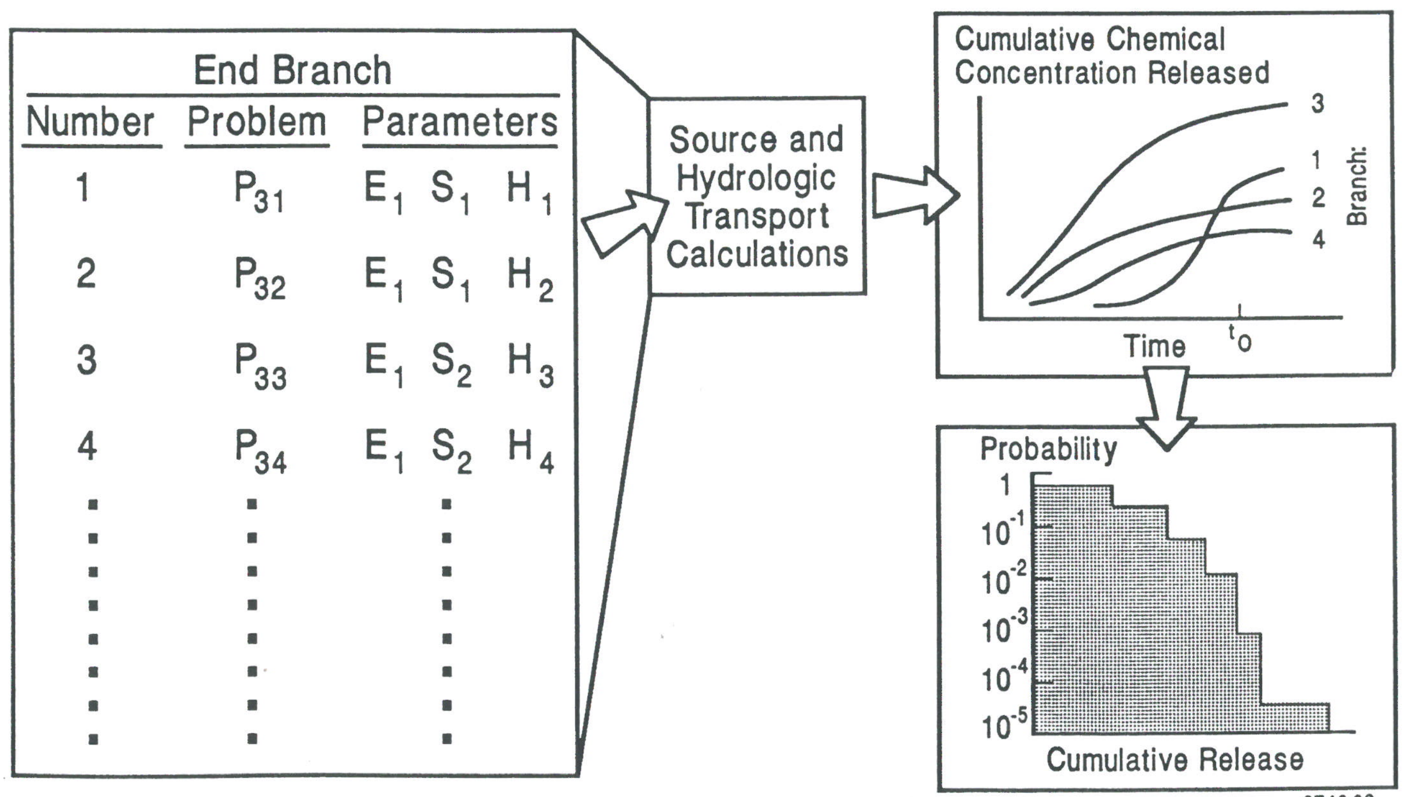
LOGIC TREE PARAMETERS TO FORM CCDF OF CUMULATIVE CHEMICAL CONCENTRATION RELEASED



