Pacific Northwest National Laboratory

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TANK VAPOR CHARACTERIZATION PROJECT

**Tank 241-BY-108 Temporal Study Headspace
Gas and Vapor Characterization Results
from Samples Collected on September 10, 1996**

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Summary

This report presents the results from analyses of samples taken from the headspace of waste storage tank 241-BY-108 (Tank BY-108) at the Hanford Site in Washington State. Tank headspace samples collected by Westinghouse Hanford Company (WHC) were analyzed by Pacific Northwest National Laboratory (PNNL) to determine headspace concentrations of selected non-radioactive analytes. Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNNL. Vapor concentrations from sorbent trap samples are based on measured sample volumes provided by WHC.

Ammonia was determined to be above the immediate notification limit of 150 ppm specified by the sampling and analysis plan (SAP) (Buckley 1996). Hydrogen was the principal flammable constituent of the Tank BY-108 headspace, determined to be present at approximately 1.463% of its lower flammability limit (LFL). Total headspace flammability was estimated to be <2.940% of the LFL.

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

Table S.1. Average Measured Concentrations of Gases and Inorganic and Organic Vapors in Tank BY-108 Sampled on 9/10/96

<u>Category</u>	<u>Sample Medium</u>	<u>Analyte</u>	<u>Concentration^(a)</u>	<u>Units</u>
Inorganic Vapors	Sorbent Traps	Ammonia	1025	ppmv
		Nitrogen Dioxide (NO ₂)	<0.16	ppmv
		Nitric Oxide (NO)	<0.16	ppmv
		Water	17.3	mg/L
Permanent Gases	SUMMA™ Canisters	Hydrogen	585	ppmv
		Methane	<25	ppmv
		Carbon Dioxide	<17	ppmv
		Carbon Monoxide	<17	ppmv
		Nitrous Oxide (N ₂ O)	827	ppmv
Total Non-Methane Organic Compounds	SUMMA™ Canisters	Total Non-Methane Organic Compounds	306.41	mg/m ³
Volatile Organic Vapors	SUMMA™ Canisters	1-Butanol	68.994	mg/m ³
		Acetone	12.489	mg/m ³
		Tridecane	7.916	mg/m ³
Volatile Organic Vapors	Sorbent Traps	1-Butanol	32.057	mg/m ³
		Methanol	10.295	mg/m ³
		Butane	8.205	mg/m ³
Flammables	SUMMA™ Canisters and Sorbent Traps	Flammables	<2.940	% LFL

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

Acknowledgments

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

Terms and Abbreviations

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

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1.0 Introduction

This report presents results of chemical analyses of vapor samples collected by WHC on September 10, 1996 from the headspace of waste storage tank 241-BY-108 (Tank BY-108) at the Hanford Site in Washington State. This sampling of Tank BY-108 is the latest in a series of sampling for the temporal study. Pacific Northwest National Laboratory^(a) provided SUMMA™ canisters and sorbent traps for sample collection, and analyzed the samples according to instructions in the SAP (Buckley 1996). Analytical work was performed by the PNNL VAL in the 300 Area of the Hanford Site under the PNNL Tank Vapor Characterization Project.

Pacific Northwest National Laboratory provided six sets of sorbent traps for selected inorganic analytes (four samples and two field blanks), five SUMMA™ canisters for permanent gases and organic analytes (three headspace samples and two ambient air samples), and eight triple sorbent traps (TSTs) for organic analytes (four samples, two field blanks, and two trip blanks). Sample devices and controls were provided to WHC on September 9, 1996 and were returned to PNNL on September 16, 1996. Westinghouse Hanford Company measured and reported to PNNL the sample volumes needed to determine headspace concentrations from sorbent trap samples.

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

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

2.0 Analytical Methods

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

Table 2.1. Sampling and Analysis Methods Summary

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

Table 2.2. Sample Media Preparation, Handling, and Storage

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

2.1 Inorganic Vapors

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

2.1.1 Sampling Methodology

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

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

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

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

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

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

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

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

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

2.1.2 Analytical Procedures

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

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

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

(SCIC) for nitrite according to PNL-ALO-212, Rev. 1^(a) modified to obviate interferences by concentrations of non-target analytes. Specifically, the modifications used were 1) eluent 1.44 mM 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

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

2.2.1 SUMMA™ Canister Preparation

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

2.2.2 Analytical Procedure

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

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

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

Table 2.4 Quantitation Limits for Permanent Gases

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

2.2.3 Quality Assurance/Quality Control

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

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

2.3 Total Non-Methane Organic Compounds

2.3.1 Analytical Procedure

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

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

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

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

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

2.3.2 Quality Assurance/Quality Control

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

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

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

2.4 SUMMA™ Canister Sample Analyses

2.4.1 Analytical Procedure

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

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

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

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

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

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

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

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

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

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

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

2.4.2 Quality Assurance/Quality Control

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

2.5 Triple Sorbent Trap Sample Analyses

2.5.1 Sampling Methodology

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

2.5.2 Analytical Procedure

The Supelco 300 tubes were analyzed according to PNNL Technical Procedure PNL-TVP-10^(a), with the exceptions noted in Section 3.4.1. The method employs Supelco 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:

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

NOTE: Because of laboratory error, STP conditions were not used. All TST tank sample results are reported as mg/m³ are at 21°C and 760 mm Hg pressure. All TST tank sample results reported as ppbv must be multiplied by 1.077. Blank sample results need no further corrections.

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

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

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

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

2.5.3 Quality Assurance/Quality Control

Before tank samples were analyzed, a diagnostic check was performed on the GC/MS instrument by running a full auto tune, as described in PNL-TVP-10. Upon satisfactory completion of the instrument diagnostic check, a blank trap was analyzed to check the cleanliness of the system. The instrument was then calibrated using six different concentrations of standard gas mixture containing the compounds listed in Table B.2. A gas mixture containing difluorobenzene, chlorobenzene- 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 BY-108 on September 10, 1996 (Sample Job S6092) are provided below.

3.1 Inorganic Vapors

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

Two field blank multi-trap trains, identical to sample multi-trap trains discussed in Section 2.1, were included in the tube bundle lowered into the headspace of Tank BY-108 during sample job S6092. No air was pulled through these field blank multi-trap trains. Any analyte found in the field blank multi-trap trains over and above levels in unexposed tubes was attributed to passive sampling. Data in Table 3.1 have been corrected for these minor effects of passive sampling.

Results provided in Table 3.1 are estimated to be accurate to within $\pm 10\%$ and within the $\pm 30\%$ specified by the SAP. Percent relative standard deviations of the measured concentrations were $<5\%$, which is within the 25% specified by the SAP.

3.1.1 Ammonia

Ammonia analyses were performed on September 23, 1996, 13 days after sample collection and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed, and no deviations from the procedure were noted.

The blank-corrected ammonia quantities in the sorbent traps ranged from 83.4 to 86.1 μmol in front sections; blank corrected back sorbent section ammonia concentrations were $<0.01 \mu\text{mol}$. Blank corrections of 0.12 μmol in front and 0.05 μmol in the back sections, were about 0.1% of collected quantities. The analysis of one sample was a duplicate and indicated a reproducibility of $\pm 2.4\%$. One blank sorbent trap was spiked with 17 ppm of ammonia and yielded a percentage recovery of 104%. One sample leachate was spiked after initial analysis with approximately the quantity of ammonia in the sample and yielded a percentage recovery of 94%. The initial and continuing calibration verification (ICV, CCV) standards, using NIST-traceable material, yielded percentage recoveries of 95% (ICV) and 101% and 102% (CCV) during the analytical session. A five-point calibration was performed over an ammonia range of 0.1 to 100 $\mu\text{g/ml}$.

3.1.2 Nitric Oxide and Nitrogen Dioxide

Nitric oxide and nitrogen oxide analyses were performed on September 24, 1996, 14 days after sample collection, and within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed. No deviations from the procedure were noted.

Blank-corrected NO_2^- quantities in the sorbent traps were all $<0.013 \mu\text{mol}$. Nitrite blank levels used to correct data were $0.0061 \mu\text{mol}$ in front (four of four blanks analyzed) and $0.0041 \mu\text{mol}$ in back (two of four blanks analyzed) sorbent sections. The analyses of two samples were duplicated and yielded repeatabilities of $\pm 0\%$ and $\pm 0.8\%$. Two sample leachates were spiked with 0.125 and 0.25 ppm NO_2^- and yielded percentage recoveries of 92% and 104%, respectively. A 4-point calibration was performed over a concentration range of 0 to $0.5 \mu\text{g/mL NO}_2^-$ in the desorbing matrix.

3.1.3 Water

Analyses for water vapor were performed on September 19, 1996, within established holding times (Ligotke et al. 1995). All samples (100%) were successfully analyzed.

All multi-trap sample mass gain is assumed to be due to adsorption of water. This is justified because the total mass concentration of other vapors in the headspace of Hanford waste tanks are typically two to three orders of magnitude less than the mass concentration of the water vapor found in even relatively dry tanks. Water vapor concentrations are given in Table 3.1 for both moist air at tank conditions and for dry air at STP (0°C and 1.013 bar). Because the sample volumes were measured after all water vapor was removed by the sorbent traps, the measured sample volumes are for dry air. The average water vapor concentration was 17.3 mg of water per L of dry air at STP. The result was determined from an average mass gain of 33.4 mg from all four multi-trap trains. The blank correction applied to the results was - 1.1 mg per multi-trap train. A control mass was measured and indicated a measurement accuracy of $\pm 0.1 \text{ mg}$. The average water vapor concentration corresponds to a tank headspace dew point at 18.2°C and relative humidity at 54% at the time of sampling.

3.2 Permanent Gases

Hydrogen analyses were performed on September 20, 1996, and analyses for other permanent gases were performed on September 19, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All 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 nitrous oxide are provided in Table 3.2. Results were based on three samples for each compound. Hydrogen at an average concentration of 585 ppmv and nitrous oxide at 827 ppmv were detected in Tank BY-108. Both compounds were present at higher concentrations in the tank headspace than in ambient air. The relative percent difference (RPD) between duplicate analyses of a single SUMMATM canister was 1% for hydrogen and 0.2% for nitrous oxide.

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

3.3 Total Non-Methane Organic Compounds

Analyses for TNMOCs were performed on October 25, 1996, which is within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All three tank samples and the two ambient samples (100%) were successfully analyzed and used in the averages. No deviations from standard procedures were noted.

Table 3.3 lists results of the 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 $306.41 \text{ mg}/\text{m}^3$ or 127.91 ppmv of carbon. The $306.41 \text{ mg}/\text{m}^3$ value compares to $146.21 \text{ mg}/\text{m}^3$ for the sum of all target compounds identified in the analysis of the SUMMA™ canisters. The $146.21 \text{ mg}/\text{m}^3$ value is conservatively low because TICs were not reported in the analysis. Results provided in Table 3.3 are estimated to be accurate to within $\pm 30\%$ as specified by the SAP. The RPD for duplicate analysis of a single SUMMA™ canister was 0.04%.

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 BY-108 headspace were sampled with SUMMA™ canisters and TSTs. These sampling methods are fundamentally different, but provide comparable results for many of the target analytes.

3.4.1 SUMMA™ Canister Results

Analyses of SUMMA™ canisters for organic vapors were performed on September 30, and October 4, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.1.1.

