

INTEROFFICE MEMORANDUM

SRR-CWDA-2015-00166

Revision 1

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UPDATED RADIONUCLIDE AND CHEMICAL INVENTORIES IN TANKS 9, 10, 11, 13, 14 AND 15

Purpose

The purpose of this memo is to present updated assigned radionuclide and chemical inventory values for Tanks 9, 10, 11, 13, 14 and 15 for use in Performance Assessment (PA) modeling. The assigned inventory values have been updated in order to incorporate lessons learned from the Type I and II tanks that have completed final characterization to date.

Revision 1 of this memo revises the updated inventory values for K-40 to remove unnecessary conservatism. The inventory values for Co, Cu, SO₄, and Sr were revised to incorporate inventory data that was collected for Tanks 5 and 6 but was not included in the F-Area Tank Farm (FTF) inventory document (SRR-CWDA-2009-00045). Revision 1 of this memo also makes minor editorial changes to clarify the basis for individual inventory assignments.

Background

The current assigned radiological and chemical constituent inventories in the H-Area Tank Farm (HTF) are provided in Revision 4 of *H-Area Tank Farm Closure Inventory for use in Performance Assessment Modeling*, SRR-CWDA-2010-00023. This document provides the radiological and chemical inventories in the HTF waste tanks (including the primary tank, the annulus and sand pads where applicable) and ancillary equipment at the presumed time of closure to support PA modeling. This document assigns volumes and estimates concentrations

of the residual material in the waste tanks and ancillary equipment at tank closure. These initial volumes and concentrations resulted in initial constituent inventories in the HTF waste tanks. Adjustments have been made periodically to these initial assignments based on new information about the residual material in the waste tanks that was learned as tanks were cleaned and waste material characterized. Revision 4 of SRR-CWDA-2010-00023 updated the Tank 16 inventory values based on Tank 16 final characterization data and updated the Tank 12 inventory assignments based on sample results taken during Tank 12 waste removal and tank cleaning efforts. Since the approval of SRR-CWDA-2010-00023, Revision 4, the Tank 12 final characterization and inventory determination has been completed and is documented in the *Tank 12 Inventory Determination*, SRR-CWDA-2015-00075. Using the Tank 12 final characterization data and the final characterization of other Type I and II tanks, additional adjustments can be made to the assigned residual inventories for the following HTF Type I and II tanks: Tanks 9, 10, 11, 13, 14 and 15.

HTF Type I and II Tanks Inventory Updates

The updates in this memo are to the assigned primary tank inventory values for Tanks 9-11 and 13-15 and to the annulus inventory values for Tanks 9, 10 and 14. The Type I and II tanks that have completed final waste characterization are FTF Tanks 5 and 6 and HTF Tanks 12 and 16. The final characterization data from the Tank 16 primary tank will not be used as a basis for any primary tank adjustments due to the unique waste removal and cleaning methods applied. [SRR-CWDA-2011-00126, SRR-CWDA-2014-00071] The final constituent inventories in Tanks 5, 6 and 12 are used along with the initial assigned inventories presented in SRR-CWDA-2010-00023 to update the assigned inventory values. For example, if the final inventory for a constituent in the characterized tanks has been trending lower or higher than the assigned value in SRR-CWDA-2010-00023 it would be prudent to raise or lower the assigned value accordingly to better represent the expected inventory values at final characterization. The following general assumptions have been used for the updated radionuclide and chemical constituent inventory values for Tanks 9, 10, 11, 13, 14 and 15.

Assumptions

1. Bulk Waste Removal Efforts (BWRE), mechanical cleaning, and chemical cleaning will be performed on Tanks 9, 10, 11, 13, 14 and 15, as needed, to remove the waste material (sludge, supernate, and/or salt) to the maximum extent practical. This includes removing any supernate trapped in the residual sludge and removing all salt related material from the tank.

Basis: *SRR Waste Removal and Operational Closure Strategy*, SRR-CWDA-2014-00003, Revision 0, states that waste material will be removed to the maximum extent practical for Tanks 9-11 and 14-15. It is reasonable to expect the same waste removal strategy will be applied to Tank 13. [SRR-CWDA-2014-00003]

2. The residual insoluble solids volume in the HTF Type I and II waste tanks is 3,000 gallons.

Basis: SRR-CWDA-2010-00023, Revision 4, assigns a residual insoluble solids volume of 4,000 gallons to the HTF Type I and II tanks. SRR-CWDA-2014-00003, Revision 0, gives residual insoluble solids volumes of 2,710 gallons each in Tanks 9 and 10. Based on the residual insoluble solids volumes left in Tanks 5, 6 and 12 (1,900 gallons, 3,000 gallons and 1,500 gallons, respectively) and the residual sludge volumes currently in Tanks 9 and 10, an assigned residual insoluble solids volume of 3,000 gallons is reasonably conservative and more representative of the expected insoluble solids volume in the tanks at final characterization. [SRR-CWDA-2010-00023, SRR-CWDA-2012-00027, SRR-CWDA-2012-00075, SRR-CWDA-2014-00003, SRR-CWDA-2015-00075]

3. Annulus cleaning will leave trace amounts (i.e., 100 gallons) of residual waste (i.e., dried supernate).

Basis: *SRR Waste Removal and Operational Closure Strategy*, SRR-CWDA-2014-00003, Revision 0, states that annulus waste material will be removed to the maximum extent practical. A volume of 100 gallons is considered to be a trace amount as stated in SRR-CWDA-2010-00023, Revision 4. [SRR-CWDA-2014-00003, SRR-CWDA-2010-00023]

4. The final radionuclide and chemical concentrations at time of operational closure (2020 for FTF and 2032 for HTF) in Tanks 5, 6 and 12 are used as a basis for the concentrations in the HTF Type I and II tanks in year 2032 for use in PA modeling. The year 2032 is the assigned year of HTF closure as presented in SRR-CWDA-2010-00023, Revision 4. Using the Tanks 5 and 6 constituent concentrations at year 2020 is conservative since decay from 2020 to 2032 is not taken into account.

