

July 25, 2011

ORGANIZATION: U.S. Department of Energy

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Low-Level Waste Branch  
Environmental Protection  
and Performance Assessment Directorate  
Division of Waste Management  
and Environmental Protection  
Office of Federal and State Materials  
and Environmental Management Programs

PROJECT: Savannah River Site, Saltstone Facility

SUBJECT: MAY 19, 2011, SUMMARY OF TELEPHONE CONFERENCE  
CALL TO DISCUSS SECOND REQUEST FOR ADDITIONAL  
INFORMATION FOR REVIEW OF THE UPDATED  
PERFORMANCE ASSESSMENT FOR THE SALTSTONE  
DISPOSAL FACILITY, DOCKET NUMBER PROJ0734

On May 19, 2011, the U.S. Nuclear Regulatory Commission (NRC) participated in a working-level phone call with the U.S. Department of Energy (DOE) to discuss DOE's proposed approach for responses to the NRC staff's second request for additional information (RAI). The purpose of the call was to ensure the comments are fully understood by DOE such that DOE may adequately respond to the NRC's second RAI made during review of the Performance Assessment for the Saltstone Facility at the Savannah River Site. NRC is reviewing the Saltstone Performance Assessment in accordance with its monitoring responsibilities under Section 3116 of the National Defense Authorization Act for Fiscal Year 2005. No formal decisions were made or intended to be made at this meeting. The purpose was for information exchange at the technical staff level and no management was present at the meeting.

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

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Enclosure: As stated

CC w/enclosures: WIR Service List

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**ML111440873**

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**OFFICIAL RECORD COPY**

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**List of Participants**  
**Telephone Conference with the U.S. Department of Energy**  
**Regarding the Savannah River Site, Saltstone Facility**

George Alexander	U.S. Nuclear Regulatory Commission
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Karen Pinkston	U.S. Nuclear Regulatory Commission
Christianne Ridge	U.S. Nuclear Regulatory Commission
Sherri R. Ross	U.S. Department of Energy
Patricia Suggs	U.S. Department of Energy
Linda Suttora	U.S. Department of Energy
Kent Rosenberger	Savannah River Remediation
Richard Sheppard	Savannah River Remediation
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Greg Flach	Savannah River National Laboratory
Barry Lester	Savannah River National Laboratory

**Request for Additional Information Discussion and Status with Regard to the U.S.  
Nuclear Regulatory Commission Monitoring Activities at the Saltstone Disposal Facility  
at the Savannah River Site  
May 19, 2011**

The U.S. Nuclear Regulatory Commission (NRC) sent its second Request for Additional Information (RAI) on December 15, 2010 (ML103400571). Due to the complexity of performance assessments (PA) and associated RAIs, extensive clarification of RAI comments is sometimes necessary. Additionally, the NRC staff provided some indication of the risk significance of the basis for various RAI comments to the U.S. Department of Energy (DOE).

**Topic:** *E<sub>H</sub>/pH Transition Times*

**Discussion:** NRC staff had two main questions regarding the E<sub>H</sub> and pH transition times:

1. NRC staff questioned the reducing capacity assumed for the saltstone in the PA. This reducing capacity was based on a measurement reported by Kaplan (SRNS-STI-2008-00045). In SRNS-STI-2008-00045, the ratio of the reducing capacity of saltstone to the reducing capacity of pure blast furnace slag was unexpectedly high based on the amount of blast furnace slag present in the saltstone. NRC staff noted a report generated by the Cement Barriers Partnership (CBP-RP-2010-013-01) that hypothesized that a possible explanation for this could be that some of the measured reducing capacity in the simulated saltstone was due to the presence of nitrite. If this hypothesis were true, the actual reducing capacity in the saltstone would be less than the amount assumed in the PA.

DOE contractor staff provided NRC staff with comments received from two of their subject matter experts. The experts believed that the measured reducing capacity in saltstone was not due to the presence of nitrite for the following reasons. Denham noted that reducing capacity measurements had been taken for saltstone prepared with various simulated salt waste (e.g., ARP/MCU, DDA). The amounts of nitrate/nitrite in these simulants were different, but there was no difference in the measured reducing capacities. Also, Denham looked at the reducing capacity measurements that had been made for Disposal Cell 2 concrete and compared them to the measurements that had been made for simulated saltstone. The ratio of these results was consistent with the expected results based on the relative amounts of slag in the vault 2 concrete and the slag. Kaplan noted that the measurement of the reducing capacity of pure slag was performed on raw slag. When viewed under a microscope, this slag had a crystal structure that had a reduced surface area, however, when a cementitious material is made with this slag and a high pH liquid, the surface area changes.

