

American Nuclear Society

12th International
High-Level Radioactive Waste
Management Conference
2008

September 7-11, 2008
Las Vegas, Nevada, USA

Volume 1 of 2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571
www.proceedings.com

ISBN: 978-1-60560-486-2

Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2008) by the American Nuclear Society.
All rights reserved.

For permission requests, please contact the American Nuclear Society
at the address below.

American Nuclear Society
555 North Kensington Avenue
LaGrange Park, Illinois 60526

American Nuclear Society
12th International
High-Level Radioactive Waste Management Conference
2008

TABLE OF CONTENTS

Volume 1

N-1-FLOW AND TRANSPORT PROCESSES

Scaling of Surface Water-subsurface Water Interaction with Implication to Hydrogeological Site Evaluations	1
<i>A. Worman, L. Marklund, S. Xu, B. Dverstorp</i>	
Groundwater Flow Through the Funeral Mountains, Death Valley National Park, California.....	5
<i>J. Bredehoeft, C. Fridrich, M. King</i>	
Accommodating Transient Velocities in Time-domain Particle Tracking Simulations of Radionuclide Transport.....	14
<i>S. Painter</i>	
Multiscale Analysis of Radionuclide Migration Using Markov Chain Models	20
<i>D. Kawasaki</i>	
Semi-Analytical Solutions for the Pseudo-Colloids Migration in the Fractured Porous Matrix	28
<i>M.S. Jeong, Y. Hwang</i>	
Thermohydrological Behavior in Rock Pillars Between Emplacement Drifts at Yucca Mountain Repository.....	33
<i>W. Zhou, M. Apted, J.H. Kessler</i>	

N-2-YUCCA MOUNTAIN FLOW AND TRANSPORT MODELING

Infiltration History at Fortymile Wash	41
<i>A. Woocay, J.C. Walton</i>	
Predictive Uncertainty Analysis for a Saturated Zone Flow Model	47
<i>A.A. Eddebbagh, S.C. James, J.E. Doherty</i>	
An Updated Site Scale Saturated Zone Ground Water Transport Model for Yucca Mountain	56
<i>S. Kelkar, M. Ding, S. Chu, B. Robinson, B. Arnold, A. Meijer</i>	
Sensitivity Analyses of Radionuclide Transport in the Saturated Zone at Yucca Mountain, Nevada	64
<i>B.W. Arnold, T. Hadgu, C.J.M. Sallaberry</i>	

Sensitivity Analysis of Unsaturated Flow Uncertainty at Yucca Mountain.....	73
<i>F. Pan, J. Zhu, M. Ye, Y.S. Wu, Z. Yu</i>	

N-3-GEOCHEMICAL STUDIES AND GEOSCIENCE DATA

Distribution of Natural Rare Earth Elements in Konrad Host Rock.....	81
<i>B. Kienzler</i>	
Yucca Mountain Region Groundwater Geochemical Data Analyses	87
<i>O. Al-Quudah, A. Woocay, J.C. Walton</i>	
Lead Isotopes and Trace Metals in Dust at Yucca Mountain	95
<i>L.A. Neymark, L.M. Kwak, Z.E. Peterman</i>	
Applying Systematic Geosynthesis Methodology to Surface-based Investigations in "Horonobe URL Project", Japan	101
<i>K. Hatanaka, N. Shigeta, T. Fukushima</i>	
Site-descriptive Modelling for Geoscientific Understanding of the Forsmark Site, Sweden.....	109
<i>S. Kristina, A. Strom, J. Andersson, K. Ahlbom, T. Lindborg, A. Winberg</i>	
Geosynthesis: Application in Switzerland and Elsewhere - What's Next?	120
<i>E. Vomvoris, C. Sprecher, I. Gaus, K. Kaku</i>	

