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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
OPC	Offsite Property Control
ORNL	Oak Ridge National Laboratory
PNL	Pacific Northwest Laboratory
SML	Sampling and Mobile Laboratories
SST	Single-Shell Tank
TCP	Tank Characterization Plan
team	SML Vapor Team
TOC	Total Organic Carbon
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-B-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-B-103. This document presents sampling data resulting from the February 8, 1995, sampling of SST 241-B-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-B-103 on February 8, 1995. 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-B-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

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

through the tube, which traps (by adsorption) virtually all the target 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-B-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	±0.7
3	200	±0.05

The VSS is also equipped with a gas chromatograph (GC). The Hewlett Packard 5890 Series II GC is equipped with a flame-ionization detector (FID), 1 ml sample loop, 10 port injection valve, 2 meter chromatographic column, programmable oven, portable computer, and HP-Chemstation software to control the GC. The GC is plumbed to directly transfer sample from the VSS manifold to the sample loop. After the sample is transferred into the sample loop and reaches equilibrium the run is initiated manually. HP-Chemstation software activates the 10 port valve to transfer the sample from the sample loop to the column. The sample passes through the column and the FID generates a signal for total organic carbon (TOC). All the data is then transmitted to the computer where it is stored for further analysis.

The GC is equipped with a HP-5 column which is 2 meters long, 0.25 mm inside diameter, and a 0.25 μ m phenyl methyl silicone phase. The GC oven is programmed to heat from 50 °C to 270 °C at a rate approximately 70 °C per minute. Helium is the carrier gas, air and hydrogen the combustion gases, and nitrogen the make-up gas.

The GC/FID is configured to quantitatively estimate concentrations of TOC. The GC/FID confirms sampling system cleanliness, sampling manifold performance, TOC of ambient air background levels during sampling, and TOC of tank vapor samples. The system is multi-point calibrated and has displayed a high degree of stability over a period of months. For further details, see Section 3.6, Field GC/FID Results.

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 EQUIPMENT DESCRIPTION

3.1 VAPOR SAMPLING SYSTEM

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-TP-250, *241-B-103 Tank Characterization Plan* (Carpenter 1995). 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 S5-003.

3.2 OPERATIONS AND SAMPLING PERSONNEL

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

- R. D. Mahon, Vapor Team Lead Scientist
- R. A. Westberg, Field Scientist
- T. B. Utecht, VSS Technician
- N. P. Beuchler, VSS Technician.

The VSS was set up at SST 241-B-103 on February 7, 1995 and was allowed to warm up overnight. Sampling began shortly after 11:00 a.m. on February 8, 1995, and was completed by 5:30 p.m. the same day.

3.3 AMBIENT CONDITIONS

The weather the day of the sampling event, February 8, 1995, was sunny and cold. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 5 miles due west of 241-B SST farm, are provided in Appendix B.

3.4 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser 2 of SST 241-B-103. The probe length, from the sample inlet to the top of the riser flange, was 7.9 meters.

All zones of the VSS were heated to 52 °C during setup of the VSS at SST 241-B-103 on February 7, 1995. The team stabilized the VSS temperature zones by 11:00 a.m. on February 8, 1995, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-B-103 were 1000.2 mbar (750.2 torr) and 15.2 °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 22 hours before the first samples were collected, the team began heating the VSS transfer tubing and sampling manifold. During this warmup period, the team maintained the VSS sampling manifold at a partial vacuum of about 291 mbar (218 torr).

Approximately 21 hours after heating began, the team purged the sampling manifold with ambient air for 30 minutes. The team collected two SUMMA[™] canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-B-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 10.00 mbar (7.5 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 23.3 mL/min at a 287 mbar (214.9 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 50 mL/min the dilution was approximately 1.1%, and for sorbent traps the dilution was approximately 1.0%.

The VSS was purged with sample vapor from SST 241-B-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).

3.5 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to connecting to SST 241-B-103, an industrial hygiene technician first field tested 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). The technician verbally reported an LEL of 0.0%, and oxygen concentration of 20.6%.

