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Savannah River Site, Aiken, SC, 29808

SRR-CWDA-2014-00061
Revision 0
RSM Track #: 10667

JUN 25 2014

Sherri R. Ross, Program Manager
Waste Removal and Tank Closure
Waste Disposition Programs Division
Savannah River Operations Office

Dear Ms. Ross:

ACTION ITEM FOLLOW-UP IN SUPPORT OF U.S. NUCLEAR REGULATORY COMMISSION ONSITE OBSERVATION VISIT ON MAY 27-29, 2014

Ref:

1. SRR-CWDA-2014-00054, *Savannah River Site Salt Waste Disposal NRC Onsite Observation Visit, May 27-29, 2014*, Savannah River Site, Aiken, SC, Revision 1, May 2014.
2. SRR-CWDA-2013-00062, *FY2013 Special Analysis for the Saltstone Disposal Facility at the Savannah River Site Salt,* Savannah River Site, Aiken, SC, Revision 2, October 2013.
3. SRNL-STI-2010-00745, Harbour, J. R. and Williams, M. F., *Impact of Curing Temperature on the Saturated Liquid Permeability of Saltstone*, Savannah River Site, Aiken, SC, Revision 0, February 2011.
4. SRNL-STI-2012-00558, Reigel, M.M., et al., *Process Formulations and Curing Conditions that Affect Saltstone Properties*, Savannah River Site, Aiken, SC, Revision 0, September 2012.
5. VSL-13R3010-1, Papathanassiu, A.E., et al., *Oxidation Rate Measurements and Humidity Effects on Saltstone*, Vitreous State Laboratory, The Catholic University of America, Washington, DC, Revision 0, August 2013.
6. VSL-14R3210-1, Papathanassiu, A.E., et al., *Final Report Saltstone Curing Assessment,* Vitreous State Laboratory, The Catholic University of America, Washington, DC, Revision 0, March 2014.

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A Salt Waste Disposal onsite observation visit by the U. S. Nuclear Regulatory Commission (NRC) was held at the Savannah River Site on May 27-29, 2014. During the outbrief for the visit a number of Action Items were captured (Reference 1, slides 74-77). Information relative to three of the Action Items is provided below. The three Action Items include the following:

4. *DOE to provide NRC SDF FY2013 Special Analysis Tecplot files in readable electronic form.*

7. *DOE to provide NRC information regarding applicability of hydraulic conductivity values provided in SRNL-STI-2010-00745.*

9. *DOE to provide NRC information regarding screen depth and zone of Z-Area wells.*

Action Item 4

Savannah River Remediation LLC (SRR) has prepared a DVD containing the requested Tecplot files supporting the Saltstone Disposal Facility (SDF) FY2013 Special Analysis (Reference 2). The files are being provided as audio-video files (*.avi) which can be viewed without the Tecplot software. Attachment 1 provides a summary of the files to aid in identification of the specific video files. A total of ten separate video files are contained on the DVD that is being provided along with this transmittal.

Action Item 7

Regarding the applicability of the hydraulic conductivity values provided in *Impact of Curing Temperature on the Saturated Liquid Permeability of Saltstone*, SRNL-STI-2010-00745 (Reference 3), more recent studies have been performed which are considered to better represent the actual curing conditions of emplaced saltstone. Three recent studies evaluating, among other things, the effect of curing temperature on the saturated hydraulic conductivity of saltstone have attempted to mimic actual temperature profiles recorded in the disposal units.

Process Formulations and Curing Conditions that Affect Saltstone Properties, SRNL-STI-2012-00558, Rev. 0 (Reference 4) — Samples were cured for 28 days (in a controlled high humidity environment) according to temperature profiles recorded in Vault 4 Cells F and K, which had approximate maximum temperatures of 57 and 82 °C, respectively. For both curing profiles, samples with an approximate (and nominal) water-to-premix ratio of 0.6 indicated saturated hydraulic conductivities in the range of 1.60E-09 to 4.50E-09 cm/s.

Oxidation Rate Measurements and Humidity Effects on Saltstone, VSL-13R3010-1, Rev. 0 (Reference 5) — Samples were cured for 28, 60, and 90 days (at 100% humidity which mimics saturated conditions that would be expected for grout covered by additional overlaying grout) according to a temperature profile recorded in SDU Cell 2B with a maximum temperature of approximately 66 °C. This is the maximum temperature recorded in SDU Cell 2B to date. The average saturated hydraulic conductivities (based on four samples

for each curing duration) were 2.93E-08, 4.23E-09, and 4.93E-09 cm/s for the 28, 60, and 90 day curing durations, respectively.

