July 16, 2013

NOTE TO: File PROJ0734

FROM: James Shaffner, Project Manager **/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 Program

SUBJECT: SUMMARY OF CLARIFICATION DISCUSSION BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION STAFF AND THE U.S DEPARTMENT OF ENERGY AND SAVANNAH RIVER REMEDIATION STAFF CONCERNING FLOW MODELING AND CALIBRATION RELATED TO H-AREA TANK FARM AT THE SAVANNAH RIVER SITE

On May 16, 2013, discussion occurred with the U.S. Department of Energy (DOE) technical staff and contractors to pose some clarifying questions related to the inventory and Maximum Extent Practical (MEP) of the H-Tank Farm at the Savannah River Site. The questions were based on the U.S. Nuclear Regulatory Commission (NRC) staff review of DOE's performance assessment and related reference material. The discussions were conducted as part of NRC's consultation responsibility per Section 3116 of the Ronald W. Reagan National Defense Authorization Act of 2005. The discussions were for clarification related to specific technical areas highlighted in the summary and no decisions or conclusions resulted from the meeting.

Meeting participants are included in Enclosure 1; Summary of discussion is included in Enclosure 2.

Docket No.: PROJ0734

Enclosures:
1. Meeting Participants
2. Summary

CONTACT: James Shaffner, FSME/DWMEP
(301) 415-5496

July 16, 2013

NOTE TO: File PROJ0734

FROM: James Shaffner, Project Manager **/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 Program

SUBJECT: SUMMARY OF CLARIFICATION DISCUSSION BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION STAFF AND THE U.S DEPARTMENT OF ENERGY AND SAVANNAH RIVER REMEDIATION STAFF CONCERNING FLOW MODELING AND CALIBRATION RELATED TO H-AREA TANK FARM AT THE SAVANNAH RIVER SITE

On May 16, 2013, discussion occurred with the U.S. Department of Energy (DOE) technical staff and contractors to pose some clarifying questions related to the inventory and Maximum Extent Practical (MEP) of the H-Tank Farm at the Savannah River Site. The questions were based on the U.S. Nuclear Regulatory Commission (NRC) staff review of DOE's performance assessment and related reference material. The discussions were conducted as part of NRC's consultation responsibility per Section 3116 of the Ronald W. Reagan National Defense Authorization Act of 2005. The discussions were for clarification related to specific technical areas highlighted in the summary and no decisions or conclusions resulted from the meeting.

Meeting participants are included in Enclosure 1; Summary of discussion is included in Enclosure 2.

Docket No.: PROJ0734

Enclosures:
1. Meeting Participants
2. Summary

CONTACT: James Shaffner, FSME/DWMEP
(301) 415-5496

ML13193A072

OFC	DWMEP	DWMEP	DWMEP	DWMEP	DWMEP
NAME	MHeath	AWalker-Smith	CMcKenney	JJessie	JShaffner
DATE	07/12/13	07/12/13	07/15/13	07/16/13	07/16/13

OFFICIAL RECORD COPY

List of Participants
Teleconference with the U.S. Department of Energy Staff Savannah River Site, H-Area Tank Farm Regarding Inventory and Maximum Extent Practical and Related Issues

May 16, 2013

Participant	**Affiliation**
Sherri Ross	U.S. Department of Energy (DOE) Savannah River (DOE-SR)
Kim Hauer	Savannah River Remediation (SRR)
Mark Layton	SRR
Larry Romanowski	SRR
Kent Rosenberger	SRR
Steve Thomas	SRR
Ben Dean	SRR
Maggie Millings	Savannah River National Laboratory (SRNL)
Gregory Flach	SRNL
Christopher Grossman	U.S. Nuclear Regulatory Commission (NRC)/Division of Waste Management and Environmental Protection (DWMEP)
Cynthia Barr	NRC/DWMEP
Maurice Heath	NRC/DWMEP
Leah Parks	NRC/DWMEP

Enclosure 1

Meeting Summary

Teleconference Between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy Staff Regarding H-Area Tank Farm Section 3116 Consultation NRC Staff Request for Clarification Regarding Flow Modeling and Calibration and Related Issues

May 16, 2013

Based on its continuing review of the performance assessment (PA) related to the draft basis for the H-Tank Farm (HTF) waste determination, the U.S. Nuclear Regulatory Commission (NRC) staff requested follow-up clarifications of the U.S. Department of Energy's (DOE's) approaches on several topics regarding inventory and Maximum Extent Practical.

