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TANK VAPOR CHARACTERIZATION PROJECT

Headspace Vapor Characterization of Hanford Waste Tank 241-C-107: Comparison Study Results from Samples Collected on 1/17/96

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Summary

This report describes the analytical results of vapor samples taken from the headspace of waste storage tank 241-C-107 (Tank C-107) at the Hanford Site in Washington State. The results described in this report were obtained to compare vapor sampling of the tank headspace using the Vapor Sampling System (VSS) and In Situ Vapor Sampling (ISVS) system with and without high efficiency particulate air (HEPA) prefiltration. The results include air concentrations of water (H_2O) and ammonia (NH_3), permanent gases, total non-methane hydrocarbons (TO-12), and individual organic analytes collected in SUMMA™ canisters and on triple sorbent traps (TSTs). Samples were collected by Westinghouse Hanford Company (WHC) and analyzed by Pacific Northwest National Laboratory (PNNL). Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNNL. Analyte concentrations were based on analytical results and, where appropriate, sample volume measurements provided by WHC.

Acknowledgments

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Glossary

CCV	continuing calibration verification
COC	chain-of-custody
DIW	deionized water
EPA	U.S. Environmental Protection Agency
EQL	estimated quantitation limit
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatograph/mass spectrometer
GC/TCD	gas chromatography/thermal conductivity detection
HEPA	high efficiency particulate air
IDL	instrument detection limit
IS	internal standard
ISVS	In Situ Vapor Sampling
LLS	low level standard
MDL	method detection limit
NIST	National Institute for Standards and Technology
% D	percent difference
PNL	previous designation for Pacific Northwest Laboratory
PNNL	Pacific Northwest National Laboratory
ppbv	part per billion by volume
ppm	parts per million
ppmv	part per million by volume
QA	quality assurance
QC	quality control
RPD	relative percent difference
RSD	relative standard deviation
SAP	sample and analysis plan
ST DEV	standard deviation
STP	standard temperature and pressure
SUMMA™	stainless steel, passivated interior canister
TBP	tributyl phosphate
TIC	tentatively identified compound
TNMHC	total non-methane hydrocarbons
TST	triple sorbent trap
UHP	ultra high purity
VAL	Vapor Analytical Laboratory
VSS	vapor sampling system
WHC	Westinghouse Hanford Company

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1.0 Introduction

This report describes the results of vapor samples obtained to compare vapor sampling of the tank headspace using the Vapor Sampling System (VSS) and In Situ Vapor Sampling System (ISVS) with and without particulate prefiltration. Samples were collected from the headspace of waste storage tank 241-C-107 (Tank C-107) at the Hanford Site in Washington State. Pacific Northwest National Laboratory (PNNL)[a] was contracted by Westinghouse Hanford Company (WHC) to provide sampling devices and analyze samples for water, ammonia, permanent gases, total nonmethane hydrocarbons (TNMHCs, also known as TO-12), and organic analytes in samples collected in SUMMA™ canisters and on triple sorbent traps (TSTs) from the tank headspace. The analytical work was performed by the PNNL Vapor Analytical Laboratory (VAL) by the Tank Vapor Characterization Project. Work performed was based on a sampling and analysis plan (SAP) prepared by WHC. The SAP provided job-specific instructions for samples, analyses, and reporting. The SAP for this sample job was "Sampling and Analysis Plan for Tank Vapor Sampling Comparison Test" (Homi 1996), and the sample jobs were designated S6001, S6002, and S6003. Samples were collected by WHC on January 17, 1996, using the VSS, a truck-based sampling method using a heated probe; and the ISVS with and without particulate prefiltration.

Sampling devices and controls provided for this job included 25 sorbent trains for water and ammonia (18 sample trains and 7 field blanks); 23 SUMMA™ canisters for permanent gases, TO-12 and volatile organic analytes (18 samples and 5 ambient canisters); and 26 TSTs for organic analytes (18 samples, 6 field blanks, and 2 trip blanks). The samples and controls were provided to WHC on January 4, 1996. Exposed samples and controls were returned to PNNL on January 19 and 22, 1996. Samples and controls were handled, stored, and transported using chain-of-custody (COC) forms to ensure sample quality was maintained.

Samples and controls were handled and stored as per PNNL technical procedure PNL-TVP-07[b], and upon return to PNNL, were logged into PNNL Laboratory Record Book 55408. Samples were stored at the VAL under conditions (e.g., ambient, refrigerated) required by technical procedures. Access to the samples was controlled and limited to PNNL staff trained in the application of specific technical procedures to handle samples for the tank vapor characterization project. Analyses were performed in the 300 Area at Hanford. Specific analytical methods are described in the text.

Tank headspace samples were analyzed for

- *water and ammonia* using weight gain for water and ion-specific electrode for ammonia,
- *permanent gases* using gas chromatography/thermal conductivity detection (GC/TCD),

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(a) Pacific Northwest National Laboratory is operated for the U. S. Department of Energy by Battelle under Contract DE-AC06-76RLO 1830. The previous name for the laboratory was Pacific Northwest Laboratory (PNL), which is used when previously published documents are cited.

(b) PNL-TVP-07, Rev. 2, December, 1995, *Sample Shipping and Receiving Procedure for PNL Waste Tank Samples*, PNL Technical Procedure, Tank Vapor Project, Pacific Northwest Laboratory, Richland, Washington.

- *total non-methane hydrocarbons* using cryogenic preconcentration followed by gas chromatography/flame ionization detection (GC/FID), and

- *organic vapors* using cryogenic preconcentration followed by gas chromatography/mass spectrometer (GC/MS) detection.

This report provides summary and detailed analytical information related to the samples and controls. Section 2.0 provides a summary of analytical results. Section 3.0 provides conclusions. Descriptions of samples, analytical methods, quality assurance (QA) and quality control issues, and detailed sample results are provided for each category of samples and analyses in Appendices A, B, C, D, and E. Appendix F contains a listing of all target analytes measured during the analysis of samples from this Tank C-107 comparison study. Appendix G contains the completed COC forms.

2.0 Analytical Results

Samples obtained by WHC from the headspace of Tank C-107 on January 17, 1996, (Sample Jobs S6001, S6002, and S6003) were analyzed in the PNNL VAL. Summarized results are described in this section. Details of samples, analyses, and data tables are provided in the appendices.

2.1 Water and Ammonia

The complete results of the water and ammonia analysis of Tank C-107 for the three sampling methods can be found in Appendix A of this report. Table 2.1 presents the mean concentration values for these two analytes. Mean water concentration values ranged from 48.5 mg/L in the ISVS samples with HEPA filtration to 50.6 mg/L for the ISVS samples without HEPA filtration. The mean H_2O concentration value for the VSS samples was 49.1 mg/L. Mean NH_3 concentration values ranged from 72.4 parts per million by volume (ppmv) for the ISVS samples without HEPA filtration to 76.0 ppmv for the VSS samples. The mean ammonia concentration value for the ISVS samples with HEPA filtration was 73.0 ppmv.

Table 2.1. Comparison of Water and Ammonia Mean Values for Samples Collected from the Headspace of Tank C-107 Using VSS and ISVS With and Without Particulate Filtration

	VSS	ISVS With Filtration	ISVS Without Filtration
Water (mg/L)	49.1	48.5	50.6
Ammonia (ppmv)	76.0	73.0	72.4

2.2 Permanent Gases

The complete results of the permanent gas analyses of Tank C-107 for the three sampling methods can be found in Appendix B of this report. Table 2.2 presents the mean concentration values for the five permanent gases measured. Hydrogen (H_2), carbon dioxide (CO_2), and nitrous oxide (N_2O) were measured above the analytical method estimated quantitation limit (EQL). Methane (CH_4) and carbon monoxide (CO) were not observed in any of the samples. Little differences in H_2, CO_2, or N_2O mean values for the three different sampling methods were found.

Table 2.2. Comparison of Permanent Gas Mean Values for Samples Collected from the Headspace of Tank C-107 Using VSS and ISVS With and Without Particulate Filtration

	VSS	ISVS With Filtration	ISVS Without Filtration
H_2 (ppmv)	242	233	241
CO_2 (ppmv)	693	693	701
N_2O (ppmv)	62	60	62
CH_4 (ppmv)	4 U	4 U	4 U
CO (ppmv)	3 U	3 U	3 U

2.3 Total Non-Methane Hydrocarbons

The complete results of the U.S. Environmental Protection Agency (EPA) TO-12 analyses for TNMHCs in Tank C-107 can be found in Appendix C of this report. A summary of those results can be found in Table 2.3. The TNMHC average concentrations ranged from 3.6 mg/m^3 for the VSS SUMMA™ samples to 6.6 mg/m^3 for the ISVS samples without particulate filtration. The average value for the ISVS samples with particulate filtration was 4.2 mg/m^3.

Table 2.3. Comparison of TO-12 Mean Values for Samples Collected from the Headspace of Tank C-107 Using VSS and ISVS With and Without Particulate Filtration

	VSS	ISVS With Filtration	ISVS Without Filtration
TO-12 (mg/m^3)	3.6	4.2	6.6

2.4 Organic Compounds from SUMMA™ Canisters

The complete results of the organic vapor analyses from SUMMA™ canisters from Tank C-107 can be found in Appendices D and F of this report. A summary of those results can be found in Table 2.4.

In summary, methanol and acetonitrile were the most abundant compounds identified in each of the SUMMA™ canister samples. Tetrahydrofuran and tetradecane were not observed in any samples from Tank C-107. Tributyl phosphate (TBP) was not observed as a tentatively identified compound (TIC) in any of the SUMMA™ canister samples. Based on the average values for each of the sampling methods the highest concentrations of dodecane and tridecane were observed in the VSS samples. The highest concentration of methanol, ethanol, acetonitrile, acetone, 1-propanol, hexane, and 1-butanol were observed in the ISVS samples without particulate filtration. The most notable differences in concentration between the different sampling methods occurred for 1-butanol. 1-Butanol concentrations for the VSS samples were an order of magnitude lower than in the ISVS

samples without particulate filtration. The 1-butanol concentrations in ISVS samples with particulate filtration concentrations were between the concentrations for VSS samples and ISVS samples without particulate filtration. These differences may have been caused by contamination from tape used to wrap the sample bundles.

2.5 Organic Compounds from Triple Sorbent Traps

The complete results of the organic vapor analyses from TSTs from Tank C-107 can be found in Appendices E and F of this report. A summary of those results can be found in Table 2.5.

In summary, methanol and acetonitrile were the most abundant compounds identified in each of the trap samples. Tetrahydrofuran and TBP were not observed in any samples from Tank C-107. Based on the average values for each of the sampling methods the highest concentrations of acetonitrile, acetone, dodecane, tridecane, and tetradecane were observed in the VSS samples. The highest concentrations of methanol was observed in the ISVS samples with particulate filtration. The highest concentrations of ethanol, hexane and 1-butanol were observed in the ISVS samples without particulate filtration. The concentration of 1-propanol was highest in both the ISVS with and without particulate filtration. The most notable differences in concentration between the different sampling methods occurred for hexane and 1-butanol. Hexane and 1-butanol concentrations for the VSS samples were an order of magnitude lower than in the ISVS samples without particulate filtration. In most cases, the concentrations of the ISVS samples with particulate filtration were between the concentrations for VSS samples and ISVS samples without particulate filtration. These differences may have been caused by contamination from tape used to wrap the sample bundles.

Blank sample analyses indicated significant contamination of the TST samples was caused by the tape used to seal the bundles. Analysis of a piece of the tape from the same roll used for the sampling job supported this conclusion. Compounds observed in the blank samples included but were not limited to methanol, 1-butanol, hexane, heptane, methyl hexane, and methyl cyclohexane.

When the ISVS samples were physically exposed to the tank vapor prior to actual sample collection some tank specific compounds diffused in the TSTs. The problem becomes progressively worse with decreasing sample volume size. Passive sampling under the conditions used for Tank C-107 is estimated to contribute 2 to 3% for the target compound found in the tank but vary somewhat with compound diffusion properties. Therefore, to minimize the effects of passive sampling, sampling should be performed as promptly as possible following insertion of the sampling bundle into the tank.

Table 2.4 Summary of SUMMA™ Sample Results for Samples Collected from the Headspace of Tank C-107 on 1/17/96

VSS Truck Samples	METHANOL (ppbv)		ETHANOL (ppbv)		ACETONITRILE (ppbv)	ACETONE (ppbv)	PROPANOL (ppbv)	TETRAHYDROFURAN (ppbv)	HEXANE (ppbv)		1-BUTANOL (ppbv)		DODECANE (ppbv)		TRIDECANE (ppbv)		TETRADECANE (ppbv)	TBP (ppbv)
Average	1146	Y	66	Y	905	617	9	U	0.7	J	5.4	J	6.6	J	4.7	J	U	Z
ST DEV	142		10		117	82	1		0.0		0.8		1.1		1.3			
% RSD	11		15		12	13	15		7		15		18		29			
ISVS with HEPA																		
Average	1180	Y	81	Y	849	579	12	U	2.0	J	23		4.8	J	3.0	J	U	Z
ST DEV	123		10		75	52	2		1.2		14		0.5		0.2			
% RSD	10		12		9	9	16		61		58		11		7			
ISVS without HEPA																		
Average	1232	Y	102	Y	911	621	14	U	7.5		73		5.3	J	3.0	J	U	Z
ST DEV	157		12		150	102	1		1.2		22		1.0		0.4			
% RSD	12		11		15	15	8		19		33		21		14			

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

Z TBP was analyzed as a TIC; however, was not identified in the sample.

Table 2.5 Summary of Triple Sorbent Trap Sample Results for Samples Collected from the Headspace of Tank C-107 on 1/17/96

VSS Truck Samples	METHANOL (ppbv)	ETHANOL (ppbv)	ACETONITRILE (ppbv)	ACETONE (ppbv)	PROPANOL (ppbv)	TETRAHYDROFURAN (ppbv)	HEXANE (ppbv)	1-BUTANOL (ppbv)	DODECANE (ppbv)	TRIDECANE (ppbv)	TETRADECANE (ppbv)	TBP (ppbv)
Average	1510 Y	229 Y	661	313	19 J	U	1.0 J	8.1 J	5.5 J	4.7 J	3.1 J	< 0.8 Y
ST DEV	513	57	100	41	5.2		0.3	1.6	1.0	1.4	3.0	
% RSD	37	27	16	14	30		24	18	18	30	97	
ISVS with HEPA												
Average	1663 Y	290 Y	597	222	22	U	33	112	4.0 J	4.5 J	1.2 J	< 0.8 Y
ST DEV	241	79	67	27	3.4		8.3	55	0.7	1.0	0.3	
% RSD	13	25	11	11	15		26	49	17	22	29	
ISVS without HEPA												
Average	1240 Y	343 Y	487.9	202	22	U	119	334	5.1 J	3.6 J	0.6 J	< 0.8 Y
ST DEV	180	39.2	16	14	2.3		23	124	0.4	0.3	0.1	
% RSD	13	11	3	8	10		19	37	8	7	21	

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

< Denotes compound not detected at or above the LLS.

3.0 Conclusions

The air concentrations of H_2O and NH_3, permanent gases, total non-methane hydrocarbons, and organic vapors were determined from samples from the headspace of Tank C-107 sampled on January 17, 1996. WHC sample job numbers were S6001, S6002, and S6003. The gas and vapor concentrations were based either on whole-volume samples (SUMMA™ canisters) or on triple sorbent traps exposed to sample flow. In the case of the canisters, the concentrations were based on analytical results of subsamples obtained directly from the canisters. In the case of the sorbent traps, concentrations were based on analyses by the VAL and sample volumes reported by WHC. Known sampling and analytical variances from established QA requirements, where significant, were documented in this report, as required by the SAP (Homi 1996).

4.0 Reference and Further Reading

Reference

Homi, C.S. 1996. *Sampling and Analysis Plan for Tank Vapor Sampling Comparison Test.* WHC-SD-WM-TSAP-073, Rev. OA, Westinghouse Hanford Company, Richland, Washington.

Further Reading

Pacific Northwest Laboratory. *Analytical Laboratory Procedure Compendium.* Procedure PNL-ALO-271. PNL-MA-599, Pacific Northwest Laboratory, Richland, Washington.

Pacific Northwest Laboratory. *Quality Assurance Manual, Part 3: Procedures for Quality Assurance Program.* PNL-MA-70, Part 3, Pacific Northwest Laboratory, Richland, Washington.

Pacific Northwest National Laboratory. *Quality Assurance Plan for Activities Conducted by the Pacific Northwest National Laboratory Vapor Analytical Laboratory (VAL) and the Pacific Northwest National Laboratory Tank Vapor Characterization Project.* ETD-002, Rev. 0, Pacific Northwest National Laboratory, Richland, Washington.

U.S. Department of Energy. *Hanford Analytical Services Quality Assurance Plan (HASQAP).* DOE/RL-94-55, Rev. 2, U. S. Department of Energy, Richland, Washington.

Westinghouse Hanford Company. *Quality Assurance Project Plan for Tank Vapor Characterization.* WHC-SD-WM-QAPP-013, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Appendix A

Tank Vapor Characterization:

Water and Ammonia

Appendix A

Tank Vapor Characterization: Water and Ammonia

Solid sorbent traps, prepared in multi-trap sampling trains, were supplied to Westinghouse Hanford Company (WHC) for sampling the tank headspace using the VSS and ISVS with and without particulate filtration. Blanks, spiked blanks (when requested), and exposed samples were returned to Pacific Northwest National Laboratory (PNNL) for analysis. Analyses were performed to provide information on the tank headspace concentration of ammonia (NH_3) and water (H_2O). Procedures were similar to those developed previously during sample jobs performed with the VSS connected to the headspace of Tank C-103 (Ligotke et al. 1994). During those sample jobs, control samples provided validation that the sorbent tubes effectively trapped NH_3 and mass. Samples were prepared, handled, and disassembled as described in Technical Procedure PNL-TVP-09[(a)]. Analytical accuracy was estimated based on procedures used. Sample preparation and analyses were performed following PNNL quality assurance (QA) impact level II requirements.

A.1 Sampling Methodology

Standard glass tubes containing sorbent materials to trap vapors of NH_3 and H_2O (supplied by SKC Inc., Eighty Four, Pennsylvania) were obtained, prepared, and submitted for vapor sampling. The sorbent traps were selected based on their use by the Occupational Safety and Health Administration to perform workplace monitoring and because of available procedures and verification results associated with that particular application. The typical sorbent traps used consisted of a glass tube containing a sorbent material specific to the compound of interest. In general, the tubes contained two sorbent layers, or sections; the first layer was the primary trap, and the second layer provided an indication of breakthrough. In the tubes, sorbent layers are generally held in packed layers separated by glass wool. The sorbent traps, with glass-sealed ends, were received from the vendor.

The type and nominal quantity of sorbent material varied by application. Sorbent traps were selected for the tank sample job and included the following products. The NH_3 sorbent traps contained carbon beads impregnated with sulfuric acid; nominally, 500 mg were contained in the primary and 250 mg in the breakthrough sections. The NH_3 was chemisorbed as ammonium sulfate [$(NH_4)_2SO_4$]. The water traps contained 300 mg of silica gel in the primary and 150 mg in the breakthrough sections.

Sorbent trains provided to trap inorganic compounds included all or some of the following: samples, spiked samples, spares, blanks, and spiked blanks. Sorbent trains were prepared from same-lot batches. After sample preparation, sorbent trains were stored at $\leq$ 10°C because of handling recommendations for the oxidizer tubes attached to some samples. After receipt of exposed and

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(a) Pacific Northwest Laboratory. 12/95. *Sorbent Trap Preparation for Sampling and Analysis: Waste Tank Inorganic Vapor Samples*, PNL-TVP-09 (Rev. 2), PNL Technical Procedure, Pacific Northwest Laboratory, Richland, Washington.

radiologically cleared samples from WHC and disassembly of the sorbent trains, samples were provided to the analytical laboratory at ambient temperature.

The sorbent traps were prepared in multi-trap sorbent trains configured so sample flow passed in order through the traps, targeting specific analytes, and then through a desiccant trap. The specific order of traps within the various sorbent trains is described in Section A.4. The ends of the glass-tube traps were broken, and the traps were weighed and then connected to each other using uniform lengths of 3/8-in. perfluoroalkoxy-grade Teflon® tubing. The tubing was heated in hot air and forced over the open ends of the traps to form a tight seal. The inlets of the sorbent trains each consist of a short section of tubing that has a 3/8-in. stainless steel Swagelok® nut, sealed using a Swagelok® cap. The trailing ends of the sorbent trains (the downstream end of the traps containing silica gel) were each sealed with red plastic end caps provided by the manufacturer. The sorbent-tube trains remained sealed other than during the actual sampling periods. During vapor sampling, C-Flex® tubing was provided by WHC to connect the downstream ends of the sorbent trains to the sampling manifold exhaust connections.

A.1.1 Concentration Calculations. The concentrations of target compounds in the tank headspace were determined from sample results, assuming effective sample transport to the sorbent traps. Concentration, in parts per million by volume (ppmv), was determined by dividing the mass of the compound, in μmol, by the volume of the dried tank air sampled in moles. The micromolar sample mass was determined by dividing the compound mass, in μg, by the molecular weight of the compound, in g/mol. The molar sample volume was determined, excluding water vapor, by dividing the standard sample volume (at 0°C and 760 torr), in L, by 22.4 L/mol. For example, the concentration by volume of a 3.00-L sample containing 75.0 μg of NH_3 is given by

$$\frac{75.0\ \mu g}{17.0\ g/mol}\left[\frac{3.00\ L}{22.4\ L/mol}\right]^{-1} = 32.9\ ppmv \qquad (A.1)$$

This calculational method produces concentration results that are slightly conservative (greater than actual) because the volume of water vapor in the sample stream is neglected. The volume of water vapor is not included in the measured sampled volume because of its removal in desiccant traps upstream of the mass flowmeter. However, the bias is generally expected to be small. For a tank headspace temperature of 35°C, the magnitude of the bias would be about 1 to 6%, assuming tank headspace relative humidities of 20 to 100%, respectively. The concentration of mass (determined gravimetrically) was also per dry-gas volume at standard conditions.

