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Title/Desc:

VAPOR & GAS SAMPLING OF SST 241SX106 USING THE
VAPOR SAMPLING SYSTEM

STA. 4
SEP 20 1995

ENGINEERING DATA TRANSMITTAL

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**This document was reviewed following the
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APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara Broz

9/20/95

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SUPPORTING DOCUMENT

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7. Abstract

THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE MARCH 24, 1995, SAMPLING OF SST 241-SX-106 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
OPC	Offsite Property Control
OVM	Organic Vapor Meter
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
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-SX-106 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-SX-106. This document presents sampling data resulting from the March 24, 1995 sampling of SST 241-SX-106. Analytical results will be presented in separate reports issued by the laboratories that supplied and analyzed the sampling media.

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-SX-106 on March 24, 1995. Mahon et al. (1994) describes in detail the VSS, its performance, and its operation. The team used the VSS to collect sorbent trap and SUMMA¹ canister headspace samples from SST 241-SX-106. The team then sent these samples to the 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 vapor mass flow, and monitors sample vapor total organic carbon (TOC) 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.

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

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 analytes. 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 moisture from the sample vapor before it is metered. Errors associated with the mass flow controllers were determined by the Westinghouse Hanford Company (WHC) Standards Laboratory before the SST 241-SX-106 sampling event (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), a 1 mL sample loop, a 10 port injection valve, a 2 meter chromatographic column, a programmable oven, and a portable computer loaded with the HP-Chemstation software used to control the GC. The GC is plumbed to directly transfer sample from the VSS manifold to the GC 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 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 which contains a 0.25 um phenyl methyl silicone phase. The GC oven is programmed to heat from 50 °C to 270 °C at a rate of approximately 70 °C per minute. Helium is the carrier gas, air and hydrogen the combustion gases, and nitrogen the make-up gas.

The gas chromatograph/flame ionization detector (GC/FID) is configured to quantitatively estimate concentrations of total organic carbon (TOC). The GC/FID confirms sampling system cleanliness, ambient air background TOC concentrations during sampling, and TOC concentration of tank vapor samples.

The system is multi-point calibrated at the weather station on a as available basis, the last time being January 1995. The GC/FID 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 manually operated valve, which is then closed to seal the sample inside. SUMMA™ canisters essentially allow collection and transfer of whole-air samples from the sample site to an analytical laboratory where the sample is analyzed. The standard capacity of each SUMMA™ canister is 6 liters.

3.0 SAMPLING EVENT DESCRIPTION

3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-314, *Tank 241-SX-106 Tank Characterization Plan* (Homi 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 S5-018.

3.2 OPERATIONS AND SAMPLING PERSONNEL

Butch Hall was the Tank Farm Operations person-in-charge. The other SML vapor team members included:

- R. D. Mahon, Vapor Sampling Project Lead
- R. A. Westberg, Field Scientist
- T. B. Utecht, VSS Technician
- N. P. Buechler, VSS Technician.

The VSS was set up at SST 241-SX-106 on March 23, 1995 and was allowed to warm up overnight. Sampling began shortly after 9:00 a.m. on March 24, 1995, and was completed by 1:30 p.m. the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to hooking up to SST 241-SX-106, an industrial hygiene technician 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) and an organic vapor meter (OVM). The measurements were verbally reported, LEL 0.0%, oxygen content of 21.0%, and the total organic carbon content of 5.5 ppm. The technician also measured 150 ppm for NH_3 .

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, March 24, 1995 was cool and sunny with gusty winds from the north. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 2.5 miles east of S Farm, are provided in Appendix B.

3.5 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser 14 of SST 241-SX-106. The probe length, from the sample inlet to the top of the riser flange, was 6.7 meters.

