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VAPOR & GAS SAMPLING OF SST 241BY103 USING THE
VAPOR SAMPLING SYSTEM

SEP 25 1995
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**This document was reviewed following the
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WHC Information Release Administration Specialist:

Kara Broz

9/25/95

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Using the Vapor Sampling System

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LIST OF TERMS

CGI	Combustible Gas Indicator
COC	Chain Of Custody
DOT	U.S. Department of Transportation
GC/FID	Gas Chromatograph/Flame Ionization Detector
GEA	Gamma Energy Analysis
HEPA	High-Efficiency Particulate Air (filter)
NH ₃	Ammonia
NO ₂	Nitrogen Dioxide
NO	Nitric Oxide
H ₂ O	Water Vapor
OGIST	Oregon Graduate Institute of Science and Technology
OPC	Offsite Property Control
ORNL	Oak Ridge National Laboratory
OVM	Organic Vapor Meter
PNL	Pacific Northwest Laboratory
SML	Sampling and Mobile Laboratories
SST	Single-Shell Tank
TCP	Tank Characterization Plan
team	SML Vapor Team
TST	Triple Sorbent Trap
VSS	Vapor Sampling System
WHC	Westinghouse Hanford Company

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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-BY-103 USING THE VAPOR SAMPLING SYSTEM

1.0 SCOPE

The Vapor Issue Resolution Program tasked the Sampling and Mobile Laboratories (SML) to collect representative headspace samples from Hanford Site single-shell tank (SST) 241-BY-103. This document presents sampling data resulting from the November 1, 1994, sampling of SST 241-BY-103.

2.0 SAMPLING EQUIPMENT DESCRIPTION

2.1 VAPOR SAMPLING SYSTEM

The SML vapor team (the team) used the vapor sampling system (VSS) to collect representative samples of the air, gases, and vapors from the headspace of SST 241-BY-103 on November 1, 1994. Mahon et al. (1994) describes in detail the VSS, its performance, and its operation. The team used the VSS to collect sorbent traps and SUMMA¹ canister headspace samples from SST 241-BY-103; subsequently, the team sent these samples to analytical laboratories for analysis.

The VSS comprises a mobile laboratory, a hot-water-jacketed stainless steel probe that is inserted into the tank headspace, and stainless steel transfer tubing that connects the mobile laboratory to the probe. A vacuum pump draws sample vapor from the tank headspace and through all transfer tubing and the sampling manifold. Electrically activated, pneumatically actuated valves direct sample flow within the VSS. Instrumentation housed in the mobile laboratory monitors and controls system temperature, monitors absolute and differential system pressure, meters and controls mass flow, and monitors sample vapor using a gas chromatograph/flame ionization detector (GC/FID).

A key feature of the VSS is its use of heated transfer tubing and a heated sampling manifold. Maintaining the system temperature at an electronically controlled elevated temperature prevents vapor condensation and reduces vapor adsorption on surfaces exposed to sample vapor. Mahon et al. (1994) describes various tests and observations that indicate the VSS sample transfer efficiency is consistently high.

Sorbent trap samples are collected at the sorbent trap station of the sampling manifold. Sorbent traps are pencil-size stainless steel or glass tubes that contain vapor-adsorbing media. A known amount of sample vapor is passed through the tube, which traps (by adsorption) virtually all the target

¹SUMMA is a registered trademark of Molectrics, Inc., Cleveland, Ohio.

analytes. The sorbent trap is then sent to an analytical laboratory and analyzed. The concentration of analytes in the vapor sampled is calculated from the quantity of analyte found in the sorbent media and the volume of vapor passed through the sorbent trap.

The sorbent trap station uses highly accurate mass flow controllers to measure and control the flow rate of sample vapor through the sorbent traps. The controllers are located downstream of the sorbent trap station and the in-line driers, which remove water vapor from the vapor before the vapor is metered. Errors associated with the mass flow controllers were determined by the Westinghouse Hanford Company (WHC) Standards Laboratory before the SST 241-BY-103 sampling (see Table 1). Flow rates and the duration of flow are specified by the analytical laboratories that supply and analyze the sorbent traps.

Table 1. Flow Control Calibration.

Flow-indicating Control Valve	Flow (stdcm ³ /min)	Error (%)
1	200	±0.15
3	200	±0.30

The sampling manifold also has a station for sampling vapor with evacuated SUMMA[™] canisters. SUMMA[™] canisters are stainless steel vessels with internal surfaces that have been prepared by the SUMMA[™] process, which passivates active sites on the canister walls to minimize adsorption of gases and vapors. An analytical laboratory must clean and evacuate SUMMA[™] canisters before use. The evacuated canister is filled with sample vapor through a valve, which is then closed to seal the sample inside. SUMMA[™] canisters essentially allow collection and transfer of whole-air samples from location to an analytical laboratory where the sample is analyzed. The standard capacity of each SUMMA[™] canister is 6 liters.