3.6 FIELD GC/FID RESULTS

The GC was single point calibrated on the day of sampling using 6.0 ppmC Propane standard by Scott Specialty Gas. The standard is an E.P.A. Protocol Gas that is +/- 2% NIST traceable. Table 2 displays the Field GC/FID results from the sampling of 241-B-103.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
5	Propane	6.00	1.87
1	Ambient	2.66	0.91
4	Tank Vapor	11.63	1.79

3.7 RADIATION SCREENING

Samples are unconditionally released from the SST farm in accordance with 1995-33300-RSP-03, *Release of Vapor Sampling Equipment* (WHC 1995c). 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:

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 February 8, 1995, SST 241-B-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 vapor, 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-B-103 filter sample results are shown in Table 3. SML scientists use the activity results from the following table 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-B-103 tritium sample results are shown in Table 3. The results in Table 3 indicate that the samples collected from SST 241-B-103 met the laboratory acceptance criteria and the DOT definition of a nonradioactive shipment.

Table 3. Radionuclide Analysis Results.

Filter	Sample Identifier	Activity Results ^a (pCi/sample)	Activity ^b (pCi/L of tank gas)
Upstream HEPA filter (box)	S5003-A35.OU1	Total Alpha = 319 Total Beta = 373 GEA = 72.8 (²⁰⁸ Tl) GEA = 183 (²¹² Pb) GEA = 42.9 (²⁴³ Am)	= 0.88 = 1.03 = 0.20 = 0.51 = 0.12
Downstream HEPA filter (box)	S5003-A36.OD1	Total Alpha = <0.71 Total Beta = 1.55 GEA = <detectable	= <0.002 = 0.004 = <detectable
Upstream HEPA filter (VSS)	S5003-A37.OU2	Total Alpha = <1.1 Total Beta = <2.4 GEA = ND	= <0.003 = <0.02 = <detectable
Downstream HEPA filter (VSS)	S5003-A38.OD2	Total Alpha = <5.84 Total Beta = 1.64 GEA = ND	= <0.02 = <0.005 = <detectable
Tritium trap	S5003-A03.OT1	Total activity = <50.0	= <50.0 ^c

NOTES:

The samples are nonradioactive. These results were evaluated against laboratory acceptance criteria and DOT limits.

^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 362 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 SUMMA™ 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. SUMMA™ 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 W95-0-0228-72). Table 4 lists the sample identifiers, sample types, and COC form numbers for all ORNL samples. The samples were delivered for transport on February 22, 1995, and shipped by Federal Express for next-day delivery.

Table 4. Oak Ridge National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5003-A10.584	TST	006752
S5003-A11.591	TST	006752
S5003-A12.731	TST	006752
S5003-A13.733	TST field blank	006752
S5003-A14.582	TST	006752
S5003-A15.741	TST	006752
S5003-A16.424	TST	006752
S5003-A17.383	TST	006752
S5003-A18.628	TST	006752
S5003-A19.807	TST	006752
S5003-A20.806	TST field blank	006752
S5003-A21.486	TST	006752
S5003-A22.726	TST	006752
S5003-A23.627	TST	006752
S5003-A24.592	TST trip blank	006752
S5003-A25.791	TST trip blank	006752

Sorbent trains and SUMMATM 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 SUMMATM canisters were transported by government vehicle directly to PNL and delivered to J. A. Edwards on February 14, 1995. Table 5 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 refrigeration unit.

Table 5. Pacific Northwest Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5003-A01.119	Ambient upwind SUMMA TM	008096
S5003-A02.121	Ambient SUMMA TM (VSS)	008096
S5003-A04.128	SUMMA TM	008096
S5003-A05.129	SUMMA TM	008096
S5003-A06.138	SUMMA TM	008096
S5003-A07.141	SUMMA TM	008096
S5003-A08.155	SUMMA TM	008096
S5003-A09.225	SUMMA TM	008096
S5003-A26.V63	NH ₃ /NO _x /NO/H ₂ O sorbent	008097
S5003-A27.V64	NH ₃ /NO _x /NO/H ₂ O sorbent	008097
S5003-A28.V65	NH ₃ /NO _x /NO/H ₂ O sorbent	008097
S5003-A29.V66	NH ₃ /NO _x /NO/H ₂ O sorbent	008097
S5003-A30.V67	NH ₃ /NO _x /NO/H ₂ O sorbent	008097
S5003-A31.V68	NH ₃ /NO _x /NO/H ₂ O sorbent	008097
S5003-A32.V69	NH ₃ /NO _x /NO/H ₂ O trip blank	008097
S5003-A33.V70	NH ₃ /NO _x /NO/H ₂ O trip blank	008097
S5003-A34.V71	NH ₃ /NO _x /NO/H ₂ O trip blank	008097

The canisters were transported by government vehicle directly to PNL for storage and delivered to J. A. Edwards on February 22, 1995. Table 5 lists the sample identifiers, sample types, and COC form numbers for all OGIST samples.