Measured concentrations of target analytes are presented in Table 3.4. Fifty-four target analytes above the instrument detection limit (IDL) were detected in the tank headspace samples. Of these, 48 target analytes were identified in two or more tank headspace samples. No TICs were reported for this temporal study. 1-Butanol at $68.994 \text{ mg}/\text{m}^3$, acetone at $12.489 \text{ mg}/\text{m}^3$, and tridecane at $7.916 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace samples. The total average concentration was $146.21 \text{ mg}/\text{m}^3$ for the target analytes. This compares to a total concentration of $306.41 \text{ mg}/\text{m}^3$ identified in the TO-12 analysis of the three tank headspace samples.

SUMMA™ canister S6092-A05.148 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. Forty-three of 49 target analytes had RPDs of less than 10%.

Results of analyses of target analytes in ambient air and ambient air through the VSS samples are provided in Table 3.6. Thirty-nine target compounds were observed in one or both of the ambient air samples. All target compounds were observed below the EQL with the exception of 2-butanone and cis-1,3-dichloropropene which were observed at 8.8 and 2.0 ppbv, respectively.

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

Appendix B, Table B.1 contains complete listings of target analyte results from the SUMMA™ analyses. These data originate directly from the evaluated instrument data and have not been rounded. The intent of the data is to list the analytes that were analyzed and to present the detection limit values associated with analytes that were not detected.

3.4.1.1 Procedural Deviations, Observations, and Anomalies. The SUMMA™ canister samples were analyzed in one batch. The tank samples were diluted and reanalyzed in a second batch.

Batch #1 (File Identifier # 26093001.b) - S6092-A01.025, S6092-A02.079, S6092-A04.147, S6092-A05.148, S6092-A05.148 REP, and S6092-A06.150.

Batch #2 (File Identifier # 26100401.b) - S6092-A04.147, S6092-A05.148, S6092-A05.148 REP, and S6092-A06.150.

Batch #1:

The volume analyzed for ambient samples was 100 mL, and the volume analyzed for tank samples was 20 mL. The analyses of the tank samples resulted in 1-butanol concentrations that exceeded the UQL.

All target compounds met the 25% difference (%D) criterion in the CCV except propanol (25.2%) and tetradecane (42.5%). These target compounds were found in all tank samples.

No target compounds were present in the CCB above the EQL except cis-1,3-dichloropropene (0.30 ppbv), which was found in the ambient sample taken through the sampling system (S6092-A02.079).

Batch #2:

Analytical batch 26903002.b (2X dilution of tank samples) resulted in a 1-butanol concentration that exceeded the UQL. Tank samples were diluted to a 10X total dilution and 30 mL of the dilution was analyzed in this batch (26100402.b) for quantitation of 1-butanol.

All target compounds met the 25% D criterion in the CCV except methanol (32.7%), vinyl chloride (26.7%), 1,3-butadiene (33.4%), butane (31.1%), bromomethane (36.3%), and tetradecane (54.3%). No target compounds were present in the CCB above the EQL except methylene chloride (1.74 ppbv) and cis-1,3-dichloropropene (0.37 ppbv). This analytical batch was not used to quantify any of the target compounds that failed the CCV or which were present in the CCB.

Information common to both batches:

All target compounds met the 30% RSD in the initial calibration.

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

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

Instrument detection limits, precision, and accuracy have not been experimentally evaluated for 1,3-butadiene. Sample results are flagged with a "<" when the absolute number of nanograms calculated in the sample is less than the lowest concentration standard used in the initial calibration. 1,3-Butadiene was not found in any sample.

3.4.2 Triple Sorbent Trap Sample Results

Analyses of TSTs were performed on October 25 and November 5, 1996. All analyses were conducted within the 60-day administrative holding time as specified in the WHC Tank Vapor Characterization QA Plan (WHC 1994). All samples (100%) were successfully analyzed. Procedural deviations, observations, and anomalies are presented in Section 3.4.2.1.

NOTE: All TST tank sample results reported in mg/m^3 are at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077. All TST tank sample results reported in ppb must be corrected by multiplying by 1.077. TST blank sample results need no further correction.

Measured concentrations of target analytes are presented in Table 3.7. Results are based on three samples for each compound. Thirty-three target analytes above the IDL were detected in the tank headspace samples. Of these, 32 target analytes were identified in two or more tank headspace samples. 1-Butanol at $32.057 \text{ mg}/\text{m}^3$, methanol at $10.295 \text{ mg}/\text{m}^3$, and butane at $8.205 \text{ mg}/\text{m}^3$ were the three most abundant compounds identified in the tank headspace sample. The total average concentration of the target analytes was $94.84 \text{ mg}/\text{m}^3$.

Triple sorbent trap sample S6092-A12.1218 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-nine of 31 target analytes had RPDs of less than 10%.

Results of analyses of target analytes in the field and trip blanks are provided in Table 3.9. Two target analytes were identified in one or more of the blank samples. Both compounds were found in a trip blank sample. Both compounds observed were below the EQL.

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

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

3.4.2.1 Procedural Deviations, Observations, and Anomalies. Samples were run under the protocols of TVP-10, Rev. 2 with the initial calibration performed on October 23, 1996 and quantitated against a CCV run at the beginning of the batch.

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

Batch #1 (file identifier #46102501.b) - S6092-A17.1221, S6092-A18.1222, S6092-A19.1223, S6092-A20.1224.

Batch #2 (file identifier #46110501.b) - S6092-A11.1217, S6092-A12.1218, S6092-A12.1218 REP, S6092-A13.1219.

Batch #1:

Samples included in this batch consisted of the two field blanks and two trip blanks. These samples were collected using the VSS truck on 9/10/96.

The CCV showed acceptable performance as specified in the procedure for all target compounds except for tridecane (28.5%) and tetradecane (62.9%). Both compounds were undetected in all field samples. The CCB was clean of all target and TIC compounds with the exception of methylene chloride and tetradecane, which showed only trace amounts (below EQL).

The field blanks were relatively clean, showing only minor trace amounts (below EQL) of methylene chloride. Both trip blanks contained trace levels (below EQL) of methylene chloride, and one trip blank also contained trace amounts (below EQL) of toluene. Methylene chloride was also found in the CCB at comparable levels and should be flagged in the final report with a B.

Batch #2:

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

The CCV showed acceptable performance as specified in the procedure for all target compounds except tetradecane (49.8%). Major amounts of tetradecane were observed in the samples. Because of the CCV performance, the results for this compound have a greater uncertainty. The CCB showed a trace of methylene chloride and toluene (below EQL) and was clean of other target and TIC compounds.

Chromatograms showed typical NPH characteristics. Methylene chloride and toluene were also found in the CCB at comparable levels to the samples and should be flagged in the final report with a "B".

Information common to both batches:

Very narrow air spikes (mass 32) occasionally are present in chromatograms from this period. This problem has been traced to high frequency air bursts from the surface of MS vacuum system o-rings and had been corrected for some time but has again reappeared. It has no known impact on data quality but the spikes do appear as features on the total ion chromatogram.

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

Tributyl phosphate (TBP) is included in the target list based on a calibration performed on January 5 and 9, 1996. The TBP was introduced onto a series of double sorbent traps as a methanolic solution standard rather than a vapor standard. This served to determine the retention time and verify the mass spectral characteristics of the compound. However, verification of the calibration acceptability was not performed because the compound is not present in the CCV. At present, it is not possible to prepare a gas standard from this material. The calibration information on TBP demonstrated that detectability at 0.08 ppbv (based on a 200-mL sample) was possible. Tributyl phosphate was not detected in the samples.

3.5 Flammability

The analytical results presented above can be used to estimate the Tank BY-108 headspace flammability at the time of sampling. Flammability is calculated using the ammonia concentration from the inorganic analysis, carbon monoxide, hydrogen, and methane concentrations measured from the permanent gas analysis, and the total nonmethane organic concentration determined from the TO-12 analysis. Table 3.10 summarizes the calculated flammability data. Hydrogen was the principal flammable constituent of the Tank BY-108 headspace, determined to be present at approximately 1.463% of its LFL. Total headspace flammability was estimated to be <2.940% of the LFL.

Table 3.1 Inorganic Vapor Concentrations from Tank BY-108 Sampled on 9/10/96

Analyte	CAS Number	S6092-A07-01R	S6092-A08-02R	S6092-A09-03R	S6092-A10-04R	Average	Standard Deviation
Ammonia (ppmv)	7664-41-7	1037	1024	1004	1037	1025	15
Nitric Oxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Nitrogen Dioxide (ppmv)		<0.16	<0.16	<0.16	<0.16	<0.16	
Water ^(a) (mg/L)		17.3	16.2	18.0	18.0	17.3	0.8
Water ^(b) (mg/L)		15.1	14.2	15.6	15.6	15.1	0.6

(a) Dry air at 0°C and 1.013 bar.

(b) Moist air at tank temperature and pressure.

Table 3.2 Permanent Gas Analysis Results from Tank BY-108 Sampled on 9/10/96

Permanent Gas Analyte	Ambient Air Upwind S6092-A01.025 ^(a)	Ambient Air Through VSS S6092-A02.079 ^(a)	Tank Samples				RPD ^(c) (%)	Mean (ppmv)	St.Dev. ^(d)
	Concentration (ppmv)	Concentration (ppmv)	S6092-A04.147 ^(a) Concentration (ppmv)	S6092-A06.150 ^(a) Concentration (ppmv)	S6092-A05.148 ^(a) Concentration (ppmv)	S6092-A05.148 ^{(a)(b)} Concentration (ppmv)			
Hydrogen	<17	<17	589	580	587	595	1	585	5
Methane	<25	<25	<25	<25	<25	<25	na	<25	
Carbon Dioxide	378	376	<17	<17	<17	<17	na	<17	
Carbon Monoxide	<17	<17	<17	<17	<17	<17	na	<17	
Nitrous Oxide	<17	<17	820	830	831	829	0.2	827	6

(a) WHC sample identification number.

(b) Replicate analysis for S6092-A05.148; results are not included in the calculation of average concentrations.

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

(d) Standard deviation.

Table 3.3 Total Non-Methane Organic Compound Analysis Results from Tank BY-108 Sampled on 9/10/96

	Ambient Air Upwind	Ambient Air Through Bundle	Tank Samples						
	S6092-A01.025 ^(a)	S6092-A02.079 ^(a)	S6092-A04.147 ^(a)	S6092-A06.150 ^(a)	S6092-A05.148 ^(a)	S6092-A05.148 ^{(a)(b)}	RPD ^(c)	Mean	St.Dev. ^(d)
	Concentration	Concentration	Concentration	Concentration	Concentration	Concentration	(%)		
TO-12 (mg/m ³)	< 0.59	< 0.59	309.81	298.35	311.08	310.96	0.04	306.41	7.01
Total Carbon (ppmv)								127.91	

(a) WHC sample identification number.

(b) Replicate analysis for S6092-A05.148; results are not included in the calculation of average concentrations.

(c) Relative percent difference (RPD) for replicate samples.

(d) Standard deviation.

