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VAPOR & GAS SAMPLING OF SST 241BY110 USING THE
VAPOR SAMPLING SYSTEM

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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-BY-110 USING THE VAPOR SAMPLING SYSTEM

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7. Abstract

THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE NOVEMBER 11, 1994, SAMPLING OF SST 241-BY-110 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
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-BY-110 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-110. This document presents sampling data resulting from the November 11, 1994, sampling of SST 241-BY-110.

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-110 on November 11, 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-110; 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-110 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 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.

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 the 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 at regular intervals and single-point calibration the day of each sampling event. The data indicated a high degree of stability over a period of months. For further details, see Section 3.6, Field GC/FID Results.

3.0 SAMPLING EVENT DESCRIPTION

3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-279 (Homi 1994). The 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 S4-082.

3.2 OPERATIONS AND SAMPLING PERSONNEL

E. A. Tamos and M. C. Jones were the Tank Farm Operations persons-in-charge. Other SML vapor team members included:

- R. A. Westberg, Field Scientist
- R. L. Ragan, Field Scientist
- T. B. Utecht, Trailer Support

The VSS was set up at SST 241-BY-110 on November 10, 1994 and was allowed to warm up. Sampling began shortly after 10:00 p.m. on November 11, 1994, and was completed by 2:30 p.m. the same day.

3.3 AMBIENT CONDITIONS

The weather the day of the sampling event, November 11, 1994, was cool, cloudy, foggy, with a light rain. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 4 miles due west of 241-BY SST farm, are provided in Appendix B.

3.4 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to connecting to SST 241-BY-110, 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). The technician verbally reported an LEL of 1.0.

3.5 SAMPLE COLLECTION

The hot-water-jacketed sampling probe was located in Riser 12B of SST 241-BY-110. 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 50 °C during setup of the VSS at SST 241-BY-110 on November 10, 1994. The team stabilized the VSS temperature zones by 9:00 a.m. on November 11, 1994, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-BY-110 were 986 mbar (739.2 torr) and 27 °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 21 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 300 mbar (225 torr).

Approximately 19 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-BY-110, 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 7.6 mbar (5.7 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 17.7 mL/min at a 286 mbar (214.6 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 25 mL/min the dilution was approximately 0.3%, for TST traps sampled at 50 mL/min the dilution was approximately 0.6%, for TST traps sampled at 100 mL/min the dilution was approximately 0.6%, and for sorbent traps the dilution was approximately 0.7%.

The VSS was purged with sample vapor from SST 241-BY-110 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.

Three analytical laboratories provided sample media. Oak Ridge National Laboratory (ORNL) provided triple sorbent traps (TSTs) for organic vapors; Pacific Northwest Laboratory (PNL) provided SUMMA[™] canisters and sorbent traps

for organic vapors, ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O); and Oregon Graduate Institute of Science and Technology (OGIST) provided SUMMA™ canisters.

3.6 FIELD GC/FID RESULTS

The GC was single point calibrated on the day of sampling using a 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 shows the Field GC/FID results from the sampling of SST 241-BY-110.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
3	Ethane	19.00	0.23
1	Ambient	2.76	-
4	Tank Vapor	50.08	3.57

3.7 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 11, 1994, SST 241-BY-110 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-BY-110 filter sample results are shown in Table 2. SML scientists use the activity results from Table 3 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-110 tritium sample results are shown in Table 3. The results in Table 3 indicate that the samples collected from SST 241-BY-110 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)	S4082-A35.OU1	Total Alpha = 962 Total Beta = 5740 GEA = 2260 (²⁰⁸ Tl) GEA = 7310 (²¹² Bi) GEA = 6340 (²¹² Pb)	=2.84 =16.9 =6.67 =21.56 =18.7
Downstream HEPA filter (box)	S4082-A36.OD1	Total Alpha = <.645 Total Beta = <2.29 GEA = <detectable	=<0.002 =<0.007 =<detectable
Upstream HEPA filter (VSS)	S4082-A37.OU2	Total Alpha = 6.66 Total Beta = 1.61 GEA = <detectable	=0.02 =0.005 =<detectable
Downstream HEPA filter (VSS)	S4082-A38.OD2	Total Alpha = <.925 Total Beta = 2.21 GEA = <detectable	=<0.003 =0.007 =<detectable
Tritium trap	S4082-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 (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 339 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 sample media was received, inventoried against the COC forms, and the "received by" block on the COC form was signed by SML. The TSTs 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 W95-0-0019). Table 4 lists the sample identifiers, sample types, and COC form numbers for all ORNL samples. The samples were delivered for transport on November 28, 1994, and shipped by Federal Express for next-day delivery.

