May 27, 2015

Ms. Jean Ridley, Director
Waste Disposition Programs Division
U.S. Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, SC 29802

SUBJECT: THE U.S. NUCLEAR REGULATORY COMMISSION FEBRUARY 4 – 5, 2015, ONSITE OBSERVATION VISIT REPORT FOR THE SAVANNAH RIVER SITE SALTSTONE DISPOSAL FACILITY (DOCKET NO. PROJ0734)

Dear Ms. Ridley:

The enclosed onsite observation visit report describes the U.S. Nuclear Regulatory Commission (NRC) onsite observation visit on February 4–5, 2015, at the Savannah River Site (SRS) Saltstone Disposal Facility (SDF). That onsite observation visit was conducted in accordance with Section 3116(b) of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (NDAA), which requires the NRC to monitor certain disposal actions taken by the U.S. Department of Energy (DOE) for the purpose of assessing compliance with the performance objectives set out in Title 10 of the Code of Federal Regulations (CFR) Part 61, Subpart C. This is the sixteenth SDF onsite observation visit since the NRC began monitoring the DOE SDF disposal actions under NDAA Section 3116(b) in October 2007.

The main activities conducted during the February 2015 SDF onsite observation visit were a tour and technical discussions. The tour included: (i) construction of Saltstone Disposal Structure (SDS) 6, (ii) Saltstone Production Facility, (iii) new monitoring wells in Z-Area; and (iv) outside of SDS 3A, SDS 3B, SDS 5A, and SDS 5B. The technical discussions focused on: (i) DOE SDF operating status and disposal structure status; (ii) routine documentation and Follow-Up Action Items from previous NRC monitoring activities; (iii) ongoing and future NRC research activities by the Center for Nuclear Waste Regulatory Analyses (CNWRA); (iv) DOE sampling and analyses plan research status; (v) iodine sorption and Tc solubility; (vi) Tan Clay Confining Zone (TCCZ) structure and ZBG-2 well sample results; (vii) SDS 3A sump Unreviewed Waste Disposal Question Evaluation (UWDQE); (ix) PORFLOW modeling for the DOE SDF Fiscal Year (FY)14 Special Analysis document; and (x) GoldSim modeling for the DOE SDF FY14 Special Analysis document.

Those activities were consistent with those described in the NRC Observation Guidance Memorandum for the SRS SDF Onsite Observation Visit (dated December 5, 2014,) [ML14321A534]. That Guidance Memorandum was developed using the SDF Monitoring Plan, Rev. 1 (dated September 2013) [ML13100A113]. The SDF Monitoring Plan contains the monitoring areas and monitoring factors, which describe how the NRC will monitor the DOE

SDF disposal actions to assess compliance with the performance objectives. All previous NRC concerns have been rolled into the monitoring factors in the 2013 SDF Monitoring Plan.

The NRC does not expect to close any of the 73 SDF monitoring factors (specific to a specific performance objective) or change the NRC staff TER overall conclusions as a result of this onsite observation visit. There were no SDF Open Issues before the February 2015 onsite observation visit and there were none identified during the onsite observation visit. Thus, there are currently no SDF Open Issues.

The NRC does expect to open and close Follow-Up Action Items during onsite observation visits and clarification teleconference calls. Most of those Follow-Up Action Items are specific short-term actions to be performed by the NRC or the DOE. Usually, most of those Follow-Up Action Items are closed before the next onsite observation visit or clarification teleconference call.

A main focus point of the NRC staff performing an onsite observation visit under NDAA monitoring at the SDF is because on April 30, 2012, the NRC issued both a Technical Evaluation Report (TER) [available via the NRC Agencywide Documents Access and Management System (ADAMS) at Accession Number ML121020140] and a Type-IV Letter of Concern [ML120650576] pertaining to waste disposal at the SRS SDF. The TER concluded that the NRC did not have reasonable assurance that salt waste disposal at the SDF met the performance objective of §61.41. The Type-IV Letter of Concern formally communicated the NRC concerns to both the DOE and the South Carolina Department of Health and Environmental Control. The DOE provided responses to the Type-IV Letter to the NRC in multiple submittals. Those submittals included an updated technetium-99 (Tc-99) inventory projection for the constructed SRS disposal structures similar in design to SDS 2A and information about the DOE Case K and K1 uncertainty and sensitivity analyses. Inventory projections described in the DOE submittal are listed in reference to SDS 2A, SDS 2B, SDS 3A, SDS 3B, SDS 5A, and SDS 5B. In August 2012, the NRC issued a letter of acknowledgement [ML12213A447] to the DOE, which included that: "… the NRC staff concludes that a Type-II Letter to the U.S. Congress is not needed at this time."

Based on the NRC TER analyses and the DOE revised Tc-99 inventory, the NRC staff determined that, if the DOE new projected Tc-99 inventory for the constructed disposal structures was correct, then it was unlikely that the salt waste disposal would cause an off-site peak dose exceeding the requirements of §61.41 (i.e., 0.25 mSv/yr (25 mrem/yr)).

The NRC and the DOE continue to work in the monitoring process to resolve all outstanding concerns that led to issuance of the NRC Type-IV Letter of Concern. Therefore, in accordance with the requirements of NDAA Section 3116(b), the NRC will continue to monitor the DOE disposal actions at SRS.

If you have any questions or need additional information regarding this onsite observation visit report, please contact Mr. Terrence C. Brimfield of my staff at Terrence.Brimfield@nrc.gov or at (301) 415-6069.

Sincerely,

/RA/
Andrew Persinko, Deputy Director
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Enclosure:
NRC Onsite Observation Visit Report

cc w /enclosure:
WIR Service List
WIR e-mail Contacts List

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U.S. NUCLEAR REGULATORY COMMISSION
FEBRUARY 4 – 5, 2015, ONSITE OBSERVATION VISIT REPORT FOR THE SAVANNAH RIVER SITE SALTSTONE DISPOAL FACILITY

EXECUTIVE SUMMARY:

The U.S. Nuclear Regulatory Commission (NRC) staff conducted its sixteenth onsite observation visit, Observation 2015-01, to the Saltstone Disposal Facility (SDF) at the Savannah River Site (SRS) on February 4 – 5, 2015. This is the first SDF onsite observation visit in Calendar Year (CY) 2015. On every onsite observation visit to SRS, the NRC is focused on assessing compliance with four performance objectives in Title 10 of the Code of Federal Regulations (CFR) Part 61, Subpart C: (1) protection of the general population from releases of radioactivity (§61.41), (2) protection of individuals from inadvertent intrusion (§61.42), (3) protection of individuals during operations (§61.43), and (4) stability of the disposal site after closure (§61.44).

For SDF Observation 2015-01, the NRC focused on the monitoring areas and monitoring factors in the SDF Monitoring Plan, Rev. 1 (September 2013). This is the second SDF onsite observation visit under SDF Monitoring Plan, Rev. 1. All previous NRC concerns have been rolled into the monitoring factors in the 2013 SDF Monitoring Plan. The NRC performs monitoring activities in coordination with the State, therefore South Carolina Department of Health and Environmental Control (SCDHEC) staff also participated in SDF Observation 2015-01 and received the same information from the U.S. Department of Energy (DOE) as the NRC received from the DOE during SDF Observation 2015-01.

