

U.S. NRC NDAA WIR Monitoring Successes at U.S. DOE Savannah River Site

02-12-2019

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NRC Monitoring at Savannah River Site (SRS)

- NRC Monitoring in Coordination with South Carolina as Required by the National Defense Authorization Act for Fiscal Year 2005 (NDAA)
- NRC Monitoring at Saltstone Disposal Facility (SDF) since 2007
- NRC Monitoring at F-Tank Farm (FTF) since 2012
- NRC Monitoring at H-Tank Farm (HTF) since 2015

NRC Monitoring Activities at SRS

- NRC Issues Plan to Monitor DOE
- Current NRC Monitoring Plans include Monitoring Areas and Monitoring Factors
- Monitoring Activities include:
 - onsite observation visits
 - technical reviews
 - data reviews

Overall Successes for NRC Monitoring at SRS

- NRC/DOE Management Meetings
- Separate Monthly Teleconference Calls:
 - NRC/DOE
 - NRC/SCDHEC/EPA Region 4
- Updated Monitoring Plans
- NRC Letters Supplementing a Monitoring Plan
- Coordination of NRC/DOE Research Activities
- Making Progress on Closure of Monitoring Factors

Monitoring at SDF

- Initial SDF Monitoring Plan Issued in 2007
- Revision 1 SDF Monitoring Plan Issued in 2013
- 20 SDF OOVs since 2007
- 16 SDF TRRs issued, including:
 - hydraulic performance of saltstone
 - technetium waste release
 - engineered cover performance

Successes for Monitoring at SDF

- Prioritization of Monitoring Factors Informed by Risk and Uncertainty
- DOE Research Aligned with NRC High-Priority Monitoring Factors
 - saltstone cores
 - simulated saltstone
- NRC Closed or Lowered in Priority Seven Monitoring Factors in Fiscal Year (FY) 2018
- NRC Opened Two New Monitoring Factors in FY 2018

Current Status and Prioritization of SDF Monitoring Factors

MA 1 Inventory	MA 2 Infiltration and Erosion Control	MA 3 Waste Form Hydraulic Performance	MA 4 Waste Form Physical Degradation	MA 5 Waste Form Chemical Degradation	MA 6 Disposal Structure Performance
- 1.01 - Inventory in Disposal Structures §	- 2.01 - Hydraulic Performance of Closure Cap ‡	- 3.01 - Hydraulic Conductivity of Field-Emplaced Saltstone ±	- 4.01 - Waste Form Matrix Degradation ±	- 5.01 - Radionuclide Release from Field-Emplaced Saltstone ±	- 6.01 - Certain Risk-Significant K_d Values in Disposal Structure Concrete ‡
- 1.02 - Methods Used to Assess Inventory ‡	- 2.02 - Erosion Control of the SDF Engineered Surface Cover and Adjacent Area. ‡	- 3.02 - Variability of Field-Emplaced Saltstone ±	- 4.02 - Waste Form Macroscopic Fracturing ±	- 5.02 - Chemical Reduction of T_c by Saltstone ±	- 6.02 - T_c Sorption in Disposal Structure Concrete ±
		- 3.03 - Applicability of Laboratory Data to Field-Emplaced Saltstone ±		- 5.03 - Reducing Capacity of Saltstone ‡	- 6.03 - Performance of Disposal Structure Roofs and HDPE/GCL Layers ‡
		- 3.04 - Effect of Curing Temperature on Saltstone Hydraulic Properties ±		- 5.04 - Certain Risk-Significant K_d Values for Saltstone ‡	- 6.04 - Disposal Structure Concrete Fracturing ‡
				- 5.05 - Potential for Short-Term Rinse Release from Saltstone ±	- 6.05 - Integrity of Non-cementitious Materials ‡
§ Periodic Monitoring Factors (i.e., MFs related to data that NRC staff expects to review on a periodic basis)					
‡ Low Priority					
± Medium Priority					
± High Priority					
Closed					

MA 7 Subsurface Transport	MA 8 Environmental Monitoring	MA 9 Site Stability	MA 10 Performance Assessment Model Revisions	MA 11 Radiation Protection Program
- 7.01 - Certain Risk-Significant K_d Values in Site Sand and Clay ‡	- 8.01 - Leak Detection §	- 9.01 - Settlement Due to Increased Overburden ‡	- 10.01 - Implementation of Conceptual Models ±	- 11.01 - Dose to Individuals During Operations
	- 8.02 - Groundwater Monitoring §	- 9.02 - Settlement Due to Dissolution of Calcareous Sediment ‡	- 10.02 - Defensibility of Conceptual Models ±	- 11.02 - Air Monitoring
	- 8.03 - Identification and Monitoring of Groundwater Plumes in the Z Area ±		- 10.03 - Diffusivity in Degraded Saltstone ‡	
			- 10.04 - K_d Values for Saltstone ‡	
			- 10.05 - Moisture Characteristic Curves ‡	
			- 10.06 - K_d Values for Disposal Structure Concrete ‡	
			- 10.07 - Calculation of Build-Up in Biosphere Soil ‡	
			- 10.08 - Consumption Factors and Uncertainty Distributions for Transfer Factors ‡	
			- 10.09 - K_d Values for SRS Soil ‡	
			- 10.10 - Far-Field Model Calibration ‡	
			- 10.11 - Far-Field Model Source Loading Approach ‡	
			- 10.12 - Far-Field Model Dispersion ‡	
			- 10.13 - Impact of Calcareous Zones on Contaminant Flow and Transport ‡	
			- 10.14 - Scenario Development and Defensibility ‡	
§ Periodic Monitoring Factors (i.e., MFs related to data that NRC staff expects to review on a periodic basis)				
‡ Low Priority				

NRC/DOE Joint Plan for SDF

- Purpose: Identify Information Needed to Support NRC Finding of Reasonable Assurance that DOE Demonstrated Meeting Title 10, *Code of Federal Regulations Part 61 Subpart C* Performance Objectives at SDF
- Needed Information Based on NRC High-Priority Monitoring Factors
- DOE Establishes the Schedule of Providing Information to NRC
- Joint Plan Issued 10/23/2018 - ML18235A068

Monitoring at Tank Farms (TFs)

- FTF Monitoring Plan Issued in January 2013
- TFs Monitoring Plan Issued in October 2015 to Include HTF
- Eight Onsite Observation Visits Since 2012
- 15 TFs TRRs issued, including:
 - tank grouting
 - waste release
 - final inventory and risk estimates after tank closure

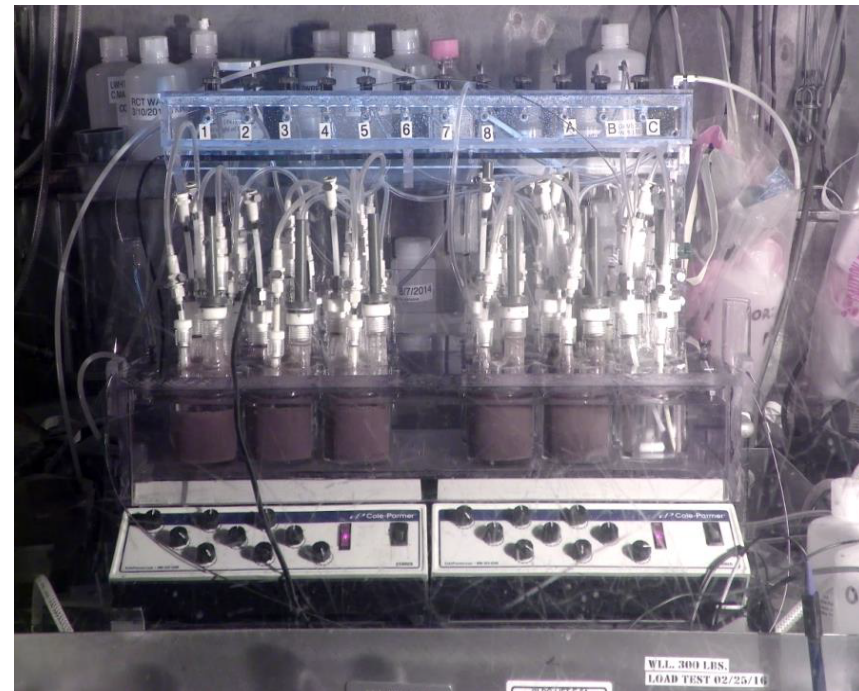
Current Prioritization of TFs Monitoring Factors

- NRC Performed Independent Analysis to Risk-Inform TFs Monitoring Plan and Prioritize Monitoring Factors

Table ES-2. NRC Prioritization of Monitoring Factors That Support 10 CFR 61.41 and 61.42					Table ES-2. NRC Prioritization of Monitoring Factors T		
MA 1 Inventory	MA 2 Waste Release	MA 3 Cementitious Material Performance	MA 4 Natural System Performance	MA 5 Closure Cap	MA 1 Inventory	MA 2 Waste Release	MA 3 Cementitious Material Performance
1.1— Final Inventory and Risk Estimates*	2.1— Solubility-Limiting Phases/Limits and Validation†	3.1— Hydraulic Performance of Concrete Vault and Annulus (As it Relates to Steel Liner Corrosion and Waste Release)‡	4.1— Natural Attenuation of Key Radionuclides†	5.1— Long-Term Hydraulic Performance§	1.4— Ancillary Equipment Inventory§		3.4— Grout Performance*
1.2— Residual Waste Sampling*	2.2— Chemical Transition Times‡	3.2— Groundwater Conditioning via Reducing Grout‡	4.2— Calcareous Zone Characterization*	5.2— Long-Term Erosion Protection Design§	1.5— Waste Removal (As It Impacts ALARA)§		3.5— Vault and Annulus Sorption‡
1.3— Residual Waste Volume*		3.3— Shrinkage and Cracking of Reducing Grout*	4.3— Environmental Monitoring*	5.3— Closure Cap Functions That Maintain Doses ALARA§			3.6— Waste Stabilization (As It Impacts ALARA)§
					§Lower Priority		
					*Medium Priority		
					†High Priority Recommended		
					‡High Priority Dependent or More Difficult		

NRC/DOE Successes at TFs

- Highest Priority Monitoring Factor 2.1 (Solubility-Limiting Phases/Limits and Validation) was Addressed by DOE in Recent Research Efforts
 - Results of several years of waste release testing of Tank 18 high-level waste samples completed in 2016
 - NRC staff completed Waste Release Testing Technical Review Report (TRR) in 2018

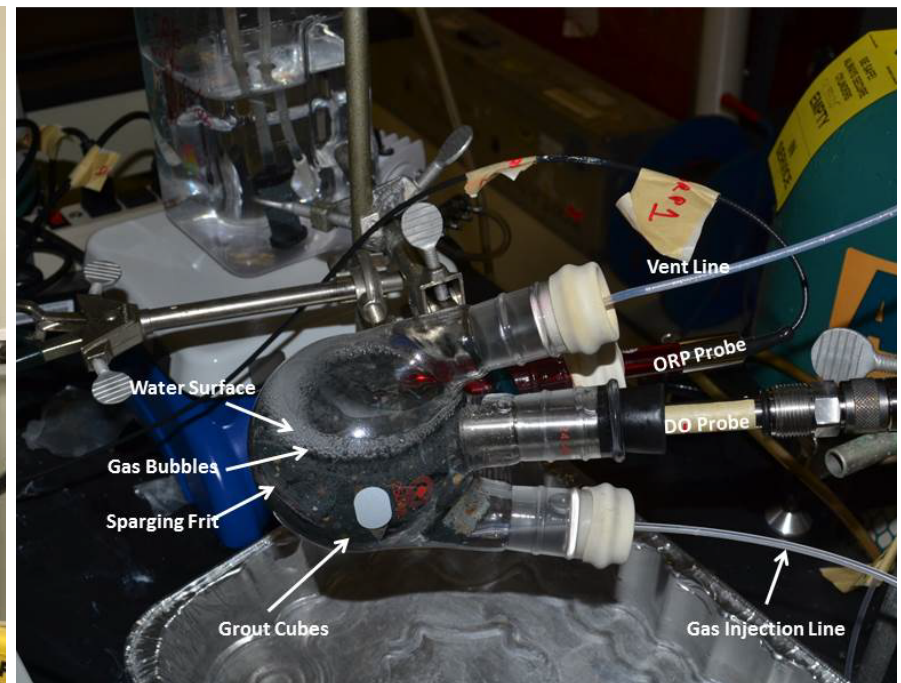


Path Forward for Monitoring at TFs

- Results of DOE Tank 18 Waste Release Experiments Indicated Risk-Significant Solubilities for Plutonium (Pu) and Higher than Expected Solubility for Other Key Radionuclides
- Next Steps Include:
 - reduction in uncertainty in barriers affecting the timing and magnitude of peak Pu dose including:
 - natural system attenuation (chemical barrier delaying timing and magnitude of peak dose)
 - tank/grout performance (hydraulic and chemical barrier to release)
 - tank vault performance (chemical barrier to release)

CNWRA Research to Support NRC NDAA WIR Monitoring at SRS

- More Recent Activities Included:
 - tank grout groundwater conditioning experiments
 - saltstone/technetium release experiments



List of Recent CNWRA Research Reports for NRC on SDF and TFs

- “Saltstone Leaching Experiments-Status Report,” September 2015. ML15302A086
- “Tank Grout Water Conditioning Tests-Status Report,” September 2015. ML15302A081
- “Fiscal Year 2016 Tank Grout Water Conditioning Tests-Status Report,” January 2017. ML18285A834
- “Fiscal Year 2016 Saltstone Leaching Experiment-Status Report,” May 2017. ML17221A038
- *Two more reports expected soon*

Future Activities at SRS

- DOE Plans to Issue Revised SDF Performance Assessment (PA) in 2020
- NRC Will Review Revised SDF PA and Issue Revised SDF Technical Evaluation Report
- NRC Will Issue Revised SDF Monitoring Plan
- NRC Currently Reviewing DOE Revised General Separations Area Groundwater Model for SDF and TFs