DOCUMENT RELEASE AND CHANGE FORM

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Derivation of Best-Basis Inventory for Tank 241-A-105 as of January 1, 2016

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Initial Release - This document reports the change in the best-basis inventory (BBI) for Tank 241-A-105 for the second quarter of fiscal year 2016. This update incorporates the decay-correction update from January 1, 2008 to July 1, 2015. In addition, sample-based polychlorinated biphenyls (PCB) template estimates have been established since the previous BBI update and will replace the previous PCB default concentrations.

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RPP-7625	12	GUIDELINES FOR UPDATING BEST-BASIS INVENTORY
RPP-8847	01B	BEST-BASIS INVENTORY TEMPLATE COMPOSITIONS OF COMMON TANK WASTE LAYERS
RPP-ENV-37956	02	HANFORD 241-A AND 241-AX TANK FARMS LEAK INVENTORY ASSESSMENT REPORT
RPP-PLAN-60585	00	Software Management Plan for Utility Calculation Software Tank Waste Volume Calculator
RPP-RPT-26878	00	Best-Basis Inventory Templates for Polychlorinated Biphenyls
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Derivation of Best-Basis Inventory for Tank 241-A-105 as of January 1, 2016

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Abstract:
This document reports the change in the best-basis inventory (BBI) for Tank 241-A-105 for the first quarter of fiscal year 2016. This update incorporates the decay-correction update for radionuclides from January 1, 2008 to July 1, 2015.

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LIST OF TERMS

Abbreviations and Acronyms

BBI	Best-Basis Inventory
BBIM	Best-Basis Inventory Maintenance
HDW	Hanford Defined Waste
HLW	High Level Waste
P2	PUREX high-level wastes generated between 1963 and 1967
PCB	Polychlorinated Biphenyl
PUREX	Plutonium Uranium Extraction (Plant)
RPP	River Protection Project
SltCk	Salt Cake
TCR	Tank Characterization Report
TWINS	Tank Waste Information Network System

Units

C	Centigrade
g/mL	Grams per milliter
kgal	Kilogallon
kL	Kiloliters
%	Percent
M	Molarity
µg/g	Microgram per gram

1.0 INTRODUCTION

The Best-Basis Inventory (BBI) effort involves developing and maintaining waste tank inventories comprising 25 chemical and 46 radionuclide components in the 177 Hanford Site underground storage tanks. These BBIs provide waste composition data necessary as part of the River Protection Project (RPP) process flowsheet modeling work, safety analyses, risk assessments, and system design for waste retrieval, treatment, and disposal operations.

Development and maintenance of the best-basis inventory is an on-going effort. The previous BBI effective April 1, 2004 was published in RPP-RPT-42743, *2009 Auto-TCR for Tank 241-A-105*. The decay-correction date for radionuclides has been updated from January 1, 2008 to July 1, 2015 since the previous BBI. In addition, sample-based polychlorinated biphenyls (PCB) template estimates have been established since the previous BBI update, which replace the previous PCB default concentrations to calculate the PCB inventories of unsampled tank waste layers. As a result, a re-evaluation of the BBI for tank 241-A-105 as of January 1, 2016 was performed and is documented in the following text.

2.0 DERIVATION OF BEST-BASIS INVENTORY

Since tank 241-A-105 (A-105) was sluiced using supernatants from tanks 241-A-101 and 241-A-102 after inhibited sulfuric acid had been placed on the waste, the waste remaining is unique. Of the alternatives available for establishing the composition of the waste in tank A-105, the only practical method is to use the sample data for available constituents from the 1972 sample and supplement it for the other constituents with the inventory predicted by the HDW model. The following information was used in this evaluation:

- Average concentrations from a 1972 sample (Internal memorandum Schulz and Hobbick, “Composition and Density of the 105A Solids”).
- Plutonium Uranium Extraction (PUREX) High Level Waste (HLW) sludge, P2 solids template (RPP-8847, *Best-Basis Inventory Template Compositions of Common Tank Waste Layers*). Templates are based on sample data for similar tank wastes supplemented with Hanford Defined Waste (HDW) model data (RPP-19822, *Hanford Defined Waste Model – Revision 5*) where sample data are not available.
- Sample-based template estimates for polychlorinated biphenyls (PCBs) in solid waste phases (RPP-RPT-26878, *Best-Basis Inventory Templates for Polychlorinated Biphenyls*).
- Process knowledge estimate for free hydroxide based on Internal Memorandum 74A30-95-018, “Sampling of Waste in Tank A-105”.

Table 2-1 summarizes how the best-basis inventories for tank A-105 were derived.

Table 2-1. Tank 241-A-105 Best-Basis Inventory Source Data.

Waste Phase	Waste Type	Applicable Concentration Data[1]	Associated Density (g/mL)	Multiplier	Associated Volume
Sludge[2]	P2	1972 Solids Sample Data (wet/dry average) (P/A105/001)	1.54	1.000	139 kL (37 kgal)
		P2 Sludge Template (TS/U204/016)	1.61	0.957	
		P2 Sludge free OH (P/A105/003)	1.54	1.000	
		P2 Sludge PCBs (TS/A105/002)	1.54	1.000	
Total tank					139 kL (37 kgal)

Notes:

[1]Vector handles, shown in parentheses, are unique serial identifiers for the vectors used in the BBIM database.

[2]The sludge waste phase contains no drainable interstitial liquid.