Basis: The HTF Type I and II waste tank heels will be the residual material remaining after bulk waste removal and final tank cleaning. The bulk sludge waste in these tanks was primarily direct transfers of H-Modified (HM) and Plutonium Uranium Extraction (PUREX) waste transfers from H-Canyon, not the accumulation of multiple transfer streams. Tanks 5, 6 and 12 also primarily received direct transfers of HM and PUREX waste from the F and H Canyons. The HTF Type I and II tanks are also expected to have similar cleaning techniques as those used for Tanks 5, 6 and 12. [SRR-CWDA-2015-00144]

Primary Tank Inventory Updates

The updates to the assigned inventory values of the HTF Type I and II tank primary tanks are not waste type or tank specific except with respect to the Tank 15 radionuclides associated with the Thorium Extraction (THOREX) campaign transfers. The updated values presented in this memo are applicable to all of the HTF Type I and II tanks because no appreciable differences have been

seen in the waste residuals in the Type I and II tanks with respect to the type of waste transferred (i.e., HM versus PUREX). As final characterization is completed for each tank, inventory updates will continue and tank specific updates will be made as necessary.

Methodology for the Primary Tank Inventory Assignment Updates

The methodology for the updates to the HTF Type I and I tank primary tank inventory assignments is shown on Figure 1 and outlined below:

1. The constituents of interest for the HTF Type I and II tanks are determined based on the *Recommended Radionuclide and Chemical Analyte List for H-Area Tank Farm Type I and II Tanks*, SRR-CWDA-2015-00144. The radionuclide and chemical analytes not on the analyte list for the HTF Type I and II tanks are those where final characterization of residual material samples is not required.
2. For those constituents not recommended for sample characterization, the HTF PA assigned radionuclide inventory values decayed to 2032 (Ci) and the assigned chemical inventory values (kg) in SRR-CWDA-2010-00023, Revision 4, are primarily used as default inventory values. For some constituents adjustments to the HTF PA inventory values were made based on sample data.
3. For radionuclide constituents that are recommended for final characterization, the highest residual inventory concentration values (Ci/gal) between the existing HTF PA, Tank 5, Tank 6 and Tank 12 final inventories for each radionuclide constituent is determined as follows:
 - a. Using the inventories in year 2032 given for each constituent in the HTF PA (SRR-CWDA-2010-00023, Revision 4), the Tank 5 inventory determination document (SRR-CWDA-2012-00027, R1), the Tank 6 inventory determination document (SRR-CWDA-2012-00075, R1) and the Tank 12 inventory determination document (SRR-CWDA-2015-00075, R1);
 - b. Using the residual primary waste tank volumes of 4,000 gallons for the HTF PA (SRR-CWDA-2010-00023, R4), 1,900 gallons for Tank 5 (SRR-CWDA-2012-00027, R1), 3,000 gallons for Tank 6 (SRR-CWDA-2012-00075, R1) and 1,500 for Tank 12 (SRR-CWDA-2015-00075, R1);
 - c. Develop the primary tank concentrations for each radionuclide constituent in units of Ci/gal for the HTF PA, Tank 5, Tank 6 and Tank 12;
 - d. Select highest concentration (Ci/gal) between the four calculated concentrations to represent concentrations in the HTF Type I and II tanks primary tank residual material.
4. Using the assumed residual sludge volume of 3,000 gallons, an updated assigned inventory value is determined for each radionuclide (Ci) constituent for the HTF Type I

and II tanks' primary tanks. Some further inventory adjustments were made to the assigned values based on sample data as noted in the comments section of Table 1.

5. For the updated HTF Type I and II tanks' residual chemical inventory values, each constituent inventory (kg) was adjusted to determine the inventory at the assumed residual sludge volume of 3,000 gallons. For example, the HTF PA inventory values (kg) were all multiplied by the ratio of 3,000 gallons/4,000 gallons.
6. The highest inventory value (kg) between the calculated HTF PA, Tank 5, Tank 6 and Tank 12 inventories within the assumed residual sludge volume of 3,000 gallons for each chemical constituent was used as the updated assigned residual chemical inventory value. Some adjustments were made to the assigned values based on sample data as noted in the comments section of Table 2.