A.2 Analytical Procedures

The compounds of interest were trapped using solid sorbents and chemisorption (adsorption of water vapor). Analytical results were based on extraction and analysis of selected ions. Analytical procedures used are specified in the text. All were compiled in PNL-MA-599.

A.2.1 Ammonia Analysis. The sorbent material from the NH_3-selective sorbent traps was placed into labeled 20-mL glass scintillation vials. Vials containing front-, or primary-, section sorbent material were treated with 10.0 mL of deionized water (DIW), and vials containing back-up-section sorbent material were treated with 5.0 mL of DIW. After extraction, the NH_3 sorbent traps were analyzed using the selective ion electrode procedure PNL-ALO-226[(a)]. Briefly, this method includes 1) preparing a 1000-μg/mL (ppm) NH_3 stock standard solution from dried reagent-grade NH_4Cl and DIW, 2) preparing 0.1-, 0.5-, 1.0-, 10-, and 100-ppm NH_3 working calibration standards by serial dilution of the freshly made stock standard, 3) generating an initial calibration curve from the measured electromotive force signal versus NH_3 concentration data obtained for the set of working standards, 4) performing a calibration-verification check, using a mid-range dilution of a certified National Institute for Standards and Technology (NIST)-traceable 0.1 M NH_4Cl standard from an independent source, after analyzing every five or six samples, 5) continuing this sequence until all samples of the batch have been measured, including duplicates and spiked samples, and 6) remeasuring the complete set of calibration standards (at the end of the session). Electromotive force (volts) signal measurements obtained for samples are compared to those for standards, either graphically or algebraically (using linear regression) to determine NH_3 concentration in the samples.

A.2.2 Mass (Water) Analysis. Sorbent traps used to make each sample train were weighed using a semi-micro mass balance, after labeling and breaking the glass tube ends, without plastic end caps. After receipt of exposed samples, the sorbent traps were again weighed to determine the change in mass. Records of the measurements were documented on sample-preparation data sheets. The mass concentration, generally roughly equal to the concentration of water, was determined by dividing the combined change in mass from all traps in a sorbent train by the actual volume of gas sampled. Blanks were included to provide information on uncertainty.

A.3 Quality Assurance/Quality Control

Analytical work was performed according to quality levels identified in the project QA plan and several PNNL documents. The samples were analyzed following PNNL Impact Level II. The PNNL documents include PNL-MA-70 (Part 3), PNL-ALO-212, PNL-ALO-226, and ETD-002. A summary of the analysis procedures and limits for the target inorganic compounds is provided in Table A.1. The table also shows generic expected notification ranges and describes related target analytical precision and accuracy levels for each analyte; the information in the table is based on the data quality objective assessment by Osborne et al. (1995). From the table, it can be seen that the method detection limit (MDL) required to resolve the analyte at one-tenth of the recommended exposure limit for each of the target analytes is achieved using current procedures and with a vapor-sample volume of 3 L and a desorption-solution volume of 3 mL (10 mL for NH_3).

The accuracy of concentration measurements depends on potential errors associated with both sampling and analysis (see Section A.4). Sampling information, including sample volumes, was provided by WHC; sample-volume uncertainty was not provided. The uncertainty of analytical results, which depends on the method used, was estimated to be within allowable tolerances (Osborne

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(a) Procedure entitled "Ammonia (Nitrogen) in Aqueous Samples," PNL-ALO-226, in the *Analytical Chemistry Laboratory (ACL) Procedure Compendium*, Vol. 3: Inorganic Instrumental Methods. Pacific Northwest Laboratory, Richland, Washington.

et al. 1995; Table A.1). For NH_3 analyses, the accuracy of laboratory measurements by selective ion electrode was estimated to be ± 5% relative, independent of concentration at 1 μg/mL or greater levels. The uncertainty includes preparation of standards, purity of the ammonium salt used to prepare standards, potential operator bias, ambient temperature variations, etc. Working standards are traceable to NIST standard reference material by using an independent calibration verification standard certified to be NIST traceable.

Table A.1. Analytical Procedures, Quantitation Limits, and Notification Levels for Selected Inorganic Analytes[a]

Analyte	Formula	Procedure	EQL[b] (μg)	EQL[b] (ppmv)	Notification Level[c] (ppmv)
Ammonia	NH_3	PNL-ALO-226	1.0	0.5	≥ 150
Mass (water)[d]	n/a	PNL-TVP-09	0.6 mg	0.2 mg/L	n/a

(a) Analytical precision and accuracy targets for results in the expected ranges equal ± 25% and 70 to 130%, respectively (Osborne et al. 1995).
(b) The lowest calibration standard is defined as the EQL.
(c) As per Table 7-1 in Osborne et al. (1995). Notification levels require verbal and written reports to WHC on completion of preliminary analyses.
(d) The vapor-mass concentration, thought to be largely water vapor, is determined gravimetrically.
n/a = not applicable.

The accuracy of measurements of sample mass is typically ± 0.1 mg, or much less than 1% of the mass changes of most samples. The analytical accuracy of measurements of the change in mass of sorbent trains, based on the variability in mass change of field-blank sorbent trains, is determined for each sample job and is typically about ± 1 mg per five-trap sorbent train.

A.4 Water and Ammonia Sample Results

Table A.2 lists results of the water and ammonia analysis from samples collected from the headspace of Tank C-107. These samples were collected through the VSS and through the ISVS with and without particulate filtration. A total of six samples each were collected with the three different sampling methods. The samples were analyzed for ammonia on January 26, 1996, and January 29, 1996, and for water on January 23, 1996. Mean water concentration values ranged from 48.5 mg/L in the ISVS with particulate filtration samples to 50.6 mg/L for the ISVS without particulate filtration samples. The mean water concentration value for the VSS samples was 49.1 mg/L. Mean ammonia concentration values ranged from 72.4 ppmv for the ISVS without particulate filtration samples to 76.0 ppmv for the VSS samples. The mean value for the VSS ammonia samples was calculated with only five sample results. The analytical value for sample S6001-A21.24S was not consistent with the other results and not used in the calculation of average value or percent relative standard deviation (% RSD). The mean ammonia concentration value for the ISVS with particulate filtration samples was 73.0 ppmv.

Table A.2 Water and Ammonia Analysis Results for Samples Collected from the Headspace of Tank C-107 on 1/17/96

VSS Truck Samples	H_2O mg/L	NH_3 ppmv
S6001-A18.21S	48.8	75.4
S6001-A19.22S	48.6	74.1
S6001-A20.23S	49.1	75.4
S6001-A21.24S	49.1	(64) *
S6001-A22.25S	49.5	78.7
S6001-A23.26S	49.3	76.3
Average	**49.1**	**76.0**
% RSD	**0.7**	**2.3**
ISVS with HEPA		
S6002-A42.30S	47.9	71.3
S6002-A43.31S	49.2	75.0
S6002-A44.32S	48.1	71.2
S6002-A51.33S	48.2	76.8
S6002-A52.34S	49.7	69.8
S6002-A53.35S	48.0	73.6
Average	**48.5**	**73.0**
% RSD	**1.5**	**3.6**
ISVS without HEPA		
S6003-A66.38S	50.0	69.1
S6003-A67.39S	48.9	75.4
S6003-A68.40S	50.9	71.2
S6003-A69.41S	51.2	76.4
S6003-A70.42S	51.4	69.7
S6003-A71.43S	51.1	72.4
Average	**50.6**	**72.4**
% RSD	**1.9**	**4.1**

* Data suspect; not used in calculation of average value or % RSD

A.5 References

Clauss, T. W., M. W. Ligotke, B. D. McVeety, K. H. Pool, R. B. Lucke, J. S. Fruchter, and S. C. Goheen. 1994. *Vapor Space Characterization of Waste Tank 241-BY-104: Results from Samples Collected on 6/24/94.* PNL-10208. Pacific Northwest Laboratory, Richland, Washington.

Ligotke, M. W., K. H. Pool, and B. D. Lerner. 1994. *Vapor Space Characterization of Waste Tank 241-C-103: Inorganic Results from Sample Job 7B (5/12/94 - 5/25/94).* PNL-10172, Pacific Northwest Laboratory, Richland, Washington.

Osborne, J. W., J. L. Huckaby, E. R. Hewitt, C. M. Anderson, D. D. Mahlum, B. A. Pulsipher, and J. Y. Young. 1995. *Data Quality Objectives for Generic In-Tank Health and Safety Vapor Resolution.* WHC-SD-WM-DQO-002, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Appendix B

Tank Vapor Characterization:

Permanent Gases

Appendix B

Tank Vapor Characterization: Permanent Gases

B.1 Sampling Methodology

Before sending SUMMA™ canisters out to the field for sampling, the canisters are cleaned and verified contaminant-free according to Pacific Northwest National Laboratory (PNNL) Technical Procedure PNL-TVP-02[a]. The cleaning procedure uses an EnTech 3000 cleaning system that controls 1) filling the canisters with purified humid air and 2) evacuating, for several cycles with applied heat, before allowing the canister to evacuate overnight. The canister is filled a final time with purified humid air for analysis. If the canister is verified as clean by TO-12, the canister is evacuated to 5 mtorr, tagged, and stored for use in the field. Before sending the canisters out to the field for sampling, the canister vacuum is measured to determine if any leakage has occurred. If the vacuum has remained constant during storage, the canisters are prehumidified with 100 μL of distilled water and labeled with a field-sampling identification. Canisters stored more than 30 but less than 60 days are re-evacuated and rehumidified before use. If stored more than 60 days, the canisters are recleaned and validated before use.

B.2 Analytical Procedure

The SUMMA™ canister samples were analyzed for permanent gases according to PNNL Technical Procedure PNL-TVP-05[b] with the exceptions listed in the following text and in the quality assurance/quality control section of this report. This method was developed in-house to analyze permanent gases, defined as hydrogen (H_2), carbon dioxide (CO_2), carbon monoxide (CO), methane (CH_4), and nitrous oxide (N_2O), by gas chromatograph/thermal conductivity detection (GC/TCD). Aliquots of sampled air are drawn directly from each canister into a 5-mL gas-tight syringe and injected into a Hewlett-Packard 5890 GC/TCD fitted with a loop injector valve and a column switching valve. An aliquot of 5 mL is used so that the 1.0-mL injection loop is completely purged with sample air, ensuring that no dilution of the sample takes place within the injection loop. One set of GC conditions is used to analyze for CO, CO_2, N_2O, and CH_4 using Helium (He) as the carrier gas. A second GC analysis is performed for H_2 (using nitrogen as the carrier gas) to enhance the signal sensitivity and lower the detection limit for this analyte. The permanent gases and the derived EQLs are listed in Table B.1.

(a) Pacific Northwest Laboratory. 8/94. *Cleaning SUMMA™ Canisters and the Validation of the Cleaning Process*, PNL-TVP-02 (Rev. 0), PNL Technical Procedure, Pacific Northwest Laboratory, Richland, Washington.

(b) Pacific Northwest Laboratory. 12/95. *Analysis Method for the Determination of Permanent Gases in Hanford Waste Tank Vapor Samples Collected in SUMMA™ Passivated Stainless Steel Canisters*, PNL-TVP-05 (Rev. 1). PNL Technical Procedure, Pacific Northwest Laboratory, Richland, Washington.

Table B.1. Analytical Procedures and Detection Limits for Permanent Gases

Analyte	Formula	Procedure	Instrument Detection Limit (ppmv)	Estimated Quantitation Limit (ppmv)
Carbon Dioxide	CO_2	PNL-TVP-05	2.4	24
Carbon Monoxide	CO	PNL-TVP-05	3.2	32
Methane	CH_4	PNL-TVP-05	4.3	43
Hydrogen	H_2	PNL-TVP-05	3.1	31
Nitrous Oxide	N_2O	PNL-TVP-05	2.0	20

B.3 Quality Assurance/Quality Control

Standards for the permanent gas analysis were blended from commercially prepared and certified standards for each of the analytes reported in Table B.1. The instrument was calibrated for CO, CO_2, N_2O, and CH_4 over a range of 25 to 2100 parts per million by volume (ppmv) using standards at five different concentrations and He as a carrier gas. A similar procedure was followed for H_2, except the carrier gas was changed to N_2. An average response factor from the calculation was used for qualification of compound peak area.

Each analyte was quantitated by comparison of sample analyte peak area to the calibration plot generated for the compound. An instrument detection limit (IDL) study was conducted and performance data are presented in Table B.1. The EQL for the method has also been established as 10 times the IDL. Before and after each sample analysis set, a gas standard was run to evaluate system performance and to measure system accuracy. The calculated concentration of the individual gases in the standards fell within $\pm$ 25% of the expected concentrations. One sample was run in duplicate to provide a measure of method precision. Results of the replicate analysis are presented in Table B.2. An N_2 reagent blank, an ambient-air sample collected $\sim$10 m upwind of Tank C-107, and the ambient air collected through the VSS were used as method blanks and used to determine the potential for analyte interferences in the samples.

B.4 Permanent Gases Sample Results

Table B.2 lists results of the permanent gas analysis from samples collected from the headspace of Tank C-107 and ambient air collected near Tank C-107. These samples were collected through the VSS and through the ISVS with and without particulate filtration. A total of six samples each were collected with the three different sampling methods. The samples were analyzed on January 23 and 24, 1996. Replicate analysis on a single SUMMA™ canister was conducted on three samples within each sampling method set. Hydrogen, carbon dioxide, and nitrous oxide were observed above the EQL in all the tank headspace samples. Average hydrogen concentrations ranged from 233 ppmv in the ISVS samples with the particulate filtration to 242 ppmv in the VSS samples. Average nitrous oxide concentrations ranged from 60 ppmv in the ISVS samples with particulate filtration to 62 ppmv in the VSS samples and ISVS samples without particulate filtration. Average carbon dioxide concentrations ranged from 693 ppm in the VSS samples and ISVS samples with particulate filtration to 701 ppmv in the ISVS samples without particulate filtration. Average methane and carbon monoxide concentrations were below the IDL.

Table B.2 Permanent Gas Analysis Results for Samples Collected from the Headspace of Tank C-107 and Ambient Air Collected Near Tank C-107 on 1/17/96

VSS Truck Samples	H_2 (ppmv)		CO_2 (ppmv)	N_2O (ppmv)		CH_4 (ppmv)		CO (ppmv)	
S6001-A01.300 (Ambient)	9	J	398	2	U	4	U	3	U
S6001-A01.301 (Ambient)	9	J	392	2	U	4	U	3	U
S6001-A03.302	237		695	64		4	U	3	U
S6001-A04.303	249		687	61		4	U	3	U
S6001-A15.304	238		699	61		4	U	3	U
S6001-A16.305	237		689	61		4	U	3	U
S6001-A27.306	248		694	64		4	U	3	U
S6001-A28.307	243		692	63		4	U	3	U
Average	**242**		**693**	**62**		**4**	**U**	**3**	**U**
% RSD	**2.3**		**0.6**	**2.2**					
S6001-A03.302 (Rep)	243		690	62		4	U	3	U
S6001-A04.303 (Rep)	244		699	65		4	U	3	U
S6001-A28.307 (Rep)	236		689	62		4	U	3	U
ISVS with HEPA									
S6002-A33.308 (Ambient)	7	J	400	2	U	4	U	3	U
S6002-A34.309 (Ambient)	8	J	393	2	U	4	U	3	U
S6002-A36.310	221		693	59		4	U	3	U
S6002-A37.311	231		691	60		4	U	3	U
S6002-A38.312	234		693	60		4	U	3	U
S6002-A45.313	237		697	61		4	U	3	U
S6002-A46.314	233		695	59		4	U	3	U
S6002-A47.315	240		690	58		4	U	3	U
Average	**233**		**693**	**60**		**4**	**U**	**3**	**U**
% RSD	**2.8**		**0.4**	**2**					
S6002-A36.310 (Rep)	224		689	58		4	U	3	U
S6002-A38.312 (Rep)	239		694	57		4	U	3	U
S6002-A46.314 (Rep)	228		699	63		4	U	3	U
ISVS without HEPA									
S6003-A35.316 (Ambient)	7	J	388	2	U	4	U	3	U
S6003-A54.317	237		700	61		4	U	3	U
S6003-A55.318	246		701	62		4	U	3	U
S6003-A56.319	243		703	63		4	U	3	U
S6003-A57.320	237		701	63		4	U	3	U
S6003-A58.321	242		703	62		4	U	3	U
S6003-A59.322	240		699	62		4	U	3	U
Average	**241**		**701**	**62**		**4**	**U**	**3**	**U**
% RSD	**1.5**		**0.2**	**1.0**					
S6003-A54.317 (Rep)	238		701	63		4	U	3	U
S6003-A56.319 (Rep)	246		698	61		4	U	3	U
S6003-A57.320 (Rep)	244		702	63		4	U	3	U

Data Qualifier Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Appendix C

Tank Vapor Characterization:

Total Non-Methane Hydrocarbons

Appendix C

Tank Vapor Characterization: Total Non-Methane Hydrocarbons

C.1 Sampling Methodology

Before sending SUMMA™ canisters out to the field for sampling, the canisters are cleaned and verified contaminant-free according to Pacific Northwest National Laboratory (PNNL) Technical Procedure PNL-TVP-02[a]. The cleaning procedure uses an EnTech 3000 cleaning system that controls 1) filling the canisters with purified humid air and 2) evacuating, for several cycles with applied heat, before allowing the canister to evacuate overnight. The canister is filled a final time with purified humid air for analysis. If the canister is verified as clean by TO-12, the canister is evacuated to 5 mtorr, tagged, and stored for use in the field. Before sending the canisters out to the field for sampling, the canister vacuum is measured to determine if any leakage has occurred. If the vacuum has remained constant during storage, the canisters are prehumidified with 100 μL of distilled water and labeled with a field-sampling identification. Canisters stored more than 30 but less than 60 days are re-evacuated and rehumidified before use. If stored more than 60 days, the canisters are recleaned and validated before use.

C.2 Analytical Procedure

The SUMMA™ canister samples were analyzed according to PNNL Technical Procedure PNL-TVP-08[b], which is similar to U.S. Environmental Protection Agency (EPA) compendium Method TO-12. The method detection limits in the sub mg/m^3 are required to determine total non-methane hydrocarbon (TNMHC) concentration in the tank samples.

The method uses an EnTech 7000 cryoconcentration system interfaced with a Hewlett-Packard 5890 gas chromatograph/flame ionization detector (GC/FID). The EnTech concentrator is used to pull a metered volume of 50 to 100 mL of sample air from the SUMMA™ canister mounted on an EnTech 7016CA 16-canister autosampler. The sample is cryogenically concentrated, and constituents are trapped in a stainless steel tube containing glass beads and Tenax. The glass bead/Tenax trap is heated to 180°C and purged with ultra high purity (UHP) helium (He). The purged TNMHCs are carried by a UHP He stream to the GC equipped with an FID where gross organic content is detected and measured.

The GC oven is programmed to run at a 150°C isothermal temperature. Chromatographic separation is not needed in this method since quantitation is from the entire FID response over the run time.

(a) Pacific Northwest Laboratory. 8/94. *Cleaning SUMMA™ Canisters and the Validation of the Cleaning Process*, PNL-TVP-02 (Rev. 0), PNL Technical Procedure, Pacific Northwest Laboratory, Richland, Washington.

(b) Pacific Northwest Laboratory. 12/95. *Determination of TO-12 Total Nonmethane Organic Compounds in Hanford Waste Tank Headspace Samples Using SUMMA™ Passivated Canister Sampling and Flame Ionization Detection*, PNL-TVP-08 (Rev. 1), PNL Technical Procedure, Pacific Northwest Laboratory, Richland, Washington.

Twenty-four hours before the analysis, the SUMMA™ canister samples are pressurized with purified air (supplied by Aadco Instruments, Inc., 1920 Sherwood St., Clearwater, Florida 34625). The starting pressure was first measured using a calibrated diaphragm gauge (Cole Parmer), then pressurized to a level exactly twice the original pressure. For example, if the canister had a starting pressure of 740 torr, it was pressurized to 1480 torr. The sample dilution was taken into account when calculating the analysis results.

C.3 Quality Assurance/Quality Control

This method requires user calibration (category 2 measuring and test equipment) of the analytical system in accordance with QA plan ETD-002.

The TNMHC is calibrated by using propane as the calibration standard and using that response factor as an external standard method. The instrument calibration mixture for the PNL-TVP-08 analysis consists of National Institute for Standards and Technology (NIST) 99.999% propane analyzed using a five-point, multi-level, linear regression curve.

A continuing calibration verification (CCV) standard of 100 ppmv propane is analyzed to confirm acceptability of instrument performance. The initial calibration is then used to quantify the samples.

Immediately before running the analysis sequence, a leak-check procedure, which includes evacuating the transfer lines and monitoring the pressure, must be performed on the sample manifold tower. The control limits on this test require that the change in pressure is < 1.5 psi, and the absolute pressure after evacuation is < 3 psi for each manifold position specified in the sequence table. If this criterion is not met, it must be corrected before the samples are analyzed.

Before the tank samples were analyzed, a diagnostic check was performed on the GC/FID instrument by running a system cleanliness procedure and an instrument continuing calibration as described in PNL-TVP-08. First, two blank volumes of Aadco purified air were analyzed to check the cleanliness of the system. This demonstrates through the analysis of a zero-air blank that the level of interference is acceptable in the analytical system. The system should be cleaned to 0.1 mg/m^3 of TNMHCs. Second, an instrument continuing calibration is run using 100-mL UHP propane analyzed using the response factor as an external standard method followed by one blank volume of Aadco air.

