STL.4

SEP 15 1995

ENGINEERING DATA TRANSMITTAL

1. EDT № 612704

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
DISTRIBUTION	SAMPLING AND MOBILE LABS OM624	N/A
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
VAPOR/HTS/SAMPLING AND MOBILE LABS	RICKY MAHON 3-7437	N/A
8. Originator Remarks:		**9. Equip./Component No.:**
241-S-111, SAMPLING USING THE VAPOR SAMPLING SYSTEM		N/A
		10. System/Bldg./Facility:
		M0292/WSCF
11. Receiver Remarks:		**12. Major Assm. Dwg. No.:**
		N/A
		13. Permit/Permit Application No.:
		N/A
		14. Required Response Date:
		17 JULY 95

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Desig-nator	(G) Reason for Trans-mittal	(H) Origi-nator Dispo-sition	(I) Receiv-er Dispo-sition
1	~~WCH~~-SD-WM-RPT-143 WHC-	ALL	0	VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-S-111 USING THE VAPOR SAMPLING SYSTEM	Q	2	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
2	1	Cog.Eng. R.D. MAHON	R D Mahon	20 AUG 95	S3-27	RESOURCE CENTER			R2-12	3	
2	1	Cog. Mgr. J.D. DORIAN	J.D. Dorian	9/5/95	S3-27	Central Files			A3-88	3	
2	1	QA C.J. STEPHAN	C.J. Stephan	7/13/95	H4-16						
3		DAVE BRATZEL			S7-21						
3		JOHN DEICHMAN			T6-03						
3		RAMPUR VISWANATH			S3-90						
~~3~~		~~O.S.T.I.~~			~~A3-36~~						

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
GLENN S. CARRIO Glenn S. Carrio 7/28/95 Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	JOHN J. DORIAN John J. Dorian 9/5/95 Cognizant Manager Date	[ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

BD-7400-172-1

THIS PAGE INTENTIONALLY
LEFT BLANK

RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-RPT-143, REV 0
Document Title:	Vapor and Gas Sampling of Single-Shell Tank 241-S-111 Using the Vapor Sampling System
Release Date:	9/15/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Tammy Ontiveros — 9/15/95

THIS PAGE INTENTIONALLY
LEFT BLANK

SUPPORTING DOCUMENT

1. Total Pages 35 30

2. Title	3. Number	4. Rev No.
VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-S-111 USING THE VAPOR SAMPLING SYSTEM	WHC-SD-WM-RPT-143	0

5. Key Words

241-S-111
VSS
SUMMA
TST
SORBENT
TANK

6. Author

Name: G.S. CAPRIO

Signature

Organization/Charge Code OM624/EL01930

7. Abstract

THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE MARCH 21, 1995, SAMPLING OF SST 241-S-111 USING THE VAPOR SAMPLING SYSTEM.

8. RELEASE STAMP

THIS PAGE INTENTIONALLY
LEFT BLANK

APPROVALS

Document title: Vapor and Gas Sampling of Single-Shell Tank 241-S-111 Using the Vapor Sampling System

Approved by:
R. A. Westberg, Field Scientist
Vapor Sampling Project
Sampling and Mobile Laboratories
6/29/95
Date

Approved by:
R. D. Mahon, Project Lead
Vapor Sampling Project
Sampling and Mobile Laboratories
20AUG95
Date

Approved by:
D. L. Edwards, Technical Lead
Vapor Sampling Project
Sampling and Mobile Laboratories
7/6/95
Date

Approved by:
R. S. Viswanath, Principal Scientist
Vapor Sampling Project
Special Analytical Studies
8/29/95
Date

THIS PAGE INTENTIONALLY
LEFT BLANK

CONTENTS

LIST OF TABLES

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_2O	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
TOC	Total Organic Carbon
TST	Triple Sorbent Trap
VSS	Vapor Sampling System
WHC	Westinghouse Hanford Company

This page intentionally left blank.

VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-S-111 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-S-111. This document presents sampling data resulting from the March 21, 1995 sampling of SST 241-S-111. 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-S-111 on March 21, 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 SUMMA[1] canister headspace samples from SST 241-S-111. 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) content 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

---

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

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-S-111 sampling event (see Table 1). Flow rates and the duration of flow are specified by the analytical laboratories that suply 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 TOC. All data is then transmitted to the computer where it is stored for further analysis. The standard capacity of each SUMMA™ canister is 6 liters.

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 GC/FID is configured to quantitatively estimate concentrations of 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.

3.0 SAMPLING EVENT DESCRIPTION

3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-317, *Tank 241-S-111 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 S5-016.

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
E. A. Johnson, Field Scientist
R. A. Westberg, Field Scientist
R. L. Ragan, Field Scientist
T. B. Utecht, VSS Technician
N. P. Beuchler, VSS Technician.

The VSS was set up at SST 241-S-111 on March 20, 1995 and was allowed to warm up overnight. Sampling began shortly after 10:00 a.m. on March 21, 1995, and was completed by 3:30 p.m. the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to hooking up to SST 241-S-111, 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 20.5%, and the TOC content of 2.4 ppm. The technician also sampled tank vapors for CO. It was believed that H_2 was affecting the CO reading of 110 ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, March 21, 1995 was cool and cloudy with gusty winds. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 2.5 miles west 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-S-111. 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-S-111 on March 20, 1995. The team stabilized the VSS temperature zones by 9:30 a.m. on March 21, 1995, and the system was ready to collect samples. Measured according to the VSS operating procedure, the pressure and temperature of SST 241-S-111 were 975 mbar (731.2 Torr) and 23 °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 23 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 21, 1995, the team collected two SUMMA™ canister samples of ambient air, one manually 10 meters upwind of the VSS connection with SST 241-S-111, 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 285 mbar (213.5 torr) and leakage of ambient air into the system was observed by monitoring system pressure for 15 minutes. Leakage resulted in an increase of 18 mbar (13.6 torr/hr) 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 13.73 mL/min at a 285 mbar (213.5 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 0.4%, for TST traps sampled at 200 mL/min the dilution was approximately 0.5%, and for sorbent traps the dilution was approximately 0.4%.

The tank probe vapor sampling valve was opened and the VSS was purged with sample vapor from SST 241-S-111 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 ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O).

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-S-111.

Table 2. TOC Results.

Number of Runs	Description	Average TOC Concentration (ppmC)	% Standard Deviation
3	Propane	6.00	1.66
5	Ambient	2.83	0.51
2	Tank Vapor	7.57	1.12

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 2,000 pCi/g of beta-gamma activity and 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 sampling devices from radioactive particulates, all sample vapor for the March 21, 1995, SST 241-S-111 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 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-S-111 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-S-111 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)	S5016-A32.OU1	Total Alpha = 174 Total Beta = 274 GEA = 34.3 (^{208}TL)	=0.52 =0.82 =0.10
Downstream HEPA filter (box)	S5016-A33.OD1	Total Alpha = <1.16 Total Beta = 1.97 GEA = <detectable	=<0.003 =0.006 =<detectable
Upstream HEPA filter (VSS)	S5016-A34.OU2	Total Alpha = <0.826 Total Beta = 1.93 GEA = <detectable	=<0.002 =0.006 =<detectable
Downstream HEPA filter (VSS)	S5016-A35.OD2	Total Alpha = <0.577 Total Beta = <5.32 GEA = <detectable	=<0.002 =<0.02 =<detectable
Tritium trap	S5016-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.

[a]All less than (<) values represent the minimum detection limits at Laboratory 222-S.

[b]Numbers 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.

