

Waste Management Symposium (WM2022)

Globally Focused, Innovative,
Connected - WMS is Engaging the Future

Phoenix, Arizona, USA
6-10 March 2022

Volume 1 of 5

ISBN: 978-1-7138-8882-6

Printed from e-media with permission by:

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



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

Copyright© (2022) by Waste Management Symposia, Inc.
All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

For permission requests, please contact Waste Management Symposia, Inc.
at the address below.

Waste Management Symposia, Inc.
P.O. Box 27646
Tempe, Arizona 85285-7646
USA

Phone: +1 480-557-0263
Fax: +1 520-829-3550

www.wmsym.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

VOLUME 1

SESSION 007 - INNOVATIVE FIELD MONITORING FOR ENVIRONMENTAL REMEDIATION

Advanced Long-term Environmental Monitoring Systems (ALTEMIS) for Sustainable Remediation	1
<i>Haruko Wainwright, Hansell Gonzalez Raymat, Thomas Danielson, Zexuan Xu, Dafflon Baptiste, Sebastian Uhlemann, Kai Vetter, Aurelien Meray, Satyarth Praveen, Masudur Siddiquee, Brian Quiter, Himanshu Upadhyay, Miles Denham, Carol Eddy-Dilek, Tim Johnson</i>	
Using Electrical Resistivity Tomography on the Hanford Site to Identify Subsurface Pathways to Support Site Management Decisions.....	13
<i>Rob Mackley, Judy Robinson, Tim Johnson, Jon Thomle, Doug McFarland, Matthew Tonkin, Vicky Freedman</i>	
A Multi-Level Porewater and Gas Sampling Tool for Evaluating Contaminant Flux in the Vadose Zone to Groundwater.....	23
<i>Dorothy Linneman, Chris Strickland, Delphine Appriou, Mark Rockhold, Jon Thomle, Jim Szecsody, Paul Martin, Vince Vermeul, Rob Mackley, Vicky Freedman</i>	

SESSION 008 - SNF STORAGE IMPROVEMENT

DOE SNF Packaging Demonstration Project Overview and 2021 Activities.....	30
<i>Daniel Thomas</i>	
Development of New Simulation Techniques to Assess Packaging and Containment Arrangements for Special Nuclear Material (SNM)	44
<i>Paul Williamson, Tim Ashworth, Helen Steele, Robert English, Pawel Woelke, Saffron Wyse, Thornton Tomasetti</i>	
Modeling of ATR Fuel in DOE Standard Canisters with Helium Backfill	55
<i>Josh Jarrell, Alexander Abboud</i>	
Evaluation of DOE's Research to Examine the Performance of Commercial High Burnup SNF During Storage and Transportation.....	70
<i>Daniel Ogg, Robert Einziger</i>	

SESSION 009 - DEVELOPMENTS IN DEEP BOREHOLE DISPOSAL AROUND THE WORLD

Methodology for Designing Deep Boreholes for Disposal of Radioactive Waste	80
<i>Toivo Wanne, Tilman Fischer, Hans-Joachim Engelhardt, Dirk Mallants</i>	
Preliminary Technology Readiness Assessment of Deep Borehole Disposal.....	95
<i>Ethan Bates, Mark Frei, John Midgley, John Mathieson, Rod Baltzer</i>	
Implementing Deep Borehole Disposal: Study of International Stakeholder Views from Regulatory, Policy & WMO Communities	105
<i>Chris Parker, Filippa Brundish, Betsy Madru, John Mathieson, Neil Chapman</i>	

SESSION 010 - PLANS FOR AND EXPERIENCE IN TRANSITIONING FROM OPERATIONS TO DECOMMISSIONING

Development of an Integrated Decommissioning Cost Estimate Method	120
<i>Dane Watson, Gerald Williams, Michael Snyder, Charles Beatty</i>	
Experiences on Radioactive Liquid Waste Treatment in Nuclear Decommissioning Projects with the NURES® Technology	124
<i>Antti Ketolainen, Wenzhong Zhang, Jukka Rahnasto, Martin Lerche</i>	
UK Magnox Reactor Decommissioning Strategy	130
<i>John Norton, Simon Boniface</i>	

SESSION 011 - APPLICATION OF INNOVATIVE D&D TECHNOLOGIES INCLUDING APPLICATION OF VIRTUAL REALITY

Robots and Lasers for Safer, Faster, Better Value Decommissioning.....	141
<i>Christopher Hope, Alan Cardwell</i>	
Biomaterial Sealing of Cracks in Degraded Concrete Nuclear Structures	156
<i>Arianna Pagano, Rebecca Lunn, Gráinne El Mountassir, James Minto, Ronald Turner, Emmanuel Salifu</i>	
Game Changers: Innovation in Nuclear Decommissioning.....	161
<i>Frank Allison, Andy Cooney, Paul Knight, Deborah Bowering</i>	
Underwater Spectroscopic Techniques for In-situ Nuclear Waste Characterisation.....	172
<i>David Megson-Smith, Yannick Verbelen, John Day, Thomas Scott, Jonathan Teague</i>	

SESSION 012 - EXPERIENCE IN PROCESSING SPECIAL LLW/ILW FORMS WORLDWIDE

Screening of Media for Iodine Removal from Liquid Feeds to the Hanford Effluent Treatment Facility.....	181
<i>Philip Schonewill, Matthew Asmussen, Gary L. Smith, Elsa Cordova, Alessandra Yamagata, Agathe Bourchy, Ridha Malbrouki, Rodney Skeen, David J Swanberg</i>	
Steam Generator Waste Management Using a Rip & Ship Approach	190
<i>Christophe Maufrays, Arne Larsson, Fredrik Nilsson, Gregor Krause, Heiko Herbell</i>	

SESSION 017 - STORAGE AND RETRIEVAL OF HLW

Qualification of Hanford Low-Activity Waste Feed for Pretreatment and Vitrification: An Integrated Approach	199
<i>Julie Colby, Darryl Nelson, Peter Benson, Bryce Eaton, Marissa Ammer</i>	
Real-Time Sampling for Process Control and Validation: Leveraging On-Line Monitoring Advances in Wastes from Hanford Tanks to Gas Phase Species	208
<i>Sam Bryan, Amanda Lines, Heather Felmy, Matthew S. Fountain</i>	
Overview of the Hanford Lead Canister.....	214
<i>Nicholas Klymyshyn, Sarah Suffield, Eric Berglin, Carl Enderlin</i>	

SESSION 018 - RADIOLOGICAL CHARACTERIZATION METHODS FOR LLW/ILW WORLDWIDE

Remote Access Training for Certification of Real-Time Radiography (RTR) Personnel to Support the WIPP Waste Characterization Program	225
<i>Georgia Kareis, Terri-Anne Groover</i>	
Faster, Accurate and Automatic Bulk Assay Systems: Construction, Testing, and Lessons Learned from Recent Deployments	233
<i>Marcel Villani, Amol Patil, John Kirkpatrick, Sasha Philips, Patricia McClay, Jeffrey Lagana, Cory Binnersley, Richard Ratner</i>	
Improvement of Quantification in Non-Destructive Characterization of Radioactive Waste Packages	247
<i>Stefan Rummel, Thomas Bücherl, Christoph Lierse Von Gostomski</i>	

SESSION 019 - INNOVATIVE FIELD MONITORING FOR ENVIRONMENTAL REMEDiation

Evaluation of Laser-Induced Breakdown Spectroscopy as a Field Screening Tool for Beryllium at the Luckey FUSRAP Site	257
<i>Peter Lorey, Brian Sparks, Adam Miranda</i>	
Reconstruction of the Background Gamma-ray Spectrum for Scanning Measurements During Characterization and Final Status Survey	272
<i>Dávid Bednár, Martin Listjak, Vladimír Necas</i>	
Understanding the Role of Biotic Vectors in the Accumulation and Spread of Radioactive Contamination on the Savannah River Site	282
<i>Mary Chapman, Guha Dharmarajan, A. Larry Bryan Jr., Travis Devault, Linda Lee, Olin E. Rhodes Jr.</i>	

SESSION 021 - D&D OF NUCLEAR POWER PLANTS

Dismantling of the Bohunice V1 Reactor Coolant System	299
<i>Joseph Boucau, Per Segerud, Matej Zachar, Marian Stubna, Tibor Rapant</i>	
Deep Decontamination of Tritium and C-14 Embedded Concrete	308
<i>Brian Gihm, Megan Goodland, Amar Jolly</i>	
Dismantling of the Ågesta PHWR Reactor Vessel and Internals	315
<i>Niklas Bergh</i>	
Decommissioning a Fleet of Cooling Ponds in the U.K. - Evolution and Learning Across a 20y Programme	324
<i>Phoebe Lynch</i>	

SESSION 022 - FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM (FUSRAP) AND US ARMY CORPS OF ENGINEERS PROJECTS

Managing FUSRAP Ineligible Sites	339
<i>Cliff Carpenter, Linda Sheader</i>	

Status, Progress, and Future Plans for Soil Sorting at the Iowa Army Ammunition Plant (IAAAP)	352
<i>Brian Young, Jonathan Rankins, Michael Winters, Greg Bright, Greg Rakers</i>	
Use of Aerial Radiological Surveys to Identify Low-Level NORM Associated with a Remediation Site.....	359
<i>Theodore Rahon, Lisa Szegedi, Ann Ewy, David Hays</i>	
Application of Indistinguishable from Background at FUSRAP Sites	369
<i>David Hays, Ann Ewy, Dan Kennedy</i>	
Integrated Geospatial Technologies for Expedited Site Closure at the Former DuPont Chambers Works Site (FUSRAP).....	377
<i>Daniel Caputo, Don Wadsworth, Daniel Sirkis, Dave Watters, Tim Cushman</i>	
Re-inventing Relationships for Revamped Radiological Remediation	383
<i>Daniel Sirkis, Joseph Loeper, Dave Watters, Daniel Caputo, Don Wadsworth, Thomas Cornuet, Tim Cushman, Christopher Bowles</i>	
Certification Summaries and Desktop Assessments Ensure Protection of FUSRAP Completed Sites	389
<i>Darina Castillo, Jill Bennett, Ellen Tomlinson</i>	