C.3.1 Quantitation Results of Target Analytes. The mg/m^3 was derived from the five-point multi-level calibration curve from the propane standard using the following equation:

$$mg/m^3 = \frac{\text{(ng TNMOC) x (dilution factor)}}{\text{mL sampled volume}} \qquad \text{(C.1)}$$

The ng/m^3 concentrations are calculated from mg/m^3 using the equation:

$$\text{ng/m}^3\ \text{TNMOC} = \frac{(\text{ng TNMOC})}{(\text{mL sampled})} \times \text{Dilution Factor} \times \frac{(\text{mg})}{(1 \times 10^6\ \text{mL})} \times \frac{(1 \times 10^6\ \text{mL})}{(\text{m}^3)} \qquad \text{(C.2)}$$

C.4 Total Non-Methane Hydrocarbons Sample Results

Table C.1 lists results of the TO-12 gas analysis from samples collected from the headspace of Tank C-107 and ambient air collected near Tank C-107. These samples were collected through the VSS and through the ISVS with and without particulate filtration. A total of six samples each were collected by each of the three sampling methods. The samples were analyzed on January 23, 1996 and January 24, 1996. Replicate analyses on SUMMA™ canisters were conducted on three samples within each sampling method set. Concentrations in the five ambient air samples ranged from 0.40 mg/m^3 to 1.2 mg/m^3. The ambient air sample results for the ISVS with particulate filtration were significantly higher than either the VSS or ISVS without particulate filtration. Average concentrations ranged from 3.6 mg/m^3 in the VSS samples to 6.6 mg/m^3 in the ISVS samples without particulate filtration. The average concentration in the ISVS with particulate filtration samples was measured at 4.2 mg/m^3.

Table C.1 TO-12 Analysis Results for Samples Collected from the Headspace of Tank C-107 and Ambient Air Near Tank C-107 on 1/17/96

VSS Truck Samples	TO-12 mg/m^3	
S6001-A01.300 (Ambient)	0.44	J
S6001-A01.301 (Ambient)	0.40	J
S6001-A03.302	3.5	
S6001-A04.303	4.1	
S6001-A15.304	3.8	
S6001-A16.305	3.5	
S6001-A27.306	3.3	
S6001-A28.307	3.4	
Average	**3.6**	
% RSD	**8.2**	
S6001-A03.302 (Rep)	3.5	
S6001-A04.303 (Rep)	3.5	
S6001-A28.307 (Rep)	3.4	
ISVS Cart with HEPA		
S6002-A33.308 (Ambient)	1.6	
S6002-A34.309 (Ambient)	1.2	
S6002-A36.310	4.5	
S6002-A37.311	4.7	
S6002-A38.312	4.6	
S6002-A45.313	3.4	
S6002-A46.314	3.8	
S6002-A47.315	3.9	
Average	**4.2**	
% RSD	**13**	
S6002-A36.310 (Rep)	4.5	
S6002-A38.312 (Rep)	4.6	
S6002-A46.314 (Rep)	3.7	
ISVS Cart without HEPA		
S6003-A35.316 (Ambient)	0.44	J
S6003-A54.317	7.0	
S6003-A55.318	6.9	
S6003-A56.319	5.2	
S6003-A57.320	7.0	
S6003-A58.321	6.8	
S6003-A59.322	6.4	
Average	**6.6**	
% RSD	**11**	
S6003-A54.317 (Rep)	6.9	
S6003-A56.319 (Rep)	5.2	
S6003-A57.320 (Rep)	7.3	

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

Appendix D

Tank Vapor Characterization:

Organic Compounds from SUMMA™ Canisters

Appendix D

Tank Vapor Characterization: Organic Compounds from SUMMA™ Canisters

D.1 Sampling Methodology

Before sending SUMMA™ canisters out to the field for sampling, the canisters are cleaned and verified contaminant free according to Pacific Northwest National Laboratory (PNNL) Technical Procedure PNL-TVP-02[a]. The cleaning procedure uses an EnTech 3000 cleaning system that controls 1) filling the canisters with purified humid air and 2) evacuating, for several cycles with applied heat, before allowing the canister to evacuate overnight. The canister is filled a final time with purified humid air for analysis by PNNL Technical Procedure PNL-TVP-03[b], which is a modification of the U.S. Environmental Protection Agency (EPA) compendium Method TO-14. If the canister is verified as clean, free of TO-14 and unknown contaminants to a level of 5 parts per billion by volume (ppbv), the canister is evacuated to 5 mtorr, tagged, and stored for use in the field. Before sending the canisters out to the field for sampling, the canister vacuum is measured to determine if any leakage has occurred. If the vacuum has remained constant during storage, the canisters are prehumidified with 100 μL of distilled water and labeled with a field-sampling identification. Cleaned canisters stored more than 30 but less than 60 days are re-evacuated and rehumidified before use. If stored more than 60 days, the canisters are recleaned and validated before use.

D.2 Analytical Procedure

The SUMMA™ canister sample was analyzed according to PNNL Technical Procedure PNL-TVP-03, which is a modified version of EPA compendium Method TO-14. The method uses EnTech 7000 cryoconcentration systems interfaced with a 5972 Hewlett-Packard benchtop gas chromatograph/mass spectrometer (GC/MS). The EnTech concentrator is used to pull a metered volume of sample air from the SUMMA™ canister, cryogenically concentrate the air volume, then transfer the volume to the GC/MS for analysis. A 100-mL volume of sample is measured and analyzed from the tank headspace. The organic components in the sampled air are separated on an analytical column, J&W Scientific DB-1 phase, 60-m by 0.32-mm internal diameter with 3-μm film thickness. The GC oven is programmed to run a temperature gradient beginning at 40°C, hold for 5 min, and ramp at 4°C per min to a final temperature of 260°C, with a 5-min hold. Twenty-four hours before the analysis, the SUMMA™ canister samples were pressurized with purified air (supplied by Aadco Instruments, Inc., 1920 Sherwood St., Clearwater, Florida 34625). The starting pressure was first measured using a calibrated diaphragm gauge (Cole Parmer), then pressurized to a level exactly twice the original pressure. For example, if the canister had a starting pressure of 740 torr, it

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(a) Pacific Northwest Laboratory. 8/94. *Cleaning SUMMA™ Canisters and the Validation of the Cleaning Process*, PNL-TVP-02 (Rev. 0), PNL Technical Procedure, Richland, Washington.

(b) Pacific Northwest Laboratory. 2/95. *Determination of TO-14 Volatile Organic Compounds in Hanford Tank Headspace Samples Using SUMMA™ Passivated Canister Sampling and Gas Chromatographic-Mass Spectrometric Analysis*, PNL-TVP-03 (Rev. 1), PNL Technical Procedure, Richland, Washington.

was pressurized to 1480 torr. This dilution was an effort to improve the precision of the analysis. The sample dilution was taken into account when calculating the analysis results.

The instrument calibration mixture for the PNL-TVP-03 analysis consists of 67 compounds. For this comparison study, only the 12 compounds listed in Table D.1 were considered organic analytes of interest. An initial calibration and CCV was performed for methanol and ethanol. The low level standard (LLS) was used as the EQL for these compounds. Results below the LLS were not reported. It should be noted that these two compounds are not currently part of the operating procedure. Tributyl phosphate was not analyzed as a target compound, but was evaluated as a TIC. The calibration mixture was prepared by blending a commercially prepared TO-14 calibration mixture with a mixture created using a Kin-Tek® permeation-tube standard generation system. The operation of the permeation-tube system follows the method detailed in PNNL Technical Procedure PNL-TVP-06[a]. The standard calibration mix was analyzed using four aliquot sizes ranging from 30 mL to 200 mL, and a response factor for each compound was calculated. The GC/MS response for these compounds has been previously determined to be linearly related to concentration. Performance-based detection limits for the target analytes will be developed as a pool of calibration data becomes available.

Table D.1. Reported Organic Analytes of Interest

Methanol	Acetone
Ethanol	Acetonitrile
1-Butanol	Tetrahydrofuran
Dodecane	Hexane
Tridecane	Propanol
Tetradecane	Tributyl Phosphate (TBP)

D.3 Quality Assurance/Quality Control

Before the tank sample was analyzed, a diagnostic check was performed on the GC/MS instrument by running an instrument "high-sensitivity tune," as described in PNL-TVP-03. Upon satisfactory completion of the instrument diagnostic check, a blank volume of purified nitrogen was analyzed to check the cleanliness of the system. The instrument was then calibrated using a standard gas mixture containing 67 organic compounds. A gas mixture containing bromochloromethane, 1,4-difluorobenzene, chlorobenzene-d_5, and bromofluorobenzene was used as an internal standard (IS) for all blank, calibration standard, and sample analyses. Analyte responses from sample components, ISs, and standards were obtained from the extracted ion plot from their selected mass ion. The calibration was generated by calculating the relative response ratios of the IS to calibration standard responses and plotting the ratios against the ratio of the calibration-standard concentration (in ppbv) to

(a) Pacific Northwest Laboratory. 8/94. *Preparation of TO-14 Volatile Organic Compounds Gas Standards,* PNL-TVP-06 (Rev. 0). PNL Technical Procedure, Richland, Washington.

the IS concentration. Once it is determined that the relative response is linear with increasing concentration, an average response factor is calculated for each target analyte and used to determine the concentration of target compounds in each sample. Method blanks are analyzed before and after calibration standards and tank headspace samples are analyzed.

D.3.1 Quantitation Results of Target Analytes. The quantitative-analysis results for the target analytes were calculated using the average response factors generated using the IS method described above and in PNL-TVP-03. The conversion from ppbv to mg/m^3 assumes standard temperature and pressure (STP) conditions of 760 torr and 273K and was calculated directly from the following equation:

$$mg/m^3 = \frac{(ppbv/1000) \times g \text{ mol wt of compound}}{22.4 \text{ L/mol}} \qquad (D.1)$$

D.4 Volatile Organic Sample Results

Twenty-three SUMMA™ canisters consisting of 18 samples and 5 ambient air samples were returned to the laboratory on January 19 and 22, 1996, under WHC COC numbers 100006, 100009, and 100012. The majority of the samples were analyzed between March 4, 1996 through March 7, 1996.

The results from the GC/MS analysis of the tank headspace SUMMA™ samples are presented in Table D.2. The results of replicate analyses on single SUMMA™ canister samples are presented in Table D.3. The results of the blank sample analyses are presented in Table D.4. Appendix F contains a complete listing of all target analytes measured.

Table D.2 lists the quantitative results for 12 compounds selected for this tank comparison study. Six individual SUMMA™ canister samples were collected using the three different sampling methods. The individual compound values for each of the SUMMA™ canister results for each sampling method were averaged and a standard deviation (ST DEV) and % RSD value calculated. Methanol and acetonitrile were the most abundant compounds identified in each of the SUMMA™ canister samples. Tetrahydrofuran and tetradecane were not observed in any samples from Tank C-107. Tributyl phosphate was not observed as a TIC in any of the SUMMA™ canister samples. Based on the average values for each of the sampling methods, the highest concentrations of dodecane and tridecane were observed in the VSS samples. The highest concentration of methanol, ethanol, acetonitrile, acetone, propanol, hexane, and 1-butanol were observed in the ISVS samples without particulate filtration. Many of the differences in average concentration values may not be significant for the different sampling methods. The most notable differences in concentration between the different sampling methods occurred for 1-butanol. Concentrations of 1-butanol for the VSS samples were an order of magnitude lower than in the ISVS samples without particulate filtration. The 1-butanol concentrations in ISVS samples with particulate filtration were between the concentrations for VSS samples and ISVS samples without particulate filtration. These differences may have been caused by contamination from the tape used to wrap the sample bundles.

Single SUMMA™ canister samples were analyzed in replicate for each of the three different sampling methods. The relative percent differences (RPDs) were calculated and are presented in Table D.3. The RPDs were calculated for analytes detected above the IDL and found in both replicates.

Instrument detection limits, precision, and accuracy have not been experimentally evaluated for methanol and ethanol. Sample results are flagged with a less-than symbol (<) when the absolute number of nanograms calculated in the sample is less than the lowest concentration standard used in the initial calibration. Results below the LLS were not reported. Methanol and ethanol results falling within their calibration range are quantitative results as evidenced by a valid calibration and CCV for these compounds. It should be noted that these compounds are not currently part of the operating procedure.

The SUMMA™ canister samples were analyzed in four batches. The analytical sequence runs (batches) were as follows:

Batch #1 (file identifier 16030401.b) - S6002-A38.312, S6003-A54.317, S6003-A54.317 REP, S6001-A27.306, S6001-A15.304, S6002-A37.311, S6003-A59.322;

Batch #2 (file identifier 16030501.b) - S6003-A55.318, S6002-A47.315, S6002-A36.310, S6002-A47.315 REP, S6003-A56.319, S6001-A03.302, S6001-A16.305;

Batch #3 (file identifier 16030601.b) - S6001-A04.303, S6001-A28.307, S6001-A28.307 REP, S6002-A46.314, S6003-A57.320, S6002-A45.313, S6003-A58.321;

Batch #4 (file identifier 16030701.b) - S6001-A01.300, S6001-A02.301, S6002-A33.308, S6002-A34.309, S6003-A35.316.

The following discussion provides details regarding quality control (QC) criterion failures for each batch.

Batch #1:

1. Three target compounds (tridecane, tetradecane, and pyridine) were outside the ± 25% difference (% D) acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Pyridine and tetradecane were not found in the tank samples. Tridecane was found in tank samples at concentrations between the EQL and IDL except for two samples (A27.306 and A15.304 REP). Tridecane concentration values may be over or under estimated because of the failed CCV.

2. The 12-hour clock procedure criterion for the analytical sequence was exceeded by 19 minutes because WHC requested the sample analysis to be in pairs (VSS sample, ISVS sample with HEPA filtration, and ISVS sample without HEPA filtration) within a batch.

3. The internal standard quantification area for the first four samples after the CCV met the internal standard percent recovery acceptance criteria (50% < quantification area <200%). However, the second, third, and forth internal standards for the last four samples were outside (~5% less than the lower limit 50%) the internal standard acceptance criteria allowed by

procedure TVP-03, Rev. 1. Changes in the internal standard areas were caused by water induced instrument fatigue. This problem is routinely observed with the HP5972 GC/MS system because of its poor pumping capacity and the high water and ammonia content in these samples. Tridecane results which had positive hits for the last four samples were the only effected target compounds of major interest to WHC. This instrument fatigue problem will continue until a larger GC/MS is used in the analysis.

Batch #2:
1. Five target compounds (1,2,4-trichlorobenzene, trichlorofluoromethane, dodecane, tridecane, and tetradecane) were outside the ± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Tetradecane and 1,2,4-trichlorobenzene were not found in the tank samples. Trichlorofluoromethane, dodecane, and tridecane were found in tank samples at concentrations between the EQL and IDL. Trichlorofluoromethane, dodecane, and tridecane concentration values may be over or under estimated because of the failed CCV.

2. The 12-hour clock procedure criterion for the analytical sequence was exceeded by 30 minutes because WHC requested the sample analysis to be in pairs (VSS sample, ISVS sample with HEPA filtration, and ISVS sample without HEPA filtration) within a batch.

Batch #3:
1. Five target compounds (trichlorofluoromethane, pentane, chloromethane, tridecane, tetradecane) were outside the ± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Pentane, chloromethane and tetradecane were not found in the tank samples. Trichlorofluoromethane and tridecane were found in tank samples at concentrations between the EQL and IDL except for tridecane in three samples (A04.303, A28.307, A28.3-7 REP). Trichlorofluoromethane and tridecane concentration values may be over or under estimated because of the failed CCV.

2. The 12-hour clock procedure criterion for the analytical sequence was exceeded by 34 minutes because WHC requested the sample analysis to be in pairs (VSS sample, ISVS sample with HEPA filtration, and ISVS sample without HEPA filtration) within a batch.

3. The internal standard quantification area for the first three and last samples after the CCV met the internal standard percent recovery acceptance criteria (50% < quantification area <200%); however, the third and forth internal standards for the middle four samples were outside (4% less than the lower limit 50%) the internal standard acceptance criteria allowed by procedure TVP-03, Rev. 1. Changes in the internal standard areas were caused by water induced instrument fatigue. This problem is routinely observed with the HP5972 GC/MS system because of its poor pumping capacity and the high water and ammonia content in these samples. Dodecane and tridecane results which had positive hits for the middle four samples were the only effected target compounds of major interest to WHC. This instrument fatigue problem will continue until a larger GC/MS is used in the analysis.

Batch #4:
Three target compounds (trichlorofluoromethane, tridecane, tetradecane) were outside the

± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Trichlorofluoromethane, tridecane, and tetradecane were not found in the tank samples.

Table D.2 SUMMA™ Sample Analysis Results for Samples Collected from the Headspace of Tank C-107 on 1/17/96

VSS Truck Samples	METHANOL (ppbv)		ETHANOL (ppbv)		ACETONITRILE (ppbv)	ACETONE (ppbv)	PROPANOL (ppbv)	TETRAHYDROFURAN (ppbv)	HEXANE (ppbv)		1-BUTANOL (ppbv)		DODECANE (ppbv)		TRIDECANE (ppbv)		TETRADECANE (ppbv)	TBP (ppbv)
A03.302	1127	Y	66	Y	889	603	8.6	U	0.7	J	5.0		5.7	J	3.5	J	U	Z
A04.303	887	Y	47	Y	695	469	7.2	U	0.8	J	4.4	J	5.9	J	4.6		U	Z
A15.304	1205	Y	73	Y	976	683	11	U	U		6.3		8.3		6.5		U	Z
A16.305	1233	Y	67	Y	879	600	9.1	U	0.7	J	6.3		5.6	J	3.1	J	U	Z
A27.306	1130	Y	66	Y	967	661	8.8	U	U		5.4		7.3		5.5		U	Z
A28.307	1296	Y	77	Y	1025	688	10	U	0.7	J	4.8		6.7		4.9		U	Z
Average	**1146**	Y	**66**	Y	**905**	**617**	**9**		**0.7**	J	**5.4**		**6.6**	J	**4.7**			
ST DEV	**142**		**10**		**117**	**82**	**1**		**0.0**		**0.8**		**1.1**		**1.3**			
% RSD	**11**		**15**		**12**	**13**	**15**		**7**		**15**		**18**		**29**			
ISVS with HEPA																		
A36.310	1037	Y	67	Y	802	559	8.5	U	2.7	J	23		4.4	J	2.6	J	U	Z
A37.311	1274	Y	92	Y	929	628	12	U	3.4	J	47		5.4	J	3.2	J	U	Z
A38.312	1151	Y	86	Y	754	510	14	U	3.1	J	29		4.2	J	2.9	J	U	Z
A45.313	1220	Y	78	Y	878	600	12	U	0.7	J	10		5.1	J	3.0	J	U	Z
A46.314	1346	Y	91	Y	932	640	13	U	0.9	J	13		5.4	J	2.9	J	U	Z
A47.315	1050	Y	73	Y	796	536	13	U	1.0	J	13		4.5	J	3.2	J	U	Z
Average	**1180**	Y	**81**	Y	**849**	**579**	**12**		**2.0**	J	**23**		**4.8**	J	**3.0**	J		
ST DEV	**123**		**10**		**75**	**52**	**2**		**1.2**		**14.0**		**0.5**		**0.2**			
% RSD	**10**		**12**		**9**	**9**	**16**		**61**		**58**		**11**		**7**			
ISVS *without* HEPA																		
A54.317	1189	Y	102	Y	881	590	14	U	8.5		80		5.5	J	3.2	J	U	Z
A55.318	943	Y	79	Y	639	434	13	U	7.4		89		U		2.9	J	U	Z
A56.319	1227	Y	101	Y	910	634	12	U	5.1		37		3.7	J	2.4	J	U	Z
A57.320	1360	Y	111	Y	983	671	15	U	8.1		60		5.8	J	3.2	J	U	Z
A58.321	1351	Y	111	Y	973	673	14	U	8		78		5.4	J	2.6	J	U	Z
A59.322	1319	Y	110	Y	1080	726	14	U	7.6		97		6.3	J	3.4	J	U	Z
Average	**1232**	Y	**102**	Y	**911**	**621**	**14**		**7.5**		**73**		**5.3**	J	**3.0**	J		
ST DEV	**157**		**12**		**150**	**102**	**1**		**1.2**		**22**		**1.0**		**0.4**			
% RSD	**12**		**11**		**15**	**15**	**8**		**19**		**33**		**21**		**14**			

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

Z TBP was analyzed as a TIC; however, was not identified in the sample.

Table D.3 Replicate Analysis of SUMMA™ Canisters for Samples Collected from the Headspace of Tank C-107 on 1/17/96

VSS Truck Samples	METHANOL (ppbv)		ETHANOL (ppbv)		ACETONITRILE (ppbv)	ACETONE (ppbv)	PROPANOL (ppbv)	TETRAHYDROFURAN (ppbv)	HEXANE (ppbv)		1-BUTANOL (ppbv)	DODECANE (ppbv)		TRIDECANE (ppbv)		TETRADECANE (ppbv)	TBP (ppbv)
A28.307	1296	Y	77	Y	1025	688	10	U	0.7	J	4.8	6.7		4.9		U	Z
A28.307 REP	1269	Y	79	Y	932	636	12	U	0.7	J	5.8	U		4.5		U	Z
Relative Percent Difference	2		3		10	8	20		0		19			9			
ISVS with HEPA																	
A47.315	1050	Y	73	Y	796	536	13	U	1.0	J	13	4.5	J	3.2	J	U	Z
A47.315 Rep	1065	Y	64	Y	849	571	7	U	1.0	J	8.6	5.6	J	3.3	J	U	Z
Relative Percent Difference	1		13		6	6	58		0		44	22		3			
ISVS without HEPA																	
A54.317	1189	Y	102	Y	881	590	14	U	8.5		80	5.5	J	3.2	J	U	Z
A54.317 Rep	1160	Y	96	Y	917	620	12	U	8.6		70	6.3	J	3.6	J	U	Z
Relative Percent Difference	2		6		4	5	13		1		13	14		12			

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

Z TBP was analyzed as a TIC; however, was not identified in the sample.

