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Characterization of Tank 9H Salt Dissolution Batch 2B in Support of Tank Closure Cesium Removal (TCCR) 1A Batch 2 Preparations

K. M. L. Taylor-Pashow

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REVIEWS AND APPROVALS

AUTHORS:

_____
K. M. L. Taylor-Pashow, Chemical Flowsheet Development Date

TECHNICAL REVIEW:

_____
W. D. King, Chemical Flowsheet Development, Reviewed per E7 2.60 Date

APPROVAL:

_____
G. A. Morgan, Manager Date
Chemical Flowsheet Development

_____
B. J. Wiedenman, Program Manager, Chemical Processing and Characterization Date

_____
F. M. Pennebaker, Director, Chemical Processing and Characterization Date

_____
G. C. Arthur, Waste Removal and Tank Closure, SRMC Date

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EXECUTIVE SUMMARY

Savannah River Mission Completion (SRMC) is currently preparing the second batch of material to be processed through the Tank Closure Cesium Removal (TCCR) 1A system. The feed for TCCR 1A consists of dissolved saltcake from Tank 9H. The second batch of salt to make up processing Batch 2 (Batch 2B) has recently been dissolved in Tank 9H and transferred to Tank 10H where it was composited with the first part of the batch (Batch 2A) in preparation for processing through the TCCR 1A unit. Savannah River National Laboratory (SRNL) received samples from the recent batch (2B) of dissolved salt for characterization.

Two samples from Batch 2B were received for characterization, a surface sample and a variable depth sample (VDS). Neither sample contained significant solids, although the VDS appeared slightly cloudy as compared to the surface sample. The sodium concentrations of both the surface and VDS filtrate samples were approximately 5.8 M, and the ^{137}Cs activity was 9.8E+07 dpm/mL in the surface sample and 9.5E+07 dpm/mL in the VDS. The total Cs concentrations were 2.5 mg/L and 2.4 mg/L in the surface sample and VDS, respectively, using the gamma activity and the Cs isotopic ratios determined by ICP-MS. The alpha activity was below the detection limit in both samples. Nitrate was the dominant anion present, and the samples were primarily concentrated sodium nitrate solutions with hydroxide, nitrite, and carbonate present at 0.1 – 0.2 M. In general, the Batch 2B samples were more dilute than the previously characterized Batch 2A samples.

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LIST OF ABBREVIATIONS

DI	deionized
ELN	Electronic Laboratory Notebook
IC	ion chromatography
ICP-ES	inductively coupled plasma – emission spectroscopy
ICP-MS	inductively coupled plasma – mass spectrometry
LSC	liquid scintillation counting
M&TE	Measurement and Test Equipment
PMP	polymethylpentene
RSD	relative standard deviation
SRNL	Savannah River National Laboratory
SRR	Savannah River Remediation
TCCR 1A	Tank Closure Cesium Removal 1a
TIC/TOC	total inorganic carbon/total organic carbon
TTQAP	Task Technical and Quality Assurance Plan
TTR	Technical Task Request
VDS	variable depth sample

1.0 Introduction

In support of the Tank Closure Cesium Removal 1A (TCCR 1A) program, SRNL analyzed two samples from Tank 9H representing the second batch of material to be transferred from Tank 9H to Tank 10H in preparation of TCCR 1A Batch 2. The relatively small batches of material being transferred from Tank 9H to Tank 10H in preparation of the next TCCR 1A batch (Batch 2) are being referred to as Batches 2A, 2B, etc. Tank 10H serves as the feed tank for the TCCR 1A system. After transfer of Batch 1 material from Tank 9H to Tank 10H, additional salt was dissolved in Tank 9H to begin preparations for Batch 2. Batch 1 salt solution was processed through the TCCR 1A unit in January and February 2022. Batch 2A was prepared by adding 30,089 gallons of domestic water in November 2021, and samples from this batch of dissolved salt were previously characterized at SRNL.[1] An additional sample was collected on January 15, 2022 for corrosion control analysis.[2] On February 23 – 25, 2022 7,317 gallons of sodium hydroxide (20 wt%) were added to Tank 9H, and a sample was collected on March 8, 2022 for corrosion control analysis.[3] Batch 2A dissolved salt was transferred from Tank 9H to 10H on April 23-24, 2022 (37,398 gallons). Beginning on April 25, 2022, 45,000 gallons of domestic water was continuously added to Tank 9H, finishing on April 26, 2022. The contents of the tank were then recirculated for 13 days prior to collecting two samples from the tank on May 10, 2022 representing Batch 2B. A surface (HTF-09-22-42) and a variable depth (HTF-09-22-43) sample were collected from the tank and delivered to SRNL the same day for characterization. On May 20-22, 2022 Batch 2B was transferred to Tank 10H where it was composited with the first batch (Batch 2A) in preparation for processing through the TCCR unit.