[c]Number 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
S5016-A7.502	TST	006759
S5016-A8.503	TST	006759
S5016-A9.504	TST	006759
S5016-A10.540	TST field blank	006759
S5016-A11.505	TST	006759
S5016-A12.507	TST	006759
S5016-A13.509	TST	006759
S5016-A14.510	TST	006759
S5016-A15.542	TST	006759
S5016-A16.512	TST	006759
S5016-A17.541	TST field blank	006759
S5016-A18.536	TST	006759
S5016-A19.537	TST	006759
S5016-A20.538	TST	006759
S5016-A21.501	TST trip blank	006759
S5016-A22.539	TST trip blank	006759

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 traps 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
S5016-A01.127	Ambient upwind SUMMA™	008110
S5016-A02.128	Ambient SUMMA™ (VSS)	008110
S5016-A04.129	SUMMA™	008110
S5016-A05.133	SUMMA™	008110
S5016-A06.134	SUMMA™	008110
S5016-A29.27U	$NH_3/NO_x/NO/H_2O$ sorbent	008111
S5016-A30.28U	$NH_3/NO_x/NO/H_2O$ sorbent	008111
S5016-A31.29U	$NH_3/NO_x/NO/H_2O$ sorbent	008111
S5016-A32.30U	$NH_3/NO_x/NO/H_2O$ sorbent	008111
S5016-A33.31U	$NH_3/NO_x/NO/H_2O$ sorbent	008111
S5016-A34.32U	$NH_3/NO_x/NO/H_2O$ sorbent	008111
S5016-A35.33U	$NH_3/NO_x/NO/H_2O$ trip blank	008111
S5016-A36.34U	$NH_3/NO_x/NO/H_2O$ trip blank	008111
S5016-A37.35U	$NH_3/NO_x/NO/H_2O$ trip blank	008111

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 Special Analysis Report 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-S-111, the VSS manifold and vapor sample transfer tubing was heated to 60 °C and ambient air was purged through the system for 22 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 contaminants were 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 1993c) the team cleaned the hot-water-jacketed probe before it was installed in SST 241-S-111. 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-S-111 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. 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-S-111.

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). During the setup of the VSS a lock and tag violation occurred. While connecting the sampling line a crescent wrench was used to operate a valve on the probe that had been removed. After the violation was recognized by SML, they reported it to the PIC. 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., *Tank 241-S-111 Tank Characterization Plan*, WHC-SD-WM-TP-317, 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, 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, 1993b, *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, 1993c, *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.

This page intentionally left blank.

APPENDIX A

SAMPLE LOG SHEETS

This page intentionally left blank.

Waste Tank
241-S-111

Set up VSS (Secton 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 23°C
GC Standard Runs
GC Ambient Air runs through port 10

Date: March 21, 1995
VSS Personnel: R. Westberg R, Ragan R, Mahon T. Utecht
Trailer Personnel: N. Buechler

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
Group # 1						SCCM	SCCM	3/20/95	3/21/95	(min.)	Liters
Purge with ambient air for 30 min.				5450	30	163500	5460	11:15	09:15	1,320	7,207
S5016- A01. 127	127		AMBIENT #1 (PNL)		1			09:45	09:46	1.0	
GC Run #1	Ambient air/Cleanliness check							09:50			
S5016- A02. 128	128	15	AMBIENT #2 (PNL)		1			09:55	09:56	1.0	
GC Run #2	Ambient air							09:59			
Leak check (Appendix A)	Leak Rate: 13.6 Torr/Hr.										
Purge with tank air for 30 min.				5450	30	163500	5460	10:34	11:04	30.0	163.80
Measure tank pressure			PE-1, 731.2								
S5016- A03. 0T1	T1856(222S)	8	Tritium Trap	200	5	1000	210.50	11:12	11:17	5.0	1.05
GC Run # 3 (Tank run #1)								11:21			
S5016- A04. 129	129	11	SUMMA #3		1			11:28	11:29	1.0	6.00
S5016- A05. 133	133	13	SUMMA #4		1			11:33	11:34	1.0	6.00
S5016- A06. 134	134	15	SUMMA # 5		1			11:38	11:39	1.0	6.00
GC Run # 4 (Tank run # 2)								11:41			

