



**Savannah River  
Remediation**

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# Savannah River Site F-Tank Farm NRC Onsite Observation Visit



## March 26 & 27, 2014

SRR-CWDA-2014-00029, Revision 1

# Agenda: 3/26/2014

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SRR-CWDA-2014-00029, Rev. 1

NRC F-Tank Farm Onsite Observation			
Wednesday, March 26, 2014			
Start	End	Topic	Location
8:00	8:45	Badging/Travel	Meet 703-46A
8:45	9:00	Opening Remarks & Inbrief	705-1C, Room 34 A-B
9:00	9:30	F-Tank Farm Status	705-1C, Room 34 A-B
9:30	11:30	Technical Discussions	705-1C, Room 34 A-B
11:30	1:00	Lunch	766-H
1:00	3:30	Technical Discussions	705-1C, Room 34 A-B
3:30	4:15	NRC Internal Review	705-1C, Room 34 A-B
4:15	4:45	NRC Outbrief	705-1C, Room 34 A-B
4:45	5:00	Travel/NRC Depart	703-46A

NRC F-Tank Farm Onsite Observation			
Thursday, March 27, 2014			
Start	End	Topic	Location
8:00	8:30	Arrive/Travel	Meet 703-46A
8:30	10:30	Technical Discussions	705-1C, Room 34 A-B
10:30	11:15	NRC Internal Review	705-1C, Room 34 A-B
11:15	11:45	NRC Outbrief	705-1C, Room 34 A-B
11:45	12:00	Travel/NRC Depart	703-46A

## Activities

1. Discuss documentation for closing FTF Tanks 5/6
2. Observe implementation of radiation protection program, including as low as reasonably achievable (ALARA), air monitoring, and final radiological data for Tanks 5/6 grouting
3. Discuss the status of the high-level waste tank residual solids sample leaching experiments, including NRC's comments on the DOE experimental plan
4. Discuss Tanks 5/6 Special Analysis Technical Review Report, FEPs Analysis Technical Review Report, and review of environmental monitoring data
5. Discuss earthquakes and other impacts on site stability

*Onsite Observation Guidance for March 26-27, 2014, Monitoring Visit to the Savannah River Site, F-Tank Farm (Docket No. PROJ0734), ML14045A215.*

- 3/26 am {
  - (2) - Observe implementation of radiation protection program, including as low as reasonably achievable (ALARA), air monitoring, and final radiological data for Tanks 5/6 grouting
  - (4) - Discuss Tanks 5/6 Special Analysis Technical Review Report, FEPs Analysis Technical Review Report, and review of environmental monitoring data
  - (5) - Discuss earthquakes and other impacts on site stability
- 3/26 pm {
  - (1) - Discuss documentation for closing FTF Tanks 5/6