Table D.4 SUMMA™ Blank Sample Analysis Results for Samples Collected from the Headspace of C-107 on 1/17/96

Blank Samples	METHANOL (ppbv)		ETHANOL (ppbv)		ACETONITRILE (ppbv)	ACETONE (ppbv)		PROPANOL (ppbv)	TETRAHYDROFURAN (ppbv)	HEXANE (ppbv)		1-BUTANOL (ppbv)		DODECANE (ppbv)	TRIDECANE (ppbv)		TETRADECANE (ppbv)		TBP (ppbv)
Upwind Ambient	77	Y	< 13	Y	U	16		U	U	U		0.9	J	U	U		U		Z
Upwind Through VSS	116	Y	< 13	Y	U	33		U	U	U		1.8	J	U	U		U		Z
Bundle A W/HEPA	132	Y	< 13	Y	U	26		U	U	1.8	J	44		U	U		U		Z
Bundle B W/HEPA	127	Y	< 13	Y	U	35		U	U	U		3.9	J	U	U		U		Z
Bundle C WO/HEPA	43	Y	< 13	Y	U	21		U	U	U		U		U	U		U		Z
Lab Control BLK	< 19	Y	< 13	Y	U	1.5	J	U	U	U		0.4	J	U	0.2	J	0.5	J	Z

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

Z TBP was analyzed as a TIC; however, was not identified in the sample.

< Denotes compound not detected at or above the LLS.

Appendix E

Tank Vapor Characterization:

Organic Compounds from Triple Sorbent Traps

Appendix E

Tank Vapor Characterization: Organic Compounds from Triple Sorbent Traps

E.1 Sampling Methodology

Samples are collected on Supelco 300 graphite-based triple sorbent traps (TSTs). Before field deployment, each trap is heated to 380°C under inert gas flow for a minimum of 60 min. Tubes are prepared in batches with each tank sampling job constituting one batch. One tube is selected from each batch and run immediately to verify cleanliness. All remaining tubes in the batch receive equal amounts of three surrogate compounds (hexafluorobenzene, toluene-d8, and bromobenzene-d5). One per batch tube is run immediately to verify successful addition of surrogate spikes to that batch. Tubes are then placed in individually labeled plastic shipping tubes (Supelco TD^3), which are sealed with gasketed end caps, thus providing a rugged, headspace-free shipping and storage medium. As a precautionary measure, sample tubes are kept in refrigerated storage before and after sampling.

E.2 Analytical Procedure

The Supelco 300 tubes were analyzed according to Pacific Northwest National Laboratory (PNNL) Technical Procedure PNL-TVP-10[(a)], with the exceptions noted in Section E.4. The method employs Supelco Carbotrap™ 300 traps for sample collection and preconcentration. The traps are ground-glass tubes (11.5 cm long X 6 mm OD, 4 mm ID) containing a series of sorbents arranged in order of increasing retentivity. Each trap contains 300 mg of Carbotrap™ C, 200 mg of Carbotrap™ B, and 125 mg of Carbosieve™ S-III. The first two sorbents are deactivated graphite with limited sorption power for less volatile compounds. The final trapping stage, the Carbosieve™ S-III, is a graphetized molecular sieve used to retain the most volatile components, including some permanent gases such as Freon-12. Following sample collection and addition of internal standard (IS), the traps are transferred to a Dynatherm ACEM 900 thermal desorber unit for analysis. The trap on the ACEM 900 is then desorbed by ballistic heating to 350°C with the sample then transferred to a smaller focusing trap. A 10:1 split is used during the transfer with 10% of the sample analyzed and the rest retained for reanalysis. The split sample collected on a second identical Carbotrap™ 300 trap is used for repeat analysis on at least one sample per batch. Since the IS also follows the same path, quantitation may be performed directly on the repeat run without changing the calibration. Following desorption from the Carbotrap™ 300 trap, the analyte is transferred to a long, thin focusing trap filled with the same type of trapping materials as the Carbotrap™ 300 traps and in approximately the same ratios. The purpose of the focusing trap is to provide an interface to a capillary gas chromatograph (GC) column, which may be thermally desorbed at a helium (He) flow rate compatible with the column and mass spectrometry (MS) interface (1.2 mL/min). The focusing trap is ballistically heated to thermally desorb components onto a capillary GC column. The column is subsequently temperature programmed to separate the method analytes, which are then detected by MS.

(a) Pacific Northwest Laboratory. 2/96. *Determination of Volatile Organic Compounds in Hanford Waste Tank Headspace Samples Using Triple Sorbent Trap Sampling and Gas Chromatograph-Mass Spectrometer Analysis*, PNL-TVP-10 (Rev. 2), PNL Technical Procedure, Richland, Washington.

The instrument calibration mixture for the TST analysis consists of 65 compounds. For this comparison study, only the 12 compounds listed in Table E.1 were considered organic analytes of interest. An initial calibration was performed for methanol and ethanol; however, a CCV was *not* performed. Therefore, concentrations reported are considered estimated for these compounds. The methanol and ethanol LLS was used as the EQL. Results below the LLS were not reported. The calibration mixture is prepared in common with the mixture used for the SUMMA™ analysis (see Section D.2). The standard calibration mix was analyzed using 4 aliquot sizes ranging from 100 mL to 1200 mL, and a response factor for each compound was calculated. Volumes of standard added to the traps are measured by pressure difference on a SUMMA™ canister of known volume. The GC/MS response for these compounds has been previously determined to be linearly related to concentration. Performance-based detection limits for the target analytes will be developed as a pool of calibration data becomes available.

Table E.1. Reported Organic Analytes of Interest

Methanol	*Acetone*
Ethanol	*Acetonitrile*
1-Butanol	Tetrahydrofuran
Dodecane	Hexane
Tridecane	Propanol
Tetradecane	Tributyl Phosphate (TBP)

NOTE: Compounds shown in italics have an exceptionally high volatility. They are routinely included in the standard and are quantified, but have a restricted linear dynamic range because of the potential for trap breakthrough.

E.3 Quality Assurance/Quality Control

Before the tank sample was analyzed, a diagnostic check was performed on the GC/MS instrument by running a full auto tune, as described in PNL-TVP-10. Upon satisfactory completion of the instrument diagnostic check, a blank tube was analyzed to check the cleanliness of the system. The instrument was then calibrated using a 300-mL volume of standard gas mixture containing 12 compounds shown in Table E.1. A gas mixture containing difluorobenzene, chlorobenzene-d_5, and 1,4 bromofluorobenzene was used as an IS for all calibration standard and sample analyses. Analyte responses from sample components, ISs, and standards were obtained from the extracted ion plot from their selected mass ion. A continuing calibration was generated by calculating the relative response ratios of the IS to calibration standard responses and plotting the ratios against the ratio of the calibration-standard concentration (in ppbv) to the IS concentration. Once it is determined that the relative response is linear with increasing concentration, an average response factor is calculated for each target analyte and used to determine the concentration of target compounds in each sample.

E.3.1 Quantitation Results of Target Analytes. The quantitative-analysis results for the target analytes were calculated directly from the calibration curve generated using the IS method described above and in PNL-TVP-10. It should be noted that the relative response factor value for tetrachloroethylene, 1-2-dibromoethane, and toluene were calculated using the first IS, not the second IS, which is nearest in retention time to these compounds. The second IS will be used to calculate the relative response factor for these compounds for subsequent analyses. The conversion from ppbv to

mg/m^3 assumes STP conditions of 760 torr and 273K and was calculated directly from the following equation:

$$mg/m^3 = \frac{(ppbv/1000) \times g \text{ mol wt of compound}}{22.4 \text{ L/mol}} \quad (E.1)$$

E.4 Triple Sorbent Trap Volatile Organic Sample Results

Twenty-six TSTs consisting of 18 samples, 6 field blanks, and 2 trip blanks were returned to the laboratory on January 19, 1996, under WHC COC numbers 100007, 100010, and 100013. The majority of the samples were analyzed between February 6, 1996 through February 13, 1996.

The results from the GC/MS analysis of the tank headspace TST samples are presented in Table E.2. The results of replicate analyses on TST samples are presented in Table E.3. The results of the blank sample and tape analyses are presented in Table E.4. Appendix F contains a complete listing of the 66 target analytes measured.

Table E.2 lists the quantitative results for 12 compounds selected for this tank comparison study. Six individual TST samples were collected for each of the three different sampling methods. The individual compound values for each of the TST samples for each sampling method were averaged and a ST DEV and % RSD value calculated. Methanol and acetonitrile were the most abundant compounds identified in each of the trap samples. Tetrahydrofuran and TBP were not observed in any samples from Tank C-107. Based on the average values for each of the sampling methods, the highest concentrations of acetonitrile, acetone, propanenitrile, dodecane, tridecane, and tetradecane were observed in the VSS samples. The highest concentrations of methanol and propanol were observed in the ISVS samples with particulate filtration. The highest concentrations of ethanol, hexane, and 1-butanol were observed in the ISVS samples without particulate filtration. Many of the differences in average concentration values may not be significant for the different sampling methods. The most notable differences in concentration between the different sampling methods occurred for hexane and 1-butanol. Hexane and 1-butanol concentrations for the VSS samples were an order of magnitude lower than in the ISVS samples without particulate filtration. The concentrations of the ISVS samples with particulate filtration were between the concentrations for VSS samples and ISVS samples without particulate filtration. These differences may have been caused by contamination from the tape used to wrap the sample bundles.

Triple sorbent trap samples were analyzed in replicate for each of the three different sampling methods. The RPDs were calculated and presented in Table E.3. The RPDs were calculated for analytes detected above the IDL and found in both replicates.

The results of the blank analyses are reported in Table E.4. The results indicated significant contamination of the TST samples may have been caused by the tape used to seal the bundles. Compounds observed in the blank samples included but were not limited to methanol, 1-butanol, hexane, heptane, methyl hexane, and methyl cyclohexane. The source of the problem was traced to the abundant use of plastic adhesive tape (3M Scotch Brand 471) to bind the in situ bundle during insertion into the tank. Analysis of a piece of the tape from the same roll used for the sampling job confirmed this supposition. A clean TST was exposed to the tape adhesive for 1 hour and analyzed by standard protocols during routine analysis of C-107 samples. The resulting chromatogram and mass spectral identification showed a good pattern match to many of the compounds seen at similarly high levels in the ISVS samples.

Triple sorbent trap samples were analyzed under the protocols of TVP-10, Rev. 2, with initial calibration performed on January 17, 1996, and quantitated against CCVs run at the beginning of each batch for the target compounds listed in the method. Minor QC problems encountered during the course of the work are noted in daily case narratives.

Instrument detection limits, precision, and accuracy have not been experimentally evaluated for methanol, ethanol and TBP. Sample results are flagged with a less-than symbol (<) when the absolute number of nanograms calculated in the sample is less than the lowest concentration standard used in the initial calibration. Results below the LLS were not reported. Methanol, ethanol and tributyl phosphate results falling within their calibration range are considered estimates. It should be noted that these compounds are not a part of the current operating method.

The TST samples were analyzed in six batches. The analytical sequence runs (batches) were as follows:

Batch 2/6/96 (file identifier 46020601.b) - S6001-A11.780, S6001-A12.781, S6002-A77.799, S6002-A81.800, S6003-A83.801, S6003-A84.803;

Batch 2/7/96 (file identifier 46020701.b) - S6001-A13.782, S6001-A14.783;

Batch 2/8/96 (file identifier 46020801.b) - S6003-A60.791, S6001-A10.778, S6002-A40.785, S6003-A62.794, S6001-A07.775, S6001-A07.775 REP;

Batch 2/9/96 (file identifier 46020901.b) - S6001-A09.777, S6002-A49.789, S6002-A41.786, S6003-A64.797, S6003-A64.797 REP;

Batch 2/12/96 (file identifier 46021201.b) - S6002-A48.788, S6001-A08.776, S6003-A65.798, S6002-A50.790, S6002-A50.790, S6003-A66.792;

Batch 2/13/96 (file identifier 46021301.b) - S6001-A10.778 REANALYSIS, S6001-A09.777 REANALYSIS, S6001-A08.776 REANALYSIS, S6001-A05.773, S6003-A63.796, S6001-A06.774, S6002-A39.784;

Batch 3/4/96 (file identifier 46030401.b) - S6001-A05.773 REANALYSIS, S6001-A06.774 REANALYSIS.

The following discussion provides details regarding QC criterion failures for each batch.

Batch 2/6/96:
Three target compounds (tridecane, tetradecane, pyridine) were outside the ± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Pyridine, tetradecane and tridecane were not found in the tank samples with the exception of tetradecane in sample S6001-A11.780 at a concentration between the EQL and IDL. Tetradecane concentration values may be over or under estimated because of the failed CCV.

Batch 2/7/96:
Four target compounds (cis-1,2,dichloroethene, acetone, decane, and tetradecane) were outside the ± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Decane,

cis-1,2,dichloroethene, and tetradecane were not found in the tank samples. Acetone was found in tank samples at concentrations between the EQL and IDL. Acetone concentration values may be over or under estimated because of the failed CCV.

The internal standard quantification area for samples after the CCV were outside the internal standard percent recovery acceptance criteria (50% < quantification area <200%); however, the responses for the samples were more typical and data quality should be satisfactory since surrogate recoveries were satisfactory and the samples were field blanks and were essentially nondetects.

Batch 2/8/96:
One target compound (tetradecane) was outside the ± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Tetradecane was not found in the tank samples.

The internal standard quantification area for the samples after the CCV did not meet the internal standard percent recovery acceptance criteria (50% < quantification area <200%); however, the responses for the continuing calibration blank and the samples were more typical and data quality should be considered acceptable since surrogate recoveries were satisfactory.

One VSS sample, A10.778, required reanalysis due to deterioration of chromatogram quality primarily affecting the early eluting compounds. The sample archived on the split tube was rerun on February 13, 1996 with fully satisfactory chromatographic resolution.

Batch 2/9/96:
Two target compounds (pyridine, tetradecane) were outside the ± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Pyridine and tetradecane were not found in the tank samples.

One VSS sample, A09.777, required reanalysis due to deterioration of chromatographic quality primarily affecting the early eluting compounds. The sample split tube was rerun on February 13, 1996 with fully satisfactory chromatographic resolution.

Batch 2/12/96:
Three target compounds (pyridine, tridecane, tetradecane) were outside the ± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Pyridine was found in two tank samples (S6001-A08.776 and S6003-A65.798) at concentrations between the EQL and IDL. Tridecane and tetradecane were found in tank samples at concentrations between the EQL and IDL. Pyridine, tridecane and tetradecane concentration values may be over or under estimated because of the failed CCV.

One VSS sample, A08.776, required reanalysis due to deterioration of chromatographic quality primarily affecting the early eluting compounds. The sample split tube was rerun on February 13, 1996 with fully satisfactory chromatographic resolution.

Batch 2/13/96:
The initial CCV for this batch was marginally satisfactory for all compounds with the exception of dichlorofluoromethane, chloromethane, pyridine, cyclohexanone, dodecane, tridecane, and tetradecane which were outside the ± 25% D acceptance criteria; however, the CCV passed the

procedural criterion requiring ± 25% D passage for 85% of all target compounds. Following the analysis of two samples (4621303 and 46021304), a supervisory decision was made to terminate the sequence and recalibrate. Because the sequence was accidentally terminated at that point, the 46021304 sample sequence was not completely analyzed. That sample was a rerun of 46020903 which had shown poor chromatographic performance for early eluting compounds but satisfactory performance for the remainder of the chromatogram. Results from the two runs were combined using all compounds eluting later than the first internal standard from the first run to recover information. A new autotune and bromofluorobenzene check were performed following the sequence shutdown. The second CCV showed far better performance with only acetone, pyridine, and decane slightly outside the ± 25% D acceptance criteria. Dichlorofluoromethane, chloromethane, pyridine, cyclohexanone, and tetradecane were not found in the first two tank samples (S6001-A10.778 REANALYSIS and S6001-A09.777 REANALYSIS), however dodecane and tetradecane were found at concentrations between the EQL and IDL. These compounds may be over or under estimated due to the failed CCV. Acetone was found in all the tank samples after the second CCV. Pyridine was found at a concentration between the EQL and IDL for samples S6001-A08.776 REANALYSIS, S6001-A05.773, and S6001-A06.774. The concentration values of the compounds identified may be over or under estimated due to the failed CCV.

Two VSS samples, A05.773 and A06.774, required reanalysis due to deterioration of chromatographic quality primarily affecting the early eluting compounds. The sample split tube was rerun on March 4, 1996 with fully satisfactory chromatographic resolution.

Batch 3/4/96:
The initial CCV for this batch was unsatisfactory therefore a reprepared CCV was run. The second CCV provided far better performance with the exception of four target compounds (pyridine, decane, tridecane, and tetradecane) which were outside the ± 25% D acceptance criteria for the CCV; however, the CCV passed the procedural criterion requiring ± 25% D passage for 85% of all target compounds. Pyridine, decane, tridecane, and tetradecane were found in all tank samples at concentrations between the EQL and IDL. The concentration values of the compounds identified may be over or under estimated due to the failed CCV.

Several issues associated with the data generated are discussed below.

Sample Handling Nonconformance:
Three sample handling issues were identified with Bundle C, Tank C-107, Sample Job S6003. The first two were noticed in the field and were documented on the COC forms. The third issue was noticed upon inspection of the samples at PNNL prior to analysis. Nonconformance Report #PNL-96-003 was generated as a result of these discrepancies, and WHC was notified on February 2, 1996.

Issue 1: The clamps on the C-flex tubes connected to all TST samples and blanks from Bundle C were loose. The issue was discovered at 1440 hours on January 17, 1996 and it is presumed that the clamps popped open while being sleeved at about 0930 hours on January 17, 1996. This time period was before samples were taken from Tank C-107. The potential impact on the analytical results is not known.

Issue 2: The Teflon inlet piece of Bundle C was observed by field personnel to have been cleaned with "Quick and Bright" after sampling. The cleaning solution was sprayed on a wipe and used to clean the inlet piece prior to disassembly when the TST and

NH_3/H_2O sample inlets were open and very close to the surface being cleaned. Based on the composition of the cleaning solution, it is not obvious whether or not this activity had an effect on analytical results.

Issue 3: All TST samples and field blanks from Bundle C were found upon inspection in the laboratory to have slightly loose end caps. The caps should have been sealed tightly. The potential for this to have had any effect on the samples is unknown.

Field and Trip Blanks:
All field samples (VSS, ISVS, and trip blanks) contained moderately high and variable amounts of 1-chloro- 1,1-difluoroethane. This compound has appeared persistently in all samples sent to the field through January 26, 1996. It is believed to be a fugitive refrigerant. This material is never present in tubes archived for a similar amount of time in the 326 Vapor Laboratory or 329 Building temporary storage. The origin of the material is unclear, but, since it has shown up in trip blanks (including those from this tank run), as well as field blanks, the most likely candidate is one of the refrigerators used for interim storage during sampling and radiological screening. It is worth noting, however, that the third tank job in the comparison study (S-102) performed on January 26, 1996, prior to the analysis of the C-107 samples did not show any evidence of this material indicating that either some change in sample storage protocol had occurred or the leak had been fixed (or the source exhausted).

Passive Sampling:
Since the ISVS samples are physically exposed to the tank vapor for some time prior to actual sample collection and removal, some amount of passive sampling by diffusion is to be expected. The problem becomes progressively worse with decreasing sample size. In order to preserve dynamic range, a relatively small sample volume (200 ml nominal) was requested for all three sampling jobs. Because of the relative lack of target detects in C-107 combined with the blank problems from the tape, the passive sampling effect is difficult to accurately assess. Since acetonitrile was relatively high in the tank and was not present in emissions from the tape, that compound provides the best estimate of passive sampling. Passive sampling under the conditions used for C-107 is estimated to contribute 2 to 3% for that compound but may vary with compound diffusion properties. Sampling should be performed as promptly as possible following insertion of the sampling bundle into the tank to minimize passive sampling associated errors.

Water Loading:
One of the advantages of the TST method has typically been a relatively high tolerance to water vapor in the sampling process. Because of the small physical size of the traps, water retention is normally low at the outset and much of the remaining adsorbed water is stripped off during the preliminary dry purge performed during analysis. In past work water loading problems have not been observed; however, during the analysis of the C-107 VSS samples serious water loading problems were encountered requiring reanalysis of five of the six VSS samples. For those samples, the early eluting compounds showed serious chromatographic degradation. Methanol and ethanol were completely absent from the chromatograms and major peak shape distortion was seen for acetone and acetonitrile. All later eluting compounds showed normal behavior. Samples exhibiting this effect were rerun at a later time using the 90% split archive sample from the initial run. Apparently the split process is adequate to provide a satisfactory secondary water removal process.

Tank C-107 is known to currently be at a somewhat higher than average temperature and thus has a higher than normal absolute humidity in the tank headspace. The abnormally high

humidity in the tank is likely to be at least partially responsible for the problem, but it is still not clear why five of the six VSS samples were affected while none of the ISVS samples were affected.

Methanol, Ethanol, and TBP:
Because of problems with a lengthy procurement process, no standards were available for methanol and ethanol in the CCV at the time the samples were run and those compounds are not currently included in PNL-TVP-10. Those compounds were initially evaluated as TICs, however, it is clear that quantitation of those compounds as TICs produces an unacceptably large error for the purposes of the comparison study. Commercially calibrated vapor permeation tubes were obtained for methanol and ethanol at the end of February and added to the Kin-Tec vapor standard generation system. A new initial calibration was prepared and run on March 1, 1996. All data from C-107 was placed in a separate batch file and batch reprocessed for quantitation of methanol and ethanol as targets using the March 1, 1996, initial calibration rather than CCVs as per standard protocol. Since the calibration mixture using internal standard (IS) from the same batch was used for sample analysis and similar response was obtained, this procedure should be valid.

