Pacific Northwest National Laboratory

Operated by Battelle for the
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TANK VAPOR CHARACTERIZATION PROJECT

Tank 241-BX-102 Headspace Gas and Vapor Characterization Results from Samples Collected on July 31, 1996

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Pacific Northwest National Laboratory
Richland, Washington 99352

Summary

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

No analytes were determined to be above the immediate notification limits specified by the sampling and analysis plan (SAP, Buckley 1996). Ammonia and TNMOCs were the principal flammable constituents of the Tank BX-102 headspace, each determined to be present at approximately 0.002% of its lower flammability limit (LFL). Total headspace flammability was estimated to be <0.107% 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-102 Sampled on 7/31/96

<u>Category</u>	<u>Sample Medium</u>	<u>Analyte</u>	<u>Concentration^(a)</u>	<u>Units</u>
Inorganic Vapors	Sorbent Traps	Ammonia	2.6	ppmv
		Nitrogen Dioxide (NO ₂)	<0.16	ppmv
		Nitric Oxide (NO)	<0.16	ppmv
		Water	16.6	mg/L
Permanent Gases	SUMMA™ Canisters	Carbon Dioxide	1271	ppmv
		Carbon Monoxide	<17	ppmv
		Methane	<25	ppmv
		Hydrogen	<17	ppmv
		Nitrous Oxide (N ₂ O)	<17	ppmv
Total Non-Methane Organic Compounds	SUMMA™ Canisters	Total Non-Methane Organic Compounds	0.87	mg/m ³
Volatile Organic Vapors	SUMMA™ Canisters	Trichlorofluoromethane	0.533	mg/m ³
		Acetone	0.119	mg/m ³
		Acetonitrile	0.068	mg/m ³
Volatile Organic Vapors	Sorbent Traps	Trichlorofluoromethane	0.560	mg/m ³
		Toluene	0.206	mg/m ³
		1-Butanol	0.166	mg/m ³
Flammables	SUMMA™ Canisters and Sorbent Traps	Flammables	<0.107	% 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.

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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
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
SAP	sample and analysis plan
SCIC	suppressed-conductivity ion chromatography
SIE	selective ion electrode
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
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 July 31, 1996 from the headspace of waste storage tank 241-BX-102 (Tank BX-102) at the Hanford Site in Washington State. Pacific Northwest National Laboratory^(a) provided SUMMA™ canisters and sorbent traps for sample collection, and analyzed the samples according to instructions in the SAP (Buckley 1996). Analytical work was performed by the PNNL VAL in the 300 Area of the Hanford Site under the PNNL Tank Vapor Characterization Project.

Pacific Northwest National Laboratory provided six sets of sorbent traps for selected inorganic analytes (four samples and two field blanks), five SUMMA™ canisters for permanent gases and organic analytes (three headspace samples and two ambient air samples), and eight triple sorbent traps (TSTs) for organic analytes (four samples, two field blanks, and two trip blanks). Sample devices and controls were provided to WHC on July 29, 1996, and returned to PNNL on August 7, 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	SIE 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 analysis. 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 selective ion electrode (SIE) 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 Laboratory, Richland, Washington.

Table 2.3 Quantitation Limits for Selected Inorganic Analytes

<u>Analyte</u>	<u>Formula</u>	<u>EQL^(a) (ppmv)</u>
Ammonia	NH ₃	0.66
Nitrogen Dioxide	NO ₂	0.15
Nitric oxide	NO	0.15
Mass (water) ^(b)	n/a	0.3 mg/L

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

(b) The vapor-mass concentration, thought to be largely water vapor, is determined gravimetrically.
n/a = not applicable.

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

2.2 Permanent Gases

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

2.2.1 SUMMA Canister Preparation

All SUMMATM canisters are cleaned and verified contaminant-free according to PNNL Technical Procedure PNL-TVP-02^(a) before use. The cleaning procedure uses an EnTech 3000 cleaning system that alternately fills the canisters with purified humid air and evacuates them for several cycles while the canister is heated. If the canister is verified as clean, the canister is evacuated to 5 mtorr and tagged. Before sending the canisters to the field for sampling, the canister vacuum is measured to determine if any leakage has occurred. If the vacuum has remained constant during storage, the canisters are prehumidified with 100 μ L of distilled water and labeled. Canisters stored more than 30 but less than 60 days are re-evacuated and rehumidified before use. If stored more than 60 days, the canisters are recleaned and validated before use. All canisters are stored at room temperature.

2.2.2 Analytical Procedure

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

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

Hewlett-Packard 5890 GC/TCD fitted with a loop injector valve and a column switching valve. An aliquot of 5 mL is used so that the 1.0-mL injection loop is completely purged with sample air, ensuring that no dilution of the sample takes place within the injection loop. One set of GC conditions is used to analyze for carbon monoxide, carbon dioxide, N₂O, and methane using helium as the carrier gas. A second GC/TCD analysis is performed for hydrogen using nitrogen as the carrier gas to enhance the signal sensitivity and lower the detection limit for this analyte. The permanent gases and the derived EQLs are listed in Table 2.4.

Table 2.4 Quantitation Limits for Permanent Gases

<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

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

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

The method uses an EnTech 7000 cryoconcentration system interfaced with a Hewlett-Packard 5890 gas chromatograph/flame ionization detector (GC/FID). The EnTech concentrator is used to pull a metered volume of 50 to 100 mL of sample air from the SUMMA™ canister mounted on an EnTech 7016CA 16-canister autosampler. The sample is cryogenically concentrated, and constituents are trapped in a stainless steel tube containing glass beads and Tenax. The glass bead/Tenax trap is heated to 180°C and purged with ultra high purity (UHP) helium into the GC/FID. The GC oven is programmed to run at a 150°C isothermal temperature. Chromatographic separation is not needed in this method since quantitation is from the entire FID response over the run time.

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

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

2.3.2 Quality Assurance/Quality Control

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

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

Before the tank samples were analyzed, a diagnostic check was performed on the GC/FID instrument by running a system cleanliness procedure and an instrument continuing calibration as described in PNL-TVP-08. First, two blank volumes of Aadco purified air were analyzed to check the cleanliness of the system. This demonstrates through the analysis of a zero-air blank that the level of interference is acceptable in the analytical system. The analysis of purified air must be below 0.1 mg/m³. Second, an instrument continuing calibration 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 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), PNL Technical Procedure, Richland, Washington.

volume of sample air from the SUMMA™ canister, cryogenically concentrate the condensable 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 Table B.1 (see Appendix B). 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 previously determined 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 2.4.2.

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

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 Table B.2 (see Appendix B). 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 previously determined 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-102 on July 31, 1996 (Sample Job S6080) 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 with the exception of only three samples for water vapor. The four inorganic vapors were collected at the same time using sorbent traps connected in series. Sample air was drawn first through an ammonia trap, then through a three-tube system that collected nitrogen dioxide and nitric oxide (described below), and then through a desiccant trap to remove any remaining water vapor.

Two field blank multi-trap trains, identical to sample multi-trap trains discussed in Section 2.1, were included in the tube bundle lowered into the headspace of Tank BX-102 during sample job S6080. 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 $<13\%$, which is within the 25% specified by the SAP.

3.1.1 Ammonia

Ammonia analyses were performed on August 15, 1996, 16 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 0.20 to 0.25 μmol in front sections; blank corrected back sorbent section ammonia concentrations were $<0.01 \mu\text{mol}$. Blank corrections of 0.099 μmol in front and 0.049 μmol in the back sections, were about 30% of collected quantities. The analysis of one sample was a duplicate and indicated a reproducibility of $\pm 1.4\%$. 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 102%. The initial and continuing calibration verification (ICV, CCV) standards, using NIST-traceable material, yielded percentage recoveries of 102% (ICV) and 104% and 109% (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 August 9, 1996, 10 days after sample collection, and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed. No deviations from the procedure were noted.

Blank-corrected NO_2^- quantities in the sorbent traps were all $<0.013 \mu\text{mol}$. Nitrite blank levels used to correct data were $0.0057 \mu\text{mol}$ in front (four of four blanks analyzed) and $0.0037 \mu\text{mol}$ in back (two of four blanks analyzed) sorbent sections. The analyses of two samples were duplicated and yielded repeatabilities of $\pm 0\%$ and $\pm 2.5\%$. Two sample leachates were spiked with 0.125 and 0.25 ppm NO_2^- and yielded percentage recoveries of 105% and 86%, 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 8, 1996, within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed, but the results of one analysis were excluded from the averages. The excluded result was an obvious outlier and was probably due to an inadvertent loss of glass chips during sample train disassembly.

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 dry air at STP (0°C and 1.013 bar) and for moist air at tank conditions. 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 16.6 mg of water per L of dry air at STP. The result was determined from an average mass gain of 34.3 mg from three of four multi-trap trains. The blank correction applied to the results was - 3.5 mg per multi-trap train. A control mass was measured and indicated a measurement accuracy of $\pm 0.1 \text{ mg}$. The average water vapor concentration corresponds to a tank headspace dew point at 17.6°C and relative humidity at 97% at the time of sampling.

3.2 Permanent Gases

Hydrogen analyses were performed on August 23, 1996, and analyses for other permanent gases were performed on August 26, 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. Carbon dioxide at an average concentration of 1271 ppmv was the only permanent gas detected in Tank BX-102. Carbon dioxide was present at a higher 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 1% for carbon dioxide.

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 September 18, 1996, which is within 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 $0.87 \text{ mg}/\text{m}^3$ or 0.36 ppmv of carbon. The $0.87 \text{ mg}/\text{m}^3$ value compares to $1.06 \text{ mg}/\text{m}^3$ 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 analytical procedure allows 15% of the target compounds to exceed the $\pm 25\%$ D specified by the procedure. The RPD for duplicate analysis of a single SUMMA™ canister was 2%.

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

3.4.1 SUMMA™ Canister Results

Analyses of SUMMA™ canisters for organic vapors were performed on September 21 and 22, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.1.1.

Measured concentrations of target analytes and TICs are presented in Table 3.4. Twenty-five target analytes and no TICs above the instrument detection limit (IDL) were detected in the tank headspace samples. Of these, twenty-three target analytes were identified in two or more tank headspace samples. Trichlorofluoromethane at $0.533 \text{ mg}/\text{m}^3$, acetone at $0.119 \text{ mg}/\text{m}^3$, and acetonitrile at $0.069 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace samples. The total average concentration of the target analytes was $1.06 \text{ mg}/\text{m}^3$. This compares to a total concentration of $0.87 \text{ mg}/\text{m}^3$ identified in the TO-12 analysis of the three tank headspace samples.