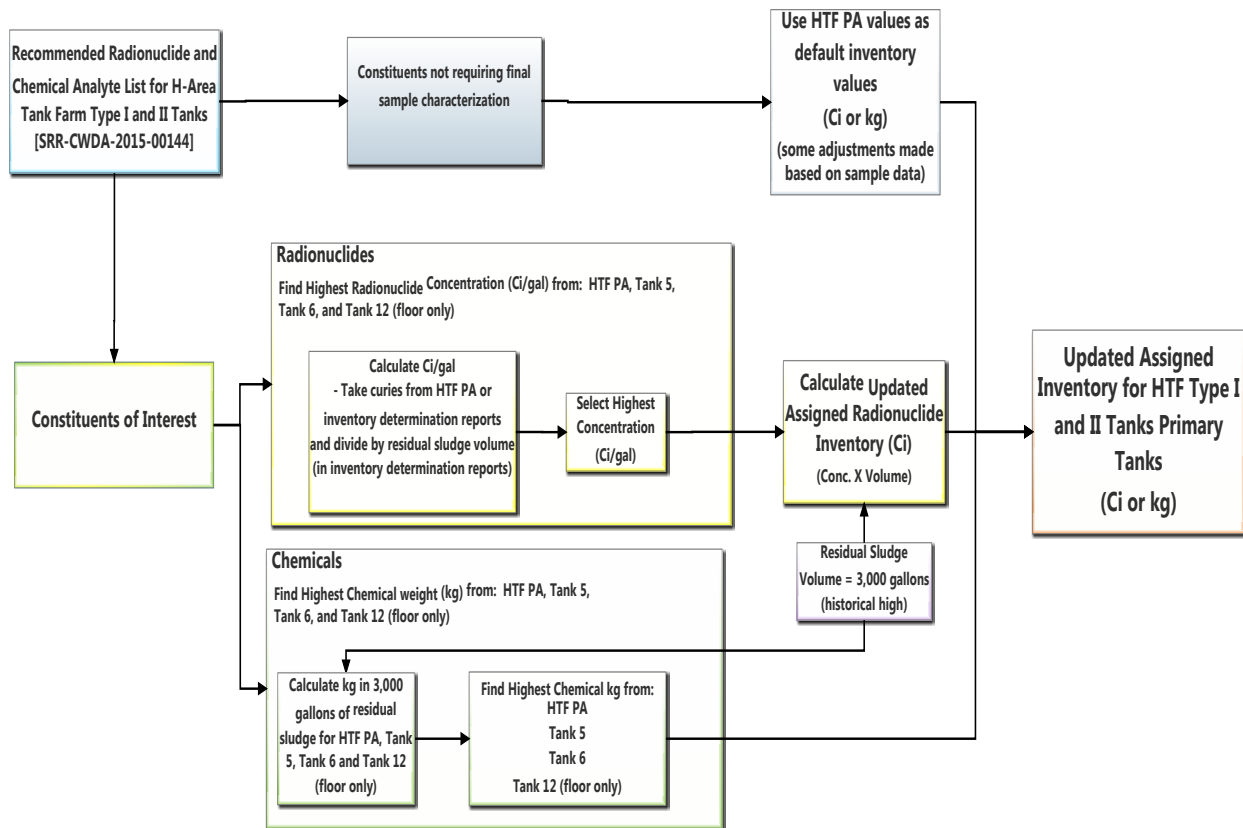


Figure 1: Methodology for Assigning Updated Primary Tank Inventories for HTF Type I and II Tanks

Updated Primary Tank Inventory Assignment Results

The radionuclide constituent curies, residual sludge volume, and calculated concentrations for determining the highest radionuclide concentrations are presented in Table 1 below. The grey indicates constituents that are recommended to be removed from the sample analysis. The highlighted cells are those with the highest concentrations values that were used to calculate the assigned inventory. The assigned radionuclide inventory is presented in the second to last column in Table 1.

Table 1: Updated Primary Tank Assigned Radionuclide Inventory Methodology Results

	HTF PA ¹	Tank 5 ²	Tank 6 ³	Tank 12 (Floor Only) ⁴	HTF PA	Tank 5	Tank 6	Tank 12	Assigned Inventory in 2032 at Assumed Residual Sludge Volume of 3,000 gallons	
Residual Volume (gal)	4,000	1,900	3,000	1,500						
Constituent	Ci	Ci	Ci	Ci	Ci/gal	Ci/gal	Ci/gal	Ci/gal	Ci	Comments
Ac-227	1.0E+00	6.9E-04	8.1E-05	NA	2.5E-04	3.6E-07	2.7E-08	NA	1.0E+00	
Al-26	1.0E+00	1.2E-01	NA	NA	2.5E-04	6.3E-05	NA	NA	1.0E+00	
Am-241	7.0E+02	6.9E+02	1.3E+03	1.3E+02	1.8E-01	3.6E-01	4.3E-01	8.64E-02	1.3E+03	
Am-242m	1.0E+00	1.7E+00	1.8E+00	3.0E-02	2.5E-04	8.9E-04	6.0E-04	1.98E-05	2.7E+00	
Am-243	3.0E+00	5.3E+00	3.0E+01	1.6E-01	7.5E-04	2.8E-03	1.0E-02	1.09E-04	3.0E+01	
Ba-137m	7.4E+02	3.3E+03	6.3E+03	5.2E+01	1.9E-01	1.7E+00	2.1E+00	3.47E-02	6.3E+03	
C-14	1.0E+00	7.1E-03	3.1E-01	3.2E-03	2.5E-04	3.7E-06	1.0E-04	2.11E-06	1.0E+00	Conservatively used HTF PA value.
Cf-249	1.0E+00	7.0E-02	6.4E-02	NA	2.5E-04	3.7E-05	2.1E-05	NA	1.0E+00	
Cf-251	1.0E+00	NA	NA	NA	2.5E-04	NA	NA	NA	1.0E+00	
Cl-36	2.1E-03	2.8E-02	NA	NA	5.3E-07	1.5E-05	NA	NA	1.0E-03	Assigned an inventory value lower than HTF PA value based on the Tank 5 inventory using a detection limit.
Cm-243	1.0E+00	4.5E-01	6.2E+00	5.1E-02	2.5E-04	2.4E-04	2.1E-03	3.38E-05	6.2E+00	
Cm-244	2.0E+01	2.2E+01	7.3E+02	1.1E+00	5.0E-03	1.2E-02	2.4E-01	7.19E-04	7.3E+02	
Cm-245	1.0E+00	5.4E-03	1.0E-01	3.0E-04	2.5E-04	2.8E-06	3.3E-05	2.01E-07	7.5E-01	
Cm-247	1.0E+00	9.7E-07	2.4E-06	NA	2.5E-04	5.1E-10	8.0E-10	NA	1.0E+00	
Cm-248	1.0E+00	1.3E-04	1.2E-04	NA	2.5E-04	6.8E-08	4.0E-08	NA	1.0E+00	
Co-60	1.0E+00	2.2E+01	4.2E+01	NA	2.5E-04	1.2E-02	1.4E-02	NA	5.0E+01	Conservatively assigned value higher than values seen in Tanks 5 and 6.
Cs-135	5.4E-03	2.2E-02	4.2E-02	6.3E-05	1.4E-06	1.2E-05	1.4E-05	4.18E-08	4.2E-02	
Cs-137	7.9E+02	3.5E+03	6.7E+03	5.5E+01	2.0E-01	1.8E+00	2.2E+00	3.67E-02	6.7E+03	
Eu-152	2.1E+01	9.0E-01	1.4E+00	NA	5.3E-03	4.7E-04	4.7E-04	NA	2.0E+01	Rounded PA value.
Eu-154	2.9E+02	1.5E+02	1.6E+02	NA	7.3E-02	7.9E-02	5.3E-02	NA	3.0E+02	Rounded PA value.