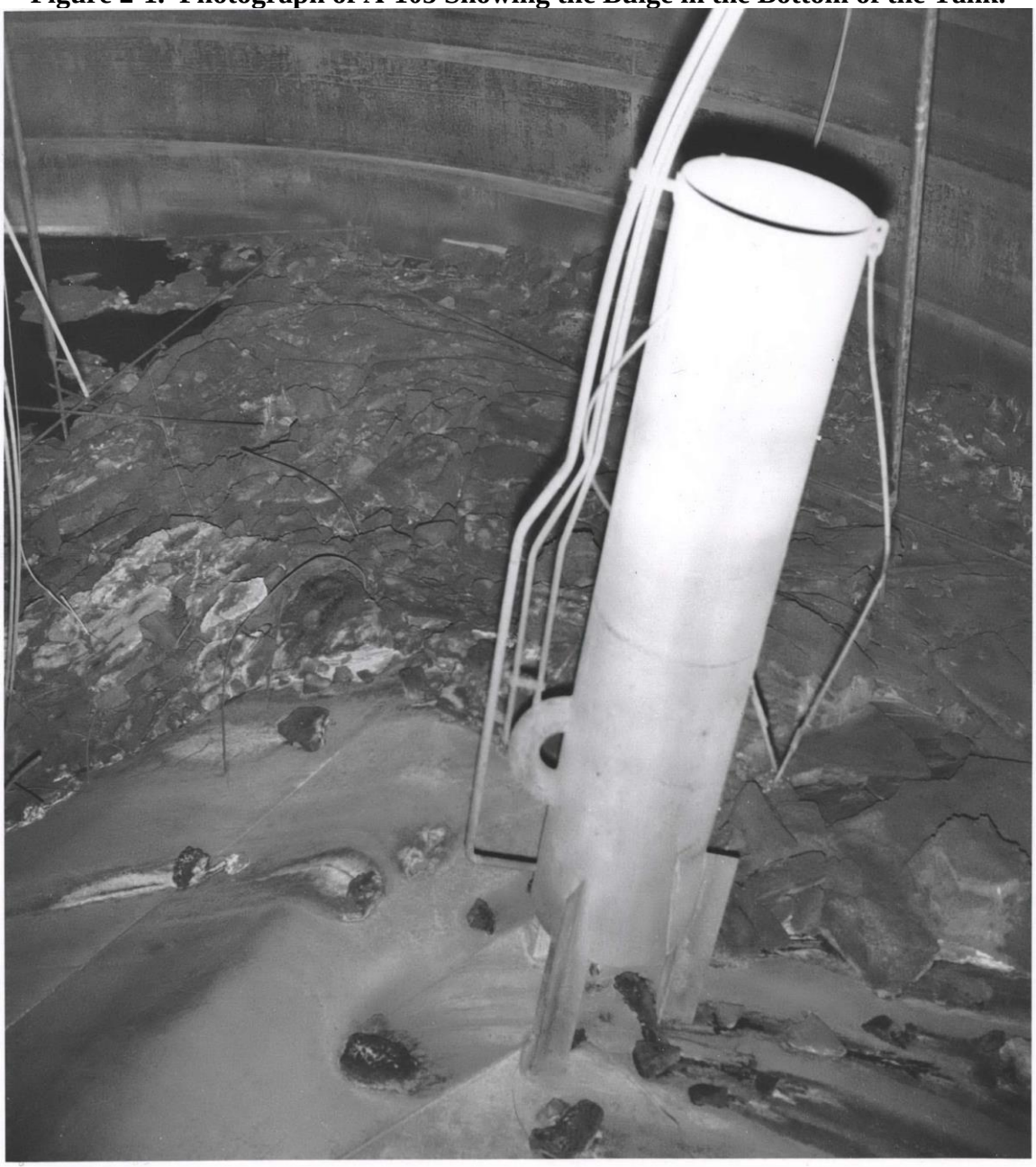
2.1 WASTE HISTORY

The 241-A tanks were designed for the storage of boiling waste generated from irradiated fuel reprocessing at the 202-A PUREX Plant (RPP-ENV-37956, *Hanford 241-A/AX farm Leak Inventory Assessment Report*). Tank A-105 initially sat unused from finish of construction in 1957 until May 1962. Aged PUREX HLW supernatant waste (short half-lived radionuclides had decayed and the waste was no longer self-boiling) was added from May 1962 until December 1962. The contents of tank A-105 were pumped out in January 1963 leaving approximately a 10-inch heel of waste in the tank.

Beginning in February 1963, tank A-105 began to receive HLW directly from the 202-A PUREX Plant. PUREX HLW contained significant concentrations of fission products that resulted in the waste self-boiling. Tank A-105 was brought up to boiling temperatures at a nearly uniform rate with HLW and reached boiling on March 5, 1963. On November 19, 1963, there were indications that tank A-105 developed a small leak because of radioactivity detected in lateral 14-05-03. By January 1965 the tank contained 3,278 kL (866 kgal) of waste (RPP-RPT-54912, *Hanford Single-Shell Tank Leak Causes and Locations – 241-A Farm*).