As described in the Observation Guidance Memorandum for SDF Observation 2015-01 (December 2014), the NRC staff and the DOE (i.e., includes DOE contractors throughout this onsite observation visit report) had a tour and technical discussions. The tour included: (i) construction of Saltstone Disposal Structure (SDS) 6, (ii) Saltstone Production Facility, (iii) new monitoring wells in Z-Area; and (iv) outside of SDS 3A, SDS 3B, SDS 5A, and SDS 5B. The technical discussions focused on: (i) DOE SDF operating status and disposal structure status; (ii) routine documentation and Follow-Up Action Items from previous NRC monitoring activities; (iii) ongoing and future NRC research activities by the Center for Nuclear Waste Regulatory Analyses (CNWRA); (iv) DOE sampling and analyses plan research status; (v) iodine sorption and Tc solubility; (vi) Tan Clay Confining Zone (TCCZ) structure and ZBG-2 well sample results; (vii) SDS 3A sump Unreviewed Waste Disposal Question Evaluation (UWDQE); (ix) PORFLOW modeling for the DOE SDF Fiscal Year (FY)14 Special Analysis document; and (x) GoldSim modeling for the DOE SDF FY14 Special Analysis document. This onsite observation visit report provides a description of the NRC activities during SDF Observation 2015-01, including observations made by the NRC staff.

The NRC does not expect to close any of the 73 SDF monitoring factors (specific to a specific performance objective) or change the NRC staff TER overall conclusions as a result of this onsite observation visit. There were no SDF Open Issues before the February 2015 onsite observation visit and there were none identified during that onsite observation visit. Thus, there are currently no SDF Open Issues. The NRC and the DOE continue to work in the monitoring process to resolve all outstanding concerns that led to issuance of the NRC Type-IV Letter of Concern.

Enclosure

The NRC staff received the updated DOE presentation (SRR-CWDA-2015-00011, Rev. 1) that pertained to the activities observed during SDF Observation 2015-01. That DOE presentation is accessible via the NRC document repository, the Agencywide Documents Access and Management System (ADAMS), via Accession No. ML15070A359.

1.0 BACKGROUND:

Section 3116(a) of the National Defense Authorization Act for Fiscal Year 2005 (NDAA) authorizes the DOE, in consultation with the NRC, to determine that certain radioactive waste related to the reprocessing of spent nuclear fuel is not high-level waste, provided certain criteria are met. NDAA Section 3116(b) requires the NRC to monitor the DOE disposal actions to assess compliance with the performance objectives in 10 CFR Part 61, Subpart C.

On March 31, 2005, the DOE submitted to the NRC the *Draft Section 3116 Determination for Salt Waste Disposal Savannah River Site* (DOE-WD-2005-001, Rev. 0) to demonstrate compliance with the NDAA criteria, including demonstration of compliance with the performance objectives in 10 CFR Part 61, Subpart C. In its consultation role, the NRC staff reviewed the draft waste determination. In the NRC TER issued in December 2005, the NRC documented the results of its review and concluded that there was reasonable assurance that the applicable criteria of NDAA could be met, provided certain assumptions made in the DOE analyses were verified via monitoring. Taking into consideration the assumptions, conclusions, and recommendations in the NRC 2005 TER, the DOE issued the final waste determination in January 2006 (DOE-WD-2005-001, Rev. 1).

The DOE submitted a revised Performance Assessment to the NRC in 2009 (SRR-CWDA-2009-00017). The NRC reviewed SRR-CWDA-2009-00017, including holding public meetings, sending requests for additional information, and reviewing the DOE responses. On April 30, 2012, the NRC issued both the TER and a Type-IV Letter of Concern. In the 2012 TER, the NRC concluded that it did not have reasonable assurance that the DOE salt waste disposal at the SDF met the performance objectives in 10 CFR Part 61, specifically 10 CFR 61.41. The NRC Type-IV Letter of Concern formally communicated the NRC concerns to both the DOE and the SCDHEC.

In July 2012, the DOE responded to the Type-IV Letter to the NRC in multiple submittals. The DOE responses included an updated technetium-99 (Tc-99) inventory projection for the constructed disposal structures similar in design to Saltstone Disposal Structure (SDS) 2A and information about the DOE Case K and K1 uncertainty and sensitivity analyses. In August 2012, the NRC issued a letter of acknowledgement [ML12213A447] to DOE, which included that: "… the NRC staff concludes that a Type-II Letter to the U.S. Congress is not needed at this time." Based on the NRC 2012 TER analyses and the DOE revised Tc-99 inventory, the NRC staff determined that, if the DOE new projected Tc-99 inventory for the constructed disposal structures was correct, then it was unlikely that the salt waste disposal would cause an off-site peak dose exceeding the requirements of §61.41 (i.e., 0.25 mSv/yr (25 mrem/yr)).

To carry out its monitoring responsibility under NDAA Section 3116(b), the NRC, in coordination with the State site regulator – SCDHEC, performs three types of activities: (1) technical reviews, (2) onsite observation visits, and (3) data reviews. Those activities focus on both:

(1) key modeling assumptions identified in the NRC SDF Monitoring Plan, Rev. 1; and (2) the DOE disposal actions. Technical reviews generally focus on review of information generated to provide support for key assumptions that the DOE made in the SDF Performance Assessment or supplements, such as special analyses. Onsite observation visits generally are performed to either: (1) observe the collection of data and review the data to assess consistency with assumptions made in the SDF final Waste Determination; or (2) observe key disposal or closure activities related to technical review areas. Data reviews supplement technical reviews by focusing on monitoring data that may indicate future system performance or reviewing records or reports that can be used to directly assess compliance with the performance objectives.

2.0 NRC ONSITE OBSERVATION VISIT ACTIVITIES:

On December 5, 2014, the NRC issued the Observation Guidance [ML14321A534] for the February 4 – 5, 2015, onsite observation visit, SDF Observation 2015-01. An Observation Guidance is a plan for what NRC expects to cover during an onsite observation visit, which may be changed based on what happens during the onsite observation visit.

The SDF Observation 2015-01 began with a short briefing on the agenda presented by the DOE contractor, Savannah River Remediation (SRR) that was attended by representatives from the DOE, the NRC, and the SCDHEC. Afterwards, there were welcoming remarks and introductions. The rest of the onsite observation visit consisted of a tour and technical discussions. The tour included: (i) construction of SDS 6, (ii) Saltstone Production Facility, (iii) new monitoring wells in Z-Area; and (iv) outside of SDS 3A, SDS 3B, SDS 5A, and SDS 5B. The technical discussions focused on: (i) DOE SDF operating status and disposal structure status; (ii) routine documentation and Follow-Up Action Items from previous NRC monitoring activities; (iii) ongoing and future NRC research activities by the Center for Nuclear Waste Regulatory Analyses (CNWRA); (iv) DOE sampling and analyses plan research status; (v) iodine sorption and Tc solubility; (vi) Tan Clay Confining Zone (TCCZ) structure and ZBG-2 well sample results; (vii) SDS 3A sump Unreviewed Waste Disposal Question Evaluation (UWDQE); (ix) PORFLOW modeling for the DOE SDF FY14 Special Analysis document; and (x) GoldSim modeling for the DOE SDF FY14 Special Analysis document.