Table 4. Oak Ridge National Laboratory Samples.

Sample Identifier	Sample Type	COC Number
S4082-A10.616	TST	006744
S4082-A11.614	TST	006744
S4082-A12.618	TST	006744
S4082-A13.662	TST field blank	006744
S4082-A14.619	TST	006744
S4082-A15.631	TST	006744
S4082-A16.635	TST	006744
S4082-A17.636	TST	006744
S4082-A18.637	TST	006744
S4082-A19.638	TST	006744
S4082-A20.642	TST field blank	006744
S4082-A21.629	TST	006744
S4082-A22.711	TST	006744
S4082-A23.640	TST	006744
S4082-A24.661	TST trip blank	006744
S4082-A25.641	TST trip blank	006744

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 28, 1994. 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
S4082-A01.147	Ambient upwind SUMMA™	008074
S4082-A02.148	Ambient SUMMA™ (VSS)	008074
S4082-A07.149	SUMMA™	008074
S4082-A08.150	SUMMA™	008074
S4082-A09.151	SUMMA™	008074
S4082-A26.82V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008075
S4082-A27.83V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008075
S4082-A28.84V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008075
S4082-A29.85V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008075
S4082-A30.86V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008075
S4082-A31.87V	NH ₃ /NO ₂ /NO/H ₂ O sorbent	008075
S4082-A32.88V	NH ₃ /NO ₂ /NO/H ₂ O trip blank	008075
S4082-A33.89V	NH ₃ /NO ₂ /NO/H ₂ O trip blank	008075
S4082-A34.90V	NH ₃ /NO ₂ /NO/H ₂ O trip blank	008075

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.

Table 6 lists the sample identifiers, sample types, and COC form numbers for all OGIST samples.

Table 6. Oregon Graduate Institute Samples.

Sample Identifier	Sample Type	COC Number
S4082-A04.210H	SUMMA™	008483
S4082-A05.211H	SUMMA™	008483
S4082-A06.212H	SUMMA™	<u>008483</u>

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-110, the VSS manifold was heated to 60 °C and ambient air was purged through the system for 30 minutes. 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 significant level of contaminants was 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-BY-110. 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-110. 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-110, 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 7. According to the calibration schedule shown in Table 7, all instrumentation was within its calibration period during the SST 241-BY-110 sampling event.

Table 7. 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 sampler, but no tank gases are drawn through them.

Table 8 lists the blank samples collected during the sampling of SST 241-BY-110.

Table 8. Blank Samples.

Sample Identifier	Blank Type	Sample Media
S4082-A01.147	Ambient	SUMMA™
S4082-A02.148	Ambient through VSS	SUMMA™
S4082-A24.661	Trip	TST
S4082-A25.641	Trip	TST
S4082-A13.662	Field Blank	TST
S4082-A20.642	Field Blank	TST
S4082-A32.88V	Trip	NH ₃ /NO ₂ /NO/H ₂ O
S4082-A33.89V	Trip	NH ₃ /NO ₂ /NO/H ₂ O
S4082-A34.90V	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-110. 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.
- Homi, C. S., 1994, *Tank Characterization Plan for Vapor and Gas Sampling Tank 241-BY-110 Using the Vapor Sampling System*, WHC-SD-WM-TP-279, Westinghouse Hanford Company, Richland, Washington.
- 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.