On January 28, 1965 a sudden steam release occurred. Heat generated by the waste turned water inside the tank into steam, which was released through a nearby riser. The maximum recorded temperature of ≈285°F was recorded in January/February 1965 (RPP-RPT-54912). Water trapped between the tank's inner steel liner and the outside concrete liner also turned into steam. The steam pressure bulged the bottom inner liner upward (See Figure 2-1) to an estimated height of 8.5 feet maximum in one area. Later visual inspection would show that the floor liner had separated from the wall liner around 75% of the tank's perimeter (SD-WM-SAR-006 *Single-Shell Tank Isolation Safety Analysis Report*; and RPP-RPT-54912). When the bulge was discovered, the tank was removed from active service. The tank liquid level was maintained between 3,218 kL (850 kgal) to 3,358 kL (887 kgal) through January 1968 by addition of water. In February 1968, the supernatant in tank A-105 was transferred to tank A-103 (leaving approximately 1-ft of supernatant cover over the sludge at the bulged area).

Figure 2-1. Photograph of A-105 Showing the Bulge in the Bottom of the Tank.



The tank was sluiced from February 1968 through August 1970 and the supernatant heel was diluted. The quantity of sludge remaining in the tank was large enough that cooling water additions were needed to maintain safe temperatures. Two sluicing campaigns were conducted in 1968 to remove the sludge from tank A-105. The first sluicing operation was halted when little of the remaining sludge could be removed. A hard crust layer atop the remaining sludge was thought to be responsible for preventing effective sluicing. Approximately half of the sludge was removed during the first sluicing campaign. In the second sluicing campaign, 1 M sulfuric acid, containing an inhibitor was sprayed onto the top layer of hard sludge in tank A-105. Samples of the remaining sludge in tank A-105 were obtained and tested to evaluate methods to expedite further sludge removal from this tank. Inhibited 1M sulfuric acid was demonstrated to effectively soften the tank A-105 sludge samples (Internal Letter from W. C. Schmidt and P. W. Smith to R. E. Smith, "Dissolution of TK-105-A Sludge with Inhibited Sulfuric Acid").

No additional sluicing activities were conducted until August 1970. Inhibited sulfuric acid was again used to soften the sludge in tank A-105. Following the completion of this phase of sluicing approximately 125 kL (33K gal) of supernatant and 125 (33 kgal) of sludge were reported to remain in the tank. The supernatant in tank A-105 was described as being a mixture of B Plant cesium ion exchange waste (i.e., cesium denuded ion exchange waste) and PUREX high-level waste (RPP-ENV-37956). Following the sluicing of the waste, water was periodically added to tank A-105 from November 1970 through December 1978 for evaporative cooling of the remaining sludge. Water was generally added in 500 gallon increments through a sprinkler system ([Woodward-Clyde, 1978, *An Estimate of Bottom Topography, Volume and Other Conditions in Tank 105A, Hanford, Washington (WCC Project 1397A-0300)*]. An estimated 610 kgal of water was added to tank A-105 for cooling and flushing of the air lift circulators (WHC-MR-0264, *Tank 241-A-105 Leak Assessment*).

Tank A-105 was declared interim stabilized effective July 31, 1979 based on a photograph evaluation dated June 21, 1979. Photographs showed "The surface appears dry with the exception of a wet spot trailing away from a circulator. The floor is approximately 40% bare metal, 30% a thin layer of sludge and the remaining 30% a heavier sludge primarily around the perimeter of the tank. The manual tape touches on a pile of old tapes and piping leading one to believe readings would be erratic. The liner of the tank is almost free of scale except for a small ridge around the lower perimeter" (HNF-SD-RE-TI-178, *Single-Shell Tank Leak Stabilization Record*).

A September 27, 2010 visual inspection showed crystal formations on all interior surfaces of tank A-105. Based on a review of previous similar crystal formations, tank chemistry, and formation mechanisms, the conclusion was reached that the crystals are most likely ammonium nitrate. A review of past research indicates no threat of detonation from these crystal formation under credible tank conditions (Internal Letter from G. E. Reeploeg to N.W. Kirch, T.G. Goetz and J.S. Schofield, "Ammonium Nitrate in Tank A-105").