WHC Sample ID	PNL OGI/ORNL Sample ID	Port Valve #	Description	Desired Flow Rate	Waste Tank 241-S-111 Desired Duration (min.)	Desired Total Flow	Actual Flow Rate	Actual Start Time	Actual End Time	Actual Total Time	Actual Total Flow
S5016- A07. 502	TST#502	9	TST #1	50	4	200	50.13	11:55	11:59	4.0	0.20
S5016- A08. 503	TST#503	10	TST #2	50	4	200	50.13	11:55	11:59	4.0	0.20
S5016- A09. 504	TST#504	8	TST #3	50	4	200	50.15	12:10	12:14	4.0	0.20
S5016- A11. 505	TST#505	10	TST #4	50	4	200	50.15	12:10	12:14	4.0	0.20
S5016- A10. 540	TST#540		TST FIELD BLANK #1					12:16	12:17	1.0	
S5016- A12. 507	TST#507	9	TST # 5	200	5	1000	200.00	12:28	12:33	5.0	1.00
S5016- A13. 509	TST#509	10	TST # 6	200	5	1000	199.00	12:28	12:33	5.0	1.00
S5016- A14. 510	TST#510	8	TST # 7	200	5	1000	200.40	12:44	12:49	5.0	1.00
S5016- A15. 542	TST#542	10	TST # 8	200	5	1000	200.40	12:44	12:49	5.0	1.00
S5016- A16. 512	TST#512	9	TST # 9	200	20	4000	200.40	12:58	13:18	20.0	4.01
S5016- A18 536	TST#536	10	TST # 10	200	20	4000	200.40	12:58	13:18	20.0	4.01
S5016- A17 541	TST#541		TST FIELD BLANK #2					12:59	13:00	1.0	
S5016- 0 537	TST#537	8	TST # 11	200	20	4000	200.40	13:29	13:49	20.0	4.01
S5016- A20. 538	TST#538	10	TST # 12	200	20	4000	200.40	13:29	13:49	20.0	4.01
GC Run # 4 (Tank run #34)								13:59			
S5016- A23. 27U	27U	9	NH3/NOx/H2O #1	200	15	3000	200.40	14:19	14:34	15.0	3.01
S5016- A24. 28U	28U	10	NH3/NOx/H2O #2	200	15	3000	200.40	14:19	14:34	15.0	3.01
S5016- A25. 29U	29U	8	NH3/NOx/H2O #3	200	15	3000	200.40	14:41	14:56	15.0	3.01
S5016- A26. 30U	30U	10	NH3/NOx/H2O #4	200	15	3000	200.40	14:41	14:56	15.0	3.01
S5016- A27. 31U	31U	9	NH3/NOx/H2O #5	200	15	3000	200.40	15:02	15:17	15.0	3.01
S5016- A29. 32U	32U	10	NH3/NOx/H2O #6	200	15	3000	200.40	15:02	15:17	15.0	3.01
GC Run # 6 (Tank run # 4)								13:26			
							TOTAL TANK GAS USED DURING SAMPLING RUNS				57.92

A-4

WHC-SD-WM-TRP-233, Rev. C

WHC Sample ID	PNL OGI/ORNL Sample ID	Port Valve #	Description	Desired Flow Rate	Waste Tank 241-S-111 Desired Duration (min.)	Desired Total Flow	Actual Flow Rate	Actual Start Time	Actual End Time	Actual Total Time	Actual Total Flow
S5016- A32. 0U1	T1857(222S)		Upstream HEPA(box)								
S5016- A33. 0D1	T1858(222S)		Downstream HEPA(box)								
S5016- A34. 0U2	T1859(222S)		Upstream HEPA (VSS)								
S5016- A35. 0D2	T1860(222S)		Downstream HEPA (VSS)								

