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VAPOR AND GAS SAMPLING OF SINGLE-SHELL TANK 241-U-104 USING the in Situ Vapor Sampling System

G.S. Caprio

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Abstract: THIS DOCUMENT PRESENTS SAMPLING DATA RESULTING FROM THE JULY 16, 1996 SAMPLING OF SST 241-U-104

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Kara J. Brin
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Document title: Vapor and Gas Sampling of Single-Shell Tank 241-U-104
Using the In Situ Vapor Sampling System

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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
OVM	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-U-104 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-U-104. This document presents In Situ Vapor Sampling System (ISVS) data resulting from the July 16, 1996 sampling of SST 241-U-104. 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-U-104 on July 16, 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 (scm).

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* (Buckley 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 S6-072.

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-U-104 on July 16, 1996 and was allowed to warm up for approximately 15 minutes. Sampling began at approximately 1127 on July 16, 1996, and was completed by 1350 the same day.

3.3 INDUSTRIAL HYGIENE FIELD RESULTS

Prior to inserting the tube bundle into SST 241-U-104, 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 four feet down the riser. The measurements reported at the breather filter: LEL 0%, NH_3 0 ppm, O_2 21.0%, and TOC 0 ppm. The measurements approximately three feet down were: LEL 0%, NH_3 0 ppm, O_2 21.0%, and TOC 0 ppm. The measurements approximately twenty four feet down were: LEL 0%, NH_3 0 ppm, O_2 21 %, and TOC 0 ppm.

3.4 AMBIENT CONDITIONS

The weather the day of the sampling event, July 9, 1996, was sunny and clear with winds approxiametely 5 mph from the northwest . Graphs of ambient temperatures and pressures taken at the Hanford Meteorological Station, which is about 2 miles north east of U-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 1100 on July 15, 1996, and finished at approximately 1200. The SHA was connected to tube bundle 14E. The top collar as described in ECN #632433 was used for this sampling event. The sample assembly was transported to 241-U-104 on July 16, 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 135.46 mbar (4 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 7.3 meters (24 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. Following the HPT survey the SHA was transported to WSCF and stored in a cusody secure RMA, then disassembled in a hood the following day. Plugs were placed 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. After disassembly, the in-line filters were transported to 222-S for analysis.

The ISVS was left in U Farm until it could be surveyed by an HPT and transported to B Farm for the next sampling event.

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.

On July 17, 1996, the particulate filters and silica gel were delivered to 222-S Laboratory. 222-S Laboratory performed analysis on the filters on July 18, 1996, and transmitted the results to the VT. The VT scientists reviewed the data and determined that the results did not allow the VT to ship the sample media to PNNL. On July 23, 1996, another analysis was requested to observe any decay. The analytical results of the second analysis showed very little decay and were still too high to ship. A third analysis was requested on July 28, 1996. The third analysis showed little change from the second. On July 31, 1996, the Vapor Sampling Program Office was notified of the elevated analytical results and the VT requested guidance.

On August 2, 1996, PNNL requested that the NH3 and H2O tubes from sample S6072-A07.34R be sacrificed for radiological analysis by WSCF. They requested that the sorbent tube be crushed and the remnants be analyzed for total alpha, total beta, and GEA. PNNL also requested that they review the analytical results from the analysis and determine if they are acceptable to deliver as non-radioactive.

On August 7, 1996, the Vapor Program office gave authorization to have WSCF analyze the sacrificial sorbent tube. Details were worked out between August 7, 1996 and October 3, 1996, on how the analysis would be performed and if the laboratory had the capability to perform the analysis.

On October 8, 1996, the sorbent tube S6072-A07.34R was submitted to WSCF, crushed, and analyzed for total alpha, total beta, and GEA. The analytical results of the analysis were reported to the VT on October 10, 1996. The results were transmitted to PNNL for their scientific review on October 18, 1996. On October 29, 1996, PNNL requested that the sorbent tubes be returned to them as non-radioactive samples. The samples were returned to PNNL on October 29, 1996, and delivered to J.A. Edwards. The analytical data used to release the sorbent tubes is provided in Table 1.

Table 1. Radionuclide Analysis Results for Sorbents.

