

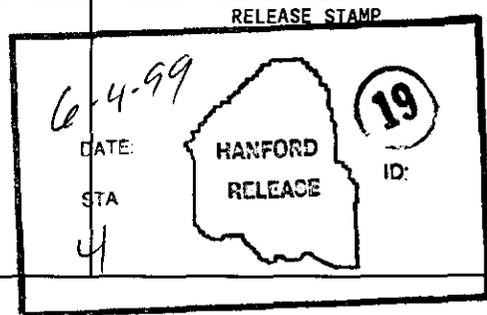
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Page 1 of 2

1. ECN **653807**

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2. ECN Category (mark one) Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersedure <input type="checkbox"/> Cancel/Void <input type="checkbox"/>	3. Originator's Name, Organization, MSIN, and Telephone No. Steve G. McKinney, Data Assessment and Interpretation, R2-12, 372-1945		4. USQ Required? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	5. Date 05/26/99
	6. Project Title/No./Work Order No. Tank 241-BY-104		7. Bldg./Sys./Fac. No. 241-BY-104	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-608, Rev. 0-B		10. Related ECN No(s). ECNs: 643411, 649435	11. Related PO No. N/A
12a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 12b) <input checked="" type="checkbox"/> No (NA Blks. 12b, 12c, 12d)	12b. Work Package No. N/A	12c. Modification Work Complete N/A Design Authority/Cog. Engineer Signature & Date	12d. Restored to Original Condition (Temp. or Standby ECN only) N/A Design Authority/Cog. Engineer Signature & Date	
13a. Description of Change This ECN has been generated in order to update the document to reflect results of recent data/information evaluation. Replace pages: 5-15 and 5-16				
13b. Design Baseline Document? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
14a. Justification (mark one) Criteria Change <input checked="" type="checkbox"/> Design Improvement <input type="checkbox"/> Environmental <input type="checkbox"/> Facility Deactivation <input type="checkbox"/> As-Found <input type="checkbox"/> Facilitate Const <input type="checkbox"/> Const. Error/Omission <input type="checkbox"/> Design Error/Omission <input type="checkbox"/>				
14b. Justification Details A tank characterization report page change revision is required to reflect the results of recent evaluation of data/information pertaining to adequacy of tank sampling for safety screening purposes (Reynolds et al. 1999, Evaluation of Tank Data for Safety Screening, HNF-4217, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington).				
15. Distribution (include name, MSIN, and no. of copies) See attached distribution.				



Tank Characterization Report for Single-Shell Tank 241-BY-104

Steve G. McKinney

Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract 8023764-9-K001

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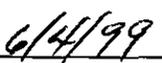
Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-BY-104, Tank BY-104, BY-104, BY Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

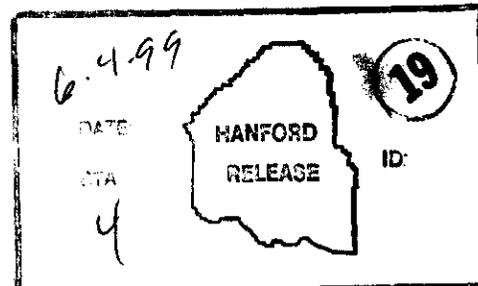
Abstract: N/A

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should be based only on the mean analytical values from the bottom three segments of each core (Agnew et al. 1996a). Another method of estimating the amount of $\text{Na}_2\text{NiFe}(\text{CN})_6$ originally present would be to assume that all the nickel currently found in the tank originated from $\text{Na}_2\text{NiFe}(\text{CN})_6$. The mean nickel concentration based on the bottom three segments of cores 116 and 117 was 3,620 $\mu\text{g/g}$. If all the nickel originated from $\text{Na}_2\text{NiFe}(\text{CN})_6$, the observed nickel concentration indicates that 19,500 $\mu\text{g/g}$ of $\text{Na}_2\text{NiFe}(\text{CN})_6$ (52,500 kg of $\text{Na}_2\text{NiFe}(\text{CN})_6$) existed in the tank before degradation. Therefore, these three sources of information place the original $\text{Na}_2\text{NiFe}(\text{CN})_6$ inventory approximately within the 14,000- to 52,500-kg range.

The total cyanide analytical mean based on the bottom three segments of cores 116 and 117 was 17.7 $\mu\text{g/g}$ (47.5 kg of cyanide) which is equivalent to 96.4 kg of $\text{Na}_2\text{NiFe}(\text{CN})_6$. Consequently, it appears that 99.3 to 99.8 percent (1-96.4/14,000 to 1-96.4/52,500) of the ferrocyanide complex has decomposed.