Trip Blanks (DO NOT EXPOSE)											
S5016- A21. 501	TST#501		TST TRIP #1								
S5016- A22. 539	TST#539		TST TRIP #1								
S5016- A29. 33U	33U		NH3/NOx/H2O TRIP #1								
S5016- A30. 34U	34U		NH3/NOx/H2O TRIP #2								
S5016- A31. 35U	35U		NH3/NOx/H2O TRIP #3								

S-111
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				57.92
TOTAL FOR TANK SAMPLING RUN				334.12

VSS SAMPLING RADIOLOGICAL SCREENING RESULTS

S-111

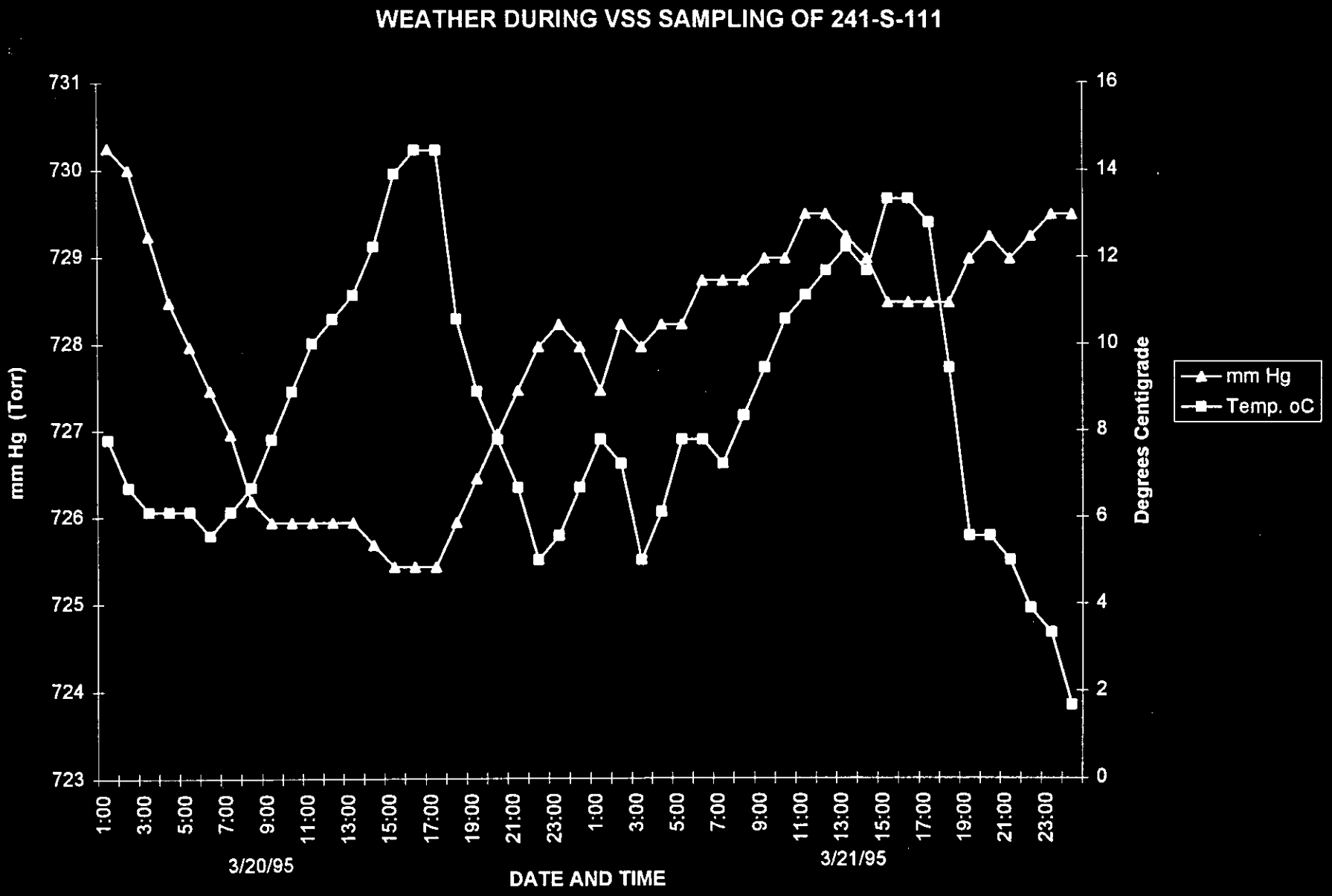
HEPA BOX UPSTREAM FILTER	Liters	pCi / filter	pCi / liter	HEPA BOX DOWNSTREAM FILTE	Liters	pCi / filter	pCi / liter
TOTAL VOLUME	334.12			TOTAL VOLUME	334.12		
BETA		274.00	0.82	BETA		1.97	<Detectable
ALPHA		174.00	0.52	ALPHA		< 1.16	<Detectable
GEA - Am-243		ND	< Detectable	GEA - Am-243		ND	<Detectable
- Bi-212		ND	< Detectable	- Bi-212		ND	<Detectable
- Np-237		ND	< Detectable	- Np-237		ND	<Detectable
- Pb-212		ND	< Detectable	- Pb-212		ND	<Detectable
- Th-229		ND	< Detectable	- Th-229		ND	<Detectable
- TL-208		34.30	0.10	- Tl-208		ND	<Detectable
-Cd-109		ND	< Detectable				
VSS UPSTREAM FILTER	Liters	pCi / filter	pCi / liter	VSS DOWNSTREAM FILTER	Liters	pCi / filter	pCi / liter