All zones of the VSS were heated to 60 °C during setup of the VSS at SST 241-SX-106 on March 23, 1995. The team stabilized the VSS temperature zones by 9:00 a.m. on March 24, 1995, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-SX-106 were 990 mbar (742.3 torr) and 30 °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 16.5 hours before the first samples were collected, the team began heating the VSS transfer tubing and sampling manifold. During this warmup period, the team began a purge of all vapor transfer tubing and the sampling manifold with ambient air. Prior to sampling tank vapors on March 24, 1995, the team collected two SUMMA[™] canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-SX-106, and the other 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 sampling probe) was performed prior to opening the tank probe vapor sampling valve. The system was evacuated to 291 mbar (218.6 torr) and leakage of ambient air into the system was observed by monitoring system pressure for 15 minutes. Leakage resulted in an increase of 5.3 mbar (4 torr) in system pressure during the 15 minute test. Given a system volume of not more than 10 L, this pressure increase corresponds to a leak rate of approximately 13.72 mL/min at a 291 mbar (218.6 torr). This leak rate was then estimated for average SUMMA[™], TST, and sorbent sampling pressures. It was found that for the SUMMA[™] canisters, dilution by ambient air was approximately 0.1%, for TST traps sampled at 50 mL/min the dilution was approximately 0.6%, for TST traps sampled at 200 mL/min the dilution was approximately 0.6%, and for sorbent traps the dilution was approximately 0.5%.

The tank probe vapor sampling valve was opened and the VSS was purged with sample vapor from SST 241-SX-106 for 30 minutes at a total flow rate of 5.46 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).

3.6 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 $\pm 2\%$ NIST traceable.

Table 2 displays the Field GC/FID results from the sampling of 241-SX-106.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
3	Propane	6.00	1.06
6	Ambient	2.73	1.82
4	Tank Vapor	5.00	0.49

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 2000 pCi/g combined beta-gamma/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 sampling devices from radioactive particulates, all sample vapor for the March 24, 1995, SST 241-SX-106 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 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 (the one furthest downstream from tank SST 241-SX-106) was analyzed to determine if the samples met DOT shipping criteria and laboratory acceptance criteria. Moisture from the tank vapors was collected in a silica gel trap through one of the sorbent station ports and analyzed for tritiated water. SST 241-SX-106 filter and silica gel analysis results are shown in Table 3. SML scientists use the activity results in Table 3 to calculate pCi/g of sample media. SML maintains this information in the project specific file. The results in Table 3 indicate that the samples collected from SST 241-SX-106 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)	S5018-A32.0U1	Total Alpha = 90.8 Total Beta = 258 GEA = 62.1 (²⁰⁸ Tl) GEA = 202 (²¹² Pb) GEA = 95.5 (²⁴³ Am)	= 0.27 = 0.77 = 0.19 = 0.60 = 0.29
Downstream HEPA filter (box)	S5018-A33.0D1	Total Alpha = 0.932 Total Beta = <2.22 GEA = <detectable	= <0.003 = <0.007 = <detectable
Upstream HEPA filter (VSS)	S5018-A34.0U2	Total Alpha = <0.579 Total Beta = <2.01 GEA = <detectable	= <0.002 = <0.006 = <detectable
Downstream HEPA filter (VSS)	S5018-A35.0D2	Total Alpha = <0.912 Total Beta = <1.60 GEA = <detectable	= <0.003 = <0.005 = <detectable
Tritium trap	S5018-A03.0T1	Total activity = <50.0	= <50.0 ^c

NOTES:

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 334 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 kept in a custody locked storage area 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 and 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 the storage area refrigeration unit.

The TSTs were shipped back to ORNL after the sampling event using offsite property control (OPC W95-0-0304-21). Table 4 lists the sample identifiers, sample types, and COC form numbers for all ORNL samples. The samples were delivered to shipping on March 29, 1995 with instructions to ship via Federal Express, next-day delivery.

