TANK VAPOR CHARACTERIZATION PROJECT

Tank 241-BX-104 Second Temporal Study Headspace Gas and Vapor Characterization Results from Samples Collected on December 12, 1996

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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 0.248% of its lower flammability limit (LFL). Total headspace flammability was estimated to be <0.645% 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 12/12/96

<u>Category</u>	<u>Sample Medium</u>	<u>Analyte</u>	<u>Concentration^(a)</u>	<u>Units</u>
Inorganic Vapors	Sorbent Traps	Ammonia	207	ppmv
		Nitrogen Dioxide (NO ₂)	<0.16	ppmv
		Nitric Oxide (NO)	0.19	ppmv
		Water	16.1	mg/L
Permanent Gases	SUMMA™ Canisters	Hydrogen	99	ppmv
		Methane	<25	ppmv
		Carbon Dioxide	<17	ppmv
		Carbon Monoxide	<17	ppmv
		Nitrous Oxide (N ₂ O)	137	ppmv
Total Non-Methane Organic Compounds	SUMMA™ Canisters	Total Non-Methane Organic Compounds	82.32	mg/m ³
Volatile Organic Vapors	SUMMA™ Canisters	Tridecane	30.435	mg/m ³
		1-Butanol	11.253	mg/m ³
		Dodecane	11.043	mg/m ³
Volatile Organic Vapors	Sorbent Traps	1-Butanol	6.134	mg/m ³
		Tridecane	3.698	mg/m ³
		Tetradecane	2.718	mg/m ³
Flammables	SUMMA™ Canisters and Sorbent Traps	Flammables	<0.645	% 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 chromatography/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 December 12, 1996 from the headspace of waste storage tank 241-BX-104 (Tank BX-104) at the Hanford Site in Washington State. Pacific Northwest National Laboratory^(a) provided SUMMA™ canisters and sorbent traps for sample collection, and analyzed the samples according to instructions in the SAP (Buckley 1996). Analytical work was performed by the PNNL VAL in the 300 Area of the Hanford Site under the PNNL Tank Vapor Characterization Project.

Pacific Northwest National Laboratory provided six sets of sorbent traps for selected inorganic analytes (four samples and two field blanks), five SUMMA™ canisters for permanent gases and organic analytes (three headspace samples and two ambient air samples), and eight triple sorbent traps (TSTs) for organic analytes (four samples, two field blanks, and two trip blanks). Sample devices and controls were provided to SESC on December 9, 1996; TSTs, sorbent traps for inorganic analytes and SUMMA™ canisters were returned to PNNL on January 2, 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>	<u>EQL^(a)</u> <u>(ppmv)</u>
Ammonia	NH ₃	0.71
Nitrogen Dioxide	NO ₂	0.16
Nitric Oxide	NO	0.16
Mass (water) ^(b)	n/a	0.3 mg/L

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

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

n/a = not applicable.

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

2.2 Permanent Gases

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

2.2.1 SUMMATM Canister Preparation

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

2.2.2 Analytical Procedure

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

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

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

Table 2.4 Quantitation Limits for Permanent Gases

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

2.2.3 Quality Assurance/Quality Control

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

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

2.3 Total Non-Methane Organic Compounds

2.3.1 Analytical Procedure

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

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

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

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

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

2.3.2 Quality Assurance/Quality Control

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

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

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

2.4 SUMMA™ Canister Sample Analyses

2.4.1 Analytical Procedure

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

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

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

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

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

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

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

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

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

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

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

2.4.2 Quality Assurance/Quality Control

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

2.5 Triple Sorbent Trap Sample Analyses

2.5.1 Sampling Methodology

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

2.5.2 Analytical Procedure

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

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

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

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

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

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

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

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

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

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

2.5.3 Quality Assurance/Quality Control

Before tank samples were analyzed, a diagnostic check was performed on the GC/MS instrument by running a full auto tune, as described in PNL-TVP-10. Upon satisfactory completion of the instrument diagnostic check, a blank trap was analyzed to check the cleanliness of the system. The instrument was then calibrated using six different concentrations of standard gas mixture containing the compounds listed in Table B.2. A gas mixture containing difluorobenzene, chlorobenzene- d_5 , and 1,4 bromofluorobenzene was used as an IS for all calibration standard and sample analyses. Analyte responses from sample components, ISs, and standards were obtained from the extracted ion plot from their selected mass ion. A continuing calibration was generated by calculating the relative response ratios of the IS to calibration standard responses and plotting the ratios against the ratio of the calibration-standard concentration (in ppbv) to the IS concentration. Once it was determined that the relative response was linear with increasing concentration, an average response factor was calculated for each target analyte and used to determine the concentration of target compounds in each sample.

3.0 Analysis Results

Results from the sampling of the headspace of Tank BX-104 on December 12, 1996 (Sample Job S7017) 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 S7017. 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 $<10\%$, which is within the 25% specified by the SAP.

3.1.1 Ammonia

Ammonia analyses were performed on January 10 and 14, 1997, 29 and 33 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 16.8 to 17.7 μmol in front sections; blank corrected back sorbent section ammonia concentrations were $<0.01 \mu\text{mol}$. Blank corrections of 0.21 μmol in front and 0.043 μmol in the back sections, were about 1.2% 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 98%. One sample leachate was spiked after initial analysis with approximately the quantity of ammonia in the sample and yielded a percentage recovery of 93%. The initial and continuing calibration verification (ICV, CCV) standards, using NIST-traceable material, yielded percentage recoveries of 95% and 98% (ICV) and 96%, 99%, and 98% 99% (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 January 9, 1997, 28 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 $<0.013 \mu\text{mol}$. Nitrite blank levels used to correct data were $0.0119 \mu\text{mol}$ in front (four of four blanks analyzed) and $0.0066 \mu\text{mol}$ in back (two of four blanks analyzed) sorbent sections. Blank corrected NO_2^- quantities in the NO sorbent tubes averaged $0.008 \mu\text{mol}$. The analyses of two samples were duplicated and yielded repeatabilities of $\pm 0\%$ and $\pm 2.0\%$. Two sample leachates were spiked with $0.25 \text{ ppm } \text{NO}_2^-$ and yielded percentage recoveries of 92% and 95% . A 4-point calibration was performed over a concentration range of 0 to $0.5 \mu\text{g/mL } \text{NO}_2^-$ in the desorbing matrix.

3.1.3 Water

Analyses for water vapor were performed on January 7, 1997, 26 days after sample collection and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed.

All multi-trap sample mass gain is assumed to be due to adsorption of water. This is justified because the total mass concentration of other vapors in the headspace of Hanford waste tanks are typically two to three orders of magnitude less than the mass concentration of the water vapor found in even relatively dry tanks. Water vapor concentrations are given in Table 3.1 for both moist air at tank conditions and for dry air at STP (0°C and 1.013 bar). Because the sample volumes were measured after all water vapor was removed by the sorbent traps, the measured sample volumes are for dry air. The average water vapor concentration was 16.1 mg of water per L of dry air at STP. The result was determined from an average mass gain of 32.4 mg from all four multi-trap trains. The blank correction applied to the results was -2.35 mg per multi-trap train. A control mass was measured and indicated a measurement accuracy of $\pm 0.1 \text{ mg}$. The average water vapor concentration corresponds to a tank headspace dew point at 17.1°C and relative humidity at 72% at the time of sampling.

3.2 Permanent Gases

Hydrogen analyses were performed on February 1, 1997, and analyses for other permanent gases were performed on January 31, 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 99 ppmv and N_2O at an average concentration of 137 ppmv were the only permanent gases detected in Tank BX-104. The relative percent difference (RPD) between duplicate analyses of a single SUMMATM canister was 2.1% and 1.4% 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 February 7, 1997, 57 days after sample collection and within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All three tank samples and the two ambient samples (100%) were successfully analyzed and used in the averages. No deviations from standard procedures were noted.

Table 3.3 lists results of the EPA TO-12 analysis of SUMMA™ canister samples for TNMOCs. Results in Table 3.3 are reported in two different units; in the upper row the mass concentration (mg/m^3) of non-methane organic compounds is given at STP (0°C and 1.013 bar), and in the lower row, by EPA TO-12 convention, as ppmv of carbon based on propane as the standard. The average concentration in the three tank headspace samples was $82.32 \text{ mg}/\text{m}^3$ or 34.28 ppmv of carbon. The $82.32 \text{ mg}/\text{m}^3$ value compares to $74.77 \text{ mg}/\text{m}^3$ for the sum of all target compounds identified in the analysis of the SUMMA™ canisters. Results provided in Table 3.3 are estimated to be accurate to within $\pm 30\%$ as specified by the SAP. The RPD for duplicate analysis of a single SUMMA™ canister was $<1\%$.