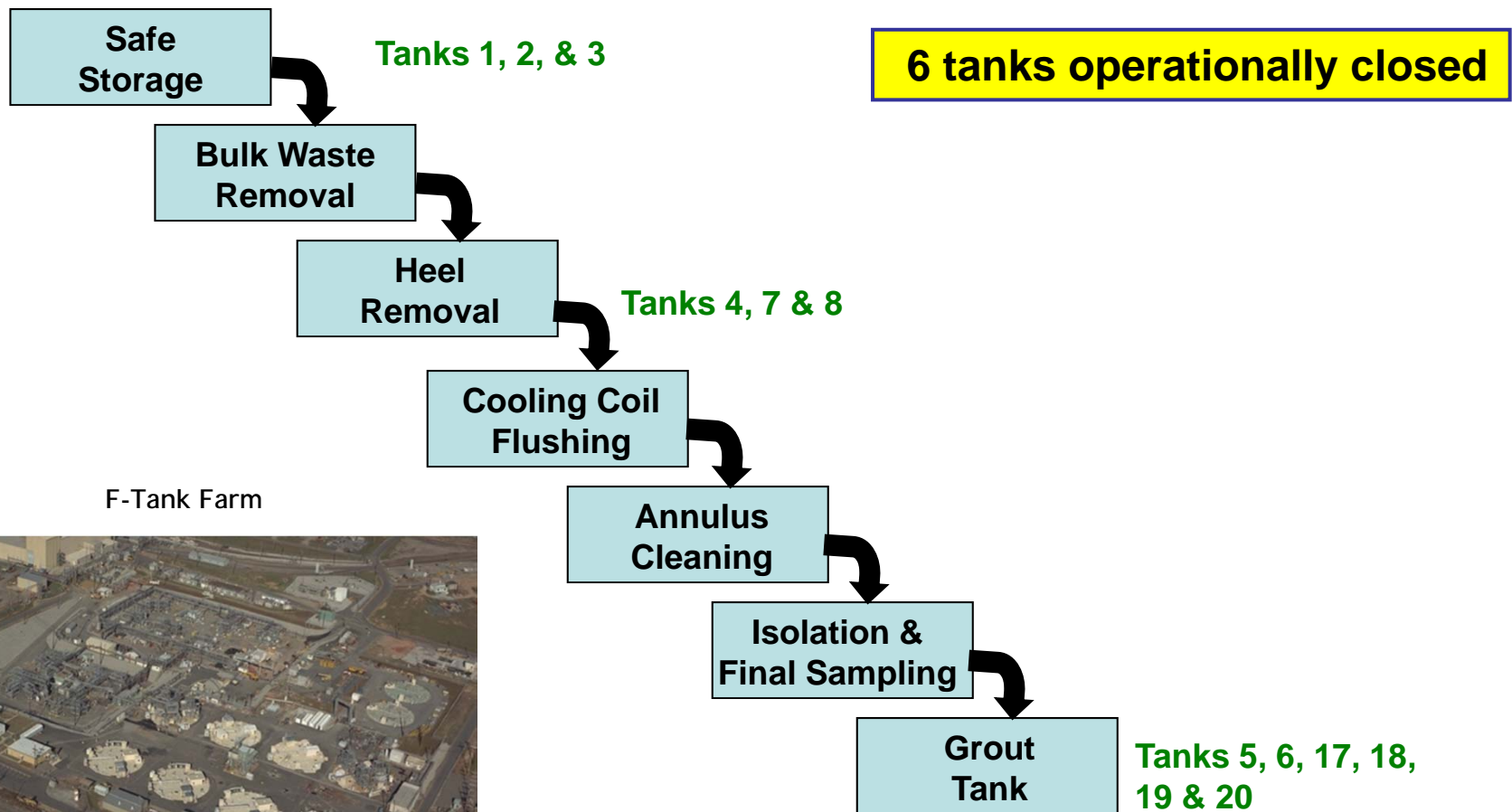
3/27 am

- (3) - Discuss the status of the high-level waste tank residual solids sample leaching experiments, including NRC's comments on the DOE experimental plan
- Follow-up discussions

# Status: Tank Closure Progression (FTF)

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# Status: Tank Closure

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Tank	Bulk Waste Removal						DOE, SCDHEC, EPA Approvals	Tank Cleaning			DOE, SCDHEC, EPA Concurrence	Residual		Isolate Tank [2]	Closure Doc.s Approved (CMMWRD/Tr2)	FFA Closure Forecast [1]	FFA Closure Commitment (CY)
	Phase I			Remaining Phases				Mechanical	Chemical	Annulus		Sample	Analyze				
	Prep	Mix	Transfer	Prep	Mix	Transfer											
FTF → 17							D/S/E		N/A	N/A	D/S/E						
→ 20							D/S/E		N/A	N/A	D/S/E						
→ 18							D/S/E		N/A	N/A	D/S/E					2012	2012
→ 19							D/S/E		N/A	N/A	D/S/E					2012	2012
→ 5							D/S/E				D/S/E					2013	2015
→ 6							D/S/E				D/S/E					2013	2015
16							D/S/E				D/S/E		Sep-14			2015	2015
12							D/S/E			N/A	Feb-14					2015	2015
→ 11							D/S/E	TBD								2018	2017
→ 4							D/S/E	Feb-24								2028	2021
→ 7							D/S/E	Apr-25								2028	2022
→ 8							D/S/E	Apr-25								2028	2022
24						Jul-17				N/A						2027	2022
21				Jul-17					N/A	N/A						2025	2022
22				Jul-17					N/A	N/A						2026	2021
→ 13			Jun-20													2023	2022
3		May-22														2028	2021
10					TBD	TBD										2022	2017
14	May-16															2024	2019
15	May-15															2024	2021
→ 9	Mar-20															2024	2021
→ 2	Feb-22															2028	2022
→ 23	Oct-16								N/A	N/A						2026	2019
1	Feb-23															2028	2022

[1] FFA Closure forecast dates per LWSP rev 18.  
[2] Ventilation and essential instrumentation may remain until final tank grouting  
[3] Forecast dates per LWSP rev 18 for tanks in BWR and Cleaning Process.

