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Name: B.C. Simpson

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7. Abstract

This document provides the characterization information and interprets the data for Double-Shell Tank AP-103

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Tank Characterization Report for Double-Shell Tank 241-AP-103

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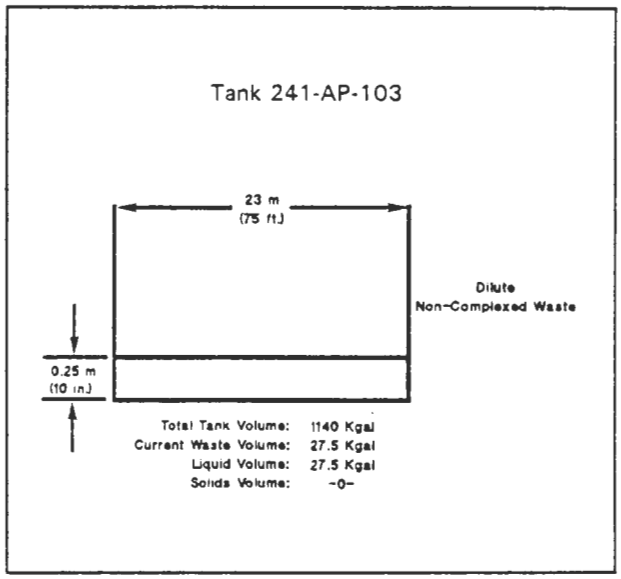
EXECUTIVE SUMMARY

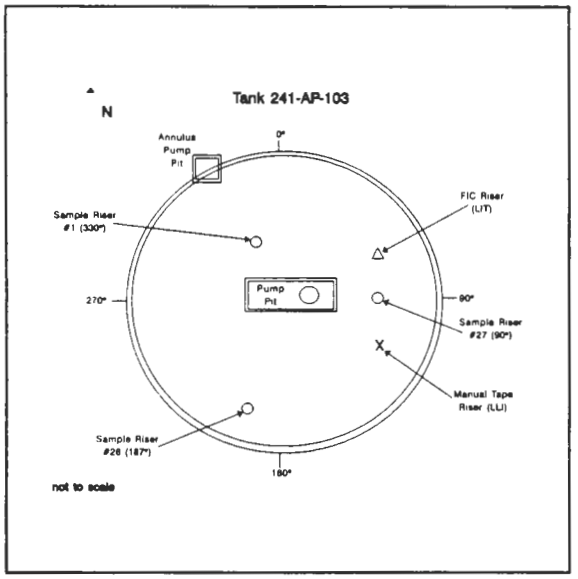
Double-Shell Tank 241-AP-103 is a radioactive waste tank most recently sampled in September, October, and November of 1991. Sampling and characterization of the waste in Tank 241-AP-103 contributes toward the fulfillment of Milestone M-44-05 of the *Hanford Federal Facility Agreement and Consent Order.* Characterization was also needed to evaluate the waste's fitness for safe processing through an evaporator as part of an overall waste volume reduction program.

Tank 241-AP-103, located in the 200 East Area AP Tank Farm, was constructed and went into service in 1986 as a dilute waste receiver tank; it has an operational capacity of 1,140,000 gallons. The waste in Tank 241-AP-103 was selected for concentration as part of the Evaporator 242-A Campaign 94-1. The volume reduction of the waste, designed to provide the maximum practicable decrease in water content, was projected to be 85-87%. Tank 241-AP-103 contained 1,131,000 gallons, 1,103,500 of which was input into the evaporator. This would result in a final waste volume from the evaporator of approximately 166,000 gallons. This evaporator product will be routed to Tank 241-AN-106 for storage.



The current residual volume of the waste in Tank 241-AP-103 is approximately 27,500 gallons. Characterization of the contents of Tank 241-AP-103 prior to the evaporator campaign provides inventory estimates to be used in the characterization of Tank 241-AN-106, the eventual destination for the concentrated evaporator product. The waste in Tank 241-AP-103 exists as an aqueous solution of metallic salts and radionuclides. The most prevalent soluble analytes include sodium, aluminum, fluoride, hydroxide, nitrate, nitrite, and ammonia. The major radionuclides present are ^{137}Cs, ^{90}Sr, and ^{3}H. Approximately 98.3% of the waste by weight is water. The calculated pH of 13.0 is above the *Resource Conservation and Recovery Act* established limits for corrosivity. Comparisons to established limits of concern for selected analytes can be made by referring to the *Tank Characterization Reference Guide* (De Lorenzo et al., 1994)

The results of the analyses have been compared to the dangerous waste codes in the Washington Dangerous Waste Regulations (WAC 173-303). This assessment was conducted by comparing tank analyses against dangerous waste characteristics ("D" waste codes) and against state waste codes. It did not include checking tank analyses against "U", "P", "F", or "K" waste codes since application of these codes is dependent on the source of the waste and not on particular constituent concentrations. The results indicate that the waste in this tank is adequately described in the Dangerous Waste Permit Application for the Double-Shell Tank System; this permit is discussed in the *Tank Characterization Reference Guide* (De Lorenzo, et al., 1994).



TANK 241-AP-103	
Tank Description	
Type:	Double-Shell
Constructed:	1986
In-Service:	1986
Diameter:	75 feet
Usable Depth:	35 feet
Operating Capacity:	1,140,000 gallons (4,315,000 L)
Bottom Shape:	Flat
Hanford Coordinates:	40.559° North 47.100° West
Ventilation:	Operating Exhauster
Tank Status: as of June 1994	
Contents:	Dilute Non-Complexed Waste
Total Waste:	27,500 gallons (104,000 L)
Supernate Volume:	27,500 gallons (104,000 L)
Drainable Interstitial Liquid:	-0- gallons
Manual Tape Surface Level:	9.75 inches (06/02/94)
FIC Surface Level:	10 inches (06/02/94)
Temperature:	58° Fahrenheit (05/31/94)
Integrity Category:	Sound

Double-Shell Tank 241-AP-103 Concentrations and Inventories for Critical List Analytes (as of June 1994)		
Total Tank Volume	1,140,000 gallons (4,315,000 L)	
Total Waste Volume	27,500 gallons (104,000 L) 104,000 kg	
Supernate Volume	27,500 gallons (104,000 L) 104,000 kg	
Physical Properties		
Specific Gravity	1.003	
H_2O	98.3 wt%	
Temperature	58°F (May 31, 1994)	
pH	13.0	
Heat Load	< 3.81 E-03 kW	
Chemical Constituents	**Average Concentration**	**Bulk Inventory**
Na (Sodium)	0.53 wt%	552 kg
Al (Aluminum)	0.025 wt%	25.6 kg
NO_3^- (Nitrate)	0.40 wt%	420 kg
OH^- (Hydroxide)	0.17 wt%	176 kg
SO_4^{2-} (Sulfate)	0.035 wt%	36.4 kg
PO_4^{3-} (Phosphate)	0.014 wt%	14.5 kg
Cl^- (Chloride)	0.005 wt%	5.15 kg
F^- (Fluoride)	0.013 wt%	13.4 kg
Total Organic Carbon	0.012 wt%	11.6 kg
Total Inorganic Carbon	0.051 wt %	53.5 kg
Radionuclides		
^{137}Cs	6,540 μCi/L	680 Ci
^{3}H	5.24 μCi/L	0.545 Ci
^{90}Sr	2.62 μCi/L	0.272 Ci
Total Plutonium	< 6.97E-03 μCi/L	< 7.25E-04 Ci
Total Uranium	3.69E-04 wt%	0.384 kg

Post-Evaporator Condition
(as of May 21, 1994)

Chemical Constituents	Feed Stream to AN-106*
Na (Sodium)	22,100 kg
Al (Aluminum)	1,020 kg
NO_3^- (Nitrate)	16,900 kg
OH^- (Hydroxide)	7,050 kg
SO_4^{2-} (Sulfate)	1,460 kg
PO_4^{3-} (Phosphate)	581 kg
F^- (Fluoride)	539 kg
Total Organic Carbon	480 kg
Total Inorganic Carbon	2,150 kg
Radionuclides	
^{137}Cs	27,300 Ci
^{3}H	21.9 Ci
^{90}Sr	10.9 Ci
Total Plutonium	< 0.0291 Ci
Total Uranium	15.4 kg

* Assuming an 85% volume reduction of the Tank 241-AP-103 waste sent to the evaporator.

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LIST OF TERMS

AAS	atomic absorption spectroscopy
AEA	alpha energy analysis
APC	alpha proportional counting
ASTM	American Society for Testing Materials
BPC	beta proportional counting
CFR	*Code of Federal Regulations*
CVAA	cold vapor atomic absorption
DM	direct measurement
DN	dilute non-complexed
DNFSB	Defense Nuclear Facilities Safety Board
DOE	United States Department of Energy
DQO	data quality objective
DSC	differential scanning calorimetry
EPA	United States Environmental Protection Agency
FIC	Food Instrument Corporation
GEA	gamma energy analysis
GHAA	gaseous hydride atomic absorption
IC	ion chromatography
ICP	inductively coupled plasma atomic emission spectrometry
KTN	Kjeldahl's Total Nitrogen
LSC	liquid scintillation counting
N/A	Not Applicable or Not Analyzed
ND	Not Detected
PUREX	Plutonium-Uranium Extraction Plant
RPD	relative percent difference
RSD	relative standard deviation
SpG	specific gravity
SVOA	semi-volatile organic analysis
TGA	thermogravimetric analysis
TIC	total inorganic carbon
TOC	total organic carbon
TWRS	Tank Waste Remediation System
VOA	volatile organic analysis
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

In September, October, and November of 1991, Double-Shell Tank 241-AP-103 was sampled in support of the 242-A Evaporator Feed Characterization Project to determine proper handling of the waste, to address corrosivity and compatibility issues, and to comply with requirements of the *Washington Administrative Code* (Ecology, 1991). This Tank Characterization Report presents an overview of that tank sampling and analysis effort, and contains observations regarding waste characteristics. It also addresses expected concentration and inventory data for the waste contents based on this latest sampling data and background tank information and provides post-evaporator product inventory estimates. Finally, this report makes recommendations regarding operational safety issues.

1.1 PURPOSE

The purpose of this report is to describe and characterize the waste in Double-Shell Tank 241-AP-103 based on information given from various sources. This report summarizes the available information regarding the waste in Tank 241-AP-103, and using the historical information to place the analytical data in context, arranges this information in a useful format for making management and technical decisions concerning this waste tank. In addition, conclusions and recommendations are given based on safety limits and further characterization needs.

Specific objectives reached by the sampling and characterization of the waste in Tank 241-AP-103 are:

- Contribute toward the fulfillment of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) Milestone M-44-05 concerning the characterization of the Hanford Site high-level radioactive waste tanks (Ecology, EPA & DOE; 1993).

- Complete safety screening of the contents of Tank 241-AP-103 to meet the characterization requirements of the *Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 93-5* (Conway, 1993).

- Provide tank waste characterization to the Tank Waste Remediation System (TWRS) Program Elements in accordance with the *TWRS Tank Waste Analysis Plan* (Bell, 1994).

1.2 SCOPE

A broad description of the tank and its historical background are presented first. This allows a detailed estimation of the contents of Tank 241-AP-103 based on historical process information and transaction records. Next, the results of the latest sampling and analysis effort are summarized and interpreted both qualitatively and statistically. The information obtained from historical sources is then compared with the most recent waste measurements to arrive at final waste inventory and concentration estimates. Finally, conclusions and recommendations are given based on the current waste inventory and tank status.

1.3 ASSUMPTIONS

The concentration and inventory estimates derived for this report are considered by the authors and by the Westinghouse Hanford Company Characterization Program to be the most accurate, defensible, technically valid, and contemporary data concerning Tank 241-AP-103. This Tank Characterization Report incorporates all available previous sampling, characterization, and transfer data concerning Tank 241-AP-103. In addition, estimates of the current tank contents based on process knowledge and waste transaction records provide important cross-checks and corroboration to the inventory estimates derived from recent analytical data. Given that the analytical data is valid and defensible, this report is the definitive characterization of the contents of Tank 241-AP-103.

The term "analytical results" is used in this report to denote sample results from the most recent sampling event. Characterization data from these samples are used for the analytical section of this report, Section 5.0. The historical characterization of this tank, Section 2.4, is based on the available "historical results" prior to the 1993 sampling.

1.4 EVAPORATOR 242-A CAMPAIGN 94-1

In May, 1994, 550,000 gallons of waste from Tank 241-AP-103 were transferred to Tank 241-AW-102 in preparation for concentration in the 242-A Evaporator. On May 21, the second and last waste transfer to Tank 241-AW-102 was completed, leaving a final volume of 27,500 gallons in Tank 241-AP-103. The volume reduction of the waste, designed to provide the maximum practicable decrease in water content, is projected to be 85-87% (Le, 1994). Given the 1,103,500 gallon input, this would result in a final waste volume from the evaporator of approximately 166,000 gallons. The disposition of this product stream will be routed to Tank 241-AN-106 for storage.

Waste concentration and inventory estimates derived for this report are based on the complete original waste volume of 1,131,000 gallons. While the concentration estimates will no longer be applicable for this tank, the inventory estimate will allow continued accounting of the waste constituents. This Tank Characterization Report is a necessary precursor to the characterization of the waste in Tank 241-AN-106, and will provide waste inventory estimates to be used during that process.

2.0 HISTORICAL TANK INFORMATION

The purpose of this section is to describe Tank 241-AP-103 based on historical tank information, and to use this information to predict the constituents of the tank waste and their concentrations. This section is divided into five parts. A brief description and historical background of the tank comprise the first part, followed by the current tank status, a summary of the process sources that contributed to the tank waste, and an estimation of the contents of Tank 241-AP-103 based on historical information. The final part details the surveillance data taken on the tank.

2.1 TANK HISTORY

Tank 241-AP-103 is a tank-in-tank design consisting of a heat-treated primary steel liner, inside a second steel liner. The tank has a design capacity for storing 1.16 million gallons of waste; however, safety considerations require a maximum operating capacity of 1.14 million gallons. Instruments access Tank 241-AP-103 through risers and monitor the pressure, temperature, liquid level, sludge level, and other bulk tank characteristics (Bell, 1994). A detailed diagram of a double-shell tank is presented in Figure 2-1 (Hanlon, 1994).