Table 3.4 Organic Compound Concentrations in SUMMA™ Canisters from Tank BY-108 Sampled on 9/10/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6092-A04.147 ^(b) VS			S6092-A05.148 ^{(b)(c)} VSS			S6092-A06.150 ^(b) VSS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Dichlorodifluoromethane	75-71-8	120.91	4.21	0.057	11	J	0.045	8.4	J	0.047	8.8	J	0.050	0.006	9.2	1.1
Chloromethane	74-87-3	50.49	4.606	0.032	14	J	0.010	4.4	U	0.010	4.4	U	d	d	d	d
1,2-dichloro1,1,2,2-tetrafluoroethane	76-14-2	170.92	4.873	0.081	11	J	0.068	8.9	J	0.074	9.7	J	0.074	0.006	9.7	0.84
Methanol	67-56-1	32.04	5.066	3.942	2756		3.780	2642		4.036	2822		3.919	0.130	2740	91
Butane	106-97-8	58.12	5.643	6.163	2375		5.663	2183		6.210	2394		6.012	0.303	2317	117
Chloroethane	75-00-3	64.51	6.563	0.034	12	J	0.030	10	J	0.035	12	J	0.033	0.003	11	0.96
Ethanol	64-17-5	46.01	6.862	2.555	1244		2.412	1174		2.653	1291		2.540	0.121	1236	59
Acetonitrile	75-05-8	41.05	7.333	0.017	9.3	J	0.016	8.7	U	0.016	8.7	U	d	d	d	d
Acetone	67-64-1	58.08	7.879	12.618	4866		11.981	4621		12.868	4963		12.489	0.458	4817	177
Trichlorofluoromethane	75-69-4	137.37	8.274	0.388	63		0.352	57		0.400	65		0.380	0.025	62	4.1
Pentane	109-66-0	72.15	9.034	7.791	2419		6.981	2167		7.752	2407		7.508	0.457	2331	142
1,1-Dichloroethene	75-35-4	96.94	9.611	0.018	4.2	U	0.037	8.6	J	0.045	10	J	0.041	d	9.5	d
Methylene Chloride	75-09-2	84.93	9.825	0.108	28	J	0.103	27	J	0.113	30	J	0.108	0.005	28	1.3
1,1,2-trichloro1,1,2,2-trifluoroethane	76-13-1	187.38	10.381	0.069	8.3	J	0.059	7.1	J	0.079	9.5	J	0.069	0.010	8.3	1.2
Propanenitrile	107-12-0	55.08	11.194	0.092	37	J	0.088	36	J	0.097	39	J	0.092	0.004	38	1.8
Propanol	71-23-8	60.1	11.248	1.737	647		1.666	621		1.778	663		1.727	0.057	644	21
1,1-Dichloroethane	75-34-3	98.96	12.103	0.047	11	J	0.041	9.3	J	0.050	11	J	0.046	0.004	10	1.00
2-Butanone	78-93-3	72.11	12.831	2.166	673		2.079	646		2.285	710		2.176	0.104	676	32
cis-1,2-Dichloroethene	156-59-2	96.94	13.719	0.041	9.5	J	0.038	8.8	J	0.046	11	J	0.042	0.004	9.6	0.94
Hexane	110-54-3	86.18	14.125	6.631	1723		6.131	1594		6.784	1763		6.515	0.341	1693	89
Chloroform	67-66-3	119.38	14.285	0.057	11	J	0.055	10	J	0.062	12	J	0.058	0.004	11	0.74
Tetrahydrofuran	109-99-9	72.11	15.051	3.468	1077		3.329	1034		3.625	1126		3.474	0.148	1079	46
1,1,1-Trichloroethane	71-55-6	133.4	16.249	0.062	10	J	0.057	9.6	J	0.069	12	J	0.063	0.006	11	1.0
1-Butanol	71-36-3	74.12	16.848	70.643	21349	*	70.999	21457	*	65.341	19747	*	68.994	3.169	20851	958
Benzene	71-43-2	78.11	17.158	0.133	38		0.129	37		0.142	41		0.135	0.007	39	1.9
Carbon Tetrachloride	56-23-5	153.82	17.447	0.064	9.4	J	0.059	8.6	J	0.073	11	J	0.066	0.007	9.6	1.0
Cyclohexane	110-82-7	84.16	17.714	0.829	221		0.514	137		0.879	234		0.741	0.198	197	53
Trichloroethene	79-01-6	131.39	19.222	0.062	11	J	0.062	11	J	0.069	12	J	0.064	0.004	11	0.72
Heptane	142-82-5	100.2	19.768	3.315	741		3.202	716		3.553	794		3.357	0.179	750	40
4-Methyl-2-Pentanone	108-10-1	100.16	20.987	0.514	115		0.489	109		0.543	121		0.515	0.027	115	6.1
Pyridine	110-86-1	79.1	21.116	0.075	21	J	0.072	20	J	0.087	25	J	0.078	0.008	22	2.3
trans-1,3-Dichloropropene	10061-02-	110.97	22.035	0.050	10	J	0.049	9.9	J	0.054	11	J	0.051	0.002	10	0.50
Pentanenitrile	110-59-8	83.13	22.089	0.155	42	J	0.148	40	J	0.171	46	J	0.158	0.012	43	3.2
1,1,2-Trichloroethane	79-00-5	133.4	22.463	0.073	12	J	0.073	12	J	0.079	13	J	0.075	0.003	13	0.58
Toluene	108-88-3	92.14	23.094	0.229	56		0.222	54		0.249	60		0.233	0.014	57	3.3
1,2-Dibromoethane	106-93-4	187.86	24.613	0.085	10	J	0.087	10	J	0.096	11	J	0.089	0.006	11	0.69
Octane	111-65-9	114.23	25.223	0.975	191		0.944	185		1.064	209		0.994	0.063	195	12

Table 3.4 (Cont'd) Organic Compound Concentrations in SUMMA™ Canisters from Tank BY-108 Sampled on 9/10/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6092-A04.147 ^(b) VS			S6092-A05.148 ^{(b)(c)} VSS			S6092-A06.150 ^(b) VSS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Tetrachloroethylene	127-18-4	165.83	25.661	0.076	10	J	0.076	10	J	0.086	12	J	0.079	0.006	11	0.82
Chlorobenzene	108-90-7	112.56	27.255	0.076	15	J	0.074	15	J	0.083	16	J	0.077	0.004	15	0.87
Hexanenitrile	628-73-9	97.13	27.565	0.109	25	J	0.104	24	J	0.112	26	J	0.109	0.004	25	0.95
Ethylbenzene	100-41-4	106.17	28.143	0.075	16	J	0.074	16	J	0.082	17	J	0.077	0.004	16	0.84
p/m-Xylene	106-42-3	106.17	28.592	0.189	40	J	0.185	39	J	0.204	43	J	0.193	0.010	41	2.1
1,1,2,2-Tetrachloroethane	79-34-5	167.85	29.726	0.089	12	J	0.090	12	J	0.096	13	J	0.091	0.004	12	0.53
o-Xylene	95-47-6	106.17	29.79	0.091	19	J	0.090	19	J	0.099	21	J	0.093	0.005	20	1.1
Nonane	111-84-2	128.26	30.271	0.673	117		0.647	113		0.725	127		0.682	0.040	119	6.9
Decane	124-18-5	142.28	34.945	1.021	161		0.992	156		1.112	175		1.042	0.063	164	9.9
1,3-Dichlorobenzene	541-73-1	147	35.138	0.066	10	U	0.066	10	U	0.068	10	J	d	d	d	d
1,4-Dichlorobenzene	106-46-7	147	35.352	0.066	10	U	0.066	10	U	0.068	10	J	d	d	d	d
1,2-Dichlorobenzene	95-50-1	147	36.464	0.066	10	U	0.066	10	U	0.068	10	J	d	d	d	d
Undecane	1120-21-4	156.31	39.256	2.387	342		2.316	332		2.553	366		2.419	0.122	347	17
Dodecane	112-40-3	170.34	43.256	7.359	968		7.057	928		7.632	1004		7.349	0.287	966	38
Hexachloro-1,3-butadiene	87-68-3	260.76	44.497	0.116	10.0	U	0.116	10.0	U	0.119	10	J	d	d	d	d
Tridecane	629-50-5	184.36	46.989	8.727	1060		7.654	930		7.367	895		7.916	0.717	962	87
Tetradecane	629-59-4	198.34	50.786	3.470	392		2.625	297		3.261	368		3.119	0.440	352	50
Total Concentration of Target Analytes													146.212			

Data Quality Flags

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

U Target compound not detected at or above the IDL.

* Diluted value was reported for target compound in table.

(a) Detected target analytes.

(b) WHC sample identification number.

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

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

Table 3.5 Comparison of Organic Compound Concentrations from Replicate Analysis of a Single SUMMA™ Canister from Tank BY-108 Sampled on 9/10/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6092-A05.148 ^(b) VSS			S6092-A05.148 ^(b) VSS Rep			RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Dichlorodifluoromethane	75-71-8	120.91	4.21	0.045	8.4	J	0.046	8.5	J	1
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	170.92	4.873	0.068	8.9	J	0.070	9.2	J	3
Methanol	67-56-1	32.04	5.066	3.780	2642		3.917	2739		4
Butane	106-97-8	58.12	5.643	5.663	2183		6.244	2406		10
Chloroethane	75-00-3	64.51	6.563	0.030	10	J	0.010	3.5	U	100
Ethanol	64-17-5	46.01	6.862	2.412	1174		2.561	1247		6
Acetonitrile	75-05-8	41.05	7.333	0.016	8.7	U	0.019	10	J	15
Acetone	67-64-1	58.08	7.879	11.981	4621		12.362	4768		3
Trichlorofluoromethane	75-69-4	137.37	8.274	0.352	57		0.381	62		8
Pentane	109-66-0	72.15	9.034	6.981	2167		7.683	2385		10
1,1-Dichloroethene	75-35-4	96.94	9.611	0.037	8.6	J	0.034	7.9	J	10
Methylene Chloride	75-09-2	84.93	9.825	0.103	27	J	0.099	26	J	3
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	187.38	10.381	0.059	7.1	J	0.058	6.9	J	2
Propanenitrile	107-12-0	55.08	11.194	0.088	36	J	0.091	37	J	3
Propanol	71-23-8	60.1	11.248	1.666	621		1.721	642		3
1,1-Dichloroethane	75-34-3	98.96	12.103	0.041	9.3	J	0.040	9.0	J	3
2-Butanone	78-93-3	72.11	12.831	2.079	646		2.176	676		5
cis-1,2-Dichloroethene	156-59-2	96.94	13.719	0.038	8.8	J	0.037	8.5	J	3
Hexane	110-54-3	86.18	14.125	6.131	1594		6.614	1719		8
Chloroform	67-66-3	119.38	14.285	0.055	10	J	0.054	10	J	1
Tetrahydrofuran	109-99-9	72.11	15.051	3.329	1034		3.422	1063		3
1,1,1-Trichloroethane	71-55-6	133.4	16.249	0.057	9.6	J	0.057	9.6	J	1
1-Butanol	71-36-3	74.12	16.848	70.999	21457	*	64.848	19598	*	9
Benzene	71-43-2	78.11	17.158	0.129	37		0.136	39		5
Carbon Tetrachloride	56-23-5	153.82	17.447	0.059	8.6	J	0.061	8.8	J	2
Cyclohexane	110-82-7	84.16	17.714	0.514	137		0.814	217		45
Trichloroethene	79-01-6	131.39	19.222	0.062	11	J	0.062	11	J	0
Heptane	142-82-5	100.2	19.768	3.202	716		3.377	755		5
4-Methyl-2-Pentanone	108-10-1	100.16	20.987	0.489	109		0.509	114		4
Pyridine	110-86-1	79.1	21.116	0.072	20	J	0.072	20	J	0
trans-1,3-Dichloropropene	10061-02-	110.97	22.035	0.049	9.9	J	0.050	10	J	2
Pentanenitrile	110-59-8	83.13	22.089	0.148	40	J	0.162	44	J	9
1,1,2-Trichloroethane	79-00-5	133.4	22.463	0.073	12	J	0.069	12	J	5
Toluene	108-88-3	92.14	23.094	0.222	54		0.235	57		6
1,2-Dibromoethane	106-93-4	187.86	24.613	0.087	10	J	0.087	10	J	0
Octane	111-65-9	114.23	25.223	0.944	185		1.005	197		6
Tetrachloroethylene	127-18-4	165.83	25.661	0.076	10	J	0.077	10	J	2
Chlorobenzene	108-90-7	112.56	27.255	0.074	15	J	0.076	15	J	2
Hexanenitrile	628-73-9	97.13	27.565	0.104	24	J	0.110	25	J	5
Ethylbenzene	100-41-4	106.17	28.143	0.074	16	J	0.076	16	J	2
p/m-Xylene	106-42-3	106.17	28.592	0.185	39	J	0.190	40	J	3
1,1,2,2-Tetrachloroethane	79-34-5	167.85	29.726	0.090	12	J	0.091	12	J	1
o-Xylene	95-47-6	106.17	29.79	0.090	19	J	0.092	19	J	3
Nonane	111-84-2	128.26	30.271	0.647	113		0.669	117		3
Decane	124-18-5	142.28	34.945	0.992	156		1.026	162		3
Undecane	1120-21-4	156.31	39.256	2.316	332		2.358	338		2
Dodecane	112-40-3	170.34	43.256	7.057	928		7.139	939		1
Tridecane	629-50-5	184.36	46.989	7.654	930		7.499	911		2
Tetradecane	629-59-4	198.34	50.786	2.625	297		2.742	310		4