APPENDIX A
SAMPLE LOG SHEETS

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Waste Tank
241-BY-110

Set up VSS (Section A)(Temperature set point = 60C)
 Ensure HEPA filters are installed
 Ensure a connection to sample probe
 System status check sheet. (Verify zones are to temp)
 Tank Temperature = 27.5 C

Date: 11 November, 1994

VSS Personnel: Rich Westberg

Bob Ragan

Trailer Personnel: Tim Utrecht

WHC Sample ID	OGI/ORNL	Port	Description	Desired Flow	Desired Duration	Actual Start	Actual End	Actual Time	Desired Total
Sample ID	Valve #			Rate	(min.)	Time	Time	Time	Flow
Group #1									
Purge with ambient air for 30 min.									
S4082 A01	147	upwind	AMBIENT #1 (PHU)	5450	30 min	9:09	9:39	0:30	
GC Run #1									
S4082 A02	148	15	AMBIENT #2 (PHU)		1	9:49	9:50	0:01	
Leak check (Appendix A)									
Purge with tank air for 30 min.									
Measure tank pressure									
S4082 A03	0T1	8	Tritium Trap	200	5	11:08	11:13	0:05	1000
GC Run #2									
S4082 A04	210	11	SUMMA #3 (OGN)		1	11:23	11:24	0:01	6000
S4082 A05	211	13	SUMMA #4 (OGN)		1	11:28	11:29	0:01	6000
S4082 A06	212	15	SUMMA #5 (OGN)		1	11:33	11:34	0:01	6000
S4082 A07	149	12	SUMMA #6		1	11:38	11:39	0:01	6000
S4082 A08	150	14	SUMMA #7		1	11:43	11:44	0:01	6000
S4082 A09	151	16	SUMMA #8		1	11:48	11:49	0:01	6000
GC Run #3									

Waste Tank
241-BY-110

WHC Sample ID	OG/ORML	Port	Description	Desired Flow	Desired Duration	Actual Start	Actual End	Actual Time	Desired Total
S4082-A10 .516	TST# 616	9	TST #1	25	2	12:06	12:08	0:02	50
S4082-A11 .614	TST# 614	10	TST #2	25	2	12:06	12:08	0:02	50
S4082-A12 .618	TST# 618	8	TST #3	25	2	12:14	12:16	0:02	50
S4082-A14 .619	TST# 619	10	TST #4	25	2	12:14	12:16	0:02	50
S4082-A13 .662	TST# 662		TST FIELD BLANK #1			12:24	12:25	0:01	
S4082-A15 .631	TST# 631	9	TST #5	50	5	12:22	12:27	0:05	250
S4082-A16 .635	TST# 635	10	TST #6	50	5	12:22	12:27	0:05	250
S4082-A17 .636	TST# 636	8	TST #7	50	5	12:38	12:43	0:05	250
S4082-A18 .637	TST# 637	10	TST #8	50	5	12:38	12:43	0:05	250
S4082-A19 .638	TST# 638	9	TST #9	100	5	12:50	12:55	0:05	500
S4082-A21 .629	TST# 629	10	TST #10	100	5	12:50	12:55	0:05	500
S4082-A20 .642	TST# 642		TST FIELD BLANK #2			12:51	12:52	0:01	
S4082-A22 .711	TST# 711	8	TST #11	100	5	13:02	13:07	0:05	500
S4082-A23 .640	TST# 640	10	TST #12	100	5	13:02	13:07	0:05	500
GC Run #4						13:13			
S4082-A26 .82V		9	NH3IND-4H2O #1	200	15	13:22	13:37	0:15	3000
S4082-A27 .83V		10	NH3IND-4H2O #2	200	15	13:22	13:37	0:15	3000
S4082-A28 .84V		8	NH3IND-4H2O #3	200	15	13:45	14:00	0:15	3000
S4082-A29 .85V		10	NH3IND-4H2O #4	200	15	13:45	14:00	0:15	3000
S4082-A30 .86V		9	NH3IND-4H2O #5	200	15	14:07	14:22	0:15	3000
S4082-A31 .87V		10	NH3IND-4H2O #6	200	15	14:07	14:22	0:15	3000
GC Run #5						14:30			
Total Flow (Tank Gas Samples) [L] =									58