¹ SRR-CWDA-2010-00023, Revision 4

² SRR-CWDA-2012-00027, Revision 1

³ SRR-CWDA-2012-00075, Revision 1

⁴ SRR-CWDA-2015-00075, Revision 1

NA indicates that an inventory value was not determined.

**Table 1: Updated Primary Tank Assigned Radionuclide Inventory Methodology Results
(Continued)**

	HTF PA ¹	Tank 5 ²	Tank 6 ³	Tank 12 (Floor Only) ⁴	HTF PA	Tank 5	Tank 6	Tank 12	Assigned Inventory in 2032 at Assumed Residual Sludge Volume of 3,000 gallons	
Residual Volume (gal)	4,000	1,900	3,000	1,500						
Constituent	Ci	Ci	Ci	Ci	Ci/gal	Ci/gal	Ci/gal	Ci/gal	Ci	Comments
H-3	1.0E+00	4.9E-02	1.8E-01	NA	2.5E-04	2.6E-05	6.0E-05	NA	1.0E+00	
I-129	2.8E-04	2.2E-03	3.0E-03	3.2E-02	7.0E-08	1.2E-06	1.0E-06	2.11E-05	3.0E-02	Assigned based on Tank 12 (rounded).
K-40	1.1E-03	7.9E-03	NA	NA	2.8E-07	4.2E-06	NA	NA	1.2E-02	Conservatively assigned inventory value higher than HTF PA value based on Tank 5 value.
Nb-94	1.1E-01	1.1E-02	1.5E-02	2.7E-03	2.8E-05	5.8E-06	5.0E-06	1.82E-06	1.1E-01	
Ni-59	8.6E+00	6.0E+01	7.5E+01	2.0E+00	2.2E-03	3.2E-02	2.5E-02	1.31E-03	9.5E+01	
Ni-63	6.3E+02	3.1E+03	5.2E+03	1.7E+02	1.6E-01	1.6E+00	1.7E+00	1.13E-01	5.2E+03	
Np-237	2.1E-01	2.6E-01	4.7E-01	1.6E-01	5.3E-05	1.4E-04	1.6E-04	1.06E-04	4.7E-01	
Pa-231	2.1E-03	1.4E-03	6.0E-03	1.5E-02	5.3E-07	7.4E-07	2.0E-06	1.02E-05	3.1E-02	
Pd-107	2.1E-01	5.0E-02	NA	NA	5.3E-05	2.6E-05	NA	NA	1.0E-01	Assigned a lower value than HTF PA based on Tank 5.
Pt-193	2.1E-01	3.6E-03	NA	NA	5.3E-05	1.9E-06	NA	NA	1.0E-01	Assigned a lower value than HTF PA based on Tank 5.
Pu-238	6.5E+03	2.5E+01	4.8E+01	8.5E+02	1.6E+00	1.3E-02	1.6E-02	5.67E-01	3.0E+03	Assigned value slightly lower than half way between HTF PA value and Tank 12 value.
Pu-239	8.0E+01	8.5E+01	4.5E+01	4.2E+01	2.0E-02	4.5E-02	1.5E-02	2.80E-02	1.3E+02	
Pu-240	5.0E+01	2.0E+01	2.8E+01	1.5E+01	1.3E-02	1.1E-02	9.3E-03	1.00E-02	3.8E+01	
Pu-241	7.6E+02	5.3E+01	6.8E+01	1.0E+02	1.9E-01	2.8E-02	2.3E-02	6.73E-02	5.7E+02	
Pu-242	1.0E+00	3.9E-03	3.3E-02	NA	2.5E-04	2.1E-06	1.1E-05	NA	1.0E+00	
Pu-244	1.0E+00	7.1E-06	8.5E-06	NA	2.5E-04	3.7E-09	2.8E-09	NA	1.0E+00	

¹ SRR-CWDA-2010-00023, Revision 4² SRR-CWDA-2012-00027, Revision 1³ SRR-CWDA-2012-00075, Revision 1⁴ SRR-CWDA-2015-00075, Revision 1

NA indicates that an inventory value was not determined.

