Pacific Northwest National Laboratory

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TANK VAPOR CHARACTERIZATION PROJECT

Tank 241-BY-108 Fourth Temporal Study Headspace Gas and Vapor Characterization Results from Samples Collected on November 14, 1996

J. C. Evans
K. H. Pool
K. B. Olsen
J. C. Hayes
A. V. Mitroshkov

J. A. Edwards
J. L. Julya
B. M. Thornton
J. S. Fruchter
K. L. Silvers

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Richland, Washington 99352

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Summary

This report presents the results from analyses of samples taken from the headspace of waste storage tank 241-BY-108 (Tank BY-108) at the Hanford Site in Washington State. Tank headspace samples collected by SGN Eurisys Service Corporation (SESC) 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 SESC.

Ammonia was determined to be above the immediate notification limit of 150 ppm specified by the sampling and analysis plan (SAP) (Buckley 1996). Hydrogen was the principal flammable constituent of the Tank BY-108 headspace, determined to be present at approximately 1.390% of its lower flammability limit (LFL). Total headspace flammability was estimated to be <2.830% 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 BY-108 Sampled on 11/14/96

<u>Category</u>	<u>Sample Medium</u>	<u>Analyte</u>	<u>Concentration^(a)</u>	<u>Units</u>
Inorganic Vapors	Sorbent Traps	Ammonia	1024	ppmv
		Nitrogen Dioxide (NO ₂)	<0.16	ppmv
		Nitric Oxide (NO)	<0.16	ppmv
		Water	18.0	mg/L
Permanent Gases	SUMMA™ Canisters	Hydrogen	556	ppmv
		Methane	<25	ppmv
		Carbon Dioxide	<17	ppmv
		Carbon Monoxide	<17	ppmv
		Nitrous Oxide (N ₂ O)	773	ppmv
Total Non-Methane Organic Compounds	SUMMA™ Canisters	Total Non-Methane Organic Compounds	311.06	mg/m ³
Volatile Organic Vapors	SUMMA™ Canisters	1-Butanol	64.987	mg/m ³
		Pentane	10.198	mg/m ³
		Dodecane	9.752	mg/m ³
Volatile Organic Vapors	Sorbent Traps	1-Butanol	32.798	mg/m ³
		Butane	5.908	mg/m ³
		Pentane	5.377	mg/m ³
Flammables	SUMMA™ Canisters and Sorbent Traps	Flammables	<2.878	% 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, 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
SESC	SGN Eurisys Service Corporation
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 SESC on November 14, 1996 from the headspace of waste storage tank 241-BY-108 (Tank BY-108) at the Hanford Site in Washington State. This sampling of Tank BY-108 is the latest in a series of sampling for the temporal study. 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 were provided to SESC on November 11, 1996 and were returned to PNNL on December 9, 1996. SESC 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 target 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 SESC 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 SESC 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 SESC 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- μ m 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 $\pm 10\%$, and for NO results it is $\pm 5\%$.

^(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

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

2.2.1 SUMMA™ Canister Preparation

All SUMMA™ 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 SUMMA™ 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 SUMMA™ canister into a 5-mL gas-tight syringe and injected into a

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

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

<u>Analyte</u>	<u>Formula</u>	<u>EQL (ppmv)</u>
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

SUMMATM 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, SUMMATM 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 SUMMATM 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 volume of sample air from the SUMMA™ canister, cryogenically concentrate the condensible organic

^(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.

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- μ m 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 Carbotrap™ 300 traps for sample collection and preconcentration. The traps are ground-glass tubes (11.5 cm long X 6 mm OD, 4 mm ID) containing a series of sorbents arranged in order of increasing retentivity. Each trap contains 300 mg of Carbotrap™ C, 200 mg of Carbotrap™ B, and 125 mg of Carbosieve™ S-III. The first two sorbents are deactivated graphite with limited sorption power for less volatile compounds. The final trapping stage, the Carbosieve™ S-III, is a 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/m³:

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

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-d₅, 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 BY-108 on November 14, 1996 (Sample Job S7009) 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 BY-108 during sample job S7009. 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 $<6\%$, which is within the 25% specified by the SAP.

3.1.1 Ammonia

Ammonia analyses were performed on December 19, 1996, 35 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 83.6 to 86.0 μmol in front sections; blank corrected back sorbent section ammonia concentrations were $<0.01 \mu\text{mol}$. Blank corrections of 0.09 μmol in front and 0.05 μmol in the back sections, were about 0.1% of collected quantities. The analysis of one sample was a duplicate and indicated a reproducibility of $\pm 0.4\%$. 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 99%. The initial and continuing calibration verification (ICV, CCV) standards, using NIST-traceable material, yielded percentage recoveries of 99% (ICV) and 100%, 103%, and 103% (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 dioxide analyses were performed on December 16, 1996, 32 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 $0.0122 \mu\text{mol}$ in front (four of four blanks analyzed) and $0.0071 \mu\text{mol}$ in back (two of four blanks analyzed) sorbent sections. The analyses of two samples were duplicated and yielded repeatabilities of $\pm 1.4\%$ and $\pm 0.6\%$. Two sample leachates were spiked with 0.25 ppm NO_2^- and yielded percentage recoveries of 97% and 85% . A 4-point calibration was performed over a concentration range of 0 to $0.5 \mu\text{g/mL NO}_2^-$ in the desorbing matrix.

3.1.3 Water

Analyses for water vapor were performed on December 12, 1996, 28 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 18.0 mg of water per L of dry air at STP. The result was determined from an average mass gain of 33.4 mg from all four multi-trap trains. The blank correction applied to the results was $+0.1 \text{ mg}$ 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 18.8°C and relative humidity at 58% at the time of sampling.

3.2 Permanent Gases

Hydrogen analyses were performed on December 20, 1996, and analyses for other permanent gases were performed on December 19, 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 tank samples (100%) were successfully analyzed and used in the averages. Upwind ambient air sample S7009-A01.069 was not analyzed due to a leaky valve. No deviations from standard procedures were noted.

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 at an average concentration of 556 ppmv and nitrous oxide at 773 ppmv were detected in Tank BY-108. Both compounds were present at higher concentrations in the tank headspace than in ambient air. The relative percent difference (RPD) between duplicate analyses of a single SUMMA™ canister was 2.4% for hydrogen and 0.9% 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 January 24, 1997, 71 days after sample collection 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.

Table 3.3 lists results of the 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 $311.06 \text{ mg}/\text{m}^3$ or 129.54 ppmv of carbon. The $311.06 \text{ mg}/\text{m}^3$ value compares to $134.08 \text{ mg}/\text{m}^3$ for the sum of all target compounds identified in the analysis of the SUMMA™ canisters. The $134.08 \text{ mg}/\text{m}^3$ value is conservatively low because TICs were not reported. 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 0.1%.

3.3.1 Procedural Deviations, Observations, and Anomalies

A deviation was made to the current procedure and documented in Vapor Deviation Report JAE082996. In accordance with the current method, past TO-12 analyses used a calibration method based on an average response factor spanning the full dynamic range. Because the low level standards are impacted to some extent by the small amount of system blank present, the average response factor method generates an apparent non linearity introducing an unnecessary amount of level dependent error. To correct this situation, data included in the August 20, 1996 and all subsequent calibrations shall use a linear regression fit which includes both a slope and intercept. The correlation coefficient for the August 20, 1996 ten point calibration curve was 0.99996, an extremely well ordered data set. A new revision of PNL-TVP-08 currently under preparation will reflect this amendment.

3.4 Organic Compound Characterization

Organic vapors in the Tank BY-108 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 January 24, 1997, 71 days after sample collection. All analyses exceeded 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. No TICs were reported for this temporal study. Forty-five target analytes above the instrument detection limit (IDL) were detected in the tank headspace samples. Of these, 42 target analytes were identified in two or more tank headspace samples. 1-Butanol at $64.987 \text{ mg}/\text{m}^3$, pentane at $10.198 \text{ mg}/\text{m}^3$, and dodecane at

9.752 mg/m³ were the three most abundant compounds identified in the tank headspace samples. The total average concentration was 134.08 mg/m³ for the target analytes. This compares to a total concentration of 311.06 mg/m³ identified in the TO-12 analysis of the three tank headspace samples. The 134.08 mg/m³ value is conservatively low because TICs were not reported.

SUMMA™ canister S7009-A05.219 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. Thirty-two of 41 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. Twenty target compounds were observed in one or both of the ambient air samples.

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 on January 24, 1997. The tank samples were diluted and reanalyzed in a second batch on January 29, 1997. The sample analytical sequence runs were as follows:

Batch #1: (file identifier 17012402.b) - S7009-A01.069, S7009-A02.118, S7009-A04.207, S7009-A05.219, S7009-A05.219 REP, S7009-A06.237;

Batch #2: (file identifier 17012902.b) - S7009-A04.207, S7009-A05.219, S7009-A05.219 REP, S7009-A06.237.

Batch #1:

This analytical sequence was run using 100 mL volumes to quantify target compounds in each tank sample.

Two target compounds (chloroethane at 47.60% and pyridine at 53.79%) surpassed the 30% RSD acceptance criteria for initial calibration. Tetradecane surpassed 0.05 response factor criteria for the initial calibration.

Tetradecane was found in all tank samples at concentrations above the UQL, with the exception of ambient air sample S7009-A01.069 where it was found at concentration between the EQL and the UQL and ambient air sample S7009-A02.118, where tetradecane was found at a concentration below the IDL. Chloroethane was not found in the tank samples at concentrations higher than the IDL. Pyridine was found in all tank samples at concentrations

between the IDL and the EQL, with the exception of ambient air sample S7009-A02.118 where it was not found at a concentration above the IDL. Due to the initial calibration performance, the uncertainty associated with the results is higher than normal. Four target compounds (chloroethane at 46.7%, pyridine at 33.0%, tridecane at 31.9%, and tetradecane at 45.3%) were outside the 25% D acceptance criteria for the continuing calibration verification (CCV) sample. However, the CCV passed the procedural criterion requiring $\pm 25\%$ D passage for 85% of all target compounds. Tridecane was found in all tank samples at concentrations between the EQL and the UQL, with the exceptions of ambient air sample S7009-A01.069, where it was found at a concentration between the IDL and the EQL, ambient air sample S7009-A02.118 where it was not found at a concentration above the IDL, and tank sample S7009-A05.219 REP where it was found at a concentration above the UQL. Due to the CCV performance for these compounds, a higher than normal uncertainty is associated with the results. Two target compounds (acetone and 1,2,4-trichlorobenzene) were found in the ICB above the EQLs.

Batch #2:

This analytical sequence was run using 30 mL volumes of diluted 1:5 (v:v) samples to quantify target compounds in each sample.

Two target compounds (chloroethane at 47.60% and pyridine at 53.79%) surpassed the 30% relative standard deviation (% RSD) acceptance criteria for the initial calibration. Tetradecane surpassed 0.05 response factor criteria for the initial calibration.

Chloroethane was not found in the samples at concentrations above the IDL. Tetradecane was found in all the tank samples at concentrations between the EQL and the upper quantitation limit (UQL). Pyridine was found in all tank samples at concentration between the IDL and the EQL.

Four target compounds (chloroethane at 47.3%, pyridine at 46.9%, tridecane at 91.8%, and tetradecane at 270.4%) were outside the 25% difference (% D) acceptance criteria for the continuing calibration verification (CCV) sample. However, the CCV passed the procedural criterion requiring $\pm 25\%$ D passage for 85% of all target compounds. Results of chloroethane, pyridine and tetradecane determination were mentioned above. Tridecane was found in all of the diluted samples at concentrations between the EQL and the UQL. Due to the CCV performance for tridecane and tetradecane, a higher than normal uncertainty is associated with the results. Only tridecane in the replicate and tetradecane in all diluted samples were reported from this run.

Two target compounds (acetone and 1,2,4-trichlorobenzene) were found in the initial calibration blank (ICB) above the EQLs. The compound 1,2,4-trichlorobenzene was also found in the continuing calibration blank (CCB) above the EQL, however its concentration was less than 1.1 ppbv. The 1,2,4-trichlorobenzene results from these runs were not reported.

Information common to both batches:

Instrument detection limits, precision, and accuracy have not been experimentally evaluated for methanol, ethanol and 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. Methanol, 1,3-butadiene and ethanol results falling within their calibration range are quantitative results as evidenced by a valid calibration for these compounds.

3.4.2 Triple Sorbent Trap Sample Results

Analyses of TSTs were performed on April 10 and 11, 1997, 148 and 149 days after sample collection. All analyses exceeded 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. No TICs were reported for this temporal study. Results are based on three samples for each compound. Forty target analytes above the IDL were detected in the tank headspace samples. Of these, 38 target analytes were identified in two or more tank headspace samples. 1-Butanol at 32.798 mg/m^3 , butane at 5.908 mg/m^3 , and pentane at 5.377 mg/m^3 were the three most abundant compounds identified in the tank headspace sample. The total average concentration of the target analytes was 70.98 mg/m^3 .

Triple sorbent trap sample S7009-A13.1214 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. Thirty-three of 37 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. Seven target analytes were identified in one or more of the blank samples. Trichlorofluoromethane, toluene, and methylene chloride were the only target analytes which exceed the compound's EQL in one or more of the blank samples.

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

Batch #1 (file identifier 47041001.b) - S7009-A17.1221, S7009-A18.1222, S7009-A19.1223, S7009-A20.1224;

Batch #2 (file identifier 47041001.b) - S7009-A11.1208, S7009-A12.1212, S7009-A13.1214, S7009-A13.1214 REP.

Batch #1:

Samples were run under the protocols of TVP-10, Rev. 2 with the initial calibration performed on April 8, 1997 and quantitated against a CCV run at the beginning of the batch. These samples were analyzed originally on March 26, 1997. The calibration data were not considered accurate so the archived samples were reanalyzed on April 10, 1997 after a new calibration was completed. Samples included in this batch consisted of two VSS field blanks and two trip blanks. Only target compounds were evaluated as stated in the SAP for this study.

The CCV showed acceptable performance as specified in the procedure for all target compounds except chloromethane (35.7%), tridecane (38.8%) and tetradecane (57.5%). Chloromethane and tridecane were undetected in all field samples. Tetradecane was detected in all samples in trace amounts (below EQL). The CCB showed trace amounts (below EQL) of methylene chloride and tetradecane. Results for these compounds are flagged with a "B."

All blanks contained minor amounts of 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. That 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.

Batch #2:

Samples were run under the protocols of TVP-10, Rev. 2 with the initial calibration performed on April 8, 1997 and quantitated against a CCV run at beginning of the batch. These samples were analyzed originally on March 26, 1997. The calibration data was not considered accurate so the archived samples were reanalyzed on April 11, 1997 after a new calibration was completed. Due to the reanalysis a CCV had to be prepped that did not contain the Surrogate standards. Surrogate results were compared with the CCV from the 04/10/97 run. Samples included in this batch consisted of three VSS tank samples with one duplicate. Only target compounds were evaluated as stated in the SAP for this study.

The CCV showed acceptable performance as specified in the procedure for all target compounds except chloromethane (29%), and tetradecane (27.1%). Major amounts of tetradecane were observed in the samples. Due to the CCV performance, the results for this compound have a greater uncertainty. The CCB showed a trace of methylene chloride and tetradecane (below EQL) and was clean of other target and TIC compounds. Sample results for methylene chloride are flagged with a "B."

Information common to both batches:

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, ethanol, 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 BY-108 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 BY-108 headspace, determined to be present at approximately 1.390% of its LFL. Total headspace flammability was estimated to be <2.878% of the LFL.

Table 3.1 Inorganic Vapor Concentrations from Tank BY-108 Sampled on 11/14/96

Analyte	CAS	S7009-A07-R97	S7009-A08-R98	S7009-A09-R99	S7009-A10-01R	Average	Standard Deviation
	Number						
Ammonia (ppmv)	7664-41-7	1006	1031	1019	1035	1024	13
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)		18.4	16.5	18.7	18.6	18.0	1.1
Water ^(b) (mg/L)		15.9	14.3	16.2	16.1	15.7	0.1

Footnotes

(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 BY-108 Sampled on 11/14/96.

Permanent Gas Analyte	Ambient Air Upwind	Ambient Air Through Bundle	Tank Samples				RPD ^(c) (%)	Mean	
	S7009-A01.069 ^(a) (ppmv)	S7009-A02.118 ^(a) (ppmv)	S7009-A04.207 ^(a) (ppmv)	S7009-A06.237 ^(a) (ppmv)	S7009-A05.219 ^(a) (ppmv)	S7009-A05.219 ^{(a)(b)} (ppmv)		(ppmv)	St.Dev.
Hydrogen	Not Analyzed	<17	551	570	548	535	2.4	556	12
Methane	Not Analyzed	<25	<25	<25	<25	<25	na	<25	
Carbon Dioxide	Not Analyzed	416	<17	<17	<17	<17	na	<17	
Carbon Monoxide	Not Analyzed	<17	<17	<17	<17	<17	na	<17	
Nitrous Oxide	Not Analyzed	<17	773	770	775	768	0.9	773	2.5

Footnotes

(a) WHC sample identification number.

(b) Replicate analysis for S7009-A05.219; results are not included in the calculation of average concentrations.

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

Sample S7009-A01.069 was not analyzed because of leaky valve

na Not applicable.

Table 3.3 Total Non-Methane Organic Compound Analysis Results from Tank BY-108 Sampled on 11/14/96

	Ambient Air Upwind S7009-A01.069 ^(a) Concentration	Ambient Air Through Bundle S7009-A02.118 ^(a) Concentration	Tank Samples				RPD ^(c) (%)	Mean	St.Dev.
			S7009-A04.207 ^(a) Concentration	S7009-A06.237 ^(a) Concentration	S7009-A05.219 ^(a) Concentration	S7009-A05.219 ^{(a)(b)} Concentration			
TO-12 (mg/m ³)	< 0.59	< 0.59	314.79	311.66	306.75	306.51	0.1	311.06	4.05
Total Carbon (ppmv)								129.54	

Footnotes

(a) WHC sample identification number.