2.1 Tour – Construction of SDS 6, Saltstone Production Facility, new monitoring wells in Z-Area; and outside of SDS 3A, SDS 3B, SDS 5A, and SDS 5B:

2.1.1 Observation Scope:

This tour supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This tour was most relevant to the following monitoring areas (MAs) and monitoring factors (MFs) in SDF Monitoring Plan, Rev. 1:

- MA 6 (Disposal Structure Performance):
    - MF 6.03 (Performance of Disposal Structure Roofs and HDPE/GCL Layers)
    - MF 6.04 (Disposal Structure Concrete Fracturing)
    - MF 6.05 (Integrity of Non-Cementitious Materials)

- MA 8 (Environmental Monitoring):
    - MF 8.02 (Groundwater Monitoring)

2.1.2 Observation Results:

The NRC staff and the DOE toured construction of SDS 6, including the floor and roof. The NRC staff observed that: (i) the floor of SDS 6 was in place, (ii) several roof panels had been placed; and (iii) pouring of concrete for wall panels and roof support columns was partially complete. The NRC staff observed construction details of SDS 6, such as: (i) forms for pouring of concrete for wall panels and columns, including placement of rebar; (ii) placement of bearing pad under wall panels; and (iii) placement of water stops between wall panels and between roof panels. The DOE showed the NRC staff pictures of SDS 6 construction on a laminated card.

In response to the NRC staff questions, the DOE explained that the SDS 6 concrete remains under cure blankets until it attains 3,500 pounds per square inch (psi) (~24.13 megapascal) strength. The DOE indicated that was in accordance with industry standards and, in the weather conditions during SDF Observation 2015-01, that standard was typically met within three weeks.

The DOE brought the NRC staff to the Saltstone Production Facility where the DOE provided an overview of the location and process. The Saltstone Production Facility was not operating. In vehicles, the DOE showed the NRC staff the locations of two new groundwater monitoring wells in the Z-Area and the outside of several disposal structures (i.e., SDS 3A, SDS 3B, SDS 5A, SDS 5B).

2.1.3 Conclusions and Follow-up Action Items:

The NRC staff will continue to monitor the DOE SDF activities. The following Follow-Up Action Items resulted from that tour:

- The DOE to provide the NRC staff with additional photos of construction of SDS 6 including:
    - photos contained in the laminated card utilized during tour;
    - aerial photos;
    - column rebar photos of the following:
        - column pedestal to floor
        - column to pedestal
        - column to roof
    - intersection of roof joints with waterstop;
    - wall bearing pads;
    - wall joints (e.g., waterstop, bearing pads);

  - o tension wires; and
  - o wall to roof connections.

2.2 Technical Discussion – DOE SDF operating status and disposal structure status:

2.2.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41, 10 CFR 61.42, and 10 CFR 61.43. This technical discussion was most relevant to the following MAs and MFs in SDF Monitoring Plan, Rev. 1:

- MA1 (Inventory):
  - o MF 1.01 (Inventory in Disposal Structures)
  - o MF 1.02 (Methods used to Assess Inventory)

- MA 8 (Environmental Monitoring):
  - o MF 8.01 (Leak Detection)
  - o MF 8.02 (Groundwater Monitoring)

- MA 11 (Radiation Protection Program):
  - o MF 11.01 (Dose to Individuals During Operations)

2.2.2 Observation Results:

The DOE presented an overview of the SDF operating status and disposal structure status (SRR-CWDA-2015-00011) [ML15070A359]. Major points from that presentation were:

Status of filling of disposal structures with saltstone:

The DOE informed the NRC that: (1) SDS 2A and SDS 2B were filled to 21.25 feet (6.48 meters) with saltstone; (2) SDS 5B was beginning to be filled; and (3)SDS 3A, SDS 3B, and SDS 5A were ready to be filled. Also, in August 2014, the DOE switched the Saltstone Production Facility from a 10-hour workday to a 12-hour workday.

Stabilization of SDS 4:

During SDF Observation 2014-01 in May 2014, the DOE indicated that the six North cells had been coated and sealed. Since then, the DOE added a clean cap to five of the six South cells. The purpose of the clean cap was to reduce radiation levels so that the cells could be coated and sealed. The remaining one South cell is scheduled to have a clean cap added in the second quarter of CY15. One of the North cells that had been coated and sealed is scheduled to have more clean cap added to reduce radiation exposures on the roof.

Individual whole body doses of the DOE personnel:

The DOE compared the top 10 individual whole body doses from CY14 with the top 10 individual doses from CY13. The DOE indicated that the CY14 doses were slightly higher than the CY13 doses for the following two reasons: (1) Defense Waste Processing Facility doses were now included with the SDF doses; and (2) higher SDF doses were attributable to the SDS 4 stabilization work. The DOE indicated that in CY14 there were no unexpected exposures and there were no exposures above either regulatory limits or SRS action levels. The NRC staff noted that all doses were less than 5.0 mSv (500 mrem).

2.2.3 Conclusions and Follow-up Action Items:

The NRC staff will continue to monitor the DOE SDF activities. The following Follow-Up Action Item resulted from that technical discussion:

- The DOE to provide the NRC staff with a table containing Tank 50 sample quarterly report historical information.

2.3 Technical Discussion – Routine documentation and Follow-Up Action Items from previous NRC monitoring activities:

2.3.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This technical discussion was most relevant to the following MAs and MFs in SDF Monitoring Plan, Rev. 1:

- MA1 (Inventory):
    - MF 1.01 (Inventory in Disposal Structures)

- MA 8 (Environmental Monitoring):
    - MF 8.02 (Groundwater Monitoring)

2.3.2 Observation Results:

The NRC staff and the DOE agreed that all but one of the previous Follow-Up Action Items were closed prior to SDF Observation 2015-01 (see more information about documents closing Follow-Up Action Items in the DOE presentation [ML15070A359]). The one open Follow-Up Action Item was discussed and indicated as closed later in this onsite observation visit report.

The NRC staff questioned the DOE about the timing of anticipated changes in Tc-99 concentrations in salt waste sent and to be sent to the Saltstone Production Facility, as described in the DOE letter for the SDF FY14 Special Analysis document [ML14322A259]. The DOE explained that the Actinide Removal Process (ARP)/Modular Caustic Side Solvent Extraction Unit (MCU) was processing Salt Batch 7 (SRNL-STI-2013-00437) [ML14002A062] and that samples for Salt Batch 8 were being characterized. The DOE indicated that NRC staff would be kept apprised of the Salt Batch 8 results and that the DOE would provide an estimate for the timing of an anticipated increase in the Tc concentration in salt waste to be sent to the Saltstone Production Facility. In response to an NRC staff question, the DOE indicated that the NRC staff would soon receive the 2014 Annual Inventory Report.