3.3.1 Procedural Deviations, Observations, and Anomalies.

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

3.4 Organic Compound Characterization

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

3.4.1 SUMMA™ Canister Results

Analyses of SUMMA™ canisters for organic vapors were performed on February 14 and 21, 1997. All analyses exceeded the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.1.1.

Measured concentrations of target analytes and TICs are presented in Table 3.4. Thirty-nine target analytes above the instrument detection limit (IDL) were detected in the tank headspace samples. All 39 target analytes were identified in two or more tank headspace samples. Tridecane at $30.435 \text{ mg}/\text{m}^3$, 1-butanol at $11.253 \text{ mg}/\text{m}^3$, and dodecane at $11.043 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace samples. The total average concentration of the target analytes was $74.77 \text{ mg}/\text{m}^3$. This compares to a total concentration of $82.32 \text{ mg}/\text{m}^3$ identified in the TO-12 analysis of the three tank headspace samples.

SUMMA™ canister sample S7017-A05.130 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-one 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. Thirteen target analytes were observed in one or both of the ambient air samples. All target compounds with the exception of 1,1,2 trichloro-1,2,2 trifluoroethane, tridecane, and tetradecane were observed above their EQLs.

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 17021402.b) - S7017-A01.123, S7017-A02.127, S7017-A04.128, S7017-A05.130, S7017-A05.130 REP, S7017-A06.134;

Batch #2: (file identifier 17022102.b) - S7017-A04.128, S7017-A05.130, S7017-A05.130 REP, S7017-A06.134.

Batch #1:

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

Two target compounds (chloroethane at 47.60% and pyridine at 53.79%) surpassed the 30% percent relative standard deviation (% RSD) acceptance criteria for initial calibration. Tetradecane surpassed 0.05 response factor criteria for the initial calibration. Tetradecane was found in all tank samples at concentrations above the upper quantitation limit (UQL), with the exceptions of ambient air sample S7017-A02.127 where it was found at a concentration between the EQL and the UQL, and ambient air sample S7017-A01.123 where tetradecane was found at a concentration below the IDL. Chloroethane was not found in the tank samples at concentrations higher their IDL. Pyridine was found in all tank samples at concentrations between its IDL and EQL, with the exceptions of ambient air samples S7017-A02.127 and S7017-A02.127 where it was not found at concentration above its IDL. Due to the initial calibration performance, the uncertainty associated with these results is higher than normal.

Three target compounds (pyridine at 30.8%, tridecane at 34.8%, tetradecane at 105.8%) were outside the 25% difference (% D) acceptance criteria for the CCV sample. However, the CCV passed the procedural criterion requiring $\pm 25\%$ D passage for 85% of all target compounds. Results of pyridine and tetradecane determination were mentioned above. Due to the CCV performance for tetradecane, a higher than normal uncertainty is associated with the results.

Two target compounds (acetone and 1,2,4-trichlorobenzene) were found in the initial calibration blank (ICB) above their EQLs. 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:

This analytical sequence was run using 30 mL volumes of diluted 1:10 samples to quantify target compounds in each tank sample.

Two target compounds (chloroethane at 47.60% and pyridine at 53.79%) surpassed the 30% RSD acceptance criteria for initial calibration. Tetradecane surpassed 0.05 response factor criteria for the initial calibration. Tetradecane was found in all tank samples at concentrations between its EQL and UQL. Chloroethane and pyridine were not found in the tank samples at concentrations higher than their IDLs. Due to the initial calibration performance, the uncertainty associated with these results is higher than normal.

Four target compounds (chloroethane at 29.2%, pyridine at 27.1%, tridecane at 33.9%, and tetradecane at 70.5%) were outside the 25% D acceptance criteria for the CCV sample. However, the CCV passed the procedural criterion requiring $\pm 25\%$ D passage for 85% of all target compounds. Results of chloroethane, pyridine and tetradecane determination were mentioned above. Tridecane was found in all tank samples at concentrations between its EQL and UQL. Due to the CCV performance for this compound a higher than normal uncertainty is associated with the results.

Two target compounds (acetone and 1,2,4-trichlorobenzene) were found in the ICB above their EQLs. One target compound (methylene chloride) was found in CCB above its EQL. Compounds found in the CCB at concentrations (in ng) greater than 5% of the sample concentration are flagged with a "B" in the tables.

Information common to both batches:

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

3.4.2 Triple Sorbent Trap Sample Results

Analyses of TSTs were performed on April 18 and 21, 1997. All analyses exceeded the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.2.1.

Measured concentrations of target analytes and TICs are presented in Table 3.7. Results are based on three samples for each compound. Thirty-four target analytes above the IDL were detected

in the tank headspace samples. Of these, 31 target analytes were identified in two or more tank headspace samples. The compounds 1-butanol at 6.134 mg/m³, tridecane at 3.698 mg/m³, and tetradecane at 2.718 mg/m³ were the three most abundant compounds identified in the tank headspace sample. The total concentration of the target analytes was 20.97 mg/m³.

Triple sorbent trap sample S7017-A12.1333 was analyzed in replicate for target analytes to determine analytical precision. The RPD results are presented in Table 3.8. The RPDs were calculated for analytes detected above the detection limit and found in both replicates. Twenty-five of 31 target analytes had RPDs of less than 10%.

Results of analyses of the field and trip blanks are provided in Table 3.9. Nine target compounds were identified in one or more of the blank samples. Two of the nine target compounds, trichlorofluoromethane and toluene, exceed their EQL's.

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

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

3.4.2.1 Procedural Deviations, Observations, and Anomalies. The TST samples were analyzed in two batches. Samples were run under the protocols of procedure PNL-TVP-10, Rev. 2 with the initial calibration performed on April 8, 1997 and quantitated against a CCV run at beginning of the batch. The sample analytical sequence runs were as follows:

Batch #1 (file identifier 47041801.b) - S7017-A17.1336, S7017-A18.1337, S7017-A19.1338, S7017-A20.1339;

Batch #2 (file identifier 47042101.b) - S7017-A11.1332, S7017-A12.1333, S7017-A12.1333 REP, S7017-A13.1334.

Batch #1:

Samples included in this batch consisted of the two field blanks and two trip blanks. Only target compounds were evaluated as stated in the SAP for this study.

The CCV showed acceptable performance as specified in the procedure for all target compounds, with the exceptions of chloromethane (30.9%), ethanol (35.8%), tridecane (26.1%) and tetradecane (34.3%). Trace amounts (below EQL) of chloromethane, methylene chloride, pyridine, tridecane, and tetradecane were seen in the 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. Only target compounds were evaluated as stated in the SAP for this study.

Trace amounts (below EQL) of methylene chloride, tridecane and tetradecane were seen in the 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.

Information common to both batches:

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

Tributyl phosphate (TBP) is included in the target list based on a calibration performed on January 5 and 9, 1996. The TBP was introduced onto a series of double sorbent traps as a methanolic solution standard rather than a vapor standard. This served to determine the retention time and verify the mass spectral characteristics of the compound. However, verification of the calibration acceptability was not performed because the compound is not present in the CCV. At present, it is not possible to prepare a gas standard from this material. The calibration information on TBP demonstrated that detectability at 0.80 ppbv (based on a 200-mL sample) was possible. Tributyl phosphate was not detected in the samples.

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 0.248% of its LFL. Total headspace flammability was estimated to be <0.645% of the LFL.

Table 3.1 Inorganic Vapor Concentrations from Tank BX-104 Sampled on 12/12/96

Analyte	CAS Number	S7017-A07-16R	S7017-A08-17R	S7017-A09-18R	S7017-A10-19R	Average	Standard Deviation
Ammonia (ppmv)	7664-41-7	202	209	204	213	207	5
Nitric Oxide (ppmv)		0.19	0.19	0.18	0.20	0.19	0.01
Nitrogen Dioxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Water ^(a) (mg/L)		15.3	17.1	14.5	17.6	16.1	1.5
Water ^(b) (mg/L)		13.6	15.2	12.9	15.6	14.3	1.3

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 12/12/96

Permanent Gas Analyte	Upwind Ambient Air	Ambient Air Through Bundle	Tank Samples				RPD ^(c) (%)	Mean (ppmv) St.Dev.	
	S7017-A01.123 ^(a) (ppmv)	S7017-A02.127 ^(a) (ppmv)	S7017-A04.128 ^(a) (ppmv)	S7017-A06.134 ^(a) (ppmv)	S7017-A05.130 ^(a) (ppmv)	S7017-A05.130 ^{(a)(b)} (ppmv)			
Hydrogen	<17	<17	102	99	96	94	2.1	99	3.0
Methane	<25	<25	<25	<25	<25	<25		<25	
Carbon Dioxide	464	464	<17	<17	<17	<17		<17	
Carbon Monoxide	<17	<17	<17	<17	<17	<17		<17	
Nitrous Oxide	<17	<17	136	137	139	137	1.4	137	1.5

Footnotes

(a) Sample identification number.