(b) Replicate analysis for S7009-A05.219; 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 BY-108 Sampled on 11/14/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7009-A05.219 ^{(b)(c)} VSS			S7009-A06.237 ^(b) VSS			S7009-A04.207 ^(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.
Dichlorodifluoromethane	75-71-8	121	4.6	0.003	0.63	J	0.003	0.59	J	0.003	0.58	J	0.003	0.000	0.60	0.026
Chloromethane	74-87-3	50	5.0	0.003	1.3	J	0.002	1.1	J	0.002	1.0	J	0.003	0.000	1.1	0.16
Methanol	67-56-1	32	5.2	2.909	2033	Y	2.802	1959	Y	2.806	1962	Y	2.839	0.060	1985	42
1,3-Butadiene	106-99-0	54	5.8	0.143	59	Y	0.279	116	Y	0.145	60	Y	0.189	0.078	78	32
Butane	106-97-8	58	5.9	6.960	2682	*	7.397	2851	*	8.780	3384	*	7.712	0.950	2972	366
Ethanol	64-17-5	46	6.8	2.361	1149	Y	2.006	977	Y	2.308	1123	Y	2.225	0.191	1083	93
Acetonitrile	75-05-8	41	7.3	0.300	164		0.288	157		0.267	146		0.285	0.017	155	9.1
Acetone	67-64-1	58	7.8	5.614	2165		5.905	2277		5.382	2076		5.633	0.262	2173	101
Trichlorofluoromethane	75-69-4	137	8.3	0.493	80		0.490	80		0.456	74		0.480	0.020	78	3.3
Pentane	109-66-0	72	8.9	9.903	3075	*	10.064	3125	*	10.627	3299	*	10.198	0.380	3166	118
Methylene Chloride	75-09-2	85	9.7	0.023	6.1		0.024	6.3		0.018	4.8	J	0.022	0.003	5.7	0.82
Propanenitrile	107-12-0	55	10.9	0.021	8.5	J	0.021	8.4	J	0.018	7.3	J	0.020	0.002	8.1	0.68
Propanol	71-23-8	60	10.9	1.899	708		1.847	688		1.767	658		1.837	0.067	685	25
2-Butanone	78-93-3	72	12.4	2.452	762		2.615	812		2.109	655		2.392	0.258	743	80
Hexane	110-54-3	86	13.7	4.594	1194		4.469	1161		4.615	1200		4.559	0.079	1185	21
Tetrahydrofuran	109-99-9	72	14.6	3.436	1067		3.502	1088		3.137	974		3.358	0.195	1043	60
1,2-Dichloroethane	107-06-2	99	15.3	0.002	0.50	U	0.004	0.91	J	0.002	0.50	U	d	d	d	d
Butanenitrile	109-74-0	69	15.8	0.055	18		0.021	6.9	J	0.019	6.1	J	0.032	0.020	10	6.5
1-Butanol	71-36-3	74	16.3	68.356	20658	*	67.359	20357	*	59.245	17904	*	64.987	4.998	19640	1510
Benzene	71-43-2	78	16.7	0.100	29		0.099	28		0.092	26		0.097	0.004	28	1.2
Cyclohexane	110-82-7	84	17.3	0.774	206		0.712	189		0.806	215		0.764	0.048	203	13
Heptane	142-82-5	100	19.2	2.709	606		2.506	560		2.784	622		2.666	0.144	596	32
4-Methyl-2-Pentanone	108-10-1	100	20.4	0.170	38		0.163	36		0.166	37		0.166	0.003	37	0.74
Pyridine	110-86-1	79	20.6	0.036	10	J	0.035	9.8	J	0.052	15	J	0.041	0.009	12	2.7
Pentanenitrile	110-59-8	83	21.5	0.070	19		0.066	18		0.068	18		0.068	0.002	18	0.52
1,1,2-Trichloroethane	79-00-5	133	21.9	0.008	1.4	J	0.007	1.1	J	0.007	1.2	J	0.007	0.001	1.2	0.15
Toluene	108-88-3	92	22.6	0.144	35		0.141	34		0.133	32		0.139	0.006	34	1.5
Octane	111-65-9	114	24.7	0.947	186		0.929	182		0.896	176		0.924	0.026	181	5.1
Chlorobenzene	108-90-7	113	26.8	0.005	1.1	J	0.005	1.0	J	0.005	1.0	J	0.005	0.000	1.1	0.026
Hexanenitrile	628-73-9	97	27.0	0.172	40		0.155	36		0.188	43		0.172	0.017	40	3.9
Ethylbenzene	100-41-4	106	27.6	0.023	4.8	J	0.021	4.5	J	0.020	4.2	J	0.021	0.001	4.5	0.29
p/m-Xylene	106-42-3	106	28.1	0.070	15	J	0.068	14	J	0.066	14	J	0.068	0.002	14	0.45
Cyclohexanone	108-94-1	98	28.5	0.380	87		0.360	82		0.381	87		0.374	0.012	85	2.7

Table 3.4 (Cont'd) Organic Compound Concentrations in SUMMA™ Canisters from Tank BY-108 Sampled on 11/14/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7009-A05.219 ^{(b)(c)} VSS			S7009-A06.237 ^(b) VSS			S7009-A04.207 ^(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.
1,1,2,2-Tetrachloroethane	79-34-5	168	29.2	0.004	0.56	U	0.004	0.56	U	0.012	1.6	J	d	d	d	d
o-Xylene	95-47-6	106	29.3	0.033	6.9		0.033	6.9		0.030	6.4		0.032	0.001	6.7	0.31
Nonane	111-84-2	128	29.7	0.388	68		0.380	66		0.378	66		0.382	0.005	67	0.94
1-Ethyl-2-Methyl-Benzene	611-14-3	120	32.7	0.004	0.69	J	0.004	0.73	J	0.005	0.84	J	0.004	0.000	0.75	0.078
1,3,5-Trimethylbenzene	108-67-8	120	32.9	0.003	0.54	J	0.003	0.47	J	0.003	0.47	J	0.003	0.000	0.49	0.040
1,2,4-Trimethylbenzene	95-63-6	120	34.2	0.008	1.4	J	0.007	1.3	J	0.007	1.4	J	0.007	0.000	1.4	0.040
Decane	124-18-5	142	34.4	0.918	145		0.897	141		0.892	140		0.902	0.014	142	2.2
Undecane	1120-21-4	156	38.8	1.910	274		1.795	257		1.891	271		1.866	0.062	267	8.8
1,2,4-Trichlorobenzene	120-82-1	181	42.3	0.003	0.35	U	0.003	0.35	U	0.006	0.70	J	d	d	d	d
Dodecane	112-40-3	170	42.8	10.142	1334	*	10.086	1326	*	9.028	1187	*	9.752	0.628	1282	83
Tridecane	629-50-5	184	46.5	4.044	491		4.271	519		4.434	539		4.250	0.196	516	24
Tetradecane	629-59-4	198	50.0	6.087	687	*	5.529	624	*	2.185	247	*	4.600	2.110	520	238
Total Concentration of Target Analytes													134.08			

Data Quality Flags

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

U Target compound not detected at or above the IDL.

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

* Denotes diluted value was reported for target compound in table.

Footnotes

(a) Detected target analytes.

(b) 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 BY-108 Sampled on 11/14/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7009-A05.219 ^(b) VSS						RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Dichlorodifluoromethane	75-71-8	121	4.6	0.003	0.63	J	0.003	0.52	U	22
Chloromethane	74-87-3	50	5.0	0.003	1.3	J	0.002	1.1	J	1
Methanol	67-56-1	32	5.2	2.909	2033	Y	2.938	2054	Y	36
1,3-Butadiene	106-99-0	54	5.8	0.143	59	Y	0.205	85	Y	20
Butane	106-97-8	58	5.9	6.960	2682	*	8.542	3292	*	3
Ethanol	64-17-5	46	6.8	2.361	1149	Y	2.285	1113	Y	1
Acetonitrile	75-05-8	41	7.3	0.300	164		0.296	161		82
Acetone	67-64-1	58	7.8	5.614	2165		13.454	5196	*	4
Trichlorofluoromethane	75-69-4	137	8.3	0.493	80		0.512	84		31
Pentane	109-66-0	72	8.9	9.903	3075	*	13.472	2853	*	4
Methylene Chloride	75-09-2	85	9.7	0.023	6.1		0.024	6.3		1
Propanenitrile	107-12-0	55	10.9	0.021	8.5	J	0.022	8.9	J	8
Propanol	71-23-8	60	10.9	1.899	708		1.912	713		3
2-Butanone	78-93-3	72	12.4	2.452	762		2.663	827		8
Hexane	110-54-3	86	13.7	4.594	1194		4.714	1225		8
Tetrahydrofuran	109-99-9	72	14.6	3.436	1067		3.741	1162		10
Butanenitrile	109-74-0	69	15.8	0.055	18		0.050	16		9
1-Butanol	71-36-3	74	16.3	68.356	20658	*	62.748	18963	*	5
Benzene	71-43-2	78	16.7	0.100	29		0.105	30		2
Cyclohexane	110-82-7	84	17.3	0.774	206		0.786	209		1
Heptane	142-82-5	100	19.2	2.709	606		2.741	613		4
4-Methyl-2-Pentanone	108-10-1	100	20.4	0.170	38		0.177	40		1
Pyridine	110-86-1	79	20.6	0.036	10	J	0.037	10	J	4
Pentanenitrile	110-59-8	83	21.5	0.070	19		0.073	20		4
1,1,2-Trichloroethane	79-00-5	133	21.9	0.008	1.4	J	0.007	1.1	J	26
Toluene	108-88-3	92	22.6	0.144	35		0.152	37		3
Octane	111-65-9	114	24.7	0.947	186		0.977	192		4
Chlorobenzene	108-90-7	113	26.8	0.005	1.1	J	0.006	1.1	J	7
Hexanenitrile	628-73-9	97	27.0	0.172	40		0.185	43		5
Ethylbenzene	100-41-4	106	27.6	0.023	4.8	J	0.024	5.0	J	5
p/m-Xylene	106-42-3	106	28.1	0.070	15	J	0.073	15	J	3
Cyclohexanone	108-94-1	98	28.5	0.380	87		0.392	89		5
o-Xylene	95-47-6	106	29.3	0.033	6.9		0.035	7.3		5
Nonane	111-84-2	128	29.7	0.388	68		0.409	71		0
1-Ethyl-2-Methyl-Benzen	611-14-3	120	32.7	0.004	0.69	J	0.004	0.70	J	7
1,3,5-Trimethylbenzene	108-67-8	120	32.9	0.003	0.54	J	0.003	0.51	J	4
1,2,4-Trimethylbenzene	95-63-6	120	34.2	0.008	1.4	J	0.007	1.4	J	3
Decane	124-18-5	142	34.4	0.918	145		0.951	150		6
Undecane	1120-21-4	156	38.8	1.910	274		2.022	290		8
Dodecane	112-40-3	170	42.8	10.142	1334	*	9.402	1236	*	78
Tridecane	629-50-5	184	46.5	4.044	491		9.206	1119	*	37
Tetradecane	629-59-4	198	50.0	6.087	687	*	4.204	475	*	

Data Quality Flags

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

U Target compound not detected at or above the IDL.

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

* Denotes diluted value was reported for target compound in table.

Footnotes

(a) Detected target analytes.

(b) 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 ISVS in SUMMATM Canisters Associated with the Sampling of Tank BY-108 on 11/14/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7009-A01.069 ^(b) ISVS			S7009-A02.118 ^(b)		
				Ambient Air			ISVS Thru Air		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	121	4.6	0.004	0.74	J	0.003	0.61	J
Chloromethane	74-87-3	50	5.0	0.002	1.1	U	0.002	0.75	J
Methanol	67-56-1	32	5.2	<0.110	<77	Y	<0.110	<77	Y
Butane	106-97-8	58	5.9	0.003	1.1	J	0.001	0.50	J
Ethanol	64-17-5	46	6.8	<0.110	<53	Y	<0.110	<53	Y
Acetone	67-64-1	58	7.8	0.029	11	J	0.012	4.8	J
Pentane	109-66-0	72	8.9	0.002	0.74	J	0.004	1.2	U
Methylene Chloride	75-09-2	85	9.7	0.018	4.7	J	0.016	4.1	J
1-Butanol	71-36-3	74	16.3	0.004	1.2	J	0.031	9.2	J
Pyridine	110-86-1	79	20.6	0.006	1.6	J	0.019	5.3	U
Toluene	108-88-3	92	22.6	0.001	0.21	J	0.002	0.49	U
Hexanenitrile	628-73-9	97	27.0	0.003	0.74	J	0.001	0.31	J
Cyclohexanone	108-94-1	98	28.5	0.020	4.5	J	0.029	6.7	J
Decane	124-18-5	142	34.4	0.002	0.27	J	0.003	0.47	U
1,3-Dichlorobenzene	541-73-1	147	34.7	0.002	0.32	J	0.002	0.27	U
1,4-Dichlorobenzene	106-46-7	147	34.7	0.002	0.34	J	0.002	0.27	U
Undecane	1120-21-4	156	38.8	0.002	0.27	J	0.028	4.0	U
1,2,4-Trichlorobenzene	120-82-1	181	42.3	0.011	1.4	J	0.003	0.35	U
Tridecane	629-50-5	184	46.5	0.022	2.7	J	0.006	0.73	U
Tetradecane	629-59-4	198	50.0	0.060	6.7		0.004	0.47	U

Data Quality Flags

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

U Target compound not detected at or above the IDL.

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

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

Table 3.7 Organic Compound Concentrations in Triple Sorbent Traps from Tank BY-108 Sampled on 11/14/96

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	S7009-A11.1208 ^(b) ISVS			S7009-A13.1214 ^{(b)(c)} ISVS			S7009-A12.1212 ^(b) ISVS			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	10.0	2.861	2000	Y	1.933	1351	Y	1.373	960	Y	2.056	0.751	1437	525
Butane	106-97-8	58	10.7	7.045	2714	E	5.377	2071	E	5.303	2043	E	5.908	0.985	2276	380
Ethanol	64-17-5	46	12.5	2.822	1372	Y	2.096	1019	Y	1.656	805	Y	2.191	0.589	1065	286
Acetonitrile	75-05-8	41	13.0	0.630	344		0.359	196		0.415	226		0.468	0.143	255	78
Acetone	67-64-1	58	13.6	4.218	1627	E	4.005	1545	E	2.866	1105	E	3.697	0.727	1426	280
Trichlorofluoromethane	75-69-4	137	14.1	0.332	54		0.141	23		0.211	34		0.228	0.097	37	16
Pentane	109-66-0	72	14.9	5.978	1860	E	4.942	1538	E	5.210	1621	E	5.377	0.537	1673	167
Methylene Chloride	75-09-2	85	15.7	0.276	73	B	0.147	39	J,B	0.077	20	J,B	0.167	0.101	44	27
Propanenitrile	107-12-0	55	17.0	0.082	34		0.053	22		0.050	20		0.062	0.018	25	7.4
Propanol	71-23-8	60	17.0	1.210	451		1.043	389		0.673	251		0.975	0.275	363	103
2-Butanone	78-93-3	72	18.6	0.281	87		0.890	276		0.706	219		0.626	0.312	194	97
Hexane	110-54-3	86	19.8	4.234	1101	E	3.596	935	E	3.803	989	E	3.878	0.326	1008	85
Tetrahydrofuran	109-99-9	72	20.7	1.728	537		1.701	529		1.435	446		1.622	0.162	504	50
Butanenitrile	109-74-0	69	21.8	0.065	21		0.045	15		0.278	90		0.129	0.129	42	42
1-Butanol	71-36-3	74	22.3	31.853	9642	E	32.463	9827	E	34.078	10315	E	32.798	1.149	9928	348
Benzene	71-43-2	78	22.7	0.113	32		0.111	32		0.097	28		0.107	0.009	31	2.5
Trichloroethene	79-01-6	131	24.7	0.006	1.1	J	0.004	0.61	U	0.004	0.61	U	d	d	d	d
Heptane	142-82-5	100	25.1	2.381	532		2.135	477		2.159	483		2.225	0.136	497	30
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.336	75		0.279	62		0.259	58		0.291	0.040	65	8.9
Pyridine	110-86-1	79	26.5	0.062	18	J	0.053	15	J	0.052	15	J	0.056	0.006	16	1.6
Toluene	108-88-3	92	28.4	1.020	248		0.187	45		0.598	145		0.602	0.417	146	101
Octane	111-65-9	114	30.4	1.057	208		0.950	187		0.916	180		0.974	0.074	191	14
Tetrachloroethylene	127-18-4	166	30.9	0.003	0.41	J	0.004	0.50	J	0.003	0.34	U	0.003	d	0.46	d
Hexanenitrile	628-73-9	97	32.7	0.018	4.1	J	0.003	0.66	U	0.003	0.66	U	d	d	d	d
Ethylbenzene	100-41-4	106	33.4	0.023	4.8		0.025	5.2		0.022	4.6		0.023	0.001	4.9	0.31
p/m-Xylene	106-42-3	106	33.8	0.075	16		0.085	18		0.075	16		0.078	0.006	17	1.2
Cyclohexanone	108-94-1	98	34.2	0.167	38		0.146	33		0.013	2.9	U	0.157	d	36	d
Styrene	100-42-5	104	34.7	0.004	0.80	J	0.007	1.5	J	0.005	1.1	J	0.005	0.002	1.1	0.34
o-Xylene	95-47-6	106	35.0	0.037	7.7		0.039	8.2		0.033	6.9		0.036	0.003	7.6	0.68
Nonane	111-84-2	128	35.4	0.333	58		0.243	43		0.213	37		0.263	0.062	46	11
1-Ethyl-2-methyl benze	611-14-3	120	38.4	0.003	0.55	J	0.004	0.69	J	0.003	0.51	J	0.003	0.000	0.58	0.095
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.003	0.53	J	0.004	0.68	J	0.002	0.43	J	0.003	0.001	0.55	0.13

Table 3.7 (Cont'd) Organic Compound Concentrations in Triple Sorbent Traps from Tank BY-108 Sampled on 11/14/96

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	S7009-A11.1208 ^(b) ISVS			S7009-A13.1214 ^{(b)(c)} ISVS			S7009-A12.1212 ^(b) ISVS			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.
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.007	1.3	J	0.008	1.5	J	0.006	1.1	J	0.007	0.001	1.3	0.21
Decane	124-18-5	142	40.1	0.436	69		0.309	49		0.266	42		0.337	0.088	53	14
1,3-Dichlorobenzene	541-73-1	147	40.4	0.001	0.16	J	0.002	0.30	J	0.003	0.48	U	0.002	d	0.23	d
1,4-Dichlorobenzene	106-46-7	147	40.6	0.003	0.48	J	0.005	0.76	J	0.003	0.52	J	0.004	0.001	0.59	0.15
Undecane	1120-21-4	156	44.4	0.991	142		0.678	97		0.635	91		0.768	0.194	110	28
Dodecane	112-40-3	170	48.4	2.673	352		1.838	242		1.766	233		2.092	0.504	276	66
Tridecane	629-50-5	184	52.2	1.772	216		1.315	160		1.259	153		1.449	0.281	176	34
Tetradecane	629-59-4	198	55.7	1.501	170		1.347	152		1.106	125		1.318	0.199	149	23
Total Concentration of Target Analytes													70.982			

Data Quality Flags

B Compound found in associated laboratory blank.

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

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

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.

Footnotes

(a) Detected target analytes.

(b) 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 Tank BY-108 Sampled on 11/14/96

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	S7009-A13.1214 ^(b) ISVS						RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Methanol	67-56-1	32	10.0	1.933	1351	Y	2.009	1405	Y	4
Butane	106-97-8	58	10.7	5.377	2071	E	5.718	2203	E	6
Ethanol	64-17-5	46	12.5	2.096	1019	Y	2.115	1028	Y	1
Acetonitrile	75-05-8	41	13.0	0.359	196		0.412	225		14
Acetone	67-64-1	58	13.6	4.005	1545	E	3.778	1457	E	6
Trichlorofluoromethane	75-69-4	137	14.1	0.141	23		0.136	22		4
Pentane	109-66-0	72	14.9	4.942	1538	E	5.323	1656	E	7
Methylene Chloride	75-09-2	85	15.7	0.147	39	J,B	0.136	36	J,B	8
Propanenitrile	107-12-0	55	17.0	0.053	22		0.057	23		7
Propanol	71-23-8	60	17.0	1.043	389		1.062	396		2
2-Butanone	78-93-3	72	18.6	0.890	276		0.680	211		27
Hexane	110-54-3	86	19.8	3.596	935	E	3.827	995	E	6
Tetrahydrofuran	109-99-9	72	20.7	1.701	529		1.750	544		3
Butanenitrile	109-74-0	69	21.8	0.045	15		0.063	21		34
1-Butanol	71-36-3	74	22.3	32.463	9827	E	32.726	9906	E	1
Benzene	71-43-2	78	22.7	0.111	32		0.107	31		3
Heptane	142-82-5	100	25.1	2.135	477		2.193	490		3
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.279	62		0.282	63		1
Pyridine	110-86-1	79	26.5	0.053	15	J	0.049	14	J	7
1,1,2-Trichloroethane	79-00-5	133	27.8	0.002	0.26	U	0.007	1.2	J	
Toluene	108-88-3	92	28.4	0.187	45		0.185	45		1
Octane	111-65-9	114	30.4	0.950	187		0.949	187		0
Tetrachloroethylene	127-18-4	166	30.9	0.004	0.50	J	0.004	0.50	J	0
Ethylbenzene	100-41-4	106	33.4	0.025	5.2		0.025	5.2		1
p/m-Xylene	106-42-3	106	33.8	0.085	18		0.084	18		2
Cyclohexanone	108-94-1	98	34.2	0.146	33		0.013	2.9	U	
Styrene	100-42-5	104	34.7	0.007	1.5	J	0.007	1.4	J	1
o-Xylene	95-47-6	106	35.0	0.039	8.2		0.038	7.9		3
Nonane	111-84-2	128	35.4	0.243	43		0.240	42		1
1-Ethyl-2-methyl benze	611-14-3	120	38.4	0.004	0.69	J	0.004	0.65	J	6
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.004	0.68	J	0.003	0.63	J	6
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.008	1.5	J	0.008	1.5	J	4
Decane	124-18-5	142	40.1	0.309	49		0.302	48		2
1,3-Dichlorobenzene	541-73-1	147	40.4	0.002	0.30	J	0.002	0.25	J	11
1,4-Dichlorobenzene	106-46-7	147	40.6	0.005	0.76	J	0.005	0.75	J	2
Undecane	1120-21-4	156	44.4	0.678	97		0.639	92		6
Dodecane	112-40-3	170	48.4	1.838	242		1.690	223		8
Tridecane	629-50-5	184	52.2	1.315	160		1.230	150		7
Tetradecane	629-59-4	198	55.7	1.347	152		1.285	145		5

Data Quality Flags

B Compound found in associated laboratory blank.

E Target compound exceeds the upper quantification 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.

Footnotes

(a) Detected target analytes.

(b) 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 BY-108 on 11/14/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7009-A19.1223 ^(b) ISVS			S7009-A17.1221 ^(b) ISVS			S7009-A18.1222 ^(b) ISVS			S7009-A20.1224 ^(b) ISVS		
				Trip Blank #1			Field Blank #1			Field Blank #2			Trip Blank #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Butane	106-97-8	58	10.7	0.004	1.4	U	0.004	1.4	U	0.004	1.4	U	0.024	9.1	J
Acetone	67-64-1	58	13.6	0.014	5.5	J	0.007	2.8	U	0.007	2.8	U	0.011	4.2	J
Trichlorofluoromethane	75-69-4	137	14.1	0.395	64		0.122	20		0.127	21		0.645	105	
Methanol	67-56-1	32	10.0	<0.274	<192	Y	<0.274	<192	Y	0.326	228	Y	<0.274	<192	Y
Methylene Chloride	75-09-2	85	15.7	0.157	41	J,B	0.087	23	J,B	0.303	80	B	0.317	83	B
Trichloroethene	79-01-6	131	24.7	0.004	0.61	U	0.004	0.61	U	0.007	1.1	J	0.006	1.0	J
Toluene	108-88-3	92	28.4	0.852	207		0.294	71		0.138	33		1.108	269	
Tetradecane	629-59-4	198	55.7	0.026	3.0	J,B	0.044	5.0	J,B	0.026	3.0	J,B	0.044	5.0	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.

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

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

Table 3.10 Flammability Data for Tank BY-108 Sampled on 11/14/96

Analyte	CAS #	Lower Flammability	Average Measured	% of LFL ^(a)
		Limit(LFL)	Concentrations	
Ammonia (ppm)	7664-41-7	150000	1024	0.683
Carbon Monoxide (ppm)	630-08-0	125000	<17	<0.014
Hydrogen (ppm)	1333-74-0	40000	556	1.390
Methane (ppm)	74-82-8	50000	<25	<0.050
TNMOC (mg/m ³)		42000	311.06	0.741
Total				<2.878

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

Figure 3.1a Typical Total Ion Chromatogram (2 - 36 min) for SUMMATM Canister Samples from Tank BY-108 Sampled on 11/14/96

3.22

3.23

3.24

4.0 Conclusions

The concentrations of inorganic and organic analytes were determined from samples of the headspace of Tank BY-108 on November 14, 1996 (Sample Job S7009). The vapor concentrations were based either on whole-volume samples (SUMMATM 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 SESC. 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 analytical results for ammonia indicated the analyte exceeded the notification levels; 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.

Ligotke, M. W., J. S. Fruchter, J. L. Huckaby, M. B. Birn, B. D. McVeety, J. C. Evans, K. H. Pool, K. L. Silvers, and S. C. Goheen. 1995. *Waste Tank Vapor Characterization Project: Annual Status Report for FY 1995*. Pacific Northwest National Laboratory, Richland, Washington.

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 - SESC

Telephone (509) 373-7533
Page 85-9656 / FAX 373-3193Project Designation/Sampling Locations 200 West Tank Farm
241-BY-108 Tank Vapor Sample SAF S7009
Temporal #4 Riser 12A VSS
Ice Chest No.Collection date 11-14-96
Preparation date 11-08-96

Field Logbook No. WHC-N-677-10

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Collectors: Caprio, Mahon

Shipped to

PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S7009 - A07 . R97
S7009 - A08 . R98
S7009 - A09 . R99
S7009 - A10 . 01RCollect NH₃/NO_x/H₂O Sorbent Trap 14 Nov 96 / 1329
Collect NH₃/NO_x/H₂O Sorbent Trap
Collect NH₃/NO_x/H₂O Sorbent Trap
Collect NH₃/NO_x/H₂O Sorbent Trap 14 Nov 96 / 1329S7009 - A15 . 02R
S7009 - A16 . 03ROpen, close and store NH₃/NO_x/H₂O field blank #1 14 Nov 96 / 1342
Open, close and store NH₃/NO_x/H₂O field blank #2 14 Nov 96 / 1342

[] Field Transfer of Custody			[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time	
G W Dennis <i>[Signature]</i>	11-11-96	0950	J A Edwards <i>[Signature]</i>	11-11-96	0950	
J A Edwards <i>[Signature]</i>	11-11-96	1315	ES MAST <i>[Signature]</i>	11-11-96	1315	
ES MAST <i>[Signature]</i>	11-14-96	0730	Rick Mahon <i>[Signature]</i>	11-14-96	0730	
Rick Mahon <i>[Signature]</i>	12-09-96	1340	CS Maclellan <i>[Signature]</i>	12-09-96	1340	
CS Maclellan <i>[Signature]</i>	12-09-96	1445	J A Edwards <i>[Signature]</i>	12-09-96	1445	
J A Edwards <i>[Signature]</i>	12-11-96	1210	CS Maclellan <i>[Signature]</i>	12-11-96	1210	

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 - SESC

Telephone (509) 373-7533

Page 85-3656 / FAX 373-3193

Project Designation/Sampling Locations 200 West Tank Farm

241-BY-108 Tank Vapor Sample SAF S7009

Temporal #4 Riser 12A

VSS

Collection date 11 - 14 - 96

Preparation date 11 - 11 - 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

Collectors: Caprio, Mahon

Shipped to

PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S7009 - A01 . 069

Collect Ambient Air Sample SUMMA #1

Sample Date/Time

14 Nov 96 / 0955

S7009 - A02 . 118

Collect Ambient Air Sample SUMMA #2 (through tube bundle) 14 Nov 96 / 1005

S7009 - A04 . 207

Collect SUMMA #3 14 Nov 96 / 1303

S7009 - A05 . 219

Collect SUMMA #4 14 Nov 96 / 1313

S7009 - A06 . 237

Collect SUMMA #5 14 Nov 96 / 1317

[] 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>	11- 11-96	1315	<i>ES Mast</i> ES Mast	11- 11-96	1315	
ES Mast <i>ES Mast</i>	11-14-96	0730	<i>Rick Mahon</i> Rick Mahon	11-14-96	0730	
<i>Rick Mahon</i> Rick Mahon	12-09-96	1340	<i>CS McEllan</i> CS McEllan	12-09-96	1340	
<i>CS McEllan</i> CS McEllan	12-09-96	1445	<i>J A Edwards</i> J A Edwards	12-09-96	1445	

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 *(Signature)*POC *(Signature)*

(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-BY-108 Tank Vapor Sample SAF S7009
Riser 12A (VSS Truck)Collection date 11-14-96
Preparation date 11-07-96

Ice Chest No.

Field Logbook No. WHC-N-847-10

Ertco Hi/Lo thermometer No.

PNL-T-006

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Collectors: Caprio, Mahon

Shipped to

WHC-

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S7009 - A11 . 1208	PNL Triple Sorbent Trap (TST) Sample # 1	14 Nov 96 / 1353
S7009 - A12 . 1212	PNL TST Sample # 2	14 Nov 96 / 1353
S7009 - A13 . 1214	PNL TST Sample # 3	14 Nov 96 / 1359
S7009 - A14 . 1215	PNL TST Sample # 4	14 Nov 96 / 1359
S7009 - A17 . 1221	Open, close & store TST Field Blank # 1	14 Nov 96 / 1403
S7009 - A18 . 1222	Open, close & store TST Field Blank # 2	14 Nov 96 / 1403
S7009 - A19 . 1223	Store TST Trip Blank #1	14 Nov 96 / 1530
S7009 - A20 . 1224	Store TST Trip Blank #2	14 Nov 96 / 1530

[] Field Transfer of Custody			[X] Chain of Possession			(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time			
JL Julia	11-07-96	1310	JA Edwards	11-07-96	1310			
JA Edwards	11-11-96	1315	ES MAST	11-11-96	1315			
ES MAST	11-11-96	0730	Rick Mahon	11-14-96	0730			
Rick Mahon	12-09-96	1340	CS McCall	12-09-96	1340			
CS McCall	12-09-96	1445	JA Edwards	12-09-96	1445			
JA Edwards	12-10-96	0715	JL Julia	12-10-96	0715			

Final Sample Disposition

Comments:

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

POC

POC

Cooler Temperature Status	
Hi -16 °C / Lo -16 °C (pick up at PNL to WHC)	
Hi °C / Lo °C (delivery at WHC from PNL)	
Hi 2 °C / Lo 2 °C (at return to PNL from WHC)	
Hi 2 °C / Lo 2 °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 BY-108 Sampled on 11/14/96

Target Analytes	CAS	MW	Ret Time	S7009-A05.219 VSS			S7009-A06.237 VSS			S7009-A04.207 VSS			S7009-A05.219 VSS Rep			S7009-A01.069 Ambient Air			S7009-A02.118 Ambient Air Thru VSS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	4.593	0.0034	0.63 J		0.0032	0.59 J		0.0031	0.58 J		0.0028	0.52 U		0.004	0.74 J		0.0033	0.61 J	
Chloromethane	74-87-3	50.49	4.969	0.003	1.32 J		0.0024	1.08 J		0.0023	1.02 J		0.0024	1.09 J		0.0024	1.06 U		0.0017	0.75 J	
1,2-dichloro 1,1,2,2-tetrafluoroethane	76-14-2	170.92	5.174	0.013	1.7 U		0.013	1.7 U		0.013	1.7 U		0.013	1.7 U		0.013	1.7 U		0.013	1.7 U	
Methanol	67-56-1	32.04	5.239	2.9085	2033.43 Y		2.8018	1958.79 Y		2.8061	1961.78 Y		2.9376	2053.75 Y		<0.110	<77 Y		<0.110	<77 Y	
Vinyl Chloride	75-01-4	62.5	5.465	0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U	
1,3-Butadiene	106-99-0	54	5.766	0.1428	59.24 Y		0.2791	115.77 Y		0.1447	60.02 Y		0.205	85.02 Y		<0.083	<34 Y		<0.083	<34 Y	
Butane	106-97-8	58.12	5.885	6.9598	2682.37 *		7.3971	2850.91 *		8.7799	3383.87 *		8.5415	3291.96 *		0.0028	1.09 J		0.0013	0.5 J	
Bromomethane	74-83-9	94.94	6.358	0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U	
Chloroethane	75-00-3	64.51	6.714	0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U	
Ethanol	64-17-5	46.01	6.821	2.3606	1149.25 Y		2.006	976.62 Y		2.3075	1123.4 Y		2.2854	1112.63 Y		<0.110	<53 Y		<0.110	<53 Y	
Acetonitrile	75-05-8	41.05	7.327	0.3001	163.77		0.2877	157		0.267	145.7		0.2958	161.41		0.004	2.18 U		0.004	2.18 U	
Acetone	67-64-1	58.08	7.844	5.6136	2165.03		5.9051	2277.43		5.3817	2075.61		13.472	5195.82 *		0.0286	11.02 J		0.0124	4.78 J	
Trichlorofluoromethane	75-69-4	137.37	8.264	0.4929	80.37		0.4895	79.82		0.4564	74.43		0.5122	83.52		0.0048	0.78 U		0.0048	0.78 U	
Pentane	109-66-0	72.15	8.942	9.9031	3074.56 *		10.0644	3124.63 *		10.6267	3299.23 *		9.1881	2852.59 *		0.0024	0.74 J		0.0038	1.18 U	
1,1-Dichloroethene	75-35-4	96.94	9.491	0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U	
Methylene Chloride	75-09-2	84.93	9.674	0.023	6.08		0.0241	6.34		0.0182	4.8 J		0.0239	6.31		0.0179	4.71 J		0.0155	4.09 J	
1,1,2-trichloro 1,2,2-trifluoroethane	76-13-1	187.38	10.17	0.004	0.48 U		0.004	0.48 U		0.004	0.48 U		0.004	0.48 U		0.004	0.48 U		0.004	0.48 U	
Propanenitrile	107-12-0	55.08	10.891	0.0209	8.49 J		0.0207	8.41 J		0.0179	7.27 J		0.0218	8.86 J		0.0038	1.55 U		0.0038	1.55 U	
Propanol	71-23-8	60.1	10.859	1.8986	707.63		1.8468	688.34		1.7666	658.42		1.9118	712.55		0.0028	1.04 U		0.0028	1.04 U	
1,1-Dichloroethane	75-34-3	98.96	11.817	0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U	
2-Butanone	78-93-3	72.11	12.441	2.4523	761.78		2.6153	812.41		2.109	655.12		2.6634	827.34		0.0028	0.87 U		0.0028	0.87 U	
cis-1,2-Dichloroethene	156-59-2	96.94	13.335	0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U	
Hexane	110-54-3	86.18	13.723	4.5941	1194.1		4.4685	1161.47		4.6149	1199.51		4.7136	1225.15		0.0032	0.83 U		0.0032	0.83 U	
Chloroform	67-66-3	119.38	13.873	0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U	
Tetrahydrofuran	109-99-9	72.11	14.627	3.436	1067.33		3.5018	1087.78		3.1368	974.39		3.7408	1162.02		0.0016	0.5 U		0.0016	0.5 U	
1,2-Dichloroethane	107-06-2	98.96	15.294	0.0022	0.5 U		0.004	0.91 J		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	15.822	0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U	
Butanenitrile	109-74-0	69.11	15.779	0.0548	17.78		0.0213	6.89 J		0.0189	6.13 J		0.0496	16.09		0.0034	1.1 U		0.0034	1.1 U	
1-Butanol	71-36-3	74.12	16.263	68.356	20658.05 *		67.3592	20356.79 *		59.2447	17904.49 *		62.7477	18963.14 *		0.004	1.21 J		0.0306	9.24 J	
Benzene	71-43-2	78.11	16.705	0.0995	28.53		0.0985	28.24		0.092	26.37		0.1049	30.09		0.0016	0.46 U		0.0016	0.46 U	
Carbon Tetrachloride	56-23-5	153.82	17.006	0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U	
Cyclohexane	110-82-7	84.16	17.276	0.774	206		0.7119	189.47		0.8064	214.63		0.7859	209.18		0.0036	0.96 U		0.0036	0.96 U	
1,2-Dichloropropane	78-87-5	112.99	18.288	0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U	
Trichloroethene	79-01-6	131.39	18.729	0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U	
Heptane	142-82-5	100.2	19.235	2.7088	605.56		2.5057	560.16		2.784	622.38		2.7411	612.78		0.0018	0.4 U		0.0018	0.4 U	
cis-1,3-Dichloropropene	10061-01-5	110.97	20.43	0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U	
4-Methyl-2-Pentanone	108-10-1	100.16	20.441	0.1695	37.9		0.1629	36.42		0.1658	37.09		0.1766	39.5		0.0034	0.76 U		0.0034	0.76 U	
Pyridine	110-86-1	79.1	20.581	0.0364	10.3 J		0.0347	9.83 J		0.0517	14.65 J		0.0369	10.46 J		0.0057	1.62 J		0.0186	5.27 U	
trans-1,3-Dichloropropene	10061-02-6	110.97	21.496	0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U	
Pentanenitrile	110-59-8	83.13	21.539	0.0698	18.81		0.066	17.77		0.0678	18.27		0.073	19.68		0.0042	1.13 U		0.0042	1.13 U	
1,1,2-Trichloroethane	79-00-5	133.4	21.937	0.0084	1.4 J		0.0066	1.12 J		0.0069	1.16 J		0.0065	1.09 J		0.0028	0.47 U		0.0028	0.47 U	

Table B.1 (Cont'd) SUMMA™ Analysis Results for All Target Analytes from Tank BY-108 Sampled on 11/14/96

Target Analytes	CAS	MW	Ret Time	S7009-A05.219 VSS			S7009-A06.237 VSS			S7009-A04.207 VSS			S7009-A05.219 VSS Rep			S7009-A01.069 Ambient Air			S7009-A02.118 Ambient Air Thru VSS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Toluene	108-88-3	92.14	22.594	0.1444	35.11		0.141	34.27		0.1328	32.28		0.1515	36.84		0.0009	0.21 J		0.002	0.49 U	
1,2-Dibromoethane	106-93-4	187.86	24.123	0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U	
Octane	111-65-9	114.23	24.661	0.9468	185.66		0.9292	182.22		0.8957	175.64		0.9769	191.57		0.0024	0.47 U		0.0024	0.47 U	
Tetrachloroethylene	127-18-4	165.83	25.167	0.0042	0.57 U		0.0042	0.57 U		0.0042	0.57 U		0.0042	0.57 U		0.0042	0.57 U		0.0042	0.57 U	
Chlorobenzene	108-90-7	112.56	26.761	0.0054	1.08 J		0.0052	1.04 J		0.0052	1.03 J		0.0056	1.12 J		0.0026	0.52 U		0.0026	0.52 U	
Hexanenitrile	628-73-9	97.13	27.019	0.1724	39.75		0.1549	35.71		0.1884	43.44		0.1851	42.68		0.0032	0.74 J		0.0013	0.31 J	
Ethylbenzene	100-41-4	106.17	27.644	0.0225	4.75 J		0.0214	4.52 J		0.0198	4.17 J		0.0237	5.01 J		0.0028	0.59 U		0.0028	0.59 U	
p/m-Xylene	106-42-3	106.17	28.096	0.0697	14.7 J		0.0679	14.32 J		0.0655	13.81 J		0.0732	15.44 J		0.013	2.74 U		0.013	2.74 U	
Cyclohexanone	108-94-1	98.14	28.494	0.3802	86.78		0.36	82.17		0.3811	86.99		0.3917	89.4		0.0197	4.49 J		0.0294	6.7 J	
Styrene	100-42-5	104.15	29	0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U	
1,1,2,2-Tetrachloroethane	79-34-5	167.85	29.226	0.0042	0.56 U		0.0042	0.56 U		0.0121	1.61 J		0.0042	0.56 U		0.0042	0.56 U		0.0042	0.56 U	
o-Xylene	95-47-6	106.17	29.291	0.0327	6.9		0.0325	6.86		0.0301	6.35		0.0345	7.28		0.0028	0.59 U		0.0028	0.59 U	
Nonane	111-84-2	128.26	29.743	0.3881	67.79		0.3796	66.29		0.3783	66.06		0.4093	71.48		0.0016	0.28 U		0.0016	0.28 U	
1-Ethyl-2-Methyl-Benzene	611-14-3	120.19	32.693	0.0037	0.69 J		0.0039	0.73 J		0.0045	0.84 J		0.0037	0.7 J		0.0018	0.34 U		0.0018	0.34 U	
1,3,5-Trimethylbenzene	108-67-8	120.19	32.919	0.0029	0.54 J		0.0025	0.47 J		0.0025	0.47 J		0.0027	0.51 J		0.0018	0.34 U		0.0018	0.34 U	
1,2,4-Trimethylbenzene	95-63-6	120.19	34.19	0.0075	1.39 J		0.007	1.31 J		0.0073	1.36 J		0.0072	1.35 J		0.0026	0.48 U		0.0026	0.48 U	
Decane	124-18-5	142.28	34.427	0.9179	144.51		0.8971	141.24		0.8919	140.42		0.9505	149.64		0.0017	0.27 J		0.003	0.47 U	
1,3-Dichlorobenzene	541-73-1	147	34.696	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0021	0.32 J		0.0018	0.27 U	
1,4-Dichlorobenzene	106-46-7	147	34.696	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0022	0.34 J		0.0018	0.27 U	
1,2-Dichlorobenzene	95-50-1	147	36.031	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U	
Undecane	1120-21-4	156.31	38.755	1.9104	273.76		1.7954	257.3		1.8914	271.04		2.0223	289.81		0.0019	0.27 J		0.0282	4.04 U	
1,2,4-Trichlorobenzene	120-82-1	181.45	42.254	0.0028	0.35 U		0.0028	0.35 U		0.0057	0.7 J		0.0028	0.35 U		0.0113	1.4 J		0.0028	0.35 U	
Dodecane	112-40-3	170.34	42.76	10.1419	1333.68 *		10.0864	1326.37 *		9.0277	1187.16 *		9.402	1236.37 *		0.0098	1.29 U		0.0098	1.29 U	
Hexachloro-1,3-butadiene	87-68-3	260.76	44.084	0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U	
Tridecane	629-50-5	184.36	46.496	4.0443	491.39		4.2706	518.88		4.4344	538.79		9.2058	1118.52 *		0.022	2.68 J		0.006	0.73 U	
Tetradecane	629-59-4	198.34	50.006	6.0873	687.48 *		5.5287	624.4 *		2.1849	246.75 *		4.2036	474.74 *		0.0597	6.74		0.0042	0.47 U	

Data Quality Flags

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

U Target compound not detected at or above the IDL.

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

* Denotes diluted value was reported for target compound in table.

Table B.2 Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BY-108 Sampled on 11/14/96.

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	S7009-A11.1208 ISVS			S7009-A13.1214 ISVS			S7009-A13.1214 ISVS Rep			S7009-A12.1212 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.817	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	8.784	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	9.496	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	9.954	2.8611	2000.3	Y	1.9327	1351.2	Y	2.0092	1404.66	Y	1.3733	960.08	Y
Vinyl Chloride	75-01-4	62.5	9.911	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	10.517	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58.14	10.74	7.0447	2714.16	E	5.3766	2071.47	E	5.7183	2203.14	E	5.3026	2042.97	E
Chloroethane	75-00-3	64.51	12.037	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	12.504	2.8222	1372.18	Y	2.0964	1019.29	Y	2.1148	1028.23	Y	1.6555	804.95	Y
Acetonitrile	75-05-8	41.05	12.983	0.63	343.79		0.3593	196.08		0.4124	225.01		0.4147	226.27	
Acetone	67-64-1	58.08	13.631	4.2181	1626.82	E	4.0052	1544.71	E	3.7775	1456.87	E	2.8662	1105.42	E
Trichlorofluoromethane	75-69-4	137.37	14.099	0.3322	54.17		0.1413	23.04		0.1357	22.13		0.211	34.4	
Pentane	109-66-0	72	14.885	5.9776	1859.71	E	4.9422	1537.58	E	5.3227	1655.96	E	5.21	1620.89	E
1,1-Dichloroethene	75-35-4	96.94	15.491	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	15.725	0.2758	72.75		0.147	38.78	J	0.1357	35.8	J	0.0767	20.24	J
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187.38	16.256	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	16.99	0.0824	33.52		0.053	21.54		0.0566	23		0.0495	20.12	
Propanol	71-23-8	60.1	17.022	1.2101	451.03		1.0426	388.61		1.0622	395.89		0.6725	250.64	
1,1-Dichloroethane	75-34-3	98.96	17.925	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	18.552	0.2807	87.21		0.89	276.46		0.6802	211.3		0.7058	219.26	
cis-1,2-Dichloroethene	156-59-2	96.94	19.445	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	19.817	4.2344	1100.62	E	3.5963	934.77	E	3.8266	994.61	E	3.8033	988.56	E
Chloroform	67-66-3	119.38	19.977	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	20.699	1.7282	536.84		1.7014	528.53		1.7502	543.69		1.4354	445.88	
1,2-Dichloroethane	107-06-2	98.96	21.358	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	21.805	0.0653	21.18		0.0451	14.63		0.0633	20.51		0.2775	89.93	
1,1,1-Trichloroethane	71-55-6	133.4	21.858	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	22.251	31.8534	9642.12	E	32.4631	9826.68	E	32.726	9906.24	E	34.0777	10315.4	E
Benzene	71-43-2	78.11	22.729	0.1132	32.45		0.1107	31.75		0.1074	30.79		0.0968	27.76	
Carbon Tetrachloride	56-23-5	153.82	23.016	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	23.282	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	24.249	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	24.674	0.0062	1.05	J	0.0036	0.61	U	0.0036	0.61	U	0.0036	0.61	U
Heptane	142-82-5	100.2	25.121	2.3811	532.3		2.135	477.29		2.1928	490.2		2.1594	482.73	
4-Methyl-2-Pentanone	108-10-1	100.16	26.279	0.3357	75.08		0.2785	62.29		0.2821	63.1		0.2593	58	
cis-1,3-Dichloropropene	10061-01-5	110.97	26.301	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U

Table B.2 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BY-108 Sampled on 11/14/96.

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	S7009-A11.1208 ISVS			S7009-A13.1214 ISVS			S7009-A13.1214 ISVS Rep			S7009-A12.1212 ISVS		
			Time	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Pyridine	110-86-1	79.1	26.471	0.062	17.57 J		0.0526	14.89 J		0.0492	13.95 J		0.0523	14.8 J	
trans-1,3-Dichloropropene	10061-02-6	110.97	27.332	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	27.332	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	27.778	0.0015	0.26 U		0.0015	0.26 U		0.0069	1.16 J		0.0015	0.26 U	
Toluene	108-88-3	92.14	28.416	1.0202	248.01		0.1865	45.35		0.1851	45.01		0.5979	145.34	
1,2-Dibromoethane	106-93-4	187.86	29.946	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	30.393	1.0565	207.59		0.9495	186.58		0.9493	186.53		0.9155	179.89	
Tetrachloroethylene	127-18-4	165.83	30.945	0.0031	0.41 J		0.0037	0.5 J		0.0037	0.5 J		0.0025	0.34 U	
Chlorobenzene	108-90-7	112.56	32.529	0.0011	0.22 U		0.0011	0.22 U		0.0011	0.22 U		0.0011	0.22 U	
Hexanenitrile	628-73-9	97	32.72	0.0177	4.09 J		0.0029	0.66 U		0.0029	0.66 U		0.0029	0.66 U	
Ethylbenzene	100-41-4	106.17	33.379	0.0226	4.76		0.0247	5.22		0.0245	5.18		0.0219	4.63	
p/m-Xylene	106-42-3	106.17	33.805	0.0746	15.74		0.0852	17.97		0.0835	17.61		0.0753	15.89	
Cyclohexanone	108-94-1	98.14	34.24	0.1674	38.22		0.1461	33.34		0.0125	2.85 U		0.0125	2.85 U	
Styrene	100-42-5	104.15	34.719	0.0037	0.8 J		0.0068	1.47 J		0.0067	1.44 J		0.0052	1.13 J	
1,1,2,2-Tetrachloroethane	79-34-5	167.85	34.942	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	35.016	0.0367	7.74		0.039	8.22		0.0377	7.94		0.0325	6.87	
Nonane	111-84-2	128	35.388	0.3325	58.19		0.2431	42.54		0.24	42		0.213	37.27	
1-Ethyl-2-methyl benzene	611-14-3	120.19	38.386	0.0029	0.55 J		0.0037	0.69 J		0.0035	0.65 J		0.0028	0.51 J	
1,3,5-Trimethylbenzene	108-67-8	120.19	38.598	0.0028	0.53 J		0.0036	0.68 J		0.0034	0.63 J		0.0023	0.43 J	
1,2,4-Trimethylbenzene	95-63-6	120.19	39.874	0.0068	1.27 J		0.0081	1.52 J		0.0078	1.45 J		0.0059	1.11 J	
Decane	124-18-5	142.28	40.054	0.4362	68.67		0.3091	48.66		0.3018	47.52		0.2662	41.92	
1,3-Dichlorobenzene	541-73-1	147	40.416	0.0011	0.16 J		0.0019	0.3 J		0.0017	0.25 J		0.0032	0.48 U	
1,4-Dichlorobenzene	106-46-7	147	40.618	0.0032	0.48 J		0.005	0.76 J		0.0049	0.75 J		0.0034	0.52 J	
1,2-Dichlorobenzene	95-50-1	147	41.755	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	44.38	0.9905	142.23		0.6777	97.31		0.6387	91.72		0.6353	91.22	
1,2,4-Trichlorobenzene	120-82-1	181.45	48.005	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	48.409	2.6728	352.17		1.8383	242.22		1.6895	222.62		1.7658	232.66	
Hexachloro-1,3-butadiene	87-68-3	260.76	49.822	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	52.171	1.7719	215.71		1.3145	160.02		1.2301	149.75		1.2594	153.32	
Tetradecane	629-59-4	198	55.689	1.5013	169.85		1.3474	152.44		1.2852	145.39		1.1056	125.08	
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	

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

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

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 BY-108 on 11/14/96.

Target Analytes	CAS	MW	Ret Time	S7009-A19.1223 ISVS			S7009-A20.1224 ISVS			S7009-A17.1221 ISVS			S7009-A18.1222 ISVS		
				TB #1			TB #2			FB #1			FB #2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.817	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	8.784	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	9.496	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	9.954	<0.274	<192	Y	<0.274	<192	Y	<0.274	<192	Y	0.3257	227.68	Y
Vinyl Chloride	75-01-4	62.5	9.911	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	10.517	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58.14	10.74	0.0036	1.39	U	0.0235	9.05	J	0.0036	1.39	U	0.0036	1.39	U
Chloroethane	75-00-3	64.51	12.037	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	12.504	<0.275	<133	Y	<0.275	<133	Y	<0.275	<133	Y	<0.275	<133	Y
Acetonitrile	75-05-8	41.05	12.983	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	13.631	0.0143	5.53	J	0.0109	4.2	J	0.0072	2.78	U	0.0072	2.78	U
Trichlorofluoromethane	75-69-4	137.37	14.099	0.3953	64.45		0.6447	105.1		0.1223	19.94		0.1272	20.74	
Pentane	109-66-0	72	14.885	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	15.491	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	15.725	0.1572	41.47	J,B	0.3165	83.46	B	0.0873	23.01	J,B	0.3025	79.78	B
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187.38	16.256	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	16.99	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	17.022	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	17.925	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	18.552	0.0022	0.68	U	0.0022	0.68	U	0.0022	0.68	U	0.0022	0.68	U
cis-1,2-Dichloroethene	156-59-2	96.94	19.445	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	19.817	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	19.977	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	20.699	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	21.358	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	21.805	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	21.858	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	22.251	0.0075	2.29	U	0.0075	2.29	U	0.0075	2.29	U	0.0075	2.29	U
Benzene	71-43-2	78.11	22.729	0.0014	0.4	U	0.0014	0.4	U	0.0014	0.4	U	0.0014	0.4	U
Carbon Tetrachloride	56-23-5	153.82	23.016	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	23.282	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	24.249	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	24.674	0.0036	0.61	U	0.006	1.02	J	0.0036	0.61	U	0.0066	1.13	J
Heptane	142-82-5	100.2	25.121	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	26.279	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	26.301	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U

Table B.3 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BY-108 on 11/14/96.

Target Analytes	CAS	MW	Ret Time	S7009-A19.1223 ISVS			S7009-A20.1224 ISVS			S7009-A17.1221 ISVS			S7009-A18.1222 ISVS		
				TB #1			TB #2			FB #1			FB #2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Pyridine	110-86-1	79.1	26.471	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	27.332	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	27.332	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	27.778	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	28.416	0.8518	207.08		1.1079	269.3		0.2938	71.42		0.1375	33.42	
1,2-Dibromoethane	106-93-4	187.86	29.946	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	30.393	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	30.945	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	32.529	0.0011	0.22 U		0.0011	0.22 U		0.0011	0.22 U		0.0011	0.22 U	
Hexanenitrile	628-73-9	97	32.72	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	33.379	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	33.805	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	34.24	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	34.719	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	34.942	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	35.016	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	35.388	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	38.386	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	38.598	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	39.874	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	40.054	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	40.416	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	40.618	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	41.755	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	44.38	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	48.005	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	48.409	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	49.822	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	52.171	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	55.689	0.0262	2.97 J,B		0.0442	5 J,B		0.044	4.98 J,B		0.0261	2.95 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	

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.

Y Initial calibration and CCV was 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

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