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2	1	Cog. Mgr. L.L. Lockrem	<i>[Signature]</i>	7/24/97							
2	1	QA Mike Barnes	<i>[Signature]</i>	7/24/97							
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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-C-201 USING the in Situ Vapor Sampling System

G.S. Caprio

SGN Eurisys Services Company, Richland, WA 99352

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Abstract: THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE JUNE 19, 1996 SAMPLING OF SST 241-C-201

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Using the In Situ Vapor Sampling System

Approved by: _____ Date _____
G. S. Caprio, Field Scientist
Vapor Sampling Project
Special Analytical Studies

Approved by: _____ Date _____
R. D. Mahon, Project Lead
Vapor Sampling Project
Special Analytical Studies

Approved by: _____ Date 7/17/97
L. L. Lookrem, Manager
Special Analytical Studies

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LIST OF TERMS

CGI	Combustible Gas Indicator
COC	Chain Of Custody
DOT	U.S. Department of Transportation
GEA	Gamma Energy Analysis
ISVS	In Situ Vapor Sampling System
NH ₃	Ammonia
H ₂ O	Water Vapor
OPC	Offsite Property Control
OVN	Organic Vapor Meter
PNNL	Pacific Northwest National Laboratory
SAS	Special Analytical Studies
SHA	Sample Head Assembly
SML	Sampling and Mobile Laboratories
SST	Single-Shell Tank
TCP	Tank Characterization Plan
TOC	Total Organic Carbon
TST	Triple Sorbent Trap
VT	Vapor Team, personnel from Sampling and Mobile Laboratories and Special Analytical Studies
WHC	Westinghouse Hanford Company
WSCF	Waste Sampling and Characterization Facility

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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-C-201 USING THE IN SITU VAPOR SAMPLING SYSTEM

1.0 SCOPE

The Vapor Issue Resolution Program tasked the Vapor Team (VT) to collect representative headspace samples from Hanford Site single-shell tank (SST) 241-C-201. This document presents In Situ Vapor Sampling System (ISVS) data resulting from the June 19, 1996 sampling of SST 241-C-201. Analytical results will be presented in separate reports issued by the Pacific Northwest National Laboratory (PNNL) which supplied and analyzed the sample media.

2.0 SAMPLING EQUIPMENT DESCRIPTION

2.1 IN SITU VAPOR SAMPLING SYSTEM

The VT, consisting of Sampling and Mobile Laboratories (SML) and Special Analytical Studies (SAS) personnel, used the ISVS to collect representative samples of the air, gases, and vapors from the headspace of SST 241-C-201 on June 19, 1996. WHC-SD-WM-SDD-068 Rev. 0, *System Design Description for the In Situ Vapor Sampling System* (Blanchard 1996a) describes, in detail the ISVS performance, its characteristics, and its operation.

In situ sampling is a method designed to collect vapor samples of the homogeneous headspace of waste tanks. Sample media, consisting of sorbent traps and radiological filters, are lowered into the tank headspace. Tank gases are drawn through the media by means of the ISVS manifold, which measure the volume of gas drawn through the system. The sample media are collected together in a sample head assembly (SHA). The SHA provides for twelve sorbent or triple sorbent trap (TST) samples (single sample each) to be sampled in sets of four, one SUMMA[®] sampling line, and one line for radiological filtration.

The SHA is protected from external contamination and breakage by a transparent plastic tube. The plastic tube is cut, formed, and connected to the SHA. The plastic tube also prevents any part of the SHA from accidentally falling into the tank.

A set of 1/4 or 5/16 inch diameter flexible tubes, approximately 50 feet long, are held together with spiral wrap to form a "tube bundle", which connects the ISVS to the SHA. The tube bundle and SHA are assembled prior to sampling and are referred to as the "sample assembly".

Sorbent traps are pencil-size stainless steel or glass tubes that contain vapor-adsorbing media. The sorbent traps may be used singly or may be prepared with several individual traps joined in series (a sorbent train). 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. In addition to the sorbent traps, SUMMA[®] canisters are also used to collect samples.

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 each use. The

evacuated canister is filled with sample vapor through a valve, which is then closed to seal the sample inside. SUMMA™ canisters 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 ISVS consists of five sample stations, (four for sorbent trap sampling and one for SUMMA™ sampling) terminating in 1/4 inch outside diameter stainless steel tubing. Each sorbent sample station is independently operable at the selected flow rate, from 50 to 500 standard cubic centimeters per minute (sccm).

