July 25, 2011

ORGANIZATION: U.S. Department of Energy

PROJECT MANAGER: Nishka Devaser */RA/*
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 12, 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 12, 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.

Docket No.: PROJ0734

Enclosures: As stated

CC w/enclosures: WIR Service List

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ML111440857

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Regarding the Savannah River Site, Saltstone Facility

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Kent Rosenberger	Savannah River Remediation
Richard Sheppard	Savannah River Remediation
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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 12, 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).

Items DOE is not planning to change based on NRC public meeting comments

SP-12: ***Comment***: Model support is needed for the process models supporting PA predictions of E_H-pH evolution for cementitious materials.

Discussion: DOE decided not to update E_H/pH transition times because the proposed change did not have a physical basis. NRC staff had stated that it did not appear to be useful to change the modeled transition times without a basis for the new values, but that E_H/pH transition times would be tracked in monitoring.

Status: Topic required clarification, NRC staff and DOE staff clarified their understanding of the topic; no additional technical discussion is required. NRC looks forward to reviewing implementation of the topic in the RAI response.

IEC-8: ***Comment***: The PA should provide a technical basis for the long-term performance of the geotextile filter fabric and the upper and lower lateral drainage layers.

Discussion: DOE stated that they would not update the assumed performance of the lateral drainage layer, and that details on the basis for the assumed performance will be provided as part of the FTF RAI responses. However, DOE indicated it would change the assumed performance of the vault roof. This is expected to result in less modeled shedding of water from the roof because the model would no longer include as abrupt a change in materials properties between the roof and the lateral drainage layer. Additionally, DOE staff stated that they would discretize the model more finely. NRC staff cautioned DOE that using the original assumed lateral drainage layer properties could result in problems at the end of the process if NRC staff still disagreed with the assumed lateral drainage layer performance. DOE contractor staff stated that they could give NRC information on the calculated water budgets to review prior to providing the final RAI responses.

Status: Topic required clarification, NRC staff and DOE staff clarified their understanding of the topic; no additional technical discussion is required. NRC looks forward to reviewing implementation of the topic in the RAI response.

Items DOE intends to change based on NRC public meeting comments

IN-5: ***Comment***: Additional information is needed about the Th-230 inventory assumed for Vault 4 and the process used to confirm that all risk-significant radionuclides have been identified as key radionuclides as waste is disposed and final inventory information becomes available.

Discussion: DOE contractor staff stated that they would look at the analytical data to date for radionuclides in the U-238 decay chain (U-238, U-234, Th-230, Ra-226) and that the inventory assumed in the model would be updated based on this information. NRC will receive this information with the RAI responses. NRC staff noted that if the inventory of these radionuclides is based on a special calculation and if the predicted inventory is significantly below the maximum possible inventory based on assuming these radionuclides are present at the detection limit, there will be significant uncertainty in the inventory of Ra-226 precursors in saltstone and this could result in the dose consequences from Ra-226 being unclear.

Status: Topic required clarification, NRC staff and DOE staff clarified their understanding of the topic; no additional technical discussion is required. NRC looks forward to reviewing implementation of the topic in the RAI response.

K_d values: ***Comment***: Pertains to entire table of comments below.

RAI	Comment
SP-10	There are indications that some measured plutonium and neptunium sorption coefficients in cementitious materials could reflect solubility rather than sorption, which could lead to a significant overestimate of plutonium and neptunium sorption.
SP-11	In recent experiments used to help define K_d values for cementitious materials, the distinction between “middle” and “old” age conditions was based chiefly on water chemistry—not on the mineralogical assemblage. It is not clear whether the differences in solid phases for the different stages can be neglected.
SP-14	Additional information is needed about the basis for the K_d values used for iodine and radium in cementitious materials.
SP-15	The basis for the adopted technetium pseudo-K_d of 1,000 mL/g for reducing conditions is not sufficient.
SP-18	Additional justification is required for the uncertainty ranges used for K_d values in cementitious materials.
FFT-1	Additional justification is required for the uncertainty ranges used for K_d values in site soils.
FFT-3	Additional justification is needed for the K_d of selenium in vadose and backfill soils.

Discussion: K_d values will be updated to reflect the results of the latest research. NRC staff indicated that, in principle, using updated K_d values seems

appropriate, but that NRC may have additional questions when it receives the updated values and supporting information.

Status: Topic required clarification, NRC staff and DOE staff clarified their understanding of the topic; no additional technical discussion is required. NRC looks forward to reviewing implementation of the topic in the RAI response.

