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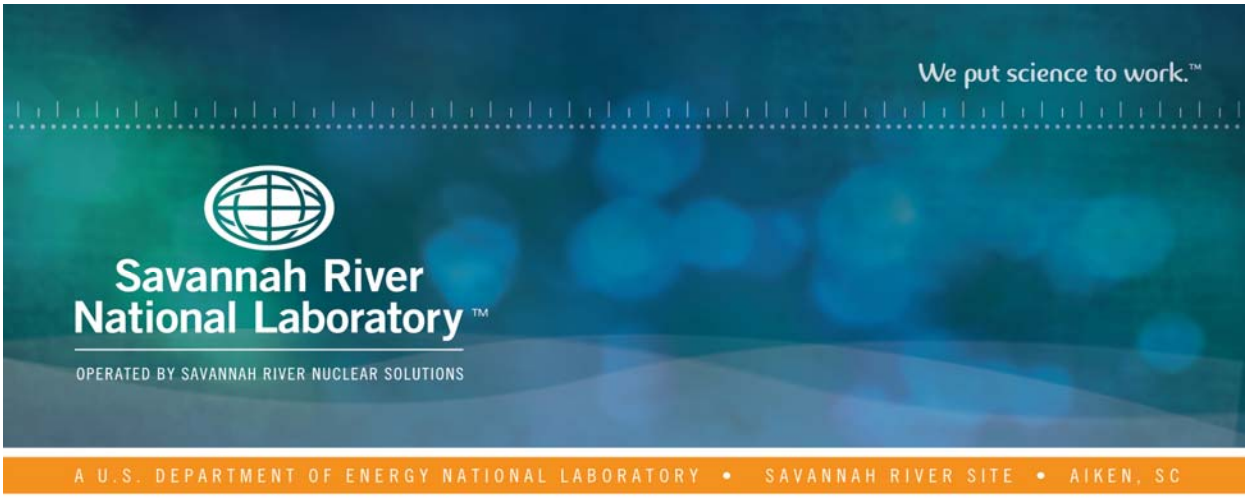

Characterization Results for the March 2016 H-Tank Farm 2H Evaporator Overhead Samples

J. C. Nicholson

September 28, 2016

SRNL-STI-2016-00253, Revision 1

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EXECUTIVE SUMMARY

This report contains the radioanalytical results of the 2H evaporator overhead sample received at SRNL on March 16, 2016. Specifically, concentrations of ^{137}Cs, ^{90}Sr, and ^{129}I are reported and compared to the corresponding Waste Acceptance Criteria (WAC) limits of the Effluent Treatment Project (ETP) Waste Water Collection Tank (WWCT) (rev. 6). All of the radionuclide concentrations in the sample were found to be in compliance with the ETP WAC limits. Revision 1 of this document corrects the cumulative beta count initially reported for ^{90}Sr content with the sole ^{90}Sr count obtained after recharacterization of the sample. The initial data was found to be a cumulative beta count rather than the ^{90}Sr count requested.

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LIST OF ABBREVIATIONS

AD	Analytical Development
ELN	Electronic Laboratory Notebook
ETP	Effluent Treatment Project
SRNL	Savannah River National Laboratory
WAC	Waste Acceptance Criteria
WWCT	Waste Water Collection Tank

1.0 Introduction

The Tank Farm submitted the annual sample from the 2H evaporator overhead stream to SRNL on March 16, 2016. SRNL analyzed the sample for ^{137}Cs, ^{90}Sr, and ^{129}I, to verify compliance with the ETP WWCT WAC (rev. 6). [1]

2.0 Experimental Procedure

The 2H overheads sample was submitted to SRNL in a 250 mL poly bottle. The volume of the sample was approximately 175 mL. For this report, the entire sample was taken from the poly bottle and transferred to a 200 mL sample bottle more suitable for transmittal to the Analytical Development (AD) laboratories. Since this sample was relatively low in activity, no dilution was required prior to submittal for analysis. 175 mL of de-ionized water was additionally submitted as a blank for routine quality assurance purposes (to monitor potential cross contamination).

Three different analytical methods were used by AD to determine the concentrations of ^{137}Cs, ^{90}Sr, and ^{129}I in the sample. Gamma spectrometry was used to determine the ^{137}Cs concentration. Radiochemical separation followed by liquid scintillation counting was utilized to determine the ^{90}Sr concentration. Radiochemical separation followed by low energy gamma photon spectroscopy was utilized to determine the ^{129}I concentration. These sample preparation and characterization techniques are in accordance with the "Task Technical and Quality Assurance Plan for 2014 Evaporator Overhead Sample Analysis".[2]

3.0 Results and Discussion

Results of the analyses are provided in Table 3-1, along with the applicable ETP WAC limits.[1] Note that these results are based on single determinations performed by AD.