The system is a portable sampling system. It is designed to allow setup and preparation to be performed outside of the tank farm, with a minimum number of steps to be performed inside the farm. It operates on 110V AC power. The ISVS was designed to meet the requirements of National Fire Protection Association 70 - 1993 (the National Electrical Code) for general industrial use. Before the ISVS can be used in any tank, procedures require a flammability check of the waste tank which shows that concentrations of flammable materials are well below lower flammability limits.

Tank gases passing through the ISVS will either pass through a sorbent trap and then a backup line dryer, or through the on-board activated charcoal/drierite cartridge. A check valve is installed in the system to prevent any possibility of siphoning materials into the waste tanks.

3.0 SAMPLING EVENT DESCRIPTION

3.1 SPECIFICATIONS

The Vapor Issue Resolution Program specifies sampling requirements in WHC-SD-WM-TP-335 Rev. 2A, *Vapor Sampling and Analysis Plan* (Homi 1996b). The Sampling and Analysis Plan 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. The VT retains these documents in the project file. The project specific number for this sampling event is S6-065.

3.2 OPERATIONS AND SAMPLING PERSONNEL

Steve Carter was the Tank Farm Operations person-in-charge. The VT members included:

- G. S. Caprio, Field Scientist
- R. D. Mahon, Lead Scientist
- C. S. McClellan, Sampling Technician.

The ISVS was set up at SST 241-C-201 on June 19, 1996 and was allowed to warm up for approximately 15 minutes. Sampling began at approximately 1220 on June 19, 1996, and was completed by 1510 the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to inserting the tube bundle into SST 241-C-201, an industrial hygiene technician field tested tank vapors. The technician purged the instrument with tank gas for 5 minutes and then field measured vapor stream contents

using a combustible gas indicator (CGI) and an organic vapor meter (OVM). The technician measured the tank vapors at the breather filter, three feet down the riser, and twenty-six feet down the riser. The measurements reported at the breather filter: LEL 0%, NH_3 0.0 ppm, O_2 20.9%, HCN 0%, and TOC 0.5 ppm. The measurements approximately three feet down were: LEL 0.0%, NH_3 0 ppm, O_2 20.9%, and TOC 0.5 ppm. The measurements approximately twenty-six feet down were: LEL 0.0%, NH_3 0 ppm, O_2 20.9%, and TOC 0.5 ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, June 19, 1996, was sunny and clear. Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 6 miles west of C-Farm, are provided in Appendix B.

3.5 SAMPLE COLLECTION

One analytical laboratory provided sample media. PNNL provided SUMMA[®] canisters, sorbent traps for organic vapors, ammonia (NH_3), NO_x , and water vapor (H_2O).

The VT began inserting the sample media into the SHA at 1615 on June 18, 1996, and finished at approximately 1845. The SHA was connected to tube bundle 14A. The top collar as described in ECN #632433 was used for this sampling event. The sample assembly was transported to 241-C-201 on June 19, 1996, and connected to ISVS #1 for the sampling event.

Prior to sample collection, a leak check of the ISVS sampling manifold and transfer tubing was performed. Pressure gauge readings were recorded at the beginning of the leak check. The gauge readings were used for the leak check calculations but for report purposes will be converted to absolute pressure. The system was evacuated to approximately 118.5 mbar (3.5 inHg) and leakage of ambient air into the system was observed by monitoring system pressure for 5 minutes. Leakage resulted in an increase of 0 mbar (0 inHg) in system pressure during the 5 minute test.

The tank flange was opened and the tube bundle was lowered 7.92 meters (26 feet). Tank vapor was drawn through each TST, sorbent, and SUMMA[®] line for a specified period of time. Appendix A indicates the exact times and volumes of tank gas that was drawn through each sample.

After the final sample was collected the sample assembly was removed from the tank. Plugs were placed between 1440 and 1500 hours in the c-flex inlets and c-flex clamps on the 1/4 inch Tygon tubing coming out of the Top Collar to isolate the samples from ambient conditions. Following the HPT survey the SHA was packaged as radiation material and transported back to a custody secure RMA at WSCF where it was disassembled the following day. The in-line filters were transported to 222-S for analysis.

The next several sampling events were scheduled in C-farm and therefore the ISVS was secured and left inside the farm.