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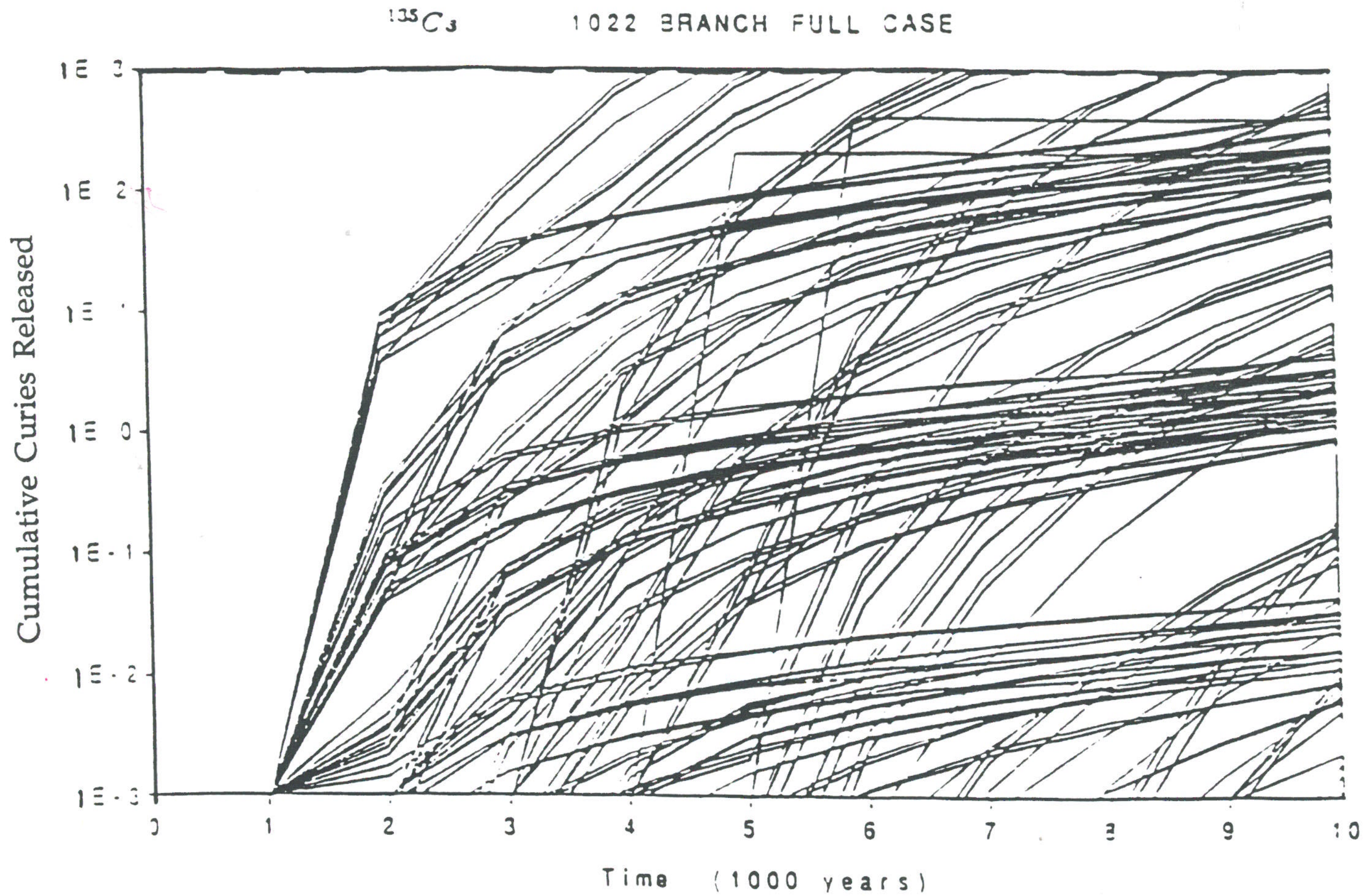
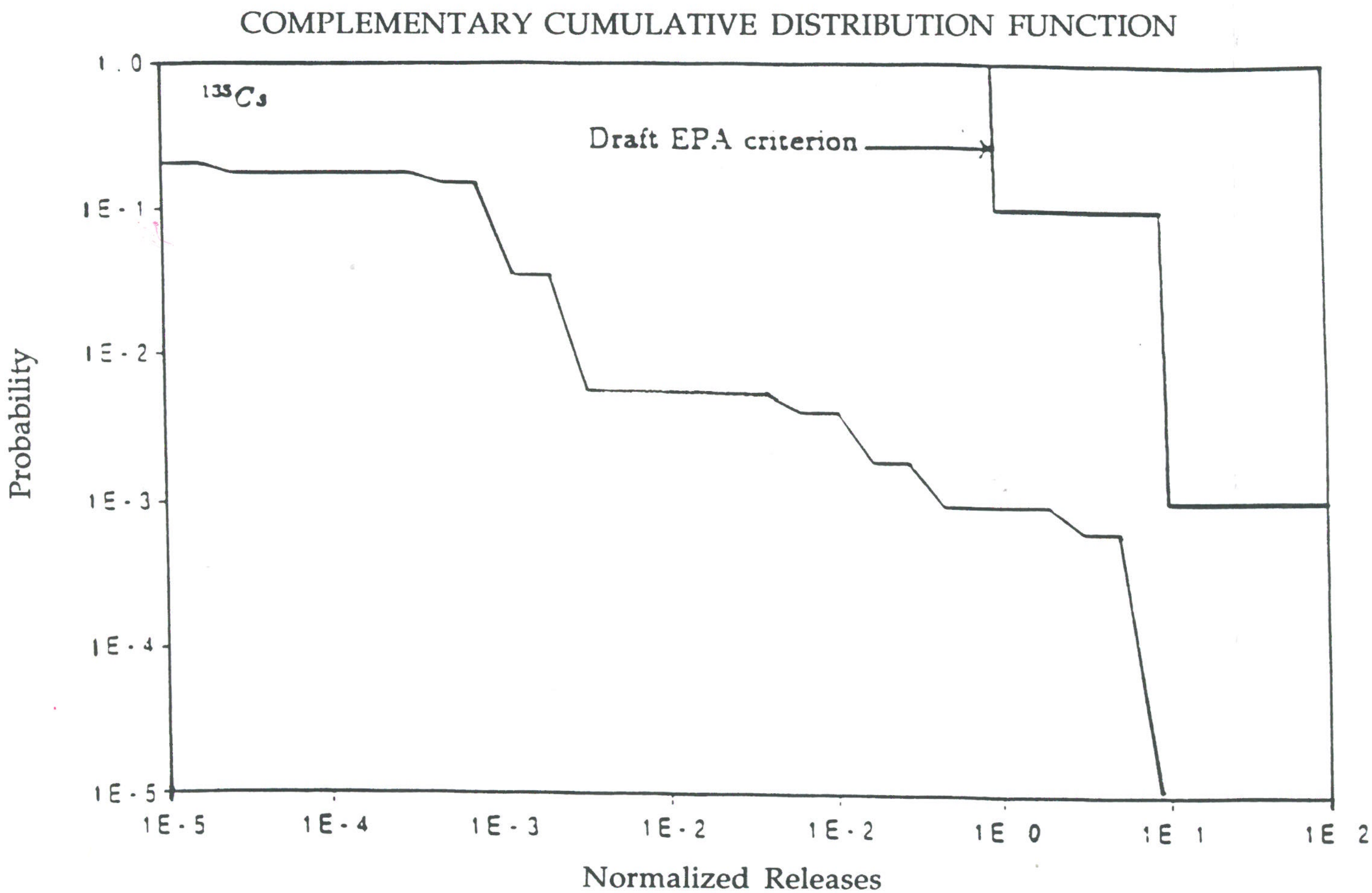