Filter	Sample Identifier	Activity Results ^a (pCi/sample)	Activity ^b (pCi/L of tank gas)
N/A	S6071-A07.34R	Total Alpha = <detectable Total Beta = <detectable GEA = <detectable	= <detectable = < detectable = <detectable
N/A	S6071-A07.34R 34RE	Total Activity = <3.78	= < 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 2 liters for the total volume of tank vapor through the sorbent tube.

The TST samples did not require further radiological analysis. Based on the analytical results provided in Table 2 the TSTs were shipped to PNNL and delivered to Jeff Edwards on October 8, 1996.

Table 2. Radionuclide Analysis Results for TSTs.

Filter	Sample Identifier	Activity Results ^a (pCi/sample)	Activity ^b (pCi/L of tank gas)
Upstream Filter	S6071-A21.OU1	Total Alpha = <0.187 Total Beta = 40.7 GEA = 46.2 (¹³⁷ Cs)	= <detectable = 40.7 = 46.2
Downstream Filter	S6071-A22.OD1	Total Alpha = 0.27 Total Beta = 34.7 GEA = 45.4 (¹³⁷ Cs)	= 0.27 = 34.7 = 45.40
Tritium Trap	S6071-A03.OT1	Total Activity = 7.42	= 7.42

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-U-104, 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-U-104 sampling event. Duration of flow are specified by the analytical laboratories that supply and analyze the sorbent traps.

Table 3. 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 3. According to the calibration

schedule shown in Table 2, all instrumentation was within its calibration period during the SST 241-U-104 sampling event.

"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".

The totalizers were calibrated in conjunction with the mass flow meters and the calibration data is summarized in Table 4.

Table 4. 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. There were no reportable anomalies noted during the sampling of 241-U-104.

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.
- Buckley, L. L., 1996b, *Vapor Sampling and Analysis Plan*, WHC-SD-WM-TP-335 Rev. 2A, Westinghouse Hanford Company, Richland, Washington.
- Tribble, 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 U-104

Set up ISVS (Section 8.1)

Date: 7/16/96

Ensure particulate filters are installed

ISVS Personnel: Glenn Caprio, Rick Mahon, McClellan

LEAK CHECK (APPENDIX I) Leak Rate: 0 inch Hg in 5 min

Tank Temperature 18.7 C

Trailer Personnel: None

Ambient Temp. 32.0 C

WHC Sample ID	PNNL Sample ID	Probe Sample Line	Cart Port	Description	Desired Flow Rate SCCM	Desired Duration (min.)	Desired Total Flow SCC	Actual 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					1000	5	5000	1000	1137	1142	5	
S6072 A01. 013	013	NA	NA	Upwind SUMMA #1		1			1135	1136	1	
S6072 A02. 029	029	S	SUMMA	Ambient #2		1			1143	1144	1	

Uncap and insert sample bundle into tank

Connect bundle lines:

1 1

S6072 A21. 0U1	0U1	1	1	UPSTREAM FILTER	200	5	1000	213	1155	NA	NA	1000
A22 0D1	0D1			DOWNSTRM FILTER								
A03 0T1	0T1			TRITIUM								

Connect bundle lines:

S SUMMA

2 1

3 2

4 3

5 4

Purge Summa line /w tank	S	SUMMA	SUMMA purge	1000	5	5000	1000	1207	1212	5	5000
S6072 A04. 050	050	S	SUMMA	Summa #3		1		1212	1213	1	6000
S6072 A05. 055	055	S	SUMMA	Summa #4		1		1220	1221	1	6000

ISVS Sampling of U-104

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
S6072 A06.099	099	S	SUMMA	Summa #5		1			1227	1228	1	6000
S6072 A07.34R	34R	2	1	NH3/NOx/H2O	200	10	2000	213	1234	NA	NA	2000
S6072 A08.35R	35R	3	2	NH3/NOx/H2O	200	10	2000	208	1234	NA	NA	2002
S6072 A09.36R	36R	4	3	NH3/NOx/H2O	200	10	2000	206	1235	NA	NA	2000
S6072 A10.37R	37R	5	4	NH3/NOx/H2O	200	10	2000	200	1235	NA	NA	2000

Connect bundle lines:

6	1
7	2
8	3
9	4

S6072 A11.1098	1098	6	1	PNNL TST #1	200	1	200	247	1301	NA	NA	202
S6072 A12.1099	1099	7	2	PNNL TST #2	200	1	200	224	1301	NA	NA	202
S6072 A13.1100	1100	8	3	PNNL TST #3	200	1	200	267	1301	NA	NA	204
S6072 A14.1101	1101	9	4	PNNL TST #4	200	1	200	258	1301	NA	NA	203

Remove sample bundle from tank and cap

1345 1351

Dismantle sample bundle

S6072 A21.0U1	S96WV0095C	1	1	Bundle line 1 Upstream filter
S6072 A22.0D1	S96WV0096C	1	1	Bundle line 1 Downstream filter
S6072 A03.0T1	S96WV0097	1	1	Bundle line 1 tritium trap
S6072 A15.38R	38R	10	NA	Bundle store NH3/NOx/H2O FIELD BLANK #1
S6072 A16.39R	39R	11	NA	Bundle store NH3/NOx/H2O FIELD BLANK #2
S6072 A17.1102	PNNL #1102	12	NA	Bundle store PNNL TST FIELD BLANK #1
S6072 A18.1103	PNNL #1103	13	NA	Bundle store PNNL TST FIELD BLANK #2
S6072 A19.1104	PNNL #1104	NA	NA	Bundle store PNNL TST TRIP BLANK #1
S6072 A20.1105	PNNL #1105	NA	NA	Bundle store PNNL TST TRIP BLANK #2

ISVS Sampling of U-104

WHC Sample ID	PNNL Sample ID	Probe		Description	Desired	Desired	Desired	Actual	Actual	Actual	Actual	Actual	
		Sample Line	Cart Port		Flow	Duration	Total	Flow	Start	End	Total	Total	
					Rate	(min.)	Flow	Rate	Time	Time	Time	Flow	
					SCCM		SCC	SCCM			(min.)	SCC	

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

BUNDLE TOTAL TANK GAS USED DURING SAMPLING RUNS (Liters) 32.81

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

Note: #VALUE! = <Detectable

S6072-A21.OU1 / S96WV0095C

PARALLEL UPSTREAM FILTER

TOTAL VOLUME

ALPHA

BETA

GEA -

Cs-60

Cs-134

Cs-137

Eu-152

Eu-154

Eu-155

Liters

pCi / filter

pCi / liter

1.00

< 0.167

#VALUE!

40.70

40.70

< 12.08

< 12.08

< 9.757

< 9.757

4.62E+01

46.20

< 50.24

< 50.24

< 22.48

< 22.48

< 30.35

< 30.35

S6072-A22.OD1 / S96WV0096C

PARALLEL DOWNSTREAM FILTER

TOTAL VOLUME

ALPHA

BETA

GEA -

Cs-60

Cs-134

Cs-137

Eu-152

Eu-154

Eu-155

Liters

pCi / filter

pCi / liter

1.00

0.27

0.27

34.70

34.70

< 12.64

< 12.64

< 9.919

< 9.919

45.40

45.40

< 50.24

< 50.24

< 31.29

< 31.29

< 32.19

< 32.19

S6072-A03.OT1 / S96WV00957

TRITIUM TRAP

TOTAL VOLUME

TOTAL ACTIVITY

Liters

pCi / filter

pCi / liter

1.00

7.42

7.42

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) = 0.27

Total Beta (pCi / liter) = 75.40

Total GEA Cs-137 (pCi / liter) = 91.60

SORBENT SAMPLING Used 5 g for sorbent mass

TOTAL VOLUME PER SAMPLE

Tritium per SAMPLE

NH3 (5 gram)

H2O (5 gram)

ALPHA per SAMPLE

NH3 (5 gram)

H2O (5 gram)

BETA per SAMPLE

NH3 (5 gram)

H2O (5 gram)

GEA per SAMPLE (Cs 137)

NH3 (5 gram)

H2O (5 gram)

2.00 Liters

2.97 pCi per gram

2.97 pCi per gram

0.11 pCi per gram

0.11 pCi per gram

30.16 pCi per gram

30.16 pCi per gram

36.64 pCi per gram

36.64 pCi per gram

TST SAMPLING Used 4.5 g for TST mass

TOTAL VOLUME PER SAMPLE

Tritium per Sample

ALPHA per Sample

BETA per Sample

GEA per SAMPLE (Cs 137)

TST (4.5 gram)

TST (4.5 gram)

TST (4.5 gram)