In addition to the methanol and ethanol, the compound sub-list used for batch processing also included TBP processed as a target using calibrated retention time and response factors determined on October 5, 1995. Response factors were taken from a six point linear calibration curve prepared from dilutions of the neat material in methanol and injected directly onto the ends of the traps. The same lot of IS was used for this calibration as for the later sample analysis discussed here. Response factors determined on October 5, 1995 were manually entered into the method so that a single processing could be used. Full performance data have not been determined for TBP. Based on the relatively high response factor obtained, it is clear that instrument response and thus detectability for TBP is excellent. An IDL of 2 ng (0.8 ppbv in 200 ml) was assumed based on comparison with other species with similar response factors. That number should be conservative. Tributyl phosphate was not observed in any sample using any of the three sampling methods.

Volumetric Flow Correction:
Since sample volumes reported from the field are based on two different calibration temperatures (21°C for ISVS and 0°C for VSS) a correction has been included in the reported data to provide a common volumetric basis. All ISVS volumes were corrected to 0°C for inclusion in the final data calculations reported for the TST samples.

Table E.2 Triple Sorbent Trap Sample Analysis Results for Samples Collected from the Headspace of Tank C-107 on 1/17/96

VSS Truck Samples	METHANOL (ppbv)		ETHANOL (ppbv)	ACETONITRILE (ppbv)	ACETONE (ppbv)	PROPANOL (ppbv)		TETRAHYDROFURAN (ppbv)	HEXANE (ppbv)		1-BUTANOL (ppbv)		DODECANE (ppbv)		TRIDECANE (ppbv)		TETRADECANE (ppbv)		TBP (ppbv)	
A10.778	1700	Y	246	696	300	16	J	U	0.9	J	8.3	J	5.5	J	4.0	J	0.9	J	< 0.8	Y
A09.777	1446	Y	251	710	355	16	J	U	0.9	J	7.2	J	4.7	J	3.7	J	0.9	J	< 0.8	Y
A07.775	2291	Y,E	319	790	374	28		U	0.9	J	8.2	J	4.8	J	U		U		< 0.8	Y
A08.776	1714	Y	219	684	276	15	J	U	0.6	J	7.7	J	4.6	J	3.4	J	0.9	J	< 0.8	Y
A06.774	1004	Y	179	532	294	17		U	1.3	J	6.3	J	6.8	J	6.4	J	6.6	J	< 0.8	Y
A05.773	904	Y	161	551	278	24		U	1.2	J	11	J	6.7	J	5.9	J	6.1	J	< 0.8	Y
Average	**1510**	**Y**	**229**	**661**	**313**	**19**	**J**	**U**	**1.0**	**J**	**8.1**	**J**	**5.5**	**J**	**4.7**	**J**	**3.1**	**J**	**< 0.8**	**Y**
ST DEV	**513**		**57**	**100**	**41**	**5.2**			**0.3**		**1.6**		**1.0**		**1.4**		**3.0**			
% RSD	**37**		**27**	**16**	**14**	**30**			**24**		**18**		**18**		**30**		**97**			
ISVS with HEPA																				
A40.785	2026	Y	376	651	207	24		U	35		116		4.9	J	U		U		< 0.8	Y
A49.789	1743	Y	318	651	231	21	J	U	35		85		4.6	J	5.2	J	1.4	J	< 0.8	Y
A48.788	1567	Y	275	558	233	25		U	23		50		4.0	J	5.6	J	1.6	J	< 0.8	Y
A41.786	1795	Y	363	578	236	20	J	U	38		175		3.8	J	4.5	J	1.1	J	< 0.8	Y
A50-790	1347	Y	168	656	249	26		U	22		67		3.7	J	4.6	J	1.1	J	< 0.8	Y
A39.784	1501	Y	240	490	174	17	J	U	43		180		2.8	J	2.9	J	0.7	J	< 0.8	Y
Average	**1663**	**Y**	**290**	**597**	**222**	**22**	**J**	**U**	**33**		**112**		**4.0**	**J**	**4.5**	**J**	**1.2**	**J**	**< 0.8**	**Y**
ST DEV	**241**		**79**	**67**	**27**	**3.4**			**8.3**		**55**		**0.7**		**1.0**		**0.3**			
% RSD	**13**		**25**	**11**	**11**	**15**			**26**		**49**		**17**		**22**		**29**			
ISVS without HEPA																				
A60.791	1558	Y	371	496	199	25		U	137		258		5.4	J	U		U		< 0.8	Y
A62.794	1073	Y	311	480	183	21		U	110		208		5.6	J	U		U		< 0.8	Y
A64.797	1186	Y	308	478	225	20	J	U	136		463		4.8	J	3.7	J	0.7	J	< 0.8	Y
A65.798	1341	Y	397	488	204	23		U	137		503		5.0	J	3.7	J	0.7	J	< 0.8	Y
A66.792	1139	Y	< 133	515	195	21		U	112		232		5.4	J	3.9	J	0.6	J	< 0.8	Y
A63.796	1141	Y	329	470	207	25		U	79		339		4.5	J	3.2	J	0.4	J	< 0.8	Y
Average	**1240**	**Y**	**343**	**488**	**202**	**22**		**U**	**119**		**334**		**5.1**	**J**	**3.6**	**J**	**0.6**	**J**	**< 0.8**	**Y**
ST DEV	**180**		**39.2**	**16**	**14**	**2.3**			**23**		**124**		**0.4**		**0.3**		**0.1**			
% RSD	**13**		**11**	**3**	**8**	**10**			**19**		**37**		**8**		**7**		**21**			

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

E Target compound exceeds upper quantification limit (UQL).

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

< Denotes compound not detected at or above the LLS.

Table E.3 Replicate Analysis of Triple Sorbent Trap Samples Collected from the Headspace of Tank C-107 on 1/17/96

VSS Truck Samples	METHANOL (ppbv)	ETHANOL (ppbv)	ACETONITRILE (ppbv)	ACETONE (ppbv)	PROPANOL (ppbv)	TETRAHYDROFURAN (ppbv)	HEXANE (ppbv)	1-BUTANOL (ppbv)	DODECANE (ppbv)	TRIDECANE (ppbv)	TETRADECANE (ppbv)	TBP (ppbv)
A07.775	2291 Y,E	319 Y	790	374	28	U	0.9 J	8.2 J	4.8 J	U	U	< 0.8 Y
A07.775 Rep	2258 Y,E	276 Y	770	372	19 J	U	0.7 J	4.8 J	4.7 J	U	U	< 0.8 Y
Relative Percent Difference	1	14	3	1	36		29	52	0			
ISVS with HEPA												
A50.790	1347 Y	168 Y	656	249	26	U	22	67	3.7 J	4.6 J	1.1 J	< 0.8 Y
A50.790 Rep	1666 Y	278 Y	637	247	23	U	22	52	3.8 J	4.2 J	1.2 J	< 0.8 Y
Relative Percent Difference	21	49	3	1	12		1	26	2	10	7	
ISVS without HEPA												
A64.797	1186 Y	308 Y	478	225	20 J	U	136	463	4.8 J	3.7 J	0.7 J	< 0.8 Y
A64.797 Rep	1426 Y	280 Y	472	237	18 J	U	135	377	4.9 J	3.6 J	0.6 J	< 0.8 Y
Relative Percent Difference	18	10	1	5	11		1	20	1	2	14	

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

E Target compound exceeds upper quantification limit (UQL).

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

< Denotes compound not detected at or above the LLS.

Table E.4 Triple Sorbent Trap Blank Sample Analysis Results for Samples Collected from the Headspace of Tank C-107 on 1/17/96

Blank Samples	METHANOL (ppbv)		ETHANOL (ppbv)		ACETONITRILE (ppbv)		ACETONE (ppbv)		PROPANOL (ppbv)		TETRAHYDROFURAN (ppbv)	HEXANE (ppbv)	1-BUTANOL (ppbv)		DODECANE (ppbv)	TRIDECANE (ppbv)	TETRADECANE (ppbv)		TBP (ppbv)	
Field Blank # 1 VSS	< 192	Y	< 133	Y	U		17	J	U		U	U	U		U	U	1.7	J	< 0.8	Y
Field Blank # 2 VSS	< 192	Y	< 133	Y	U		16	J	U		U	U	U		U	U	U		< 0.8	Y
Field Blank #3 W/HEPA	< 192	Y	< 133	Y	U		18	J	U		U	17	13	J	U	U	U		< 0.8	Y
Field Blank #4 W/HEPA	< 192	Y	< 133	Y	11	J	36		U		U	23	36		U	U	U		< 0.8	Y
Field Blank #5 WO/HEPA	207	Y	< 133	Y	11	J	37		U		U	53	28		U	U	U		< 0.8	Y
Field Blank #6 WO/HEPA	367	Y	< 133	Y	17	J	46		U		U	60	33		U	U	U		< 0.8	Y
Trip Blank #1	< 192	Y	< 133	Y	U		10	J	U		U	U	U		U	U	U		< 0.8	Y
Trip Blank #2	< 192	Y	< 133	Y	U		10	J	U		U	U	U		U	U	U		< 0.8	Y
Tape Sample	225	Y	< 133	Y	U		18	J	U		U	168	1626	E	U	U	U		< 0.8	Y

Data Qualifier Flag

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

E Target compound exceeds upper quantification limit (UQL).

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

< Denotes compound not detected at or above the LLS.

Appendix F

Tank Vapor Characterization:

Target Analytes Measured

Table F.1 SUMMA™ Analysis Results for All Target Analytes for VSS Samples Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6001-A03.302 (ppbv)	Flag	S6001-A04.303 (ppbv)	Flag	S6001-A15.304 (ppbv)	Flag	S6001-A16-305 (ppbv)	Flag	S6001-A27.306 (ppbv)	Flag	S6001-A28.307 (ppbv)	Flag	Mean	Flag	Std. Dev.
DICHLORODIFLUOROMETHANE	75-71-8	0.9	J	0.8	J	1.1	J	0.9	J	1.1	J	1.1	J	1.0	J	0.1
CHLOROMETHANE	74-87-3	U		U		U		U		U		2.3	J	2.3	J	
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHAN	76-14-2	U		U		U		U		U		U				
METHANOL	67-56-1	1127	Y	887	Y	1205	Y	1233	Y	1130	Y	1296	Y	1146	Y	142
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U				
BUTANE	106-97-8	3.8	J	2.6	J	U		3.6	J	U		4.3	J	3.6	J	0.7
BROMOMETHANE	74-83-9	U		U		U		U		U		U				
CHLOROETHANE	75-00-3	U		U		U		U		U		U				
ETHANOL	64-17-5	66	Y	47	Y	73	Y	67	Y	66	Y	77	Y	66	Y	10
ACETONITRILE	75-05-8	889		695		976		879		967		1025		905		117
ACETONE	67-64-1	603		469		683		600		661		688		617		82
TRICHLOROFLUOROMETHANE	75-69-4	2.5	J	1.4	J	1.3	J	2.7	J	1.1	J	2.2	J	1.9	J	0.7
PENTANE	109-66-0	U		U		U		U		U		U				
1,1-DICHLOROETHENE	75-35-4	U		U		U		U		U		U				
METHYLENE CHLORIDE	75-09-2	U		U		U		U		U		U				
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U				
PROPANOL	71-23-8	8.6		7.2		11		9.1		8.8		10		9.0		1.2
PROPANENITRILE	107-12-0	117		119		124		117		124		126		121		4.0
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U				
2-BUTANONE	78-93-3	27		27		29		27		28		28		28		0.8
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U				
HEXANE	110-54-3	0.7	J	0.8	J	U		0.7	J	U		0.7	J	0.7	J	0.1
CHLOROFORM	67-66-3	0.4	J	0.4	J	0.4	J	0.4	J	0.4	J	0.4	J	0.4	J	0.02
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U				
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U				
BUTANENITRILE	109-74-0	42		44		56		40		55		46		47		6.8
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U				
1-BUTANOL	71-36-3	5.0		4.4	J	6.3		6.3		5.4		4.8	J	5.4	J	0.8
BENZENE	71-43-2	U		U		U		U		U		U				
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U				
CYCLOHEXANE	110-82-7	4.3	J	4.2	J	5.6		4.5	J	5.5		4.6	J	4.8	J	0.6
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U				
TRICHLOROETHENE	79-01-6	U		U		U		U		U		U				
HEPTANE	142-82-5	0.7	J	1.0	J	U		0.9	J	U		0.6	J	0.8	J	0.2
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U				
4-METHYL-2-PENTANONE	108-10-1	U		U		U		U		U		U				
PYRIDINE	110-86-1	U		U		U		U		U		U				
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U				

Table F.1 SUMMA™ Analysis Results for All Target Analytes for VSS Samples Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6001-A03.302 (ppbv)	Flag	S6001-A04.303 (ppbv)	Flag	S6001-A15.304 (ppbv)	Flag	S6001-A16-305 (ppbv)	Flag	S6001-A27.306 (ppbv)	Flag	S6001-A28.307 (ppbv)	Flag	Mean	Flag	Std. Dev.
PENTANENITRILE	110-59-8	4.1	J	5.2	J	6.0		4.1	J	5.9		5.4	J	5.1	J	0.8
1,1,2-TRICHLOROETHANE	79-00-5	U		U		U		U		U		U				
TOLUENE	108-88-3	1.1	J	2.1	J	0.5	J	2.6		0.3	J	0.7	J	1.2	J	0.9
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U				
OCTANE	111-65-9	0.4	J	0.5	J	0.5	J	U		0.6	J	0.5	J	0.5	J	0.05
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U				
CHLOROBENZENE	108-90-7	U		U		U		U		U		U				
HEXANENITRILE	628-73-9	3.1	J	3.5	J	3.8	J	3.0	J	3.6	J	3.3	J	3.4	J	0.3
ETHYLBENZENE	100-41-4	U		U		U		U		U		U				
P/M-XYLENE	106-42-3	U		U		U		U		U		U				
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U				
STYRENE	100-42-5	U		U		U		U		U		U				
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U				
O-XYLENE	95-47-6	U		U		U		U		U		U				
NONANE	111-84-2	U		0.4	J	U		U		U		U		0.4	J	
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U		U				
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		U		U		U		U				
1,2,4-TRIMETHYLBENZENE	95-63-6	U		U		U		U		U		U				
DECANE	124-18-5	0.5	J	0.8	J	0.8	J	0.5	J	0.7	J	0.5	J	0.6	J	0.1
CHLOROMETHYLBENZENE, ALPHA	100-44-7	U		U		U		U		U		U				
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U				
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U				
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U				
UNDECANE	1120-21-4	4.3		5.1		6.3		4.2		5.7		4.8		5.1		0.8
1,2,4-TRICHLOROBENZENE	120-82-1	U		0.3	J	U		U		U		U		0.3	J	
DODECANE	112-40-3	5.7	J	5.9	J	8.3		5.6	J	7.3		6.7		6.6	J	1.1
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		0.2	J	U		U		U		U		0.2	J	
TRIDECANE	629-50-5	3.5	J	4.6		6.5		3.1	J	5.5		4.9		4.7	J	1.3
TETRADECANE	629-59-4	U		U		U		U		U		U				

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

Table F.2 Triple Sorbent Trap Analysis Results for All Target Analytes for VSS Samples Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6001-A05.773 (ppbv)	Flag	S6001-A06.774 (ppbv)	Flag	S6001-A07.775 (ppbv)	Flag	S6001-A08.776 (ppbv)	Flag	S6001-A09.777 (ppbv)	Flag	S6001-A10.778 (ppbv)	Flag	Mean	Flag	Std. Dev.
DICHLORODIFLUOROMETHANE	75-71-8	U		U		U		U		U		U				
CHLOROMETHANE	74-87-3	U		U		U		U		U		U				
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	76-14-2	U		U		U		U		U		U				
METHANOL	67-56-1	904	Y	1004	Y	2291	Y,E	1714	Y	1446	Y	1700	Y	1510	Y,E	513
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U				
BUTANE	106-97-8	3.8	J	3.9	J	4.1	J	3.8	J	4.4	J	U		4.0	J	0.3
CHLOROETHANE	75-00-3	9.1	J	6.3	J	22		8.2	J	U		U		11	J	7.2
ETHANOL	64-17-5	161	Y	179	Y	319	Y	219	Y	251	Y	246	Y	229	Y	57
ACETONITRILE	75-05-8	551		532		790		684		710		696		661		100
ACETONE	67-64-1	278		294		374		276		355		300		313		41
TRICHLOROFLUOROMETHANE	75-69-4	1.0	J	1.2	J	U		U		1.1	J	U		1.1	J	0.1
PENTANE	109-66-0	U		U		5.4	J	U		U		U		5.4	J	
1,1-DICHLOROETHENE	75-35-4	U		U		U		U		U		U				
METHYLENE CHLORIDE	75-09-2	15	J	15	J	34	J	29	J	33	J	23	J	25	J	8.5
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U				
PROPANENITRILE	107-12-0	96		100		112		97		109		104		103		6.5
PROPANOL	71-23-8	24		17	J	28		15	J	16	J	16	J	19	J	5.4
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U				
2-BUTANONE	78-93-3	22		23		26		21		22		19		22		2.3
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U				
HEXANE	110-54-3	1.2	J	1.3	J	0.9	J	0.6	J	0.9	J	0.9	J	1.0	J	0.3
CHLOROFORM	67-66-3	U		U		U		U		U		U				
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U				
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U				
BUTANENITRILE	109-74-0	38		37		40		34		37		36		37		2.0
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U				
1-BUTANOL	71-36-3	11	J	6.3	J	8.2	J	7.8	J	7.2	J	8.3	J	8.1	J	1.6
BENZENE	71-43-2	9.1		12		7.0		7.7		7.4		5.8		8.2		2.2
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U				
CYCLOHEXANE	110-82-7	U		U		U		U		U		U				
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U				
TRICHLOROETHENE	79-01-6	U		U		U		U		U		U				
HEPTANE	142-82-5	0.8	J	0.9	J	0.8	J	U		U		U		0.8	J	0.1
4-METHYL-2-PENTANONE	108-10-1	2.3	J	1.8	J	U		3.1	J	U		U		2.4	J	0.7
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U				
PYRIDINE	110-86-1	3.8	J	3.5	J	U		1.8	J	U		U		3.0	J	1.1
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U				
PENTANENITRILE	110-59-8	4.8		4.8		4.1		3.4		3.7		3.7		4.1		0.6

Table F.2 Triple Sorbent Trap Analysis Results for All Target Analytes for VSS Samples Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6001-A05.773 (ppbv)	Flag	S6001-A06.774 (ppbv)	Flag	S6001-A07.775 (ppbv)	Flag	S6001-A08.776 (ppbv)	Flag	S6001-A09.777 (ppbv)	Flag	S6001-A10.778 (ppbv)	Flag	Mean	Flag	Std. Dev.
1,1,2-TRICHLOROETHANE	79-00-5	U		2.7		U		U		U		U		2.7		
TOLUENE	108-88-3	2.3		2.0	J	1.6	J	2.2	J	0.9	J	1.5	J	1.8	J	0.5
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U				
OCTANE	111-65-9	U		U		U		U		U		U				
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U				
CHLOROBENZENE	108-90-7	U		U		U		U		U		U				
HEXANENITRILE	628-73-9	3.5	J	3.4	J	2.4	J	2.2	J	2.1	J	2.7	J	2.7	J	0.6
ETHYLBENZENE	100-41-4	0.4	J	0.5	J	U		U		U		U		0.4	J	0.1
P/M-XYLENE	106-42-3	0.8	J	1.3	J	U		U		U		U		1.1	J	0.4
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U				
STYRENE	100-42-5	U		U		U		U		U		U				
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U				
O-XYLENE	95-47-6	U		U		U		U		U		U				
NONANE	111-84-2	U		U		0.3	J	0.4	J	U		U		0.3	J	0.1
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U		U				
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		U		U		U		U				
1,2,4-TRIMETHYLBENZENE	95-63-6	U		U		U		U		U		U				
DECANE	124-18-5	1.3	J	1.5	J	0.8	J	0.9	J	0.9	J	1.0	J	1.1	J	0.3
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U				
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U				
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U				
UNDECANE	1120-21-4	6.1	J	6.1	J	4.8	J	4.5	J	4.3	J	5.1	J	5.1	J	0.8
1,2,4-TRICHLOROBENZENE	120-82-1	U		U		U		U		U		U				
DODECANE	112-40-3	6.7	J	6.8	J	4.8	J	4.6	J	4.7	J	5.5	J	5.5	J	1.0
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U		U				
TRIDECANE	629-50-5	5.9	J	6.4	J	U		3.4	J	3.7	J	4.0	J	4.7	J	1.4
TETRADECANE	629-59-4	6.1	J	6.6	J	U		0.9	J	0.9	J	0.9	J	3.1	J	3.0
TBP	126-73-8	U		U		U		U		U		U				

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

E Target compound exceeds upper quantification limit (UQL).