**Table 1: Updated Primary Tank Assigned Radionuclide Inventory Methodology Results
(Continued)**

	HTF PA ¹	Tank 5 ²	Tank 6 ³	Tank 12 (Floor Only) ⁴	HTF PA	Tank 5	Tank 6	Tank 12	Assigned Inventory in 2032 at Assumed Residual Sludge Volume of 3,000 gallons	
Residual Volume (gal)	4,000	1,900	3,000	1,500						
Constituent	Ci	Ci	Ci	Ci	Ci/gal	Ci/gal	Ci/gal	Ci/gal	Ci	Comments
Ra-226	2.1E-02	6.5E-03	3.8E-02	2.9E-03	5.3E-06	3.4E-06	1.3E-05	1.94E-06	3.8E-02	Used Tank 6 value because higher than HTF PA.
Ra-228	2.1E+00	NA	NA	6.1E-03	5.3E-04	NA	NA	4.04E-06	2.1E+00	
Se-79	4.8E+00	1.3E-01	3.0E-01	NA	1.2E-03	6.8E-05	1.0E-04	NA	1.0E+00	Assigned value lower than the HTF PA value based on Tanks 5 and 6.
Sm-151	1.1E+04	7.3E+03	2.9E+03	NA	2.8E+00	3.8E+00	9.7E-01	NA	1.1E+04	
Sn-126	4.6E+00	7.7E+00	9.3E+00	1.4E-01	1.2E-03	4.1E-03	3.1E-03	9.30E-05	1.2E+01	
Sr-90	1.4E+04	9.7E+04	2.0E+05	8.0E+04	3.5E+00	5.1E+01	6.7E+01	5.33E+01	2.0E+05	
Tc-99	8.1E+00	1.0E-01	1.7E+00	2.8E-02	2.0E-03	5.3E-05	5.7E-04	1.87E-05	3.0E+00	Assigned value slightly lower than half way between HTF PA value and Tank 6 value.
Th-229	2.1E-03	2.9E-04	1.5E-03	1.3E-03	5.3E-07	1.5E-07	5.0E-07	8.52E-07	2.6E-03	
Th-230	2.1E-02	2.2E-02	1.5E-02	2.2E-03	5.3E-06	1.2E-05	5.0E-06	1.47E-06	3.5E-02	
Th-232 ^(a)	2.9E-02	NA	NA	6.6E-02	7.3E-06			4.42E-05	2.9E-02	
U-232 ^(a)	2.1E-03	4.1E-05	1.1E-03	2.2E-02	5.3E-07	2.2E-08	3.7E-07	1.44E-05	2.1E-03	
U-233	5.9E-01	2.2E-03	5.2E-02	2.0E-01	1.5E-04	1.2E-06	1.7E-05	1.35E-04	4.4E-01	
U-234	9.6E-02	4.5E-02	1.5E-01	5.5E-02	2.4E-05	2.4E-05	5.0E-05	3.65E-05	1.5E-01	
U-235	2.1E-02	2.0E-03	6.8E-03	3.4E-04	5.3E-06	1.1E-06	2.3E-06	2.28E-07	1.6E-02	
U-236	2.1E-02	2.5E-03	8.3E-03	NA	5.3E-06	1.3E-06	2.8E-06	NA	2.1E-02	
U-238	2.9E-02	4.7E-02	2.5E-01	5.9E-03	7.3E-06	2.5E-05	8.3E-05	3.92E-06	2.5E-01	
Y-90	1.4E+04	9.7E+04	2.0E+05	8.0E+04	3.5E+00	5.1E+01	6.7E+01	5.33E+01	2.0E+05	
Zr-93	4.0E-01	3.0E+01	2.2E+01	4.0E+00	1.0E-04	1.6E-02	7.3E-03	2.65E-03	4.7E+01	

(a) This constituent is included in the sample analysis for Tank 15 only

¹ SRR-CWDA-2010-00023, Revision 4² SRR-CWDA-2012-00027, Revision 1³ SRR-CWDA-2012-00075, Revision 1⁴ SRR-CWDA-2015-00075, Revision 1

NA indicates that an inventory value was not determined.

The chemical constituent inventory values (kg) assigned in the HTF PA and the actual chemical inventories in Tanks 5, 6 and 12 are presented in Table 2. The highlighted cells are those with the highest kg inventory values that were used to assign the HTF Type I and II tanks' primary

tank inventory values. The assigned chemical inventory values are presented in the second to last column in Table 2.