Prior to sampling, a GC/FID confirms that the VSS is free of hydrocarbon contamination, to the limit of detection. The GC/FID is part of the VSS and can be used during a sampling event to periodically monitor organic vapor concentrations in the vapor being sampled.

3.0 SAMPLING EVENT DESCRIPTION

3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-231, *Tank 241-BY-103 Tank Characterization Plan* (Carpenter 1994). The Tank Characterization Plan (TCP) also specifies the types and number of samples to be collected, flow rates, and durations. These key sampling parameters are summarized on the sample log sheets in Appendix A. In addition

to the sample log sheets, checksheets for each individual sample help ensure correct sampling procedures. SML retains these documents in the project file. This sample event's project-specific number is S4-080.

3.2 OPERATIONS AND SAMPLING PERSONNEL

E. A. Tampos was the Tank Farm Operations person-in-charge. The other SML vapor team members included:

- E. A. Johnson, Field Scientist
- R. A. Westberg, Field Scientist
- T. B. Utecht, VSS Technician
- R. L. Ragan, Field Scientist (Training)
- N. P. Buechler, Trailer Support.

The VSS was set up at SST 241-BY-103 on October 31, 1994, and was allowed to warm up. Sampling began shortly after 6:00 a.m. on November 1, 1994, and was completed by 11:00 a.m. the same day.

3.3 AMBIENT CONDITIONS

The weather the day of the sampling event, November 1, 1994, was cold and partly cloudy with gusty winds from the southwest. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 4 miles due west of 241-BY tank farm are provided in Appendix B.

3.4 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser 10B of SST 241-BY-103. The probe length, from the sample inlet to the top of the riser flange, was 7.9 m.

All zones of the VSS were heated to 60 °C during setup of the VSS at SST 241-BY-103 on October 31, 1994. The team stabilized the VSS temperature zones by 6:00 a.m. on November 1, 1994, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-BY-103 were 981 mbar (735.7 torr) and 17.6 °C, respectively. The sample log sheets (Appendix A) provide a complete chronology of the sample event including start and end times, flow rates, volumes, and specific sample identifiers.

Approximately 17 hours before the first samples were collected, the team began heating the VSS transfer tubing and sampling manifold. During this warmup period the team purged the sampling manifold with ambient air. The team also collected two SUMMA[™] canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-BY-103, and one using the VSS

sampling manifold. The former was collected to establish background levels of trace organic vapors, and the latter was collected to establish the cleanliness of the sampling manifold.

A leak check of the VSS sampling manifold and transfer tubing (up to the connection to the in-tank sampling probe) was performed. Leakage resulted in an increase of mbar (6.6 torr) rise in pressure over the 15 minute test. Given a system volume of not more than 10 L, this pressure rise corresponds to a leak rate of approximately 20.0 mL/min at a 293 mbar (220.0 torr) system pressure. This leak rate was estimated for average SUMMA™, TST, and sorbent sampling pressures. It was found that for the SUMMA™ canisters, dilution by ambient air was approximately 0.2%, for TST traps sampled at 200 mL/min the dilution was approximately 0.6%, and for sorbent traps the dilution was approximately 0.6%.

The VSS was purged with sample vapor from SST 241-BY-103 for 30 minutes at a total flow rate of 5.45 L/min. This purge was performed to flush ambient air from the system and saturate the system's active adsorption sites. Because the volume of transfer tubing and the sampling manifold upstream of the sampling devices is estimated to be no more than 10 L, this purge provided about 16.4 air turnovers in the system.

Two analytical laboratories provided sample media. Oak Ridge National Laboratory (ORNL) provided triple sorbent traps (TSTs) for organic vapors; and Pacific Northwest Laboratory (PNL) provided SUMMA™ canisters and sorbent traps for organic vapors, ammonia (NH₃), nitrogen dioxide (NO₂), nitric oxide (NO), and water vapor (H₂O). Three SUMMA™ canisters were to be analyzed by the Oregon Graduate Institute of Science and Technology (OGIST).

3.5 INDUSTRIAL HYGIENE FIELD RESULTS

Before connecting to SST 241-BY-103, an industrial hygiene technician field tested the tank vapors. The technician purged the vapor probe sample tube for 5 minutes and then field measured vapor stream contents using a combustible gas indicator (CGI) and organic vapor meter (OVM). The technician verbally reported an LEL of 0.0%, and a total organic carbon content of 0.0 ppm using the OVM. The technician also used a Dräger tube to estimate the ammonia content of the tank as only a trace amount.