Table 4. Oak Ridge National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5018-A7.492	TST	006761
S5018-A8.493	TST	006761
S5018-A9.494	TST	006761
S5018-A10.848	TST field blank	006761
S5018-A11.495	TST	006761
S5018-A12.496	TST	006761
S5018-A13.497	TST	006761
S5018-A14.498	TST	006761
S5018-A15.499	TST	006761
S5018-A16.544	TST	006761
S5018-A17.569	TST field blank	006761
S5018-A18.545	TST	006761
S5018-A19.546	TST	006761
S5018-A20.551	TST	006761
S5018-A21.491	TST trip blank	006761
S5018-A22.568	TST trip blank	006761

PNL supplied sorbent chain traps and SUMMA™ canisters, including COC forms. These sampling devices were picked up from PNL by SML and transported in a government vehicle to a custody locked storage area. The sorbent trains were maintained at 4 ± 2 °C before and after the sampling event in storage area refrigeration unit.

After sampling, the PNL sorbent tubes and SUMMA™ canisters were transported by government vehicle directly to PNL and delivered to J. A. Edwards on March 29, 1995. Table 5 lists the sample identifiers, sample types, and COC form numbers for all PNL samples.

Table 5. Pacific Northwest Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S5018-A01.170	Ambient upwind SUMMA™	008882
S5018-A02.171	Ambient SUMMA™ (VSS)	008882
S5018-A04.205	SUMMA™	008882
S5018-A05.206	SUMMA™	008882
S5018-A06.207	SUMMA™	008882
S5018-A23.45U	NH ₃ /NO _x /NO/H ₂ O sorbent	008883
S5018-A24.46U	NH ₃ /NO _x /NO/H ₂ O sorbent	008883
S5018-A25.47U	NH ₃ /NO _x /NO/H ₂ O sorbent	008883
S5018-A26.48U	NH ₃ /NO _x /NO/H ₂ O sorbent	008883
S5018-A27.49U	NH ₃ /NO _x /NO/H ₂ O sorbent	008883
S5018-A28.50U	NH ₃ /NO _x /NO/H ₂ O sorbent	008883
S5018-A29.51U	NH ₃ /NO _x /NO/H ₂ O trip blank	008883
S5018-A30.52U	NH ₃ /NO _x /NO/H ₂ O trip blank	008883
S5018-A31.53U	NH ₃ /NO _x /NO/H ₂ O trip blank	008883

From the time that samples are received by SML until they are shipped back to the analytical laboratory, all COCs are maintained by SML in accordance with WHC-IP-1127-1.3, *Chain-of-Custody for RCRA and CERCLA Protocol Samples* (WHC 1995a). Copies of the completed COC forms for this sampling event are included in Appendix C.

5.0 QUALITY ASSURANCE AND CONTROLS

5.1 VAPOR SAMPLING SYSTEM CLEANING

Immediately prior to sampling of SST 241-SX-106, the VSS manifold and vapor sample transfer tubing was heated to 60 °C and ambient air was purged through the system for 16.5 hours. Also, 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 significant level of contaminants was detected. A second ambient air GC/FID run confirmed that the VSS manifold and transfer tubing was free of organic remnant residue down to ambient levels. A SUMMA™ canister ambient air sample was then collected to confirm by laboratory analysis that the VSS sampling manifold was free of trace organic contaminants (or to determine which contaminants were present and at what concentration), as discussed in Section 3.5. For further details, refer to Appendix C of WHC-IP-1127-4.5 (WHC 1995b) and the project-specific file located with SML.

In compliance with the *Vapor Space Probe Cleaning Procedure* (WHC 1995d) the team cleaned the hot-water-jacketed probe before it was installed in SST 241-SX-106. 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 via a hand-held organic vapor meter that the total organic concentration in the sample line is below 1 ppmv.

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, are summarized in Table 6. According to the calibration schedule shown in Table 6, all instrumentation was within its calibration period during the SST 241-SX-106 sampling event.

Table 6. Calibration Data.

System	Calibration Date	Expiration Date	WHC Standards Laboratory code
Temperature Control System	4/21/94	4/21/95	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. They are transported to the field with the sample collection media but remain unopened during the sampling event. Analysis of trip blanks is used to assess cross-contamination of sample media during field transport and storage.

Field blanks are sampling devices similar to trip blanks. They are prepared and handled in the same manner as the sampling media, including mounting on the sampling port for one minute, but no tank vapors are drawn through the field blanks.