Table 2: Updated Primary Tank Assigned Chemical Inventory Methodology Results

	HTF PA ¹	Tank 5 ²	Tank 6 ³	Tank 12 (Floor Only) ⁴	HTF PA	Tank 5	Tank 6	Tank 12 (Floor Only)	Assigned Inventory in 2032 at Assumed Residual Volume of 3,000 gallons
Residual Volume (gal)	4,000	1,900	3,000	1,500	3,000	3,000	3,000	3,000	
Constituent	kg	kg	kg	kg	kg	kg	kg	kg	kg
Ag	5.3E+00	3.0E+00	1.7E+00	6.7E+00	4.0E+00	4.7E+00	1.7E+00	1.3E+01	1.3E+01
Al	2.5E+03	5.5E+01	3.7E+02	6.6E+02	1.9E+03	8.7E+01	3.7E+02	1.3E+03	1.9E+03
As	1.4E-01	9.1E-02	7.9E-02	1.6E-02	1.1E-01	1.4E-01	7.9E-02	3.3E-02	1.4E-01
B	3.6E+01	1.3E+01	2.3E+00	8.8E+00	2.7E+01	2.1E+01	2.3E+00	1.8E+01	2.7E+01
Ba	2.0E+01	2.1E+01	2.0E+01	4.4E+00	1.5E+01	3.3E+01	2.0E+01	8.9E+00	3.3E+01
Cd	1.5E+01	9.0E-01	1.7E+00	2.2E-01	1.1E+01	1.4E+00	1.7E+00	4.4E-01	1.1E+01
Cl	1.0E+02	4.3E-01	5.9E+00	1.1E+00	7.5E+01	6.8E-01	5.9E+00	2.1E+00	7.5E+01
Co	2.1E-01	2.5E+00	4.2E+00	4.2E-01	1.6E-01	3.9E+00	4.2E+00	8.4E-01	4.2E+00
Cr	1.7E+01	1.1E+01	8.2E+00	4.7E+00	1.3E+01	1.7E+01	8.2E+00	9.5E+00	1.7E+01
Cu	5.1E+00	7.5E+00	1.7E+01	1.2E+01	3.8E+00	1.2E+01	1.7E+01	2.5E+01	2.5E+01
F	1.4E+01	3.5E-01	5.9E+00	1.8E-01	1.1E+01	5.5E-01	5.9E+00	3.7E-01	1.1E+01
Fe	3.0E+03	4.9E+03	3.3E+03	2.6E+03	2.3E+03	7.7E+03	3.3E+03	5.3E+03	7.7E+03
Hg	4.2E+02	2.4E+01	6.1E+01	1.4E+03	3.2E+02	3.8E+01	6.1E+01	2.8E+03	2.8E+03
I	5.0E-01	NA	8.2E-02	1.9E-01	3.8E-01	0.0E+00	8.2E-02	3.8E-01	3.8E-01
Mn	5.7E+02	3.4E+02	3.0E+02	1.1E+02	4.3E+02	5.4E+02	3.0E+02	2.1E+02	5.4E+02
Mo	3.6E+01	5.0E-01	1.1E+00	9.5E-02	2.7E+01	7.9E-01	1.1E+00	1.9E-01	2.7E+01
Ni	6.3E+01	5.8E+02	8.5E+02	7.4E+01	4.7E+01	9.2E+02	8.5E+02	1.5E+02	9.2E+02
NO ₂	3.5E+03	5.0E-01	4.9E+02	6.4E-01	2.6E+03	7.9E-01	4.9E+02	1.3E+00	2.6E+03
NO ₃	3.2E+02	2.0E+00	4.9E+02	9.9E-01	2.4E+02	3.2E+00	4.9E+02	2.0E+00	4.9E+02
Pb	5.0E+01	3.6E+01	8.2E+00	2.4E+00	3.8E+01	5.7E+01	8.2E+00	4.8E+00	5.7E+01
PO ₄	8.8E+00	3.5E-01	5.9E+00	1.8E-01	6.6E+00	5.5E-01	5.9E+00	3.7E-01	6.6E+00
Sb	6.0E+00	7.4E+00	1.5E+01	1.2E-02	4.5E+00	1.2E+01	1.5E+01	2.4E-02	1.5E+01
Se	1.1E-02	1.9E-02	1.6E-01	1.8E-02	8.3E-03	3.0E-02	1.6E-01	3.6E-02	1.6E-01
SO ₄	4.4E+01	2.7E+00	1.6E+02	7.6E+00	3.3E+01	4.3E+00	1.6E+02	1.5E+01	1.6E+02
Sr	5.6E+00	4.1E+00	8.3E+00	3.4E+00	4.2E+00	6.5E+00	8.3E+00	6.8E+00	8.3E+00
U	8.8E+01	9.3E+01	7.1E+02	1.1E+01	6.6E+01	1.5E+02	7.1E+02	2.3E+01	7.1E+02
Zn	6.0E+00	4.9E+00	1.6E+01	2.3E+00	4.5E+00	7.7E+00	1.6E+01	4.7E+00	1.6E+01

¹ SRR-CWDA-2010-00023, Revision 4

² SRR-CWDA-2012-00027, Revision 1

³ SRR-CWDA-2012-00075, Revision 1

⁴ SRR-CWDA-2015-00075, Revision 1

NA indicates that an inventory value was not determined.

Annulus Inventory Updates

The updates to the assigned annulus inventories of the HTF Type I and II tanks incorporates the Savannah River Remediation (SRR) waste removal and operational closure strategy to remove all supernate waste from the HTF Type I and II tanks' annuli to the maximum extent practical. The methods and strategies for annulus waste removal are outlined in the *SRR Waste Removal*

and Operational Closure Strategy, SRR-CWDA-2014-00003, Revision 0. The maximum extent practical is assumed to be equal to trace amounts as stated in the *H-Area Tank Farm Closure Inventory for use in Performance Assessment Modeling*, SRR-CWDA-2010-00023, Revision 4. SRR-CWDA-2010-00023 already assumes trace amounts of residual material in the annuli of Tanks 11, 13 and 15. Using the annulus radionuclide and chemical constituent concentrations presented in SRR-CWDA-2010-00023, Revision 4, and a residual material volume of 100 gallons, the updated assigned annulus inventory for Tanks 9, 10 and 14 was determined and is presented in Table 3.

Table 3: Updated Tanks 9, 10 and 14 Annulus Assigned Radionuclide and Chemical Inventory in 2032

Radionuclide	(Ci)	Radionuclide	(Ci)	Chemical	(kg)
Ac-227	1.0E+00	Pa-231	8.2E-05	Ag	1.2E-02
Al-26	1.0E+00	Pd-107	5.3E-03	Al	2.7E+01
Am-241	3.9E-01	Pt-193	5.3E-03	As	9.3E-04
Am-242m	2.0E-04	Pu-238	1.6E+00	B	1.7E-01
Am-243	4.2E-04	Pu-239	2.5E-01	Ba	7.9E-02
Ba-137m	1.8E+02	Pu-240	1.1E-01	Cd	1.2E-02
C-14	2.6E-04	Pu-241	3.0E-01	Cl	2.4E-01
Cf-249	3.3E-04	Pu-242	4.4E-05	Co	1.0E-01
Cf-251	8.9E-04	Pu-244	3.7E-08	Cr	1.1E-01
Cl-36	1.6E-04	Ra-226	5.5E-05	Cu	5.5E-01
Cm-243	7.2E-04	Ra-228	5.3E-02	F	9.9E-02
Cm-244	2.0E-02	Se-79	4.8E+00	Fe	1.2E+01
Cm-245	3.9E-06	Sm-151	4.7E+00	Hg	8.9E-01
Cm-247	2.5E-10	Sn-126	4.6E+00	I	1.4E-03
Cm-248	2.8E-07	Sr-90	5.3E+02	Mn	1.2E-01
Co-60	9.8E-05	Tc-99	1.0E-01	Mo	1.3E-01
Cs-135	1.0E-03	Th-229	5.3E-05	Ni	1.8E-01
Cs-137	2.0E+02	Th-230 ^(a)	1.9E-05	NO ₂	2.3E+01
Eu-152	2.1E+01	Th-232 ^(a)	7.1E-04	NO ₃	2.0E+01
Eu-154	8.8E-02	U-232	5.3E-05	Pb	4.7E-01
H-3	1.0E+00	U-233	5.9E-04	PO ₄	9.9E-02
I-129	4.1E-04	U-234	6.5E-04	Sb	2.6E-01
K-40	8.9E-06	U-235	9.2E-06	Se	4.5E-03
Nb-94	1.4E-04	U-236	3.6E-05	SO ₄	3.5E+00
Ni-59	4.9E-04	U-238	4.1E-05	Sr	2.3E-02
Ni-63	1.9E-02	Y-90	5.3E+02	U	8.6E-01
Np-237	1.1E-03	Zr-93	4.5E-02	Zn	1.6E-01