Key:  
Mo-Yr Activity planned start or resume (mo/yr)  
Activity is complete  
N/A Activity is not needed  
Mo-Yr Activity is in progress, projected finish (mo/yr)  
Red box or text denotes change vs. last report

• Both F-Tank Farm and H-Tank Farm tanks are shown for completeness, however, H-Tank Farm tanks are not within the scope of Section 3116 Determination for Closure of F-Tank Farm at the Savannah River Site



## Requested Information

(E-mail dated 2/19/2014)

1. Grout video similar to what was provided by DOE for FTF Tanks 18/19. For example, DOE provided representative footage at the beginning and end of the day; beginning, middle, and end of the week; all throughout the grouting period, including providing video of pan views of the entire grout surface. Video of annulus and damaged cooling coil grouting would also be helpful.
2. 5 accepted and 5 rejected batch tickets for FTF Tanks 5/6, assuming that there were at least 5 accepted and 5 rejected batch tickets.
3. DOE schedule for completion of the Final Configuration Report for FTF Tanks 5/6. If the schedule for completion of the Report is far out in time, NRC requests that DOE provide NRC with inputs in advance of the Report, similar to what was done for FTF Tanks 18/19.

## Requested Information (cont'd)

(E-mail dated 3/10/2014)

1. Please provide the status of leak sites for FTF Tanks. For example, NRC learned of leak sites in Tank 4 recently. Please provide DOE's comparison between FTF and HTF tanks with respect to the number and location of leak sites. NRC's understanding is that: (1) HTF tanks were assumed to be initially failed; and (2) FTF tanks have leak sites near the bottom (e.g., Tank 5), but were not assumed to be initially failed. Please let NRC know if that is incorrect.
2. Please provide the status of the lysimeter experiments in A-Area. Are any results available yet? How/when will the results be communicated by DOE to NRC?

[ Information provided in *Requested Pre-Visit Information in Support of U.S. Nuclear Regulatory Commission F-Tank Farm March 2014 Onsite Observation Visit*, SRR-CWDA-2014-00026. Document provided 3/17/2014. ]

## Tank 5/6 Grout Video

- Complete set of videos for Tank 5 and Tank 6
  - Approximately 30 DVDs per tank
- Calendar of grouting activities

# Tank 5 Grout Video

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**Aug-13**

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22 <sup>(2)</sup>	23 <sup>(2)</sup>	24
25	26	27	28	29	30	31

**Sep-13**

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

**Oct-13**

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

**Nov-13**

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

**Dec-13**

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Days Tank 5 primary tank received grout

Days Tank 5 annulus received grout

Days Tank 5 riser(s) received grout

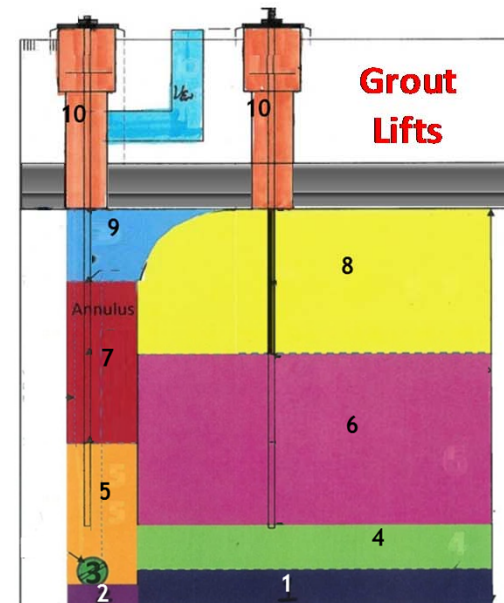
Days Tank 5 failed cooling coils received grout

Days Tank 5 intact cooling coils received grout

Days Tank 5 in tank equipment received grout

(1) - Video is available and provided for all dates noted in Red.

(2) - Failed Cooling Coils filled in addition to primary tank/annulus fill.