2.0 Experimental Procedure

2.1 Tank 9H Batch 2B Samples (HTF-09-22-42 and HTF-09-22-43)

Two 200-mL dip samples were received from Tank 9H on May 10, 2022, one surface (201" from the bottom of the tank) and one variable depth sample (VDS, 185" from the bottom of the tank). The samples were then placed into the Shielded Cells, opened, and transferred to clear polymethylpentene (PMP) beakers for observation after being shaken by hand (manipulator) to mix. The surface sample (HTF-09-22-42) appeared clear, while the VDS (HTF-09-22-43) was slightly cloudy, but did not contain significant solids. Photographs of the samples are provided in Figure 3-1. The samples were not combined and were analyzed individually. Both the surface sample and the variable depth sample were characterized using the following methods: gamma spectroscopy (with and without Cs removal), liquid scintillation counting (LSC, with and without Cs removal), ion chromatography (IC) for anions, free hydroxide, total inorganic and total organic carbon (TIC/TOC), inductively couple plasma – emission spectroscopy (ICP-ES), and inductively coupled plasma – mass spectrometry (ICP-MS). The samples were diluted by a factor of approximately 3 with either distilled deionized (DI) water or 3 M nitric acid prior to submission for analysis. The densities of the samples were measured using a Measuring & Test Equipment (M&TE) balance in duplicate using 2-mL density tubes. Samples used for density measurements were returned to the sample bottle.

2.2 Quality Assurance

Requirements for performing reviews of technical reports and the extent of review are established in manual E7 2.60. SRNL documents the extent and type of review using the SRNL Technical Report Design Checklist contained in WSRC-IM-2002-00011, Rev. 2.[4] This work was performed following the applicable Task Technical and Quality Assurance Plan (TTQAP).[5] The Task Technical Request (TTR) associated with this work[6] requested a functional classification of Safety Class (see section 9.5 of the TTQAP entitled

"Clarification of Safety Significant Functional Classification"). To match the requested functional classification, this report and calculations within received a technical review by design verification.[7] Data are recorded in the Electronic Laboratory Notebook (ELN) system.[8]

3.0 Results and Discussion

3.1 Tank 9H Batch 2B Samples

Photographs of the Tank 9H Batch 2B samples are provided in Figure 3-1. The surface sample (HTF-09-22-42) appeared clear, while the variable depth sample (HTF-09-22-43) appeared slightly cloudy, but did not contain significant solids.