3.6 RADIATION SCREENING

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 combined pCi/g of beta-gamma activity and alpha activity. Samples exceeding these DOT limits may be shipped as radioactive material if the samples do not exceed the following laboratory acceptance criteria:

PNNL: Beta-gamma activity <15 pCi/g of sample media.
Alpha activity <5 pCi/g of sample media.

The sample media was not filtered for radiological particulates. The idea of unfiltered samples was to provide better analytical data for the laboratories. The samples were released for shipment based on the analytical results of the series of two filters and tritium trap collected through one of the 1/4 inch flexible lines. Based on the radiological results for the filters and tritium trap it is believed that the same concentration of radiological contaminants passed through the other 13 lines. The filters were analyzed by 222-S Laboratory. Based on the analytical results provided in Table 1 the samples were shipped to PNNL and delivered to J. L. Julya. The VT scientists use the activity results in Table 1 to calculate pCi/g of sample media. The VT maintains this information in the project-specific file.

Table 1. Radionuclide Analysis Results.

Filter	Sample Identifier	Activity Results ^a (pCi/sample)	Activity ^b (pCi/L of tank gas)
Upstream filter	S6065-A21.OU1	Total Alpha = <.346 Total Beta = <2.13 GEA = <detectable	= <.346 = < 2.13 = <detectable
Downstream filter	S6065-A22.OD1	Total Alpha = <.346 Total Beta = <1.27 GEA = <detectable	= <.346 = <1.27 = <detectable
Tritium Trap	S6065-A03.OT1	Total Activity = <3.29	= <detectable

NOTES:

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

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

^bNumbers based on 1 liter for the total volume of tank vapor through the filters.

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

All sorbent trains, TSTs, and SUMMA[™] canisters received from PNNL are kept in a custody locked storage area maintained by SML. Sorbent trains and TSTs were maintained at 4 ± 2 °C in a refrigeration unit. SUMMA[™] canisters were stored in the same locked storage area, but were not refrigerated. The sample media was picked up from PNNL by SAS and transported in a government vehicle to a custody locked storage area. Appendix C lists the sample identifiers, sample types, and COC form numbers for the sampling event.

From the time that samples are received by SAS until they are shipped back to the analytical laboratory, all COCs are maintained by SAS in accordance with WHC-IP-1127-1.3, *Chain-of-Custody/Special Analysis Request for RCRA and CERCLA Protocol Samples* (WHC 1995a).

5.0 QUALITY ASSURANCE AND CONTROLS

5.1 CLEANLINESS OF SYSTEM

Immediately prior to sampling of SST 241-C-201, the ISVS manifold was purged with ambient air for 5 minutes at 1 L/min. After this purge an ambient air SUMMA sample was drawn through the ISVS manifold and the 1/4 inch SUMMA sampling line. A second ambient air SUMMA sample was collected 10 meters upwind from the tank breather filter. The ambient air samples were then collected to confirm by laboratory analysis that the ISVS sampling manifold was free of trace organic contaminants (or to determine which contaminants were present and at what concentration). For further details, refer to WHC-IP-1127-4.8 (WHC 1995b) and the project-specific file located with the VT.

5.2 INSTRUMENT CALIBRATION

The ISVS uses mass flow meters to measure the flow rate and totalizers to measure the total volume of sample vapor drawn through the sample media. Errors associated with the mass flow meters and totalizers were determined by the Westinghouse Hanford Company (WHC) Standards Laboratory before the SST 241-C-201 sampling event. Duration of flow are specified by the analytical laboratories that supply and analyze the sorbent traps.

Due to calibration discrepancies, the mass flow measurements for this sampling event may have an error of 6% to 14%. A detailed description of this discrepancy can be found in internal memo 75820-96-028.

Table 2. Calibration Data.

Element	Calibration Date	Expiration Date	WHC Standards Laboratory Code
Rotameter AALBORG 102-05	8/8/95	8/8/96	518-28-13-001
Digital Thermometer HH22	1/11/96	1/11/97	518-79-06-003
Vacuum Gauge ASHCROFT	8/7/95	8/7/96	518-31-05-003
Headspace Thermocouple	5/31/96	5/31/97	518-78-02-010
Mass Flowmeters Sierra 822-13-OV1 FM-1/FT-1	8/8/95	8/8/96	518-28-03-015
Mass Flowmeters Sierra 822-13-OV1 FM-2/FT-2	8/8/95	8/8/96	518-28-03-016
Mass Flowmeters Sierra 822-13-OV1 FM-3/FT-3	8/8/95	8/8/96	518-28-03-017
Mass Flowmeters Sierra 822-13-OV1 FM-4/FT-4	8/8/95	8/8/96	518-28-03-018

Instruments located in the ISVS are calibrated on an annual basis at the WHC Standards Laboratory. ISVS instrumentation calibration data, maintained in files by the VT, are summarized in Table 2. According to the calibration schedule shown in Table 2, all instrumentation was within its calibration period during the SST 241-C-201 sampling event.