(b) Replicate analysis for S7017-A05.130; 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 12/12/96

	Upwind Ambient Air	Ambient Air Through Bundle	Tank Samples				RPD ^(c)		
	S7017-A01.123 ^(a) Concentration	S7017-A02.127 ^(a) Concentration	S7017-A04.128 ^(a) Concentration	S7017-A06.134 ^(a) Concentration	S7017-A05.130 ^(a) Concentration	S7017-A05.130 ^{(a)(b)} Concentration	(%)	Mean	St.Dev.
TO-12 (mg/m ³)	< 0.59	< 0.59	79.77	82.08	85.10	84.66	0.5	82.32	2.67
Total Carbon (ppmv)								34.28	

Footnotes

- (a) Sample identification number.
- (b) Replicate analysis for S7017-A05.130; results are not included in the calculation of average concentrations.
- (c) Relative percent difference (RPD) based on replicate analysis.

Table 3.4 Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 12/12/96

Target Analytes ^(a)	CAS	MW	Time	Ret S7017-A05.130 ^{(b)(c)} ISVS			S7017-A06.134 ^(b) ISVS			S7017-A04.128 ^(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	0.010	1.9	J	0.009	0.001	1.7	0.20
Chloromethane	74-87-3	50	5.0	0.004	1.7	J	0.003	1.4	J	0.005	2.1	J	0.004	0.001	1.8	0.35
Methanol	67-56-1	32	5.2	1.627	1138	Y	1.451	1015	Y	2.082	1455	Y	1.720	0.325	1203	227
1,3-Butadiene	106-99-0	54	5.7	<0.083	<34	Y	<0.083	<34	Y	<0.083	<34	Y	d	d	d	d
Butane	106-97-8	58	5.9	0.786	303		0.729	281		1.073	414		0.863	0.184	333	71
Ethanol	64-17-5	46	6.8	0.633	308	Y	0.615	300	Y	0.666	324	Y	0.638	0.026	311	13
Acetonitrile	75-05-8	41	7.3	0.244	133		0.235	128		0.250	136		0.243	0.007	132	4.1
Acetone	67-64-1	58	7.8	2.727	1052		2.637	1017		3.083	1189		2.816	0.236	1086	91
Trichlorofluoromethane	75-69-4	137	8.3	0.639	104		0.617	101		0.643	105		0.633	0.014	103	2.3
Pentane	109-66-0	72	8.9	0.427	133		0.415	129		0.428	133		0.424	0.007	131	2.3
Methylene Chloride	75-09-2	85	9.7	0.020	5.4	B	0.021	5.4	B	0.020	5.2	J,B	0.020	0.000	5.3	0.096
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	10.2	0.035	4.1	J	0.034	4.0	J	0.035	4.2	J	0.034	0.001	4.1	0.074
Propanenitrile	107-12-0	55	10.9	0.118	48		0.114	46		0.113	46		0.115	0.003	47	1.1
Propanol	71-23-8	60	10.8	0.814	303		0.809	301		0.807	301		0.810	0.004	302	1.4
2-Butanone	78-93-3	72	12.4	0.523	162		0.501	156		0.513	159		0.512	0.011	159	3.4
Hexane	110-54-3	86	13.7	0.256	66		0.248	64		0.241	63		0.248	0.008	64	2.0
Tetrahydrofuran	109-99-9	72	14.6	0.804	250		0.785	244		0.739	230		0.776	0.033	241	10
Butanenitrile	109-74-0	69	15.8	0.121	39		0.117	38		0.128	42		0.122	0.006	40	1.9
1-Butanol	71-36-3	74	16.3	12.143	3670	*	12.387	3744	*	9.229	2789	*	11.253	1.757	3401	531
Benzene	71-43-2	78	16.7	0.010	2.8	J	0.009	2.7	J	0.010	2.8	J	0.010	0.000	2.8	0.084
Cyclohexane	110-82-7	84	17.3	0.029	7.7	J	0.026	6.9	J	0.041	11		0.032	0.008	8.5	2.2
Heptane	142-82-5	100	19.2	0.211	47		0.203	45		0.217	49		0.211	0.007	47	1.6
4-Methyl-2-Pentanone	108-10-1	100	20.4	0.045	10		0.043	9.6		0.050	11		0.046	0.004	10	0.79
Pyridine	110-86-1	79	20.6	0.015	4.1	J	0.014	4.0	J	0.016	4.4	J	0.015	0.001	4.2	0.22
Pentanenitrile	110-59-8	83	21.5	0.044	12		0.041	11	J	0.045	12		0.043	0.002	12	0.60
Toluene	108-88-3	92	22.6	0.035	8.4		0.034	8.2		0.032	7.8		0.034	0.001	8.2	0.31
Octane	111-65-9	114	24.7	0.123	24		0.119	23		0.114	22		0.119	0.004	23	0.85
Tetrachloroethylene	127-18-4	166	25.2	0.012	1.6	J	0.012	1.6	J	0.004	0.57	U	0.012	d	1.6	d
Hexanenitrile	628-73-9	97	27.0	0.079	18		0.085	19		0.091	21		0.085	0.006	20	1.4
Ethylbenzene	100-41-4	106	27.6	0.005	1.1	J	0.005	1.1	J	0.005	1.1	J	0.005	0.000	1.1	0.023
p/m-Xylene	106-42-3	106	28.1	0.022	4.6	J	0.022	4.6	J	0.022	4.6	J	0.022	0.000	4.6	0.010

Table 3.4 (Cont'd) Organic Compound Concentrations in SUMMA™ Canisters from Tank BX-104 Sampled on 12/12/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7017-A05.130 ^{(b)(c)} ISVS			S7017-A06.134 ^(b) ISVS			S7017-A04.128 ^(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.
Cyclohexanone	108-94-1	98	28.5	0.122	28		0.140	32		0.139	32		0.134	0.010	30	2.3
o-Xylene	95-47-6	106	29.3	0.011	2.2	J	0.011	2.4	J	0.010	2.0	J	0.011	0.001	2.2	0.19
Nonane	111-84-2	128	29.7	0.075	13		0.074	13		0.065	11		0.071	0.005	12	0.94
Decane	124-18-5	142	34.4	0.136	21		0.137	22		0.128	20		0.133	0.005	21	0.79
Undecane	1120-21-4	156	38.8	0.944	135		0.968	139		0.988	142		0.967	0.022	139	3.1
Dodecane	112-40-3	170	42.8	12.049	1584	*	11.938	1570	*	9.143	1202	*	11.043	1.646	1452	216
Tridecane	629-50-5	184	46.5	33.501	4070	*	36.151	4392	*	21.653	2631	*	30.435	7.720	3698	938
Tetradecane	629-59-4	198	50.0	9.417	1064	*	11.199	1265	*	9.697	1095	*	10.104	0.958	1141	108
Total Concentration of Target Analytes													74.77			

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 Organic Compound Concentrations from Replicate Analysis of a Single SUMMA™ Canister from Tank BX-104 Sampled on 12/12/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7017-A05.130 ^(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	7
Chloromethane	74-87-3	50	5.0	0.004	1.7	J	0.003	1.4	J	23
Methanol	67-56-1	32	5.2	1.627	1138	Y	1.439	1006	Y	12
1,3-Butadiene	106-99-0	54	5.7	<0.083	<34	Y	<0.083	<34	Y	
Butane	106-97-8	58	5.9	0.786	303		0.713	275		10
Ethanol	64-17-5	46	6.8	0.633	308	Y	0.612	298	Y	3
Acetonitrile	75-05-8	41	7.3	0.244	133		0.240	131		2
Acetone	67-64-1	58	7.8	2.727	1052		2.707	1044		1
Trichlorofluoromethane	75-69-4	137	8.3	0.639	104		0.602	98		6
Pentane	109-66-0	72	8.9	0.427	133		0.413	128		3
Methylene Chloride	75-09-2	85	9.7	0.020	5.4	B	0.021	5.4	B	0
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187	10.2	0.035	4.1	J	0.035	4.1	J	0
Propanenitrile	107-12-0	55	10.9	0.118	48		0.119	48		1
Propanol	71-23-8	60	10.8	0.814	303		0.804	300		1
2-Butanone	78-93-3	72	12.4	0.523	162		0.526	163		1
Hexane	110-54-3	86	13.7	0.256	66		0.258	67		1
Tetrahydrofuran	109-99-9	72	14.6	0.804	250		0.817	254		2
Butanenitrile	109-74-0	69	15.8	0.121	39		0.120	39		1
1-Butanol	71-36-3	74	16.3	12.143	3670	*	12.401	3748	*	2
Benzene	71-43-2	78	16.7	0.010	2.8	J	0.010	2.8	J	0
Cyclohexane	110-82-7	84	17.3	0.029	7.7	J	0.035	9.4	J	21
Heptane	142-82-5	100	19.2	0.211	47		0.211	47		0
4-Methyl-2-Pentanone	108-10-1	100	20.4	0.045	10		0.044	9.7		4
Pyridine	110-86-1	79	20.6	0.015	4.1	J	0.014	4.0	J	3
Pentanenitrile	110-59-8	83	21.5	0.044	12		0.042	11		4
Toluene	108-88-3	92	22.6	0.035	8.4		0.034	8.4		1
Octane	111-65-9	114	24.7	0.123	24		0.122	24		1
Tetrachloroethylene	127-18-4	166	25.2	0.012	1.6	J	0.012	1.6	J	2
Hexanenitrile	628-73-9	97	27.0	0.079	18		0.081	19		2
Ethylbenzene	100-41-4	106	27.6	0.005	1.1	J	0.005	1.1	J	6
p/m-Xylene	106-42-3	106	28.1	0.022	4.6	J	0.022	4.6	J	0
Cyclohexanone	108-94-1	98	28.5	0.122	28		0.118	27		4
o-Xylene	95-47-6	106	29.3	0.011	2.2	J	0.011	2.3	J	3
Nonane	111-84-2	128	29.7	0.075	13		0.074	13		1
Decane	124-18-5	142	34.4	0.136	21		0.137	22		1
Undecane	1120-21-4	156	38.8	0.944	135		0.953	137		1
Dodecane	112-40-3	170	42.8	12.049	1584	*	10.910	1435	*	10
Tridecane	629-50-5	184	46.5	33.501	4070	*	27.500	3341	*	20
Tetradecane	629-59-4	198	50.0	9.417	1064	*	7.760	876	*	19