Data Quality Flags

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

U Target compound not detected at or above the IDL.

* Diluted value was reported for target compound in table.

(a) Detected target analytes.

(b) WHC 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 SUMMA™ Canisters Associated with the Sampling of Tank BY-108 on 9/10/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6092-A01.025 ^(b) VSS			S6092-A02.079 ^(b) VSS		
				Ambient Air Upwind			Ambient Air through VSS		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	4.21	0.011	2.0	J	0.015	2.7	J
Chloromethane	74-87-3	50.49	4.606	0.002	0.89	U	0.007	3.2	J
1,2-dichloro1,1,2,2-tetrafluoroethane	76-14-2	170.92	4.873	0.013	1.6	J	0.020	2.6	J
Vinyl Chloride	75-01-4	62.5	5.162	0.006	2.2	U	0.006	2.3	J
Chloroethane	75-00-3	64.51	6.563	0.002	0.69	U	0.008	2.7	J
Ethanol	64-17-5	46.01	6.862	0.014	6.7	J	0.018	8.7	J
Acetonitrile	75-05-8	41.05	7.333	0.008	4.6	J	0.013	7.3	J
Acetone	67-64-1	58.08	7.879	0.031	12	J	0.006	2.3	U
Trichlorofluoromethane	75-69-4	137.37	8.274	0.011	1.7	J	0.017	2.7	J
Pentane	109-66-0	72.15	9.034	0.007	2.2	J	0.011	3.3	J
1,1-Dichloroethene	75-35-4	96.94	9.611	0.006	1.4	J	0.009	2.1	J
Methylene Chloride	75-09-2	84.93	9.825	0.020	5.3	J	0.023	6.1	J
1,1,2-trichloro1,1,2,2-trifluoroethane	76-13-1	187.38	10.381	0.004	0.53	U	0.018	2.2	J
1,1-Dichloroethane	75-34-3	98.96	12.103	0.002	0.50	U	0.011	2.5	J
2-Butanone	78-93-3	72.11	12.831	0.015	4.5	J	0.028	8.8	
cis-1,2-Dichloroethene	156-59-2	96.94	13.719	0.006	1.4	J	0.009	2.2	J
Hexane	110-54-3	86.18	14.125	0.011	2.8	J	0.016	4.2	J
Chloroform	67-66-3	119.38	14.285	0.008	1.6	J	0.013	2.4	J
Tetrahydrofuran	109-99-9	72.11	15.051	0.003	0.81	U	0.010	3.0	J
1,1,1-Trichloroethane	71-55-6	133.4	16.249	0.009	1.6	J	0.015	2.5	J
1-Butanol	71-36-3	74.12	16.848	0.010	3.1	J	0.026	7.9	J
Benzene	71-43-2	78.11	17.158	0.006	1.6	J	0.008	2.4	J
Carbon Tetrachloride	56-23-5	153.82	17.447	0.010	1.5	J	0.016	2.3	J
Trichloroethene	79-01-6	131.39	19.222	0.009	1.5	J	0.014	2.3	J
Heptane	142-82-5	100.2	19.768	0.010	2.2	J	0.011	2.4	J
cis-1,3-Dichloropropene	10061-01-5	110.97	20.955	0.000	0.040	U	0.010	2.0	B
4-Methyl-2-Pentanone	108-10-1	100.16	20.987	0.010	2.2	J	0.017	3.8	J
Pentanenitrile	110-59-8	83.13	22.089	0.010	2.7	J	0.015	4.0	J
1,1,2-Trichloroethane	79-00-5	133.4	22.463	0.010	1.7	J	0.015	2.4	J
Toluene	108-88-3	92.14	23.094	0.010	2.3	J	0.010	2.4	J
1,2-Dibromoethane	106-93-4	187.86	24.613	0.012	1.5	J	0.018	2.2	J
Octane	111-65-9	114.23	25.223	0.006	1.1	J	0.009	1.8	J
Tetrachloroethylene	127-18-4	165.83	25.661	0.010	1.4	J	0.016	2.1	J
Chlorobenzene	108-90-7	112.56	27.255	0.007	1.5	J	0.012	2.3	J
Hexanenitrile	628-73-9	97.13	27.565	0.008	1.9	J	0.014	3.3	J
Ethylbenzene	100-41-4	106.17	28.143	0.007	1.5	J	0.011	2.3	J
p/m-Xylene	106-42-3	106.17	28.592	0.015	3.2	J	0.022	4.7	J
1,1,2,2-Tetrachloroethane	79-34-5	167.85	29.726	0.015	2.0	U	0.019	2.5	J
Decane	124-18-5	142.28	34.945	0.014	2.3	U	0.016	2.4	J

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.

(a) Detected target analytes.

(b) WHC sample identification number.

Table 3.7 Organic Compound Concentrations in Triple Sorbent Traps from Tank BY-108 Sampled on 9/10/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes ^(a)	CAS	MW	Ret Time	S6092-A11.1217 ^(b) VSS			S6092-A12.1218 ^{(b)(c)} VSS			S6092-A13.1219 ^(b) VSS			Mean and Standard Deviation			
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	St. Dev.	(ppbv)	St. Dev.
Dichlorodifluoromethane	75-71-8	120.91	7.902	0.017	3.1	J	0.004	0.79	U	0.004	0.79	U	d	d	d	d
Methanol	67-56-1	32.04	10.091	11.990	8382	E,Y	9.465	6617	E,Y	9.431	6594	E,Y	10.295	1.468	7198	1026
Butane	106-97-8	58.14	10.835	9.101	3507	E	7.668	2954	E	7.844	3022	E	8.205	0.782	3161	301
Ethanol	64-17-5	46.07	12.621	3.197	1555	Y	2.555	1242	Y	2.454	1193	Y	2.735	0.403	1330	196
Acetonitrile	75-05-8	41.05	13.089	0.671	366		0.555	303		0.539	294		0.588	0.072	321	40
Acetone	67-64-1	58.08	13.737	8.547	3296	E	7.603	2932	E	7.825	3018	E	7.992	0.494	3082	190
Trichlorofluoromethane	75-69-4	137.37	14.194	0.115	19		0.097	16		0.100	16		0.104	0.010	17	1.6
Pentane	109-66-0	72	14.981	6.461	2010	E	5.598	1742	E	5.736	1784	E	5.931	0.463	1845	144
Methylene Chloride	75-09-2	84.93	15.831	1.102	291		0.084	22	J,B	0.251	66	B	0.479	0.546	126	144
Propanenitrile	107-12-0	55.08	17.085	0.059	24		0.052	21		0.055	22		0.055	0.003	22	1.3
Propanol	71-23-8	60.1	17.128	1.244	464		0.995	371		1.010	377		1.083	0.140	404	52
2-Butanone	78-93-3	72.11	18.669	1.354	421		1.230	382		1.238	385		1.274	0.069	396	22
Hexane	110-54-3	86.18	19.923	4.931	1282	E	4.291	1115	E	4.335	1127	E	4.519	0.357	1175	93
Tetrahydrofuran	109-99-9	72.11	20.816	2.216	688		2.020	627		2.131	662		2.122	0.098	659	31
Butanenitrile	109-74-0	69.11	21.921	0.054	17		0.034	11		0.038	12		0.042	0.010	14	3.3
1-Butanol	71-36-3	74	22.357	33.338	10092	E	31.427	9513	E	31.405	9506	E	32.057	1.110	9704	336
Benzene	71-43-2	78.11	22.846	0.108	31		0.103	30		0.107	31		0.106	0.003	30	0.73
Cyclohexane	110-82-7	84.16	23.388	0.900	239		0.801	213		0.770	205		0.824	0.068	219	18
Trichloroethene	79-01-6	131.39	24.791	0.025	4.2	J	0.004	0.61	U	0.006	1.0	J	0.015	d	2.6	d
Heptane	142-82-5	100.2	25.237	2.879	644	E	2.630	588		2.605	582		2.705	0.151	605	34
4-Methyl-2-Pentanone	108-10-1	100.16	26.396	0.154	34		0.130	29		0.138	31		0.141	0.012	31	2.7
Pyridine	110-86-1	79.1	26.598	0.064	18	J	0.055	16	J	0.051	14	J	0.057	0.007	16	1.9
Toluene	108-88-3	92.14	28.532	0.201	49		0.177	43		0.189	46		0.189	0.012	46	2.8
Octane	111-65-9	114	30.499	0.891	175		0.839	165		0.842	165		0.857	0.029	168	5.7
Ethylbenzene	100-41-4	106.17	33.485	0.024	5.1		0.021	4.4		0.023	4.8		0.023	0.002	4.7	0.35
p/m-Xylene	106-42-3	106.17	33.921	0.073	15		0.065	14		0.071	15		0.070	0.004	15	0.84
o-Xylene	95-47-6	106.17	35.122	0.034	7.1		0.030	6.3		0.032	6.7		0.032	0.002	6.7	0.41
Nonane	111-84-2	128	35.484	0.369	65		0.309	54		0.315	55		0.331	0.033	58	5.8
Decane	124-18-5	142.28	40.139	0.504	79		0.402	63		0.424	67		0.443	0.053	70	8.4
Undecane	1120-21-4	156	44.465	1.068	153		0.873	125		0.885	127		0.942	0.109	135	16
Dodecane	112-40-3	170	48.483	3.806	502	E	2.958	390		3.067	404		3.277	0.462	432	61
Tridecane	629-50-5	184	52.235	5.183	631	E	4.119	501	E	4.165	507	E	4.489	0.601	547	73
Tetradecane	629-59-4	198	55.742	4.722	534	E	3.709	420	E	3.793	429	E	4.075	0.562	461	64
Total Concentration of Target Analytes													96.055			

Data Quality Flags

B Compound found in associated laboratory blank.