3.6 RADIATION SCREENING

Samples are unconditionally released from the SST farm in accordance with DI-33300-93-004, *Release of Vapor Sampling Equipment* (WHC 1993b). Radiological screening results are used to determine (1) if the samples must be shipped as radioactive or nonradioactive in accordance with U.S. Department of Transportation (DOT) regulations and (2) if the samples meet the laboratory acceptance criteria.

The DOT limits for shipping a nonradioactive sample are 200 pCi/g of beta-gamma activity and 60 pCi/g of alpha activity. Samples exceeding these DOT limits may be shipped as radioactive material, if the samples do not exceed the following laboratory acceptance criteria:

- OGIST: The laboratory has supplied no acceptance criteria for alpha-beta-gamma activity. Notify the laboratory if radioactive levels exceed the DOT limits specified above, or if >50 pCi/g tritium are found.
- ORNL: Beta-gamma activity <450 pCi/g of sample media. Alpha activity <135 pCi/g.
- PNL: Beta-gamma activity <400 pCi/g of sample media. Alpha activity <100 pCi/g of sample media.

To protect the sampling manifold and all sampling devices from radioactive particulates, all sample vapor for the November 1, 1994, SST 241-BY-103 vapor sampling event was drawn through a series of four glass-fiber high-efficiency particulate air (HEPA) filters placed upstream of the sampling manifold. These four filters were in place any time tank headspace air, gases, and vapors were flowing through the system. When sampling was complete, the filters were removed and assigned unique sample identifiers. All four HEPA filters were submitted to Laboratory 222-S for total alpha, total beta, and gamma energy analysis (GEA). The HEPA filter closest to the sampling manifold was analyzed to determine if the samples met DOT shipping criteria and laboratory acceptance criteria. SST 241-BY-103 filter sample results are shown in Table 2. SML scientists use the activity results from Table 2 to calculate pCi/g of sample media. SML maintains this information in the project-specific file.

A water vapor sample was also collected through one of the sorbent station ports and analyzed for tritiated water. SST 241-BY-103 tritium sample results are shown in Table 2. The results in Table 2 indicate that the samples collected from SST 241-BY-103 met the laboratory acceptance criteria and the DOT definition of a nonradioactive shipment.

Table 2. Radionuclide Analysis Results.

Filter	Sample Identifier	Activity results ^a (pCi/sample)	Activity ^b (pCi/L of tank gas)
Upstream HEPA filter (box)	S4080-A25.OU1	Total Alpha = 788 Total Beta = 4940 GEA = 788 (²⁰⁸ Tl) GEA = 2350 (²¹² Pb) GEA = 2350 (²¹² Bi)	=2.44 =15.29 =2.44 =7.27 =7.27
Downstream HEPA filter (box)	S4080-A26.OD1	Total Alpha = .428 Total Beta = <3.47 GEA = <detectable	=.001 =<.01 =<detectable
Upstream HEPA filter (VSS)	S4080-A27.OU2	Total Alpha = <.592 Total Beta = <2.37 GEA = <detectable	=<.002 =<.007 =<detectable
Downstream HEPA filter (VSS)	S4080-A28.OD2	Total Alpha = 3.10 Total Beta = 8.39 GEA = <detectable	= 0.01 =0.03 =<detectable
Tritium trap	S4080-A03.OT1	Total activity = <50	=<50.0 ^c

NOTE:

The samples are nonradioactive. These results were evaluated against laboratory acceptance criteria and DOT limits (see Section 3.5).

^aAll less than (<) values represent the minimum detection limits at Laboratory 222-S.

^bNumbers based on an approximation of the total volume of tank vapor through the HEPA filters. Appendix A and the sample checksheets were used to estimate a total flow through the VSS of 323 L.

^cNumber is calculated using a total volume of 1 L passing through the tritium trap.

4.0 SAMPLE CHAIN OF CUSTODY: RECEIPT, STORAGE, AND SHIPMENT

All sorbent trains, sorbent tubes, and SUMMATM canisters received by SML are stored in a custody locker maintained by SML. Sorbent trains and tubes were maintained at 4 ± 2 °C in a refrigeration unit. SUMMATM canisters were stored in the same locked storage area, but were not refrigerated.

TSTs are supplied by ORNL. ORNL initiates the chain-of-custody (COC) forms. The sample media is placed in 40-mL volatile organic analysis vials. Evidence tape is applied to the vials, which are then placed in a shipping container along with the relinquished COC forms and shipped to SML. TSTs are shipped to SML in a cooler containing "blue" ice.

The TSTs were received, inventoried against the COC forms, and the "received by" block on the COC form was signed by SML. They were maintained at 4 ± 2 °C before and after the sampling event in a refrigeration unit.