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.

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

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

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

Table 3.6 Organic Compound Concentrations in Ambient Air and Ambient Air through the ISVS
in SUMMATM Canisters Associated with the Sampling of Tank BX-104 on 12/12/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7017-A01.123 ^(b)			S7017-A02.127 ^(b)		
				Ambient Air			Ambient Air Thru ISVS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	121	4.6	0.004	0.67	J	0.004	0.78	J
Chloromethane	74-87-3	50	5.0	0.003	1.2	J	0.002	1.1	U
Acetone	67-64-1	58	7.8	0.030	11	J	0.018	6.9	J
Methylene Chloride	75-09-2	85	9.7	0.018	4.6	J,B	0.018	4.6	J,B
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187	10.2	0.004	0.48	U	0.054	6.4	
Propanol	71-23-8	60	10.8	0.001	0.46	J	0.003	1.0	U
2-Butanone	78-93-3	72	12.4	0.004	1.2	J	0.003	0.87	U
1-Butanol	71-36-3	74	16.3	0.004	1.2	J	0.004	1.1	J
4-Methyl-2-Pentanone	108-10-1	100	20.4	0.001	0.28	J	0.003	0.76	U
Hexanenitrile	628-73-9	97	27.0	0.004	0.89	J	0.005	1.2	U
Cyclohexanone	108-94-1	98	28.5	0.052	12	J	0.006	1.3	U
Tridecane	629-50-5	184	46.5	0.006	0.73	U	0.181	22	
Tetradecane	629-59-4	198	50.0	0.004	0.47	U	0.178	20	

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 12/12/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7017-A11.1332 ^(b) ISVS			S7017-A12.1333 ^{(b)(c)} ISVS			S7017-A13.1334 ^(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	1.663	1162	Y	0.645	451	Y	0.596	417	Y	0.968	0.602	677	421
Butane	106-97-8	58	10.8	0.642	247		0.353	136		0.346	133		0.447	0.169	172	65
Ethanol	64-17-5	46	12.6	0.841	409	Y	0.292	142	Y	0.289	141	Y	0.474	0.318	230	154
Acetonitrile	75-05-8	41	13.0	0.225	123		0.130	71		0.117	64		0.157	0.059	86	32
Acetone	67-64-1	58	13.7	1.280	494		0.646	249		0.669	258		0.865	0.360	334	139
Trichlorofluoromethane	75-69-4	137	14.2	0.490	80		0.421	69		0.492	80		0.467	0.041	76	6.6
Pentane	109-66-0	72	14.9	0.382	119		0.222	69		0.206	64		0.270	0.097	84	30
Methylene Chloride	75-09-2	85	15.8	0.036	9.4	J,B	0.031	8.2	J,B	0.023	6.0	J,B	0.030	0.007	7.8	1.7
Propanenitrile	107-12-0	55	17.1	0.117	48		0.065	26		0.062	25		0.081	0.031	33	13
Propanol	71-23-8	60	17.1	0.942	351		0.378	141		0.427	159		0.582	0.313	217	117
2-Butanone	78-93-3	72	18.6	0.304	94		0.217	67		0.196	61		0.239	0.057	74	18
Hexane	110-54-3	86	19.9	0.238	62		0.161	42		0.150	39		0.183	0.048	47	12
Tetrahydrofuran	109-99-9	72	20.8	0.699	217		0.468	146		0.514	160		0.560	0.122	174	38
Butanenitrile	109-74-0	69	21.9	0.129	42		0.056	18		0.065	21		0.083	0.040	27	13
1-Butanol	71-36-3	74	22.3	7.737	2342	E	5.537	1676	E	5.129	1553	E	6.134	1.403	1857	425
Benzene	71-43-2	78	22.8	0.013	3.7	J	0.012	3.4	J	0.009	2.5	J	0.011	0.002	3.2	0.59
Heptane	142-82-5	100	25.2	0.154	34		0.124	28		0.107	24		0.128	0.024	29	5.3
4-Methyl-2-Pentanone	108-10-1	100	26.4	0.083	19		0.047	11		0.043	9.7		0.058	0.022	13	4.9
Pyridine	110-86-1	79	26.5	0.035	9.9	J	0.023	6.6	U	0.023	6.5	U	d	d	d	d
Pentanenitrile	110-59-8	83	27.4	0.050	13		0.030	8.2		0.026	7.0		0.035	0.013	9.5	3.5
Toluene	108-88-3	92	28.5	0.166	40		0.158	38		0.119	29		0.148	0.025	36	6.1
Octane	111-65-9	114	30.5	0.098	19		0.071	14		0.056	11		0.075	0.021	15	4.2
Tetrachloroethylene	127-18-4	166	31.0	0.008	1.0	J	0.007	0.97	J	0.005	0.62	J	0.006	0.002	0.87	0.22
Hexanenitrile	628-73-9	97	32.8	0.042	9.8		0.025	5.8	J	0.018	4.3	J	0.029	0.012	6.6	2.8
Ethylbenzene	100-41-4	106	33.5	0.008	1.7	J	0.003	0.59	J	0.002	0.48	J	0.004	0.003	0.91	0.65
p/m-Xylene	106-42-3	106	33.9	0.006	1.2	J	0.003	0.69	U	0.003	0.68	U	d	d	d	d
Styrene	100-42-5	104	34.8	0.003	0.66	J	0.002	0.36	U	0.002	0.36	U	d	d	d	d
o-Xylene	95-47-6	106	35.1	0.016	3.4	J	0.004	0.85	J	0.003	0.60	J	0.008	0.007	1.6	1.6
Nonane	111-84-2	128	35.5	0.040	7.0		0.016	2.9		0.010	1.8	J	0.022	0.016	3.9	2.7
Decane	124-18-5	142	40.1	0.056	8.9		0.017	2.6	J	0.011	1.7	J	0.028	0.025	4.4	3.9
Undecane	1120-21-4	156	44.5	0.438	63		0.161	23		0.086	12		0.228	0.185	33	27
Dodecane	112-40-3	170	48.5	4.073	537	E	1.677	221		0.942	124		2.231	1.637	294	216
Tridecane	629-50-5	184	52.2	6.252	761	E	3.067	373		1.774	216		3.698	2.304	450	281
Tetradecane	629-59-4	198	55.8	4.469	506	E	2.307	261		1.377	156		2.718	1.586	307	179
Total Concentration of Target Analytes													20.97			

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.