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

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

U Target compound not detected at or above the IDL.

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

(a) Detected target analytes.

(b) WHC sample identification number.

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

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

Table 3.8 Comparison of Organic Compound Concentrations from Replicate Analysis of a Single Triple Sorbent Trap from Tank BY-108 Sampled on 9/10/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes ^(a)	CAS	MW	Ret Time	S6092-A12.1218 ^(b) VSS			S6092-A12.1218 ^(b) VSS REP			RPD ^(c) (%)
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	
Methanol	67-56-1	32.04	10.091	9.465	6617	E,Y	9.307	6507	E,Y	2
Butane	106-97-8	58.14	10.835	7.668	2954	E	8.007	3085	E	4
Ethanol	64-17-5	46.07	12.621	2.555	1242	Y	2.331	1133	Y	9
Acetonitrile	75-05-8	41.05	13.089	0.555	303		0.608	331		9
Acetone	67-64-1	58.08	13.737	7.603	2932	E	7.463	2878	E	2
Trichlorofluoromethane	75-69-4	137.37	14.194	0.097	16		0.093	15		5
Pentane	109-66-0	72	14.981	5.598	1742	E	6.105	1899	E	9
Methylene Chloride	75-09-2	84.93	15.831	0.084	22	J,B	0.088	23	J,B	4
Propanenitrile	107-12-0	55.08	17.085	0.052	21		0.052	21		1
Propanol	71-23-8	60.1	17.128	0.995	371		1.032	384		4
2-Butanone	78-93-3	72.11	18.669	1.230	382		1.295	402		5
Hexane	110-54-3	86.18	19.923	4.291	1115	E	4.630	1203	E	8
Tetrahydrofuran	109-99-9	72.11	20.816	2.020	627		2.074	644		3
Butanenitrile	109-74-0	69.11	21.921	0.034	11		0.043	14		22
1-Butanol	71-36-3	74	22.357	31.427	9513	E	32.938	9970	E	5
Benzene	71-43-2	78.11	22.846	0.103	30		0.103	29		0
Cyclohexane	110-82-7	84.16	23.388	0.801	213		0.898	239		11
Heptane	142-82-5	100.2	25.237	2.630	588		2.696	603		2
4-Methyl-2-Pentanone	108-10-1	100.16	26.396	0.130	29		0.134	30		3
Pyridine	110-86-1	79.1	26.598	0.055	16	J	0.054	15	J	3
Toluene	108-88-3	92.14	28.532	0.177	43		0.176	43		1
Octane	111-65-9	114	30.499	0.839	165		0.836	164		0
Ethylbenzene	100-41-4	106.17	33.485	0.021	4.4		0.021	4.5		2
p/m-Xylene	106-42-3	106.17	33.921	0.065	14		0.067	14		2
o-Xylene	95-47-6	106.17	35.122	0.030	6.3		0.031	6.5		3
Nonane	111-84-2	128	35.484	0.309	54		0.305	53		1
Decane	124-18-5	142.28	40.139	0.402	63		0.409	64		2
Undecane	1120-21-4	156	44.465	0.873	125		0.872	125		0
Dodecane	112-40-3	170	48.483	2.958	390		3.099	408		5
Tridecane	629-50-5	184	52.235	4.119	501	E	4.257	518	E	3
Tetradecane	629-59-4	198	55.742	3.709	420	E	3.788	429	E	2

Data Quality Flags

B Compound found in associated laboratory blank.

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

E Target compound exceeds the UQL.

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

(a) Detected target analytes.

(b) WHC sample identification number.

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

Table 3.9 Organic Compound Concentrations in Triple Sorbent Trap Blank Samples Associated with the Sampling of Tank BY-108 on 9/10/96

Target Analytes ^(a)	CAS	MW	Ret Time	S6092-A17.1221 ^(b) VSS FB #1			S6092-A18.1222 ^(b) VSS FB #2			S6092-A19.1223 ^(b) VSS TB #1			S6092-A20.1224 ^(b) VSS TB #2		
				(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Methylene Chloride	75-09-2	84.93	15.831	0.038	10	J,B	0.042	11	J,B	0.040	11	J,B	0.034	9.1	J,B
Toluene	108-88-3	92.14	28.532	0.001	0.23	U	0.001	0.23	U	0.002	0.42	J	0.001	0.23	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.

(a) Detected target analytes.

(b) WHC sample identification number.

Table 3.10 Flammability Data for Tank BY-108 Sampled on 9/10/96

Analyte	CAS #	Lower Flammability Limit(LFL)	Average Measured Concentrations	% of LFL ^(a)
Ammonia (ppm)	7664-41-7	150000	1025	0.683
Carbon Monoxide (ppm)	630-08-0	125000	<17	<0.014
Hydrogen (ppm)	1333-74-0	40000	585	1.463
Methane (ppm)	74-82-8	50000	<25	<0.050
TNMOC (mg/m ³)		42000	306.41	0.730
Total				<2.940

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

3.20

Figure 3.2a Typical Total Ion Chromatogram (2 - 36 min) for Triple Sorbent Trap Samples from Tank BY-108 Sampled on 9/10/96

4.0 Conclusions

The concentrations of inorganic and organic analytes were determined from samples of the headspace of Tank BY-108 on September 10, 1996 (Sample Job S6092). The vapor concentrations were based either on whole-volume samples (SUMMA™ canisters) or on sorbent traps exposed to sample flow. In the case of the canisters, the concentrations were based on analytical results and the tracking of dilution/concentration of sample volumes obtained directly from the canisters. In the case of the sorbent traps, concentrations were based on analytical results and sample volumes reported by WHC. Known sampling and analytical variances from established quality assurance requirements, where significant, were documented in this report, as required by the SAP (Buckley 1996). No immediate notifications were provided because analytical results indicated no specific analytes exceeded the notification levels; notification levels and notification procedures are described in the SAP (Buckley 1996).

5.0 References

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

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) 373-7437

Page 85-9656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm
241-BY-108 Tank Vapor Sample SAF S6092

Temporal

VSS

Collection date 09 - 10 - 96

Preparation date 09 - 09 - 96

Ice Chest No.

Field Logbook No. WHC- N-647-10

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6092 - A07 . R01

Collect NH₃/NO_x/H₂O Sorbent Trap

S6092 - A08 . R02

Collect NH₃/NO_x/H₂O Sorbent Trap

S6092 - A09 . R03

Collect NH₃/NO_x/H₂O Sorbent Trap

S6092 - A10 . R04

Collect NH₃/NO_x/H₂O Sorbent Trap

S6092 - A15 . R05

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

S6092 - A16 . R06

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>	09-09-96	1340	J A Edwards <i>J A Edwards</i>	09-09-96	1340		
J A Edwards <i>J A Edwards</i>	09-09-96	1425	GS CARCO <i>GS CARCO</i>	09-09-96	1425		
GS CARCO <i>GS CARCO</i>	09-16-96	0830	Rick Mahon <i>Rick Mahon</i>	09-16-96	0830		
Rick Mahon <i>Rick Mahon</i>	09-16-96	1430	J A Edwards <i>J A Edwards</i>	09-16-96	1430		
J A Edwards <i>J A Edwards</i>	09-17-96	0900	G W Dennis <i>G.W. Dennis</i>	09-17-96	0900		

Final Sample Disposition

Comments:

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

POC

POC

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

(Revised 05/30/96 PNNL)

Custody Form Initiator

J. A. Edwards - PNNL

Telephone (509) 373-0141

Page 85-3009 / FAX 376-2329

Company Contact

R. D. Mahon - WHC

Telephone (509) 373-2891

Page 85-3656 / FAX 373-3793

Project Designation/Sampling Locations 200 West Tank Farm

241-BY-108 Tank Vapor Sample SAF S6092
VSS

Collection date 09 - 10 - 96

Preparation date 09 - 09 - 96

Ice Chest No.

Field Logbook No. WHC- 11-64710

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

PNNL

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6092 - A01 . 025 Collect Ambient Air Sample SUMMA #1
S6092 - A02 . 079 Collect Ambient Air Sample SUMMA #2 (through tube bundle)

S6092 - A04 . 147 Collect SUMMA #3
S6092 - A05 . 148 Collect SUMMA #4
S6092 - A06 . 150 Collect SUMMA #5

[] Field Transfer of Custody			[X] Chain of Possession			(Sign and Print Names)		
Relinquished By	Date	Time	Received By	Date	Time			
J A Edwards <i>J A Edwards</i>	09-09-96	1420	GS CAPrio <i>GS CAPrio</i>	09-09-96	1420			
GS CAPrio <i>GS CAPrio</i>	09-16-96	0830	Rick Mahon <i>Rick Mahon</i>	09-16-96	0830			
Rick Mahon <i>Rick Mahon</i>	09-16-96	1435	J A Edwards <i>J A Edwards</i>	09-16-96	1435			

Final Sample Disposition

Comments:

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

POC

POC

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

(Revised 05/30/96 PNNL)

Custody Form Initiator J. A. Edwards - PNL

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

Company Contact R. D. Mahon - WHC

Telephone (509) 373-7437
Page 85-9656 / S3-27 / FAX 373-7076Project Designation/Sampling Locations 200 West Tank Farm
241-BY-108 Tank Vapor Sample SAF S6092
(VSS Truck)Collection date 09 - 10 - 96
Preparation date 09 - 08 - 96

Ice Chest No.

Field Logbook No. WHC- N-64710

Ertco Hi/Lo thermometer No.

PNL-T-004

Bill of Lading/Airbill No.