The TSTs were shipped back to ORNL after the sampling event using offsite property control (OPC W95-0-0053-34). Table 3 lists the sample identifiers, sample types, and COC form numbers for all ORNL samples. The samples were delivered for transport on November 7, 1994, and shipped by Federal Express for next-day delivery.

Table 3. Oak Ridge National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S4080-A10.484	TST	006741
S4080-A11.275	TST	006741
S4080-A12.803	TST field blank	006741
S4080-A13.483	TST	006741
S4080-A14.382	TST	006741
S4080-A15.270	TST trip blank	006741

Sorbent trains and SUMMA™ canister sampling devices were supplied with COC forms by PNL. Sampling devices were picked up from PNL by SML and transported in a government vehicle to a custody locker.

After sampling, the PNL sorbent traps and SUMMA™ canisters were transported by government vehicle directly to PNL and delivered to J. A. Edwards on November 8, 1994. Table 4 lists the sample identifiers, sample types, and COC form numbers for all PNL samples. The sorbent trains were maintained at 4 ± 2 °C before and after the sampling event in a refrigerator unit.

Table 4. Pacific Northwest Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S4080-A01.239	Ambient upwind SUMMA™	008072
S4080-A02.240	Ambient SUMMA™ (VSS)	008072
S4080-A04.241	SUMMA™	008072
S4080-A05.242	SUMMA™	008072
S4080-A06.243	SUMMA™	008072
S4080-A07.244	SUMMA™	008072
S4080-A08.245	SUMMA™	008072
S4080-A09.246	SUMMA™	008072
S4080-A16.73V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008073
S4080-A17.74V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008073
S4080-A18.75V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008073
S4080-A19.76V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008073
S4080-A20.77V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008073
S4080-A21.78V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008073
S4080-A22.79V	NH ₃ /NO ₂ /NO/H ₂ O trip blank	008073
S4080-A23.80V	NH ₃ /NO ₂ /NO/H ₂ O trip blank	008073
S4080-A24.81V	NH ₃ /NO ₂ /NO/H ₂ O trip blank	008073

SUMMA™ canisters were also supplied by OGIST. The sample media is shipped to SML without a COC form. The sample media is inventoried at SML, where the COC is initiated.

From the time that samples are received by SML until they are shipped back to the analytical laboratory, COC is maintained by SML in accordance with LO-090-443/A0, *Chain-of-Custody for RCRA and CERCLA Protocol Samples* (WHC 1992). Final COCs from this sampling event are in Appendix C.

5.0 QUALITY ASSURANCE AND CONTROLS

5.1 VAPOR SAMPLING SYSTEM CLEANING

Immediately prior to sampling of SST 241-BY-103, the VSS manifold was heated to 60 °C and ambient air was purged through the system for 17 minutes. After this purge, an ambient air sample was drawn through the VSS manifold and a GC/FID run was initiated. This first run showed that organic contaminants were still present in the GC. The GC oven was heated at 325° for 1 hour. A second sample indicated that some contamination remained in the GC but could not clean further. For further details, refer to Appendix C of LO-080-450/A0 (WHC 1993c) and the project-specific file located with SML.

In compliance with the *Vapor Space Probe Cleaning Procedure* (WHC 1993c), the team cleaned the hot-water-jacketed probe before it was installed in SST 241-BY-103. This procedure requires a solvent rinse of all internal probe surfaces with acetone and methanol to clear the sample line of possible contamination remaining from the construction process. The probes are then heated to 90 °C, and dry air is passed through the probe to evaporate the solvents. Before the probes are released, the team ensures, using a hand-held organic vapor meter, that the total organic concentration in the sample line is below 1 ppmv.

SUMMA™ canister ambient air samples were also collected to confirm that the VSS sampling manifold was free of trace organic contaminants (or to determine what contaminants were present). One SUMMA™ canister was filled with ambient air upwind of SST 241-BY-103, and a second canister was filled with ambient air via the VSS sampling manifold. The canisters were shipped to PNL for analysis.

5.2 INSTRUMENT CALIBRATION

Instruments located in the VSS are calibrated on an annual basis at the WHC Standards Laboratory. VSS instrumentation calibration data, maintained in files by SML, is summarized in Table 5. According to the calibration schedule shown in Table 5, all instrumentation was within its calibration period during the SST 241-BY-103 sampling event.

Table 5. Calibration Data.

System	Calibration Date	Expiration Date	WHC Standards Laboratory Code
Temperature Control System	04/21/94	04/21/95	804-67-74-009
Mass Flow System	04/29/94	04/29/95	804-28-03-001
Pressure System	05/03/94	05/03/95	804-67-89-001

5.3 BLANK SAMPLES

Trip blanks are samples that accompany the sample media from the point of generation through sample analysis. Analysis of trip blanks is used to assess cross-contamination of the sample media during transport and storage. Trip blanks are transported to the field with the sample collection media but remain unopened throughout the sampling event.