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 WHC-IP-1127-1.3, *Chain-of-Custody Special analysis Request for RCRA and CERCLA Protocol Samples* (WHC 1995a). The final COCs for 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-B-103, the VSS manifold was heated to 60 °C and ambient air was purged through the system for approximately 21 hours. Throughout this purge, all pertinent system valves were actuated to release any contaminants that may have collected in the VSS valves themselves. After this purge, an ambient air sample was drawn through the VSS manifold and a GC/FID run was initiated. No contaminants were detected by the FID. A second sample confirmed the VSS was free of organic remnants down to ambient levels. Thus, the system was ready to sample SST 241-B-103. For further details, refer to Appendix C of WHC-IP-1127-4.5 (WHC 1995b) and the project-specific file located with SML.

The hot-water-jacketed probe was initially cleaned in compliance with the *Vapor Space Probe Cleaning Procedure* (WHC 1993) the team cleaned the hot-water-jacketed probe before it was installed in SST 241-B-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. Following the sampling, the probe was removed and transferred to U Farm. Before installation in 241-B-103, the probe was recleaned in accordance with Appendix C of WHC-IP-1127-4.5 (WHC 1995b)

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-B-103, and a second canister was filled with ambient air via the VSS sampling manifold. The canisters were shipped to PNL for analysis. 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 manifold, so a second 1 hour ambient air purge was started. Throughout this purge, various system valves were actuated to release any contaminants hung up in the VSS valves themselves. A second GC run was initiated and no contaminants were detected by the FID. A third sample confirmed the VSS was free of organic remnants down to the detection limits of the system and ready to sample 241-B-103. For further details, refer to Appendix C of WHC-IP-1127-4.5 (WHC 1995b) and the project-specific file located with SML.

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 6. According to the calibration schedule shown in Table 6, all instrumentation was within its calibration period during the SST 241-B-103 sampling event.

Table 6. 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	12/08/94	12/08/95	804-28-03-001
Pressure System	12/07/94	12/07/95	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 4 and 5 also list the blank samples used during the sampling of SST 241-B-103.

6.0 ANOMALIES

All samples were collected in accordance with the TCP and WHC-IP-1127-4.5, *Collection of SUMMA Canisters and Sorbent Tube Samples Using the Vapor Sampling System* (WHC 1995b). An anomaly was discovered after the sampling event. The TCP indicated that the system temperature should be set at 50 °C but the system temperature was actually set at 60 °C. Further details are available in the project-specific file maintained by SML.

7.0 REFERENCES

- 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.
- Carpenter, B. C., 1995, *Tank Characterization Plan for Vapor and Gas Sampling Tank 241-B-103 Using the Vapor Sampling System*, WHC-SD-TP-250, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995a, *Chain-of-Custody Special Analysis Request for RCRA and CERCLA Protocol Samples*, Procedure WHC-IP-1127-1.3, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995b, *Collection of SUMMA Canisters and Sorbent Tube Samples Using the Vapor Sampling System (VSS)*, Procedure WHC-IP-1127-4.5, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995c, *Release of Vapor Sampling Equipment*, Procedure 1995-33300-RSP-03, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1993, *Vapor Space Probe Cleaning Procedure*, Procedure LO-080-405/A0, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A
SAMPLE LOG SHEETS