NRC staff asked a follow up question related to the lack of variability seen in the reducing capacity for slag in three different literature reports.

DOE contractor staff responded that the three reported measurements had low variability because they were all performed on the same slag from SRS.

NRC staff commented that at West Valley, a study showed that a rind formed and not all of the blast furnace slag reacted. NRC contractor staff also noted that in the Kaplan report it was stated that the blast furnace slag was ground (which would seem to contradict the hypothesis that the explanation was due to the crystal structure and surface area of the slag).

DOE contractor staff proposed dividing the assumed number of pore volumes required for the  $E_H$  transition times by four to resolve the above comments. DOE contractor staff noted that they had previously proposed making this change, but NRC staff had stated that there was no basis for the amount of reduction and that it was not helpful to change parameters by arbitrary amounts. However, based on the discussion in this meeting, it was noted that the possible discrepancy observed between the reducing capacity measured for saltstone and blast furnace slag could result in the pore volumes required for  $E_H$  transition to be off by a factor of four. NRC staff stated that this approach seemed reasonable.

2. NRC staff performed a simple calculation of the number of pore volumes required for the  $E_H$  to transition to oxidizing conditions by matching the reported reducing capacity to the amount of oxygen (in oxygen-saturated water) and assuming oxygen transforms from the zero-valent to (-II) valence state. The resulting number of pore volumes differed from the answer that DOE obtained using a more complicated analysis with Geochemist's Workbench by a factor of two. NRC staff asked for clarification about the reason for the different results and why it is not accurate to model the transition times using the simple linear calculation.

The DOE contractor staff stated that a more complex model was required to account for all of the other reactions.

NRC staff requested that DOE provide more information about this in the RAI response, including what other reactions DOE believed to be consuming oxygen and why they were not accounted for in the reported reducing capacity. NRC also asked that DOE provide more information about how the reducing capacity was implemented in Geochemist's Workbench.

DOE contractor staff noted that the Geochemist's Workbench modeling was performed at the same time the saltstone properties studies were being performed. Therefore, the Geochemist's Workbench calculations did not include the updated porosity measurements. NRC staff asked if it

would be possible to update the number of pore volumes required for the  $E_H$  transition in Case K. DOE contractor staff stated that they could correct both the number of pore volumes required for  $E_H$  transition as well as pH transition in Case K.

- Status:** Topic required clarification, NRC staff clarified the RAI to DOE staff; no additional technical discussion is required. NRC looks forward to reviewing the response.
- Topic:** *Conversion of Reducing Capacity to Pyrrhotite for Geochemist's Workbench Model*
- Discussion:** NRC staff asked a question regarding the methodology used to convert the assumed reducing capacity to an equivalent amount of pyrrhotite in the Geochemist's Workbench calculations. A calculation performed by NRC staff seemed to indicate that the assumed amount of pyrrhotite seemed to be inconsistent with the assumed reducing capacity. NRC staff had an action item to send more details on the calculation to DOE following the meeting.
- Status:** Topic required clarification, NRC staff clarified the RAI to DOE staff; no additional technical discussion is required. NRC looks forward to reviewing the response.
- Topic:** *Technetium Modeling Methodology*
- Discussion:** NRC staff also asked if the Smith and Walton approach was going to be used for the modeling of the release of Tc. DOE contractor staff stated that they were using Smith and Walton to model the oxidation front. The model also tracks (i) the development of new fractures over time and, (ii) how the oxidation front would develop from these fractures.
- Status:** Topic required clarification, NRC staff clarified the RAI to DOE staff; no additional technical discussion is required. NRC looks forward to reviewing the response.
- Topic:** *Simulation Duration*
- Discussion:** NRC staff asked if the model was going to be run for the same length of time for Case K as for the previous cases. DOE contractor staff stated that the model was going to be run for 20,000 years as was done for the other cases.
- Status:** Topic required clarification, NRC staff clarified the RAI to DOE staff; no additional technical discussion is required. NRC looks forward to reviewing the response.

References

CBP-RP-2010-013-01, Cementitious Barriers Partnership., Technical Insights for Saltstone PA Maintenance, United States Department of Energy, Office of Environmental Management, Washington, DC. March 2011

SRNS-STI-2008-00045, Kaplan, D. I., et al., *Saltstone and Concrete Interactions with Radionuclides: Sorption ( $K_d$ ), Desorption, and Reduction Capacity Measurements*, Savannah River Site, Aiken, SC, October 30, 2008.