N/A

Offsite Property No. N/A

Method of Shipment

Government Truck

Shipped to

WHC-

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S6092 - A11 . 1217	PNL Triple Sorbent Trap (TST) Sample # 1
S6092 - A12 . 1218	PNL TST Sample # 2
S6092 - A13 . 1219	PNL TST Sample # 3
S6092 - A14 . 1220	PNL TST Sample # 4
S6092 - A17 . 1221	Open, close & store TST Field Blank # 1
S6092 - A18 . 1222	Open, close & store TST Field Blank #2
S6092 - A19 . 1223	Store TST Trip Blank #1
S6092 - A20 . 1224	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>	09-09-96	0925	JA Edwards <i>JA Edwards</i>	09-09-96	0925			
JA Edwards <i>JA Edwards</i>	09-09-96	1425	GS CAPRIO <i>GS CAPRIO</i>	09-09-96	1425			
GS CAPRIO <i>GS CAPRIO</i>	09-16-96	0830	Rick Mahon <i>Rick Mahon</i>	09-16-96	0830			
Rick Mahon <i>Rick Mahon</i>	9-16-96	1430	JA Edwards <i>JA Edwards</i>	9-16-96	1430			
JA Edwards <i>JA Edwards</i>	09-16-96	0930	TI Julia <i>Janet L. Julia</i>	09-16-96	0930			

Final Sample Disposition

Comments:

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

POC (12)

POC (12)

Cooler Temperature Status	
IHi -15°C / Lo -15°C (pick up at PNL to WHC)	
IHi -15°C / Lo -15°C (delivery at WHC from PNL)	
IHi 8°C / Lo -15°C (at return to PNL from WHC)	
IHi 8°C / Lo -15°C (at delivery from WHC to PNL)	

(Revised 06/21/95 PNL)

Appendix B

Listing of All Target Compounds for Organic Compound Analysis

Table B.1 SUMMA™ Analysis Results for All Target Analytes from Tank BY-108 Sampled on 9/10/96

Target Analytes	CAS	MW	Ret Time	S6092-A01.025 VSS			S6092-A02.079 VSS			S6092-A04.147 VSS			S6092-A05.148 VSS			S6092-A05.148 VSS Rep			S6092-A06.150 VSS		
				Ambient Air Upwind			Ambient Air through VSS														
				(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	4.21	0.0106	1.97	J	0.0147	2.72	J	0.0568	10.53	J	0.0454	8.42	J	0.0459	8.49	J	0.0473	8.75	J
Chloromethane	74-87-3	50.49	4.606	0.002	0.89	U	0.0072	3.21	J	0.0318	14.11	J	0.01	4.44	U	0.01	4.44	U	0.01	4.44	U
1,2-dichloro 1,1,2,2-tetrafluoroethane	76-14-2	170.92	4.873	0.0125	1.64	J	0.0196	2.56	J	0.081	10.62	J	0.0682	8.94	J	0.0703	9.22	J	0.0737	9.66	J
Methanol	67-56-1	32.04	5.066	0.0126	8.81	U	0.0126	8.81	U	3.9423	2756.17		3.7797	2642.48		3.9174	2738.79		4.0359	2821.61	
Vinyl Chloride	75-01-4	62.5	5.162	0.006	2.15	U	0.0064	2.29	J	0.03	10.75	U	0.03	10.75	U	0.03	10.75	U	0.03	10.75	U
1,3-Butadiene	106-99-0	54	5.504	<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	58.12	5.643	0.0076	2.93	U	0.0076	2.93	U	6.1626	2375.12		5.6634	2182.74		6.2437	2406.4		6.2103	2393.5	
Bromomethane	74-83-9	94.94	6.157	0.0268	6.32	U	0.0268	6.32	U	0.134	31.62	U	0.134	31.62	U	0.134	31.62	U	0.134	31.62	U
Chloroethane	75-00-3	64.51	6.563	0.002	0.69	U	0.0077	2.66	J	0.0343	11.92	J	0.0299	10.4	J	0.01	3.47	U	0.035	12.17	J
Ethanol	64-17-5	46.01	6.862	0.0138	6.71	J	0.0179	8.7	J	2.5547	1243.77		2.412	1174.3		2.5609	1246.77		2.6525	1291.38	
Acetonitrile	75-05-8	41.05	7.333	0.0084	4.59	J	0.0133	7.26	J	0.0171	9.32	J	0.016	8.73	U	0.0186	10.17	J	0.016	8.73	U
Acetone	67-64-1	58.08	7.879	0.0313	12.09	J	0.006	2.31	U	12.6181	4866.49		11.9807	4620.67		12.3618	4767.63		12.8684	4963.03	
Trichlorofluoromethane	75-69-4	137.37	8.274	0.0107	1.74	J	0.0165	2.69	J	0.3876	63.21		0.3523	57.46		0.3808	62.1		0.4004	65.29	
Pentane	109-66-0	72.15	9.034	0.007	2.17	J	0.0106	3.29	J	7.7906	2418.71		6.9809	2167.32		7.6829	2385.27		7.7523	2406.81	
1,1-Dichloroethene	75-35-4	96.94	9.611	0.0062	1.44	J	0.0091	2.1	J	0.018	4.16	U	0.0374	8.63	J	0.034	7.85	J	0.0449	10.38	J
Methylene Chloride	75-09-2	84.93	9.825	0.0199	5.26	J	0.0232	6.12	J	0.108	28.49	J	0.1029	27.15	J	0.0994	26.21	J	0.1125	29.67	J
1,1,2-trichloro 1,1,2,2-trifluoroethane	76-13-1	187.38	10.381	0.0044	0.53	U	0.0184	2.2	J	0.0693	8.28	J	0.0591	7.06	J	0.0577	6.9	J	0.0791	9.45	J
Propanenitrile	107-12-0	55.08	11.194	0.005	2.03	U	0.005	2.03	U	0.0919	37.39	J	0.0884	35.94	J	0.0907	36.89	J	0.097	39.45	J
Propanol	71-23-8	60.1	11.248	0.0042	1.57	U	0.0042	1.57	U	1.7369	647.36		1.6656	620.78		1.7213	641.54		1.7776	662.52	
1,1-Dichloroethane	75-34-3	98.96	12.103	0.0022	0.5	U	0.011	2.49	J	0.0468	10.6	J	0.041	9.28	J	0.0399	9.03	J	0.0497	11.24	J
2-Butanone	78-93-3	72.11	12.831	0.0145	4.5	J	0.0283	8.79		2.1655	672.68		2.0785	645.66		2.1763	676.03		2.2852	709.87	
cis-1,2-Dichloroethene	156-59-2	96.94	13.719	0.0062	1.42	J	0.0094	2.17	J	0.041	9.48	J	0.038	8.78	J	0.0369	8.54	J	0.0461	10.64	J
Hexane	110-54-3	86.18	14.125	0.0107	2.78	J	0.0163	4.22	J	6.6305	1723.4		6.131	1593.57		6.6141	1719.14		6.7837	1763.23	
Chloroform	67-66-3	119.38	14.285	0.0083	1.56	J	0.013	2.43	J	0.0565	10.6	J	0.0549	10.29	J	0.0543	10.18	J	0.0623	11.7	J
Tetrahydrofuran	109-99-9	72.11	15.051	0.0026	0.81	U	0.0095	2.95	J	3.4681	1077.31		3.3287	1034.03		3.4215	1062.83		3.6254	1126.19	
1,2-Dichloroethane	107-06-2	98.96	15.736	0.0022	0.5	U	0.0022	0.5	U	0.011	2.49	U	0.011	2.49	U	0.011	2.49	U	0.011	2.49	U
1,1,1-Trichloroethane	71-55-6	133.4	16.249	0.0094	1.58	J	0.0146	2.45	J	0.0621	10.43	J	0.0569	9.56	J	0.0573	9.62	J	0.0693	11.63	J
Butanenitrile	109-74-0	69.11	16.281	0.005	1.62	U	0.005	1.62	U	0.025	8.1	U	0.025	8.1	U	0.025	8.1	U	0.025	8.1	U
1-Butanol	71-36-3	74.12	16.848	0.0103	3.12	J	0.0263	7.93	J	70.6433	21349.3	*	70.9988	21456.7	*	64.8483	19597.98	*	65.3413	19746.95	*
Benzene	71-43-2	78.11	17.158	0.0057	1.64	J	0.0083	2.39	J	0.133	38.15		0.1294	37.1		0.1355	38.87		0.1421	40.74	
Carbon Tetrachloride	56-23-5	153.82	17.447	0.0101	1.47	J	0.0157	2.28	J	0.0644	9.37	J	0.0592	8.63	J	0.0605	8.81	J	0.0732	10.66	J
Cyclohexane	110-82-7	84.16	17.714	0.005	1.33	U	0.005	1.33	U	0.8292	220.71		0.5136	136.69		0.8143	216.73		0.8794	234.07	
1,2-Dichloropropane	78-87-5	112.99	18.773	0.0026	0.52	U	0.0026	0.52	U	0.013	2.58	U	0.013	2.58	U	0.013	2.58	U	0.013	2.58	U
Trichloroethene	79-01-6	131.39	19.222	0.0088	1.49	J	0.0136	2.33	J	0.0616	10.5	J	0.0617	10.51	J	0.0619	10.55	J	0.069	11.76	J
Heptane	142-82-5	100.2	19.768	0.0096	2.15	J	0.0108	2.42	J	3.3146	740.98		3.2024	715.9		3.3772	754.97		3.553	794.29	
cis-1,3-Dichloropropene	10061-01-5	110.97	20.955	0.0002	0.04	U	0.0099	1.99	B	0.0009	0.18	U	0.0009	0.18	U	0.0009	0.18	U	0.0009	0.18	U
4-Methyl-2-Pentanone	108-10-1	100.16	20.987	0.0098	2.19	J	0.0168	3.77	J	0.5137	114.89		0.4889	109.33		0.5086	113.74		0.5431	121.47	
Pyridine	110-86-1	79.1	21.116	0.0076	2.15	U	0.0076	2.15	U	0.0748	21.2	J	0.0715	20.25	J	0.0717	20.31	J	0.0872	24.68	J
trans-1,3-Dichloropropene	10061-02-6	110.97	22.035	0.0028	0.57	U	0.0028	0.57	U	0.05	10.09	J	0.0492	9.94	J	0.0503	10.14	J	0.0538	10.87	J
Pentanenitrile	110-59-8	83.13	22.089	0.0098	2.65	J	0.0149	4.02	J	0.1554	41.88	J	0.1483	39.95	J	0.1616	43.55	J	0.1713	46.16	J
1,1,2-Trichloroethane	79-00-5	133.4	22.463	0.01	1.68	J	0.0145	2.44	J	0.0725	12.17	J	0.0728	12.23	J	0.0694	11.65	J	0.0786	13.2	J
Toluene	108-88-3	92.14	23.094	0.0095	2.31	J	0.0097	2.35	J	0.2286	55.57		0.2224	54.08		0.2354	57.22		0.2485	60.41	
1,2-Dibromoethane	106-93-4	187.86	24.613	0.0121	1.45	J	0.0184	2.19	J	0.0845	10.07	J	0.087	10.37	J	0.0871	10.39	J	0.0955	11.39	J
Octane	111-65-9	114.23	25.223	0.0058	1.14	J	0.0092	1.81	J	0.9745	191.09		0.9437	185.05		1.0045	196.98		1.0642	208.68	
Tetrachloroethylene	127-18-4	165.83	25.661	0.01	1.35	J	0.0155	2.1	J	0.0755	10.2	J	0.076	10.27	J	0.0774	10.45	J	0.0863	11.65	J
Chlorobenzene	108-90-7	112.56	27.255	0.0073	1.46	J	0.0115	2.29	J	0.0755	15.03	J	0.0744	14.81	J	0.0756	15.05	J	0.0825	16.42	J
Hexanenitrile	628-73-9	97.13	27.565	0.0081	1.87	J	0.0142	3.27	J	0.1092	25.19	J	0.1041	24.01	J	0.1095	25.25	J	0.1122	25.88	J

Table B.1 (Cont'd) SUMMA™ Analysis Results for All Target Analytes from Tank BY-108 Sampled on 9/10/96