(a) Tank 15 only

Sand Pad Inventory Updates

There are no updates to the assigned sand pad inventory values of the HTF Type II tanks. The constituent concentrations and residual material volumes presented in SRR-CWDA-2010-00023, Revision 4, are still applicable to the sand pad inventory values of the HTF Type II tanks.

HTF Type I and II Tank Inventory Updates Impact to PA Dose Modeling Results

The updated assigned radionuclide inventory values presented in Tables 1 and 3 were input into the HTF GoldSim model (documented in SRR-CWDA-2014-00060) to see how these updated values might impact PA dose modeling results. The 100-meter Member of Public (MOP) and Inadvertent Intruder (IHI) dose results at 20,000 years after HTF closure are presented on Figures 2 and 3, respectively. The Total Effective Dose Equivalent (TEDE) is shown on Figures 2 and 3 as well as the constituents with the highest contribution to the total dose. As seen on Figure 2 the MOP dose is less than the 25 mrem/year requirement at 10,000 years. As seen on Figure 3, the IHI dose is less than the 500 mrem/year requirement at 10,000 years. [SRR-CWDA-2010-00128]

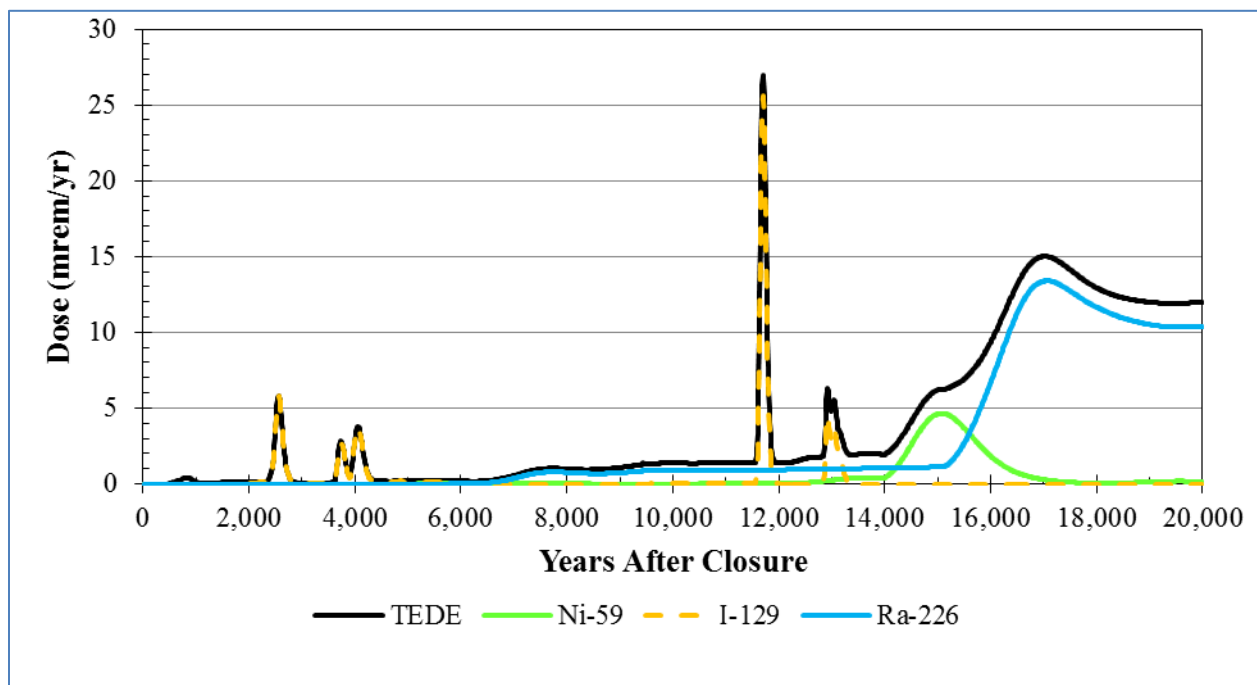


Figure 2: MOP Dose with Updated Assigned Inventory Values for HTF Type I and II Tanks at 20,000 Years after Closure