TST (4.5 gram)

0.20 Liter

0.33 pCi per gram

0.01 pCi per gram

3.35 pCi per gram

4.07 pCi per gram

SUMMA SAMPLING

TOTAL VOLUME PER CANISTER

Tritium PER SAMPLE

ALPHA PER SAMPLE

BETA PER SAMPLE

GEA per SAMPLE (Cs 137)

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

6.39 pCi per gram

0.23 pCi per gram

64.94 pCi per gram

78.90 pCi per gram

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APPENDIX B
AMBIENT CONDITIONS

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B-3

WEATHER DURING ISVS SAMPLING OF 241-U-104

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APPENDIX C
CHAIN-OF-CUSTODY FORMS

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Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100253
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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 373-3793
Project Designation/Sampling Locations	200 West Tank Farm 241-U-104 Tank Vapor Sample SAF S6072 (ISVS Cart)	Collection date 07 - 16 - 96 Preparation date 07 - 12 - 96
Ice Chest No.		Field Logbook No. WHC- <u>N-447-8</u>
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

S6072 - A01 . 013	Collect Ambient Air Sample SUMMA #1
S6072 - A02 . 029	Collect Ambient Air Sample SUMMA #2 (through tube bundle)
S6072 - A04 . 050	Collect SUMMA #3
S6072 - A05 . 055	Collect SUMMA #4
S6072 - A06 . 099	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>	07-12-96	1030	GSCAPRIO <i>GSCAPRIO</i>	07-12-96	1030
GSCAPRIO <i>GSCAPRIO</i>	10-8-96	0950	J.A. Edwards <i>J.A. Edwards</i>	10-8-96	0950

Final Sample Disposition

Comments:

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

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

POC

POC

(Revised 05/30/96 PNNL)

attelle Pacific
Northwest Laboratory

CHAIN OF CUSTODY

WHC 100254

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-U-104 Tank Vapor Sample SAF S6072
(ISVS Cart)Collection date 07-16-96
Preparation date 07-08-96

Ice Chest No.

Field Logbook No. WHC-N-647-S

Ertco Hi/Lo thermometer No.

PNL-T-007

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

S6072 - A11 . 1098 - PNL Triple Sorbent Trap (TST) Sample # 1
 S6072 - A12 . 1099 - PNL TST Sample # 2
 S6072 - A13 . 1100 - PNL TST Sample # 3
 S6072 - A14 . 1101 - PNL TST Sample # 4
 S6072 - A17 . 1102 - Open, close & store TST Field Blank # 1
 S6072 - A18 . 1103 - Open, close & store TST Field Blank # 2
 S6072 - A19 . 1104 - Store TST Trip Blank #1
 S6072 - A20 . 1105 - 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	07-12-96	8:25	JA Edwards	07-12-96	08:25
JA Edwards	07-12-96	10:25	GS CHAPMAN	07-12-96	10:25
GS CHAPMAN	10-8-96	09:50	JA Edwards	10-8-96	09:50

Final Sample Disposition

Comments:

PNL (only) Checklist Pick-up / Delivery

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 222S? Y/N

COC copy for LRB, RIDS filed? Y/N

POC (LF) POC (LF)

Comments:

1. Cooler Temperature Status

Hi -5 °C / Lo -5 °C (pick up at PNL to WHC)

Hi -5 °C / Lo -5 °C (delivery at WHC from PNL)

Hi +1 °C / Lo -12 °C (at return to PNL from WHC)

Hi 75 °C / Lo -12 °C (at delivery from WHC to PNL)

(Revised 06/21/95 PNL)

Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100255
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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-U-104 Tank Vapor Sample SAF S6072 (ISVS Cart)	
Collection date	07 - 10 - 96	
Preparation date	07 - 08 - 96	
Ice Chest No.	Field Logbook No. WHC- <u>N</u> <u>497</u> - <u>8</u>	
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

S6072 - A07 . 34R	Collect NH₃/NO_x/H₂O Sorbent Trap <i>7/24/96</i>
S6072 - A08 . 35R	Collect NH ₃ /NO _x /H ₂ O Sorbent Trap
S6072 - A09 . 36R	Collect NH ₃ /NO _x /H ₂ O Sorbent Trap
S6072 - A10 . 37R	Collect NH ₃ /NO _x /H ₂ O Sorbent Trap
 S6072 - A15 . 38R	 Open, close and store NH ₃ /NO _x /H ₂ O field blank #1
S6072 - A16 . 39R	Open, close and store NH ₃ /NO _x /H ₂ O field blank #2