# Tank 6 Grout Video

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Aug-13

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19 Lift-1	20 Lift-1	21 Lift-2	22 Lift-2 & 3	23	24
25	26	27 Failed Coils	28 Lift-4	29 Lift-4 & 5	30	31

Sep-13

S	M	T	W	T	F	S
1	2	3 Lift-5	4	5 Failed Coils	6	7
8	9	10	11	12	13	14
15	16	17 Lift-6	18 Lift-6	19 Lift-6	20	21
22	23 Lift-6	24 Lift-6	25 Lift-6	26 Lift-7	27	28
29	30					

Oct-13

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30 Lift-8	31		

Nov-13

S	M	T	W	T	F	S
					1 Lift-8	2
3	4	5 Lift-8	6	7 Lift-8	8	9
10	11 Lift-8	12	13 Lift-8	14	15	16
17	18	19	20 Lift-9	21 Equip. Fill	22	23
24	25 Intact Coils	26	27	28	29	30

Dec-13

S	M	T	W	T	F	S
1	2 Intact Coils	3 Intact Coils	4 Intact Coils	5 Intact Coils	6 Equip. Fill	7
8	9	10	11 Lift-10	12 Lift-10	13	14
15	16 Lift-10	17	18 Lift-10	19	20	21
22	23	24	25	26	27	28
29	30	31				

Days Tank 6 primary tank received grout

Days Tank 6 annulus received grout

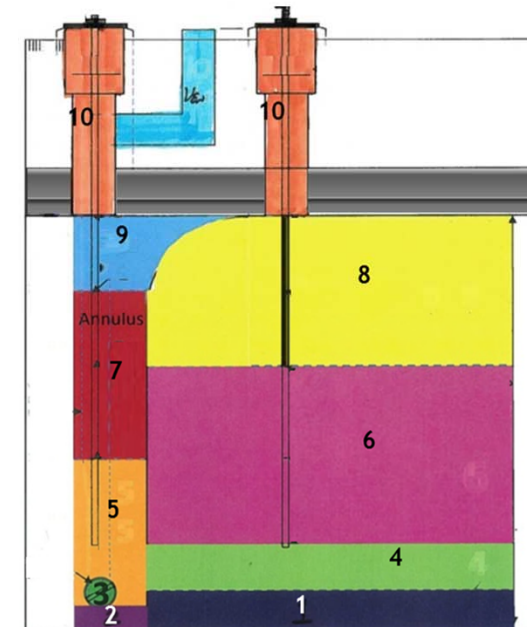
Days Tank 6 riser(s) received grout

Days Tank 6 failed cooling coils received grout

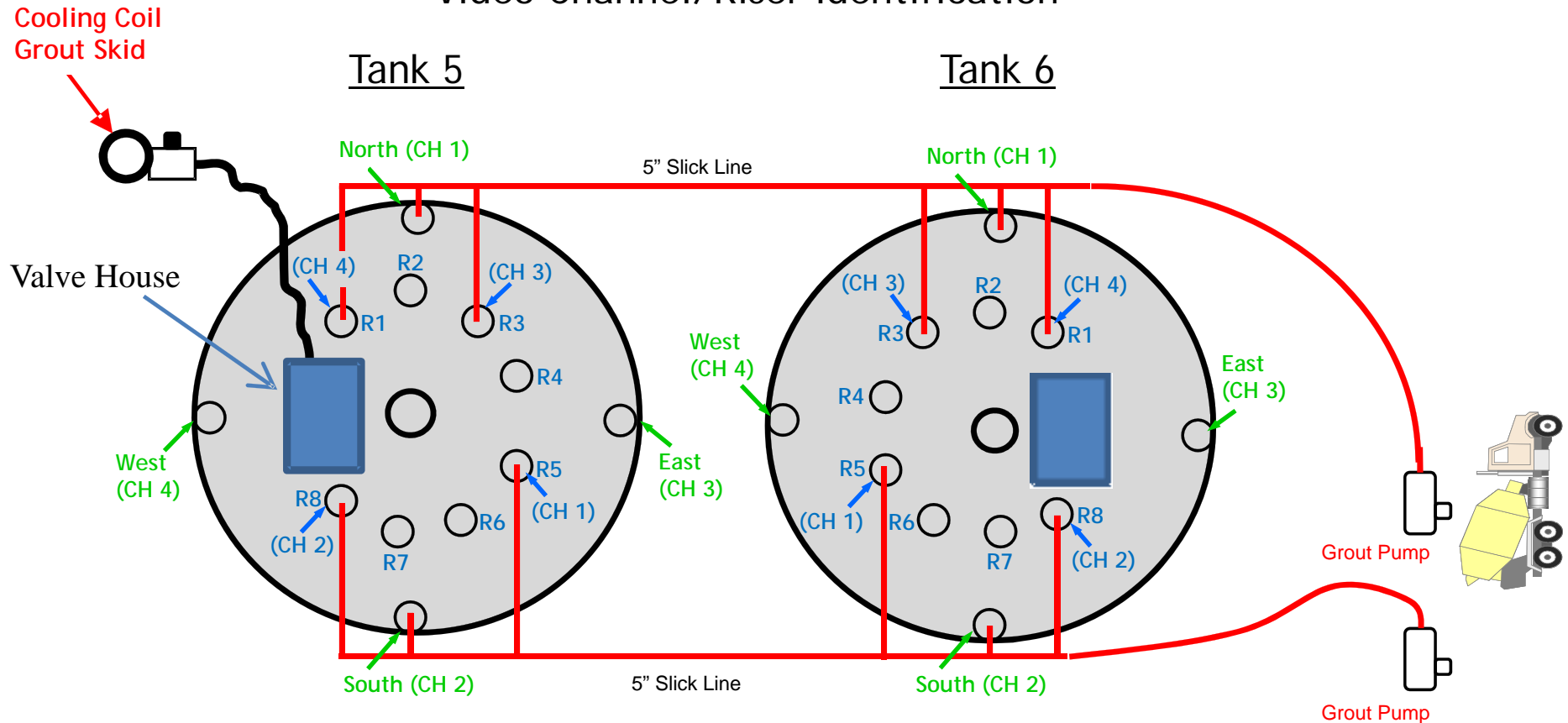
Days Tank 6 intact cooling coils received grout

Days Tank 6 in tank equipment received grout

(1) - Video is available and provided for all dates noted in Red.



## Video Channel/Riser Identification<sup>1</sup>



Annulus Risers - (e.g., North)

Primary Tank Risers - (e.g., R#)

<sup>1</sup>The riser location and video channel designations shown were consistent throughout grouting activities with the only exception occurring during the final filling of the tank during which some camera relocation was required if grout level within the tank did not allow insertion of a camera in certain risers.

# Tank 5/6 Batch Tickets

- Tank 5
  - Five accepted
  - Three rejected
    - Only three total rejected for Tank 5
- Tank 6
  - Five accepted
  - Five rejected

[illegible]



## Tank 5/6 Final Configuration Report

- Anticipated to be issued fall of 2014
- Report of grouting related input information recently issued
  - *Tanks 5 and 6 Final Configuration Report Inputs,*  
SRR-LWE-2013-00227



## Tank Leaksite Information

- Current status of leak sites for FTF and HTF waste tanks available in *SRS High Level Waste Tank Crack and Leak Information*, C-ESR-G-000003, Revision 10.

## Lysimeter Testing

- Current status of lysimeter experiments is provided in *Determination of Constituent Concentrations in Field Lysimeter Effluents, FY13 Final Report, Task 2: Lysimeter Leachate Chemistry*, SRR-CWDA-2013-00121.



## Action Items

1. DOE to provide NRC an electronic copy of presentation material [SRR-CWDA-2013-00116, Revision 1] including action items and attendance rosters. (Complete)
2. DOE to provide NRC an electronic copy of *Follow-up in Support of U.S. Nuclear Regulatory Commission Monitoring Activities in F-Tank Farm*, SRR-CWDA-2013-00103. (Complete)
3. DOE to provide NRC with electronic copies of *Liquid Waste Tank Residuals Sampling and Analysis Program Plan*, SRR-CWDA-2011-00050, Revision 2 and *Liquid Waste Tanks Residual Sampling-Quality Assurance Program Plan*, SRR-CWDA-2011-00117, Revision 1. (Including Tracked Changes Version and Final Version) (Complete)

## Action Items (Cont'd)

4. DOE to provide NRC with Idaho grout drop report  
*Grout/CLSM Testing and Selection for the INTEC Tank Farm Closure*, EDF-6715. (Complete - Document available under ADAMS Ascension # ML060810244 )
5. DOE to provide NRC with basis for the 10-foot grout drop height. (Tank 5/6 grouting all performed at <5-foot drop, 10-foot drop not utilized.)
6. DOE to provide NRC with Tank 5/6 Special Analysis PORFLOW files (NRC to provide hard drive) (Complete)
7. DOE to provide NRC with *Task Technical and Quality Assurance Plan for Determining the Radionuclide Release from Tank Waste Residual Solids*, SRNL-STI-2013-00203. (Complete)

## Action Items (Follow-up Phone Calls)

1. DOE provide response in writing or another telecon to NRC main points about water segregation and previously provided observations.