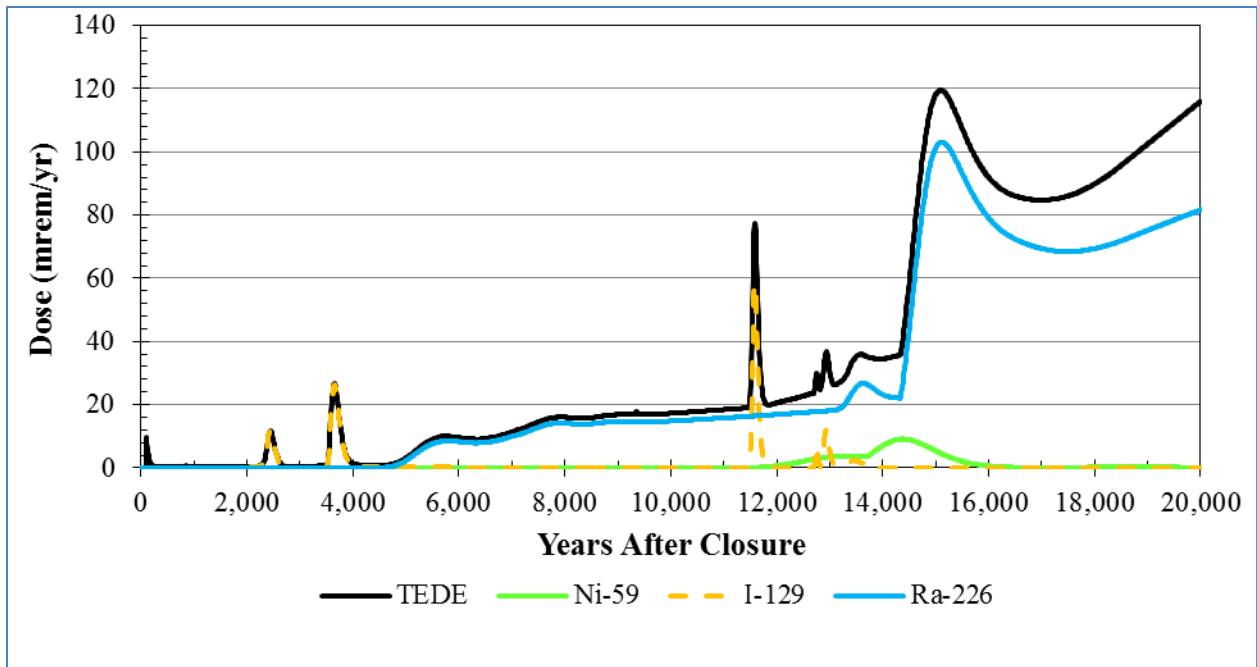


Figure 3: IHI Dose with Updated Assigned Inventory Values for HTF Type I and II Tanks at 20,000 Years after Closure

The updated assigned chemical constituent inventory values presented in Tables 2 and 3 were also input into the HTF GoldSim model. Figure 4 presents the results for the only constituent, Mn (Manganese), which exceeded the regulatory Maximum Contaminant Level (MCL) requirements. As seen on Figure 4, the peak contaminant level for Mn within 10,000 years is 55 $\mu\text{g/L}$. This value is just slightly above the MCL value of 50 $\mu\text{g/L}$.

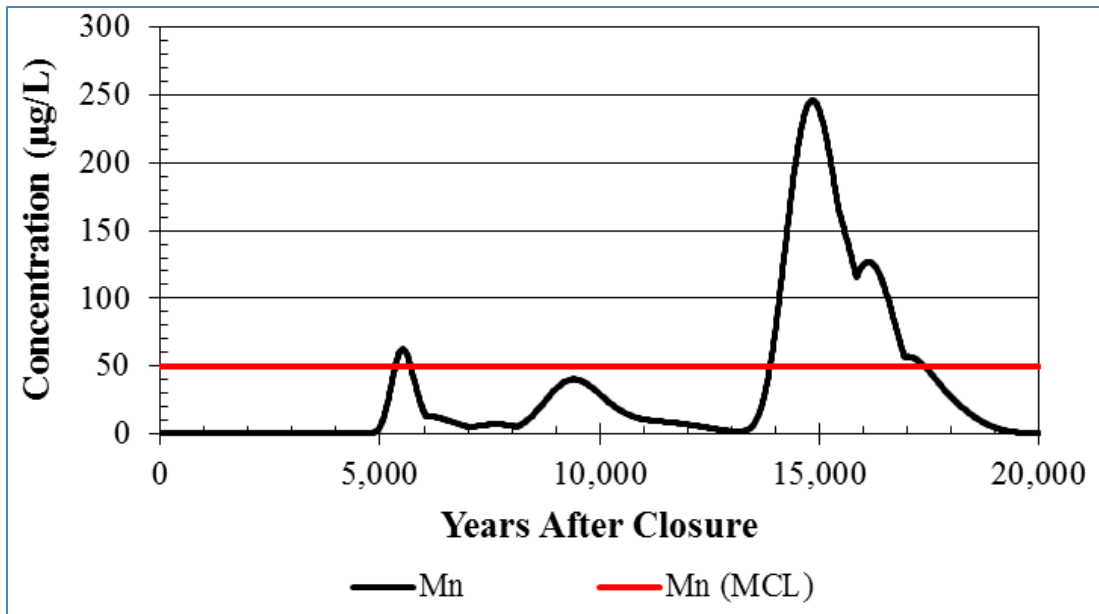


Figure 4: Updated Mn Contaminant Levels for HTF Type I and II Tanks at 20,000 Years after Closure

Conclusion

The updated assigned radionuclide and chemical primary tank inventory values for the HTF Type I and II tanks (Tanks 9, 10, 11, 13, 14 and 15) and the updated assigned radionuclide and chemical annulus inventory values for Tanks 9, 10 and 14 are presented in Tables 1, 2 and 3. These assigned inventory values are based on lessons learned from final characterization of Tanks 5, 6 and 12. As shown in Figures 2, 3 and 4, the updated assigned inventory values given in Tables 1, 2 and 3 have a minimal impact on long-term performance against the PA performance objectives. Therefore, the updated assigned inventories presented in Tables 1, 2 and 3 are acceptable for use in PA modeling of the radionuclide and chemical inventories in the HTF Type I and II tanks.

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SRR-CWDA-2015-00075, *Tank 12 Inventory Determination*, Savannah River Site, Aiken, SC, Rev. 1, August 2015.

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