2.3.3 Conclusions and Follow-up Action Items:

The NRC staff will continue to monitor the DOE SDF activities. The following Follow-Up Action Item resulted from that technical discussion:

- The DOE to provide the NRC staff with the Salt Batch 8 qualification report, when available, and information on the timing of processing future batches, including anticipated increase in Tc-99 concentration.

2,4 Technical Discussion – Ongoing and future NRC research activities by the Center for Nuclear Waste Regulatory Analyses (CNWRA):

2.4.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This technical discussion was most relevant to the following MAs and MFs in SDF Monitoring Plan, Rev. 1:

- MA 3 (Waste Form Hydraulic Performance):
    - MF 3.04 (Effect of Curing Temperature on Saltstone Hydraulic Properties)

- MA5 (Waste Form Chemical Degradation):
    - MF 5.02 (Chemical Reduction of Tc by Saltstone)
    - MF 5.05 (Potential for Short Term Rinse-Release from Saltstone)

2.4.2 Observation Results:

The NRC staff presented an overview of the research that the Center for Nuclear Waste Regulatory Analyses (CNWRA was performing for the NRC. The goals of that research are to evaluate the following four issues:

- presence of a persistent oxidized fraction of Tc in saltstone;
- spatial distribution of Tc and reducing agents after exposure to artificial groundwater;
- correlation between reducing capacity and Tc retention in saltstone; and
- solubility of Tc under chemically reducing conditions.

The NRC staff presented an overview of the planned use of a flexible-walled permeameter to study matrix flow through saltstone samples to be prepared in a variety of ways. The NRC staff presented a matrix of parameters to be varied during sample preparation, including oxygen in saltstone solution, grinding of blast furnace slag, oxygen in the mixing atmosphere, temperature ramp rate, highest curing temperature, and cure time.

The DOE provided the NRC staff with the following observations and suggestions about the NRC staff experimental plans, including about the NRC samples:

- saltstone simulant preparation should follow the ARP/MCU formulation;
- preparation of saltstone simulant can be challenging;
- humidity should be maintained at or close to 100 percent during curing;
- saltstone simulant following the Salt Waste Processing Facility formulation should be compared against the baseline experiment;
- Sample 2 and Sample 3 should be cured under 0 parts-per-million (ppm) oxygen;
- temperature curing profile should mimic actual as-emplaced saltstone conditions as much as possible;
- peak cure temperature (e.g., 65°C (149°F)) should not be maintained longer than observed in field;
- ramping down from maximum curing temperature is important;
- channeling through samples is potential concern with use of permeameter;
- steps should be taken to minimize potential artifact of using permeatmeter;
    - *NOTE: artifact means something in the experimental plan or implementation of the experimental plan that leads to misinterpretation of results of the experiment.*
- secondary purpose of permeameter is to measure hydraulic conductivity of samples;
- larger diameter sample with shorter length allows more pore volumes to migrate through column in given amount of time;
- Savannah River Ecology Laboratory is switching holder and sleeve to accommodate larger samples;
- leachate analysis should include nitrite, which requires use of Tedlar bag to minimize oxygen contamination; and
- preliminary saltstone simulants should be evaluated prior to producing matrix of saltstone simulant cores to verify that core samples are reasonably representative of saltstone grout.

2.4.3 Conclusions and Follow-Up Action Items:

The NRC staff will continue to monitor the DOE SDF activities. The following Follow-Up Action Items resulted from that technical discussion:

- The DOE will attach the NRC presentation to Revision 1 of the DOE presentation.

- The DOE to provide the NRC staff with the Savannah River National Laboratory report on saltstone simulant preparation.

- The DOE to provide the NRC staff with saltstone preparation (i.e., mixing) procedure(s).

2.5 Technical Discussion – DOE sampling and analyses plan research status:

2.5.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This technical discussion was most relevant to the following MA and MFs in SDF Monitoring Plan, Rev. 1:

- MA 3 (Waste Form Hydraulic Performance).
  - MF 3.01 (Hydraulic Conductivity of Field-Emplaced Saltstone)
  - MF 3.03 (Applicability of Laboratory Data to Field-Emplaced Saltstone)

2.5.2 Observation Results:

The DOE provided a summary of the DOE 2014 critical property testing results and planned DOE 2015 critical property testing associated with the following topics and documents:

- iodine (SREL Doc. R-14-0005);
- oxidation rate of cementitious materials (SRRA042328SR);
- technetium leaching from saltstone monoliths (SREL Doc. R-14-0006 and SREL Doc. R-14-0007); and
- temperature effects on saltstone curing (VSL-14R3210-1).

In response to an NRC staff question, the DOE clarified that the SREL Doc. R-14-0005 document included work with cementitious materials, not just soils, as implied in the document title. That topic is discussed in more detail later in this onsite observation visit report.

In the SREL Doc. R-14-007 document, the DOE described work to develop a method for performing dynamic leaching experiments for Tc, where a flexible-wall permeameter was used to force artificial groundwater through a simulated saltstone sample spiked with iodide and perrhenate.

The DOE described a study relevant to the SRRA042328SR document where X-Ray Absorption Spectroscopy (XAS) methods were used to evaluate the oxidation state of Tc in saltstone cured for different times. The DOE noted that to be detectable with XAS, Tc was spiked in samples at ~200 times the concentration than would be representative in saltstone. The DOE attributed the fraction of Tc remaining oxidized after 30 days of curing to the relatively high Tc concentration. The results were available for samples cured for three months, but the results were not yet available for samples cured for six months.

The DOE described results associated with the VSL-14R3210-1 document. The study examined the effects of ramping temperatures at different rates. The DOE indicated that 55°C (130°F) was the maximum temperature expected in SDS 6. The NRC staff questioned whether continuous pouring, which could occur when the Salt Waste Processing Facility would be operational, could increase that maximum temperature in the 375-foot diameter disposal structures (i.e., SDS 6 through SDS 12). The DOE indicated that it does not expect such a large temperature increase in any of those disposal structures. The DOE indicated that samples cured for 30 days had hydraulic conductivities of ~1.0×10^{-8} cm/s, but that samples cured for 90 days had hydraulic conductivities of approximately ~2.0×10^{-9} cm/s. In response to an NRC staff question, the DOE indicated that it considered 90 days to be the minimum curing time for a representative sample. The DOE noted that it usually saw a factor of ~six decrease in hydraulic conductivity between 30 days and 90 days of curing.