## Other Documentation Available

- FY2014 PA Maintenance Plan
  - *Savannah River Site Liquid Waste Facilities Performance Assessment Maintenance Program - FY2014 Implementation Plan*, SRR-CWDA-2013-00133, was recently transmitted (3/2/2014) with the reference DVD provided with the submittal of the *Crosswalk of Select Documents Related to the Monitoring Programs for the Saltstone Disposal Facility*, SRR-CWDA-2014-00002.

3/26 am

- (2) - Observe implementation of radiation protection program, including as low as reasonably achievable (ALARA), air monitoring, and final radiological data for Tanks 5/6 grouting
- (4) - Discuss Tanks 5/6 Special Analysis Technical Review Report, FEPs Analysis Technical Review Report, and review of environmental monitoring data
- (5) - Discuss earthquakes and other impacts on site stability.

- Radiological Data
  - Tank 5 and Tank 6 Grouting Post Job ALARA Reviews
  - Anticipated completion: 2Q CY2014
- Air Monitoring
  - 2013 FARMS Report, *Facility Annual Review of Monitoring Systems F-Tank Farm Facility*, SRR-FSH-2013-00024
  - DOE to provide electronic copy to NRC



- Tank 5 and 6 Special Analysis Technical Review Report
  - Provided (2/4/2014) *Impact of Cementitious Leachate on Se, Nb and Ra Partitioning*, SREL Doc. R-13-0005
  - Real waste testing status and discussion planned for 3/27/2014 Technical Discussion topic

- FEPs Analysis Technical Review Report
- Environmental Monitoring Data
  - Groundwater Report: *2013 Annual Groundwater Monitoring Report for the F- and H-Area Radioactive Liquid Waste Tank Farms*
  - Anticipated completion: March 31, 2014
- Earthquakes and other impacts on site stability

- 3/26 pm {
- (1) - Discuss documentation for closing FTF Tanks 5/6



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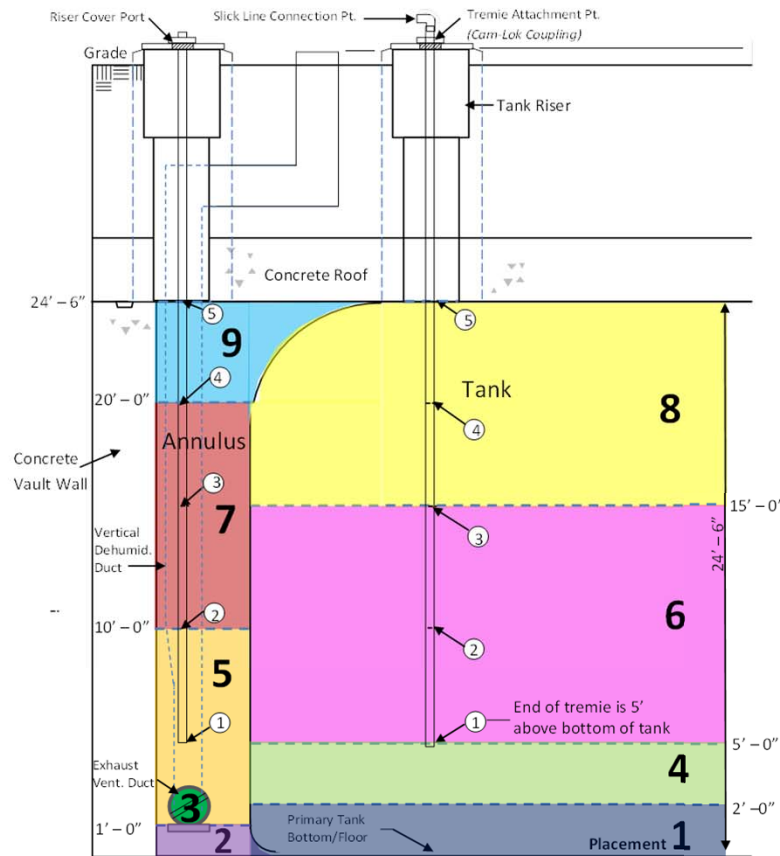
# Technical Discussion Topics 3/26/2014 PM

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## Technical Discussions: 3/26/2014 PM

- Final Configuration Report Inputs
  - Grouting Summary



Estimated vs. Actual Grout Volumes for Tank 5

Tank 5	Estimated (CY)	Actual (CY)
Total Tank 5 w/o Risers	3927	3871
Total Tank 5 Annulus w/o Risers	583	612
Total Tank 5 Risers	43	36
Total Tank 5	4553	4519

Estimated vs. Actual Grout Volumes for Tank 6

Tank 6	Estimated (CY)	Actual (CY)
Total Tank 6 w/o Risers	3922	3849
Total Tank 6 Annulus w/o Risers	583	601
Total Tank 6 Risers	43	30.5
Total Tank 6	4548	4480.5

## Failed Cooling Coil Grouting

- Failed cooling coils, coils with a guillotine failure, were grouted successfully from each end (inlet and outlet)
  - Tank 5 had seven failed coils
  - Tank 6 had nine failed coils

## Intact Cooling Coil Grouting

- Fifty-six of the seventy-two were designated as intact. Of the fifty-six, fifty-one were fully grouted, with the remaining five partially filled due to complications encountered during the coil grouting evolution
  - (2) Grouting addition piping became plugged
  - (2) Known holes, believed plugged during subsequent grouting activities
  - (1) High radiation rates

## Equipment Grouting

Equipment	Location	Calculated Fill Volume (Gallons)	Actual Grout Volume (Gallons)
Submersible Transfer Pump and caisson	Tank 5, Riser 6	13.4	11
Thermowell	Tank 5, Riser 6	1.6	2
Submersible Transfer Pump and caisson	Tank 6, Riser 6	13.4	11
Thermowell	Tank 6, Riser 6	1.6	2
Transfer Jet	Tank 6, Riser 4	9.5	12
Thermowell	Tank 6, Riser 4	1.5	1.5

## Grout General

- Over 375 grout test cylinders (total from both waste tanks) were tested for compressive strength. The average 28-day compressive strength was 2,966 pounds per square inch (psi), all tested cylinders had a compressive strength greater than the design 28-day compressive strength of 2000 psi.
- Grouting plan anomalies
  - Test cylinder curing room temperature and humidity instrumentation verification
  - Timing of test cylinder compressive strength testing for limited number of cylinders (17) due to partial stop work during lapse in appropriations
  - Excess water content (< 3% excess) for grout placed into Tank 6 on September 19, 2013



## NRC FTF Outbrief

- NRC Staff Outbrief
- Action Items Captured

NRC F-Tank Farm Onsite Observation			
Thursday, March 27, 2014			
Start	End	Topic	Location
8:00	8:30	Arrive/Travel	Meet 703-46A
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11:45	12:00	Travel/NRC Depart	703-46A

3/27

- (3) - Discuss the status of the high-level waste tank residual solids sample leaching experiments, including NRC's comments on the DOE experimental plan.
- Follow-up discussions

## Technical Discussions: 3/27/2014

- Real Waste Testing Status
  - Presentation: *Radionuclide Release from Tank Waste Residual Solids*, SRNL-STI-2014-00117
- NRC Review Questions

## NRC FTF Outbrief

- NRC Staff Outbrief
- Action Items Captured
- Closing Statements

## Action Items

1. DOE to provide NRC an electronic copy of presentation material [SRR-CWDA-2014-00029, Revision 1] including action items and attendance rosters.
2. DOE to provide NRC an electronic copy of Tank 5 and Tank 6 Grouting Post Job ALARA Reviews when available.
3. DOE to provide NRC an electronic copy of 2013 FARMS Report, *Facility Annual Review of Monitoring Systems (FARMS) F-Tank Farm Facility*, SRR-FSH-2013-00024.
4. DOE to provide NRC an electronic copy of *2013 Annual Groundwater Monitoring Report for the F- and H-Area Radioactive Liquid Waste Tank Farms* when available.

## Action Items (Cont'd)

5. DOE to provide NRC an electronic copy of presentation material *Radionuclide Release from Tank Waste Residual Solids*, SRNL-STI-2014-00117.
6. DOE to provide NRC a copy of the Tank 5/6 Final Configuration Report when available.
7. DOE to provide NRC a copy of the Tank 5/6 sampling Pre-Job ALARA Reviews.
8. DOE to provide NRC example survey log sheet from the Tank 5 crawler sampling Post-Job ALARA Review [11-FTF-147].
9. DOE to provide NRC the site procedure governing Post-Job ALARA Reviews.