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 12/12/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7017-A12.1333 ^(b) ISVS						RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Methanol	67-56-1	32	10.0	0.645	451	Y	0.623	435	Y	3
Butane	106-97-8	58	10.8	0.353	136		0.364	140		3
Ethanol	64-17-5	46	12.6	0.292	142	Y	0.297	144	Y	2
Acetonitrile	75-05-8	41	13.0	0.130	71		0.142	77		9
Acetone	67-64-1	58	13.7	0.646	249		0.638	246		1
Trichlorofluoromethane	75-69-4	137	14.2	0.421	69		0.417	68		1
Pentane	109-66-0	72	14.9	0.222	69		0.226	70		2
Methylene Chloride	75-09-2	85	15.8	0.031	8.2	J,B	0.062	16	J,B	67
Propanenitrile	107-12-0	55	17.1	0.065	26		0.069	28		5
Propanol	71-23-8	60	17.1	0.378	141		0.424	158		12
2-Butanone	78-93-3	72	18.6	0.217	67		0.204	63		6
Hexane	110-54-3	86	19.9	0.161	42		0.163	42		1
Tetrahydrofuran	109-99-9	72	20.8	0.468	146		0.476	148		2
Butanenitrile	109-74-0	69	21.9	0.056	18		0.057	18		2
1-Butanol	71-36-3	74	22.3	5.537	1676	E	5.523	1672	E	0
Benzene	71-43-2	78	22.8	0.012	3.4	J	0.014	3.9	J	15
Heptane	142-82-5	100	25.2	0.124	28		0.124	28		0
4-Methyl-2-Pentanone	108-10-1	100	26.4	0.047	11		0.052	12		10
Pentanenitrile	110-59-8	83	27.4	0.030	8.2		0.032	8.5		4
Toluene	108-88-3	92	28.5	0.158	38		0.161	39		2
Octane	111-65-9	114	30.5	0.071	14		0.075	15		6
Tetrachloroethylene	127-18-4	166	31.0	0.007	0.97	J	0.007	0.98	J	3
Hexanenitrile	628-73-9	97	32.8	0.025	5.8	J	0.025	5.8	J	0
Ethylbenzene	100-41-4	106	33.5	0.003	0.59	J	0.003	0.67	J	13
o-Xylene	95-47-6	106	35.1	0.004	0.85	J	0.005	0.97	J	14
Nonane	111-84-2	128	35.5	0.016	2.9		0.017	3.0		6
Decane	124-18-5	142	40.1	0.017	2.6	J	0.017	2.6	J	1
Undecane	1120-21-4	156	44.5	0.161	23		0.167	24		3
Dodecane	112-40-3	170	48.5	1.677	221		1.768	233		5
Tridecane	629-50-5	184	52.2	3.067	373		3.197	389		4
Tetradecane	629-59-4	198	55.8	2.307	261		2.433	275		5

Data Quality Flags

B Compound found in associated laboratory blank.

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

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

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

Footnotes

(a) Detected target analytes.

(b) Sample identification number.

(c) 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 12/12/96

Target Analytes ^(a)	CAS	MW	Ret Time	S7017-A17.1336 ^(b)			S7017-A18.1337 ^(b)			S7017-A19.1338 ^(b)			S7017-A20.1339 ^(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
Acetone	67-64-1	58	13.7	0.015	5.7	J	0.023	8.9	J	0.007	2.8	U	0.007	2.8	U
Trichlorofluoromethane	75-69-4	137	14.2	0.010	1.7	J	0.003	0.50	J	0.048	7.8		0.004	0.72	U
Methylene Chloride	75-09-2	85	15.8	0.030	7.9	J,B	0.039	10	J,B	0.118	31	J,B	0.034	9.1	J,B
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187	16.3	0.003	0.36	U	0.005	0.56	J	0.003	0.36	U	0.003	0.36	U
Trichloroethene	79-01-6	131	24.7	0.004	0.61	U	0.004	0.61	U	0.004	0.63	J	0.004	0.61	U
Toluene	108-88-3	92	28.5	0.097	24		0.131	32		0.077	19		0.011	2.7	
Decane	124-18-5	142	40.1	0.003	0.47	U	0.015	2.4	J	0.003	0.47	U	0.003	0.47	U
Undecane	1120-21-4	156	44.5	0.004	0.63	U	0.011	1.6	J	0.004	0.63	U	0.004	0.63	U
Tetradecane	629-59-4	198	55.8	0.033	3.7	J,B	0.025	2.8	J,B	0.020	2.3	J,B	0.019	2.2	U

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 12/12/96

Analyte	CAS #	Lower Flammability Limit(LFL)	Average	% of LFL ^(a)
			Measured Concentrations	
Ammonia (ppm)	7664-41-7	150000	207	0.138
Carbon Monoxide (ppm)	630-08-0	125000	<17	<0.014
Hydrogen (ppm)	1333-74-0	40000	99	0.248
Methane (ppm)	74-82-8	50000	<25	<0.050
TNMOC (mg/m ³)		42000	82.32	0.196
Total				<0.645

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

Figure 3.1b Typical Total Ion Chromatogram (36 - 70 min) for SUMMATM Canister Samples from Tank BX-104 Sampled on 12/12/96

3.21

4.0 Conclusions

The concentrations of inorganic and organic analytes were determined from samples of the headspace of Tank BX-104 on December 12, 1996 (Sample Job S7017). 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.

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

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

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

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

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

Appendix A

Chain-of-Custody Sample Control Forms

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-0418

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-7533

Page 85-9656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm
241-BX-104 Tank Vapor Sample SAF S7017

Collection date 12 - 12 - 96

Preparation date 12 - 09 - 96

Temporal study #4 *R15227* (ISVS)

Ice Chest No.

Field Logbook No. WHC-11-447-8

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

PNNL

Collectors CAP40, MAST

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S7017 - A07 . R16 .

Collect NH₃/NO_x/H₂O Sorbent Trap *TIME DA-65* 1155 12/12/96

S7017 - A08 . R17 .

Collect NH₃/NO_x/H₂O Sorbent Trap 1155 12/14/96

S7017 - A09 . R18 .

Collect NH₃/NO_x/H₂O Sorbent Trap 1155 12/12/96

S7017 - A10 . R19 .

Collect NH₃/NO_x/H₂O Sorbent Trap 1156 12/12/96

S7017 - A15 . R20 .

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

S7017 - A16 . R21 .

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

[] Field Transfer of Custody			[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time	
G W Dennis <i>G W Dennis</i>	12-09-96	0900	J A Edwards <i>J A Edwards</i>	12-09-96	0900	
J A Edwards <i>J A Edwards</i>	12-9-96	1454	CS McCallum <i>CS McCallum</i>	12-09-96	1454	
CS McCallum <i>CS McCallum</i>	12-11-96	1217	CS MAST <i>CS MAST</i>	12-11-96	1217	
CS MAST <i>CS MAST</i>	01/02/97	1415	J A Edwards <i>J A Edwards</i>	01/02/97	1415	
J A Edwards <i>J A Edwards</i>	01/06/97	1545	K H Pool <i>K H Pool</i>	01/06/97	1545	

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

(2)

POC

(15)

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

(Revised 05/30/96 PNNL)

A-6000-407 (12/92) WEF061

1 of 1

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-2329

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-7533

Page 85-9656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm

241-BX-104 Tank Vapor Sample SAF S7017

Temporal #4 *12/12/96* (ISVS)

Ice Chest No.

Collection date 12 - 12 - 96

Preparation date 12 - 09 - 96

Field Logbook No. WHC-N-647-8

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

PNNL

Customs CAPA 10, MAST

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S7017 - A01 . 123

S7017 - A02 . 127

S7017 - A04 . 128

S7017 - A05 . 130

S7017 - A06 . 134

Collect Ambient Air Sample SUMMA #1 12/12/96 1108

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

12/12/96 111412/12/96 114112/12/96 114612/12/96 1150

[] Field Transfer of Custody			[X] Chain of Possession		(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time	
J A Edwards <i>J A Edwards</i>	12-9-96	1455	CS Macella <i>CS Macella</i>	12-9-96	1445	
CS Macella <i>CS Macella</i>	12-11-96	1215	CS Macella <i>CS Macella</i>	12-11-96	1215	
CS Macella <i>CS Macella</i>	12-11-96	1216	ES MAST <i>ES MAST</i>	12-11-96	1216	
ES MAST <i>ES MAST</i>	12-12-97	1400	J A Edwards <i>J A Edwards</i>	12-12-97	1400	

Final Sample Disposition

Comments:

PNNL (only) Checklist

Media labeled and checked?	☒ Y / ☐ N
Letter of instruction?	☒ Y / ☐ N
Media in good condition?	☒ Y / ☐ N
COC info/signatures complete?	☒ Y / ☐ N
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

Comments:

POC *(Signature)* POC _____

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

(Revised 05/30/96 PNNL)

Custody Form Initiator

J. A. Edwards - PNL

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

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-7437
Page 85-9656 / S3-27 / FAX 373-7076Project Designation/Sampling Locations 200 West Tank Farm
241-BX-104 Tank *12/28/96* Vapor Sample SAF S7017
(ISVS Cart)Collection date 12 - *12* - 96
Preparation date 12 - 07 - 96

Ice Chest No.

Field Logbook No. WHC *1-647.8*

Ertco Hi/Lo thermometer No.

