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ENGINEERING CHANGE NOTICE

0052582

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Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Melvin R. Adams, Data Developmment and Interpretation, R2-12, 373-6167	[] Yes [X] No	02/03/00
	6. Project Title/No./Work Order No. Tank 241-AN-101	7. Bldg./Sys./Fac. No. 241-AN-101	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-578, Rev. 0-C	10. Related ECN No(s). N/A	11. Related PO No. N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? [] Yes [X] No

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14a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

Electronic access to information and data is superseding hard copy document.

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1. ECN (use no. from pg. 1) ECN-657281

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specificatio n	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng. M. R. Adams	M R Adams	2/3/00	PE		
Cog. Mgr. J. G. Field	J G Field	2/7/00	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other			Other		
			DEPARTMENT OF ENERGY		
			Signature or a Control Number that tracks the Approval Signature		
			ADDITIONAL		

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Tank Characterization Report for Double-Shell Tank 241-AN-101

Melvin R. Adams
CH2M HILL Hanford Group, Inc., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

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Abstract: N/A.

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(2) Title
Tank Characterization Report for Double-Shell Tank 241-AN-101

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initially released 8/8/96 on EDT 617505.	C. J. Benar	J. G. Kristofzski
0A RS	Incorporate per ECN-612284.	M. J. Kupfer 7-25-97	K. M. Hodgson K.M. Hodgson 7-25-97
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1 RS	Incorporate per ECN-657281	M. R. Adams	J. G. Field 2/7/00

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Some of the reports herein may contain data that has not been reviewed or edited. The data will have been reviewed or edited as of the date that a Tank Interpretive Report (TIR) is prepared and approved. The TIR for this tank was approved on February 2, 2000.

Tank: 241-AN-101

Sampling Events:
- 1AN-95-1
- 1AN-95-2
- 1AN-95-3
- 1AN-95-4
- 1AN-95-5
- 1AN-95-6
- 1AN-95-7
- 1AN-98-1
- 1AN-98-2
- 1AN-98-3

Reports:
- Analysis Methods and Procedures
- Analytical Results
- Best Basis Inventory Calculation Detail
- Best Basis Inventory Estimate for Nonradioactive Components
- Best Basis Inventory Estimate for Radioactive Components
- Core Profiles
- Data Source Reference List
- Description of Tank
- Dilution and Mixing Studies
- IH Sniff Data
- Major Transfers
- Means and Confidence Intervals
- Riser Configuration for Tank
- Sample Breakdown Diagrams
- Tank Interpretive Report
- Tank Plan View
- Tank Profile View
- Tank Sample Analysis Summary
- Tank Subsampling Scheme and Sample Description
- Tank Surface Level
- Tank Temperature Profile
- Vapor Data

Constituent Groups:
- Anions
- Inorganics
- Metals/Nonmetals
- Organics
- PCBs
- Physical Properties
- Radionuclides

Organics
PCBs
Physical Properties
Radionuclides

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Data Dictionary to Reports in this Document

Report	Field	Description
Tank Interpretive Report		Interprets information about the tank answering a series of six questions covering areas such as information drivers, tank history, tank comparisons, disposal implications, data quality and quantity, and unique aspects of the tank.
Description of Tank		Provides an executive summary of information about the tank including tank description, tank status, sampling dates, and service status.
Tank Profile View		A cross sectional view of the tank showing basic dimensions, components and riser penetrations. The level of waste in the tank is also represented.
Tank Plan View		Shows a plan view of the riser locations and piping.
Riser Configuration for Tank		Shows riser numbers, diameters, and a description of the risers.
Best Basis Inventory Estimate for Nonradioactive Components		Contains best basis constituent inventory estimates for non-radioactive contents of the Hanford waste tanks.
	Analyte	The name of the constituent used for reporting purposes.
	Total Inventory	Best Basis Inventory estimate, reported in kg.
	Basis	The basis for the inventory value.
	Comment	Further information to clarify the information in the table.
Best Basis Inventory Estimate for Radioactive Components		Contains best basis constituent inventory estimates for radioactive contents of the Hanford waste tanks.
	Analyte	The name of the constituent used for reporting purposes.
	Total Inventory	Best Basis Inventory estimate, reported in Ci.
	Basis	The basis for the inventory value.
	Comment	Further information to clarify the information in the table.
Best Basis Inventory Calculation Detail		This report contains the detailed calculations showing the actual concentration, density, volume, and unit adjustment values used to derive inventory values by analyte by phase.
	Analyte	Standard best-basis analyte expressed as chemical symbol (reported without charge designation per the best-basis inventory convention).
	Waste Phase/Type	Waste Phase is the phase of waste to which the concentration data is applicable (e.g., supernatant, saltcake, sludge, liquid, solid, etc.). The Waste Type is the waste type as defined in HDW Rev. 4 or as defined by "templates" (e.g., SMMA1, SMMT1, etc.).
	Inventory	Tank inventory value reported in standard units (kg or Ci).
	Basis	Indicates the basis for the best-basis inventory concentration data. (S - Sample-based, M - Model-based, C - Calculated, E - Engineering assessment-based)