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

Table F.3 SUMMA™ Analysis Results for All Target Analytes for ISVS Samples With HEPA Filtration Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6002-A36.310 (ppbv)	Flag	S6002-A37.311 (ppbv)	Flag	S6002-A38.312 (ppbv)	Flag	S6002-A45.313 (ppbv)	Flag	S6002-A46.314 (ppbv)	Flag	S6002-A47.315 (ppbv)	Flag	Mean	Flag	Std. Dev.
DICHLORODIFLUOROMETHANE	75-71-8	0.9	J	1.1	J	0.8	J	1.1	J	1.0	J	0.8	J	0.9	J	0.1
CHLOROMETHANE	74-87-3	U		U		U		2.4	J	2.6	J	U		2.5	J	0.1
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	76-14-2	U		U		U		U		U		U				
METHANOL	67-56-1	1037	Y	1274	Y	1151	Y	1220	Y	1346	Y	1050	Y	1180	Y	123
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U				
BUTANE	106-97-8	3.9	J	3.8	J	U		3.8	J	4.0	J	3.3	J	3.8	J	0.3
BROMOMETHANE	74-83-9	U		U		U		U		U		U				
CHLOROETHANE	75-00-3	U		U		U		U		U		U				
ETHANOL	64-17-5	67	Y	92	Y	86	Y	78	Y	91	Y	73	Y	81	Y	10
ACETONITRILE	75-05-8	802		929		754		878		932		796		849		75
ACETONE	67-64-1	559		628		510		600		640		536		579		52
TRICHLOROFLUOROMETHANE	75-69-4	1.8	J	1.1	J	0.9	J	1.9	J	2.1	J	1.7	J	1.6	J	0.5
PENTANE	109-66-0	U		U		U		U		U		U				
1,1-DICHLOROETHENE	75-35-4	U		U		U		U		U		U				
METHYLENE CHLORIDE	75-09-2	U		U		U		U		U		U				
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U				
PROPANOL	71-23-8	8.5		12		14		12		13		13		12		1.9
PROPANENITRILE	107-12-0	106		117		111		115		117		110		113		4.4
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U				
2-BUTANONE	78-93-3	26		25		25		27		27		25		25.8		1.0
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U				
HEXANE	110-54-3	2.7	J	3.4	J	3.1	J	0.7	J	0.9	J	1.0	J	1.9	J	1.2
CHLOROFORM	67-66-3	U		0.4	J	U		0.4	J	0.4	J	0.3	J	0.4	J	0.0
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U				
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U				
BUTANENITRILE	109-74-0	40		50		46		45		45		36		44		4.9
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U				
1-BUTANOL	71-36-3	23		47		29		10		13		13		23		14
BENZENE	71-43-2	U		U		U		U		U		U				
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U				
CYCLOHEXANE	110-82-7	8.7		12		10		4.8		4.9		U		8.1		3.2
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U				
TRICHLOROETHENE	79-01-6	U		U		U		U		U		U				
HEPTANE	142-82-5	11		16		12		1.0	J	1.6	J	3.7		7.5	J	6.3
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U				
4-METHYL-2-PENTANONE	108-10-1	U		U		U		U		U		U				
PYRIDINE	110-86-1	U		U		U		U		U		U				
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U				
PENTANENITRILE	110-59-8	3.9	J	5.5	J	5.2	J	5.3	J	5.3	J	3.6	J	4.8	J	0.8

Table F.3 SUMMA™ Analysis Results for All Target Analytes for ISVS Samples With HEPA Filtration Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6002-A36.310 (ppbv)	Flag	S6002-A37.311 (ppbv)	Flag	S6002-A38.312 (ppbv)	Flag	S6002-A45.313 (ppbv)	Flag	S6002-A46.314 (ppbv)	Flag	S6002-A47.315 (ppbv)	Flag	Mean	Flag	Std. Dev.
1,1,2-TRICHLOROETHANE	79-00-5	U		U		U		U		U		U				
TOLUENE	108-88-3	18		28		17		1.4	J	2.9		9.1		13	J	10
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U				
OCTANE	111-65-9	0.7	J	0.7	J	0.7	J	0.5	J	0.5	J	0.4	J	0.6	J	0.1
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U				
CHLOROBENZENE	108-90-7	U		U		U		U		U		U				
HEXANENITRILE	628-73-9	3.1	J	3.6	J	3.6	J	3.2	J	3.3	J	2.7	J	3.3	J	0.3
ETHYLBENZENE	100-41-4	0.4	J	0.6	J	0.4	J	U		U		U		0.5	J	0.1
P/M-XYLENE	106-42-3	U		2.2	J	1.5	J	U		U		U		1.9	J	0.5
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U				
STYRENE	100-42-5	U		U		U		U		U		U				
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U				
O-XYLENE	95-47-6	0.4	J	0.6	J	0.4	J	U		U		U		0.5	J	0.1
NONANE	111-84-2	0.4	J	0.5	J	0.5	J	0.4	J	0.4	J	U		0.4	J	0.1
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U		U				
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		U		U		U		U				
1,2,4-TRIMETHYLBENZENE	95-63-6	0.4	J	0.5	J	0.5	J	U		U		U		0.4	J	0.0
DECANE	124-18-5	0.6	J	0.8	J	0.7	J	0.6	J	0.7	J	U		0.7	J	0.1
CHLOROMETHYLBENZENE, ALPHA	100-44-7	U		U		U		U		U		U				
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U				
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U				
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U				
UNDECANE	1120-21-4	4.1		4.6		4.6		4.5		4.4		4.2		4.4		0.2
1,2,4-TRICHLOROBENZENE	120-82-1	U		U		0.4	J	U		U		U		0.4	J	
DODECANE	112-40-3	4.4	J	5.4	J	4.2	J	5.1	J	5.4	J	4.5	J	4.8	J	0.5
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U		U				
TRIDECANE	629-50-5	2.6	J	3.2	J	2.9	J	3.0	J	2.9	J	3.2	J	3.0	J	0.2
TETRADECANE	629-59-4	U		U		U		U		U		U				

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

Table F.4 Triple Sorbent Trap Analysis Results for All Target Analytes for ISVS Samples With HEPA Filtration Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6002-A39.784 (ppbv)	Flag	S6002-A40.785 (ppbv)	Flag	S6002-A41.786 (ppbv)	Flag	S6002-A48.788 (ppbv)	Flag	S6002-A49.789 (ppbv)	Flag	S6002-A50-790 (ppbv)	Flag	Mean	Flag	Std. Dev.
DICHLORODIFLUOROMETHANE	75-71-8	U		U		U		U		U		U				
CHLOROMETHANE	74-87-3	U		U		U		U		U		U				
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	76-14-2	U		U		U		U		U		U				
METHANOL	67-56-1	1501	Y	2026	Y,E	1795	Y	1567	Y	1743	Y	1347	Y	1663	Y,E	241
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U				
BUTANE	106-97-8	8.3	J	17		20		8.7	J	16		5.9	J	13	J	5.7
CHLOROETHANE	75-00-3	14	J	15		U		U		20		U		16	J	3.2
ETHANOL	64-17-5	240	Y	376	Y	363	Y	275	Y	318	Y	168	Y	290	Y	79
ACETONITRILE	75-05-8	490		651		578		558		651		656		597		67
ACETONE	67-64-1	174		207		236		233		231		249		222		27
TRICHLOROFLUOROMETHANE	75-69-4	U		5.0	J	6.2	J	1.2	J	2.9	J	2.1	J	3.5	J	2.1
PENTANE	109-66-0	U		4.7	J	6.9	J	3.1	J	7.3	J	3.1	J	5.0	J	2.0
1,1-DICHLOROETHENE	75-35-4	U		U		4.2	J	U		U		U		4.2	J	
METHYLENE CHLORIDE	75-09-2	23	J	235		337		32	J	165		66		143	J	126
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U				
PROPANENITRILE	107-12-0	68		88		83		82		94		95		85		9.9
PROPANOL	71-23-8	17	J	24		20	J	25		21	J	26		22	J	3.4
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U				
2-BUTANONE	78-93-3	21		21		27		24		20		29		24		3.7
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U				
HEXANE	110-54-3	43		35		38		23		35		22		33		8.4
CHLOROFORM	67-66-3	U		U		U		U		U		U				
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U				
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U				
BUTANENITRILE	109-74-0	41		44		40		36		42		41		41		2.7
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U				
1-BUTANOL	71-36-3	180		116		175		50		85		67		112		55
BENZENE	71-43-2	8.8		8.8		9.8		8.5		8.5		14		9.7		2.2
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U				
CYCLOHEXANE	110-82-7	71		59		68		23		45		25		49		21
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U				
TRICHLOROETHENE	79-01-6	U		3.4	J	5.8	J	U		U		U		4.6	J	1.7
HEPTANE	142-82-5	183		147		148		49		88		45		110		58
4-METHYL-2-PENTANONE	108-10-1	13		U		U		U		5.6		U		9.3		5.2
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U				
PYRIDINE	110-86-1	U		8.7	J	U		U		U		U		8.7	J	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U				
PENTANENITRILE	110-59-8	2.5		4.1		3.3		3.6		3.8		2.9		3.4		0.6
1,1,2-TRICHLOROETHANE	79-00-5	U		U		9.4		U		3.4		U		6.4		4.2

Table F.4 Triple Sorbent Trap Analysis Results for All Target Analytes for ISVS Samples With HEPA Filtration Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6002-A39.784 (ppbv)	Flag	S6002-A40.785 (ppbv)	Flag	S6002-A41.786 (ppbv)	Flag	S6002-A48.788 (ppbv)	Flag	S6002-A49.789 (ppbv)	Flag	S6002-A50-790 (ppbv)	Flag	Mean	Flag	Std. Dev.
TOLUENE	108-88-3	124		131		132		44		74		44		92		43
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U				
OCTANE	111-65-9	U		U		U		U		U		U				
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U				
CHLOROBENZENE	108-90-7	U		U		U		U		U		U				
HEXANENITRILE	628-73-9	1.2	J	2.2	J	1.9	J	2.6	J	2.0	J	2.0	J	2.0	J	0.5
ETHYLBENZENE	100-41-4	2.0	J	2.3	J	3.0	J	2.0	J	2.2	J	1.8	J	2.2	J	0.4
P/M-XYLENE	106-42-3	7.8		7.5		10		7.5		8.8		6.6	J	8.0	J	1.2
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U				
STYRENE	100-42-5	U		U		U		U		U		U				
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U				
O-XYLENE	95-47-6	2.1	J	2.5	J	3.2	J	2.5	J	2.6	J	2.1	J	2.5	J	0.4
NONANE	111-84-2	U		0.5	J	U		0.7	J	U		0.5	J	0.6	J	0.1
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U		U				
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		2.1	J	U		1.9	J	1.7	J	1.9	J	0.2
1,2,4-TRIMETHYLBENZENE	95-63-6	1.9	J	2.2	J	2.9	J	3.0	J	2.7	J	2.6	J	2.5	J	0.4
DECANE	124-18-5	0.6	J	1.0	J	0.9	J	1.2	J	1.0	J	0.4	J	0.8	J	0.3
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U				
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U				
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U				
UNDECANE	1120-21-4	2.5	J	4.3	J	3.3	J	3.6	J	4.1	J	3.3	J	3.5	J	0.7
1,2,4-TRICHLOROBENZENE	120-82-1	U		U		U		U		U		U				
DODECANE	112-40-3	2.8	J	4.9	J	3.8	J	4	J	4.6	J	3.7	J	4.0	J	0.7
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U		U				
TRIDECANE	629-50-5	2.9	J	U		4.5	J	5.6	J	5.2	J	4.6	J	4.6	J	1.0
TETRADECANE	629-59-4	0.7	J	U		1.1	J	1.6	J	1.4	J	1.1	J	1.2	J	0.3
TBP	126-73-8	U		U		U		U		U		U				

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

E Target compound exceeds upper quantification limit (UQL).

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

Table F.5 SUMMA™ Analysis Results for All Target Analytes for ISVS Samples Without HEPA Filtration Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6003-A54.317 (ppbv)	Flag	S6003-A55.318 (ppbv)	Flag	S6003-A56.319 (ppbv)	Flag	S6003-A57.320 (ppbv)	Flag	S6003-A58-321 (ppbv)	Flag	S6003-A59-322 (ppbv)	Flag	Mean	Flag	Std. Dev.
DICHLORODIFLUOROMETHANE	75-71-8	1.1	J	0.7	J	1.0	J	1.1	J	1.1	J	1.2	J	1.0	J	0.2
CHLOROMETHANE	74-87-3	2.6	J	1.5	J	2.3	J	2.9	J	2.6	J	2.7	J	2.4	J	0.5
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	76-14-2	U		U		U		U		U		U				
METHANOL	67-56-1	1189	Y	943	Y	1227	Y	1360	Y	1351	Y	1319	Y	1232	Y	157
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U				
BUTANE	106-97-8	4.1	J	3.4	J	4.0	J	4.3	J	4.5	J	4.4	J	4.1	J	0.4
BROMOMETHANE	74-83-9	U		U		U		U		U		U				
CHLOROETHANE	75-00-3	U		U		U		U		U		U				
ETHANOL	64-17-5	102	Y	79	Y	101	Y	111	Y	111	Y	110	Y	102	Y	12
ACETONITRILE	75-05-8	881		639		910		983		973		1080		911		150
ACETONE	67-64-1	590		434		634		671		673		726		621		102
TRICHLOROFLUOROMETHANE	75-69-4	1.0	J	1.4	J	2.0	J	2.1	J	2.1	J	1.2	J	1.6	J	0.5
PENTANE	109-66-0	U		U		U		U		U		U				
1,1-DICHLOROETHENE	75-35-4	U		U		U		U		U		U				
METHYLENE CHLORIDE	75-09-2	U		U		U		U		U		U				
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U				
PROPANOL	71-23-8	14		13		12		15		14		14		14		1.0
PROPANENITRILE	107-12-0	118		104		116		126		120		140		121		12
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U				
2-BUTANONE	78-93-3	27		25		30		29		30		32		29		2.5
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U				
HEXANE	110-54-3	8.5		7.4		5.1		8.1		8.1		7.6		7.5		1.2
CHLOROFORM	67-66-3	0.4	J	0.3	J	0.4	J	0.4	J	0.4	J	0.4	J	0.4	J	0.02
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U				
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U				
BUTANENITRILE	109-74-0	52		37		42		47		48		57		47		7.1
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U				
1-BUTANOL	71-36-3	80		89		37		60		78		97		74		22
BENZENE	71-43-2	U		U		U		U		U		U				
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U				
CYCLOHEXANE	110-82-7	21		15		12		18		19		19		17		3.3
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U				
TRICHLOROETHENE	79-01-6	U		U		U		U		U		U				
HEPTANE	142-82-5	48		35		20		39		44		44		38		10
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U				
4-METHYL-2-PENTANONE	108-10-1	U		U		U		U		U		U				
PYRIDINE	110-86-1	U		U		U		6.1	J	6.4	J	U		6.3	J	0.2
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U				

Table F.5 SUMMA™ Analysis Results for All Target Analytes for ISVS Samples Without HEPA Filtration Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6003-A54.317 (ppbv)	Flag	S6003-A55.318 (ppbv)	Flag	S6003-A56.319 (ppbv)	Flag	S6003-A57.320 (ppbv)	Flag	S6003-A58-321 (ppbv)	Flag	S6003-A59-322 (ppbv)	Flag	Mean	Flag	Std. Dev.
PENTANENITRILE	110-59-8	5.9		3.7	J	4.3	J	4.9	J	5.9		6.4		5.2	J	1.1
1,1,2-TRICHLOROETHANE	79-00-5	U		U		U		U		U		U				
TOLUENE	108-88-3	47		34		12		46		46		45		38		14
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U				
OCTANE	111-65-9	0.8	J	0.6	J	0.5	J	0.7	J	0.7	J	0.8	J	0.7	J	0.1
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U				
CHLOROBENZENE	108-90-7	U		U		U		U		U		U				
HEXANENITRILE	628-73-9	3.8	J	3.0	J	2.9	J	3.4	J	3.5	J	3.8	J	3.4	J	0.4
ETHYLBENZENE	100-41-4	U		U		U		U		U		U				
P/M-XYLENE	106-42-3	U		U		U		U		U		U				
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U				
STYRENE	100-42-5	U		U		U		U		U		U				
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U				
O-XYLENE	95-47-6	U		U		U		U		U		U				
NONANE	111-84-2	U		U		U		U		U		U				
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U		U				
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		U		U		U		U				
1,2,4-TRIMETHYLBENZENE	95-63-6	U		U		U		U		U		U				
DECANE	124-18-5	0.8	J	0.6	J	0.6	J	0.8	J	0.8	J	0.8	J	0.7	J	0.1
CHLOROMETHYLBENZENE, ALPHA	100-44-7	U		U		U		U		U		U				
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U				
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U				
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U				
UNDECANE	1120-21-4	5.2		3.9		3.9		4.5		4.7		5.3		4.6		0.6
1,2,4-TRICHLOROBENZENE	120-82-1	U		0.3	J	U		U		U		U		0.3	J	
DODECANE	112-40-3	5.5	J	U		3.7	J	5.8	J	5.4	J	6.3	J	5.3	J	1.0
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U		U				
TRIDECANE	629-50-5	3.2	J	2.9	J	2.4	J	3.2	J	2.6	J	3.4	J	2.9	J	0.4
TETRADECANE	629-59-4	U		U		U		U		U		U				

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

Table F.6 Triple Sorbent Trap Analysis Results for All Target Analytes for ISVS Samples Without HEPA Filtration Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6003-A60.791 (ppbv)	Flag	S6003-A62.794 (ppbv)	Flag	S6003-A63-796 (ppbv)	Flag	S6003-A64.797 (ppbv)	Flag	S6003-A65.798 (ppbv)	Flag	S6003-A61.792 (ppbv)	Flag	Mean	Flag	Std. Dev.
DICHLORODIFLUOROMETHANE	75-71-8	U		20		U		U		U		U		20		
CHLOROMETHANE	74-87-3	U		U		U		U		U		U				
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	76-14-2	U		U		U		U		U		U				
METHANOL	67-56-1	1558	Y	1073	Y	1141	Y	1186	Y	1341	Y	1139	Y	1240	Y	180
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U				
BUTANE	106-97-8	20		18		13	J	11	J	19		14	J	16	J	3.7
CHLOROETHANE	75-00-3	15		20		17		U		U		U		17		2.5
ETHANOL	64-17-5	371	Y	311	Y	329	Y	308	Y	397	Y	< 133	Y	343	Y	39
ACETONITRILE	75-05-8	496		480		470		478		488		515		488		16
ACETONE	67-64-1	199		183		207		225		204		195		202		14
TRICHLOROFLUOROMETHANE	75-69-4	5.0	J	5.7	J	3.1	J	2.7	J	5	J	7.9		4.9	J	1.9
PENTANE	109-66-0	13		12		7.7	J	11		12		14		12	J	2.2
1,1-DICHLOROETHENE	75-35-4	U		U		U		U		U		U				
METHYLENE CHLORIDE	75-09-2	617		767	E	369		310		731	E	1474	E	711	E	418
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U				
PROPANENITRILE	107-12-0	71		76		86		71		80		75		77		5.8
PROPANOL	71-23-8	25		21		25		20	J	23		21	J	23	J	2.2
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U				
2-BUTANONE	78-93-3	39		27		37		44		48		35		38		7.3
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U				
HEXANE	110-54-3	137		110		79		136		137		112		119		23
CHLOROFORM	67-66-3	U		U		U		U		U		U				
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U				
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U				
BUTANENITRILE	109-74-0	63		57		49		58		63		57		58		5.2
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U				
1-BUTANOL	71-36-3	258		208		339		463		503		232		334		124
BENZENE	71-43-2	21		13		9.5		14		16		16		15		3.8
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U				
CYCLOHEXANE	110-82-7	196		132		104		175		192		139		156		37
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U				
TRICHLOROETHENE	79-01-6	7.1		10		4.5	J	4.7	J	9.7		17		8.9	J	4.7
HEPTANE	142-82-5	450		315		228		460		467		311		372		101
4-METHYL-2-PENTANONE	108-10-1	32		U		16		29		31		18		25		7.6
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U				
PYRIDINE	110-86-1	25	J	16	J	U		U		30	J	U		24	J	7.1
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U				
PENTANENITRILE	110-59-8	3.9		3.7		3.4		2.6		3.7		1.8	J	3.2	J	0.8
1,1,2-TRICHLOROETHANE	79-00-5	U		U		14		30		28		U		24		8.7

Table F.6 Triple Sorbent Trap Analysis Results for All Target Analytes for ISVS Samples Without HEPA Filtration Collected from the Headspace of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6003-A60.791 (ppbv)	Flag	S6003-A62.794 (ppbv)	Flag	S6003-A63-796 (ppbv)	Flag	S6003-A64.797 (ppbv)	Flag	S6003-A65.798 (ppbv)	Flag	S6003-A61.792 (ppbv)	Flag	Mean	Flag	Std. Dev.
TOLUENE	108-88-3	163		131		124		205		230		130		164		44
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U				
OCTANE	111-65-9	1.9	J	U		U		U		1.5	J	U		1.7	J	0.3
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U				
CHLOROBENZENE	108-90-7	U		U		U		U		U		U				
HEXANENITRILE	628-73-9	2.8	J	2.2	J	1.9	J	2.0	J	2.1	J	2.0	J	2.2	J	0.3
ETHYLBENZENE	100-41-4	4.3		3.8		2.2	J	4.1		3.8		4.0		3.7	J	0.7
P/M-XYLENE	106-42-3	14		13		8.2		15		13		13		13		2.4
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U				
STYRENE	100-42-5	U		U		U		U		U		U				
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U				
O-XYLENE	95-47-6	5.5		5.1		2.8	J	5.3		4.9		5.0		4.8	J	1.0
NONANE	111-84-2	1.1	J	U		U		U		U		1.0	J	1.1		0.1
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U		U				
1,3,5-TRIMETHYLBENZENE	108-67-8	1.6	J	1.4	J	1.9	J	1.5	J	1.3	J	1.3	J	1.5	J	0.2
1,2,4-TRIMETHYLBENZENE	95-63-6	5.8		5.7		3.2	J	5.9		5.4		5.1		5.2	J	1.0
DECANE	124-18-5	1.7	J	1.4	J	1.0	J	0.8	J	1.4	J	0.1	J	1.0	J	0.5
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U				
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U				
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U				
UNDECANE	1120-21-4	5.3	J	5.4	J	4.3	J	4.8	J	4.9	J	5.0	J	5.0	J	0.4
1,2,4-TRICHLOROBENZENE	120-82-1	U		U		U		U		U		U				
DODECANE	112-40-3	5.4	J	5.6	J	4.5	J	4.8	J	5.0	J	5.4	J	5.1	J	0.4
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U		U				
TRIDECANE	629-50-5	U		U		3.2	J	3.7	J	3.7	J	3.9	J	3.6	J	0.3
TETRADECANE	629-59-4	U		U		0.4	J	0.7	J	0.7	J	0.6	J	0.6	J	0.1
TBP	126-73-8	U		U		U		U		U		U				

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

E Target compound exceeds upper quantification limit (UQL).

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

< Denotes compound not detected at or above the LLS.