The DOE summarized the status and future plans to sample cores from full-scale saltstone. The DOE plan will be to sample six cores from SDS 2A in April 2015. The samples are expected to be 2.0 meters (~6.0 feet) long. The DOE noted that originally the cores were expected to be ~1.07 meters (3.5 feet) long, but now the fill height of the 150-foot diameter disposal structures (i.e., SDS 2A, SDS 2B, SDS 3A, SDS 3B, SDS 5A, SDS 5B) was increased. Thus, the DOE now required a longer core to reach the sample at the correct height to correspond to the saltstone that was sampled during emplacement in SDS 2A. The DOE explained that one of the challenges of drilling such a longer core in SDS 2A was that it was composed of 17 lifts poured over a 10 month time period. The DOE explained that, as a drill is pulled out, the lifts may break free from one another and can misalign, which makes it difficult to insert the core extraction tool. The DOE explained that the core extraction tool was modified to help align the lifts. The DOE noted that the mockup work is no longer being conducted in the B25 box, as described in the SDF Observation 2015-01 Report. Instead, the mockup work is being performed in a pilot scale sample poured into a commercial sonotube. The DOE described work done to prepare for full-scale core drilling, including drilling without light in full personal protective equipment. The DOE indicated that the Tc oxidation state would be studied with field-emplaced core samples, but not in laboratory-produced samples because laboratory samples were not spiked with Tc.

In response to an NRC staff question, the DOE indicated that it did not expect significant artifacts from core drilling. Microcracking could be an issue, but scoring along the external surfaces was not expected to cause significant artifacts because the pressure cuff used in the permeameter would eliminate the potential effects of scoring.

The DOE explained that, after a core sample is taken, 1.2 meters (~4.0 feet) of the sample would be placed back in SDS 2A and 0.6 meters (~2.0 feet) would be sent to Savannah River National Laboratory (SRNL) in a specialized holder. To limit oxidation, the sample would be saturated with water and the sampleholder would be purged with nitrogen gas. The DOE explained that, it had initially tried shipping the sample with oxygen absorbers, instead of purging the sample holder, but the oxygen absorbers did not work quickly enough. To remove the core from the sampleholder, the whole sampleholder would be placed in an airlock chamber and the core sample would be removed from the sampleholder in a nitrogen gas atmosphere. All sample preparation would occur in the airlock chamber in an “inert” environment. In this report, the NRC notes that this is a correction to what is described in the DOE presentation for SDF Observation 2015-01.

In response to an NRC staff question, the DOE explained that, cores would be taken from three locations at the top of SDS 2A and that each location has a pair of sampling ports. For each of the three pairs, one port would be used for a camera and two cores would be taken from the other port.

In response to an NRC staff question, the DOE indicated that, it does not plan to measure reducing capacity of the core samples. The DOE plans to conduct dynamic leaching experiments and would measure density, porosity, moisture content, saturated hydraulic conductivity, Tc oxidation state, and sorption coefficients (K_ds) as well as compositional analysis on the radioactive samples, including total Tc, strontium, iodine, selenium, and radium. The DOE explained that, for K_d tests, the samples will be crushed and leached and then the solution concentration would be measured. The DOE agreed with an NRC staff comment that, in that type of experiment, if different solid-to-liquid ratios yielded the same leached concentration of Tc, then the result would indicate a solubility limit rather than sorption. The NRC staff indicated that, if the blast furnace slag is crushed, then it could become more reactive than field-scale blast furnace slag because crushing could remove any oxidized rind that might limit reactivity of the slag. In response to that NRC staff comment, the DOE indicated that, it was still working out that experimental detail. The NRC staff understood that the purpose of the DOE sampling and analyses plan was to determine whether the laboratory results could accurately mimic the field scale results and that purpose could be accomplished as long as the blast furnace slag was treated the same way for measurements in both laboratory and field samples.

In response to an NRC staff question about visual differences in laboratory and field-scale cored samples, the DOE indicated that the color difference was attributable to the oxidation state of iron. The DOE cited a report (SRRA042328SR) that indicated that the sulfur in blast furnace slag is oxidized to sulfate rapidly in salt solution. The NRC staff indicated that, in CNWRA experiments, a white coating formed on the samples and the CNWRA believed that was due to a carbonation reaction because the coating bubbled when acid was applied. The DOE indicated that the color change will occur within minutes of a sample being exposed to air.

In response to an NRC staff question, the DOE indicated that, it was not sure how long samples would be archived, but that they would be saved in an inert environment. In response to an NRC staff question, the DOE explained that, sometime in the future, the holes in the saltstone monolith left by the core samples would be filled in with the clean cap.

2.5.3 Conclusions and Follow-Up Action Items:

The NRC staff concluded that the thoroughness with which the DOE has planned core sample handling appears to be promising for useful research results. The NRC staff will continue to monitor DOE research plans and results. The NRC staff will continue to monitor the DOE SDF activities. No Follow-Up Action Items resulted from that technical discussion.

2.6 Technical Discussion – Iodine sorption and Tc solubility:

2.6.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This technical discussion was most relevant to the following MAs and MFs in SDF Monitoring Plan, Rev. 1:

- MA 5 (Waste Form Chemical Degradation):
  - MF 5.01 (Radionuclide Release from Field-Emplaced Saltstone)

- MA 10 (Performance Assessment Model Revisions):
  - MF 10.04 (K_d Values for Saltstone)
  - MF 10.06 (K_d Values for Disposal Structure Concrete)
  - MF 10.09 (K_d Values for SRS Soil)

2.6.2 Observation Results:

The NRC staff and the DOE discussed the solubility of Tc(IV) in saltstone. The DOE explained that the Almond and Kaplan reference (SRNL-STI-2010-00667), which the NRC staff previously considered in the NRC 2012 TER [ML121170309], provided a solubility measurement for Tc(IV) of 1×10^{-10} Molarity. The NRC staff indicated that it would review the conditions of that measurement and evaluate the relevance to field-emplaced saltstone. In response to the NRC staff questions about the differences between the results of Cantrell and Williams [PNNL-21723] and the results of Almond and Kaplan, the DOE (i.e., Dr. Kaplan himself) attributed the lower solubility observed by Almond and Kaplan to the following two phenomena: (1) high solubility value observed by Cantrell and Williams (1.5 x 10-6 M) was attributed to the high pH of the sample solution (i.e., 12.5), which would be representative of young concrete; and (2) study by Cantrell and Williams used a flow through system that had not achieved steady state. Dr. Kaplan indicated that the Almond and Kaplan study was based on a two to three year old field-emplaced saltstone core, which he indicated was a high quality sample.

In response to an NRC staff question, the DOE indicated that the basis for the sorption coefficients for iodine used in the SDF FY14 Special Analysis document were from the *Geochemical Data Package for Performance Assessment Calculations Related to the Savannah River Site* (SRNL-STI-2009-00473). The DOE 2015 Performance Assessment Maintenance Implementation Plan (SRR-CWDA-2014-00108) indicated that the DOE will update the values in the Geochemical Data Package. The NRC staff asked Dr. Kaplan how he anticipated updating the values for iodine, and if he could provide context for differences between the values in the 2010 Geochemical Data Package and the lower sorption coefficients measured by Seaman and Chang (2014) (SREL Doc. R-14-0005).

Dr. Kaplan discussed three studies performed on iodine sorption since 2010: (i) review paper, (ii) SREL experiments, and (iii) Hanford study:

- Dr. Kaplan explained that one reason the SREL study may have detected less sorption than the other two studies was that it used iodine concentrations much greater than will be present in saltstone (i.e., a 16,000 pCi/g spike used in SREL study, compared to 7 pCi/g in saltstone). Dr. Kaplan hypothesized that the higher concentration of iodine had filled all of the sorption sites and left the majority of iodine unsorbed.