2.2 TANK VOLUME

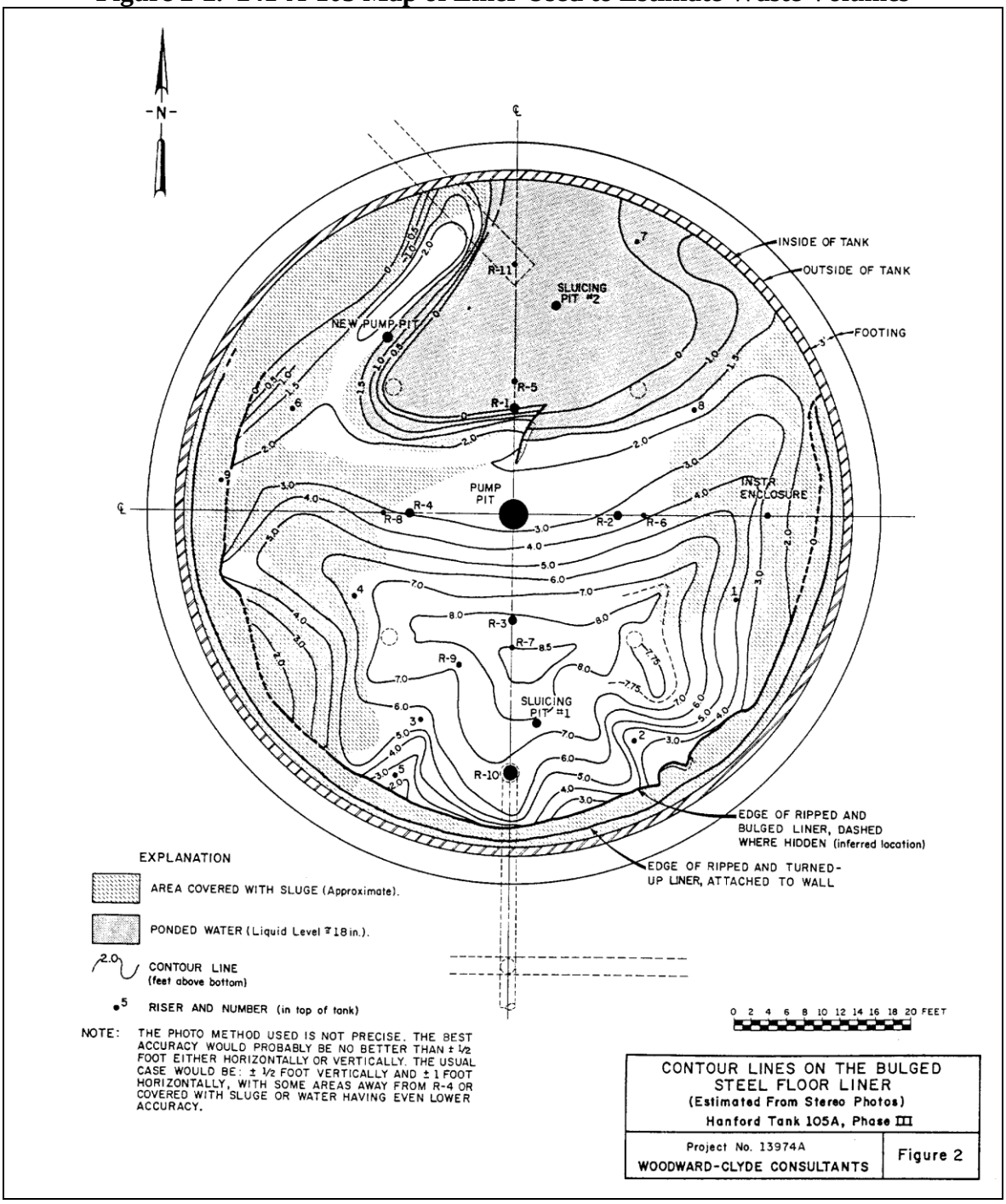
In 1977, tank 241-A-105 liner was mapped (See Figure 2-4) to estimate the volume under the bulged liner and the waste volume in the tank (Woodward-Clyde). The volumes of sludge were estimated to be as follows using a model assuming an essentially dry waste:

- The volume of sludge under the bulged liner of the tank was estimated to be between 56.6 and 70.8 kL (15.0 and 18.7 kgal). The average estimated sludge volume was 63.7 kL (16.8 kgal).
- The volume of sludge between the bulged and ripped liner and the wall of the tank was estimated to be a least 28 kL (7.5 kgal) but not more than 34 kL (9.0 kgal), with an average of 31 kL (8.2 kgal).
- The volume of sludge on the liner was calculated to be 44.3 kL (11.7 kgal).

The total tank waste volume obtained from summing the sludge volumes under the liner, between the liner and the tank wall, and on the liner is 139 kL (37 kgal). The entire waste volume is attributed to the dry sludge layer. A separate drainable interstitial liquid inventory was not determined for this tank because the remaining waste in the tank should be dry (as a result of the high heat waste; bottom temperature of the tank is approximately 112°C).

The ENRAF surface level measurement as of September 21, 2015 is 13.57 inches TWINS Queried January 9, 2016 (Level/Temp, Surface Level, Tank Name: A-105, Sensor Type: Measurement Date: 4/1/2004 to 1/09/2016, Sensor Type: ENRAF, Date 04/1/2004, 13.21 inches and 09/21/2015, 13.57 inches). The total estimated waste volume using 13.57 inches is 142 kL (37.5 kgal) (RPP-PLAN-60585, 2015, *Software Management Plan for Utility Calculation Software Tank Waste Volume Calculator*). However the tank floor is bulged, some of the waste is under the tank liner and photographs of the floor of tank A-105 indicates that the solid waste is randomly distributed. Therefore the Woodward-Clyde *WCC Project 1397A-0300* sludge volume estimate of 139 kL (37 kgal) will be used as the total tank volume for this BBI.

Figure 2-2. 241-A-105 Map of Liner Used to Estimate Waste Volumes



2.3 SAMPLING HISTORY

Tank 241-A-105 was sampled three times:

- Dip samples of tank A-105 (TK-105-A) slurry above settled sludge were obtained in February 1965 (ARH-78, *PUREX TK-105-A Waste Storage Liner Instability and Its Implications on Waste Containment and Control*, 1968)

- Two core samples of the sludge from A-105 (TK-105-A) were collected in 1968 (see Figure 2-3). The samples of the remaining sludge in tank A-105 were obtained and tested to evaluate methods to expedite further sludge removal from this tank. Inhibited 1M H_2SO_4 was demonstrated to effectively soften the tank A-105 sludge samples (Schmidt, 1968). The results are also discussed in ARH-308 DEL, "Waste Management Process Engineering Section".

- Two samples were taken of the sludge remaining after sluicing in 1972. One sample was identified as "dry" and was received in the form of hard, dry, brown lumps. The "wet" solids were originally received as a wet slurry and then air dried. The two samples were taken from different locations in the tank. Duplicate analysis of the "Dry" solids was performed (Internal memorandum - Schulz and Hobbick).