N-4-SITE CHARACTERIZATION AND PROPERTY MEASUREMENTS

Jointing Structure Characterization for the Preselected Area of China's Deep Geological Disposal of High-level Radioactive Waste	127
<i>G. Wang, C. Yang, L. Yin</i>	
Tectonic Hazard and the Siting of Japan's HLW Repository: Preliminary Results of the Tohoku Case Study in the Itm Project	134
<i>H. Tsuchi, J. Goto</i>	
Hydraulic Head and Salinity Calibration of the Paris Basin Hydrogeological Model Developed by Irsn	142
<i>A. de Hoyos, P. Viennot, E. Ledoux, C. Certes, M. Rocher</i>	
Expected Behavior of Basaltic Lava at the Proposed High Level Nuclear Repository at Yucca Mountain, Nevada.....	150
<i>M.M. Morrissey, M. Apted, J. Kessler</i>	
Testing Models for Basaltic Volcanism: Implications for Yucca Mountain, Nevada	156
<i>E. Smith, C.P. Conrad, T. Plank, A. Tibbetts, D. Keenan</i>	
Conceptual Groundwater Flow Modeling from Non-disturbing Drilling in Sedimentary Rocks.....	165
<i>K. Ito, Y. Suzuki, T. Suko, N. Takeno</i>	
Effective Kd Values for Radionuclides in Yucca Mountain Saturated Alluvium	171
<i>C.A. Dean, P.W. Reimus</i>	
Biogeochemical and Microbiological Site-characterization of the Deep Geological Environment	179
<i>Y. Suzuki, T. Suko, N. Takeno, K. Ito</i>	
Millimeter-scale Geologic Mapping Using Field Spectroscopy Techniques	184
<i>D.C. Buesch, D.E. Ragona, M.C. Helmlinger</i>	

Modeling of Transport Rates Through Unsaturated Soil at Pena Blanca.....	196
<i>K. Pekar, J. Walton, P. Goodell</i>	
Isotope and Chemical Monitoring of Modern Precipitation, Yucca Mountain, Nevada	204
<i>R.J. Moscati, K.M. Scofield, P.M. Fransioli, T.M. Moran, G.W. Jones</i>	

E-1-WASTE PACKAGE ISSUES

Analysis of Damage to Waste Packages Caused by Seismic Events During Post-closure	214
<i>S.W. Alves, S.C. Blair, S.R. Carlson, M. Gerhard, T.A. Buscheck</i>	
Microbial Impact on Selecting the Repository Sealing System Designs	221
<i>P. Maak</i>	
The Impact of Microbiologically Influenced Corrosion on the Lifetimes of the Yucca Mountain Engineered Barrier System	229
<i>F. King</i>	
Multipurpose Transportation, Aging, and Disposal Canisters for Used Nuclear Fuel - Capitalizing on the Lessons Learned.....	241
<i>R. McCullum</i>	

E-2-INTERNATIONAL PERSPECTIVES ON ENGINEERED BARRIERS

Development of Engineering Technology for Sedimentary Rock in "Horonobe URL Project", Japan	250
<i>K. Hatanaka, H. Morioka, T. Fukushima</i>	
Evolution of the EBS in the Ondraf/niras Disposal Concept for HLW and Spent Fuel	258
<i>S. Wickham, L. Harvey</i>	
Design Options for the UK's HLW Geological Disposal Facility	266
<i>N. Chapman, T. Baldwin, F. Neall, J. Mathieson, M. White</i>	
Posiva's Spent Fuel Disposal Program - Extension Before Construction.....	274
<i>J. Palmu, T. Aikas</i>	
Quantifying the Performance of Various EBS Emplacement Methods	280
<i>H. Kawamura, I.G. McKinley, S. Toguri, H. Asano</i>	
Thereda - Thermodynamic Reference Database for Nuclear Waste Disposal in Germany.....	287
<i>S. Gester, M. Altmaier, V. Brendler, S. Hagemann, H.J. Herbert, C. Marquardt, H.C. Moog, V. Neck, A. Richter, W. Voigt, S. Wilhelm</i>	

E-3-IN-DRIFT THERMAL-HYDROLOGIC ENVIRONMENT

Dual-permeability Modeling and Evaluation of Drift-shadow Experiments	291
<i>C.K. Ho, B.W. Arnold, S.J. Altman</i>	
Comparison of Axial Convection and Equivalent Dispersion Models in Emplacement Drifts	299
<i>G. Danko, D. Bahrami, J.T. Birkholzer</i>	
The Buffer in the SR-CAN Safety Assessment - Some Important Issues	308
<i>P. Sellin</i>	

Axial Temperature Variation Due to Radiation Exchange Between Concentric Cylinders.....	316
<i>T. de Bues</i>	
Due Diligence - Sealing a Fracture Zone in Underground Workings	324
<i>J.B. Martino, D.A. Dixon, D.P. Onagi</i>	