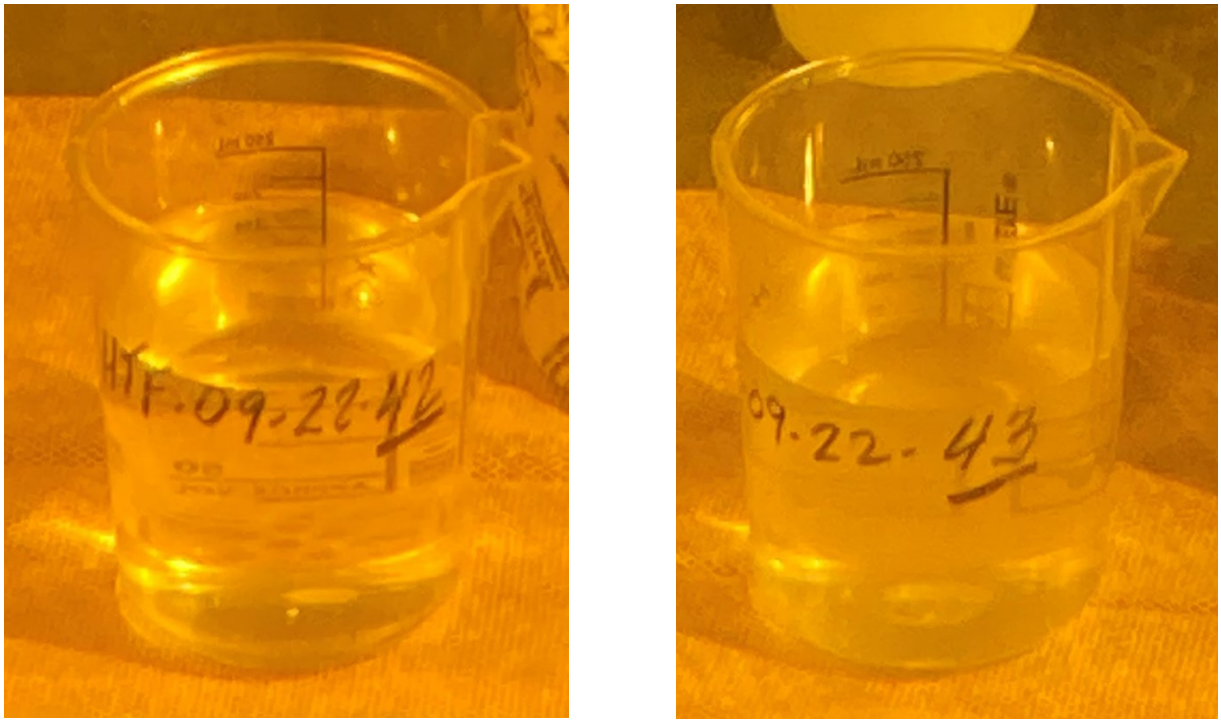

Figure 3-1. Photographs of Tank 9H Batch 2B samples HTF-09-22-42 (left) and HTF-09-22-43 (right).

The densities of the Tank 9H Batch 2B samples are reported in Table 3-1. The densities of the surface and variable depth samples were similar, with the VDS being only slightly higher (~1%).

Table 3-1. Density Measurements of Tank 9H Batch 2B Samples

Sample	Sample Location	Avg. Density (g/mL)[a]	% RSD[b]
HTF-09-22-42	surface	1.301	0.353
HTF-09-22-43	variable depth	1.315	0.242

[a] Temperature during density measurements was 22 °C. [b] Percent relative standard deviation from duplicate measurements.

The ICP-ES results of the Tank 9H Batch 2B samples are shown in Table 3-2. Both the surface and the VDS filtrate samples contained detectable amounts of Al, Cr, Mo, Na, P, and S. The surface and the VDS samples had similar sodium concentrations (~5.8 M). The element with the largest difference between the two samples was Al, where the VDS had a concentration about 14% higher than the surface sample.

Table 3-2. ICP-ES Results for the Tank 9H Batch 2B Samples

Element	HTF-09-22-42 (mg/L)	%RSD[a]	HTF-09-22-43 (mg/L)	%RSD[a]
Ag	< 0.241	n/a	< 0.243	n/a
Al	1215	0.175%	1380	1.55%
B	< 1.00	n/a	< 1.01	n/a
Ba	< 0.166	n/a	< 0.168	n/a
Be	< 0.151	n/a	< 0.153	n/a
Ca	< 0.677	n/a	< 0.683	n/a
Cd	< 0.198	n/a	< 0.200	n/a
Ce	< 3.90	n/a	< 3.93	n/a
Co	< 0.434	n/a	< 0.438	n/a
Cr	7.97	0.191%	7.32	1.00%
Cu	< 0.507	n/a	< 0.512	n/a
Fe	< 1.52	n/a	< 1.54	n/a
Gd	< 0.542	n/a	< 0.547	n/a
K	< 145	n/a	< 146	n/a
La	< 0.402	n/a	< 0.405	n/a
Li	< 5.42	n/a	< 5.47	n/a
Mg	< 0.703	n/a	< 0.710	n/a
Mn	< 0.0926	n/a	< 0.0935	n/a
Mo	4.31	1.52%	4.35	1.50%
Na	132630 (5.77 M)	0.900%	133115 (5.79 M)	0.424%
Ni	< 0.683	n/a	< 0.689	n/a
P	28.9	2.80%	28.9	0.445%
Pb	< 5.48	n/a	< 5.53	n/a
S	330	0.516%	330	0.210%
Sb	< 2.91	n/a	< 2.93	n/a
Si	< 3.93	n/a	< 3.96	n/a
Sn	< 11.9	n/a	< 12.0	n/a
Sr	< 0.205	n/a	< 0.207	n/a
Th	< 2.92	n/a	< 2.94	n/a
Ti	< 2.08	n/a	< 2.09	n/a
U	< 7.56	n/a	< 7.63	n/a
V	< 2.86	n/a	< 2.89	n/a
Zn	< 0.361	n/a	< 0.364	n/a
Zr	< 0.487	n/a	< 0.491	n/a

[a]Percent relative standard deviation from duplicate samples. The reported analytical method uncertainty is 10% (at two sigma).