SUMMA™ canister sample S6080-A05.171 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. Nineteen of 21 compounds had RPDs of less than 10%.

Results of analyses of target analytes and TICs in ambient air and ambient air through the ISVS samples are provided in Table 3.6. No TICs were observed in the ambient samples. Fourteen target compounds were observed in one or both of the ambient air samples. All target compounds were observed below the EQL with the exception of 1,1,2-trichloro-1,2,2-trifluoroethane which was observed at 12 ppbv.

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. The SUMMA™ canister samples were analyzed in one batch. The sample analytical sequence run (batch) was as follows:

Batch #1 (File Identifier # 26092101.d) - S6080-A01.167, S6080-A02.169, S6080-A04.170, S6080-A05.171, S6080-A05.171 REP, and S6080-A06.205.

The initial calibration blank (ICB) showed evidence of contamination carry-over from the initial calibration verification. Tubing between the multi-position and the 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.

All target compounds met the 25% D criterion in the CCV with the exception of tetrahydrofuran (29.3%), decane (26.1%), undecane (26.1%), dodecane (25.3%), tridecane (25.8), and tetradecane (34.7%). None of the target compounds that failed the CCV criterion were found in tank samples.

The only target compounds present in the continuing calibration blank (CCB) above the EQL was cis-1,3-dichloropropene (0.22 ppbv), which was not found in tank samples.

The compound 1,3-butadiene is not currently included in the method performance section of the procedure for System 2; however, this analyte was analyzed by this method. The low level standard is used as the EQL for this compound. Sample results are flagged with a less-than symbol (<) when less than the EQL value.

3.4.2 Triple Sorbent Trap Sample Results

Analyses of TSTs were performed on August 29 and 30, 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. Thirty-two target analytes above the IDL and 10 TICs were detected in the tank headspace samples. Of these, 30 target analytes and eight TICs were

identified in two or more tank headspace samples. Three of the 10 TICs were identified as unknowns. Trichlorofluoromethane at 0.560 mg/m³, toluene at 0.206 mg/m³, and 1-butanol at 0.166 mg/m³ were the three most abundant compounds identified in the tank headspace sample. The total concentration of the target analytes was 2.10 mg/m³ and the total concentration of the TICs was 5.54 mg/m³. The total concentration of all compounds found was 7.63 mg/m³.

Triple sorbent trap sample S6080-A12.716 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. Twenty-three of 28 target analytes and six of eight 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. Twenty-nine target compounds were identified in one or more of the blank samples. Most of the compounds were found in the field blank samples. Most of the compounds observed were below the EQL; however, acetone, 2-butanone, tetrahydrofuran, heptane, ethylbenzene, p/m-xylene, styrene, o-xylene, and toluene exceed the EQLs. In addition to the target compounds, nine 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 procedure PNL-TVP-10, Rev. 2 with the initial calibration performed on August 13, 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 #46082901.d) - S6080-A17.742, S6080-A18.766, S6080-A19.795, S6080-A20.804.

Batch #2 (file identifier #46083001.d) - S6080-A11.706, S6080-A12.716, S6080-A12.716 REP, S6080-A13.718.

Batch #1:

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

Performance of the first CCV was unacceptable and a second CCV was run. The second CCV showed acceptable performance as specified in the procedure for all target compounds with the exception of chloromethane (22.5%), 1,2-dichloro-1,1,2,2-tetrafluoroethane (30.8%), methanol

(42.9%), 1,3-butadiene (55.2%), and acetone (33.1%); however, the CCV passed the procedure criterion requiring $\pm 25\%$ D passage for 85% of all target compounds.

Target compounds observed in at least one field blank at levels in excess of the EQL included acetone, 1,1-dichloroethene, 2-butanone, tetrahydrofuran, heptane, toluene, ethyl benzene, p/m xylene, styrene, and o-xylene. The trip blanks showed only methylene chloride above the EQL with traces of several other compounds at levels below the EQL. Environmental contamination problems apparently associated in past work with field bundle preparation, were evident in this sampling job.

Both field blanks, one of the trip blanks, and all samples contained minor amounts of the TIC 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, it may be associated with one of the refrigerators used for interim storage. Other TICs present in the field blanks included acetaldehyde, 2-methyl propene, 1-fluoro-1,1-dichloroethane, some alkanes, and two siloxane compounds believed to be originating 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 chloromethane (28.4%), methanol (76.6%), 1,3-butadiene (43.9%), butane (27.5%), ethanol (36.8%), and propanol (31.5%); however, the CCV passed the procedure criterion requiring $\pm 25\%$ D passage for 85% of all target compounds.

Organic loading in Tank BX-102 was relatively low. The TICs detected were essentially the same as in the field blanks and probably represent environmental contamination associated with assembly of the ISVS sampling bundle.

Sample volumes for all ISVS 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:

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. There is 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 procedure PNL-TVP-10; however, these compounds were analyzed per this method. The low level standard was used as the EQL for these compounds. Sample results flagged with a less-than symbol (<) when less than the EQL value.

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 performed on TBP demonstrated that detectability at 0.08 ppbv (based on a 200 mL sample) was possible. Tributyl phosphate was not detected in any sample.

3.5 Flammability

The analytical results presented above can be used to estimate the tank BX-102 headspace flammability at the time of sampling. Flammability is calculated using the ammonia concentration from the inorganic analysis, carbon monoxide, hydrogen, and methane concentrations measured from the permanent gas analysis, and the total nonmethane hydrocarbon concentration determined from the TO-12 analysis. Table 3.10 summarizes the calculated flammability data. Ammonia and TNMOC were the principle flammable constituents of the Tank BX-102 headspace, each determined to be present at approximately 0.002% of its LFL. Total headspace flammability was estimated to be <0.107% of the LFL.

Table 3.1 Inorganic Vapor Concentrations from Tank BX-102 Sampled on 7/31/96

Analyte	CAS Number	S6080-A07-58R	S6080-A08-59R	S6080-A09-60R	S6080-A10-61R	Average	Standard Deviation
Ammonia (ppmv)	7664-41-7	2.5	2.4	2.5	3.0	2.6	0.3
Nitric Oxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Nitrogen Dioxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Water ^(a) (mg/L)		9.2 x	17.6	17.50	14.6	16.6	1.7
Water ^(b) (mg/L)		8.4 x	15.9	15.90	13.3	15	1.5

Footnotes

(a) Dry air at 0°C and 1.013 bar.

(b) Moist air at tank temperature and pressure.

x Values not used in calculation of average and standard deviation.

Table 3.2 Permanent Gas Analysis Results from Tank BX-102 Sampled on 7/31/96

Permanent Gas Analyte	Ambient Air Upwind S6080-A01.167 ^(a)	Ambient Air Through Bundle S6080-A02.169 ^(a)	Tank Samples				RPD ^(c) (%)	Mean (ppmv)	St. Dev. ^(d)
	Concentration (ppmv)	Concentration (ppmv)	S6080-A04.170 ^(a) Concentration (ppmv)	S6080-A06.205 ^(a) Concentration (ppmv)	S6080-A05.171 ^{(a)(b)} Concentration (ppmv)	S6080-A05.171 ^{(a)(b)} Concentration (ppmv)			
Hydrogen	<17	<17	<17	<17	<17	<17	na	<17	
Methane	<25	<25	<25	<25	<25	<25	na	<25	
Carbon Dioxide	480	378	1257	1281	1276	1283	1	1271	13
Carbon Monoxide	<17	<17	<17	<17	<17	<17	na	<17	
Nitrous Oxide	<17	<17	<17	<17	<17	<17	na	<17	

Footnotes

(a) WHC sample identification number.

(b) Replicate analysis for S6080-A05.171; results are not included in the calculation of average concentrations.

(c) Relative percent differences (RPDs) for replicate analysis

(d) Standard deviation (St. Dev.)

na Not Applicable

Table 3.3 Total Non-Methane Organic Compound Analysis Results from Tank BX-102 Sampled on 7/31/96

	Ambient Air Upwind	Ambient Air Through Bundle	Tank Samples				RPD ^(c) (%)	Mean	St. Dev.
	S6080-A01.167 ^(a) Concentration	S6080-A02.169 ^(a) Concentration	S6080-A04.170 ^(a) Concentration	S6080-A06.205 ^(a) Concentration	S6080-A05.171 ^{(a)(b)} Concentration	S6080-A05.171 ^{(a)(b)} Concentration			
TO-12 (mg/m ³)	<0.59	<0.59	0.92	0.82	0.86	0.84	2	0.87	0.05
Total Carbon (ppm)								0.36	

Footnotes

(a) WHC sample identification number.

(b) Replicate analysis for S6080-A05.171; results are not included in the calculation of average concentrations.