Cumulative Curies Released vs. Time for 10,000 Years



CCDF of Cumulative Curies Released at 10,000 Years (Log Probability Axis)

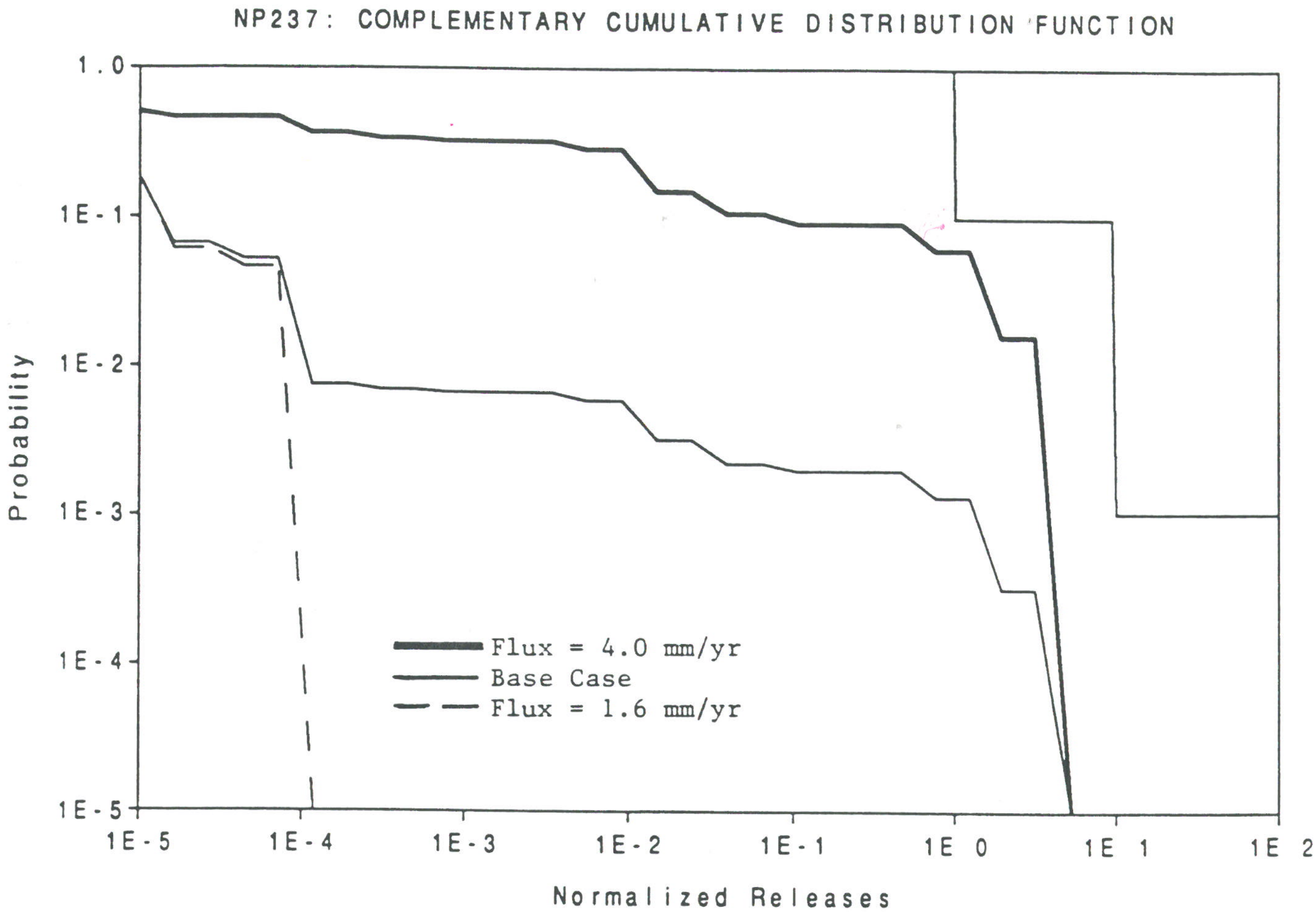
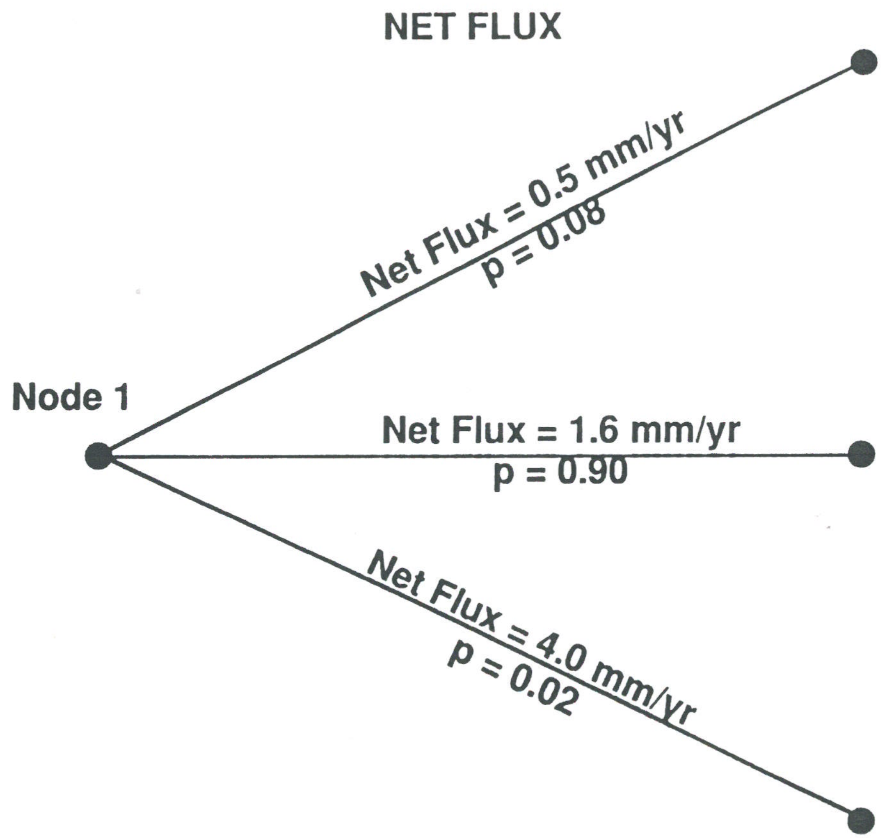
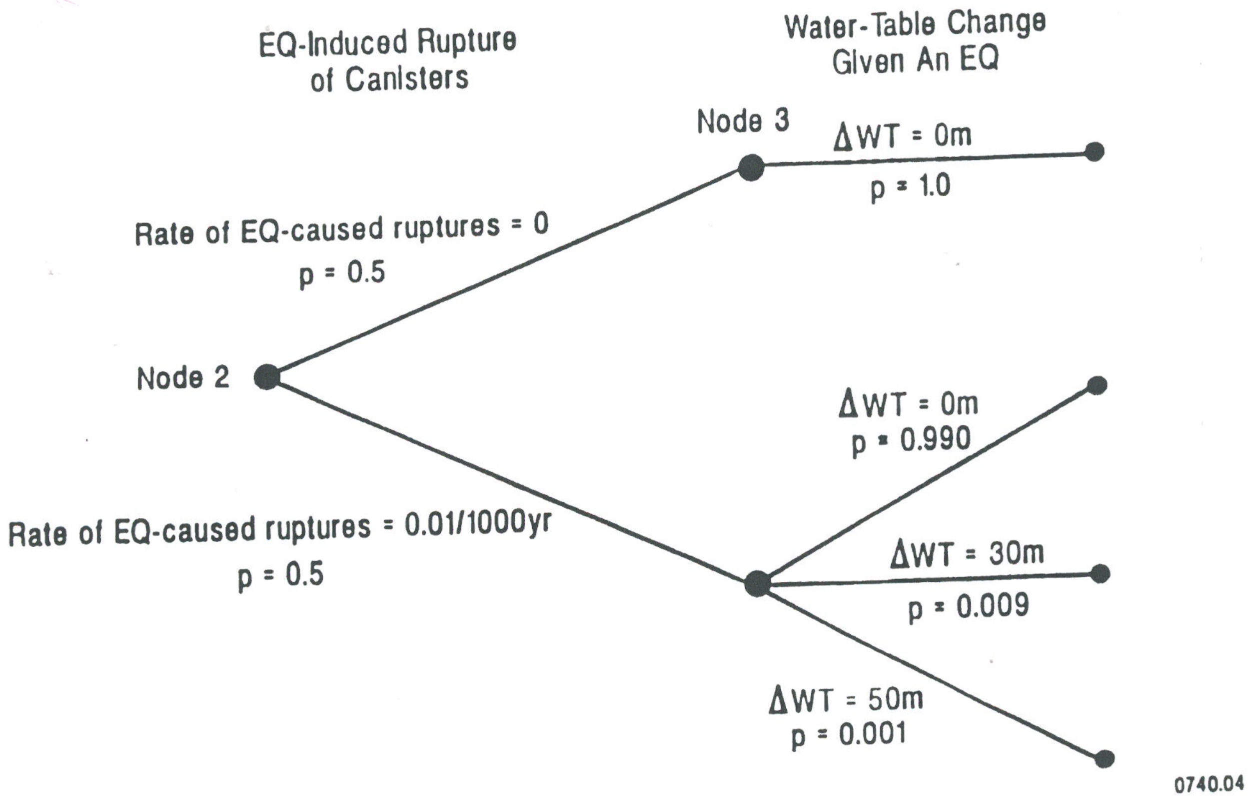