Tank 241-AP-103 was constructed and went into service in 1986 as a Dilute Receiver Tank. It is one of eight tanks that comprise the AP Tank Farm located in the southeast corner of the 200 East Area. Figure 2-2 details the Hanford Site's 200 East Area and the location of the 241-AP Tank Farm.

Tank 241-AP-103 is used to store dilute non-complexed waste from several sources. Tank 241-AY-102 is the source of most of the waste currently stored in Tank 241-AP-103. Minor sources include the PUREX Ammonia Scrubber, Tank 241-AP-101, and flush water (transfers of these wastes are detailed in section 2.4).

2.2 TANK STATUS

As of March 1994, Tank 241-AP-103 contained 1,131,000 gallons of liquid dilute non-complexed waste prior to the waste's processing through the evaporator. The *Tank Farm Surveillance and Waste Status Summary Report for November 1993* (Hanlon, 1994) reported that all of the waste existed as liquid; however, the *Process Control Plan for Evaporator 242-A Campaign 94-1* (Le, 1994) indicated that a sludge-level measurement showed some possible solids in Tank 241-AP-103. Unfortunately, further detail was not provided. The majority of the waste contents of the tank were transferred out for evaporation, leaving a residual waste volume of 27,500 gallons. Since Tank 241-AP-103 has an operational capacity of 1,140,000 gallons, the tank is 2.4% full with 1,112,500 gallons of reserve capacity. Tank 241-AP-103 is still in service. The "in service" designation allows this tank to continue receiving liquid in conjunction with production and/or waste processing. The tank integrity is classified as sound and it currently is not on a Watch List. There are no Unreviewed Safety Questions associated with Tank 241-AP-103 at this time.

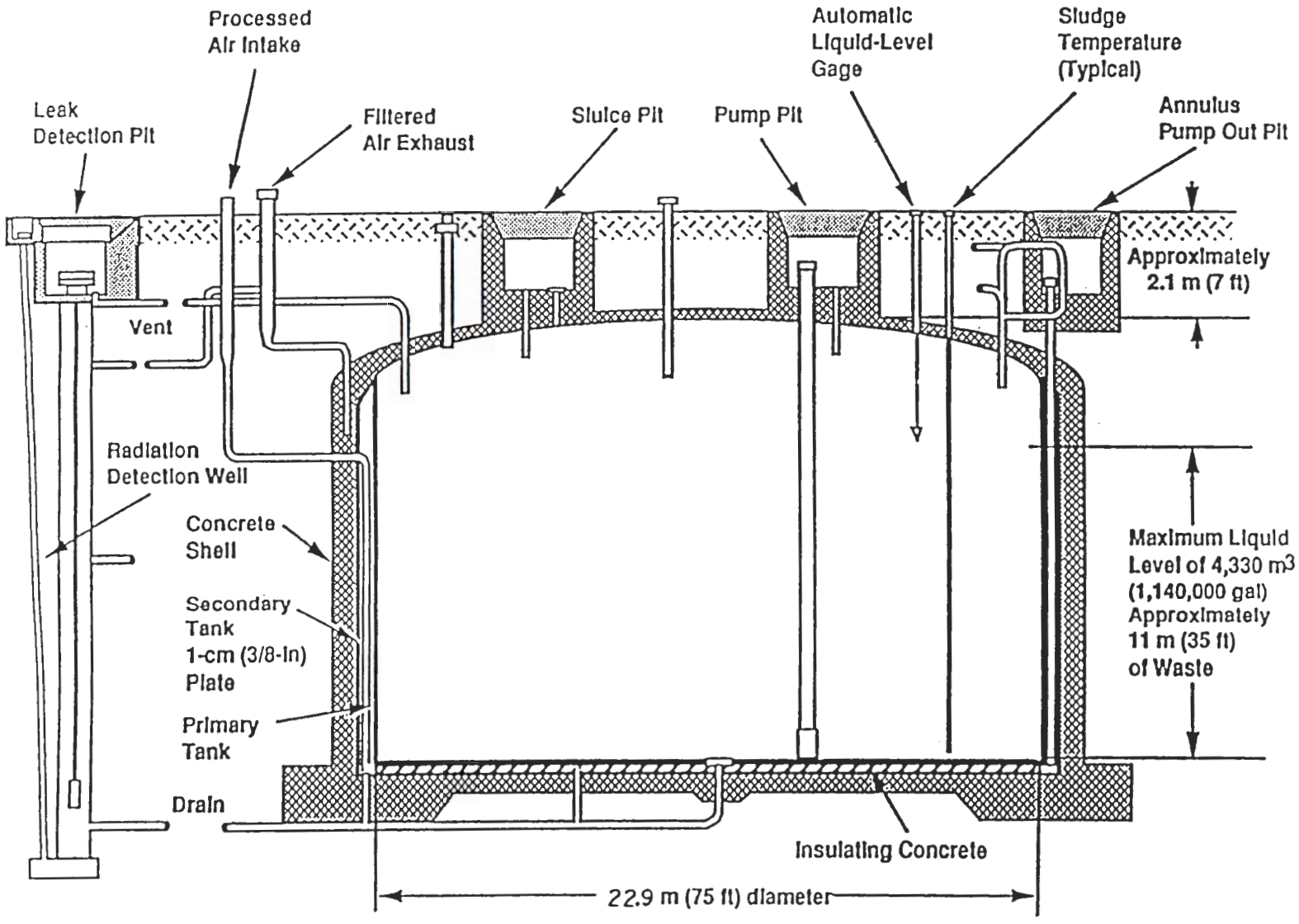
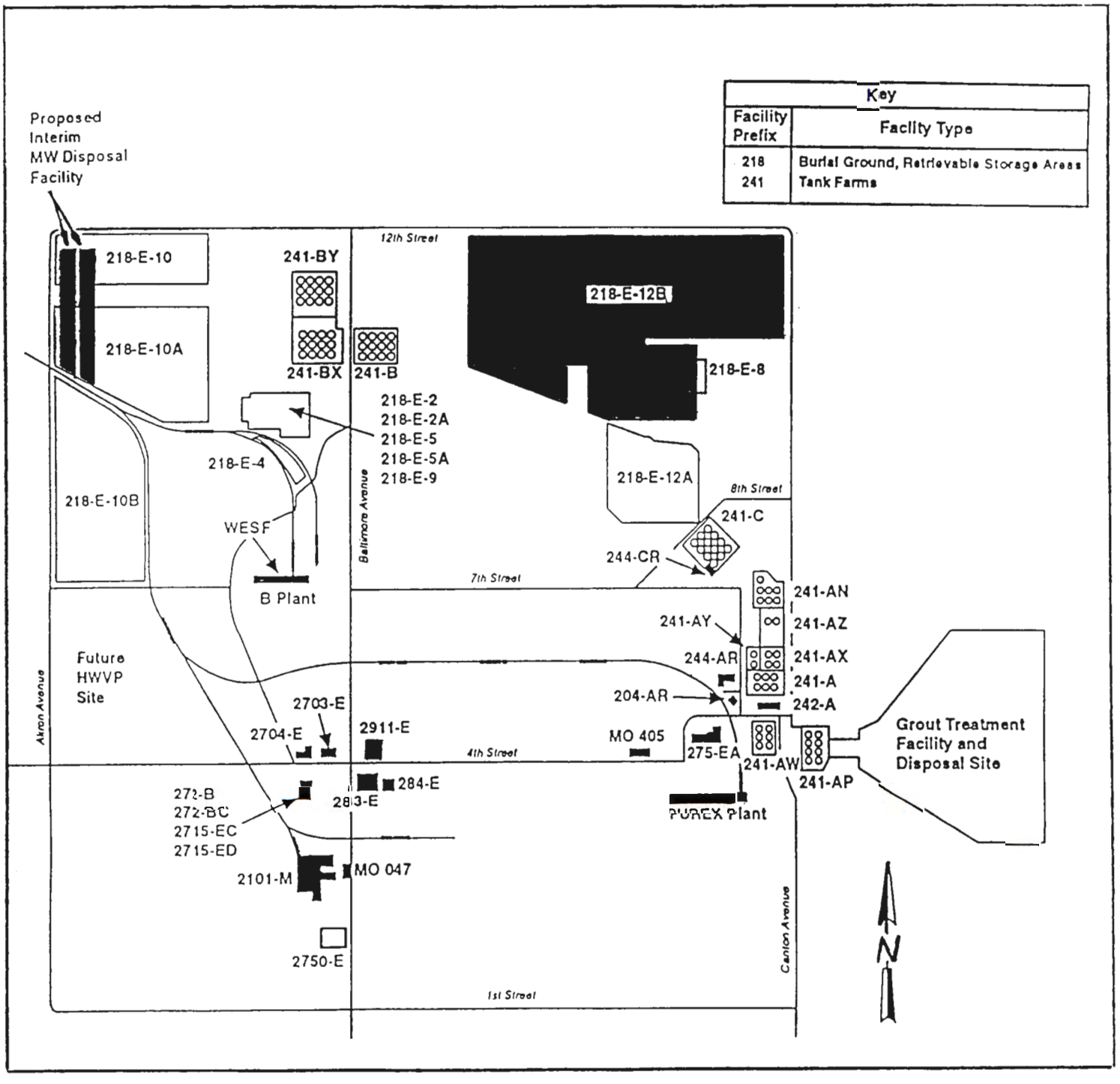


Figure 2-1. Double-Shell Tank Configuration.

Figure 2-2. Location of the 241-AP Tank Farm



Tank 241-AP-103 is equipped with both a manual tape and an automated liquid indicator device for waste surface level readings; both are operable. The waste occupied approximately the bottom 10 inches of the tank. All tank instruments, with the exception of the Leak Detection Pit radiation readings, are in monitoring compliance (Hanlon, 1994). Temperatures within the tank are stable (Husa et al., 1993), with 55°F reported on May 5, 1994. Active ventilation is used to keep the tank contents cool and to minimize the potential for release of airborne contaminants to the environment (Husa et al., 1993).

Approximately 98% of the original waste volume in Tank 241-AP-103 was transferred from Tank 241-AY-102 between October 1989 and June 1991 (Koreski, 1994). A small amount (22,000 gallons) of waste in the tank before this transfer most likely consisted of waste transferred from Tank 241-AP-101, flush water, and PUREX Ammonia Scrubber Feed.

2.3 PROCESS KNOWLEDGE

Figure 2-3 depicts the fill history of Tank 241-AP-103 from when it became operational in 1986, to the present (Koreski, 1994). A detailed description of the transfers responsible for these fluctuations follows. All of the volume data were taken from Koreski.

Tank 241-AP-103 was brought into service in August 1986, with a transfer of 25,000 gallons of flush water from miscellaneous sources. The next transfer was not received until January 1988, with the beginning of a series of dilute non-complexed (DN) waste transfers from the PUREX Ammonia Scrubber totaling 1,068,000 gallons. During the period these PUREX Ammonia Scrubber Feed transfers were received, Tank 241-AP-103 also received 21,000 gallons of flush water. By the end of July 1988, the tank contained 1,102,000 gallons of DN waste, approximately 94% of which came from the PUREX Ammonia Scrubber.

Most of the contents of Tank 241-AP-103 (about 98%) were sent to Tank 241-AW-102 (the feed tank for the 242-A Evaporator) in two transfers during August and September of 1988. The first transfer consisted of 807,000 gallons, while the second was 283,000 gallons.

Tank 241-AP-103 received 38,000 gallons of flush water in September 1988, and a transfer of 578,000 gallons of DN supernate from Tank 241-AP-101 in November. These transfers were combined with the 22,000 gallons of waste remaining in the tank from previous activity for a total waste volume of 638,000 gallons at the end of 1988. During October 1989, most of the contents (nearly 97%) of Tank 241-AP-103 were transferred to Tank 241-AP-101, leaving 22,000 gallons of waste in the tank.

The next series of transfers comprise most (nearly 98%) of the latest waste volume that occupied Tank 241-AP-103 prior to its latest processing in the evaporator. During a three-year period, beginning in October 1989, a total of 1,113,000 gallons of DN waste were received from Tank 241-AY-102. These transfers consisted of 569,000 gallons in October 1989, 366,000 gallons in October 1990, and 178,000 gallons in June 1991.

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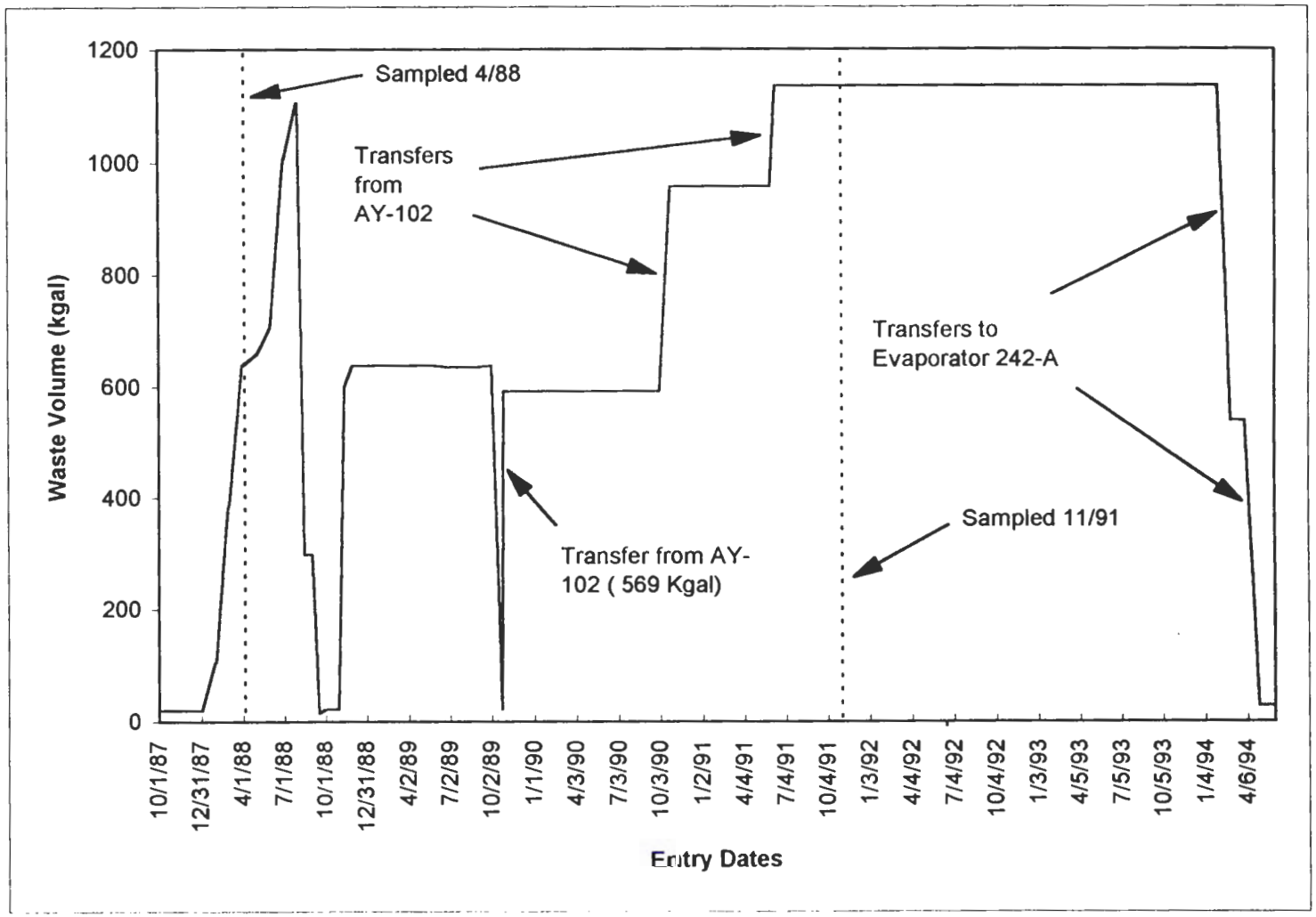


Figure 2-3. Tank 241-AP-103 Fill History.