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Waste Tank
241-B-103

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

Date: 8-Feb-95

Ensure HEPA filters are installed

VSS Personnel: E. Johnson R. Ragan

Ensure connection to sample probe

R. Mahon R. Westberg

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

Trailer Personnel: N. Buechler T. Utecht

Tank Temperature

				Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
PNL				Flow	Duration	Total	Flow	Start	End	Total	Total
WHC Sample ID	OGI/ORNL	Port	Description	Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
Group # 1	Sample ID	Valve #				SCCM	SCCM	2/7/95	2/8/95	(min.)	Liters
Purge with ambient air for 30 min.				5450	30	163500	5460	12:30	09:45	21hrs, 15min	6,961
S5003- 01 119	119		AMBIENT #1 (PNL)		1			10:32	10:33	1	
GC Run #1	Ambient air/Cleanliness check										
S5003- A02. 121	121	15	AMBIENT #2 (PNL)		1			10:41	10:42	1	
GC Run #2	Standards Runs										
Leak check (Appendix A)	Leak Rate: 29.6 Torr/Hr.										
Purge with tank air for 30 min.				5450	30	163500	5459	11:19	11:49	30	163.77
Measure tank pressure	PE-1 750.2 Torr										
S5003- A03 OT1	T1791(222S	8	Tritium Trap	200	5	1000	200.40	12:03	12:08	5.0	1.00
GC Run # 3 (Tank run #1)	12:15										
S5003- A04. 128	128	11	SUMMA #3 (OGI)		1			12:27	12:28	1	6.00
S5003- A05. 129	129	13	SUMMA #4 (OGI)		1			12:36	12:37	1	6.00
S5003- A06. 138	138	15	SUMMA # 5 (OGI)		1			12:45	12:46	1	6.00
S5003- A07. 141	141	12	SUMMA #6 (PNL)		1			12:50	12:51	1	6.00
S5003- A08. 155	155	14	SUMMA #7 (PNL)		1			12:55	12:56	1	6.00
S5003- A09. 225	225	16	SUMMA #8 (PNL)		1			13:00	13:01	1	6.00
GC Run # 4 (Tank run # 2)	13:10										

Waste Tank
241-B-103

PNL		Port	Description	Desired		Desired	Actual		Actual	Actual	Actual	Actual
WHC Sample ID	OGI/ORNL			Flow	Rate		Flow	Rate				
Sample ID	Sample ID	Valve #		Rate	(min.)	Total	Flow	Rate	Start	End	Total	Total
S5003-A10.584	TST#584	9	TST #1	50	4	200	50.12	13:26	13:26	13:30	4.0	0.20
S5003-A11.591	TST#591	10	TST #2	50	4	200	50.12	13:26	13:26	13:30	4.0	0.20
S5003-A12.731	TST#731	8	TST #3	50	4	200	50.13	13:35	13:35	13:39	4.0	0.20
S5003-A14.582	TST#582	10	TST #4	50	4	200	50.13	13:35	13:35	13:39	4.0	0.20
S5003-A13.733	TST#733		TST FIELD BLANK #1					13:46	13:46	13:47	1.0	
S5003-A15.741	TST#741	9	TST #5	200	5	1000	200.40	13:44	13:44	13:49	5.0	1.00
S5003-A16.424	TST#424	10	TST #6	200	5	1000	200.40	13:44	13:44	13:49	5.0	1.00
S5003-A17.383	TST#383	8	TST #7	200	5	1000	200.40	13:55	13:55	14:00	5.0	1.00
S5003-A18.628	TST#628	10	TST #8	200	5	1000	200.40	13:55	13:55	14:00	5.0	1.00
S5003-A19.807	TST#807	9	TST #9	200	20	4000	200.40	14:07	14:07	14:27	20.0	4.01
S5003-A21.486	TST#486	10	TST #10	200	20	4000	200.40	14:07	14:07	14:27	20.0	4.01
S5003-A20.806	TST#806		TST FIELD BLANK #2					14:10	14:10	14:11	1.0	
S5003-A22.726	TST#726	8	TST #11	200	20	4000	200.40	14:35	14:35	14:55	20.0	4.01
S5003-A23.627	TST#627	10	TST #12	200	20	4000	200.40	14:35	14:35	14:55	20.0	4.01
GC Run # 5 (Tank run #3)								15:10	15:10			
S5003-A26.V63	V63	9	NH3/NOx/H2O #1	200	15	3000	200.40	15:28	15:28	15:43	15.0	3.01
S5003-A27.V64	V64	10	NH3/NOx/H2O #2	200	15	3000	200.40	15:28	15:28	15:43	15.0	3.01
S5003-A28.V65	V65	8	NH3/NOx/H2O #3	200	15	3000	200.40	15:49	15:49	16:04	15.0	3.01
S5003-A29.V66	V66	10	NH3/NOx/H2O #4	200	15	3000	200.40	15:49	15:49	16:04	15.0	3.01
S5003-A30.V67	V67	9	NH3/NOx/H2O #5	200	15	3000	200.40	18:10	18:10	16:25	15.0	3.01
S5003-A31.V68	V68	10	NH3/NOx/H2O #6	200	15	3000	200.40	16:10	16:10	16:25	15.0	3.01
GC Run # 6 (Tank run # 4)												