Data Dictionary to Reports in this Document

Report	Field	Description
	Formula	The mathematical expression for the calculation used in deriving inventories.
	Calculation	Detailed calculation showing the actual concentration, density, volume, and unit adjustment values used to derive the corresponding inventory value.
Tank Sample Analysis Summary		A table identifying samples, sample number, sample portion and analysis method by core number (if applicable) and the riser number from which the sample was taken.
	Riser	Fixed Sample Space Identifier. This identifier uniquely identifies a sample space for a given waste site.
	Sample Identification	Identification number of a sampling event collected from a waste site. For cores, a core number, for supernate samples, a supernate sample number, and for surface samples, a surface sample number is provided.
	Sample Number	Internal lab identifier assigned by the lab that analyzed the sample.
	Sample Portion	Description of the portion of the original tank sample represented by the current sample.
	Analyses	Analyses performed on the particular sample.
Analysis Methods and Procedures		Lists procedure numbers and applicable analyses. Optionally displays appropriate analytes for each analyses.
	Analyte	The name of the constituent used for reporting purposes.
	Method	Name assigned to the general group of laboratory analytical methods to which the current method belongs.
	Procedure	Laboratory procedure identifier.
Tank Subsampling Scheme and Sample Description		Contains information on samples taken in a sampling event including sample identification, sample weight, percent of sample recovery and sample physical appearance.
	Riser	Fixed Sample Space Identifier. This identifier uniquely identifies a sample space for a given waste site.
	Sample Identification	Identification number of a sampling event collected from a waste site. For cores, a core number, for supernate samples, a supernate sample number, and for surface samples, a surface sample number is provided.
	Weight	Mass of the sample in grams.
	Sample Recovery	Percentage of the expected sample size that was recovered during removal from the tank.
	Sample Portion	Description of the portion of the original tank sample represented by the current sample.
	Sample Characteristics	Description of the physical appearance of the sample.
Sample Breakdown Diagrams		Sample Breakdown Diagrams show the pedigree for each of the sample vials drawn from a tank waste material source, such as core sample, auger sample, or grab sample.

Data Dictionary to Reports in this Document

Report	Field	Description
Analytical Results		Contains results (primary/ duplicate/ triplicate/ average) of laboratory measurement of rheological properties of waste site samples. Grouped by analyte and procedure.
	Sample Number	Internal lab identifier assigned by the lab that analyzed the sample.
	Sample Location	Location from which sample was taken. Could be core and segment or riser identification depending on the sampling type.
	Sample Portion	Description of the portion of the original tank sample represented by the current sample.
	Result	Primary result of the analysis of the sample.
	Duplicate	Duplicate result of the analysis of the sample.
	Triplicate	Triplicate result of the analysis of the sample.
	Average	Average of the primary, duplicate, and triplicate results.
Means and Confidence Intervals		Contains statistical analysis data for tank content including means and variances.
	Analyte	The name of the constituent used for reporting purposes.
	Method	Name assigned to the general group of laboratory analytical methods to which the current method belongs.
	Mean	Average of the primary, duplicate, and triplicate results.
	df	Degrees of freedom
	LL	Lower 95% limit
	UL	Upper 95% limit
	Units	Measurement units
Vapor Data		Contains tank headspace characterization data obtained after 1992. Data are averaged analytical reported results from replicate samples, excluding suspect data. Samples were collected from the central regions of the headspaces.
	Reference Temperature	Temperature for which mass per unit volume concentration results have been converted. Units are degrees Celcius.
	Sample Job Number	Reference number of sampling job assigned by sample collecting organization. This number is the first 5 characters of the Sample Id.
	Compound	The name of the constituent used for reporting purposes.
	Lab Code	Acronym of laboratory performing analyses.
	Sample Device	Description of the type of container used to collect a sample (a sample is defined as a discrete quantity of material collected for analysis).
	Sampling Method	Description of the type of general method used to collect a sample (a sample is defined as a discrete quantity of material collected for analysis).

Data Dictionary to Reports in this Document

Report	Field	Description
	Average Result	Arithmetic mean of all non-zero results for an identified constituent excluding suspect data. The average result is specific for the tank, sample event, sample device, and analytical laboratory.
	Standard Deviation	Standard deviation of all non-suspect results for identified constituent.
	Flag	Single-letter flags that indicate noteworthy aspects of sample result. See table at end of this report for vapor qualifier definitions.
	Number of Samples	Number of sample results used in "Average Result".
	CAS Number	Chemical Abstract Services (CAS) number or appropriate code that uniquely identifies a chemical.
Major Transfers		Waste Transfers summarizes the waste transfer history of the tank after January 1, 1994.
	Transfer Source	The description of the source of the waste that was transferred.
	Transfer Destination	The description of the destination of the waste that wast transferred.
	Waste Type	The description of the type of waste that was transferred.
	Time Period	The time over which the waste transfer occurred.
	Estimated Waste Volume (kL)	The estimated volume of waste transferred in kL.
	Estimated Waste Volume (kgal)	The estimated volume of waste transferred in kgal.
IH Sniff Data		Contains industrial hygiene field monitoring results for in-tank measurements.
	Measurement	Type of measurement reported.
	Result Value	Estimated or quantified concentration of a chemical.
	Units	Measurement units
	Analysis Method	Primary instrumentation used to analyze a sample. Includes Combustible Gas Meter (CGM) and Organic Vapor Monitor (OVM).
HTCE Surface Level		Surface level information as reported in the 1996 Historical Tank Contents Estimate (HTCE) report.
Tank Surface Level		Contains history of current tank waste surface level plot by year and month.
Tank Temperature Profile		Contains history of and current tank maximum temperature by year and month. Please note that tank temperature is not necessarily the same as waste temperature.
Core Profiles		Core Profiles are graphical depictions of physical properties of each segment of a core of tank waste.