Following the transfers from Tank 241-AY-102, Tank 241-AP-103 reached its peak volume (1,136,000 gallons) in June 1991, with the addition of 1,000 gallons of flush water. There was no further fill activity during 1992 and 1993. At end of 1993, the final volume for Tank 241-AP-103 was 1,131,000 gallons of DN waste. This figure included minor fluctuations (unknown losses of 7,000 gallons and unknown gains of 2,000 gallons) during the last two and a half years. These losses and gains were most likely attributable to evaporation or measurement inconsistencies, since an inch on the measuring tape is equivalent to approximately 2,750 gallons of waste.

The waste in Tank 241-AP-103 was selected for concentration as part of the Evaporator 242-A Campaign 94-1 (Le, 1994). The campaign would concentrate the waste approximately 85-87% through evaporation of water. In April 1994, 550,000 gallons of waste were processed through the evaporator, leaving a volume of 597,000 gallons in the tank (Rios, 1994). In May, the final transfer from Tank 241-AP-103 was made to the evaporator. The 13-15% of the waste (approximately 166,000 gallons) that remained after evaporation was routed to Tank 241-AN-106 for storage. Around 27,500 gallons of waste were left in Tank 241-AP-103 after the completion of the campaign.

2.4 HISTORICAL ESTIMATION OF THE CONTENTS OF TANK 241-AP-103

A preliminary estimate of the waste constituents in a storage tank can often be generated by reviewing the historical characterization data available for the tank. Unfortunately, this was not the case with Tank 241-AP-103.

Figure 2-3 presents a fill history of Tank 241-AP-103 based on Koreski (1994). As can be seen from the graph, the tank was sampled in April 1988, three years before the most recent sampling event which produced the Tank Characterization Report results. However, after the April 1988 sampling, two waste reductions occurred which decreased the tank waste level to 2% of the tank volume at the time of the sampling. Consequently, this April 1988 sampling data is not useful as historical data.

Since over 98% of the final waste volume of Tank 241-AP-103 came in three transfers from Tank 241-AY-102, characterization data of the waste in Tank 241-AY-102 at the times of the transfers could be used to derive historical concentration estimates for Tank 241-AP-103. These transfers occurred during the period of October 1989 to July 1991. Unfortunately, this method does not provide valid historical estimates for two reasons. For the first waste transfer from Tank 241-AY-102 in October 1989, no historical data is available. Numerous sources contributed to the waste in Tank 241-AY-102, and any constituent concentrations for the tank at the time of the transfer into Tank 241-AP-103 were unable to be determined. This waste transfer constitutes approximately 50% of tank 241-AP-103 contents. Tank 241-AY-102 was sampled in February 1990 prior to the two remaining transfers to Tank 241-AP-103. However, Tank 241-AY-102 continued to receive waste after the February sampling date and before transfer into Tank 241-AP-103. The sources of the waste received between the sampling and transfer dates was completely different than the sources which had produced the sampled waste. Also, these additional waste transfers into Tank 241-AY-102 constituted nearly 50% of the volume of the tank at the time of the transfer into Tank 241-AP-103. So, the characterization data from the February sampling date was no longer representative of the tank contents by the time the transfers into Tank 241-AP-103 took place.

For the reasons discussed above, any historical data that could be compiled for Tank 241-AP-103 would be highly unreliable. Therefore, no historical constituent estimations are reported.

2.5 SURVEILLANCE DATA

2.5.1 Surface Level Readings

To determine the surface level of the waste, Tank 241-AP-103 is equipped with both an automatic gauge manufactured by the Food Instrument Corporation (FIC) and a manual tape. The manual tape readings are used when the FIC indicator is out of service. Both devices are currently operable. The most recent FIC liquid level measurement available was 411 inches on May 5, 1994. The manual tape reading for the same date was 410.75 inches (Rios, 1994).

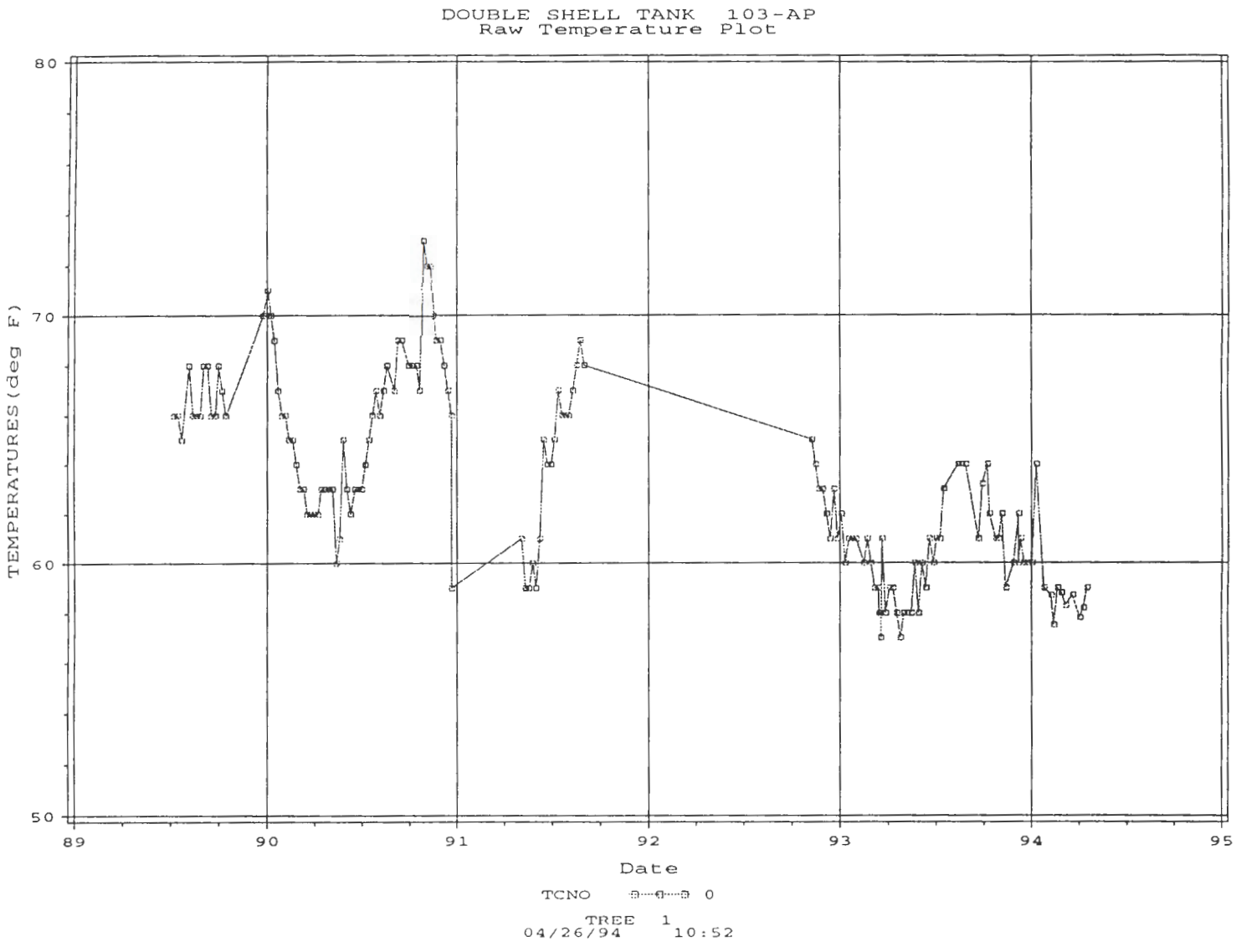
The FIC indicator uses a conductivity electrode which is lowered by machine until electrical contact is established with the waste surface; it can be monitored either automatically or manually (Husa et al., 1993). When monitored automatically, the FIC gauge is electrically connected to a computer for data transmission, analysis, and reporting via the Computer Automated Surveillance System. The manual tape also uses a conductivity probe but must be lowered by hand crank.

2.5.2 Internal Tank Temperatures

Each double-shelled tank is equipped with approximately 100 thermocouples which measure the local tank temperatures. A probe with 18 thermocouples assembled in a pipe, called a thermocouple tree, is inserted into a waste tank and used to monitor the waste temperatures at various levels in the primary tank, usually every two feet. Weekly temperature readings for Tank 241-AP-103 have been recorded automatically since the beginning of the third quarter 1989, by surveillance analysis computer systems. The maximum temperature readings from inside the tank are plotted in Figure 2-4. This graph, along with all of the temperature data, have been taken from Rios (1994). The last available temperature reading for Tank 241-AP-103 was 55°F on May 5, 1994.

It is apparent from the plotted temperature graph in Figure 2-4 that the temperature of the tank contents exhibits seasonal fluctuations. This is expected since the soil between the surface level and approximately 10 feet below surface level creates a zone that is thermally transient, thus displaying diurnal and seasonal variations in temperature (Freeze and Cherry, 1979). Usually the soil below this 10-foot zone attenuates the effects of changing ambient air temperature. The bottom of the tank is 60 feet below the surface level, but unlike a solid mass of soil the effects of changing air temperature are still felt because the tank is a more efficient heat conductor. The tank's metal and concrete container filled with liquid, surrounded by actively ventilated annular space and connected to the surface by risers and drywell openings, will transfer heat to and from the surface more readily. Furthermore, the active ventilation system forces heat transfer between the tank contents and the ambient air. Seasonal variations have caused the temperatures of the waste in Tank 241-AP-103 to fluctuate between a high of 73°F to a low of 55°F.

Figure 2-4. Tank 241-AP-103 Thermocouple Tree Raw Temperature Plot (Rios, 1994).



Except for three time periods when the thermocouple equipment was out of service, the internal temperature of Tank 241-AP-103 has been monitored about weekly since mid-1989. The three periods with no thermocouple data are most of the fourth quarter of 1989, from the end of the fourth quarter 1990 to the second quarter 1991, and from the third quarter 1991 to the fourth quarter of 1992.

As depicted in Figure 2-4, peak temperatures (71°F, 73°F, and 69°F) from the available data on Tank 241-AP-103 appear to coincide with the transfer activity with Tank 241-AY-102 in October 1989, October 1990, and June 1991. Average tank temperatures appear to have decreased slightly since the fill activity ended.

An unexpectedly high reading of 65°F was recorded in January 1994. It is several degrees warmer than readings that immediately precede and follow it. The 65°F reading appears to be either an equipment malfunction or an error in recording the temperature.

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3.0 TANK SAMPLING OVERVIEW

Tank 241-AP-103 was sampled on September 19 and 24, October 9, and November 25, 1991 (see Table 3-1). The test plan for double-shell tanks (halgren, 1991) states that samples are to be collected from three vertical risers within the tank. The exact risers chosen were from riser 27 (E) 90°, riser 28 (SW) 187°, and riser 1 (NW) 330°. Wastes may stratify vertically so the sampling plan divides each tank into top, middle, and bottom vertical layers with samples taken from each layer. Figure 3-1 displays the arrangement of the sample locations for Tank 241-AP-103. The "bottle-on-a-string" method (ASTM, 1973) was used to collect the liquid samples from the tank. Each glass sample bottle collected approximately 100 milliliters of liquid. For a further description of sampling procedures, see the *Tank Characterization Reference Guide* (DeLorenzo et al., 1994). A total of ten samples (nine samples and a duplicate) were collected.

The samples were delivered to the Westinghouse Hanford Company 222-S Process and Analytical Chemistry Laboratory for analysis (see Table 3-2). These sample results were used to characterize the organic, inorganic, physical, and radiochemical properties of the tank. Sample 3AP891-3 was resampled and replaced by Sample 3AP1191-1 due to the custody seal being improperly attached. A list of the analytes evaluated in each sample is presented in Table 3-3.

Figure 3-1. Tank 241-AP-103 Sample Locations.