TOTAL TANK GAS USED DURING SAMPLING RUNS

75.88

Waste Tank
241-B-103

WHC Sample ID	PNL OGI/ORNL Sample ID	Port Valve #	Description	Desired Flow Rate	Desired Duration (min.)	Desired Total Flow	Actual Flow Rate	Actual Start Time	Actual End Time	Actual Total Time	Actual Total Flow
S5003- A35. 0U1	T1787(222S)		Upstream HEPA(box)						17:30		
S5003- A36. 0D1	T1788(222S)		Downstream HEPA(box)						17:30		
S5003- A37. 0U2	T1789(222S)		Upstream HEPA (VSS)						17:30		
S5003- A38. 0D2	T1790(222S)		Downstream HEPA (VSS)						17:30		

WHC-SD-WM-RPT-133, Rev. 0

Trip Blanks (DO NOT EXPOSE)

S5003- A24. 592	TST#592		TST TRIP #1								
S5003- A25. 791	TST#791		TST TRIP #1								
S5003- A32. V69	V69		NH3/NOx/H2O TRIP #1								
S5003- A33. V70	V70		NH3/NOx/H2O TRIP #2								
S5003- A34. V71	V71		NH3/NOx/H2O TRIP #3								

B-103
TOTAL TANK VAPOR USED

	NUMBER		TIME		VOLUME		TOTAL
	OF		IN		IN		VOLUME,
	EVENTS		MINUTES		SCCM		LITERS
LEAK CHECKS	1		0		5600		5.60
TANK PURGE PUMP DOWNS	3		1		5600		16.80
TANK PURGE TIME (From Spreadsheet)	1		30		5450		163.77
GC PURGES	4		2		5000		40.00
SUMMA PURGES	6		2		5000		60.00
ALL SAMPLES COLLECTED							75.88
TOTAL FOR TANK SAMPLING RUN							362.05

A-6

WHC-SD-WM-RPT-133, Rev. 0

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APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING VSS SAMPLING OF 241-B-103

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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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Westinghouse
Hanford Company

CHAIN OF CUSTODY

WHC 008096

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) 373-7437
Page 85-9656 / FAX 373-7076Project Designation/Sampling Locations 200 East Tank Farm
241-B-103 Tank Vapor Sample SAF S5-003
(VSS Truck)Collection date 01-08-95
Preparation date 01-10-95

Ice Chest No.

Field Logbook No. WHC-N-442-4

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to PNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S5-003 - A01 . 119 \	Ambient Air SUMMA #1 Upwind B-103 (PNL)
S5-003 - A02 . 121 \	Ambient Air SUMMA #2 Through Port 15 (PNL)
S5-003 - A04 . 128 \	SUMMA #3 Port 11 (store for OGI)
S5-003 - A05 . 129 \	SUMMA #4 Port 13 (store for OGI)
S5-003 - A06 . 138 \	SUMMA #5 Port 15 (store for OGI)
S5-003 - A07 . 141 \	SUMMA #6 Port 12 (PNL)
S5-003 - A08 . 155 \	SUMMA #7 Port 14 (PNL)
S5-003 - A09 . 225 \	SUMMA #8 Port 16 (PNL)

[] Field Transfer of Custody			[] Chain of Possession			(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time		
J. A. Edwards	01-12-95	1335	T. B. Williams	01-12-95	1335		
T. B. Williams	2-14-95	1415	J. A. Edwards	2-14-95	1415		

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 / Y/N	
COC info/signatures complete?	Y/N / Y/N	
Sorbents shipped on ice?	Y/N / Y/N	
Rad release stickers on samples?	Y/N / Y/N	
Activity report from 222S?	Y/N / Y/N	
COC copy for LRB, RIDS filed?	Y/N / Y/N	
COC copy for sorbent follow-on?	Y/N / Y/N	
POC	POC	

Westinghouse
Hanford Company

CHAIN OF CUSTODY

WHC 0080

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) 373-7437

Page 85-9656 / FAX 373-7076

Project Designation/Sampling Locations 200 East Tank Farm

241-B-103 Tank

Vapor Sample SAF S5-003

(VSS Truck)

Collection date 01 - 01 - 95

Preparation date 01 - 10 - 95

Ice Chest No.