Data Dictionary to Reports in this Document

Report	Field	Description
Data Source Reference List		Lists the documents found in the Data Source Access (DSA) database which are appropriate for this tank. Provides hyperlinks to both the DSA metadata and to the electronic documents themselves.
Dilution and Mixing Studies		Lists the Dilution and Mixing Studies documents found in the Data Source Access (DSA) database which are appropriate for this tank. Provides hyperlinks to both the DSA metadata and to the electronic documents themselves.

Tank Interpretive Report For 241-AN-101

Tank Information Drivers

Question 1: What are the information drivers applicable to this tank? What type of information does each driver require from this tank? (Examples of drivers are Data Quality Objectives, Mid-Level Disposal Logic, RPP Operation and Utilization Plan, test plans and Letters of Instruction.) To what extent have the information and data required in the driving document been satisfied to date by the analytical and interpretive work done on this tank?

The information drivers for tank 241-AN-101 are *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue* (Bauer and Jackson 1998), *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995), *Data Quality Objectives for the Waste Compatibility Program* (Carothers 1994 and Mulkey and Miller 1997), *Tank Farm Waste Transfer Compatibility Program* (Sutey 1994), and *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue* (Meacham et al. 1997). *Data Requirements for TWRS Privatization Characterization of Low Potential Low Activity Waste Feed* (Jones and Wiemers 1996) was listed in Brown et al. (1997) as applicable to tank 241-AN-101, but the requirement has since been removed (Brown et al. (1998) and Adams et al. 1999). The tank is scheduled to function as a staging tank for waste being transferred to the vitrification process during Phase I operations (Kirkbride et al. 1999).

Flammable Gas DQO: Does a possibility exist for releasing flammable gases into the headspace of the tank or releasing chemical or radioactive materials into the environment?

The requirements to support the flammable gas issue are documented in *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue* (Bauer and Jackson 1998). The Flammable Gas Data Quality Objective (DQO) has been extended to apply to all tanks. In response to this DQO, all tanks are measured for flammable gas. High priority tanks are being sampled for retained gas, using a special sampler, and are undergoing analysis of headspace gases. Lower priority tanks, such as tank 241-AN-101, are monitored by Standard Hydrogen Monitoring System (SHMS) and are sampled for headspace gases prior to and during intrusive activities such as sampling. Analyses and evaluations will change according to program needs until this issue is resolved. Final resolution of the flammable gas issue is expected to be completed by September 30, 2001 (Johnson 1997).

In June 1997, a SHMS was installed in tank 241-AN-101 to continuously monitor the tank and collect vapor-phase data to support resolution of flammable gas issues. Tank 241-AN-101 has experienced at least one hydrogen gas release event (GRE), based on SHMS data (McCain 1999). The maximum concentration of hydrogen released was 330 ppm on May 11, 1998. This is below the action level of 6,250 ppm of hydrogen specified in the *Tank Waste Remediation System Basis for Interim Operation*, (LMHC 1999c).

Standard Hydrogen Monitoring System verification grab sample data are available in the TCD database (LMHC 1999b). All samples from tank 241-AN-101 are well below 25 percent of the Lower Flammability Limit (LFL).

As with all 177 high-level waste tanks at Hanford, the possibility exists in tank 241-AN-101 for releasing flammable gases into the headspace of the tank. The amounts and rates of release, however, are well within the safety limits.

Safety Screening DQO: Does the waste pose or contribute to any recognized potential safety problems?

Tank Safety Screening Data Quality Objective (Dukelow et al. 1995) identifies the criteria needed to screen the waste in tank 241-AN-101 for potential safety problems. These potential safety problems are exothermic conditions in the waste, flammable gases in the waste and/or tank headspace, and criticality conditions in the waste. Tank 241-AN-101 was grab sampled from riser 22A on August 31, 1995 (Jones 1995). Grab samples were collected on December 12, 1995 from riser 15B (Benar 1995). In order to fulfill the requirements of the safety screening DQO, archived samples from the August 31, 1995 event were used to perform the total alpha analysis (Benar and Amato 1996).

As requested in the tank *241-AN-101 Grab Sampling and Analysis Plan* (Benar 1995), headspace vapor measurements were taken before obtaining the grab samples in 1995. The combustible gas meter indicated flammable gas levels of 0 percent of the LFL as measured in the tank domespace below riser 22A. As requested in *Compatibility Grab Sampling and Analysis Plan for Fiscal Year 1998* (Sasaki 1998), headspace vapor measurements were taken before obtaining the grab samples in 1998. The combustible gas meter showed a flammable gas reading of 0 percent of the LFL in the tank domespace below riser 15B (LMHC 1998). Combustibility measurements for both the 1995 and the 1998 sampling efforts were well below the action level of 25 percent of the LFL.

The differential scanning calorimetry (DSC) results from the 1995 and 1998 grab sampling events exhibited no exotherms. No confidence intervals were calculated for the DSC results from these two sampling events. These results suggest that energetics are not a concern for this tank. Note that DSC results with no exotherms do not appear in the "Analytical Results" Standard Report.

The threshold limit for criticality screening is 1 g/L of plutonium (Dukelow et al. 1995). Assuming that all alpha activity is from ^{239}Pu, and, using the maximum sample specific gravity of 1.27, 1 g/L of ^{239}Pu is equivalent to 61.5 μCi/mL of alpha activity for the liquid (Benar 1995). Total alpha activity analyses were performed on the 1995 grab samples only. The 1998 grab samples were not analyzed in accordance with the safety screening DQO. Concentrations in all samples were below the detection limit for the particular sample (Esch 1996), and well below the safety screening notification limit as listed in Benar (1995). The maximum value was 0.0022 μCi/mL, for sample number S95T003915. The detection limit for sample number S95T003915 was 0.00241 μCi/mL. Since all results were less than the detection limit, upper limits to a one-sided 95 percent confidence interval on the mean were not calculated. The data suggest that criticality is not a concern with the waste in tank 241-AN-101.

Compatibility DQO: Will safety problems be created as a result of mixing waste in interim storage? Do operations issues exist which should be addressed before waste is transferred?

Tank 241-AN-101 was grab sampled in accordance with the requirements of Le (1995), Carothers (1994), and Sutey (1994). Samples 1AN-95-1, 1AN-95-2, and 1AN-95-3 were obtained from riser 22A on August 31, 1995. The tank was sampled for compatibility to support waste transfers and evaporator operations in the 200 East and 200 West areas. The analytical results were assessed for waste transfer to tank 241-AP-105 in Blaak (1996). The transfer was recommended to take place, and 968 kgal (3660 kL) was transferred to tank 241-AP-105 on August 16, 1996.

The tank again was grab sampled in 1998, in accordance with the requirements of Sasaki (1998), and Mulkey and Miller (1997). Samples 1AN-98-1, 1AN-98-2, and 1AN-98-3 were obtained from riser 16 on April 8, 1998. In addition to the requirements of the compatibility data quality objective and the sampling and analysis plan, analyses for ammonia were performed in accordance with Hall (1997). No compatibility assessment was performed on the basis of the 1998 grab samples, and no transfers have taken place as of December 31, 1999. The samples were scheduled to be used for the transfer of waste from single-shell tank saltwells into tank 241-AN-101, but the transfers were not performed. The transfers could still be performed in the future. Table 1-1 lists the compatibility issues, the program requirements for those issues, and the analytical results from the 1995 grab sampling event (Esch 1996).

Table 1-1. Waste Compatibility Data Quality Objective Criteria

Issue	Program Requirement[1]	Analytical Result[2]
Criticality	Pu < 0.001 g/L	9.71E-07 g/L[3]
Flammable gas accumulation	SpG < 1.3 or commingled waste <1.41	1.23
Energetics	Exotherm/endotherm ratio < 1	0 (no exotherms)
	no separable organic phase	no separable organics
TRU segregation	TRU < 100 nCi/g	0.0904 nCi/g (sum of $^{239/240}Pu$ and ^{241}Am)
Corrosion control	If $NO_3 < 1.0$ M: then $0.01 M < OH < 8.0 M$ and $0.011 M \leq NO_2 \leq 5.5 M$ If $1.0 NO_3 \leq 3.0$ M: then $0.1 \times NO_3 \leq OH < 10 M$ and $OH + NO_2 \geq 0.4 \times NO_3$ For $NO_3 > 3.0$ M: then $0.3 M \leq OH < 10 M$ and $OH + NO_2 \geq 1.2 M$ and $NO_3 \leq 5.5 M$	OH = 1.85 M NO_2 = 1.05 M NO_3 = 1.57 M
Phosphate waste	If $PO_4 < 0.1$ M, then do not mix with high salt (Na > 8.0 M) waste	0.0223 M PO_4

Notes:

[1]Mulkey and Miller (1997)
[2]"Means and Confidence Intervals" Standard Report
[3]Assumes all $^{239/240}Pu$ is ^{239}Pu and uses a specific gravity of 0.0615 Ci/g.

Organic Solvent Safety Issue DQO: Does an organic solvent pool exist that may cause a fire or ignition of organic solvents in entrained waste solids?

The data required to support the organic solvent screening issue are documented in the *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue* (Meacham et al. 1997). The DQO requires tank headspace samples be analyzed for total nonmethane organic compounds. The purpose of this assessment is to ensure that an organic solvent pool fire or ignition of organic solvent cannot occur.