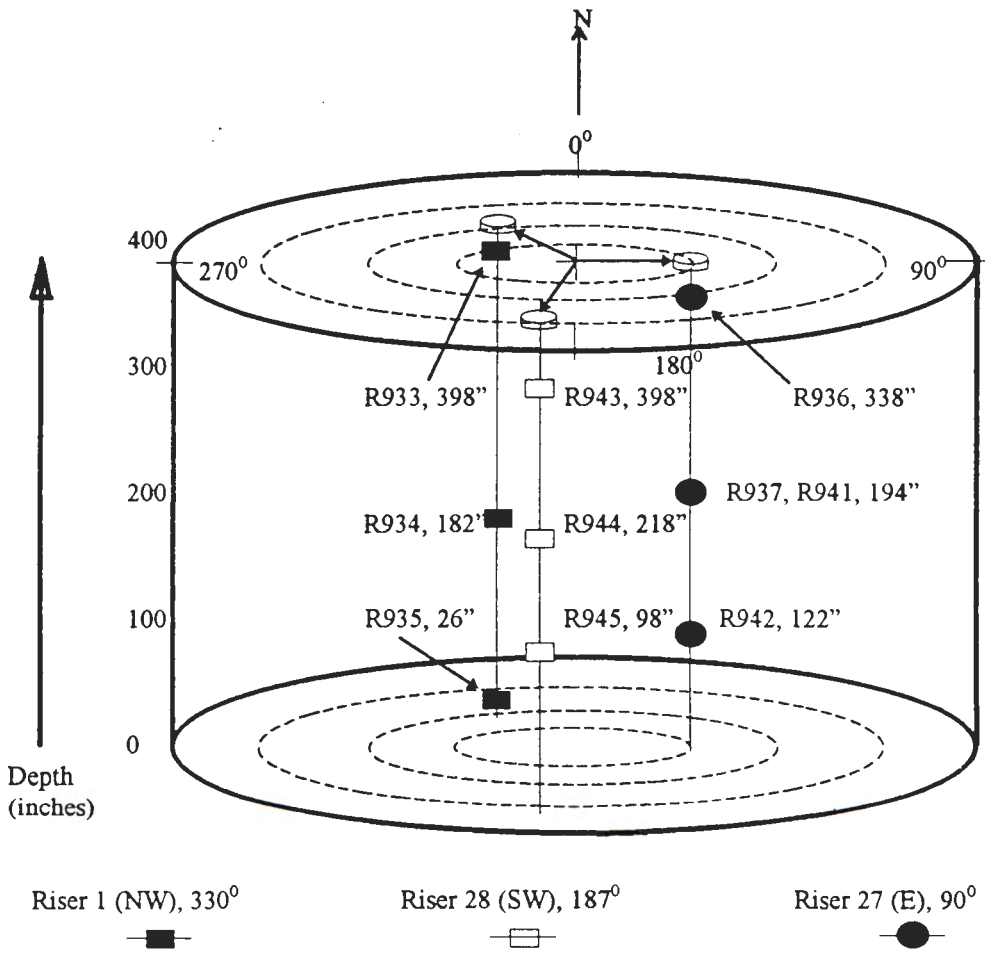

Table 3-1. Tank 241-AP-103 Sample Dates and Numbers

Sample Number	Sample Date
3AP891-1	9/19/91
3AP891-2	9/19/91
3AP891-3	9/19/91
3AP891-4	9/24/91
3AP891-5	9/24/91
3AP891-6	9/24/91
3AP891-7	9/24/91
3AP891-8	10/9/91
3AP891-9	10/9/91
3AP891-10	10/9/91
3AP1191-1	11/25/91

Table 3-2. Tank 241-AP-103 WHC Sample Numbers

Riser, Angle	Depth from tank bottom (inches)	Shipping Sample Number	Tank Farm Sample Number	Laboratory Sample Number
1 (NW), 330°	398 182 26	R0119 R0120 R0121	3AP891-1 3AP891-2 3AP891-3*	R933 R934 R935
27 (East), 90°	338 194 194 122	R0122 R0123 R0124 R0125	3AP891-4 3AP891-5 3AP891-6 3AP891-7	R936 R937 R941 R942
28 (SW), 187°	398 218 98	R0126 R0127 R0128	3AP891-8 3AP981-9 3AP891-10	R943 R944 R945
Composite +				R949

* Sample number 3AP891-3 was replaced with sample number 3AP1191-1
\+ Composite sample consisted of all 10 samples

Table 3-3. Tank 241-AP-103 Samples and Requested Analytes.

Tank Farm Sample Numbers	Laboratory Sample Numbers	Actual Evaluated Analytes	Requested Analytes (Halgren, 1991)
3AP1119-1	R935	Ag, Al, As, Ba, Cd, Cr, Fe, Hg, Mg, Mn, Na, Pb, Se, Zn, F^-, Cl^-, CN^-, OH^-, $_3$, NO_2^-, NO_3^-, PO_4^{3-}, SO_4^{2} Specific Gravity, DSC, TOC, TIC ^{137}Cs, ^{134}Cs, ^{155}Eu	Ag, Al, As, Ba, Bi, Ca, Cd, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, P, Pb, Se, Si, Ti, Zn, Zr, F^-, Cl^-, CN^-, OH^-, NH_3, NO_2^-, NO_3^-, PO_4^{3-}, SO_4^{2-}, TC, TOC, TIC, Volatile Organic, Semivolatile Organic, Specific Gravity, DSC, ^{60}Co, ^{137}Cs, $^{106}Ru/Rh$, ^{3}H, ^{14}C, ^{79}Se, ^{90}Sr, ^{99}Tc, ^{129}I, ^{241}Am, ^{237}Np, $^{239/240}Pu$, ^{244}Cm
3AP891-1	R933	same as for R935	
3AP891-2	R934	same as for R935	
3AP891-4	R936	same as for R935	
3AP891-5	R937	same as for R935	
3AP891-6	R941	same as for R935	
3AP891-7	R942	same as for R935, $^{154/155}Eu$, ^{113}Sn, $^{106}RuRh$, ^{60}Co, ^{94}Nb, $^{144}CePr$, ^{226}Ra	
3AP891-8	R943	same as for R935	
3AP981-9	R944	same as for R935, $^{154/155}Eu$, ^{60}Co	
3AP891-10	R945	same as for R935, ^{154}Eu, ^{60}Co	
Composite	R949	Total U, ^{137}Cs, ^{134}Cs, $^{154/155}Eu$, ^{113}Sn, $^{106}Ru/Rh$, ^{60}Co, ^{95}Nb, $^{144}CePr$, ^{226}Ra, $^{239/240}Pu$, ^{241}Am, ^{99}Tc, ^{129}I, ^{90}Sr, ^{79}Se, ^{3}H, ^{14}C, ^{234}U, ^{235}U, ^{238}U	

4.0 SAMPLE HANDLING AND ANALYTICAL SCHEME

The analytical procedures performed on the samples upon receipt from the tank farm sampling activity is the focus of this chapter. In addition, the characterization program analyses specific to Tank 241-AP-103 are discussed.

4.1 WASTE DESCRIPTION

Descriptions of the waste samples were very difficult to locate. For samples R933, R934, R935, and R936, the Extraction Log Book stated they were all a "clear liquid." No other descriptions about the samples were located.

4.2 HOLD TIME CONSIDERATIONS

For a description of hold time considerations see the *Tank Characterization Reference Guide* (DeLorenzo et al., 1994).

4.2.1 WHC - 222-S Laboratory

Tank 241-AP-103 was sampled between September 24, and November 25, 1991. The analyses of the samples by WHC 222-S Process and Analytical Chemistry Laboratory occurred between the last quarter of 1991 and first quarter of 1992. Samples were not preserved (acidification or refrigeration) at the time of sampling.

The volatile organics analysis (VOA) and semivolatile organics analysis (SVOA) samples were also performed at the WHC 222-S Laboratory. The volatile organics analyses were performed on January 2, 7, and 8, 1992 and the semivolatile organic analyses on April 2, 3, and 8, 1992. The Total Organic Carbon analyses were conducted on January 28, 1992.

According to the data validation report, the maximum holding times for both the volatile and semivolatile organic analyses were exceeded for all samples. The violation of recommended holding times for these analyses were not expected to substantially affect the data. (Refer to Section 5.3 for further discussion).

4.3 SAMPLE PREPARATION

A discussion concerning sample preservation is provided in the *Tank Characterization Reference Guide* (DeLorenzo et al., 1994).

4.4 ANALYTICAL METHODS

This section briefly describes the analytical methods that were used to characterize the waste in Tank 241-AP-103. The overall character of the waste is based on the analysis of the individual and composite samples. Table 4-1 lists the analytical methods that were used for Tank 241-AP-103 to determine the presence of each constituent.

Table 4-1. General Analytical Methods.

Analyte	Method	Procedure
F^-, Cl^-, NO_2^-, NO_3^-, PO_4^{3-}, SO_4^{2-}	Ion Chromatography	LA-533-105
NH_3	Kjeldahl[1]	LA-634-102
OH^-	Titration	LA-661-102
CN^-	Distillation/Spectrometric Analysis	LA-695-101
TIC	Acidification followed by CO_2 detection	LA-622-102
TOC	Combustion/CO_2 detection by coulometry	LA-344-105
Total U	Alpha Proportional Counting	LA-508-101
As Se	GHAA[2]	LA-355-131 LA-362-131
Hg	CVAA[3]	LA-325-102
Total Metals	ICP[4]	LA-505-151
^{241}Am, $^{144}Ce/Pr$, $^{134/137}Cs$, ^{60}Co, $^{154/155}Eu$, ^{94}Nb, ^{226}Ra, ^{103}Ru, $^{106}RuRh$, ^{113}Sn	Gamma Energy Analysis	LA-548-121
% H_2O	Oven drying	LA-564-101
^{3}H ^{14}C	Liquid Scintillation	LA-218-114 LA-348-104
^{79}Se ^{99}Tc	Liquid Scintillation	LA-365-131 LA-438-101
^{90}Sr	separation/Beta[5]	LA-220-101
^{129}I	Low Energy Gamma Analysis	LA-378-103
^{237}Np	extraction/Alpha[6]	LA-933-141
$^{238/239/240}Pu$, ^{241}Am, $^{243/244}Cm$, $^{234/235/238}U$	separation/AEA[7]	LA-503-156
Specific Gravity	Direct	LA-510-112
Energetics	Differential Scanning Calorimetry	LA-514-113
Total Alpha Total Beta	Proportional Counting	LA-508-101

1 - Ammonia analysis by caustic addition, distillation, and capture in a boric acid solution
2 - Gaseous Hydride Atomic Absorption Spectrometry
3 - Cold Vapor Atomic Absorption Spectrometry
4 - Inductively Coupled Plasma
5 - Chemical separation along with Beta Proportional Counting
6 - Extraction followed by Alpha Proportional Counting
7 - Chemical separation followed by Alpha Energy Analysis.

4.4.1 Chemical and Radionuclide Constituent Analysis

A limited amount of quality control data was available for Tank 241-AP-103. Duplicate analyses were performed on samples R933, R941, and R949. Spike analyses were run on R933. Check standards were evaluated before and after each evaluation in order to verify instrument calibration and analytical performances.

4.4.2 Volatile and Semivolatile Organic Constituent Analysis

Samples of waste from Tank 241-AP-103 were analyzed for volatile (VOA) and semivolatile (SVOA) constituents at the WHC 222-S Laboratory as well. The samples were delivered in the 100 milliliter bottles and were stored at room temperature until aliquots were drawn for VOA and SVOA analysis. The original 100 milliliter bottles were not pre-cleaned, had plastic caps with plastic liners, and contained significant headspace. The VOA aliquots were transferred to pre-cleaned 5-milliliter glass bottles, capped with a teflon/silicone septum and refrigerated until analyzed. The samples were analyzed using uncontrolled draft procedures which largely complied with analytical protocols given in the EPA Contract Laboratory Program Statement of Work (EPA, 1991).

4.5 MODULE SPECIFIC ANALYSES

Sampling and analysis of Tank 241-AP-103 was originally intended to fulfill requirements of the Evaporator 242-A Campaign 94-1 (Le, 1994). The characterization program for Tank 241-AP-103 also satisfies the criteria set by the Tank Waste Remediation System (TWRS). The TWRS sample characterization objectives are to provide adequate description of physical, chemical, and radiological properties of Hanford Site tank wastes to support the resolution of Unreviewed Safety Questions, other safety issues surrounding the Watch List tanks, and the design of retrieval, pretreatment, and final disposal systems (Bell, 1994). For this specific tank, analyses to provide sufficient information to confidently determine whether constituent concentrations are within safe operating limits such as nonflammability and nonexplosiveness were performed. In addition these analyses were used to determine functional limits such as solids formation for operation of the evaporator. Characterization of Tank 241-AP-103 also provides data to predict where the types and amounts of environmentally hazardous waste are likely to occur in the evaporator product streams.

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5.0 ANALYTICAL RESULTS AND WASTE INVENTORY

The chemical, radiochemical, physical, and organic results associated with Tank 241-AP-103 were obtained from the Summary Data Report (WHC, 1992a) and are presented within this document as indicated in Table 5-1. The samples from which these results were derived were collected on the following dates in 1991: September 19, September 24, October 9, and November 11. These sampling events were the most recent regarding Tank 241-AP-103 and reflected the most accurate characterization of the tank waste available at the present time. A detailed discussion of the sampling process was presented in Section 3.

Table 5-1. Analytical Data Presentation Tables

Analysis	Tabulated Results
Metals	Table A-1
Ions	Table A-2
Radionuclides	Table A-3
Physical and General Chemical Data	Table A-4
Volatile Organics	Table A-5
Semivolatile Organics	Table A-6
Tank Characterization Report Results	Table 5-3

In cases where a duplicate analysis was performed on a sample, the data presented in the Appendix A tables were obtained by calculating an average concentration value from the initial and duplicate results. If an analyte was detected by the original but not by the duplicate sample evaluation, or vice-versa, only the single positive result was recorded. When both sample runs failed to detect an analyte, the detection limit preceded by a less than (<) sign was recorded as the sample result.

The representative tank concentration for each analyte was reported in the Appendix A tables under the "Evaluated Data Result" column. This value was derived by considering the analytical results in conjunction with corresponding quality control data. If all available sample analyses failed to detect a particular analyte, the tank concentration of the analyte was reported to be less than the highest recorded detection limit. With respect to detected analytes, an average value obtained from sample data was determined to be the most accurate conclusion unless stated otherwise within the text. Measurement error estimates for the data are presented in Table 7-2 of Section 7. Detection limit values were not utilized in any statistical calculations.

The range of the tabulated sample data associated with each analyte was also included in the Appendix A tables. The projected tank inventory value reported in the Appendix A tables was obtained by multiplying the "Evaluated Data Result" by the volume of waste in the tank. At the time of sampling, the tank contained 4.29E+06 liters of waste. The appropriate conversion factors were included in the calculations to obtain the reported units.