PNL-T-00__

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

WHC-

Comments CAPRI, MAST

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S7017 - A11 . 1332.
S7017 - A12 . 1333.
S7017 - A13 . 1334.
S7017 - A14 . 1335.PNL Triple Sorbent Trap (TST) Sample # 1
PNL TST Sample # 2
PNL TST Sample # 3
PNL TST Sample # 4*12/12/96 1213*
12/12/96 1213
12/12/96 1213
*12/12/96 1214*S7017 - A17 . 1336.
S7017 - A18 . 1337.Open, close & store TST Field Blank # 1
Open, close & store TST Field Blank # 2S7017 - A19 . 1338.
S7017 - A20 . 1339.Store TST Trip Blank #1
Store TST Trip Blank #2

[] Field Transfer of Custody			[X] Chain of Possession			(Sign and Print Names)	
Relinquished By	Date	Time	Received By	Date	Time		
JL Julia <i>Janet L. Julia</i>	12-9-96	0740	JA Edwards <i>JA Edwards</i>	12-9-96	0740		
JA Edwards <i>JA Edwards</i>	12-9-96	1455	CS McClellan <i>CS McClellan</i>	12-9-96	1455		
CS McClellan <i>CS McClellan</i>	12-11-96	1217	ES MAST <i>ES MAST</i>	12-11-96	1217		
ES MAST <i>ES MAST</i>	01/02/97	1430	JA Edwards <i>JA Edwards</i>	01/02/97	1430		

Final Sample Disposition

Comments:

PNL (only) Checklist

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

Pick-up / Delivery

PN
PN
PN / *PN*
PN / *PN*
PN / *PN*
PN
PN
PN
PN
PN

Comments:

Cooler Temperature Status

Hi *15* °C / Lo *-15* °C (pick up at PNL to WHC)
Hi ____ °C / Lo ____ °C (delivery at WHC from PNL)
Hi ____ °C / Lo ____ °C (at return to PNL from WHC)
Hi *10* °C / Lo *-22* °C (at delivery from WHC to PNL)

POC

POC

(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 12/12/96

Target Analytes	CAS	MW	Ret Time	S7017-A01.123 ISVS			S7017-A02.127			S7017-A05.130 ISVS			S7017-A05.130 ISVS Rep			S7017-A06.134 ISVS			S7017-A04.128 ISVS		
				Ambient Air			Ambient Air Thur 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	0.0036	0.67 J		0.0042	0.78 J		0.0087	1.61 J		0.0081	1.51 J		0.0083	1.53 J		0.0103	1.91 J	
Chloromethane	74-87-3	50.5	5.0	0.0027	1.19 J		0.0024	1.06 U		0.0039	1.72 J		0.0031	1.38 J		0.0032	1.43 J		0.0048	2.12 J	
1,2-dichloro1,1,2,2-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	5.2	<0.110	<77 Y		<0.110	<77 Y		1.6273	1137.68 Y		1.4393	1006.27 Y		1.4513	1014.62 Y		2.0818	1455.44 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	5.7	<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		0.0024	0.92 U		0.7863	303.06		0.7126	274.65		0.7293	281.09		1.073	413.54	
Bromomethane	74-83-9	94.9	6.3	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		0.6328	308.08 Y		0.612	297.94 Y		0.6153	299.56 Y		0.6662	324.36 Y	
Acetonitrile	75-05-8	41.1	7.3	0.004	2.18 U		0.004	2.18 U		0.2435	132.89		0.2396	130.76		0.2349	128.2		0.2498	136.33	
Acetone	67-64-1	58.1	7.8	0.0296	11.42 J		0.0178	6.88 J		2.7271	1051.76		2.707	1044.03		2.6369	1016.97		3.0832	1189.12	
Trichlorofluoromethane	75-69-4	137.4	8.3	0.0048	0.78 U		0.0048	0.78 U		0.639	104.19		0.6023	98.21		0.6166	100.55		0.6427	104.8	
Pentane	109-66-0	72.2	8.9	0.0038	1.18 U		0.0038	1.18 U		0.4274	132.68		0.4134	128.36		0.4151	128.88		0.4282	132.93	
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	0.0175	4.61 J,B		0.0176	4.64 J,B		0.0204	5.37 B		0.0205	5.41 B		0.0205	5.4 B		0.0198	5.22 J,B	
1,1,2-trichloro1,2,2-trifluoroethane	76-13-1	187.4	10.2	0.004	0.48 U		0.0539	6.44		0.0346	4.13 J		0.0346	4.13 J		0.0336	4.02 J		0.0348	4.16 J	
Propanenitrile	107-12-0	55.1	10.9	0.0038	1.55 U		0.0038	1.55 U		0.1178	47.92		0.1185	48.19		0.114	46.36		0.1128	45.89	
Propanol	71-23-8	60.1	10.8	0.0012	0.46 J		0.0028	1.04 U		0.814	303.39		0.804	299.66		0.8087	301.4		0.8065	300.6	
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	12.4	0.004	1.23 J		0.0028	0.87 U		0.5228	162.39		0.5257	163.3		0.5007	155.53		0.5128	159.29	
cis-1,2-Dichloroethene	156-59-2	96.9	13.3	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		0.2558	66.48		0.2583	67.15		0.2478	64.4		0.2405	62.51	
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		0.0016	0.5 U		0.8039	249.73		0.8174	253.9		0.7853	243.95		0.7393	229.65	
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		0.0034	1.1 U		0.1207	39.12		0.12	38.89		0.1171	37.95		0.1284	41.61	
1-Butanol	71-36-3	74.1	16.3	0.0041	1.23 J		0.0037	1.13 J		12.1431	3669.81 *		12.4011	3747.77 *		12.3874	3743.63 *		9.2291	2789.15 *	
Benzene	71-43-2	78.1	16.7	0.0016	0.46 U		0.0016	0.46 U		0.0098	2.81 J		0.0098	2.81 J		0.0093	2.66 J		0.0098	2.8 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		0.0287	7.65 J		0.0353	9.41 J		0.0259	6.89 J		0.0413	10.98	
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	18.7	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	19.2	0.0018	0.4 U		0.0018	0.4 U		0.2108	47.12		0.2109	47.14		0.2033	45.45		0.2174	48.61	
cis-1,3-Dichloropropene	10061-01-5	111.0	20.4	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	20.4	0.0013	0.28 J		0.0034	0.76 U		0.0451	10.08		0.0435	9.72		0.043	9.62		0.0499	11.15	
Pyridine	110-86-1	79.1	20.6	0.0186	5.27 U		0.0186	5.27 U		0.0146	4.14 J		0.0142	4.03 J		0.0142	4.02 J		0.0157	4.44 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	21.5	0.0042	1.13 U		0.0042	1.13 U		0.0436	11.75		0.0421	11.35		0.041	11.04 J		0.0454	12.23	
1,1,2-Trichloroethane	79-00-5	133.4	21.9	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		0.0347	8.43		0.0343	8.35		0.0338	8.21		0.0322	7.82	

B.1

Table B.1 (Cont'd) SUMMA™ Analysis Results for All Target Analytes from Tank BX-104 Sampled on 12/12/96

Target Analytes	CAS	MW	Ret Time	S7017-A01.123 ISVS			S7017-A02.127			S7017-A05.130 ISVS			S7017-A05.130 ISVS Rep			S7017-A06.134 ISVS			S7017-A04.128 ISVS		
				Ambient Air			Ambient Air Thur 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
1,2-Dibromoethane	106-93-4	187.9	24.1	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	0.123	24.12		0.1223	23.98		0.119	23.34		0.1143	22.42	
Tetrachloroethylene	127-18-4	165.8	25.2	0.0042	0.57	U	0.0042	0.57	U	0.0119	1.61	J	0.0121	1.63	J	0.0119	1.61	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	27.0	0.0038	0.89	J	0.0052	1.2	U	0.0789	18.19		0.0808	18.63		0.0845	19.48		0.0908	20.95	
Ethylbenzene	100-41-4	106.2	27.6	0.0028	0.59	U	0.0028	0.59	U	0.0054	1.13	J	0.0051	1.08	J	0.0054	1.13	J	0.0051	1.09	J
p/m-Xylene	106-42-3	106.2	28.1	0.013	2.74	U	0.013	2.74	U	0.0219	4.61	J	0.022	4.64	J	0.0219	4.63	J	0.0219	4.62	J
Cyclohexanone	108-94-1	98.1	28.5	0.0522	11.92	J	0.0058	1.32	U	0.1221	27.87		0.1177	26.87		0.14	31.95		0.1387	31.66	
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	29.2	0.0042	0.56	U	0.0042	0.56	U	0.0042	0.56	U	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	0.0106	2.23	J	0.0109	2.31	J	0.0113	2.39	J	0.0096	2.02	J
Nonane	111-84-2	128.3	29.7	0.0016	0.28	U	0.0016	0.28	U	0.0747	13.05		0.0742	12.95		0.0741	12.94		0.0651	11.37	
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	32.9	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	34.4	0.003	0.47	U	0.003	0.47	U	0.1356	21.35		0.1374	21.63		0.1365	21.5		0.1275	20.07	
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	36.0	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	0.9443	135.32		0.9533	136.62		0.9676	138.66		0.9879	141.58	
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	0.0098	1.29	U	12.0485	1584.39	*	10.9102	1434.71	*	11.9378	1569.84	*	9.1432	1202.35	*
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	0.0046	0.4	U	0.0046	0.4	U
Tridecane	629-50-5	184.4	46.5	0.006	0.73	U	0.1812	22.01		33.5011	4070.43	*	27.5003	3341.33	*	36.1505	4392.33	*	21.6527	2630.83	*
Tetradecane	629-59-4	198.3	50.0	0.0042	0.47	U	0.1775	20.05		9.4174	1063.58	*	7.7597	876.36	*	11.1989	1264.77	*	9.6971	1095.17	*

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 12/12/96.