The totalizers were calibrated in conjunction with the mass flow meters and the calibration data is summarized in Table 3.

Table 3. Totalizer Calibration Data.

Number	Calibration Date	Expiration Date	Flow Rate (stdcm ³ /min)	Time (min)	Calc. Total	UUT	Deviation
3494-1 FT-1	8/8/95	8/8/96	247.1	5.833	1441.2	1500	3.9%
3494-2 FT-2	8/8/95	8/8/96	253.8	7.065	1793.1	1800	0.4%
3494-3 FT-3	8/8/95	8/8/96	262.7	5.081	1334.7	1300	2.6%
3494-4 FT-4	8/8/95	8/8/96	25.2	5.186	1302.8	1300	0.2%

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, but no tank vapors are drawn through them.

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 ISVS immediately prior to sampling operations.

6.0 ANOMALIES

The VT used the Sampling and Analysis Plan and WHC-IP-1127-4.8, *Vapor Sampling of Waste Tanks Using In Situ Vapor Sampling System (ISVS)*, (1995b) to guide the sample collection. Anomalies noted during the sample collection are briefly described below.

This was the first job to use the "Top Hat" adapter, which converts a 12 inch riser to 4 inch PVC pipe to allow easier insertion of the Sample Assembly. No problems were encountered with the use of the "Top Hat".

Prior to the start of sorbent sampling, it was discovered that some of the sample lines were missing labels. The labels had most likely fallen off due to the heat and moving the tube bundle around. The result is that lines 4, 5, 7, and 8 could not be identified. Non-labeled sample lines were

4	NH3/NOx/H2O	2,000 scc
5	NH3/NOx/H2O	2,000 scc
7	TST	200 scc
8	TST	200 scc

The labeled NH3 and TST lines were samples as indicated in the SAP. This provided two NH3 and two TST samples at the desired volume. All four non-labeled lines were samples at a flow rate of 220 sccm for a total of 1,000 scc. The actual volumes ranged from 1000 scc to 1002 scc. This was five times the volume desired in the TST and half the volume desired in the NH3 sorbents, but still allows for the chemists to calculate headspace concentrations.

These anomalies were also noted on the sample log sheets in Appendix A.

7.0 REFERENCES

- 49 CFR 100-177, 1992, "Transportation," *Code of Federal Regulations*, as amended.
- Blanchard, R. J., 1996a, *System Design Description for the In Situ Vapor Sampling System*, WHC-SD-WM-SDD-068 Rev. 0, Westinghouse Hanford Company, Richland, Washington.
- Homi, C. S., 1996b, *Vapor Sampling and Analysis Plan*, WHC-SD-WM-TP-335 Rev. 2A, Westinghouse Hanford Company, Richland, Washington.
- Trible, T. C., Viswanath, R. S., 1996c, *Recommendation concerning the ISVS/VSS comparison study data with respect to calibration errors in Mass flow monitors and controllers*, (internal memo 75820-96-028 to L.D. Pennington, August 28), Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995a, *Chain-of-Custody/Special Analysis Request for RCRA and CERCLA Protocol Samples*, Procedure WHC-IP-1127-1.3, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1995b, *Vapor Sampling of Waste Tanks Using In Situ Vapor Sampling System (ISVS)*, Procedure WHC-IP-1127-4.8, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A
SAMPLE LOG SHEETS

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ISVS Sampling of C-201

Set up ISVS (Section 8.1)

Ensure particulate filters are installed

LEAK CHECK (APPENDIX I) Leak Rate:

Tank Temperature 15.2 C

Date: 19-Jun-96

ISVS Personnel: Mahon, McClellan

0 inch Hg in 5 min

Trailer Personnel: Caprio

WHC Sample ID	PNL Sample ID	Probe Sample Cart Port	Description	Desired Flow Rate SCCM	Desired Duration (min.)	Desired Total Flow Rate SCCM	Actual Start Time	Actual End Time	Actual Total Time (min.)	Actual Total Flow SCC
Purge SUMMA line of sample line with ambient air										
S6065 A01 102	102	NA	NA	1000	5	5000	1221	1226	5	
Upwind SUMMA #1					1		1225	1226	1	
S6065 A02 318	318	S	SUMMA	1000	5	5000	1226	1227	1	
Ambient #2					1		1226	1227	1	

Uncap and insert sample bundle into tank

Connect bundle lines: 1 1

S6065 A21 0U1	0U1	1	1	UPSTREAM FILTER	200	5	1000	1248	NA	999
A22 0D1	0D1			DOWNSTRM FILTER						
A03 0T1	0T1			TRITIUM						

Connect bundle lines:

S	SUMMA
2	1
3	2
4	3
5	4

Purge Suma line /w tank	S	SUMMA	SUMMA purge	1000	5	5000	1256	1301	5	5000
S6065 A04 319	319	S	SUMMA	Summa #3	1		1301	1302	1	6000
S6065 A05 321	321	S	SUMMA	Summa #4	1		1308	1309	1	6000
S6065 A06 322	322	S	SUMMA	Summa #5	1		1330	1331	1	6000
S6065 A07 10R	10R	2	1	NH3/NOx/H2O	10	2000	1335	NA	NA	2003

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ISVS Sampling of C-201

WHC Sample ID	PNNL Sample ID	Probe Sample Line	Cart Port	Description	Desired		Desired		Actual		Actual		Actual	
					Flow Rate	Duration (min.)	Flow Rate	Total Flow	Flow Rate	Start Time	End Time	Total Time (min.)	Flow	Total
					SCM		SCM	SCC	SCCM				SCC	
S0605 A08 11R	11R	3	2	NH3/NOx/H2O	200	10	200	2000	214	13:35:30	NA	NA	2001	NA
S0605 A09 12R	12R	4	3	NH3/NOx/H2O	200	10	200	2000	NA	0	NA	NA	NA	NA
S0605 A10 13R	13R	5	4	NH3/NOx/H2O	200	10	200	2000	NA	0	NA	NA	NA	NA

Connect bundle lines:

6	1
7	2
8	3
9	4

S0605 A11 1058	1058	6	1	PNNL TST #1	200	1	200	259	1402	NA	NA	NA	193	
S0605 A12 1059	1059	7	2	PNNL TST #2	200	1	200	NA	NA	NA	NA	NA	NA	
S0605 A13 1060	1060	8	3	PNNL TST #3	200	1	200	NA	NA	NA	NA	NA	NA	
S0605 A14 1061	1061	9	4	PNNL TST #4	200	1	200	270	1402	NA	NA	NA	200	

RUN 4 Mystery sorbents / TSTs. C-Flex clamp marked with "?" See Anomalies comments below.

Connect bundle lines:

?	1
?	2
?	3
?	4

S0605 A09 12R	12R	?	1	NH3/NOx/H2O	200	5	1000	209	14:13	NA	NA	1000 + 2 / -0		
S0605 A10 13R	13R	?	2	NH3/NOx/H2O	200	5	1000	211	14:13:30	NA	NA	1000 + 2 / -0		
S0605 A12 1059	1059	?	3	PNNL TST #2	200	5	1000	197	14:14	NA	NA	1000 + 2 / -0		
S0605 A13 1060	1060	?	4	PNNL TST #3	200	5	1000	199	14:14:30	NA	NA	1000 + 2 / -0		

Remove sample bundle from tank and cap

~ 1430

Dismantle sample bundle

S0605 A21 0U1 S06WV0080 1 1 Bundle line 1 Upstream filter

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ISVS Sampling of C-201

WHC Sample ID	PNNL Sample ID	Probe		Description	Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual
		Sample	Cart		Flow	Duration	Total	Flow	Start	End	Total	Total
		Line	Port		Rate	(min.)	Flow	Rate	Time	Time	Time	Flow
					SCCM		SCC	SCCM			(min.)	SCC
S6065 A22 0D1	S96WV0081	1	1	Bundle line 1 Downstream filter								
S6065 A03 0T1	S96WV0082	1	1	Bundle line 1 tritium trap								
S6065 A15 14R	14R	10	NA	Bundle store NH3/NOx/H2O FIELD BLANK #1								
S6065 A16 15R	15R	11	NA	Bundle store NH3/NOx/H2O FIELD BLANK #2								
S6065 A17 1063	PNNL #1063	12	NA	Bundle store PNNL TST FIELD BLANK #1								
S6065 A18 1064	PNNL #1064	13	NA	Bundle store PNNL TST FIELD BLANK #2								
S6065 A19 1065	PNNL #1065	NA	NA	Bundle store PNNL TST TRIP BLANK #1								
S6065 A20 1066	PNNL #1066	NA	NA	Bundle store PNNL TST TRIP BLANK #2								