- Regarding the Hanford study, Dr. Kaplan noted that he had observed coprecipitation of iodate in a calcium carbonate phase that was ~25 percent iodate by weight and that this could be a long-term process that was not adequately represented in such short-term experiments.

In response to an NRC staff question, Dr. Kaplan indicated that, he expected to use one set of values to represent sorption to both concrete and saltstone in the next revision of the Geochemical Data Package because there was not enough data available to differentiate between the two conditions and that he is confident in the values provided for iodine sorption in SRS soil because they are consistent with the behavior of an Iodine-129 plume at SRS.

In response to an NRC staff question, the DOE explained that, when the Geochemical Data Package is updated the effects on the revised values on the projected performance of the SDF will be addressed through an Unreviewed Waste Management Question Evaluation (UWMQE) or a revised Special Analysis, as appropriate, based on the significance of the changes.

2.6.3 Conclusions and Follow-Up Action Items:

The NRC staff will continue to monitor the DOE SDF activities. The following Follow-Up Action Item resulted from that technical discussion:

- The DOE to provide the NRC staff with additional documentation relative to iodine K_d values for concrete, including the European study and SRS F-Area iodine studies (soils).

2.7 Technical Discussion – Tan Clay Confining Zone (TCCZ) structure and ZBG-2 well sample results:

2.7.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This technical discussion was most relevant to the following MAs and MFs in SDF Monitoring Plan, Rev. 1:

- MA 8 (Environmental Monitoring):
    - MF 8.02 (Groundwater Monitoring)

- MA 10 (Performance Assessment Model Revisions):
    - MF 10.02 (Defensibility of Conceptual Models)

2.7.2 Observation Results:

The DOE discussed two new monitoring wells, ZBG-016D and ZBG-016C. The wells are close to each other and downgradient of Sedimentation Basin 4. ZBG-016D is above the TCCZ and ZBG-16C is screened below the TCCZ. The DOE indicated that no contamination has been detected in either well. In response to an NRC staff question, the DOE clarified that "no contamination" included nitrate and conductivity as well as gross beta and several other radiological measurements.

In response to an NRC staff question, the DOE explained that well ZBG-2 would be sealed because its screened length extended into the top of the TCCZ, where it could act as a conduit of contamination into the lower aquifer zone. The DOE indicated that a new well would be installed nearby that would be screened above the TCCZ. The NRC staff pointed out that several screened lengths of other wells in the Z-area extended into the TCCZ and that the thickness between the screened interval and the boundary of the TCCZ may be too thin to prevent contaminant movement between the upper zone and the lower zone of the Upper Three Runs Aquifer (UTRA). The NRC staff asked if the DOE planned to close those wells too. The DOE explained that well ZBG-2 was a priority because contamination had been detected in it.

The NRC staff questioned the DOE assumption that contamination was not present in the other locations in the Z Area and pointed out that there were no wells screened above the TCCZ in the other locations, which means that the DOE could not be sure if there was contamination in those other wells. In response, the DOE noted that in another location downgradient of SDS 4, a Direct Push Technology (DPT) sample pushed into the top of the TCCZ did not show elevated nitrate. The NRC staff pointed out that was in the same location and there were no wells screened above the TCCZ in the other locations.

The DOE described a conceptual model where water from near SDS 4 would flow along the top of the TCCZ and into ZBG-2, which would act as a sump. At some places at SRS, the water table terminates in the upper zone of the UTRA and re-occurs in the lower zone of the UTRA. The NRC staff indicated that only two wells listed in the 2014 Z-Area Groundwater Monitoring Report were screened in the correct location to measure the water table [SRNS-TR-2014-00283]. The DOE explained that much of the data came from other SRS areas, not the Z-area.

The NRC staff expressed interest in whether the water above the TCCZ was interconnected or occurred in isolated areas. The DOE replied that the upper zone of the UTRA is not present in much of Z-Area and that the new well, ZBG-016D, is dry. The NRC staff indicated that there was insufficient data within the Z Area to know if the upper zone of the UTRA was saturated and that the temporal and spatial extent of a saturated zone in upper zone of the UTRA in Z-Area could have a significant role in influencing potential contaminate transport. The NRC staff suggested that the DOE could update a spreadsheet that it had previously provided to the NRC staff that included historical data to support the thickness of the upper zone of the UTRA over time, which included data from 1987 to 2007 (RSS-REG-2008-00025).

The NRC staff asked the DOE about the source of the contamination observed at ZBG-2. The DOE indicated that: (i) it continued to believe that the contamination was attributable to weeping from the walls of SDS 4 in about the year 2000; (ii) SDS 4 had been effectively isolated and that it was not an ongoing source of contamination; and (iii) fall in contaminant concentrations was caused by sample dilution with heavy rainfall.

The DOE described plans to use DPT and Cone Penetrometer Test (CPT) measurements to characterize the top of the TCCZ and that much of the work would be done in April and May of 2015. The NRC staff indicated that, it would be useful to understand the vertical gradient between the upper and lower zones of the UTRA as well. The DOE responded that there are not many well pairs available in Z-Area to measure the vertical gradient and that the new well pair that will replace ZBG-2 will provide some data. The vertical gradient is modeled as ~3.0 meters (10 feet) in the General Separations Area and was typically modeled as ~1.5 meters (5.0 feet) in Z-Area. The NRC staff and the DOE agreed that the gradient depended on the climate in recent years.

In response to an NRC staff question, the DOE indicated that, it did not expect any effect on surficial aquifers from the three new extraction wells installed into the Congaree Aquifer to supply water for hydrotesting of the 375-foot disposal structures (i.e., SDS 6 through SDS 12). The site already has extraction wells at ~150 meters (500 feet) depth, screened over 50 meters (150 feet), which pump 25 liters per second (400 gallons per minute) and show no detectable drawdown. Before the DOE uses the three new extraction wells, the DOE would do an eight-hour test of pumping all three wells at once to measure drawdown.

The NRC staff expressed concern that the DOE may not be adequately considering an alternate conceptual model, applicable to a potentially wetter future climate, in which the upper zone of the UTRA is the main source of drinking water and contamination would be concentrated in the upper zone of the UTRA by the TCCZ. The NRC staff suggested that could be the topic of a future technical teleconference call.

2.7.3 <u>Conclusions and Follow-Up Action Items</u>:

The NRC staff will continue to monitor the DOE SDF activities. The following Follow-Up Action Items resulted from that technical discussion:

- The DOE to provide the NRC staff with additional groundwater data relative to:
    - historical data on Z-Area wells.
        - water thickness of upper zone of the Upper Three Runs Aquifer over time
    - additional well data related to changes in position of the water line between the lower and upper zones of the Upper Three Runs Aquifer over time (including wells beyond Z-Area as applicable).

- The DOE to provide the NRC staff with an updated version of SRS-REG-2008-00025.