Target Analytes	CAS	MW	Ret Time	S7017-A11.1332 ISVS			S7017-A12.1333 ISVS			S7017-A12.1333 ISVS REP			S7017-A13.1334 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.9	7.9	0.0045	0.84	U	0.0046	0.86	U	0.0046	0.86	U	0.0045	0.84	U
Chloromethane	74-87-3	50.5	8.9	0.0034	1.49	U	0.0034	1.52	U	0.0034	1.52	U	0.0034	1.5	U
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	170.9	9.6	0.0034	0.44	U	0.0034	0.45	U	0.0034	0.45	U	0.0034	0.44	U
Methanol	67-56-1	32.0	10.0	1.6627	1162.44	Y	0.6446	450.68	Y	0.6228	435.38	Y	0.5958	416.5	Y
Vinyl Chloride	75-01-4	62.5	10.0	0.0032	1.14	U	0.0033	1.17	U	0.0033	1.17	U	0.0032	1.15	U
1,3-Butadiene	106-99-0	54.0	10.6	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58.1	10.8	0.6423	247.46		0.3533	136.1		0.3637	140.11		0.3456	133.2	
Chloroethane	75-00-3	64.5	12.1	0.0044	1.51	U	0.0045	1.55	U	0.0045	1.55	U	0.0044	1.52	U
Ethanol	64-17-5	46.1	12.6	0.8407	408.75	Y	0.2924	142.18	Y	0.2971	144.45	Y	0.2891	140.6	Y
Acetonitrile	75-05-8	41.1	13.0	0.2246	122.57		0.1299	70.9		0.1416	77.28		0.117	63.84	
Acetone	67-64-1	58.1	13.7	1.2803	493.76		0.646	249.13		0.6375	245.86		0.6689	258	
Trichlorofluoromethane	75-69-4	137.4	14.2	0.4898	79.87		0.4206	68.59		0.4168	67.97		0.4918	80.19	
Pentane	109-66-0	72.0	14.9	0.3815	118.68		0.2224	69.21		0.2261	70.35		0.2059	64.07	
1,1-Dichloroethene	75-35-4	96.9	15.6	0.0022	0.5	U	0.0022	0.52	U	0.0022	0.52	U	0.0022	0.51	U
Methylene Chloride	75-09-2	84.9	15.8	0.0355	9.37	J,B	0.0309	8.15	J,B	0.0617	16.28	J,B	0.0226	5.96	J,B
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187.4	16.3	0.0032	0.38	U	0.0033	0.39	U	0.0033	0.39	U	0.0032	0.38	U
Propanenitrile	107-12-0	55.1	17.1	0.1171	47.63		0.0651	26.48		0.0687	27.93		0.0622	25.29	
Propanol	71-23-8	60.1	17.1	0.9421	351.12		0.3779	140.83		0.4242	158.12		0.4268	159.1	
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	0.3037	94.33		0.2166	67.29		0.2043	63.45		0.1962	60.94	
cis-1,2-Dichloroethene	156-59-2	96.9	19.5	0.0027	0.61	U	0.0027	0.63	U	0.0027	0.63	U	0.0027	0.62	U
Hexane	110-54-3	86.2	19.9	0.2376	61.75		0.1609	41.83		0.1632	42.42		0.1495	38.86	
Chloroform	67-66-3	119.4	20.0	0.003	0.57	U	0.0031	0.58	U	0.0031	0.58	U	0.003	0.57	U
Tetrahydrofuran	109-99-9	72.1	20.8	0.6987	217.04		0.4684	145.51		0.4762	147.94		0.5138	159.6	
1,2-Dichloroethane	107-06-2	99.0	21.4	0.0012	0.26	U	0.0012	0.27	U	0.0012	0.27	U	0.0012	0.27	U
Butanenitrile	109-74-0	69.1	21.9	0.1285	41.66		0.0559	18.11		0.0569	18.44		0.0645	20.9	
1,1,1-Trichloroethane	71-55-6	133.4	21.9	0.0028	0.47	U	0.0029	0.48	U	0.0029	0.48	U	0.0028	0.48	U
1-Butanol	71-36-3	74.0	22.3	7.7374	2342.14	E	5.5369	1676.03	E	5.5229	1671.81	E	5.1288	1553	E
Benzene	71-43-2	78.1	22.8	0.0128	3.67	J	0.0117	3.36	J	0.0136	3.9	J	0.0088	2.53	J
Carbon Tetrachloride	56-23-5	153.8	23.1	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	23.4	0.0044	1.16	U	0.0045	1.19	U	0.0045	1.19	U	0.0044	1.17	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	0.002	0.4	U
Trichloroethene	79-01-6	131.4	24.7	0.0038	0.65	U	0.0039	0.67	U	0.0039	0.67	U	0.0039	0.66	U
Heptane	142-82-5	100.2	25.2	0.1535	34.32		0.1236	27.62		0.1242	27.76		0.1069	23.9	
4-Methyl-2-Pentanone	108-10-1	100.2	26.4	0.0828	18.52		0.0474	10.59		0.0524	11.73		0.0432	9.65	
cis-1,3-Dichloropropene	10061-01-5	111.0	26.4	0.0013	0.27	U	0.0014	0.27	U	0.0014	0.27	U	0.0013	0.27	U

Table B.2 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BX-104 Sampled on 12/12/96.

Target Analytes	CAS	MW	Ret Time	S7017-A11.1332 ISVS			S7017-A12.1333 ISVS			S7017-A12.1333 ISVS REP			S7017-A13.1334 ISVS		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Pyridine	110-86-1	79.1	26.5	0.0349	9.87 J		0.0232	6.57 U		0.0232	6.57 U		0.0228	6.46 U	
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		0.0028	0.57 U	
Pentanenitrile	110-59-8	83.2	27.4	0.0501	13.49		0.0304	8.18		0.0315	8.48		0.0258	6.96	
1,1,2-Trichloroethane	79-00-5	133.4	27.9	0.0016	0.28 U		0.0017	0.28 U		0.0017	0.28 U		0.0017	0.28 U	
Toluene	108-88-3	92.1	28.5	0.1658	40.3		0.1579	38.4		0.1605	39.02		0.1193	28.99	
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	30.5	0.0983	19.32		0.0707	13.9		0.0752	14.77		0.0561	11.01	
Tetrachloroethylene	127-18-4	165.8	31.0	0.0076	1.03 J		0.0071	0.97 J		0.0073	0.98 J		0.0046	0.62 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	0.23 U	
Hexanenitrile	628-73-9	97.0	32.8	0.0423	9.76		0.0251	5.8 J		0.0252	5.83 J		0.0184	4.25 J	
Ethylbenzene	100-41-4	106.2	33.5	0.0079	1.66 J		0.0028	0.59 J		0.0032	0.67 J		0.0023	0.48 J	
p/m-Xylene	106-42-3	106.2	33.9	0.0059	1.23 J		0.0033	0.69 U		0.0033	0.69 U		0.0032	0.68 U	
Cyclohexanone	108-94-1	98.1	34.3	0.0133	3.04 U		0.0136	3.1 U		0.0136	3.1 U		0.0134	3.06 U	
Styrene	100-42-5	104.2	34.8	0.0031	0.66 J		0.0017	0.36 U		0.0017	0.36 U		0.0017	0.36 U	
1,1,2,2-Tetrachloroethane	79-34-5	167.9	35.0	0.0062	0.82 U		0.0063	0.84 U		0.0063	0.84 U		0.0062	0.83 U	
o-Xylene	95-47-6	106.2	35.1	0.0163	3.44 J		0.004	0.85 J		0.0046	0.97 J		0.0029	0.6 J	
Nonane	111-84-2	128.0	35.5	0.0401	7.02		0.0164	2.87		0.0174	3.04		0.0104	1.82 J	
1-Ethyl-2-methyl benzene	611-14-3	120.2	38.5	0.0025	0.47 U		0.0025	0.48 U		0.0025	0.48 U		0.0025	0.47 U	
1,3,5-Trimethylbenzene	108-67-8	120.2	38.7	0.0025	0.47 U		0.0025	0.48 U		0.0025	0.48 U		0.0025	0.47 U	
1,2,4-Trimethylbenzene	95-63-6	120.2	39.9	0.0027	0.5 U		0.0027	0.51 U		0.0027	0.51 U		0.0027	0.5 U	
Decane	124-18-5	142.3	40.1	0.0562	8.85		0.0166	2.61 J		0.0167	2.63 J		0.0106	1.66 J	
1,3-Dichlorobenzene	541-73-1	147.0	40.5	0.0034	0.51 U		0.0034	0.52 U		0.0034	0.52 U		0.0034	0.51 U	
1,4-Dichlorobenzene	106-46-7	147.0	40.7	0.003	0.46 U		0.0031	0.47 U		0.0031	0.47 U		0.003	0.46 U	
1,2-Dichlorobenzene	95-50-1	147.0	41.8	0.005	0.76 U		0.0051	0.78 U		0.0051	0.78 U		0.005	0.77 U	
Undecane	1120-21-4	156.0	44.5	0.4377	62.85		0.161	23.12		0.1667	23.93		0.0856	12.29	
1,2,4-Trichlorobenzene	120-82-1	181.5	48.1	0.0165	2.04 U		0.0168	2.07 U		0.0168	2.07 U		0.0166	2.05 U	
Dodecane	112-40-3	170.0	48.5	4.0725	536.61 E		1.6768	220.94		1.7677	232.92		0.9424	124.2	
Hexachloro-1,3-butadiene	87-68-3	260.8	49.9	0.0218	1.87 U		0.0223	1.92 U		0.0223	1.92 U		0.0219	1.88 U	
Tridecane	629-50-5	184.0	52.2	6.2518	761.09 E		3.0673	373.41		3.1972	389.23		1.7742	216	
Tetradecane	629-59-4	198.0	55.8	4.4688	505.56 E		2.3068	260.97		2.4328	275.22		1.377	155.8	
Tributyl Phosphate	126-73-8	266.0	63.1	<0.0105	<0.88 Z		<0.0108	<0.91 Z		<0.0108	<0.91 Z		<0.0106	<0.89 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 3.4.2.1 for more information.