Target Analytes	CAS	MW	Ret Time	S6092-A01.025 VSS			S6092-A02.079 VSS			S6092-A04.147 VSS			S6092-A05.148 VSS			S6092-A05.148 VSS Rep			S6092-A06.150 VSS		
				Ambient Air Upwind			Ambient Air through VSS														
				(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag	(mg/m³)	(ppbv)	Flag
Ethylbenzene	100-41-4	106.17	28.143	0.0073	1.54	J	0.0107	2.26	J	0.0749	15.79	J	0.0744	15.7	J	0.0759	16.02	J	0.0815	17.19	J
p/m-Xylene	106-42-3	106.17	28.592	0.015	3.17	J	0.0222	4.69	J	0.1889	39.85	J	0.1854	39.12	J	0.1901	40.11	J	0.2044	43.12	J
Cyclohexanone	108-94-1	98.14	28.988	0.0064	1.46	U	0.0064	1.46	U	0.032	7.3	U	0.032	7.3	U	0.032	7.3	U	0.032	7.3	U
Styrene	100-42-5	104.15	29.491	0.0104	2.24	U	0.0104	2.24	U	0.052	11.18	U	0.052	11.18	U	0.052	11.18	U	0.052	11.18	U
1,1,2,2-Tetrachloroethane	79-34-5	167.85	29.726	0.0152	2.03	U	0.0188	2.51	J	0.0885	11.81	J	0.0897	11.97	J	0.0906	12.08	J	0.0959	12.79	J
o-Xylene	95-47-6	106.17	29.79	0.0116	2.45	U	0.0116	2.45	U	0.0911	19.22	J	0.0899	18.96	J	0.0922	19.45	J	0.0991	20.92	J
Nonane	111-84-2	128.26	30.271	0.0102	1.78	U	0.0102	1.78	U	0.6727	117.48		0.6472	113.03		0.669	116.84		0.7252	126.65	
1-Ethyl-2-Methyl-Benzene	611-14-3	120.19	33.181	0.0216	4.03	U	0.0216	4.03	U	0.108	20.13	U	0.108	20.13	U	0.108	20.13	U	0.108	20.13	U
1,3,5-Trimethylbenzene	108-67-8	120.19	33.405	0.0172	3.21	U	0.0172	3.21	U	0.086	16.03	U	0.086	16.03	U	0.086	16.03	U	0.086	16.03	U
1,2,4-Trimethylbenzene	95-63-6	120.19	34.657	0.0196	3.65	U	0.0196	3.65	U	0.098	18.26	U	0.098	18.26	U	0.098	18.26	U	0.098	18.26	U
Decane	124-18-5	142.28	34.945	0.0144	2.27	U	0.0155	2.43	J	1.0208	160.71		0.992	156.18		1.0264	161.59		1.1119	175.05	
1,3-Dichlorobenzene	541-73-1	147	35.138	0.0132	2.01	U	0.0132	2.01	U	0.066	10.06	U	0.066	10.06	U	0.066	10.06	U	0.0683	10.41	J
1,4-Dichlorobenzene	106-46-7	147	35.352	<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20	
1,2-Dichlorobenzene	95-50-1	147	36.464	<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20		<0.132	<20	
Undecane	1120-21-4	156.31	39.256	<0.111	<16		<0.111	<16		2.3874	342.13		2.3164	331.95		2.3576	337.85		2.5533	365.91	
1,2,4-Trichlorobenzene	120-82-1	181.45	42.657	<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60		<0.486	<60	
Dodecane	112-40-3	170.34	43.256	<0.348	<46		<0.348	<46		7.3593	967.76		7.0569	928		7.1391	938.8		7.6315	1003.56	
Hexachloro-1,3-butadiene	87-68-3	260.76	44.497	0.0233	2	U	0.0233	2	U	0.1163	9.99	U	0.1163	9.99	U	0.1163	9.99	U	0.119	10.22	J
Tridecane	629-50-5	184.36	46.989	<0.312	<38		<0.312	<38		8.7271	1060.36		7.6543	930		7.499	911.13		7.3666	895.05	
Tetradecane	629-59-4	198.34	50.786	<0.228	<26		<0.228	<26		3.4702	391.92		2.6253	296.5		2.7423	309.71		3.261	368.29	

Data Quality Flags

B Compound found in associated laboratory blank.

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

U Target compound not detected at or above the IDL.

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

* Diluted value was reported for target compound in table.

Table B.2 Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BY-108 Sampled on 9/10/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes	CAS	MW	Ret	S6092-A11.1217 VSS			S6092-A12.1218 VSS			S6092-A12.1218 VSS REP			S6092-A13.1219 VSS		
			Time	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.902	0.0167	3.09	J	0.0043	0.79	U	0.0043	0.79	U	0.0043	0.79	U
Chloromethane	74-87-3	50.49	8.869	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U	0.0032	1.4	U
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	170.92	9.581	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U	0.0032	0.41	U
Methanol	67-56-1	32.04	10.091	11.9898	8382.38	E,Y	9.4647	6616.99	E,Y	9.3072	6506.9	E,Y	9.4311	6593.5	E,Y
Vinyl Chloride	75-01-4	62.5	9.996	0.003	1.08	U	0.003	1.08	U	0.003	1.08	U	0.003	1.08	U
1,3-Butadiene	106-99-0	54	10.612	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y	<0.208	<86	Y
Butane	106-97-8	58.14	10.835	9.1014	3506.56	E	7.6682	2954.37	E	8.0065	3084.73	E	7.8443	3022.24	E
Chloroethane	75-00-3	64.51	12.132	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U	0.0041	1.42	U
Ethanol	64-17-5	46.07	12.621	3.1972	1554.55	Y	2.5548	1242.17	Y	2.3309	1133.3	Y	2.4541	1193.21	Y
Acetonitrile	75-05-8	41.05	13.089	0.6714	366.37		0.5546	302.65		0.6075	331.48		0.5389	294.04	
Acetone	67-64-1	58.08	13.737	8.5468	3296.27	E	7.6027	2932.18	E	7.463	2878.27	E	7.8253	3018.02	E
Trichlorofluoromethane	75-69-4	137.37	14.194	0.1148	18.72		0.0971	15.83		0.0926	15.1		0.0996	16.24	
Pentane	109-66-0	72	14.981	6.4605	2009.92	E	5.5978	1741.53	E	6.1047	1899.25	E	5.7355	1784.37	E
1,1-Dichloroethene	75-35-4	96.94	15.586	0.0021	0.47	U	0.0021	0.47	U	0.0021	0.47	U	0.0021	0.47	U
Methylene Chloride	75-09-2	84.93	15.831	1.1019	290.61		0.0841	22.19	J,B	0.0877	23.12	J,B	0.2513	66.28	B
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187.38	16.362	0.003	0.36	U	0.003	0.36	U	0.003	0.36	U	0.003	0.36	U
Propanenitrile	107-12-0	55.08	17.085	0.0585	23.77		0.052	21.16		0.0523	21.27		0.0548	22.3	
Propanol	71-23-8	60.1	17.128	1.2441	463.69		0.9945	370.66		1.0315	384.46		1.0102	376.53	
1,1-Dichloroethane	75-34-3	98.96	18.031	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U	0.0014	0.32	U
2-Butanone	78-93-3	72.11	18.669	1.354	420.61		1.23	382.09		1.2949	402.24		1.2382	384.62	
cis-1,2-Dichloroethene	156-59-2	96.94	19.562	0.0025	0.58	U	0.0025	0.58	U	0.0025	0.58	U	0.0025	0.58	U
Hexane	110-54-3	86.18	19.923	4.9305	1281.55	E	4.2906	1115.23	E	4.6299	1203.41	E	4.3349	1126.73	E
Chloroform	67-66-3	119.38	20.093	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U	0.0029	0.53	U
Tetrahydrofuran	109-99-9	72.11	20.816	2.2157	688.28		2.0198	627.42		2.0744	644.38		2.131	661.97	
1,2-Dichloroethane	107-06-2	98.96	21.475	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U	0.0011	0.25	U
Butanenitrile	109-74-0	69.11	21.921	0.0536	17.36		0.0343	11.12		0.0428	13.86		0.0379	12.27	
1,1,1-Trichloroethane	71-55-6	133.4	21.974	0.0027	0.44	U	0.0027	0.44	U	0.0027	0.44	U	0.0027	0.44	U
1-Butanol	71-36-3	74	22.357	33.3384	10091.64	E	31.4269	9513.02	E	32.9381	9970.45	E	31.4052	9506.45	E
Benzene	71-43-2	78.11	22.846	0.1078	30.92		0.1029	29.52		0.1027	29.46		0.1067	30.6	
Carbon Tetrachloride	56-23-5	153.82	23.133	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U	0.0014	0.2	U
Cyclohexane	110-82-7	84.16	23.388	0.8998	239.48		0.8008	213.13		0.8983	239.09		0.7699	204.92	
1,2-Dichloropropane	78-87-5	112.99	24.366	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U	0.0019	0.38	U
Trichloroethene	79-01-6	131.39	24.791	0.0246	4.2	J	0.0036	0.61	U	0.0036	0.61	U	0.0059	1.01	J
Heptane	142-82-5	100.2	25.237	2.879	643.6	E	2.6301	587.98		2.6955	602.6		2.6053	582.42	
4-Methyl-2-Pentanone	108-10-1	100.16	26.396	0.1539	34.43		0.13	29.07		0.1343	30.04		0.1378	30.81	
cis-1,3-Dichloropropene	10061-01-5	110.97	26.417	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U	0.0013	0.25	U
Pyridine	110-86-1	79.1	26.598	0.0642	18.18	J	0.0551	15.61	J	0.0535	15.16	J	0.0507	14.37	J
trans-1,3-Dichloropropene	10061-02-6	110.97	27.448	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U	0.0027	0.53	U

Table B.2 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Tank BY-108 Sampled on 9/10/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes	CAS	MW	Ret Time	S6092-A11.1217 VSS (mg/m ³)	(ppbv)	Flag	S6092-A12.1218 VSS (mg/m ³)	(ppbv)	Flag	S6092-A12.1218 VSS REP (mg/m ³)	(ppbv)	Flag	S6092-A13.1219 VSS (mg/m ³)	(ppbv)	Flag
Pentanenitrile	110-59-8	83.15	27.448	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	27.895	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U	0.0015	0.26	U
Toluene	108-88-3	92.14	28.532	0.2005	48.74		0.1774	43.12		0.1761	42.8		0.189	45.96	
1,2-Dibromoethane	106-93-4	187.86	30.063	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U
Octane	111-65-9	114	30.499	0.8905	174.97		0.8394	164.93		0.8357	164.21		0.8415	165.35	
Tetrachloroethylene	127-18-4	165.83	31.062	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U
Chlorobenzene	108-90-7	112.56	32.646	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U
Hexanenitrile	628-73-9	97	32.826	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U
Ethylbenzene	100-41-4	106.17	33.485	0.0241	5.08		0.0208	4.39		0.0212	4.47		0.0226	4.77	
p/m-Xylene	106-42-3	106.17	33.921	0.0725	15.3		0.0651	13.72		0.0666	14.05		0.0712	15.02	
Cyclohexanone	108-94-1	98.14	34.357	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U
Styrene	100-42-5	104.15	34.825	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U
1,1,2,2-Tetrachloroethane	79-34-5	167.85	35.058	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U
o-Xylene	95-47-6	106.17	35.122	0.0339	7.14		0.03	6.32		0.031	6.54		0.0317	6.7	
Nonane	111-84-2	128	35.484	0.3687	64.53		0.309	54.08		0.3048	53.33		0.3148	55.09	
1-Ethyl-2-methyl benzene	611-14-3	120.19	38.693	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,3,5-Trimethylbenzene	108-67-8	120.19	38.693	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,2,4-Trimethylbenzene	95-63-6	120.19	39.969	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U
Decane	124-18-5	142.28	40.139	0.5037	79.31		0.4023	63.34		0.4093	64.44		0.4239	66.74	
1,3-Dichlorobenzene	541-73-1	147	40.511	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U
1,4-Dichlorobenzene	106-46-7	147	40.713	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U
1,2-Dichlorobenzene	95-50-1	147	41.85	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U
Undecane	1120-21-4	156	44.465	1.068	153.35		0.8733	125.4		0.8719	125.2		0.8852	127.11	
1,2,4-Trichlorobenzene	120-82-1	181.45	48.089	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U
Dodecane	112-40-3	170	48.483	3.8064	501.55	E	2.9584	389.81		3.0985	408.28		3.0667	404.08	
Hexachloro-1,3-butadiene	87-68-3	260.76	49.907	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U
Tridecane	629-50-5	184	52.235	5.1831	630.98	E	4.1192	501.47	E	4.2573	518.28	E	4.1652	507.06	E
Tetradecane	629-59-4	198	55.742	4.7217	534.18	E	3.7093	419.64	E	3.7884	428.58	E	3.7925	429.05	E
Tributyl Phosphate	126-73-8	266	63.1	<0.0099	<0.83	Z	<0.0099	<0.83	Z	<0.0099	<0.83	Z	<0.0099	<0.83	Z

Data Quality Flags

B Compound found in associated laboratory blank.