Spiked blanks are prepared as regular sampling media but also contain a known amount of special analyte. Tank vapors are drawn through these blanks and they are handled and analyzed just like any other sample. 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 or in the transfer tubing or sampling manifold of the VSS immediately prior to sampling operations.

Tables 4 and 5 also list sample blanks used during the sampling of SST 241-SX-106.

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). After the time synchronizing of the data logger download and the computer it was apparent that they were not equal. The data logger download was exactly one hour behind the computer readout. The times as indicated on the spreadsheet (Appendix A) are accurate and it did not affect the sample collection.

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.
- Homi, C. S., 1995, *Tank 241-SX-106 Tank Characterization Plan*, WHC-SD-WM-TP-314, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995a, *Chain-of-Custody for RCRA and CERCLA Protocol Samples*, Procedure WHC-IP-1127-1.3, 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, 1995d, *Vapor Space Probe Cleaning Procedure*, Procedure WHC-IP-1127-4.4, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A
SAMPLE LOG SHEETS

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Waste Tank
241-SX-106

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

Ensure HEPA filters are installed

Ensure connection to sample probe

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

Tank Temperature 30° C

GC Standard Runs

GC Ambient Air Runs through port 10

Date: 24 March, 1994

VSS Personnel: R. Mahon T. Utecht

R. Westberg

Trailer Personnel: N. Buechler

PNL				Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
OGI/ORNL		Port	Description	Flow	Duration	Total	Flow	Start	End	Total	Total
WHC Sample ID	Sample ID	Valve #		Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
Group # 1						SCCM	SCCM	3/23/95	3/24/95	(min.)	Liters
Purge with ambient air for 30 min.				5450	30	163500	5459	1600	0830	990.00	5,404
S5018- A01. 170	170		AMBIENT #1 (PNL)		1			0904	0905	1	
GC Run #1	Ambient air/Cleanliness check							0908			
S5018- A02. 171	171	15	AMBIENT #2 (PNL)		1			0915	0916	1	
GC Run #2	Ambient air							0918			
Leak check (Appendix A)	Leak Rate: <u>18 Torr/HR</u>							0923	0938		
Purge with tank air for 30 min.				5450	30	163500	5460	0948	1018	30	163.80
Measure tank pressure	PE-1 = 742.3 TORR							1020			
S5018- A03. 0T1	T1868(222S)	8	Tritium Trap	200	5	1000	200.40	1024	1029	5	1.00
GC Run # 3	(Tank run #1)							1032			
S5018- A04. 205	205	11	SUMMA #3		1			1036	1037	1.0	6.00
S5018- A05. 206	206	13	SUMMA #4		1			1040	1041	1.0	6.00
S5018- A06. 207	207	15	SUMMA # 5		1			1044	1045	1.0	6.00
GC Run # 4	(Tank run # 2)							1047			