Table 3-3 provides the anion and carbon results for the Tank 9H Batch 2B samples. The anion and cation sums for each sample agreed within 10% with anions being high in both cases. Nitrate was the dominant anion present, and the samples were primarily concentrated (5.6 M) sodium nitrate solutions with hydroxide, nitrite, and carbonate present at 0.1 – 0.2 M.

Table 3-3. Anion and Carbon Results for the Tank 9H Batch 2B Samples

Analyte	HTF-09-22-42	%RSD[a]	HTF-09-22-43	%RSD[a]
Free OH^- (M)	0.210	0.214%	0.204	1.74%
NO_3^- (M)	5.58	0.382%	5.62	0.871%
SO_4^{2-} (M)	9.30E-03	0.214%	9.47E-03	0.174%
NO_2^- (M)	0.137	5.45%	0.146	3.39%
$C_2O_4^{2-}$ (M)	< 3.32E-03	n/a	< 3.31E-03	n/a
F^- (M)	< 1.54E-02	n/a	< 1.53E-02	n/a
Cl^- (M)	< 8.23E-03	n/a	< 8.22E-03	n/a
HCO_2^- (M)	< 6.48E-03	n/a	< 6.47E-03	n/a
CO_3^{2-} (M)	0.172	1.52%	0.170	0.448%
$Al(OH)_4^-$ (M)[b]	0.0450	0.175%	0.0511	1.55%
TOC[c] (mg/L)	126	1.35%	125	0.571%

[a]Percent relative standard deviation from duplicate samples. The reported analytical method uncertainties were 10% for IC anion results (one sigma) and the free hydroxide results (two sigma). The reported analytical uncertainties for TIC/TOC results was 14% (two sigma). [b]Based on Al concentration measured by ICP-ES (see Table 3-2). [c]Total organic carbon.

Gamma spectroscopy and liquid scintillation counting (LSC), with and without Cs removal, were performed on the surface and variable depth samples and those results are summarized in Table 3-4. The alpha activity (with and without Cs removal) was below the detection limit in both samples. The total beta activities (including Cs) were very similar for the surface and VDS samples whereas the beta activity after Cs removal showed a difference of ~15% with the VDS having higher activity. The ^{137}Cs activities were the same within analytical error (< 5% difference).

Table 3-4. Alpha, Beta, and Gamma Activity in Tank 9H Batch 2B Samples[a]

	^{137}Cs (dpm/mL)	Alpha Activity (dpm/mL)	Beta Activity (dpm/mL)	Cs Removed	
				Alpha Activity (dpm/mL)	Beta Activity (dpm/mL)
HTF-09-22-42	9.83E+07 (0.776% RSD)	< 8.12E+04	1.12E+08 (1.87% RSD)	< 4.17E+03	2.75E+05 (4.54% RSD)
HTF-09-22-43	9.47E+07 (0.0984% RSD)	< 8.15E+04	1.13E+08 (1.02% RSD)	< 1.02E+04	3.18E+05 (6.38% RSD)

[a]The %RSD is the relative standard deviation of duplicate measurements. The reported method uncertainties are 5% for gamma and 10% for beta at 1 sigma.

Gamma spectroscopy was also performed on the surface and variable depth samples after Cs removal to obtain activities of other radionuclides present in lower concentrations than the Cs. Results from these analyses are summarized in Table 3-5. The majority of the isotopes were below the method detection limit with the exception of ^{126}Sb, ^{126}Sn, and ^{241}Am (VDS only). The ^{126}Sb and ^{126}Sn activities were similar in the surface and variable depth samples. The ^{241}Am activity was below the detection limit in the surface sample and just above the detection limit in the VDS.

Table 3-5. Activities of Other Radionuclides in Tank 9H Batch 2B Samples

Radionuclide	HTF-09-22-42 (dpm/mL)	%RSD[a]	Avg. Method Unc.	HTF-09-22-43 (dpm/mL)	%RSD[a]	Avg. Method Unc.
^{60}Co	< 2.54E+01	n/a	MDA[b]	< 2.45E+01	n/a	MDA
^{106}Ru	< 1.95E+02	n/a	MDA	< 1.99E+02	n/a	MDA
^{125}Sb	< 1.10E+02	n/a	MDA	< 1.10E+02	n/a	MDA
^{126}Sb	4.19E+02	3.85%	5.14%	4.23E+02	4.18%	5.20%
^{126}Sn	4.19E+02	3.85%	5.14%	4.23E+02	4.18%	5.20%
^{144}Ce	< 2.84E+02	n/a	MDA	< 2.83E+02	n/a	MDA
^{154}Eu	< 7.70E+01	n/a	MDA	< 6.67E+01	n/a	MDA
^{155}Eu	< 4.15E+02	n/a	Upper Limit	< 3.31E+02	n/a	Upper Limit/MDA
^{237}Np	< 1.10E+03	n/a	Upper Limit	< 9.08E+02	n/a	Upper Limit/MDA
^{241}Am	< 2.49E+02	n/a	MDA	2.63E+02	1.60%	25.2%

[a]The %RSD is based on the standard deviation of duplicate samples. [b]MDA = minimum detectable activity.