Remove filters from cart manifold ports 1, 2, 3, 4, and SUMMA to release cart.

BUNDLE TOTAL TANK GAS USED DURING SAMPLING RUNS (Liters) 28.40

Note: SCCM for the ISVS is reported at 760 torr, 21 C

ANOMALIES

S6065-A09.12R ~ 1310 It was observed that some of the labels had fallen off of the Tygon lines. By process of elimination, it was determined that the labels had fallen off of Lines 4, 5, 7 and 8. Because there was no way to determine which line went to which sample, the four unlabeled lines were ran as a set at 200 sccm for a total volume of 1,000 scc -0/+ 2 scc. New checksheets were added labeled "Mystery Lines". The logic was to split the difference between the 2,000 scc for NH3 traps and the 200 scc for TSTs.

A-5

HNF-SD-WM-RPT-248, Rev. 0

Note: #VALUE! = <Detectable

S6065-A21.0U1 / S96WV0080

PARALLEL UPSTREAM FILTER

TOTAL VOLUME

ALPHA

BETA

GEA - Co-60
Cs-134
Cs-137
Eu-152
Eu-154
Eu-155

Liters
1.00

pCi / filter

pCi / liter

< 0.346 #VALUE!
< 2.13 #VALUE!
< 11.6 < Detectable
< 9.805 < Detectable
< 25.98 < Detectable
< 55.29 < Detectable
< 31.4 < Detectable
< 30.16 < Detectable

S6065-A22.0D1 / S96WV0081

PARALLEL DOWNSTREAM FILTER

TOTAL VOLUME

ALPHA

BETA

GEA - Co-60
Cs-134
Cs-137
Eu-152
Eu-154
Eu-155

Liters
1.00

pCi / filter

pCi / liter

< 0.346 #VALUE!
< 1.27 #VALUE!
< 9.333 < Detectable
< 8.522 < Detectable
< 24.99 < Detectable
< 30.93 < Detectable
< 27.61 < Detectable
< 29.6 < Detectable

S6065-A03.0T1 / S96WV0082

TRITIUM TRAP

TOTAL VOLUME

TOTAL ACTIVITY

Liters
1

pCi / filter

pCi / liter

< 3.29 #VALUE!

SAMPLE EXPOSURE ANALYSIS, USING TOTAL OF BOTH UPSTREAM AND DOWNSTREAM FILTER ANALYSIS AS POSSIBLE EXPOSURE LEVEL

= BETA and ALPHA Less than DOT shipping limits

Total Alpha (pCi / liter) =

#VALUE!

Total Beta (pCi / liter) =

#VALUE!

Total GEA Cs-137 (pCi / liter) =

#VALUE!

SORBENT SAMPLING Used 5 g for sorbent mass

TOTAL VOLUME PER SAMPLE

2.00 Liters

Tritium per SAMPLE

NH3 (5 gram)

#VALUE! pCi per gram

H2O (5 gram)

#VALUE! pCi per gram

ALPHA per SAMPLE

NH3 (5 gram)

#VALUE! pCi per gram

H2O (5 gram)

#VALUE! pCi per gram

BETA per SAMPLE

NH3 (5 gram)

#VALUE! pCi per gram

H2O (5 gram)

#VALUE! pCi per gram

GEA per SAMPLE Cs-137

NH3 (5 gram)

#VALUE! pCi per gram

H2O (5 gram)

#VALUE! pCi per gram

TST SAMPLING Used 4.5 g for TST mass

TOTAL VOLUME PER SAMPLE

1.00 Liter

Tritium per Sample

TST (4.5 gram)

#VALUE! pCi per gram

ALPHA per Sample

TST (4.5 gram)

#VALUE! pCi per gram

BETA per Sample

TST (4.5 gram)