Spiked blanks are samples that are spiked with a known amount of analyte before shipment. These blanks are handled and analyzed with the other samples. Analysis of the spiked blanks is used to evaluate potential sample loss during shipment or storage.

Ambient blanks are samples of ambient air collected at the sampling location. Analysis of ambient blanks is used to assess contamination that may be present in the atmosphere surrounding the sampling system or in the system itself prior to sampling.

Field blanks are sampling devices prepared and handled in the same manner as the samples, but no tank gases are drawn through them.

Table 6 lists the blank samples collected during the sampling of SST 241-BY-103.

Table 6. Blank Samples.

Sample Identifier	Blank Type	Sample Media
S4080-A01.239	Ambient	SUMMA™
S4080-A02.240	Ambient through VSS	SUMMA™
S4080-A15.270	Trip	TST
S4080-A12.803	Field Blank	TST
S4080-A22.79V	Trip	NH ₃ /NO ₂ /NO/H ₂ O
S4080-A23.80V	Trip	NH ₃ /NO ₂ /NO/H ₂ O
S4080-A24.81V	Trip	NH ₃ /NO ₂ /NO/H ₂ O

6.0 ANOMALIES

All samples were collected in accordance with the TCP and LO-080-450/A0, *Collection of SUMMA Canisters and Sorbent Tube Samples Using the Vapor Sampling System* (WHC 1993a). No anomalies to the TCP or the operating procedure were noted during the sampling of SST 241-BY-103. Further details are available in the project-specific file maintained by SML.

7.0 REFERENCES

- Carpenter, B. C., 1994, *Tank Characterization Plan for Vapor and Gas Sampling Tank 241-BY-103 Using the Vapor Sampling System*, WHC-SD-WM-TP-231, Westinghouse Hanford Company, Richland, Washington.
- 49 CFR 100-177, 1992, "Transportation," *Code of Federal Regulations*, as amended.
- Mahon, R. D., C. M. Jones, and M. S. Story, 1994 (draft), *Evaluation of the Capabilities and Use of the Vapor Sampling System for Tank Headspace Sampling and Characterization*, SD-WM-RPT-094, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1993a, *Collection of SUMMA Canisters and Sorbent Tube Samples Using the Vapor Sampling System (VSS)*, Procedure LO-080-450/A0, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1993b, *Release of Vapor Sampling Equipment*, Procedure DI-33300-93-004, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1993c, *Vapor Space Probe Cleaning Procedure*, Procedure LO-080-405/A0, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1992, *Chain-of-Custody for RCRA and CERCLA Protocol Samples*, Procedure LO-090-443/A0, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A
SAMPLE LOG SHEETS

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Set up VSS (Secton A)(Temperature set point = 60C)

Ensure HEPA filters are installed

Ensure connection to sample probe

System status check sheet. (Verify zones are to temp)

Date: 1 November, 1994

VSS Personnel: E. Johnson, T. Utecht

R. Ragan, R. Westburg

Trailer Personnel: N. Buechler

WHC Sample ID	Sample ID	SAP Reference	Description	Desired Flow Rate	Desired Duration (min.)	Actual Start Time	Actual End Time	Actual Total Time	Desired Total Flow	Port
Group # 1										
Purge with ambient air for 30 min.					30 min	14:30, 10/31	07:30, 11/1	17 hrs		upwind
S4080- A01 .239	239	1	AMBIENT #1 (PNL)		1	06:04	06:05	1		
GC Run #1						06:11				
S4080- A02 .240	240	2	AMBIENT #2 (PNL)		1	06:32	06:33	1		15
Leak check (Appendix A)			Leak Rate 26.6 Torr/Hr.							
Purge with tank air for 30 min.					30 min	06:54	07:24	30 min		
Measure tank pressure			735.7 Torr (PE-1)							
S4080- A03 .0T1	T1584(222S)	3	Tritium Trap	200	5	07:56	8:01	5	1000	8
GC Run # 2	(Tank run #1)					08:40				
S4080- A04 .241	241	4	SUMMA #3		1	08:07	08:08	1		11
S4080- A05 .242	242	5	SUMMA #4		1	08:13	08:14	1		12
S4080- A06 .243	243	6	SUMMA #5		1	08:19	08:20	1		13
S4080- A07 .244	244	7	SUMMA #6		1	08:24	08:25	1		14
S4080- A08 .245	245	8	SUMMA #7		1	08:30	08:31	1		15
S4080- A09 .246	246	9	SUMMA #8		1	08:35	08:36	1		16
GC Run # 3	(Tank run #2)					09:05				