No vapor samples have been taken from tank 241-AN-101 to estimate the organic pool size. However, the organic program has determined that even if an organic solvent pool does exist, the consequence of a fire or ignition of organic solvents is below risk evaluation guidelines for all tanks (Brown et al. 1998). In addition, tank 241-AN-101 contains no solids to entrain solvents. The organic solvent issue was closed in December 1998 (Owendoff 1998).

Heat Load Estimate:

A factor in assessing tank safety is the heat generation and temperature of the waste. Heat is generated in the tanks from radioactive decay. The heat load estimate based on the process history was 2,110 W (7,200 Btu/hr) (Agnew et al. 1997). The heat load estimate derived from the tank radionuclide content was 2,340 W (8,000 Btu/hr) (Kummerer 1995). The heat load estimated from the best-basis inventory is 250 W (854 Btu/hr), as shown in Table 1-2. Cesium-137 is the major contributor to the tank heat load. Other radioactive species are present in the tank waste, but they exhibit activities which contribute less than about 2 percent of the heat contributed by cesium-137.

All of the heat load estimates are below the 20,500 W (70,000 Btu/hr) operating specification limit for double-shell tanks (Fowler 1999).

Table 1-2. Heat Load Estimate Based on the Best-Basis Inventory.

Radionuclide	Waste Inventory[1] (Ci)	Decay Heat Rate (W/Ci)	Heat Load (W)
^{137}Cs	53,000	0.00472	250
Total			250

Note:
[1]See "Best-Basis Inventory Estimate (Radioactive Components)" Standard Report.

Tank History

Question 2: What is known about the history of this tank as it relates to waste behavior?

The seven double-shell tanks that comprise the 241-AN Tank Farm were constructed during 1980 and 1981 in the 200 East Area. These tanks each have a capacity of 4,391 kL (1,160 kgal) and are 22.9 m (75 ft) in diameter. They were designed to hold boiling waste with a maximum design temperature of 177 °C (350 °F) (Brevick et al. 1997). There is not a cascade system between tanks for the 241-AN Tank Farm, like all double-shell tanks. Tank 241-AN-101 is constructed with a reinforced concrete shell with primary and secondary carbon steel liners. The tank has 22 risers that allow access to the tank and 37 risers that allow access to the annulus. Additional tank descriptive material is provided in the "Tank Plan View," "Tank Profile View," and "Riser Configuration Table" Standard Reports.

Tank 241-AN-101 went into service in September 1981 by first receiving Plutonium Uranium Extraction (PUREX) low-level waste. Water was added to the tank from the fourth quarter of 1981 until the second quarter of 1982. From the third quarter of 1982 until the second quarter of 1985, tank 241-AN-101 received additional low-level waste from PUREX. From the second quarter of 1983, until the first quarter of 1992, the tank received dilute, noncomplexed waste from tanks in the A, AX, B, BX, BY, C, S, T, TX, and U tank farms. From the fourth quarter of 1983 until the fourth quarter of 1988, the tank transferred waste to tank 241-AW-102 for further use as feed for the 242-A Evaporator. The tank received unknown waste from tanks 241-AY-102, 241-AW-105, and 241-AN-103 during 1984. The tank also transferred noncomplexed waste to tanks 241-AN-102, 241-AZ-102, 241-AW-101, and 241-AN-103. During 1984, the tank received additional low-level waste from B Plant. During the second quarter of 1985, the tank received low-level waste from PUREX. In the second quarter of 1985, the tank received concentrated phosphate waste from N Reactor, and in the second quarter of 1987, received waste from tank 241-AW-102. The tank received dilute noncomplexed waste from saltwell pumping of single-shell tanks until the final transfer of saltwell liquid in October, 1995. The tank also transferred 969 kgal of dilute noncomplexed waste to tank 241-AP-105 in August, 1996. The tank continued to receive small transfers of flush water from miscellaneous sources until the second quarter of 1998.

Tank 241-AN-101 contains an estimated 606 kL (160 kgal) of dilute noncomplexed waste, all of which is supernatant. The total waste volume was derived from surface level measurements (LMHC 1999a). The tank is listed as sound and is actively ventilated. The tank is not on the Watch List (Public Law 101-510 1990). Tank 241-AN-101 is currently scheduled to act as a staging tank for Phase I of privatization (Kirkbride et al. 1999).

Tank Comparisons

Question 3: What other tanks have similar waste types and waste behaviors, and how does knowledge of the similar tanks contribute to the understanding of this tank?

The waste in tank 241-AN-101 is classified as dilute noncomplexed (Hanlon 1999), as is the waste in several other double-shell tanks such as 241-AP-103, 241-AP-104, 241-AP-106, 241-AP-107, and other tanks in the AW and AY tank farms. The waste presently in the tank originated mostly in the saltwell of single-shell tanks. Much of the

waste in the tank was transferred to tank 241-AP-105 in August 1996. That waste was subsequently transferred to tank 241-AW-102 and then processed through the 242-A Evaporator. There are no special issues associated with the tank or its waste. The tank is not on a Watch List. As shown by the sample results from the 1995 and 1998 grab sampling events, the waste contains low levels of organic fuels and fissile material. The heat load caused by the decay of radionuclides is low.