#VALUE! pCi per gram

GEA per Sample Cs-137

TST (4.5 gram)

#VALUE! pCi per gram

SUMMA SAMPLING

TOTAL VOLUME PER CANISTER

6 Liters (air at 300K, 1 bar = 1.161 g/L)

Tritium PER SAMPLE

#VALUE! pCi per gram

ALPHA PER SAMPLE

#VALUE! pCi per gram

BETA PER SAMPLE

#VALUE! pCi per gram

GEA PER SAMPLE Cs-137

#VALUE! pCi per gram

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APPENDIX B
AMBIENT CONDITIONS

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WEATHER DURING ISVS SAMPLING OF 241-C-201

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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100241
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Custody Form Initiator J. A. Edwards - PNNL

Telephone (509) 373-0141
Page 85-3009 / FAX 376-2329

Company Contact R. D. Mahon - WHC

Telephone (509) 373-2891
Page 85-3656 / FAX 373-3793Project Designation/Sampling Locations 200 West Tank Farm
241-C-201 Tank Vapor Sample SAF S6065
(ISVS Cart)Collection date 06-19-96
Preparation date 06-17-96

Ice Chest No.

Field Logbook No. WHC-N-647-8

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6065 - A01 . 102	Collect Ambient Air Sample SUMMA #1
S6065 - A02 . 318	Collect Ambient Air Sample SUMMA #2 (through tube bundle)
S6065 - A04 . 319	Collect SUMMA #3
S6065 - A05 . 321	Collect SUMMA #4
S6065 - A06 . 322	Collect SUMMA #5

() Field Transfer of Custody		(X) Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
J A Edwards <i>J A Edwards</i>	06-17-96	1400	Rm Arnold <i>Rm Arnold</i>	06-17-96	1400
Rm Arnold <i>Rm Arnold</i>	06-17-96	1500	RD Mahon <i>RD Mahon</i>	06-17-96	1500
RD Mahon <i>RD Mahon</i>	06-24-96	1140	GS CAPREO <i>GS CAPREO</i>	06-24-96	1140
GS CAPREO <i>GS CAPREO</i>	6-24-96	1322	JL Tulpe <i>JL Tulpe</i>	6-24-96	1322

Final Sample Disposition

Comments:

PNNL (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 2225?	☒ Y / ☐ N	
RSR/release? (a ≤100/B ≤400 pCi/g)	☒ Y / ☐ N	
COC copy for LRB, RIDS filed?	☒ Y / ☐ N	

(WHC-SD-WM-TP-335, REV. 2, Table 2b)

POC

(Revised 05/30/96 PNNL)

Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100243
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Custody Form Initiator J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-2329

Company Contact R. D. Mahon - WHC

Telephone (509) 373-7437

Page 85-9656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm

241-C-201 Tank Vapor Sample SAF S6065

(ISVS Cart)

Collection date 06 - 19 - 96

Preparation date 06 - 17 - 96

Ice Chest No.

Field Logbook No. WHC-N-647.8

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6065 - A07 . 10R

Collect NH₃/NO_x/H₂O Sorbent Trap

S6065 - A08 . 11R

Collect NH₃/NO_x/H₂O Sorbent Trap

S6065 - A09 . 12R

Collect NH₃/NO_x/H₂O Sorbent Trap

S6065 - A10 . 13R

Collect NH₃/NO_x/H₂O Sorbent Trap

S6065 - A15 . 14R

Open, close and store NH₃/NO_x/H₂O field blank #1

S6065 - A16 . 15R

Open, close and store NH₃/NO_x/H₂O field blank #2

Field Transfer of Custody			Chain of Possession		(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time		
GW Dennis <i>GW Dennis</i>	06-17-96	0915	J A Edwards <i>J A Edwards</i>	06-17-96	0915		
J A Edwards <i>J A Edwards</i>	06-18-96	1041	CS Camilo <i>CS Camilo</i>	06-18-96	1041		
CS Camilo <i>CS Camilo</i>	06-24-96	1322	FL Julia <i>FL Julia</i>	06-24-96	1322		

Final Sample Disposition

Comments:

- PNNL (only) Checklist
- ☐ Media labeled and checked?
 - ☐ Letter of instruction?
 - ☐ Media in good condition?
 - ☐ COC info/signatures complete?
 - ☐ Rad release stickers on samples?
 - ☐ Activity report from 222S?
 - ☐ RSR/release? (a ≤100/B ≤400 pCi/g)
 - ☐ COC copy for LRB, RIDS filed?