The isotopic distribution of Cs based on the mass spectrometry results is provided in Table 3-6. The total Cs calculated using the isotopic ratios from the ICP-MS data and the ^{137}Cs amount from the gamma data is 2.54 mg/L for the surface sample and 2.41 mg/L for the VDS. These values are approximately 12% and 17% lower, respectively, than the sum of the Cs isotope masses reported by ICP-MS (2.89 mg/L and 2.90 mg/L). The full suite of ICP-MS results are provided in Tables 3-7 and 3-8.

Table 3-6. Cs Isotopes from ICP-MS for the Tank 9H Batch 2B Samples

HTF-09-22-42				
Isotope	**Mean Concentration (mg/L)**	**%RSD[a]**	**Isotopic Distribution, Mass %**	**Mole Fraction**
Cs-133	2.11	0.407	72.9	0.734
Cs-134	< 5.60E-03	n/a	< 0.19	< 1.94E-03
Cs-135	0.203	0.528	7.02	0.0697
Cs-137	0.580	0.0792	20.1	0.196
HTF-09-22-43				
Isotope	**Mean Concentration (mg/L)**	**%RSD[a]**	**Isotopic Distribution, Mass %**	**Mole Fraction**
Cs-133	2.11	0.0770	72.7	0.732
Cs-134	< 5.64E-03	n/a	< 0.19	< 1.94E-03
Cs-135	0.203	0.732	7.01	0.0696
Cs-137	0.589	0.208	20.3	0.199

[a]The %RSD is based on the standard deviation of duplicate samples. The reported method uncertainty is 20% at two sigma.

Table 3-7. ICP-MS Results for Tank 9H Batch 2B Surface Sample (HTF-09-22-42)