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time	
GW Dennis <i>JA Edwards</i>	07-08-96	1335	JA Edwards <i>JA Edwards</i>	07-08-96	1335	
JA Edwards <i>JA Edwards</i>	07-12-96	1025	CS CAPITO <i>CS CAPITO</i>	07-12-96	1025	
CS CAPITO <i>CS CAPITO</i>	07-30-96	1338	Rick Mahon <i>Rick Mahon</i>	09-30-96	1338	
Rick Mahon <i>Rick Mahon</i>	29-09-96	1345	CS Mest <i>CS Mest</i>	29-09-96	1343	
CS Mest <i>CS Mest</i>	10-29-96	1415	JA Edwards <i>JA Edwards</i>	10-29-96	1415	

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 ☒ Y N
---	--

Comments:

S6072-A07.34R was moved to COC 100519 to allow WSCF to perform a destructive analysis of the NH₃ and silica gel tube. The two NO_x tubes were moved to COC 100520 for return to PNNL. RDM 3 OCT96

EST
COPY
3-11-71

Collector Glenn Caprio/Rick Mahon	Contact/Requestor Rick Mahon	Tel. No. 373-735-1515	FAX 373-7076
SAF Number S6072	Sample Origin U-104	Purchase Order/Charge Code E29937/75745	
Project Title ISVS Vapor Sampling	Logbook # N/A	Ice Chest # n/a	Temp. n/a
Shipped To (Lab) 222-S Laboratory	Method of Shipment Government Vehicle	Bill of Lading/Air Bill No. n/a	
Protocol none	Data Turnaround 24 hr	Offsite Property No. n/a	

<u>Name</u>							<u>Perservative</u>
<u>Sample No.</u>	<u>Lab ID</u>	<u>x</u>	<u>Date</u>	<u>Time</u>	<u>No>Type Container</u>	<u>Sample Analysis</u>	
S6072-AZ1.DW	S96HV	X	7/16/96	1300	(L) 13mm Filter Holder	AT/TB/GEA	n/a
S6072-AZ2.OBI	S96HV	X			(T) 13mm Filter Holder	AT/TB/GEA	n/a
S6072-AD3.TI	S96HW	X			(D)silica ge	Total Activity	n/a
					()		
					()		
					()		
					()		
					()	M/L 7/12/96	
					()		
					()		
					()		
					()		

POSSIBLE SAMPLE HAZARDS/REMARKS	
1st all known wastes.	

MSDS Yes ☐ No ☒

SPECIAL INSTRUCTIONS

Hold Time

These samples require multi-day analysis to calculate decay rates. Please analyze these once every 5 days for 20 days. Please fax reports to Rick Mahon. Thanks.

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time	Matrix *	
Relinquished By				Received By				S = Soil	DS = Drum Solids
Relinquished By				Received By				SE = Sediment	DL = Drum Liquids
Relinquished By				Received By				SO = Solid	T = Tissue
Relinquished By				Received By				SL = Sludge	WI = Wipe
Relinquished By				Received By				WV = Water	L = Liquid
Relinquished By				Received By				O = Oil	V = Vegetation
Relinquished By				Received By				A = Air	X = Other
FINAL SAMPLE DISPOSITION				Disposal Method e.g. Return to customer, per lab procedure, used in process.				Disposed By	
								Date/Time	

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6001-500 (07/95)