Table F.7 SUMMA™ Replicate Analysis Results for All Target Analytes Sampled from the Headspace of Tank C-107 on 1/17/96

		VSS				ISVS With HEPA				ISVS Without HEPA			
		S6001-A28.307		S6001-A28.307 Rep		S6002-A47.315		S6002-A47.315 Rep		S6003-A54.317		S6003-A54.317 Rep	
Target Analytes	CAS No.	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag
DICHLORODIFLUOROMETHANE	75-71-8	1.1	J	1.1	J	0.8	J	0.9	J	1.1	J	1.1	J
CHLOROMETHANE	74-87-3	2.3	J	2.7	J	U		U		2.6	J	2.6	J
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	76-14-2	U		U		U		U		U		U	
METHANOL	67-56-1	1296	Y	1269	Y	1050	Y	1065	Y	1189	Y	1160	Y
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U	
BUTANE	106-97-8	4.3	J	4.0	J	3.3	J	3.8	J	4.1	J	3.9	J
BROMOMETHANE	74-83-9	U		U		U		U		U		U	
CHLOROETHANE	75-00-3	U		U		U		U		U		U	
ETHANOL	64-17-5	77	Y	79	Y	73	Y	64	Y	102	Y	96	Y
ACETONITRILE	75-05-8	1025		932		796		849		881		917	
ACETONE	67-64-1	688		636		536		571		590		620	
TRICHLOROFLUOROMETHANE	75-69-4	2.2	J	2.1	J	1.7	J	1.8	J	1.0	J	1.1	J
PENTANE	109-66-0	U		U		U		U		U		U	
1,1-DICHLOROETHENE	75-35-4	U		U		U		U		U		U	
METHYLENE CHLORIDE	75-09-2	U		U		U		U		U		U	
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U	
PROPANOL	71-23-8	10		12		13		7.0		14		12	
PROPANENITRILE	107-12-0	126		118		110		109		118		118	
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U	
2-BUTANONE	78-93-3	28		26		25		26		27		28	
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U	
HEXANE	110-54-3	0.7	J	0.7	J	1.0	J	1.0	J	8.5		8.6	
CHLOROFORM	67-66-3	0.4	J	0.4	J	0.3	J	0.4	J	0.4	J	0.4	J
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U	
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U	
BUTANENITRILE	109-74-0	46		44		36		39		52		50	
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U	
1-BUTANOL	71-36-3	4.8	J	5.8		13		9.0		80		70	
BENZENE	71-43-2	U		U		U		U		U		U	
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U	
CYCLOHEXANE	110-82-7	4.6	J	4.2	J	U		2.0	J	21		20	
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U	
TRICHLOROETHENE	79-01-6	U		U		U		U		U		U	
HEPTANE	142-82-5	0.6	J	0.5	J	3.7		3.9		48		42	
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U	
4-METHYL-2-PENTANONE	108-10-1	U		U		U		U		U		U	
PYRIDINE	110-86-1	U		U		U		U		U		U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U	
PENTANENITRILE	110-59-8	5.4	J	4.9	J	3.6	J	3.9	J	5.9		4.7	J
1,1,2-TRICHLOROETHANE	79-00-5	U		U		U		U		U		U	
TOLUENE	108-88-3	0.7	J	0.7	J	9.1		9.6		47		45	

Table F.7 SUMMA™ Replicate Analysis Results for All Target Analytes Sampled from the Headspace of Tank C-107 on 1/17/96

		VSS				ISVS With HEPA				ISVS Without HEPA			
		S6001-A28.307		S6001-A28.307 Rep		S6002-A47.315		S6002-A47.315 Rep		S6003-A54.317		S6003-A54.317 Rep	
Target Analytes	CAS No.	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U	
OCTANE	111-65-9	0.5	J	0.4	J	0.4	J	0.5	J	0.8	J	0.7	J
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U	
CHLOROBENZENE	108-90-7	U		U		U		U		U		U	
HEXANENITRILE	628-73-9	3.3	J	3.4	J	2.7	J	2.8	J	3.8	J	3.5	J
ETHYLBENZENE	100-41-4	U		U		U		U		U		U	
P/M-XYLENE	106-42-3	U		U		U		U		U		U	
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U	
STYRENE	100-42-5	U		U		U		U		U		U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U	
O-XYLENE	95-47-6	U		U		U		U		U		U	
NONANE	111-84-2	U		U		U		0.3	J	U		U	
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U		U	
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		U		U		U		U	
1,2,4-TRIMETHYLBENZENE	95-63-6	U		U		U		U		U		U	
DECANE	124-18-5	0.5	J	0.7	J	U		0.6	J	0.8	J	0.8	J
CHLOROMETHYLBENZENE, ALPHA	100-44-7	U		U		U		U		U		U	
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U	
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U	
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U	
UNDECANE	1120-21-4	4.8		4.7		4.2		4.3		5.2		5.0	
1,2,4-TRICHLOROBENZENE	120-82-1	U		U		U		U		U		U	
DODECANE	112-40-3	6.7		U		4.5	J	5.6	J	5.5	J	6.3	J
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U		U	
TRIDECANE	629-50-5	4.9		4.5		3.2	J	3.3	J	3.2	J	3.6	J
TETRADECANE	629-59-4	U		U		U		U		U		U	

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

Table F.8 Triple Sorbent Trap Replicate Analysis Results for All Target Analytes Sampled from the Headspace of Tank C-107 on 1/17/96

		VSS				ISVS With HEPA				ISVS Without HEPA			
		S6001-A07.775		S6001-A07.775 Rep		S6002-A50-790		S6002-A50-790 Rep		S6003-A64.797		S6003-A64.797 Rep	
Target Analytes	CAS No.	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag
DICHLORODIFLUOROMETHANE	75-71-8	U		U		U		U		U		U	
CHLOROMETHANE	74-87-3	U		U		U		U		U		U	
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	76-14-2	U		U		U		U		U		U	
METHANOL	67-56-1	2291	Y,E	2258	Y,E	1347	Y	1666	Y	1186	Y	1426	Y
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U	
BUTANE	106-97-8	4.1	J	4.7	J	5.9	J	U		11	J	12	J
CHLOROETHANE	75-00-3	22		7.6	J	U		U		U		U	
ETHANOL	64-17-5	319	Y	276	Y	168	Y	278	Y	308	Y	280	Y
ACETONITRILE	75-05-8	790		770		656		637		478		472	
ACETONE	67-64-1	374		372		249		247		225		237	
TRICHLOROFLUOROMETHANE	75-69-4	U		U		2.1	J	2.1	J	2.7	J	2.9	J
PENTANE	109-66-0	5.4	J	U		3.1	J	6.1	J	11		11	
1,1-DICHLOROETHENE	75-35-4	U		U		U		U		U		U	
METHYLENE CHLORIDE	75-09-2	34	J	25	J	66		62		310		309	
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U	
PROPANENITRILE	107-12-0	112		110		95		93		71		70	
PROPANOL	71-23-8	28		19	J	26		23		20	J	18	J
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U	
2-BUTANONE	78-93-3	26		24		29		27		44		43	
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U	
HEXANE	110-54-3	0.9	J	0.7	J	22		22		136		135	
CHLOROFORM	67-66-3	U		U		U		U		U		U	
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U	
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U	
BUTANENITRILE	109-74-0	40		40		41		41		58		58	
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U	
1-BUTANOL	71-36-3	8.2	J	4.8	J	67		52		463		377	
BENZENE	71-43-2	7.0		10		14		15		14		15	
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U	
CYCLOHEXANE	110-82-7	U		U		25		23		175		179	
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U	
TRICHLOROETHENE	79-01-6	U		U		U		U		4.7	J	4.4	J
HEPTANE	142-82-5	0.8	J	U		45		44		460		453	
4-METHYL-2-PENTANONE	108-10-1	U		U		U		U		29		29	
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U	
PYRIDINE	110-86-1	U		U		U		U		U		U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U	
PENTANENITRILE	110-59-8	4.1		4.0		2.9		3.8		2.6		2.6	
1,1,2-TRICHLOROETHANE	79-00-5	U		U		U		U		30		29	
TOLUENE	108-88-3	1.6	J	2.1	J	44		44		205		204	
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U	

Table F.8 Triple Sorbent Trap Replicate Analysis Results for All Target Analytes Sampled from the Headspace of Tank C-107 on 1/17/96

		VSS				ISVS With HEPA				ISVS Without HEPA			
		S6001-A07.775		S6001-A07.775 Rep		S6002-A50-790		S6002-A50-790 Rep		S6003-A64.797		S6003-A64.797 Rep	
Target Analytes	CAS No.	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag
OCTANE	111-65-9	U		U		U		U		U		U	
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U	
CHLOROBENZENE	108-90-7	U		U		U		U		U		U	
HEXANENITRILE	628-73-9	2.4	J	2.2	J	2.0	J	2.2	J	2.0	J	1.9	J
ETHYLBENZENE	100-41-4	U		U		1.8	J	1.9	J	4.1		4.2	
P/M-XYLENE	106-42-3	U		U		6.6	J	7.1		15		15	
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U	
STYRENE	100-42-5	U		U		U		U		U		U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U	
O-XYLENE	95-47-6	U		U		2.1	J	2.3	J	5.3		5.5	
NONANE	111-84-2	0.3	J	U		0.5	J	0.8	J	U		U	
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U		U	
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		1.7	J	U		1.5	J	1.5	J
1,2,4-TRIMETHYLBENZENE	95-63-6	U		U		2.6	J	2.8	J	5.9		5.9	
DECANE	124-18-5	0.8	J	0.8	J	0.4	J	1.1	J	0.8	J	0.8	J
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U	
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U	
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U	
UNDECANE	1120-21-4	4.8	J	4.5	J	3.3	J	3.3	J	4.8	J	4.7	J
1,2,4-TRICHLOROBENZENE	120-82-1	U		U		U		U		U		U	
DODECANE	112-40-3	4.8	J	4.7	J	3.7	J	3.8	J	4.8	J	4.9	J
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U		U	
TRIDECANE	629-50-5	U		U		4.6	J	4.2	J	3.7	J	3.6	J
TETRADECANE	629-59-4	U		U		1.1	J	1.2	J	0.7	J	0.6	J
TBP	126-73-8	U		U		U		U		U		U	

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

E Target compound exceeds upper quantification limit (UQL).

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

Table F.9 SUMMA™ Blank Sample Analysis Results for All Target Analytes Associated with the Headspace Sampling of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6001-A01.300 VSS Ambient Upwind (ppbv)	Flag	S6001-A02.301 Ambient Thru VSS (ppbv)	Flag	S6002-A33.308 ISVS W/HEPA Bundle A (ppbv)	Flag	S6002-A34.309 ISVS W/HEPA Bundle B (ppbv)	Flag	S6003-A35.316 ISVS W/O HEPA Bundle C (ppbv)	Flag
DICHLORODIFLUOROMETHANE	75-71-8	0.6	J	0.9	J	0.9	J	0.9	J	1.1	J
CHLOROMETHANE	74-87-3	U		U		U		2.0	J	U	
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHANE	76-14-2	U		U		U		U		U	
METHANOL	67-56-1	77	Y	116	Y	132	Y	127	Y	43	Y
VINYL CHLORIDE	75-01-4	U		U		U		U		U	
BUTANE	106-97-8	U		U		U		U		U	
BROMOMETHANE	74-83-9	U		U		U		U		U	
CHLOROETHANE	75-00-3	U		U		U		U		U	
ETHANOL	64-17-5	< 13	Y	< 13	Y	< 13	J	< 13	Y	< 13	Y
ACETONITRILE	75-05-8	U		U		U		U		U	
ACETONE	67-64-1	16		33		26		35		21	
TRICHLOROFLUOROMETHANE	75-69-4	U		U		U		U		0.7	J
PENTANE	109-66-0	U		U		U		U		U	
1,1-DICHLOROETHENE	75-35-4	U		U		U		U		U	
METHYLENE CHLORIDE	75-09-2	0.4	J	U		U		U		U	
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U	
PROPANOL	71-23-8	U		U		U		U		U	
PROPANENITRILE	107-12-0	U		U		U		U		U	
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U	
2-BUTANONE	78-93-3	U		U		U		U		U	
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U	
HEXANE	110-54-3	U		U		1.8	J	U		U	
CHLOROFORM	67-66-3	U		U		U		U		U	
TETRAHYDROFURAN	109-99-9	U		U		U		U		U	
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U	
BUTANENITRILE	109-74-0	U		U		U		U		U	
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U	
1-BUTANOL	71-36-3	0.9	J	1.8	J	44		3.9	J	U	
BENZENE	71-43-2	U		U		U		U		U	
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U	
CYCLOHEXANE	110-82-7	U		U		7.9		U		U	
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U	
TRICHLOROETHENE	79-01-6	U		U		U		U		U	
HEPTANE	142-82-5	U		U		7.4		U		U	
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U	
4-METHYL-2-PENTANONE	108-10-1	U		U		U		U		U	

Table F.9 SUMMA™ Blank Sample Analysis Results for All Target Analytes Associated with the Headspace Sampling of Tank C-107 on 1/17/96

Target Analytes	CAS No.	S6001-A01.300 VSS Ambient Upwind (ppbv)	Flag	S6001-A02.301 Ambient Thru VSS (ppbv)	Flag	S6002-A33.308 ISVS W/HEPA Bundle A (ppbv)	Flag	S6002-A34.309 ISVS W/HEPA Bundle B (ppbv)	Flag	S6003-A35.316 ISVS W/O HEPA Bundle C (ppbv)	Flag
PYRIDINE	110-86-1	U		U		U		U		U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U	
PENTANENITRILE	110-59-8	U		U		U		U		U	
1,1,2-TRICHLOROETHANE	79-00-5	U		U		U		U		U	
TOLUENE	108-88-3	U		U		17		1.1	J	0.3	J
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U	
OCTANE	111-65-9	U		U		U		U		U	
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U	
CHLOROBENZENE	108-90-7	U		U		U		U		U	
HEXANENITRILE	628-73-9	U		U		U		U		U	
ETHYLBENZENE	100-41-4	U		U		0.4	J	U		U	
P/M-XYLENE	106-42-3	U		U		U		U		U	
CYCLOHEXANONE	108-94-1	U		U		U		U		U	
STYRENE	100-42-5	U		U		U		U		U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U	
O-XYLENE	95-47-6	U		U		0.4	J	U		U	
NONANE	111-84-2	U		U		U		U		U	
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		U	
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		U		U		U	
1,2,4-TRIMETHYLBENZENE	95-63-6	U		U		0.4	J	U		U	
DECANE	124-18-5	U		U		U		U		U	
CHLOROMETHYLBENZENE, ALPHA	100-44-7	U		U		U		U		U	
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U	
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U	
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U	
UNDECANE	1120-21-4	U		U		U		U		U	
1,2,4-TRICHLOROBENZENE	120-82-1	0.2	J	U		U		U		U	
DODECANE	112-40-3	U		U		U		U		U	
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U	
TRIDECANE	629-50-5	U		U		U		U		U	
TETRADECANE	629-59-4	U		U		U		U		U	

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

Y Initial calibration and CCV was performed; however, the analyte was not part of the current operating procedure.

< Denotes compound not detected at or above the LLS.

Table F.10 Triple Sorbent Trap Blank Sample Analysis Results for All Target Analytes Associated with the Headspace Sampling of Tank C-107 on 1/17/96

		S6001-A11.780		S6001-A13.782				S6002-A77.799				S6003-A83.801			
				S6001-A12.781		S6001-A14.783				S6002-A81.800				S6003-A84.803	
		VSS		VSS				ISVS W/HEPA		ISVA W/HEPA		ISVS wo/HEPA		ISVS wo/HEPA	
		FB #1		FB #2		TB #1		TB #2		FB #3		FB #4		FB #5		FB #6	
Target Analytes	**CAS No.**	(ppbv)	Flag	(ppbv)	Flag	(ppbv	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag
DICHLORODIFLUOROMETHANE	75-71-8	U		U		U		U		U		U		10		23	
CHLOROMETHANE	74-87-3	U		U		U		U		U		U		U		U	
1,2-DICHLORO-1,1,2,2-TETRAFLUOROETHAN	76-14-2	U		U		U		U		U		U		U		U	
METHANOL	67-56-1	< 192	Y	< 192	Y	< 192	Y	< 192	Y	< 192	Y	< 192	Y	207		367	
VINYL CHLORIDE	75-01-4	U		U		U		U		U		U		U		U	
BUTANE	106-97-8	U		U		U		U		5.6	J	11	J	12	J	24	
CHLOROETHANE	75-00-3	U		U		U		U		U		U		U		U	
ETHANOL	64-17-5	< 133	Y	< 133	Y	< 133	Y	< 133	Y	< 133	Y	< 133	Y	< 133	Y	< 133	Y
ACETONITRILE	75-05-8	U		U		U		U		U		11	J	11	J	17	J
ACETONE	67-64-1	17	J	16	J	10	J	10	J	18	J	36		37		46	
TRICHLOROFLUOROMETHANE	75-69-4	U		U		U		U		1.3	J	1.2	J	1.8	J	4.6	J
PENTANE	109-66-0	U		U		U		U		U		1.3	J	5.1	J	8.1	J
1,1-DICHLOROETHENE	75-35-4	U		U		U		104		U		U		U		U	
METHYLENE CHLORIDE	75-09-2	11	J	14	J	12	J	U		31	J	85		769	E	1673	E
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	U		U		U		U		U		U		U		U	
PROPANENITRILE	107-12-0	U		U		U		U		U		U		U		U	
PROPANOL	71-23-8	U		U		U		U		U		U		U		U	
1,1-DICHLOROETHANE	75-34-3	U		U		U		U		U		U		U		U	
2-BUTANONE	78-93-3	U		U		U		U		1.6	J	3.3	J	9.1		10	
CIS-1,2-DICHLOROETHENE	156-59-2	U		U		U		U		U		U		U		U	
HEXANE	110-54-3	U		U		U		U		17		23		53		60	
CHLOROFORM	67-66-3	U		U		U		U		U		U		U		U	
TETRAHYDROFURAN	109-99-9	U		U		U		U		U		U		U		U	
1,2-DICHLOROETHANE	107-06-2	U		U		U		U		U		U		U		U	
BUTANENITRILE	109-74-0	U		U		U		U		U		U		U		U	
1,1,1-TRICHLOROETHANE	71-55-6	U		U		U		U		U		U		U		U	
1-BUTANOL	71-36-3	U		U		U		U		13	J	36		28		33	
BENZENE	71-43-2	12		U		U		2.3	J	2.2	J	4.1		6.7		11	
CARBON TETRACHLORIDE	56-23-5	U		U		U		U		U		U		U		U	
CYCLOHEXANE	110-82-7	U		U		U		U		U		U		U		U	
1,2-DICHLOROPROPANE	78-87-5	U		U		U		U		U		U		U		U	
TRICHLOROETHENE	79-01-6	U		U		U		U		U		0.4	J	2.8	J	6.4	
HEPTANE	142-82-5	U		U		U		U		66		53		89		116	
4-METHYL-2-PENTANONE	108-10-1	U		U		U		U		4.9		U		7.4		9.9	
CIS-1,3-DICHLOROPROPENE	10061-01-5	U		U		U		U		U		U		U		U	
PYRIDINE	110-86-1	U		U		U		U		U		U		U		U	
TRANS-1,3-DICHLOROPROPENE	10061-02-6	U		U		U		U		U		U		U		U	
PENTANENITRILE	110-59-8	U		U		U		U		U		U		U		U	

Table F.10 Triple Sorbent Trap Blank Sample Analysis Results for All Target Analytes Associated with the Headspace Sampling of Tank C-107 on 1/17/96

		S6001-A11.780		S6001-A12.781		S6001-A13.782		S6001-A14.783		S6002-A77.799		S6002-A81.800		S6003-A83.801		S6003-A84.803	
		VSS		VSS						ISVS W/HEPA		ISVA W/HEPA		ISVS wo/HEPA		ISVS wo/HEPA	
		FB #1		FB #2		TB #1		TB #2		FB #3		FB #4		FB #5		FB #6	
Target Analytes	**CAS No.**	(ppbv)	Flag	(ppbv)	Flag	(ppbv	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag	(ppbv)	Flag
1,1,2-TRICHLOROETHANE	79-00-5	U		U		U		U		3.7		1.2	J	4.9		6.9	
TOLUENE	108-88-3	U		U		U		U		53		47		54		65	
1,2-DIBROMOETHANE	106-93-4	U		U		U		U		U		U		U		U	
OCTANE	111-65-9	U		U		U		U		U		U		U		U	
TETRACHLOROETHYLENE	127-18-4	U		U		U		U		U		U		U		U	
CHLOROBENZENE	108-90-7	U		U		U		U		U		U		U		U	
HEXANENITRILE	628-73-9	U		U		U		U		U		U		U		U	
ETHYLBENZENE	100-41-4	U		U		U		U		0.9	J	1.8	J	1.9	J	2.3	J
P/M-XYLENE	106-42-3	U		U		U		U		3.2	J	6.5		7.1		8.1	
CYCLOHEXANONE	108-94-1	U		U		U		U		U		U		U		U	
STYRENE	100-42-5	U		U		U		U		U		U		U		U	
1,1,2,2-TETRACHLOROETHANE	79-34-5	U		U		U		U		U		U		U		U	
O-XYLENE	95-47-6	U		U		U		U		0.5	J	2.0	J	U		3.0	J
NONANE	111-84-2	U		U		U		U		U		U		U		U	
1-ETHYL-2-METHYL BENZENE	611-14-3	U		U		U		U		0.4	J	U		2.1	J	2.2	J
1,3,5-TRIMETHYLBENZENE	108-67-8	U		U		U		U		U		U		2.2	J	1.0	J
1,2,4-TRIMETHYLBENZENE	95-63-6	U		U		U		U		U		1.8	J	3.6	J	3.9	J
DECANE	124-18-5	U		U		U		U		U		U		U		U	
1,3-DICHLOROBENZENE	541-73-1	U		U		U		U		U		U		U		U	
1,4-DICHLOROBENZENE	106-46-7	U		U		U		U		U		U		U		U	
1,2-DICHLOROBENZENE	95-50-1	U		U		U		U		U		U		U		U	
UNDECANE	1120-21-4	U		U		U		U		U		U		U		U	
1,2,4-TRICHLOROBENZENE	120-82-1	U		U		U		U		U		U		U		U	
DODECANE	112-40-3	U		U		U		U		U		U		U		U	
HEXACHLORO-1,3-BUTADIENE	87-68-3	U		U		U		U		U		U		U		U	
TRIDECANE	629-50-5	U		U		U		U		U		U		U		U	
TETRADECANE	629-59-4	1.7	J	U		U		U		U		U		U		U	
TBP	126-73-8	< 0.8	Y	< 0.8	Y	< 0.8	Y	< 0.8	Y	< 0.8	Y	< 0.8	Y	< 0.8	Y	< 0.8	Y

Data Quality Flags

J Target compound detected above the IDL but below the EQL.