m/z	Avg. Conc. (µg/L)	% RSD[a]	m/z	Avg. Conc. (µg/L)	% RSD[a]	m/z	Avg. Conc. (µg/L)	% RSD[a]
59	< 5.86E+00	n/a	**134**	< 5.86E+00	n/a	**180**	< 5.86E+00	n/a
84	< 5.86E+00	n/a	**135**	2.04E+02	0.528%	**181**	< 5.86E+00	n/a
85	2.46E+02	3.14%	**136**	< 5.86E+00	n/a	**182**	1.73E+01	4.45%
86	< 5.86E+00	n/a	**137**	5.81E+02	0.0792%	**183**	9.49E+00	1.56%
87	5.27E+02	0.833%	**138**	7.71E+00	11.3%	**184**	2.03E+01	1.21%
88	1.03E+01	4.96%	**139**	< 5.86E+00	n/a	**185**	< 5.86E+00	n/a
89	< 5.86E+00	n/a	**140**	< 5.86E+00	n/a	**186**	2.01E+01	0.747%
90	< 5.86E+00	n/a	**141**	< 5.86E+00	n/a	**187**	< 5.86E+00	n/a
91	< 5.86E+00	n/a	**142**	< 5.86E+00	n/a	**188**	< 5.86E+00	n/a
92	2.42E+01	0.804%	**143**	< 5.86E+00	n/a	**189**	< 5.86E+00	n/a
93	5.90E+00[b]	n/a	**144**	< 5.86E+00	n/a	**191**	< 5.86E+00	n/a
94	1.63E+01	0.271%	**145**	< 5.86E+00	n/a	**193**	< 5.86E+00	n/a
95	1.28E+03	0.372%	**146**	< 5.86E+00	n/a	**194**	< 5.86E+00	n/a
96	2.89E+01	0.111%	**147**	< 5.86E+00	n/a	**195**	< 5.86E+00	n/a
97	1.18E+03	0.0435%	**148**	< 5.86E+00	n/a	**196**	< 5.86E+00	n/a
98	1.23E+03	0.182%	**149**	< 5.86E+00	n/a	**198**	8.41E+01	0.796%
99	8.05E+02	0.344%	**150**	< 5.86E+00	n/a	**203**	< 5.86E+00	n/a
100	1.29E+03	0.327%	**151**	< 5.86E+00	n/a	**204**	4.61E+01	2.20%
101	7.32E+01	2.46%	**152**	< 5.86E+00	n/a	**205**	< 5.86E+00	n/a
102	6.30E+01	2.56%	**153**	< 5.86E+00	n/a	**206**	1.46E+02	2.89%
103	1.61E+02	0.501%	**154**	< 5.86E+00	n/a	**207**	1.23E+02	1.35%
104	3.36E+01	0.750%	**155**	< 5.86E+00	n/a	**208**	2.98E+02	3.16%
105	< 1.46E+01	n/a	**156**	< 5.86E+00	n/a	**229**	< 5.86E+00	n/a
106	< 5.86E+00	n/a	**157**	< 5.86E+00	n/a	**230**	< 5.86E+00	n/a
107	< 2.93E+01	n/a	**158**	< 5.86E+00	n/a	**232**	< 5.86E+00	n/a
108	< 5.86E+00	n/a	**159**	< 5.86E+00	n/a	**233**	< 5.86E+00	n/a
109	< 2.93E+01	n/a	**160**	< 5.86E+00	n/a	**234**	< 5.86E+00	n/a
110	< 5.86E+00	n/a	**161**	< 5.86E+00	n/a	**235**	< 5.86E+00	n/a
111	< 5.86E+00	n/a	**162**	< 5.86E+00	n/a	**236**	< 5.86E+00	n/a
112	< 5.86E+00	n/a	**163**	< 5.86E+00	n/a	**237**	< 5.86E+00	n/a
113	< 5.86E+00	n/a	**164**	< 5.86E+00	n/a	**238**	1.40E+02	3.28%
114	6.04E+00	0.568%	**165**	< 5.86E+00	n/a	**239**	< 5.86E+00	n/a
116	3.75E+01	2.09%	**166**	< 5.86E+00	n/a	**240**	< 5.86E+00	n/a
117	2.44E+01	2.15%	**167**	< 5.86E+00	n/a	**241**	< 5.86E+00	n/a
118	7.13E+01	0.0664%	**168**	< 5.86E+00	n/a	**242**	< 5.86E+00	n/a
119	2.30E+01	2.37%	**169**	< 5.86E+00	n/a	**243**	< 5.86E+00	n/a
120	9.86E+01	1.51%	**170**	< 5.86E+00	n/a	**244**	< 5.86E+00	n/a
121	< 5.86E+00	n/a	**171**	< 5.86E+00	n/a	**245**	< 5.86E+00	n/a
122	2.34E+01	0.160%	**172**	< 5.86E+00	n/a	**246**	< 5.86E+00	n/a
123	< 5.86E+00	n/a	**173**	< 5.86E+00	n/a	**247**	< 5.86E+00	n/a
124	3.93E+01	2.29%	**174**	< 5.86E+00	n/a	**248**	< 5.86E+00	n/a
125	< 5.86E+00	n/a	**175**	< 5.86E+00	n/a	**249**	< 5.86E+00	n/a
126	1.11E+02	3.40%	**176**	< 5.86E+00	n/a	**250**	< 5.86E+00	n/a
128	< 5.86E+00	n/a	**177**	< 5.86E+00	n/a	**251**	< 5.86E+00	n/a
130	< 5.86E+00	n/a	**178**	< 5.86E+00	n/a			
133	2.11E+03	0.407%	**179**	< 5.86E+00	n/a			

[a]The %RSD is based on the standard deviation of duplicate samples. The reported method uncertainty is 20% at two sigma. [b]Single replicate above the method detection limit. The duplicate sample had a reported concentration of < 5.85E+00 µg/L.

Table 3-8. ICP-MS Results for Tank 9H Batch 2B VDS (HTF-09-22-43)