Disposal Implications

Question 4: Given what is known about the waste properties and waste behaviors in this tank, what are the implications of the waste properties and behaviors to the waste retrieval/processing methodologies and equipment selection?

Given what is known about the waste types and behaviors in tank 241-AN-101, the following items should be considered with regard to waste retrieval.

There should be little difficulty encountered during the retrieval of the waste from tank 241-AN-101. The presence of organic vapors in tank 241-AN-101 is considered small, the total alpha activity was less than the detection limit, and the waste contains low levels of organic fuels.

One issue that remains to be resolved is the presence of a sludge or saltcake component in the tank waste. A sludge weight measurement was performed in August 1988 which showed the existence of a layer of solids 12 inches thick, and was subsequently reported in Hanlon (1999). A subsequent examination of the tank process history cast doubt on the measurement, and it is now believed that it was in error. Grab samples taken in 1995 and in 1998 were all clear, yellow, liquid, with no suspended solids. A possible source of the error is an incorrect elevation noted for the riser through which the measurement was taken. The layer was reported to be exactly 12 inches thick. It is possible that an error of exactly one foot was made during the measurement or during the calculations of the results. It is recommended that the sludge measurement be repeated, with particular attention paid to the riser elevation.

Scientists Assessment of Data Quality and Quantity

Question 5: Given the current state of understanding of the waste in this tank on the one hand and the information drivers on the other; should additional tank data be sought via sampling/analysis from a strictly technical point-of-view? Can the waste behavior in this tank be adequately understood by other means (eg. archive samples, tank grouping studies, modeling) without additional sampling and analysis? If so, what characteristics of the tank waste lend themselves to a non-sample alternative? Is the quality of the data from this tank adequate from a field sampling and analytical laboratory point-of-view? Are there any clarifications or explanations needed for the data tables and figures?

Sampling and Analysis

The following information drivers have been addressed for this tank and accepted by the Project Hanford Management Contract River Protection Project (RPP): *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue* (Bauer and Jackson 1998), *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995), *Data Quality Objectives for the Waste Compatibility Program* (Carothers 1994 and Mulkey and Miller 1997), *Tank Farm Waste Transfer Compatibility Program* (Sutey 1994), and *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue* (Meacham et al. 1997). No additional sampling or analyses are necessary to satisfy current safety issue requirements for this tank. The tank is an active receiver of waste from many sources, primarily saltwell pumping of single-shell tanks undergoing interim stabilization. As such, it is not a good candidate for modeling or grouping studies.

Data Quality

Samples obtained in the grab sampling events were collected and analyzed in accordance with approved and recognized sampling and laboratory procedures as requested in Benar (1995), Le (1995), and Sasaki (1998). The laboratory procedures for the grab sample analysis can be found in the Standard Report "Analytical Methods and Procedures." Quality Control (QC) parameters assessed in conjunction with tank 241-AN-101 samples included standard recoveries, spike recoveries, duplicate analyses, and blanks. Appropriate QC footnotes were applied to data outside QC parameter limits. Quality control limits and parameters may be found in the "QC Limits" Standard Report. Analytical results and data quality are discussed in Esch (1996) and in Fuller (1998).

The vast majority of QC results were within the boundaries specified in the sampling and analysis plans. Small discrepancies noted in the analytical reports and footnoted in the "Analytical Results" Standard Report should not impact the data validity or use. A brief discussion of the QC results is provided below

Few data anomalies were observed among the 1995 and 1998 grab sample data. The pH measurement is not reliable at levels greater than about 12.5 because the highest calibration pH buffer is 12.5, and because the pH electrode performance degrades at high pH. The narrative in the data package for the 1995 grab samples (Esch 1996) stated that analyses for chloride and fluoride for sample 1AN-95-2 exhibited high RPD values. The data summary and the data in the package both showed RPDs within limits. The inductively coupled plasma (ICP) analysis of sample S98T001362 (a subsample of 1AN-98-1) exhibited high spike recovery values for sodium. This was caused by high sodium levels in the sample that overpowered the pre-digestion spike. A post-digestion spike was added which yielded a 101.9 percent recovery. Additionally, a five-fold serial dilution of the sample was analyzed, with a small (1.54 percent) RPD with the undiluted sample results.

Unique Aspects of the Tank

Question 6: What are unique chemical, physical, historical, operational or other characteristics of this tank or its contents?

There are no exceptional unique chemical, physical, historical, operational or other characteristics of tank 241-AN-101. The liquid waste in this tank are relatively well defined and understood, and can be found in a number of other tanks. No photographs or videos of the tank interior are available.

Best-Basis Inventory Derivation

Question 7: What is the source data used to derive this tank's Best-Basis inventories by mass (kg) and activity (Ci) for the standard list of 25 chemicals and 46 radionuclides?

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 best-basis inventories provide waste composition data necessary as part of the 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 inventories for certain tanks are changing as the result of waste being transferred into or out of the tanks. The process of updating the inventories for these tanks is being performed on a quarterly basis. Since new sample data were recently made available for double-shell tank 241-AN-101, a re-evaluation of the best-basis inventories was performed and is documented in the following text. The following information was used in this evaluation:

- Statistical means based on the tank 241-AN-101 1993 and 1998 grab samples (see "Means and Confidence Intervals" Standard Report).

- Process knowledge of tank 241-AN-101 and the tanks which contributed the major portion of the waste presently in the tank.

- The Hanford Defined Waste (HDW) model document (Agnew et al. 1997) which provides tank content estimates in terms of component concentrations and inventories.

Table 7-1 represents how the available data are used to derive best-basis inventories for tank 241-AN-101.

Table 7-1. Tank 241-AN-101 Best-Basis Inventory Source Data.

Waste Phase	Waste Type	Applicable Concentration Data	Associated Density	Associated BBI Volume[1]
Supernatant	Dilute non complexed	1993 grab samples	1.23	606 kL (160 kgal)
		1998 grab samples	1.16	
		HDW	1.2506	
		Process knowledge	1	
Total tank				606 kL (160 kgal)

Notes:
[1]LMHC (1999a)

Two sample-based concentration vectors were available for the Best Basis inventory. The remaining two vectors were model-based; one vector was taken from the HDW, and the other was an engineered model using the process knowledge of the tank. The specific gravity values associated with the sample-based vectors were sample means from the "Means and Variances Standard Report."

The current overall tank volume, 606 kL (160 kgal), is in agreement with surveillance information (see "Tank Surface Level" Standard Report). The HDW Model total tank volume, 2,800 kL (740 kgal), differs from the current tank volume because of transfers, evaporation, equipment adjustments, etc.

All calculations were performed using the Best-Basis Inventory Maintenance Tool. Updated Best-Basis inventory values for tank 241-AN-101 are shown in the "Best-Basis Inventory (Non-Radionuclides)" and "Best Basis Inventory (Radionuclides)" Standard Reports. The data hierarchy is: 1998 grab sample means, 1993 grab sample means, and process knowledge. The 1993 grabs were chosen over the 1995 grab samples because they were more complete. The process knowledge vector was developed to provide concentrations for analytes which were either not presented in the 1993 or 1998 grab sample data, or which exhibited concentrations that were not consistent with chemical principles or with known Hanford processes. The analytical means from each of the sampling events and from the HDW were adjusted to account for the transfers into the tank. The multiplication factors take into account the weight percent water, specific gravity, and the dilution from the added liquid. The factors can be found in the "Calculation Detail" Standard Report.

Discussions of unique data treatments are provided below by analyte.

Bismuth and Lanthanum. The concentrations of bismuth and lanthanum are listed as '0 μg/mL' because of their very high insolubility. It is highly unlikely that they would appear in a tank that contains dilute supernatant waste, such as that in tank 241-AN-101.

Mercury. The concentration of mercury is listed as '0 μg/mL' because of the high improbability of its presence in this tank waste (Simpson 1998).

Total Hydroxide. Once the best-basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valences of other analytes. This charge balance approach is consistent with that used by Agnew et al. (1997).

Reference List

Adams, M. R., J. W. Hunt, and J. A. Johnston, 1999, *Fiscal Year 2000 Tank Characterization Technical Sampling Basis and Waste Information Requirements Document,* HNF-4048, Rev. 0, Lockheed Martin Hanford Corp., Richland, Washington.

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. FitzPatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, LA-UR-96-3860, Los Alamos National Laboratory, Los Alamos, New Mexico.

Bauer, R. E. and L. P. Jackson, 1998, *Data Quality Objective to Support Resolution of the Flammable Gas Safety Issue*, HNF-SD-WM-DQO-004, Rev. 3A, Duke Engineering and Services Hanford, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

Benar, C. J., 1995, *Tank 241-AN-101 Grab Sampling and Analysis Plan,* WHC-SD-WM-TSAP-064, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Benar, C. J. and L. C. Amato, 1996, *Tank Characterization Report for Double-Shell Tank 241-AN-101,* WHC-SD-WM-ER-578, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Blaak, T. M., 1996, *242-A Evaporator Campaign 97-1 Waste Compatibility Assessment for Staging Tank 241-AN-101 Waste in Tank 241-AP-105,* (internal memorandum to G. N. Hanson, dated April 10, 1996), Lockheed Martin Hanford Corporation, Richland, Washington.