Westinghouse Hanford Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				C.O.C.# 100519	
				Page 1 of 1			
Collector Glenn Caprio/ Rick Mahon		Contact/Requestor Rick Mahon		Tel. No. 373-7437 MSN 83-27 FAX 373-7076			
SAF Number S6072		Sample Origin U-104 /SUS		Purchase Order/Charge Code E46353			
Project Title Vapor Sampling		Logbook #		Ice Chest # NA Temp. NA			
Shipped To (Lab) WSCF		Method of Shipment Government Vehicle		Bill of Lading/Air Bill No. NA			
Protocol None		Data Turnaround 24 hr.		Offsite Property No. NA			
Sample No.	Lab. ID	A	Date	Time	No/Type Container	Sample Analysis	Preservative
S6072-107.34R			16JUL96	1100	(1)	AT/TB/GEA	NA
S6072-107.34R			16JUL96	1100	(1)	Tritium	NA
NA	NA	NA	NA	NA	()	NOTE: These samples were moved from COC 100255. This sample is listed as one entry on the original COC but is listed here as two separate samples because the tubes were separated from each other. The PFA connections were cut off to allow WSCF to analyze the NH ₃ and silica gel tubes separately. The NOX portion of the sample was moved to COC 100520. ADM 30896	
					()		
					()		
					()		
					()		
					()		
					()		
					()		
					()		
					()		
POSSIBLE SAMPLE HAZARDS/REMARKS List all known wastes.		MSDS Yes ☐ No ☒		SPECIAL INSTRUCTIONS		Hold Time	
				Please fax the results with the time and day of analysis to Rick Mahon at 373-7076. Thank You.			
Relinquished By Print Sign	Date/Time	Received By Print Sign	Date/Time	Matrix *			
Rick Mahon Rick Mahon	700796/10-7-96	TAMIA BATES Tamia Bates	10-7-96/10-7-96	S = Soil	DS = Drum Solids		
Relinquished By	Date/Time	Received By	Date/Time	SE = Sediment	DL = Drum Liquids		
				SO = Solid	T = Tissue		
				SL = Sludge	W1 = Wipe		
				W = Water	L = Liquid		
				O = Oil	V = Vegetation		
				A = Air	X = Other		
Relinquished By	Date/Time	Received By	Date/Time				
Relinquished By	Date/Time	Received By	Date/Time				
FINAL SAMPLE DISPOSITION	Disposal Method e.g. Return to customer, per lab procedure, used in process.		Disposed By		Date/Time		

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6031-500 (07/95)

Westinghouse Hanford Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				C.O.C.# 100520	
Collector Rick Mahon		Contact/Requestor Rick Mahon		Tel. No. 373-7437 MSIN 53-27 FAX 373-7076		Page of.	
SAF Number 56072		Sample Origin U-104 ISVS		Purchase Order/Charge Code See Lucy Pennington		Temp. NA	
Project Title Vapor Sampling		Logbook # WHC-N-647-8		Ice Chest # NA		Temp. NA	
Shipped To (Lab) PNNL		Method of Shipment Government Vehicle		Bill of Lading/Air Bill No. NA		Offsite Property No. NA	
Protocol RCRA/CERCLA		Data Turnaround See SAP					
Sample No.	Lab. ID	A	Date	Time	No/Type Container	Sample Analysis	Perservative
34R6 56072-10734R			16 JUL 96	1155	(1)	See SAP	NA
34R6 56072-10734R			16 JUL 96	1155	(1)	See SAP	
34R6 56072-10734R			16 JUL 96	1155	(1)	See SAP	
NA	NA		NA	NA	() NA	NOTE: These samples were moved from COC 100255. This sample is listed as one entry on the original COC but is listed here as three separate samples because the tubes were separated from each other. The PFA connections were cut off to allow WLF to analyze the NH3 and silica gel tubes separately. The NOx samples will be returned to PNNL. The NH3 and silica gel were moved to COC 100519. KDM 3 Oct 96	
					()		
					()		
					()		
					()		
					()		
					()		
					()		
					()		
					()		
					()		
POSSIBLE SAMPLE HAZARDS/REMARKS List all known wastes.				MSDS Yes ☐ No ☒		SPECIAL INSTRUCTIONS	
						Hold Time	
Relinquished By Print Sign		Date/Time		Received By Print Sign		Date/Time	
Rick Mahon Rick Mahon		29 Oct 96 / 1345		Eric Marx Eric Marx		29 Oct 96 / 1345	
Relinquished By		Date/Time		Received By		Date/Time	
Eric Marx Eric Marx		29 Oct 96 / 1345		Jeff Edwards Jeff Edwards		10/29/96/1330	
Relinquished By		Date/Time		Received By		Date/Time	
Relinquished By		Date/Time		Received By		Date/Time	
FINAL SAMPLE DISPOSITION		Disposal Method e.g. Return to customer, per lab procedure, used in process.				Disposed By	
						Date/Time	

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6001-500 (07/95)

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>621402</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			