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Waste Tank
241-SX-106

WHC Sample ID	PNL	Port Valve #	Description	Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
	OGI/ORNL Sample ID			Flow Rate	Duration (min.)	Total Flow	Flow Rate	Start Time	End Time	Total Time	Total Flow
S5018- A07. 492	TST#492	9	TST #1	50	4	200	48.50	1051	1055	4.0	0.20
S5018- A08. 493	TST#493	10	TST #2	50	4	200	50.10	1051	1055	4.0	0.20
S5018- A09. 494	TST#494	8	TST #3	50	4	200	50.04	1102	1106	4.0	0.20
S5018- A11. 495	TST#495	10	TST #4	50	4	200	50.04	1102	1106	4.0	0.20
S5018- A10. 848	TST#848		TST FIELD BLANK #1					1104:30	1105:30	1.0	
S5018- A12. 496	TST#496	9	TST # 5	200	5	1000	200.40	1120	1125	5.0	1.00
S5018- A13. 497	TST#497	10	TST # 6	200	5	1000	200.40	1120	1125	5.0	1.00
S5018- A14. 498	TST#498	8	TST # 7	200	5	1000	200.40	1136	1141	5.0	1.00
S5018- A15. 499	TST#499	10	TST # 8	200	5	1000	200.40	1136	1141	5.0	1.00
S5018- A16. 544	TST#544	9	TST # 9	200	20	4000	194-200	1151	1211	20.0	3.92*
S5018- A18 545	TST#545	10	TST # 10	200	20	4000	201.15	1151	1211	20.0	4.02
S5018- A17 569	TST#569		TST FIELD BLANK #2					1154	1155	1.0	
S5018- A19. 546	TST#546	8	TST # 11	200	20	4000	200.40	1235	1255	20.0	4.01
S5018- A20. 551	TST#551	10	TST # 12	200	20	4000	200.94	1235	1255	20.0	4.02
GC Run # 5 (Tank run #3)								1301			
S5018- A23. 45U	45U	9	NH3/NOx/H2O #1	200	15	3000	201.60	1305	1320	15.0	3.02
S5018- A24. 46U	46U	10	NH3/NOx/H2O #2	200	15	3000	201.40	1305	1320	15.0	3.02
S5018- A25. 47U	47U	8	NH3/NOx/H2O #3	200	15	3000	201.45	1325	1340	15.0	3.02
S5018- A26. 48U	48U	10	NH3/NOx/H2O #4	200	15	3000	201.10	1325	1340	15.0	3.02
S5018- A27. 49U	49U	9	NH3/NOx/H2O #5	200	15	3000	201.60	1345	1400	15.0	3.02
S5018- A28. 50U	50U	10	NH3/NOx/H2O #6	200	15	3000	201.40	1345	1400	15.0	3.02
GC Run # 6 (Tank run # 4)								1405			
*TST packing affected flow										TOTAL TANK GAS USED DURING SAMPLING RUNS	
										57.91	

Waste Tank
241-SX-106

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
S5018- A32. 0U1	T1869(222S)		Upstream HEPA(box)						1415		
S5018- A33. 0D1	T1870(222S)		Downstream HEPA(box)						1415		
S5018- A34. 0U2	T1871(222S)		Upstream HEPA (VSS)						1415		
S5018- A35. 0D2	T 1872(222S)		Downstream HEPA (VSS)						1415		

Trip Blanks (DO NOT EXPOSE)

S5018- A21. 491	TST#491		TST TRIP #1
S5018- A22. 568	TST#568		TST TRIP #1
S5018- A29. 51U	51U		NH3/NOx/H2O TRIP #1
S5018- A30. 52U	52U		NH3/NOx/H2O TRIP #2
S5018- A31. 53U	53U		NH3/NOx/H2O TRIP #3

SX-106
TOTAL TANK VAPOR USED

	NUMBER OF EVENTS	TIME IN MINUTES	VOLUME IN SCCM	TOTAL VOLUME, 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	163.80	
GC PURGES	4	3	5000	60.00	
SUMMA PURGES	3	2	5000	30.00	
ALL SAMPLES COLLECTED				57.91	
TOTAL FOR TANK SAMPLING RUN				334.11	

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APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING VSS SAMPLING OF 241-SX-106

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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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**Westinghouse
Hanford Company****CHAIN OF CUSTODY****WHC 008882**

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) 373-2891

Page 85-3152 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm
241-SX-106 Tank Vapor Sample SAF S5-018
(VSS Truck)

Collection date 03 - 24 - 95

Preparation date 03 - 14 - 95

Ice Chest No.

Field Logbook No. WHC- *N-647-470*

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

S5-018 - A01 . 170

Ambient Air SUMMA #1 Upwind of SX-106

S5-018 - A02 . 171

Ambient Air SUMMA #2 Through Port 15

S5-018 - A04 . 205

SUMMA #3 Port 11

S5-018 - A05 . 206

SUMMA #4 Port 13

S5-018 - A06 . 207

SUMMA #5 Port 15

[] 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>	03-17-95	1010	T B Utecht <i>T B Utecht</i>	03-17-95	1010		
<i>T B Utecht</i>	<i>3-29-95</i>	<i>1345</i>	<i>J A Edwards</i>	<i>03/29/95</i>	<i>1345</i>		

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	
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

WHC 008883

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) 373-2891

Page 85-3152 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm

241-SX-106 Tank

Vapor Sample SAF S5-018

(VSS Truck)

Collection date 03 - 24 - 95

Preparation date 03 - 14 - 95

Ice Chest No.