Waste Tank
241-BY-110

WHC Sample ID	OGI/ORNL	Port	Description	Desired Flow	Desired Duration (min.)	Actual Start Time	Actual End Time	Actual Total Time	Desired Total Flow
S4082-A35 .0U1	I-1631 (222S)	Valve #	Upstream HEPA (BOX)						
S4082-A36 .0D1	I-1632 (222S)		Downstream HEPA (box)						
S4082-A37 .0U2	I-1633 (222S)		Upstream HEPA (VSS)						
S4082-A38 .0D2	I-1634 (222S)		Downstream HEPA (VSS)						
Trip Blanks (DO NOT EXPOSE)									
S4082-A24 .661	TST/661		TST TRIP #1						
S4082-A25 .641	TST/641		TST TRIP #2						
S4082-A32 .88V	88V		NH3/NOx/H2O TRIP #1						
S4082-A33 .89V	89V		NH3/NOx/H2O TRIP #2						
S4082-A34 .90V	90V		NH3/NOx/H2O TRIP #3						

[illegible]

APPENDIX B
AMBIENT CONDITIONS

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WEATHER FOR VSS VAPOR SAMPLING OF BY-110

Time on 11/11/94

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APPENDIX C
CHAIN-OF CUSTODY FORMS

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WHC-SD-WM-RPT-123, Rev. 0

Westinghouse
Hanford Company

CHAIN OF CUSTODY

ORNL-006744

Custody Form Initiator Amy Dindal

Company Contact Roger Jenkins

Telephone (615) 576-8594

Project Designation/Sampling Locations 241-BY-110 (VSS)

Collection Date

Ice Chest No.

Field Logbook No.

Bill of Lading/Airbill No.

Offsite Property No.

Method of Shipment Federal Express

Shipped to Rick Mahon

Possible Sample Hazards/Remarks NONE

Sample Identification

S4082-A10.616	✓TST# 616	ORNL Triple Sorbent Trap
S4082-A11.614	✓TST# 614	ORNL Triple Sorbent Trap
S4082-A12.618	✓TST# 618	ORNL Triple Sorbent Trap
S4082-A14.619	✓TST# 619	ORNL Triple Sorbent Trap
S4082-A15.631	✓TST# 631	ORNL Triple Sorbent Trap
S4082-A16.635	✓TST# 635	ORNL Triple Sorbent Trap
S4082-A17.636	✓TST# 636	ORNL Triple Sorbent Trap
S4082-A18.637	✓TST# 637	ORNL Triple Sorbent Trap
S4082-A19.638	✓TST# 638	ORNL Triple Sorbent Trap
S4082-A21.629	✓TST# 629	ORNL Triple Sorbent Trap
S4082-A22.711	✓TST# 711	ORNL Triple Sorbent Trap
S4082-A23.640	✓TST# 640	ORNL Triple Sorbent Trap
S4082-A24.661	✓TST# 661	ORNL Trip Blank
S4082-A25.641	✓TST# 641	ORNL Trip Blank
S4082-A13.662	✓TST# 662	ORNL Field Blank
S4082-A20.642	✓TST# 642	ORNL Field Blank

[] Field Transfer of Custody

Chain of Possession

(Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
AB Dindal	11/3/94	10:46 AM	JP Bunch	11-4-94	1400
JP Bunch	11-11-94	0830	TKA Wooten	11-11-94	0930
TKA Wooten	11-11-94	1600	T.B. Wooten	11-11-94	1600
T.B. Wooten	11-28-94	1100	AB Dindal	11/29/94	1724

Did not include

Max/Min Thermometer
ABD 11/29/94

Temperature (°C)	Min	Max
When shipped (ORNL)	0	12
When received (WHC)	2	6
When shipped (WHC)		
When received (ORNL)		0.6

Westinghouse
Hanford Company

CHAIN OF CUSTODY

WHC 008074

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 373-3193Project Designation/Sampling Locations 200 East Tank Farm
241-BY-110 Tank Vapor Sample SAF S4082
(VSS Truck)Collection date 11-11-94 @ 11-28-94
Preparation date 11-1 0-94