Figure 1: Sensitivity to hydrologic flux values.

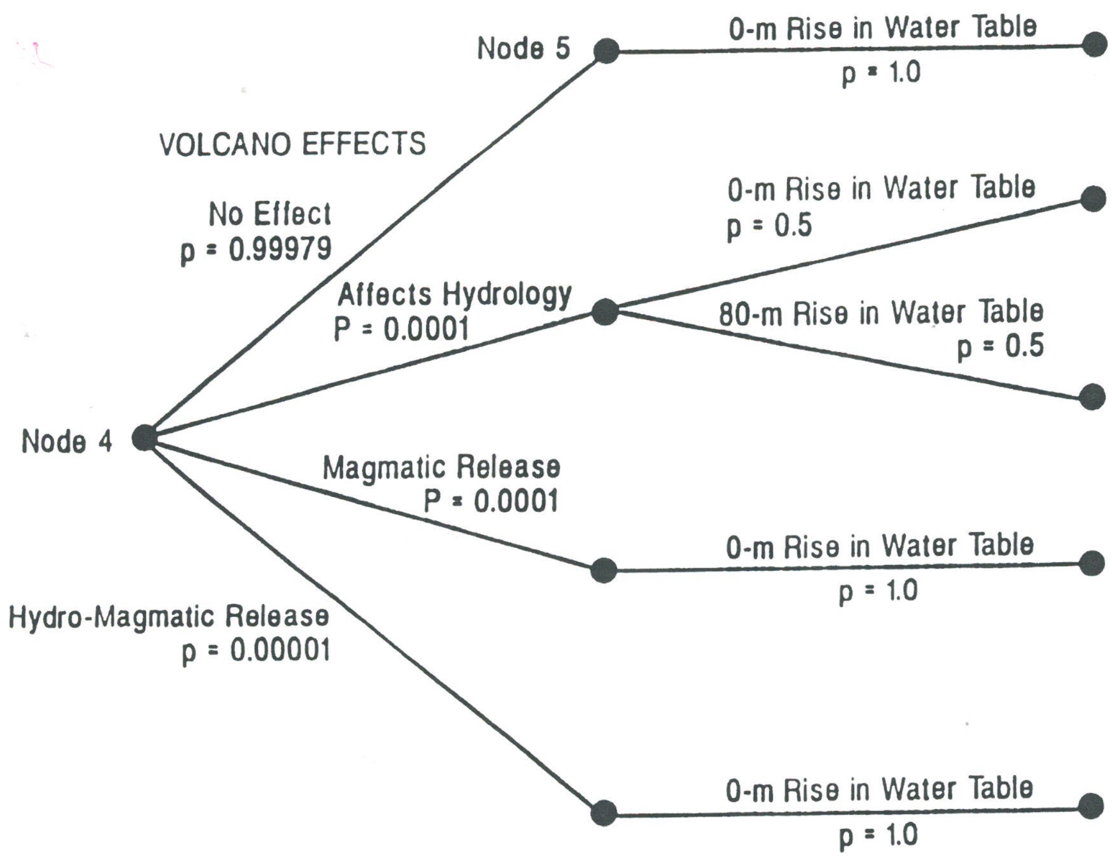


Logic Tree Values and Probabilities for Node 1

LOGIC TREE VALUES AND PROBABILITIES FOR NODES 2 AND 3



LOGIC TREE VALUES & PROBABILITIES FOR NODES 4 AND 5
Water-Table Change - Volcano



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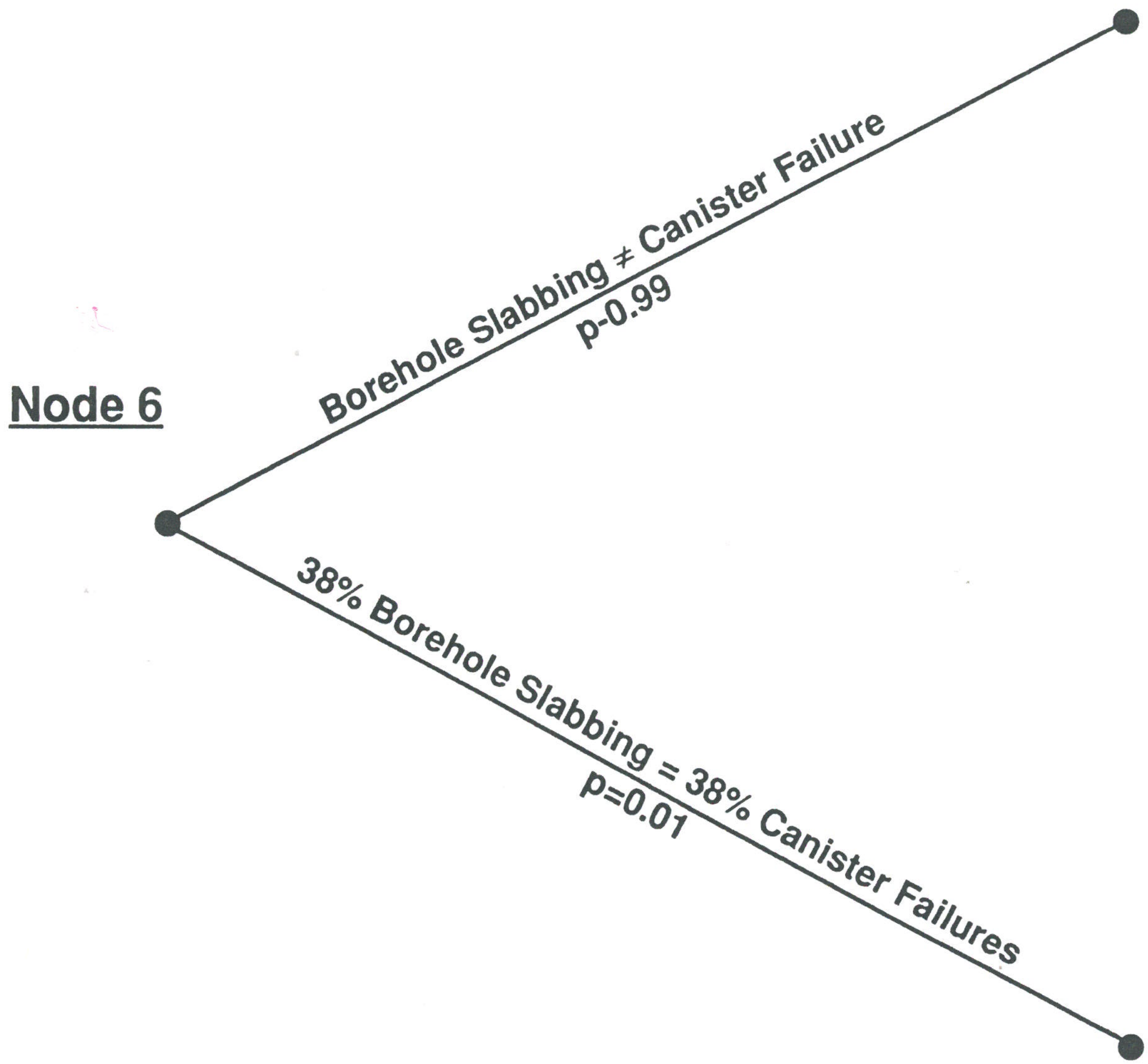
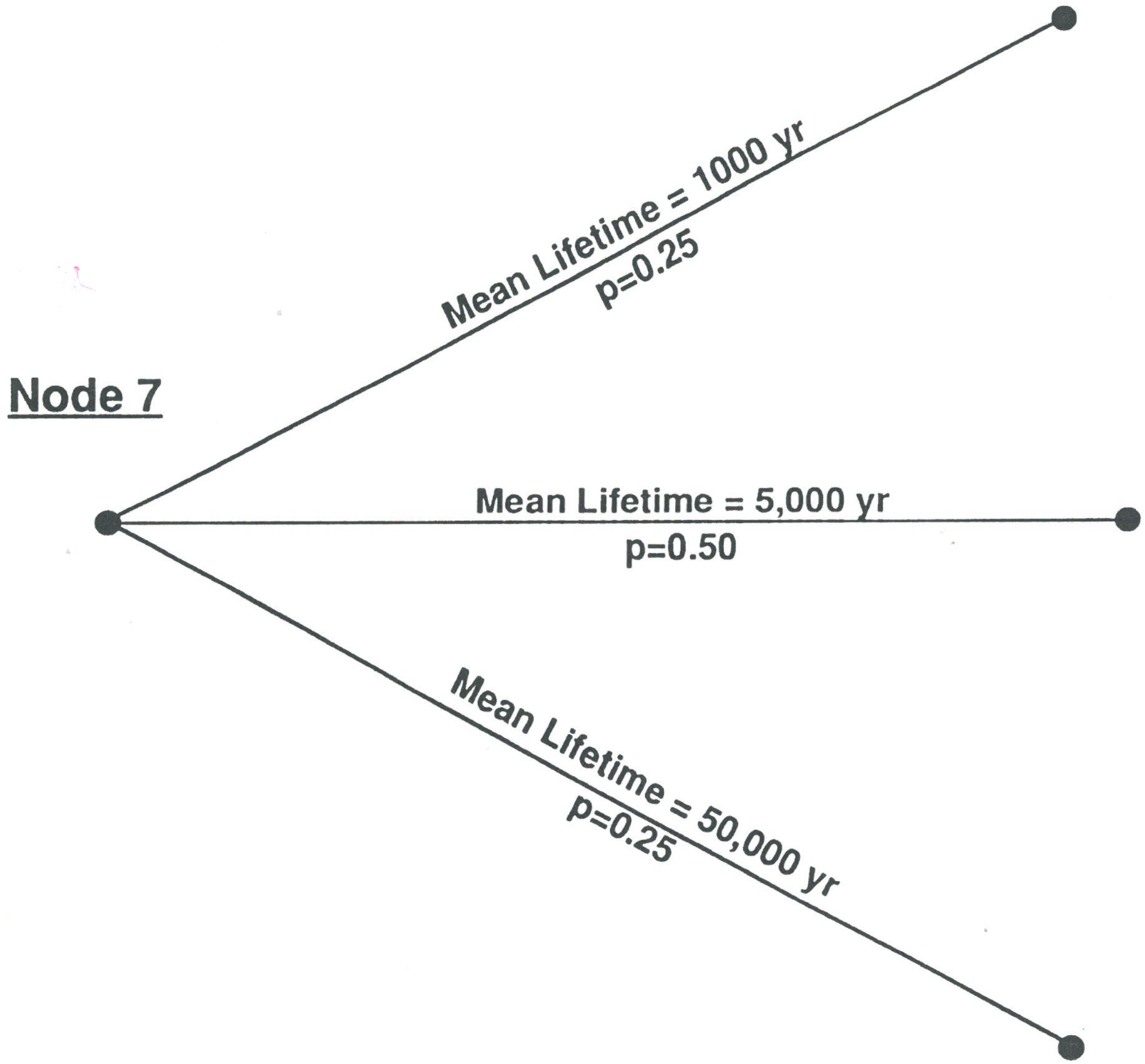
BOREHOLE STABILITY



Elements of logic tree for borehole stability, for weak and moderate canisters.
(Strong canisters are unaffected by borehole slabbing.)