Table B.3 Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BX-104 on 12/12/96.

Target Analytes	CAS	MW	Ret Time	S7017-A17.1336 FB #1			S7017-A18.1337 FB #2			S7017-A19.1338 TB #1			S7017-A20.1339 TB #2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.9	7.9	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-dichloro 1,1,2,2-tetrafluoroethane	76-14-2	170.9	9.6	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	10.0	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	10.6	<0.208	<86 Y		<0.208	<86 Y		<0.208	<86 Y		<0.208	<86 Y	
Butane	106-97-8	58.1	10.8	0.0036	1.39 U		0.0036	1.39 U		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	12.6	<0.274	<133 Y		<0.274	<133 Y		<0.274	<133 Y		<0.274	<133 Y	
Acetonitrile	75-05-8	41.1	13.0	0.0033	1.8 U		0.0033	1.8 U		0.0033	1.8 U		0.0033	1.8 U	
Acetone	67-64-1	58.1	13.7	0.0149	5.74 J		0.023	8.87 J		0.0072	2.78 U		0.0072	2.78 U	
Trichlorofluoromethane	75-69-4	137.4	14.2	0.0101	1.65 J		0.003	0.5 J		0.0476	7.76		0.0044	0.72 U	
Pentane	109-66-0	72.0	14.9	0.0029	0.89 U		0.0029	0.89 U		0.0029	0.89 U		0.0029	0.89 U	
1,1-Dichloroethene	75-35-4	96.9	15.6	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	15.8	0.03	7.9 J,B		0.0391	10.3 J,B		0.118	31.13 J,B		0.0344	9.06 J,B	
1,1,2-trichloro 1,1,2,2-trifluoroethane	76-13-1	187.4	16.3	0.003	0.36 U		0.0047	0.56 J		0.003	0.36 U		0.003	0.36 U	
Propanenitrile	107-12-0	55.1	17.1	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	17.1	0.0053	1.99 U		0.0053	1.99 U		0.0053	1.99 U		0.0053	1.99 U	
1,1-Dichloroethane	75-34-3	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	0.0022	0.68 U		0.0022	0.68 U		0.0022	0.68 U		0.0022	0.68 U	
cis-1,2-Dichloroethene	156-59-2	96.9	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	19.9	0.0013	0.32 U		0.0013	0.32 U		0.0013	0.32 U		0.0013	0.32 U	
Chloroform	67-66-3	119.4	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	20.8	0.0035	1.07 U		0.0035	1.07 U		0.0035	1.07 U		0.0035	1.07 U	
1,2-Dichloroethane	107-06-2	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	21.9	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	0.0027	0.44 U		0.0027	0.44 U		0.0027	0.44 U		0.0027	0.44 U	
1-Butanol	71-36-3	74.0	22.3	0.0075	2.29 U		0.0075	2.29 U		0.0075	2.29 U		0.0075	2.29 U	
Benzene	71-43-2	78.1	22.8	0.0014	0.4 U		0.0014	0.4 U		0.0014	0.4 U		0.0014	0.4 U	
Carbon Tetrachloride	56-23-5	153.8	23.1	0.0014	0.2 U		0.0014	0.2 U		0.0014	0.2 U		0.0014	0.2 U	
Cyclohexane	110-82-7	84.2	23.4	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		0.0037	0.63 J		0.0036	0.61 U	
Heptane	142-82-5	100.2	25.2	0.0015	0.35 U		0.0015	0.35 U		0.0015	0.35 U		0.0015	0.35 U	
4-Methyl-2-Pentanone	108-10-1	100.2	26.4	0.0021	0.46 U		0.0021	0.46 U		0.0021	0.46 U		0.0021	0.46 U	
cis-1,3-Dichloropropene	10061-01-5	111.0	26.4	0.0013	0.25 U		0.0013	0.25 U		0.0013	0.25 U		0.0013	0.25 U	

Table B.3 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BX-104 on 12/12/96.

Target Analytes	CAS	MW	Ret Time	S7017-A17.1336 FB #1			S7017-A18.1337 FB #2			S7017-A19.1338 TB #1			S7017-A20.1339 TB #2		
				(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag	(mg/m3)	(ppbv)	Flag
Pyridine	110-86-1	79.1	26.5	0.0214	6.06	U	0.0214	6.06	U	0.0214	6.06	U	0.0214	6.06	U
trans-1,3-Dichloropropene	10061-02-6	111.0	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
1,1,2-Trichloroethane	79-00-5	133.4	27.9	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U
Toluene	108-88-3	92.1	28.5	0.0967	23.51		0.1312	31.89		0.0766	18.63		0.0111	2.71	
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	30.5	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	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U
Ethylbenzene	100-41-4	106.2	33.5	0.0014	0.3	U	0.0014	0.3	U	0.0014	0.3	U	0.0014	0.3	U
p/m-Xylene	106-42-3	106.2	33.9	0.003	0.63	U	0.003	0.63	U	0.003	0.63	U	0.003	0.63	U
Cyclohexanone	108-94-1	98.1	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	34.8	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U
1,1,2,2-Tetrachloroethane	79-34-5	167.9	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	35.1	0.0019	0.4	U	0.0019	0.4	U	0.0019	0.4	U	0.0019	0.4	U
Nonane	111-84-2	128.0	35.5	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U
1-Ethyl-2-methyl benzene	611-14-3	120.2	38.5	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	38.7	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	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U
Decane	124-18-5	142.3	40.1	0.003	0.47	U	0.0154	2.42	J	0.003	0.47	U	0.003	0.47	U
1,3-Dichlorobenzene	541-73-1	147.0	40.5	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U
1,4-Dichlorobenzene	106-46-7	147.0	40.7	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U
1,2-Dichlorobenzene	95-50-1	147.0	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	44.5	0.0044	0.63	U	0.0109	1.56	J	0.0044	0.63	U	0.0044	0.63	U
1,2,4-Trichlorobenzene	120-82-1	181.5	48.1	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	48.5	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	49.9	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U
Tridecane	629-50-5	184.0	52.2	0.026	3.17	U	0.026	3.17	U	0.026	3.17	U	0.026	3.17	U
Tetradecane	629-59-4	198.0	55.8	0.033	3.73	J	0.025	2.83	J	0.0202	2.29	J	0.019	2.15	U
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 TBP was analyzed as a positively identified compound (PIC) however, the analyte was not part of the current operating procedure.

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