TOTAL VOLUME	334.12			0	334.12		
BETA		1.93	0.01	BETA		< 5.32	< Detectable
ALPHA		< 0.826	< Detectable	ALPHA		< 0.577	< Detectable
GEA - Am-243		ND	< Detectable	GEA - Am-243		ND	< Detectable
- Bi-212		ND	< Detectable	- Bi-212		ND	< Detectable
- Np-237		ND	< Detectable	- Np-237		ND	< Detectable
- Pb-212		ND	< Detectable	- Pb-212		ND	< Detectable
- Th-229		ND	< Detectable	- Th-229		ND	< Detectable
- TL-208		ND	< Detectable	- Tl-208		ND	< Detectable
TRITIUM TRAP	Liters	pCi / filter	pCi / liter				
TOTAL VOLUME	1.0						
TOTAL ACTIVITY		< 50.0	< 50.0				
SAMPLE EXPOSURE ANALYSIS, USING VSS DOWNSTREAM FILTER ANALYSIS AS POSSIBLE EXPOSURE LEVEL							
= BETA @ 0.004 pCi/Liter and ALPHA @ 0.104 pCi/Liter, GEA not detected							
SORBENT SAMPLING				TST'S,	pCi		
TOTAL VOLUME PER SAMPLE	3.00	Liters		ALPHA and BETA per Sample	< Detectable		
ALPHA and BETA per Sample	< Detectable	pCi					
ALL SORBENTS							
NH3 (0.75 gram)	< Detectable	pCi per gram					
NO2 (0.60 gram)	< Detectable	pCi per gram					
H2O (0.45 gram)	< Detectable	pCi per gram					
SUMMA SAMPLING							
TOTAL VOLUME PER CANISTER	6	Liters					
ALPHA AND BETA PER SAMPL	< Detectable	pCi					