Other Discussion Topics

Modeling of Fractures:

Comment: Pertains to entire table of comments below.

RAI	Comment
PA-8	The base case does not represent the current and reasonably expected future conditions.
PA-10	Assumptions in the PA regarding the conceptual model and parameterization may result in unsupported modeled flow rates through saltstone.
SP-4	Characteristic curves implemented in the PA are based on a continuum approach that does not reflect non-equilibrium flow.

Discussion: NRC staff had a series of comments about DOE's proposed approach for modeling degradation of saltstone and fracture flow. First, NRC staff noted that the modeled saturation of saltstone was high and NRC staff does not expect that there would be much change in hydraulic conductivity between completely saturated conditions and the modeled saturations. NRC staff stated that the moisture characteristic curves for fractured concrete in the PA rely on an analytical approach that has only been tested against a limited range of suction head (Or and Tuller, 2000; Tokunaga and Wan, 1997). The relevant range of suction head for the fractured concrete moisture characteristic curves in the PA, where minor changes in saturation result in significant changes in suction head, extend well beyond these experimental test conditions. NRC staff suggested that, given the high saltstone saturations predicated by DOE, it may be easier and more appropriate to use a relative permeability of one (i.e., to model the system as saturated).

DOE contractor staff noted that if the fractures are dry, they do not believe that there would be much flow through the system. NRC staff asked if this statement was based on experimental results or on theoretical information. DOE contractor staff stated that it was based on theory, but that they believed that it was appropriate to use literature information. NRC staff noted that uptake of water from the fracture into the matrix may be limited under gravity-driven infiltration conditions and in the case of saltstone, which is predicted to be near saturation in the PA, the matrix would have a limited uptake capacity. NRC and DOE acknowledged differences in modeling fracture flow. NRC staff will evaluate this topic upon further review of Case K.

Status: Topic required clarification, NRC staff and DOE staff discussed the topic; additional technical discussion is required.

Modeling of Technetium Oxidation*:*

Comment: Pertains to entire table of comments below.

RAI	Comment
SP-15	The basis for the adopted technetium pseudo-K_d of 1,000 mL/g for reducing conditions is not sufficient.
SP-19	Research related to the release of Tc-99 from saltstone appears to be inconsistent with the Tc-99 releases modeled in the PA.

Discussion: In previous conversations, NRC and DOE contractor staff discussed whether it is appropriate to model the oxidation of Tc by using a K_d value based on a weighted average of the oxidized and reduced K_d values. Prior to this phone call, NRC staff provided the results of simple GoldSim calculations that were performed to assess the results of using a weighted average for the K_d value rather than modeling the oxidized and reduced portions of the grout separately. This model only included advective transport and did not include diffusion. The model was run with various assumed fractions of oxidized saltstone, but these fractions were assumed to remain constant with time. The results of this analysis indicated that very different results could be obtained when modeling the release using a weighted average K_d value instead of modeling the system using separate oxidized and reduced K_d values.

In response to the NRC results, DOE contractor staff prepared their own GoldSim model that involved a 20x21 matrix of mixing cells, including one column of fracture cells and 20 columns of intact cells. These cells oxidized over time and the number of fractures also increased with time. The DOE contractor staff found that the results of this model matched the results obtained from using the weighted K_d approach. DOE contractor staff also stated that they did not believe that the simplifying assumption that there is no diffusion that was made in the NRC model was accurate. The DOE contractor staff stated that they believed that there would be back diffusion from the oxidized to reduced zones because the concentration in the pore fluid in the oxidized portion of the wasteform is expected to be much greater than the concentration in the reduced portion.

NRC staff asked if DOE had quantified the amount of diffusion from the oxidized to reduced zone in their model. They responded that they had not.

NRC staff asked about the methods used by DOE to determine the flows through their model. Advective flow was determined by using the average velocity calculated using PORFLOW multiplied by the area of the wasteform. This entire volumetric flow was then modeled as being routed through the fracture. NRC staff noted that in the real system it is likely that the oxidized portion of the

wasteform would also have some hydraulic degradation. NRC staff hypothesized that the modeled amount of diffusion from the oxidized zone to the reduced zone might be less if some flow is modeled as going through the oxidized cells because this would purge some of the high concentration pore fluid from the oxidized cells. DOE proposed that contaminants diffuse to the fracture zone.

NRC stated that they would like to consider the topic and continue discussions on a follow-up call on Tuesday May 15th. Due to scheduling conflicts, the Tuesday, May 15th follow-up call took place on May 17th.

Status: Topic required clarification, NRC staff and DOE staff discussed the topic; additional technical discussion is required.