While concentrations for only a limited number of analytes were determined, the 1972 sample should represent the waste remaining after sluicing. The other 2 sampling events were determined not to be as representative as the 1972 samples. While the 1968 core samples will not be used for inventory purposes the testing and observations are still of interest. The following summary is provided: A sample of the sludge in TK-105-A was secured on September 20, through bottom detection riser No. **7** in the northeast portion of the tank near the tank wall. The sample was cored from the sludge by impacting with a 300-pound weight. The sampler sank 1-1/2 inches from its own weight (approximately 600 pounds) and was then impacted an additional 19 inches. The sludge appeared to be relatively hard near the surface with a softer layer near the tank liner. The sampler contained only a 10-12-inch core, even though it passed through 20-21 inches of sludge. The sample did not have the consistency expected for the hard blocks observed in the photographs; it had the color and consistency of brown mud and lost its shape when the core sampler barrel was opened (See Figure 2-5). Since the sample had no discernible strata, five arbitrary strata approximately 2 inches apart were chosen for analysis. The PNL laboratory performed cation, anion, and fission product analyses (ARH- 308 DEL, 1968**).**

Figure 2-3. Tank 241-A-105 Sludge Sample (10-18-68)

The duplicate "dry" sample results and the air dried "wet" sample results from the 1972 samples were averaged. The 1972 sample of neutralized PUREX high-level waste that has been leached with inhibited sulfuric acid and supernatant from various tanks, is unique. The ^{90}Sr concentrations from the 1972 sampling event were high, as expected. The high-level waste sludge in the A tank farm resulted from PUREX reactor fuel reprocessing. The soluble salts have been washed out and the sludge has been allowed to dry. The ^{90}Sr in this sludge is not diluted by the aluminum present in waste from the reprocessing of N Reactor fuels as in the case of tanks 241-AZ-101 and 241-A-102.

2.4 COMPONENT DENSITY AND WEIGHT PERCENT WATER

The previous BBI used a weight percent water of 0% due to the designation of the tank as a catastrophic leaker and assumed drying out of the waste by high waste temperatures. However, the amount of drying or drainage that occurred after the tank sample was taken in 1972 is unknown. Given that the waste is sludge and 37,000 gal of waste (~13 in) is estimated to remain in the tank and under the tank liner, interstitial liquid would be held by capillary forces and little drainage from solids interstitial liquids would be expected after 1972. Drying of the solids by evaporation due to high temperatures, would have removed only water and would not have changed the inventory of other constituents in the waste. Sample data on weight percent water for tank 241-A-105 are not available, therefore, lacking additional data, the percent water in the P2 sludge template (44.2%) is assumed for this BBI. The 1972 sample density of 1.54 g/ml was used as the component density.

Table 2-2 summarizes the assumed Density and Wt% Water for each waste type.

Table 2-2. Tank 241-A-105 Component Density and Wt% Water

Waste Phase	Waste Type	Component Density (g/mL)	Component Wt% Water	Source
Sludge Solids	P2	1.54	44.2	1972 Sample results and P2 template

2.5 TEMPLATE VECTORS

Templates are based on sampling data from tanks that contain the same waste type as tank A-105, supplemented with HDW model Revision 5 data (RPP-19822, *Hanford Defined Waste Model – Revision 5*). A more detailed description of template data is found in RPP-8847.

The tank 241-A-105, neutralized PUREX high-level waste (P2) which has been leached with inhibited sulfuric acid is unique. Soluble salts have been washed out and the sludge has been allowed to dry. This "adulterated" P2 sludge in tank A-105 is physically and chemically

different than the P2 sludges in tanks 241-AX-103 and 241-AX-104 and the representative of the P2 sludge template may not be fully representative of the sludge solids in tank A-105.

For constituents where the 1972 analytical results were not available, concentrations from the P2 solids template were used. For P2 sludge the template density is 1.61 g/mL and the weight percent water is 44.2. A multiplier is used to scale template vectors to the sample data. However, because the 1972 sampling event did not report percent water the multiplier was based on the difference in density values for the 1972 sample (1.54 g/mL) and the P2 sludge template (1.61 g/mL). A multiplier of 0.957 was calculated (=1.54/1.61).

2.6 DEVELOPMENT OF THE BBI

The inventories in this BBI were developed with the BBI creation rules documented in RPP-7625 *Guidelines for Updating Best-Basis Inventory*. All inventory calculations were performed using the Best-Basis Inventory Maintenance (BBIM) Tool. The updated BBI values for tank A-105 can be found in the *Best-Basis Calculation Detail Report* and the *Best-Basis Calculation Detail-Supplemental Analytes* report in TWINS. A condensed version of these reports is included in Appendix A. Radionuclides in these reports are decay-corrected to July 1, 2015

Alpha-emitting Isotopes – Data from analysis of $^{239/240}$Pu, total uranium, and template model isotopic distribution ratios were used to generate inventories for the uranium and plutonium isotopes. Americium and curium isotopes are based on template concentrations.

PCBs – The PCB inventory is estimated per guidelines established in RPP-7625. PCB inventories for each waste phase were developed using the sample-based PCB template values reported in RPP-RPT-26878, since current sample data were not available. The sample-based PCB concentrations for the PCB solids templates are reported on a dry weight basis. The reported concentrations are converted to wet weight using the associated waste weight percent water result. The PCB concentration for the P2 is <3.236 µg/g (dry weight). When this concentration is converted to wet weight using the mean P2 sludge template weight percent water of 44.2 it equals <1.806 µg/g [<3.236 µg/g (µg/g * (100%-44.2%)/100]. The density of the P2 sludge PCB vector is assumed to be 1.54 g/mL the same as the sample based density.