Waste Tank
241-BY-103

WHC Sample ID	OGI/ORNL	SAP Referenc	Description	Desired Flow	Desired Duration	Actual Start	Actual End	Actual Total	Desired Total	Port
Sample ID		Number		Rate	(min.)	Time	Time	Time	Flow	Valve #
S4080- A10 .484	TST# 484	10	TST #1	200	5	08:45	08:50	5	1000	9
S4080- A11 .275	TST# 275	11	TST #2	200	5	08:45	08:50	5	1000	10
S4080- A12 .803	TST# 803	12	TST FIELD BLANK #1			08:59	09:00	1 min		ambient
S4080- A13 .483	TST# 483	13	TST # 9	200	5	09:11:02	09:16:02	5	1000	8
S4080- A14 .382	TST# 382	14	TST # 10	200	5	09:11:02	09:16:02	5	1000	10
GC Run # 4 (Tank run #2)						09:27				
S4080- A16 .73V	73V	16	NH3/NOx/H2O #1	200	15	09:37	09:52	15	3000	9
S4080- A17 .74V	74V	17	NH3/NOx/H2O #2	200	15	09:37	09:52	15	3000	10
S4080- A18 .75V	75V	18	NH3/NOx/H2O #3	200	15	10:01	10:16:10	15.17	3034	8
S4080- A19 .76V	76V	19	NH3/NOx/H2O #4	200	15	10:01	10:16:10	15.17	3034	10
S4080- A20 .77V	77V	20	NH3/NOx/H2O #5	200	15	10:32	10:47	15	3000	9
S4080- A21 .78V	78V	21	NH3/NOx/H2O #6	200	15	10:32	10:47	15	3000	10

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WHC-SD-MN-RPT-122, Rev. 0

Waste Tank
241-BY-103

WHC Sample ID	OGI/ORNL Sample ID	SAP Referenc Number	Description	Desired		Desired Duration (min.)	Actual		Desired Total Flow	Port Valve #
				Flow	Rate		Start Time	End Time		
S4080- A25 .OU1	T1585(222S)	25	Upstream HEPA(box)					11:15		
S4080- A26 .OD1	T1586(222S)	26	Downstream HEPA(box)					11:15		
S4080- A27 .OU2	T1587(222S)	27	Upstream HEPA (VSS)					11:15		
S4080- A28 .OD2	T1588(222S)	28	Downstream HEPA (VSS)					11:15		

Trip Blanks (DO NOT EXPOSE)

		TST # 270		15	TST TRIP #1
S4080- A15 .270					
S4080- A22 .79V	79V			22	NH3/NOx/H2O TRIP #1
S4080- A23 .80V	80V			23	NH3/NOx/H2O TRIP #2
S4080- A24 .81V	81V			24	NH3/NOx/H2O TRIP #3

VSS SAMPLING RADIOLOGICAL SCREENING RESULTS

SAMPLING DATE 11 NOV. 94									
TANK # BY-103									
HEPA BOX UPSTREAM FILTER									
	Liters	pci / filter	pci / liter		Liters	pci / filter	pci / liter		
BETA	4.940		15.28		BETA				
ALPHA	788		2.44		ALPHA				
GEA - Am-243	ND				GEA - Am-243				
- Bi-212	2,350	7.27			- Bi-212				
- Np-237	ND				- Np-237				
- Pb-212	2,350	7.27			- Pb-212				
- Th-229	ND				- Th-229				
- Tl-208	788		2.44		- Tl-208				
TOTAL VOLUME									
	323.3					323.3			
HEPA BOX DOWNSTREAM FILTER									
	Liters	pci / filter	pci / liter		Liters	pci / filter	pci / liter		
BETA					BETA				
ALPHA					ALPHA				
GEA - Am-243	ND				GEA - Am-243				
- Bi-212	2,350	7.27			- Bi-212				
- Np-237	ND				- Np-237				
- Pb-212	2,350	7.27			- Pb-212				
- Th-229	ND				- Th-229				
- Tl-208	788		2.44		- Tl-208				
TOTAL VOLUME									
	323.3					323.3			
VSS UPSTREAM FILTER									
	Liters	pci / filter	pci / liter		Liters	pci / filter	pci / liter		
BETA					BETA				
ALPHA					ALPHA				
GEA - Am-243	ND				GEA - Am-243				
- Bi-212	2,350	7.27			- Bi-212				
- Np-237	ND				- Np-237				
- Pb-212	2,350	7.27			- Pb-212				
- Th-229	ND				- Th-229				
- Tl-208	788		2.44		- Tl-208				
TOTAL VOLUME									
	323.3					323.3			
VSS DOWNSTREAM FILTER									
	Liters	pci / filter	pci / liter		Liters	pci / filter	pci / liter		
BETA					BETA				
ALPHA					ALPHA				
GEA - Am-243	ND				GEA - Am-243				
- Bi-212	2,350	7.27			- Bi-212				
- Np-237	ND				- Np-237				
- Pb-212	2,350	7.27			- Pb-212				
- Th-229	ND				- Th-229				
- Tl-208	788		2.44		- Tl-208				
TOTAL VOLUME									
	323.3					323.3			
TRITIUM TRAP									
	pci / filter		pci / liter						
TOTAL VOLUME	1.0								
TOTAL ACTIVITY		< 50.0							
SAMPLE EXPOSURE ANALYSIS, USING VSS DOWNSTREAM FILTER ANALYSIS AS POSSIBLE EXPOSURE LEVEL									
= BETA 0.026 pci/liter, ALPHA 0.009 pci/liter, GEA not detected									
SORBENT SAMPLING									
TOTAL VOLUME PER SAMPLE	3.00 Liters				TOTAL VOLUME PER SAMPLE				
BETA/ALPHA PER SAMPLE	0.08/0.03 pci				BETA/ALPHA PER SAMPLE				
INDIVIDUAL SORBENTS					INDIVIDUAL SORBENTS				
NH3 (0.75 gram)	0.11/0.12 pci per gram				NH3 (0.75 gram)				
NO2 (0.60 gram)	0.13/0.15 pci per gram				NO2 (0.60 gram)				
H2O (0.45 gram)	0.53/0.20 pci per gram				H2O (0.45 gram)				
SUMMA SAMPLING									
TOTAL VOLUME PER CANISTER	6 Liters				TOTAL VOLUME PER CANISTER				
BETA PER SAMPLE	0.16 pci				BETA PER SAMPLE				
ALPHA PER SAMPLE	0.05 pci				ALPHA PER SAMPLE				