5.1 CHEMICAL ANALYSES

5.1.1 Metals

The following analytes were evaluated by Inductively Coupled Plasma Emission Spectroscopy (ICP): Al, Ba, Cd, Cr, Fe, Pb, Mg, Mn, Ag, Na, and Zn. Arsenic and selenium were determined by Gaseous Hydride Atomic Absorption Spectroscopy (GHAA), and mercury was analyzed by Cold Vapor Atomic Absorption Spectroscopy (CVAA). Total uranium was analyzed by alpha proportional counting and reported in μg/L rather than μCi/L. The specific isotopic uranium determinations are discussed in Section 5.2. Total uranium was not determined by laser fluorimetry.

Aluminum and sodium were the most abundant metals in Tank 241-AP-103. The data for these analytes exhibited good precision, and sample contamination was negligible as indicated by the blank results. Arsenic, cadmium, and chromium were detected in the waste but exhibited average concentrations below their respective Toxicity Characteristic Leaching Procedure threshold values (EPA, 1990). The following analytes were not detected in any of the evaluated samples affiliated with Tank 241-AP-103: Ba, Pb, Hg, Se, and Ag. Only the composite sample was analyzed for uranium, and the metal yielded a concentration of 3690 μg/L.

Although a historical potassium concentration could not be determined for Tank 241-AP-103, it is certain that potassium is present in the tank. The majority of the tank waste was received from Tank 241-AY-102, which was known to contain potassium (Van Fleet, 1993). Potassium was not evaluated by the laboratory, but its estimated concentration in Tank 241-AP-103 was calculated from the mass and charge balance (Section 7.1). A resulting value of 1.52E+06 μg/L was reported in Table 5-3.

5.1.2 Ions

The following anions were determined by ion chromatography (IC): fluoride, chloride, nitrite, nitrate, sulfate, and phosphate. All were present in Tank 241-AP-103, and the corresponding data exhibited good precision. The spike analysis associated with nitrite yielded a high recovery, but the indicated high bias in the data may have been caused by the use of an inappropriate spiking concentration relative to the sample concentration.

The ammonia analysis was performed by the Kjeldahl method followed by titrimetric detection. Five samples were analyzed after the maximum allowable holding time specification had been exceeded. Since these samples failed to detect ammonia, their results were determined to be unusable according to the data validation report (WHC, 1992b). Detectable concentrations of ammonia were found in only three of the remaining samples, and an average value was calculated from these data.

Cyanide was evaluated spectrophotometrically after samples were initially distilled. Sample R933 was determined to be unusable according to the validation report (WHC, 1992b) since the analysis exceeded maximum allowable holding times and yielded a result below the detection limit. The remaining samples demonstrated that cyanide was present in detectable concentrations, and the reported mean for cyanide was calculated from these nine data points.

Hydroxide was analyzed by titration. Sample R943 was statistically rejected by the Q-test, and a mean concentration was derived from the remaining data. The pH value of 13.0 reported in Table 5-3 was derived from the hydroxide results.

5.2 RADIOLOGICAL DETERMINATIONS

The activities of the following radionuclides were determined by gamma energy analysis (GEA): ^{144}Ce/Pr, ^{134}Cs, ^{137}Cs, ^{60}Co, $^{154/155}$Eu, $^{94/95}$Nb, ^{226}Ra, ^{113}Sn, and ^{106}Ru/Rh. Tritium, ^{14}C, ^{79}Se, and ^{99}Tc were analyzed by liquid scintillation. Beta proportional counting was utilized to determine ^{90}Sr activity, and ^{129}I was analyzed by low energy GEA. Neptunium-237 was determined by alpha proportional counting. The following were evaluated by alpha energy analysis: ^{234}U, ^{235}U, ^{238}U, $^{239/240}$Pu, ^{238}Pu, ^{241}Am, and $^{243/244}$Cm. Most radiochemical data were derived exclusively from the composite sample; exceptions were noted in Table 3-3.

The ^{129}I results were rejected according to data validation guidelines due to the lack of efficiency and background checks; therefore, a value for the isotope was not reported in Table 5-3. The result, however, is displayed in Appendix A.

The following radionuclides demonstrated activities above their corresponding detection limits in Tank 241-AP-103: ^{14}C, ^{137}Cs, ^{79}Se, ^{90}Sr, ^{99}Tc, tritium, ^{234}U, ^{235}U, and ^{238}U. As demonstrated in Table 5-2, the relative percent difference between the total uranium value derived from alpha proportional counting and the sum of the isotopic results is only 7.5%. However, the uranium in the tank is approximately 0.025% ^{234}U, 3.94% ^{235}U, and 96.0% ^{238}U compared to natural uranium which is 0.0054% ^{234}U, 0.71% ^{235}U, and 99.28% ^{238}U.

5.3 ORGANIC CONSTITUENTS

Volatile and semi-volatile organic analytes are listed in Tables A-5 and A-6. Because of their volatile nature and relatively small contribution to the waste as indicated by historical records, the appearance of these compounds in Tank 241-AP-103 is not expected.

None of the volatile organic target compounds were considered to be detected in the samples except acetone. The presence of acetone may have been caused by laboratory contamination, but the observed concentrations were too high to dismiss in the absence of further evidence. The few tentatively identified volatiles which appeared during the analyses were of no concern since none of them demonstrated a concentration above 25 ppb.

The data associated with acetone are presented in the Appendix A tables even though the results are questionable. Since the samples were analyzed well beyond the maximum allowable holding times for volatile organic analyses, it is likely that the acetone results are extremely low. If the actual concentration of acetone is significantly higher, the emissions from the evaporator process could become an issue under the Resource Conservation and Recovery Act.

Table 5-2. Uranium Data.

Analyte	Activity (μCi/L)	Concentration (μg/L)
Total Uranium from Alpha Proportional Counting		3,690
^{234}U	6.56E-03	1.05
^{235}U	3.39E-04	157
^{238}U	1.26E-03	3,820
Total Uranium from Isotopic Data		3,980

Table 5-3. Tank Characterization Report Data for Double-Shell Tank 241-AP-103. (3 pages)

Analyte	Historic Tank Content Estimate	Tank Characterization Report Result		Pre-Evaporator Campaign 94-1 Inventory
Metals	(μg/L)	(μg/L)	(μg/g)	(kg)
Aluminum (Al)	---	**2.46E+05**	**245**	1,050
Antimony (Sb)	---	---	---	---
Arsenic (As)	---	**48.4**	**0.0483**	0.207
Barium (Ba)	---	**< 65.0**	**< 0.0648**	< 0.278
Beryllium (Be)	---	---	---	---
Bismuth (Bi)	---	---	---	---
Boron (B)	---	---	---	---
Cadmium (Cd)	---	**111**	**0.111**	0.475
Calcium (Ca)	---	---	---	---
Chromium (Cr)	---	**4,390**	**4.38**	18.8
Copper (Cu)	---	---	---	---
Iron (Fe)	---	**1,230**	**1.23**	5.28
Lead (Pb)	---	**< 400**	**< 0.399**	< 1.71
Magnesium (Mg)	---	**1,190**	**1.19**	5.11
Manganese (Mn)	---	**43.1**	**0.0430**	0.185
Mercury (Hg)	---	**< 5.00**	**< 4.99E-03**	< 0.0214
Molybdenum (Mo)	---	---	---	---
Neptunium (Np)	---	---	---	---
Nickel (Ni)	---	---	---	---
Phosphorus (P)	---	---	---	---
Plutonium (Pu)	---	---	---	---

Table 5-3. Tank Characterization Report Data for Double-Shell Tank 241-AP-103. (3 pages)

Analyte	Historic Tank Content Estimate	Tank Characterization Report Result		Pre-Evaporator Campaign 94-1 Inventory
Metals (cont.)	(μg/L)	(μg/L)	(μg/g)	(kg)
Potassium (K)	---	1.52E+06	1,520	6,500
Selenium (Se)	---	< 20.0	< 0.0200	< 0.0856
Silicon (Si)	---	---	---	---
Silver (Ag)	---	< 40.0	< 0.0399	< 0.171
Sodium (Na)	---	5.31E+06	5,290	22,700
Titanium (Ti)	---	---	---	---
Uranium (U)	---	3,690	3.68	15.8
Zinc (Zn)	---	441	0.440	1.89
Zirconium (Zr)	---	---	---	---
Ions	(μg/L)	(μg/L)	μg/g	(kg)
Ammonia (NH_3)	---	38,200	38.1	164
Carbonate (CO_3^{2-})	---	2.57E+06	2,560	11,000
Chloride (Cl^-)	---	49,500	49.4	212
Cyanide (CN^-)	---	551	0.549	2.36
Fluoride (F^-)	---	1.29E+05	129	552
Hydroxide (OH^-)	---	1.69E+06	1,680	7,230
Nitrate (NO_3^-)	---	4.04E+06	4,030	17,300
Nitrite (NO_2^-)	---	1.30E+06	1,300	5,560
Phosphate (PO_4^{3-})	---	1.39E+05	139	595
Sulfate (SO_4^{2-})	---	3.50E+05	350	1,500
Radionuclides	(μCi/L)	(μCi/L)	μCi/g	(Ci)
Americium-241	---	< 0.0114	< 1.14E-05	< 0.0488
Carbon-14	---	4.47E-03	4.46E-06	0.0191
Cerium/Praseodymium-144	---	< 170	< 0.169	< 728
Cesium-134	---	< 22.4	< 0.0223	< 95.9
Cesium-137	---	6,540	6.52	28,000
Cobalt-60	---	< 12	< 0.0120	< 51.4
Europium-154	---	< 32	< 0.0319	< 137
Europium-155	---	< 87.5	< 0.0872	< 375
Europium-154/155	---	< 32	< 0.0319	< 137

Table 5-3. Tank Characterization Report Data for Double-Shell Tank 241-AP-103. (3 pages)

Analyte	Historic Tank Content Estimate	Tank Characterization Report Result		Pre-Evaporator Campaign 94-1 Inventory
Radionuclides (cont.)	(μCi/L)	(μCi/L)	μCi/g	(Ci)
Iodine-129	---	---	---	---
Niobium-94	---	< 9.30	< 9.27E-03	< 39.8
Niobium-95	---	< 8.25	< 8.23E-03	< 35.3
Plutonium-239/240	---	< 6.97E-03	< 6.95E-06	< 0.0298
Radium-226	---	< 247	< 0.246	< 1,060
Ruthenium/Rhodium-106	---	< 340	< 0.339	< 1,460
Selenium-79	---	0.0112	1.12E-05	0.0479
Strontium-90	---	2.62	2.61E-03	11.2
Technetium-99	---	1.08	1.08E-03	4.62
Tin-113	---	< 30.0	< 0.0299	< 128
Tritium	---	5.24	5.22E-03	22.4
Uranium-234	---	6.56E-03	6.54E-06	0.0281
Uranium-235	---	3.39E-04	3.38E-07	1.45E-03
Uranium-238	---	1.26E-03	1.26E-06	5.39E-03
Physical Properties				
Water	---	98.3 wt%	---	---
pH	---	13.0	---	---
Viscosity	---	1.01 cP	---	N/A
Specific Gravity	---	1.003	---	N/A
TIC	---	5.14E+05 μg/L	512 μg/g	2,200 kg
TOC	---	1.12E+05 μg/L	112 μg/g	479 kg
Organics	---	(μg/L)	μg/g	(kg)
Acetone	---	728	0.726	3.12
2,4-dichloropentane	---	22,000	21.9	94

Semivolatile organic target compounds were not detected in Tank 241-AP-103. With regard to the tentatively identified semivolatile organics, a reaction between the waste matrix and the organic surrogate compounds led to the detection of nitration reaction products. These compounds, however, were not indigenous to the tank. The presence of 2,4-dichloropentane was not anticipated upon review of the available historical data, but the compound was found in appreciable concentrations in five samples. Since the detection of 2,4-dichloropentane could not be dismissed on the basis of contamination, the data were included in Appendix A.

5.4 PHYSICAL MEASUREMENTS

Physical analyses conducted on samples collected from Tank 241-AP-103 consisted of total inorganic carbon (TIC), total organic carbon (TOC), specific gravity, and differential scanning calorimetry. As a note, TIC and TOC are not physical measurements but are nonspecific chemical analyses; their results are discussed in this section for organizational purposes. The pH of the tank was not evaluated by the laboratory, but this property was previously discussed in Section 5.1.2.

5.4.1 Carbon Analyses

Inorganic carbon in the tank was assumed to be in the form of carbonate. The reported value for total inorganic carbon (TIC) was 5.14E+05 μg of C/L and translated into a carbonate concentration of 2.57E+06 μg/L. The total organic carbon (TOC) result was 1.12E+05 μg of C/L and could not be attributed solely to acetone and 2,4-dichloropentane; therefore, organic complexants may be present in the tank waste.

5.4.2 Specific Gravity and Percent Water

The specific gravity of the tank was determined to be 1.003. The weight percent of water was not determined by the laboratory; therefore, it was calculated to be 98.3% by performing a mass and charge balance (Section 7.1).

5.4.3 Rheology

Due to the lack of rheological estimates, the viscosity of the tank was estimated. The specific gravity of the waste is 1.003, and the tank is approximately 98.3% water, by weight. Since a 2%, by weight, sodium nitrate solution has a specific gravity of 1.01, its corresponding viscosity of 1.01 centipoise (0.000679 lbs/ft-s) was estimated to be the viscosity of the waste.

5.4.4 Energetics

As expected, no exotherms were observed by the differential scanning calorimetry analyses. An exothermic reaction is unlikely due to the high water content of the tank waste.

5.5 DATA PRESENTATION

5.5.1 Constituent Concentrations

The "Evaluated Data Result" associated with each analyte from Appendix A was recorded in Table 5-3 as the Tank Characterization Report Result, which is the final constituent estimate for this document. However, if serious flaws occurred in the laboratory data, as previously or subsequently discussed in this text, other factors necessitated consideration. If laboratory results were not available for an analyte, the Tank Characterization Report Result was derived from either mass or charge balance calculations.

Since transport of the waste in Tank 241-AP-103 to the evaporator began before this document was completed, Table 5-4 was included in order to identify the current tank inventory. Calculations were based on a volume of 104,000 liters (27,500 gallons), and it was assumed that analyte concentrations remained constant.

Table 5-4. Post Evaporator 242-A Campaign 94-1 Inventory for Double-Shell Tank 241-AP-103. (3 pages)

Analyte	Current Inventory
Metals	(kg)
Aluminum (Al)	25.6
Antimony (Sb)	---
Arsenic (As)	5.03E-03
Barium (Ba)	< 6.76E-03
Beryllium (Be)	---
Bismuth (Bi)	---
Boron (B)	---
Cadmium (Cd)	0.0115
Calcium (Ca)	---
Chromium (Cr)	0.457
Copper (Cu)	---
Iron (Fe)	0.128
Lead (Pb)	< 0.0416
Magnesium (Mg)	0.124
Manganese (Mn)	4.49E-03
Mercury (Hg)	< 5.20E-04

Table 5-4. Post Evaporator 242-A Campaign 94-1 Inventory for Double-Shell Tank 241-AP-103. (3 pages)

Analyte	Current Inventory
Metals (cont.)	(kg)
Molybdenum (Mo)	---
Neptunium (Np)	---
Nickel (Ni)	---
Phosphorus (P)	---
Plutonium (Pu)	---
Potassium (K)	158
Selenium (Se)	< 2.08 E-03
Silicon (Si)	---
Silver (Ag)	< 4.16 E-03
Sodium (Na)	552
Titanium (Ti)	---
Uranium (U)	0.384
Zinc (Zn)	0.0459
Zirconium (Zr)	---
Ions	(kg)
Ammonia (NH_3)	3.98
Carbonate (CO_3^{2-})	267
Chloride (Cl^-)	5.15
Cyanide (CN^-)	0.0573
Fluoride (F^-)	13.4
Hydroxide (OH^-)	176
Nitrate (NO_3^-)	420
Nitrite (NO_2^-)	135
Phosphate (PO_4^{3-})	14.5
Sulfate (SO_4^{2-})	36.4
Radionuclides	(Ci)
Americium-241	< 1.19 E-03
Carbon-14	4.65 E-04
Cerium/Praseodymium-144	< 17.7

Table 5-4. Post Evaporator 242-A Campaign 94-1 Inventory for Double-Shell Tank 241-AP-103. (3 pages)

Analyte	Current Inventory
Radionuclides (cont.)	(Ci)
Cesium-134	< 2.33
Cesium-137	680
Cobalt-60	< 1.25
Europium-154	< 3.33
Europium-155	< 9.11
Europium-154/155	< 3.33
Iodine-129	---
Niobium-94	< 0.967
Niobium-95	< 0.858
Plutonium-239/240	< 7.25 E-04
Radium-226	< 25.7
Ruthenium/Rhodium-106	< 35.4
Selenium-79	1.16 E-03
Strontium-90	0.272
Technetium-99	0.112
Tin-113	< 3.12
Tritium	0.545
Uranium-234	6.82 E-04
Uranium-235	3.53 E-05
Uranium-238	1.31 E-04
Physical Properties	
Water	98.3 wt.%
pH	13.0
Viscosity	1.01 cP
Specific Gravity	1.003
TIC	53.5 kg
TOC	11.6 kg

6.0 ANALYTICAL RESULTS INTERPRETATION

6.1 TANK WASTE SUMMARY

Examination of the analytical results reveals that the waste in Tank 241-AP-103 is a solution consisting of approximately 98.3% water. The most abundant ions in the tank are aluminum, sodium, nitrite, nitrate, and hydroxide; carbonate, as indicated by the TIC analysis, is also present at a relatively high concentration. Radionuclides which demonstrated a detectable activity included ^{14}C, ^{137}Cs, ^{79}Se, ^{90}Sr, ^{99}Tc, ^{3}H, ^{234}U, ^{235}U, and ^{238}U; ^{137}Cs was the most abundant isotope. With regard to organic constituents, acetone and 2,4-dichloropentane were identified in the tank waste. Organic chelating compounds may exist in Tank 241-AP-103, but analyses specific to their detection were not conducted. Tank homogeneity is discussed in Section 7.2

6.2 WASTE CONDITIONS

6.2.1 Regulatory Limits

None of the average concentrations of the Toxicity Characteristic Leaching Procedure metals defined in the Code of Federal Regulations, 40 CFR Part 261 exceeded their specified limits; however, the calculated pH of 13.0 is above the Resource Conservation and Recovery Act pH limit of 12.5 for corrosivity (EPA, 1990).

6.2.2 Projected Tank Heat Load

The low relative level of radionuclides in Tank 241-AP-103 is reflected in the low heat load (Table 6-1a). Only six of the elements tested for were detected by the analytical methods used. Detection limit numbers for the other analytes were included in the calculation in order to obtain the most conservative estimate possible. This projected head load is calculated from the pre-Evaporator inventory, and provides an indication of the radionuclides that will be transferred to Tank 241-AN-106.

A tank heatload was also calculated form the post-Evaporator radionuclide inventory, using the same method discussed above. It is presented in Table 6-1b. As can be seen, the heatload is insignificant.

Table 6-1a. Tank 241-AP-103 Pre-Evaporator Projected Heat Load.

Radionuclide	Ci	Watts
^{241}Am	< 0.0488	< 1.60E-03
$^{144}Ce/Pr$	< 728	< 5.83
^{134}Cs	< 95.9	< 0.978
^{137}Cs	28,000	132
^{60}Co	< 51.4	< 0.792
^{154}Eu	< 137	< 1.24
^{155}Eu	< 375	< 0.273
$^{154/155}Eu$	< 137	< 0.668
^{95}Nb	< 35.3	< 0.169
$^{239/240}Pu$	< 0.0298	< 9.10E-03
$^{106}Ru/Rh$	< 1,460	< 14.1
^{90}Sr	11.2	0.0750
^{99}Tc	4.62	2.31E-03
^{234}U	0.0281	7.95E-04
^{235}U	1.45E-03	3.93E-05
^{238}U	5.39E-03	1.34E-04
Watts		**< 156**

Table 6-1b. Tank 241-AP-103 Post-Evaporator Projected Heat Load.

Radionuclide	Ci	Watts
^{241}Am	< 1.19E-03	< 3.90E-05
$^{144}Ce/Pr$	< 17.7	< 0.142
^{134}Cs	< 2.33	< 0.0238
^{137}Cs	680	3.21
^{60}Co	< 1.25	< 0.0193
^{154}Eu	< 3.33	< 0.0301
^{155}Eu	< 9.11	6.62E-03
$^{154/155}Eu$	< 3.33	< 0.0301
^{95}Nb	< 0.858	< 4.11E-03
$^{239/240}Pu$	< 7.25E-04	< 2.21E-05
$^{106}Ru/Rh$	< 35.4	< 0.342
^{90}Sr	0.272	1.82E-03
^{99}Tc	0.112	5.61E-05
^{234}U	6.82E-04	1.93E-05
^{235}U	3.53E-05	9.56E-07
^{238}U	1.31E-04	3.26E-06
Watts		**< 3.81**

6.3 PROGRAM ELEMENT SPECIFIC ANALYSES

The sampling and analysis of Hanford Site waste tanks is driven by the need to satisfy the characterization requirements of the various Tank Waste Remediation System (TWRS) program elements. These characterization needs are implemented and documented through the Data Quality Objective (DQO) process, and expressed in a series of program specific DQO documents. The data needs are summarized in the *TWRS Tank Waste Analysis Plan* (Bell, 1994).

This Tank Characterization Report is the final step in the characterization of Tank 241-AP-103. According to the process and issue based data requirements, the inventory estimates and waste properties contained in this report can be applied to the data requirements of the various program elements. Contained in Table 6-2 is a summary of which program data needs are fulfilled through this characterization of the waste in Tank 241-AP-103, based on a review of the stated sampling and analysis requirements. In the future, the applicability of Tank Characterization Report results to each TWRS program element will be documented in tank specific Tank Characterization Plans, prior to the tank sampling.

Table 6-2. Applicability of Characterization Information to the Data Needs of the TWRS Program Elements

Data Quality Objective	Applicability to Characterization of Tank 241-AP-103
Tank Safety Screening	applies[1]
Ferrocyanide Safety Issue	does not apply
Flammable Gas Tanks Crust Burn Issue	does not apply
Generic Tank Vapor Issue Resolution	not addressed
Flammable Gas Tank	not completed
Waste Compatibility	applies
Organic Fuel Rich Tank	does not apply
Rotary Core Vapor Sampling	does not apply
Evaporator Operations	not completed
Process Control	not completed
Waste Tank Retrieval	not completed
Waste Tank Pretreatment	not completed
High-Level Waste Immobilization	not completed
Low-Level Waste Immobilization	not completed
Solid, Low-Level Waste Disposal	not completed
RCRA Part B Permit Application	not completed
Tank C-106 High-Heat Safety Issue	does not apply
Organic Layer Sampling of Tank C-103	does not apply
Tank C-103 Vapor and Gas Sampling	does not apply

[1] The sampling requirement for the Safety Screening Data Quality Objective (Babad, 1994) calls for both vertical waste samples and a vapor space sample. The sampling and analysis of Tank 241-AP-103 supports full characterization of the waste in the tank; vapor space sampling or characterization was not conducted as part of this activity.

applies - The data needs expressed in this Data Quality Objectives document are fulfilled through this characterization report.

does not apply - The data needs expressed in this Data Quality Objectives document do not apply to the waste in Tank 241-AP-103.

not addressed - The data needs expressed in this Data Quality Objectives document were not addressed by this characterization report.

not complete - At the date of preparation of this report, this Data Quality Objectives document has not yet been completed.

7.0 STATISTICAL INTERPRETATION

7.1 MASS AND CHARGE BALANCE

The principle objective in performing a mass and charge balance is to determine if the measurements are self-consistent. It also provides a method of estimating the weight percentage of water in the tank, since it was not evaluated by the laboratory. In calculating the balances, only analytes detected at a concentration of 1 ppm or greater were considered; all values were derived from the laboratory results. Mass and charge balance results are reported in Table 7-1.

Table 7-1. Tank 241-AP-103 Mass/Charge Balance.

	Mass μg/g	Charge μmol/g
Cations		
Aluminum (Al^{+3})	245	27.2
Chromium (Cr^{+6})	4.38	0.505
Iron (Fe^{+3})	1.23	0.0661
Magnesium (Mg^{+2})	1.19	0.0979
Sodium (Na^{+})	5,290	230
Uranium (U^{+6})	3.68	0.0928
Anions		
Ammonia (NH_3)	38.1	NA
Chloride (Cl^{-})	49.4	1.39
Fluoride (F^{-})	129	6.77
Hydroxide (OH^{-})	1,680	98.8
Nitrate (NO_3^{-})	4,030	65.0
Nitrite (NO_2^{-})	1,300	28.2
Phosphate (PO_4^{-3})	139	4.39
Sulfate (SO_4^{-2})	349	7.27
TIC-Carbonate (CO_3^{-2})	2,560	85.3
Totals		
Cations	5,550	258
Anions	10,300	297
Potassium (K^{+}) (est.)	1,525	39
Water (est.)	983,000	

Tabulation of the data revealed an excess of negative charge. Since the potassium concentration of the tank was not determined, the excess negative charge was compensated by assuming that potassium would provide the balance of positive charge. The mass of potassium was then predicted from the derived charge data.

The mass concentration, μg/g, resulting from the sum of the cations, anions, and estimated potassium was subtracted from a million in order to obtain an estimated value for the weight percent of water. In other words, mass not accountable to the analyte concentrations is attributed to water. The tank was predicted to be approximately 98.3% water from the data in Table 7-1.

7.2 TANK HOMOGENEITY

An analysis of variance was calculated on the analytical data results to determine if the tank contents were homogeneous. Sampling location means were not found to be different for 14 out of 18 analytes tested (at the $p = 0.05$ significance level), indicating that the tank contents are homogeneous. Furthermore, the weight percent water content of 98.3% estimated from the mass balance calculations and the specific gravity result of 1.003 support the conclusion.

7.3 ANALYTICAL ERROR ESTIMATION

Analytical error is comprised of two parts, random and systematic. Table 7-2 outlines both the analytical and systematic error estimates, organized by analyte.

Random Analytical Error

The random analytical error was estimated from the analytical results of the duplicate samples only. Error estimates were calculated using detected values only (no "less than" values). Many of the Relative Percent Difference (RPD) or Relative Standard Deviation (RSD) values in Table 7-2 for random analytical error (based on sample results) can be deceiving. Although the values for Al^{+3} and Cd^{+2} appeared low, each had 1 duplicate sample with an RPD or RSD over the criterion of 3 times the random analytical error from sample results. Zn^{+2} and Cl^{-} also had one duplicate sample over the criterion. The high values for many of the analytes can be explained by the presence of outliers. Another cause may be that the analyte concentration is near the detection limit, although detection limits were not reported in the Tank 241-AP-103 data package. Standard deviations were also quite high for many analytes, often being larger than half the analyzed data result. This is indicative of generally poor lab data.

Systematic Analytical Error

The systematic error estimate can be determined from the analysis of standards or spike recoveries. For the majority of analytes, the difference between the two estimates is not large, and the recoveries for most analytes were good (Table 7-2).

Table 7-2. Measurement Error Estimates Tank 241-AP-103.

Analyte	Random analytical error estimate - 1 RSD (%) From sample results	Systematic error estimate - 1 RSD (%)	
		From Standard Results*	From Spike Analyses
Aluminum (Al^{+3})	5.8	16	3.2
Arsenic (As^{+5})	13	4.4	16
Barium (Ba^{+2})	NA	1.0	1.3
Cadmium (Cd^{+2})	2.4	4.3	1.3
Chromium (Cr^{+6})	5.5	3.6	2.7
Iron (Fe^{+3})	24	8.5	2.6
Lead (Pb^{+2})	NA	2.3	3.5
Mercury $Hg^{+0.00}$	NA	3.7	3.9
Magnesium (Mg^{+2})	7.9	5.4	**
Manganese (Mn^{+2})	123	1.9	1.5
Selenium (Se^{+4})	NA	13	20
Silver (Ag^{+})	NA	17	1.0
Sodium (Na^{+})	40	51	**
Zinc (Zn^{+2})	35	1.3	2.4
Ammonia (NH_3)	NA	1.2	1.6
Chloride (Cl^{-})	32	4.0	4.6
Cyanide (CN^{-})	8.1	1.8	3.6
Fluoride (F^{-})	29	3.5	9.8
Hydroxide (OH^{-})	5.5	1.8	**
Nitrate (NO_3^{-})	15	4.1	13
Nitrite (NO_2^{-})	1.0	5.2	51
Phosphate (PO_4^{-3})	4.6	1.4	3.7
Sulfate (SO_4^{-2})	27	2.2	6.4
TOC-Total Organic Carbon	26	0.83	3.0
TIC-Total Inorganic Carbon	1.7	1.1	**
Specific Gravity	1.1	1.2	**
Cesium 137 (^{137}Cs)	1.7	4.9	6.7
Cobalt 60 (^{60}Co)	NA	0.65	**

NA Values below the detection limit.
* : Calculated from the Laboratory Measurement Control System standards analyzed in conjunction with the samples.
**: Data not available.

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8.0 RECOMMENDATIONS

8.1 SAFETY ISSUES

Characterization of Double-Shell Tank 241-AP-103 supports the classification of the tank as non-Watch List. Given the current tank inventory of fissionable radionuclides and organic or exothermic waste constituents, no credible potential exists for loss of tank integrity or release of radioactivity due to in-tank processes. Tank 241-AP-103 is within established operating safety requirements, as defined by applicable Data Quality Objectives.

Tank 241-AP-103 is considered sound and non-leaking (Hanlon, 1994), and examination of the waste volume history supports this conclusion (Koreski, 1994). Thermocouple data indicate that no self heating occurs in the waste, and that all variations in waste temperature are due to seasonal fluctuations. Therefore, there is no credible risk of self-boiling or excessive heating of the current tank contents. Given the present tank integrity and waste properties, the continued active operation of Tank 241-AP-103 for waste management and storage functions poses no unreasonable risk to personnel, the public, or the environment.

8.2 FURTHER CHARACTERIZATION NEEDS

Accurate and defensible characterization of the liquid contents of Tank 241-AP-103 has been performed in this report. Transfer of the tank waste to the evaporator began before this document was completed; as a consequence, further characterization recommendations are presently meaningless.

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APPENDIX A

ANALYTICAL RESULTS

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A.1 Introduction

A.1.1 Appendix A presents the chemical and radiological characteristics of tank 241-AP-103 in a tabular form, in terms of the specific concentrations of anions, metals, and radionuclides. In addition, a physical characteristic, specific gravity, is listed.

The data table for each analyte lists laboratory sample identification, analytical result, standard deviation, range of results, an evaluated data result, and a projected tank inventory for the particular analyte. The projected tank inventory column is not applicable for the specific gravity data. The data are listed in standard notation for values >.001 and <100,000; values outside these limits are listed in scientific notation.

A.2 Table Description

A.2.1 Abbreviations

Standard abbreviations are used to describe analytical methods.

Metals:	ICP - Inductively Coupled Plasma (generic for all metals unless otherwise known)
	CVAA - Cold Vapor Atomic Absorption
	AAS - Atomic Absorption Spectroscopy
Anions:	IC - Ion Chromatography
	KTN - Kjeldahl's Total Nitrogen
Radionuclides	GEA - Gamma Energy Analysis
	AEA - Alpha Energy Analysis
	APC - Alpha Proportional Counting
	BPC - Beta Proportional Counting
	LSC - Liquid Scintillation Counting
Physical Properties	DM - Direct Measurement
	DSC - Differential Scanning Calorimetry
	TGA - Thermogravimetric Analysis

A.3 Column Headings

A.3.1 The 'Analyte' column contains, in addition to the name of the analyte or physical characteristic, information about the method of measurement.

The analyte and method are presented as follows: 'method.analyte'. For example, the specific concentration of ^{90}Sr was measured with a beta proportional counter and is listed 'BPC.^{90}Sr'. The specific concentration of Fe as determined by the inductively coupled plasma method which is listed as 'ICP.Fe'.

A.3.2 The 'Laboratory Sample Identification' column lists the samples for which the analyte was measured. The 'Sampling Identification Number' is different from the number assigned to the samples at the tank farm. Sampling rationale, locations, and descriptions of sampling events are contained in Section 3.0.

A.3.3 'Analytical Data Result' is the specific concentration of the analyte determined at different sampling points. No quality control data such as matrix spikes, serial dilutions, or duplicate analyses are listed. This information may be obtained from the 241-AP-103 data package. Data which was qualified as estimated (denoted by 'J' or 'UJ' in the data package) will be enclosed in parentheses, i.e., (395) μg/ml. Unusable data (denoted by 'R' in the data package) will be entered with a strikeout, i.e., ~~395~~ μg/ml. Unqualified data will be entered in standard form.

A.3.4 The 'Range of Values' column lists the highest and the lowest values for a particular analyte.

A.3.5 Column 5 'Evaluated Data Result' is derived as discussed in Section 5.0.

A.3.6 Column 6, 'Projected Inventory', is the product of the concentration of the analyte and the volume of the waste in the tank. (4.28E+06 Liters).

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Table A-1. Tank 241-AP-103 Analytical Data: Aluminum

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Al	Sample R935	(3.07E+05)	76,000 to 5.60E+05	**2.46E+05**	1,050
	Sample R933	(1.02E+05)			
	Sample R934	(76,000)			
	Sample R936	(1.03E+05)			
	Sample R937	(2.30E+05)			
	Sample R941	(2.59E+05)			
	Sample R942	(5.60E+05)			
	Sample R943	(1.04E+05)			
	Sample R944	(1.71E+05)			
	Sample R945	(5.50E+05)			

Table A-1. Tank 241-AP-103 Analytical Data: Arsenic

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		mg/L	mg/L	**mg/L**	kg
AAS.As	Sample R935	0.0550	0.0280 to 0.0840	0.0484	0.207
	Sample R933	0.0520			
	Sample R934	(0.0350)			
	Sample R936	(0.0455)			
	Sample R937	(0.0490)			
	Sample R941	0.0390			
	Sample R942	0.0840			
	Sample R943	0.0280			
	Sample R944	0.035			
	Sample R945	0.0610			

Table A-1. Tank 241-AP-103 Analytical Data: Barium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Ba	Sample R935	(< 65.0)	N/A	**< 65.0**	< 0.278
	Sample R933	(< 65.0)			
	Sample R934	(< 65.0)			
	Sample R936	(< 65.0)			
	Sample R937	(< 65.0)			
	Sample R941	< 65.0			
	Sample R942	< 65.0			
	Sample R943	< 65.0			
	Sample R944	< 65.0			
	Sample R945	< 65.0			

Table A-1. Tank 241-AP-103 Analytical Data: Cadmium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Cd	Sample R935	(133)	48.0 to 183	**111**	0.475
	Sample R933	(71.5)			
	Sample R934	(48.0)			
	Sample R936	(64.5)			
	Sample R937	(124)			
	Sample R941	126			
	Sample R942	183			
	Sample R943	81.0			
	Sample R944	97.0			
	Sample R945	180			

Table A-1. Tank 241-AP-103 Analytical Data: Chromium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Cr	Sample R935	(4,870)	2,050 to 6,600	**4,390**	18.8
	Sample R933	(3,540)			
	Sample R934	(2,050)			
	Sample R936	(3,380)			
	Sample R937	(4,480)			
	Sample R941	4,860			
	Sample R942	6,600			
	Sample R943	3,530			
	Sample R944	4,150			
	Sample R945	6,400			

Table A-1. Tank 241-AP-103 Analytical Data: Iron

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Fe	Sample R935	(990)	< 435 to 2,670	**1,230**	5.28
	Sample R933	(< 435)			
	Sample R934	(481)			
	Sample R936	(< 435)			
	Sample R937	(< 435)			
	Sample R941	(1,360)			
	Sample R942	2,670			
	Sample R943	630			
	Sample R944	< 435			
	Sample R945	< 435			

Table A-1. Tank 241-AP-103 Analytical Data: Lead

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Pb	Sample R935	(< 400)	N/A	**< 400**	< 1.71
	Sample R933	(< 400)			
	Sample R934	(< 400)			
	Sample R936	(< 400)			
	Sample R937	(< 400)			
	Sample R941	< 400			
	Sample R942	< 400			
	Sample R943	< 400			
	Sample R944	< 400			
	Sample R945	< 400			

Table A-1. Tank 241-AP-103 Analytical Data: Magnesium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Mg	Sample R935	1,530	< 255 to 1,530	**1,190**	5.11
	Sample R933	1,090			
	Sample R934	1,030			
	Sample R936	1,150			
	Sample R937	1,140			
	Sample R941	< 255			
	Sample R942	< 255			
	Sample R943	< 255			
	Sample R944	< 255			
	Sample R945	< 255			

Table A-1. Tank 241-AP-103 Analytical Data: Manganese

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Mn	Sample R935	(51.5)	< 15.0 to 61.8	**43.1**	0.185
	Sample R933	(< 15.0)			
	Sample R934	(< 15.0)			
	Sample R936	(< 15.0)			
	Sample R937	(45.0)			
	Sample R941	(61.8)			
	Sample R942	34.1			
	Sample R943	< 15.0			
	Sample R944	< 15.0			
	Sample R945	23.0			

Table A-1. Tank 241-AP-103 Analytical Data: Mercury

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		mg/L	mg/L	**mg/L**	kg
AAS.Hg	Sample R935	(< 0.00170)	< 0.00170 to < 0.00500	**< 0.00500**	< 0.0214
	Sample R933	~~< 0.00170~~			
	Sample R934	< 0.00170			
	Sample R936	~~< 0.00170~~			
	Sample R937	(0.00170)			
	Sample R941	(< 0.00170)			
	Sample R942	~~< 0.00170~~			
	Sample R943	(< 0.00500)			
	Sample R944	(< 0.0017)			
	Sample R945	(< 0.0017)			

Table A-1. Tank 241-AP-103 Analytical Data: Selenium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		mg/L	mg/L	**mg/L**	kg
AAS.Se	Sample R935	< 0.00500	< 0.00500 to < 0.0200	**< 0.0200**	< 0.0856
	Sample R933	(< 0.0200)			
	Sample R934	< 0.00500			
	Sample R936	< 0.00500			
	Sample R937	(< 0.00500)			
	Sample R941	< 0.0200			
	Sample R942	< 0.00710			
	Sample R943	< 0.00500			
	Sample R944	< 0.0050			
	Sample R945	< 0.0059			

Table A-1. Tank 241-AP-103 Analytical Data: Silver

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Ag	Sample R935	(< 40.0)	N/A	**< 40.0**	< 0.171
	Sample R933	(< 40.0)			
	Sample R934	(< 40.0)			
	Sample R936	(< 40.0)			
	Sample R937	(< 40.0)			
	Sample R941	~~< 40.0~~			
	Sample R942	~~< 40.0~~			
	Sample R943	~~< 40.0~~			
	Sample R944	~~< 40.0~~			
	Sample R945	~~< 40~~			

Table A-1. Tank 241-AP-103 Analytical Data: Sodium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Na	Sample R935	(2.46E+06)	2.05E+06 to 1.20E+07	**5.31E+06**	22,700
	Sample R933	(3.67E+06)			
	Sample R934	(2.32E+06)			
	Sample R936	(3.82E+06)			
	Sample R937	(2.05E+06)			
	Sample R941	(6.54E+06)			
	Sample R942	(1.17E+07)			
	Sample R943	(3.70E+06)			
	Sample R944	(4.87E+06)			
	Sample R945	(1.20E+07)			

Table A-1. Tank 241-AP-103 Analytical Data: Total Uranium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
APC. Tot.U	Composite Sample R949	3,690	N A	**3,690**	15.8

Table A-1. Tank 241-AP-103 Analytical Data: Zinc

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Metal		µg/L	µg/L	**µg/L**	kg
ICP.Zn	Sample R935	(1,210)	< 20.0 to 1,210	**441**	1.89
	Sample R933	< 33.5			
	Sample R934	(< 20.0)			
	Sample R936	(550)			
	Sample R937	(221)			
	Sample R941	(48.0)			
	Sample R942	309			
	Sample R943	< 20.0			
	Sample R944	< 20.0			
	Sample R945	309			

Table A-2. Tank 241-AP-103 Analytical Data: Ammonia

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Cation		mg/L	mg/L	**mg/L**	kg
KTN.NH_3	Sample R935	(35.0)	13.1 to < 90.0	**38.2**	164
	Sample R933	~~< 45.0~~			
	Sample R934	~~< 22.5~~			
	Sample R936	~~< 22.5~~			
	Sample R937	~~< 22.5~~			
	Sample R941	(< 90.0)			
	Sample R942	~~< 90.0~~			
	Sample R943	(< 90.0)			
	Sample R944	(13.1)			
	Sample R945	(65.7)			

Table A-2. Tank 241-AP-103 Analytical Data: Chloride

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Anion		mg/L	mg/L	**mg/L**	kg
IC.Cl^-	Sample R935	(49.8)	17.8 to 103	**49.5**	212
	Sample R933	(36.6)			
	Sample R934	(34.5)			
	Sample R936	(31.0)			
	Sample R937	(17.8)			
	Sample R941	(51.1)			
	Sample R942	(92.9)			
	Sample R943	(38.3)			
	Sample R944	(39.8)			
	Sample R945	(103)			

Table A-2. Tank 241-AP-103 Analytical Data: Cyanide

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Anion		mg/L	mg/L	**mg/L**	kg
SPECTRO PHOT.CN^-	Sample R935	(0.584)	0.469 to 0.610	**0.551**	2.36
	Sample R933	~~< 1.00~~			
	~~Sample R934~~	~~(0.495)~~			
	Sample R936	(0.469)			
	Sample R937	(0.527)			
	Sample R941	(0.605)			
	Sample R942	(0.610)			
	Sample R943	(0.511)			
	Sample R944	(0.552)			
	Sample R945	(0.61)			

Table A-2. Tank 241-AP-103 Analytical Data: Fluoride

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Anion		mg/L	mg/L	**mg/L**	kg
IC.F^-	Sample R935	(178)	54.1 to 305	**129**	552
	Sample R933	(61.2)			
	Sample R934	(88.2)			
	Sample R936	(60.3)			
	Sample R937	(54.1)			
	Sample R941	(130)			
	Sample R942	(305)			
	Sample R943	(60.6)			
	Sample R944	(96.4)			
	Sample R945	(260)			

Table A-2. Tank 241-AP-103 Analytical Data: Hydroxide

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Anion		mg/L	mg/L	**mg/L**	kg
AUTOTIT.OH^-	Sample R935	(1,890)	546 to 3,430	**1,690**	7,230
	Sample R933	(546)			
	Sample R934	(850)			
	Sample R936	(1,120)			
	Sample R937	(1,500)			
	Sample R941	(1,510)			
	Sample R942	(3,430)			
	Sample R943	~~12.9~~			
	Sample R944	991			
	Sample R945	3,350			

Table A-2. Tank 241-AP-103 Analytical Data: Nitrate

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Anion		mg/L	mg/L	**mg/L**	kg
IC.NO_3^-	Sample R935	(3,500)	1,620 to 9,790	**4,040**	17,300
	Sample R933	(1,680)			
	Sample R934	(2,060)			
	Sample R936	(1,720)			
	Sample R937	(3,250)			
	Sample R941	(4,480)			
	Sample R942	(9,440)			
	Sample R943	(1,620)			
	Sample R944	(2,850)			
	Sample R945	(9,790)			

Table A-2. Tank 241-AP-103 Analytical Data: Nitrite

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Anion		mg/L	mg/L	**mg/L**	kg
IC.NO_2^-	Sample R935	(1,380)	983 to 1,810	**1,300**	5,560
	Sample R933	(1,140)			
	Sample R934	(983)			
	Sample R936	(1,130)			
	Sample R937	(1,280)			
	Sample R941	(1,260)			
	Sample R942	(1,700)			
	Sample R943	(1,120)			
	Sample R944	(1,200)			
	Sample R945	(1,810)			

Table A-2. Tank 241-AP-103 Analytical Data: Phosphate

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Anion		mg/L	mg/L	**mg/L**	kg
IC.PO_4^{3-}	Sample R935	(151)	112 to 168	**139**	595
	Sample R933	(127)			
	Sample R934	(147)			
	Sample R936	(121)			
	Sample R937	(139)			
	Sample R941	137			
	Sample R942	(149)			
	Sample R943	112			
	Sample R944	134			
	Sample R945	168			

Table A-2. Tank 241-AP-103 Analytical Data: Sulfate

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Anion		mg/L	mg/L	**mg/L**	kg
IC.SO_4^{2-}	Sample R935	(318)	162 to 502	**350**	1,500
	Sample R933	(452)			
	Sample R934	(502)			
	Sample R936	(414)			
	Sample R937	(196)			
	Sample R941	396			
	Sample R942	(162)			
	Sample R943	(418)			
	Sample R944	(482)			
	Sample R945	(163)			

Table A-3. Tank 241-AP-103 Analytical Data: Americium-241

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
AEA.^{241}Am	Composite Sample R949	(< 0.0114)	N/A	**< 0.0114**	< 0.0488

Table A-3. Tank 241-AP-103 Analytical Data: Carbon-14

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
LSC.^{14}C	Composite Sample R949	(0.00447)	N/A	**0.00447**	0.0191

Table A-3. Tank 241-AP-103 Analytical Data: Cerium/Praseodymium-144

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{144}Ce/Pr	Sample R942	< 170	< 96.7 to < 170	**< 170**	< 728
	Composite Sample R949	< 96.7			

Table A-3. Tank 241-AP-103 Analytical Data: Cesium-134

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{134}Cs	Sample R935	< 9.69	< 8.32 to < 22.4	**< 22.4**	< 95.9
	Sample R933	< 22.4			
	Sample R934	< 10.4			
	Sample R936	< 9.94			
	Sample R937	< 8.32			
	Sample R941	< 10.7			
	Sample R942	< 9.43			
	Sample R943	< 9.17			
	Sample R944	< 8.62			
	Sample R945	< 11.3			
	Composite Sample R949	< 9.89			

Table A-3. Tank 241-AP-103 Analytical Data: Cesium-137

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{137}Cs	Sample R935	5,800	4,230 to 8,500	**6,540**	28,000
	Sample R933	6,700			
	Sample R934	7,200			
	Sample R936	7,020			
	Sample R937	6,590			
	Sample R941	6,420			
	Sample R942	8,500			
	Sample R943	6,590			
	Sample R944	6,930			
	Sample R945	4,230			
	Composite Sample R949	6,010			

Table A-3. Tank 241-AP-103 Analytical Data: Cobalt-60

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{60}Co	Sample R942	< 10.0	< 9.60 to < 12	**< 12**	< 51.4
	Sample R944	< 12			
	Sample R945	< 11			
	Composite Sample R949	< 9.60			

Table A-3. Tank 241-AP-103 Analytical Data: Europium-154

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{154}Eu	Sample R945	< 32	< 27.1 to < 32	**< 32**	< 137
	Composite Sample R949	< 27.1			

Table A-3. Tank 241-AP-103 Analytical Data: Europium-154/155

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.$^{154/155}$Eu	Sample R942	< 22.0	< 22.0 to < 32	**< 32**	< 137
	Sample R944	< 32			

Table A-3. Tank 241-AP-103 Analytical Data: Europium-155

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{155}Eu	Sample R935	< 48.3	< 25.5 to < 87.5	**< 87.5**	< 375
	Sample R933	< 87.5			
	Sample R934	< 52.1			
	Sample R936	< 50.0			
	Sample R937	< 50.2			
	Sample R941	< 26.0			
	Sample R943	< 47.4			
	Composite Sample R949	< 25.5			

Table A-3. Tank 241-AP-103 Analytical Data: Iodine-129

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
Low Energy GEA.^{129}I	Composite Sample R949	~~< 3.34~~	N/A	**N/A**	N/A

NOTE: Data rejected by Laboratory due to the lack of Efficiency and Background Checks.

Table A-3. Tank 241-AP-103 Analytical Data: Niobium-94

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{94}Nb	Sample R942	< 9.30	N/A	**< 9.30**	< 39.8

Table A-3. Tank 241-AP-103 Analytical Data: Niobium-95

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{95}Nb	Composite Sample R949	< 8.25	N/A	**< 8.25**	< 35.3

Table A-3. Tank 241-AP-103 Analytical Data: Plutonium-239/240

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
AEA.$^{239/240}$Pu	Composite Sample R949	< 0.00697	N/A	**< 0.00697**	< 0.0298

Table A-3. Tank 241-AP-103 Analytical Data: Radium-226

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{226}Ra	Sample R942	< 43.0	< 43.0 to < 247	**< 247**	< 1,060
	Composite Sample R949	< 247			

Table A-3. Tank 241-AP-103 Analytical Data: Ruthenium/Rhodium-106

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{106}Ru/Rh	Sample R942	< 340	< 195 to < 340	**< 340**	< 1,460
	Composite Sample R949	< 195			

Table A-3. Tank 241-AP-103 Analytical Data: Selenium-79

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
LSC.^{79}Se	Composite Sample R949	0.0112	N/A	**0.0112**	0.0479

Table A-3. Tank 241-AP-103 Analytical Data: Strontium-90

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
BPC.^{90}Sr	Composite Sample R949	2.62	N/A	**2.62**	11.2

Table A-3. Tank 241-AP-103 Analytical Data: Technecium-99

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
LSC.^{99}Tc	Composite Sample R949	1.08	N/A	**1.08**	4.62

Table A-3. Tank 241-AP-103 Analytical Data: Tin-113

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
GEA.^{113}Sn	Sample R942	< 30.0	< 17.6 to < 30.0	**< 30.0**	< 128
	Composite Sample R949	< 17.6			

Table A-3. Tank 241-AP-103 Analytical Data: Tritium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
LSC.^{3}H	Composite Sample R949	5.24	N/A	**5.24**	**22.4**

Table A-3. Tank 241-AP-103 Analytical Data: Uranium-234

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
AEA.^{234}U	Composite Sample R949	0.00656	N/A	**0.00656**	0.0281

Table A-3. Tank 241-AP-103 Analytical Data: Uranium-235

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
AEA.^{235}U	Composite Sample R949	3.39E-04	N/A	**3.39E-04**	0.00145

Table A-3. Tank 241-AP-103 Analytical Data: Uranium-238

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Radionuclide		µCi/L	µCi/L	**µCi/L**	Ci
AEA.^{238}U	Composite Sample R949	0.00126	N/A	**0.00126**	**0.00539**

Table A-4. Tank 241-AP-103 Analytical Data: Specific Gravity

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Physical Property					
SpG	Sample R935	(1.018)	0.992 to 1.018	**1.003**	---
	Sample R933	(0.998)			
	Sample R934	(1.008)			
	Sample R936	(1.002)			
	Sample R937	(1.017)			
	Sample R941	(0.995)			
	Sample R942	(1.0044)			
	Sample R943	0.992			
	Sample R944	0.994			
	Sample R945	1.006			

Table A-4. Tank 241-AP-103 Analytical Data: Total Inorganic Carbon

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Physical Property		mg/L	mg/L	**mg/L**	kg
TIC	Sample R935	(522)	430 to 650	**514**	2,200
	Sample R933	(544)			
	Sample R934	(498)			
	Sample R936	(430)			
	Sample R937	(460)			
	Sample R941	(449)			
	Sample R942	(650)			
	Sample R943	(530)			
	Sample R944	(545)			
	Sample R945	(512)			

Table A-4. Tank 241-AP-103 Analytical Data: Total Organic Carbon

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Physical Property		mg/L	mg/L	**mg/L**	kg
TOC	Sample R935	(130)	87.7 to 150	**112**	479
	Sample R933	(110)			
	Sample R934	(150)			
	Sample R936	(120)			
	Sample R937	(150)			
	Sample R941	(91.1)			
	Sample R942	(91.5)			
	Sample R943	(87.7)			
	Sample R944	(99.7)			
	Sample R945	(90.8)			

Table A-5. Tank 241-AP-103 Analytical Data: Volatile Organics

Analyte	Result µg/L	Analyte	Result µg/L
Chloromethane	ND	cis-1,3-Dichloropropene	ND
Bromomethane	ND	Trichloroethane	ND
Vinyl Chloride	ND	Dibromochloromethane	ND
Chloroethane	ND	1,1,2-Trichloroethane	ND
Methylene Chloride	ND	Benzene	ND
Acetone	ND	trans-1,3-Dichloropropene	ND
Carbon Disulfide	ND	Bromoform	ND
1,1-Dichloroethene	ND	4-Methyl-2-Pentanone	ND
1,1-Dichloroethane	ND	2-Hexanone	ND
1,2-Dichloroethene (total)	ND	Tetrachloroethane	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
1,2-Dichloroethane	ND	Toluene	ND
2-Butanone	N/A	Chlorobenzene	ND
1,1,1-Trichloroethane	ND	Ethylbenzene	ND
Carbon Tetrachloride	ND	Styrene	ND
Bromodichloromethane	ND	Xylene (total)	ND
1,2-Dichloropropane	ND		

NOTE: VOA results were all rejected.
ND = Not Detected

Table A-5. Tank 241-AP-103 Analytical Data: Acetone

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Volatile Organic		µg/L	µg/L	**µg/L**	kg
Acetone	Sample R935	935	440 to 1,000	**728**	3.12
	Sample R933	895			
	Sample R934	720			
	Sample R936	660			
	Sample R937	685			
	Sample R941	720			
	Sample R942	1,000			
	Sample R943	665			
	Sample R944	440			
	Sample R945	555			

Table A-6. Tank 241-AP-105 Analytical Data: Semivolatile Organic

Analyte	Result µg/L	Analyte	Result µg/L
Phenol	ND	Acenaphthene	ND
bis(2-Chloroethyl)ether	ND	2,4-Dinitrophenol	ND
2-Chlorophenol	ND	4-Nitrophenol	ND
1,3-Dichlorobenzene	ND	Dibenzofuran	ND
1,4-Dichlorobenzene	ND	2,4-Dinitrotoluene	ND
1,2-Dichlorobenzene	ND	Diethylphthalate	ND
2-Methylphenol	ND	4-Chlorophenyl-phenylether	ND
2,2'-oxybis(1-Chloropropane)	ND	Fluorene	ND
4-Methylphenol	ND	4-Nitroaniline	ND
N-Nitroso-di-n-propylamine	ND	4,6-Dinitro-2-methylphenol	ND
Hexachloroethane	ND	N-Nitrosodiphenylamine (1)	ND
Nitrobenzene	ND	4-Bromophenyl-phenylether	ND
Isophorone	ND	Hexachlorobenzene	ND
2-Nitrophenol	ND	Pentachlorophenol	ND
2,4-Dimethylphenol	ND	Phenanthrene	ND
bis(2-Chloroethoxy)methane	ND	Anthracene	ND
2,4-Dichlorophenol	ND	Carbazole	ND
1,2,4-Trichlorobenzene	ND	Di-n-butylphthalate	ND
Naphthalene	ND	Fluoranthene	ND
4-Chloroaniline	ND	Pyrene	ND
Hexachlorobutadiene	ND	Butylbenzylphthalate	ND
4-Chloro-3-methylphenol	ND	3,3'-Dichlorobenzidine	ND
5-Methylnaphthalene	ND	Benzo(a)anthracene	ND
Hexachlorocyclopentadiene	ND	Chrysene	ND
2,4,6-Trichlorophenol	ND	bis-(2-Ethylexyl)phthalate	ND
2,4,5-Trichlorophenol	ND	Di-n-octylphthalate	ND
2-Chloronaphthalene	ND	Benzo(b)fluoranthene	ND
2-Nitroaniline	ND	Benzo(k)fluoranthene	ND
Dimethylphthalate	ND	Benzo(a)pyrene	ND
Acenaphthalate	ND	Indeno(1,2,3-cd)pyrene	ND
2,6-Dinitrotoluene	ND	Dibenz(a,h)anthracene	ND
3-Nitroaniline	ND	Benzo(g,h,i)perylene	ND

NOTE: SVOA results are rejected
ND = Not Detected

Table A-6. Tank 241-AP-103 Analytical Data: 2,4-dichloropentane

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	**Evaluated Data Result**	Projected Inventory
Semivolatile Organic		µg/L	µg/L	**µg/L**	kg
2,4-dichloropentane	Sample R937	5,500	5,500 to 62,000	**22,000**	94
	Sample R941	20,000			
	Sample R942	9,900			
	Sample R943	62,000			
	Sample R944	12,000			

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