m/z	Avg. Conc. (µg/L)	% RSD[a]	m/z	Avg. Conc. (µg/L)	% RSD[a]	m/z	Avg. Conc. (µg/L)	% RSD[a]
59	< 5.90E+00	n/a	**134**	< 5.90E+00	n/a	**180**	< 5.90E+00	n/a
84	< 5.90E+00	n/a	**135**	2.04E+02	0.732%	**181**	< 5.90E+00	n/a
85	2.45E+02	2.09%	**136**	< 5.90E+00	n/a	**182**	1.73E+01	4.71%
86	< 5.90E+00	n/a	**137**	5.91E+02	0.208%	**183**	9.90E+00	1.48%
87	5.22E+02	0.523%	**138**	7.67E+00	6.53%	**184**	2.07E+01	0.490%
88	8.63E+00	2.72%	**139**	< 5.90E+00	n/a	**185**	< 5.90E+00	n/a
89	< 5.90E+00	n/a	**140**	< 5.90E+00	n/a	**186**	1.93E+01	2.45%
90	< 5.90E+00	n/a	**141**	< 5.90E+00	n/a	**187**	< 5.90E+00	n/a
91	< 5.90E+00	n/a	**142**	< 5.90E+00	n/a	**188**	< 5.90E+00	n/a
92	2.33E+01	0.896%	**143**	< 5.90E+00	n/a	**189**	< 5.90E+00	n/a
93	< 5.90E+00	n/a	**144**	< 5.90E+00	n/a	**191**	< 5.90E+00	n/a
94	1.63E+01	1.05%	**145**	< 5.90E+00	n/a	**193**	< 5.90E+00	n/a
95	1.27E+03	0.644%	**146**	< 5.90E+00	n/a	**194**	< 5.90E+00	n/a
96	2.80E+01	2.67%	**147**	< 5.90E+00	n/a	**195**	< 5.90E+00	n/a
97	1.17E+03	1.04%	**148**	< 5.90E+00	n/a	**196**	< 5.90E+00	n/a
98	1.23E+03	0.909%	**149**	< 5.90E+00	n/a	**198**	7.54E+01	0.609%
99	7.91E+02	0.196%	**150**	< 5.90E+00	n/a	**203**	< 5.90E+00	n/a
100	1.27E+03	0.824%	**151**	< 5.90E+00	n/a	**204**	4.36E+01	0.893%
101	7.26E+01	1.06%	**152**	< 5.90E+00	n/a	**205**	< 5.90E+00	n/a
102	6.35E+01	0.0559%	**153**	< 5.90E+00	n/a	**206**	1.22E+02	0.200%
103	1.60E+02	1.05%	**154**	< 5.90E+00	n/a	**207**	1.04E+02	1.49%
104	3.34E+01	1.22%	**155**	< 5.90E+00	n/a	**208**	2.55E+02	1.26%
105	< 1.48E+01	n/a	**156**	< 5.90E+00	n/a	**229**	< 5.90E+00	n/a
106	< 5.90E+00	n/a	**157**	< 5.90E+00	n/a	**230**	< 5.90E+00	n/a
107	< 2.95E+01	n/a	**158**	< 5.90E+00	n/a	**232**	< 5.90E+00	n/a
108	< 5.90E+00	n/a	**159**	< 5.90E+00	n/a	**233**	< 5.90E+00	n/a
109	< 2.95E+01	n/a	**160**	< 5.90E+00	n/a	**234**	< 5.90E+00	n/a
110	< 5.90E+00	n/a	**161**	< 5.90E+00	n/a	**235**	< 5.90E+00	n/a
111	< 5.90E+00	n/a	**162**	< 5.90E+00	n/a	**236**	< 5.90E+00	n/a
112	< 5.90E+00	n/a	**163**	< 5.90E+00	n/a	**237**	< 5.90E+00	n/a
113	< 5.90E+00	n/a	**164**	< 5.90E+00	n/a	**238**	1.59E+02	0.596%
114	6.10E+00	1.89%	**165**	< 5.90E+00	n/a	**239**	< 5.90E+00	n/a
116	3.71E+01	0.891%	**166**	< 5.90E+00	n/a	**240**	< 5.90E+00	n/a
117	2.48E+01	0.873%	**167**	< 5.90E+00	n/a	**241**	< 5.90E+00	n/a
118	7.34E+01	0.000577%	**168**	< 5.90E+00	n/a	**242**	< 5.90E+00	n/a
119	2.38E+01	3.16%	**169**	< 5.90E+00	n/a	**243**	< 5.90E+00	n/a
120	9.95E+01	1.64%	**170**	< 5.90E+00	n/a	**244**	< 5.90E+00	n/a
121	< 5.90E+00	n/a	**171**	< 5.90E+00	n/a	**245**	< 5.90E+00	n/a
122	2.41E+01	0.519%	**172**	< 5.90E+00	n/a	**246**	< 5.90E+00	n/a
123	< 5.90E+00	n/a	**173**	< 5.90E+00	n/a	**247**	< 5.90E+00	n/a
124	3.95E+01	1.39%	**174**	< 5.90E+00	n/a	**248**	< 5.90E+00	n/a
125	< 5.90E+00	n/a	**175**	< 5.90E+00	n/a	**249**	< 5.90E+00	n/a
126	1.14E+02	5.10%	**176**	< 5.90E+00	n/a	**250**	< 5.90E+00	n/a
128	< 5.90E+00	n/a	**177**	< 5.90E+00	n/a	**251**	< 5.90E+00	n/a
130	< 5.90E+00	n/a	**178**	< 5.90E+00	n/a			
133	2.11E+03	0.0770%	**179**	< 5.90E+00	n/a			

[a]The %RSD is based on the standard deviation of duplicate samples. The reported method uncertainty is 20% at two sigma.