2.8 Technical Discussion – SDS 3A sump Unreviewed Waste Disposal Question Evaluation (UWDQE):

2.8.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This technical discussion was most relevant to the following MAs and MFs in SDF Monitoring Plan, Rev. 1:

- MA 6 (Disposal Structure Performance):
    - MF 6.05 (Integrity of Non-cementitious materials)

- MA 8 (Environmental Monitoring):
    - MF 8.01(Leak Detection)

2.8.2 Observation Results:

The NRC staff and the DOE discussed the results of the Unreviewed Waste Disposal Question Evaluation (UWDQE) “Evaluation of Potential Breach of Side Wall High Density Polyethylene (HDPE) Liner on Saltstone Disposal Unit Cell 3A” (SRR-CWDA-2014-00070).

In response to the NRC staff questions about the geonet fabric, DOE explained that, the geonet is ~1.0 centimeters (~0.39 inches) thick and it sits on top of the HDPE on the Geosynthetic Clay Liner (GCL) between the upper and lower mud mats. The geonet allows any water that might drain from SDS 3A to enter the sump box. In response to the NRC staff and the SCDHEC staff questions, the DOE explained that, a test for water tightness was performed on the SDS 3A sump box, but the test was not performed on the connections of the HDPE to the SDS 3A sump box.

The DOE provided an example of a seam welded section of HDPE and explained that, seam welds on the flat HDPE in the closure cap and below the drainage layer were expected to be more robust than the extrusion welds around the SDS 3A sump. The DOE suggested that the most likely explanation was a failure of an extrusion weld. The NRC staff noted that, in the UWDQE, the DOE had not ruled out an HDPE tear or a failure of a seam weld. The NRC staff expressed concern that the UWDQE only evaluated the potential impacts of a breach in the HDPE around SDS 3A and did not evaluate the potential impact of a breach in the HDPE layer in either the closure cap or below the drainage layer above SDS 3A. In response, the DOE explained that, it expected better protection of the HDPE in the cover and below the drainage layers.

The DOE explained that, a camera was used to examine the SDS 3A sump and no major flaws were found in the HDPE. The DOE was not surprised because a small flaw could be responsible for the slow rate of water infiltration into the SDS 3A sump box. In response to an NRC staff question, the DOE explained that, there is a water level indicator in the SDS 3A sump box and that water is pumped out as needed.

The DOE explained that, the SDS 3A sump box still functions as a leak collection system and that concentrations of radionuclides in the collected water were still measured. The NRC staff and the DOE agreed that the concentrations would be diluted with rainwater, but the measurements could still show how much activity was collected. The DOE indicated that the pH of the collected water provided a good indication of the relative proportions of rainwater and leachate.

2.8.3 Conclusions and Follow-Up Action Items:

The NRC staff concluded that the analysis in the UWDQE did not cover potential effects of a flaw in the HDPE or a flaw in an HDPE seam in the drainage layers in the closure cap, or a flaw in the engineered layers above each disposal structure. The NRC staff concluded that those omissions added uncertainty to the DOE projections of long-term performance of those features. The NRC staff will continue to monitor disposal structure performance, including the projected performance of drainage layers. The NRC staff will continue to monitor DOE SDF activities. No Follow-Up Action Items resulted from that technical discussion.

2.9 Technical Discussion – PORFLOW modeling for the DOE SDF FY14 Special Analysis Document:

2.9.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This technical discussion was most relevant to the following MAs and MFs in SDF Monitoring Plan, Rev. 1:

- MA 5 (Waste Form Chemical Degradation):
    - MF 5.01 (Radionuclide Release from Field-Emplaced Saltstone)

- MA 8 (Environmental Monitoring):
    - MF 8.02 (Groundwater Monitoring)

- MA 10 (Performance Assessment Model Revisions):
    - MF 10.01 (Implementation of Conceptual Models)
    - MF 10.02 (Defensibility of Conceptual Models)

2.9.2 Observation Results:

This technical discussion included both intermediate model results for Tc release and the conceptual model for flow through the lower unsaturated zone and saturated zone.

To address the NRC staff questions about projected Tc release in the PORFLOW model, the DOE summarized the main points from the technical report, "Sensitivity Analysis for Saltstone Disposal Unit Column Degradation Analyses" (SRNL-STI-2014-00505).

The DOE explained that, in the PORFLOW model, a zone of slower oxidation, which the DOE called "oxidation shadow," occurs near the walls and roof support columns of a disposal structure because they are more permeable than the saltstone and they divert flow from the saltstone. The NRC staff suggested that, the oxidation shadows would not occur if the PORFLOW model included the effects of oxidation due to diffusion of oxygen into the saltstone from soil gas. The DOE indicated that gas-phase oxygen was not included in the model because the saltstone was assumed to be fully saturated. The NRC staff indicated that there was not adequate model support to preclude the possibility of unsaturated fractures in the saltstone monolith. The NRC staff reiterated concerns that fractures due to mechanical degradation should be included in the evaluation case.

The DOE continued to review intermediate model results from the same report (SRNL-STI-2014-00505), including a series of figures that showed projected Tc in the aqueous and solid phases in different locations in the saltstone waste form and disposal structure. The DOE presented results that showed that most of the Tc release occurred through the disposal structure basemats, rather than through the walls. The DOE presented intermediate flow results from the same report (SRNL-STI-2014-00505). The DOE explained that, a small amount of water flows back into the disposal structures through the walls because most of the infiltrating water is shed around the disposal structures through the sand drainage layer.

To address the NRC staff questions about the conceptual model of flow through the engineered barriers and unsaturated zone, the DOE discussed flow beginning at the land surface and flowing through both the engineered barriers and the disposal structure. The DOE explained the context of the saltstone PORFLOW model in the context of the PORFLOW model of the larger area, which is the General Separations Area (GSA) model. The DOE explained that, in the saltstone PORFLOW model, it assumed that there were two soil types in the unsaturated zone, both native soil and backfill. In general, backfill was assumed to contain less clay and to have a lower saturated hydraulic conductivity. Unsaturated flow was modeled with the Richards Equation and that the characteristic curves used were provided in the SDF FY14 Special Analysis document.

The NRC staff asked the DOE about the flow and transport through the various components of the disposal structures (e.g., concrete floor, bearing pad, mud mat, geosynthetic clay liner). The NRC staff asked the DOE about the significance to performance of each component and the major differences between the 375-foot disposal structures (i.e., SDS 6 through SDS 12) and the other two types of disposal structures (i.e., SDS 1, SDS 4, SDS 2A, SDS 2B, SDS 3A, SDS 3B, SDS 5A, SDS 5B). The NRC staff asked the DOE if flow through the components occurred in a homogeneous manner or if the water collected at certain locations and then followed in preferential flow paths until released at the bottom of the lower mud mat. The DOE did not discuss a more detailed conceptual model that differentiated each disposal structure component, other than the consideration of fast flow paths through construction joints. The NRC staff agreed with DOE that the PORFLOW model showed that the release of contaminants from the disposal structure was not laterally uniform. However, the NRC staff indicated that, a more realistic representation of the various disposal structure features may result in an even less uniform release. The NRC staff indicated that, an alternative conceptual model could have infiltrating water with higher flow rates and/or greater concentrations released at fewer preferential locations from the lower mud mat.

