Pacific Northwest National Laboratory

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TANK VAPOR CHARACTERIZATION PROJECT

Tank 241-S-102 Temporal Study Headspace Gas and Vapor Characterization Results from Samples Collected on September 19, 1996

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August 1997

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Summary

This report presents the results from analyses of samples taken from the headspace of waste storage tank 241-S-102 (Tank S-102) at the Hanford Site in Washington State. Tank headspace samples collected by Westinghouse Hanford Company (WHC) were analyzed by Pacific Northwest National Laboratory (PNNL) to determine headspace concentrations of selected non-radioactive analytes. Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNNL. Vapor concentrations from sorbent trap samples are based on measured sample volumes provided by WHC.

Ammonia was determined to be above the immediate notification limit of 150 ppm as specified by the sampling and analysis plan (SAP) (Buckley 1996). Hydrogen was the principal flammable constituent of the Tank S-102 headspace, determined to be present at approximately 2.948% of its lower flammability limit (LFL). Total headspace flammability was estimated to be <3.659% of the LFL.

Average measured concentrations of targeted gases, inorganic vapors, and selected organic vapors are provided in Table S.1. A summary of experimental methods, including sampling methodology, analytical procedures, and quality assurance and control methods are presented in Section 2.0. Detailed descriptions of the analytical results are provided in Section 3.0.

Table S.1. Average Measured Concentrations of Gases and Inorganic and Organic Vapors in Tank S-102 Sampled on 9/19/96

<u>Category</u>	<u>Sample Medium</u>	<u>Analyte</u>	<u>Concentration^(a)</u>	<u>Units</u>
Inorganic Vapors	Sorbent Traps	Ammonia	798	ppmv
		Nitrogen Dioxide (NO ₂)	<0.16	ppmv
		Nitric Oxide (NO)	<0.16	ppmv
		Water	17.6	mg/L
Permanent Gases	SUMMA™ Canisters	Hydrogen	1179	ppmv
		Methane	<50	ppmv
		Carbon Dioxide	<17	ppmv
		Carbon Monoxide	<17	ppmv
		Nitrous Oxide (N ₂ O)	1041	ppmv
Total Non-Methane Organic Compounds	SUMMA™ Canisters	Total Non-Methane Organic Compounds	27.50	mg/m ³
Volatile Organic Vapors	SUMMA™ Canisters	Ethanol	19.184	mg/m ³
		Methanol	12.441	mg/m ³
		1-Butanol	3.254	mg/m ³
Volatile Organic Vapors	Sorbent Traps	Methanol	27.407	mg/m ³
		Ethanol	27.251	mg/m ³
		1-Butanol	3.348	mg/m ³
Flammables	SUMMA™ Canisters and Sorbent Traps	Flammables	<3.659	% LFL

(a) Concentrations were determined using sample-volume data provided by Westinghouse Hanford Company and are based on averaged data from three samples. Mass concentrations are at reference temperature and pressure of 0°C and 1.013 bar.

Acknowledgments

The authors gratefully acknowledge the support of other project staff at PNNL who contributed to the successful completion of this sampling and analysis activity. S. O. Slate, K. P. Schielke, L. M. P. Thomas, and G. W. Dennis supported inorganic laboratory work.

Terms and Abbreviations

% D	% Difference
CAS	Chemical Abstracts Service
CCB	continuing calibration blank
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
IC	ion chromatography
ICB	initial calibration blank
ICV	initial calibration verification
IDL	instrument detection limit
IS	internal standard
ISE	ion selective electrode
ISVS	In Situ Vapor Sampling System
LFL	lower flammability limit
MW	molecular weight
NIST	National Institute for Standards and Technology
OSHA	Occupational Safety and Health Administration
PNL	Pacific Northwest Laboratory (previous name for the 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
RPD	relative percent difference
RSD	relative standard deviation
SAP	sample and analysis plan
SCIC	suppressed-conductivity ion chromatography
SRM	standard reference material
STP	standard temperature and pressure
SUMMA™	process for passivating stainless steel
TBP	tributyl phosphate
TEA	triethanolamine
TIC	tentatively identified compound
TNMOC	total non-methane organic compound
TST	triple sorbent trap
UHP	ultra high purity
UQL	upper quantitation limit
VAL	Vapor Analytical Laboratory
VSS	vapor sampling system
WHC	Westinghouse Hanford Company

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1.0 Introduction

This report presents results of chemical analyses of vapor samples collected by WHC on September 19, 1996 from the headspace of waste storage tank 241-S-102 (Tank S-102) at the Hanford Site in Washington State. Pacific Northwest National Laboratory^(a) provided SUMMA™ canisters and sorbent traps for sample collection, and analyzed the samples according to instructions in the SAP (Buckley 1996). Analytical work was performed by the PNNL VAL in the 300 Area of the Hanford Site under the PNNL Tank Vapor Characterization Project.

Pacific Northwest National Laboratory provided six sets of sorbent traps for selected inorganic analytes (four samples and two field blanks), five SUMMA™ canisters for permanent gases and organic analytes (three headspace samples and two ambient air samples), and eight triple sorbent traps (TSTs) for organic analytes (four samples, two field blanks, and two trip blanks). Sample devices and controls for sorbent traps for inorganic analytes were provided to WHC on September 9, 1996; sample devices and controls for SUMMA™ canisters and TSTs were provided to WHC on September 16, 1996. All samples were returned to PNNL on September 26, 1996. Westinghouse Hanford Company measured and reported to PNNL the sample volumes needed to determine headspace concentrations from sorbent trap samples.

Specific analytical methods for sample analysis are described in Section 2.0. Results and known sampling and analytical variances from established quality assurance (QA) requirements, where significant, are documented in Section 3.0. Chain-of-custody forms used to document possession and transfer of samples and controls are provided in Appendix A. Appendix B contains a complete listing of target analyte results for the organic analyses.

^(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 of the laboratory was Pacific Northwest Laboratory. The former name is used when previously published documents are referenced.

2.0 Analytical Methods

Table 2.1 summarizes the analytes, sampling media, analytical methods, and laboratory procedures. Table 2.2 summarizes information regarding sample media, handling, and storage procedures.

Table 2.1. Sampling and Analysis Methods Summary

<u>Analyte</u>	<u>Sampling Media</u>	<u>Extraction Method</u>	<u>Analysis Method</u>	<u>Procedure</u>
Ammonia	Acidified carbon bead sorbent trap	Aqueous extraction	ISE analysis	PNL-ALO-226
Nitric Oxide and Nitrogen Dioxide	Triethanolamine impregnated sorbent traps	Aqueous extraction	IC	PNL-ALO-212
Water Vapor	Other inorganic sorbent traps + silica gel sorbent trap	None	Gravimetric analysis (sample weight gain)	PNL-TVP-09
Carbon Monoxide, Carbon Dioxide, Hydrogen, Methane, and Nitrous Oxide	SUMMA™ canisters	Analysis of SUMMA™ canister subsample	GC/TCD	PNL-TVP-05
Organic Vapors	Triple sorbent traps	Thermal desorption	GC/MS	PNL-TVP-10
Organic Vapors	SUMMA™ canisters	Cryo-focusing of SUMMA™ canister subsample	GC/MS	PNL-TVP-03
Total Non-Methane Organic Compounds	SUMMA™ canisters	Cryo-focusing of SUMMA™ canister subsample	GC/FID	PNL-TVP-08

Table 2.2. Sample Media Preparation, Handling, and Storage

<u>Sampling Media</u>	<u>Supplier and Catalog Number</u>	<u>Preparation Procedure</u>	<u>Handling and Storage Procedure</u>
Inorganic vapor sorbent traps	SKC No. 226-29 SKC No. 226-40-02 SKC No. 226-10-04	PNL-TVP-09	PNL-TVP-07
SUMMA™ canisters	Scientific Instrumentation Specialist	PNL-TVP-02	PNL-TVP-07
Triple sorbent traps	Supelco CarboTrap 300	PNL-TVP-10	PNL-TVP-07

2.1 Inorganic Vapors

Solid sorbent traps, prepared in multi-trap sampling trains, were supplied to WHC for sampling the tank headspace. Blanks and exposed samples were returned to PNNL for analyses. Analyses were performed to provide information on the tank-headspace concentration of the following analytes: ammonia, nitrogen dioxide (NO₂), nitric oxide (NO), and water. Samples were prepared, handled, and disassembled as described in Technical Procedure PNL-TVP-09^(a).

2.1.1 Sampling Methodology

Standard glass tubes containing sorbent materials to trap ammonia, NO, NO₂, and water vapors were obtained, prepared, and submitted for vapor sampling. The sorbent traps were selected based on their use by the Occupational Safety and Health Administration (OSHA) to perform workplace monitoring and because of available procedures and verification results associated with that particular application. Each sorbent trap contained two sorbent sections separated by a glass wool plug. Sorbent media in the two sections were segregated and analyzed separately (except for analysis for water). Analyses of the second sorbent (breakthrough) sections were performed to demonstrate complete collection of the target analyte by the first sorbent section.

The ammonia 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 ammonia was chemisorbed as ammonium sulfate [(NH₄)₂SO₄]. The NO₂ traps contained a zeolite impregnated with triethanolamine (TEA), with 400 mg in the primary and 200 mg in the breakthrough sections. The NO₂ was absorbed and disproportionated to equi-molar quantities of nitrite ions (NO₂⁻) and nitrate ions (NO₃⁻). Glass tubes containing 800 mg of an oxidant were used to convert NO to NO₂. The converted NO was then collected as nitrite and nitrate in an NO₂ trap. The water traps contained a total of 450 mg of silica gel. All sorbent traps for a given analyte were from a single manufacturer's batch.

After sample preparation, sorbent trains were stored at ≤ 10°C because of handling recommendations for the oxidizer tubes attached to some samples. After receipt of exposed and

^(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, 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 trains configured so sample air flow passed in order through the ammonia, nitrogen dioxide, oxidizer, nitric oxide, and desiccant traps. Traps were weighed and then connected to each other using uniform lengths of 3/8-in. perfluoroalkoxy-grade (PFA) Teflon® tubing. The perfluoroalkoxy-grade 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 having a 3/8-in. stainless steel Swagelok® nut, and sealed using a Swagelok® cap. The trailing ends of the sorbent trains were each sealed with red plastic caps provided by the manufacturer.

2.1.1.1 Concentration Calculations. Concentration, in parts per million by volume (ppmv), was determined by dividing the amount of analyte, in μmol , by the moles of the dried tank air sampled. For example, the concentration of a 3.00-L sample containing 75.0 μg of ammonia equals

$$\frac{(75.0 \mu\text{g})(22.4 \text{ L/mol})}{(17.0 \mu\text{g}/\mu\text{mol})(3.00 \text{ L})} = 32.9 \text{ ppmv} \quad (2.1)$$

Measured sample volumes were specified by WHC at standard temperature and pressure (STP; 0°C, 1.013 bar). Because water vapor is removed as an analyte before the sample air stream passes through the mass flow meters, sample volumes exclude water vapor.

2.1.2 Analytical Procedures

2.1.2.1 Ammonia Analysis. The sorbent material from the ammonia traps was placed into labeled 20-mL glass scintillation vials. Vials containing front-section sorbent material were treated with 10.0 mL of deionized water (DIW), and vials containing breakthrough-section sorbent material were treated with 5.0 mL of DIW. Ammonia present was measured using the ion selective electrode (ISE) procedure PNL-ALO-226^(a). Briefly, the method includes 1) preparing a 1000- $\mu\text{g}/\text{mL}$ ammonia stock standard solution from dried reagent-grade NH_4Cl and DIW, 2) preparing 0.1-, 0.5-, 1.0-, 10-, and 100- $\mu\text{g}/\text{mL}$ ammonia 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 ammonia 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, at a minimum of once per batch, 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 signal measurements obtained for samples are compared to those for standards to determine ammonia concentration in the samples.

2.1.2.2 Nitrite Analysis. The sorbent material for NO_2 and NO traps were desorbed in an aqueous TEA and n-butanol solution and analyzed by suppressed-conductivity ion chromatography

^(a) Procedure entitled "Ammonia (Nitrogen) in Aqueous Samples," PNL-ALO-226 Rev. 0, in the *Analytical Chemistry Laboratory (ACL) Procedure Compendium*, Vol. 3: Inorganic Instrumental Methods. Pacific Northwest National Laboratory, Richland, Washington.

(SCIC) for nitrite according to PNL-ALO-212, Rev. 1^(a) modified to obviate interferences by concentrations of non-target analytes. Specifically, the modifications used were 1) eluent 1.44 mM Na₂CO₃ + 1.8 mM NaHCO₃ at 2.0 mL/min, 2) one guard column (AG4A) and two separator columns (AS4A) in series instead of just one separator column, and 3) all standards, samples, and blanks injected into the sample loop through 0.45-μm syringe filters.

Primary and breakthrough section materials were analyzed separately using identical procedures. Each analytical session was conducted as follows. Working nitrite standards were prepared by diluting a stock nitrite standard with desorbing solution. An initial calibration curve was prepared from the instrument response versus nitrite standard concentration data for the set of working standards. A calibration verification check using one of the midrange standards was performed at a minimum of once per batch. If the instrument response indicated that sample nitrite concentration was outside the calibration range, the sample was diluted with desorbing solution and reanalyzed. After all samples of a batch were analyzed, the complete set of calibration standards was remeasured to verify consistent instrument response. Instrument responses observed for samples were compared to those for standards to determine the nitrite concentration of the samples. Because the analytes were collected on the sorbent as equal quantities of nitrite and nitrate, and the analysis was specific for nitrite, the moles of NO₂ and NO were determined by doubling the analytically determined moles of nitrite.

2.1.2.3 Water Analysis. All sorbent traps used to make each multi-trap 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. Mass gain was assumed to be entirely due to collection of water vapor. Field blanks were used to correct results.

2.1.3 Quality Assurance/Quality Control

Analytical work was performed according to quality levels identified in PNL-ALO-212, PNL-ALO-226, and Quality Assurance Plan ETD-002. Estimated quantitation limits (EQLs) for the inorganic vapors are given in Table 2.3.

The accuracy of concentration measurements depends on errors associated with both sampling and analysis. Ammonia results were estimated to be within 5% of their true values. 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 (SRM) by using an independent calibration verification standard certified to be NIST-traceable. Nitrite analyses (for NO₂ and NO) are performed using certified but not NIST-traceable SRM; this is because NIST does not make a nitrite SRM. Based on experience in comparing nitrite working standards prepared from several different sources and factors mentioned for ammonia above, the estimated maximum bias for NO₂ results is ± 10%, and for NO results it is ± 5%.

^(a) Procedure entitled "Determination of Inorganic Anions by Ion Chromatography," PNL-ALO-212, in the *Analytical Chemistry Laboratory (ACL) Procedure Compendium*, Vol. 3: Inorganic Instrumental Methods. Pacific Northwest National Laboratory, Richland, Washington.

Table 2.3 Quantitation Limits for Selected Inorganic Analytes

<u>Analyte</u>	<u>Formula</u>	<u>EQL^(a) (ppmv)</u>
Ammonia	NH ₃	0.71
Nitrogen Dioxide	NO ₂	0.16
Nitric oxide	NO	0.16
Mass (water) ^(b)	n/a	0.3 mg/L

(a) The lowest calibration standard is defined as the EQL.

(b) 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 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 multi-trap trains, is determined for each sample job and is typically about ± 1 mg per five-trap sorbent train.

2.2 Permanent Gases

SUMMATM canister samples were analyzed for carbon dioxide, carbon monoxide, hydrogen, methane, and nitrous oxide (N₂O).

2.2.1 SUMMATM Canister Preparation

All SUMMATM canisters are cleaned and verified contaminant-free according to PNNL Technical Procedure PNL-TVP-02^(a) before use. The cleaning procedure uses an EnTech 3000 cleaning system that alternately fills the canisters with purified humid air and evacuates them for several cycles while the canister is heated. If the canister is verified as clean, the canister is evacuated to 5 mtorr and tagged. Before sending the canisters 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 μ L of distilled water and labeled. 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. All canisters are stored at room temperature.

2.2.2 Analytical Procedure

The SUMMATM canister samples were analyzed for five permanent gases by gas chromatography/thermal conductivity detection (GC/TCD). Aliquots of sampled air (undiluted) are drawn directly from each SUMMATM canister into a 5-mL gas-tight syringe and injected into a

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

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 carbon monoxide, carbon dioxide, N₂O, and methane using helium as the carrier gas. A second GC/TCD analysis is performed for hydrogen 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 2.4.

Table 2.4 Quantitation Limits for Permanent Gases

Analyte	Formula	EQL (ppmv)
Carbon Dioxide	CO ₂	17
Carbon Monoxide	CO	17
Methane	CH ₄	25
Hydrogen	H ₂	17
Nitrous Oxide	N ₂ O	17

2.2.3 Quality Assurance/Quality Control

Standards for the permanent gas analyses were blended from commercially prepared and certified standards. The instrument was calibrated at five different concentrations for methane over a range of 25 to 2100 ppmv, calibrated for carbon monoxide, carbon dioxide, and N₂O over a range of 17 to 2100 ppmv, and calibrated for hydrogen over a range of 17 to 2120 ppmv. An average response factor from the calibration was used for quantification.

Each analyte was quantitated by comparison of sample analyte peak area to the calibration plot generated for the compound. The EQL for the method has been established as the low level calibration standard. 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.

2.3 Total Non-Methane Organic Compounds

2.3.1 Analytical Procedure

SUMMA™ canister samples were analyzed for total non-methane organic compounds (TNMOCs) according to PNNL Technical Procedure PNL-TVP-08^(a), which is similar to U.S. Environmental Protection Agency (EPA) Task Order 12 (TO-12). Twenty-four hours before analysis, SUMMA™ canister samples are pressurized with purified air (Aadco Instruments, Inc., 1920 Sherwood St., Clearwater, Florida 34625). The original pressure is first measured using a calibrated diaphragm gauge (Cole Parmer), then pressurized to a level exactly twice the original pressure.

^(a) 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, Richland, Washington.

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 into the GC/FID. 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.

Concentration in mg/m³ was derived from the 10-point multilevel calibration curve from the propane standard using the following equation:

$$\text{mg/m}^3 = \frac{(\text{ng TNMOC}) \times (\text{dilution factor})}{\text{mL sampled volume}} \quad (2.2)$$

2.3.2 Quality Assurance/Quality Control

The TNMOC is calibrated by using propane as the calibration standard. The instrument calibration mixture for the TNMOC analysis consists of NIST 99.999% propane analyzed using a 10-point, multilevel, linear regression curve.

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 either 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 analysis of purified air must be below 0.1 mg/m³. Second, an instrument continuing calibration is run using 100-mL UHP propane followed by one blank volume of Aadco air.

2.4 SUMMA™ Canister Sample Analyses

2.4.1 Analytical Procedure

SUMMA™ canister samples were analyzed according to PNNL Technical Procedure PNL-TVP-03^(a), which is a modified version of EPA Task Order 14 (TO-14). The method uses an EnTech 7000 cryoconcentration system interfaced with a 5972 Hewlett-Packard benchtop gas chromatograph/mass spectrometer (GC/MS). The EnTech concentrator is used to pull a metered

^(a) Pacific Northwest National Laboratory. 8/96. *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. 2), PNNL Technical Procedure, Richland, Washington.

volume of sample air from the SUMMA™ canister, cryogenically concentrate the condensible organic vapors, then transfer the vapors 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 a J&W Scientific DB-1 phase, 60-m by 0.32-mm internal diameter with 3-μm film thickness column. 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.

The instrument calibration mixture for the PNL-TVP-03 analysis consists of organic analytes listed in Appendix B, Table B.1. These target analytes are quantitated in this analysis. 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 six different concentrations, and a response factor for each compound was calculated. The GC/MS response for these compounds has been determined previously to be linearly related to concentration. Instrument detection limits and EQLs have been determined.

Quantitative concentrations for the target analytes were calculated using the average response factors generated using the internal standard (IS) method described in procedure PNL-TVP-03. The conversion from ppbv to mg/m³ assumes STP conditions (0°C and 1.013 bar) and was calculated using the gross molecular weight (MW) of the compound from the following equation:

$$\text{concentration in mg/m}^3 = \frac{(\text{concentration in ppbv})(\text{MW})}{(1000)(22.4 \text{ L/mol})} \quad (2.3)$$

The tentatively identified compounds (TICs) are determined by mass-spectral interpretation and comparison of the spectra with the EPA/NIST and WILEY electronic mass spectra libraries. Chromatographic peaks with an area count greater than, or equal to, one-tenth of the total area count of the nearest eluting IS are tentatively identified and their concentrations are estimated. The quality of the mass spectra match was then reviewed by the principal investigators before the identification was assigned to each chromatographic peak.

The concentration of each TIC was estimated using a relative response factor calculated using the total peak area for the nearest eluting IS. The IS peak area was used to calculate a response factor using the IS concentration in mg/m³:

$$\text{Response Factor} = \frac{\text{IS conc. (mg/m}^3\text{)}}{\text{IS peak area}} \quad (2.4)$$

The calculated response factor was then multiplied by the TIC peak area to give an estimated concentration for that compound. All calculated sample concentrations were multiplied by a factor of 2 to account for the dilution step described in Section 2.3.1.

^(a) Pacific Northwest Laboratory. 11/94. *Preparation of TO-14 Volatile Organic Compounds Gas Standards*, PNL-TVP-06 (Rev. 0). PNL Technical Procedure, Richland, Washington.

2.4.2 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 the organic compounds listed in Table B.1. A gas mixture containing bromochloromethane, 1,4-difluorobenzene, chlorobenzene- d_5 , and bromofluorobenzene was used as an 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 the IS concentration. Once it was determined that the relative response was linear with increasing concentration, an average response factor was calculated for each target analyte and used to determine the concentration of target compounds in each sample. Method blanks were analyzed before and after calibration verification standards.

2.5 Triple Sorbent Trap Sample Analyses

2.5.1 Sampling Methodology

Samples are collected on Supelco 300 graphite-based TSTs. Before field deployment, each trap is heated to 380°C under inert gas flow for a minimum of 60 min. Traps are prepared in batches with each tank sampling job constituting one batch. One trap is selected from each batch and run immediately to verify cleanliness. All remaining traps in the batch receive equal amounts of three surrogate compounds (hexafluorobenzene, toluene- d_8 , and bromobenzene- d_5). One trap per batch is run immediately to verify successful addition of surrogate spikes to that batch. Traps are then placed in individually labeled plastic shipping tubes (Supelco TD³), which are sealed with gasketed end caps. This provides a rugged, headspace-free shipping and storage method. As a precautionary measure, sample tubes are kept in refrigerated storage before and after sampling.

2.5.2 Analytical Procedure

The Supelco 300 tubes were analyzed according to PNNL Technical Procedure PNL-TVP-10^(a), with the exceptions noted in Section 3.4.1. The method employs Supelco CarbotrapTM 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 CarbotrapTM C, 200 mg of CarbotrapTM B, and 125 mg of CarbosieveTM S-III. The first two sorbents are deactivated graphite with limited sorption power for less volatile compounds. The final trapping stage, the CarbosieveTM S-III, is a graphitized molecular sieve used to retain the most volatile components, including some permanent gases such as Freon-12. Following sample collection and addition of 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

^(a) Pacific Northwest National 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), PNNL Technical Procedure, Richland, Washington.

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 GC column, which may be thermally desorbed using helium at a flow rate compatible with the column and 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 the MS.

The instrument calibration mixture for the TST analysis consists of the compounds listed in Appendix B, Table B.2. These compounds that are directly quantified in this analysis make up the target analyte list (these compounds will be referred to as target analytes). The calibration mixture is prepared in common with the mixture used for the SUMMA™ analysis (see Section 2.4.2). The standard calibration mix was analyzed using six different concentrations, 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 determined previously to be linearly related to concentration.

Quantitative concentrations for the target analytes were calculated directly from the calibration curve generated using the IS method described in procedure PNL-TVP-10. The conversion from ppbv to mg/m³ assumes STP conditions (0°C and 1.013 bar) and was calculated directly from the following equation:

$$\text{mg/m}^3 = \frac{(\text{ppbv}/1000) \times \text{g mol wt of compound}}{22.4 \text{ L/mol}} \quad (2.5)$$

NOTE: Because of laboratory error, STP conditions were not used. All TST tank sample results are reported as mg/m³ are at 21°C and 760 mm Hg pressure. All TST tank sample results reported as ppbv must be multiplied by 1.077. Blank sample results need no further corrections.

The TICs are determined by mass-spectral interpretation and comparison of the spectra with the EPA/NIST and WILEY Libraries, which are a part of the Hewlett-Packard 5971/5972 instrument operating system. Chromatographic peaks with an area count greater than, or equal to, one-tenth of the total area count of the nearest eluting IS are tentatively identified and quantitatively estimated. The quality of the mass-spectral searches was then reviewed by the principal investigators before the identification was assigned to each chromatographic peak.

The concentration of each TIC was estimated using a relative response factor calculated using the total peak area for the nearest eluting IS. The IS peak area was used to calculate a response factor using the IS concentration in mg/m^3 :

$$\text{Response Factor} = \frac{\text{IS conc. (mg/m}^3\text{)}}{\text{IS peak area}} \quad (2.6)$$

The calculated response factor was then multiplied by the TIC peak area to give an estimated concentration for that compound.

2.5.3 Quality Assurance/Quality Control

Before tank samples were 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 trap was analyzed to check the cleanliness of the system. The instrument was then calibrated using six different concentrations of standard gas mixture containing the compounds listed in Table B.2. 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 was determined that the relative response was linear with increasing concentration, an average response factor was calculated for each target analyte and used to determine the concentration of target compounds in each sample.

3.0 Analysis Results

Results from the sampling of the headspace of Tank S-102 on September 19, 1996 (Sample Job S6093) are provided below.

3.1 Inorganic Vapors

Measured vapor concentrations of ammonia, nitric oxide (NO), nitrogen dioxide (NO₂), and water are given in Table 3.1. The vapor concentration results were based on four samples for each compound. The four inorganic vapors were collected at the same time using sorbent traps connected in series. Sample air was drawn first through an ammonia trap, then through a three-tube system that collected nitrogen dioxide and nitric oxide (described below), and then through a desiccant trap to remove any remaining water vapor.

Two field blank multi-trap trains, identical to sample multi-trap trains discussed in Section 2.1, were included in the tube bundle lowered into the headspace of Tank S-102 during sample job S6093. No air was pulled through these field blank multi-trap trains. Any analyte found in the field blank multi-trap trains over and above levels in unexposed tubes was attributed to passive sampling. Data in Table 3.1 have been corrected for these minor effects of passive sampling.

Results provided in Table 3.1 are estimated to be accurate to within $\pm 10\%$ and within the $\pm 30\%$ specified by the SAP. Percent relative standard deviations of the measured concentrations were $<2\%$, which is within the 25% specified by the SAP.

3.1.1 Ammonia

Ammonia analyses were performed on October 9, 1996, 20 days after sample collection and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed, and no deviations from the procedure were noted.

The blank-corrected ammonia quantities in the sorbent traps ranged from 65.3 to 66.9 μmol in front sections; blank corrected back sorbent section ammonia concentrations were $<0.01 \mu\text{mol}$. Blank corrections of 0.12 μmol in front and 0.08 μmol in the back sections, were about 0.2% of collected quantities. The analysis of one sample was a duplicate and indicated a reproducibility of $\pm 1.6\%$. One blank sorbent trap was spiked with 17 ppm of ammonia and yielded a percentage recovery of 103%. One sample leachate was spiked after initial analysis with approximately the quantity of ammonia in the sample and yielded a percentage recovery of 96%. The initial and continuing calibration verification (ICV, CCV) standards, using NIST-traceable material, yielded percentage recoveries of 95% (ICV) and 101% (CCV) during the analytical session. A five-point calibration was performed over an ammonia range of 0.1 to 100 $\mu\text{g/ml}$.

3.1.2 Nitric Oxide and Nitrogen Dioxide

Nitric oxide and nitrogen oxide analyses were performed on October 8 and 9, 1996, 19 and 20 days after sample collection, and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed. No deviations from the procedure were noted.

Blank-corrected NO_2^- quantities in the sorbent traps were all $<0.013 \mu\text{mol}$. Nitrite blank levels used to correct data were $0.0046 \mu\text{mol}$ in front (four of four blanks analyzed) and $0.0031 \mu\text{mol}$ in back (two of four blanks analyzed) sorbent sections. The analyses of two samples were duplicated and yielded repeatabilities of $\pm 0\%$ and $\pm 0.6\%$. Two sample leachates were spiked with $0.125 \text{ ppm } \text{NO}_2^-$ and yielded percentage recoveries of 103% and 92% . A 4-point calibration was performed over a concentration range of 0 to $0.5 \mu\text{g/mL } \text{NO}_2^-$ in the desorbing matrix.

3.1.3 Water

Analyses for water vapor were performed on October 8, 1996, 19 days after sample collection and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed.

All multi-trap sample mass gain is assumed to be due to adsorption of water. This is justified because the total mass concentration of other vapors in the headspace of Hanford waste tanks are typically two to three orders of magnitude less than the mass concentration of the water vapor found in even relatively dry tanks. Water vapor concentrations are given in Table 3.1 for both moist air at tank conditions and for dry air at STP (0°C and 1.013 bar). Because the sample volumes were measured after all water vapor was removed by the sorbent traps, the measured sample volumes are for dry air. The average water vapor concentration was 17.6 mg of water per L of dry air at STP. The result was determined from an average mass gain of 34.5 mg from three of four multi-trap trains. The blank correction applied to the results was -1.7 mg per multi-trap train. A control mass was measured and indicated a measurement accuracy of $\pm 0.1 \text{ mg}$. The average water vapor concentration corresponds to a tank headspace dew point at 18.5°C and relative humidity at 55% at the time of sampling.

3.2 Permanent Gases

Hydrogen analyses were performed on October 3, 1996, and analyses for other permanent gases were performed on October 10, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed and used in the averages. No deviations from standard procedures were noted. The EQL for methane was double what has been reported in prior analyses. This was a result of the removal of the lowest level standard due to poor performance. Three calibration standards were used as required by the procedure to produce the calibration curve.

Measured concentrations of carbon monoxide, carbon dioxide, hydrogen, methane, and nitrous oxide are provided in Table 3.2. Results were based on three samples for each compound. Hydrogen (1179 ppmv) and nitrous oxide (1041 ppmv) were detected in Tank S-102 at concentrations above those in ambient air. The relative percent difference (RPD) between duplicate analyses of a single SUMMA™ canister was 1% for hydrogen and 2% for nitrous oxide.

Results provided in Table 3.2 are estimated to be accurate to within $\pm 30\%$ as specified by the SAP.

3.3 Total Non-Methane Organic Compounds

Analyses for TNMOCs were performed on December 3, 1996, which exceeded the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All three tank samples and the two ambient samples (100%) were successfully analyzed and used in the averages. No deviations from standard procedures were noted.

Table 3.3 lists results of the EPA TO-12 analysis of SUMMA™ canister samples for TNMOCs. Results in Table 3.3 are reported in two different units; in the upper row the mass concentration (mg/m^3) of non-methane organic compounds is given at STP (0°C and 1.013 bar), and in the lower row, by EPA TO-12 convention, as ppmv of carbon based on propane as the standard. The average concentration in the three tank headspace samples was $27.50 \text{ mg}/\text{m}^3$ or 11.48 ppmv of carbon. The $27.50 \text{ mg}/\text{m}^3$ value compares to $39.12 \text{ mg}/\text{m}^3$ for the sum of all target compounds identified in the analysis of the SUMMA™ canisters. Results provided in Table 3.3 are estimated to be accurate to within $\pm 30\%$ as specified by the SAP. The RPD for duplicate analysis of a single SUMMA™ canister was 0.5%.

3.3.1 Procedural Deviations, Observations, and Anomalies.

The calibration method described in Section 2.3.2 reflects a deviation from procedure PNL-TVP-08. Refer to Deviation Report JAE082996 for further details.

3.4 Organic Compound Characterization

Organic vapors in the Tank S-102 headspace were sampled with SUMMA™ canisters and TSTs. These sampling methods are fundamentally different, but provide comparable results for many of the target analytes.

3.4.1 SUMMA™ Canister Results

Analyses of SUMMA™ canisters for organic vapors were performed on October 24, and November 5, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.1.1.

Measured concentrations of target analytes are presented in Table 3.4. Thirty-seven target analytes above the instrument detection limit (IDL) were detected in the tank headspace samples. Of these, 30 target analytes were identified in two or more tank headspace samples. Ethanol at $19.184 \text{ mg}/\text{m}^3$, methanol at $12.441 \text{ mg}/\text{m}^3$, and 1-butanol at $3.254 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace samples. The total average concentration was $39.12 \text{ mg}/\text{m}^3$ for the target analytes. This compares to a total concentration of $27.50 \text{ mg}/\text{m}^3$ identified in the TO-12 analysis of the three tank headspace samples.

SUMMA™ canister S6093-A05.065 was analyzed in replicate for target analytes to determine analytical precision. The RPD results are presented in Table 3.5. The RPDs were calculated for analytes detected above the IDL and found in both replicates. Twenty-two of 30 target analytes had RPDs of less than 10%.

Results of analyses of target analytes in ambient air and ambient air through the VSS samples are provided in Table 3.6. Twelve target compounds were observed in one or both of the ambient air samples. All target compounds were observed below the EQL.

A representative total ion chromatogram showing the major constituents identified in the SUMMA™ analysis is provided in Figure 3.1.

Appendix B, Table B.1 contains complete listings of target analyte results from the SUMMA™ analyses. These data originate directly from the evaluated instrument data and have not been rounded. The intent of the data is to list the analytes that were analyzed and to present the detection limit values associated with analytes that were not detected.

3.4.1.1 Procedural Deviations, Observations, and Anomalies. The SUMMA™ canister samples were analyzed in one batch. The samples were diluted and reanalyzed in a second batch.

Batch #1 (File Identifier # 26102401.b) - S6093-A01.133, S6093-A02.034, S6093-A04.038, S6093-A05.065, S6093-A05.065 REP, and S6093-A06.104.

Batch #2 (File Identifier # 26110501.b) - S6093-A01.133, S6093-A02.034, S6093-A04.038, S6093-A05.065, S6093-A05.065 REP, and S6093-A06.104.

Batch #1:

The volume analyzed for ambient and tank samples was 100 mL following dilution of the canisters by a factor of 2 with clean air. The analyses of the tank samples resulted in methanol and ethanol concentrations that exceeded the UQL. Tank samples were diluted and reanalyzed.

All target compounds met the 30% RSD in the initial calibration except tridecane (30.349%) and tetradecane (37.815%).

The percent difference (%D) for the ICV was less than 25% for all target compounds except bromomethane (38.6%), 1-butanol (33.8%), pyridine (30.6%), 1,2,4-trichlorobenzene (39.1%), hexachloro-1,3-butadiene (48.4%), and tridecane (25.6%).

All target compounds met the 25% D criterion in the CCV except hexachloro-1,3-butadiene (33.9%). This target compound was not detected in ambient or tank samples above the EQL.

Instrument detection limits, precision, and accuracy have not been experimentally evaluated for 1,3-butadiene. Sample results are flagged with a "<" when the absolute number of nanograms calculated in the sample is less than the lowest concentration standard used in the initial calibration. Results for 1,3-butadiene falling within its calibration range are quantitative results as evidenced by a valid calibration for this compound.

Tridecane and tetradecane were not detected above the EQL in any tank or ambient samples except S6093-A04.038. However, they were present in that sample at relatively high concentrations (113 and 30 ppbv, respectively).

Batch #2:

The tank samples were diluted 10X and a 50-mL sample aliquot was analyzed to quantify methanol and ethanol.

The %D for the initial calibration verification was less than 25% for all target compounds with the exception of methanol (30.0%), 1,3-butadiene (30.7%), butane (28.7%), pyridine (44.3%), and tetradecane (67.5%).

Target compounds exceeding the EQL in a 200-mL initial calibration blank were methylene chloride (1.31 ng on column, 1.73 ppbv), hexane (1.51 ng on column, 1.97 ppbv), 1,1,1-trichloroethane (1.12 ng on column, 0.94 ppbv), trichloroethene (1.09 ng on column, 0.92 ppbv), cis-1,3-dichloropropene (0.88 ng on column, 0.89 ppbv), and 1,2-dibromoethane (1.62 ng on column, 0.97 ppbv). Note that no target compounds exceeding the EQL were detected at concentrations greater than 5 ppbv.

All target compounds met the 25% D criterion in the CCV except 1,3-butadiene (32.2%), bromomethane (50.1%), pyridine (31.3%), 1,2,4-trichlorobenzene (25.5%), hexachloro-1,3-butadiene (30.3%), and tetradecane (68.4%). These target compounds were not quantified in this analytical batch of tank samples.

No target compounds were present in the CCB above the EQL except cis-1,3-dichloropropene (0.28 ppbv). It was not quantified in this analytical batch of samples.

3.4.2 Triple Sorbent Trap Sample Results

Analyses of TSTs were performed on November 6 and 7, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.2.1.

NOTE: All TST tank sample results reported in mg/m^3 are at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077. All TST tank sample results reported in ppb must be corrected by multiplying by 1.077. TST blank sample results need no further correction.

Measured concentrations of target analytes are presented in Table 3.7. Results are based on three samples for each compound. Thirty-five target analytes above the IDL were detected in the tank headspace samples. Of these, 32 target analytes were identified in two or more tank headspace samples. Methanol at $27.407 \text{ mg}/\text{m}^3$, ethanol at $27.251 \text{ mg}/\text{m}^3$, and 1-butanol at $3.348 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace sample. The total average concentration of the target analytes was $62.72 \text{ mg}/\text{m}^3$.

Triple sorbent trap sample S6093-A12.1232 was analyzed in replicate for target analytes to determine analytical precision. The RPD results are presented in Table 3.8. The RPDs were calculated for analytes detected above the detection limit and found in both replicates. Twenty-seven of 32 target analytes had RPDs of less than 10%.

Results of analyses of target analytes in the field and trip blanks are provided in Table 3.9. Eleven target analytes were identified in one or more of the blank samples. Most of the compounds

were found in the field blank samples. Most of the compounds observed were below the EQL; however, 1,1-dichloroethene and methylene chloride exceed the EQLs.

A representative total ion chromatogram showing the major constituents identified in the triple sorbent trap analysis is provided in Figure 3.2.

Appendix B, Tables B.2 and B.3 contain complete listings of target analyte results from the TST analyses. These data originate directly from the evaluated instrument data and have not been rounded. The intent of the data is to list the analytes that were analyzed and to present the detection limit values associated with analytes that were not detected.

3.4.2.1 Procedural Deviations, Observations, and Anomalies. Samples were run under the protocols of TVP-10, Rev. 2 with the initial calibration performed on November 4, 1996 and quantitated against a CCV run at the beginning of the batch.

The TST samples were analyzed in two batches. The sample analytical sequence runs were as follows:

Batch #1 (file identifier #46110601.b) - S6093-A17.1235, S6093-A18.1236, S6093-A19.1237, S6093-A20.1238.

Batch #2 (file identifier #46110701.b) - S6093-A11.1231, S6093-A12.1232, S6093-A12.1232 REP, S6093-A13.1233.

Batch #1:

Samples included in this batch consisted of the two field blanks and two trip blanks. These samples were collected using the VSS truck on 9/19/96.

The CCV was satisfactory for all target compounds except methanol (32.7%), tridecane (32.3%), and tetradecane (61.7%). The field blanks and one trip blank contained minor amounts of tetradecane (below EQL). Tetradecane has consistently exhibited a much higher than average uncertainty in reproducibility of standards. The CCB contained a trace amount (below EQL) of methylene chloride, 1-butanol, toluene, and tetradecane. The CCB was otherwise clean.

The first VSS field blanks contained 1,1-dichloroethene and methylene chloride at levels in excess of the EQL. The trip blanks contained only trace amounts (below the EQL) of methylene chloride and tetradecane and were otherwise clean. Methylene chloride and tetradecane were also found in the CCB at comparable levels and are flagged in the tables with a "B".

Batch #2:

Samples included in this batch consisted of the three tank samples and one repeat analysis of a tank sample.

The CCV was satisfactory for all target compounds except chloromethane (34.3%), chloroethane (26.1%), acetonitrile (29.5%), pentane (26.5%), propanol (27.3%), and

tetradecane (34.7%). The tank samples contained quantifiable amounts of acetonitrile, pentane, and propanol and minor (below EQL) amounts of tetradecane. The uncertainty in the CCV impacts the quantitation of these compounds. Tetradecane has consistently exhibited a much higher than average uncertainty in reproducibility of standards. The CCB contained some apparent minor carryover from the CCV including quantifiable amounts of dichlorofluoromethane, methanol, and toluene as well as trace amounts (below EQL) of butane, ethanol, acetonitrile, acetone, trichlorofluoromethane, methylene chloride, benzene, p/m xylene, and tetradecane. Methylene chloride and tetradecane were at similar levels in the sample and the CCB. These two compounds are marked with a "B" in the tables. This much carryover in a CCB is unusual but should not represent any serious impact on the samples since the CCB is effectively a cleanout run for the instrument.

Information common to both batches:

Both field blanks, one trip blank, and all samples contained 1-chloro-1,1-difluoroethane. This compound has appeared persistently in most samples sent to the field in the past including blanks. 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 Lab or 329 Building temporary storage. The origin of the material is unclear but since it has shown up in trip blanks as well as field blanks, the most likely candidate is one of the refrigerators used for interim storage.

Very narrow air spikes occasionally are present in chromatograms from this period. This problem was traced to high frequency air leakage through the diffusion pump o-ring and had been corrected for some time but has again reappeared. It has no known impact on data quality but the spikes do appear as features on the total ion chromatogram.

Methanol, and 1,3-butadiene are not currently included in the method performance section of the procedure; however, these analytes were analyzed by this method. The low level standard is used as the EQL for these compounds. Sample results are flagged with a less-than symbol (<) when less than the EQL.

Tributyl phosphate is included in the target list based on a calibration performed on January 5 and 9, 1996. The TBP was introduced onto a series of double sorbent traps as a methanolic solution standard rather than a vapor standard. This served to determine the retention time and verify the mass spectral characteristics of the compound but does not constitute a true target analysis since the compound is not routinely included in a vapor CCV. At present there is no known way to prepare a vapor standard from this material. The calibration information on TBP demonstrated that detectability at 20 ng on column (0.1 mg/m^3 in 200 scc) is possible and thus confirms the validity of nondetects. Tributyl phosphate was not detected in any sample.

3.5 Flammability

The analytical results presented above can be used to estimate the Tank S-102 headspace flammability at the time of sampling. Flammability is calculated using the ammonia concentration from the inorganic analysis, carbon monoxide, hydrogen, and methane concentrations measured from the permanent gas analysis, and the total nonmethane organic concentration determined from the TO-12 analysis. Table 3.10 summarizes the calculated flammability data. Hydrogen was the principal flammable constituent of the Tank S-102 headspace, determined to be present at approximately 2.948% of its LFL. Total headspace flammability was estimated to be <3.659% of the LFL.

Table 3.1 Inorganic Vapor Concentrations from Tank S-102 Sampled on 9/19/96

Analyte	CAS Number	S6093-A07-07R	S6093-A08-08R	S6093-A09-09R	S6093-A10-10R	Average	Standard Deviation
Ammonia (ppmv)	7664-41-7	786	799	799	805	798	9
Nitric Oxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Nitrogen Dioxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Water ^(a) (mg/L)		17.5	17.6	17.7	17.7	17.6	0.1
Water ^(b) (mg/L)		15.3	15.3	15.4	15.5	15.4	0.1

(a) Dry air at 0°C and 1.013 bar.

(b) Moist air at tank temperature and pressure.

Table 3.2 Permanent Gas Analysis Results from Tank S-102 Sampled on 9/19/96

Permanent Gas Analyte	Ambient Air Upwind S6093-A01.033 ^(a)	Ambient Air Through VSS S6093-A02.034 ^(a)	Tank Samples				RPD ^(c) (%)	Mean	
	Concentration (ppmv)	Concentration (ppmv)	S6093-A04.038 ^(a) Concentration (ppmv)	S6093-A06.104 ^(a) Concentration (ppmv)	S6093-A05.065 ^(a) Concentration (ppmv)	S6093-A05.065 ^{(a)(b)} Concentration (ppmv)		(ppmv)	St.Dev.
Hydrogen	<17	<17	1159	1187	1191	1200	1	1179	17
Methane	<50	<50	<50	<50	<50	<50		<50	
Carbon Dioxide	407	416	<17	<17	<17	<17		<17	
Carbon Monoxide	<17	<17	<17	<17	<17	<17		<17	
Nitrous Oxide	<17	<17	1046	1040	1038	1055	2	1041	4

(a) WHC sample identification number.

(b) Replicate analysis for S6093-A05.065; results are not included in the calculation of average concentrations.

(c) Relative percent difference (RPD) based on replicate analysis.

na Not applicable.

Table 3.3 Total Non-Methane Organic Compound Analysis Results from Tank S-102 Sampled on 9/19/96

	Ambient Air Upwind	Ambient Air Through Bundle	Tank Samples						
	S6093-A01.033 ^(a)	S6093-A02.034 ^(a)	S6093-A04.038 ^(a)	S6093-A06.104 ^(a)	S6093-A05.065 ^(a)	S6093-A05.065 ^{(a)(b)}	RPD ^(c)	Mean	St.Dev.
	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration	(%)		
TO-12 (mg/m ³)	<0.59	<0.59	29.69	26.39	26.42	26.56	0.5	27.50	1.90
Total Carbon (ppmv)								11.48	

Data Quality Flags

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

(a) WHC sample identification number.

(b) Replicate analysis for S6093-A05.065; results are not included in the calculation of average concentrations.

(c) Relative percent difference (RPD) based on replicate analysis.

Table 3.4 Organic Compound Concentrations in SUMMA™ Canisters from Tank S-102 Sampled on September 19, 1996

Target Analytes ^(a)	CAS	MW	Ret Time	S6093-A04.038 ^(b) VSS			S6093-A05.065 ^{(b)(c)} VSS			S6093-A06.104 ^(b) VSS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev	(ppbv)	t. Dev
Chloromethane	74-87-3	50	4.6	0.007	3.1	J	0.007	3.0	J	0.007	3.1	J	0.007	0.000	3.1	0.025
Methanol	67-56-1	32	5.1	10.693	7476	*	15.244	10658	*	11.387	7961	*	12.441	2.452	8698	1714
Butane	106-97-8	58	5.6	0.303	117		0.260	100		0.248	96		0.270	0.029	104	11
Ethanol	64-17-5	46	6.9	19.967	9721	*	18.147	8835	*	19.440	9464	*	19.184	0.936	9340	456
Acetonitrile	75-05-8	41	7.3	0.035	19		0.030	16	J	0.037	20		0.034	0.003	19	1.9
Acetone	67-64-1	58	7.9	1.088	419		1.108	427		1.083	418		1.093	0.013	421	5.2
Trichlorofluoromethane	75-69-4	137	8.3	0.423	69		0.441	72		0.431	70		0.432	0.009	70	1.4
Pentane	109-66-0	72	9.0	0.051	16		0.053	16		0.051	16		0.052	0.001	16	0.40
Methylene Chloride	75-09-2	85	9.8	0.018	4.8	J	0.019	5.0	J	0.019	5.0	J	0.019	0.000	4.9	0.10
Propanenitrile	107-12-0	55	11.2	0.013	5.4	J	0.014	5.8	J	0.013	5.4	J	0.014	0.001	5.5	0.23
Propanol	71-23-8	60	11.3	0.201	75		0.208	77		0.203	76		0.204	0.003	76	1.3
2-Butanone	78-93-3	72	12.8	0.302	94		0.318	99		0.276	86		0.298	0.021	93	6.6
Hexane	110-54-3	86	14.1	0.041	11		0.042	11		0.039	10		0.040	0.002	10	0.40
Chloroform	67-66-3	119	14.3	0.002	0.41	U	0.003	0.62	J	0.002	0.41	U	d	d	d	d
Tetrahydrofuran	109-99-9	72	15.1	0.174	54		0.179	56		0.171	53		0.175	0.004	54	1.2
1-Butanol	71-36-3	74	16.9	3.541	1070		3.053	923		3.168	957		3.254	0.255	983	77
Benzene	71-43-2	78	17.2	0.085	24		0.085	24		0.084	24		0.085	0.000	24	0.070
Carbon Tetrachloride	56-23-5	154	17.5	0.004	0.60	J	0.004	0.59	J	0.004	0.57	J	0.004	0.000	0.59	0.015
Trichloroethene	79-01-6	131	19.2	0.001	0.24	U	0.004	0.76	J	0.001	0.24	U	d	d	d	d
Heptane	142-82-5	100	19.8	0.057	13		0.059	13		0.056	13		0.058	0.002	13	0.34
4-Methyl-2-Pentanone	108-10-1	100	21.0	0.028	6.2	J	0.028	6.3	J	0.027	6.0	J	0.027	0.001	6.1	0.13
Pyridine	110-86-1	79	21.1	0.019	5.5	J	0.021	5.8	J	0.018	5.1	J	0.019	0.001	5.5	0.35
1,1,2-Trichloroethane	79-00-5	133	22.5	0.003	0.47	U	0.005	0.80	J	0.003	0.47	U	d	d	d	d
Toluene	108-88-3	92	23.1	1.224	297		1.227	298		1.230	299		1.227	0.003	298	0.73
1,2-Dibromoethane	106-93-4	188	24.6	0.006	0.66	J	0.006	0.70	J	0.005	0.58	J	0.005	0.000	0.65	0.061
Octane	111-65-9	114	25.2	0.030	5.8	J	0.032	6.2	J	0.030	5.8	J	0.030	0.001	5.9	0.21
Tetrachloroethylene	127-18-4	166	25.7	0.040	5.4		0.041	5.6		0.039	5.3		0.040	0.001	5.4	0.16
Chlorobenzene	108-90-7	113	27.3	0.006	1.2	J	0.006	1.2	J	0.006	1.1	J	0.006	0.000	1.2	0.053
Ethylbenzene	100-41-4	106	28.1	0.010	2.2	J	0.011	2.3	J	0.010	2.1	J	0.010	0.001	2.2	0.11
p/m-Xylene	106-42-3	106	28.6	0.032	6.7	J	0.034	7.2	J	0.032	6.8	J	0.033	0.001	6.9	0.27
o-Xylene	95-47-6	106	29.8	0.014	3.0	J	0.016	3.4	J	0.015	3.1	J	0.015	0.001	3.2	0.18
Nonane	111-84-2	128	30.3	0.018	3.2	J	0.019	3.3	J	0.018	3.1	J	0.018	0.001	3.2	0.11
Decane	124-18-5	142	34.9	0.028	4.4	J	0.027	4.2	J	0.024	3.7	J	0.026	0.002	4.1	0.33
Undecane	1120-21-4	156	39.3	<0.111	<16		<0.111	<16		<0.111	<16		d	d	d	d
Dodecane	112-40-3	170	43.3	0.407	53		0.035	4.6	U	0.035	4.6	U	d	d	d	d
Tridecane	629-50-5	184	47.0	0.926	113		<0.312	<38		<0.312	<38		d	d	d	d
Tetradecane	629-59-4	198	50.5	0.269	30		<0.228	<26		<0.228	<26		d	d	d	d
Total Concentration of Target Analytes													39.120			

Data Quality Flags

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

U Target compound not detected at or above the IDL.

* Diluted value was reported for target compound in table.

(a) Detected target analytes.

(b) WHC sample identification number.

(c) Replicates of this sample are found in Table 3.5.

(d) Mean and/or standard deviation are not meaningful for this analyte.

Table 3.5 Comparison of Organic Compound Concentrations from Replicate Analysis of a Single SUMMA™ Canister from Tank S-102 Sampled on 9/19/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6093-A05.065 ^(b) VSS			S6093-A05.065 ^(b) VSS Rep			RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Chloromethane	74-87-3	50	4.6	0.007	3.0	J	0.007	3.0	J	1
Methanol	67-56-1	32	5.1	15.244	10658	*	10.608	7416	*	36
Butane	106-97-8	58	5.6	0.260	100		0.253	98		3
Ethanol	64-17-5	46	6.9	18.147	8835	*	17.779	8656	*	2
Acetonitrile	75-05-8	41	7.3	0.030	16	J	0.027	15	J	9
Acetone	67-64-1	58	7.9	1.108	427		1.044	403		6
Trichlorofluoromethane	75-69-4	137	8.3	0.441	72		0.420	68		5
Pentane	109-66-0	72	9.0	0.053	16		0.050	15		7
Methylene Chloride	75-09-2	85	9.8	0.019	5.0	J	0.018	4.8	J	5
Propanenitrile	107-12-0	55	11.2	0.014	5.8	J	0.012	4.8	J	18
Propanol	71-23-8	60	11.3	0.208	77		0.189	71		9
2-Butanone	78-93-3	72	12.8	0.318	99		0.299	93		6
Hexane	110-54-3	86	14.1	0.042	11		0.039	10		8
Chloroform	67-66-3	119	14.3	0.003	0.62	J	0.002	0.41	U	
Tetrahydrofuran	109-99-9	72	15.1	0.179	56		0.171	53		5
1-Butanol	71-36-3	74	16.9	3.053	923		2.980	901		2
Benzene	71-43-2	78	17.2	0.085	24		0.082	23		4
Carbon Tetrachloride	56-23-5	154	17.5	0.004	0.59	J	0.004	0.54	J	10
Trichloroethene	79-01-6	131	19.2	0.004	0.76	J	0.001	0.24	U	
Heptane	142-82-5	100	19.8	0.059	13		0.055	12		8
4-Methyl-2-Pentanone	108-10-1	100	21.0	0.028	6.3	J	0.025	5.6	J	11
Pyridine	110-86-1	79	21.1	0.021	5.8	J	0.020	5.6	J	4
1,1,2-Trichloroethane	79-00-5	133	22.5	0.005	0.80	J	0.003	0.47	U	
Toluene	108-88-3	92	23.1	1.227	298		1.195	290		3
1,2-Dibromoethane	106-93-4	188	24.6	0.006	0.70	J	0.004	0.51	J	30
Octane	111-65-9	114	25.2	0.032	6.2	J	0.029	5.7	J	9
Tetrachloroethylene	127-18-4	166	25.7	0.041	5.6		0.039	5.2		7
Chlorobenzene	108-90-7	113	27.3	0.006	1.2	J	0.005	1.0	J	14
Ethylbenzene	100-41-4	106	28.1	0.011	2.3	J	0.010	2.0	J	13
p/m-Xylene	106-42-3	106	28.6	0.034	7.2	J	0.032	6.7	J	8
o-Xylene	95-47-6	106	29.8	0.016	3.4	J	0.015	3.1	J	6
Nonane	111-84-2	128	30.3	0.019	3.3	J	0.018	3.1	J	7
Decane	124-18-5	142	34.9	0.027	4.2	J	0.023	3.5	J	16

Data Quality Flags

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

U Target compound not detected at or above the IDL.

* Diluted value was reported for target compound in table.

(a) Detected target analytes.

(b) WHC sample identification number.

(c) Relative percent differences (RPDs) based on mg/m³ values.

Table 3.6 Organic Compound Concentrations in Ambient Air and Ambient Air through the VSS in SUMMA™ Canisters Associated with the Sampling of Tank S-102 on 9/19/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6093-A01.033 ^(b) VSS			S6093-A02.034 ^(b) VSS		
				Ambient Air Upwind			Ambient Air through VSS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluorometha	75-71-8	121	4.2	0.007	1.3	U	0.007	1.3	J
Ethanol	64-17-5	46	6.9	0.012	5.7	J	0.012	5.6	J
Trichlorofluoromethan	75-69-4	137	8.3	0.004	0.68	U	0.005	0.81	J
Methylene Chloride	75-09-2	85	9.8	0.017	4.4	J	0.017	4.4	J
2-Butanone	78-93-3	72	12.8	0.016	5.1	J	0.018	5.6	J
Hexane	110-54-3	86	14.1	0.003	0.80	J	0.004	0.97	J
1-Butanol	71-36-3	74	16.9	0.017	5.1	J	0.015	4.4	J
Carbon Tetrachloride	56-23-5	154	17.5	0.003	0.38	U	0.005	0.70	J
4-Methyl-2-Pentanone	108-10-1	100	21.0	0.006	1.3	U	0.007	1.5	J
1,1,2-Trichloroethane	79-00-5	133	22.5	0.003	0.47	U	0.006	0.95	J
Toluene	108-88-3	92	23.1	0.002	0.49	U	0.004	0.91	J
1,2-Dibromoethane	106-93-4	188	24.6	0.003	0.36	U	0.007	0.79	J

Data Quality Flags

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

U Target compound not detected at or above the IDL.

(a) Detected target analytes.

(b) WHC sample identification number.

Table 3.7 Organic Compound Concentrations in Triple Sorbent traps from Tank S-102 Sampled on 9/19/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes ^(a)	CAS	MW	Ret Time	S6093-A11.1231 ^(b) VSS			S6093-A12.1232 ^{(b)(c)} VSS			S6093-A13.1233 ^(b) VSS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Methanol	67-56-1	32	10.1	20.013	13992	E,Y	25.070	17527	E,Y	37.136	25963	E,Y	27.407	8.797	19161	6150
Butane	106-97-8	58	10.8	0.277	107		0.288	111		0.294	113		0.287	0.009	110	3.4
Ethanol	64-17-5	46	12.6	23.384	11370	E,Y	27.117	13185	E,Y	31.252	15195	E,Y	27.251	3.936	13250	1913
Acetonitrile	75-05-8	41	13.0	0.204	111		0.174	95		0.223	122		0.200	0.024	109	13
Acetone	67-64-1	58	13.7	0.838	323		1.014	391		1.120	432		0.991	0.143	382	55
Trichlorofluoromethane	75-69-4	137	14.2	0.436	71		0.450	73		0.466	76		0.450	0.015	73	2.4
Pentane	109-66-0	72	15.0	0.064	20		0.065	20		0.068	21		0.066	0.002	20	0.60
Methylene Chloride	75-09-2	85	15.8	0.057	15	J,B	0.033	8.8	J,B	0.047	12	J,B	0.046	0.012	12	3.2
Propanenitrile	107-12-0	55	17.1	0.016	6.4	J	0.016	6.6	J	0.018	7.3	J	0.017	0.001	6.8	0.48
Propanol	71-23-8	60	17.1	0.227	85		0.249	93		0.261	97		0.246	0.017	92	6.3
2-Butanone	78-93-3	72	18.6	0.202	63		0.252	78		0.279	87		0.245	0.039	76	12
Hexane	110-54-3	86	19.9	0.059	15		0.061	16		0.063	16		0.061	0.002	16	0.58
Tetrahydrofuran	109-99-9	72	20.8	0.236	73		0.243	75		0.248	77		0.242	0.006	75	1.8
Butanenitrile	109-74-0	69	21.9	0.014	4.4	J	0.011	3.7	J	0.012	3.9	J	0.012	0.001	4.0	0.36
1-Butanol	71-36-3	74	22.4	3.350	1014		3.356	1016		3.339	1011		3.348	0.008	1014	2.6
Benzene	71-43-2	78	22.8	0.090	26		0.093	27		0.095	27		0.093	0.002	27	0.70
Heptane	142-82-5	100	25.2	0.084	19		0.085	19		0.088	20		0.086	0.002	19	0.46
4-Methyl-2-Pentanone	108-10-1	100	26.4	0.025	5.7		0.027	6.0		0.028	6.2		0.027	0.001	6.0	0.28
Pyridine	110-86-1	79	26.6	0.076	22	J	0.089	25	J	0.065	19	J	0.077	0.012	22	3.4
Pentanenitrile	110-59-8	83	27.5	0.001	0.22	U	0.004	0.98	J	0.001	0.22	U	d	d	d	d
Toluene	108-88-3	92	28.5	1.218	296		1.245	303		1.287	313		1.250	0.035	304	8.5
Octane	111-65-9	114	30.5	0.036	7.1		0.037	7.3		0.039	7.7		0.038	0.002	7.4	0.31
Tetrachloroethylene	127-18-4	166	31.1	0.047	6.3		0.048	6.4		0.049	6.7		0.048	0.001	6.5	0.20
Chlorobenzene	108-90-7	113	32.7	0.001	0.22	U	0.001	0.22	U	0.004	0.71	J	d	d	d	d
Hexanenitrile	628-73-9	97	32.8	0.004	0.88	J	0.003	0.66	U	0.003	0.66	U	d	d	d	d
Ethylbenzene	100-41-4	106	33.5	0.010	2.2	J	0.010	2.1	J	0.011	2.4	J	0.011	0.001	2.2	0.12
p/m-Xylene	106-42-3	106	33.9	0.039	8.2		0.040	8.3		0.044	9.3		0.041	0.003	8.6	0.61
o-Xylene	95-47-6	106	35.1	0.017	3.6	J	0.018	3.7	J	0.019	4.0		0.018	0.001	3.8	0.22
Nonane	111-84-2	128	35.5	0.022	3.8		0.022	3.9		0.026	4.6		0.023	0.002	4.1	0.41
1,2,4-Trimethylbenzene	95-63-6	120	40.0	0.003	0.59	J	0.003	0.61	J	0.003	0.63	J	0.003	0.000	0.61	0.020
Decane	124-18-5	142	40.2	0.021	3.3	J	0.018	2.9	J	0.021	3.3	J	0.020	0.001	3.2	0.23
Undecane	1120-21-4	156	44.5	0.023	3.3	J	0.024	3.4	J	0.023	3.3	J	0.023	0.001	3.3	0.090
Dodecane	112-40-3	170	48.6	0.037	4.9	J	0.037	4.9	J	0.034	4.5	J	0.036	0.002	4.8	0.21
Tridecane	629-50-5	184	52.3	0.041	5.0	J	0.044	5.3	J	0.040	4.8	J	0.041	0.002	5.1	0.26
Tetradecane	629-59-4	198	55.9	0.042	4.7	J,B	0.038	4.3	J,B	0.031	3.5	J,B	0.037	0.006	4.2	0.64
Total Concentration of Target Analytes													62.738			

Data Quality Flags

B Compound found in associated laboratory blank.

E Target compound exceeds the upper quantitation limit (UQL).

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.

(a) Detected target analytes.

(b) WHC sample identification number.

(c) Replicates of this sample are found in Table 3.8.

(d) Mean and/or standard deviation are not meaningful for this analyte.

Table 3.8 Comparison of Organic Compound Concentrations from Replicate Analysis of a Single Triple Sorbent Trap from S-102 Sampled on 9/19/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure.
To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes ^(a)	CAS	MW	Ret Time	S6093-A12.1232 ^(b) VSS			S6093-A12.1232 ^(b) VSS REP			RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Methanol	67-56-1	32	10.1	25.070	17527	E,Y	24.098	16847	E,Y	4
Butane	106-97-8	58	10.8	0.288	111		0.281	108		3
Ethanol	64-17-5	46	12.6	27.117	13185	E,Y	26.267	12771	E,Y	3
Acetonitrile	75-05-8	41	13.0	0.174	95		0.215	117		21
Acetone	67-64-1	58	13.7	1.014	391		0.954	368		6
Trichlorofluoromethane	75-69-4	137	14.2	0.450	73		0.454	74		1
Pentane	109-66-0	72	15.0	0.065	20		0.065	20		1
Methylene Chloride	75-09-2	85	15.8	0.033	8.8	J,B	0.029	7.5	J,B	16
Propanenitrile	107-12-0	55	17.1	0.016	6.6	J	0.016	6.4	J	3
Propanol	71-23-8	60	17.1	0.249	93		0.244	91		2
2-Butanone	78-93-3	72	18.6	0.252	78		0.231	72		9
Hexane	110-54-3	86	19.9	0.061	16		0.061	16		0
Tetrahydrofuran	109-99-9	72	20.8	0.243	75		0.243	75		0
Butanenitrile	109-74-0	69	21.9	0.011	3.7	J	0.021	6.8		59
1-Butanol	71-36-3	74	22.4	3.356	1016		3.429	1038		2
Benzene	71-43-2	78	22.8	0.093	27		0.093	27		0
Heptane	142-82-5	100	25.2	0.085	19		0.084	19		2
4-Methyl-2-Pentanone	108-10-1	100	26.4	0.027	6.0		0.027	6.0		1
Pyridine	110-86-1	79	26.6	0.089	25	J	0.071	20	J	23
Pentanenitrile	110-59-8	83	27.5	0.004	0.98	J	0.001	0.22	U	
Toluene	108-88-3	92	28.5	1.245	303		1.257	305		1
Octane	111-65-9	114	30.5	0.037	7.3		0.037	7.3		0
Tetrachloroethylene	127-18-4	166	31.1	0.048	6.4		0.047	6.3		2
Ethylbenzene	100-41-4	106	33.5	0.010	2.1	J	0.010	2.2	J	2
p/m-Xylene	106-42-3	106	33.9	0.040	8.3		0.040	8.4		0
o-Xylene	95-47-6	106	35.1	0.018	3.7	J	0.017	3.6	J	3
Nonane	111-84-2	128	35.5	0.022	3.9		0.022	3.9		0
1,2,4-Trimethylbenzene	95-63-6	120	40.0	0.003	0.61	J	0.004	0.66	J	6
Decane	124-18-5	142	40.2	0.018	2.9	J	0.021	3.3	J	14
Undecane	1120-21-4	156	44.5	0.024	3.4	J	0.023	3.3	J	3
Dodecane	112-40-3	170	48.6	0.037	4.9	J	0.037	4.9	J	0
Tridecane	629-50-5	184	52.3	0.044	5.3	J	0.043	5.3	J	1
Tetradecane	629-59-4	198	55.9	0.038	4.3	J,B	0.037	4.2	J,B	3

Data Quality Flags

B Compound found in associated laboratory blank.

E Target compound exceeds the upper quantitation limit (UQL).

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.

(a) Detected target analytes.

(b) WHC sample identification number.

(c) Relative percent differences (RPDs) based on mg/m³ values.

Table 3.9 Organic Compound Concentrations in Triple Sorbent Trap Blank Samples Associated with the Sampling of Tank S-102 on 9/19/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6093-A17.1235 ^(b) VSS FB #1			S6093-A18.1236 ^(b) VSS FB #2			S6093-A19.1237 ^(b) VSS TB #1			S6093-A20.1238 ^(b) VSS TB #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Acetone	67-64-1	58	13.7	0.020	7.6	J	0.007	2.8	U	0.007	2.8	U	0.007	2.8	U
Trichlorofluorometha	75-69-4	137	14.2	0.027	4.5	J	0.004	0.72	U	0.004	0.72	U	0.004	0.72	U
1,1-Dichloroethene	75-35-4	97	15.5	0.069	16		0.002	0.47	U	0.002	0.47	U	0.002	0.47	U
Methylene Chloride	75-09-2	85	15.8	1.109	292		0.028	7.4	J,B	0.089	23	J,B	0.028	7.4	J,B
2-Butanone	78-93-3	72	18.6	0.005	1.4	J	0.002	0.68	U	0.002	0.68	U	0.002	0.68	U
1,1,1-Trichloroethane	71-55-6	133	22.0	0.006	0.96	J	0.003	0.44	U	0.003	0.44	U	0.003	0.44	U
1-Butanol	71-36-3	74	22.4	0.019	5.9	J	0.008	2.3	U	0.008	2.3	U	0.008	2.3	U
Benzene	71-43-2	78	22.8	0.003	0.84	J	0.001	0.40	U	0.001	0.40	U	0.001	0.40	U
Trichloroethene	79-01-6	131	24.8	0.031	5.3	J	0.004	0.61	U	0.004	0.61	U	0.004	0.61	U
Toluene	108-88-3	92	28.5	0.008	2.0	J	0.001	0.23	U	0.001	0.23	U	0.001	0.23	U
Tetradecane	629-59-4	198	55.9	0.041	4.6	J,B	0.034	3.9	J,B	0.019	2.2	U	0.031	3.5	J,B

Data Quality Flags

B Compound found in associated laboratory blank.

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

U Target compound not detected at or above the IDL.

(a) Detected target analytes.

(b) WHC sample identification number.

Table 3.10 Flammability Data for Tank S-102 Sampled on 9/19/96

Analyte	CAS #	Lower Flammability	Average	% of LFL ^(a)
		Limit(LFL)	Measured Concentrations	
Ammonia (ppm)	7664-41-7	150000	798	0.532
Carbon Monoxide (ppm)	630-08-0	125000	<17	<0.014
Hydrogen (ppm)	1333-74-0	40000	1179	2.948
Methane (ppm)	74-82-8	50000	<50	<0.100
TNMOC (mg/m ³)		42000	27.50	0.065
Total				<3.659

(a) Less than values are calculated using the average concentration less than values.
These values are summed to determine the total LFL.

Figure 3.1b Typical Total Ion Chromatogram (36 - 70 min) for SUMMA™ Canister Samples from Tank S-102 Sampled on 9/19/96

Figure 3.2a Typical Total Ion Chromatogram (2 - 36 min) for Triple Sorbent Trap Samples from Tank S-102 Sampled on 9/19/96

Figure 3.2b Typical Total Ion Chromatogram (36 - 70 min) for Triple Sorbent Trap Samples from Tank S-102 Sampled on 9/19/96

4.0 Conclusions

The concentrations of inorganic and organic analytes were determined from samples of the headspace of Tank S-102 on September 19, 1996 (Sample Job S6093). The vapor concentrations were based either on whole-volume samples (SUMMA™ canisters) or on sorbent traps exposed to sample flow. In the case of the canisters, the concentrations were based on analytical results and the tracking of dilution/concentration of sample volumes obtained directly from the canisters. In the case of the sorbent traps, concentrations were based on analytical results and sample volumes reported by WHC. Known sampling and analytical variances from established quality assurance requirements, where significant, were documented in this report, as required by the SAP (Buckley 1996). Immediate notification was provided because the ammonia concentration exceeded the 150 ppmv notification level; notification levels and notification procedures are described in the SAP (Buckley 1996).

5.0 References

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

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Pacific Northwest National Laboratory. *Analytical Laboratory Procedure Compendium*. Procedure PNL-ALO-271. PNL-MA-599, Pacific Northwest National 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. 1, Pacific Northwest National Laboratory, Richland, Washington.

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

Westinghouse Hanford Company (WHC). 1994. *Quality Assurance Project Plan for Tank Vapor Characterization*. WHC-SD-WM-QAPP-013, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Appendix A

Chain-of-Custody Sample Control Forms

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) 373-7437

Page 85-9656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm
241-S-102 Tank Vapor Sample SAF S6093

Collection date 09 - 17 - 96

Preparation date 09 - 09 - 96

Temporal

VSS

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

S6093 - A07 . R07

Collect NH₃/NO_x/H₂O Sorbent Trap

S6093 - A08 . R08

Collect NH₃/NO_x/H₂O Sorbent Trap

S6093 - A09 . R09

Collect NH₃/NO_x/H₂O Sorbent Trap

S6093 - A10 . R10

Collect NH₃/NO_x/H₂O Sorbent Trap

S6093 - A15 . R11

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

S6093 - A16 . R12

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

[] Field Transfer of Custody			[X] Chain of Possession			(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time		
G W Dennis <i>G.W. Dennis</i>	09-09-96	1340	J A Edwards <i>J A Edwards</i>	09-09-96	1340		
J A Edwards <i>J A Edwards</i>	09-09-96	1457	Rick Mahon <i>Rick Mahon</i>	09-09-96	1457		
Rick Mahon <i>Rick Mahon</i>	09-26-96	1255	GSCAPRIO <i>GSCAPRIO</i>	09-26-96	1255		
GSCAPRIO <i>GSCAPRIO</i>	09-26-96	1400	J A Edwards <i>J A Edwards</i>	9-26-96	1400		
J A Edwards <i>J A Edwards</i>	10-7-96	1505	G.W. Dennis <i>G.W. Dennis</i>	10-7-96	1515		

Final Sample Disposition

Comments:

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

POC

POC

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

(Revised 05/30/96 PNNL)

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-2329

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-2891

Page 85-3656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm

241-S-102 Tank Vapor Sample SAF S6093

Temporal

VSS

Collection date 09 - 19 - 96

Preparation date 09 - 16 - 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

S6093 - A01 . 033

Collect Ambient Air Sample SUMMA #1

S6093 - A02 . 034

Collect Ambient Air Sample SUMMA #2 (through tube bundle)

S6093 - A04 . 038

Collect SUMMA #3

S6093 - A05 . 065

Collect SUMMA #4

S6093 - A06 . 104

Collect SUMMA #5

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
J A Edwards <i>J A Edwards</i>	09- 16 -96	1445	Rick Mahon <i>Rick Mahon</i>	09- 16 -96	1445
Rick Mahon <i>Rick Mahon</i>	09-26-96	1255	GS CAPRIO <i>GS CAPRIO</i>	09-26-96	1255
GS CAPRIO <i>GS CAPRIO</i>	09-26-96	1400	J A Edwards <i>J A Edwards</i>	9-26-96	1400

Final Sample Disposition

Comments:

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

POC

POC

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

(Revised 05/30/96 PNNL)

Custody Form Initiator

J. A. Edwards - PNL

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

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-7437
Page 85-9656 / S3-27 / FAX 373-7076Project Designation/Sampling Locations 200 West Tank Farm
241-S-102 Tank Vapor Sample SAF S6093
(VSS Truck)Collection date 09-19-96
Preparation date 09-13-96

Ice Chest No.

Field Logbook No. WHC-N-647-10

Ertco Hi/Lo thermometer No.

PNL-T-005

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

S6093 - A11 . 1231	PNL Triple Sorbent Trap (TST) Sample # 1
S6093 - A12 . 1232	PNL TST Sample # 2
S6093 - A13 . 1233	PNL TST Sample # 3
S6093 - A14 . 1234	PNL TST Sample # 4
S6093 - A17 . 1235	Open, close & store TST Field Blank # 1
S6093 - A18 . 1236	Open, close & store TST Field Blank #2
S6093 - A19 . 1237	Store TST Trip Blank #1
S6093 - A20 . 1238	Store TST Trip Blank #2

[] Field Transfer of Custody			[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time	
JL Julia <i>JA Edwards</i>	09-13-96	1310	JA Edwards <i>JA Edwards</i>	09-13-96	1310	
JA Edwards <i>JA Edwards</i>	09-16-96	1455	Rick Mahon <i>Rick Mahon</i>	09-16-96	1455	
Rick Mahon <i>Rick Mahon</i>	09-26-96	1255	GS CAPETO <i>GS CAPETO</i>	09-26-96	1255	
GS CAPETO <i>JA Edwards</i>	09-26-96	1400	JA Edwards <i>JA Edwards</i>	09-26-96	1400	

Final Sample Disposition

Comments:

- PNL (only) Checklist
- ◇ Media labeled and checked? ☒ Y/N
 - ◇ Letter of instruction? ☒ Y/N
 - ◇ Media in good condition? ☒ Y/N
 - ◇ COC info/signatures complete? ☒ Y/N
 - ◇ Sorbents shipped on ice? (<5°C) ☒ Y/N
 - ◇ Hi/Lo thermometer - *Keep upright!* ☒ Y/N
 - ◇ Hi/Lo thermometer ☒ Y/N
 - ◇ Rad release stickers on samples? ☒ Y/N
 - ◇ Activity report from 222S? ☒ Y/N
 - ◇ COC copy for LRB, RIDS filed? ☒ Y/N

Pick-up / Delivery

POC ☒ ☒

Comments:

Cooler Temperature Status

Hi -15°C / Lo -15°C (pick up at PNL to WHC)	
Hi 3°C / Lo -15°C (delivery at WHC from PNL)	
Hi 2°C / Lo -14°C (at return to PNL from WHC)	
Hi 5°C / Lo -14°C (at delivery from WHC to PNL)	

(Revised 06/21/95 PNL)

Appendix B

Listing of All Target Compounds for Organic Compound Analysis

Table B.1 SUMMA™ Analysis Results for All Target Analytes from Tank S-102 Sampled on 9/19/96

Target Analytes	CAS	MW	Ret Time	S6093-A01.033 VSS			S6093-A02.034 VS			S6093-A04.038 VSS			S6093-A05.065 VSS			S6093-A05.065 VSS Rep			S6093-A06.104 VSS		
				Ambient Air			Amb. Air thru VSS														
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	4.212	0.007	1.3	U	0.0072	1.34	J	0.007	1.3	U	0.007	1.3	U	0.007	1.3	U	0.007	1.3	U
Chloromethane	74-87-3	50.49	4.619	0.002	0.89	U	0.002	0.89	U	0.0069	3.05	J	0.0068	3.03	J	0.0067	2.98	J	0.0069	3.08	J
1,2-dichloro1,1,2,2-tetrafluoroethane	76-14-2	170.92	4.886	0.0104	1.36	U	0.0104	1.36	U	0.0104	1.36	U	0.0104	1.36	U	0.0104	1.36	U	0.0104	1.36	U
Methanol	67-56-1	32.04	5.09	0.0126	8.81	U	0.0126	8.81	U	10.6929	7475.71	*	15.2444	10657.79	*	10.6078	7416.2	*	11.387	7960.98	*
Vinyl Chloride	75-01-4	62.5	5.175	0.006	2.15	U	0.006	2.15	U	0.006	2.15	U	0.006	2.15	U	0.006	2.15	U	0.006	2.15	U
1,3-Butadiene	106-99-0	54	5.517	<0.083	<34	Y	<0.083	<34	Y	<0.083	<34	Y	<0.083	<34	Y	<0.083	<34	Y	<0.083	<34	Y
Butane	106-97-8	58.12	5.646	0.0076	2.93	U	0.0076	2.93	U	0.3032	116.85		0.2598	100.12		0.2532	97.6		0.2481	95.61	
Bromomethane	74-83-9	94.94	6.159	0.0268	6.32	U	0.0268	6.32	U	0.0268	6.32	U	0.0268	6.32	U	0.0268	6.32	U	0.0268	6.32	U
Chloroethane	75-00-3	64.51	6.576	0.002	0.69	U	0.002	0.69	U	0.002	0.69	U	0.002	0.69	U	0.002	0.69	U	0.002	0.69	U
Ethanol	64-17-5	46.01	6.897	0.0117	5.68	J	0.0115	5.62	J	19.9667	9720.81	*	18.1468	8834.8	*	17.7786	8655.51	*	19.4395	9464.13	*
Acetonitrile	75-05-8	41.05	7.346	0.0032	1.75	U	0.0032	1.75	U	0.0353	19.27		0.03	16.39	J	0.0274	14.93	J	0.0366	19.96	
Acetone	67-64-1	58.08	7.892	0.006	2.31	U	0.006	2.31	U	1.0877	419.48		1.1079	427.29		1.0443	402.78		1.0826	417.54	
Trichlorofluoromethane	75-69-4	137.37	8.277	0.0042	0.68	U	0.005	0.81	J	0.4234	69.03		0.4405	71.83		0.4195	68.4		0.431	70.28	
Pentane	109-66-0	72.15	9.036	0.0024	0.75	U	0.0024	0.75	U	0.0505	15.69		0.053	16.46		0.0495	15.37		0.0512	15.88	
1,1-Dichloroethene	75-35-4	96.94	9.614	0.0036	0.83	U	0.0036	0.83	U	0.0036	0.83	U	0.0036	0.83	U	0.0036	0.83	U	0.0036	0.83	U
Methylene Chloride	75-09-2	84.93	9.828	0.0167	4.41	J	0.0168	4.44	J	0.0183	4.84	J	0.0191	5.04	J	0.0182	4.8	J	0.0188	4.96	J
1,1,1-trichloro-2,2,2-trifluoroethane	76-13-1	187.38	10.38	0.0044	0.53	U	0.0044	0.53	U	0.0044	0.53	U	0.0044	0.53	U	0.0044	0.53	U	0.0044	0.53	U
Propanenitrile	107-12-0	55.08	11.21	0.005	2.03	U	0.005	2.03	U	0.0132	5.39	J	0.0142	5.78	J	0.0118	4.78	J	0.0132	5.39	J
Propanol	71-23-8	60.1	11.27	0.0042	1.57	U	0.0042	1.57	U	0.2012	74.99		0.2078	77.45		0.1894	70.6		0.2032	75.74	
1,1-Dichloroethane	75-34-3	98.96	12.12	0.0022	0.5	U	0.0022	0.5	U	0.0022	0.5	U	0.0022	0.5	U	0.0022	0.5	U	0.0022	0.5	U
2-Butanone	78-93-3	72.11	12.84	0.0163	5.06	J	0.018	5.6	J	0.3017	93.72		0.3177	98.7		0.2992	92.96		0.2759	85.71	
cis-1,2-Dichloroethene	156-59-2	96.94	13.72	0.0036	0.83	U	0.0036	0.83	U	0.0036	0.83	U	0.0036	0.83	U	0.0036	0.83	U	0.0036	0.83	U
Hexane	110-54-3	86.18	14.13	0.0031	0.8	J	0.0037	0.97	J	0.0406	10.54		0.0415	10.79		0.0385	10		0.0385	10.01	
Chloroform	67-66-3	119.38	14.3	0.0022	0.41	U	0.0022	0.41	U	0.0022	0.41	U	0.0033	0.62	J	0.0022	0.41	U	0.0022	0.41	U
Tetrahydrofuran	109-99-9	72.11	15.06	0.0026	0.81	U	0.0026	0.81	U	0.1743	54.16		0.179	55.59		0.171	53.12		0.171	53.12	
1,2-Dichloroethane	107-06-2	98.96	15.74	0.0022	0.5	U	0.0022	0.5	U	0.0022	0.5	U	0.0022	0.5	U	0.0022	0.5	U	0.0022	0.5	U
1,1,1-Trichloroethane	71-55-6	133.4	16.25	0.0018	0.3	U	0.0018	0.3	U	0.0018	0.3	U	0.0018	0.3	U	0.0018	0.3	U	0.0018	0.3	U
Butanenitrile	109-74-0	69.11	16.29	0.005	1.62	U	0.005	1.62	U	0.005	1.62	U	0.005	1.62	U	0.005	1.62	U	0.005	1.62	U
1-Butanol	71-36-3	74.12	16.86	0.017	5.14	J	0.0145	4.37	J	3.5405	1069.99		3.0532	922.72		2.9798	900.53		3.168	957.42	
Benzene	71-43-2	78.11	17.17	0.0016	0.46	U	0.0016	0.46	U	0.0846	24.25		0.0848	24.32		0.0816	23.4		0.0843	24.18	
Carbon Tetrachloride	56-23-5	153.82	17.46	0.0026	0.38	U	0.0048	0.7	J	0.0041	0.6	J	0.0041	0.59	J	0.0037	0.54	J	0.0039	0.57	J
Cyclohexane	110-82-7	84.16	17.71	0.005	1.33	U	0.005	1.33	U	0.005	1.33	U	0.005	1.33	U	0.005	1.33	U	0.005	1.33	U
1,2-Dichloropropane	78-87-5	112.99	18.77	0.0026	0.52	U	0.0026	0.52	U	0.0026	0.52	U	0.0026	0.52	U	0.0026	0.52	U	0.0026	0.52	U
Trichloroethene	79-01-6	131.39	19.23	0.0014	0.24	U	0.0014	0.24	U	0.0014	0.24	U	0.0044	0.76	J	0.0014	0.24	U	0.0014	0.24	U
Heptane	142-82-5	100.2	19.78	0.0036	0.8	U	0.0036	0.8	U	0.0569	12.73		0.0593	13.25		0.055	12.29		0.0564	12.6	
cis-1,3-Dichloropropene	0061-01-	110.97	20.95	0.0002	0.04	U	0.0002	0.04	U	0.0002	0.04	U	0.0002	0.04	U	0.0002	0.04	U	0.0002	0.04	U
4-Methyl-2-Pentanone	108-10-1	100.16	20.99	0.0058	1.3	U	0.0066	1.47	J	0.0276	6.16	J	0.028	6.25	J	0.0252	5.63	J	0.0268	5.99	J
Pyridine	110-86-1	79.1	21.12	0.0076	2.15	U	0.0076	2.15	U	0.0193	5.46	J	0.0205	5.81	J	0.0197	5.57	J	0.018	5.11	J
trans-1,3-Dichloropropene	0061-02-	110.97	22.04	0.0028	0.57	U	0.0028	0.57	U	0.0028	0.57	U	0.0028	0.57	U	0.0028	0.57	U	0.0028	0.57	U
Pentanenitrile	110-59-8	83.13	22.1	0.0038	1.02	U	0.0038	1.02	U	0.0038	1.02	U	0.0038	1.02	U	0.0038	1.02	U	0.0038	1.02	U
1,1,2-Trichloroethane	79-00-5	133.4	22.47	0.0028	0.47	U	0.0057	0.95	J	0.0028	0.47	U	0.0048	0.8	J	0.0028	0.47	U	0.0028	0.47	U
Toluene	108-88-3	92.14	23.1	0.002	0.49	U	0.0037	0.91	J	1.2236	297.46		1.2274	298.39		1.1945	290.4		1.2295	298.91	
1,2-Dibromoethane	106-93-4	187.86	24.62	0.003	0.36	U	0.0067	0.79	J	0.0055	0.66	J	0.0058	0.7	J	0.0043	0.51	J	0.0049	0.58	J

Table B.1 (Cont'd) SUMMA™ Analysis Results for All Target Analytes from Tank S-102 Sampled on 9/19/96

Target Analytes	CAS	MW	Ret Time	S6093-A01.033 VSS			S6093-A02.034 VS			S6093-A04.038 VSS			S6093-A05.065 VSS			S6093-A05.065 VSS Rep			S6093-A06.104 VSS		
				Ambient Air			Amb. Air thru VSS														
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Octane	111-65-9	114.23	25.23	0.0048	0.94	U	0.0048	0.94	U	0.0298	5.84	J	0.0316	6.19	J	0.029	5.69	J	0.0296	5.81	J
Tetrachloroethylene	127-18-4	165.83	25.66	0.0034	0.46	U	0.0034	0.46	U	0.0398	5.37		0.0414	5.6		0.0387	5.23		0.0392	5.3	
Chlorobenzene	108-90-7	112.56	27.26	0.0026	0.52	U	0.0026	0.52	U	0.0059	1.18	J	0.006	1.2	J	0.0052	1.04	J	0.0055	1.1	J
Hexanenitrile	628-73-9	97.13	27.57	0.0064	1.48	U	0.0064	1.48	U	0.0064	1.48	U	0.0064	1.48	U	0.0064	1.48	U	0.0064	1.48	U
Ethylbenzene	100-41-4	106.17	28.15	0.0034	0.72	U	0.0034	0.72	U	0.0102	2.16	J	0.011	2.32	J	0.0097	2.04	J	0.01	2.12	J
p/m-Xylene	106-42-3	106.17	28.6	0.0084	1.77	U	0.0084	1.77	U	0.0317	6.7	J	0.0341	7.2	J	0.0316	6.67	J	0.0321	6.77	J
Cyclohexanone	108-94-1	98.14	28.99	0.0064	1.46	U	0.0064	1.46	U	0.0064	1.46	U	0.0064	1.46	U	0.0064	1.46	U	0.0064	1.46	U
Styrene	100-42-5	104.15	29.5	0.0104	2.24	U	0.0104	2.24	U	0.0104	2.24	U	0.0104	2.24	U	0.0104	2.24	U	0.0104	2.24	U
1,1,2,2-Tetrachloroethane	79-34-5	167.85	29.73	0.0152	2.03	U	0.0152	2.03	U	0.0152	2.03	U	0.0152	2.03	U	0.0152	2.03	U	0.0152	2.03	U
o-Xylene	95-47-6	106.17	29.79	0.0116	2.45	U	0.0116	2.45	U	0.0144	3.03	J	0.0159	3.36	J	0.0149	3.14	J	0.0145	3.06	J
Nonane	111-84-2	128.26	30.29	0.0102	1.78	U	0.0102	1.78	U	0.0182	3.17	J	0.0191	3.34	J	0.0178	3.1	J	0.018	3.14	J
1-Ethyl-2-Methyl-Benzene	611-14-3	120.19	33.18	0.0216	4.03	U	0.0216	4.03	U	0.0216	4.03	U	0.0216	4.03	U	0.0216	4.03	U	0.0216	4.03	U
1,3,5-Trimethylbenzene	108-67-8	120.19	33.41	0.0172	3.21	U	0.0172	3.21	U	0.0172	3.21	U	0.0172	3.21	U	0.0172	3.21	U	0.0172	3.21	U
1,2,4-Trimethylbenzene	95-63-6	120.19	34.66	0.0196	3.65	U	0.0196	3.65	U	0.0196	3.65	U	0.0196	3.65	U	0.0196	3.65	U	0.0196	3.65	U
Decane	124-18-5	142.28	34.95	0.0144	2.27	U	0.0144	2.27	U	0.0278	4.38	J	0.0265	4.18	J	0.0225	3.54	J	0.0238	3.74	J
1,3-Dichlorobenzene	541-73-1	147	35.14	0.0132	2.01	U	0.0132	2.01	U	0.0132	2.01	U	0.0132	2.01	U	0.0132	2.01	U	0.0132	2.01	U
1,4-Dichlorobenzene	106-46-7	147	35.35	<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20	
1,2-Dichlorobenzene	95-50-1	147	36.47	<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20	
Undecane	1120-21-4	156.31	39.26	<0.111	<16		<0.111	<16		<0.111	<16		<0.111	<16		<0.111	<16		<0.111	<16	
1,2,4-Trichlorobenzene	120-82-1	181.45	42.66	<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60	
Dodecane	112-40-3	170.34	43.26	<0.348	<46		<0.348	<46		0.4067	53.48		<0.348	<46		<0.348	<46		<0.348	<46	
Hexachloro-1,3-butadiene	87-68-3	260.76	44.5	0.0233	2	U	0.0233	2	U	0.0233	2	U	0.0233	2	U	0.0233	2	U	0.0233	2	U
Tridecane	629-50-5	184.36	46.99	<0.312	<38		<0.312	<38		0.9262	112.53		<0.312	<38		<0.312	<38		<0.312	<38	
Tetradecane	629-59-4	198.34	50.48	<0.228	<26		<0.228	<26		0.2689	30.37		<0.228	<26		<0.228	<26		<0.228	<26	

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.

* Diluted value was reported for target compound in table.

Table B.2 Triple Sorbent Trap Analysis Results for All Target Analytes from Tank S-102 Sampled on 9/19/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes	CAS	MW	Ret	S6093-A11.1231 VSS			S6093-A12.1232 VSS			S6093-A12.1232 VSS REP			S6093-A13.1233 VSS		
			Time	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.829	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U
Chloromethane	74-87-3	50.49	8.818	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U
1,2-dichloro1,1,2,2-tetrafluoroethane	76-14-2	170.92	9.53	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U
Methanol	67-56-1	32.04	10.104	20.0134	13991.91	E,Y	25.0703	17527.28	E,Y	24.0978	16847.42	E,Y	37.1358	25962.6	E,Y
Vinyl Chloride	75-01-4	62.5	9.934	0.003	1.08	U	0.003	1.08	U	0.003	1.08	U	0.003	1.08	U
1,3-Butadiene	106-99-0	54	10.561	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58.14	10.773	0.2771	106.77		0.288	110.95		0.2806	108.09		0.2944	113.42	
Chloroethane	75-00-3	64.51	12.081	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U
Ethanol	64-17-5	46.07	12.57	23.3844	11369.9	E,Y	27.117	13184.74	E,Y	26.2671	12771.49	E,Y	31.252	15195.23	E,Y
Acetonitrile	75-05-8	41.05	13.048	0.2042	111.42		0.1744	95.15		0.2148	117.21		0.2227	121.53	
Acetone	67-64-1	58.08	13.696	0.8379	323.16		1.0136	390.94		0.9539	367.89		1.1204	432.09	
Trichlorofluoromethane	75-69-4	137.37	14.153	0.4361	71.11		0.4497	73.33		0.454	74.04		0.4655	75.9	
Pentane	109-66-0	72	14.95	0.0642	19.98		0.0651	20.26		0.0647	20.12		0.0679	21.13	
1,1-Dichloroethene	75-35-4	96.94	15.546	0.0021	0.47	U	0.0021	0.47	U	0.0021	0.47	U	0.0021	0.47	U
Methylene Chloride	75-09-2	84.93	15.79	0.0572	15.08	J,B	0.0333	8.78	J,B	0.0285	7.53	J,B	0.0466	12.3	J,B
1,1,2-trichloro1,2,2-trifluoroethane	76-13-1	187.38	16.332	0.003	0.36	U	0.003	0.36	U	0.003	0.36	U	0.003	0.36	U
Propanenitrile	107-12-0	55.08	17.066	0.0157	6.38	J	0.0163	6.62	J	0.0158	6.43	J	0.018	7.31	J
Propanol	71-23-8	60.1	17.097	0.2273	84.71		0.2493	92.93		0.2441	90.98		0.2606	97.12	
1,1-Dichloroethane	75-34-3	98.96	18.012	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U
2-Butanone	78-93-3	72.11	18.649	0.2022	62.81		0.2519	78.26		0.2312	71.82		0.2794	86.78	
cis-1,2-Dichloroethene	156-59-2	96.94	19.542	0.0025	0.58	U	0.0025	0.58	U	0.0025	0.58	U	0.0025	0.58	U
Hexane	110-54-3	86.18	19.903	0.0590	15.34		0.0607	15.77		0.0610	15.86		0.0627	16.30	
Chloroform	67-66-3	119.38	20.074	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U
Tetrahydrofuran	109-99-9	72.11	20.796	0.2361	73.33		0.2425	75.34		0.2427	75.39		0.2475	76.88	
1,2-Dichloroethane	107-06-2	98.96	21.455	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U
Butanenitrile	109-74-0	69.11	21.902	0.0135	4.39	J	0.0114	3.7	J	0.0209	6.78		0.0119	3.86	J
1,1,1-Trichloroethane	71-55-6	133.4	21.965	0.0027	0.44	U	0.0027	0.44	U	0.0027	0.44	U	0.0027	0.44	U
1-Butanol	71-36-3	74	22.359	3.35	1014.05		3.3557	1015.77		3.4291	1037.99		3.3391	1010.74	
Benzene	71-43-2	78.11	22.826	0.09	25.8		0.093	26.66		0.0926	26.56		0.0948	27.19	
Carbon Tetrachloride	56-23-5	153.82	23.124	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U
Cyclohexane	110-82-7	84.16	23.379	0.0041	1.09	U	0.0041	1.09	U	0.0041	1.09	U	0.0041	1.09	U
1,2-Dichloropropane	78-87-5	112.99	24.357	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U
Trichloroethene	79-01-6	131.39	24.793	0.0036	0.61	U	0.0036	0.61	U	0.0036	0.61	U	0.0036	0.61	U
Heptane	142-82-5	100.2	25.239	0.0838	18.72		0.0852	19.06		0.0839	18.76		0.0878	19.63	
4-Methyl-2-Pentanone	108-10-1	100.16	26.398	0.0253	5.66		0.0268	5.99		0.0266	5.96		0.0278	6.21	
cis-1,3-Dichloropropene	10061-01-5	110.97	26.419	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U
Pyridine	110-86-1	79.1	26.6	0.076	21.53	J	0.0893	25.29	J	0.0709	20.07	J	0.0654	18.51	J
trans-1,3-Dichloropropene	10061-02-6	110.97	27.45	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U
Pentanenitrile	110-59-8	83.15	27.461	0.0008	0.22	U	0.0036	0.98	J	0.0008	0.22	U	0.0008	0.22	U
1,1,2-Trichloroethane	79-00-5	133.4	27.896	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U
Toluene	108-88-3	92.14	28.545	1.2175	295.98		1.245	302.68		1.2565	305.47		1.2872	312.94	
1,2-Dibromoethane	106-93-4	187.86	30.075	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U
Octane	111-65-9	114	30.522	0.0361	7.09		0.0372	7.31		0.0373	7.33		0.0392	7.71	
Tetrachloroethylene	127-18-4	165.83	31.074	0.0466	6.29		0.0477	6.44		0.0467	6.31		0.0494	6.68	
Chlorobenzene	108-90-7	112.56	32.669	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U	0.0036	0.71	J

Table B.2 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Tank S-102 Sampled on 9/19/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes	CAS	MW	Ret Time	S6093-A11.1231 VSS			S6093-A12.1232 VSS			S6093-A12.1232 VSS REP			S6093-A13.1233 VSS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Hexanenitrile	628-73-9	97	32.849	0.0038	0.88	J	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U
Ethylbenzene	100-41-4	106.17	33.508	0.0104	2.19	J	0.01	2.12	J	0.0102	2.16	J	0.0112	2.36	J
p/m-Xylene	106-42-3	106.17	33.934	0.0388	8.19		0.0395	8.33		0.0396	8.37		0.0441	9.31	
Cyclohexanone	108-94-1	98.14	34.38	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U
Styrene	100-42-5	104.15	34.848	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U
1,1,2,2-Tetrachloroethane	79-34-5	167.85	35.081	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U
o-Xylene	95-47-6	106.17	35.145	0.0171	3.61	J	0.0177	3.74	J	0.0171	3.6	J	0.0192	4.04	
Nonane	111-84-2	128	35.528	0.0219	3.84		0.0222	3.89		0.0222	3.89		0.0262	4.58	
1-Ethyl-2-methyl benzene	611-14-3	120.19	38.738	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,3,5-Trimethylbenzene	108-67-8	120.19	38.738	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,2,4-Trimethylbenzene	95-63-6	120.19	40.024	0.0031	0.59	J	0.0033	0.61	J	0.0035	0.66	J	0.0034	0.63	J
Decane	124-18-5	142.28	40.194	0.021	3.3	J	0.0184	2.89	J	0.0212	3.34	J	0.0209	3.29	J
1,3-Dichlorobenzene	541-73-1	147	40.555	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U
1,4-Dichlorobenzene	106-46-7	147	40.768	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U
1,2-Dichlorobenzene	95-50-1	147	41.905	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U
Undecane	1120-21-4	156	44.541	0.0228	3.28	J	0.0239	3.43	J	0.0232	3.33	J	0.0228	3.27	J
1,2,4-Trichlorobenzene	120-82-1	181.45	48.166	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U
Dodecane	112-40-3	170	48.58	0.0374	4.93	J	0.0369	4.86	J	0.0369	4.87	J	0.0344	4.53	J
Hexachloro-1,3-butadiene	87-68-3	260.76	49.983	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U
Tridecane	629-50-5	184	52.343	0.0409	4.98	J	0.0438	5.34	J	0.0434	5.28	J	0.0397	4.83	J
Tetradecane	629-59-4	198	55.861	0.0416	4.71	J,B	0.038	4.3	J,B	0.0367	4.15	J,B	0.0305	3.45	J,B
Tributyl Phosphate	126-73-8	266	63.1	<0.0099	<0.83	Z	<0.0099	<0.83	Z	<0.0099	<0.83	Z	<0.0099	<0.83	Z

B Compound found in associated laboratory blank.

E Target compound exceeds the upper quantitation limit (UQL).

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 were performed; however, the analyte was not part of the current operating procedure.

Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv;

however, this compound is not currently part of the analytical method. See Section 3.4.2.1 for more information.

Table B.3 Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank S-102 on 9/19/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes	CAS	MW	Ret Time	S6093-A17.1235 VSS Field Blank #1			S6093-A18.1236 VSS Field Blank #2			S6093-A19.1237 VSS Trip Blank #1			S6093-A20.1238 VSS Trip Blank #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.829	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U
Chloromethane	74-87-3	50.49	8.818	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	170.92	9.53	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U
Methanol	67-56-1	32.04	10.104	<0.274	<192	Y	<0.274	<192	Y	<0.274	<192	Y	<0.274	<192	Y
Vinyl Chloride	75-01-4	62.5	9.934	0.003	1.08	U	0.003	1.08	U	0.003	1.08	U	0.003	1.08	U
1,3-Butadiene	106-99-0	54	10.561	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58.14	10.773	0.0036	1.39	U	0.0036	1.39	U	0.0036	1.39	U	0.0036	1.39	U
Chloroethane	75-00-3	64.51	12.081	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U
Ethanol	64-17-5	46.07	12.57	<0.275	<133	Y	<0.275	<133	Y	<0.275	<133	Y	<0.275	<133	Y
Acetonitrile	75-05-8	41.05	13.048	0.0033	1.8	U	0.0033	1.8	U	0.0033	1.8	U	0.0033	1.8	U
Acetone	67-64-1	58.08	13.696	0.0197	7.59	J	0.0072	2.78	U	0.0072	2.78	U	0.0072	2.78	U
Trichlorofluoromethane	75-69-4	137.37	14.153	0.0273	4.46	J	0.0044	0.72	U	0.0044	0.72	U	0.0044	0.72	U
Pentane	109-66-0	72	14.95	0.0029	0.89	U	0.0029	0.89	U	0.0029	0.89	U	0.0029	0.89	U
1,1-Dichloroethene	75-35-4	96.94	15.546	0.0693	16.02		0.0021	0.47	U	0.0021	0.47	U	0.0021	0.47	U
Methylene Chloride	75-09-2	84.93	15.79	1.109	292.49		0.0279	7.37	J,B	0.0888	23.43	J,B	0.0279	7.37	J,B
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187.38	16.332	0.003	0.36	U	0.003	0.36	U	0.003	0.36	U	0.003	0.36	U
Propanenitrile	107-12-0	55.08	17.066	0.0019	0.77	U	0.0019	0.77	U	0.0019	0.77	U	0.0019	0.77	U
Propanol	71-23-8	60.1	17.097	0.0053	1.99	U	0.0053	1.99	U	0.0053	1.99	U	0.0053	1.99	U
1,1-Dichloroethane	75-34-3	98.96	18.012	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U
2-Butanone	78-93-3	72.11	18.649	0.0046	1.42	J	0.0022	0.68	U	0.0022	0.68	U	0.0022	0.68	U
cis-1,2-Dichloroethene	156-59-2	96.94	19.542	0.0025	0.58	U	0.0025	0.58	U	0.0025	0.58	U	0.0025	0.58	U
Hexane	110-54-3	86.18	19.903	0.0013	0.32	U	0.0013	0.32	U	0.0013	0.32	U	0.0013	0.32	U
Chloroform	67-66-3	119.38	20.074	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U
Tetrahydrofuran	109-99-9	72.11	20.796	0.0035	1.07	U	0.0035	1.07	U	0.0035	1.07	U	0.0035	1.07	U
1,2-Dichloroethane	107-06-2	98.96	21.455	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U
Butanenitrile	109-74-0	69.11	21.902	0.0014	0.45	U	0.0014	0.45	U	0.0014	0.45	U	0.0014	0.45	U
1,1,1-Trichloroethane	71-55-6	133.4	21.965	0.0057	0.96	J	0.0027	0.44	U	0.0027	0.44	U	0.0027	0.44	U
1-Butanol	71-36-3	74	22.359	0.0193	5.85	J	0.0075	2.29	U	0.0075	2.29	U	0.0075	2.29	U
Benzene	71-43-2	78.11	22.826	0.0029	0.84	J	0.0014	0.4	U	0.0014	0.4	U	0.0014	0.4	U
Carbon Tetrachloride	56-23-5	153.82	23.124	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U
Cyclohexane	110-82-7	84.16	23.379	0.0041	1.09	U	0.0041	1.09	U	0.0041	1.09	U	0.0041	1.09	U
1,2-Dichloropropane	78-87-5	112.99	24.357	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U
Trichloroethene	79-01-6	131.39	24.793	0.0313	5.33	J	0.0036	0.61	U	0.0036	0.61	U	0.0036	0.61	U
Heptane	142-82-5	100.2	25.239	0.0015	0.35	U	0.0015	0.35	U	0.0015	0.35	U	0.0015	0.35	U
4-Methyl-2-Pentanone	108-10-1	100.16	26.398	0.0021	0.46	U	0.0021	0.46	U	0.0021	0.46	U	0.0021	0.46	U
cis-1,3-Dichloropropene	10061-01-5	110.97	26.419	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U
Pyridine	110-86-1	79.1	26.6	0.0214	6.06	U	0.0214	6.06	U	0.0214	6.06	U	0.0214	6.06	U
trans-1,3-Dichloropropene	10061-02-6	110.97	27.45	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U
Pentanenitrile	110-59-8	83.15	27.461	0.0008	0.22	U	0.0008	0.22	U	0.0008	0.22	U	0.0008	0.22	U
1,1,2-Trichloroethane	79-00-5	133.4	27.896	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U
Toluene	108-88-3	92.14	28.545	0.0083	2.02	J	0.0009	0.23	U	0.0009	0.23	U	0.0009	0.23	U
1,2-Dibromoethane	106-93-4	187.86	30.075	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U
Octane	111-65-9	114	30.522	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U
Tetrachloroethylene	127-18-4	165.83	31.074	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U
Chlorobenzene	108-90-7	112.56	32.669	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U

Table B.3 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank S-102 on 9/19/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes	CAS	MW	Ret Time	S6093-A17.1235 VSS			S6093-A18.1236 VSS			S6093-A19.1237 VSS			S6093-A20.1238 VSS		
				Field Blank #1			Field Blank #2			Trip Blank #1			Trip Blank #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Hexanenitrile	628-73-9	97	32.849	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U
Ethylbenzene	100-41-4	106.17	33.508	0.0014	0.3	U	0.0014	0.3	U	0.0014	0.3	U	0.0014	0.3	U
p/m-Xylene	106-42-3	106.17	33.934	0.003	0.63	U	0.003	0.63	U	0.003	0.63	U	0.003	0.63	U
Cyclohexanone	108-94-1	98.14	34.38	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U
Styrene	100-42-5	104.15	34.848	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U
1,1,2,2-Tetrachloroethane	79-34-5	167.85	35.081	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U
o-Xylene	95-47-6	106.17	35.145	0.0019	0.4	U	0.0019	0.4	U	0.0019	0.4	U	0.0019	0.4	U
Nonane	111-84-2	128	35.528	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U
1-Ethyl-2-methyl benzene	611-14-3	120.19	38.738	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,3,5-Trimethylbenzene	108-67-8	120.19	38.738	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,2,4-Trimethylbenzene	95-63-6	120.19	40.024	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U
Decane	124-18-5	142.28	40.194	0.003	0.47	U	0.003	0.47	U	0.003	0.47	U	0.003	0.47	U
1,3-Dichlorobenzene	541-73-1	147	40.555	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U
1,4-Dichlorobenzene	106-46-7	147	40.768	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U
1,2-Dichlorobenzene	95-50-1	147	41.905	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U
Undecane	1120-21-4	156	44.541	0.0044	0.63	U	0.0044	0.63	U	0.0044	0.63	U	0.0044	0.63	U
1,2,4-Trichlorobenzene	120-82-1	181.45	48.166	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U
Dodecane	112-40-3	170	48.58	0.0255	3.36	U	0.0255	3.36	U	0.0255	3.36	U	0.0255	3.36	U
Hexachloro-1,3-butadiene	87-68-3	260.76	49.983	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U
Tridecane	629-50-5	184	52.343	0.026	3.17	U	0.026	3.17	U	0.026	3.17	U	0.026	3.17	U
Tetradecane	629-59-4	198	55.861	0.0409	4.62	J,B	0.0342	3.87	J,B	0.019	2.15	U	0.0311	3.52	J,B
Tributyl Phosphate	126-73-8	266	63.1	<0.0099	<0.83	Z	<0.0099	<0.83	Z	<0.0099	<0.83	Z	<0.0099	<0.83	Z

B Compound found in associated laboratory blank.

E Target compound exceeds the upper quantitation limit (UQL).

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 were performed; however, the analyte was not part of the current operating procedure.

Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv;
however, this compound is not currently part of the analytical method. See Section 3.4.2.1 for more information.

Distribution List

PNNL-11502

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