4.0 Conclusions

SRNL received and characterized samples from the second batch (Batch 2B) of dissolved salt in Tank 9H that will make up Batch 2 for TCCR 1A. The sodium concentrations of both the surface and variable depth samples were approximately 5.8 M, and the ^{137}Cs activity was 9.8E+07 dpm/mL in the surface sample and 9.5E+07 dpm/mL in the VDS. The total Cs concentrations were 2.5 mg/L and 2.4 mg/L in the surface sample and VDS, respectively, using the gamma activity and the Cs isotopic ratios determined by ICP-MS. The alpha activity was below the detection limit in both samples. The beta activities for the samples prior to cesium removal were near 1.1E+08 dpm/mL. Following cesium removal the beta activities for the two samples ranged from 2.8E+05 to 3.2E+05 dpm/mL. In general, the Batch 2B samples were more dilute than the previously characterized Batch 2A samples.[1] Nitrate was the dominant anion present, and the samples were primarily concentrated sodium nitrate solutions with hydroxide, nitrite, and carbonate present at 0.1 – 0.2 M.

5.0 References

[1] K. M. L. Taylor-Pashow, "Characterization of Tank 9H Salt Dissolution Batch 2A in Support of Tank Closure Cesium Removal (TCCR) 1A Batch 2 Preparations", SRNL-STI-2022-00040, Rev. 0, January 2022.
[2] Corrosion control sample results report for HTF-09-22-8, LW-AD-PROJ-220120-1, LIMS sample ID LW25314.
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[4] "Savannah River National Laboratory Technical Report Design Check Guidelines" WSRC-IM-2002-00011, Rev. 2, August 2004.
[5] L. N. Oji, "Task Technical and Quality Assurance Plan for the Analysis of Tank 9H Salt Solution Supernatant", SRNL-RP-2019-00463, Rev. 0, July 11, 2019.
[6] T. L. Fellinger, "Analysis of Tank 9H Salt Solution Samples", X-TTR-H-00088, June 13, 2019.
[7] Savannah River Site Manual E7 "Conduct of Engineering", Procedure 2.60 Rev. 20 "Technical Reviews", November 9, 2021.
[8] SRNL Electronic Laboratory Notebook #E7518-00472-06.

Distribution:

cj.bannochie@srnl.doe.gov
William.bates@srnl.doe.gov
marion.cofer@srnl.doe.gov
alex.cozzi@srnl.doe.gov
connie.herman@srnl.doe.gov
brady.lee@srnl.doe.gov
Joseph.Manna@srnl.doe.gov
Gregg.Morgan@srnl.doe.gov
frank.pennebaker@srnl.doe.gov
William.Ramsey@srnl.doe.gov
Marissa.Reigel@srnl.doe.gov
eric.skidmore@srnl.doe.gov
michael.stone@srnl.doe.gov
Boyd.Wiedenman@srnl.doe.gov
Records Administration (EDWS)

bill.clark@srs.gov
jeffrey.crenshaw@srs.gov
james.folk@srs.gov
Curtis.Gardner@srs.gov
timothy.littleton@srs.gov
Anna.Murphy@srs.gov
tony.polk@srs.gov
Anthony.Robinson@srs.gov
mark-a.smith@srs.gov
patricia.suggs@srs.gov
thomas.temple@srs.gov

john.occhipinti@srs.gov
terri.fellinger@srs.gov
david.harris@srs.gov
mason.clark@srs.gov
john.tihey@srs.gov
gregory.arthur@srs.gov
azikiwe.hooker@srs.gov
andrea.bridges@srs.gov
seth.campbell@srs.gov
david02.martin@srs.gov
kurtis.miklia@srs.gov
joshua.goldblatt@srs.gov
fred.williams@srs.gov
robert.voegtlen@srs.gov
keisha.martin@srs.gov
rachel.seeley@srs.gov

kim.crapse@srnl.doe.gov
william02.king@srnl.doe.gov
charles.nash@srnl.doe.gov