Pick-up / Delivery

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

Comments:

1310hrs 19JUN96. The labels had fallen off of
 Rids 4, 5, 7, 8. The four mystery lines were ran at
 200sec for a total volume of 1,000 sec + 2/-0 sec.
 This affects samples S6065-A09, 12R and
 S6065-A10, 13R by decreasing volume to
 1,000 sec + 2/-0 sec. RDM 24JUN96

POC (15)

POC _____

(WHC-SD-WM-TP-335, REV. 2, Table 2b)
 A-6000-407 (12/92) WEF061

1 of 1

(Revised 05/30/96 PNNL)

Battelle Pacific
Northwest Laboratory

CHAIN OF CUSTODY

WHC 100242

Custody Form Initiator

J. A. Edwards - PNL

Telephone (509) 373-0141
Page 85-3009 / P8-08 / FAX 376-0418

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-7437
Page 85-9656 / S3-27 / FAX 373-7076Project Designation/Sampling Locations 200 West Tank Farm
241-C-201 Tank Vapor Sample SAF S6065
(ISVS Cart)Collection date 06 - 19 - 96
Preparation date 06 - 17 - 96

Ice Chest No.

Field Logbook No. WHC- N-6478

Ertco Hi/Lo thermometer No.

PNL-T-00 6

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

WHC

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6065 - A11 . 1058 ✓ PNL Triple Sorbent Trap (TST) Sample # 1
 S6065 - A12 . 1059 ✓ PNL TST Sample # 2
 S6065 - A13 . 1060 ✓ PNL TST Sample # 3
 S6065 - A14 . 1061 ✓ PNL TST Sample # 4

 S6065 - A17 . 1063 ✓ Open, close & store TST Field Blank # 1
 S6065 - A18 . 1064 ✓ Open, close & store TST Field Blank # 2

 S6065 - A19 . 1065 ✓ Store TST Trip Blank #1
 S6065 - A20 . 1066 ✓ Store TST Trip Blank #2

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
JL Julia	06-17-96	1255	JA Edwards	06-17-96	1255
JA Edwards	06-17-96	1400	RM Arnold	06-17-96	1400
RM Arnold	06-17-96	1500	RD Mahon	06-17-96	1500
RD Mahon	06-24-96	1140	GS CAPRIO	06-24-96	1140
GS CAPRIO	06-24-96	1320	JA Edwards	06-24-96	1320

Final Sample Disposition

Comments:

- PNL (only) Checklist
- 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? (<5°C) ☒ Y/N
 - Hi/Lo thermometer - Keep upright! ☒ Y/N
 - Hi/Lo thermometer ☐ Y/N
 - Rad release stickers on samples? ☐ Y/N
 - Activity report from 2225? ☐ Y/N
 - COC copy for LRB, RIDS filed? ☒ Y/N

POC

POC

Comments: 1310 hrs 14 JUN 96. The labels had fallen off of lines 4, 5, 7, 8. The four mystery lines were run at 2000cc for a total volume of 1,000 sec + 2/-0 sec. This affects samples S6065-A12, 1059 and S6065-A13, 1060 by 1,000 sec.

Cooler Temperature Status

IHi -23 °C / Lo -23 °C (pick up at PNL to WHC) increasing
 IHi 7 °C / Lo -23 °C (delivery at WHC from PNL) 1 volume to
 IHi 9 °C / Lo -23 °C (at return to PNL from WHC) 1,000 sec
 IHi 10 °C / Lo -23 °C (at delivery from WHC to PNL) 1,000 sec

24 JUN 96 RDM
 (Revised 06/21/95 PNL)

DISTRIBUTION SHEET

To Distribution	From Special Analytical Support, Numatec Hanford	Page 1 of 1 Date 8/7/97
Project Title/Work Order VAPOR AND GAS SAMPLING USING THE IN SITU VAPOR SAMPLING SYSTEM		EDT No. <u>621267</u> ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
<u>Lockheed Martin Hanford Company</u>					
L. L. Buckley	R2-12	X			
<u>Lockheed Martin Services, Inc.</u>					
Central Files	A3-88	X			
<u>SGN Eurisys Services Corporation</u>					
E. S. Mast	S3-90	X			
<u>PNNL</u>					
J. L. Huckaby	K6-80	X			