U Target compound not detected at or above the IDL.

E Target compound exceeds upper quantification limit (UQL).

Y Initial calibration was performed; however, a CCV was not performed. Concentration is considered an estimate.

< Denotes compound not detected at or above the LLS.

Appendix G

Tank Vapor Characterization:

Chain of Custody Sample Control Forms

Battelle Pacific
National Northwest Lab

CHAIN OF CUSTODY

WHC 100008

Custody Form Initiator: J. A. Edwards - PNNL
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-C-107 Tank Vapor Sample SAF S6001
(VSS Truck)

Collection date: 01 - 17 - 96
Preparation date: 01 - 03 - 96

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: PNNL

Possible Sample Hazards/Remarks: Unknown at time of sampling

Sample Identification		
S6001 - A18 . 21S	Collect NH_3/H_2O Sorbent Trap #1	Sorbent line 3
S6001 - A19 . 22S	Collect NH_3/H_2O Sorbent Trap #2	Sorbent line 4
S6001 - A20 . 23S	Collect NH_3/H_2O Sorbent Trap #3	Sorbent line 5
S6001 - A21 . 24S	Collect NH_3/H_2O Sorbent Trap #4	Sorbent line 6
S6001 - A22 . 25S	Collect NH_3/H_2O Sorbent Trap #5	Sorbent line 7
S6001 - A23 . 26S	Collect NH_3/H_2O Sorbent Trap #6	Sorbent line 8
S6001 - A24 . 27S	Open, close & store NH_3/H_2O field blank #1	N/A
S6001 - A25 . 28S	Open, close & store NH_3/H_2O field blank #2	N/A
S6001 - A26 . 29S	Open, close & store NH_3/H_2O field blank #2	N/A

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

Relinquished By	Date	Time	Received By	Date	Time
G W Dennis G.W. Dennis	01-04-96	1300	J A Edwards JAEdwards	01-04-96	1300
J A Edwards JAEdwards	01-04-96	1400	D E Richards DERichards	01-04-96	1400
D E Richards DERichards	1-19-96	1200	T. B Ulteit T. B Ulteit	1-19-96	1205
T. B Ulteit T. B Ulteit	1-19-96	1207	J A Edwards JAEdwards	1-19-96	1307
J A Edwards JAEdwards	1-19-96	1307	M.W. Dennis G.W. Dennis	1-19-96	1309

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 / (Y)/N	
◊	COC info/signatures complete?	(Y)/N / (Y)/N	
◊	Rad release stickers on samples?	/ (Y)/N	
◊	Activity report from 222S?	/ (Y)/N	
◊	RSR/copy? (a ≤100/ß ≤400 pCi/g)	/ (Y)/N	
◊	COC copy for LRB, RIDS filed?	/ (Y)/N	

POC JAE POC JAE

(Revised 11/30/95 PNNL)

Battelle Pacific
National Northwest Lab

CHAIN OF CUSTODY

WHC 100011

Custody Form Initiator: J. A. Edwards - PNNL
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-C-107 Tank Vapor Sample SAF S6002
With HEPA filters *(ISVS Cart)*
Collection date 01 - 17 - 96
Preparation date 01 - 03 - 96
Ice Chest No.:
Field Logbook No. WHC-N-642-8

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

S6002 - A42 . 30S	Collect NH_3/H_2O Sorbent Trap #7	A4
S6002 - A43 . 31S	Collect NH_3/H_2O Sorbent Trap #8	A5
S6002 - A44 . 32S	Collect NH_3/H_2O Sorbent Trap #9	A6
S6002 - A51 . 33S	Collect NH_3/H_2O Sorbent Trap #10	B4
S6002 - A52 . 34S	Collect NH_3/H_2O Sorbent Trap #11	B5
S6002 - A53 . 35S	Collect NH_3/H_2O Sorbent Trap #12	B6
S6002 - A78 . 36S	Bundle A Store NH_3/H_2O field blank #4	A8
S6002 - A82 . 37S	Bundle B Store NH_3/H_2O field blank #5	B8

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

Relinquished By	Date	Time	Received By	Date	Time
G W Dennis G.W. Dennis	01-04-96	1300	J A Edwards JA Edwards	01-04-96	1300
J A Edwards JA Edwards	01-04-96	1400	DE Richards DE Richards	01-04-96	1400
DE Richards DE Richards	1-19-96	1200	T B White TB White	1-19-96	1305
T B White TB White	1-19-96	1305	JA Edwards JA Edwards	1-19-96	1305
JA Edwards JA Edwards	1-19-96	1325	G.W. Dennis G.W. Dennis	1-19-96	1309

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	/ (Y)/N	
◊	COC info/signatures complete?	(Y)/N	/ (Y)/N	
◊	Rad release stickers on samples?		/ (Y)/N	
◊	Activity report from 222S?		/ (Y)/N	
◊	RSR/copy? (a ≤100/ß ≤400 pCi/g)		/ (Y)/N	
◊	COC copy for LRB, RIDS filed?		/ (Y)/N	

POC (RE) POC (RE)

(Revised 11/30/95 PNNL)

A-6000-407 (12/92) WEF061

Battelle Pacific
National Northwest Lab

CHAIN OF CUSTODY

WHC 100014

Custody Form Initiator	J. A. Edwards - PNNL	Telephone Page	(509) 373-0141 85-3009 / FAX 376-0418
Company Contact	R. D. Mahon - WHC	Telephone Page	(509) 373-2891 85-3152 / FAX 373-3793
Project Designation/Sampling Locations	200 West Tank Farm Vapor Sample SAF S6003 (ISVS Cart)	Collection date Preparation date	01 - 17 - 96 01 - 03 - 96
241-C-107 Tank *Without HEPA filters* 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

S6003 - A66 . 38S	Collect NH_3/H_2O Sorbent Trap #13	C7
S6003 - A67 . 39S	Collect NH_3/H_2O Sorbent Trap #14	C8
S6003 - A68 . 40S	Collect NH_3/H_2O Sorbent Trap #15	C9
S6003 - A69 . 41S	Collect NH_3/H_2O Sorbent Trap #16	C10
S6003 - A70 . 42S	Collect NH_3/H_2O Sorbent Trap #17	C11
S6003 - A71 . 43S	Collect NH_3/H_2O Sorbent Trap #18	C12
S6003 - A85 . 44S	Bundle C Store NH_3/H_2O field blank #6	C16
S6003 - A86 . 45S	Bundle C Store NH_3/H_2O field blank #7	C17

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

Relinquished By	Date	Time	Received By	Date	Time
G W Dennis	01-04-96	1300	J A Edwards	01-04-96	1300
J A Edwards	01-04-96	1400	DE Richards	01-04-96	1400
DE Richards	1-22-96	1200	T.B. Ulteh/TE Ulteh	1-22-96	1200
T B Ulteh/TE Ulteh	1-22-96	1415	JAEdwards/JAEdwards	1-22-96	1415
JAEdwards/JAEdwards	1-23-96	1000	G.W. Dennis/GWD	1-23-96	1000

Final Sample Disposition

Comments: At 1440 hrs on 17JAN it was noticed that some of the c-flex clamps were open on the tygon tubing. The clamps that were open were on lines C4, C8, C9, C10 & C11. It is presumed that these were opened while ~~cleaning~~ sleeving the bundle at about 22JAN96 RD on 22JAN96

PNNL (only) Checklist 22JAN96 Pick-up / Delivery

◊	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
◊	RSR/copy? (a ≤100/ß ≤400 pCi/g)		/ (Y) N
◊	COC copy for LRB, RIDS filed?		/ (Y) N

POC (JE) POC (TU)

Comments: 0930 on 17JAN96.

After sampling with Bundle C, the HPT sprayed "Quick and Brite" on a rag and wiped the rag across the teflon ~~filter~~ screen while the head was still assembled. Some of the samples may have been contaminated by this decontamination step. RD on 22JAN96

(Revised 11/30/95 PNNL)

A-6000-407 (12/92) WEF061

Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100006

Custody Form Initiator: J. A. Edwards - PNNL
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-C-107 Tank Vapor Sample SAF S6001
(VSS Truck)

Collection date 01 - 17 - 96
Preparation date 01 - 03 - 96

Ice Chest No.

Field Logbook No. WHC- N-642 10

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

S6001 - A01 . 300	Collect Ambient Air Sample SUMMA #1	Upwind of Tank
S6001 - A02 . 301	Collect Ambient Air Sample SUMMA #2	SUMMA Port 15
S6001 - A03 . 302	Collect SUMMA #3	SUMMA Port 13
S6001 - A04 . 303	Collect SUMMA #4	SUMMA Port 15
S6001 - A15 . 304	Collect SUMMA #5	SUMMA Port 13
S6001 - A16 . 305	Collect SUMMA #6	SUMMA Port 15
S6001 - A27 . 306	Collect SUMMA #7	SUMMA Port 13
S6001 - A28 . 307	Collect SUMMA #8	SUMMA Port 15

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

Relinquished By	Date	Time	Received By	Date	Time
J A Edwards JAEdwards	01-04-96	1400	PE Richards PERichards	01-04-96	1900
PE Richards PERichards	1-19-96	~~1900~~ 84	T. B Utsh / T- B Utsh	1-19-96	1305
T.B. Utsh / T- B Utsh	1-19-96	1305	JAEDWARDS JAEdwards	1-19-96	1305

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 / (Y)/N	
◊	COC info/signatures complete?	(Y)/N / (Y)/N	
◊	Rad release stickers on samples?	/ (Y)/N	
◊	Activity report from 222S?	/ (Y)/N	
◊	RSR/copy? (a ≤100/ß ≤400 pCi/g)	/ (Y)/N	
◊	COC copy for LRB, RIDS filed?	/ (Y)N	

POC [illegible] POC [illegible]

(Revised 11/30/95 PNNL)

A-6000-407 (12/92) WEF061

Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100009

Custody Form Initiator: J. A. Edwards - PNNL
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-C-107 Tank Vapor Sample SAF S6002
With HEPA filters *(ISVS Cart)*
Collection date 01 - 17 - 96
Preparation date 01 - 03 - 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

S6002 - A33 . 308	Collect Ambient Air Sample SUMMA #9	AS
S6002 - A34 . 309	Collect Ambient Air Sample SUMMA #10	BS
S6002 - A36 . 310	Collect SUMMA #12	AS
S6002 - A37 . 311	Collect SUMMA #13	AS
S6002 - A38 . 312	Collect SUMMA #14	AS
S6002 - A45 . 313	Collect SUMMA #15	BS
S6002 - A46 . 314	Collect SUMMA #16	BS
S6002 - A47 . 315	Collect SUMMA #17	BS

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

Relinquished By	Date	Time	Received By	Date	Time
J A Edwards JAEdwards	01-04-96	1400	VE Richards VERichards	01-04-96	1400
VE Richards VERichards	1-15-96	1200	T-B Utech /T.B Utech	1-15-96	1205
T-B Utech /T.B Utech	1-15-96	1305	JAEDWARDS JAEdwards	1-19-96	1305

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	/ (Y)/N	
◊	COC info/signatures complete?	(Y)/N	/ (Y)/N	
◊	Rad release stickers on samples?		/ (Y)/N	
◊	Activity report from 222S?		/ (Y)/N	
◊	RSR/copy? (a ≤100/ß ≤400 pCi/g)		/ (Y)/N	
◊	COC copy for LRB, RIDS filed?		/ (Y)/N	

POC (16) POC (16)

(Revised 11/30/95 PNNL)

Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100012

Custody Form Initiator: J. A. Edwards - PNNL
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-C-107 Tank Vapor Sample SAF S6003
Without HEPA filters *(ISVS Cart)*
Collection date 01 - 17 - 96
Preparation date 01 - 03 - 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

S6003 - A35 . 316	Collect Ambient Air Sample SUMMA #11	CS
S6003 - A54 . 317	Collect SUMMA #18	CS
S6003 - A55 . 318	Collect SUMMA #19	CS
S6003 - A56 . 319	Collect SUMMA #20	CS
S6003 - A57 . 320	Collect SUMMA #21	CS
S6003 - A58 . 321	Collect SUMMA #22	CS
S6003 - A59 . 322	Collect SUMMA #23	CS

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

Relinquished By	Date	Time	Received By	Date	Time
J A Edwards / J A Edwards	01-04-96	1400	D E Richards	01-04-96	1400
D E Richards / D E Richards	1-22-96	1200	T B Utehult / T B Utehult	1-22-96	1200
T.B. Utehult / T B Utehult	1-22-96	1415	J A Edwards / J A Edwards	1-22-96	1415

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	/ (Y)/N	
◊	COC info/signatures complete?	(Y)/N	/ (Y)/N	
◊	Rad release stickers on samples?		/ (Y)/N	
◊	Activity report from 222S?		/ (Y)/N	
◊	RSR/copy? (a ≤100/ß ≤400 pCi/g)		/ (Y)/N	
◊	COC copy for LRB, RIDS filed?		/ (Y)/N	

POC (Y) POC (Y)

(Revised 11/30/95 PNNL)

A-6000-407 (12/92) WEF061

Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100007

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 373-7076

Project Designation/Sampling Locations: 200 West Tank Farm
241-C-107 Tank — Vapor Sample SAF S6001 (VSS Truck)
Collection date 01 - 17 - 96
Preparation date 01 - 03 - 96

Ice Chest No.
Field Logbook No. WHC-N-647-10

Ertco Hi/Lo thermometer No. PNL-T-004

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

S6001 - A05 . 773 ·	Collect TST Sample # 1	Sorbent Line 3
S6001 - A06 . 774.	Collect TST Sample # 2	Sorbent Line 4
S6001 - A07 . 775 .	Collect TST Sample # 3	Sorbent Line 5
S6001 - A08 . 776 ·	Collect TST Sample # 4	Sorbent Line 6
S6001 - A09 . 777 ·	Collect TST Sample # 5	Sorbent Line 7
S6001 - A10 . 778 ·	Collect TST Sample # 6	Sorbent Line 8
S6001 - A11 . 780 ·	Open, close & store TST Field Blank # 1	In VSS truck
S6001 - A12 . 781 ·	Open, close & store TST Field Blank # 2	In VSS truck
S6001 - A13 . 782 ·	Store TST Trip Blank # 1	N/A
S6001 - A14 . 783 ·	Store TST Trip Blank # 2	N/A

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

Relinquished By	Date	Time	Received By	Date	Time
J L Julya Janet Julya	01-04-96	1420	J A Edwards J A Edwards	01-04-96	1420
J A Edwards J A Edwards	01-04-96	1920	D E Richards D E Richards	01-04-96	1420
D E Richards D E Richards	1-15-96	1200	T. B Utsett / T. B Utsett	1-15-96	1205
T. B Utsett / T. B Utsett	1-19-96	1305	J A Edwards J A Edwards	1-19-96	1305
J A Edwards J A Edwards	1-19-96	1435	Janet L Julya	1-19-96	1435

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	/ (Y) N
◊	COC info/signatures complete?	(Y) N	/ (Y) N
◊	Sorbents shipped on ice? (<5°C)	(Y) N	/ (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
◊	RSR/copy? (a ≤100/ß ≤400 pCi/g)		/ (Y) N
◊	COC copy for LRB, RIDS filed?		/ (Y) N
	POC		POC

Comments:

Cooler Temperature Status	
Hi	°C / Lo °C (pick up at PNL to WHC)
Hi	°C / Lo °C (delivery at WHC from PNL)
Hi	°C / Lo °C (at return to PNL from WHC)
Hi +10 °C	/ Lo −6 °C (at delivery from WHC to PNL)

(Revised 06/21/95 PNL)

Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100010

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 373-7076

Project Designation/Sampling Locations: 200 West Tank Farm
241-C-107 Tank Vapor Sample SAF S6002
With HEPA filters (ISVS Cart)
Collection date 01 - 17 - 96
Preparation date 01 - 03 - 96
Ice Chest No.
Field Logbook No. WHC-N1-6478

Ertco Hi/Lo thermometer No. PNL-T-004

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

S6002 - A39 . 784	Collect TST Sample # 7	A1
S6002 - A40 . 785	Collect TST Sample # 8	A2
S6002 - A41 . 786	Collect TST Sample # 9	A3
S6002 - A48 . 788	Collect TST Sample # 10	B1
S6002 - A49 . 789	Collect TST Sample # 11	B2
S6002 - A50 . 790	Collect TST Sample # 12	B3
S6002 - A77 . 799	Bundle A Store TST Field Blank # 3	A7
S6002 - A81 . 800	Bundle B Store TST Field Blank # 4	B7

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

Relinquished By	Date	Time	Received By	Date	Time
J L Julya	01-04-96	1420	J A Edwards	01-04-96	1920
J A Edwards	01-04-96	1420	DE Richards	01-04-96	1420
DE Richards	1-19-96	1200	T + B Utsett	1-19-96	1205
T + B Utsett	1-19-96	1305	J A Edwards	1-19-96	1305
J A Edwards	1-19-96	1435	Joan L Julya	1-19-96	1935

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	/ (Y)/N
◊	COC info/signatures complete?	(Y)/N	/ (Y)/N
◊	Sorbents shipped on ice? (<5°C)	(Y)/N	/ (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
◊	RSR/copy? (a ≤100/ß ≤400 pCi/g)		/ (Y)/N
◊	COC copy for LRB, RIDS filed?		/ (Y)/N
		POC (VB)	POC (VB)

Comments:

Cooler Temperature Status

Hi +4 °C / Lo -6 °C (pick up at PNL to WHC)
Hi ___°C / Lo ___°C (delivery at WHC from PNL)
Hi ___°C / Lo ___°C (at return to PNL from WHC)
Hi +10 °C / Lo -6 °C (at delivery from WHC to PNL)

(Revised 06/21/95 PNL)

Battelle Pacific National Northwest Lab	CHAIN OF CUSTODY	WHC 100013

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 373-7076

Project Designation/Sampling Locations: 200 West Tank Farm
241-C-107 Tank Vapor Sample SAF S6003
Without HEPA filters (ISVS Cart)
Collection date 01 - 17 - 96
Preparation date 01 - 03 - 96

Ice Chest No.
Field Logbook No. WHC-N-697-8

Erico Hi/Lo thermometer No. PNL-T-00 4

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

S6003 - A60 . 791	Collect TST Sample # 13	C1
S6003 - A61 . 792	Collect TST Sample # 14	C2
S6003 - A62 . 794	Collect TST Sample # 15	C3
S6003 - A63 . 796	Collect TST Sample # 16	C4
S6003 - A64 . 797	Collect TST Sample # 17	C5
S6003 - A65 . 798	Collect TST Sample # 18	C6
S6003 - A83 . 801	Bundle C Store TST Field Blank # 5	C14
S6003 - A84 . 803	Bundle C Store TST Field Blank # 6	C15

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

Relinquished By	Date	Time	Received By	Date	Time
J L Julya JO Julya	01-04-96	1420	J A Edwards JA Edwards	01-04-96	1420
J A Edwards JA Edwards	01-04-96	1420	V E Richards VE Richards	01-04-96	1420
V E Richards VE Richards	1-22-96	1200	T. B. Utesch / T B Utesch	1-22-96	1200
T. B. Utesch / T B Utesch	1-22-96	1415	J A Edwards / JA Edwards	1-22-96	1415
J A Edwards / JA Edwards	1-23-96	0830	Joan L Julya	1-23-96	0830

Final Sample Disposition At 144 hrs on 17 JAN 96 the following c-flex clamps were found open on lines C4, C8, C9, C11. It is presumed that these clamps popped open while being sleeved at about 0930 on 17 JAN 96. RD M 22JAN96

Comments:

PNL (only) Checklist	Pick-up	Delivery
◊ 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? (<5°C)	(Y)/N	/ (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
◊ RSR/copy? (a ≤100/ß ≤400 pCi/g)		/ (Y)N
◊ COC copy for LRB, RIDS filed?		/ (Y)N
	POC (JE)	POC (JE)

Comments:

Cooler Temperature Status	
Hi +4 °C / Lo -6 °C	(pick up at PNL to WHC)
Hi ___ °C / Lo ___ °C	(delivery at WHC from PNL)
Hi ___ °C / Lo ___ °C	(at return to PNL from WHC)
Hi ___ °C / Lo ___ °C	(at delivery from WHC to PNL)

After Sampling with Bundle C, the HPT sprayed "Quick and Brite" on a rag and wiped the rag across the teflon screen while the head was still assembled. Some of the samples may have been contaminated during this decontamination step. RD M 22JAN96.

(Revised 06/21/95 PNL)

PNNL

Karl Pool	P8-08
Berta Thomas	P8-08
John Evans	K6-96
Khris Olsen	K6-96
Kurt Silvers	K9-08
Jon Fruchter	K6-96
Jim Huckaby	K6-80
Brenda Thornton	K6-80
Darlene Varley	K1-06
Katherine Savard	K9-04

Lockheed

Larry Pennington	S7-21
Luther Buckley	R2-12

DOE-RL

Carol Babel	S7-54
Jim Thompson	S7-54