Brevick, C. H., J. L. Stroup, and J. W. Funk, 1997, *Supporting Document for the Historical Tank Content Estimate for the AN Tank Farm*, WHC-SD-WM-ER-314, Rev. 1, Fluor Daniel Northwest, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

Brown, T. M., J. W. Hunt, and L. J. Fergestrom, 1997, *Tank Characterization Technical Sampling Basis*, HNF-SD-WM-TA-164, Rev. 3, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Brown, T. M., J. W. Hunt, and L. J. Fergestrom, 1998, *Tank Characterization Technical Sampling Basis*, HNF-SD-WM-TA-164, Rev. 4, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Carothers, K. G., 1994, *Data Quality Objectives for the Waste Compatibility Program,* WHC-SD-WM-DQO-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Dukelow, G. T., J. W. Hunt, H. Babad, and J. E. Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Esch, R. A., 1996, *Revised Final Report for Tank 241-AN-101, Grab Samples 1AN-95-1 Through 1AN-95-7,* WHC-SD-WM-DP-148, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Fowler, K. D., 1999, *Tank Farm Waste Transfer Compatibility Program*, HNF-SD-WM-OCD-015, Rev. 2, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Fuller, R. K., 1998, *Tank 241-AN-101, Grab Samples, 1AN-98-1, 1AN-98-2, and 1AN-98-3 Analytical Results for the Final Report,* HNF-1640, Rev. 0, Waste Management Hanford, Inc., Richland, Washington.

Hall, K. M., 1997, *Scope Increase for All Liquid Samples Taken from Single-Shell or Receiver Tanks,* (internal memorandum 74620-97-197 to J. W. Hunt, May 19), Lockheed Martin Hanford Corp., Richland, Washington.

Hanlon, B. M., 1999, *Waste Tank Summary Report for Month Ending August 31, 1999*, HNF-EP-0182-137, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Johnson, G. D., 1997, *Strategy for Resolution of the Flammable Gas Safety Issue*, HNF-SD-WM-ER-680, Rev. 0, Duke Engineering and Services Hanford, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

Jones, J. M., 1995, *Compatibility and Grab Sampling Analysis Plan,* WHC-SD-WM-TSAP-037, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Jones, T. E., and K. D. Wiemers, 1996, *Data Requirements for TWRS Privatization Characterization of Low Potential Low Activity Waste Feed,* WHC-SD-WM-DQO-023, Rev. 0 Westinghouse Hanford Company, Richland, Washington.

Kirkbride, R. A., G. K. Allen, R. M. Orme, R. S. Wittman, J. H. Baldwin, T. W. Crawford, J. Jo, L. J. Fergerstrom, T. M. Hohl, D. L. Penwell, *Tank Waste Remediation System Operation and Utilization Plan,* HNF-SD-WM-SP-012, Rev. , Numatec Hanford Corp., Richland, Washington.

Kummerer, M. 1995, *Heat Removal Characteristics of Waste Storage Tanks*, WHC-SD-WM-SARR-010, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Le, E. Q., 1995, *Compatibility Grab Sampling and Analysis Plan,* WHC-SD-WM-TSAP-037, Rev. 1A, Westinghouse Hanford Company, Richland, Washington.

LMHC, 1998, *241-AN-101: Obtain Grab Samples,* Work Package ES-98-00030, Rev. 0, Lockheed Martin Hanford Corp., Richland, Washington.

LMHC, 1999a, *Tank Transfers, Tank Characterization Database*, 10/01/99, Internet at http://twins.pnl.gov/data/datamenu.htm.

LMHC, 1999b, *SHMS Verification Grab Samples, Tank Characterization Database,* 7/19/99, Internet at http://twins.pnl.gov/data/datamenu.htm

LMHC, 1999c, *Tank Waste Remediation System Basis for Interim Operation*, HNF-SD-WM-BIO-001, Rev. 1, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

McCain, D. J., 1999, *Results of Vapor Space Monitoring of Flammable Gas Watch List Tanks,* HNF-SD-WM-TI-797. Rev. 0, Lockheed Martin Hanford Corp., Richland, Washington.

Meacham, J. E., D. L. Banning, M. R. Allen, and L. D. Muhlestein, 1997, *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue*, HNF-SD-WM-DQO-026, Rev. 0, DE&S Hanford, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

Mulkey, C. H., and M. S. Miller, 1997, *Data Quality Objectives for the Waste Compatibility Program,* HNF-SD-WM-DQO-001, Rev. 2, Lockheed Martin Hanford Corp., Richland, Washington.

Owendoff, J. M., 1998, *Approval to Close the Organic Complexant Safety Issue and Remove 18 Organic Compexant Tanks from the Watchlist,* (internal memorandum to J. Wagoner, December 9), U. S. Department of Energy, Washington, D. C.

Public Law 101-510, 1990, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137 of *National Defense Authorization Act for Fiscal Year 1991.*

Reynolds, D. A., W. L. Cowley, J. A. Lechelt, B. C. Simpson, C. DeFigh-Price, 1999, *Evaluation of Tank Data for Safety Screening,* HNF-4217, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington

Sasaki, L. M., 1998, *Compatibilty Grab Sampling and Analysis Plan for Fiscal Year 1998,* HNF-SD-WM-TSAP-150, Rev. 0B, Lockheed Martin Hanford Corp., Richland, Washington.

Simpson, B. C., 1998, *Best Basis Inventory Change Package for Reconciliation of Mercury Values, Change Package #7,* (internal memorandum 7A120-98-005 to J. W. Cammann, February 26), Lockheed Martin Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

Sutey, M. J., 1994, *Tank Farm Waste Compatibility Program,* WHC-SD-WM-OCD-015, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

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