Oxidation Rate Measurements and Humidity Effects on Saltstone, VSL-14R3210-1, Rev. 0 (Reference 6) — Samples were cured for 90 days (at 100% humidity) at maximum temperatures of 35, 45, and 55 °C; heating rates of 10 °C per day from a starting temperature of 25 °C to each maximum temperature were used. These temperature profiles were based on a qualitative assessment of profiles recorded in the SDUs. The maximum temperature was limited to 55 °C because the highest temperature recorded in SDU Cell 2B of 66 °C had previously been assessed in VSL-13R3010-1, Rev. 0 (reference 4). The average saturated hydraulic conductivities measured for the 35, 45, and 55 °C profiles (based on four samples per temperature profile) were 2.43E-09, 1.75E-09, and 1.33E-09 cm/s, respectively.

DOE believes that the results of these more recent studies are more representative of the conditions that would be encountered within the SDU's when compared to the method utilized in *Impact of Curing Temperature on the Saturated Liquid Permeability of Saltstone*, SRNL-STI-2010-00745. The abundance of more representative data at the E-09 cm/s range suggests that E-09 cm/s is the most likely value for hydraulic conductivity. Therefore, a hydraulic conductivity value of 6.4E-09 cm/s was used in the FY2013 SDF SA Evaluation Case. However, to bound the range of data observed throughout the development of experimental techniques, sensitivity analyses were utilized to evaluate the impacts of an initial saltstone hydraulic conductivity of 4.5E-07 cm/s, similar to those determined in SRNL-STI-2010-00745 (Reference 3). SRNL-STI-2012-00558 (Reference 4) and VSL-13R3010-1 (Reference 5) have been provided to the NRC in previous submittals. VSL-14R3210-1 (Reference 6) is being provided along with this transmittal.

Action Item 9

The screen depth and aquifer zone for each of the Z-Area groundwater monitoring wells is provided in Attachment 2. The table provided in Attachment 2 includes the estimated elevation above mean sea level (MSL) for the ground at the well location, top of the screen zone, bottom of the screen zone, top of the Tan Clay Confining Zone (TCCZ) and bottom of the TCCZ. The elevations for the top and bottom of the TCCZ, and determination of the aquifer zone, are estimated based on available Cone Penetrometer Testing (CPT) data in the vicinity of the well location.

Action Items –General

Including this transmittal, information has been provided for Action Items 1, 2, 3, 4, 5, 7, 8 and 9 from the NRC Observation Visit. The three remaining Action Items cannot be closed at this time, however, information for those Action Items will be provided as soon as it is available or during a future Onsite Observation Visit, as applicable. The three remaining Action Items from the May Observation Visit include:

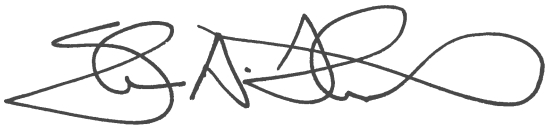
6. *DOE to provide NRC follow-up documentation on ongoing monitoring of SDU Cell 3A sump and potential impact on the SDF Performance Assessment.*

10. *DOE to provide NRC information on the structure contour map of the top of the Tan Clay Confining Zone. (Share at next monitoring visit.)*

11. *DOE to provide NRC large scale diagrams of cell layout and stream traces and cross section of SDU 6 with the FY2014 SDF SA.*

If you have any questions please contact me at 557-8960.

Sincerely,



Steven A. Thomas
Manager
Waste Disposal Authority

st/lr

Att.