CANISTER PERFORMANCE



Logic tree elements for canister design

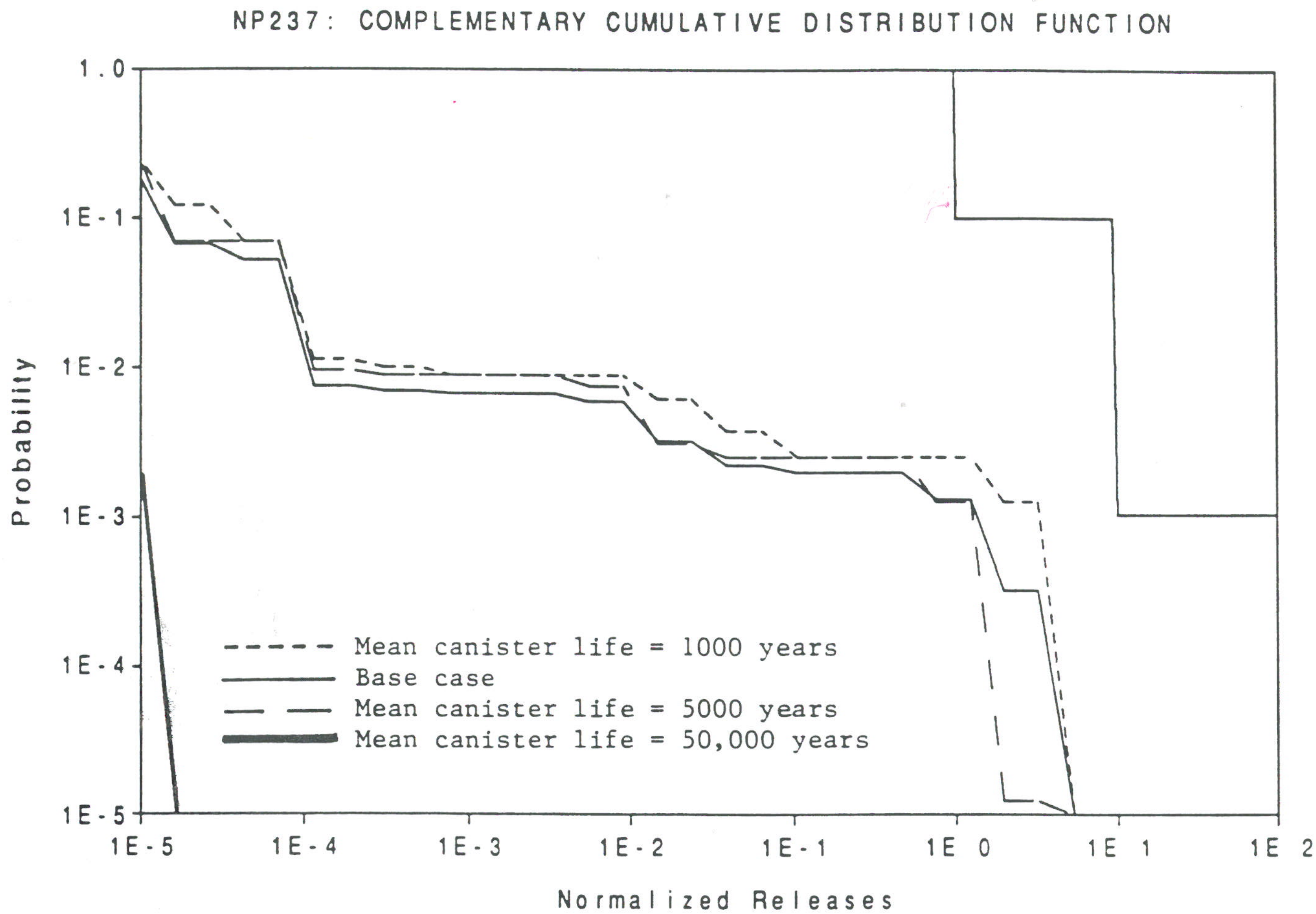
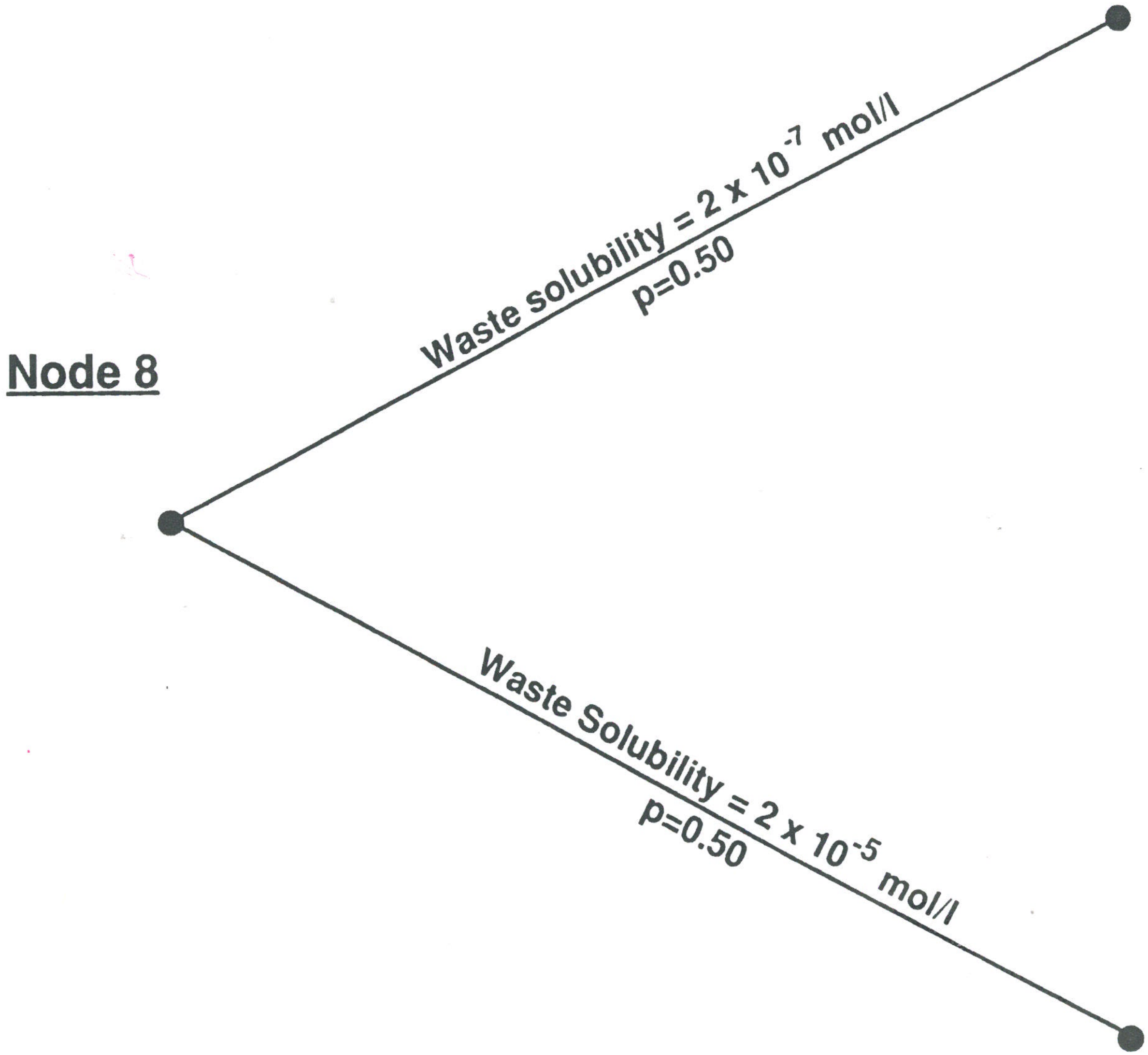
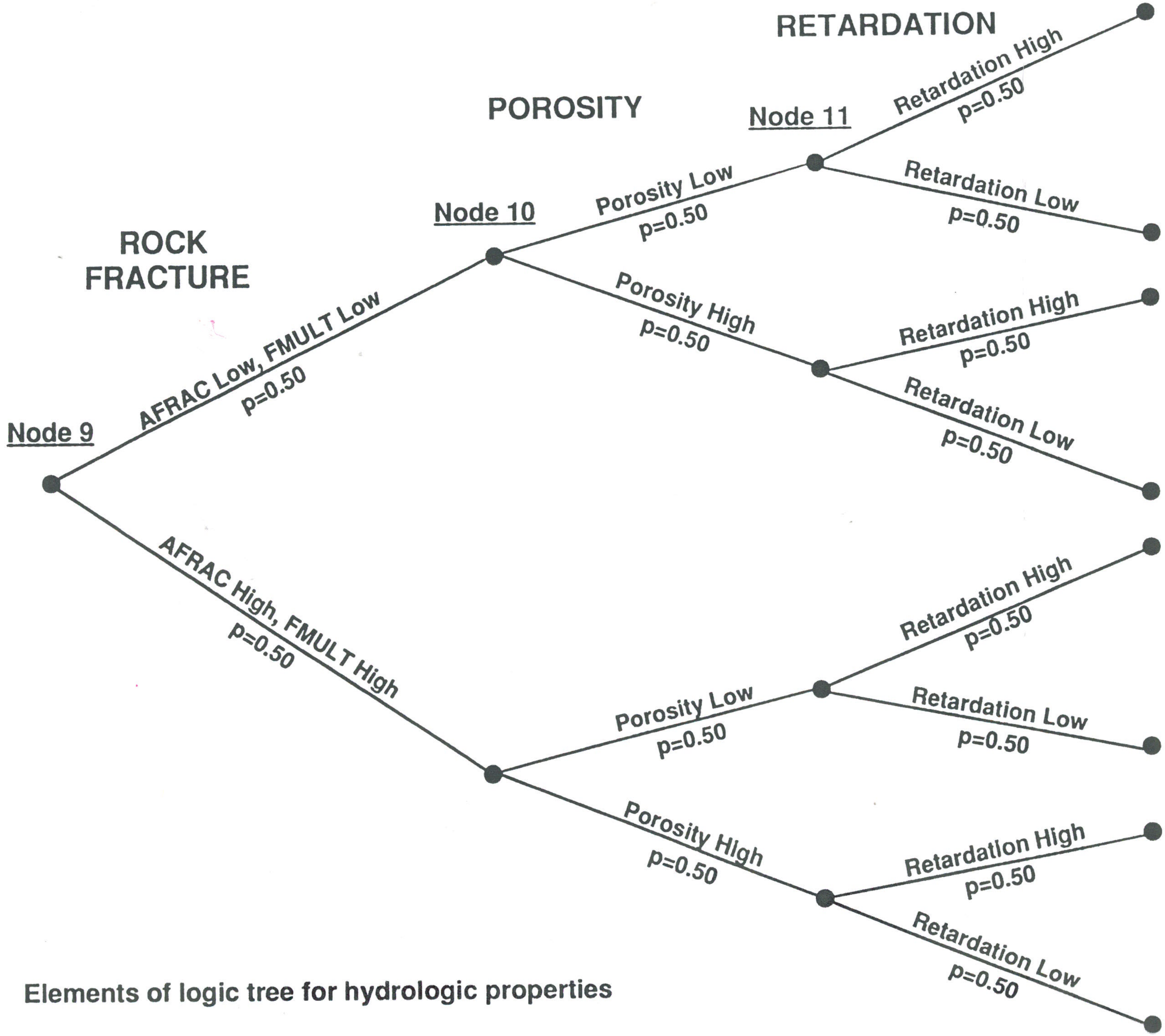


FIGURE 6: Sensitivity to canister design parameters.

GEOCHEMICAL EFFECTS



Elements of logic tree showing geochemical effects.



Elements of logic tree for hydrologic properties

Key Features

- Capture uncertainties
- Integrative aspects of model
- Transfer functions
- Document assumptions, conclusions, etc.

Current Key Efforts

- Gaseous transport
- Add time-dependence for inputs
- Non-homogeneous hydrologic properties
- Temperature dependence
- Human intrusion
- Model infiltration
- Strengthen linkages