Field Logbook No. WHC- N-697-410

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

S5-018 - A23 . 45U -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 1)	Line # 9
S5-018 - A24 . 46U -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 2)	Line # 10
S5-018 - A25 . 47U -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 3)	Line # 8
S5-018 - A26 . 48U -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 4)	Line # 10
S5-018 - A27 . 49U -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 5)	Line # 9
S5-018 - A28 . 50U -	NH ₃ /NO _x /H ₂ O (Sorbent Trap # 6)	Line # 10
S5-018 - A29 . 51U	NH ₃ /NO _x /H ₂ O (Trap Trip Blank # 1)	
S5-018 - A30 . 52U	NH ₃ /NO _x /H ₂ O (Trap Trip Blank # 2)	
S5-018 - A31 . 53U	NH ₃ /NO _x /H ₂ O (Trap Trip Blank # 3)	

Field Transfer of Custody			Chain of Possession (Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time
G W Dennis <i>A.W. Dennis</i>	03-16-95	11:00	J A Edwards <i>J A Edwards</i>	03-16-95	11:00
J A Edwards <i>J A Edwards</i>	03-17-95	10:10	T B Utecht <i>T B Utecht</i>	03-17-95	10:10
T B Utecht <i>T B Utecht</i>	3-29-95	1345	J A Edwards <i>J A Edwards</i>	3-29-95	1345

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)

ORNL

CHAIN OF CUSTODY (Rev 1)

006761

Custody Form Initiator Amy Dindal
 ORNL Contact Roger Jenkins
 Method of Shipment Federal Express

Sampling Location 241-SX-106 (VSS)
 Telephone (615) 576-8594
 Shipped to Rick Mahon

Sample Identification

WHC Identifier	TST #	Trap Type	Received at WHC (✓)	Received at ORNL (✓)
S5018-A7.492	492	SAMPLE	✓ 3-16-95	✓
S5018-A8.493	493	SAMPLE	✓	✓
S5018-A9.494	494	SAMPLE	✓	✓
S5018-A11.495	495	SAMPLE	✓	✓
S5018-A12.496	496	SAMPLE	✓	✓
S5018-A13.497	497	SAMPLE	✓	✓
S5018-A14.498	498	SAMPLE	✓	✓
S5018-A15.499	499	SAMPLE	✓	✓
S5018-A16.544	544	SAMPLE	✓	✓
S5018-A18.545	545	SAMPLE	✓	✓
S5018-A19.546	546	SAMPLE	✓	✓
S5018-A20.551	551	SAMPLE	✓	✓
S5018-A21.491	491	TRIP BLANK	✓	✓
S5018-A22.568	568	TRIP BLANK	✓	✓
S5018-A10.848	848	FIELD BLANK	✓	✓
S5018-A17.569	569	FIELD BLANK	✓	✓

COMMENTS: TST 544 sample volume was lower than desired. Reviewing datalogger down bad on S5018-A16.544, the volume is 3920 secm. TST packing restricted flow.

Samples collected 24 MAR 95; Inspected on arrival @ ORNL - OK X B.D

[] Field Transfer of Custody

Chain of Possession

(Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
AB Dindal AB Dindal	3/15/95	10:36am	T.P. Buechler/T.P. Buechler	3-16-95	1600
T.P. Buechler/T.P. Buechler	3-24-95	0745	T.B. Utech/T.B. Utech	3-24-95	0745
T.B. Utech/T.B. Utech	3-29-95	0900	AB Dindal AB Dindal	3-30-95	1603

Cooler Temperature Status

Temperature (°C)	Min	Max
When Shipped from ORNL	-5	6
When Received at WHC	-3	6
When Shipped from WHC	-4°C	5°C
When Received at ORNL	-7°	9°

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