This page intentionally left blank.

APPENDIX B

AMBIENT CONDITIONS

This page intentionally left blank.


WEATHER DURING VSS SAMPLING OF 241-S-111
mm Hg (Torr)
Degrees Centigrade
731
730
729
728
727
726
725
724
723
16
14
12
10
8
6
4
2
0
mm Hg
Temp. oC
1:00
3:00
5:00
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
3/20/95
3/21/95
DATE AND TIME

This page intentionally left blank.

APPENDIX C

CHAIN-OF-CUSTODY FORMS

This page intentionally left blank.

Westinghouse Hanford Company

CHAIN OF CUSTODY ORNL-006759

Custody Form Initiator: Amy Dindal
Company Contact: Roger Jenkins
Telephone: (615) 576-8594
Project Designation/Sampling Locations: 241-S-111 (VSS)
Collection Date: ~~2-28-95~~ TBL 3-21-95 ~~3-13-95~~
Ice Chest No. ~~207~~ 8-28-95 SML-485
Field Logbook No. WHC-N-~~447~~ TBL-10
Bill of Lading/Airbill No.
Offsite Property No.
Method of Shipment: Federal Express
Shipped to: Rick Mahon
Possible Sample Hazards/Remarks: NONE

Rec'd @ ORNL 3/30/95

Sample Identification		
S5016-A7.502	TST# 502	ORNL Triple Sorbent Trap
S5016-A8.503	TST# 503	ORNL Triple Sorbent Trap
S5016-A9.504	TST# 504	ORNL Triple Sorbent Trap
S5016-A11.505	TST# 505	ORNL Triple Sorbent Trap
S5016-A12.507	TST# 507	ORNL Triple Sorbent Trap
S5016-A13.509	TST# 509	ORNL Triple Sorbent Trap
S5016-A14.510	TST# 510	ORNL Triple Sorbent Trap
S5016-A15.542	TST# 542	ORNL Triple Sorbent Trap
S5016-A16.512	TST# 512	ORNL Triple Sorbent Trap
S5016-A18.536	TST# 536	ORNL Triple Sorbent Trap
S5016-A19.537	TST# 537	ORNL Triple Sorbent Trap
S5016-A20.538	TST# 538	ORNL Triple Sorbent Trap
S5016-A21.501	TST# 501	ORNL Trip Blank
S5016-A22.539	TST# 539	ORNL Trip Blank
S5016-A10.540	TST# 540	ORNL Field Blank
S5016-A17.541	TST# 541	ORNL Field Blank

[ ] Field Transfer of Custody — Chain of Possession — (Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
A B Dindal / A B Dindal	3/9/95	10 560 Lv	N P Bumbles / N P Bumbles	3-10-95	1445
N P Bumbles / N P Bumbles	3/13/95	0800	T B Litecut / T. B Litecut	3-13-95	0800
T B. Litecut / T. B Litecut	3-29-95	0900	A B Dindal / A B Dindal	3-30-95	1601

Inspected cooler & trays OK ABD 3/30/95

Temperture (°C)	Min	Max
When shipped (ORNL)	-4°	-2°
When received (WHC)	-3°C	7°C
When shipped (WHC)	-4°C	5°C
When received (ORNL)	-1°	9°

Westinghouse Hanford Company | **CHAIN OF CUSTODY** | **WHC 008110**

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 241-S-111 Tank	200 West Tank Farm Vapor Sample SAF S5-016 (VSS Truck)	Collection date 03 - 21 - 95 Preparation date 03 - 08 - 95
Ice Chest No.		Field Logbook No. WHC-N-647-18
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

S5-016 - A01 . 127	Ambient Air SUMMA #1 Upwind of S-111
S5-016 - A02 . 128	Ambient Air SUMMA #2 Through Port 15
S5-016 - A04 . 129	SUMMA #3 Port 11
S5-016 - A05 . 133	SUMMA #4 Port 13
S5-016 - A06 . 134	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 /JA Edwards	03-10-95	0940	Neil Buechler /N Buechler	03-10-95	3-10-95
N Buechler / N Buechler	3-29-95	1345	JA Edwards /JA Edwards	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 / (Y)/N	
◊	COC info/signatures complete?	(Y)/N / (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 (JA)	POC (JA)	

(Revised 10/17/94 PNL)

Westinghouse Hanford Company	CHAIN OF CUSTODY	WHC 008111

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-S-111 Tank Vapor Sample SAF S5-016
(VSS Truck)

Collection date 03 - 21 - 95
Preparation date 03 - 08 - 95

Ice Chest No.