(c) Relative percent differences (RPDs) for replicate analysis

Table 3.4 Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-102 Sampled on 7/31/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6080-A06.205 ^(c) ISVS			S6080-A04.170 ^(c) ISVS			S6080-A05.171 ^{(c)(d)} 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	0.012	2.2	J	0.012	2.2	J	0.012	2.2	J	0.012	0.000	2.2	0.026
Chloromethane	74-87-3	50	4.6	0.010	4.5	J	0.010	4.3	J	0.010	4.4	J	0.010	0.000	4.4	0.11
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	171	4.9	0.011	1.5	J	0.011	1.4	J	0.011	1.4	J	0.011	0.000	1.4	0.045
Methanol	67-56-1	32	5.1	0.0651	46	J	0.0733	51	J	0.0661	46	J	0.068	0.004	48	3.1
Butane	106-97-8	58	5.6	0.033	13	J	0.035	13	J	0.035	14	J	0.034	0.001	13	0.55
Ethanol	64-17-5	46	6.9	0.0126	6.1	J	0.0158	7.7	J	0.012	5.8	J	0.013	0.002	7	1.0
Acetonitrile	75-05-8	41	7.3	0.070	38		0.068	37		0.068	37		0.069	0.001	37	0.52
Acetone	67-64-1	58	7.9	0.110	42		0.138	53		0.109	42		0.119	0.016	46	6.3
Trichlorofluoromethane	75-69-4	137	8.2	0.531	87		0.535	87		0.534	87		0.533	0.002	87	0.36
Methylene Chloride	75-09-2	85	9.8	0.020	5.4	J	0.020	5.2	J	0.020	5.4	J	0.020	0.000	5.3	0.087
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	10.3	0.027	3.3	J	0.038	4.5	J	0.035	4.2	J	0.033	0.005	4.0	0.65
Propanenitrile	107-12-0	55	11.2	0.029	12	J	0.005	2.0	U	0.028	12	J	0.028	e	12	e
2-Butanone	78-93-3	72	12.8	0.030	9.4		0.003	0.87	U	0.003	0.87	U	e	e	e	e
Hexane	110-54-3	86	14.1	0.009	2.3	J	0.009	2.3	J	0.009	2.3	J	0.009	0.000	2.3	0.015
Chloroform	67-66-3	119	14.2	0.006	1.1	J	0.006	1.1	J	0.006	1.1	J	0.006	0.000	1.1	0.031
1,1,1-Trichloroethane	71-55-6	133	16.2	0.008	1.3	J	0.007	1.3	J	0.008	1.3	J	0.008	0.000	1.3	0.020
1-Butanol	71-36-3	74	16.8	0.023	7.1	J	0.051	15	J	0.028	8.4	J	0.034	0.015	10	4.5
Carbon Tetrachloride	56-23-5	154	17.4	0.007	0.98	J	0.007	1.0	J	0.007	1.0	J	0.007	0.000	1.0	0.025
Trichloroethene	79-01-6	131	19.2	0.005	0.91	J	0.006	0.94	J	0.005	0.88	J	0.005	0.000	0.91	0.030
Pentanenitrile	110-59-8	83	22.0	0.004	1.0	U	0.008	2.0	J	0.007	2.0	J	0.007	e	2.0	e
Toluene	108-88-3	92	23.0	0.004	1.1	J	0.005	1.2	J	0.005	1.1	J	0.005	0.000	1.1	0.075
1,2-Dibromoethane	106-93-4	188	24.6	0.007	0.83	J	0.008	0.90	J	0.007	0.85	J	0.007	0.000	0.86	0.036
Tetrachloroethylene	127-18-4	166	25.6	0.010	1.3	J	0.011	1.4	J	0.010	1.3	J	0.010	0.000	1.4	0.062
Hexanenitrile	628-73-9	97	27.5	0.007	1.7	J	0.008	1.8	J	0.007	1.7	J	0.007	0.000	1.7	0.046
Ethylbenzene	100-41-4	106	28.1	0.003	0.72	U	0.003	0.72	U	0.004	0.86	J	e	e	e	e

Data Quality Flags

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

U Target compound not detected at or above the IDL.

Footnotes

(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 D.3.

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

Table 3.5 Comparison of Organic Compound Concentrations from Replicate Analysis of a Single SUMMA™ Canister from Tank BX-102 Sampled on 7/31/96

Target Analytes	CAS	MW	Ret Time	S6080-A05.171 ^(c) ISVS						Relative Percent Difference ^(d)	
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	%	
Dichlorodifluoromethane	75-71-8	121	4.2	0.012	2.2	J	0.012	2.2	J	1	
Chloromethane	74-87-3	50	4.6	0.010	4.4	J	0.010	4.5	J	2	
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	171	4.9	0.011	1.4	J	0.011	1.4	J	1	
Methanol	67-56-1	32	5.07	0.0661	46	J	0.068	48	J	3	
Butane	106-97-8	58	5.6	0.035	14	J	0.034	13	J	2	
Ethanol	64-17-5	46	6.9	0.012	5.8	J	0.0137	6.7	J	13	
Acetonitrile	75-05-8	41	7.3	0.068	37		0.068	37		1	
Acetone	67-64-1	58	7.9	0.109	42		0.110	42		1	
Trichlorofluoromethane	75-69-4	137	8.2	0.536	87		0.534	87		0	
Methylene Chloride	75-09-2	85	9.8	0.020	5.4	J	0.020	5.3	J	0	
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	10.3	0.035	4.2	J	0.036	4.2	J	1	
Propanenitrile	107-12-0	55	11.2	0.028	12	J	0.029	12	J	2	
Hexane	110-54-3	86	14.1	0.009	2.3	J	0.009	2.3	J	1	
Chloroform	67-66-3	119	14.2	0.006	1.1	J	0.006	1.1	J	0	
1,1,1-Trichloroethane	71-55-6	133	16.2	0.008	1.3	J	0.008	1.3	J	3	
1-Butanol	71-36-3	74	16.8	0.028	8.4	J	0.025	7.7	J	9	
Carbon Tetrachloride	56-23-5	154	17.4	0.007	1.0	J	0.007	1.0	J	3	
Trichloroethene	79-01-6	131	19.2	0.005	0.88	J	0.001	0.24	U		
Pentanenitrile	110-59-8	83	22.0	0.007	2.0	J	0.004	1.0	U		
Toluene	108-88-3	92	23.0	0.005	1.1	J	0.005	1.1	J	4	
1,2-Dibromoethane	106-93-4	188	24.6	0.007	0.85	J	0.007	0.86	J	1	
Tetrachloroethylene	127-18-4	166	25.6	0.010	1.3	J	0.010	1.4	J	1	
Hexanenitrile	628-73-9	97	27.5	0.007	1.7	J	0.006	1.5	U		
Ethylbenzene	100-41-4	106	28.1	0.004	0.86	J	0.004	0.77	J	10	

Data Quality Flags

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

U Target compound not detected at or above the IDL.

Footnotes

- (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.

Table 3.6. Organic Compound Concentrations in Ambient Air and Ambient Air through the ISVS
Collected in SUMMA Canisters Associated with the Sampling of Tank BX-102 on 7/31/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6080-A02.169 ^(b)			S6080-A01.167 ^(b)		
				Ambient Air Through ISVS			Ambient Air		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	121	4.2	0.012	2.2	J	0.012	2.2	J
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	171	4.9	0.011	1.5	J	0.011	1.4	J
Ethanol	64-17-5	46	6.9	0.013	6.2	J	0.012	5.7	J
Trichlorofluoromethane	75-69-4	137	8.2	0.009	1.5	J	0.009	1.5	J
Methylene Chloride	75-09-2	85	9.8	0.020	5.2	J	0.020	5.2	J
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187	10.3	0.103	12		0.004	0.53	U
Hexane	110-54-3	86	14.1	0.007	1.8	J	0.006	1.6	J
Chloroform	67-66-3	119	14.2	0.006	1.1	J	0.006	1.1	J
1,1,1-Trichloroethane	71-55-6	133	16.2	0.007	1.2	J	0.008	1.3	J
Carbon Tetrachloride	56-23-5	154	17.4	0.007	1.1	J	0.008	1.1	J
Trichloroethene	79-01-6	131	19.2	0.006	0.97	J	0.001	0.24	U
Toluene	108-88-3	92	23.0	0.006	1.4	J	0.005	1.2	J
1,2-Dibromoethane	106-93-4	188	24.6	0.007	0.87	J	0.007	0.87	J
Ethylbenzene	100-41-4	106	28.1	0.005	0.95	J	0.003	0.72	U

Data Quality Flags

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

U Target compound not detected at or above the IDL.

Footnotes

(a) Detected target analytes.

(b) WHC sample identification number.

Table 3.7 Organic Compound Concentrations in Triple Sorbent Traps from Tank BX-102 Sampled on 7/31/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6080-A11.706 ^(c) ISVS			S6080-A12.716 ^{(c)(d)} ISVS			S6080-A13.718 ^(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.
Butane	106-97-8	58	10.8	0.036	14	J	0.041	16		0.040	15		0.039	0.003	15	1.1
Acetonitrile	75-05-8	41	13.0	0.064	35		0.051	28		0.073	40		0.063	0.011	34	6.0
Acetone	67-64-1	58	13.6	0.189	73		0.138	53		0.143	55		0.157	0.028	60	11
Trichlorofluoromethane	75-69-4	137	14.1	0.521	85		0.569	93		0.589	96		0.560	0.035	91	5.7
Methylene Chloride	75-09-2	85	15.7	0.197	52		0.089	23	J	0.091	24	J	0.125	0.062	33	16
1,1,1-Trichloro-2,2,2-trifluoroethane	76-13-1	187	16.3	0.003	0.38	U	0.004	0.51	J	0.003	0.39	U	e	e	e	e
Propanenitrile	107-12-0	55	17.0	0.029	12		0.030	12		0.031	12		0.030	0.001	12	0.41
Propanol	71-23-8	60	17.0	0.031	12	J	0.037	14	J	0.039	14	J	0.036	0.004	13	1.4
2-Butanone	78-93-3	72	18.6	0.065	20		0.072	22		0.088	27		0.075	0.012	23	3.6
Hexane	110-54-3	86	19.8	0.011	3.0	J	0.013	3.4	J	0.012	3.2	J	0.012	0.001	3.2	0.21
Tetrahydrofuran	109-99-9	72	20.7	0.041	13		0.069	22		0.116	36		0.075	0.038	23	12
1,1,1-Trichloroethane	71-55-6	133	21.9	0.013	2.1	J	0.020	3.4	J	0.010	1.7	J	0.014	0.005	2.4	0.87
1-Butanol	71-36-3	74	22.3	0.135	41		0.191	58		0.171	52		0.166	0.028	50	8.6
Benzene	71-43-2	78	22.8	0.007	2.1	J	0.007	2.1	J	0.007	2.0	J	0.007	0.000	2.1	0.049
Trichloroethene	79-01-6	131	24.7	0.007	1.1	J	0.004	0.66	U	0.004	0.66	U	e	e	e	e
Heptane	142-82-5	100	25.2	0.017	3.9		0.032	7.2		0.017	3.8		0.022	0.009	5.0	1.9
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.026	5.8		0.022	5.0		0.023	5.2		0.024	0.002	5.3	0.43
Pentanenitrile	110-59-8	83	27.4	0.002	0.58	J	0.005	1.4	J	0.006	1.6	J	0.004	0.002	1.2	0.52
Toluene	108-88-3	92	28.4	0.198	48		0.242	59		0.179	44		0.206	0.032	50	7.8
Ethylbenzene	100-41-4	106	33.4	0.048	10		0.034	7.1		0.041	8.7		0.041	0.007	8.6	1.5
p/m-Xylene	106-42-3	106	33.8	0.168	35		0.119	25		0.147	31		0.145	0.024	31	5.1
Cyclohexanone	108-94-1	98	34.3	0.126	29	J	0.054	12	J	0.085	19	J	0.088	0.036	20	8.2
Styrene	100-42-5	104	34.7	0.039	8.5		0.031	6.6		0.036	7.8		0.035	0.004	7.6	0.95
o-Xylene	95-47-6	106	35.0	0.073	15		0.048	10		0.066	14		0.062	0.013	13	2.7
Nonane	111-84-2	128	35.4	0.016	2.8		0.011	1.9	J	0.014	2.5		0.014	0.003	2.4	0.50
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.006	1.0	J	0.008	1.4	J	0.005	0.84	J	0.006	0.002	1.1	0.28
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.006	1.1	J	0.004	0.78	J	0.005	0.91	J	0.005	0.001	0.92	0.15
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.015	2.8	J	0.011	2.1	J	0.013	2.4	J	0.013	0.002	2.4	0.35
Decane	124-18-5	142	40.1	0.045	7.1		0.033	5.2		0.047	7.3		0.042	0.008	6.6	1.2
1,3-Dichlorobenzene	541-73-1	147	40.4	0.010	1.6	J	0.006	0.86	J	0.008	1.3	J	0.008	0.002	1.2	0.35
1,4-Dichlorobenzene	106-46-7	147	40.6	0.010	1.6	J	0.006	0.86	J	0.008	1.3	J	0.008	0.002	1.2	0.35
Undecane	1120-21-4	156	44.4	0.018	2.5	J	0.014	2.0	J	0.015	2.2	J	0.016	0.002	2.2	0.25

Table 3.7 Organic Compound Concentrations in Triple Sorbent Traps from Tank BX-102 Sampled on 7/31/96

Tentatively Identified Compounds ^(b)	CAS	MW	Ret Time	S6080-A11.706 ^(c) ISVS			S6080-A12.716 ^{(c)(d)} ISVS			S6080-A13.718 ^(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.
Ethane, 1-chloro-1,1-difluoro-	75-68-3	100	8.8	0.875	196	N	0.122	27	N	0.131	29	N	0.376	0.432	84	97
1-Propene, 2-methyl-	115-11-7	56	10.4	0.184	74	N	0.216	86	N	0.145	58	N	0.182	0.035	73	14
1-Fluoro-1,1-dichloro-ethane	1717-00-6	116	14.4	0.300	58	N	0.292	56	N	0.154	30	N	0.249	0.082	48	16
Cyclotrisiloxane, hexamethyl-	541-05-9	222	31.1	2.067	209	N	1.038	105	N	1.801	182	N	1.635	0.534	165	54
Hexane, 2,3,5-trimethyl-	1069-53-0	128	31.5	0.305	53	N	0.174	30	N	0.262	46	N	0.247	0.067	43	12
Unknown C9 Alkane		128	31.7	1.148	201	N	0.685	120	N	1.001	175		0.944	0.237	165	41
2,4-Dimethyl-1-heptene	19549-87-2	126	32.6	nd	nd		nd	nd		0.123	22	N	e	e	e	e
Unknown C9 Alkene/Cycloalkane		126	32.6	0.136	24	N	nd	nd		nd	nd		e	e	e	e
Cyclotetrasiloxane, octamethyl-	556-67-2	296	39.4	0.788	60	N	1.264	96	N	0.742	56	N	0.931	0.289	70	22
Unknown C12 Alkane		170	42.9	1.058	139	N	0.804	106	N	1.057	139	N	0.973	0.146	128	19

Data Quality Flags

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

N Denotes tentatively identified compound

U Target compound not detected at or above the IDL.

Footnotes

(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.

nd Not detected

Table 3.8 Comparison of Organic Compound Concentrations from Replicate Analysis of a Single Triple Sorbent Trap from Tank BX-102 Sampled on 7/31/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6080-A12.716 ^(c) ISVS						Relative Percent Difference	
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	%	
Butane	106-97-8	58	10.8	0.041	16		0.039	15		6	
Acetonitrile	75-05-8	41	13.0	0.051	28		0.053	29		3	
Acetone	67-64-1	58	13.6	0.138	53		0.130	50		6	
Trichlorofluoromethane	75-69-4	137	14.1	0.569	93		0.539	88		5	
Methylene Chloride	75-09-2	85	15.7	0.089	23	J	0.090	24	J	2	
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	16.3	0.004	0.51	J	0.003	0.38	U		
Propanenitrile	107-12-0	55	17.0	0.030	12		0.027	11		9	
Propanol	71-23-8	60	17.0	0.037	14	J	0.033	12	J	11	
2-Butanone	78-93-3	72	18.6	0.072	22		0.067	21		6	
Hexane	110-54-3	86	19.8	0.013	3.4	J	0.012	3.2	J	7	
Tetrahydrofuran	109-99-9	72	20.7	0.069	22		0.068	21		2	
1,1,1-Trichloroethane	71-55-6	133	21.9	0.020	3.4	J	0.019	3.2	J	5	
1-Butanol	71-36-3	74	22.3	0.191	58		0.134	41		35	
Benzene	71-43-2	78	22.8	0.007	2.1	J	0.009	2.5	J	16	
Heptane	142-82-5	100	25.2	0.032	7.2		0.032	7.0		2	
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.022	5.0		0.033	7.3		38	
Pentanenitrile	110-59-8	83	27.4	0.005	1.4	J	0.005	1.2	J	10	
Toluene	108-88-3	92	28.4	0.242	59		0.240	58		1	
Ethylbenzene	100-41-4	106	33.4	0.034	7.1		0.033	6.9		3	
p/m-Xylene	106-42-3	106	33.8	0.119	25		0.118	25		2	
Cyclohexanone	108-94-1	98	34.3	0.054	12	J	0.055	13	J	1	
Styrene	100-42-5	104	34.7	0.031	6.6		0.030	6.4		3	
o-Xylene	95-47-6	106	35.0	0.048	10		0.047	10.0		1	
Nonane	111-84-2	128	35.4	0.011	1.9	J	0.010	1.8	J	4	
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.008	1.4	J	0.007	1.4	J	1	
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.004	0.78	J	0.004	0.75	J	5	
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.011	2.1	J	0.011	2.1	J	2	
Decane	124-18-5	142	40.1	0.033	5.2		0.033	5.1		2	
1,3-Dichlorobenzene	541-73-1	147	40.4	0.006	0.86	J	0.003	0.51	U		
1,4-Dichlorobenzene	106-46-7	147	40.6	0.006	0.86	J	0.003	0.46	U		
Undecane	1120-21-4	156	44.4	0.014	2.0	J	0.014	2.0	J	0	

Tentatively

Identified Compounds^(b)

Ethane, 1-chloro-1,1-difluoro-	75-68-3	100	8.8	0.122	27	N	0.101	23	N	18	
1-Propene, 2-methyl-	115-11-7	56	10.4	0.216	86	N	0.182	73	N	17	
1-Fluoro-1,1-dichloro-ethane	1717-00-6	116	14.4	0.292	56	N	0.286	55	N	2	
Cyclotrisiloxane, hexamethyl-	541-05-9	222	31.1	1.038	105	N	1.035	104	N	0	
Hexane, 2,3,5-trimethyl-	1069-53-0	128	31.5	0.174	30	N	0.167	29	N	4	
Unknown C9 Alkane		128	31.7	0.685	120	N	0.670	117	N	2	
Cyclotetrasiloxane, octamethyl-	556-67-2	296	39.4	1.264	96	N	1.253	95	N	1	
Unknown C12 Alkane		170	42.9	0.804	106	N	0.799	105	N	1	

Data Quality Flags

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

N Denotes tentatively identified compound

U Target compound not detected at or above the IDL.

Footnotes

(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.

Table 3.9 Organic Compound Concentrations in Triple Sorbent Trap Blank Samples Associated with the Sampling of Tank BX-102 on 7/31/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6080-A17.742 ^(c) ISVS FB #1			S6080-A18.766 ^(c) ISVS FB #2			S6080-A19.795 ^(c) ISVS TB #1			S6080-A20.804 ^(c) ISVS TB #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Acetonitrile	75-05-8	41	13.0	0.012	6.5	J	0.014	7.7	J	0.003	1.8	U	0.003	1.8	U
Acetone	67-64-1	58	13.6	0.180	69		0.079	30		0.017	6.7	J	0.023	8.9	J
Trichlorofluoromethane	75-69-4	137	14.1	0.016	2.5	J	0.019	3.2	J	0.004	0.72	U	0.040	6.5	J
1,1-Dichloroethene	75-35-4	97	15.5	0.059	14		0.018	4.1	J	0.002	0.47	U	0.002	0.47	U
Methylene Chloride	75-09-2	85	15.7	0.155	41	J	0.069	18	J	0.174	46		0.414	109	
Propanol	71-23-8	60	17.0	0.005	2.0	U	0.018	6.5	J	0.005	2.0	U	0.005	2.0	U
2-Butanone	78-93-3	72	18.6	0.049	15		0.066	20		0.008	2.6	J	0.002	0.68	U
Hexane	110-54-3	86	19.8	0.006	1.5	J	0.007	1.7	J	0.001	0.32	U	0.001	0.32	U
Tetrahydrofuran	109-99-9	72	20.7	0.043	13		0.086	27		0.018	5.7	J	0.020	6.2	J
1,1,1-Trichloroethane	71-55-6	133	21.9	0.014	2.4	J	0.013	2.2	J	0.003	0.44	U	0.003	0.44	U
1-Butanol	71-36-3	74	22.3	0.020	6.0	J	0.023	6.9	J	0.008	2.3	U	0.008	2.3	U
Benzene	71-43-2	78	22.8	0.009	2.6	J	0.007	2.1	J	0.001	0.40	U	0.001	0.40	U
Cyclohexane	110-82-7	84	23.3	0.028	7.6	J	0.004	1.1	U	0.004	1.1	U	0.004	1.1	U
Trichloroethene	79-01-6	131	24.7	0.004	0.61	U	0.004	0.61	U	0.004	0.61	U	0.015	2.5	J
Heptane	142-82-5	100	25.2	0.019	4.3		0.022	4.9		0.002	0.35	U	0.002	0.35	U
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.020	4.4	J	0.017	3.8	J	0.002	0.46	U	0.002	0.46	U
Toluene	108-88-3	92	28.4	0.162	39		0.162	39		0.001	0.23	U	0.002	0.55	J
Ethylbenzene	100-41-4	106	33.4	0.019	4.1		0.020	4.3		0.001	0.30	U	0.001	0.30	U
p/m-Xylene	106-42-3	106	33.8	0.068	14		0.070	15		0.003	0.63	U	0.003	0.63	U
Cyclohexanone	108-94-1	98	34.3	0.050	11	J	0.056	13	J	0.013	2.9	U	0.013	2.9	U
Styrene	100-42-5	104	34.7	0.017	3.7		0.018	3.8		0.002	0.33	U	0.002	0.33	U
o-Xylene	95-47-6	106	35.0	0.026	5.5		0.029	6.2		0.002	0.40	U	0.002	0.40	U
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.002	0.44	U	0.004	0.76	J	0.002	0.44	U	0.002	0.44	U
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.002	0.44	U	0.003	0.49	J	0.002	0.44	U	0.002	0.44	U
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.007	1.4	J	0.008	1.4	J	0.003	0.47	U	0.003	0.47	U
Decane	124-18-5	142	40.1	0.018	2.9	J	0.019	3.0	J	0.003	0.47	U	0.003	0.47	U
1,3-Dichlorobenzene	541-73-1	147	40.4	0.003	0.48	U	0.004	0.68	J	0.003	0.48	U	0.003	0.48	U
1,4-Dichlorobenzene	106-46-7	147	40.6	0.003	0.43	U	0.004	0.67	J	0.003	0.43	U	0.003	0.43	U
Undecane	1120-21-4	156	44.4	0.009	1.3	J	0.007	1.0	J	0.004	0.63	U	0.004	0.63	U