Free Hydroxide – Tank A-105 was sluiced with inhibited sulfuric acid; hence any free hydroxide present would have been neutralized (74A30-95-018, internal memorandum). Therefore, the P2 sludge total inventory of free hydroxide is zero.

3.0 SUMMARY OF CHANGES

This update incorporated a radionuclide decay-correction of July 1, 2015. The previous weight percent water was changed from 0 to 44.2. The total PCB concentration for the waste phase was updated to use sample rather than default process knowledge values. The overall waste volume did not change. Template based inventories changed significantly.

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APPENDIX A
CONDENSED BEST-BASIS CALCULATION DETAIL REPORTS FOR TANK 241-A-105 PRIMARY AND SUPPLEMENTAL ANALYTES

Table A-1. Condensed Best-Basis Calculation Detail Reports for Tank 241-A-105 Primary and Supplemental Analytes

Radionuclide Decay Date 7/1/2015

Analyte	Phase	Waste Type	Qualifier	Inventory	Units	RSD (%)	Basis	Calculation (Density*Volume* Concentration*Conversion*Multiplier)[a]
Al	Sludge Solid	P2 (Solid)		8.28E+03	kg		Process Knowledge	1.54 g/ml * 139 kL * 38700 ug/g * 0.001 * 1
Bi	Sludge Solid	P2 (Solid)		0.00E+00	kg		Template Engineering	1.61 g/ml * 139 kL * 0 ug/g * 0.001 * 0.957
Ca	Sludge Solid	P2 (Solid)		1.30E+03	kg		Template Engineering	1.61 g/ml * 139 kL * 6080 ug/g * 0.001 * 0.957
Cl	Sludge Solid	P2 (Solid)		5.20E+01	kg		Template Engineering	1.61 g/ml * 139 kL * 243 ug/g * 0.001 * 0.957
TIC as CO3	Sludge Solid	P2 (Solid)		1.17E+04	kg		Template Engineering	1.61 g/ml * 139 kL * 54400 ug/g * 0.001 * 0.957
Cr	Sludge Solid	P2 (Solid)		3.56E+02	kg		Template Engineering	1.61 g/ml * 139 kL * 1660 ug/g * 0.001 * 0.957
F	Sludge Solid	P2 (Solid)		1.68E+01	kg		Template Engineering	1.61 g/ml * 139 kL * 78.5 ug/g * 0.001 * 0.957
Fe	Sludge Solid	P2 (Solid)		1.92E+04	kg		Process Knowledge	1.54 g/ml * 139 kL * 89700 ug/g * 0.001 * 1
Hg	Sludge Solid	P2 (Solid)		2.14E+01	kg		Template Engineering	1.61 g/ml * 139 kL * 99.8 ug/g * 0.001 * 0.957
K	Sludge Solid	P2 (Solid)		2.09E+01	kg		Template Engineering	1.61 g/ml * 139 kL * 97.4 ug/g * 0.001 * 0.957
La	Sludge Solid	P2 (Solid)		2.44E+02	kg		Template Engineering	1.61 g/ml * 139 kL * 1140 ug/g * 0.001 * 0.957
Mn	Sludge Solid	P2 (Solid)		6.49E+02	kg		Process Knowledge	1.54 g/ml * 139 kL * 3030 ug/g * 0.001 * 1
Na	Sludge Solid	P2 (Solid)		5.50E+04	kg		Process Knowledge	1.54 g/ml * 139 kL * 257000 ug/g * 0.001 * 1

Table A-1. Condensed Best-Basis Calculation Detail Reports for Tank 241-A-105 Primary and Supplemental Analytes

Radionuclide Decay Date 7/1/2015

Analyte	Phase	Waste Type	Qualifier	Inventory	Units	RSD (%)	Basis	Calculation (Density*Volume* Concentration*Conversion*Multiplier)[a]
Ni	Sludge Solid	P2 (Solid)		1.55E+03	kg		Template Engineering	1.61 g/ml * 139 kL * 7250 ug/g * 0.001 * 0.957
NO2	Sludge Solid	P2 (Solid)		3.73E+02	kg		Template Engineering	1.61 g/ml * 139 kL * 1740 ug/g * 0.001 * 0.957
NO3	Sludge Solid	P2 (Solid)		9.53E+03	kg		Template Engineering	1.61 g/ml * 139 kL * 44500 ug/g * 0.001 * 0.957
Free OH	Sludge Solid	P2 (Solid)		0.00E+00	kg		Process Knowledge	1.54 g/ml * 139 kL * 0 ug/g * 0.001 * 1
Oxalate	Sludge Solid	P2 (Solid)		0.00E+00	kg		Calculated	(0 kg * 0.98)/ 0.273
Pb	Sludge Solid	P2 (Solid)		1.54E+03	kg		Template Engineering	1.61 g/ml * 139 kL * 7200 ug/g * 0.001 * 0.957
PO4	Sludge Solid	P2 (Solid)		5.31E+03	kg		Template Engineering	1.61 g/ml * 139 kL * 24800 ug/g * 0.001 * 0.957
Aroclors (Total PCB)	Sludge Solid	P2 (Solid)	<	3.87E-01	kg		Template Sample	1.54 g/ml * 139 kL * 1.806 ug/g * 0.001 * 1
Si	Sludge Solid	P2 (Solid)		4.86E+03	kg		Process Knowledge	1.54 g/ml * 139 kL * 22700 ug/g * 0.001 * 1
SO4	Sludge Solid	P2 (Solid)		4.93E+03	kg		Template Engineering	1.61 g/ml * 139 kL * 23000 ug/g * 0.001 * 0.957
Sr	Sludge Solid	P2 (Solid)		5.34E+01	kg		Calculated	90Sr * 2.4436e-005
Th	Sludge Solid	P2 (Solid)		1.72E-07	kg		Template Engineering	1.61 g/ml * 139 kL * 8.03e-007 ug/g * 0.001 * 0.957
TOC	Sludge Solid	P2 (Solid)		0.00E+00	kg		Template Engineering	1.61 g/ml * 139 kL * 0 ug/g * 0.001 * 0.957
UTOTAL	Sludge Solid	P2 (Solid)		2.57E+00	kg		Process Knowledge	1.54 g/ml * 139 kL * 12 ug/g * 0.001 * 1

Table A-1. Condensed Best-Basis Calculation Detail Reports for Tank 241-A-105 Primary and Supplemental Analytes

Radionuclide Decay Date 7/1/2015

Analyte	Phase	Waste Type	Qualifier	Inventory	Units	RSD (%)	Basis	Calculation (Density*Volume* Concentration*Conversion*Multiplier)[a]
Zr	Sludge Solid	P2 (Solid)		6.57E+02	kg		Template Engineering	1.61 g/ml * 139 kL * 3070 ug/g * 0.001 * 0.957
3H	Sludge Solid	P2 (Solid)		4.85E-01	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.00226525 uCi/g * 1 * 0.957
14C	Sludge Solid	P2 (Solid)		2.76E-01	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.00128773 uCi/g * 1 * 0.957
59Ni	Sludge Solid	P2 (Solid)		7.20E+00	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.0335956 uCi/g * 1 * 0.957
60Co	Sludge Solid	P2 (Solid)		3.76E+01	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.175433 uCi/g * 1 * 0.957
63Ni	Sludge Solid	P2 (Solid)		6.26E+02	Ci		Template Engineering	1.61 g/ml * 139 kL * 2.92126 uCi/g * 1 * 0.957
79Se	Sludge Solid	P2 (Solid)		1.13E-01	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.000528952 uCi/g * 1 * 0.957
90Sr	Sludge Solid	P2 (Solid)		2.19E+06	Ci		Process Knowledge	1.54 g/ml * 139 kL * 10207.9 uCi/g * 1 * 1
90Y	Sludge Solid	P2 (Solid)		2.19E+06	Ci		Calculated	90Sr * 1
93mNb	Sludge Solid	P2 (Solid)		2.67E+00	Ci		Template Engineering	1.61 g/mL * 139 kL * 0.011911 uCi/g
93Zr	Sludge Solid	P2 (Solid)		3.00E+00	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.0139999 uCi/g * 1 * 0.957
99Tc	Sludge Solid	P2 (Solid)		1.58E+01	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.0735965 uCi/g * 1 * 0.957
106Ru	Sludge Solid	P2 (Solid)		2.84E-08	Ci		Process Knowledge	1.54 g/ml * 139 kL * 1.32467e-010 uCi/g * 1 * 1
113mCd	Sludge Solid	P2 (Solid)		1.70E+00	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.00794455 uCi/g * 1 * 0.957

Table A-1. Condensed Best-Basis Calculation Detail Reports for Tank 241-A-105 Primary and Supplemental Analytes

Radionuclide Decay Date 7/1/2015

Analyte	Phase	Waste Type	Qualifier	Inventory	Units	RSD (%)	Basis	Calculation (Density*Volume* Concentration*Conversion*Multiplier)[a]
125Sb	Sludge Solid	P2 (Solid)		1.63E+00	Ci		Process Knowledge	1.54 g/ml * 139 kL * 0.00763666 uCi/g * 1 * 1
126Sn	Sludge Solid	P2 (Solid)		2.29E-01	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.00106739 uCi/g * 1 * 0.957
129I	Sludge Solid	P2 (Solid)		9.47E-04	Ci		Template Engineering	1.61 g/ml * 139 kL * 4.42e-006 uCi/g * 1 * 0.957
134Cs	Sludge Solid	P2 (Solid)		3.30E-03	Ci		Template Engineering	1.61 g/ml * 139 kL * 1.54208e-005 uCi/g * 1 * 0.957
137Cs	Sludge Solid	P2 (Solid)		8.25E+04	Ci		Process Knowledge	1.54 g/ml * 139 kL * 385.256 uCi/g * 1 * 1
137mBa	Sludge Solid	P2 (Solid)		7.78E+04	Ci		Calculated	137Cs * 0.944
151Sm	Sludge Solid	P2 (Solid)		7.30E+04	Ci		Template Engineering	1.61 g/ml * 139 kL * 340.757 uCi/g * 1 * 0.957
152Eu	Sludge Solid	P2 (Solid)		3.88E+01	Ci		Template Engineering	1.61 g/mL * 139 kL * 0.173162 uCi/g
154Eu	Sludge Solid	P2 (Solid)		1.14E+03	Ci		Process Knowledge	1.54 g/ml * 139 kL * 5.32917 uCi/g * 1 * 1
155Eu	Sludge Solid	P2 (Solid)		9.07E+01	Ci		Process Knowledge	1.54 g/mL * 139 kL * 0.42389 uCi/g
226Ra	Sludge Solid	P2 (Solid)		2.21E-06	Ci		Template Engineering	1.61 g/ml * 139 kL * 1.03349e-008 uCi/g * 1 * 0.957
227Ac	Sludge Solid	P2 (Solid)		1.23E-05	Ci		Template Engineering	1.61 g/mL * 139 kL * 5.49513e-008 uCi/g
228Ra	Sludge Solid	P2 (Solid)		1.89E-11	Ci		Calculated	232Th * 1
229Th	Sludge Solid	P2 (Solid)		1.35E-08	Ci		Template Engineering	1.61 g/ml * 139 kL * 6.29134e-011 uCi/g * 1 * 0.957