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Attachment 1

Summary of AVI Files Supporting the FY2013 SDF Special Analysis (SRR-CWDA-2013-00062)

The table below summarizes the AVI format files showing:

- Tc-99 Concentrations (designated "C" in the video files with units = moles/liter)
- Oxygen Concentrations (designated "C2" in the video files with units = 1.0E-18 × meq e-/ml)
- Reduction Capacity (designated as "C3" in the video files with units = 1.0E-18 × meq e-/g)

File Name	Technetium Solubility (mol/L)		Oxygen Sources within Saltstone (% volume)	Flow Case	Associated SDF FY2013 SA Figures
	Saltstone	SDU Concrete			
SDU 1 Tc Eval Case	1.0E-08	1.0E-08	0	F1	Not applicable
SDU 4 Tc Eval Case	1.0E-08	1.0E-08	0	F1	5.5-3 [(a)]; 5.6-67 [(b)]
FDC Tc Eval Case	1.0E-08	1.0E-08	0	F1	5.5-4 [(a)]; 5.6-68 [(b,c)]
FDC Tc Eval Case_Ox Conc	1.0E-08	oxidized	0	F1	5.6-81 [(a)]
FDC Tc Eval Case 5% O2 Sources	1.0E-08	oxidized	5	F1	5.6-83 [(a)]
FDC Tc Eval Case 20% O2 Sources	1.0E-08	oxidized	20	F1	5.6-83 [(a)]
FDC Tc FC_5_NomSol	1.0E-08	oxidized	0	F5	5.6-88 [(c)]
FDC Tc FC_5_HighSol	1.0E-07	oxidized	0	F5	5.6-88 [(c)]
FDC Tc FC_5_LowSol	1.0E-09	oxidized	0	F5	5.6-88 [(c)]
FDC Tc FC_14_NomSol	1.0E-08	oxidized	0	F14	Not applicable

(a) Total integrated Tc-99 release shown in the figure
(b) Tc-99 release rate shown as "Evaluation Case" in the figure
(c) Tc-99 release rate for 20,000 years

Attachment 2

Summary of Z-Area Groundwater Monitoring Wells

The table below summarizes the existing Z-Area groundwater wells.

Well	Ground Elevation (MSL)	Top of Screen Zone (MSL)	Bottom of Screen Zone (MSL)	Top of TCCZ[(a)] (MSL)	Bottom of TCCZ[(a)] (MSL)	Aquifer Zone[(a)]	Nearest CPT
ZBG 1	288.9	240.1	220.0	217.0	205.0	UAZ	ZCP1
ZBG 1A	287.8	281.0	276.0	217.0	205.0	Perched	ZCP1
ZBG 2	275.8	230.9	210.9	215.7	204.8	UAZ	Z2PC3
ZBG002C	275.3	205.3	195.3	220.0	208.5	LAZ	(b)
ZBG 3	270.0	214.0	204.0	227.3	218.7	LAZ	ZCP6
ZBG 4	271.4	215.4	205.4	224.2	212.5	LAZ	ZCP24
ZBG 5	269.8	213.8	203.8	224.2	212.5	LAZ	ZCP24
ZBG 6	286.0	226.0	211.0	217.0	205.0	UAZ	ZCP1
ZBG 7	285.2	225.2	210.2	217.0	205.0	UAZ	ZCP1
ZBG 8	286.0	228.0	213.0	217.0	205.0	UAZ	ZCP1
ZBG009D	272.7	212.7	197.7	227.6	213.5	LAZ	ZV2CP10
ZBG010D	274.5	214.5	199.5	227.6	213.5	LAZ	ZV2CP10
ZBG011D	277.8	217.8	202.8	222.2	207.7	LAZ	ZV2CP7
ZBG012D	259.2	193.7	178.7	206.0	196.0	LAZ	SDS-21A
ZBG013D	259.7	194.7	179.7	206.0	196.0	LAZ	SDS-21A
ZBG014D	264.7	190.1	175.1	206.0	196.0	LAZ	SDS-21A
ZBG015D	295.3	234.3	214.3	217.0	205.0	UAZ	ZCP1
ZBG016D	253.0	236.0	226.0	225.8	213.3	UAZ	ZCPT01
ZBG016C	252.4	207.4	197.4	225.8	213.3	LAZ	ZCPT01

CPT – Cone Penetrometer Test
MSL – Mean Sea Level
TCCZ – Tan Clay Confining Zone
UAZ – Upper Aquifer Zone - Upper Three Runs Aquifer
LAZ – Lower Aquifer Zone - Upper Three Runs Aquifer

(a) Top and Bottom of the TCCZ is estimated based on nearest available CPT data. Aquifer Zone is estimated based on top and bottom elevations of the TCCZ.

(b) The TCCZ elevations at well ZBG002C are averages from two lithology CPTs: The existing CPT (Z2CP3); and a new CPT (ZCPT03).