In response to an NRC staff question about credit given for the unsaturated zone in the PORFLOW model, the DOE explained that, although water spends a relatively short amount of time (e.g., 10 years or fewer) in the unsaturated zone, some contaminants, such as plutonium, are significantly delayed by sorption. In response to an NRC staff question about whether the unsaturated zone thickness was modeled as a constant, the DOE indicated that a different thickness was used for each type of disposal structure, but that each of those thicknesses was assumed to be uniform across the SDF. The DOE referred to a figure in the SDF FY14 Special Analysis document that showed the thickness used for each type of disposal structure, contrasted with the best estimate of the unsaturated zone thickness in different parts of the SDF.

In response to an NRC staff question, the DOE explained that, the flux from the unsaturated zone model was placed into the first grid block that was fully saturated. In response to an NRC staff question, the DOE clarified that, the grid block does not change with time. The NRC staff and the DOE reviewed the discussion of whether the water table is in the upper or lower zone of the UTRA. The NRC staff asked if the DOE expected changes in the water table elevation due to the closure cap. The DOE indicated that it was possible, but that flow through the closure cap was projected to return to near normal infiltration rates within several hundred years of site closure.

2.9.3 Conclusions and Follow-Up Action Items:

The NRC staff will continue to monitor the DOE SDF PORFLOW model as part of its review of the SDF FY14 Special Analysis document. The NRC staff will continue to monitor DOE SDF activities. No Follow-Up Action Items resulted from that technical discussion.

2.10 Technical Discussion – GoldSim modeling for the DOE SDF FY14 Special Analysis Document:

2.10.1 Observation Scope:

This technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41 and 10 CFR 61.42. This technical discussion was most relevant to the following MA and MF in SDF Monitoring Plan, Rev. 1:

- MA 10 (Performance Assessment Model Revisions):
  - MF 10.01 (Implementation of Conceptual Models)

2.10.2 Observation Results:

The NRC staff and the DOE reviewed the file locations for model files associated with the GoldSim Model for the SDF FY14 Special Analysis document. The DOE clarified that, results from Tc were run in a separate model from the model used for other radionuclides. The DOE explained that, a Dynamic Link Library (DLL) identified as “TS PROC” was needed to send results from each submodel to the main GoldSim model. The NRC staff and the DOE discussed the file locations needed for the DLL and submodel files to allow the model to execute.

A smaller group of the NRC staff and the DOE reviewed individual model containers in the GoldSim model and discussed the purpose and implementation of each to understand how the DOE model worked.

2.10.3 Conclusions and Follow-Up Action Items:

The NRC staff will continue to monitor the DOE SDF GoldSim model as part of its review of the SDF FY14 Special Analysis document. The NRC staff will continue to monitor DOE SDF activities. No Follow-Up Action Items resulted from that technical discussion.

3.0 OVERALL CONCLUSIONS, STATUS OF MONITORING FACTORS, OPEN ISSUES, OPEN FOLLOW-UP ACTION ITEMS; AND ISSUANCE OF NRC TECHNICAL REVIEW REPORTS:

3.1 Overall Conclusions:

The information gathered during SDF Observation 2015-01 will be used for multiple NRC Technical Review Reports via memoranda, review of the DOE SDF FY14 Special Analysis document, and future onsite observation visits, based on the topics discussed. There is no change to the NRC staff overall conclusions from the SDF TER regarding compliance of DOE disposal actions with the 10 CFR Part 61 performance objectives.

3.2 Status of Monitoring Factors in SDF Monitoring Plan, Rev. 1:

SDF Observation 2015-01 is the second onsite observation visit under SDF Monitoring Plan, Rev. 1. The NRC staff did not close any monitoring factors during SDF Observation 2015-01. Therefore, all 73 monitoring factors in SDF Monitoring Plan, Rev. 1 remain open.

3.3 Status of Open Issues for SDF Monitoring:

All previous NRC concerns have been rolled into the Monitoring Factors in SDF Monitoring Plan, Rev.1. The NRC staff did not open any new Open Issues during SDF 2015-01. Therefore, there are currently no SDF Open Issues.

3.4 Status of Open Follow-up Action Items from Previous SDF Onsite Observation Visit Reports:

There were fifteen previous NRC SDF onsite observation visits. All Follow-Up Action Items from reports for those previous SDF onsite observation visits have been closed.

3.5 Status of Open Follow-up Action Items from Clarifying Teleconference Calls:

All Follow-Up Action Items from previous clarification teleconference calls have been closed.

3.6 Summary of Follow-Up Action Items Opened During this Onsite Observation Visit:

The table below contains the nine Follow-Up Action Items that were open during this onsite observation visit, including a unique NRC identifier for each Follow-Up Action Item:

Unique Identifier	Follow-Up Action Item
SDF-CY15-01-001	• The DOE to provide the NRC staff with additional photos of construction of SDS 6 including: o photos contained in the laminated card utilized during tour; o aerial photos; o column rebar photos of the following: ▪ column pedestal to floor ▪ column to pedestal ▪ column to roof o intersection of roof joints with waterstop; o wall bearing pads; o wall joints (e.g., waterstop, bearing pads); o tension wires; and o wall to roof connections.
SDF-CY15-01-002	• The DOE to provide the NRC staff with a table containing Tank 50 sample quarterly report historical information.
SDF-CY15-01-003	• The DOE to provide the NRC staff with the Salt Batch 8 qualification report, when available, and information on the timing of processing future batches, including anticipated increase in Tc-99 concentration.
SDF-CY15-01-004	• The DOE will attach the NRC presentation to Revision 1 of the DOE presentation.
SDF-CY15-01-005	• The DOE to provide the NRC staff with the Savannah River National Laboratory report on saltstone simulant preparation.
SDF-CY15-01-006	• The DOE to provide the NRC staff with saltstone preparation (i.e., mixing) procedure(s).
SDF-CY15-01-007	• The DOE to provide the NRC staff with additional documentation relative to iodine K_d values for concrete, including the European study and SRS F-Area iodine studies (soils).
SDF-CY15-01-008	• The DOE to provide the NRC staff with additional groundwater data relative to: o historical data on Z-Area wells ▪ water thickness of upper zone of the Upper Three Runs Aquifer over time o additional well data related to changes in position of the water line between the lower and upper zones of the Upper Three Runs Aquifer over time (including wells beyond Z-Area as applicable)
SDF-CY15-01-009	• The DOE to provide the NRC staff with an updated version of SRS-REG-2008-00025.

3.7 Issuance of NRC Technical Review Reports:

Between SDF Observation 2014-01 and SDF Observation 2015-01, the NRC did not issue any SDF Technical Review Reports via memorandum.

4.0 PARTICIPANTS:

U. S. NRC	SCDHEC	U.S. DOE	SRR	SRNL
George Alexander	Justin Koon	Dan Ferguson	Tim Coffield	Greg Flach
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