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

S4082-A01.147~
S4082-A02.148~Ambient Air #1 Upwind @ VSS (PNL)
Ambient Air #2 Through VSS (PNL)S4082-A07.149~
S4082-A08.150~
S4082-A09.151~Sample #6 (PNL)
Sample #7 (PNL)
Sample #8 (PNL)

Field Transfer of Custody			Chain of Possession (Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time
J. A. Edwards	11-10-94	1400	R. D. Mahon	11-10-94	1400
R. D. Mahon	11-11-94	0930	R. A. Weatherly / R. A. Weatherly	11-11-94	0930
R. A. Weatherly	11-11-94	1200	T. B. Lusk / T. B. Lusk	11-11-94	1200
T. B. Lusk	11-25-94	1200	R. Edwards / J. Edwards	11-28-94	1200

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	
	POC (1/2)	POC (1/2)

(Revised 10/17/94 PNL)

Westinghouse
Hanford Company

CHAIN OF CUSTODY

WHC 008075

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-110 Tank Vapor Sample SAF S4082
(VSS Truck)

Collection date 11-__-94

Preparation date 11-0 7-94

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

S4082 - A26 . 82V\	NH ₃ /NO _x /H ₂ O (Trap # 1) Line # 9
S4082 - A27 . 83V\	NH ₃ /NO _x /H ₂ O (Trap # 2) Line #10
S4082 - A28 . 84V\	NH ₃ /NO _x /H ₂ O (Trap # 3) Line # 8
S4082 - A29 . 85V\	NH ₃ /NO _x /H ₂ O (Trap # 4) Line #10
S4082 - A30 . 86V\	NH ₃ /NO _x /H ₂ O (Trap # 5) Line # 9
S4082 - A31 . 87V\	NH ₃ /NO _x /H ₂ O (Trap # 6) Line #10
S4082 - A32 . 88V\	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 1)
S4082 - A33 . 89V\	NH ₃ /NO _x /H ₂ O a-b-c (Trap Trip Blank# 2)
S4082 - A34 . 90V\	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
Gary Dennis <i>[Signature]</i>	11-09-94	0800	J. A. Edwards <i>[Signature]</i>	11-09-94	0800
J. A. Edwards <i>[Signature]</i>	11-10-94	1400	T. B. Latta <i>[Signature]</i>	11-10-94	1400
T. B. Latta <i>[Signature]</i>	11-11-94	0930	R. A. Westberg <i>[Signature]</i>	11-11-94	0930
R. A. Westberg <i>[Signature]</i>	11-11-94	1530	T. B. Latta <i>[Signature]</i>	11-11-94	1530
T. B. Latta <i>[Signature]</i>	11-25-94	1200			

Final Sample Disposition

Comments:

PNL (only) Checklist	Pick-up / Delivery	Comments:
Media labeled and checked?	☒ N	
Letter of instruction?	☒ N	
Media in good condition?	☒ N	
COC info/signatures complete?	☒ N	
Sorbents shipped on ice?	☒ N	
Rad release stickers on samples?	☒ N	
Activity report from 222S?	☒ N	
COC copy for LRB, RIDS filed?	☒ N	
COC copy for sorbent follow-on?	☒ N	
	POC <i>[Signature]</i>	C-5

(Revised 10/17/94 PNL)

Westinghouse Hanford Company

CHAIN OF CUSTODY

WHC 008081

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-110 Tank Vapor Sample SAF S4082
(VSS Truck)

Collection date 11-__-94
Preparation date 11-0 9-94

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

S4082 - A26 . 82V	H ₂ O-(f) (Trap # 1)	Line # 9
S4082 - A27 . 83V	H ₂ O-(f) (Trap # 2)	Line #10
S4082 - A28 . 84V	H ₂ O-(f) (Trap # 3)	Line # 8
S4082 - A29 . 85V	H ₂ O-(f) (Trap # 4)	Line #10
S4082 - A30 . 86V	H ₂ O-(f) (Trap # 5)	Line # 9
S4082 - A31 . 87V	H ₂ O-(f) (Trap # 6)	Line #10