Field Logbook No. WHC-N-647-7 4 784 2-14-95

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

PNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S5-003 - A26 . V63 ~	NH ₃ /NO _x /H ₂ O (Trap # 1) Line # 9
S5-003 - A27 . V64 ~	NH ₃ /NO _x /H ₂ O (Trap # 2) Line # 10
S5-003 - A28 . V65 ~	NH ₃ /NO _x /H ₂ O (Trap # 3) Line # 8
S5-003 - A29 . V66 ~	NH ₃ /NO _x /H ₂ O (Trap # 4) Line # 10
S5-003 - A30 . V67 ~	NH ₃ /NO _x /H ₂ O (Trap # 5) Line # 9
S5-003 - A31 . V68 ~	NH ₃ /NO _x /H ₂ O (Trap # 6) Line # 10
S5-003 - A32 . V69 ~	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 1) 1-12-95
S5-003 - A33 . V70 ~	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 2) 1-12-95
S5-003 - A34 . V71 ~	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 3) 1-12-95

[] Field Transfer of Custody			[] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time	
G W Dennis <i>G W Dennis</i>	01-12-94 ^{HE}	1000	J A Edwards <i>J A Edwards</i>	01-12-94 ^{HE}	1000	
J A Edwards <i>J A Edwards</i>	01-12-94 ^{HE}	1335	T.B. Utkelt / F.B. Utkelt	01-12-94 ^{HE}	1335	
T.B. Utkelt / F.B. Utkelt	2-14-95	1415	J A Edwards / J A Edwards	2-14-95	1415	

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>	

(Revised 10/17/94 PNL)

Westinghouse
Hanford Company

CHAIN OF CUSTODY

ORNL-006752

Custody Form Initiator Amy Dindal

Company Contact Roger Jenkins

Project Designation/Sampling Locations 241-B-103 (VSS)

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 2/8/95

Field Logbook No. WHC-#6474

Offsite Property No.

Sample Identification

S5003-A10.584	TST# 584 ✓	ORNL Triple Sorbent Trap
S5003-A11.591	TST# 591 ✓	ORNL Triple Sorbent Trap
S5003-A12.731	TST# 731 ✓	ORNL Triple Sorbent Trap
S5003-A14.582	TST# 582 ✓	ORNL Triple Sorbent Trap
S5003-A15.741	TST# 741 ✓	ORNL Triple Sorbent Trap
S5003-A16.424	TST# 424 ✓	ORNL Triple Sorbent Trap
S5003-A17.383	TST# 383 ✓	ORNL Triple Sorbent Trap
S5003-A18.628	TST# 628 ✓	ORNL Triple Sorbent Trap
S5003-A19.807	TST# 807 ✓	ORNL Triple Sorbent Trap
S5003-A21.486	TST# 486 ✓	ORNL Triple Sorbent Trap
S5003-A22.726	TST# 726 ✓	ORNL Triple Sorbent Trap
S5003-A23.627	TST# 627 ✓	ORNL Triple Sorbent Trap
S5003-A24.592	TST# 592 ✓	ORNL Trip Blank
S5003-A25.791	TST# 791 ✓	ORNL Trip Blank
S5003-A13.733	TST# 733 ✓	ORNL Field Blank
S5003-A20.806	TST# 806 ✓	ORNL Field Blank

Inspected cooler
& traps OK
ABD

[] Field Transfer of Custody

Chain of Possession

(Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
ABDindal	1/10/95	1106am	TR Mahon	1-11-95	1500
TR Mahon	02-22-95	1030	ABDindal	02-23-95	1519

Temperature (°C)	Min	Max
When shipped (ORNL)	-14°C	10°C
When received (WHC)	-2°C	4°C
When shipped (WHC)	-6°C	6°C
When received (ORNL)	2°C	13°C

COPY
008546Westinghouse Hanford
Company

CHAIN OF CUSTODY

Custody Form Initiator T.B. Licht

Company Contact R.D. Mankin Telephone 373-2891

Project Designation/Sampling Locations 241-B 103 Collection Date 2-8-95

Ice Chest No. N/A Field Logbook No. N/A

Bill of Lading/Airbill No. N/A Offsite Property No. N/A

Method of Shipment Truck Vehicle #929

Shipped to 222-S Lab, 200 West Area

Possible Sample Hazards/Remarks NONE

Sample Identification

SS003-0T1	T-1791
SS003-0A1	T-1787
SS003-0D1	T-1788
SS003-0A2	T-1789
SS003- CD- 2-5-95 781	T-1790

☐ Field Transfer of Custody

CHAIN OF POSSESSION

(Sign and Print Name)

Relinquished By	Date	Time	Received By	Date	Time
<i>R. Buehler</i>	2-8-95	1430	<i>Sandra Cobb</i>	02-09-95	1430

Final Sample Disposition

Disposal Method: _____ Disposed by: _____ Date/Time: _____

Comments: _____