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BY103VOL.XLS 11/9/94 12:49 PM

APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING VSS SAMPLING OF 241-BY-103

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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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COPY

Westinghouse
Hanford Company

CHAIN OF CUSTODY

ORNL-006741

Custody Form Initiator Amy Dindal

Company Contact Roger Jenkins

Project Designation/Sampling Locations 241-BY-103 (IS8)

Ice Chest No.

Bill of Lading/Airbill No.

Method of Shipment Federal Express

Shipped to Rick Mahon

Possible Sample Hazards/Remarks NONE

Telephone (615) 576-8594

Collection Date

Field Logbook No.

Offsite Property No.

Sample Identification

- ✓ TST# 484 ORNL Triple Sorbent Trap
- ✓ TST# 275 ORNL Triple Sorbent Trap
- ✓ TST# 483 ORNL Triple Sorbent Trap
- ✓ TST# 382 ORNL Triple Sorbent Trap
- ✓ TST# 270 ORNL Trip Blank
- ✓ TST# 803 ORNL Field Blank

[] Field Transfer of Custody

Chain of Possession

(Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
AR Dindal / RD Mahon	9/26/94	942	RD Mahon / Rick Mahon	27 SEP 94	2000

Final Sample Disposition

Disposal Method:

Disposed by:

Date/Time:

Comments:

To
HanfordTo
ORNL

Initials

Temperature at Shipping: -110 °C

Temperature at Receiving: 1.8 °C

C-3 VLR gauge {
 Min 40K 4.5°C
 Max 44K 6.5°C

Westinghouse
Hanford Company

CHAIN OF CUSTODY

WHC 008072

Custody Form Initiator J. A. Edwards-PNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-0418

Company Contact R. D. Mahon-WHC

Telephone (509) 373-1101

Page 85-9656 / FAX 373-3193

Project Designation/Sampling Locations 200 East Tank Farm
241-BY-103 Tank Vapor Sample SAF S4080
(VSS Truck)

Collection date 10-__-94

Preparation date 10-2 4-94

Ice Chest No.

Field Logbook No. WHC-__-__-__

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to PNL

Sample Job # ____

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S4080-A01.239

Ambient Air #1 Upwind @ VSS (PNL)

S4080-A02.240

Ambient Air #2 Through VSS (PNL)

S4080-A04.241

Sample #3 (PNL)

S4080-A05.242

Sample #4 (PNL)

S4080-A06.243

Sample #5 (PNL)

S4080-A07.244

Sample #6 (OGI)

S4080-A08.245

Sample #7 (OGI)

S4080-A09.246

Sample #8 (OGI)

[] Field Transfer of Custody			[] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time	
J. A. Edwards <i>J. A. Edwards</i>	10-24-94	1415	<i>JP Burch</i>	10-24-94	1415	
<i>JP Burch</i>	11-8-94	1330	<i>J. A. Edwards</i>	11-8-94	1330	

Final Sample Disposition

Comments:

PNL (only) Checklist	Pick-up / Delivery	Comments:
Media labeled and checked?	☒ Y / ☐ N	
Letter of instruction?	☒ Y / ☐ N	
Media in good condition?	☒ Y / ☐ N	
COC info/signatures complete?	☒ Y / ☐ N	
Sorbents shipped on ice?	☒ Y / ☐ N	
Rad release stickers on samples?	☒ Y / ☐ N	
Activity report from 222S?	☒ Y / ☐ N	
COC copy for LRB, RIDS filed?	☒ Y / ☐ N	
COC copy for sorbent follow-on?	☒ Y / ☐ N/A	
POC <i>(Signature)</i>	POC <i>(Signature)</i>	

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(Revised 10/17/94 PNL)

Westinghouse
Hanford Company

CHAIN OF CUSTODY

WHC 008073

Custody Form Initiator

J. A. Edwards-PNL

Telephone

(509) 373-0141

Page

85-3009 / FAX 376-0418

Company Contact

R. D. Mahon-WHC

Telephone

(509) 373-1101

Page

85-9656 / FAX 373-3193

Project Designation/Sampling Locations 200 East Tank Farm
241-BY-103 Tank Vapor Sample SAF S4080
(VSS Truck)

Collection date

10-__-94

Preparation date

10-2 4-94

Ice Chest No.

Field Logbook No. WHC-____-____-____

Bill of Lading/Airbill No.

N/A

Offsite Property No.

N/A

Method of Shipment

Government Truck

Shipped to

PNL

Sample Job # _____

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S4080 - A16 . 73V	NH ₃ /NO _x /H ₂ O (Trap # 1) Line # 9
S4080 - A17 . 74V	NH ₃ /NO _x /H ₂ O (Trap # 2) Line #10
S4080 - A18 . 75V	NH ₃ /NO _x /H ₂ O (Trap # 3) Line # 8
S4080 - A19 . 76V	NH ₃ /NO _x /H ₂ O (Trap # 4) Line #10
S4080 - A20 . 77V	NH ₃ /NO _x /H ₂ O (Trap # 5) Line # 9
S4080 - A21 . 78V	NH ₃ /NO _x /H ₂ O (Trap # 6) Line #10
S4080 - A22 . 79V	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 1)
S4080 - A23 . 80V	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 2)
S4080 - A24 . 81V	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 3)

Field Transfer of Custody			Chain of Possession (Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time
B. Jarrell <i>B. Jarrell</i>	10-24-94	10:55	J. A. Edwards <i>J. A. Edwards</i>	10-24-94	10:55
J. A. Edwards <i>J. A. Edwards</i>	10-24-94	1425	<i>J. A. Edwards</i>	10-24-94	1425
<i>J. A. Edwards</i>	11-8-94	1345	<i>J. A. Edwards</i>	11-8-94	1345

Final Sample Disposition

Comments:

PNL (only) Checklist

- ☐ Media labeled and checked?
- ☐ Letter of instruction?
- ☐ Media in good condition?
- ☐ COC info/signatures complete?
- ☐ Sorbents shipped on ice?
- ☐ Rad release stickers on samples?
- ☐ Activity report from 222S?
- ☐ COC copy for LRB, RIDS filed?
- ☐ COC copy for sorbent follow-on?

Pick-up / Delivery

- ☒ Y/N
- ☒ Y/N
- ☒ Y/N / Y/N
- ☒ Y/N / Y/N
- ☒ Y/N / Y/N
- ☒ Y/N / Y/N
- ☒ Y/N / Y/N
- ☒ Y/N / Y/N
- ☒ Y/N / Y/N

Comments:

POC

(Signature)

POC

(Signature)

(Revised 10/17/94 PNL)

Westinghouse Hanford
Company

CHAIN OF CUSTODY

008501

Custody Form Initiator T.B. UrechtCompany Contact R.D. MahonTelephone 373-1101Project Designation/Sampling Locations 241-BY Tank 103Collection Date 11-1-94Ice Chest No. N/AField Logbook No. N/ABill of Lading/Airbill No. N/AOffsite Property No. N/AMethod of Shipment Gov't VehicleShipped to 222-S Labs 200 west areaPossible Sample Hazards/Remarks NONE

Sample Identification

54080-0T1

T- 1584 ✓

54080-0U1

T- 1585 ✓

54080-0D1

T- 1586 ✓

54080-0U2

T- 1587 ✓

54080-0D2

T- 1588 ✓

☒ Field Transfer of Custody

CHAIN OF POSSESSION

(Sign and Print Name)

Relinquished By

Date

Time

Received By

Date

Time

T.B. Urecht11-1-941340R.D. Mahon11/1/942-1340

Final Sample Disposition

Disposal Method:

Disposed by:

Date/Time:

Comments: