TANK VAPOR CHARACTERIZATION PROJECT

Tank 241-BX-104 Fourth Temporal Study: Headspace Gas and Vapor Characterization Results from Samples Collected on April 7, 1997

A. V. Mitroshkov
J. C. Hayes
J. C. Evans
K. H. Pool
K. B. Olsen
J. A. Edwards
J. L. Julya
B. M. Thornton
J. S. Fruchter
K. L. Silvers

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Pacific Northwest National Laboratory
Richland, Washington 99352

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Summary

This report presents the results from analyses of samples taken from the headspace of waste storage tank 241-BX-104 (Tank BX-104) at the Hanford Site in Washington State. Tank headspace samples collected by SGN Eurisys Service Corporation (SESC) were analyzed by Pacific Northwest National Laboratory (PNNL) to determine headspace concentrations of selected non-radioactive analytes. Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNNL. Vapor concentrations from sorbent trap samples are based on measured sample volumes provided by SESC.

Ammonia was determined to be above the immediate notification limit specified by the sampling and analysis plan (SAP) (Buckley 1996). Hydrogen was the principal flammable constituent of the Tank BX-104 headspace, determined to be present at approximately 0.208% of its lower flammability limit (LFL). Total headspace flammability was estimated to be <0.536% of the LFL.

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

Table S.1. Average Measured Concentrations of Gases and Inorganic and Organic Vapors in Tank BX-104 Sampled on 4/7/97

<u>Category</u>	<u>Sample Medium</u>	<u>Analyte</u>	<u>Concentration^(a)</u>	<u>Units</u>
Inorganic Vapors	Sorbent Traps	Ammonia	189	ppmv
		Nitrogen Dioxide (NO ₂)	<0.16	ppmv
		Nitric Oxide (NO)	0.35	ppmv
		Water	13.7	mg/L
Permanent Gases	SUMMA™ Canisters	Hydrogen	83	ppmv
		Methane	<25	ppmv
		Carbon Dioxide	<17	ppmv
		Carbon Monoxide	<17	ppmv
		Nitrous Oxide (N ₂ O)	120	ppmv
Total Non-Methane Organic Compounds	SUMMA™ Canisters	Total Non-Methane Organic Compounds	58.46	mg/m ³
Volatile Organic Vapors	SUMMA™ Canisters	Tridecane	30.910	mg/m ³
		Tetradecane	17.881	mg/m ³
		Dodecane	8.036	mg/m ³
Volatile Organic Vapors	Sorbent Traps	1-Butanol	4.025	mg/m ³
		Tridecane	2.527	mg/m ³
		Tetradecane	1.732	mg/m ³
Flammables	SUMMA™ Canisters and Sorbent Traps	Flammables	<0.536	% LFL

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

Acknowledgments

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Terms and Abbreviations

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

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1.0 Introduction

This report presents results of chemical analyses of vapor samples collected by SESC on April 7, 1997 from the headspace of waste storage tank 241-BX-104 (Tank BX-104) at the Hanford Site in Washington State. Pacific Northwest National Laboratory^(a) provided SUMMA™ canisters and sorbent traps for sample collection, and analyzed the samples according to instructions in the SAP (Buckley 1996). Analytical work was performed by the PNNL VAL in the 300 Area of the Hanford Site under the PNNL Tank Vapor Characterization Project.

Pacific Northwest National Laboratory provided six sets of sorbent traps for selected inorganic analytes (four samples and two field blanks), five SUMMA™ canisters for permanent gases and organic analytes (three headspace samples and two ambient air samples), and eight triple sorbent traps (TSTs) for organic analytes (four samples, two field blanks, and two trip blanks). Sample devices and controls were provided to SESC on March 31, 1997, and were returned to PNNL on April 11, 1997. SESC measured and reported to PNNL the sample volumes needed to determine headspace concentrations from sorbent trap samples.

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

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

2.0 Analytical Methods

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

Table 2.1. Sampling and Analysis Methods Summary

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

Table 2.2. Sample Media Preparation, Handling, and Storage

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

2.1 Inorganic Vapors

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

2.1.1 Sampling Methodology

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

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

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

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

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

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

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

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

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

2.1.2 Analytical Procedures

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

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

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

(SCIC) for nitrite according to PNL-ALO-212, Rev. 1^(a) modified to obviate interferences by concentrations of non-target analytes. Specifically, the modifications used were 1) eluent 1.44 mM Na_2CO_3 + 1.8 mM NaHCO_3 at 2.0 mL/min; 2) one guard column (AG4A) and two separator columns (AS4A) in series instead of just one separator column, and 3) all standards, samples, and blanks injected into the sample loop through 0.45- μm syringe filters.

Primary and breakthrough section materials were analyzed separately using identical procedures. Each analytical session was conducted as follows. Working nitrite standards were prepared by diluting a stock nitrite standard with desorbing solution. An initial calibration curve was prepared from the instrument response versus nitrite standard concentration data for the set of working standards. A calibration verification check using one of the midrange standards was performed at a minimum of once per batch. If the instrument response indicated that sample nitrite concentration was outside the calibration range, the sample was diluted with desorbing solution and reanalyzed. After all samples of a batch were analyzed, the complete set of calibration standards was remeasured to verify consistent instrument response. Instrument responses observed for samples were compared to those for standards to determine the nitrite concentration of the samples. Because the analytes were collected on the sorbent as equal quantities of nitrite and nitrate, and the analysis was specific for nitrite, the moles of NO_2 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 NO_2 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 NO_2 results is $\pm 10\%$, and for NO results it is $\pm 5\%$.

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

Table 2.3 Quantitation Limits for Selected
Inorganic Analytes

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

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

(b) The vapor-mass concentration, thought to be largely water vapor, is determined gravimetrically.

n/a = not applicable.

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

2.2 Permanent Gases

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

2.2.1 SUMMA™ Canister Preparation

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

2.2.2 Analytical Procedure

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

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

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

Table 2.4 Quantitation Limits for Permanent Gases

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

2.2.3 Quality Assurance/Quality Control

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

Each analyte was quantitated by comparison of sample analyte peak area to the calibration plot generated for the compound. The EQL for the method has been established as the low level calibration standard. Before and after each sample analysis set, a gas standard was run to evaluate system performance and to measure system accuracy. The calculated concentration of the individual gases in the standards fell within $\pm 25\%$ of the expected concentrations.

2.3 Total Non-Methane Organic Compounds

2.3.1 Analytical Procedure

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

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

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

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

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

2.3.2 Quality Assurance/Quality Control

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

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

Before the tank samples were analyzed, a diagnostic check was performed on the GC/FID instrument by running a system cleanliness procedure and an instrument continuing calibration as described in PNL-TVP-08. First, two blank volumes of Aadco purified air were analyzed to check the cleanliness of the system. This demonstrates through the analysis of a zero-air blank that the level of interference is acceptable in the analytical system. The analysis of purified air must be below 0.1 mg/m³. Second, an instrument continuing calibration is run using 100-mL UHP propane followed by one blank volume of Aadco air.

2.4 SUMMA™ Canister Sample Analyses

2.4.1 Analytical Procedure

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

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

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

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

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

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

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

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

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

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

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

2.4.2 Quality Assurance/Quality Control

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

2.5 Triple Sorbent Trap Sample Analyses

2.5.1 Sampling Methodology

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

2.5.2 Analytical Procedure

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

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

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

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

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

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

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

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

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

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

2.5.3 Quality Assurance/Quality Control

Before tank samples were analyzed, a diagnostic check was performed on the GC/MS instrument by running a full auto tune, as described in PNL-TVP-10. Upon satisfactory completion of the instrument diagnostic check, a blank trap was analyzed to check the cleanliness of the system. The instrument was then calibrated using six different concentrations of standard gas mixture containing the compounds listed in Table B.2. A gas mixture containing difluorobenzene, chlorobenzene-d₅, and 1,4 bromofluorobenzene was used as an IS for all calibration standard and sample analyses. Analyte responses from sample components, ISs, and standards were obtained from the extracted ion plot from their selected mass ion. A continuing calibration was generated by calculating the relative response ratios of the IS to calibration standard responses and plotting the ratios against the ratio of the calibration-standard concentration (in ppbv) to the IS concentration. Once it was determined that the relative response was linear with increasing concentration, an average response factor was calculated for each target analyte and used to determine the concentration of target compounds in each sample.

3.0 Analysis Results

Results from the sampling of the headspace of Tank BX-104 on April 7, 1997 (Sample Job V7014) are provided below.

3.1 Inorganic Vapors

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

Two field blank multi-trap trains, identical to sample multi-trap trains discussed in Section 2.1, were included in the tube bundle lowered into the headspace of Tank BX-104 during Sample Job V7014. No air was pulled through these field blank multi-trap trains. Any analyte found in the field blank multi-trap trains over and above levels in unexposed tubes was attributed to passive sampling. Data in Table 3.1 have been corrected for these minor effects of passive sampling.

Results provided in Table 3.1 are estimated to be accurate to within $\pm 10\%$ and within the $\pm 30\%$ specified by the SAP. Percent relative standard deviations of the measured concentrations were $<6\%$, which is within the 25% specified by the SAP.

3.1.1 Ammonia

Ammonia analyses were performed on April 15, 1997, 8 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 15.1 to 16.1 μmol in front sections; blank corrected back sorbent section ammonia concentrations were $<0.01 \mu\text{mol}$. Blank corrections of 0.19 μmol in front and 0.04 μmol in the back sections, were about 1.0% of collected quantities. The analysis of one sample was a duplicate and indicated a reproducibility of $\pm 0.8\%$. One blank sorbent trap was spiked with 17 ppm of ammonia and yielded a percentage recovery of 99%. One sample leachate was spiked after initial analysis with approximately the quantity of ammonia in the sample and yielded a percentage recovery of 96%. The initial and continuing calibration verification (ICV, CCV) standards, using NIST-traceable material, yielded percentage recoveries of 100% and 98% (ICV) and 104% and 105% (CCV) during the analytical sessions. A five-point calibration was performed over an ammonia range of 0.1 to 100 $\mu\text{g/ml}$.

3.1.2 Nitric Oxide and Nitrogen Dioxide

Nitric oxide and nitrogen dioxide analyses were performed on April 17 and 22, 1997, 10 and 15 days after sample collection, and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed. No deviations from the procedure were noted.

Blank-corrected NO_2^- quantities in the NO_2 sorbent traps were all $<0.013 \mu\text{mol}$. Blank corrected NO_2^- quantities in the NO sorbent traps ranged from 0.014 to $0.016 \mu\text{mol}$. Nitrite blank levels used to correct data were $0.0116 \mu\text{mol}$ in front (four of four blanks analyzed) and $0.0070 \mu\text{mol}$ in back (two of four blanks analyzed) sorbent sections. The analyses of two samples were duplicated and both yielded repeatabilities of $\pm 0.0\%$. Two sample leachates were spiked with 0.25 and 0.5 ppm NO_2^- and yielded percentage recoveries of 90% and 82% , 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 April 14, 1997, seven days after sample collection and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed.

All multi-trap sample mass gain is assumed to be due to adsorption of water. This is justified because the total mass concentration of other vapors in the headspace of Hanford waste tanks are typically from two to three orders of magnitude less than the mass concentration of the water vapor found in even relatively dry tanks. Water vapor concentrations are given in Table 3.1 for both moist air at tank conditions and for dry air at STP (0°C and 1.013 bar). Because the sample volumes were measured after all water vapor was removed by the sorbent traps, the measured sample volumes are for dry air. The average water vapor concentration was 13.7 mg of water per L of dry air at STP. The result was determined from an average mass gain of 28.9 mg from all four multi-trap trains. The blank correction applied to the results was -3.4 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 14.6°C and relative humidity at 75% at the time of sampling.

3.2 Permanent Gases

Hydrogen analyses were performed on April 18, 1997 and analyses for other permanent gases were performed on April 21, 1997. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed and used in the averages. No deviations from standard procedures were noted.

Measured concentrations of carbon monoxide, carbon dioxide, hydrogen, methane, and N_2O are provided in Table 3.2. Results were based on three samples for each compound. Hydrogen at an average concentration of 83 ppmv and N_2O at an average concentration of 120 ppmv were the only permanent gases detected in Tank BX-104 above the IDL. The relative percent difference (RPD) between duplicate analyses of a single SUMMA™ canister was 1.2% and 0.8% for hydrogen and nitrous oxide, respectively.

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

3.3 Total Non-Methane Organic Compounds

Analyses for TNMOCs were performed on April 30 and May 1, 1997, which was 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.

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 $58.46 \text{ mg}/\text{m}^3$ or 24.34 ppmv of carbon. The $58.46 \text{ mg}/\text{m}^3$ value compares to $71.23 \text{ mg}/\text{m}^3$ for the sum of all target compounds identified in the analysis of the SUMMA™ canisters. The $71.23 \text{ mg}/\text{m}^3$ value should be considered a minimum as TICs were not reported for this study. Results provided in Table 3.3 are estimated to be accurate to within $\pm 30\%$ as specified by the SAP. The RPD for duplicate analysis of a single SUMMA™ canister was 1.5%.

3.3.1 Procedural Deviations, Observations, and Anomalies.

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

Due to a non-detect of the last sample, V7014-A06.287, in the 37043001.b sequence, the sample was reanalyzed on the following sequence, 37050101.b, and reported in Table 3.3. The non-detect was due to lack of liquid cryogen for the analysis of the last sample in the sequence.

3.4 Organic Compound Characterization

Organic vapors in the Tank BX-104 headspace were sampled with SUMMA™ canisters and TSTs. These sampling methods are fundamentally different, but provide comparable results for many of the target analytes.

3.4.1 SUMMA™ Canister Results

Analyses of SUMMA™ canisters for organic vapors were performed on April 29 and May 21, 1997. All analyses were analyzed 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. Only target compounds were evaluated as stated in the SAP. Procedural deviations, observations, and anomalies are presented in Section 3.4.1.1.

Measured concentrations of target analytes are presented in Table 3.4. Forty target analytes above the instrument detection limit (IDL) were detected in the tank headspace samples. Thirty-eight target analytes were identified in two or more tank headspace samples. Tridecane, at $30.910 \text{ mg}/\text{m}^3$, tetradecane at $17.881 \text{ mg}/\text{m}^3$, and dodecane at $8.036 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace samples. The total average concentration of the target analytes was $71.23 \text{ mg}/\text{m}^3$. This compares to a total concentration of $58.46 \text{ mg}/\text{m}^3$ identified in the TO-12 analysis of the three tank headspace samples.

SUMMA™ canister sample V7014-A05.284 was analyzed in replicate for target analytes to determine analytical precision. The RPD results are presented in Table 3.5. The RPDs were calculated for analytes detected above the IDL and found in both replicates. Thirty-three of 38 target compounds had RPDs of less than 10%.

Results of analyses of the ambient air and ambient air through the ISVS samples are provided in Table 3.6. Eighteen target analytes were observed in one or both of the ambient air samples. All target compounds with the exception of acetone, 1,1,2-trichloro-1,2,2-trifluoroethane, 1-butanol, dodecane, tetradecane, and tridecane were observed below their EQL's.

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 tank samples were diluted and reanalyzed in a second batch. The sample analytical sequence runs were as follows:

Batch #1: (file identifier 17042902.b) - V7014-A01.225, V7014-A02.275, V7014-A04.283, V7014-A05.284, V7014-A05.284 REP, V7014-A06.287;

Batch #2: (file identifier 17052102.b) - V7014-A04.283, V7014-A05.284, V7014-A05.284 REP, V7014-A06.287.

Batch #1:

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

Two target compounds (chloroethane - 47.60% and pyridine - 53.79%) surpassed the 30% relative standard deviation (% RSD) acceptance criteria for initial calibration. Tetradecane surpassed the 0.05 response factor (RF) criteria for the initial calibration. Tetradecane was found in all tank samples at concentrations above the upper quantitation limit (UQL) with the exceptions of ambient air sample V7014-A01.225, where it was found at concentration below the IDL and ambient air sample V7014-A02.275, where it was found at a concentration between the EQL and UQL. Chloroethane was not found in the tank samples at concentrations higher than its IDL. Pyridine was found in all tank samples at concentrations between its IDL and EQL, except ambient air samples V7014-A01.225 and V7014-A02.275, where it was not found at concentrations higher than its IDL. Due to the initial calibration performance the uncertainty associated with the results is higher than normal.

Seven target compounds (ethanol - 32.8%, 1,1,2-trichloro-1,2,2-trifluoroethane - 30.2%, 1,2-dichloroethane - 35.3%, 1,1,1-trichloroethane - 27.5%, carbon tetrachloride - 33.1%, hexanitride - 26.9%, and cyclohexanone - 32.2%) were outside the 25% difference (% D)

acceptance criteria for the CCV sample. Tetradecane surpassed the 0.05 RF criteria for the CCV. However, the CCV passed the procedural criterion requiring $\pm 25\%$ D passage for 85% of all target compounds. The compounds 1,2-dichloroethane, 1,1,1-trichloroethane and carbon tetrachloride were not found in the tank samples at concentrations higher than their IDL. Ethanol, 1,1,2-trichloro-1,2,2-trifluoroethane, hexanitride and cyclohexanone were found in the tank samples at concentrations between their EQL and UQL, except in ambient air sample V7014-A01.225, where these compounds were not found at concentrations higher than their IDL, except ethanol and cyclohexanone which were found at concentration between their IDL and EQL and ambient air sample V7014-A02.275, where these compounds were found at concentrations between their IDL and EQL, except 1,1,2-trichloro-1,2,2-trifluoroethane, which was found at concentration between its EQL and UQL.

Batch #2:

This analytical sequence was run using 100 mL volumes of diluted 1:20 samples to quantify target compounds in each tank sample.

Two target compounds (chloroethane - 47.60% and pyridine - 53.79%) surpassed the 30% RSD acceptance criteria for initial calibration. Tetradecane surpassed 0.05 RF criteria for the initial calibration. Tetradecane was found in all tank samples at concentrations between its EQL and UQL. Chloroethane and pyridine were not found in the tank samples at concentrations higher than their IDLs, with the exception of tank sample V7014-A04.283, where pyridine was found at a concentration between the IDL and EQL. Due to the initial calibration performance, the uncertainty associated with these results is higher than normal.

Two target compounds (chloroethane - 42.9%, pyridine - 37.2%) were outside the 25% Difference acceptance criteria for the CCV sample. Tetradecane surpassed the 0.05 RF criteria for the CCV. However, the CCV passed the procedural criterion requiring $\pm 25\%$ D passage for 85% of all target compounds. Due to the CCV performance for these compounds, a higher than normal uncertainty is associated with the results.

Information common to both batches:

Two target compounds (acetone and 1,2,4-trichlorobenzene) were found in the initial calibration blank above their EQLs. No target compounds were detected in the continuing calibration blank above their EQLs.

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

3.4.2 Triple Sorbent Trap Sample Results

Analyses of TSTs were performed on May 9 and 12, 1997. 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. Only target compounds were evaluated as stated in the SAP. Procedural deviations, observations, and anomalies are presented in Section 3.4.2.1.

Measured concentrations of target analytes and TICs are presented in Table 3.7. Results are based on three samples for each compound. Forty-three target analytes above the IDL were detected in the tank headspace samples. Thirty-nine target analytes were identified in two or more tank headspace samples. The compounds 1-butanol at 4.025 mg/m³, tridecane at 2.527 mg/m³, and tetradecane at 1.732 mg/m³ were the three most abundant compounds identified in the tank headspace sample. The total concentration of the target analytes was 15.19 mg/m³.

Triple sorbent trap sample V7014-A12.1401 was analyzed in replicate for target analytes to determine analytical precision. The RPD results are presented in Table 3.8. The RPDs were calculated for analytes detected above the detection limit and found in both replicates. Thirty-seven of 42 target analytes had RPDs of less than 10%.

Results of analyses of the field and trip blanks are provided in Table 3.9. Thirty-one target compounds were identified in one or more of the blank samples. Four of the thirty-one target compounds, butane, methylene chloride, hexane, and toluene, exceed their EQLs.

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

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

3.4.2.1 Procedural Deviations, Observations, and Anomalies. Samples were run under the protocols of procedure PNL-TVP-10, Rev. 2 with the initial calibration performed on 04/08/97 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 47050901.b) - V7014-A17.1404, V7014-A18.1405, V7014-A19.1406, V7014-A20.1407;

Batch #2 (file identifier 47051201.b) - V7014-A11.1400, V7014-A23.1401, V7014-A12.1401 REP, V7014-A13.1402.

Batch #1:

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

The CCV showed acceptable performance as specified in the procedure for all target compounds, with the exceptions of chloromethane (28.5%), ethanol (30.3), pyridine (30.9%), tridecane (32.5%), and tetradecane (58.0%). The uncertainty in the CCV impacts the quantitation of these compounds. Pyridine, tridecane and tetradecane were found in the samples. Trace amounts (below EQL) of methylene chloride, 1,1-dichloroethane, chloroform and tetradecane were seen in the continuing calibration blank (CCB). Compounds found in the CCB at concentrations "in ng" greater than 5% of the sample concentration are flagged with a "B" in the tables.

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 (31.9%), ethanol (30.7%), pyridine (30.3%) and cyclohexanone (28.5%). The uncertainty in the CCV impacts the quantitation of these compounds. Internal standard responses were satisfactory for all runs except for difluorobenzene (47.79%), chlorobenzene (49.68%), and 1-bromo-4-fluorobenzene (49.44%) in the replicate analysis. Surrogate recoveries were satisfactory and ranged from 86% to 106%. Trace amounts (below EQL) of 1,2-dichloro-1,1,2,2-trichloroethane, 1,1-dichloroethane, methylene chloride, chloroform, toluene, and tetradecane were seen in the CCB. Those compounds found in the CCB at concentrations (ng on column) greater than 5% of the sample are flagged with a "B" in the tables.

The total ion chromatogram for these samples showed a typical NPH pattern with a small but visible hydrocarbon hump.

Of particular interest in this sampling job was the positive identification of TBP, which was observed in all three BX-104 samples above the detection limit.

Information common to both batches:

Tributyl phosphate (TBP) is included in the target list based on a calibration performed on January 5 and 9, 1996. The TBP was introduced onto a series of double sorbent traps as a methanolic solution standard rather than a vapor standard. This served to determine the retention time and verify the mass spectral characteristics of the compound. However, verification of the calibration acceptability was not performed because the compound is not present in the CCV. At present, it is not possible to prepare a gas standard from this material. The calibration information on TBP demonstrated that detectability at 0.8 ppbv (based on a 200-mL sample) was possible. Tributyl phosphate was detected in all tank the samples.

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

3.5 Flammability

The analytical results presented above can be used to estimate the Tank BX-104 headspace flammability at the time of sampling. Flammability is calculated using the ammonia concentration from the inorganic analysis, carbon monoxide, hydrogen, and methane concentrations measured from the permanent gas analysis, and the total non-methane organic concentration determined from the TO-12 analysis. Table 3.10 summarizes the calculated flammability data. Hydrogen was the principal flammable constituent of the Tank BX-104 headspace, determined to be present at approximately 0.208% of its LFL. Total headspace flammability was estimated to be <0.536% of the LFL.

Table 3.1 Inorganic Vapor Concentrations from Tank BX-104 Sampled on 4/7/97

Analyte	CAS					Average	Standard Deviation
	Number	V7014-A07-46R	V7014-A08-47R	V7014-A09-48R	V7014-A10-49R		
Ammonia (ppmv)	7664-41-7	192	194	182	190	189	5
Nitric Oxide (ppmv)		0.35	0.37	0.33	0.35	0.35	0.02
Nitrogen Dioxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Water ^(a) (mg/L)		13.3	14.4	13.1	14.1	13.7	0.6
Water ^(b) (mg/L)		12.0	13.0	11.8	12.7	12.4	0.6

Footnotes

(a) Dry air at 0°C and 1.013 bar.

(b) Moist air at tank temperature and pressure.

Table 3.2 Permanent Gas Analysis Results from Tank BX-104 Sampled on 4/7/97.

Permanent Gas Analyte	Upwind Ambient Air	Ambient Air Through Bundle	Tank Samples				RPD ^(c) (%)	Mean	
	V7014-A01.225 ^(a) (ppmv)	V7014-A02.275 ^(a) (ppmv)	V7014-A04.283 ^(a) (ppmv)	V7014-A06.287 ^(a) (ppmv)	V7014-A05.284 ^(a) (ppmv)	V7014-A05.284 ^{(a)(b)} (ppmv)		(ppmv)	St.Dev.
Hydrogen	<17	<17	84	82	82	83	1.2	83	1.2
Methane	<25	<25	<25	<25	<25	<25		<25	
Carbon Dioxide	458	456	<17	<17	<17	<17		<17	
Carbon Monoxide	<17	<17	<17	<17	<17	<17		<17	
Nitrous Oxide	<17	<17	120	119	120	119	0.8	120	0.6

Footnotes

(a) Sample identification number.

(b) Replicate analysis for V7014-A05.284; results are not included in the calculation of average concentrations.

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

Table 3.3 Total Non-Methane Organic Compound Analysis Results from Tank BX-104 Sampled on 4/7/97

	Upwind Ambient Air	Ambient Air Through Bundle	Tank Samples						
	V7014-A01.225 ^(a) Concentration	V7014-A02.275 ^(a) Concentration	V7014-A04.283 ^(a) Concentration	V7014-A06.287 ^{(a)(d)} Concentration	V7014-A05.284 ^(a) Concentration	V7014-A05.284 ^{(a)(b)} Concentration	RPD ^(c) (%)	Mean	St.Dev.
TO-12 (mg/m ³)	< 0.59	1.08	57.18	59.62	58.56	59.47	1.5	58.46	1.2
Total Carbon (ppmv)								24.34	

Footnotes

- (a) Sample identification number.
- (b) Replicate analysis for V7014-A05.284; results are not included in the calculation of average concentrations.
- (c) Relative percent difference (RPD) based on replicate analysis.
- (d) Sample was re-analyzed on sequence 37050101.b.

Table 3.4 Target Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 4/7/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7014-A05.284 ^{(b)(c)} ISVS			V7014-A06.287 ^(b) ISVS			V7014-A04.283 ^(b) ISVS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Dichlorodifluoromethane	75-71-8	121	4.6	0.009	1.6	J	0.008	1.5	J	0.008	1.4	J	0.008	0.000	1.5	0.081
Chloromethane	74-87-3	50	5.0	0.003	1.3	J	0.003	1.2	J	0.003	1.2	J	0.003	0.000	1.2	0.035
Methanol	67-56-1	32	5.3	0.949	663	Y	0.825	577	Y	0.938	656	Y	0.904	0.069	632	48
Butane	106-97-8	58	5.9	0.541	208		0.489	189		0.543	209		0.524	0.030	202	12
Ethanol	64-17-5	46	6.8	0.370	180	Y	0.345	168	Y	0.374	182	Y	0.363	0.016	177	7.6
Acetonitrile	75-05-8	41	7.3	0.286	156		0.281	153		0.275	150		0.281	0.006	153	3.1
Acetone	67-64-1	58	7.9	1.862	718		1.682	649		1.828	705		1.791	0.095	691	37
Trichlorofluoromethane	75-69-4	137	8.3	0.526	86		0.475	77		0.447	73		0.483	0.040	79	6.6
Pentane	109-66-0	72	9.0	0.403	125		0.383	119		0.365	113		0.383	0.019	119	5.8
Methylene Chloride	75-09-2	85	9.7	0.011	2.8	J,B	0.010	2.8	J,B	0.008	2.1	J,B	0.010	0.001	2.5	0.36
1,1,2,2-Tetrachloroethane	76-13-1	187	10.2	0.120	14		0.098	12		0.083	10.0		0.101	0.018	12	2.2
Propanenitrile	107-12-0	55	10.9	0.154	63		0.154	63		0.137	56		0.149	0.010	60	4.0
Propanol	71-23-8	60	10.9	0.621	231		0.585	218		0.616	230		0.607	0.019	226	7.3
2-Butanone	78-93-3	72	12.5	0.620	193		0.688	214		0.501	156		0.603	0.095	187	29
Hexane	110-54-3	86	13.7	0.252	65		0.253	66		0.207	54		0.237	0.026	62	6.8
Tetrahydrofuran	109-99-9	72	14.6	0.864	268		0.930	289		0.693	215		0.829	0.122	258	38
Butanenitrile	109-74-0	69	15.8	0.103	33		0.095	31		0.125	40		0.107	0.015	35	4.9
1-Butanol	71-36-3	74	16.3	5.168	1562		4.591	1387		6.674	2017	*	5.478	1.076	1655	325
Benzene	71-43-2	78	16.7	0.009	2.5	J	0.008	2.4	J	0.009	2.6	J	0.009	0.000	2.5	0.079
Cyclohexane	110-82-7	84	17.3	0.037	9.9		0.034	9.1	J	0.027	7.3	J	0.033	0.005	8.8	1.3
Heptane	142-82-5	100	19.3	0.177	40		0.166	37		0.174	39		0.172	0.006	39	1.3
4-Methyl-2-Pentanone	108-10-1	100	20.5	0.029	6.4	J	0.025	5.7	J	0.033	7.4	J	0.029	0.004	6.5	0.88
Pyridine	110-86-1	79	20.6	0.017	4.9	J	0.015	4.4	J	0.019	5.3	J	0.017	0.002	4.8	0.46
Pentanenitrile	110-59-8	83	21.6	0.038	10	J	0.034	9.1	J	0.042	11	J	0.038	0.004	10	1.1
Toluene	108-88-3	92	22.6	0.024	5.8		0.023	5.7		0.022	5.4		0.023	0.001	5.6	0.22
Octane	111-65-9	114	24.7	0.122	24		0.112	22		0.111	22		0.115	0.006	23	1.2
Tetrachloroethylene	127-18-4	166	25.2	0.008	1.1	J	0.008	1.1	J	0.004	0.57	U	0.008	d	1.1	d
Hexanenitrile	628-73-9	97	27.1	0.064	15		0.054	12		0.068	16		0.062	0.007	14	1.7
Ethylbenzene	100-41-4	106	27.7	0.003	0.72	J	0.003	0.67	J	0.003	0.67	J	0.003	0.000	0.69	0.029
p/m-Xylene	106-42-3	106	28.1	0.014	2.9	J	0.013	2.8	J	0.013	2.8	J	0.013	0.000	2.8	0.074
Cyclohexanone	108-94-1	98	28.5	0.100	23		0.088	20		0.113	26		0.100	0.013	23	2.9
1,1,2,2-Tetrachloroethane	79-34-5	168	29.3	0.005	0.60	J	0.004	0.56	U	0.004	0.56	U	d	d	d	d
o-Xylene	95-47-6	106	29.3	0.008	1.8	J	0.008	1.8	J	0.008	1.6	J	0.008	0.000	1.7	0.081
Nonane	111-84-2	128	29.8	0.076	13		0.073	13		0.070	12		0.073	0.003	13	0.51
Decane	124-18-5	142	34.5	0.106	17		0.100	16		0.101	16		0.102	0.003	16	0.49
Undecane	1120-21-4	156	38.8	0.787	113		0.773	111		0.640	92		0.733	0.081	105	12
Dodecane	112-40-3	170	42.8	8.462	1113	*	8.105	1066	*	7.542	992	*	8.036	0.464	1057	61
Hexachloro-1,3-butadiene	87-68-3	261	44.1	0.005	0.40	U	0.009	0.76	J,B	0.005	0.40	U	d	d	d	d

Table 3.4 (Cont'd) Target Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 4/7/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7014-A05.284 ^{(b)(c)} ISVS			V7014-A06.287 ^(b) ISVS			V7014-A04.283 ^(b) ISVS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Tridecane	629-50-5	184	46.5	32.618	3963	*	30.087	3656	*	30.026	3648	*	30.910	1.479	3756	180
Tetradecane	629-59-4	198	50.1	18.394	2077	*	17.209	1944	*	18.041	2037	*	17.881	0.608	2019	69
Total Concentration of Target Analytes													71.23			

Data Quality Flags

B Compound found in associated laboratory blank.

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

U Target compound not detected at or above the IDL.

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

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

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

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

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

Table 3.5 Comparison of Target Organic Compound Concentrations from Replicate Analysis of a Single SUMMATM Canister from Tank BX-104 Sampled on 4/7/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7014-A05.284 ^(b) ISVS						RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Dichlorodifluoromethane	75-71-8	121	4.6	0.009	1.6	J	0.008	1.5	J	11
Chloromethane	74-87-3	50	5.0	0.003	1.3	J	0.003	1.2	J	7
Methanol	67-56-1	32	5.3	0.949	663	Y	0.902	630	Y	5
Butane	106-97-8	58	5.9	0.541	208		0.480	185		12
Ethanol	64-17-5	46	6.8	0.370	180	Y	0.340	165	Y	8
Acetonitrile	75-05-8	41	7.3	0.286	156		0.286	156		0
Acetone	67-64-1	58	7.9	1.862	718		1.761	679		6
Trichlorofluoromethane	75-69-4	137	8.3	0.526	86		0.483	79		9
Pentane	109-66-0	72	9.0	0.403	125		0.392	122		3
Methylene Chloride	75-09-2	85	9.7	0.011	2.8	J,B	0.011	2.8	J,B	3
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187	10.2	0.120	14		0.121	15		1
Propanenitrile	107-12-0	55	10.9	0.154	63		0.160	65		3
Propanol	71-23-8	60	10.9	0.621	231		0.603	225		3
2-Butanone	78-93-3	72	12.5	0.620	193		0.654	203		5
Hexane	110-54-3	86	13.7	0.252	65		0.258	67		2
Tetrahydrofuran	109-99-9	72	14.6	0.864	268		0.960	298		11
Butanenitrile	109-74-0	69	15.8	0.103	33		0.101	33		2
1-Butanol	71-36-3	74	16.3	5.168	1562		4.823	1458		7
Benzene	71-43-2	78	16.7	0.009	2.5	J	0.009	2.6	J	1
Cyclohexane	110-82-7	84	17.3	0.037	9.9		0.028	7.6	J	27
Heptane	142-82-5	100	19.3	0.177	40		0.176	39		1
4-Methyl-2-Pentanone	108-10-1	100	20.5	0.029	6.4	J	0.026	5.9	J	9
Pyridine	110-86-1	79	20.6	0.017	4.9	J	0.018	5.1	J	4
Pentanenitrile	110-59-8	83	21.6	0.038	10	J	0.036	9.7	J	6
Toluene	108-88-3	92	22.6	0.024	5.8		0.024	5.9		1
Octane	111-65-9	114	24.7	0.122	24		0.118	23		3
Tetrachloroethylene	127-18-4	166	25.2	0.008	1.1	J	0.009	1.2	J	5
Hexanenitrile	628-73-9	97	27.1	0.064	15		0.057	13		12
Ethylbenzene	100-41-4	106	27.7	0.003	0.72	J	0.003	0.69	J	3
p/m-Xylene	106-42-3	106	28.1	0.014	2.9	J	0.014	2.9	J	1
Cyclohexanone	108-94-1	98	28.5	0.100	23		0.092	21		8
1,1,2,2-Tetrachloroethane	79-34-5	168	29.3	0.005	0.60	J	0.004	0.56	U	
o-Xylene	95-47-6	106	29.3	0.008	1.8	J	0.008	1.8	J	0
Nonane	111-84-2	128	29.8	0.076	13		0.075	13		1
Decane	124-18-5	142	34.5	0.106	17		0.101	16		5
Undecane	1120-21-4	156	38.8	0.787	113		0.753	108		4
Dodecane	112-40-3	170	42.8	8.462	1113	*	7.873	1035	*	7
Tridecane	629-50-5	184	46.5	32.618	3963	*	30.027	3648	*	8
Tetradecane	629-59-4	198	50.1	18.394	2077	*	17.746	2004	*	4

Data Quality Flags

B Compound found in associated laboratory blank.

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

U Target compound not detected at or above the IDL.

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

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

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

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

Table 3.6 Target Organic Compound Concentrations in Ambient Air and Ambient Air through the ISVS in SUMMATM Canisters Associated with the Sampling of Tank BX-104 on 4/7/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7014-A01.225 ^(b)			V7014-A02.275 ^(b)		
				Ambient Air			Ambient Air Through ISVS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	121	4.6	0.003	0.58	J	0.003	0.61	J
Chloromethane	74-87-3	50	5.0	0.002	0.74	J	0.002	0.90	J
Butane	106-97-8	58	5.9	0.002	0.92	U	0.010	3.9	J
Acetone	67-64-1	58	7.9	0.028	11	J	0.047	18	
Trichlorofluoromethane	75-69-4	137	8.3	0.005	0.78	U	0.008	1.4	J
Pentane	109-66-0	72	9.0	0.004	1.2	U	0.006	1.9	J
Methylene Chloride	75-09-2	85	9.7	0.007	1.9	J,B	0.007	1.7	J,B
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	10.2	0.004	0.48	U	0.215	26	
Propanol	71-23-8	60	10.9	0.002	0.87	J	0.011	3.9	J
2-Butanone	78-93-3	72	12.5	0.020	6.3	J	0.027	8.3	J
Tetrahydrofuran	109-99-9	72	14.6	0.002	0.50	U	0.009	2.9	J
Butanenitrile	109-74-0	69	15.8	0.003	1.1	U	0.002	0.74	J
1-Butanol	71-36-3	74	16.3	0.003	0.97	U	0.094	28	
Hexanenitrile	628-73-9	97	27.1	0.005	1.2	U	0.002	0.42	J
Cyclohexanone	108-94-1	98	28.5	0.034	7.9	J	0.016	3.6	J
Dodecane	112-40-3	170	42.8	0.010	1.3	U	0.118	16	
Tridecane	629-50-5	184	46.5	0.006	0.73	U	1.279	155	
Tetradecane	629-59-4	198	50.1	0.004	0.47	U	0.611	69	

Data Quality Flags

B Compound found in associated laboratory blank.

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

U Target compound not detected at or above the IDL.

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

Table 3.7 Target Organic Compound Concentrations in Triple Sorbent Traps from Tank BX-104 Sampled on 4/7/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7014-A11.1400 ^(b) ISVS			V7014-A12.1401 ^{(b)(c)} ISVS			V7014-A13.1402 ^(b) ISVS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Methanol	67-56-1	32	10.0	0.848	593	Y	0.459	321	Y	0.386	270	Y	0.564	0.248	394	173
Butane	106-97-8	58	10.8	0.628	242		0.386	149		0.395	152		0.470	0.137	181	53
Ethanol	64-17-5	46	12.5	0.370	180	Y	<0.275	<133	Y	<0.275	<133	Y	d	d	d	d
Acetonitrile	75-05-8	41	13.0	0.285	155		0.177	97		0.158	86		0.207	0.068	113	37
Acetone	67-64-1	58	13.7	1.116	430		0.748	289		0.683	263		0.849	0.233	327	90
Trichlorofluoromethane	75-69-4	137	14.1	0.504	82		0.431	70		0.419	68		0.451	0.046	74	7.6
Pentane	109-66-0	72	14.9	0.376	117		0.226	70		0.235	73		0.279	0.084	87	26
Methylene Chloride	75-09-2	85	15.7	0.059	16	J,B	0.060	16	J,B	0.041	11	J,B	0.053	0.011	14	2.9
1,1,2,2-tetrachloroethane	76-13-1	187	16.3	0.026	3.1	J	0.041	4.9		0.029	3.5	J	0.032	0.008	3.8	0.96
Propanenitrile	107-12-0	55	17.0	0.130	53		0.085	35		0.083	34		0.099	0.027	40	11
Propanol	71-23-8	60	17.0	0.742	276		0.264	98		0.373	139		0.460	0.250	171	93
2-Butanone	78-93-3	72	18.6	0.286	89		0.172	54		0.179	56		0.213	0.064	66	20
cis-1,2-Dichloroethene	156-59-2	97	19.5	0.004	0.81	J	0.003	0.72	J	0.004	0.82	J	0.003	0.000	0.78	0.055
Hexane	110-54-3	86	19.8	0.253	66		0.175	46		0.179	46		0.202	0.044	53	11
Tetrahydrofuran	109-99-9	72	20.7	0.632	196		0.464	144		0.494	153		0.530	0.090	165	28
Butanenitrile	109-74-0	69	21.8	0.107	35		0.062	20		0.068	22		0.079	0.024	26	7.8
1,1,1-Trichloroethane	71-55-6	133	21.9	0.007	1.1	J	0.006	1.1	J	0.007	1.2	J	0.007	0.000	1.1	0.070
1-Butanol	71-36-3	74	22.3	5.279	1598	E	3.227	977		3.568	1080		4.025	1.100	1218	333
Benzene	71-43-2	78	22.8	0.013	3.7	J	0.012	3.4	J	0.012	3.5	J	0.012	0.001	3.5	0.15
Heptane	142-82-5	100	25.1	0.159	36		0.107	24		0.124	28		0.130	0.027	29	6.0
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.071	16		0.042	9.3		0.048	11		0.053	0.016	12	3.5
Pyridine	110-86-1	79	26.5	0.054	15	J	0.043	12	J	0.043	12	J	0.047	0.006	13	1.8
Pentanenitrile	110-59-8	83	27.4	0.059	16		0.034	9.0		0.039	11		0.044	0.013	12	3.6
1,1,2-Trichloroethane	79-00-5	133	27.8	0.011	1.8	J	0.010	1.6	J	0.010	1.6	J	0.010	0.001	1.7	0.11
Toluene	108-88-3	92	28.5	0.052	13		0.045	11		0.051	12		0.050	0.004	12	0.93
Octane	111-65-9	114	30.4	0.101	20		0.054	11		0.079	16		0.078	0.023	15	4.6
Tetrachloroethylene	127-18-4	166	31.0	0.006	0.74	J	0.004	0.54	J	0.005	0.67	J	0.005	0.001	0.65	0.10
Hexanenitrile	628-73-9	97	32.8	0.055	13		0.029	6.7	J	0.039	9.1		0.041	0.013	9.5	3.1
Ethylbenzene	100-41-4	106	33.4	0.005	1.1	J	0.005	1.0	J	0.005	1.0	J	0.005	0.000	1.1	0.053
p/m-Xylene	106-42-3	106	33.8	0.018	3.8	J	0.016	3.5	J	0.017	3.5	J	0.017	0.001	3.6	0.16
Styrene	100-42-5	104	34.7	0.002	0.36	U	0.003	0.63	J	0.002	0.36	U	d	d	d	d
o-Xylene	95-47-6	106	35.0	0.008	1.7	J	0.007	1.4	J	0.007	1.5	J	0.007	0.001	1.5	0.17
Nonane	111-84-2	128	35.4	0.043	7.6		0.014	2.4		0.025	4.4		0.027	0.015	4.8	2.6
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.003	0.47	U	0.003	0.54	J	0.003	0.47	U	d	d	d	d
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.003	0.47	U	0.003	0.55	J	0.003	0.51	J	0.003	d	0.53	d
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.005	0.91	J	0.007	1.3	J	0.005	0.95	J	0.006	0.001	1.0	0.19
Decane	124-18-5	142	40.1	0.052	8.2		0.026	4.1	J	0.032	5.0	J	0.037	0.014	5.8	2.2
1,4-Dichlorobenzene	106-46-7	147	40.6	0.003	0.46	U	0.003	0.48	J	0.003	0.47	U	d	d	d	d

Table 3.7 (Cont'd) Target Organic Compound Concentrations in Triple Sorbent Traps from Tank BX-104 Sampled on 4/7/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7014-A11.1400 ^(b) ISVS			V7014-A12.1401 ^{(b)(c)} ISVS			V7014-A13.1402 ^(b) ISVS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Undecane	1120-21-4	156	44.4	0.310	45		0.072	10		0.172	25		0.185	0.120	27	17
Dodecane	112-40-3	170	48.4	2.790	368		0.499	66		1.470	194		1.586	1.150	209	151
Tridecane	629-50-5	184	52.2	4.291	522	E	0.906	110		2.384	290		2.527	1.697	308	207
Tetradecane	629-59-4	198	55.7	2.897	328	E	0.631	71	B	1.667	189		1.732	1.135	196	128
Tributyl Phosphate	126-73-8	266	63.1	0.058	4.9	Z	0.061	5.1	Z	0.079	6.6	Z	0.066	0.011	5.6	0.94
Total Concentration of Target Analytes													15.19			

Data Quality Flags

- B Compound found in associated laboratory blank.
- E Target compound exceeds the upper quantification limit (UQL).
- J Target compound detected above the IDL but below the EQL.
- U Target compound not detected at or above the IDL.
- Y Initial calibration and CCV were performed; however, the analyte was not part of the current operating procedure.
- Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv; however, this compound is not currently part of the analytical method. See Section 3.4.2 for more information.

Footnotes

- (a) Detected target analytes.
- (b) Sample identification number.
- (c) Replicates of this sample are found in Table 3.8.
- (d) Mean and/or standard deviation are not meaningful for this analyte.

Table 3.8 Comparison of Target Organic Compound Concentrations from Replicate Analysis of a Single Triple Sorbent Trap from Tank BX-104 Sampled on 4/7/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7014-A12.1401 ^(b) ISVS						RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Methanol	67-56-1	32	10.0	0.459	321	Y	0.483	338	Y	5
Butane	106-97-8	58	10.8	0.386	149		0.400	154		4
Acetonitrile	75-05-8	41	13.0	0.177	97		0.187	102		5
Acetone	67-64-1	58	13.7	0.748	289		0.707	273		6
Trichlorofluoromethane	75-69-4	137	14.1	0.431	70		0.431	70		0
Pentane	109-66-0	72	14.9	0.226	70		0.234	73		3
Methylene Chloride	75-09-2	85	15.7	0.060	16	J,B	0.060	16	J,B	1
112trichloro122trifluoroethane	76-13-1	187	16.3	0.041	4.9		0.040	4.8		2
Propanenitrile	107-12-0	55	17.0	0.085	35		0.087	35		2
Propanol	71-23-8	60	17.0	0.264	98		0.283	105		7
2-Butanone	78-93-3	72	18.6	0.172	54		0.172	53		0
cis-1,2-Dichloroethene	156-59-2	97	19.5	0.003	0.72	J	0.003	0.74	J	3
Hexane	110-54-3	86	19.8	0.175	46		0.179	47		2
Tetrahydrofuran	109-99-9	72	20.7	0.464	144		0.480	149		3
Butanenitrile	109-74-0	69	21.8	0.062	20		0.064	21		3
1,1,1-Trichloroethane	71-55-6	133	21.9	0.006	1.1	J	0.006	1.1	J	2
1-Butanol	71-36-3	74	22.3	3.227	977		3.295	997		2
Benzene	71-43-2	78	22.8	0.012	3.4	J	0.021	6.1		55
Heptane	142-82-5	100	25.1	0.107	24		0.108	24		1
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.042	9.3		0.043	9.6		4
Pyridine	110-86-1	79	26.5	0.043	12	J	0.044	13	J	3
Pentanenitrile	110-59-8	83	27.4	0.034	9.0		0.034	9.1		1
1,1,2-Trichloroethane	79-00-5	133	27.8	0.010	1.6	J	0.009	1.5	J	4
Toluene	108-88-3	92	28.5	0.045	11		0.046	11		1
Octane	111-65-9	114	30.4	0.054	11		0.051	10		5
Tetrachloroethylene	127-18-4	166	31.0	0.004	0.54	J	0.003	0.44	J	22
Hexanenitrile	628-73-9	97	32.8	0.029	6.7	J	0.028	6.5	J	3
Ethylbenzene	100-41-4	106	33.4	0.005	1.0	J	0.005	1.0	J	0
p/m-Xylene	106-42-3	106	33.8	0.016	3.5	J	0.017	3.5	J	1
Styrene	100-42-5	104	34.7	0.003	0.63	J	0.003	0.65	J	3
o-Xylene	95-47-6	106	35.0	0.007	1.4	J	0.007	1.5	J	10
Nonane	111-84-2	128	35.4	0.014	2.4		0.015	2.7		12
1-Ethyl-2-methyl benzene	611-14-3	120	38.4	0.003	0.54	J	0.003	0.57	J	7
1,3,5-Trimethylbenzene	108-67-8	120	38.6	0.003	0.55	J	0.003	0.59	J	6
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.007	1.3	J	0.007	1.3	J	3
Decane	124-18-5	142	40.1	0.026	4.1	J	0.027	4.2	J	3
1,4-Dichlorobenzene	106-46-7	147	40.6	0.003	0.48	J	0.003	0.48	J	3
Undecane	1120-21-4	156	44.4	0.072	10		0.071	10		2
Dodecane	112-40-3	170	48.4	0.499	66		0.504	66		1
Tridecane	629-50-5	184	52.2	0.906	110		0.930	113		3
Tetradecane	629-59-4	198	55.7	0.631	71	B	0.631	71	B	0
Tributyl Phosphate	126-73-8	266	63.1	0.061	5.1	Z	0.013	1.1	Z	131

Data Quality Flags

B Compound found in associated laboratory blank.

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

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

Z TBP was analyzed as a positively identified compound (PIC) however, the analyte was not part of the current operating procedure.

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

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

Table 3.9 Target Organic Compound Concentrations in Triple Sorbent Trap Blank Samples
Associated with the Sampling of Tank BX-104 on 4/7/97

Target Analytes ^(a)	CAS	MW	Ret Time	V7014-A17.1404 ^(b)			V7014-A18.1405 ^(b)			V7014-A19.1406 ^(b)			V7014-A20.1407 ^(b)		
				Field Blank #1			Field Blank #2			Trip Blank #1			Trip Blank #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Butane	106-97-8	58	10.8	0.040	15		0.029	11	J	0.004	1.4	U	0.004	1.4	U
Acetonitrile	75-05-8	41	13.0	0.006	3.4	J	0.006	3.0	J	0.003	1.8	U	0.003	1.8	U
Acetone	67-64-1	58	13.7	0.036	14	J	0.030	12	J	0.004	1.6	J	0.019	7.4	J
Trichlorofluoromethane	75-69-4	137	14.1	0.020	3.3	J	0.016	2.6	J	0.004	0.72	U	0.005	0.86	J
Pentane	109-66-0	72	14.9	0.012	3.7	J	0.009	2.9	J	0.003	0.89	U	0.003	0.89	U
Methylene Chloride	75-09-2	85	15.7	0.035	9.2	J,B	0.033	8.8	J,B	0.049	13	J,B	0.291	77	B
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	16.3	0.022	2.7	J	0.024	2.9	J	0.003	0.36	U	0.003	0.36	U
Propanol	71-23-8	60	17.0	0.016	5.8	J	0.011	4.0	J	0.005	2.0	U	0.005	2.0	U
2-Butanone	78-93-3	72	18.6	0.005	1.7	J	0.005	1.4	J	0.002	0.68	U	0.002	0.68	U
Hexane	110-54-3	86	19.8	0.015	4.0		0.021	5.4		0.001	0.19	J	0.002	0.45	J
Tetrahydrofuran	109-99-9	72	20.7	0.011	3.3	J	0.008	2.5	J	0.004	1.1	U	0.004	1.1	U
1,1,1-Trichloroethane	71-55-6	133	21.9	0.004	0.67	J	0.003	0.57	J	0.003	0.44	U	0.003	0.44	U
1-Butanol	71-36-3	74	22.3	0.024	7.1	J	0.031	9.3	J	0.008	2.3	U	0.008	2.3	U
Benzene	71-43-2	78	22.8	0.005	1.5	J	0.005	1.4	J	0.002	0.51	J	0.002	0.62	J
Trichloroethene	79-01-6	131	24.7	0.004	0.61	U	0.004	0.61	U	0.002	0.34	J	0.009	1.5	J
Heptane	142-82-5	100	25.1	0.003	0.61	J	0.003	0.60	J	0.002	0.35	U	0.002	0.35	U
4-Methyl-2-Pentanone	108-10-1	100	26.3	0.009	2.0	J	0.010	2.2	J	0.005	1.1	J	0.008	1.7	J
Pyridine	110-86-1	79	26.5	0.035	9.9	J	0.034	9.7	J	0.033	9.5	J	0.033	9.2	J
1,1,2-Trichloroethane	79-00-5	133	27.8	0.010	1.6	J	0.009	1.6	J	0.010	1.6	J	0.010	1.7	J
Toluene	108-88-3	92	28.5	0.033	8.0		0.029	7.1		0.001	0.30	J	0.005	1.1	J
Hexanenitrile	628-73-9	97	32.8	0.012	2.8	J	0.012	2.7	J	0.011	2.5	J	0.012	2.7	J
Ethylbenzene	100-41-4	106	33.4	0.003	0.59	J	0.003	0.61	J	0.001	0.30	U	0.001	0.30	U
p/m-Xylene	106-42-3	106	33.8	0.010	2.0	J	0.010	2.1	J	0.003	0.63	U	0.003	0.63	U
Styrene	100-42-5	104	34.7	0.001	0.19	J	0.002	0.37	J	0.002	0.33	U	0.002	0.33	U
o-Xylene	95-47-6	106	35.0	0.004	0.77	J	0.004	0.86	J	0.002	0.40	U	0.002	0.40	U
Nonane	111-84-2	128	35.4	0.006	0.98	J	0.005	0.94	J	0.001	0.22	U	0.001	0.22	U
1,2,4-Trimethylbenzene	95-63-6	120	39.9	0.004	0.68	J	0.004	0.78	J	0.003	0.47	U	0.003	0.47	U
Decane	124-18-5	142	40.1	0.018	2.9	J	0.021	3.3	J	0.003	0.47	U	0.003	0.47	U
Undecane	1120-21-4	156	44.4	0.009	1.3	J	0.015	2.2	J	0.004	0.63	U	0.004	0.63	U
Tridecane	629-50-5	184	52.2	0.027	3.3	J	0.076	9.3	J	0.026	3.2	U	0.026	3.2	U
Tetradecane	629-59-4	198	55.7	0.057	6.5	J,B	0.052	5.9	J,B	0.036	4.0	J,B	0.051	5.8	J,B

Data Quality Flags

B Compound found in associated laboratory blank.

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

U Target compound not detected at or above the IDL.

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

Table 3.10 Flammability Data for Tank BX-104 Sampled on 4/7/97

Analyte	CAS #	Lower Flammability	Average Measured	% of LFL ^(a)
		Limit(LFL)	Concentrations	
Ammonia (ppm)	7664-41-7	150000	189	0.126
Carbon Monoxide (ppm)	630-08-0	125000	<17	<0.014
Hydrogen (ppm)	1333-74-0	40000	83	0.208
Methane (ppm)	74-82-8	50000	<25	<0.050
TNMOC (mg/m ³)		42000	58.46	0.139
Total				<0.536

(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-104 Sampled on 4/7/97

Figure 3.2b Typical Total Ion Chromatogram (36 - 70 min) for Triple Sorbent Trap Samples from Tank BX-104 Sampled on 4/7/97

4.0 Conclusions

The concentrations of inorganic and organic analytes were determined from samples of the headspace of Tank BX-104 on April 7, 1997 (Sample Job V7014). 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 SESC. Known sampling and analytical variances from established quality assurance requirements, where significant, were documented in this report, as required by the SAP (Buckley 1996). Immediate notification was provided because the ammonia concentration exceeded the 150 ppmv notification level; notification levels and notification procedures are described in the SAP (Buckley 1996).

5.0 References

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

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

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

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

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

Appendix A

Chain-of-Custody Sample Control Forms

Custody Form Initiator

J. A. Edwards - PNNL

Telephone

(509) 373-0141

Page

85-3009 / FAX 376-0418

Company Contact

G. S. Caprio - SESC

Telephone

(509) 372-3531

Page

85-5282 / FAX 373-3193

Project Designation/Sampling Locations 200 West Tank Farm

241-BX-104 Tank Vapor Sample SAF V7014

Temporal #4 Riser # 7 ISVS

Ice Chest No.

Collection date

04 - 7 - 97

Preparation date

03 - - - 97

Field Logbook No. WHC - N - 647 - 8

Bill of Lading/Airbill No.

N/A

Offsite Property No.

N/A

Method of Shipment

Government Truck

Collectors: G. CAPRIO

Shipped to

PNNL

ES MAST

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

		Sample Date/Time
V7014 - A07 .46R	Collect NH ₃ /NO _x /H ₂ O Sorbent Trap	4/7/97 / 1200 ⁻
V7014 - A08 .47R	Collect NH ₃ /NO _x /H ₂ O Sorbent Trap	4/7/97 / 1200 ⁺
V7014 - A09 .48R	Collect NH ₃ /NO _x /H ₂ O Sorbent Trap	4/7/97 / 1201 ⁻
V7014 - A10 .49R	Collect NH ₃ /NO _x /H ₂ O Sorbent Trap	4/7/97 / 1201 ³⁰
V7014 - A15 .50R	Open, close and store NH ₃ /NO _x /H ₂ O field blank #1	4/7/97 / NA
V7014 - A16 .51R	Open, close and store NH ₃ /NO _x /H ₂ O field blank #2	4/7/97 / NA

[] Field Transfer of Custody		[X] Chain of Possession		(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time	
A.W. Edwards	03-31-97	1405	J.A. Edwards	03-31-97	1405	
J.A. Edwards	03-31-97	1415	C. Smith	03-31-97	1415	
C. Smith	03-31-97	1530	G.S. Caprio	03-31-97	1530	
G.S. Caprio	4-7-97	1330	ES MAST	4-7-97	1330	
ES MAST	4/11/97	1330	J.A. Edwards	4/11/97	1330	
J.A. Edwards	4/14/97	0915	LMP Thomas	4/14/97	0915	

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

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

1 of 1

(Revised 02/01/97 PNNL)

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-0418

Company Contact

G. S. Caprio - SESC

Telephone (509) 372-3531

Page 85-5282 / FAX 373-3193

Project Designation/Sampling Locations 200 West Tank Farm

241-BX-104 Tank Vapor Sample SAF V7014

Temporal #4 Riser # 7 ISVS

Ice Chest No.

Collection date 04 - 7 - 97

Preparation date 03 - - 97

Field Logbook No. WHC - N - 617 - 8

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Collectors: CAPRIO

Shipped to

PNNL

MAST

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

V7014 - A01 . 225 Collect Ambient Air Sample SUMMA #1

V7014 - A02 . 275 Collect Ambient Air Sample SUMMA #2

V7014 - A04 . 283 Collect SUMMA #3

V7014 - A05 . 284 Collect SUMMA #4

V7014 - A06 . 287 Collect SUMMA #5

Sample Date/Time

4/7/97 / 1129⁰⁰ to 1128⁰⁰
4/7/97 / 1123⁰⁰ to 1124⁰⁰4/7/97 / 1147⁰⁰ to 1148⁰⁰
4/7/97 / 1151⁰⁰ to 1152⁰⁰
4/7/97 / 1156⁰⁰ to 1157⁰⁰

☐ Field Transfer of Custody		☒ Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time
J A Edwards J A Edwards	03-31-97	1415	CSMiciella Cmiella	03-31-97	1415
CSMiciella Cmiella	03-31-97	1530	GS Caprio GS Caprio	03-31-97	1530
GS Caprio GS Caprio	4-7-97	1330	ES Mast ES Mast	4-7-97	1330
ES Mast ES Mast	4/11/97	1330	J A Edwards J A Edwards	4/11/97	1330

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

1/2

POC

1/2

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

(Revised 02/01/97 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 373-7076

Project Designation/Sampling Locations 200 West Tank Farm

241-BX-104

Tank Vapor Sample SAF V7014

Temporal #4

Riser #

7

(ISVS Cart)

Ice Chest No.

Collection date

4-7-97

Preparation date

03-28-97

Field Logbook No.

RUST-0-447-8

Ertco Hi/Lo thermometer No.

PNL-T-006

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

RUST-

Collector(s) GS CAPRIO

ES Mast

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

V7014 - A11 . 1400	PNL Triple Sorbent Trap (TST) Sample #1	4-7-97 / 1220
V7014 - A12 . 1401	PNL TST Sample #2	4-7-97 / 1220
V7014 - A13 . 1402	PNL TST Sample #3	4-7-97 / 1220
V7014 - A14 . 1403	PNL TST Sample #4	4-7-97 / 1220
V7014 - A17 . 1404	Open, close & store TST Field Blank #1	4-7-97 / NA
V7014 - A18 . 1405	Open, close & store TST Field Blank #2	4-7-97 / NA
V7014 - A19 . 1406	Store TST Trip Blank #1	NA - NA - 9NA / NA
V7014 - A20 . 1407	Store TST Trip Blank #2	NA - NA - 9NA / NA

[] Field Transfer of Custody			[X] Chain of Possession			(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time		
JL Julia	03-31-97	1330	JA Edwards	03-31-97	1330		
JA Edwards	03-31-97	1415	CSM. C. Kille	03-31-97	1415		
CSM. C. Kille	03-31-97	1530	GS CAPRIO	3-31-97	1530		
GS CAPRIO	4-7-97	1335	ES Mast	4-7-97	1335		
ES Mast	4-11-97	1330	JA Edwards	4-11-97	1330		
JA Edwards	5/6/97	1100	JL Julia	5/6/97	1100		

Final Sample Disposition

Comments:

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

POC

(E)

POC

(E)

Comments:

Cooler Temperature Status
Hi -12 °C / Lo -12 °C (pick up at PNL to WHC)
Hi +3 °C / Lo -15 °C (delivery at WHC from PNL)
Hi +3 °C / Lo -15 °C (at return to PNL from WHC)
Hi +7 °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-104 Sampled on 4/7/97

Target Analytes	CAS	MW	Ret Time	V7014-A01.225 Upwind Ambient Air			V7014-A02.275 Ambient Air Thru ISVS			V7014-A05.284 ISVS			V7014-A05.284 ISVS Rep			V7014-A06.287 ISVS			V7014-A04.283 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.9	4.6	0.0031	0.58 J		0.0033	0.61 J		0.0087	1.6 J		0.0078	1.45 J		0.0081	1.5 J		0.0078	1.44 J	
Chloromethane	74-87-3	50.5	5.0	0.0017	0.74 J		0.002	0.9 J		0.0028	1.25 J		0.0026	1.15 J		0.0027	1.18 J		0.0028	1.22 J	
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	170.9	5.2	0.013	1.7 U		0.013	1.7 U		0.013	1.7 U		0.013	1.7 U		0.013	1.7 U		0.013	1.7 U	
Methanol	67-56-1	32.0	5.3	<0.110	< 77 Y		<0.110	< 77 Y		0.949	663.45 Y		0.9015	630.29 Y		0.8251	576.82 Y		0.9378	655.62 Y	
Vinyl Chloride	75-01-4	62.5	5.5	0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U		0.0016	0.57 U	
1,3-Butadiene	106-99-0	54.0	5.8	<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	5.9	0.0024	0.92 U		0.01	3.85 J		0.5405	208.3		0.48	185		0.4894	188.61		0.5428	209.22	
Bromomethane	74-83-9	94.9	6.4	0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U		0.0052	1.23 U	
Chloroethane	75-00-3	64.5	6.7	0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U		0.0054	1.88 U	
Ethanol	64-17-5	46.0	6.8	<0.110	< 53 Y		<0.110	< 53 Y		0.3699	180.09 Y		0.3399	165.48 Y		0.3453	168.11 Y		0.3744	182.29 Y	
Acetonitrile	75-05-8	41.1	7.3	0.004	2.18 U		0.004	2.18 U		0.286	156.05		0.2855	155.76		0.2809	153.29		0.2746	149.83	
Acetone	67-64-1	58.1	7.9	0.028	10.81 J		0.0469	18.09		1.8617	718.01		1.761	679.16		1.6823	648.83		1.8276	704.86	
Trichlorofluoromethane	75-69-4	137.4	8.3	0.0048	0.78 U		0.0084	1.37 J		0.5264	85.84		0.4831	78.77		0.4748	77.42		0.447	72.89	
Pentane	109-66-0	72.2	9.0	0.0038	1.18 U		0.0062	1.92 J		0.4025	124.98		0.3917	121.61		0.3825	118.75		0.3654	113.46	
1,1-Dichloroethene	75-35-4	96.9	9.5	0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U		0.0038	0.88 U	
Methylene Chloride	75-09-2	84.9	9.7	0.0073	1.92 J,B		0.0065	1.71 J,B		0.0105	2.76 J,B		0.0108	2.84 J,B		0.0104	2.75 J,B		0.0081	2.13 J,B	
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	187.4	10.2	0.004	0.48 U		0.02148	25.68		0.1199	14.33		0.1213	14.5		0.0982	11.74		0.0834	9.97	
Propanenitrile	107-12-0	55.1	10.9	0.0038	1.55 U		0.0038	1.55 U		0.1544	62.81		0.1599	65.04		0.1542	62.72		0.1371	55.77	
Propanol	71-23-8	60.1	10.9	0.0023	0.87 J		0.0105	3.91 J		0.6205	231.28		0.6032	224.82		0.5848	217.95		0.6162	229.67	
1,1-Dichloroethane	75-34-3	99.0	11.8	0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U		0.002	0.45 U	
2-Butanone	78-93-3	72.1	12.5	0.0202	6.29 J		0.0268	8.32 J		0.6203	192.69		0.6339	203.12		0.6878	213.66		0.5008	155.57	
cis-1,2-Dichloroethene	156-59-2	96.9	13.4	0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U		0.0034	0.79 U	
Hexane	110-54-3	86.2	13.7	0.0032	0.83 U		0.0032	0.83 U		0.2516	65.4		0.2579	67.04		0.253	65.75		0.2071	53.83	
Chloroform	67-66-3	119.4	13.9	0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U		0.0026	0.49 U	
Tetrahydrofuran	109-99-9	72.1	14.6	0.0016	0.5 U		0.0093	2.9 J		0.8642	268.44		0.96	298.22		0.9299	288.88		0.6934	215.41	
1,2-Dichloroethane	107-06-2	99.0	15.3	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	15.8	0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U		0.0032	0.54 U	
Butanenitrile	109-74-0	69.1	15.8	0.0034	1.1 U		0.0023	0.74 J		0.1026	33.26		0.1008	32.67		0.0952	30.84		0.1245	40.35	
1-Butanol	71-36-3	74.1	16.3	0.0032	0.97 U		0.0937	28.31		5.1681	1561.88		4.8229	1457.54		4.5908	1387.39		6.6741	2016.99 *	
Benzene	71-43-2	78.1	16.7	0.0016	0.46 U		0.0016	0.46 U		0.0088	2.52 J		0.0089	2.56 J		0.0084	2.4 J		0.0089	2.55 J	
Carbon Tetrachloride	56-23-5	153.8	17.0	0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U		0.0034	0.5 U	
Cyclohexane	110-82-7	84.2	17.3	0.0036	0.96 U		0.0036	0.96 U		0.0372	9.9		0.0284	7.57 J		0.0343	9.14 J		0.0274	7.3 J	
1,2-Dichloropropane	78-87-5	113.0	18.3	0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U		0.003	0.59 U	
Trichloroethene	79-01-6	131.4	18.8	0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U		0.0024	0.41 U	
Heptane	142-82-5	100.2	19.3	0.0018	0.4 U		0.0018	0.4 U		0.1769	39.54		0.1759	39.33		0.1656	37.03		0.1741	38.99	
cis-1,3-Dichloropropene	10061-01-5	111.0	20.5	0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U		0.0024	0.48 U	
4-Methyl-2-Pentanone	108-10-1	100.2	20.5	0.0034	0.76 U		0.0034	0.76 U		0.0287	6.42 J		0.0261	5.85 J		0.0253	5.66 J		0.0331	7.41 J	
Pyridine	110-86-1	79.1	20.6	0.0186	5.27 U		0.0186	5.27 U		0.0172	4.87 J		0.0179	5.06 J		0.0154	4.37 J		0.0186	5.28 J	
trans-1,3-Dichloropropene	10061-02-6	111.0	21.5	0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U		0.0018	0.36 U	
Pentanenitrile	110-59-8	83.1	21.6	0.0042	1.13 U		0.0042	1.13 U		0.0382	10.3 J		0.0361	9.72 J		0.0339	9.13 J		0.0419	11.29 J	
1,1,2-Trichloroethane	79-00-5	133.4	22.0	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	
Toluene	108-88-3	92.1	22.6	0.002	0.49 U		0.002	0.49 U		0.024	5.82		0.0242	5.88		0.0234	5.7		0.0222	5.39	
1,2-Dibromoethane	106-93-4	187.9	24.2	0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U		0.0052	0.62 U	
Octane	111-65-9	114.2	24.7	0.0024	0.47 U		0.0024	0.47 U		0.1216	23.85		0.118	23.13		0.1122	22		0.1108	21.73	
Tetrachloroethylene	127-18-4	165.8	25.2	0.0042	0.57 U		0.0042	0.57 U		0.0083	1.12 J		0.0087	1.18 J		0.0084	1.14 J		0.0042	0.57 U	
Chlorobenzene	108-90-7	112.6	26.8	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	
Hexanenitrile	628-73-9	97.1	27.1	0.0052	1.2 U		0.0018	0.42 J		0.0643	14.84		0.057	13.15		0.0536	12.36		0.0678	15.64	
Ethylbenzene	100-41-4	106.2	27.7	0.0028	0.59 U		0.0028	0.59 U		0.0034	0.72 J		0.0033	0.69 J		0.0032	0.67 J		0.0032	0.67 J	

Table B.1 (Cont'd) SUMMA™ Analysis Results for All Target Analytes from Tank BX-104 Sampled on 4/7/97

Target Analytes	CAS	MW	Ret Time	V7014-A01.225			V7014-A02.275			V7014-A05.284 ISVS			V7014-A05.284 ISVS			V7014-A06.287 ISVS			V7014-A04.283 ISVS		
				Upwind Ambient Air			Ambient Air Thru ISVS			Rep			Rep			Rep			Rep		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
p/in-Xylene	106-42-3	106.2	28.1	0.013	2.74 U		0.013	2.74 U		0.0138	2.91 J		0.0136	2.87 J		0.0132	2.8 J		0.0131	2.77 J	
Cyclohexanone	108-94-1	98.1	28.5	0.0344	7.85 J		0.0159	3.62 J		0.0999	22.81		0.0923	21.07		0.0882	20.13		0.1132	25.83	
Styrene	100-42-5	104.2	29.0	0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U		0.0022	0.47 U	
1,1,2,2-Tetrachloroethane	79-34-5	167.9	29.3	0.0042	0.56 U		0.0042	0.56 U		0.0045	0.6 J		0.0042	0.56 U		0.0042	0.56 U		0.0042	0.56 U	
o-Xylene	95-47-6	106.2	29.3	0.0028	0.59 U		0.0028	0.59 U		0.0084	1.77 J		0.0084	1.77 J		0.0083	1.75 J		0.0077	1.62 J	
Nonane	111-84-2	128.3	29.8	0.0016	0.28 U		0.0016	0.28 U		0.0759	13.25		0.0749	13.08		0.0733	12.79		0.07	12.23	
1-Ethyl-2-Methyl-Benzene	611-14-3	120.2	32.7	0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U	
1,3,5-Trimethylbenzene	108-67-8	120.2	33.0	0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U		0.0018	0.34 U	
1,2,4-Trimethylbenzene	95-63-6	120.2	34.2	0.0026	0.48 U		0.0026	0.48 U		0.0026	0.48 U		0.0026	0.48 U		0.0026	0.48 U		0.0026	0.48 U	
Decane	124-18-5	142.3	34.5	0.003	0.47 U		0.003	0.47 U		0.106	16.68		0.101	15.91		0.1002	15.78		0.101	15.89	
1,3-Dichlorobenzene	541-73-1	147.0	34.7	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U	
1,4-Dichlorobenzene	106-46-7	147.0	34.9	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U	
1,2-Dichlorobenzene	95-50-1	147.0	36.1	0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U		0.0018	0.27 U	
Undecane	1120-21-4	156.3	38.8	0.0282	4.04 U		0.0282	4.04 U		0.7866	112.73		0.7531	107.93		0.773	110.77		0.64	91.71	
1,2,4-Trichlorobenzene	120-82-1	181.5	42.3	0.0028	0.35 U		0.0028	0.35 U		0.0028	0.35 U		0.0028	0.35 U		0.0028	0.35 U		0.0028	0.35 U	
Dodecane	112-40-3	170.3	42.8	0.0098	1.29 U		0.1182	15.54		8.4618	1112.74 *		7.8732	1035.34 *		8.1045	1065.75 *		7.5422	991.81 *	
Hexachloro-1,3-butadiene	87-68-3	260.8	44.1	0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U		0.0046	0.4 U		0.0089	0.76 J,B		0.0046	0.4 U	
Tridecane	629-50-5	184.4	46.5	0.006	0.73 U		1.2787	155.37		32.618	3963.13 *		30.027	3648.32 *		30.087	3655.62 *		30.0256	3648.16 *	
Tetradecane	629-59-4	198.3	50.1	0.0042	0.47 U		0.6107	68.97		18.3936	2077.32 *		17.7464	2004.23 *		17.209	1943.54 *		18.0406	2037.46 *	

B Compound found in associated laboratory blank.

J Target compound detected above the IDL but below the EQL

U Target compound not detected at or above the IDL.

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

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

Table B.2 Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-104 Sampled on 4/7/97.

Target Analytes	CAS	MW	Ret Time	V7014-A11.1400 ISVS			V7014-A12.1401 ISVS			V7014-A12.1401 ISVS Rep			V7014-A13.1402 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.9	7.8	0.0045	0.84	U	0.0046	0.86	U	0.0046	0.86	U	0.0046	0.85	U
Chloromethane	74-87-3	50.5	8.9	0.0034	1.5	U	0.0034	1.52	U	0.0034	1.52	U	0.0034	1.51	U
1,2-dichloro1,1,2,2-tetrafluoroethane	76-14-2	170.9	9.5	0.0034	0.44	U	0.0034	0.45	U	0.0034	0.45	U	0.0034	0.45	U
Methanol	67-56-1	32.0	10.0	0.8475	592.54	Y	0.4593	321.08	Y	0.483	337.7	Y	0.3857	269.65	Y
Vinyl Chloride	75-01-4	62.5	9.9	0.0032	1.15	U	0.0033	1.17	U	0.0033	1.17	U	0.0032	1.16	U
1,3-Butadiene	106-99-0	54.0	10.5	<0.208	< 86	Y	<0.208	< 86	Y	<0.208	< 86	Y	<0.208	< 86	Y
Butane	106-97-8	58.1	10.8	0.6282	242.05		0.386	148.73		0.3998	154.05		0.3949	152.13	
Chloroethane	75-00-3	64.5	12.1	0.0044	1.52	U	0.0045	1.55	U	0.0045	1.55	U	0.0044	1.54	U
Ethanol	64-17-5	46.1	12.5	0.3704	180.12	Y	<0.274	<133	Y	<0.274	<133	Y	<0.274	<133	Y
Acetonitrile	75-05-8	41.1	13.0	0.2849	155.48		0.1773	96.74		0.1873	102.22		0.1584	86.45	
Acetone	67-64-1	58.1	13.7	1.1158	430.34		0.7482	288.54		0.7066	272.53		0.6828	263.33	
Trichlorofluoromethane	75-69-4	137.4	14.1	0.5044	82.25		0.4307	70.23		0.4306	70.22		0.4189	68.3	
Pentane	109-66-0	72.0	14.9	0.3762	117.04		0.2264	70.44		0.2339	72.78		0.2349	73.07	
1,1-Dichloroethene	75-35-4	96.9	15.5	0.0022	0.51	U	0.0022	0.52	U	0.0022	0.52	U	0.0022	0.51	U
Methylene Chloride	75-09-2	84.9	15.7	0.0594	15.67	J,B	0.0598	15.77	J,B	0.0595	15.7	J,B	0.0406	10.7	J,B
1,1,2-trichloro1,1,2,2-trifluoroethane	76-13-1	187.4	16.3	0.0263	3.14	J	0.0412	4.93		0.0402	4.8		0.0289	3.45	J
Propanenitrile	107-12-0	55.1	17.0	0.1304	53.02		0.085	34.55		0.087	35.39		0.0826	33.59	
Propanol	71-23-8	60.1	17.0	0.7415	276.35		0.2638	98.34		0.2829	105.42		0.3733	139.14	
1,1-Dichloroethane	75-34-3	99.0	18.0	0.0015	0.34	U	0.0015	0.34	U	0.0015	0.34	U	0.0015	0.34	U
2-Butanone	78-93-3	72.1	18.6	0.2862	88.91		0.1723	53.51		0.1718	53.38		0.1794	55.72	
cis-1,2-Dichloroethene	156-59-2	96.9	19.5	0.0035	0.81	J	0.0031	0.72	J	0.0032	0.74	J	0.0035	0.82	J
Hexane	110-54-3	86.2	19.8	0.2531	65.78		0.1752	45.53		0.1793	46.6		0.1788	46.48	
Chloroform	67-66-3	119.4	20.0	0.003	0.57	U	0.0031	0.58	U	0.0031	0.58	U	0.0031	0.58	U
Tetrahydrofuran	109-99-9	72.1	20.7	0.632	196.31		0.4637	144.03		0.4799	149.08		0.4935	153.29	
1,2-Dichloroethane	107-06-2	99.0	21.4	0.0012	0.27	U	0.0012	0.27	U	0.0012	0.27	U	0.0012	0.27	U
Butanenitrile	109-74-0	69.1	21.8	0.1067	34.57		0.0621	20.14		0.0643	20.85		0.0681	22.09	
1,1,1-Trichloroethane	71-55-6	133.4	21.9	0.0067	1.13	J	0.0064	1.07	J	0.0063	1.06	J	0.0072	1.21	J
1-Butanol	71-36-3	74.0	22.3	5.2794	1598.08	E	3.2267	976.74		3.2951	997.43		3.5682	1080.11	
Benzene	71-43-2	78.1	22.8	0.0129	3.71	J	0.012	3.44	J	0.0211	6.05		0.012	3.45	J
Carbon Tetrachloride	56-23-5	153.8	23.0	0.0015	0.22	U	0.0015	0.22	U	0.0015	0.22	U	0.0015	0.22	U
Cyclohexane	110-82-7	84.2	23.3	0.0044	1.17	U	0.0045	1.19	U	0.0045	1.19	U	0.0044	1.18	U
1,2-Dichloropropane	78-87-5	113.0	24.3	0.002	0.4	U	0.0021	0.41	U	0.0021	0.41	U	0.0021	0.41	U
Trichloroethene	79-01-6	131.4	24.7	0.0039	0.66	U	0.0039	0.67	U	0.0039	0.67	U	0.0039	0.66	U
Heptane	142-82-5	100.2	25.1	0.1592	35.6		0.1069	23.91		0.108	24.15		0.1238	27.69	
4-Methyl-2-Pentanone	108-10-1	100.2	26.3	0.0712	15.92		0.0416	9.3		0.0431	9.64		0.0476	10.65	
cis-1,3-Dichloropropene	10061-01-5	111.0	26.3	0.0013	0.27	U	0.0014	0.27	U	0.0014	0.27	U	0.0014	0.27	U
Pyridine	110-86-1	79.1	26.5	0.0538	15.25	J	0.0433	12.26	J	0.0444	12.57	J	0.043	12.17	J
trans-1,3-Dichloropropene	10061-02-6	111.0	27.4	0.0028	0.57	U	0.0029	0.58	U	0.0029	0.58	U	0.0029	0.58	U
Pentanenitrile	110-59-8	83.2	27.4	0.0591	15.92		0.0335	9.02		0.0337	9.07		0.0392	10.56	

Table B.2 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-104 Sampled on 4/7/97.

Target Analytes	CAS	MW	Ret Time	V7014-A11.1400 ISVS			V7014-A12.1401 ISVS			V7014-A12.1401 ISVS Rep			V7014-A13.1402 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
1,1,2-Trichloroethane	79-00-5	133.4	27.8	0.0106	1.78	J	0.0095	1.59	J	0.0091	1.52	J	0.0095	1.6	J
Toluene	108-88-3	92.1	28.5	0.0524	12.74		0.0452	10.98		0.0458	11.14		0.0509	12.38	
1,2-Dibromoethane	106-93-4	187.9	30.0	0.0025	0.3	U	0.0025	0.3	U	0.0025	0.3	U	0.0025	0.3	U
Octane	111-65-9	114.0	30.4	0.1005	19.75		0.0542	10.65		0.0514	10.1		0.0792	15.56	
Tetrachloroethylene	127-18-4	165.8	31.0	0.0055	0.74	J	0.004	0.54	J	0.0032	0.44	J	0.005	0.67	J
Chlorobenzene	108-90-7	112.6	32.6	0.0012	0.23	U	0.0012	0.24	U	0.0012	0.24	U	0.0012	0.24	U
Hexanenitrile	628-73-9	97.0	32.8	0.0552	12.75		0.0289	6.68	J	0.028	6.46	J	0.0393	9.08	
Ethylbenzene	100-41-4	106.2	33.4	0.0053	1.11	J	0.0048	1.01	J	0.0048	1.02	J	0.0049	1.03	J
p/m-Xylene	106-42-3	106.2	33.8	0.0178	3.76	J	0.0164	3.46	J	0.0166	3.51	J	0.0168	3.53	J
Cyclohexanone	108-94-1	98.1	34.3	0.0134	3.06	U	0.0136	3.1	U	0.0136	3.1	U	0.0135	3.08	U
Styrene	100-42-5	104.2	34.7	0.0017	0.36	U	0.0029	0.63	J	0.003	0.65	J	0.0017	0.36	U
1,1,2,2-Tetrachloroethane	79-34-5	167.9	35.0	0.0062	0.83	U	0.0063	0.84	U	0.0063	0.84	U	0.0063	0.84	U
o-Xylene	95-47-6	106.2	35.0	0.0082	1.72	J	0.0066	1.4	J	0.0073	1.54	J	0.0069	1.45	J
Nonane	111-84-2	128.0	35.4	0.0432	7.57		0.0136	2.39		0.0154	2.69		0.0252	4.42	
1-Ethyl-2-methyl benzene	611-14-3	120.2	38.4	0.0025	0.47	U	0.0029	0.54	J	0.0031	0.57	J	0.0025	0.47	U
1,3,5-Trimethylbenzene	108-67-8	120.2	38.6	0.0025	0.47	U	0.003	0.55	J	0.0032	0.59	J	0.0027	0.51	J
1,2,4-Trimethylbenzene	95-63-6	120.2	39.9	0.0049	0.91	J	0.0067	1.25	J	0.0069	1.29	J	0.0051	0.95	J
Decane	124-18-5	142.3	40.1	0.0522	8.21		0.026	4.09	J	0.0267	4.21	J	0.0317	5	J
1,3-Dichlorobenzene	541-73-1	147.0	40.4	0.0034	0.51	U	0.0034	0.52	U	0.0034	0.52	U	0.0034	0.52	U
1,4-Dichlorobenzene	106-46-7	147.0	40.6	0.003	0.46	U	0.0031	0.48	J	0.0032	0.48	J	0.0031	0.47	U
1,2-Dichlorobenzene	95-50-1	147.0	41.8	0.005	0.77	U	0.0051	0.78	U	0.0051	0.78	U	0.0051	0.77	U
Undecane	1120-21-4	156.0	44.4	0.3104	44.58		0.072	10.34		0.0709	10.18		0.1723	24.75	
1,2,4-Trichlorobenzene	120-82-1	181.5	48.0	0.0166	2.05	U	0.0168	2.07	U	0.0168	2.07	U	0.0168	2.07	U
Dodecane	112-40-3	170.0	48.4	2.7899	367.61		0.4993	65.8		0.5039	66.4		1.47	193.69	
Hexachloro-1,3-butadiene	87-68-3	260.8	49.8	0.0219	1.88	U	0.0223	1.92	U	0.0223	1.92	U	0.0222	1.91	U
Tridecane	629-50-5	184.0	52.2	4.2913	522.42	E	0.9057	110.26		0.9296	113.17		2.3836	290.18	
Tetradecane	629-59-4	198.0	55.7	2.8973	327.78	E	0.631	71.39	B	0.6308	71.37	B	1.6672	188.61	
Tributyl Phosphate	126-73-8	266.0	63.1	0.0583	4.91	Z	0.0608	5.12	Z	0.0127	1.07	Z	0.0787	6.63	Z

B Compound found in associated laboratory blank.

E Target compound exceeds upper quantification limit (UQL).

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

U Target compound not detected at or above the IDL.

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

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

however, this compound is not currently part of the analytical method. See Section 3.4.2 for more information.

Table B.3 Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BX-104 on 4/7/97.

Target Analytes	CAS	MW	Ret Time	V7014-A17.1404 FB #1 (mg/m ³)	Flag	V7014-A18.1405 FB #2 (ppbv)	Flag	V7014-A19.1406 TB #1 (mg/m ³)	Flag	V7014-A20.1407 TB #2 (ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.9	7.8	0.0043	0.79 U	0.0043	0.79 U	0.0043	0.79 U	0.0043	0.79 U
Chloromethane	74-87-3	50.5	8.9	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	170.9	9.5	0.0032	0.41 U	0.0032	0.41 U	0.0032	0.41 U	0.0032	0.41 U
Methanol	67-56-1	32.0	10.0	<0.274	<192 Y	<0.274	<192 Y	<0.274	<192 Y	<0.274	<192 Y
Vinyl Chloride	75-01-4	62.5	9.9	0.003	1.08 U	0.003	1.08 U	0.003	1.08 U	0.003	1.08 U
1,3-Butadiene	106-99-0	54.0	10.5	<0.208	<86 Y	<0.208	<86 Y	<0.208	<86 Y	<0.208	<86 Y
Butane	106-97-8	58.1	10.8	0.0397	15.29	0.0288	11.08 J	0.0036	1.39 U	0.0036	1.39 U
Chloroethane	75-00-3	64.5	12.1	0.0041	1.42 U	0.0041	1.42 U	0.0041	1.42 U	0.0041	1.42 U
Ethanol	64-17-5	46.1	12.5	<0.274	<133 Y	<0.274	<133 Y	<0.274	<133 Y	<0.274	<133 Y
Acetonitrile	75-05-8	41.1	13.0	0.0063	3.44 J	0.0056	3.03 J	0.0033	1.8 U	0.0033	1.8 U
Acetone	67-64-1	58.1	13.7	0.0357	13.75 J	0.0304	11.74 J	0.0043	1.64 J	0.0191	7.37 J
Trichlorofluoromethane	75-69-4	137.4	14.1	0.0202	3.29 J	0.0158	2.57 J	0.0044	0.72 U	0.0053	0.86 J
Pentane	109-66-0	72.0	14.9	0.012	3.74 J	0.0093	2.9 J	0.0029	0.89 U	0.0029	0.89 U
1,1-Dichloroethene	75-35-4	96.9	15.5	0.0021	0.47 U	0.0021	0.47 U	0.0021	0.47 U	0.0021	0.47 U
Methylene Chloride	75-09-2	84.9	15.7	0.0348	9.19 J,B	0.0334	8.8 J,B	0.0486	12.82 J,B	0.2909	76.72 B
1,1,2-trichloro1,2,2-trifluoroethane	76-13-1	187.4	16.3	0.0222	2.65 J	0.0242	2.89 J	0.003	0.36 U	0.003	0.36 U
Propanenitrile	107-12-0	55.1	17.0	0.0019	0.77 U	0.0019	0.77 U	0.0019	0.77 U	0.0019	0.77 U
Propanol	71-23-8	60.1	17.0	0.0157	5.84 J	0.0107	3.98 J	0.0053	1.99 U	0.0053	1.99 U
1,1-Dichloroethane	75-34-3	99.0	18.0	0.0014	0.32 U	0.0014	0.32 U	0.0014	0.32 U	0.0014	0.32 U
2-Butanone	78-93-3	72.1	18.6	0.0054	1.69 J	0.0046	1.43 J	0.0022	0.68 U	0.0022	0.68 U
cis-1,2-Dichloroethene	156-59-2	96.9	19.5	0.0025	0.58 U	0.0025	0.58 U	0.0025	0.58 U	0.0025	0.58 U
Hexane	110-54-3	86.2	19.8	0.0153	3.97	0.0209	5.44	0.0007	0.19 J	0.0017	0.45 J
Chloroform	67-66-3	119.4	20.0	0.0029	0.53 U	0.0029	0.53 U	0.0029	0.53 U	0.0029	0.53 U
Tetrahydrofuran	109-99-9	72.1	20.7	0.0107	3.33 J	0.0079	2.47 J	0.0035	1.07 U	0.0035	1.07 U
1,2-Dichloroethane	107-06-2	99.0	21.4	0.0011	0.25 U	0.0011	0.25 U	0.0011	0.25 U	0.0011	0.25 U
Butanenitrile	109-74-0	69.1	21.8	0.0014	0.45 U	0.0014	0.45 U	0.0014	0.45 U	0.0014	0.45 U
1,1,1-Trichloroethane	71-55-6	133.4	21.9	0.004	0.67 J	0.0034	0.57 J	0.0027	0.44 U	0.0027	0.44 U
1-Butanol	71-36-3	74.0	22.3	0.0235	7.11 J	0.0306	9.25 J	0.0075	2.29 U	0.0075	2.29 U
Benzene	71-43-2	78.1	22.8	0.0052	1.5 J	0.005	1.42 J	0.0018	0.51 J	0.0022	0.62 J
Carbon Tetrachloride	56-23-5	153.8	23.0	0.0014	0.2 U	0.0014	0.2 U	0.0014	0.2 U	0.0014	0.2 U
Cyclohexane	110-82-7	84.2	23.3	0.0041	1.09 U	0.0041	1.09 U	0.0041	1.09 U	0.0041	1.09 U
1,2-Dichloropropane	78-87-5	113.0	24.3	0.0019	0.38 U	0.0019	0.38 U	0.0019	0.38 U	0.0019	0.38 U
Trichloroethene	79-01-6	131.4	24.7	0.0036	0.61 U	0.0036	0.61 U	0.002	0.34 J	0.0087	1.49 J
Heptane	142-82-5	100.2	25.1	0.0027	0.61 J	0.0027	0.6 J	0.0015	0.35 U	0.0015	0.35 U
4-Methyl-2-Pentanone	108-10-1	100.2	26.3	0.0091	2.04 J	0.0099	2.21 J	0.0051	1.14 J	0.0078	1.74 J
cis-1,3-Dichloropropene	10061-01-5	111.0	26.3	0.0013	0.25 U	0.0013	0.25 U	0.0013	0.25 U	0.0013	0.25 U
Pyridine	110-86-1	79.1	26.5	0.0348	9.85 J	0.0342	9.7 J	0.0334	9.47 J	0.0325	9.21 J
trans-1,3-Dichloropropene	10061-02-6	111.0	27.4	0.0027	0.53 U	0.0027	0.53 U	0.0027	0.53 U	0.0027	0.53 U
Pentanenitrile	110-59-8	83.2	27.4	0.0008	0.22 U	0.0008	0.22 U	0.0008	0.22 U	0.0008	0.22 U

Table B.3 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BX-104 on 4/7/97.

Target Analytes	CAS	MW	Ret Time	V7014-A17.1404 FB #1			V7014-A18.1405 FB #2			V7014-A19.1406 TB #1			V7014-A20.1407 TB #2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
1,1,2-Trichloroethane	79-00-5	133.4	27.8	0.0095	1.6 J		0.0092	1.55 J		0.0096	1.61 J		0.0104	1.74 J	
Toluene	108-88-3	92.1	28.5	0.0331	8.04		0.029	7.06		0.0012	0.3 J		0.0045	1.09 J	
1,2-Dibromoethane	106-93-4	187.9	30.0	0.0024	0.28 U		0.0024	0.28 U		0.0024	0.28 U		0.0024	0.28 U	
Octane	111-65-9	114.0	30.4	0.0027	0.52 U		0.0027	0.52 U		0.0027	0.52 U		0.0027	0.52 U	
Tetrachloroethylene	127-18-4	165.8	31.0	0.0025	0.34 U		0.0025	0.34 U		0.0025	0.34 U		0.0025	0.34 U	
Chlorobenzene	108-90-7	112.6	32.6	0.0011	0.22 U		0.0011	0.22 U		0.0011	0.22 U		0.0011	0.22 U	
Hexanenitrile	628-73-9	97.0	32.8	0.0119	2.75 J		0.0118	2.73 J		0.011	2.54 J		0.0119	2.74 J	
Ethylbenzene	100-41-4	106.2	33.4	0.0028	0.59 J		0.0029	0.61 J		0.0014	0.3 U		0.0014	0.3 U	
p/m-Xylene	106-42-3	106.2	33.8	0.0095	2.01 J		0.0098	2.06 J		0.003	0.63 U		0.003	0.63 U	
Cyclohexanone	108-94-1	98.1	34.3	0.0125	2.85 U		0.0125	2.85 U		0.0125	2.85 U		0.0125	2.85 U	
Styrene	100-42-5	104.2	34.7	0.0009	0.19 J		0.0017	0.37 J		0.0015	0.33 U		0.0015	0.33 U	
1,1,2,2-Tetrachloroethane	79-34-5	167.9	35.0	0.0058	0.77 U		0.0058	0.77 U		0.0058	0.77 U		0.0058	0.77 U	
o-Xylene	95-47-6	106.2	35.0	0.0036	0.77 J		0.0041	0.86 J		0.0019	0.4 U		0.0019	0.4 U	
Nonane	111-84-2	128.0	35.4	0.0056	0.98 J		0.0054	0.94 J		0.0013	0.22 U		0.0013	0.22 U	
1-Ethyl-2-methyl benzene	611-14-3	120.2	38.4	0.0024	0.44 U		0.0024	0.44 U		0.0024	0.44 U		0.0024	0.44 U	
1,3,5-Trimethylbenzene	108-67-8	120.2	38.6	0.0024	0.44 U		0.0024	0.44 U		0.0024	0.44 U		0.0024	0.44 U	
1,2,4-Trimethylbenzene	95-63-6	120.2	39.9	0.0037	0.68 J		0.0042	0.78 J		0.0025	0.47 U		0.0025	0.47 U	
Decane	124-18-5	142.3	40.1	0.0184	2.9 J		0.0209	3.29 J		0.003	0.47 U		0.003	0.47 U	
1,3-Dichlorobenzene	541-73-1	147.0	40.4	0.0032	0.48 U		0.0032	0.48 U		0.0032	0.48 U		0.0032	0.48 U	
1,4-Dichlorobenzene	106-46-7	147.0	40.6	0.0029	0.43 U		0.0029	0.43 U		0.0029	0.43 U		0.0029	0.43 U	
1,2-Dichlorobenzene	95-50-1	147.0	41.8	0.0047	0.72 U		0.0047	0.72 U		0.0047	0.72 U		0.0047	0.72 U	
Undecane	1120-21-4	156.0	44.4	0.0088	1.27 J		0.0154	2.21 J		0.0044	0.63 U		0.0044	0.63 U	
1,2,4-Trichlorobenzene	120-82-1	181.5	48.0	0.0155	1.91 U		0.0155	1.91 U		0.0155	1.91 U		0.0155	1.91 U	
Dodecane	112-40-3	170.0	48.4	0.0255	3.36 U		0.0255	3.36 U		0.0255	3.36 U		0.0255	3.36 U	
Hexachloro-1,3-butadiene	87-68-3	260.8	49.8	0.0205	1.76 U		0.0205	1.76 U		0.0205	1.76 U		0.0205	1.76 U	
Tridecane	629-50-5	184.0	52.2	0.0271	3.3 J		0.0764	9.3 J		0.026	3.17 U		0.026	3.17 U	
Tetradecane	629-59-4	198.0	55.7	0.0572	6.48 J,B		0.0522	5.9 J,B		0.0357	4.04 J,B		0.0513	5.8 J,B	
Tributyl Phosphate	126-73-8	266.0	63.1	<0.0099	<0.83 Z		<0.0099	<0.83 Z		<0.0099	<0.83 Z		<0.0099	<0.83 Z	

B Compound found in associated laboratory blank.

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

U Target compound not detected at or above the IDL.

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

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

however, this compound is not currently part of the analytical method. See Section 3.4.2 for more information.

Distribution List

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