For this sample set, no concentrations for the sample were found to be below the detectable limit, and are thus reported as discrete values. A blank sample of deionized water was run for quality assurance and all concentrations were found to be less than the minimum detectable concentrations and are therefore reported as values preceded by "<" symbols. One-sigma uncertainties are reported in brackets beside the result.

As shown in the table, all three radionuclide concentrations in the sample were found to be less than the corresponding ETP WAC limits.

Table 3-1. Results of Radiochemical Analysis

Analyte	March 2016 2H Evap Overheads Concentration (dpm/mL)	March 2016 2H Blank Sample Concentration (dpm/mL)	ETP WAC Acceptance Limits (dpm/mL)[1]
^{137}Cs	7.04E+01[5.00%]	<1.62E-01	3.28E+02
^{90}Sr	<1.00E+01	<2.06E+01	1.76E+02
^{129}I	5.83E-02 [14.6%]	<3.75E-02	1.00E+00

The analytical results listed in Table 3-1 are in relatively good agreement with previous results for 2H samples collected in 2009, 2011, and 2015 shown in Table 3-2. Initial results for ^{90}Sr showed a large, discrete value of 9.27E+01, however this was found to be due to an incorrect analytical method request where total beta count was measured rather than solely ^{90}Sr count. As

^{137}Cs is also a beta emitter, this drastically affected the results due to the much higher amount of ^{137}Cs relative to ^{90}Sr. Though discrete values are reported this year for ^{129}I, the concentration is well below the ETP WAC limits. The reported value falls well into the range of numbers reported for the previous years and presents no cause for concern. The ^{90}Sr concentration is still below detectable limits, well below the ETP WAC limit. Finally, the ^{137}Cs concentration has also increased this year by about 40% over the 2015 results. With the high variability of ^{137}Cs concentrations found across the four years reported herein, all were found to be less than the ETP WAC acceptance limit.

Table 3-2. Results of Radiochemical Analysis

Analyte	2009 2H Evap Overheads Concentration (dpm/mL)[3]	2011 2H Evap Overheads Concentration (dpm/mL)[4]	2015 2H Evap Overheads Concentration (dpm/mL)[5]	ETP WAC Acceptance Limits (dpm/mL)[1]
^{137}Cs	3.51E+01	1.76E+01	5.0E+01	3.28E+02
^{90}Sr	<2.98E+01	<1.63E+01	<8.17E+00	1.76E+02
^{129}I	<6.73E-01	<5.77E-01	<8.02E-02	1.00E+00

Quality Assurance

This report was developed in accordance with the protocols identified in Task Technical and Quality Assurance Plan SRNL-RP-2014-00797.[5] 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. The data from this experiment is contained in an electronic laboratory notebook (ELN).[6]

4.0 Conclusions

The March 2016 2H Evaporator Overhead sample was found to be in compliance with the ETP WAC, based on the required radiochemical analysis performed for ^{137}Cs, ^{90}Sr, and ^{129}I. Additionally, the concentrations of the aforementioned radionuclides are reasonably consistent with the concentrations previously reported for the 2009, 2011, and 2015 2H Overhead samples. Rev. 1 of this document has remedied incorrect ^{90}Sr results initially reported for this sample due to an incorrect analytical method request which resulted in artificially high ^{90}Sr levels.

5.0 References

[1] "F/H Effluent Treatment Facility Waste Acceptance Criteria," X-SD-H-00009, Revision 6, June 2012.

[2] Washington, A.L., "Task Technical and Quality Assurance Plan for 2014 Evaporator Overhead Sample Analysis," SRNL-RP-2014-00797, Rev. 0, September 8, 2014.

[3.] Washington, A. L., "Report on the Analysis on WAC Samples from Evaporator Overheads for 2009-revised," SRNL-STI-2010-00134-1, Dec. 2010.

[4] Washington, A.L., "Report on the Analysis of WAC Samples from Evaporator Overheads for 2011," SRNL-STI-2011-00660, March 2012.

[5] Washington, A.L., "Characterization Results for the 2014 HTF 3H & 2H Evaporator Overhead Samples," SRNL-STI-2015-00198, May 8, 2015.

[6] Electronic Laboratory Notebook "2016 2H Evaporator Overhead Samples," L5796-00226-02.

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