E-4-ENGINEERED SYSTEMS TRANSPORT PROCESSES

Studies to Quantify Effects of Water Inflow Rate on Backfill Behaviour	331
<i>D.A. Dixon, P. Keto, T. Sanden, D. Gunnarsson, J. Hansen, S. Anttila</i>	
Large-eddy, Post-closure Natural Convection CFD Model for Yucca Mountain	339
<i>G. Danko, D. Bahrami</i>	
Limitations and Patterns of Radionuclide Release from Partially Failed Containers	348
<i>L. Hamdan, J. Walton, A. Woocay</i>	
Development of Compartment Models for Radionuclide Transport in Repository Region	352
<i>H. Murakami, J. Ahn</i>	
Cation Exchange and Radionuclide Migration in the Engineered Barrier System	360
<i>R.A. Borrelli, S. Nagasaki, S. Tanaka</i>	

E-5-WASTE FORM BEHAVIOR

Researches in Safety of Compacted Waste and Spent Nuclear Fuel.....	367
<i>V. Wasselin-Trupin, C. Guipponi, N. Millard-Pinard, E. Serris, M. Pijolat, N. Bererd, C. Corbel, M.F. Barthe, P. C. Leverd</i>	
Testing Protocols for GNEP Waste Forms	372
<i>W.L. Ebert</i>	
High Burn-up UO₂ Fuel Corrosion Under Reducing Conditions.....	380
<i>P. Fors, P. Carbol, S. Van Winckel, K. Spahiu</i>	
Factors Affecting UO₂ Dissolution Under Geologic Disposal Conditions	388
<i>A. Casella, B. Hanson, W. Miller</i>	
Neptunium Thermodynamics in a Geological Repository for Spent Nuclear Fuel	395
<i>J.I. Friese, M. Douglas, B.D. Hanson, R.F. Payne, M.K. Edwards, P.P. Bachelor</i>	

Volume 2

Examining the Conservatisms in Dissolution Rates of Commercial Spent Nuclear Fuel	404
<i>B. Hanson</i>	
Contribution to Leaching Studies of High-burnup Spent Nuclear Fuel	412
<i>J. de Pablo, I. Casas, J. Gimenez, F. Clarens, E. Gonzalez-Robles, D. Serrano-Purroy, J.P. Glatz, D. Wegen, B. Christiansen, A. Martinez-Esparza</i>	
Grain Boundary Inventory and Instant Release Fractions for SBR Mox.....	418
<i>V.V. Rondinella, D. Serrano-Purroy, J.P. Hiernaut, D. Wegen, D. Papaioannou, M. Barker</i>	
Modelling the H₂ Inhibition Effect on UO₂ Matrix Dissolution	424
<i>J. Merino, L. Duro, A. Tamayo, J. Bruno</i>	

A Revised EPRI Source-term Model for the Dissolution of Commercial Spent Nuclear Fuel.....	432
<i>F. King, M. Kolar, R. Arthur, M. Apted</i>	
Water Availability Inside Proposed Yucca Mountain Repository Breached Waste Packages.....	440
<i>Y. Wang, C.F. Jove-Colon, M.E. Lord, P.D. Mattie, R.J. Mackinnon</i>	

B-1-BIOSPHERE TOPICS

Ambient Radon-222 Monitoring in Amargosa Valley, Nevada	446
<i>L.H. Karr, J.J. Tappen, T. Kluesner, D. Shafer, K.J. Gray</i>	
Glaciation Biosphere Model for a Canadian Used Fuel Repository	453
<i>P. Lum, F. Garisto</i>	
Uncertainty and Variability in Biospere Dose Conversion Factors for the Groundwater Release Scenario for Yucca Mountain	460
<i>G. Smith, J. Merino, M.W. Kozak</i>	
A Regulatory Modelling Strategy for Review of Dose Calculations	466
<i>S. Xu, B. Dverstorp, L. Marklund, A. Worman</i>	
Accumulation in the Overburden of Radionuclides from a Leaking Nuclear Waste Repository	473
<i>L. Marklund, S. Xu, A. Worman</i>	

T-1-POST-CLOSURE SAFETY ASSESSMENT

Broader Perspectives on the Yucca Mountain Performance Assessment	479
<i>P.N. Swift, K. Knowles, J. McNeish, S. David Sevougian, M. Tynan, A. van Luik</i>	
A Peer Review of the Yucca Mountain IMARC Total System Performance Assessment EPRI Model	486
<i>N.C. Garisto, D.G. Bennett, J. Andersson</i>	
Safety Assessments for Licensing a Spent Nuclear Fuel Repository in Sweden.....	493
<i>A. Hedina, J. Andersson, U. Kautsky, L. Moren, R. Munier, J.O. Naslund, K. Pers, I. Puigdomenech, P. Sellin, J.O. Selroos, K. Skagius, K. Spahiu, F. Vahlund, L. Werme</i>	
Regulatory Review of SKB's Dress-rehearsal Safety Assessment for a Swedish Spent Nuclear Fuel Repository.....	501
<i>B. Dverstorp, B. Stromberg</i>	
Development of the CYPRUS Information System for Performance Assessment in HLW Disposal	509
<i>Y. Hwang, M.S. Jeong</i>	
Safety Assessment of a Glaciation Scenario - Preliminary Results	513
<i>F. Garisto, J. Avis, P. Lum, G. Kwong</i>	
Simplified Probabilistic Seismic Hazard Model for Yucca Mountain	521
<i>M. Stirling</i>	

T-2-YUCCA MOUNTAIN TOTAL SYSTEM PERFORMANCE ASSESSMENT

Yucca Mountain 2008 Performance Assessment: Conceptual Structure and Computational Organization	524
<i>J.C. Helton, C.W. Hansen, C.J. Sallaberry</i>	

Yucca Mountain 2008 Performance Assessment: Modeling Disruptive Events and Early Failures.....	533
S.D. Sevougian, A. Behie, V. Chipman, M.B. Gross, S. Mehta, W. Statham	
Yucca Mountain 2008 Performance Assessment: Modeling the Engineered Barrier System	542
R.J. MacKinnon, R.G. Baca, A. Behie, Y. Chen, V. Chipman, J. Lee, K.P. Lee, P.D. Mattie, S. Mehta, K.G. Mon, J.D. Schreiber, S.D. Sevougian, C.T. Stockman, E.D. Zwahlen	
Yucca Mountain 2008 Performance Assessment: Modeling the Natural System.....	550
P.D. Mattie, T. Hadgu, B. Lester, A. Smith, M. Wasiolek, E. Zwahlen	
Yucca Mountain 2008 Performance Assessment: Uncertainty and Sensitivity Analysis for Physical Processes.....	559
C. J. Sallaberry, A. Aragon , A. Bier, Y. Chen, J.W. Groves, C.W. Hansen, J.C. Helton, S. Mehta, S.P. Miller, J. Min, P. Vo	
Yucca Mountain 2008 Performance Assessment: Uncertainty and Sensitivity Analysis for Expected Dose.....	567
C.W. Hansen, K. Brooks, J.W. Groves, J.C. Helton, K.P. Lee, C.J. Sallaberry, W. Statham, C. Thom	
Yucca Mountain 2008 Performance Assessment: Summary	575
P.N. Swift, K. Knowles, J. McNeish, C.W. Hansen, R.L. Howard, R. MacKinnon, S.D. Sevougian	

T-3-UNCERTAINTY AND SENSITIVITY ANALYSES

Use of Robust Sensitivity Indices to Analyze the Structure of Stochastic Performance Assessment Models	582
O. Pensado	
Numerical Illustration: Effects of Uncertainty and Bias on Risk Predictions.....	588
R.W. Rice, J.C. Walton	
"What-if?" Calculations to Illustrate Fault-Movement Effects on a HLW Repository	593
K. Miyahara, M. Inagaki, M. Kawamura, T. Ebina	
Uncertainty Analysis of Radionuclide Release Rate from a Geologic Repository	600
D. Kawasaki, S. Nagasaki, S. Tanaka	
Total System Model Support for the Yucca Mountain Project	608
D. Kim, S.G. Gillespie, S.L. Turner	
Repository Conditions and Environmental Impacts Reduction by Recycling	614
J. Ahn	

R-1-INTERNATIONAL REGULATORY ISSUES

Security Concerns at the Back End of the Nuclear Fuel Cycle.....	622
C. McCombie, N. Chapman, T. Isaacs	
Ukrainian General Provisions on Safe Disposal of Radioactive Waste in Geological Repositories	627
E. Slobotovich, B. Zlobenko, L. Spasova, A. Pavlenko, Z. Alexeeva	
Development of the Requirement Management System for Japanese HLW Program	631
S. Suzuki, H. Ueda, Y. Sakabe, K. Ishiguro, K. Kitayama, K. Oyamada, S. Yashio	

A Scaled-back QA Program Suitable for Basic Research	637
<i>A.J. Smiecinski, R.E. Keeler, J.A. Bertoia, T.L. Mueller</i>	
Overview of the IAEA's New Safety Guide for Geological Disposal	641
<i>J. Rowat, T. McCartin, P. Metcalf</i>	
Towards a Globally Harmonized Approach to Demonstrating the Safety of Geological Disposal.....	648
<i>P. Metcalf, D. Louvat, G. Bruno, F. Besnus</i>	

I-1-NATIONAL PROGRAMS AND POLICIES

20 Years of HLW Repository Equipment Development in Germany from Conceptual Design to Full-scale Demonstration of Waste Encapsulation, Handling, and Disposal	655
<i>E. Biurrun, B. Haverkamp, W. Filbert, W. Bollingerfehr</i>	
Site Selection in Switzerland - the Sectoral Plan and Nagra's Responsibilities	663
<i>E. Vomvoris, P. Zuidema, L. Johnson</i>	
High-level Waste Management in Korea.....	670
<i>J. Choi</i>	
Effects of Future Deployment of Nuclear Power in the Netherlands.....	676
<i>J. Hart, A.I. van Heek</i>	
Impact of Nuclear Renaissance on Waste Management Programs: A South Africa Perspective	684
<i>M. E. Makgae, Z.N Hlatshwayo</i>	
IP Funmig: Achievements Within the European Far-field Project	688
<i>B. Kienzler, G. Buckau</i>	
WIPP - a Safely Operating, Expandable, Proof of Principle for Deep Geological Disposal of Long-lived Radioactive Materials	695
<i>G.E. Dials, L.G. Eriksson</i>	

I-2-INSTITUTIONAL ISSUES

Does Nuclear Waste Stigmatise a Municipality Selected for Final Disposal? - Experiences and Results Six Years After Site Selection in Finland	704
<i>T. Seppala</i>	
Proposal for an International Reversibility-retrievability Scale	709
<i>J.N. Dumont, M.C. Dupuis, J.M. Hoorelbeke, T. Labalette, G. Ouzounian</i>	
Trust, Distrust, and LLW Management in Three Ontario Communities	717
<i>E. Meadd</i>	
NWMO as Implementer: Early Steps in Moving Forward Together	722
<i>J.A. Facella</i>	
A Nuclear Renaissance Without Disposal?	730
<i>C. McCombie, N. Chapman</i>	

Addressing Public Confidence in the Case for Yucca Mountain Safety	737
<i>A.E. Van Luik, D. Dobson, P.N. Swift, M.C. Tynan</i>	

O-1-CHEMICAL PROCESSES FOR MANAGING WASTES

Determining Aluminum Compounds and Amounts in Hanford Tank Waste	744
<i>R.F. Gimpel, D.A. Reynolds</i>	
A pH Criterion for Controlling Pretreated Hanford Waste Slurry Rheology	749
<i>J.G. Reynolds</i>	
RECOZY: Investigations of Redox Controlling Systems in EU's 7th Framework Programme	755
<i>B. Kienzler, G. Buckau</i>	
Retrievability of Metals in the Borosilicate Glass for Nuclear Waste.....	761
<i>Y. Enokida, K. Sawada, K. Uruga</i>	
Alternative Use of Irradiated Graphite Waste	768
<i>W.C. Meyer, A Goede, I. van der Walt</i>	

O-2-FACILITIES, TRANSPORTATION, AND FUEL ISSUES

A Study on Durability of Reinforced Concrete Structure for Spent Fuel Storage Facility	772
<i>Y.H. Lee, C.M. Lee, K.J. Lee</i>	
Fluidized Bed Steam Reforming Enabling Organic High Level Waste Disposal.....	776
<i>M.R. Williams</i>	
A Low-PH Cement-based Combined Spent-nuclear-fuel Storage and Repository Facility	784
<i>C.W. Forsberg, L. Dole</i>	
Assessment of Spent Nuclear Fuel Transport Accident Risk Using Radtran 5.5	793
<i>E.M. Supko, J.H. Kessler</i>	
Determination of the Depletion Bias Using SAS2H for the K24 Burnup Credit Cask.....	799
<i>C.T. Rombough, D.B. Lancaster, S.H. Kim, G.U. Lee, J.H. Park</i>	
Preliminary Assessment of Burnup Credit for Dual-purpose Cask for SNF.....	803
<i>D. Kim, U. Lee, J. Ko, K. Choi</i>	

Author Index