Field Logbook No. WHC-N-647-10

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

S5-016 - A29 . 27U	$NH_3/NO_x/H_2O$ (Sorbent Trap # 1)	Line # 9
S5-016 - A30 . 28U	$NH_3/NO_x/H_2O$ (Sorbent Trap # 2)	Line # 10
S5-016 - A31 . 29U	$NH_3/NO_x/H_2O$ (Sorbent Trap # 3)	Line # 8
S5-016 - A32 . 30U	$NH_3/NO_x/H_2O$ (Sorbent Trap # 4)	Line # 10
S5-016 - A33 . 31U	$NH_3/NO_x/H_2O$ (Sorbent Trap # 5)	Line # 9
S5-016 - A34 . 32U	$NH_3/NO_x/H_2O$ (Sorbent Trap # 6)	Line # 10
S5-016 - A35 . 33U	$NH_3/NO_x/H_2O$ (Trap Trip Blank # 1)	
S5-016 - A36 . 34U	$NH_3/NO_x/H_2O$ (Trap Trip Blank # 2)	
S5-016 - A37 . 35U	$NH_3/NO_x/H_2O$ (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	03-10-95	1315	J A Edwards	03-10-95	1315
J A Edwards	03-10-95	0940	Neil Buechler	03-10-95	0940
N Buechler	3-29-95	1345	JA Edwards	3-29-95	1345
2nd N Buechler					

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	
◊	Activity report from 222S?	/ (Y)/N	
◊	COC copy for LRB, RIDS filed?	/ (Y)/N	
◊	COC copy for sorbent follow-on?	/ (Y)/N/A	
		POC (GE) POC (GE)	

(Revised 10/17/94 PNL)

COC # 009095

Westinghouse Hanford Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 1

Data Turnaround: ☐ Priority ☒ Normal

Collector: I.B. UTECHT	Company Contact: R.D Mahon	Telephone No.: 373-2891
Project Designation: NA	Sampling Location: 241 S 111	SAF No.: S5016
Ice Chest No.: NA	Field Logbook No.: WHC-N-467-4	Method of Shipment: Govt Vehicle 929
Shipped To: 222 S Labs	Offsite Property No.: NA	Bill of Lading/Air Bill No.: NA
Possible Sample Hazards/Remarks: None	Preservative: NA	
	Type of Container: Silica Gel / HEPA filters	
	No. of Container(s): 5	
Special Handling and/or Storage: NA	Volume: 47 MM	

COPY

SAMPLE ANALYSIS

Sample No.	Matrix*	Date Sampled	Time Sampled	
S5016-OT1	Silica Gel	3-21-95		T-1856
S5016-OU1	HEPA	3-21-95		T-1857
S5016-OD1	HEPA	3-21-95		T-1858
S5016-OU2	HEPA	3-21-95		T-1859
S5016-OD2	HEPA	3-21-95		T-1860

CHAIN OF POSSESSION — Sign/Print Names

Relinquished By	Date/Time	Received By	Date/Time
W.P. Bueltel / W.P. Bueltel	3-22-95 1430	E.E. Dudley	3-22-95 1430

SPECIAL INSTRUCTIONS

Matrix*

S	=	Soil
SE	=	Sediment
SO	=	Solid
SL	=	Sludge
W	=	Water
O	=	Oil
A	=	Air
DS	=	Drum Solids
DL	=	Drum Liquids
T	=	Tissue
WI	=	Wipe
L	=	Liquid
V	=	Vegetation
X	=	Other

LABORATORY SECTION — Received By: ____ Title: ____ Date/Time: ____

FINAL SAMPLE DISPOSITION — Disposal Method: ____ Disposed By: ____ Date/Time: ____

DISTRIBUTION: Original - Sample Yellow - Sampler

BC-6000-828 (12/92)

C-6

WHC-SD-WM-RPT-143, Rev. 0