## Action Items (Cont'd)

10. DOE to provide NRC copies of 2013 groundwater reports for GSA Eastern and Western Operable Units.
11. DOE and NRC to arrange for telecon regarding on-going NRC waste tank structural analysis calculations. In preparation for telecon:
  - a) NRC to provide DOE listing of documents already reviewed and any additional documents being requested
  - b) DOE to provide any additional documentation available regarding tank farm structural analysis
  - c) DOE to provide NRC documentation available regarding DOE response to recent earthquake event



## Action Items (Cont'd)

12. DOE to provide NRC documentation relative to non-conformance reports for Tank 5/6 grouting (i.e., excess water & grout curing conditions).
13. DOE to provide NRC available information regarding adiabatic temperature rise in tank fill grout. (see Item #3 from NRC e-mail dated 3/25/2014)
14. DOE to provide NRC documentation relative to completion of full-scale batching (i.e., qualification testing) as recommended (page 24) in SRNL-STI-2011-00551.
15. DOE to provide NRC information relative to differences in grout density values listed in Tables 3-4 and 3-5 of SRNL-STI-2011-00551. (see Item #6 from NRC e-mail dated 3/25/2014)

## Action Items (Cont'd)

16. DOE to provide NRC information regarding DOE decision to not utilize shrinkage compensating admixtures in tank grout formulation.
17. DOE to provide NRC documentation of Work Order modification which added the steps for potentially removing excess liquid during riser fill activities.
18. DOE to provide NRC total volume of tremie lubricant (i.e., Slick Willie) added to Tanks 5 and 6 during grouting activities.
19. DOE to provide NRC water-to-cement ratios for all batch tickets from grouting activities on 9/19/2013 & 9/23/2013.
20. DOE to provide NRC, SCDHEC and EPA a copy of documentation on Tank 5/6 grouting lessons learned.

## Action Items (Cont'd)

21. DOE and NRC to arrange for telecon regarding on-going residual waste testing.
22. DOE to provide NRC a copy of Revision 1 of *Task Technical and Quality Assurance Plan for Determining the Radionuclide Release from Tank Waste Residual Solids*, SRNL-RP-2013-00203, when available.

NRC F-Tank Farm Monitoring Visit  
Savannah River Site, Aiken, South Carolina  
March 26, 2014

Name	Affiliation	Phone
LARRY ROMANOWSKI	SRR	
MARK LAYTON	SRR	
Leigh Beatty	SCDHEC	
Cynthia Barr	NRC	
HARRY FELSHER	NRC	
LEAH PARKS	NRC	
GREGORY SUBER	NRC	
George Alexander	NRC	
Martha Berry	EPA	
Sherri R. Ross	DOE-SR	
Kent Rosenberger	SRR	
STEVEN A. THOMAS	SRR	
BARRY S. MULLINAX	SCDHEC	
Dan Ferguson	DOE-SR	
Byron Amick	SCDHEC	
Scott H. Simons	SCDHEC	
Joel Cantrell	SRR	
JAMES RUSHT	SRR	
Bruce Martin	SRR	
Greg Arthur	SRR	
Mark Mahoney	SRR	
JOHN OCCHIPINTI	SRR	

# Attendance Sheet 3/27/2014

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NRC F-Tank Farm Monitoring Visit  
Savannah River Site, Aiken, South Carolina  
March 27, 2014

Name	Affiliation	Phone
LARRY ROMANOWSKI	SRR	
DAVID HOBBS	SRNL	
MARK LAYTON	SRR	
Leigh Beatty	SCDHEC	
HARRY FELSNER	NRC	
JEAN PARKS	NRC	
Cynthia Bair	NRC	
George Alexander	NRC	
Martha Berry	EPA	
Sherri R. Rost	DOE-SR	
Kent Rosenberger	SRR	
STEVE THOMAS	SRR	
Byron Amick	SCDHEC	
Barry Mullinax	SCDHEC	
Dan Ferguson	DOE-SR	
CLIFF WINKLER	SRR	
JAMES RUSH	SRR	
JOHN OCCHIPINTI	SRR	
Mark Mahoney	SRR	
Joel Cantrell	SRR	