Pacific Northwest National Laboratory

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TANK VAPOR CHARACTERIZATION PROJECT

Tank 241-BX-104 Headspace Gas and Vapor Characterization Results from Samples Collected on August 22, 1996

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August 1997

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Pacific Northwest National Laboratory
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-BX-104 (Tank BX-104) at the Hanford Site in Washington State. Tank headspace samples collected by Westinghouse Hanford Company (WHC) were analyzed by Pacific Northwest National Laboratory (PNNL) to determine headspace concentrations of selected non-radioactive analytes. Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNNL. Vapor concentrations from sorbent trap samples are based on measured sample volumes provided by WHC.

Ammonia was determined to be above the immediate notification limit specified by the sampling and analysis plan (SAP) (Buckley 1996). Total non-methane organic compounds was the principal flammable constituent of the Tank BX-104 headspace, determined to be present at approximately 0.310% of its lower flammability limit (LFL). Total headspace flammability was estimated to be <0.784% 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 BX-104 Sampled on 8/22/96

<u>Category</u>	<u>Sample Medium</u>	<u>Analyte</u>	<u>Concentration^(a)</u>	<u>Units</u>
Inorganic Vapors	Sorbent Traps	Ammonia	263	ppmv
		Nitrogen Dioxide (NO ₂)	0.42	ppmv
		Nitric Oxide (NO)	<0.16	ppmv
		Water	17.5	mg/L
Permanent Gases	SUMMATM Canisters	Hydrogen	94	ppmv
		Methane	<25	ppmv
		Carbon Dioxide	<17	ppmv
		Carbon Monoxide	<17	ppmv
		Nitrous Oxide (N ₂ O)	130	ppmv
Total Non-Methane Organic Compounds	SUMMATM Canisters	Total Non-Methane Organic Compounds	130.09	mg/m ³
Volatile Organic Vapors	SUMMATM Canisters	1-Butanol	28.808	mg/m ³
		Tridecane	23.523	mg/m ³
		Dodecane	10.962	mg/m ³
Volatile Organic Vapors	Sorbent Traps	1-Butanol	20.554	mg/m ³
		Tridecane	6.928	mg/m ³
		Acetone	5.260	mg/m ³
Flammables	SUMMATM Canisters and Sorbent Traps	Flammables	<0.784	% LFL

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

Acknowledgments

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

Terms and Abbreviations

% D	% Difference
CAS	Chemical Abstracts Service
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain-of-custody
DIW	deionized water
EPA	U.S. Environmental Protection Agency
EQL	estimated quantitation limit
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatograph/mass spectrometer
GC/TCD	gas chromatography/thermal conductivity detection
IC	ion chromatography
ICB	initial calibration blank
ICV	initial calibration verification
IDL	instrument detection limit
IS	internal standard
ISE	ion selective electrode
ISVS	In Situ Vapor Sampling System
LFL	lower flammability limit
MW	molecular weight
NIST	National Institute for Standards and Technology
OSHA	Occupational Safety and Health Administration
PNL	Pacific Northwest Laboratory (previous name for the laboratory)
PNNL	Pacific Northwest National Laboratory
ppbv	part per billion by volume
ppm	parts per million
ppmv	part per million by volume
QA	quality assurance
RPD	relative percent difference
RSD	relative standard deviation
SAP	sample and analysis plan
SCIC	suppressed-conductivity ion chromatography
SRM	standard reference material
STP	standard temperature and pressure
SUMMA™	process for passivating stainless steel
TBP	tributyl phosphate
TEA	triethanolamine
TIC	tentatively identified compound
TNMOC	total non-methane organic compound
TST	triple sorbent trap
UHP	ultra high purity
UQL	upper quantitation limit
VAL	Vapor Analytical Laboratory
VSS	vapor sampling system
WHC	Westinghouse Hanford Company

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1.0 Introduction

This report presents results of chemical analyses of vapor samples collected by WHC on August 22, 1996 from the headspace of waste storage tank 241-BX-104 (Tank BX-104) at the Hanford Site in Washington State. Pacific Northwest National Laboratory^(a) provided SUMMA™ canisters and sorbent traps for sample collection, and analyzed the samples according to instructions in the SAP (Buckley 1996). Analytical work was performed by the PNNL VAL in the 300 Area of the Hanford Site under the PNNL Tank Vapor Characterization Project.

Pacific Northwest National Laboratory provided six sets of sorbent traps for selected inorganic analytes (four samples and two field blanks), five SUMMA™ canisters for permanent gases and organic analytes (three headspace samples and two ambient air samples), and eight triple sorbent traps (TSTs) for organic analytes (four samples, two field blanks, and two trip blanks). Sample devices and controls were provided to WHC on August 21, 1996; TSTs and sorbent traps for inorganic analytes were returned to PNNL on August 26, 1996 and SUMMA™ canisters were returned on September 3, 1996. Westinghouse Hanford Company measured and reported to PNNL the sample volumes needed to determine headspace concentrations from sorbent trap samples.

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

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

2.0 Analytical Methods

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

Table 2.1. Sampling and Analysis Methods Summary

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

Table 2.2. Sample Media Preparation, Handling, and Storage

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

2.1 Inorganic Vapors

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

2.1.1 Sampling Methodology

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

The ammonia sorbent traps contained carbon beads impregnated with sulfuric acid; nominally, 500 mg were contained in the primary and 250 mg in the breakthrough sections. The ammonia was chemisorbed as ammonium sulfate [(NH₄)₂SO₄]. The NO₂ traps contained a zeolite impregnated with triethanolamine (TEA), with 400 mg in the primary and 200 mg in the breakthrough sections. The NO₂ was absorbed and disproportionated to equi-molar quantities of nitrite ions (NO₂⁻) and nitrate ions (NO₃⁻). Glass tubes containing 800 mg of an oxidant were used to convert NO to NO₂. The converted NO was then collected as nitrite and nitrate in an NO₂ trap. The water traps contained a total of 450 mg of silica gel. All sorbent traps for a given analyte were from a single manufacturer's batch.

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

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

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

The sorbent traps were prepared in multi-trap trains configured so sample air flow passed in order through the ammonia, nitrogen dioxide, oxidizer, nitric oxide, and desiccant traps. Traps were weighed and then connected to each other using uniform lengths of 3/8-in. perfluoroalkoxy-grade (PFA) Teflon® tubing. The perfluoroalkoxy-grade tubing was heated in hot air and forced over the open ends of the traps to form a tight seal. The inlets of the sorbent trains each consist of a short section of tubing having a 3/8-in. stainless steel Swagelok® nut, and sealed using a Swagelok® cap. The trailing ends of the sorbent trains were each sealed with red plastic caps provided by the manufacturer.

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

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

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

2.1.2 Analytical Procedures

2.1.2.1 Ammonia Analysis. The sorbent material from the ammonia traps was placed into labeled 20-mL glass scintillation vials. Vials containing front-section sorbent material were treated with 10.0 mL of deionized water (DIW), and vials containing breakthrough-section sorbent material were treated with 5.0 mL of DIW. Ammonia present was measured using the ion selective electrode (ISE) procedure PNL-ALO-226^(a). Briefly, the method includes 1) preparing a 1000- $\mu\text{g}/\text{mL}$ ammonia stock standard solution from dried reagent-grade NH_4Cl and DIW, 2) preparing 0.1-, 0.5-, 1.0-, 10-, and 100- $\mu\text{g}/\text{mL}$ ammonia working calibration standards by serial dilution of the freshly made stock standard, 3) generating an initial calibration curve from the measured electromotive force signal versus ammonia concentration data obtained for the set of working standards, 4) performing a calibration-verification check, using a mid-range dilution of a certified National Institute for Standards and Technology (NIST)-traceable 0.1 M NH_4Cl standard from an independent source, at a minimum of once per batch, 5) continuing this sequence until all samples of the batch have been measured, including duplicates and spiked samples, and 6) remeasuring the complete set of calibration standards (at the end of the session). Electromotive force signal measurements obtained for samples are compared to those for standards to determine ammonia concentration in the samples.

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

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

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

^(a) Pacific Northwest National Laboratory. 8/96. *Determination of TO-14 Volatile Organic Compounds in Hanford Tank Headspace Samples Using SUMMA™ Passivated Canister Sampling and Gas Chromatographic-Mass Spectrometric Analysis*, PNL-TVP-03 (Rev. 2), PNNL Technical Procedure, Richland, Washington.

volume of sample air from the SUMMA™ canister, cryogenically concentrate the condensible organic vapors, then transfer the vapors to the GC/MS for analysis. A 100-mL volume of sample is measured and analyzed from the tank headspace. The organic components in the sampled air are separated on a J&W Scientific DB-1 phase, 60-m by 0.32-mm internal diameter with 3-μm film thickness column. The GC oven is programmed to run a temperature gradient beginning at 40°C, hold for 5 min, and ramp at 4°C per min to a final temperature of 260°C, with a 5-min hold.

The instrument calibration mixture for the PNL-TVP-03 analysis consists of organic analytes listed in Appendix B, Table B.1. These target analytes are quantitated in this analysis. The calibration mixture was prepared by blending a commercially prepared TO-14 calibration mixture with a mixture created using a Kin-Tek® permeation-tube standard generation system. The operation of the permeation-tube system follows the method detailed in PNNL Technical Procedure PNL-TVP-06^(a). The standard calibration mix was analyzed using six different concentrations, and a response factor for each compound was calculated. The GC/MS response for these compounds has been determined previously to be linearly related to concentration. Instrument detection limits and EQLs have been determined.

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

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

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

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

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

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

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

2.4.2 Quality Assurance/Quality Control

Before the tank sample was analyzed, a diagnostic check was performed on the GC/MS instrument by running an instrument "high-sensitivity tune", as described in PNL-TVP-03. Upon satisfactory completion of the instrument diagnostic check, a blank volume of purified nitrogen was analyzed to check the cleanliness of the system. The instrument was then calibrated using a standard gas mixture containing the organic compounds listed in Table B.1. A gas mixture containing bromochloromethane, 1,4-difluorobenzene, chlorobenzene- d_5 , and bromofluorobenzene was used as an IS for all blank, calibration standard, and sample analyses. Analyte responses from sample components, ISs, and standards were obtained from the extracted ion plot from their selected mass ion. The calibration was generated by calculating the relative response ratios of the IS to calibration standard responses and plotting the ratios against the ratio of the calibration-standard concentration (in ppbv) to the IS concentration. Once it was determined that the relative response was linear with increasing concentration, an average response factor was calculated for each target analyte and used to determine the concentration of target compounds in each sample. Method blanks were analyzed before and after calibration verification standards.

2.5 Triple Sorbent Trap Sample Analyses

2.5.1 Sampling Methodology

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

2.5.2 Analytical Procedure

The Supelco 300 tubes were analyzed according to PNNL Technical Procedure PNL-TVP-10^(a), with the exceptions noted in Section 3.4.1. The method employs Supelco CarbotrapTM 300 traps for sample collection and preconcentration. The traps are ground-glass tubes (11.5 cm long X 6 mm OD, 4 mm ID) containing a series of sorbents arranged in order of increasing retentivity. Each trap contains 300 mg of CarbotrapTM C, 200 mg of CarbotrapTM B, and 125 mg of CarbosieveTM S-III. The first two sorbents are deactivated graphite with limited sorption power for less volatile compounds. The final trapping stage, the CarbosieveTM S-III, is a graphitized molecular sieve used to retain the most volatile components, including some permanent gases such as Freon-12. Following sample collection and addition of IS, the traps are transferred to a Dynatherm ACEM 900 thermal desorber unit for analysis. The trap on the ACEM 900 is then desorbed by ballistic heating to 350°C with the sample then transferred to a smaller focusing trap. A 10:1 split is used during the transfer with 10% of the sample analyzed and the rest retained for reanalysis. The split sample

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

collected on a second identical Carbotrap™ 300 trap is used for repeat analysis on at least one sample per batch. Since the IS also follows the same path, quantitation may be performed directly on the repeat run without changing the calibration. Following desorption from the Carbotrap™ 300 trap, the analyte is transferred to a long, thin focusing trap filled with the same type of trapping materials as the Carbotrap™ 300 traps and in approximately the same ratios. The purpose of the focusing trap is to provide an interface to a capillary GC column, which may be thermally desorbed using helium at a flow rate compatible with the column and MS interface (1.2 mL/min). The focusing trap is ballistically heated to thermally desorb components onto a capillary GC column. The column is subsequently temperature programmed to separate the method analytes, which are then detected by the MS.

The instrument calibration mixture for the TST analysis consists of the compounds listed in Appendix B, Table B.2. These compounds that are directly quantified in this analysis make up the target analyte list (these compounds will be referred to as target analytes). The calibration mixture is prepared in common with the mixture used for the SUMMA™ analysis (see Section 2.4.2). The standard calibration mix was analyzed using six different concentrations, and a response factor for each compound was calculated. Volumes of standard added to the traps are measured by pressure difference on a SUMMA™ canister of known volume. The GC/MS response for these compounds has been determined previously to be linearly related to concentration.

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

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

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- d_5 , and 1,4 bromofluorobenzene was used as an IS for all calibration standard and sample analyses. Analyte responses from sample components, ISs, and standards were obtained from the extracted ion plot from their selected mass ion. A continuing calibration was generated by calculating the relative response ratios of the IS to calibration standard responses and plotting the ratios against the ratio of the calibration-standard concentration (in ppbv) to the IS concentration. Once it was determined that the relative response was linear with increasing concentration, an average response factor was calculated for each target analyte and used to determine the concentration of target compounds in each sample.

3.0 Analysis Results

Results from the sampling of the headspace of Tank BX-104 on August 22, 1996 (Sample Job S6086) 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 NO₂ and NO (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 BX-104 during sample job S6086. 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 $<5\%$, which is within the 25% specified by the SAP.

3.1.1 Ammonia

Ammonia analyses were performed on September 3, 1996, 12 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 21.1 to 22.3 μmol in front sections; blank corrected back sorbent section ammonia concentrations were $<0.01 \mu\text{mol}$. Blank corrections of 0.29 μmol in front and 0.07 μmol in the back sections, were about 1.3% of collected quantities. The analysis of one sample was duplicated and indicated a reproducibility of $\pm 0.0\%$. One blank sorbent trap was spiked with 17 ppm of ammonia and yielded a percentage recovery of 104%. 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 101% and 102% (CCV) during the analytical session. A five-point calibration was performed over an ammonia range of 0.1 to 100 $\mu\text{g/ml}$.

3.1.2 Nitric Oxide and Nitrogen Dioxide

Nitric oxide and nitrogen oxide analyses were performed on September 5 and 9, 1996, 14 and 18 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 NO_2 sorbent traps were all $<0.013 \mu\text{mol}$. Blank corrected NO_2^- quantities in the NO sorbent traps ranged from 0.016 to 0.018 μmol . Nitrite blank levels used to correct data were 0.0059 μmol in front (four of four blanks analyzed) and 0.0043 μmol in back (two of four blanks analyzed) sorbent sections. The analyses of two samples were duplicated and yielded repeatabilities of $\pm 1.8\%$ and $\pm 0.9\%$. Two sample leachates were spiked with 0.125 and 0.5 ppm NO_2^- and yielded percentage recoveries of 70% and 83%, respectively. 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 August 27, 1996, five days after sample collection and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed.

All multi-trap sample mass gain is assumed to be due to adsorption of water. This is justified because the total mass concentration of other vapors in the headspace of Hanford waste tanks are typically two to three orders of magnitude less than the mass concentration of the water vapor found in even relatively dry tanks. Water vapor concentrations are given in Table 3.1 for both moist air at tank conditions and for dry air at STP (0 °C and 1.013 bar). Because the sample volumes were measured after all water vapor was removed by the sorbent traps, the measured sample volumes are for dry air. The average water vapor concentration was 17.5 mg of water per L of dry air at STP. The result was determined from an average mass gain of 36.3 mg from all four multi-trap trains. The blank correction applied to the results was - 3.7 mg per multi-trap train. A control mass was measured and indicated a measurement accuracy of ± 0.1 mg. The average water vapor concentration corresponds to a tank headspace dew point at 18.4°C and relative humidity at 78% at the time of sampling.

3.2 Permanent Gases

Hydrogen analyses were performed on September 12, 1996, and analyses for other permanent gases were performed on September 11, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed and used in the averages. No deviations from standard procedures were noted.

Measured concentrations of carbon monoxide, carbon dioxide, hydrogen, methane, and N_2O are provided in Table 3.2. Results were based on three samples for each compound. Hydrogen at an average concentration of 94 ppmv and N_2O at an average concentration of 130 ppmv were the only permanent gases detected in Tank BX-104. Carbon dioxide was present at a much lower concentration in the tank headspace than in ambient air, where it typically ranges between 300 and 400 ppmv. The relative percent difference (RPD) between duplicate analyses of a single SUMMA™ canister was 3% and 0% for hydrogen and nitrous oxide, respectively.

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 October 24, 1996, which exceeded the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All three tank samples and the two ambient samples (100%) were successfully analyzed and used in the averages. No deviations from standard procedures were noted.

Table 3.3 lists results of the EPA TO-12 analysis of SUMMA™ canister samples for TNMOCs. Results in Table 3.3 are reported in two different units; in the upper row the mass concentration (mg/m^3) of non-methane organic compounds is given at STP (0°C and 1.013 bar), and in the lower row, by EPA TO-12 convention, as ppmv of carbon based on propane as the standard. The average concentration in the three tank headspace samples was $130.09 \text{ mg}/\text{m}^3$ or 54.31 ppmv of carbon. The $130.09 \text{ mg}/\text{m}^3$ value compares to $96.64 \text{ mg}/\text{m}^3$ for the sum of all target compounds identified in the analysis of the SUMMA™ canisters. Results provided in Table 3.3 are estimated to be accurate to within $\pm 30\%$ as specified by the SAP. The RPD for duplicate analysis of a single SUMMA™ canister was 1%.

3.3.1 Procedural Deviations, Observations, and Anomalies.

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

3.4 Organic Compound Characterization

Organic vapors in the Tank BX-104 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 September 19 and 23, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.2.1.

Measured concentrations of target analytes and TICs are presented in Table 3.4. Forty-six target analytes above the instrument detection limit (IDL) and 28 TICs were detected in the tank headspace samples. Of these, 44 target analytes and all TICs were identified in two or more tank headspace samples. Thirteen of 28 TICs were identified as unknowns. The compounds 1-butanol at $28.81 \text{ mg}/\text{m}^3$, tridecane at 25.523 , and dodecane at $10.96 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace samples. The total average concentration of the target analytes was $84.71 \text{ mg}/\text{m}^3$ and the total average concentration of TICs was $11.93 \text{ mg}/\text{m}^3$. The total average concentration of all compounds identified in this analysis was $96.64 \text{ mg}/\text{m}^3$. This compares to a total concentration of $130.09 \text{ mg}/\text{m}^3$ identified in the TO-12 analysis of the three tank headspace samples.

SUMMA™ canister sample S6086-A05.295 was analyzed in replicate for target analytes and TICs 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. Forty-one of 43 target compounds and 24 of 27 TICs had RPDs of less than 10%.

Results of analyses of the ambient air and ambient air through the ISVS samples are provided in Table 3.6. Twenty-two target analytes and no TICs were observed in one or both of the ambient air samples. Only cis-1,3-dichloropropene at 0.78 ppbv was observed above its EQL.

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

Appendix B, Table B.1 contains a complete listing 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.

Batch #1 (file identifier 26091901.b): undiluted samples

All target compounds met the 25% D criterion in the CCV with the exception of tetrahydrofuran (27.3%), decane (31.3%), undecane (25.9%), and tetradecane (30.9%). Target compounds that failed the CCV criterion that were found in tank samples above the EQL were tetrahydrofuran and undecane. Decane was found in tank samples between the IDL and the EQL.

Acetone was found in tank sample S6086-A04-294 above the upper quantitation limit (UQL). The compounds 1-butanol and dodecane were found in tank samples above the UQL.

No target compounds were present in the CCB above the EQL except cis-1,3-dichloropropene (0.22 ng on column, 0.22 ppbv) which was not found in tank samples.

Batch #2 (file identifier 26092301.b and 26092302.b): diluted samples of S6086-A04.294, S6086-A05.295, S6086-A05.295 REP, S6086-A06.297.

All target compounds met the 25% D criterion in the CCV except ethanol (25.1%), cyclohexane (31.1%), 4-methyl-2-pentanone (31.8%), pentanenitrile (36.9%), hexanenitrile (29.7%), decane (42.2%), and undecane (35.0). The above target compounds were not reported from this reanalysis data.

Acetone was found in tank sample S6086-A04-294 above the upper quantitation limit (UQL). The compounds 1-butanol and dodecane were found in tank samples above the UQL in the first analyses of these samples (batch 26091902.b). Tank samples were further diluted by a factor of 5 relative to the dilution of tank samples in the first analytical batch. This reanalysis data was used for reporting concentrations of these target compounds. The reanalysis data was also used for reporting tank concentrations of tridecane and tetradecane because the chromatography for the undiluted samples was degraded in the region where tridecane and tetradecane elute.

No target compounds were present in the CCB above the EQL except cis-1,3-dichloropropene (0.21 ng on column, 0.22 ppbv) which was not found in tank samples.

Information common to both batches:

The % D for the initial calibration verification was less than 25% for all target compounds except 1,3-butadiene (27.0%), 1-butanol (45.9%), pyridine (86.5%), cyclohexanone (32.1%), tridecane (52.7%) and tetradecane (98.1%).

The ICB showed evidence of contamination carry-over from the initial calibration verification. Tubing between the multiposition and the 2 position valves within the Entech were changed following analysis of this ICB. Twenty-three target compounds exceeded the EQL in the 200-mL ICB. Note that no target compounds exceeding the EQL were detected at concentrations greater than 5 ppbv except acetonitrile, acetone, and pyridine.

Instrument detection limits, precision, and accuracy have not been experimentally evaluated for 1,3-butadiene. Sample results are flagged with a "J" when the absolute number of nanograms calculated in the sample is less than the lowest concentration standard used in the initial calibration. The 1,3-butadiene results falling within the 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 September 10 and 11, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.2.1.

Measured concentrations of target analytes and TICs are presented in Table 3.7. Results are based on three samples for each compound. Forty-three target analytes above the IDL and 43 TICs were detected in the tank headspace samples. Of these, all 43 target analytes and 34 TICs were identified in two or more tank headspace samples. Twenty-one of the 43 TICs were identified as unknowns. The compounds 1-butanol at 20.55 mg/m³, tridecane at 6.93 mg/m³, and acetone at 5.26 mg/m³ were the three most abundant compounds identified in the tank headspace sample. The total concentration of the target analytes was 53.69 mg/m³ and the total concentration of the TICs was 11.68 mg/m³. The total concentration of all compounds found was 65.38 mg/m³.

Triple sorbent trap sample S6086-A12.1174 was analyzed in replicate for target analytes and TICs 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-five of 41 target analytes and 29 of 39 TICs had RPDs of less than 10%.

Results of analyses of target analytes and TICs in the field and trip blanks are provided in Table 3.9. Thirty-one target compounds were identified in one or more of the blank samples. Most of the compounds were found in the field blank samples. Fifteen of 31 target compounds were observed above the EQL including methanol, acetone, methylene chloride, 1-butanol, heptane, ethylbenzene, trichlorofluoromethane, propanol, 2-butanone, hexane, 4-methyl-2-pentanone, p/m-xylene, styrene, o-xylene, and toluene exceed the EQLs. In addition to the target compounds, seven TICs were observed 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. Samples were run under the protocols of TVP-10, Rev. 2 with the initial calibration performed on September 9, 1996 and quantitated against a CCV run at beginning of the batch.

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

Batch #1 (file identifier 46091001.b) - S6086-A17.1177, S6086-A18.1178, S6086-A19.1179, S6086-A20.1180;

Batch #2 (file identifier 46091101.b) - S6086-A11.1173, S6086-A12.1174, S6086-A12.1174 REP, S6086-A13.1175.

Batch #1:

Samples included in this batch consisted of the two field blanks and two trip blanks.

The CCV showed acceptable performance as specified in the procedure for all target compounds except tetradecane (40%). The uncertainty of the results for this compound are higher.

The field blanks showed significant levels of environmental contamination during sampling which has been a problem on many of the past ISVS jobs. However, because of the relatively heavy organic loading observed on the samples themselves, the blank problem was of limited importance. No target compounds were present at levels above the EQL in either of the trip blanks.

Two siloxane compounds present as TICs are believed to originate from the C-Flex tubing used in the ISVS sample bundle.

Batch #2:

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

The CCV was within nominal limits for all compounds except ethanol (31%) and 1,1,2,2-tetrachloroethane (29%). The uncertainty of the results is higher for these compounds.

The total ion chromatogram for these samples showed a typical NPH pattern with a small but visible hydrocarbon hump and numerous straight chain and branched alkanes and alkenes with carbon numbers ranging from C12 to C15 resolvable above the baseline. Pentadecane was readily observable in all three samples. Other tentatively identified compounds worth noting include acetaldehyde, butanal, and several ketones and alcohols. Additional TICs which were also present in the field blanks included 2-methyl propene, 1-fluoro-1,1-dichloroethane, and two siloxane compounds believed to originate from the C-Flex tubing used in the ISVS sample bundle.

Of particular interest in this sampling job was the positive identification of tributyl phosphate (TBP) which had only been observed previously in one ISVS job (C-204, at a similarly low level). TBP was observed in only one of the three BX-104 samples at a very low level (1.1 ppbv) and can be considered to be just above the EQL.

Sample volumes for all ISVS tank samples have been corrected to STP from the 21°C calibration used on the sampling cart flowmeters. The correction was included in the reported data to provide seamless compatibility with past VSS data which were collected using a 0°C calibration.

Information common to both batches:

The samples, field blanks, and trip 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. This material is never present in tubes archived for a similar amount of time in the 326 Vapor Lab or 329 Building temporary storage. The origin of the material is unclear but since it has shown up in trip blanks as well as field blanks, the most likely candidate is one of the refrigerators used for interim storage.

Very narrow air spikes (mass 32) occasionally are present in chromatograms from this period. This problem has been traced to high frequency air bursts from the surface of MS vacuum system o-rings. Attempts at permanently eliminating this problems have been unsuccessful to date and the matter has been referred to HP for further investigation. 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 (TBP) 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. However, verification of the calibration acceptability was not performed because the compound is not present in the CCV. At present, it is not possible to prepare a gas standard from this material. The calibration information on TBP demonstrated that detectability at 0.08 ppbv (based on a 200-mL sample) was possible. Tributyl phosphate was not quantitated according to the current

analytical method and QA program because of non-confirmation of calibration acceptability. The compound, however, was positively identified by mass spectral data.

3.5 Flammability

The analytical results presented above can be used to estimate the Tank BX-104 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. Total non-methane organic compounds was the principal flammable constituent of the Tank BX-104 headspace, determined to be present at approximately 0.310% of its LFL. Total headspace flammability was estimated to be <0.784% of the LFL.

Table 3.1 Inorganic Vapor Concentrations from Tank BX-104 Sampled on 8/22/96

Analyte	CAS Number	S6086-A07-88R	S6086-A08-89R	S6086-A09-90R	S6086-A10-91R	Average	Standard Deviation
Ammonia (ppmv)	7664-41-7	264	264	254	269	263	6
Nitric Oxide (ppmv)		0.43	0.43	0.43	0.39	0.42	0.02
Nitrogen Dioxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Water ^(a) (mg/L)		17.7	17.9	16.9	17.6	17.5	0.5
Water ^(b) (mg/L)		15.8	15.9	15.0	15.7	15.6	0.4

(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 for Tank BX-104 Sampled on 8/22/96

Permanent Gas Analyte	Ambient Air Upwind	Ambient Air Through Bundle	Tank Samples				RPD ^(c) %	Mean (ppmv)	St.Dev. ^(d)
	S6086-A01.019 ^(a) (ppmv)	S6086-A02.068 ^(a) (ppmv)	S6086-A04.294 ^(a) (ppmv)	S6086-A06.297 ^(a) (ppmv)	S6086-A05.295 ^(a) (ppmv)	S6086-A05.295 ^{(a)(b)} (ppmv)			
Hydrogen	<17	<17	96	93	94	97	3	94	1.5
Methane	<25	<25	<25	<25	<25	<25		<25	
Carbon Dioxide	383	372	<17	<17	<17	<17		<17	
Carbon Monoxide	<17	<17	<17	<17	<17	<17		<17	
Nitrous Oxide	<17	<17	128	131	130	130	0	130	1.5

(a) WHC sample identification number.

(b) Replicate analysis for S6086-A05-295; results are not included in the calculation of average concentrations.

(c) Relative percent difference (RPD) based on replicate analysis on S6086-A05-295.

(d) Standard Deviation (St.Dev.)

Table 3.3 Total Non-Methane Organic Compound Analysis Results from Tank BX-104 Sampled on 8/22/96

	Ambient Air Upwind S6086-A01.019 ^(a) Concentration	Ambient Air Through Bundle S6086-A02.068 ^(a) Concentration	Tank Samples				RPD ^(c)	Mean	Std. Dev. ^(d)
			S6086-A04.294 ^(a) Concentration	S6086-A06.297 ^(a) Concentration	S6086-A05.295 ^(a) Concentration	S6086-A05.295 ^{(a)(b)} Concentration	%		
TO-12 (mg/m ³)	< 0.59	< 0.59	127.56	133.06	129.65	131.05	1	130.09	2.8
Total Carbon (ppmv)								54.31	

(a) WHC sample identification number.

(b) Replicate analysis for S6086-A05-295; results are not included in the calculation of average concentrations.

(c) Relative percent difference (RPD) based on replicate analysis on S6086-A05-295.

(d) Standard Deviation (St.Dev.)

Table 3.4 Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 8/22/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6086-A06.297 ^(c) ISVS			S6086-A05.295 ^{(c)(d)} ISVS			S6086-A04.294 ^(c) 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.
Dichlorodifluoromethane	75-71-8	121	4.2	0.016	2.9	J	0.016	3.1	J	0.018	3.4	J	0.017	0.001	3.1	0.25
Chloromethane	74-87-3	50	4.6	0.005	2.2	J	0.005	2.4	J	0.006	2.8	J	0.006	0.001	2.5	0.29
Methanol	67-56-1	32	5.1	1.375	962		1.376	962		1.858	1299		1.536	0.279	1074	195
Butane	106-97-8	58	5.6	0.442	170		0.472	182		0.563	217		0.493	0.063	190	24
Ethanol	64-17-5	46	6.9	0.693	337		0.675	329		0.913	445		0.760	0.133	370	65
Acetonitrile	75-05-8	41	7.4	0.292	160		0.305	166		0.343	187		0.314	0.026	171	14
Acetone	67-64-1	58	7.9	5.178	1997		5.292	2041		9.277	3578	*	6.582	2.334	2539	900
Trichlorofluoromethane	75-69-4	137	8.3	1.873	305		1.970	321		2.120	346		1.988	0.124	324	20
Pentane	109-66-0	72	9.0	0.203	63		0.217	67		0.232	72		0.217	0.014	67	4.4
1,1-Dichloroethene	75-35-4	97	9.6	0.005	1.1	J	0.006	1.4	J	0.004	0.83	U	0.006	e	1.3	e
Methylene Chloride	75-09-2	85	9.8	0.028	7.2		0.028	7.4		0.027	7.2		0.028	0.000	7.3	0.10
1,1,1,2,2,2-Hexafluoroethane	76-13-1	187	10.4	0.010	1.2	J	0.004	0.53	U	0.008	1.0	J	0.009	e	1.1	e
Propanenitrile	107-12-0	55	11.2	0.189	77		0.196	80		0.206	84		0.197	0.009	80	3.5
Propanol	71-23-8	60	11.3	1.125	419		1.097	409		1.409	525		1.210	0.172	451	64
1,1-Dichloroethane	75-34-3	99	12.1	0.005	1.1	J	0.002	0.50	U	0.002	0.50	U	e	e	e	e
2-Butanone	78-93-3	72	12.8	1.263	392		1.383	430		1.356	421		1.334	0.063	414	20
Hexane	110-54-3	86	14.1	0.176	46		0.184	48		0.190	49		0.183	0.007	48	1.9
Chloroform	67-66-3	119	14.3	0.006	1.1	J	0.006	1.1	J	0.006	1.1	J	0.006	0.000	1.1	0.020
Tetrahydrofuran	109-99-9	72	15.0	0.983	305		1.089	338		1.014	315		1.029	0.054	320	17
1,1,1-Trichloroethane	71-55-6	133	16.2	0.048	8.0		0.049	8.2		0.046	7.8		0.048	0.001	8.0	0.23
Butanenitrile	109-74-0	69	16.3	0.269	87		0.273	89		0.285	93		0.276	0.008	89	2.7
1-Butanol	71-36-3	74	16.9	20.901	6316	*	31.564	9539	*	33.960	10263	*	28.808	6.952	8706	2101
Benzene	71-43-2	78	17.1	0.013	3.6	J	0.013	3.6	J	0.012	3.4	J	0.012	0.000	3.5	0.091
Carbon Tetrachloride	56-23-5	154	17.4	0.007	1.1	J	0.008	1.1	J	0.003	0.38	U	0.008	e	1.1	e
Trichloroethene	79-01-6	131	19.2	0.007	1.2	J	0.007	1.1	J	0.006	1.1	J	0.007	0.000	1.1	0.044
Heptane	142-82-5	100	19.7	0.168	38		0.174	39		0.160	36		0.167	0.007	37	1.6
4-Methyl-2-Pentanone	108-10-1	100	21.0	0.163	36		0.169	38		0.182	41		0.171	0.010	38	2.1
Pyridine	110-86-1	79	21.1	0.019	5.5	J	0.019	5.4	J	0.018	5.2	J	0.019	0.001	5.3	0.14
Pentanenitrile	110-59-8	83	22.1	0.083	22		0.083	22		0.085	23		0.084	0.001	23	0.33
1,1,2-Trichloroethane	79-00-5	133	22.4	0.003	0.47	U	0.003	0.47	U	0.008	1.4	J	e	e	e	e
Toluene	108-88-3	92	23.1	0.071	17		0.073	18		0.071	17		0.071	0.002	17	0.38
1,2-Dibromoethane	106-93-4	188	24.6	0.009	1.1	J	0.009	1.0	J	0.008	0.96	J	0.009	0.000	1.0	0.049
Octane	111-65-9	114	25.2	0.119	23		0.121	24		0.106	21		0.116	0.008	23	1.6
Tetrachloroethylene	127-18-4	166	25.6	0.020	2.7	J	0.020	2.6	J	0.017	2.3	J	0.019	0.002	2.5	0.24
Chlorobenzene	108-90-7	113	27.2	0.007	1.4	J	0.007	1.4	J	0.007	1.3	J	0.007	0.000	1.4	0.051
Hexanenitrile	628-73-9	97	27.5	0.134	31		0.136	31		0.136	31		0.135	0.001	31	0.18

Table 3.4 (Cont'd) Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 8/22/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6086-A06.297 ^(c) ISVS			S6086-A05.295 ^{(c)(d)} ISVS			S6086-A04.294 ^(c) 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.
Ethylbenzene	100-41-4	106	28.1	0.011	2.4	J	0.011	2.4	J	0.010	2.2	J	0.011	0.001	2.3	0.13
p/m-Xylene	106-42-3	106	28.5	0.041	8.6	J	0.040	8.5	J	0.037	7.8	J	0.039	0.002	8.3	0.40
Cyclohexanone	108-94-1	98	28.9	0.096	22		0.092	21		0.097	22		0.095	0.002	22	0.53
o-Xylene	95-47-6	106	29.7	0.022	4.5	J	0.021	4.5	J	0.019	4.1	J	0.021	0.001	4.4	0.25
Nonane	111-84-2	128	30.2	0.118	21		0.117	21		0.114	20		0.116	0.002	20	0.34
Decane	124-18-5	142	34.9	0.130	20	J	0.127	20	J	0.138	22	J	0.132	0.006	21	0.92
Undecane	1120-21-4	156	39.2	1.037	149		1.035	148		1.060	152		1.044	0.014	150	2.0
Dodecane	112-40-3	170	43.2	9.122	1200	*	11.261	1481	*	12.502	1644	*	10.962	1.709	1441	225
Tridecane	629-50-5	184	46.9	20.262	2462	*	19.961	2425	*	30.347	3687	*	23.523	5.911	2858	718
Tetradecane	629-59-4	198	50.4	2.593	293	*	2.198	248	*	5.289	597	*	3.360	1.682	379	190
Total Target Analyte Concentration													85.17			
Tentatively Identified Compounds ^(b)																
Propene	115-07-1	42	4.0	0.123	65		0.137	73		0.160	85		0.140	0.019	75	10
Propane	74-98-6	44	4.1	0.543	276		0.562	286		0.616	314		0.573	0.038	292	19
Unknown			4.4	0.234	f		0.213	f		0.277	f		0.241	0.033	e	e
Acetaldehyde	75-07-0	44	4.9	0.670	341		0.689	351		0.745	379		0.701	0.039	357	20
Unknown C4 Alkene/Cycloalkane		56	5.4	0.123	49		0.136	54		0.144	58		0.134	0.011	54	4.3
Unknown			6.1	0.130	f		0.155	f		0.149	f		0.144	0.013	e	e
Unknown C4 Alkene/Cycloalkane		56	6.2	0.114	45		0.119	47		0.132	53		0.121	0.009	49	3.8
Isopropyl Alcohol	67-63-0	60	8.4	0.284	106		0.275	103		0.294	110		0.284	0.009	106	3.4
Pentane, 2-methyl-	107-83-5	86	12.4	0.130	34		0.133	35		0.127	33		0.130	0.003	34	0.75
Butanal	123-72-8	72	12.6	2.007	624		2.071	644		2.140	666		2.073	0.067	645	21
2-Butanol	78-92-2	74	13.4	0.153	46		0.160	48		0.163	49		0.158	0.005	48	1.5
2-Pentanone	107-87-9	86	17.8	0.556	145		0.601	157		0.620	161		0.592	0.033	154	8.6
Pentanal	110-62-3	86	18.4	0.439	114		0.450	117		0.442	115		0.444	0.006	116	1.4
2-Hexanone	591-78-6	100	23.5	0.291	65		0.290	65		0.283	63		0.288	0.004	65	0.97
Hexanal	66-25-1	100	24.0	0.209	47		0.207	46		0.200	45		0.205	0.005	46	1.0
Unknown			25.2	0.302	f		0.291	f		0.299	f		0.297	0.005	e	e
Unknown C7 Ketone			28.7	0.358	f		0.349	f		0.371	f		0.359	0.011	e	e
Heptanal	111-71-7	114	29.3	0.297	58		0.284	56		0.267	52		0.283	0.015	56	3.0
2-Heptanone, 6-methyl-	928-68-7	128	32.0	0.741	130		0.737	129		0.742	130		0.740	0.003	129	0.49
2-Octanone	111-13-7	128	33.6	0.217	38		0.219	38		0.216	38		0.217	0.001	38	0.25
Unknown Alkane			41.4	0.195	f		0.189	f		0.175	f		0.186	0.011	e	e
Unknown C13 Alkane		184	43.8	1.432	174		1.400	170		1.412	172		1.414	0.016	172	2.0
Cyclohexane, 2-butyl-1,1,3-trimethyl-	54676-39-0	182	45.1	0.226	28		0.232	29		0.228	28		0.228	0.003	28	0.41

Table 3.4 (Cont'd) Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 8/22/96

Tentatively Identified Compounds ^(b)	CAS	MW	Ret Time	S6086-A06.297 ^(c) ISVS			S6086-A05.295 ^{(c)(d)} ISVS			S6086-A04.294 ^(c) 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.
Unknown C12 Alkene/Cycloalkane		68	45.2	0.556	183		0.513	68		0.532	71		0.533	0.022	107	66
Unknown Alkane			45.5	0.210	f		0.189	f		0.198	f		0.199	0.011	e	e
Unknown Alkane			45.9	0.214	f		0.171	f		0.227	f		0.204	0.030	e	e
Unknown Alkane			46.0	0.884	f		0.592	f		0.883	f		0.786	0.168	e	e
Unknown			47.2	0.314	f		0.190	f		nd	nd		0.252	e	e	e
Total TIC Concentration													11.93			

Data Quality Flags

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

U Target compound not detected at or above the IDL.

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

(a) Detected target analytes.

(b) Semi-quantitative estimate calculated using concentration of closest eluting IS.

(c) WHC sample identification number.

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

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

(f) No molecular weight available for calculation.

nd Not detected

Table 3.5 Comparison of Organic Compound Concentrations from Replicate Analysis of a Single SUMMA™ Canister from Tank BX-104 Sampled on 8/22/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6086-A05.295 ^(c) ISVS						RPD ^(d)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Dichlorodifluoromethane	75-71-8	121	4.2	0.016	3.0	J	0.016	3.1	J	2
Chloromethane	74-87-3	50	4.6	0.005	2.4	J	0.005	2.4	J	0
Methanol	67-56-1	32	5.1	1.416	990		1.376	962		3
Butane	106-97-8	58	5.6	0.454	175		0.472	182		4
Chloroethane	75-00-3	65	6.6	0.004	1.5	J	0.002	0.69	U	
Ethanol	64-17-5	46	6.9	0.694	338		0.675	329		3
Acetonitrile	75-05-8	41	7.4	0.290	158		0.305	166		5
Acetone	67-64-1	58	7.9	5.173	1995		5.292	2041		2
Trichlorofluoromethane	75-69-4	137	8.3	1.933	315		1.970	321		2
Pentane	109-66-0	72	9.0	0.209	65		0.217	67		4
1,1-Dichloroethene	75-35-4	97	9.6	0.004	0.96	J	0.006	1.4	J	39
Methylene Chloride	75-09-2	85	9.8	0.028	7.4		0.028	7.4		0
Propanenitrile	107-12-0	55	11.2	0.190	77		0.196	80		3
Propanol	71-23-8	60	11.3	1.116	416		1.097	409		2
1,1-Dichloroethane	75-34-3	99	12.1	0.005	1.1	J	0.002	0.50	U	
2-Butanone	78-93-3	72	12.8	1.312	408		1.383	430		5
Hexane	110-54-3	86	14.1	0.178	46		0.184	48		3
Chloroform	67-66-3	119	14.3	0.006	1.1	J	0.006	1.1	J	0
Tetrahydrofuran	109-99-9	72	15.0	1.052	327		1.089	338		3
1,1,1-Trichloroethane	71-55-6	133	16.2	0.048	8.0		0.049	8.2		2
Butanenitrile	109-74-0	69	16.3	0.265	86		0.273	89		3
1-Butanol	71-36-3	74	16.9	28.448	8597	*	31.564	9539	*	10
Benzene	71-43-2	78	17.1	0.012	3.5	J	0.013	3.6	J	4
Carbon Tetrachloride	56-23-5	154	17.4	0.008	1.1	J	0.008	1.1	J	1
Trichloroethene	79-01-6	131	19.2	0.007	1.1	J	0.007	1.1	J	0
Heptane	142-82-5	100	19.7	0.169	38		0.174	39		3
4-Methyl-2-Pentanone	108-10-1	100	21.0	0.166	37		0.169	38		2
Pyridine	110-86-1	79	21.1	0.019	5.4	J	0.019	5.4	J	1
Pentanenitrile	110-59-8	83	22.1	0.081	22		0.083	22		3
Toluene	108-88-3	92	23.1	0.071	17		0.073	18		3
1,2-Dibromoethane	106-93-4	188	24.6	0.009	1.0	J	0.009	1.0	J	1
Octane	111-65-9	114	25.2	0.118	23		0.121	24		3
Tetrachloroethylene	127-18-4	166	25.6	0.020	2.7	J	0.020	2.6	J	1
Chlorobenzene	108-90-7	113	27.2	0.007	1.3	J	0.007	1.4	J	6
Hexanenitrile	628-73-9	97	27.5	0.131	30		0.136	31		4
Ethylbenzene	100-41-4	106	28.1	0.011	2.3	J	0.011	2.4	J	3
p/m-Xylene	106-42-3	106	28.5	0.040	8.4	J	0.040	8.5	J	1
Cyclohexanone	108-94-1	98	28.9	0.093	21		0.092	21		1
o-Xylene	95-47-6	106	29.7	0.021	4.5	J	0.021	4.5	J	0
Nonane	111-84-2	128	30.2	0.115	20		0.117	21		2
Decane	124-18-5	142	34.9	0.126	20	J	0.127	20	J	0
Undecane	1120-21-4	156	39.2	1.007	144		1.035	148		3
Dodecane	112-40-3	170	43.2	10.485	1379	*	11.261	1481	*	7
Tridecane	629-50-5	184	46.9	19.961	2425	*	19.962	2425	*	0
Tetradecane	629-59-4	198	50.4	2.198	248	*	2.248	254	*	2

Tentatively

Identified Compounds^(b)

Propene	115-07-1	42	4.0	0.135	72		0.137	73		2
Propane	74-98-6	44	4.1	0.535	273		0.562	286		5
Methyl	624-91-9	61	4.4	0.233	86		nd	nd		
Unknown			4.4	nd	nd		0.213	e		
Acetaldehyde	75-07-0	44	4.9	0.661	336		0.689	351		4

Table 3.5 (Cont'd) Comparison of Organic Compound Concentrations from Replicate Analysis of a Single SUMMA™ Canister from Tank BX-104 Sampled on 8/22/96

Tentatively Identified Compounds ^(b)	CAS	MW	Ret Time	S6086-A05.295 ^(c) ISVS						RPD ^(d) %
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Unknown C4 Alkene/Cycloalkane		56	5.4	0.128	51		0.136	54		6
Unknown			6.1	0.145	e		0.155	e		7
Unknown C4 Alkene/Cycloalkane		56	6.2	0.114	46		0.119	47		4
Isopropyl Alcohol	67-63-0	60	8.4	0.283	106		0.275	103		3
Pentane, 2-methyl-	107-83-5	86	12.4	0.126	33		0.133	35		5
Butanal	123-72-8	72	12.6	2.000	622		2.071	644		4
2-Butanol	78-92-2	74	13.4	0.162	49		0.160	48		2
2-Pentanone	107-87-9	86	17.8	0.565	147		0.601	157		6
Pentanal	110-62-3	86	18.4	0.430	112		0.450	117		4
2-Hexanone	591-78-6	100	23.5	0.281	63		0.290	65		3
Hexanal	66-25-1	100	24.0	0.199	45		0.207	46		4
Unknown			25.2	0.295	e		0.291	e		1
Unknown C7 Ketone			28.7	0.357	e		0.349	e		2
Heptanal	111-71-7	114	29.3	0.279	55		0.284	56		2
2-Heptanone, 6-methyl-	928-68-7	128	32.0	0.708	124		0.737	129		4
2-Octanone	111-13-7	128	33.6	0.212	37		0.219	38		3
Unknown Alkane			41.4	0.183	e		0.189	e		3
Unknown C13 Alkane		184	43.8	1.348	164		1.400	170		4
Cyclohexane, 2-butyl-1,1,3-trimethyl-	54676-39-0	182	45.1	0.223	27		0.232	29		4
Unknown C12 Alkene/Cycloalkane		168	45.2	0.504	67		0.513	68		2
Unknown Alkane			45.5	0.199	e		0.189	e		5
Unknown Alkane			45.9	0.188	e		0.171	e		10
Unknown Alkane			46.0	0.737	e		0.592	e		22
Unknown			47.2	0.272	e		0.190	e		36

Data Quality Flags

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

U Target compound not detected at or above the IDL.

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

(a) Detected target analytes.

(b) Semi-quantitative estimate calculated using concentration of closest eluting IS.

(c) WHC sample identification number.

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

(e) No molecular weight available for calculation.

nd Not detected

Table 3.6 Organic Compound Concentrations in Ambient Air and Ambient Air through the ISVS
in SUMMA™ Canisters Associated with the Sampling of Tank BX-104 on 8/22/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6086-A01.019 ^(c) ISVS			S6086-A02.068 ^(c) ISVS		
				Ambient Air			Ambient Air Thru ISVS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	121	4.2	0.009	1.7	J	0.009	1.7	J
Ethanol	64-17-5	46	6.9	0.011	5.5	J	0.007	3.5	J
Acetone	67-64-1	58	7.9	0.039	15	J	0.025	9.4	J
Trichlorofluoromethane	75-69-4	137	8.3	0.009	1.5	J	0.009	1.5	J
1,1-Dichloroethene	75-35-4	97	9.6	0.004	0.83	U	0.005	1.2	J
Methylene Chloride	75-09-2	85	9.8	0.019	5.1	J	0.020	5.2	J
112trichloro122trifluoroethane	76-13-1	187	10.4	0.009	1.0	J	0.009	1.1	J
2-Butanone	78-93-3	72	12.8	0.003	0.87	U	0.009	2.8	J
Hexane	110-54-3	86	14.1	0.006	1.7	J	0.006	1.7	J
Chloroform	67-66-3	119	14.3	0.006	1.1	J	0.006	1.1	J
1,1,1-Trichloroethane	71-55-6	133	16.2	0.002	0.30	U	0.007	1.2	J
Carbon Tetrachloride	56-23-5	154	17.4	0.007	1.1	J	0.003	0.38	U
Trichloroethene	79-01-6	131	19.2	0.006	1.1	J	0.006	0.93	J
Heptane	142-82-5	100	19.7	0.005	1.2	J	0.004	0.80	U
cis-1,3-Dichloropropene	10061-01-5	111	20.9	0.004	0.78		0.000	0.040	U
Pyridine	110-86-1	79	21.1	0.011	3.2	J	0.008	2.2	U
1,1,2-Trichloroethane	79-00-5	133	22.4	0.006	0.93	J	0.006	0.92	J
Toluene	108-88-3	92	23.1	0.006	1.4	J	0.006	1.4	J
1,2-Dibromoethane	106-93-4	188	24.6	0.007	0.85	J	0.007	0.88	J
Tetrachloroethylene	127-18-4	166	25.6	0.006	0.80	J	0.006	0.82	J
Chlorobenzene	108-90-7	113	27.2	0.005	0.98	J	0.005	0.97	J
Ethylbenzene	100-41-4	106	28.1	0.004	0.83	J	0.004	0.83	J

Data Quality Flags

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

U Target compound not detected at or above the IDL.

(a) Detected target analytes.

(b) Semi-quantitative estimate calculated using concentration of closest eluting IS.

(c) WHC sample identification number.

(d) No molecular weight available for calculation.

nd Not detected

Table 3.7 Organic Compound Concentrations in Triple Sorbent Traps from Tank BX-104 Sampled on 8/22/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6086-A11.1173 ^(c) ISVS			S6086-A12.1174 ^{(c)(d)} ISV			S6086-A13.1175 ^(c) 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	2.239	1565	Y	2.298	1606	Y	1.642	1148	Y	2.059	0.363	1440	254
Butane	106-97-8	58	10.8	0.599	231		0.579	223		0.515	198		0.565	0.044	218	17
Ethanol	64-17-5	46	12.5	1.924	935	Y	1.769	860	Y	1.426	694	Y	1.707	0.255	830	124
Acetonitrile	75-05-8	41	13.0	0.566	309		0.653	356		0.498	272		0.572	0.078	312	43
Acetone	67-64-1	58	13.7	5.846	2254	E	5.448	2101	E	4.486	1730	E	5.260	0.699	2028	270
Trichlorofluoromethane	75-69-4	137	14.1	1.908	311		1.716	280		1.639	267		1.754	0.139	286	23
Pentane	109-66-0	72	14.9	0.291	91		0.281	88		0.254	79		0.276	0.019	86	6.0
Methylene Chloride	75-09-2	85	15.8	0.201	53		0.167	44		0.142	37	J	0.170	0.030	45	7.8
Propanenitrile	107-12-0	55	17.0	0.251	102		0.243	99		0.201	82		0.232	0.027	94	11
Propanol	71-23-8	60	17.0	2.089	779		1.941	723		1.675	624		1.901	0.210	709	78
2-Butanone	78-93-3	72	18.6	1.831	569		1.664	517		1.403	436		1.633	0.216	507	67
Hexane	110-54-3	86	19.9	0.252	65		0.252	65		0.223	58		0.242	0.017	63	4.3
Tetrahydrofuran	109-99-9	72	20.7	0.956	297		0.961	299		0.829	258		0.915	0.075	284	23
Butanenitrile	109-74-0	69	21.8	0.304	98		0.308	100		0.247	80		0.286	0.034	93	11
1,1,1-Trichloroethane	71-55-6	133	21.9	0.057	9.5		0.056	9.4		0.053	9.0		0.055	0.002	9.3	0.31
1-Butanol	71-36-3	74	22.3	21.046	6371	E	22.302	6751	E	18.314	5544	E	20.554	2.039	6222	617
Benzene	71-43-2	78	22.8	0.012	3.6	J	0.013	3.7	J	0.011	3.2	J	0.012	0.001	3.5	0.24
Trichloroethene	79-01-6	131	24.7	0.007	1.2	J	0.004	0.61	J	0.004	0.70	J	0.005	0.002	0.82	0.30
Heptane	142-82-5	100	25.2	0.233	52		0.235	52		0.205	46		0.224	0.017	50	3.8
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.289	65		0.270	60		0.246	55		0.268	0.022	60	4.9
Pyridine	110-86-1	79	26.5	0.034	9.6	J	0.032	9.2	J	0.027	7.6	J	0.031	0.004	8.8	1.1
Pentanenitrile	110-59-8	83	27.4	0.083	22		0.088	24		0.065	18		0.079	0.012	21	3.3
Toluene	108-88-3	92	28.5	0.521	127		0.506	123		0.527	128		0.518	0.011	126	2.7
Octane	111-65-9	114	30.4	0.095	19		0.132	26		0.071	14		0.099	0.031	20	6.0
Tetrachloroethylene	127-18-4	166	31.0	0.012	1.7	J	0.015	2.0	J	0.010	1.3	J	0.012	0.003	1.6	0.35
Hexanenitrile	628-73-9	97	32.8	0.091	21		0.130	30		0.061	14		0.094	0.035	22	8.0
Ethylbenzene	100-41-4	106	33.4	0.092	19		0.093	20		0.092	19		0.092	0.001	19	0.13
p/m-Xylene	106-42-3	106	33.8	0.280	59		0.293	62		0.274	58		0.282	0.010	60	2.0
Cyclohexanone	108-94-1	98	34.3	0.109	25	J	0.088	20	J	0.082	19	J	0.093	0.015	21	3.3
Styrene	100-42-5	104	34.8	0.031	6.8		0.030	6.4		0.030	6.5		0.030	0.001	6.5	0.19
o-Xylene	95-47-6	106	35.1	0.089	19		0.092	19		0.081	17		0.087	0.005	18	1.1
Nonane	111-84-2	128	35.4	0.053	9.3		0.082	14		0.037	6.5		0.057	0.023	10	4.0
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.012	2.1	J	0.006	1.1	J	0.005	0.95	J	0.007	0.004	1.4	0.65
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.006	1.1	J	0.003	0.58	J	0.005	1.0	J	0.005	0.001	0.88	0.27
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.015	2.8	J	0.015	2.9	J	0.014	2.6	J	0.015	0.001	2.8	0.12
Decane	124-18-5	142	40.1	0.060	9.5		0.074	12		0.041	6.5		0.058	0.016	9.2	2.6
1,3-Dichlorobenzene	541-73-1	147	40.5	0.007	1.0	J	0.007	1.1	J	0.006	0.97	J	0.007	0.000	1.0	0.060
1,4-Dichlorobenzene	106-46-7	147	40.7	0.007	1.1	J	0.007	1.1	J	0.006	0.97	J	0.007	0.000	1.0	0.066

Table 3.7 (Cont'd) Organic Compound Concentrations in Triple Sorbent Traps from Tank BX-104 Sampled on 8/22/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6086-A11.1173 ^(c) ISVS			S6086-A12.1174 ^{(c)(d)} ISV			S6086-A13.1175 ^(c) 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.
Undecane	1120-21-4	156	44.4	0.235	34		0.396	57		0.107	15		0.246	0.145	35	21
Dodecane	112-40-3	170	48.4	2.253	297		3.745	493	E	1.025	135		2.341	1.362	308	179
Tridecane	629-50-5	184	52.2	6.892	839	E	10.398	1266	E	3.493	425	E	6.928	3.453	843	420
Tetradecane	629-59-4	198	55.7	3.875	438	E	5.915	669	E	1.916	217	E	3.902	1.999	441	226
Tributyl Phosphate	126-73-8	266	63.1	<0.011	<0.88	Z	<0.010	<0.85	Z	0.013	1.1	Z	e	e	e	e
Total Target Concentration													53.682			
Tentatively Identified Compounds ^(b)																
Propene	115-07-1	42	7.3	nd	nd		0.050	27		0.048	26		0.049	e	26	e
Propane	74-98-6	44	7.4	0.357	182		0.267	136		0.243	124		0.289	0.060	147	31
Ethane, 1-chloro-1,1-difluoro-	75-68-3	100	8.8	0.355	79		0.185	41		0.160	36		0.233	0.106	52	24
Acetaldehyde	75-07-0	44	9.5	0.123	63		0.112	57		0.113	57		0.116	0.006	59	3.1
1-Propene, 2-methyl-	115-11-7	56	10.4	0.184	74		0.204	82		0.292	117		0.227	0.057	91	23
1-Fluoro-1,1-dichloro-ethane	0-00-0	116	14.4	0.208	40		0.161	31		0.214	41		0.194	0.029	38	5.6
2-Propanol, 2-methyl-	75-65-0	74	15.5	0.072	22		0.065	20		nd	nd		0.069	e	21	e
3-Buten-2-one	78-94-4	70	18.1	0.041	13		0.038	12		nd	nd		0.040	e	13	e
Pentane, 2-methyl-	107-83-5	86	18.3	0.073	19		0.073	19		nd	nd		0.073	e	19	e
Butanal	123-72-8	72	18.4	0.520	162		0.377	117		0.330	103		0.409	0.099	127	31
2-Butanol	78-92-2	74	19.2	0.044	13		0.042	13		nd	nd		0.043	e	13	e
2-Butanone, 3-methyl-	563-80-4	86	22.0	0.049	13		0.043	11		nd	nd		0.046	e	12	e
Butanal, 2-methyl-	96-17-3	86	23.9	0.086	22		0.081	21		0.072	19		0.080	0.007	21	1.8
Unknown			24.0	nd	nd		0.081	f		nd	nd		e	e	e	e
Unknown			24.0	0.111	f		0.109	f		0.093	f		0.104	0.010	e	e
1-Butanol, 3-methyl-	123-51-3	88	27.8	0.106	27		0.109	28		nd	nd		0.108	e	27	e
2-Hexanone	591-78-6	100	28.8	0.275	62		0.309	69		0.238	53		0.274	0.036	61	8.0
1-Butanol, 2-methyl-	137-32-6	88	29.4	0.073	19		0.070	18		nd	nd		0.071	e	18	e
Unknown			31.4	0.186	f		0.322	f		0.123	f		0.210	0.102	e	e
Heptane, 2,3-dimethyl-	3074-71-3	128	31.5	nd	nd		nd	nd		0.130	23		e	e	e	e
Heptane, 2,4-dimethyl-	2213-23-2	128	31.8	0.458	80		0.395	69		0.472	83		0.442	0.041	77	7.2
2-Heptanone	110-43-0	114	34.0	0.228	45		0.292	57		0.140	27		0.220	0.076	43	15
2-Heptanone, 6-methyl-	928-68-7	128	37.2	0.368	64		0.482	84		0.217	38		0.356	0.133	62	23
Cyclotetrasiloxane, octamethyl-	556-67-2	296	39.4	0.511	39	S	0.432	33	S	0.703	53	S	0.548	0.140	42	11
Unknown C12 Alkane		170	42.9	0.731	96		0.658	87		0.721	95		0.703	0.040	93	5.2
Unknown C12 Alkane		170	43.2	0.386	51		0.345	45		0.377	50		0.369	0.022	49	2.9
Unknown C13 Alkane		184	49.1	0.539	66		0.916	111		0.242	30		0.566	0.337	69	41
Unknown C13 Alkene/Cycloalkane		182	50.5	0.277	34		0.471	58		nd	nd		0.374	e	46	e
Unknown C13 Alkane		184	50.8	nd	nd		0.247	30		nd	nd		e	e	e	e

Table 3.7 (Cont'd) Organic Compound Concentrations in Triple Sorbent Traps from Tank BX-104 Sampled on 8/22/96

Tentatively Identified Compounds ^(b)	CAS	MW	Ret Time	S6086-A11.1173 ^(c) ISVS			S6086-A12.1174 ^{(c)(d)} ISV			S6086-A13.1175 ^(e) 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.
Unknown C13 Alkane		184	50.9	nd	nd		0.290	f		nd	nd		e	e	e	e
Unknown C13 Alkane		184	51.2	nd	nd		0.208	25		nd	nd		e	e	e	e
Unknown C14 Alkane		198	51.4	1.149	130		1.920	217		0.571	65		1.213	0.677	137	77
Unknown C13 Alkane		184	51.8	nd	nd		0.200	24		nd	nd		e	e	e	e
Unknown C14 Alkene/Cycloalkane		196	52.7	0.200	23		0.348	40		nd	nd		0.274	e	31	e
Unknown C14 Alkane		198	53.0	0.257	29		0.426	48		nd	nd		0.341	e	39	e
Unknown C13 Alkene/Cycloalkane		182	54.4	0.449	55		0.786	97		0.218	27		0.484	0.286	60	35
Unknown C14 Alkane		198	54.5	0.214	24		0.321	36		nd	nd		0.267	e	30	e
Unknown C15 Alkane		212	54.8	nd	nd		0.213	22		nd	nd		e	e	e	e
Unknown C15 Alkane		212	55.1	1.471	155		2.358	249		0.743	78		1.524	0.809	161	85
Unknown C15 Alkene/Cycloalkane		210	56.5	nd	nd		0.230	25		nd	nd		e	e	e	e
Unknown C13 Ketone		209	57.8	0.323	35		0.477	51		nd	nd		0.400	e	43	e
Unknown C15 Alkane		212	57.9	0.923	97		1.488	157		0.489	52		0.967	0.501	102	53
Pentadecane	629-62-9	212	59.0	0.552	58		nd	nd		nd	nd		e	e	e	e
Total TIC Concentration													11.683			

Data Quality Flags

E Target compound exceeds upper quantification limit (UQL).

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

S Suspect data; the siloxane compounds are suspected to be originating from the silicone tubing used in the sample bundle.

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.

(a) Detected target analytes.

(b) Semi-quantitative estimate calculated using concentration of closest eluting IS.

(c) WHC sample identification number.

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

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

(f) Value was not calculated by the instrument.

nd Not detected

Table 3.8 Comparison of Organic Compound Concentrations from Replicate Analysis of a Single Triple Sorbent Trap from Tank BX-104 Sampled on 8/22/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6086-A12.1174 ^(c) ISVS						RPD ^(d)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Methanol	67-56-1	32	10.0	2.298	1606	Y	1.968	1376	Y	15
Butane	106-97-8	58	10.8	0.579	223		0.543	209		6
Ethanol	64-17-5	46	12.5	1.769	860	Y	1.418	690	Y	22
Acetonitrile	75-05-8	41	13.0	0.653	356		0.608	332		7
Acetone	67-64-1	58	13.7	5.448	2101	E	4.766	1838	E	13
Trichlorofluoromethane	75-69-4	137	14.1	1.716	280		1.672	273		3
Pentane	109-66-0	72	14.9	0.281	88		0.275	86		2
Methylene Chloride	75-09-2	85	15.8	0.167	44		0.175	46		5
Propanenitrile	107-12-0	55	17.0	0.243	99		0.236	96		3
Propanol	71-23-8	60	17.0	1.941	723		1.840	686		5
2-Butanone	78-93-3	72	18.6	1.664	517		1.594	495		4
Hexane	110-54-3	86	19.9	0.252	65		0.246	64		2
Tetrahydrofuran	109-99-9	72	20.7	0.961	299		0.937	291		3
Butanenitrile	109-74-0	69	21.8	0.308	100		0.292	95		5
1,1,1-Trichloroethane	71-55-6	133	21.9	0.056	9.4		0.057	9.5		1
1-Butanol	71-36-3	74	22.3	22.302	6751	E	22.236	6731	E	0
Benzene	71-43-2	78	22.8	0.013	3.7	J	0.015	4.2		14
Trichloroethene	79-01-6	131	24.7	0.004	0.61	J	0.004	0.63	U	
Heptane	142-82-5	100	25.2	0.235	52		0.226	51		4
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.270	60		0.266	59		2
Pyridine	110-86-1	79	26.5	0.032	9.2	J	0.031	8.8	J	5
Pentanenitrile	110-59-8	83	27.4	0.088	24		0.085	23		3
Toluene	108-88-3	92	28.5	0.506	123		0.475	115		6
Octane	111-65-9	114	30.4	0.132	26		0.122	24		8
Tetrachloroethylene	127-18-4	166	31.0	0.015	2.0	J	0.014	1.9	J	4
Hexanenitrile	628-73-9	97	32.8	0.130	30		0.124	29		5
Ethylbenzene	100-41-4	106	33.4	0.093	20		0.088	19		6
p/m-Xylene	106-42-3	106	33.8	0.293	62		0.273	58		7
Cyclohexanone	108-94-1	98	34.3	0.088	20	J	0.072	16	J	20
Styrene	100-42-5	104	34.8	0.030	6.4		0.029	6.2		3
o-Xylene	95-47-6	106	35.1	0.092	19		0.090	19		2
Nonane	111-84-2	128	35.4	0.082	14		0.078	14		5
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.006	1.1	J	0.005	0.99	J	9
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.003	0.58	J	0.006	1.1	J	57
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.015	2.9	J	0.015	2.7	J	5
Decane	124-18-5	142	40.1	0.074	12		0.071	11		3
1,3-Dichlorobenzene	541-73-1	147	40.5	0.007	1.1	J	0.007	1.1	J	4
1,4-Dichlorobenzene	106-46-7	147	40.7	0.007	1.1	J	0.007	1.1	J	4
Undecane	1120-21-4	156	44.4	0.396	57		0.370	53		7
Dodecane	112-40-3	170	48.4	3.745	493	E	3.620	477	E	3
Tridecane	629-50-5	184	52.2	10.398	1266	E	10.270	1250	E	1
Tetradecane	629-59-4	198	55.7	5.915	669	E	5.742	650	E	3
Tributyl Phosphate	126-73-8	266	63.1	<0.010	<0.85	Z	<0.010	<0.85	Z	

Tentatively

Identified Compounds^(b)

Propene	115-07-1	42	7.3	0.050	27		0.175	94		112
Propane	74-98-6	44	7.4	0.267	136		0.119	61		77
Ethane, 1-chloro-1,1-difluoro-	75-68-3	100	8.8	0.185	41		0.165	37		12
Acetaldehyde	75-07-0	44	9.5	0.112	57		0.051	26		76
1-Propene, 2-methyl-	115-11-7	56	10.4	0.204	82		0.171	68		18
1-Fluoro-1,1-dichloro-ethane	0-00-0	116	14.4	0.161	31		0.151	29		7

Table 3.8 (Cont'd) Comparison of Organic Compound Concentrations from Replicate Analysis of a Single Triple Sorbent Trap from Tank BX-104 Sampled on 8/22/96

Tentatively Identified Compounds ^(b)	CAS	MW	Ret Time	S6086-A12.1174 ^(c) ISVS						RPD ^(d) %
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
2-Propanol, 2-methyl-	75-65-0	74	15.5	0.065	20		0.065	20		0
3-Buten-2-one	78-94-4	70	18.1	0.038	12		0.039	12		1
Pentane, 2-methyl-	107-83-5	86	18.3	0.073	19		0.070	18		4
Butanal	123-72-8	72	18.4	0.377	117		0.220	68		53
2-Butanol	78-92-2	74	19.2	0.042	13		nd	nd		
2-Butanone, 3-methyl-	563-80-4	86	22.0	0.043	11		0.040	10		7
Butanal, 2-methyl-	96-17-3	86	23.9	0.081	21		0.070	18		15
Unknown			24.0	0.081	e		nd	nd		
Unknown			24.0	0.109	e		0.105	e		4
1-Butanol, 3-methyl-	123-51-3	88	27.8	0.109	28		0.103	26		6
2-Hexanone	591-78-6	100	28.8	0.309	69		0.293	66		5
1-Butanol, 2-methyl-	137-32-6	88	29.4	0.070	18		0.032	8.2		74
Unknown			31.4	0.322	e		0.217	e		39
Heptane, 2,4-dimethyl-	2213-23-2	128	31.8	0.395	69		0.370	65		6
2-Heptanone	110-43-0	114	34.0	0.292	57		0.290	57		1
2-Heptanone, 6-methyl-	928-68-7	128	37.2	0.482	84		0.465	81		4
Cyclotetrasiloxane, octamethyl-	556-67-2	296	39.4	0.432	33	S	0.515	39	S	18
Unknown C12 Alkane		170	42.9	0.658	87		0.643	85		2
Unknown C12 Alkane		170	43.2	0.345	45		0.334	44		3
Unknown C13 Alkane		184	49.1	0.916	111		0.888	108		3
Unknown C13 Alkene/Cycloalkane		182	50.5	0.471	58		0.462	57		2
Unknown C13 Alkane		184	50.8	0.247	30		0.240	29		3
Unknown C13 Alkane		184	50.9	0.290	e		0.278	34		4
Unknown C13 Alkane		184	51.2	0.208	25		0.205	25		2
Unknown C14 Alkane		198	51.4	1.920	217		1.796	203		7
Unknown C13 Alkane		184	51.8	0.200	24		nd	nd		
Unknown C13 Alkane		184	51.8	0.200	24		0.198	24		1
Unknown C14 Alkene/Cycloalkane		196	52.7	0.348	40		0.325	37		7
Unknown C14 Alkane		198	53.0	0.426	48		0.412	47		3
Unknown C13 Alkene/Cycloalkane		182	54.4	0.786	97		0.762	94		3
Unknown C14 Alkane		198	54.5	0.321	36		0.337	38		5
Unknown C15 Alkane		212	54.8	0.213	22		0.212	22		0
Unknown C15 Alkane		212	55.1	2.358	249		2.274	240		4
Unknown C15 Alkene/Cycloalkane		210	56.5	0.230	25		0.228	24		1
Unknown C13 Ketone		209	57.8	0.477	51		0.487	52		2
Unknown C15 Alkane		212	57.9	1.488	157		1.422	150		5

Data Quality Flags

E Target compound exceeds upper quantification limit (UQL).

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

S Suspect data; the siloxane compounds are suspected to be originating from the silicone tubing used in the sample bundle.

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.

(a) Detected target analytes.

(b) Semi-quantitative estimate calculated using concentration of closest eluting IS.

(c) WHC sample identification number.

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

(e) Value was not calculated by the instrument.

nd Not detected

Table 3.9 Organic Compound Concentrations in Triple Sorbent Trap Blank Samples Associated with the Sampling of Tank BX-104 on 8/22/96

Target Analytes ^(a)	CAS	MW	S6086-A17.1177 ^(c) ISVS					S6086-A18.1178 ^(c) ISVS			6086-A19.1179 ^(c) ISVS			S6086-A20.1180 ^(c) ISV		
			Ret	FB #1				FB #2			TB #1			TB #2		
			Time	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Methanol	67-56-1	32	10.0	0.276	193	Y	<0.274	<192	Y	<0.274	<192	Y	<0.274	<192	Y	
Butane	106-97-8	58	10.8	0.027	10	J	0.004	1.4	U	0.004	1.4	U	0.004	1.4	U	
Acetonitrile	75-05-8	41	13.0	0.017	9.2	J	0.007	3.6	J	0.003	1.8	U	0.003	1.8	U	
Acetone	67-64-1	58	13.7	0.204	79		0.112	43		0.007	2.8	U	0.017	6.5	J	
Trichlorofluoromethane	75-69-4	137	14.1	0.067	11		0.035	5.6	J	0.004	0.72	U	0.004	0.72	U	
Pentane	109-66-0	72	14.9	0.017	5.3	J	0.010	3.2	J	0.003	0.89	U	0.003	0.89	U	
1,1-Dichloroethene	75-35-4	97	15.5	0.006	1.3	J	0.002	0.47	U	0.002	0.47	U	0.002	0.47	U	
Methylene Chloride	75-09-2	85	15.8	0.127	34	J	0.491	129		0.106	28	J	0.130	34	J	
Propanol	71-23-8	60	17.0	0.068	25		0.005	2.0	U	0.005	2.0	U	0.005	2.0	U	
2-Butanone	78-93-3	72	18.6	0.049	15		0.017	5.3	J	0.002	0.68	U	0.002	0.68	U	
Hexane	110-54-3	86	19.9	0.037	9.5		0.028	7.2		0.001	0.32	U	0.001	0.32	U	
Tetrahydrofuran	109-99-9	72	20.7	0.021	6.5	J	0.004	1.1	U	0.004	1.1	U	0.004	1.1	U	
1,1,1-Trichloroethane	71-55-6	133	21.9	0.009	1.5	J	0.009	1.5	J	0.003	0.44	U	0.003	0.44	U	
1-Butanol	71-36-3	74	22.3	0.512	155		0.060	18	J	0.008	2.3	U	0.008	2.3	U	
Cyclohexane	110-82-7	84	23.3	0.031	8.1	J	0.023	6.0	J	0.004	1.1	U	0.004	1.1	U	
Trichloroethene	79-01-6	131	24.7	0.004	0.61	U	0.023	3.9	J	0.004	0.62	J	0.004	0.71	J	
Heptane	142-82-5	100	25.2	0.051	11		0.044	9.9		0.002	0.35	U	0.002	0.35	U	
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.061	14		0.049	11		0.002	0.46	U	0.002	0.46	U	
Toluene	108-88-3	92	28.5	0.330	80		0.289	70		0.001	0.27	J	0.001	0.23	U	
Ethylbenzene	100-41-4	106	33.4	0.051	11		0.040	8.4		0.001	0.30	U	0.001	0.30	U	
p/m-Xylene	106-42-3	106	33.8	0.152	32		0.116	24		0.003	0.63	U	0.003	0.63	U	
Cyclohexanone	108-94-1	98	34.3	0.067	15	J	0.013	2.9	U	0.013	2.9	U	0.013	2.9	U	
Styrene	100-42-5	104	34.8	0.016	3.5		0.014	3.1	J	0.002	0.33	U	0.002	0.33	U	
o-Xylene	95-47-6	106	35.1	0.045	9.6		0.032	6.8		0.002	0.40	U	0.002	0.40	U	
Nonane	111-84-2	128	35.4	0.006	1.1	J	0.001	0.22	U	0.001	0.22	U	0.001	0.22	U	
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.006	1.0	J	0.002	0.44	U	0.002	0.44	U	0.002	0.44	U	
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.003	0.47	J	0.002	0.44	U	0.002	0.44	U	0.002	0.44	U	
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.007	1.3	J	0.005	0.91	J	0.003	0.47	U	0.003	0.47	U	
Decane	124-18-5	142	40.1	0.016	2.5	J	0.013	2.0	J	0.003	0.47	U	0.003	0.47	U	
Undecane	1120-21-4	156	44.4	0.010	1.4	J	0.006	0.86	J	0.004	0.63	U	0.004	0.63	U	
Tetradecane	629-59-4	198	55.7	0.023	2.6	J	0.013	1.5	U	0.033	3.7	J	0.013	1.5	U	

Table 3.9 (Cont'd) Organic Compound Concentrations in Triple Sorbent Trap Blank Samples Associated with the Sampling of Tank BX-104 on 8/22/96.

Tentatively Identified Compounds ^(b)	CAS	MW	Ret Time	S6086-A17.1177 ^(c) ISVS			S6086-A18.1178 ^(c) ISVS			6086-A19.1179 ^(c) ISVS			S6086-A20.1180 ^(c) ISV		
				(mg/m ³)	FB #1 (ppbv)	Flag	(mg/m ³)	FB #2 (ppbv)	Flag	(mg/m ³)	TB #1 (ppbv)	Flag	(mg/m ³)	TB #2 (ppbv)	Flag
Ethane, 1-chloro-1,1-difluoro-	75-68-3	100	8.8	0.701	157		3.296	738		0.366	82		0.403	90	
1-Propene, 2-methyl-	115-11-7	56	10.4	0.286	114		0.356	142		nd	nd		nd	nd	
1-Fluoro-1,1-dichloro-ethane	0-00-0	116	14.4	0.221	43		0.693	134		0.047	9.1		0.023	4.5	
Cyclotrisiloxane, hexamethyl-	541-05-9	222	31.1	0.697	70	S	0.715	72	S	nd	nd		nd	nd	
Unknown C9 Alkane		128	31.7	0.295	52		0.253	44		nd	nd		nd	nd	
Cyclotetrasiloxane, octamethyl-	556-67-2	296	39.4	0.232	18	S	0.211	16	S	nd	nd		nd	nd	
Unknown C9 Alkane		128	42.9	0.331	58		nd	nd		nd	nd		nd	nd	

Data Quality Flags

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

S Suspect data; the siloxane compounds are suspected to be originating from the silicone tubing used in the sample bundle.

U Target compound not detected at or above the IDL.

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

(a) Detected target analytes.

(b) Semi-quantitative estimate calculated using concentration of closest eluting IS.

(c) WHC sample identification number.

(d) No molecular weight available for calculation.

nd Not detected

Table 3.10. Flammability Data for Tank BX-104 Sampled on 8/22/96

Analyte	CAS #	Lower Flammability	Average	% of LFL
		Limit(LFL)	Measured Concentrations	
Ammonia (ppm)	7664-41-7	150000	263	0.175
Carbon Monoxide (ppm)	630-08-0	125000	<17	<0.014
Hydrogen (ppm)	1333-74-0	40000	94	0.235
Methane (ppm)	74-82-8	50000	<25	<0.050
TNMOC (mg/m ³)		42000	130	0.310
Total				<0.784

Note: Less than values are calculated using the average concentration less than values.
These values are summed to determine the total LFL.

3.26

Figure 3.1b Typical Total Ion Chromatogram (36 - 70 min) for SUMMA™ Canister Samples from Tank BX-104 Sampled on 8/22/96

Figure 3.2b Typical Total Ion Chromatogram (36 - 70 min) for Triple Sorbent Trap Samples from Tank BX-104 Sampled on 8/22/96

4.0 Conclusions

The concentrations of inorganic and organic analytes were determined from samples of the headspace of Tank BX-104 on August 22, 1996 (Sample Job S6081). The vapor concentrations were based either on whole-volume samples (SUMMA™ canisters) or on sorbent traps exposed to sample flow. In the case of the canisters, the concentrations were based on analytical results and the tracking of dilution/concentration of sample volumes obtained directly from the canisters. In the case of the sorbent traps, concentrations were based on analytical results and sample volumes reported by WHC. Known sampling and analytical variances from established quality assurance requirements, where significant, were documented in this report, as required by the SAP (Buckley 1996). Immediate notification was provided because the ammonia concentration exceeded the 150 ppmv notification level; notification levels and notification procedures are described in the SAP (Buckley 1996).

5.0 References

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

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

Pacific Northwest National Laboratory. *Quality Assurance Plan for Activities Conducted by the Pacific Northwest National Laboratory Vapor Analytical Laboratory (VAL) and the Pacific Northwest National Laboratory Tank Vapor Characterization Project*. ETD-002, Rev. 1, Pacific Northwest National Laboratory, Richland, Washington.

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Appendix A

Chain-of-Custody Sample Control Forms

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-0418

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-7437

Page 85-9656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm

241-BX-104 Tank Vapor Sample SAF S6086

Temporal study ISVS

Ice Chest No.

Collection date 08 - 22 - 96

Preparation date 08 - 19 - 96

Field Logbook No. WHC- N-647-8

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6086 - A07 . 88R -

Collect NH₃/NO_x/H₂O Sorbent Trap

S6086 - A08 . 89R -

Collect NH₃/NO_x/H₂O Sorbent Trap

S6086 - A09 . 90R -

Collect NH₃/NO_x/H₂O Sorbent Trap

S6086 - A10 . 91R -

Collect NH₃/NO_x/H₂O Sorbent Trap

S6086 - A15 . 92R -

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

S6086 - A16 . 93R -

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

[] Field Transfer of Custody			[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time	
G W Dennis <i>G.W. Dennis</i>	08-21-96	1100	J A Edwards <i>J A Edwards</i>	08-21-96	1100	
J A Edwards <i>J A Edwards</i>	08-21-96	1500	Rick Mahon / Rick Mahon	08-21-96	1500	
Rick Mahon / Rick Mahon	08-21-96	1838	GS CAPRIO / GS CAPRIO	08-21-96	1838	
GS CAPRIO / GS CAPRIO	8/26/96	1350	J A Edwards <i>J A Edwards</i>	8/26/96	1350	
J A Edwards <i>J A Edwards</i>	8/27/96	0745	G.W. Dennis <i>G.W. Dennis</i>	8/27/96	0745	

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 - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-2329

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-2891

Page 85-3656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm
241-BX-104 Tank Vapor Sample SAF S6086
(ISVS Cart)

Collection date 08 - 22 - 96

Preparation date 08 - 19 - 96

Ice Chest No.

Field Logbook No. WHC-N-647-8

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6086 - A01 . 019 Collect Ambient Air Sample SUMMA #1
S6086 - A02 . 068 Collect Ambient Air Sample SUMMA #2 (through tube bundle)
S6086 - A04 . 294 Collect SUMMA #3
S6086 - A05 . 295 Collect SUMMA #4
S6086 - A06 . 297 Collect SUMMA #5

[] Field Transfer of Custody			[X] Chain of Possession			(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time		
J A Edwards	08-21-96	1450	Rick Mahon / Rick Mahon	08-21-96	1450		
Rick Mahon / Rick Mahon	08-21-96	1838	GSCAPRIO / J A Edwards	08-21-96	1838		
GSCAPRIO / J A Edwards	08/26/96	1350	ES MAST	08/26/96	1350		
GSCAPRIO / J A Edwards	08/13/96	0945	ES MAST	08/13/96	0945		
ES MAST	9/3/96	210	J A Edwards	9/3/96	210		

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

(18)

POC

(18)

(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-BX-104 Tank Vapor Sample SAF S6086
(ISVS Cart)Collection date 08-21-96
Preparation date 08-19-96

Ice Chest No.

Field Logbook No. WHC-N-647-8

Ertco Hi/Lo thermometer No. PNL-T-003

Bill of Lading/Airbill No. N/A

Offsite Property No. N/A

Method of Shipment Government Truck

Shipped to WHC-

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6086 - A11 . 1173	PNL Triple Sorbent Trap (TST) Sample # 1
S6086 - A12 . 1174	PNL TST Sample # 2
S6086 - A13 . 1175	PNL TST Sample # 3
S6086 - A14 . 1176	PNL TST Sample # 4
S6086 - A17 . 1177	Open, close & store TST Field Blank # 1
S6086 - A18 . 1178	Open, close & store TST Field Blank #2
S6086 - A19 . 1179	Store TST Trip Blank #1
S6086 - A20 . 1180	Store TST Trip Blank #2

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
JL Julia	08-21-96	0800	JA Edwards	08-21-96	0800
JA Edwards	08-21-96	1502	Rick Mahon/Rick Mahon	08-21-96	1502
Rick Mahon/Rick Mahon	08-21-96	1838	GS CAPRIO / GS CAPRIO	08-21-96	1838
GS CAPRIO / GS CAPRIO	8/26/96	1350	JA Edwards	8/26/96	1350
JA Edwards	9/13/96	1205	JL Julia	9/13/96	1205

Final Sample Disposition

Comments: NOT SHIPPED TO WHC/SMC ON ICE, @ 8/21/96

PNL (only) Checklist	Pick-up / Delivery	Comments:
Media labeled and checked?	Y/N	
Letter of instruction?	Y/N	
Media in good condition?	Y/N / Y/N	
COC info/signatures complete?	Y/N / Y/N	
Sorbents shipped on ice? (<5°C)	Y/N / Y/N	
Hi/Lo thermometer - <u>Keep upright!</u>	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 -10 °C / Lo -10 °C (pick up at PNL to WHC)
Hi 24 °C / Lo -6 °C (delivery at WHC from PNL)
Hi 34 °C / Lo -1 °C (at return to PNL from WHC)
Hi 34 °C / Lo -9 °C (at delivery from WHC to PNL)

RESET @ WHC

(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 BX-104 Sampled on 8/22/96

Target Analytes	CAS	MW	Ret Time	S6086-A01.019 ISVS			S6086-A02.068 ISVS			S6086-A04.294 ISVS			S6086-A05.295 ISVS			S6086-A05.295 ISVS			S6086-A06.297 ISVS		
				Ambient Air			Ambient Air Thru ISVS			S6086-A04.294 ISVS			S6086-A05.295 ISVS			Repeat			S6086-A06.297 ISVS		
				(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	121	4.2	0.0091	1.68 J		0.0091	1.69 J		0.0184	3.4 J		0.0164	3.05 J		0.016	2.97 J		0.0158	2.92 J	
Chloromethane	74-87-3	50	4.6	0.002	0.89 U		0.002	0.89 U		0.0063	2.81 J		0.0054	2.42 J		0.0054	2.38 J		0.005	2.24 J	
1,2-dichloro 1,2,2-tetrafluoroethane	76-14-2	171	4.9	0.0104	1.36 U		0.0104	1.36 U		0.0104	1.36 U		0.0104	1.36 U		0.0104	1.36 U		0.0104	1.36 U	
Methanol	67-56-1	32	5.1	0.0126	8.81 U		0.0126	8.81 U		1.8582	1299.09		1.3758	961.88		1.4163	990.17		1.3753	961.53	
Vinyl Chloride	75-01-4	63	5.2	0.006	2.15 U		0.006	2.15 U		0.006	2.15 U		0.006	2.15 U		0.006	2.15 U		0.006	2.15 U	
1,3-Butadiene	106-99-0	54	5.5	<0.083	<34 Y		<0.083	<34 Y		<0.083	<34 Y		<0.083	<34 Y		<0.083	<34 Y		<0.083	<34 Y	
Butane	106-97-8	58	5.6	0.0076	2.93 U		0.0076	2.93 U		0.563	216.99		0.4723	182.03		0.454	174.96		0.4422	170.42	
Bromomethane	74-83-9	95	6.2	0.0268	6.32 U		0.0268	6.32 U		0.0268	6.32 U		0.0268	6.32 U		0.0268	6.32 U		0.0268	6.32 U	
Chloroethane	75-00-3	65	6.6	0.002	0.69 U		0.002	0.69 U		0.002	0.69 U		0.002	0.69 U		0.0044	1.54 J		0.002	0.69 U	
Ethanol	64-17-5	46	6.9	0.0113	5.52 J		0.0072	3.49 J		0.9134	444.7		0.6751	328.67		0.6942	338		0.6926	337.19	
Acetonitrile	75-05-8	41	7.4	0.0032	1.75 U		0.0032	1.75 U		0.343	187.15		0.3051	166.47		0.2901	158.28		0.2924	159.54	
Acetone	67-64-1	58	7.9	0.0388	14.98 J		0.0245	9.44 J		9.2765	3577.7 *		5.2924	2041.13		5.1729	1995.06		5.1775	1996.83	
Trichlorofluoromethane	75-69-4	137	8.3	0.0092	1.5 J		0.0094	1.53 J		2.12	345.7		1.97	321.23		1.9327	315.15		1.8729	305.41	
Pentane	109-66-0	72	9.0	0.0024	0.75 U		0.0024	0.75 U		0.2316	71.91		0.2171	67.39		0.2093	64.99		0.203	63.02	
1,1-Dichloroethene	75-35-4	97	9.6	0.0036	0.83 U		0.0051	1.18 J		0.0036	0.83 U		0.0061	1.42 J		0.0041	0.96 J		0.0049	1.13 J	
Methylene Chloride	75-09-2	85	9.8	0.0193	5.08 J		0.0197	5.19 J		0.0274	7.22		0.0281	7.41		0.028	7.38		0.0275	7.24	
1,1,2-trichloro 1,2,2-trifluoroethane	76-13-1	187	10.4	0.0086	1.03 J		0.0088	1.05 J		0.0084	1.01 J		0.0044	0.53 U		0.0044	0.53 U		0.0096	1.15 J	
Propanenitrile	107-12-0	55	11.2	0.005	2.03 U		0.005	2.03 U		0.206	83.77		0.1955	79.52		0.1897	77.16		0.189	76.86	
Propanol	71-23-8	60	11.3	0.0042	1.57 U		0.0042	1.57 U		1.4085	524.98		1.0973	408.97		1.1156	415.79		1.1254	419.44	
1,1-Dichloroethane	75-34-3	99	12.1	0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0048	1.08 J		0.005	1.12 J	
2-Butanone	78-93-3	72	12.8	0.0028	0.87 U		0.0089	2.75 J		1.3555	421.06		1.3827	429.52		1.312	407.55		1.2629	392.29	
cis-1,2-Dichloroethene	156-59-2	97	13.7	0.0036	0.83 U		0.0036	0.83 U		0.0036	0.83 U		0.0036	0.83 U		0.0036	0.83 U		0.0036	0.83 U	
Hexane	110-54-3	86	14.1	0.0064	1.67 J		0.0064	1.67 J		0.1901	49.41		0.1839	47.8		0.1782	46.31		0.1759	45.71	
Chloroform	67-66-3	119	14.3	0.006	1.13 J		0.0059	1.1 J		0.0059	1.11 J		0.0058	1.09 J		0.0058	1.09 J		0.006	1.13 J	
Tetrahydrofuran	109-99-9	72	15.0	0.0026	0.81 U		0.0026	0.81 U		1.0143	315.09		1.089	338.27		1.0524	326.93		0.9831	305.4	
1,2-Dichloroethane	107-06-2	99	15.7	0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U	
1,1,1-Trichloroethane	71-55-6	133	16.2	0.0018	0.3 U		0.0069	1.16 J		0.0463	7.78		0.0491	8.24		0.0479	8.04		0.0479	8.04	
Butanenitrile	109-74-0	69	16.3	0.005	1.62 U		0.005	1.62 U		0.2854	92.5		0.2732	88.56		0.2649	85.87		0.2691	87.21	
1-Butanol	71-36-3	74	16.9	0.009	2.72 U		0.009	2.72 U		33.9597	10263.05 *		31.5642	9539.09 *		28.4478	8597.3 *		20.9006	6316.44 *	
Benzene	71-43-2	78	17.1	0.0016	0.46 U		0.0016	0.46 U		0.012	3.43 J		0.0126	3.6 J		0.0121	3.48 J		0.0125	3.57 J	
Carbon Tetrachloride	56-23-5	154	17.4	0.0074	1.08 J		0.0026	0.38 U		0.0026	0.38 U		0.0076	1.1 J		0.0075	1.09 J		0.0074	1.07 J	
Cyclohexane	110-82-7	84	17.7	0.005	1.33 U		0.005	1.33 U		0.005	1.33 U		0.005	1.33 U		0.005	1.33 U		0.005	1.33 U	
1,2-Dichloropropane	78-87-5	113	18.7	0.0026	0.52 U		0.0026	0.52 U		0.0026	0.52 U		0.0026	0.52 U		0.0026	0.52 U		0.0026	0.52 U	
Trichloroethene	79-01-6	131	19.2	0.0062	1.06 J		0.0055	0.93 J		0.0063	1.07 J		0.0067	1.14 J		0.0067	1.14 J		0.0067	1.15 J	
Heptane	142-82-5	100	19.7	0.0054	1.21 J		0.0036	0.8 U		0.16	35.77		0.1738	38.86		0.1685	37.68		0.168	37.56	
cis-1,3-Dichloropropene	10061-01-5	111	20.9	0.0039	0.78		0.0002	0.04 U		0.0002	0.04 U		0.0002	0.04 U		0.0002	0.04 U		0.0002	0.04 U	
4-Methyl-2-Pentanone	108-10-1	100	21.0	0.0058	1.3 U		0.0058	1.3 U		0.1816	40.61		0.1689	37.77		0.1662	37.17		0.1627	36.4	
Pyridine	110-86-1	79	21.1	0.0111	3.15 J		0.0076	2.15 U		0.0183	5.18 J		0.0189	5.35 J		0.0191	5.42 J		0.0193	5.45 J	
trans-1,3-Dichloropropene	10061-02-6	111	22.0	0.0028	0.57 U		0.0028	0.57 U		0.0028	0.57 U		0.0028	0.57 U		0.0028	0.57 U		0.0028	0.57 U	
Pentanenitrile	110-59-8	83	22.1	0.0038	1.02 U		0.0038	1.02 U		0.0852	22.96		0.083	22.37		0.0808	21.77		0.0832	22.41	
1,1,2-Trichloroethane	79-00-5	133	22.4	0.0055	0.93 J		0.0055	0.92 J		0.0082	1.37 J		0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U	

Table B.1 (Cont'd) SUMMA™ Analysis Results for All Target Analytes from Tank BX-104 Sampled on 8/22/96

Target Analytes	CAS	MW	Ret Time	S6086-A01.019 ISVS			S6086-A02.068 ISVS			S6086-A04.294 ISVS			S6086-A05.295 ISVS			S6086-A05.295 ISVS			S6086-A06.297 ISVS		
				Ambient Air			Ambient Air Thru ISVS									Repeat					
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Toluene	108-88-3	92	23.1	0.0057	1.39 J		0.0057	1.37 J		0.0705	17.15		0.0732	17.8		0.0713	17.33		0.0705	17.15	
1,2-Dibromoethane	106-93-4	188	24.6	0.0071	0.85 J		0.0074	0.88 J		0.0081	0.96 J		0.0087	1.04 J		0.0086	1.03 J		0.0088	1.05 J	
Octane	111-65-9	114	25.2	0.0048	0.94 U		0.0048	0.94 U		0.106	20.79		0.1214	23.81		0.1177	23.09		0.1194	23.42	
Tetrachloroethylene	127-18-4	166	25.6	0.0059	0.8 J		0.0061	0.82 J		0.0168	2.27 J		0.0195	2.64 J		0.0196	2.65 J		0.0201	2.71 J	
Chlorobenzene	108-90-7	113	27.2	0.0049	0.98 J		0.0049	0.97 J		0.0066	1.31 J		0.0071	1.41 J		0.0067	1.34 J		0.007	1.38 J	
Hexanenitrile	628-73-9	97	27.5	0.0064	1.48 U		0.0064	1.48 U		0.1358	31.33		0.1357	31.3		0.1308	30.17		0.1344	31	
Ethylbenzene	100-41-4	106	28.1	0.0039	0.83 J		0.004	0.83 J		0.0103	2.17 J		0.0114	2.4 J		0.0111	2.33 J		0.0113	2.38 J	
p/m-Xylene	106-42-3	106	28.5	0.0084	1.77 U		0.0084	1.77 U		0.037	7.81 J		0.0401	8.45 J		0.0396	8.36 J		0.0405	8.55 J	
Cyclohexanone	108-94-1	98	28.9	0.0064	1.46 U		0.0064	1.46 U		0.0967	22.06		0.0922	21.04		0.093	21.23		0.0955	21.79	
Styrene	100-42-5	104	29.4	0.0104	2.24 U		0.0104	2.24 U		0.0104	2.24 U		0.0104	2.24 U		0.0104	2.24 U		0.0104	2.24 U	
1,1,2,2-Tetrachloroethane	79-34-5	168	29.7	0.0152	2.03 U		0.0152	2.03 U		0.0152	2.03 U		0.0152	2.03 U		0.0152	2.03 U		0.0152	2.03 U	
o-Xylene	95-47-6	106	29.7	0.0116	2.45 U		0.0116	2.45 U		0.0193	4.08 J		0.0212	4.46 J		0.0211	4.45 J		0.0215	4.54 J	
Nonane	111-84-2	128	30.2	0.0102	1.78 U		0.0102	1.78 U		0.1142	19.94		0.1174	20.51		0.1154	20.15		0.1178	20.56	
1-Ethyl-2-Methyl-Benzene	611-14-3	120	33.1	0.0216	4.03 U		0.0216	4.03 U		0.0216	4.03 U		0.0216	4.03 U		0.0216	4.03 U		0.0216	4.03 U	
1,3,5-Trimethylbenzene	108-67-8	120	33.4	0.0172	3.21 U		0.0172	3.21 U		0.0172	3.21 U		0.0172	3.21 U		0.0172	3.21 U		0.0172	3.21 U	
1,2,4-Trimethylbenzene	95-63-6	120	34.6	0.0196	3.65 U		0.0196	3.65 U		0.0196	3.65 U		0.0196	3.65 U		0.0196	3.65 U		0.0196	3.65 U	
Decane	124-18-5	142	34.9	0.0144	2.27 U		0.0144	2.27 U		0.1381	21.75 J		0.1269	19.98 J		0.1263	19.89 J		0.1297	20.42 J	
1,3-Dichlorobenzene	541-73-1	147	35.1	0.0132	2.01 U		0.0132	2.01 U		0.0132	2.01 U		0.0132	2.01 U		0.0132	2.01 U		0.0132	2.01 U	
1,4-Dichlorobenzene	106-46-7	147	35.3	<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20	
1,2-Dichlorobenzene	95-50-1	147	36.4	<0.132	<16		<0.132	<16		<0.132	<16		<0.132	<16		<0.132	<16		<0.132	<16	
Undecane	1120-21-4	156	39.2	<0.111	<16		<0.111	<16		<0.111	<16		<0.111	<16		<0.111	<16		<0.111	<16	
1,2,4-Trichlorobenzene	120-82-1	181	42.6	<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60	
Dodecane	112-40-3	170	43.2	<0.348	<46		<0.348	<46		12.5017	1643.99 *		11.2606	1480.79 *		10.4851	1378.81 *		9.1223	1199.6 *	
Hexachloro-1,3-butadiene	87-68-3	261	44.4	0.0233	2 U		0.0233	2 U		0.0233	2 U		0.0233	2 U		0.0233	2 U		0.0233	2 U	
Tridecane	629-50-5	184	46.9	<0.312	<38		<0.312	<38		30.347	3687 *		19.961	2425 *		19.962	2425 *		20.262	2462 *	
Tetradecane	629-59-4	198	50.4	<0.228	<26		<0.228	<26		5.289	597 *		2.198	248 *		2.248	254 *		2.593	293 *	

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

U Target compound not detected at or above the IDL.

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

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

Table B.2 Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-104 Sampled on 8/22/96.

Target Analytes	CAS	MW	Ret Time	S6086-A11.1173 ISVS			S6086-A12.1174 ISVS			S6086-A12.1174 ISVS REP			S6086-A13.1175 ISVS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	121	7.8	0.0045	0.84	U	0.0043	0.8	U	0.0043	0.8	U	0.0046	0.84	U
Chloromethane	74-87-3	50	8.8	0.0033	1.48	U	0.0032	1.43	U	0.0032	1.43	U	0.0034	1.5	U
1,2-dichloro 1,1,2,2-tetrafluoroethane	76-14-2	171	9.5	0.0033	0.44	U	0.0032	0.42	U	0.0032	0.42	U	0.0034	0.44	U
Methanol	67-56-1	32	10.0	2.2389	1565.3	Y	2.2978	1606.48	Y	1.9677	1375.68	Y	1.6416	1147.65	Y
Vinyl Chloride	75-01-4	63	9.9	0.0032	1.14	U	0.0031	1.1	U	0.0031	1.1	U	0.0032	1.15	U
1,3-Butadiene	106-99-0	54	10.5	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58	10.8	0.5993	230.89		0.5793	223.19		0.5429	209.15		0.515	198.42	
Chloroethane	75-00-3	65	12.1	0.0043	1.51	U	0.0042	1.45	U	0.0042	1.45	U	0.0044	1.52	U
Ethanol	64-17-5	46	12.5	1.9238	935.37	Y	1.7694	860.3	Y	1.4182	689.56	Y	1.4264	693.54	Y
Acetonitrile	75-05-8	41	13.0	0.5664	309.05		0.6531	356.37		0.6077	331.59		0.4975	271.5	
Acetone	67-64-1	58	13.7	5.8456	2254.5	E	5.4477	2101.05	E	4.7658	1838.04	E	4.4855	1729.94	E
Trichlorofluoromethane	75-69-4	137	14.1	1.9084	311.18		1.716	279.82		1.6719	272.63		1.6389	267.25	
Pentane	109-66-0	72	14.9	0.2913	90.62		0.2814	87.54		0.2752	85.63		0.254	79.02	
1,1-Dichloroethene	75-35-4	97	15.5	0.0022	0.5	U	0.0021	0.48	U	0.0021	0.48	U	0.0022	0.51	U
Methylene Chloride	75-09-2	85	15.8	0.2007	52.92		0.1669	44.02		0.1751	46.18		0.1419	37.42	J
1,1,2-trichloro 1,1,2,2-trifluoroethane	76-13-1	187	16.3	0.0032	0.38	U	0.0031	0.37	U	0.0031	0.37	U	0.0032	0.38	U
Propanenitrile	107-12-0	55	17.0	0.2506	101.92		0.2433	98.93		0.2356	95.83		0.201	81.74	
Propanol	71-23-8	60	17.0	2.0888	778.54		1.9409	723.38		1.84	685.79		1.6746	624.13	
1,1-Dichloroethane	75-34-3	99	18.0	0.0015	0.34	U	0.0014	0.32	U	0.0014	0.32	U	0.0015	0.34	U
2-Butanone	78-93-3	72	18.6	1.8313	568.88		1.6639	516.88		1.5943	495.25		1.4028	435.76	
cis-1,2-Dichloroethene	156-59-2	97	19.5	0.0027	0.61	U	0.0025	0.59	U	0.0025	0.59	U	0.0027	0.62	U
Hexane	110-54-3	86	19.9	0.252	65.49		0.2517	65.43		0.2462	63.99		0.2231	57.99	
Chloroform	67-66-3	119	20.0	0.003	0.57	U	0.0029	0.55	U	0.0029	0.55	U	0.003	0.57	U
Tetrahydrofuran	109-99-9	72	20.7	0.956	296.96		0.9611	298.55		0.9372	291.14		0.8291	257.54	
1,2-Dichloroethane	107-06-2	99	21.4	0.0012	0.26	U	0.0011	0.25	U	0.0011	0.25	U	0.0012	0.27	U
Butanenitrile	109-74-0	69	21.8	0.3037	98.44		0.3077	99.73		0.292	94.65		0.2465	79.9	
1,1,1-Trichloroethane	71-55-6	133	21.9	0.0568	9.54		0.0562	9.43		0.0565	9.48		0.0533	8.95	
1-Butanol	71-36-3	74	22.3	21.0456	6370.6	E	22.3019	6750.83	E	22.2362	6730.97	E	18.3144	5543.82	E
Benzene	71-43-2	78	22.8	0.0124	3.56	J	0.0128	3.68	J	0.0147	4.22		0.0112	3.22	J
Carbon Tetrachloride	56-23-5	154	23.1	0.0015	0.22	U	0.0014	0.21	U	0.0014	0.21	U	0.0015	0.22	U
Cyclohexane	110-82-7	84	23.3	0.0043	1.16	U	0.0042	1.11	U	0.0042	1.11	U	0.0044	1.17	U
1,2-Dichloropropane	78-87-5	113	24.3	0.002	0.4	U	0.0019	0.38	U	0.0019	0.38	U	0.002	0.4	U
Trichloroethene	79-01-6	131	24.7	0.0068	1.16	J	0.0036	0.61	J	0.0037	0.63	U	0.0041	0.7	J
Heptane	142-82-5	100	25.2	0.2331	52.1		0.2347	52.46		0.2263	50.6		0.2045	45.72	
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.2888	64.59		0.27	60.38		0.2657	59.43		0.2455	54.9	
cis-1,3-Dichloropropene	10061-01-5	111	26.4	0.0013	0.27	U	0.0013	0.26	U	0.0013	0.26	U	0.0013	0.27	U

Table B.2 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-104 Sampled on 8/22/96.

Target Analytes	CAS	MW	Ret Time	S6086-A11.1173 ISVS			S6086-A12.1174 ISVS			S6086-A12.1174 ISVS REP			S6086-A13.1175 ISVS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Pyridine	110-86-1	79	26.5	0.034	9.62	J	0.0324	9.16	J	0.0309	8.75	J	0.0267	7.56	J
trans-1,3-Dichloropropene	10061-02-6	111	27.4	0.0028	0.57	U	0.0027	0.55	U	0.0027	0.55	U	0.0028	0.57	U
Pentanenitrile	110-59-8	83	27.4	0.0834	22.47		0.0884	23.82		0.0854	23		0.065	17.5	
1,1,2-Trichloroethane	79-00-5	133	27.8	0.0016	0.28	U	0.0016	0.27	U	0.0016	0.27	U	0.0017	0.28	U
Toluene	108-88-3	92	28.5	0.5214	126.75		0.5057	122.93		0.4749	115.45		0.527	128.13	
1,2-Dibromoethane	106-93-4	188	30.0	0.0025	0.3	U	0.0024	0.29	U	0.0024	0.29	U	0.0025	0.3	U
Octane	111-65-9	114	30.4	0.0947	18.6		0.132	25.94		0.1216	23.89		0.0714	14.04	
Tetrachloroethylene	127-18-4	166	31.0	0.0123	1.66	J	0.0147	1.99	J	0.0141	1.91	J	0.0096	1.29	J
Chlorobenzene	108-90-7	113	32.6	0.0012	0.23	U	0.0011	0.22	U	0.0011	0.22	U	0.0012	0.23	U
Hexanenitrile	628-73-9	97	32.8	0.0914	21.1		0.1302	30.08		0.1236	28.54		0.0612	14.13	
Ethylbenzene	100-41-4	106	33.4	0.0918	19.38		0.093	19.62		0.0878	18.52		0.092	19.4	
p/m-Xylene	106-42-3	106	33.8	0.2797	59.02		0.2925	61.71		0.2733	57.67		0.2739	57.79	
Cyclohexanone	108-94-1	98	34.3	0.1094	24.97	J	0.0876	20	J	0.072	16.44	J	0.0815	18.6	J
Styrene	100-42-5	104	34.8	0.0314	6.76		0.0297	6.38		0.0288	6.19		0.0302	6.5	
1,1,2,2-Tetrachloroethane	79-34-5	168	35.0	0.0062	0.82	U	0.0059	0.79	U	0.0059	0.79	U	0.0062	0.83	U
o-Xylene	95-47-6	106	35.1	0.089	18.77		0.0918	19.37		0.0898	18.94		0.0814	17.17	
Nonane	111-84-2	128	35.4	0.0529	9.26		0.0817	14.29		0.0777	13.61		0.0369	6.45	
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.0115	2.14	J	0.0058	1.08	J	0.0053	0.99	J	0.0051	0.95	J
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.0057	1.07	J	0.0031	0.58	J	0.0056	1.05	J	0.0054	1	J
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.0151	2.82	J	0.0153	2.86	J	0.0145	2.71	J	0.0141	2.63	J
Decane	124-18-5	142	40.1	0.0604	9.51		0.0736	11.58		0.0711	11.19		0.0413	6.5	
1,3-Dichlorobenzene	541-73-1	147	40.5	0.0068	1.04	J	0.0072	1.09	J	0.0069	1.05	J	0.0063	0.97	J
1,4-Dichlorobenzene	106-46-7	147	40.7	0.0069	1.05	J	0.0072	1.1	J	0.0069	1.05	J	0.0064	0.97	J
1,2-Dichlorobenzene	95-50-1	147	41.8	0.005	0.76	U	0.0048	0.73	U	0.0048	0.73	U	0.005	0.77	U
Undecane	1120-21-4	156	44.4	0.2352	33.78		0.3964	56.92		0.3697	53.09		0.1068	15.33	
1,2,4-Trichlorobenzene	120-82-1	181	48.0	0.0164	2.02	U	0.0158	1.95	U	0.0158	1.95	U	0.0166	2.05	U
Dodecane	112-40-3	170	48.4	2.2533	296.9		3.7445	493.39	E	3.6203	477.03	E	1.0248	135.04	
Hexachloro-1,3-butadiene	87-68-3	261	49.9	0.0218	1.87	U	0.0209	1.8	U	0.0209	1.8	U	0.022	1.89	U
Tridecane	629-50-5	184	52.2	6.8918	839	E	10.3984	1265.89	E	10.2699	1250.25	E	3.4931	425.25	E
Tetradecane	629-59-4	198	55.7	3.875	438.39	E	5.9146	669.13	E	5.742	649.6	E	1.9164	216.8	E
Tributyl Phosphate	126-73-8	266	63.1	<0.0105	<0.88	Z	<0.010	<0.85	Z	<0.0101	<0.85	Z	0.0132	1.12	Z

E Target compound exceeds 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.

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 BX-104 on 8/22/96.

Target Analytes	CAS	MW	Ret Time	S6086-A17.1177 ISVS			S6086-A18.1178 ISVS			S6086-A19.1179 ISVS			S6086-A20.1180 ISVS		
				(mg/m ³)	FB # 1		(mg/m ³)	FB # 2		(mg/m ³)	TB # 1		(mg/m ³)	TB # 2	
					(ppbv)	Flag		(ppbv)	Flag		(ppbv)	Flag		(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	121	7.8	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	8.8	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U
1,2-dichloro1,1,2,2-tetrafluoroethane	76-14-2	171	9.5	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	10.0	0.276	192.93	Y	<0.274	<192	Y	<0.274	<192	Y	<0.274	<192	Y
Vinyl Chloride	75-01-4	63	9.9	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	10.5	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58	10.8	0.027	10.4	J	0.0036	1.39	U	0.0036	1.39	U	0.0036	1.39	U
Chloroethane	75-00-3	65	12.1	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	12.5	<0.275	<133	Y	<0.275	<133	Y	<0.275	<133	Y	<0.275	<133	Y
Acetonitrile	75-05-8	41	13.0	0.0169	9.24	J	0.0065	3.55	J	0.0033	1.8	U	0.0033	1.8	U
Acetone	67-64-1	58	13.7	0.2039	78.62		0.1118	43.1		0.0072	2.78	U	0.0169	6.5	J
Trichlorofluoromethane	75-69-4	137	14.1	0.067	10.92		0.0345	5.63	J	0.0044	0.72	U	0.0044	0.72	U
Pentane	109-66-0	72	14.9	0.017	5.29	J	0.0102	3.17	J	0.0029	0.89	U	0.0029	0.89	U
1,1-Dichloroethene	75-35-4	97	15.5	0.0056	1.29	J	0.0021	0.47	U	0.0021	0.47	U	0.0021	0.47	U
Methylene Chloride	75-09-2	85	15.8	0.1272	33.54	J	0.4908	129.45		0.1058	27.9	J	0.1299	34.26	J
1,1,2-trichloro1,2,2-trifluoroethane	76-13-1	187	16.3	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	17.0	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	17.0	0.068	25.34		0.0053	1.99	U	0.0053	1.99	U	0.0053	1.99	U
1,1-Dichloroethane	75-34-3	99	18.0	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	18.6	0.0486	15.1		0.0171	5.32	J	0.0022	0.68	U	0.0022	0.68	U
cis-1,2-Dichloroethene	156-59-2	97	19.5	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	19.9	0.0366	9.52		0.0275	7.15		0.0013	0.32	U	0.0013	0.32	U
Chloroform	67-66-3	119	20.0	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	20.7	0.0211	6.54	J	0.0035	1.07	U	0.0035	1.07	U	0.0035	1.07	U
1,2-Dichloroethane	107-06-2	99	21.4	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	21.8	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	21.9	0.0087	1.46	J	0.009	1.51	J	0.0027	0.44	U	0.0027	0.44	U
1-Butanol	71-36-3	74	22.3	0.5119	154.94		0.0597	18.07	J	0.0075	2.29	U	0.0075	2.29	U
Benzene	71-43-2	78	22.8	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	154	23.1	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	23.3	0.0305	8.12	J	0.0226	6.02	J	0.0041	1.09	U	0.0041	1.09	U
1,2-Dichloropropane	78-87-5	113	24.3	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	24.7	0.0036	0.61	U	0.0229	3.91	J	0.0037	0.62	J	0.0042	0.71	J
Heptane	142-82-5	100	25.2	0.0512	11.45		0.0444	9.94		0.0015	0.35	U	0.0015	0.35	U
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.0607	13.59		0.0494	11.05		0.0021	0.46	U	0.0021	0.46	U
cis-1,3-Dichloropropene	10061-01-5	111	26.4	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 BX-104 on 8/22/96.

Target Analytes	CAS	MW	Ret Time	S6086-A17.1177 ISVS			S6086-A18.1178 ISVS			S6086-A19.1179 ISVS			S6086-A20.1180 ISVS		
				(mg/m ³)	FB # 1		(mg/m ³)	FB # 2		(mg/m ³)	TB # 1		(mg/m ³)	TB # 2	
					(ppbv)	Flag		(ppbv)	Flag		(ppbv)	Flag		(ppbv)	Flag
Pyridine	110-86-1	79	26.5	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	111	27.4	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	27.4	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	27.8	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	28.5	0.3299	80.2		0.2889	70.23		0.0011	0.27	J	0.0009	0.23	U
1,2-Dibromoethane	106-93-4	188	30.0	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	30.4	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U
Tetrachloroethylene	127-18-4	166	31.0	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U
Chlorobenzene	108-90-7	113	32.6	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	32.8	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	33.4	0.0513	10.82		0.04	8.43		0.0014	0.3	U	0.0014	0.3	U
p/m-Xylene	106-42-3	106	33.8	0.1516	31.98		0.1158	24.43		0.003	0.63	U	0.003	0.63	U
Cyclohexanone	108-94-1	98	34.3	0.0673	15.36	J	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U
Styrene	100-42-5	104	34.8	0.0161	3.46		0.0142	3.06	J	0.0015	0.33	U	0.0015	0.33	U
1,1,2,2-Tetrachloroethane	79-34-5	168	35.0	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	35.1	0.0454	9.58		0.0321	6.78		0.0019	0.4	U	0.0019	0.4	U
Nonane	111-84-2	128	35.4	0.0061	1.06	J	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.0056	1.04	J	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.0025	0.47	J	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.0068	1.26	J	0.0049	0.91	J	0.0025	0.47	U	0.0025	0.47	U
Decane	124-18-5	142	40.1	0.016	2.52	J	0.0126	1.99	J	0.003	0.47	U	0.003	0.47	U
1,3-Dichlorobenzene	541-73-1	147	40.5	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	40.7	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	41.8	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	44.4	0.0096	1.38	J	0.006	0.86	J	0.0044	0.63	U	0.0044	0.63	U
1,2,4-Trichlorobenzene	120-82-1	181	48.0	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	48.4	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	261	49.9	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	52.2	0.054	6.57	U	0.054	6.57	U	0.054	6.57	U	0.054	6.57	U
Tetradecane	629-59-4	198	55.7	0.0232	2.62	J	0.013	1.47	U	0.0329	3.72	J	0.013	1.47	U
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.

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

PNNL-11482

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