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September 1, 2021

MEMORANDUM TO: Melissa Ralph, Acting Chief
Low-Level Waste and Projects Branch
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

THROUGH: Christopher McKenney, Chief *Ch McKenney* Signed by McKenney, Christopher
Risk and Technical Analysis Branch on 09/01/21
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

FROM: Cynthia Barr, Senior Risk Analyst *CBarr* Signed by Barr, Cynthia
Risk and Technical Analysis Branch on 09/01/21
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

SUBJECT: TECHNICAL REVIEW: U.S. DEPARTMENT OF ENERGY
DOCUMENTATION RELATED TO TYPE I AND II TANKS SPECIAL
ANALYSIS (PROJECT NO. PROJ0734)

The U.S. Nuclear Regulatory Commission (NRC) staff has performed a technical review of several documents prepared by the U.S. Department of Energy (DOE) that provide information on anticipated Type I and Type II tank performance after closure at H-Area Tank Farm (HTF) at the Savannah River Site (SRS). The H-Tank Farm Type I and Type II Tank Special Analysis (hereafter, SA), updates the HTF Performance Assessment (PA) model (SRR-CWDA-2010-00128, Revision 1). The SA also documents sensitivity analyses performed to provide additional information that can be used to inform decision-making. The sensitivity analyses provided information about the impact on peak dose of alternative tank configurations/fast-flow paths, variable waste volumes and inventories, iodine solubility variability, iodine and plutonium soil partitioning coefficient (K_d) variability, and grout/cement transition-time variability. The focus of NRC's technical review is engineered and natural features important to Type I and Type II tank performance at the SRS.

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This technical review report (TRR) supports several monitoring factors listed in NRC's combined F-Area and HTF Monitoring Plan entitled "U.S. Nuclear Regulatory Commission Plan for Monitoring Disposal Actions Taken by the U.S. Department of Energy at the Savannah River Site F-Area and H-Area Tank Farm Facilities in Accordance with the National Defense Authorization Act for Fiscal Year 2005" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15238A761), issued in October 2015. The Monitoring Plan discusses NRC's approach to fulfilling its responsibilities under the National Defense Authorization Act for Fiscal Year 2005 to monitor DOE disposal actions to assess compliance with the Performance Objectives in Title 10 of the *Code of Federal Regulations* (CFR) Part 61, Subpart C, for DOE wastes (and associated disposal facilities) to be incidental to reprocessing. Engineered barriers and their performance is a key component to long-term containment of the residual radionuclides remaining after the tanks have been remediated. Natural barriers help mitigate releases from the tank farm facilities. NRC's Monitoring Plan lists the technical areas that are the focus of NRC's monitoring activities. This technical review supports the following Monitoring Factors (MFs):

1. MF 1.1, "Final Inventory and Risk Estimates,"
2. MF 1.2, "Residual Waste Sampling,"
3. MF 1.3, "Residual Waste Volume,"
4. MF 1.4, "Ancillary Equipment Inventory,"
5. MF 2.1, "Solubility-Limiting Phases/Limits and Validation,"
6. MF 3.1, "Hydraulic Performance of Concrete Vault and Annulus (As It Related to Steel Liner Corrosion and Waste Release),"
7. MF 3.2, "Groundwater Conditioning Via Reducing Grout,"
8. MF 3.3, "Shrinkage and Cracking of Reducing Grout,"
9. MF 3.5 "Vault and Annulus Sorption,"
10. MF 4.1, "Natural Attenuation of Key Radionuclides,"
11. MF 6.1, "Scenario Analysis," and
12. MF 6.2 "Model and Parameter Support"

This TRR supplements information from previous TRRs related to Special Analyses (SA) and inventory assessments. NRC revisits findings from previous TRRs including the following:

1. Tanks 18 and 19 SA, ADAMS Accession No. ML13100A230
2. Tanks 5 and 6 SA, ADAMS Accession No. ML13273A299
3. Tank 16 SA, ADAMS Accession No. ML15301A710
4. Tank 16 Inventory, and ADAMS Accession No. ML15301A830
5. Tank 12 Inventory and SA, ADAMS Accession No. ML17277B235.

The NRC staff concludes that:

1. DOE's Special Analysis provides useful information on engineered and natural system performance.
2. DOE's Special Analysis is an improvement over the HTF PA and associated special analyses providing updated inventory information and extensive uncertainty and sensitivity analysis.
3. Many of NRC staff's previous findings are still applicable as noted in more detail in the enclosure.

4. DOE's future PA documentation could be improved with additional information and analyses as indicated in the table below and discussed in more detail in the enclosure.

Table ES-1 Summary of Findings

#	MF	Description of Finding	TRR Section
1	3.5	Technical basis for the cement iodine K_d sorption coefficient value in RR_II and explanation for lack of importance of iodine leachate impact factors on dose.	2.2, 3.2.3
2	4.1	Technical issues associated with iodine K_d sorption coefficient values for soils.	3.2.3
3	2.1	Technical support for iodine solubility values and explanation for lack of importance of iodine solubility in submerged region C on dose.	3.2.2
4	4.1	Technical basis for selection of Pu K_d values in soils.	3.2.3
5	2.1 and 3.5	Lack of sensitivity of Pu solubility and leachate impact factors on dose.	3.2.2
6	1.1, 1.2, and 1.3	Sampling and inventory development for tanks with waste in secondary containment.	3.1.1
7	1.1	Consideration of uncertainty in primary tank inventory.	3.1.1
8	1.4	Validation of ancillary equipment inventory.	3.1.2
9	1.4	Consideration of uncertainty in ancillary equipment inventory.	3.1.2
10	3.1, 3.2, 3.3, 6.1, and 6.2	Modeling treatment of the alternative fast zone (AFZ) case for Type I tanks (e.g., AFZ pathway under tanks).	3.2.6
11	1.1	Potential missed inventory under Type I tank backing strips at bottom plate welds.	3.2.6
12	3.1	Lack of consideration of impact of AFZ pathways on enhancing steel liner corrosion (Type I and II tanks).	3.2.6
13	6.1	Modeling treatment of AFZ case for Type II tanks (e.g., joining of primary and secondary sand pads after secondary liner failure).	3.2.6
14	6.1	Modeling treatment of AFZ case for Type I and II tanks (e.g., lack of consideration of diffusion, which may be important at early times; advection is the only transfer mechanism from the tank grout to the fast zone).	3.2.6
15	6.1	Simulation of release associated with water table rise and fall.	3.2.7
16	6.2	Need for more extensive interpretation of sensitivity analysis results, and technical issues associated with use of one-off analyses.	3.2
17	6.2	Recommendations for probabilistic analysis metrics and presentation of results.	3.3

In this report, there is no significant change to the NRC staff's overall conclusions from the F- and HTF Technical Evaluation Reports (TERs) regarding compliance of DOE disposal actions with the 10 CFR Part 61 performance objectives.

Enclosure:

Technical Review of Documents Related
to the Type I and II Tanks SA

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(PROJECT NO. PROJ0734) DATE: September 1, 2021

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