Table A-1. Condensed Best-Basis Calculation Detail Reports for Tank 241-A-105 Primary and Supplemental Analytes

Radionuclide Decay Date 7/1/2015

Analyte	Phase	Waste Type	Qualifier	Inventory	Units	RSD (%)	Basis	Calculation (Density*Volume* Concentration*Conversion*Multiplier)[a]
231Pa	Sludge Solid	P2 (Solid)		1.57E-05	Ci		Template Engineering	1.61 g/ml * 139 kL * 7.34775e-008 uCi/g * 1 * 0.957
232Th	Sludge Solid	P2 (Solid)		1.89E-11	Ci		Template Engineering	1.61 g/ml * 139 kL * 8.84e-014 uCi/g * 1 * 0.957
232U	Sludge Solid	P2 (Solid)		5.93E-08	Ci		Calculated	1.54 g/mL * 139 kL * 2.77102e-010 uCi/g
233U	Sludge Solid	P2 (Solid)		1.24E-07	Ci		Calculated	1.54 g/mL * 139 kL * 5.78787e-010 uCi/g
234U	Sludge Solid	P2 (Solid)		8.77E-04	Ci		Calculated	1.54 g/mL * 139 kL * 4.09866e-006 uCi/g
235U	Sludge Solid	P2 (Solid)		3.67E-05	Ci		Calculated	1.54 g/mL * 139 kL * 1.71294e-007 uCi/g
236U	Sludge Solid	P2 (Solid)		2.26E-05	Ci		Calculated	1.54 g/mL * 139 kL * 1.05412e-007 uCi/g
237Np	Sludge Solid	P2 (Solid)		4.24E-02	Ci		Template Engineering	1.61 g/ml * 139 kL * 0.000197999 uCi/g * 1 * 0.957
238Pu	Sludge Solid	P2 (Solid)		2.39E+01	Ci		Calculated	1.54 g/mL * 139 kL * 0.111458 uCi/g
238U	Sludge Solid	P2 (Solid)		8.57E-04	Ci		Calculated	1.54 g/mL * 139 kL * 4.00471e-006 uCi/g
239/240Pu	Sludge Solid	P2 (Solid)		6.94E+02	Ci		Process Knowledge	1.54 g/ml * 139 kL * 3.24 uCi/g * 1 * 1
239Pu	Sludge Solid	P2 (Solid)		5.56E+02	Ci		Calculated	1.54 g/mL * 139 kL * 2.59706 uCi/g
240Pu	Sludge Solid	P2 (Solid)		1.36E+02	Ci		Calculated	1.54 g/mL * 139 kL * 0.636751 uCi/g
241Am	Sludge Solid	P2 (Solid)		3.10E+03	Ci		Template Engineering	1.61 g/mL * 139 kL * 13.8387 uCi/g
241Pu	Sludge Solid	P2 (Solid)		6.05E+02	Ci		Calculated	1.54 g/mL * 139 kL * 2.82642 uCi/g

Table A-1. Condensed Best-Basis Calculation Detail Reports for Tank 241-A-105 Primary and Supplemental Analytes

Radionuclide Decay Date 7/1/2015

Analyte	Phase	Waste Type	Qualifier	Inventory	Units	RSD (%)	Basis	Calculation (Density*Volume* Concentration*Conversion*Multiplier)[a]
242Cm	Sludge Solid	P2 (Solid)		2.63E+00	Ci		Template Engineering	1.61 g/mL * 139 kL * 0.0117636 uCi/g
242Pu	Sludge Solid	P2 (Solid)		9.88E-03	Ci		Calculated	1.54 g/mL * 139 kL * 4.61552e-005 uCi/g
243Am	Sludge Solid	P2 (Solid)		1.67E+00	Ci		Template Engineering	1.61 g/mL * 139 kL * 0.0074831 uCi/g
243Cm	Sludge Solid	P2 (Solid)		1.20E-01	Ci		Template Engineering	1.61 g/mL * 139 kL * 0.000535305 uCi/g
242Pu	Sludge Solid	P2 (Solid)		2.27E+00	Ci		Template Engineering	1.61 g/mL * 139 kL * 0.010163 uCi/g
Component wt% water	Sludge Solid	P2 (Solid)		44.2	%			
Component density	Sludge Solid	P2 (Solid)		1.54	g/ml			

Notes:
Ci = Curies
g/mL = grams per milliliter
kg = kilograms
kL = kiloliters
RSD = relative standard deviation
uCi/g = microcuries per gram
Wt% = weight percen