Field Transfer of Custody			Chain of Possession (Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time
Gary Dennis <i>[Signature]</i>	11-10-94	0800	J. A. Edwards <i>[Signature]</i>	11-10-94	0800
J. A. Edwards <i>[Signature]</i>	11-10-94	1400	T.B. Uhlert / T.R. Uhlert	11-10-94	1400
T.B. Uhlert / T.R. Uhlert	11-11-94	0530	R.A. Westberg / J.A. Westberg	11-11-94	0530
R.A. Westberg / J.A. Westberg	11-11-94	1530	T.B. Uhlert / T.R. Uhlert	11-11-94	1530
T.B. Uhlert / T.R. Uhlert	11-28-94	1200	J.A. Edwards / R.D. Mahon	11-28-94	1200

Final Sample Disposition

Comments:

*** Attach to sorbents on COC 008075 ***

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 ☒	POC ☒	

(Revised 10/17/94 PNL)

Westinghouse Hanford
Company

CHAIN OF CUSTODY

008483

Custody Form Initiator T.B. Utecht

Company Contact R.D. Mahan

Telephone 373-1101

Project Designation/Sampling Locations 241 BY TANK 110

Collection Date 11-11-94

T.B. 11-11-94

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 Federal Express

Shipped to OREGON GRADUATE INSTITUTE

Possible Sample Hazards/Remarks NONE

Sample Identification

S4082-A04. H210

S4082-A05. H211

S4082-A06. H212

☒ Field Transfer of Custody

CHAIN OF POSSESSION

(Sign and Print Name)

Relinquished By	Date	Time	Received By	Date	Time
<u>T.B. Utecht / T.B. Utecht</u>	<u>11-11-94</u>	<u>0930</u>	<u>Rick Wastberg</u>	<u>11-11-94</u>	<u>0930</u>
<u>Rick Wastberg</u>	<u>11-11-94</u>	<u>1200</u>	<u>T.B. Utecht / T.B. Utecht</u>	<u>11-11-94</u>	<u>1200</u>
<u>T.B. Utecht / T.B. Utecht</u>	<u>11-28-94</u>	<u>1200</u>	<u>J. Edwards / J. Edwards</u>	<u>11-28-94</u>	<u>1200</u>

Final Sample Disposition

Disposal Method:

Disposed by:

Date/Time:

Comments:

Westinghouse Hanford
Company

CHAIN OF CUSTODY

008483

Custody Form Initiator T.B. UtkeltCompany Contact R.D. MahonTelephone 373-1101Project Designation/Sampling Locations 241 BY TANK¹¹⁰
~~107~~Collection Date 11-11-94⁷⁸⁴ 11-11-94Ice Chest No. N/AField Logbook No. N/ABill of Lading/Airbill No. N/AOffsite Property No. N/AMethod of Shipment Federal ExpressShipped to OREGON GRADUATE INSTITUTEPossible Sample Hazards/Remarks NONE

Sample Identification

S4082-A04. H210S4082-A05. H211S4082-A06. H212☒ Field Transfer of Custody

CHAIN OF POSSESSION

(Sign and Print Name)

Relinquished By	Date	Time	Received By	Date	Time
<u>T.B. Utkelt / T.B. Utkelt</u>	<u>11-11-94</u>	<u>0930</u>	<u>Ruth Westbury</u>	<u>11-11-94</u>	<u>0930</u>
<u>Ruth Westbury</u>	<u>11-11-94</u>	<u>1200</u>	<u>T.B. Utkelt / T.B. Utkelt</u>	<u>11-11-94</u>	<u>1200</u>
<u>T.B. Utkelt / T.B. Utkelt</u>	<u>11-25-94</u>	<u>1200</u>	<u>J. Edwards / J. Edwards</u>	<u>11-28-94</u>	<u>1200</u>

Final Sample Disposition

Disposal Method:

Disposed by:

Date/Time:

Comments: