September 7, 2012

ORGANIZATION: Department of Energy

SITE: Savannah River Site, F Tank Farm Closure

SUBJECT: SUMMARY OF TELEPHONE CONFERENCE CALL HELD ON JULY 26, 2012, BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION STAFF AND DEPARTMENT OF ENERGY REPRESENTATIVES CONCERNING REQUEST FOR ADDITIONAL INFORMATION/CLARIFICATION PERTAINING TO THE RESIDUAL WASTE SOLUBILITY RELATED TO REMOVAL OF HIGHLY RADIOACTIVE RADIONUCLIDES FROM TANK 18, F AREA TANK FARM (DOCKET NO. PROJ0734)

On July 26, 2012, the U.S. Nuclear Regulatory Commission (NRC) staff and representatives of the U.S. Department of Energy (DOE) held a telephone conference call to discuss evolution of solubility (particularly plutonium) of residual waste in Tank 18, F Area Tank Farm.

The conference call was used to discuss the staff's Request for Additional Information (RAIs) previously provided in writing to DOE staff.

Enclosure 1 provides a listing of the telephone conference participants. Enclosure 2 contains a listing of the RAI's and a brief description of the status of each item. A copy of this summary was provided to the DOE for comment.

/RA/

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Office of Federal and State Materials
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Docket No.: PROJ0734

Enclosures:
1. List of Participants
2. List of RAI's

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NAME	JShaffner	TMoon	CMcKenney	M.Lee for GSuber	JShaffner
DATE	8/23/12	8/24/12	8/27/12	9/04/12	9/7/12

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LIST OF PARTICIPANTS
TELEPHONE CALLS WITH DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE, F AREA TANK FARM CLOSURE

July 26, 2012

Participants	**Affiliation**
Sherri Ross	Department of Energy (DOE), Savannah River Site
Linda Suttora	DOE HQ
Cynthia Barr	U.S. Nuclear Regulatory Commission (NRC)
George Alexander	NRC
Christopher Grossman	NRC
Mark Fuhrmann	NRC
James Shaffner	NRC
Roberto Pabalan	Center for Nuclear Waste Regulatory Analyses (CNWRA)
David Pickett	CNWRA
Kim Hauer	Savannah River Remediation (SRR)
Steve Thomas	SRR
Larry Romanowski	SRR
Mark Layton	SRR
Kent Rosenberger	SRR
Miles Denham	Savannah River National Laboratory

REQUEST FOR ADDITIONAL INFORMATION-SOLUBILITY ANALYSIS

Please note that the following is a high level summary of the discussions. Additional details will be provided in the staff's technical review report on this topic

RAI Number 1-5:

U.S. Nuclear Regulatory Commission (NRC) staff requested information regarding U.S. Department of Energy (DOE) plans for conducting (i) solubility and leach tests recommended by the Plutonium solubility peer review team (LA-UR-12-00079) and NRC in its Technical Evaluation Report (TER) (ADAMS accession number ML112371751), (ii) SRNL recommended solid phase analysis to determine the presence of Plutonium (Pu) carbonate in the waste (SRNL-STI-2012-00106, SRNL-L3100-2012-00017), (iii) tests to determine the ability of Pu carbonates to transform to less soluble forms upon contact with grout (SRNL-STI-2012-00106), and (iv) other test related to waste release (e.g., chemical evolution of waste zone and resultant changes in solubility).

Status:

DOE noted that Performance Assessment (PA) maintenance is required by DOE Order 435.1. F-Tank Farm (FTF) PA maintenance items take into consideration NRC TER recommendations. Due to limited resources, feedback is needed on prioritization of activities. DOE is in the process of developing an integrated priority list for Fiscal Year 2013 and ensuring that activities are aligned with current funding levels. DOE is attempting to optimize research efforts to achieve the greatest overall benefit to the program including development of activities that will support multiple projects. In reference to previous NRC staff interest in obtaining tank waste samples for analysis, DOE expressed interest in leveraging NRC resources to perform experimental analyses. DOE noted that it has almost 1 kg of individual and composite samples from Tank 18 that could be used for experiments. Information regarding the chemical and radiological content of Tank 18 samples is provided in SRR-CWDA-2010-00117.

RAI Number 6-7

NRC requested clarification regarding derivation of Eh values for (i) tank grout and (ii) Savannah River Site (SRS) groundwater, and the basis for the linear interpolation between the two Eh values to determine the expected Eh that controls Pu solubility in the waste zone.

Status

With regard to the conclusion in SRNL-L3200-2011-00011, DOE indicated that the report addresses the Pu solubility peer review team's comments regarding the limited potential for groundwater to oxidize the tank grout. The report concludes that the PA assumption that infiltrating water into the tank is in equilibrium with atmospheric oxygen is reasonable (although it might be slightly conservative). Therefore, it is reasonable to assume that the reductive capacity of the tank grout will be depleted at some point in the future.

DOE indicated that the assumption regarding the linearity of Eh as a function of pH is consistent with Krupka and Serne (NUREG-6377) and that the extrapolation of Eh between cement and natural system groundwaters does not reflect any particular Eh couple. DOE stated that the Eh of groundwater is oftentimes found to be significantly lower than one would assume based on an assumption that the groundwater is in equilibrium with oxygen the mineral phases and Eh couples present in soils and cementitious materials often dictate the Eh.

With respect to reductive capacity of the tank grout, DOE indicated that the minerals assumed to be present in the grout geochemical models generically represent the reductive capacity of the tank grout (i.e., actual minerals controlling Eh may not be explicitly represented). DOE indicated that hydration of the ground blast furnace slag present in the tank grout is expected to release reducing species to the infiltrating groundwater.

NRC inquired whether carbonation of tank grout along fractures would preclude further interaction between infiltrating groundwater and the tank grout. Although the reductive capacity is uncertain, DOE indicates that large error bars are considered in the PA modeling to account for uncertainty in chemical transition times.

DOE has provided NRC geochemist's workbench modeling files and can provide additional files (e.g., activity files). NRC indicates that some examples files used to construct figures in SRNL-STI-2012-00087 would be helpful.

RAI Number 8:

NRC staff inquired about the rationale for using the geochemist's work bench flush mode.

Status:

DOE indicated that the flush mode is analogous to a column experiment and is more representative of the base case conceptual model than batch mode. The batch mode was used for comparison in previous analyses, and was seen to result in longer chemical transition times.

RAI Number 9:

NRC staff inquired about the implications of relying on a three step chemical evolution model given the differences in sensitivity of radioelement solubility to changes in Eh and pH. NRC also questioned the shape of the pH versus time curve.

Status:

DOE indicated that due to the limited amount of portlandite present in the SRS tank grout formulations, compared to that assumed for cement materials modeled by Atkinson and Glasser, for example, the transition of pH control by portlandite to C-S-H is quicker in the geochemical modeling used to support the FTF PA. DOE also indicated that the shape of the curve (discrete changes) is a result of the limitation of the Geochemist's Workbench to model changes in the solubility of C-S-H over time. If the solubility of C-S-H- was changed continuously over time, then a more gradual decrease in pH would occur. The end result of these modeling assumptions and simplifications is that the pH is over-estimated at some times and underestimated at other times. DOE indicated that they evaluated the sensitivity of solubility of key radioelements to slight variations in assumed pH. In some cases, solubility

increases with increasing pH; of the key radionuclides, uranium solubility appears to be relatively more sensitive to pH variations in the pH range of interest.

RAI Number 10:

NRC noted that the final mineral controlling pH in DOE's updated geochemical modeling is hydrotalcite (pH 9.2) rather than calcite (pH 8.3) in the previous modeling. NRC staff requested clarification on how this assumption might affect radioelement solubility and whether other geochemical factors important to solubility (e.g., carbonate concentrations) might be affected by this assumption (i.e., if calcite was the controlling material and could lead to higher carbonate concentrations, then solubility of key radioelements could be higher).

Status:

DOE indicated that sensitivity of solubility to carbonate concentrations was addressed in sensitivity analyses in SRNL-STI-2012-00087 and that figures in that report should resolve the question.

RAI Number 11:

NRC requested information on validation of grout normative mineralogy.

Status:

DOE indicated that no attempt has been made to validate the assumed normative mineralogy of the grout through comparison to actual SRS grout analyses or published data.

RAI Number 12:

NRC requested clarification on DOEs use of new solubility model results in its performance assessment.

Status:

DOE indicated that no single value has been selected at this time. DOE stated that the results are used in sensitivity analyses and evaluation of extremely unlikely cases to evaluate the impact of Pu solubility on PA results. NRC noted that the results of the updated Pu solubility analyses show that the predicted doses could be significantly higher or lower than the performance standard over longer periods of performance. Due to uncertainty in the timing of the peak dose and concerns with the likelihood of alternative conceptual models such as by-pass flow through the tank system and water-table rise that could hasten the time to peak dose, NRC staff noted that peak doses over longer periods of time are of interest. NRC staff stated that it will be important to perform waste release experiments with actual tank samples to help constrain the potential solubility and dose associated with Pu under a range of chemical conditions that the tank wastes may come into contact with over time. NRC staff also noted that the Pu solubility modeling in the new special analysis shows that the transition to higher solubility can occur much earlier in time (i.e., upon transition to Oxidized Region II [around 10K years] rather than transition to Oxidized Region III [around 30K years] in DOE's reference case.

RAI Number 13:

NRC asked if there are new insights on the potential for colloidal plutonium.

Status:

DOE said there were no new insights.

RAI Number 14:

NRC asked how DOE is addressing Quality Assurance (QA) issues identified by the Pu solubility peer review team.

Status:

DOE indicated that it addresses the QA issues in three documents that can be made available to NRC. The contractor performed a causal analysis and corrective actions were developed. An independent QA review of the PA will be performed by DOE headquarters.

RAI Number 15:

NRC asked how DOE addressed issues raised by the Pu solubility peer review team report related to the likelihood of fracture flow (i.e., the report indicated that preferential flow through cracks appears to be a much more likely scenario that should be evaluated).

Status:

DOE has not yet addressed the peer review comment. Fracture flow will be addressed through PA maintenance. Work in this area may be combined with PA maintenance activities conducted for the Saltstone Disposal Facility.