Tentatively

Identified Compounds^(b)

Ethane, 1-chloro-1,1-difluoro-	75-68-3	100	8.8	0.409	92	N	0.170	38	N	0.758	170	N	1.452	325	N
Acetaldehyde	75-07-0	44	9.5	0.048	24	N	0.019	9.8	N	nd	nd		nd	nd	
1-Propene, 2-methyl-	115-11-7	56	10.4	0.240	96	N	0.119	48	N	nd	nd		nd	nd	
1-Fluoro-1,1-dichloro-ethane	0-00-0	116	14.4	0.379	73	N	0.284	55	N	nd	nd		0.221	43	N

Table 3.9 Organic Compound Concentrations in Triple Sorbent Trap Blank Samples Associated with the Sampling of Tank BX-102 on 7/31/96

Tentatively Identified Compounds ^(b)	CAS	MW	Ret Time	S6080-A17.742 ^(c) ISVS FB #1			S6080-A18.766 ^(c) ISVS FB #2			S6080-A19.795 ^(c) ISVS TB #1			S6080-A20.804 ^(c) ISVS TB #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Cyclotrisiloxane, hexamethyl-	541-05-9	222	31.1	0.942	95	N	0.899	91	N	nd	nd		nd	nd	
Hexane, 2,3,5-trimethyl-	1069-53-0	128	31.5	0.110	19	N	0.113	20	N	nd	nd		nd	nd	
Heptane, 2,4-dimethyl-	2213-23-2	128	31.7	0.420	73	N	0.434	76	N	nd	nd		nd	nd	
Cyclotetrasiloxane, octamethyl-	556-67-2	296	39.4	0.362	27	N	0.407	31	N	nd	nd		nd	nd	
Unknown C12 Alkane			42.9	0.399	d		0.428	d		nd	nd		nd	nd	

Data Quality Flags

J Flag denotes target compound detected above Instrument Detection Limit (IDL), but below estimated Quantitation Limit (EQL)

N Flag denotes tentatively identified compound

U Flag denotes compound not detected above listed IDL

Footnotes

(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-102 Sampled on 7/31/96

Analyte	CAS #	Lower Flammability Limit(LFL)	Average Measured Concentrations	% of LFL ^(a)
Ammonia (ppm)	7664-41-7	150000	2.6	0.002
Carbon Monoxide (ppm)	630-08-0	125000	<17	<0.013
Hydrogen (ppm)	1333-74-0	40000	<17	<0.040
Methane (ppm)	74-82-8	50000	<25	<0.05
TNMOC (mg/m ³)		42000	0.87	0.002
Total				<0.107

(a) Less than values are calculated using the average concentration less than values.

These values are summed to determine the total LFL.

Figure 3.1a Typical Total Ion Chromatogram (2 - 36 min) for SUMMA™ Canister Samples from Tank BX-102 Sampled on 7/31/96

Figure 3.1b Typical Total Ion Chromatogram (36 - 70 min) for SUMMA™ Canister Samples from Tank BX-102 Sampled on 7/31/96

Figure 3.2a Typical Total Ion Chromatogram (2 - 36 min) for Triple Sorbent Trap Samples from Tank BX-102 Sampled on 7/31/96

Figure 3.2b Typical Total Ion Chromatogram (36 - 70 min) for Triple Sorbent Trap Samples from Tank BX-102 Sampled on 7/31/96

4.0 Conclusions

The concentrations of inorganic and organic analytes were determined from samples of the headspace of Tank BX-105 on July 31, 1996 (Sample Job S6080). 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). No immediate notifications were provided because analytical results indicated no specific analytes exceeded the notification levels; notification levels and notification procedures are described in the SAP (Buckley 1996).

5.0 References

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

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

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

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

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

Appendix A

Chain-of-Custody Sample Control Forms

Custody Form Initiator J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-2329

Company Contact R. D. Mahon - WHC

Telephone (509) 373-7437

Page 85-9656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm
241-BX-102 Tank Vapor Sample SAF S6080
(ISVS Cart)

Collection date 07 - 31 - 96

Preparation date 07 - 22 - 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

S6080 - A07 . 58R . Collect NH₃/NO_x/H₂O Sorbent Trap
S6080 - A08 . 59R . Collect NH₃/NO_x/H₂O Sorbent Trap
S6080 - A09 . 60R . Collect NH₃/NO_x/H₂O Sorbent Trap
S6080 - A10 . 61R . Collect NH₃/NO_x/H₂O Sorbent Trap

S6080 - A15 . 62R . Open, close and store NH₃/NO_x/H₂O field blank #1
S6080 - A16 . 63R . 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>	07-23-96	0830	J A Edwards <i>J A Edwards</i>	07-23-96	0830		
J A Edwards <i>J A Edwards</i>	07-29-96	1020	GS CAPRID <i>GS CAPRID</i>	07-29-96	1020		
<i>GS CAPRID</i>	08-07-96	0830	ES MAST <i>ES MAST</i>	08-07-96	0830		
ES MAST <i>ES MAST</i>	08-07-96	1015	G.W. Dennis <i>G.W. Dennis</i>	08-07-96	1015		
G.W. Dennis <i>G.W. Dennis</i>	08-07-96	1515	K.H. Pool <i>K.H. Pool</i>	08-07-96	1515		

Final Sample Disposition

Comments:

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

POC *(Signature)* POC *(Signature)*(WHC-SD-WM-TP-335, REV. 2, Table 2b)
A-6000-407 (12/92) WEF061

1 of 1

(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-102 Tank Vapor Sample SAF S6080

(ISVS Cart)

Collection date 07 - 31 - 96

Preparation date 07 - 26 - 96

Ice Chest No.

Field Logbook No. WHC- N-6978

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

S6080 - A01 . 167

Collect Ambient Air Sample SUMMA #1

S6080 - A02 . 169

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

S6080 - A04 . 170

Collect SUMMA #3

S6080 - A05 . 171

Collect SUMMA #4

S6080 - A06 . 205

Collect SUMMA #5

[] Field Transfer of Custody			[X] Chain of Possession			(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time		
J A Edwards <i>J A Edwards</i>	07-29-96	1020	AS CAPRIO <i>AS CAPRIO</i>	07-29-96	1020		
ES CAPRIO <i>ES CAPRIO</i>	08-07-96	0830	ES MAST <i>ES MAST</i>	08-07-96	0830		
ES MAST <i>ES MAST</i>	8-7-96	1015	TL Tredge <i>TL Tredge</i>	8-7-96	1015		

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 2225?	☒ Y/N	
RSR/release? (a ≤100/B ≤400 pCi/g)	☒ Y/N	
COC copy for LRB, RIDS filed?	☒ Y/N	

POC

POC

HC-SD-WM-TP-535, 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-102 Tank Vapor Sample SAF S6080
(ISVS Cart)Collection date 07 - 31 - 96
Preparation date 07 - 26 - 96

Ice Chest No.

Field Logbook No. WHC- N-6428

Ertco Hi/Lo thermometer No.

PNL-T-00 5

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

S6080 - A11 . 706 .	PNL Triple Sorbent Trap (TST) Sample # 1
S6080 - A12 . 716 .	PNL TST Sample # 2
S6080 - A13 . 718 .	PNL TST Sample # 3
S6080 - A14 . 725 .	PNL TST Sample # 4
S6080 - A17 . 742 .	Open, close & store TST Field Blank # 1
S6080 - A18 . 766 .	Open, close & store TST Field Blank #2
S6080 - A19 . 795 .	Store TST Trip Blank #1
S6080 - A20 . 804 .	Store TST Trip Blank #2

[] Field Transfer of Custody			[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time	
JL Julia	07-29-96	0930	JA Edwards	07-29-96	0930	
JA Edwards	07-29-96	1020	ES CAPETO	07-29-96	1020	
ES CAPETO	08-07-96	0830	ES MAST	08-07-96	0830	
ES MAST	8/7/96	1015	JA Edwards	8-7-96	1015	

Final Sample Disposition

Comments:

<u>PNL (only) Checklist</u>	Pick-up / Delivery
Media labeled and checked?	Y/N
Letter of instruction?	Y/N
Media in good condition?	Y/N / Y/N
COC info/signatures complete?	Y/N / Y/N
Sorbents shipped on ice? (<5°C)	Y/N / Y/N
Hi/Lo thermometer - <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

Comments:

Large Flow Drop was noted on 716, 718, 725.
Desired total flow was attained.

Cooler Temperature Status	
Hi -15 °C / Lo -15 °C (pick up at PNL to WHC)	
Hi -15 °C / Lo -15 °C (delivery at WHC from PNL)	
Hi -15 °C / Lo -15 °C (at return to PNL from WHC)	
Hi -15 °C / Lo -15 °C (at delivery from WHC to PNL)	

(Revised 06/21/95 PNL)

Appendix B

Listing of All Target Compounds for Organic Compound Analysis

Table B.1 SUMMA™ Analysis Results for All Target Analytes from Tank BX-102 Sampled on 7/31/96

Target Analytes	CAS	MW	Ret Time	S6080-A05.171 ISVS			S6080-A02.169 ISVS			S6080-A06.205 ISVS			S6080-A04.170 ISVS			S6080-A01.167 ISVS			S6080-A05.171 ISVS		
				Rep			Amb. Air Thru ISVS									Upwind Ambient Air					
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.9	4.2	0.0118	2.19 J		0.0116	2.16 J		0.0119	2.21 J		0.0117	2.16 J		0.0116	2.15 J		0.0117	2.17 J	
Chloromethane	74-87-3	50.5	4.6	0.0102	4.54 J		0.002	0.89 U		0.0102	4.52 J		0.0097	4.31 J		0.002	0.89 U		0.01	4.42 J	
1,2-dichloro1,1,2,2-tetrafluoroethane	76-14-2	170.9	4.9	0.011	1.44 J		0.0111	1.45 J		0.0111	1.46 J		0.0105	1.37 J		0.0106	1.39 J		0.0109	1.42 J	
Methanol	67-56-1	32.0	5.1	0.068	47.55 J		0.0126	8.81 U		0.0651	45.53 J		0.0733	51.23 J		0.0126	8.81 U		0.0661	46.21 J	
Vinyl Chloride	75-01-4	62.5	5.1	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	54.0	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	58.1	5.6	0.0343	13.23 J		0.0076	2.93 U		0.0325	12.52 J		0.0349	13.43 J		0.0076	2.93 U		0.0351	13.52 J	
Bromomethane	74-83-9	94.9	6.1	0.0268	6.32 U		0.0268	6.32 U		0.0268	6.32 U		0.0268	6.32 U		0.0268	6.32 U		0.0268	6.32 U	
Chloroethane	75-00-3	64.5	6.5	0.002	0.69 U		0.002	0.69 U		0.002	0.69 U		0.002	0.69 U		0.002	0.69 U		0.002	0.69 U	
Ethanol	64-17-5	46.0	6.9	0.0137	6.65 J		0.0126	6.16 J		0.0126	6.13 J		0.0158	7.68 J		0.0118	5.72 J		0.012	5.82 J	
Acetonitrile	75-05-8	41.1	7.3	0.0684	37.33		0.0032	1.75 U		0.0695	37.92		0.0684	37.34		0.0032	1.75 U		0.0676	36.89	
Acetone	67-64-1	58.1	7.9	0.1101	42.45		0.006	2.31 U		0.1101	42.45		0.1376	53.07		0.006	2.31 U		0.1087	41.91	
Trichlorofluoromethane	75-69-4	137.4	8.2	0.5362	87.44		0.0093	1.51 J		0.531	86.58		0.5353	87.29		0.0093	1.52 J		0.5337	87.02	
Pentane	109-66-0	72.2	9.0	0.0024	0.75 U		0.0024	0.75 U		0.0024	0.75 U		0.0024	0.75 U		0.0024	0.75 U		0.0024	0.75 U	
1,1-Dichloroethene	75-35-4	96.9	9.6	0.0036	0.83 U		0.0036	0.83 U		0.0036	0.83 U		0.0036	0.83 U		0.0036	0.83 U		0.0036	0.83 U	
Methylene Chloride	75-09-2	84.9	9.8	0.0202	5.32 J		0.0196	5.17 J		0.0203	5.37 J		0.0197	5.21 J		0.0198	5.22 J		0.0203	5.35 J	
1,1,2-trichloro1,1,2,2-trifluoroethane	76-13-1	187.4	10.3	0.0355	4.24 J		0.1031	12.33		0.0273	3.26 J		0.0377	4.51 J		0.0044	0.53 U		0.035	4.18 J	
Propanenitrile	107-12-0	55.1	11.2	0.029	11.78 J		0.005	2.03 U		0.0285	11.6 J		0.005	2.03 U		0.005	2.03 U		0.0283	11.5 J	
Propanol	71-23-8	60.1	11.2	0.0042	1.57 U		0.0042	1.57 U		0.0042	1.57 U		0.0042	1.57 U		0.0042	1.57 U		0.0042	1.57 U	
1,1-Dichloroethane	75-34-3	99.0	12.1	0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U		0.0022	0.5 U	
2-Butanone	78-93-3	72.1	12.8	0.0028	0.87 U		0.0028	0.87 U		0.0302	9.37		0.0028	0.87 U		0.0028	0.87 U		0.0028	0.87 U	
cis-1,2-Dichloroethene	156-59-2	96.9	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	86.2	14.1	0.0087	2.25 J		0.0071	1.84 J		0.0088	2.28 J		0.0087	2.27 J		0.0061	1.58 J		0.0086	2.25 J	
Chloroform	67-66-3	119.4	14.2	0.006	1.13 J		0.0058	1.09 J		0.0057	1.08 J		0.0061	1.14 J		0.0058	1.1 J		0.006	1.12 J	
Tetrahydrofuran	109-99-9	72.1	15.0	0.0026	0.81 U		0.0026	0.81 U		0.0026	0.81 U		0.0026	0.81 U		0.0026	0.81 U		0.0026	0.81 U	
1,2-Dichloroethane	107-06-2	99.0	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	133.4	16.2	0.0075	1.26 J		0.0069	1.17 J		0.0075	1.27 J		0.0074	1.25 J		0.0075	1.26 J		0.0077	1.29 J	
Butanenitrile	109-74-0	69.1	16.2	0.005	1.62 U		0.005	1.62 U		0.005	1.62 U		0.005	1.62 U		0.005	1.62 U		0.005	1.62 U	
1-Butanol	71-36-3	74.1	16.8	0.0254	7.66 J		0.009	2.72 U		0.0234	7.07 J		0.051	15.41 J		0.009	2.72 U		0.0277	8.38 J	
Benzene	71-43-2	78.1	17.1	0.0016	0.46 U		0.0016	0.46 U		0.0016	0.46 U		0.0016	0.46 U		0.0016	0.46 U		0.0016	0.46 U	
Carbon Tetrachloride	56-23-5	153.8	17.4	0.0069	1 J		0.0073	1.06 J		0.0067	0.98 J		0.0069	1 J		0.0076	1.11 J		0.0071	1.03 J	
Cyclohexane	110-82-7	84.2	17.6	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	113.0	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	131.4	19.2	0.0014	0.24 U		0.0057	0.97 J		0.0053	0.91 J		0.0055	0.94 J		0.0014	0.24 U		0.0052	0.88 J	
Heptane	142-82-5	100.2	19.7	0.0036	0.8 U		0.0036	0.8 U		0.0036	0.8 U		0.0036	0.8 U		0.0036	0.8 U		0.0036	0.8 U	
cis-1,3-Dichloropropene	10061-01-5	111.0	20.9	0.0002	0.04 U		0.0002	0.04 U		0.0002	0.04 U		0.0002	0.04 U		0.0002	0.04 U		0.0002	0.04 U	
4-Methyl-2-Pentanone	108-10-1	100.2	20.9	0.0058	1.3 U		0.0058	1.3 U		0.0058	1.3 U		0.0058	1.3 U		0.0058	1.3 U		0.0058	1.3 U	
Pyridine	110-86-1	79.1	21.1	0.0076	2.15 U		0.0076	2.15 U		0.0076	2.15 U		0.0076	2.15 U		0.0076	2.15 U		0.0076	2.15 U	
trans-1,3-Dichloropropene	10061-02-6	111.0	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	83.1	22.0	0.0038	1.02 U		0.0038	1.02 U		0.0038	1.02 U		0.0075	2.03 J		0.0038	1.02 U		0.0074	1.99 J	
1,1,2-Trichloroethane	79-00-5	133.4	22.4	0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U		0.0028	0.47 U	

Table B.1 SUMMA™ Analysis Results for All Target Analytes from Tank BX-102 Sampled on 7/31/96

Target Analytes	CAS	MW	S6080-A05.171 ISVS			S6080-A02.169 ISVS			S6080-A06.205 ISVS			S6080-A01.167 ISVS			S6080-A05.171 ISVS			
			Ret	Rep	Amb. Air Thru ISVS													
			Time	(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	92.1	23.0	0.0045	1.08	J	0.0057	1.39	J	0.0043	1.05	J	0.0049	1.2	J	0.005	1.22	J
1,2-Dibromoethane	106-93-4	187.9	24.6	0.0072	0.86	J	0.0073	0.87	J	0.0069	0.83	J	0.0075	0.9	J	0.0073	0.87	J
Octane	111-65-9	114.2	25.2	0.0048	0.94	U	0.0048	0.94	U	0.0048	0.94	U	0.0048	0.94	U	0.0048	0.94	U
Tetrachloroethylene	127-18-4	165.8	25.6	0.01	1.35	J	0.0034	0.46	U	0.0097	1.31	J	0.0106	1.43	J	0.0034	0.46	U
Chlorobenzene	108-90-7	112.6	27.2	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
Hexanenitrile	628-73-9	97.1	27.5	0.0064	1.48	U	0.0064	1.48	U	0.0072	1.67	J	0.0076	1.76	J	0.0064	1.48	U
Ethylbenzene	100-41-4	106.2	28.1	0.0037	0.77	J	0.0045	0.95	J	0.0034	0.72	U	0.0034	0.72	U	0.0034	0.72	U
p/m-Xylene	106-42-3	106.2	28.5	0.0084	1.77	U	0.0084	1.77	U	0.0084	1.77	U	0.0084	1.77	U	0.0084	1.77	U
Cyclohexanone	108-94-1	98.1	28.9	0.0064	1.46	U	0.0064	1.46	U	0.0064	1.46	U	0.0064	1.46	U	0.0064	1.46	U
Styrene	100-42-5	104.2	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
1,1,2,2-Tetrachloroethane	79-34-5	167.9	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
o-Xylene	95-47-6	106.2	29.7	0.0116	2.45	U	0.0116	2.45	U	0.0116	2.45	U	0.0116	2.45	U	0.0116	2.45	U
Nonane	111-84-2	128.3	30.2	0.0102	1.78	U	0.0102	1.78	U	0.0102	1.78	U	0.0102	1.78	U	0.0102	1.78	U
1-Ethyl-2-Methyl-Benzene	611-14-3	120.2	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
1,3,5-Trimethylbenzene	108-67-8	120.2	33.3	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	120.2	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
Decane	124-18-5	142.3	34.9	0.0144	2.27	U	0.0144	2.27	U	0.0144	2.27	U	0.0144	2.27	U	0.0144	2.27	U
1,3-Dichlorobenzene	541-73-1	147.0	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
1,4-Dichlorobenzene	106-46-7	147.0	35.3	<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20	
1,2-Dichlorobenzene	95-50-1	147.0	36.4	<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20	
Undecane	1120-21-4	156.3	39.2	<0.111	<16		<0.111	<16		<0.111	<16		<0.111	<16		<0.111	<16	
1,2,4-Trichlorobenzene	120-82-1	181.5	42.6	<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60	
Dodecane	112-40-3	170.3	43.2	<0.348	<46		<0.348	<46		<0.348	<46		<0.348	<46		<0.348	<46	
Hexachloro-1,3-butadiene	87-68-3	260.8	44.4	0.0233	2	U	0.0233	2	U	0.0233	2	U	0.0233	2	U	0.0233	2	U
Tridecane	629-50-5	184.4	46.9	<0.312	<38		<0.312	<38		<0.312	<38		<0.312	<38		<0.312	<38	
Tetradecane	629-59-4	198.3	50.4	<0.228	<26		<0.228	<26		<0.228	<26		<0.228	<26		<0.228	<26	

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

U Target compound not detected at or above the IDL.

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

Table B.2 Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-102 Sampled on 7/31/96

Target Analytes	CAS	MW	Ret	S6080-A11.706 ISVS			S6080-A12.716 ISVS			S6080-A12.716 ISVS REP			S6080-A13.718 ISVS		
			Time	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.828	0.0044	0.82	U	0.0046	0.84	U	0.0046	0.84	U	0.0046	0.85	U
Chloromethane	74-87-3	50.49	8.796	0.0033	1.46	U	0.0034	1.5	U	0.0034	1.5	U	0.0034	1.5	U
1,2-dichloro 1,1,2,2-tetrafluoroethane	76-14-2	170.92	9.518	0.0033	0.43	U	0.0034	0.44	U	0.0034	0.44	U	0.0034	0.44	U
Methanol	67-56-1	32.04	10.007	< 0.274	< 192	Y	< 0.274	< 192	Y	< 0.274	< 192	Y	< 0.274	< 192	Y
Vinyl Chloride	75-01-4	62.5	9.912	0.0031	1.13	U	0.0032	1.15	U	0.0032	1.15	U	0.0032	1.16	U
1,3-Butadiene	106-99-0	54	10.528	< 0.208	< 86	Y	< 0.208	< 86	Y	< 0.208	< 86	Y	< 0.208	< 86	Y
Butane	106-97-8	58.14	10.751	0.0355	13.68	J	0.0412	15.87		0.0389	15		0.0395	15.22	
Chloroethane	75-00-3	64.51	12.048	0.0043	1.49	U	0.0044	1.52	U	0.0044	1.52	U	0.0044	1.53	U
Ethanol	64-17-5	46.07	12.526	< 0.275	< 133	Y	< 0.275	< 133	Y	< 0.275	< 133	Y	< 0.275	< 133	Y
Acetonitrile	75-05-8	41.05	13.005	0.0643	35.1		0.0514	28.06		0.0528	28.8		0.0734	40.07	
Acetone	67-64-1	58.08	13.642	0.1893	73		0.1383	53.33		0.1297	50.02		0.1425	54.94	
Trichlorofluoromethane	75-69-4	137.37	14.11	0.5206	84.9		0.5692	92.81		0.5391	87.91		0.5887	96	
Pentane	109-66-0	72	14.907	0.003	0.93	U	0.003	0.95	U	0.003	0.95	U	0.0031	0.96	U
1,1-Dichloroethene	75-35-4	96.94	15.492	0.0021	0.49	U	0.0022	0.51	U	0.0022	0.51	U	0.0022	0.51	U
Methylene Chloride	75-09-2	84.93	15.736	0.1965	51.82		0.0886	23.36	J	0.0901	23.75	J	0.0908	23.96	J
1,1,2-trichloro 1,1,2,2-trifluoroethane	76-13-1	187.38	16.268	0.0031	0.38	U	0.0042	0.51	J	0.0032	0.38	U	0.0032	0.39	U
Propanenitrile	107-12-0	55.08	17.001	0.0286	11.62		0.0299	12.14		0.0274	11.13		0.0305	12.42	
Propanol	71-23-8	60.1	17.033	0.0314	11.72	J	0.0373	13.9	J	0.0333	12.4	J	0.0388	14.46	J
1,1-Dichloroethane	75-34-3	98.96	17.947	0.0015	0.33	U	0.0015	0.34	U	0.0015	0.34	U	0.0015	0.34	U
2-Butanone	78-93-3	72.11	18.574	0.0654	20.31		0.0716	22.23		0.0671	20.84		0.088	27.35	
cis-1,2-Dichloroethene	156-59-2	96.94	19.467	0.0026	0.6	U	0.0027	0.62	U	0.0027	0.62	U	0.0027	0.62	U
Hexane	110-54-3	86.18	19.828	0.0114	2.96	J	0.013	3.37	J	0.0121	3.15	J	0.0123	3.19	J
Chloroform	67-66-3	119.38	19.998	0.003	0.56	U	0.003	0.57	U	0.003	0.57	U	0.0031	0.58	U
Tetrahydrofuran	109-99-9	72.11	20.721	0.041	12.75		0.0692	21.51		0.0676	20.99		0.1159	36	
1,2-Dichloroethane	107-06-2	98.96	21.38	0.0011	0.26	U	0.0012	0.27	U	0.0012	0.27	U	0.0012	0.27	U
Butanenitrile	109-74-0	69.11	21.827	0.0015	0.47	U	0.0015	0.49	U	0.0015	0.49	U	0.0015	0.49	U
1,1,1-Trichloroethane	71-55-6	133.4	21.89	0.0126	2.12	J	0.02	3.36	J	0.019	3.2	J	0.01	1.68	J
1-Butanol	71-36-3	74	22.273	0.1353	40.96		0.1912	57.89		0.1344	40.7		0.1706	51.63	
Benzene	71-43-2	78.11	22.751	0.0074	2.12	J	0.0074	2.13	J	0.0087	2.49	J	0.0071	2.04	J
Carbon Tetrachloride	56-23-5	153.82	23.038	0.0015	0.21	U	0.0015	0.22	U	0.0015	0.22	U	0.0015	0.22	U
Cyclohexane	110-82-7	84.16	23.304	0.0043	1.14	U	0.0044	1.17	U	0.0044	1.17	U	0.0044	1.18	U
1,2-Dichloropropane	78-87-5	112.99	24.271	0.002	0.39	U	0.002	0.4	U	0.002	0.4	U	0.0021	0.41	U
Trichloroethene	79-01-6	131.39	24.707	0.0067	1.13	J	0.0039	0.66	U	0.0039	0.66	U	0.0039	0.66	U
Heptane	142-82-5	100.2	25.153	0.0174	3.9		0.0322	7.2		0.0315	7.03		0.0171	3.83	
4-Methyl-2-Pentanone	108-10-1	100.16	26.312	0.026	5.82		0.0223	4.98		0.0326	7.3		0.0233	5.21	
cis-1,3-Dichloropropene	10061-01-5	110.97	26.333	0.0013	0.26	U	0.0013	0.27	U	0.0013	0.27	U	0.0014	0.27	U
Pyridine	110-86-1	79.1	26.514	0.0223	6.32	U	0.0229	6.48	U	0.0229	6.48	U	0.023	6.51	U
trans-1,3-Dichloropropene	10061-02-6	110.97	27.364	0.0028	0.56	U	0.0028	0.57	U	0.0028	0.57	U	0.0029	0.58	U

Table B.2 Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-102 Sampled on 7/31/96

Target Analytes	CAS	MW	Ret Time	S6080-A11.706 ISVS			S6080-A12.716 ISVS			S6080-A12.716 ISVS REP			S6080-A13.718 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Pentanenitrile	110-59-8	83.15	27.364	0.0022	0.58	J	0.0051	1.38	J	0.0046	1.23	J	0.0058	1.56	J
1,1,2-Trichloroethane	79-00-5	133.4	27.811	0.0016	0.27	U	0.0017	0.28	U	0.0017	0.28	U	0.0017	0.28	U
Toluene	108-88-3	92.14	28.448	0.1976	48.05		0.2416	58.73		0.2403	58.43		0.179	43.51	
1,2-Dibromoethane	106-93-4	187.86	29.979	0.0025	0.29	U	0.0025	0.3	U	0.0025	0.3	U	0.0025	0.3	U
Octane	111-65-9	114	30.415	0.0028	0.54	U	0.0028	0.56	U	0.0028	0.56	U	0.0029	0.56	U
Tetrachloroethylene	127-18-4	165.83	30.978	0.0026	0.35	U	0.0027	0.36	U	0.0027	0.36	U	0.0027	0.36	U
Chlorobenzene	108-90-7	112.56	32.562	0.0011	0.23	U	0.0012	0.23	U	0.0012	0.23	U	0.0012	0.23	U
Hexanenitrile	628-73-9	97	32.753	0.003	0.69	U	0.003	0.7	U	0.003	0.7	U	0.0031	0.71	U
Ethylbenzene	100-41-4	106.17	33.401	0.0475	10.02		0.0335	7.07		0.0325	6.85		0.041	8.65	
p/m-Xylene	106-42-3	106.17	33.837	0.1677	35.39		0.1194	25.19		0.1176	24.8		0.147	31.02	
Cyclohexanone	108-94-1	98.14	34.273	0.1259	28.73	J	0.0542	12.38	J	0.0548	12.52	J	0.0849	19.37	J
Styrene	100-42-5	104.15	34.741	0.0393	8.46		0.0306	6.58		0.0296	6.37		0.0362	7.78	
1,1,2,2-Tetrachloroethane	79-34-5	167.85	34.974	0.0061	0.81	U	0.0062	0.83	U	0.0062	0.83	U	0.0063	0.83	U
o-Xylene	95-47-6	106.17	35.038	0.0727	15.34		0.0478	10.09		0.0472	9.97		0.0657	13.86	
Nonane	111-84-2	128	35.41	0.0162	2.84		0.0106	1.85	J	0.0102	1.78	J	0.0142	2.49	
1-Ethyl-2-methyl benzene	611-14-3	120.19	38.408	0.0056	1.04	J	0.0075	1.39	J	0.0074	1.38	J	0.0045	0.84	J
1,3,5-Trimethylbenzene	108-67-8	120.19	38.62	0.0058	1.07	J	0.0042	0.78	J	0.004	0.75	J	0.0049	0.91	J
1,2,4-Trimethylbenzene	95-63-6	120.19	39.896	0.0148	2.76	J	0.011	2.06	J	0.0112	2.08	J	0.0128	2.38	J
Decane	124-18-5	142.28	40.076	0.0454	7.14		0.033	5.19		0.0325	5.11		0.0466	7.33	
1,3-Dichlorobenzene	541-73-1	147	40.438	0.0103	1.56	J	0.0057	0.86	J	0.0034	0.51	U	0.0083	1.27	J
1,4-Dichlorobenzene	106-46-7	147	40.64	0.0102	1.55	J	0.0056	0.86	J	0.003	0.46	U	0.0083	1.26	J
1,2-Dichlorobenzene	95-50-1	147	41.777	0.0049	0.75	U	0.005	0.77	U	0.005	0.77	U	0.0051	0.77	U
Undecane	1120-21-4	156	44.402	0.0175	2.52	J	0.014	2.02	J	0.014	2.01	J	0.0152	2.19	J
1,2,4-Trichlorobenzene	120-82-1	181.45	48.016	0.0162	2	U	0.0166	2.05	U	0.0166	2.05	U	0.0167	2.06	U
Dodecane	112-40-3	170	48.42	0.0266	3.5	U	0.0273	3.6	U	0.0273	3.6	U	0.0275	3.62	U
Hexachloro-1,3-butadiene	87-68-3	260.76	49.834	0.0214	1.84	U	0.022	1.89	U	0.022	1.89	U	0.0221	1.9	U
Tridecane	629-50-5	184	52.183	0.0564	6.87	U	0.0578	7.04	U	0.0578	7.04	U	0.0582	7.09	U
Tetradecane	629-59-4	198	55.69	0.0136	1.54	U	0.0139	1.57	U	0.0139	1.57	U	0.014	1.58	U
Tributyl Phosphate	126-73-8	266	63.1	0.0104	<0.88	Z	0.0106	<0.89	Z	0.0106	<0.89	Z	0.0107	<0.90	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.

Table B.3 Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BX-102 on 7/31/96

Target Analytes	CAS	MW	Ret Time	S6080-A17.742 ISVS			S6080-A18.766 ISVS			S6080-A19.795 ISVS			S6080-A20.804 ISVS		
				Field Blank # 1			Field Blank # 2			Trip Blank # 1			Trip Blank #2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.828	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U
Chloromethane	74-87-3	50.49	8.796	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U
1,2-dichloro1,1,2,2-tetrafluoroethane	76-14-2	170.92	9.518	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U
Methanol	67-56-1	32.04	10.007	< 0.274	< 192	Y	< 0.274	< 192	Y	< 0.274	< 192	Y	< 0.274	< 192	Y
Vinyl Chloride	75-01-4	62.5	9.912	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	10.528	< 0.208	< 86	Y	< 0.208	< 86	Y	< 0.208	< 86	Y	< 0.208	< 86	Y
Butane	106-97-8	58.14	10.751	0.0036	1.39	U	0.0036	1.39	U	0.0036	1.39	U	0.0036	1.39	U
Chloroethane	75-00-3	64.51	12.048	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U
Ethanol	64-17-5	46.07	12.526	< 0.275	< 133	Y	< 0.275	< 133	Y	< 0.275	< 133	Y	< 0.275	< 133	Y
Acetonitrile	75-05-8	41.05	13.005	0.0119	6.52	J	0.0142	7.73	J	0.0033	1.8	U	0.0033	1.8	U
Acetone	67-64-1	58.08	13.642	0.1801	69.44		0.079	30.46		0.0173	6.65	J	0.023	8.87	J
Trichlorofluoromethane	75-69-4	137.37	14.11	0.0155	2.52	J	0.0193	3.15	J	0.0044	0.72	U	0.0401	6.53	J
Pentane	109-66-0	72	14.907	0.0029	0.89	U	0.0029	0.89	U	0.0029	0.89	U	0.0029	0.89	U
1,1-Dichloroethene	75-35-4	96.94	15.492	0.0586	13.54		0.0179	4.14	J	0.0021	0.47	U	0.0021	0.47	U
Methylene Chloride	75-09-2	84.93	15.736	0.1553	40.97	J	0.069	18.21	J	0.1737	45.82		0.4139	109.16	
1,1,2-trichloro1,2,2-trifluoroethane	76-13-1	187.38	16.268	0.003	0.36	U	0.003	0.36	U	0.003	0.36	U	0.003	0.36	U
Propanenitrile	107-12-0	55.08	17.001	0.0019	0.77	U	0.0019	0.77	U	0.0019	0.77	U	0.0019	0.77	U
Propanol	71-23-8	60.1	17.033	0.0053	1.99	U	0.0175	6.53	J	0.0053	1.99	U	0.0053	1.99	U
1,1-Dichloroethane	75-34-3	98.96	17.947	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U
2-Butanone	78-93-3	72.11	18.574	0.0493	15.3		0.0659	20.47		0.0082	2.55	J	0.0022	0.68	U
cis-1,2-Dichloroethene	156-59-2	96.94	19.467	0.0025	0.58	U	0.0025	0.58	U	0.0025	0.58	U	0.0025	0.58	U
Hexane	110-54-3	86.18	19.828	0.0056	1.47	J	0.0067	1.74	J	0.0013	0.32	U	0.0013	0.32	U
Chloroform	67-66-3	119.38	19.998	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U
Tetrahydrofuran	109-99-9	72.11	20.721	0.0425	13.22		0.0857	26.62		0.0184	5.72	J	0.0198	6.15	J
1,2-Dichloroethane	107-06-2	98.96	21.38	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U
Butanenitrile	109-74-0	69.11	21.827	0.0014	0.45	U	0.0014	0.45	U	0.0014	0.45	U	0.0014	0.45	U
1,1,1-Trichloroethane	71-55-6	133.4	21.89	0.0141	2.38	J	0.0129	2.16	J	0.0027	0.44	U	0.0027	0.44	U
1-Butanol	71-36-3	74	22.273	0.0198	5.99	J	0.0228	6.89	J	0.0075	2.29	U	0.0075	2.29	U
Benzene	71-43-2	78.11	22.751	0.0091	2.6	J	0.0073	2.09	J	0.0014	0.4	U	0.0014	0.4	U
Carbon Tetrachloride	56-23-5	153.82	23.038	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U
Cyclohexane	110-82-7	84.16	23.304	0.0284	7.57	J	0.0041	1.09	U	0.0041	1.09	U	0.0041	1.09	U
1,2-Dichloropropane	78-87-5	112.99	24.271	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U
Trichloroethene	79-01-6	131.39	24.707	0.0036	0.61	U	0.0036	0.61	U	0.0036	0.61	U	0.0145	2.47	J
Heptane	142-82-5	100.2	25.153	0.0194	4.34		0.0218	4.88		0.0015	0.35	U	0.0015	0.35	U
4-Methyl-2-Pentanone	108-10-1	100.16	26.312	0.0197	4.4	J	0.0171	3.82	J	0.0021	0.46	U	0.0021	0.46	U
cis-1,3-Dichloropropene	10061-01-5	110.97	26.333	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U

Table B.3 Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BX-102 on 7/31/96

Target Analytes	CAS	MW	Ret Time	S6080-A17.742 ISVS			S6080-A18.766 ISVS			S6080-A19.795 ISVS			S6080-A20.804 ISVS		
				Field Blank # 1			Field Blank # 2			Trip Blank # 1			Trip Blank # 2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Pyridine	110-86-1	79.1	26.514	0.0214	6.06	U	0.0214	6.06	U	0.0214	6.06	U	0.0214	6.06	U
trans-1,3-Dichloropropene	10061-02-6	110.97	27.364	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U
Pentanenitrile	110-59-8	83.15	27.364	0.0008	0.22	U	0.0008	0.22	U	0.0008	0.22	U	0.0008	0.22	U
1,1,2-Trichloroethane	79-00-5	133.4	27.811	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U
Toluene	108-88-3	92.14	28.448	0.1622	39.43		0.1618	39.33		0.0009	0.23	U	0.0023	0.55	J
1,2-Dibromoethane	106-93-4	187.86	29.979	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	30.415	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U
Tetrachloroethylene	127-18-4	165.83	30.978	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U
Chlorobenzene	108-90-7	112.56	32.562	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	32.753	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U
Ethylbenzene	100-41-4	106.17	33.401	0.0192	4.05		0.0201	4.25		0.0014	0.3	U	0.0014	0.3	U
p/m-Xylene	106-42-3	106.17	33.837	0.0675	14.23		0.07	14.78		0.003	0.63	U	0.003	0.63	U
Cyclohexanone	108-94-1	98.14	34.273	0.0501	11.43	J	0.0563	12.84	J	0.0125	2.85	U	0.0125	2.85	U
Styrene	100-42-5	104.15	34.741	0.017	3.65		0.0177	3.8		0.0015	0.33	U	0.0015	0.33	U
1,1,2,2-Tetrachloroethane	79-34-5	167.85	34.974	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U
o-Xylene	95-47-6	106.17	35.038	0.0263	5.54		0.0292	6.15		0.0019	0.4	U	0.0019	0.4	U
Nonane	111-84-2	128	35.41	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U
1-Ethyl-2-methyl benzene	611-14-3	120.19	38.408	0.0024	0.44	U	0.0041	0.76	J	0.0024	0.44	U	0.0024	0.44	U
1,3,5-Trimethylbenzene	108-67-8	120.19	38.62	0.0024	0.44	U	0.0026	0.49	J	0.0024	0.44	U	0.0024	0.44	U
1,2,4-Trimethylbenzene	95-63-6	120.19	39.896	0.0073	1.35	J	0.0076	1.41	J	0.0025	0.47	U	0.0025	0.47	U
Decane	124-18-5	142.28	40.076	0.0181	2.85	J	0.0189	2.98	J	0.003	0.47	U	0.003	0.47	U
1,3-Dichlorobenzene	541-73-1	147	40.438	0.0032	0.48	U	0.0044	0.68	J	0.0032	0.48	U	0.0032	0.48	U
1,4-Dichlorobenzene	106-46-7	147	40.64	0.0029	0.43	U	0.0044	0.67	J	0.0029	0.43	U	0.0029	0.43	U
1,2-Dichlorobenzene	95-50-1	147	41.777	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	44.402	0.0093	1.33	J	0.0072	1.03	J	0.0044	0.63	U	0.0044	0.63	U
1,2,4-Trichlorobenzene	120-82-1	181.45	48.016	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	48.42	0.0255	3.36	U	0.0255	3.36	U	0.0255	3.36	U	0.0255	3.36	U
Hexachloro-1,3-butadiene	87-68-3	260.76	49.834	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	52.183	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	55.69	0.013	1.47	U	0.013	1.47	U	0.013	1.47	U	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-11437

PNNL

J. C. Evans	K6-96
K. H. Pool	P8-08
B. L. Thomas	K4-13
K. B. Olsen	K6-96
A. V. Mitroshkov	K6-96
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L. L. Buckley	R2-12

DOE-RL

C. A. Babel	S7-54
J. F. Thompson	S7-54