SESSION 023 - HLW, SNF/UNF AND LONG-LIVED ALPHA/TRU PROGRAMS AND POLICIES

Developing the Feed Selection & Sequencing Strategy for Hanford Waste Feed Delivery	403
<i>Zabrina Smith, Bryce Eaton</i>	
Risk Mitigation - A Case Study in Iodine.....	409
<i>Laura Cree, Todd Wagnon</i>	
Optimization of Closure for Hanford's Waste Management Area C through Systems Engineering Analysis.....	422
<i>Michelle Hendrickson, Terry Sams, Joan Wu</i>	
RWM Overview of the Challenge's Metallic Fuels and Chemically Reactive HAW Presents for Geological Disposal.....	443
<i>Martin Cairns, Robin Cowley, Paul Skelton</i>	
A Citizens' Conference on the Industrial Pilot Phase of the French Deep Geological Disposal Project to Feed its Construction.....	461
<i>Pascal Claude Leverd, Daniel Delort</i>	

SESSION 024 - TANK FARM PROCESSING

The Destination and the Journey: Safely Navigating Waste Transfers in the SRS Tank Farms	466
<i>Jason Stergion, Warren Ottenfeld</i>	
Enhanced Commercial Submersible Mixer Pump (ECSMP) - Development, Testing, and Benefit to SRS Waste Removal	474
<i>Alexander Herd</i>	
Performance of Enhanced Low Volume Mixing Jets for Salt Dissolution - Development, Deployment, Results, and Benefits to SRS	482
<i>Sarah Kelly, Eric Barrowclough, Timothy Baughman</i>	

Evaluation of Pipeline Flushing Requirements for High-Level Waste at Hanford and Savannah River.....	496
<i>Brendon Cintas, Shervin Tashakori, Dwayne McDaniel, Aparna Aravelli, Desmond Sinnott, Michael Poirier</i>	

SESSION 025 - NON-RADIOLOGICAL CHARACTERIZATION METHODS FOR LLW/ILW WORLDWIDE

Measuring Liquid Low Activity Waste Simulants with Process Analytical Technology: Real-Time In-Line Monitoring at Hanford.....	508
<i>Stefani Kocavska, Steven Crouse, Rupanjali Gurprasad, Giovanni Maria Maggioni, Martha A. Grover, Ronald W. Rousseau</i>	
Smart Sensor Networks for Radioactive Waste Package Monitoring.....	516
<i>Jens Verbeeck, Dylan Gybels, Thomas Huys, Ying Cao</i>	
Data Fusion of ATR-FTIR and Raman Spectroscopies for Component Quantification: Applications at Hanford.....	524
<i>Steven Crouse, Stefani Kocavska, Rupanjali Gurprasad, Martha A. Grover, Ronald W. Rousseau</i>	

SESSION 026 - PERSPECTIVES ON MANAGEMENT OF NUCLEAR POWER PLANT LIQUID AND WET WASTE

Energy Saving Waste Water Treatment in Nuclear Industry by Evaporation with Vapor Compression.....	536
<i>Daniele David, Wolfgang Schuch</i>	
Waste Volume Reduction Factors Achieved Using AMFMTM Ultrasonically Regenerated Filters	545
<i>Dale Vines, Michael Little</i>	
Spent Nuclear Fuel Canister Deposition Modeling Update.....	560
<i>Nicholas Klymyshyn, Sarah Suffield, Philip Jensen, Ben Jensen, Brady Hanson, Steven Ross</i>	
Purification and Treatment of Waters from Wet Cutting Pools and Sludges Processing into SIAL® Matrix	568
<i>Helena Mrazova, Marcela Blazsekova, Maroš Juraška, Michaela Petrik Addova, Sergi Mila, Dušan Krásny</i>	

SESSION 032 - POSTERS - PACKAGING AND TRANSPORTATION

Developing the SRNL Radioactive Material Packaging Test Centre of Excellence.....	580
<i>Matthew Howard, Edward Ketusky</i>	
Verification and Validation of the Stakeholder Tool for Assessing Radioactive Transportation (START)	588
<i>Steven Maheras, Caitlin Condon, Philip Jensen, Patrick Royer, Harish Reddy Gadey, Mark Abkowitz, Robert Claypool, Matt Feldman</i>	

SESSION 033A - POSTERS - HLW, SNF/UNF AND LONG-LIVED ALPHA/TRU WASTE STORAGE AND DISPOSAL

Dry Storage System Design, Fabrication and Aging Management Strategy to Support Extended Storage for up to 300 Years	596
<i>Gary Cannell, Marie Gillespie, Jan Pennock, Gary Pyles</i>	
The Backfill Integrated Project: Providing Scientific, Technological, and Engineering Underpinning for UK GDF Backfill Materials.....	606
<i>William Bower, Robert Winsley, Shaun Robarts, David Holton, Matthew Kirby, David Lever</i>	
Process for Designing a Canister and Baskets for DOE-Managed SNF at INL	621
<i>Daniel Thomas, Sam Trost, Elmar Eidelpes, Evans Kitcher, Gordon Petersen</i>	
The Cigéo Project of French Deep Geological Repository: Evolution of Andra's Scientific and Technological R&D Programme to Prepare and Accompany Its Future Construction and Operating Development	635
<i>Daniel Delort, Frederic Plas, Marie-Anne Bruneaux</i>	

SESSION 033B - POSTERS - HLW, SNF/UNF AND LONG-LIVED ALPHA/TRU WASTE SENSORS

Progress Towards Radiation Hard Long-Term Smart Sensors	648
<i>Simon Malone, Paul Mort</i>	
Advancements in Integration of Raman-Based, Real-time Process Monitoring for Hanford Applications.....	653
<i>Sam Bryan, Amanda Lines, Michael Minette, Heather Felmy, Matthew S. Fountain, Isabelle Wheeler</i>	
Radiolysis Testing of SNF Materials and Surrogates in a "Mini-Canister".....	660
<i>Bruce Wiersma, Anna D'Entremont, Christopher Verst, Benton Randall, Joy McNamara, Andrew Duncan, Robert Sindelar</i>	
Calibration of a High Efficiency Neutron Counter using Diluted Plutonium Standards	674
<i>Adam Gallegos, William Mussman, Joe Harvill, James Zickefoose, John Kirkpatrick, William Searcy, Sean Stanfield, Daniel Remington</i>	
Aluminum Container Visual Examination for Wet Storage of Non-Aluminum-Clad Spent Nuclear Fuel.....	687
<i>Lisa Ward, Marvin Trimm, Kevin Counts, Sean Boland, Michelle Hromyak, Robert Sindelar, Christopher Verst</i>	

SESSION 033C - POSTERS - HLW, SNF/UNF AND LONG-LIVED ALPHA/TRU WASTE RETRIEVAL AND PROCESSING

Engaging the Future via Pilot Plant Availability During IWTU Radiological Operations	700
<i>Craig Porter, Barry O'Brien</i>	
Technology Development of a Large Volume Shielded Tank Waste Sampler and Sample Transportation System.....	713
<i>Theodore (Ted) Wooley, Kayle Boomer, Erik Nelson, Nicholas Doyle, Ivan Thomas</i>	

VOLUME 2

Calcine Retrieval Project Integrated Mockup Operational Difficulties and Improvements	735
<i>Taylor Sandow, Zachary Hansen, Jon Orton</i>	

Effect of Caustic Simulant Flow on the Corrosion Characteristics of Waste Transfer Pipe Components.....	749
<i>Dwayne McDaniel, Desmond Sinnott, Aparna Aravelli, Raymond Piloto, Leonel Lagos, Bruce Wiersma</i>	

SESSION 034A - WM2022 ROY G. POST SCHOLARSHIP WINNERS POSTER DISPLAY

Improving Laser Fume for Nuclear Decommissioning: Relating Gas Flow Dynamics in Laser Cutting	757
<i>Jacob Lavin, Matthew Jones, Lewis Jones, John Tyrer, Edward Long, Julian Spencer, Jonathan Dodds</i>	

Atomistic Simulation of Helium Incorporation in PuO ₂	771
<i>Elanor Murray, Rob Jackson, Mark Read, Nathan Palmer, Helen Steele, Robin Orr, William Neilson</i>	

SESSION 034B - STUDENT POSTERS: THE NEXT GENERATION - INDUSTRY LEADERS OF TOMORROW

Alternative Reductants for Efficient Vitrification of Radioactive Wastes High in Multivalent Species.....	783
<i>Jessica Rigby, Derek Dixon, Derek Cutforth, Richard Pokorny, Alex Scrimshire, Albert Kruger, Paul Bingham, Jose Marcial, Anthony Bell, Jaroslav Kloužek</i>	

Remote Analysis of Complex Mineral Suspensions in Engineered Pipelines Utilizing Underwater Acoustic Backscatter Systems	797
<i>Serish Tanya Hussain, Timothy Hunter, Martyn Barnes, Jeff Peakall, Hugh Rice</i>	

Analysis of Simulant UK PCM Waste Trials.....	812
<i>Daniel Parkes, Claire Corkhill, Clare Thorpe, Michael Harrison, Sean Morgan</i>	

AGR Fuel and its Behaviour During Drying	825
<i>Thomas Bainbridge, Devin Johnson</i>	

SESSION 041 - STABILIZATION/IMMOBILIZATION OF HLW, SNF/UNF AND LONG-LIVED ALPHA/TRU

DEM&MELT In-Can Melter Solution: from Demonstration Tests to Industrial Design.....	839
<i>Régis Didierlaurent, Laurent David, Maxime Fournier, Caroline Michel, Jean Francois Hollebecque</i>	

Laboratory-Scale Melter Systems for Simulated and Real Tank Waste	852
<i>Jesse Lang, Derek Dixon, William Eaton, Mark Hall, Cody Stewart, Derek Cutforth, Amy Westesen, Reid Peterson, Kris Colosi, Albert Kruger</i>	

Disposition of Beryllium Reflectors for Oak Ridge National Laboratory's High Flux Isotope Reactor	864
<i>Timothy Forrester, Brian Oakley, Randal Pudelek, Sharon Robinson</i>	

Concrete Testing Case for Closure of Hanford's 241-C Underground Storage Tanks.....	873
<i>Michelle Hendrickson, Christine Langton, Joan Wu</i>	

SESSION 042 - WASTE GENERATION ISSUES AND SOLUTIONS FOR LLW/ILW WORLDWIDE

Development Programme for Retrieval of Stored Secondary Waste from the Sellafield Ion Exchange Plant	892
<i>Thomas McMillan, Sean Morgan, George McArthur, Andrew Riley</i>	
The Demolition of the Sellafield Pile 1 Chimney.....	904
<i>Stephen Murdock</i>	
The Iterative Process of Waste Characterization and How to Develop Efficiencies Prior to Building Decommissioning	918
<i>Gabrielle Psotka</i>	
Progress Made Across the Globe During a Pandemic - Moving Highly Radioactive Capsules on the Hanford Site to Dry Storage	925
<i>Gary Cannell, Marie Gillespie, Mark Buckmaster, Neal Sullivan, Gary Pyles</i>	

SESSION 043 - GLOBAL PERSPECTIVES ON ADVANCES IN NUCLEAR SAFETY MANAGEMENT

Development of Climate Resilience Assessment Toolkits for Nuclear Waste Sites	934
<i>Zexuan Xu, Erica Siirila-Woodburn, Haruko Wainwright, Kenneth Williams, Satyarth Praveen, Efthymios Nikolopoulos</i>	
Behaviors, Values, and Positive Reinforcement: Developing a Strong Nuclear Safety Culture.....	945
<i>John Mills</i>	
Keeping the Workforce Safe - Effective Noncontact Methods for Detecting Elevated Body Temperature.....	959
<i>Kevin Young, Kevin Bake, Joseph Giebel</i>	

SESSION 045 - WORLDWIDE PERSPECTIVES OF RADIOACTIVE WASTE MANAGEMENT - CHALLENGES AND SOLUTIONS

The Main Orientations of the New 2021-2026 French National Plan for Radioactive Materials and Waste Management.....	977
<i>Jean Luc Lachaume</i>	
An Integrated Approach to Radioactive Waste Management	988
<i>Claire Gallery-Strong, Corhyn Parr, James McKinney</i>	
Dounreay's Waste Management Strategies for Success.....	998
<i>Alan Mowat</i>	
Developing an Integrated Infrastructure Management Plan for the US DOE Department of Environmental Management.....	1010
<i>Ian Seed, Elizabeth Forinash, Nancy Buschman, Jennifer McCloskey, Albes Gaona, Jeffrey Burnett, Laurie Judd, Jay Rhoderick</i>	

Update on Nuclear Liabilities Risks for Waste Shipment and Disposal	1022
<i>Rupert Cowen, Jonathan Leech</i>	
Arctic Monitoring and Assessment Program Plans and Methodologies for 2023 Assessment of Radioactivity in the Arctic.....	1028
<i>Amanda Anderson, William Standring, Jan Rene Larsen, Justin Gwynn, Margarita Katkova, Alexander Kryshev, Louise Kiel Jensen, Violeta Hansen, Jixin Qiao, Hilde Elise Heldal, Kjartan Guðnason, Ari-Pekka Leppänen, Edyta Lokas, Weihua Zhang, Chuanlei Liu, Trevor J. Stocki, Jussi Paatero, Malcolm McKee, Pål Andersson, Ole Christian Lind, Hans-Christian Teien, Anthony Armstrong, Robert Bock</i>	

SESSION 046 - EMERGING CONTAMINANT ISSUES

PFAS - Forever Chemicals a Set of Regulatory Emerging Compounds of Interest for the Nuclear Industry.....	1034
<i>Bob Seyer, Trent Temperly, Robert Pullano</i>	
Monitoring an Emerging Contaminant as Environmental Regulations Develop.....	1039
<i>Stephen Cochran</i>	
Highly Sensitive, Simultaneously, Determination of PFOS using Non -planar Microfluidic Electrochemical Cell	1048
<i>Zhenglong Li, Sagnik Basuray, Charmi Chande, Yu Cheng, Joshua Torgeson, Julian Schmid, Craig Divine, Jeffrey McDonough, Radha Kishan Motkuri, Anil Krishna Battu</i>	
Advances in High-Resolution Site Characterization to Expedite Site Closure.....	1055
<i>Tamzen Macbeth, Thomas Cook, Karla Leslie, Kent Glover, Jeffrey Davis, Gina Rose, Matthew Gamache, Elliot Grunwald</i>	

SESSION 048 - UPDATE ON SALT AND SUPERNATE TANK WASTE PROCESSING

SWPF Transition into the Liquid Waste Program at SRS and Implementation of NGS.....	1070
<i>Alexander Luzzatti, Keith Harp, Mark Johnson</i>	
Tank Farm Upgrades and Salt Batch Preparation Enhancements to Support Feed Supply to SWPF	1079
<i>Azadeh (Azi) Samadi, Jesse Benedict, Andrew Jung</i>	
Saltstone Enhancements and Performance During 1st year of Salt Waste Processing Facility Operations	1087
<i>Andrew Jezewski</i>	
DWPF Process Improvements and Performance During the First Year of SWPF Operations	1093
<i>Helen Boyd</i>	

SESSION 049 - SELECTED KEY TOPICS IN US COMMERCIAL LLW MANAGEMENT

WM2022 Hodes Award - Transformation of the Industry Through Development of Soft- Sided Containers for LLW Contaminated Debris and Soils	1103
<i>Aldon Beale</i>	
Using TableCalculator to Evaluate Parametric and Model Uncertainty in the Development of the US NRC LLW Classification Tables	1108
<i>Louis Caponi, A. Christianne Ridge, David Esh, Christopher McKenney, Patrick Laplante</i>	

Update on the Depleted Uranium Performance Assessment for the EnergySolutions Clive, UT Disposal Facility	1123
<i>Sean McCandless, Katie Catlett, Paul Black, Gregg Occhiogrosso, Kelly Crowell, Ralph Perona, Dylan Boyle, Aaron Bandler, Paul Duffy</i>	

SESSION 055 - POSTERS: LLW, ILW, MW, NORM, TENORM AND DEPLETED URANIUM

Waste Information Management System with 2021-22 Waste Streams	1139
<i>Himanshu Upadhyay, Walter Quintero, Leonel Lagos, Santosh Joshi</i>	
Processing of Liquid Radioactive Waste into Solid and Safe Form	1149
<i>Miroslav Toth</i>	
Oak Ridge Process Waste Treatment Complex (PWTC) - Summary of Process Improvements and Testing of New Ion Exchange Media	1155
<i>Paul Townson, Jason Jeansonne</i>	
Dounreay LLW Disposal Facilities - Verification of Disposed Waste and Assessment of Remedial Options for Non-compliant Waste	1169
<i>Sarah Bullivant, Tamara Baldwin, Mark Crawford, Rebecca Houghton, Laura Kerr, Graeme Morgan, Roger Wilmot</i>	
Dounreay LLW Disposal Facilities - Optimisation of Near-Field Engineering During the Operational Phase	1183
<i>Sarah Bullivant, Graeme Morgan, J Douglas Clarke, Angus Mackay, Michael Tait, Scott Brown</i>	
Ten Lessons from Ten Years of Leading the UK Low Level Waste National Programme - A Recipe for Cultural Transformation.....	1198
<i>Helen Cassidy</i>	
Effect of Grout-Contacted Solution on the Glass Dissolution Behavior	1210
<i>Yelena Katsenovich, Vadym Drozd, Matthew Asmussen, Shambhu Kandel, Alicia Maratos, Ravi Gudavalli, Leonel Lagos</i>	
Safe, Efficient Cementation of Challenging Radioactive Wastes Using Alkali-activated Materials	1217
<i>Daniel Geddes, John Provis, Antonia Yorkshire, Sean Morgan, Elakneswaran Yogarajah, Tsutomu Sato</i>	
Transfer of Tritium from Air to Water	1225
<i>Sung Paal Yim, Cheo Kyung Lee</i>	

SESSION 061 - EXPERIENCE IN PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS

Hydrogen Permeation Through Radioactive Materials Packaging Components.....	1232
<i>Kurt Eberl, William R. Johnson</i>	
Radiological Sample Screening at N3B-Los Alamos for Shipping Classification	1240
<i>Ekaterina Popova, John Garrett, Rane Onstott, Jen Patureau, Sean Sandborgh, Lisa Tower, Corey White, Paul Mark, Rachel Cowan</i>	

SESSION 062 - GLOBAL EXPERIENCE OF RECORDS, KNOWLEDGE AND MEMORY (RK&M): GLOBAL MARKER SYSTEMS

Nuclear Energy Agency Work in the Area of Records, Knowledge and Long-term Memory Keeping	1251
<i>Rebecca Tadesse</i>	
Blockchain Technology Applications for the Waste Isolation Pilot Plant.....	1255
<i>Robert Watson, Jeremy Standiford, Daniel Standiford</i>	
Creatively Closing the Data Management Loop at Los Alamos National Laboratory: Verifying Waste Compliance & Tracking System	1265
<i>Oral Saulters, Shanon Goldberg, Wendy Staples, Ellena Martinez, Lorie Sanchez, Diego Archuleta, Deborah Williams, Scot Johnson</i>	

SESSION 065 - DISPOSAL EXPERIENCES FOR LLW/ILW WORLDWIDE

Site Investigation to Support Potential Near Surface Disposal Facilities at the United Kingdom Low Level Waste Repository.....	1274
<i>John Shevelan, Amy Huntington</i>	
Derogation Management for Waste Acceptance Criteria at the French LLW Surface Disposal.....	1286
<i>Maxime Burgio, Jérôme Robin</i>	
A Radiometric Classification Technique for Nuclear Waste Objects.....	1295
<i>Sam White, Dean Connor, David Megson-Smith, Suresh Kaluvan, Thomas Scott</i>	
Using Hydrological Modeling and Particle Tracking to Identify Monitoring Well Locations Near a LLW Disposal Facility.....	1311
<i>Jiannan Chen, Craig Benson</i>	

SESSION 066 - TECHNICAL INNOVATIONS IN ENVIRONMENTAL REMEDIATION AND SITE CLOSURE

Optimising the Remediation End State for the B300 Floor Slab at the Capenhurst Site	1316
<i>Allan Wilson, Richard Kipling</i>	
Freeze-Tec Descriptions and Benefits for Environmental Remediation of Soils, Sludges, and Underwater Sediments.....	1329
<i>Bob Manseill, Jonathan Inman, Tammy Monday</i>	
Pilot-Scale Study for In-situ Leaching of Residual Uranium from Remediated Soil	1339
<i>Deepak Bhojwani, Glen Anderson, Matthew Faryan</i>	
How Innovation and the Application of Existing Technology Led to EM Nevada's Radiological Clearance of Nuclear Test Release Sites.....	1353
<i>Ryan Dodd, Lynn Kidman</i>	
Development of a Method to Evaluate Ecological Risk: Oak Ridge Reservation as a Case Study.....	1367
<i>Joanna Burger, Michael Gochfeld, David Kosson, Kevin Brown, Monica Cortes</i>	
Assessment of the Tessengerlo Site Using the AMBER Tool to Support Development of the MODARIA Decision Analysis Framework	1377
<i>Louise Bruffell, Alan Paulley, Ben McMahon</i>	

SESSION 067 - NUCLEAR AND INDUSTRIAL ROBOTICS, REMOTE SYSTEMS AND EMERGING TECHNOLOGY

Radiation Mapping Using Drones	1393
<i>Wendell Chun, Elizabeth Phillips</i>	
Radiological Surveillance of Hanford Tank Farm Using an Autonomous Mobile Platform	1399
<i>Joel Adams, Thi Tran, Jeff Natividad, Anthony Abrahao, Dwayne McDaniel, Leonel Lagos</i>	
AVERT Robotic Mission Planning & Operations (AVERT-MPO) to Support Decontamination & Decommissioning	1407
<i>Jim Raines</i>	
High Fidelity Simulation of an Omnidirectional Wall Crawling Mobile Platform for Use Inside H-Canyon Tunnel	1414
<i>Anthony Abrahao, Mackenson Telusma, Jeff Natividad, Dwayne McDaniel, Leonel Lagos</i>	
Process and Tooling Selection for Remote Closure of DOE Standard Canisters	1422
<i>Janusz Bialach, Daniel Thomas, Brandon Selley, Michael Wright</i>	

SESSION 068 - APPLICATION OF INNOVATIVE D&D TECHNOLOGIES INCLUDING APPLICATION OF VIRTUAL REALITY

Technical Capability Development for Decommissioning the Sellafield Site	1436
<i>Edwin Matthews</i>	
Preparation of Artificially Contaminated Stainless-Steel Samples for Decontamination Technology Development	1446
<i>Anne Callow, Thomas Carey, Daniel Barton, Thomas Johnson, Clint Sharrad, Sarah Bibby, Junliang Liu</i>	

SESSION 069 - COMMUNICATION OF TECHNICAL ISSUES: WORLDWIDE EXPERIENCES

Facilitating Equitable and Inclusive Participation in the Context of Social License	1457
<i>Laura Hermann</i>	
Changing the Future of Nuclear Power Narrative: Moving from Binary Risk/risk Trade- off to a Story of Climate Crisis Aversion	1463
<i>Larissa Shasko</i>	

VOLUME 3

Being Authentic: Lessons Learned from Speaking to the Public on Radiation Safety Issues	1476
<i>Kathryn Higley, Stephen Kustka</i>	

SESSION 077 - POSTERS - ENVIRONMENTAL REMEDIATION

Organic Gas Injection Delivery Behavior for Vadose Zone Remediation	1490
<i>Kenneth Carroll, Christian Johnson, Cheyenne Stice, Jim Szecsody, Chia-Hsing Tsai</i>	

Polymeric Micro-Ribbons Engineering for Wastes Oil and Mercury Removal from Water	1496
<i>Kexin Jiao, Joseph Sinicrope, Mellissa Komninakis, Juana Perucina, Punit Kohli, Annie Vargas</i>	
US EPA Superfund Update: Revisions to Risk and Dose Assessment Tools.....	1502
<i>Stuart Walker</i>	
Sensor Package Development for Inspection and Long Term Surveillance of the Waste Isolation Pilot Plant (WIPP).....	1513
<i>Anthony Abrahao, Maria Karla Sotolongo, Fernando Moreau, Leonel Lagos</i>	
AVANTech's PFAS Selective Ion Exchange Development, Testing, and Pilot Work.....	1526
<i>Tracy Barker, Michael Reed, Robert Wilson, James Braun, Jaclyn Siewert</i>	
Unplanned High-Capacity PFAS Treatment at a CERCLA Site.....	1531
<i>Chelsea Rush Headley, Frederic Coll, Lester (Mac) Walling</i>	

SESSION 084 - PROGRAMS AND INITIATIVES THAT FOSTER STEM LEARNING

Engaging and Inspiring the Next Generation of Engineers through Hands-On Experience and Adapting to COVID Restrictions	1541
<i>Samantha Randall, Jennifer Kadinger</i>	
Zombies, Super Powers and Apocalyptic Narratives: Novel Approaches to Advance Youth Engagement on Radiation.....	1554
<i>Larissa Shasko</i>	
CINDe (Centre for Innovative Nuclear Decommissioning) - An Industry Based PhD Centre.....	1565
<i>Ed Butcher, Anthony Banford, Steve Hepworth</i>	
I'm a Nuclear Scientist! Online Stem Enrichment Inspiring the Next Generation of Nuclear Advocates	1573
<i>Chris Hutson, James Barker, Robbie Mackenzie, Sebastian Oakes, Jarred Minards, Antonios Banos, Sam White, Dimitrios Samaras, Erin Holland, Sarah Lu, Jacob Moorman, Grace Sercombe, Olivia Douglas, Hannah McCombs, Phoebe Lynch, Marianne Morris, Deanna Gillespie, Iona Murdock, Calum Cunningham, Elen Lloyd Williams, Kathryn Hutson</i>	

SESSION 085 - MODELING APPLICATIONS AND RISK/DOSE ANALYSIS IN ENVIRONMENTAL REMEDIATION

Modeling an Ecological Radiological Risk Assessment Using a Graded Approach at LANL Area G.....	1582
<i>Aharon Fleury, Gregory J. McDermott, Doug Anderson, Randall Ryt, Paul Black, Daniel Levitt</i>	
When to Watch: Impacts, Limitations, and Alternatives of a 100-year Institutional Control Duration	1596
<i>Dylan Boyle, Amy Rice, Katie Catlett, Matthew Bowers, Kelly Crowell, Tom Stockton, Daniel Levitt</i>	
Clarifying Some Misconceptions About EPA's Superfund Approach for Risk Assessment	1606
<i>Stuart Walker</i>	
Web-based Tools for Risk Visualization at Hanford.....	1617
<i>Nicolas Huerta, Vicky Freedman, Patrick Royer, Christian Johnson</i>	

SESSION 086 - D&D OF US DOE FACILITIES

Hazard Categorization for Deactivation and Decommissioning of Nuclear Facilities	1627
<i>Brenda Hawks, Amanda Anderson</i>	
US DOE Implementation of Pre-approved Volumetric Authorized Limits in Environmental Management	1632
<i>Amanda Anderson</i>	
Evaluation of Dose Rates During 105-KW Basin Dewatering and Grouting Operations	1637
<i>Walter Josephson, Peter Sauer</i>	
Y-12 Biology Complex Demolition - Enabling U.S. Lithium Production Mission	1652
<i>Tommy Morgan, Tim Carty</i>	
Quantifying the Performance of Fixative Technologies Under Impact Stress for D&D Activities	1659
<i>Mellissa Komninakis, Joseph Sinicrope, James Nicholson, Jennifer Wohlwend, Kexin Jiao</i>	
Introducing the Order of Engineering into the Chaos of Demolition	1665
<i>Ryan Smith, Chris Waters</i>	
Development and Evaluation of Aged Concrete Surfaces for the Study of Coatings for the HCAEX Tunnel at Savannah River.....	1675
<i>Mayren Echeverria Boan, Aubrey Litzinger, Leonel Lagos, Dwayne McDaniel</i>	
Development of a Site-Wide Water Management Strategy at the Portsmouth Gaseous Diffusion Plant.....	1687
<i>Scott Murphy, Jyh-Dong Chiou</i>	

SESSION 087 - GEOLOGICAL DISPOSAL OF HLW, SNF/UNF AND LONG-LIVED ALPHA/TRU

Brine Availability Test in Salt: International Collaborative Modeling in the DECOVALEX Project.....	1704
<i>Eric Guiltinan, Jeroen Bartol, Steven Benbow, Michelle Bourret, Oliver Czaikowski, Richard Jayne, Kristopher Kuhlman, Simon Norris, Jonny Rutqvist, Hua Shao, Haffsa Tounsi, Claire Watson, Philip Stauffer</i>	
The Role of Geometry on alpha-radiation Modelling of Spent Nuclear Fuel/water Interfaces	1721
<i>Angus Siberry, David Hambley, Anna Adamska, Ross Springell</i>	
Modeling Internal Degradation and Crushing of Dual-Purpose Canisters	1732
<i>Varun Varun, Zorica Radakovic-Guzina, Branko Damjanac, Ernest Hardin</i>	
Performance Assessment of the Waste Isolation Pilot Plant with Additional Waste Storage Volume	1745
<i>Seth King, Sarah Brunell, Clifford Hansen, Dwayne Kicker, Sungtae Kim, Jennifer Long</i>	
The Industrial Pilot Phase of the French Deep Geological Repository Project	1761
<i>Pascal Claude Leverd, Daniel Delort</i>	

SESSION 088 - DATA ANALYTIC AND PROGRAMMATIC CHARACTERIZATION METHODS FOR LLW/ILW WORLDWIDE

Representative Sampling and Radiological Characterization of Heterogeneous Legacy Waste.....	1767
<i>Robin Tuerlinckx, Thomas Huys, Kim Harry Esbensen</i>	

A Framework for Capturing and Representing the Decision Making Processes to Classify Nuclear Waste	1777
<i>Seonaid Hume, Graeme West, Gordon Dobie</i>	
Questions Raised by the Management of LL-LL/NORM Waste and Depleted Uranium: An Application of the Graded Approach in France	1791
<i>Virginie Wasselin, Daniel Delort, Jean-Michel Hoorelbeke</i>	
AVANTech CH2M ORNL Melton Valley Simulant Tank Waste Mixing Study	1796
<i>Tracy Barker, Michael Reed, Ryan Lavisky, Abram Kolb, Michael Johnson, Robert Wilson</i>	
Correlating Immobilized Low-Activity Waste Glass Corrosion Model Parameters to Glass Composition	1802
<i>Sebastien Kerisit, Scott Cooley, Jarrod Crum, Charmayne Lonergan, Jim Neeway, Benjamin Parruzot, Joseph Ryan, Matthew Asmussen, Gary L. Smith, Elvie Brown, Ridha Malbrouki, Rodney Skeen, David J Swanberg</i>	
Field-Scale Lysimeter Studies of Glass and Cementitious Waste Forms at the Hanford Site	1811
<i>Philip Meyer, Matthew Asmussen, Jim Neeway, Jon Thomle, Ryan Ekre, Hilary Emerson, Nathan Philips, Lirong Zhong, Gary L. Smith, Ridha Malbrouki, David J Swanberg</i>	
The Importance of Inventory for Informing Waste Strategy	1826
<i>Michelle Dickinson, Andrew Tuxworth, Bill Miller, Antonio Guida</i>	
Development of a Disposal Strategy for Uncharacterized Legacy Mixed Liquid Waste.....	1831
<i>Rebecca Peters, Laurie Cassidy, Thomas Smith, Sriram Suryanarayan</i>	

SESSION 090 - ER POST CLOSURE CHALLENGES AND LONG-TERM STEWARDSHIP/LEGACY MANAGEMENT

Progress in Stewardship of the DOE Colonie, New York, Site	1836
<i>Carl Young, Darina Castillo, Matthew Spinelli</i>	
Tribal Revegetation of a Low-level Radioactive Waste Disposal Site	1847
<i>Brittany Kruger, Jeremy Spoon, Richard Arnold</i>	
The US Department of Energy Long-Term Stewardship Working Group.....	1855
<i>Padraic Benson, Cliff Carpenter, Tracy Atkins</i>	
A Geospatial Data Preservation Strategy at the DOE Office of Legacy Management	1862
<i>Denise Bleakly, Joshua Linard, Matthew Cuneo</i>	

SESSION 091 - PROJECT MANAGEMENT IMPROVEMENTS-PLANNING THROUGH COMPLETION-SCOPE, COST, & SCHEDULE CONTROL

Evaluation of Options for Integrated Waste Management Across the NDA Estate Using the Enterprise Model Optimisation Tool	1876
<i>Charlie Jackson, Meagan King, Carwyn Chamberlain, Graham Cantillon, Claire Gallery-Strong, Dave Clark, Felipe Basaglia</i>	
Hanford's Connected Enterprise Vision.....	1892
<i>Jason Lacher</i>	
Positive Engagement - Two Frames of Reference.....	1903
<i>Laurel Boucher</i>	

SESSION 098 - POSTERS - D&D

Analysis of a Generic Hot Cell Facility Using Attila® and MCNP	1908
<i>Andrew Cooper, Eric Heritage, Matthew Smith, Greg Failla</i>	
Meeting the UK's Nuclear Decommissioning Authorities "Grand Challenges"	1915
<i>Loren Jones, Valerie Drake, Tony Burnett</i>	
D&D KM-IT 2022 Updates.....	1924
<i>Himanshu Upadhyay, Walter Quintero, Leonel Lagos, Santosh Joshi</i>	
Pressurizer Cutting Scenario for Reducing the Radiation Dose Received by Workers	1931
<i>Sun Il Kim, Hakyun Lee, Jong Soon Song</i>	

SESSION 099 - POSTERS - SPECIAL TOPICS AND TRACK CROSS CUTTING TECHNOLOGY TOPICS

Validating the Nuclear Option for Hydrogen Storage	1952
<i>Antonios Banos, Thomas Scott</i>	
Evaluating 12" x 12" Filter Responses to Smoke Loading at 75 Cubic Feet Per Minute.....	1964
<i>Spencer Phillips, John Wilson, Jaime Rickert</i>	
Hanford Site Traffic Safety Initiative Poster Board.....	1979
<i>Ginger Benecke, Andrew Foster</i>	
New Maximum Entropy Methods for Analysis of Data with Nondetects	1987
<i>John Carson, Paul Black</i>	
Potential Waste Minimization Activities Following a Wide-Area Radiological Release	1993
<i>Paul Lemieux, Timothy Boe, Matthew Magnuson, Colin Hayes</i>	
Calculation of Permeability of a Porous Medium with Crossing Fractures.....	2004
<i>Sung Paal Yim, Cheo Kyung Lee, Pho Prosheng</i>	
Plateau Risk Elimination Program - Decision Making Tool to Reinvigorate the Completion Mindset	2012
<i>Charles Simpson, Linda Maiden, Carwyn Chamberlain</i>	
Macroscale Elastic Coefficients for Concrete with Reinforcements Under Axial and Shear Loading.....	2019
<i>Cheo Kyung Lee, Seanghai Tha</i>	
Water Flow and Solute Transport in a Partially Saturated Soil Under Intermittent Head Condition on the Ground Surface.....	2030
<i>Cheo Kyung Lee, Makara Khov</i>	

SESSION 104 - INTERNATIONAL EXPERIENCE IN WASTE OPTIMIZATION/MINIMIZATION, RECYCLING AND CLEARANCE FROM D&D (6.6)

Implementing Waste Management for UK Graphite Reactors in a Rolling Programme of Decommissioning.....	2039
<i>Richard Harris</i>	
Berkeley Active Waste Removal	2055
<i>Gary Ward, Valerie Drake</i>	

Recycling of Metals Originating from Nuclear Installations.....	2064
<i>Christophe Maufrais, Arne Larsson, Gregor Krause, Anders Stenmark</i>	
Utilization of Multi-Layer Modifiable Package Forms for Activated RAW in Terms of Costs Optimization and Increasing the Disposability in Slovakia.....	2073
<i>Helena Mrazova, Tibor Rapant, Sergi Mila</i>	

SESSION 105 - GROUNDWATER REMEDIATION PROJECTS - WORLDWIDE EXPERIENCES

Sustainable Sorbent Technology for Mercury Remediation in a Freshwater Aquatic System.....	2088
<i>Caridad Estrada, Johnbull Dickson, Yelena Katsenovich, Leonel Lagos, Alex Johs, Eric Pierce</i>	
In Situ Groundwater Remediation of Hexavalent Chromium: Global Examples.....	2100
<i>Roger Olsen</i>	
Evaluating Ion Exchange Resins for Pump-and-Treat Remedy Optimization.....	2115
<i>Rob Mackley, Sarah Saslow, Elsa Cordova, Nancy Avalos, Amanda Lawter, Odeta Qafoku, Charles T. Resch, Nabajit Lahiri, Emily Nienhuis, Tatiana Levitskaia, Peter Meyers, Hilary Emerson, Jim Szecsody, Eva Arm, Carolyn Pearce, Vicky Freedman</i>	
Adaptive Site Management for the Hanford Central Plateau	2123
<i>Nicolas Huerta, Inci Demirkanli, Vicky Freedman</i>	

SESSION 106 - UK ADVANCED FUEL CYCLE PROGRAM UPDATE

UK AFCP Off-gas Capture Project Update 2021-2022	2131
<i>Joshua Turner, Adam Canner, Claire Utton, Sarah Kearney, Laura Swansbury, Russell Hand, Neil Hyatt, Hajime Kinoshita, Brant Walkley, Clint Sharrad, Mark Ogden</i>	
AFCP: Progress and Future Plans on the Vitrification of High-Level Waste Arising from Advanced Fuel Cycles	2142
<i>Michael Harrison, Lucy Kavanagh, Julian Spencer, James Eales, Jessica Rigby, Katrina Skerratt-Love, Alex Scrimshire, Prince Rautiyal, Josh Radford, Paul Bingham, Russell Hand</i>	
AFCP: Improved Glass Formulations for Advanced Oxide Fuels - Glasses with Lower Processing Temperatures	2154
<i>Jessica Rigby, James Eales, Katrina Skerratt-Love, Alex Scrimshire, Prince Rautiyal, Josh Radford, Julian Spencer, Michael Harrison, Lisa Hollands, Claire Corkhill, Neil Hyatt, Russell Hand, Paul Bingham</i>	
AFCP: Treatment of Waste Salt Arising from the Pyrochemical Processing of Used Nuclear Fuel	2169
<i>Michael Harrison, Donna McKendrick, Daniel Bailey, Keting Hu, Neil Hyatt, Mark Ogden, Wei Deng, Alex Scrimshire, Paul Bingham, Daniel Backhouse</i>	

SESSION 107 - DIGITAL ENGINEERING – TRANSFORMING THE WAY WE DESIGN, DELIVER, AND MANAGE PROJECTS

Beartooth: Nuclear Material Processing with MBSE and Digital Twin	2183
<i>Kaleb Houck, Troy Burnett, Christopher Ritter</i>	
Integrating Vision with an Industrial Manipulator for Packaging Special Nuclear Material.....	2196
<i>Robert Schloen, Beth Boardman</i>	

SESSION 111A - TREATMENT AND PROCESSING EXPERIENCE OF LLW/ILW WORLDWIDE

- Pyrolysis of Radioactive Spent Resins in the PRIME Installation 2204
Jurgen Hansen, Ine Bruyninckx, Stefan Stouten

VOLUME 4

- Overview of Innovative Solutions for Management of Challenging Mixed Wastes 2214
Sriram Suryanarayan
- Metal Treatment Facility in the UK - Concept Design..... 2230
Per Lidar, David Oxberry
- French National R&D Program on Waste from Decommissioning: Development of New Treatment
and Conditioning Processes..... 2234
Benjamin Frasca, Frederic Plas, Pierre Henocq
- Pyrohydrolysis of Bituminised Waste Drums..... 2244
Klaus Buettner, Georg Braehler, Stefan Thiel
- Progress in Establishing an Australian National Facility for Radioactive Waste Management 2249
Sam Usher, David Osborn, Jonathan Shatwell

SESSION 115 - THE STAKEHOLDER'S VOICE – STAKEHOLDER AND TRIBAL PERSPECTIVE RELATED TO ENVIRONMENTAL CLEANUP

- Regulatory Decision Making Process Using “Weight of Evidence: An Evidence Integration
Approach” by the State of Washington at the Hanford Site..... 2258
Jerry Yokel, Dibakar (Dib) Goswami
- Lessons Learned in the Development of Industry Guidance 2267
Michelle Dickinson, Nick Jefferies, Cristiano Padovani, Rebecca Davies, Antonio Guida

SESSION 116 - DATA ANALYSIS AND MANAGEMENT

- Leveraging Innovative Data Collection and 3D Visualization Tools for Optimizing Real- time
Decision-Making at a FUSRAP Site 2271
*Tim Cushman, Christopher Bowles, Thomas Cornuet, Danielle Radomile, Kyle Kohler, Daniel
Sirkis, George Bock, Joseph Loeper, Daniel Caputo, Don Wadsworth*
- The Unrestricted Release of the Harborview Research & Training Building after a Cesium Incident..... 2281
Alex Lopez, Jesus Zamora
- Implementation of an Enterprise Geospatial Program at the DOE Office of Legacy Management 2292
Joshua Linard, Matthew Cuneo, Frank Orr
- Addressing Big Data Challenges with Geophysical Data Archival, Discoverability, and Re-use 2304
Nicolas Huerta, Vicky Freedman, Judy Robinson, Kenneth Ham, Jon Thomle

SESSION 118 - ANALYSIS AND APPLICATION OF SNF CHEMISTRY INNOVATION

Solid-State Electrochemical Oxidation of PuO ₂ to PuO ₂ +x.....	2311
<i>Colin Boxall, Dominic</i>	
The Modified Basalt Fiber as Neutron-Absorber Additive for Concrete of Spent Nuclear Fuel Containers.....	2321
<i>John Chapman, Volodymyr Gulik, Maryna Holiuk, Alexander Biland, Anatolii Nosovskyi</i>	
Sensitivity Analysis and Modeling of the HBU Cask.....	2335
<i>Megan Higley, Mustafa Hadj-Nacer, Miles Greiner</i>	

SESSION 123 - TANK FARM INSPECTIONS

Hanford Double-Shell Primary Tank Bottom Inspection Technology Development	2346
<i>Kayle Boomer, Theodore (Ted) Wooley, Amanda Hede, Jason Gunter, Glenn Soon, Erik Nelson, Kayte Denslow</i>	
Hanford Tank Corrosion Inspection with Machine Learning	2356
<i>Kayle Boomer, Douglas Reid, Josh Weisbrod, Erik Nelson, Eric Smith, Joseph Rice, Richard Passarelli</i>	
Development and In-House Deployment of the Miniature Rover for Inspection of Hanford's Double Shell Tanks.....	2371
<i>Sebastian Story, Daniel Martin, Shervin Tashakori, Dwayne McDaniel, Glenn Soon, Leonel Lagos</i>	
Next-generation Flaw Characterization in Hanford Under-tank Inspection by the Robotic Air-slot Volumetric Inspection System.....	2379
<i>William Rosenthal, Kayte Denslow, Scott Cooley, Kayle Boomer, Amanda Hede, Jason Gunter, Glenn Soon, Erik Nelson, Cody Borigo, Russell Love, Theodore (Ted) Wooley</i>	

SESSION 124 - SOCIAL SCIENCES AS A RESOURCE FOR IMPROVING PUBLIC INVOLVEMENT IN HLW ISSUES

Problem Framing and Politicization: Complex Problems and Public Participation	2397
<i>Margot Hurlbert</i>	
Analysis of the Effects of Geographical Location on Public Perception of People Living Close to a Nuclear Power Station.....	2408
<i>Jose Condor, Margot Hurlbert, Larissa Shasko</i>	
The Perception of Radioactive Waste in France in 2021	2420
<i>Ludivine Gilli</i>	
DGRs, an Insurance for Societal Degradation Risks Over 150 Years, Result of the Socio-Economic Assessment of the French DGR.....	2428
<i>Pascal Claude Leverd, Daniel Delort</i>	

SESSION 125 - ENSURING ADEQUACY OF PACKAGE DESIGN AND ANALYSIS

Master of Science in Nuclear Packaging at the University of Nevada, Reno	2433
<i>Miles Greiner, Yung Liu, James Shuler</i>	

OPTIMUS® Packaging for HALEU Fuel.....	2440
<i>Steven Sisley, Janet Bivens</i>	
Evaluation of Pharmaceutical Containment Valves for Transferring Solid Powder Nuclear Waste	2448
<i>Ryan Wilding</i>	
Reviewing the Safety Analysis Report in Packaging Revision Developed for Adding Pu-238 Targets as Approved Content in the BRR Cask	2470
<i>Edward Ketusky, Dan Leduc, Charles McKeel, William R. Johnson, James Shuler</i>	

SESSION 128 - D&D OF NUCLEAR AND NON-POWER GENERATING FACILITIES BOTH LARGE AND SMALL

Retrievals, Processing and Encapsulation - Use of Silo Emptying Machines and Box Encapsulation on Complex Nuclear Sites	2479
<i>Mark Ritchie, Rob Firby</i>	
Decontamination and Decommissioning of a Radiopharmaceuticals Production Facility: Waste Management	2493
<i>Antoine Goffinet, Serge Vanderperre, Candice De Jonghe</i>	
Characterisation of Stainless Steel Waste from Nuclear Facilities for Tailored Decontamination Approaches	2508
<i>Daniel Barton, Thomas Carey, Anne Callow, Dirk Engelberg, Clint Sharrad</i>	
Towards the Decontamination of Plutonium Contaminated Bricks: Investigation of Cerium Based Simulant on Brick Penetration.....	2517
<i>James Kennedy, Colin Boxall, Anthony Banford, Rick Demmer, Andrew Parker, David Hutchinson</i>	
Optimised Decommissioning and Waste Management of a Former Uranium Diffusion Plant at the Capenhurst Site.....	2532
<i>Richard Kipling, Allan Wilson</i>	
Magnox Experience of Research Reactor Decommissioning in the U.K.	2547
<i>Matthew Tilsley</i>	
Sharing Decommissioning Good Practice Across Industrial Sectors	2562
<i>Frank Allison, Anthony Banford, Heather Barton, Karl Sanderson, Simon Sjenitzer</i>	

SESSION 129 - ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING (ML) APPLICATIONS IN RADIOACTIVE WM

A Machine Learning Algorithm for Optimizing Radiological Counting	2574
<i>Steve Reese, Ophir Frieder, Mario Gomez Fernandez, Jessica Curtis, Ian Brown, Sean Gillen, Yihong Liu</i>	
pyLEnM: An Open Source Machine Learning Framework for Long-term Water Quality Monitoring	2583
<i>Aurelien Meray, Haruko Wainwright, Masudur Siddiquee, Himanshu Upadhyay, Savannah Sturla, Rebecca Serata, Sebastian Uhlemann, Miles Denham, Hansell Gonzalez Raymat, Leonel Lagos, Carol Eddy-Dilek</i>	
Foreseeing the Future: Redefining Hanford Planning with Machine Learning and Operations Research	2593
<i>Brandon Loveless, Brennan Angevine, Jennifer Kadinger</i>	

Mobile Platform for Structural Health Monitoring Using Convolutional Neural Network.....	2612
<i>Himanshu Upadhyay, Santosh Joshi, Roger Boza, Walter Quintero, Leonel Lagos</i>	
Modelling Methodologies and Applications for use in Calibrating and Defining Measurement and Uncertainty Parameters in Non-Destructive Assay Systems	2618
<i>Gareth White, Colin Wilkins, Adrian Gallozzi-Ulmann, Patrick Chard</i>	
Qualification of Radiation Transport Code Attila to CSA N286.7 Standard	2633
<i>Eric Heritage, Matthew Smith, Greg Failla, Andrew Cooper, Tom Stockton, Paul Black, Matthew Bowers, Paul Duffy</i>	

SESSION 130 - RADIOLOGICAL CHARACTERIZATION METHODS FOR LLW/ILW WORLDWIDE

Particle Swarm Imaging (PSIM) - A Swarming Algorithm for Improved Source Term Estimation	2646
<i>Daniel Parvin</i>	
Innovation in Alpha Plant Characterisation (PHUMS AND AMCAM)	2661
<i>Daniel Parvin, David Kenwright</i>	
Miniaturized CZT Modules for Drone-Based Waste Characterization Applications.....	2676
<i>David Goodman, David Barron, Willy Kaye, Y. Andy Boucher, Jonathon Sowers</i>	
Cosmic-ray Muography for Nuclear Waste Management & Decommissioning	2686
<i>David Mahon, John Annand, Anthony Clarkson, Simon Gardner, David Ireland, Ramsey Al Jebali, Ralf Kaiser, Dan Wright, Guangliang Yang, Craig Shearer, Matt Ryan, Christiane Vieh, Klaus Föhl</i>	
The REACH™ Detector System: An Innovative Handheld Nuclear Waste Characterization System.....	2701
<i>Sean Kelly Jr., Massimo Morichi, Andrea Pepperosa, Kevin Tuite</i>	
Use and Benefits of Radiation Imaging for Waste Characterisation.....	2718
<i>Bruce Begg, Nicholas Karantonis, Jayden Ilter, Mathew Guenette, Lachlan Chartier, Alison Flynn, Geoffrey Watt, John Barnes, Lennon Petkovic, David Boardman</i>	
Realtime Consignment of Waste from Large-scale Land Remediation Projects	2724
<i>Dan Clifton-Climas, Helen Beddow, Winston Smith, Gary Bethel</i>	

SESSION 131 - SOLIDIFICATION TECHNIQUES FOR LLW/ILW WORLDWIDE

Modular Grout System Processing Variables and Struvite Stability Study for Stabilization of Hanford Liquid Secondary Waste.....	2730
<i>Grace Chen, Rodney Skeen, Jeanne Bernards, David J Swanberg, Weilang Gong, Howard Abramowitz, Ian Pegg, Innocent Joseph, Christine Langton, Sean Noble, Katie Hill, Joseph Manna, Agathe Bouchy, Sarah Saslow, Matthew Asmussen</i>	
In-Can Vitrification of ALPS Slurries from Fukushima Effluent Treatment Waste Using DEM&MELT Technology.....	2742
<i>Caroline Michel, Maxime Fournier, Jean Francois Hollebecque, Régis Didierlaurent</i>	
Encapsulation Using Adapted Geopolymer Formulations Based on Foundation Industry Wastes.....	2754
<i>Stuart Maclachlan, Marta Fedorciuc-Onisa, Thomas Jones, Richard White, Adrian Davis- Johnston</i>	

Preliminary results of the Sellafield Ltd Led Encapsulant Integrated Research Team	2764
<i>Simon Malone, Sean Morgan, Stephen Farris, Martin Hayes, John Provis, Newton Bowmer, Gavin Cann</i>	

Strontium Retention Within Geopolymer Wasteforms	2777
<i>Daniel Geddes, Brant Walkley, John Provis</i>	

SESSION 132 - UPDATE ON SALT AND SUPERNATE TANK WASTE PROCESSING

Hanford Tank Side Cesium Removal (TSCR) System Project Overview	2785
<i>David Houghton, Tracy Barker, Michael Leonard</i>	

Tank Side Cesium Removal System Project and Technology Testing Activities	2798
<i>Matt Landon, Kevin Ard, Blake Chamberlain, David Herman, Daniel McCabe, Reid Peterson, Philip Schonewill, Ian Pegg, Robert Wilson, Tim Foley, Blake Nolan, Janet Diediker</i>	

Cesium-137 Profile Measurements of Spent CST Columns from the Savannah River Site Tank Closure Cesium Removal (TCCR) Project.....	2807
<i>David Diprete, Christopher McGrath, Adam Judy, Timothy Aucott</i>	

SESSION 133 - ADVANCES IN PACKAGING FOR INTERIM STORAGE, TRANSPORT AND DISPOSAL

Update on DOE's Atlas Railcar Project.....	2816
<i>Erica Bickford, Patrick Schwab, William Reich, Matt Feldman, Steven Maheras, Scott Dam, Mike Schultze</i>	

Development of a Draft Safety Inspection Protocol for Rail Shipments of Spent Nuclear Fuel	2829
<i>Steven Maheras, Erica Bickford</i>	

Next Generation System Analysis Model: Recently Added Features and Future Plans	2844
<i>Robert Joseph, Gordon Petersen, Lucas Vander Wal, Brian Craig, Charles Olson, Evan Vanderzee, Riley Cumberland, Abiodun Adeniyi</i>	

A Review of N-stamping Requirements in Connection with the DOE Standard Canister	2853
<i>Gordon Petersen, Elmar Eidelpes</i>	

SESSION 134 - CHARACTERIZATION AND ER TECHNOLOGIES FOR COMPLEX AND COMINGLED CONTAMINANTS

Mercury Management in the Oak Ridge Reservation	2862
<i>Joseph Hull</i>	

An Innovative Approach for Radiological Assay of Dredged Materials from a US Navy Base in San Diego, California	2871
<i>Javid Kelley, Alex Lopez, Christopher Weddermann</i>	

Evaluation and Design of a Potential Tracer Test for the Ringold Upper Mud Aquifer at the 100-H Area of the Hanford Site.....	2884
<i>Rob Mackley, Judy Robinson, Joshua Torgeson, Mark Rockhold, Nikolla Qafoku, Jon Thomle, Vicky Freedman, Travis Hammond, Dean Neshem</i>	

Bismuth-Based Materials for Subsurface Remediation	2899
<i>Nicolas Huerta, Sarah Saslow, Carolyn Pearce, Tatiana Levitskaia, Elsa Cordova, Nancy Avalos, Amanda Lawter, Mark Bowden, Nabajit Lahiri, Odeta Qafoku, Daria Boglaienko, Steve Heald, Mahalingam Balasubramanian, Nikolla Qafoku, Vicky Freedman</i>	

SESSION 141 - ADVANCED PROCESSING OF SNF AND ASSOCIATED WASTES

Update on Non-aluminum Spent Nuclear Fuel Disposition at the Savannah River Site	2905
<i>Lisa Ward, Marissa Reigel, Edwin Moore, Thanh-Tam Truong, Joshua Boerstler</i>	
Highly-Lipophilic Sulfonamide Chelators and Analogs for Actinide Separation from Caustic High-Level Waste	2918
<i>Konstantinos Kavallieratos, Rene Panzer, Oluwaseun Adedoyin, Xinrui Zhang, Evgen V. Govor, Alexander N. Morozov, Alexander M. Mebel</i>	
Strategies for Managing Waste Streams from Heavy Isotope Production and Advanced Fuel Cycle Development at ORNL.....	2924
<i>Sharon Robinson, Tom Hylton, Brian Oakley, David Depaoli</i>	
Flash Sintering, a Novel Technique, for Nuclear Waste Management	2930
<i>Carolyn Grimley, Samira Bostanchi, Robert Harrison, Nicholas Barron, Christopher Green, Jonathan Morgan</i>	

SESSION 142 - INFRASTRUCTURE IMPROVEMENTS IN HLW, SNF/UNF AND LONG LIVED ALPHA/TRU AGING FACILITIES

An Ode to Tank Repair and a Longevity Strategy for Underground Storage Tanks at the Hanford Site.....	2940
<i>Ron Calmus, Theodore (Ted) Wooley, Alexander Pappas, Kayle Boomer</i>	

VOLUME 5

A Cold Spray Technology for the Life Extension of Critical Waste Tanks.....	2949
<i>Kyle Johnson, Aaron Nardi, Jamie Beard, Stephen Canfield, Jeff Buczek, Michael Quintana, Terry Sams</i>	
Service Life Prediction of Polymeric Hose-In-Hose Systems Used to Transfer High Level Liquid Waste Between Operations	2967
<i>Mark Kranjc, Thomas Skidmore, Robert Hawsey</i>	
Effects of Sodium Hydroxide, Temperature, and Exposure Duration on Hose-In-Hose Transfer Lines Used at the Hanford Site.....	2980
<i>Dwayne McDaniel, Leonel Lagos, Amer Awwad, Jose Rivera</i>	

SESSION 143 - ENVIRONMENTAL REMEDIATION OF ABANDONED URANIUM MINES AND MILLS

Challenges in Developing Background Concentrations for a Former Uranium Milling Site with a Complex Groundwater Flow Regime.....	2987
<i>Susan Kamp, Mark Kautsky, Peter Schillig, Anthony Farinacci, Kate Whysner</i>	

Multiple Lines of Evidence Approach for Evaluating Mining-Related Impacts at Abandoned Uranium Mines.....	3000
<i>J. Paul Knightly, Monica Heintz</i>	

Interaction of Hydroxyapatite and Uranium in Groundwater at the Old Rifle Site to Facilitate Site Remediation.....	3011
<i>Olivia Bustillo, Ravi Gudavalli</i>	

Radiological Aerial and Ground Survey at the Middlesex Sampling Plant Formerly Utilized Sites Remedial Action Program Site	3023
<i>Lisa Szegedi, Ann Ewy, David Hays, Theodore Rahon</i>	

SESSION 144 - RADIOACTIVE CONTAINMENT VENTILATION

A Summary of the Effects of Aging on Nuclear Grade High Efficiency Particulate Air Media and Filters.....	3033
<i>John Wilson, Jaime Rickert</i>	

Custodial Services Support for the COVID-19 Pandemic.....	3049
<i>Brian Von Bargaen</i>	

Thinking Differently About Radioactive Waste in the UK– A Site License Company’s Journey of Growth and Improvement.....	3052
<i>Martin Walkingshaw, Helen Cassidy</i>	

Considerations Supporting a 20-Year Nuclear Facility HEPA Filter Lifecycle	3065
<i>Matthew Barnett, Mary Bliss, Scott Cooley, Kurt Haunreiter</i>	

SESSION 145 - STORAGE EXPERIENCES FOR LLW/ILW WORLDWIDE

Waste Package Development - Focus on the Right Container for the Right Job.....	3080
<i>Richard Harris</i>	

Dounreay LLW Disposal Facilities - Proposal to Control Radionuclide Content via a Sum of Fractions Approach.....	3092
<i>Richard Lewis, Tamara Baldwin, Graeme Morgan, Mark Crawford, Chris Herbert, Rebecca Houghton, Emily Swain-Phipps, Roger Wilmot, Michael Tait</i>	

Seismic Analysis of Stacked Disposal Containers in a Silo-type LILW Repository	3106
<i>Byeon Hyeongjin, Jaeyeong Park</i>	

SESSION 146 - APPLICATION OF INNOVATIVE D&D TECHNOLOGIES INCLUDING APPLICATION OF VIRTUAL REALITY

Using a Modified Inspection Drone to Create a 3D Map of Obstructions Within a High- Radiation Confined Space.....	3118
<i>Kevin Young, Joe Crane, Alexandre Meldem</i>	

Electrokinetic In Situ Decontamination of Entrained Radioactivity Within a Concrete Matrix.....	3131
<i>Thomas McCarthy, Colin Boxall, Malcolm Joyce, Anthony Banford</i>	

Reducing Hazard in Spent Fuel Removal Using Colloidal Silica Gel.....	3147
<i>Arianna Pagano, Gráinne El Mountassir, Rebecca Lunn</i>	

Radiological Imaging of the Chernobyl Reactor 4 Shelter with YanDavos II.....	3153
<i>David Megson-Smith, Yannick Verbelen, Maxim Saveliev, Pavel Sabenin, Anastasiia Nechytailo, Erin Holland, Matthew Ryan Tucker, Peter Martin, Dean Connor, Freddie Russell-Pavier, Thomas Scott</i>	
Virtual Reality Visualization of Dose Rate Fields for Dose and Decommissioning Planning Using ADEPT-PSIM.....	3166
<i>Matthew Smith, Daniel Parvin, Minh Nguyen, Eric Heritage</i>	
Integrated Innovation for Nuclear Decommissioning: Delivering a Safer, Faster and Cheaper Decommissioning Solution	3180
<i>John Brotherhood, Marti Morta Garriga, Christopher Hope</i>	
The First-Generation Magnox Storage Pond (FGMSP) Retrievals Story.....	3194
<i>Megan Holmes, Steve Teasdale, Nick Barlow</i>	

SESSION 147 - THE UK EPSRC “TRANSCEND” COLLABORATIVE RESEARCH PROGRAMME

The TRANSCEND University Consortium: An Overview	3201
<i>Michael Fairweather, Lois Tovey, Phoebe Allan, Colin Boxall, Claire Corkhill, Andy Cundy, Fred Currell, Neil Hyatt, Nikolas Kaltsoyannis, Rebecca Lunn, David Read, Thomas Scott, Luc Vandeperre</i>	
The TRANSCEND University Consortium: Integrated Waste Management	3215
<i>Timothy Hunter, Phoebe Allan, Claire Corkhill, Fred Currell, Michael Fairweather, Robert Harrison, Joseph Hartley, Joseph Hriljac, Andrea Kozlowski, Merve Kuman, Laura Leay, Lee Mortimer, Antony Nearchou, Brian O'Driscoll, Daniel Parkes, James Reed, Gurpreet Singh, Bisrat Wolde, Tamás Zagyva</i>	
The TRANSCEND University Consortium: Theme 2 - Site Decommissioning and Remediation	3229
<i>Andy Cundy, Rebecca Lunn, Matteo Pedrotti, Jamie Purkis, Arianna Pagano, Shaun Hemming, Joanna Renshaw, Athanasios Karampourniotis, Luke Lee-Brewin, David Read, Caroline Shenton-Taylor, Soraia Elisio, Malcolm Joyce, Luc Vandeperre</i>	
The TRANSCEND University Consortium: Spent Nuclear Fuels	3238
<i>Ross Springell, David Read, Thomas Scott, Mahmoud Mostafavi, Angus Siberry, Colin Boxall, Bruce Hanson, Neil Hyatt, David Hambley, Victoria Frankland, Ian Robertson, Richard Wilbraham</i>	
The TRANSCEND University Consortium Theme 4: Nuclear Materials	3250
<i>Colin Boxall, Lewis Blackburn, Chris Anderson, Claire Corkhill, Malin Dixon Wilkins, Fred Currell, Jeff Hobbs, Neil Hyatt, Nikolas Kaltsoyannis, Merve Kuman, Dominic Laventine, Samuel Murphy, Elanor Murray, William Neilson, Robin Orr, Mark Read, Helen Steele, Xiaoyu Han, Shikuan Sun</i>	
Radioactive Sample Research Within the TRANSCEND Consortium and Associated Collaborations	3262
<i>Andy Cundy, Fred Currell, Michael Fairweather, Phoebe Allan, Chris Anderson, Lewis Blackburn, Colin Boxall, Claire Corkhill, Neil Hyatt, Nikolas Kaltsoyannis, Rebecca Lunn, Mel O'Leary, David Read, Thomas Scott, Luc Vandeperre, Lucy Mottram, Malin Dixon Wilkins</i>	

Industry Overview of TRANSCEND (Transformative Science and Engineering for Nuclear Decommissioning).....	3272
<i>Ed Butcher, Steve Hepworth, Helen Steele, Rick Short, Anthony Banford, Robin Orr, James Graham, David Hambley</i>	

SESSION 148 - RADIOACTIVE MATERIAL PACKAGING AND TRANSPORTATION ISSUES

New ORANO TN LLW Handling, Processing, Storage and Transportation Capabilities	3280
<i>Nicolas Guibert</i>	
Creation of a New Nuclear Decommissioning Authority Group Transport Organisation	3289
<i>Chris Watson, Alastair Brown</i>	
The Use of Emergency Exercises to Promote a Culture of Security and Resilience	3297
<i>Philip Murphy</i>	
Mixed Loads Transport.....	3307
<i>Beverley Stothart</i>	
The Evolution of International Criticality Safety Regulations for the Transport of Fissile Material in Certified Packages.....	3317
<i>Antonio Rigato, Calvin Hopper, Ronald Pope, Steven Maheras</i>	
Non-destructive Material Characterization of Radioactive Waste Packages with QUANTOM®.....	3327
<i>Hauke Grages, Heiko Herbell, Laurent Coquard, Julian Hummel, Andreas Havenith, Kai Krycki, Bo Fu, Helmes Christopher, Marco Doemeland, Marcel Heidner, Frederic Simons, Theo Koeble, Olaf Schumann, Alexander Jesser</i>	
Accelerated Ageing Program for O-ring Seals Used in Type B Casks.....	3342
<i>Jay Horin, Hatim Laadoua, Constance Robeyns</i>	

SESSION 149 - MATERIAL & DISPOSAL SYSTEM PERFORMANCE FOR LLW/ILW WORLDWIDE

Estimating Rates of Percolation Through a Hybrid Cover Design - EnergySolutions' Clive, UT Depleted Uranium Disposal Facility	3348
<i>Dylan Boyle, Gregg Occhiogrosso, Sean McCandless, Daniel Levitt</i>	
Use of Regression Analysis to Abstract a Complex Percolation Model into a Simplified Site-Specific Empirical Formula.....	3363
<i>Steven Hommel</i>	
A Model to Predict Steel Liner Performance in Cementitious Environments for Geologic Timeframes.....	3377
<i>Bruce Wiersma, Greg Flach, Mark Layton, Xian- Kui Zhu</i>	
Modeling of Oxidized Cementitious Waste Forms: Oxidation Depths Estimation and Tc Leaching Assessment Under Field Scenarios.....	3392
<i>Zhiliang Chen, Peng Zhang, Kevin Brown, Hans Van Der Slood, Johannes Meeussen, Andrew Garbrabants, Rossane Delapp, David Kosson</i>	
Applicability of RESRAD Codes as Tools for Evaluating Radioactive Waste Landfills and Release Sites	3406
<i>Katie Catlett, Ralph Perona, Paul Black, Danesha Byron, Aharon Fleury, Sam Van Sickle</i>	

Leaching Behavior Test and Microscopic Observation of Lead, Cadmium, Antimony Included Solidified Waste.....	3414
<i>Yulim Lee, Jaeyeong Park</i>	

Interactions Between Geosynthetic Clay Liners and Concrete in Low-Level Radioactive Waste Disposal Facilities	3426
<i>Yu Tan, Jiannan Chen, Craig Benson, Huyuan Zhang</i>	

SESSION 153 - UPDATE ON SALT AND SUPERNATE TANK WASTE PROCESSING

Temperature Comparisons of Cesium Ion Exchange Performance with Crystalline Silicotitanate on Hanford Tank Waste	3433
<i>Amy Westesen, Sandra Fiskum, Truc Trang-Le, Emily Campbell, Andrew Carney, Reid Peterson, Matt Landon, Kris Colosi</i>	

Batch Contact Results to Evaluate Matrix Effects on Cs Exchange with Crystalline Silicotitanate in Tank Waste	3437
<i>Emily Campbell, Amy Westesen, Reid Peterson, Sandra Fiskum</i>	

Performance of a Scaled Tank Side Cesium Removal Test System at High Solids Loading.....	3442
<i>Philip Schonewill, Phillip Gauglitz, Richard Daniel, Carolyn Burns, Stephen Davidson, Matt Landon</i>	

Filtration of Hanford Tank 241-AP-107 Supernatant Samples Obtained at Prototypic Tank Level and Filtered at 16 °C.....	3456
<i>Reid Peterson, Jarrod Allred, John Geeting, Amy Westesen, Edgar Buck, Kris Colosi</i>	

SESSION 154 - REGULATORY ISSUES AND SOLUTIONS FOR LLW/ILW WORLDWIDE

New Developments in France for VLLW Management	3467
<i>Virginie Wasselin, Jean-Michel Hoorelbeke, Fanny Gérard, Daniel Delort</i>	

Relationship Between Terrestrial Background and Remedial Criteria for NORM in the US.....	3472
<i>Steven Brown</i>	

Revision of the NNSSWAC and Resolution of the FOAV Settlement Agreement	3473
<i>Marilew Bartling</i>	

Developing Transport Regulations for Large-Volume Decommissioning Wastes.....	3480
<i>Ceinion Thomas, Daniel Fisher, Pierre Malesys</i>	

SESSION 155 - ADVANCEMENTS IN TECHNICAL EDUCATION AND TRAINING TO IMPROVE AND SUSTAIN INSTITUTIONAL KNOWLEDGE

The Value of Interpretation for Preservation of Knowledge and Communication of Institutional Controls	3493
<i>Kevin McCarthy, Padraic Benson, Shawn Montgomery, Penny Borgman, Steven Juhlin, Richie Ashcraft</i>	

Innovation and Success During the COVID-19 Pandemic.....	3499
<i>Kerry Adamson, Paul Vandervert</i>	

Formal Onboarding and Turnover for Easy Change and Teamwork	3505
<i>Tamara Shokes</i>	

An Approach for Evaluating Contaminants of Concern and Communicating Risk to the Public Using ETTP of Oak Ridge as a Case Study.....	3515
<i>Michael Gochfeld, Joanna Burger, David Kosson, Kevin Brown</i>	

SESSION 156 - MODELING APPLICATIONS AND FLOW/TRANSPORT ANALYSIS IN ENVIRONMENTAL REMEDIATION

3-D Numerical Modeling for Decision Support, Material Disposal Area L, LANL, NM, USA	3526
<i>Philip Stauffer, Hannah Behar, David Diehl, John Hopkins, Kenneth Ocker, Emily Snyder, Cheryl Rodriguez</i>	
Numerical Modeling of the Performance of an Evapotranspiration Surface Barrier at Hanford.....	3537
<i>Fred Zhang, Sunil Mehta, Marcel Bergeron</i>	
Reactive Transport Modeling for Nuclear Waste Sites.....	3550
<i>Zexuan Xu, Bhavna Arora, Miles Denham, Rebecca Serata, Hansell Gonzalez Raymat, Haruko Wainwright, Carol Eddy-Dilek</i>	
Vadose Zone Flow and Transport Simulations in Support of the Hanford Site Central Plateau Cumulative Impact Evaluation	3564
<i>Mart Oostrom, Praveena Allena, Christopher Farrow, Dennis Fryar, John McDonald, Guzel Tartakovsky, Mary Weber</i>	

SESSION 157 - ENVIRONMENTAL REMEDIATION PROGRESS TOWARD CLOSURE OF CONTAMINATED SITES AROUND THE WORLD

Update on Cameco Corporation's Vision in Motion Project.....	3577
<i>Rebecca Peters, Thomas Smith, George Trotter</i>	
Current Technologies for the Remediation of Difficult-to-Measure Radionuclides at Nuclear Sites	3586
<i>Shaun Hemming, Jamie Purkis, Phil Warwick, James Graham, Andy Cundy</i>	
Vertical Dynamics of Contaminant Plumes Over Long-Term Monitoring Timeframes.....	3600
<i>Miles Denham, Hansell Gonzalez Raymat, Carol Eddy-Dilek, Anamary Daniel</i>	

SESSION 158 - DEVELOPMENTS IN DEEP BOREHOLE DISPOSAL AROUND THE WORLD

A Framework for Streamlining RD&D Activities for Deep Borehole Disposal.....	3614
<i>Dirk Mallants, Delle Piane Claudio, David Dewhurst, Christian Doblin, Hans-Joachim Engelhardt, Lionel Esteban, Matthew Josh, Ulrich Kelka, Manoj Khanal, Peter Schaub, Baotang Shen, Jingyu Shi, Tilman Fischer, Cornelia Wilske</i>	
Modelling of Geomechanical Stability of a Large-diameter, Deep Borehole for Disposal of Long-lived Intermediate Level Waste	3624
<i>Baotang Shen, Jingyu Shi, Manoj Khanal, Dirk Mallants</i>	
Noble Gas Composition of Deep Rocks to Interpret Provenance and Residence Time of Fluids at a Granite Site in Australia	3639
<i>Cornelia Wilske, Dirk Mallants, Axel Suckow, Julien Bourdet, Delle Piane Claudio, Punjehl Crane, Alec Deslandes, Christoph Gerber, Nigel Spooner, Danielle Questiaux</i>	
Cold Spray Technology Applied to Nuclear Waste Disposal Canisters for Deep Boreholes.....	3654
<i>Christian Doblin, Dirk Mallants, Stefan Gulizia</i>	

Using Numerical Simulation of Fault Zones to Aid Site Selection for Deep Borehole Waste Repositories	3663
<i>Peter Schaub, Ulrich Kelka, Thomas Poulet, Heather Sheldon, Dirk Mallants</i>	

Combining Petrophysics and Mineralogy to Infer Containment Potential of Granites for Borehole Disposal of ILW in Australia	3674
<i>Lionel Esteban, Matthew Josh, David Dewhurst, Delle Piane Claudio, Dirk Mallants</i>	

Author Index