NOTE: Herein, the use of the term NRC staff refers collectively to NRC staff and its contractors; the use of the term DOE staff refers collectively to DOE staff and its contractors.

Enclosure 2

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
1	Inventory Screening Methodology from 159 Radionuclides to 54 Radionuclides	The screening methodology describes the process to reduce the inventory list from 849 radionuclides to159 radionuclides and then to 54 radionuclides. Appendix B of SRR-CWDA-2010-00023, Rev. 3 only lists a rationale for 90 radionuclides that were eliminated from the list of 159. Please clarify the screening from 159 radionuclides to 54.	Indicated this was a documentation error that will be revised in the next version, possibly after Tank 16 data collected and analyzed (~late 2014). Agreed to provide list of 13 radionuclides (Bk-249, Ce-144, Cf-252, Cm-242, Cs-134, Eu-155, Na-22, Pm-147, Pr-144, Rh-106, Ru-106, Sb-125, Te-125m) and explain screening, which is related to half-lives.
2	Screening of Ba-137m, Y-90, Ra-226 and Th-229 in Inventory	The DOE/SRS-WD-2013-001, Rev. 0, page 5-3, states that Ba-137m, Y-90, Ra-226 and Th-229 were eliminated in the screening. However, these are all part of the 54 radionuclides for HTF. Please clarify.	Radionuclides cited were not meant to be examples of radionuclides that were eliminated because they were decay products of parents. They were simply examples of decay products from parents.
3	Initial Inventory Multiplier	SRR-CWDA-2010-00128, Rev. 1, page 217, states that initial inventories were increased by one order of magnitude for Type I, II and IV. However, SRR-CWDA-2010-00023, Rev. 3 does not mention increasing the Waste Characterization System (WCS) inventories by one order of magnitude. Please clarify.	Compared FTF approach (Ci = 10 x WCS inventories) to HTF approach (Ci = normalized estimated concentration from WCS to 4,000 gallons, the assumed residual volume).
4	Impact of Tank Cleaning on Cs, Sr, Zr Inventories	In SRR-CWDA-201-00023, Section 3.2.1.2, DOE reduces the inventory of all tank types of cesium, strontium, and zirconium by one order of magnitude based on Tank 5 cleaning experience. Clarify the basis for reducing all three radionuclides by a one order of magnitude for all Tank Types, especially comparing the projected vs. measured for Tank 18 and 19.	Stated the basis derived from changes in concentration observed before (process sample) and after chemical cleaning (final characterization). Observed reductions in Cs, Sr, and Zr. Accumulated grab samples from Tank 5 from under riser prior to cleaning (WSRC-STI-2007-00192). Agreed to provide clarification in writing for Cs, Sr, and Zr.
5	Inventory Ratios	DOE states that it based the Zr-93 values on ratios of Zr-93 to S-90 measured in Tank 5. The measured ratio for Tank 5 was 3000, but the projected ratio for HTF 30,000. Please clarify the basis for assuming different ratios.	Zr-93 based on ratio with Sr-90. Agreed to provide clarification in writing for Cs, Sr, and Zr.
6	Zeolite Fractions	DOE assumed that zeolite weight and volume fractions are the same in residual material after cleaning as prior to cleaning. Please clarify how it will estimate the amount of zeolite weight and volume fractions that are applied.	Cited CBU-PIT-2005-00099 for weight and volume fractions. Indicated no preferential removal assumed; the same zeolite ratio in this reference is applied to the 4000 gallons in final projections.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
7	Determination of Annular Inventory in Non-Visible Regions	SRR-CWDA-2010-00128, Rev. 1 and SRR-LWE-2012-00039 estimate the remaining volume in the Tank 16 annulus as 3,300 gallons through the use of camera views and interior landmarks (i.e., duct diameter, annulus wall radius). There is residual material in the bottom of the annulus (estimated at 2,100 gallons) as well as inside the duct (estimated at 1,200 gallons). However, there are many areas of the annulus (and duct) where visual determination of the waste level was not possible. In those areas, DOE extrapolated the waste level using the data from surrounding areas. Please clarify the basis for the extrapolation and the uncertainty of this volume estimate given that the material visible from the access points may have been at a lower level (i.e., the material directly under the access points may have dissolved in prior cleaning attempts, leaving lower levels of material in the ducts under access points and higher levels of material further away from the visible areas).	Indicated video mapping to obtain estimated volumes and extrapolated for areas beyond visible portions. Indicated that there is almost 100% coverage in Tank 16 annulus (outside the duct) as a result of 13 additional inspection ports that were added (Other Type I and II tanks have 4 ports), except for pipe obstruction in one spot from two directions. Stated that the ducts were drilled into to obtain samples for solubility estimates but that the material depth was not measured where these samples were taken because the sample was not a core but was broken pieces retrieved with a vacuum. Indicated that the final volume determination for Tank 16 primary and annulus will be done along with final sampling and characterization.
8	Tank 16 Annulus Residual Waste Volume	Page 40 of SRR-CWDA-2011-00126 states that 4,700 gallons is estimated to be in the Tank 16 Annulus. However, the Performance Assessment (PA) and SRR-LWE-2012-00039 estimate the remaining volume as 3,300. Confirm that 3,300 is the current estimate.	Confirmed 3,300 gallons.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
9	Tanks 9, 10, and 14 Annular Volumes	DOE applies the Tank 16 estimate of 3,300 gallons to Tanks 9, 10 and 14, which also have significant volume in the annulus. DOE expects the material in those other Type I and Type II tanks to be highly soluble since it was originally the supernate that leaked into the annulus and later dried. For Tank 16, the material is not expected to be soluble because sand was introduced into the annulus to investigate the leak sites of the primary tank. SRR-LWE-2012-00039 describes the waste depths in Tank 16 annulus that were observed below each of the risers to be 2-4 inches from the bottom of the annulus. The HTF Inventory (SRR-CWDA-2010-00023) states that the material depth in Tank 9 is 8-10 inches and the material depth in Tank 14 is 12-13 inches. Please clarify how it is conservative to apply the inventory for Tank 16 to Tanks 9 and 14 if the material depth is much less for Tank 16. Does DOE have plans to remove additional material from the annulus of Tanks 9 and 14? Also, in [LWO-LWE-2007-00204], DOE states that "Recent annulus samples taken both inside and outside the duct from Risers IP-118 and IP 35 contained significant amount of soluble waste (~50 vol%)." Please clarify their assumptions regarding the solubility of the material in the Tank 16 annulus in light of these sample results.	Indicated that depth of material cited in Tanks 9 and 14 is at various leak sites, but is not uniform around entire annulus as it is expected to be in Tank 16. Stated that after annulus cleaning the volume in Tanks 9 and 14 is expected to be much less than the 3,300 gallons estimated for Tank 16. Stated that material in mounds can be seen tapering off. Plans (as part of the baseline) to remove additional annular inventory in Tanks 9, 10 and 14. Stated that the material in Tanks 9 and 14 annuli is expected to be similar to the material inside the Tank 16 annulus duct but dissimilar to the material in the Tank 16 annulus but outside the duct due to the unique nature of the Tank 16 leak. Indicated ducts in Tank 16 annulus were drilled to obtain samples for solubility analyses. Cited 2007 and 2011 SRNL reports. Laboratory data indicates 35-50 percent soluble in duct. Expect waste in duct to contain less silica (from sand added for sandblasting in Tank 16). However, DOE is not surprised that there are "pockets" of material in the Tank 16 annulus that would be more soluble.
10	Representitiveness of Tank 16 annulus samples for Tanks 9, 10, and 14	For those radionuclides analyzed in the four Tank 16 annulus samples, DOE uses the concentrations of the Tank 16 annulus sample results for tanks with annulus material (Tanks 9, 10 and 14). Clarify the basis for using Tank 16 concentrations if Tank 16 annulus material is expected to be chemically different than the other Tanks with residual material (9, 10 and 14).	Expect material leaking into Tank 16 annulus to be radiologically similar to fresh waste from H Canyon. Most radionuclides precipitate quickly upon alkalining. However, some (e.g., Sr) precipitate more slowly. In Tank 16, fresh waste leaked immediately so some differences may occur such as with Sr. DOE explained that the Tank 16 concentrations were conservative because they believed the Tank 16 to contain more Sr-90 than the other tanks. Since the leak was so rapid, the Sr-90 had not precipitated out of the supernate and into the sludge within the primary tank, so there is more Sr-90 in Tank 16 annulus than would be expected in Tanks 9,10, and 14 annuli.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
11	Differences Between Annular and Primary Residual Inventory for Ni-59	The estimated Ni-59 inventory in the Type I tank annuli was estimated by setting the annulus residual inventory equal to the primary tank residual inventory (i.e., 8.6 Ci). The actual annulus inventory for Ni-59 in the Type I tanks is expected to be considerably lower than the inventory used in the HTF PA modeling. Clarify why the actual inventory in the annulus is expected to be much less than that projected in the primary if the expected volumes assumed are relatively the same, as well as the concentrations. The volume in the annulus is assumed to be 3,300 gallons and the volume in the primary is assumed to be 4,000 gallons.	Expect Ni to precipitate immediately upon pH adjustment; therefore, should primarily reside in the sludge within the primary tank versus within supernate that leaked from primary liner.
12	Potential Limits on Oxalic Acid (OA) Cleaning	Section 2.3.3 of DOE/SRS-WD-2013-001, Rev. 0 discusses chemical cleaning technologies. WSRC-TR-2004-00317 discusses potential limits on the use of oxalic acid due to downstream impacts on the Liquid Waste System. Specifically, the "sludge batch can contain about 10 wt percent of total solids as sodium oxalate before increasing the number of canisters produced or changing sludge processing", and "10 wt percent sodium oxalate in total solids amounts to disposal of 1 to 6 sludge heels depending on waste type of sludge heel cleaned and specific sludge batch." Please clarify how these limits might impact the cumulative number of HTF tanks that can undergo chemical cleaning with OA, and also the schedule of cleaning with OA.	Indicated this question would take longer to address. Continuing to evaluate chemical cleaning technologies and impacts of oxalates on downstream processes. Agreed to clarify statement about 1-6 sludge heels.
13	Environmental Conditions Impacting OA Effectiveness	The DOE/SRS-WD-2013-001, Rev. 0 states that OA might not be as effective on some of the tanks depending on the environmental conditions to which tank has been exposed. "Environmental conditions to which the waste has been exposed also affect its dissolution characteristics; therefore, in future chemical cleaning planning, each waste tank (or groups of tanks with similar waste and similar historical conditioning) will be considered individually." Please clarify under what conditions OA is not expected to be as effective and which tanks DOE expects OA's effectiveness to be limited. Also, please clarify what DOE intends to use as an alternative to OA for these tanks.	Indicated this will be evaluated on a tank-by-tank basis.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
14	Enhanced Chemical Cleaning Plans	The Waste Removal Technology Baseline discusses Enhanced Chemical Cleaning (ECC) [V-ESR-G-00003], which uses lower acid strength. It states that Tank 8 will be the prototype for ECC. However, Tank 8 is not planned for closure until 2020 as stated in the Liquid Waste System Plan [SRR-LWP-2009-00001 R17]. Please elaborate on the ECC technology and clarify whether any HTF tanks will be used as a prototype. Is the Chemical Cleaning that is planned for Tank 12 considered "enhanced" since DOE is planning to dilute the acid strength after the first strike, or is ECC an entirely different technology?	Clarified that ECC is intended to destroy oxalates. Currently a lack of funding and there were nuclear safety concerns.
15	Lessons Learned for Tank 12 OA Cleaning Campaign	In the Tank 12 Bulk OA presentation [SRR-STI-2013-00198], the following lessons learned were described. Please elaborate on these specific adjustments for the Tank 12 cleaning campaign. i. Maximize contact of residuals with oxalic acid a. Sludge depth and chemical consituents b. Insoluble particulate mobilization ii. Provide adequate mixing iii. Control pH to prevent oxalate production iv. Pre-wash treatment tank to target sodium oxalate solubility	(i) Indicated use of 4 Standard Slurry Pumps (SLP's) at maximum speed to maximize the OA-sludge surface area contact. The pumps will spread out the mounds to achieve good contact between the sludge and the acid where the sludge is deeper. This will also mobilize the insoluble particles. (ii) For Tank 12 they can operate the pumps during the entire campaign instead of just at the beginning during cleaning Tanks 5 and 6. (iii) Experience indicates increased pH (>2) reduces the solubility of metals, therefore precipitating oxalates. (iv) Pre-wash to a target based on solubility of sodium oxalate, i.e. [Na+] = 0.5 M; goal is to reduce the sodium concentration to minimize sodium oxalate precipitation.
16	Monitoring During Tank 12 Chemical Cleaning	DOE also stated in SRR-STI-2013-00198 that there will be "Sampling and monitoring program in place to ensure operational efficiency and safety envelope maintained" during Tank 12 OA cleaning. Please clarify what sampling and monitoring will take place during the Tank 12 chemical cleaning.	Indicated there is an operating procedure that might clarify and DOE would investigate providing the operating procedure.
17	Additional Testing of OA Effectiveness for HTF Wastes	Clarify whether DOE plans to perform additional testing of oxalic acid effectiveness in treating the specific type of waste expected to be present in HTF tanks targeted for chemical sludge removal with oxalic acid.	Not planning additional OA testing at this time.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
18	Plans for Evaluation of Tank 12 Chemical Cleaning	As a comment on the Tanks 5 and 6 Closure Module, the NRC staff suggested that DOE perform a critical evaluation of the differences in oxalic acid delivery, waste agitation, waste transfer, and other factors that led to more successful use of oxalic acid in Tank 16 compared to Tank 5 and 6 would be informative. Such an evaluation could also compare the results of the upcoming Tank 12 chemical cleaning. Clarify whether DOE plans to perform such an evaluation for Tank 12.	Plans to evaluate the efficiency and effectiveness of Tank 12 OA cleaning. DOE does not plan to formally document the evaluation of Tank 12 OA cleaning other than in the Closure Module document for Tank 12.
19	Tank 5 Lessons Learned on Mound Dispersal for HTF	During the cleaning of Tank 5, the cooling coils served as an obstacle to breaking up a mound under Riser 1. Please clarify how DOE intends to apply this particular lesson learned from Tank 5 experience having to do with cooling coils to HTF tanks.	Believed final state is not indicative of ability to move sludge. Stated that mounds under mixing pumps were mobilized even though the pump was not able to be lowered to the design level above the tank floor. Indicated that DOE systematically develops a mixing strategy prior to each cleaning campaign and continue to evaluate the number and location of pumps to build a strategy for heel removal campaigns in the tanks.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
20	Feasibility fo Tank Amendments to Lower Submersible Mixer Pump (SMP) for Cleaning	SRR-CWDA-2012-00071, Rev. 0 (page 37) indicates that the SMP installed in Riser 1 of Tank 5 could not be lowered to the tank floor due to interference with existing cooling coils that were covered by a sludge mound at the time of SMP installation. The cooling coil cutter was not implemented and the pump was left suspended directly above the sludge level. The SMP was later lowered to the horizontal cooling coil level (around 13 inches) to slurry the sludge after the mound under Riser 1 was mobilized to an area near Risers 3 and 5 (page 40). Although installation of the SMP under Riser 1 was credited with lowering the large mound under Riser 1 during mechanical sludge removal, the height of the SMP above the tank floor may have affected final solids accumulation following mechanical feed and bleed. LWO-LWE-2006-00128 indicates that the SMP design calls for placement 8 inches above or on the tank bottom. SRR-CWDA-2012-00071, Rev. 0 (page 59) indicates that the 16 inches between the SMP pump and the bottom of the tank during mechanical feed and bleed may be responsible for the solids accumulation under Riser 1. Please clarify whether DOE has plans to evaluate or has evaluated the feasibility of cutting the cooling coils under Riser 1 to allow the pump to be lowered to the tank floor during final stages of cleaning.	Believed final state is not indicative of ability to move sludge. Stated that mounds under mixing pumps were mobilized even though the pump was not able to be lowered to the design level above the tank floor.
21	Status of Small Scale Robotics and Sampling Technology for HTF	Section 5.2.3 of DOE/SRS-2013-001, Rev. 0 discusses optimization of existing technologies. It states that DOE is pursuing small scale robotics and sampling applications in tanks with internal obstructions. Please clarify the timeline and status of this type of technology for use in HTF.	Indicated that Tank 16 will be sampled the week of May 26 using a small vacuum technology, which is different from the technology used to retrieve the scrape samples from Tank 18 and 19.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
22	Status of Robotic Arm Technology for HTF	Section 5.3, page 5-21 of the DOE/SRS-2013-001, Rev. 0 discusses how DOE is currently evaluating a robotic arm technology and other alternate technologies to determine the practicality of additional waste removal from the Tank 16 annulus. This technology is also mentioned in SRR-LWE-2012-00082. Please elaborate on the evaluations that were performed in 2007 and in 2010 conducted for potentially using this technology for annulus cleaning. Please clarify the status and timeline of this technology for HTF.	Clarified that two different robotic arm technologies were being pursued. One is for the primary Type IV tanks. A different type of robotic arm crawler technology was pursued for Tank 16 annulus. In 2007 a vendor demonstrated a technology that was portrayed to be fairly mature. However in 2010 the vendor indicated that it is not deployable. Indicated that a slucing technology was also evaluated but was not pusued due to nuclear safety issues and installation problems (inspection ports were not large enough). Will be discussed in Tank 16 Maximum Extent Potential (MEP) document.
23	Metrics for Determining Effectiveness of Heel Removal	Section 5.3 of the DOE/SRS-2013-001, Rev. 0 states that "throughout the heel removal process, DOE continually evaluates the ongoing effectiveness of the technology being implemented and optimizes the existing technologies." Please clarify how DOE continually evaluates the ongoing effectiveness of the technologies during the Mechanical Sludge Removal (MSR) or the Chemical Sludge Removal (CSR) campaigns, especially given that photographs or samples are not usually taken until the end of the campaign. Clarify what metrics are used throughout the process to determine effectiveness (e.g., radiation transfer line readings).	Metrics are determined on a case-by-case basis in development of the specific operating strategy for each tank. Can't do this generically.
24	Status of Mixing Model Development for HTF	DOE reviewed their efforts in investigating new technologies in a briefing to the State of South Carolina in April 2013 [SRR-LWE-2013-00077]. DOE is cooperating with Hanford on the development of mixing models that can predict different slurry behavior. DOE stated that this is still in the beginning stages, but is a growing area with potential to enhance cleaning efforts at SRS. Please clarify the timeline of their use of the mixing model in HTF that is being developed for Hanford.	Nothing additional to add.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
25	Comparative Effectiveness of SMPs and Slurry Pumps	Clarify the relative effectiveness of SMPs to other types of slurry pumps for bulk sludge removal versus residual heel removal.	SMPs are more powerful with a theoretical effective cleaning radius of approximately 50 ft. SLPs only have approximately 30 ft theoretical effective cleaning radius. SMPs have limitations - nuclear safety, aerosolization, electrical loading. SMPs are being considered for Heel removal in most tanks, whereas SLPs or SMPs are being considered for Bulk Removal.
26	Status of Low Volume Mixing Pump Technology for HTF	Section 2.3.2.1 of DOE/SRS-2013-001, Rev. 0 states that "the SMPs are required to be shut down as the liquid level approaches the elevation of the discharge nozzles to prevent waste spraying". Because the SMPs could not be operated at lower liquid levels, ineffective mixing during acid strike 2 in Tanks 5 and 6 appears to have contributed to the formation of solids during chemical cleaning. DOE has indicated that a low volume mixing pump has been evaluated to support chemical cleaning but that it is not available at this time. Please clarify the timeline of the low volume mixing pump technology and whether they anticipate it to be available for future cleaning of HTF tanks.	Pulse-jet mixers found to be ineffective. Not pursuing low-volume pump.
27	Tank 16 Sampling Data	Please indicate when sampling data for Tank 16 will be available to NRC.	Indicated data should be available in late 2014 - first the primary, then the annulus.
28	Determination of Number of SLPs	Section 3.3.3 of SRR-CWDA-2011-00126 states that three SLPs were installed in Tank 16 Risers for MSR Campaigns 3-5, whereas one pump had been used for the first two campaigns. Please describe how DOE determined that three SLPs as opposed to four were sufficient in Tank 16. Additional details regarding the practicality (financial and schedule costs and uncertain benefit) of installation of a fourth pump would be helpful. Please also describe how this type of decision will be made for future tanks.	DOE referred NRC to Appendix B of the Waste Determination.
29	Basis for Compositing Tank 16 Samples	The Tank 16 presentation on sampling and analysis plan (SRR-CWDA-2013-00055) states that there are three populations within the annulus (north, south, and inside the duct). Slide 29 shows a figure with the samples and composites. Please clarify the basis for compositing from the various populations. How does the decision to combine samples from different populations impact the Upper Confidence Limit (UCL)?	Indicated UCL is not adversely impacted by the compositing approach.

ID	TITLE	NRC QUESTION	SUMMARY OF DOE RESPONSE
30	Conceptual Model of Construction Joint in Annulus	In SRR-CWDA-2010-00128, Rev. 1, Section 5.6.2.2.2, DOE describes the mass release from Type II tanks with an Intact Liner. Please clarify if this conceptual model also considers the possibility that the residual material could travel through the construction joint at the top of the annulus pan, which is what is thought to have happened with Tank 16.	PA does not explicitly model the tank vault construction joints. However, DOE has evaluated the scenario qualitatively, and does not envision this leak pathway to be a risk-significant pathway. DOE indicated that the downward flux through the tank causes the significant peaks.