Eight samples had less than the required 17 weight percent water, 12 after computation of the 95 percent confidence interval lower limits. Analysis for moisture content using gravimetry was performed for the eight original samples and one of the four additional samples which had DSC results above the decision threshold. Gravimetric analysis indicated six samples still had water contents below 17 weight percent.

Another factor in assessing tank safety is the heat generation from radioactive decay and the resultant temperature increase of the waste. The 1995 analytical results provided mean estimates for ^{60}Co , ^{137}Cs , and ^{90}Sr . Table 5-9 predicts the tank heat load to be 8,270 W (28,200 Btu/hr). Agnew 1996a provides an estimate of 1,310 W (4,470 Btu/hr), and Kummerer (1994) estimated 2,550 W (8,700 Btu/hr) based on tank headspace temperatures. All estimates were below the 11,700 W (40,000 Btu/hr) design specification for single-shell tanks (Bergmann 1991). Because tank temperatures have decreased since January 1993, it may be concluded that any heat generated from radioactive sources is adequately dissipated.

Table 5-9. Tank 241-BY-104 Estimated Heat Load.

Radionuclide	$\mu\text{Ci/g}$	CI	Watts
^{60}Co	< 0.0149	< 40.1	< 0.618
^{137}Cs	97.0	2.61E+05	1,230
^{90}Sr	391	1.05E+06	7,040
Total		1.31E+06	8,270

In summary, all analyses requested by the safety DQOs were performed during the October and November 1995 sampling event. The analytical results indicate the tank can be assumed to be safe based on current DQO and threshold values.

5.5.2 Historical Model Evaluation

The primary objective of the historical model evaluation DQO was to acquire adequate information through selective tank sampling to quantify the errors associated with predicting tank waste composition based on waste transaction history and waste type compositions (Simpson and McCain 1995). The requirement of a minimum of two widely spaced cores with thick layered segments was met. The DQO identifies key waste components for certain waste types including BY saltcake and ferrocyanide waste. Tank 241-BY-104 was selected for historical evaluation because it was expected to contain layers thick enough to provide entire segments composed of these two waste types (Agnew et al. 1996a). The first step in the evaluation is to compare the analytical results with DQO-defined concentration levels for waste components. If the analytical results are ≥ 10 percent of the DQO levels (ratio of 0.1 or more), the waste type and layer identification are considered acceptable and further analyses are requested (Simpson and McCain 1995).

According to the TLM (see Figure 2-3), it is likely the top three segments were BY saltcake, and the bottom three segments consisted of ferrocyanide waste. The analytical results were compared in Table 5-10 to the historical model evaluation DQO predicted concentrations for the BY saltcake and ferrocyanide waste types. The waste components for BY saltcake were sodium, aluminum, nitrate, sulfate, and percent water, and those for ferrocyanide waste were sodium, bismuth, nickel, ^{137}Cs , ^{90}Sr , and percent water. As samples were collected to meet historical DQOs in Simpson and McCain (1995), adequate analyses also were completed to fulfill requirements for Simpson and McCain (1996). The 1996 revision of the historical DQOs adds uranium as a waste component for BY saltcake waste and iron and phosphate for PFeCN waste.

When possible, the fusion digested results for the metals were used rather than the acid digested results because the fusion results more closely represent total concentrations. Only the saltcake results (subsegments upper or lower half in the Appendix A tables) were compared to the BY saltcake levels, and only the sludge results (subsegments A, B, C, or D in the Appendix A tables) were used for the ferrocyanide waste levels. Subsegment breakdowns did not strictly follow the TLM predictions: sludge subsegments were formed from material from the top three subsegments, and a saltcake subsegment was formed from segment 4 of core 117. The comparisons were made at the subsegment mean level for both cores.

All analytical results for the BY saltcake waste components exceeded the 10 percent criterion specified in the DQO with the exception of sulfate in some subsegments. For the ferrocyanide waste comparison, some subsegments from four out of eight analytes (iron, bismuth, nickel, and percent water) did not meet the criterion. The TLM seems to overpredict these analytes for other BY-tanks also. A closer inspection of the data reveals that several adjacent subsegments met the criteria, but comparing the results for all sludge subsegments causes the ratios to be below the DQO levels. Results from the bottom three subsegments from core 116 and the bottom subsegment from segment 2 through segment 4

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