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

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

U Target compound not detected at or above the IDL.

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

Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv;
however, this compound is not currently part of the analytical method. See Section 3.4.2.1 for more information.

Table B.3 Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BY-108 on 9/10/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes	CAS	MW	Ret Time	S6092-A17.1221 VSS FB #1 (mg/m ³) (ppbv)	Flag	S6092-A18.1222 VSS FB # (mg/m ³) (ppbv)	Flag	S6092-A19.1223 VSS TB #1 (mg/m ³) (ppbv)	Flag	S6092-A20.1224 VSS TB #2 (mg/m ³) (ppbv)	Flag
Dichlorodifluoromethane	75-71-8	120.91	7.902	0.0043	0.79 U	0.0043	0.79 U	0.0043	0.79 U	0.0043	0.79 U
Chloromethane	74-87-3	50.49	8.869	0.0032	1.4 U	0.0032	1.4 U	0.0032	1.4 U	0.0032	1.4 U
1,2-dichloro-1,1,2,2-tetrafluoroethane	76-14-2	170.92	9.581	0.0032	0.41 U	0.0032	0.41 U	0.0032	0.41 U	0.0032	0.41 U
Methanol	67-56-1	32.04	10.091	<0.274	<192 Y	<0.274	<192 Y	<0.274	<192 Y	<0.274	<192 Y
Vinyl Chloride	75-01-4	62.5	9.996	0.003	1.08 U	0.003	1.08 U	0.003	1.08 U	0.003	1.08 U
1,3-Butadiene	106-99-0	54	10.612	<0.208	<86 Y	<0.208	<86 Y	<0.208	<86 Y	<0.208	<86 Y
Butane	106-97-8	58.14	10.835	0.0036	1.39 U	0.0036	1.39 U	0.0036	1.39 U	0.0036	1.39 U
Chloroethane	75-00-3	64.51	12.132	0.0041	1.42 U	0.0041	1.42 U	0.0041	1.42 U	0.0041	1.42 U
Ethanol	64-17-5	46.07	12.621	<0.275	<133 Y	<0.275	<133 Y	<0.275	<133 Y	<0.275	<133 Y
Acetonitrile	75-05-8	41.05	13.089	0.0033	1.8 U	0.0033	1.8 U	0.0033	1.8 U	0.0033	1.8 U
Acetone	67-64-1	58.08	13.737	0.0072	2.78 U	0.0072	2.78 U	0.0072	2.78 U	0.0072	2.78 U
Trichlorofluoromethane	75-69-4	137.37	14.194	0.0044	0.72 U	0.0044	0.72 U	0.0044	0.72 U	0.0044	0.72 U
Pentane	109-66-0	72	14.981	0.0029	0.89 U	0.0029	0.89 U	0.0029	0.89 U	0.0029	0.89 U
1,1-Dichloroethene	75-35-4	96.94	15.586	0.0021	0.47 U	0.0021	0.47 U	0.0021	0.47 U	0.0021	0.47 U
Methylene Chloride	75-09-2	84.93	15.831	0.038	10.02 J,B	0.0423	11.15 J,B	0.04	10.56 J,B	0.0343	9.05 J,B
1,1,2-trichloro-2,2,2-trifluoroethane	76-13-1	187.38	16.362	0.003	0.36 U	0.003	0.36 U	0.003	0.36 U	0.003	0.36 U
Propanenitrile	107-12-0	55.08	17.085	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	17.128	0.0053	1.99 U	0.0053	1.99 U	0.0053	1.99 U	0.0053	1.99 U
1,1-Dichloroethane	75-34-3	98.96	18.031	0.0014	0.32 U	0.0014	0.32 U	0.0014	0.32 U	0.0014	0.32 U
2-Butanone	78-93-3	72.11	18.669	0.0022	0.68 U	0.0022	0.68 U	0.0022	0.68 U	0.0022	0.68 U
cis-1,2-Dichloroethene	156-59-2	96.94	19.562	0.0025	0.58 U	0.0025	0.58 U	0.0025	0.58 U	0.0025	0.58 U
Hexane	110-54-3	86.18	19.923	0.0013	0.32 U	0.0013	0.32 U	0.0013	0.32 U	0.0013	0.32 U
Chloroform	67-66-3	119.38	20.093	0.0029	0.53 U	0.0029	0.53 U	0.0029	0.53 U	0.0029	0.53 U
Tetrahydrofuran	109-99-9	72.11	20.816	0.0035	1.07 U	0.0035	1.07 U	0.0035	1.07 U	0.0035	1.07 U
1,2-Dichloroethane	107-06-2	98.96	21.475	0.0011	0.25 U	0.0011	0.25 U	0.0011	0.25 U	0.0011	0.25 U
Butanenitrile	109-74-0	69.11	21.921	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	21.974	0.0027	0.44 U	0.0027	0.44 U	0.0027	0.44 U	0.0027	0.44 U
1-Butanol	71-36-3	74	22.357	0.0075	2.29 U	0.0075	2.29 U	0.0075	2.29 U	0.0075	2.29 U
Benzene	71-43-2	78.11	22.846	0.0014	0.4 U	0.0014	0.4 U	0.0014	0.4 U	0.0014	0.4 U
Carbon Tetrachloride	56-23-5	153.82	23.133	0.0014	0.2 U	0.0014	0.2 U	0.0014	0.2 U	0.0014	0.2 U
Cyclohexane	110-82-7	84.16	23.388	0.0041	1.09 U	0.0041	1.09 U	0.0041	1.09 U	0.0041	1.09 U
1,2-Dichloropropane	78-87-5	112.99	24.366	0.0019	0.38 U	0.0019	0.38 U	0.0019	0.38 U	0.0019	0.38 U
Trichloroethene	79-01-6	131.39	24.791	0.0036	0.61 U	0.0036	0.61 U	0.0036	0.61 U	0.0036	0.61 U
Heptane	142-82-5	100.2	25.237	0.0015	0.35 U	0.0015	0.35 U	0.0015	0.35 U	0.0015	0.35 U
4-Methyl-2-Pentanone	108-10-1	100.16	26.396	0.0021	0.46 U	0.0021	0.46 U	0.0021	0.46 U	0.0021	0.46 U
cis-1,3-Dichloropropene	10061-01-5	110.97	26.417	0.0013	0.25 U	0.0013	0.25 U	0.0013	0.25 U	0.0013	0.25 U
Pyridine	110-86-1	79.1	26.598	0.0214	6.06 U	0.0214	6.06 U	0.0214	6.06 U	0.0214	6.06 U
trans-1,3-Dichloropropene	10061-02-6	110.97	27.448	0.0027	0.53 U	0.0027	0.53 U	0.0027	0.53 U	0.0027	0.53 U
Pentanenitrile	110-59-8	83.15	27.448	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	27.895	0.0015	0.26 U	0.0015	0.26 U	0.0015	0.26 U	0.0015	0.26 U
Toluene	108-88-3	92.14	28.532	0.0009	0.23 U	0.0009	0.23 U	0.0017	0.42 J	0.0009	0.23 U

Table B.3 (Cont'd) Triple Sorbent Trap Analysis Results for All Target Analytes from Blank Samples Associated with the Sampling of Tank BY-108 on 9/10/96

NOTE: All data in this table is reported at 21°C and 760 mm Hg pressure. To correct to 0°C and 760 mm Hg pressure multiply by 1.077.

Target Analytes	CAS	MW	Ret	S6092-A17.1221 VSS FB #1			S6092-A18.1222 VSS FB #			S6092-A19.1223 VSS TB #1			S6092-A20.1224 VSS TB #2		
			Time	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag	(mg/m ³)	(ppbv)	Flag
1,2-Dibromoethane	106-93-4	187.86	30.063	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U	0.0024	0.28	U
Octane	111-65-9	114	30.499	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U	0.0027	0.52	U
Tetrachloroethylene	127-18-4	165.83	31.062	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U	0.0025	0.34	U
Chlorobenzene	108-90-7	112.56	32.646	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U	0.0011	0.22	U
Hexanenitrile	628-73-9	97	32.826	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U	0.0029	0.66	U
Ethylbenzene	100-41-4	106.17	33.485	0.0014	0.3	U	0.0014	0.3	U	0.0014	0.3	U	0.0014	0.3	U
p/m-Xylene	106-42-3	106.17	33.921	0.003	0.63	U	0.003	0.63	U	0.003	0.63	U	0.003	0.63	U
Cyclohexanone	108-94-1	98.14	34.357	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U	0.0125	2.85	U
Styrene	100-42-5	104.15	34.825	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U	0.0015	0.33	U
1,1,2,2-Tetrachloroethane	79-34-5	167.85	35.058	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U	0.0058	0.77	U
o-Xylene	95-47-6	106.17	35.122	0.0019	0.4	U	0.0019	0.4	U	0.0019	0.4	U	0.0019	0.4	U
Nonane	111-84-2	128	35.484	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U	0.0013	0.22	U
1-Ethyl-2-methyl benzene	611-14-3	120.19	38.693	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,3,5-Trimethylbenzene	108-67-8	120.19	38.693	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U	0.0024	0.44	U
1,2,4-Trimethylbenzene	95-63-6	120.19	39.969	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U	0.0025	0.47	U
Decane	124-18-5	142.28	40.139	0.003	0.47	U	0.003	0.47	U	0.003	0.47	U	0.003	0.47	U
1,3-Dichlorobenzene	541-73-1	147	40.511	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U	0.0032	0.48	U
1,4-Dichlorobenzene	106-46-7	147	40.713	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U	0.0029	0.43	U
1,2-Dichlorobenzene	95-50-1	147	41.85	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U	0.0047	0.72	U
Undecane	1120-21-4	156	44.465	0.0044	0.63	U	0.0044	0.63	U	0.0044	0.63	U	0.0044	0.63	U
1,2,4-Trichlorobenzene	120-82-1	181.45	48.089	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U	0.0155	1.91	U
Dodecane	112-40-3	170	48.483	0.0255	3.36	U	0.0255	3.36	U	0.0255	3.36	U	0.0255	3.36	U
Hexachloro-1,3-butadiene	87-68-3	260.76	49.907	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U	0.0205	1.76	U
Tridecane	629-50-5	184	52.235	0.052	6.33	U	0.052	6.33	U	0.052	6.33	U	0.052	6.33	U
Tetradecane	629-59-4	198	55.742	0.038	4.3	U	0.038	4.3	U	0.038	4.3	U	0.038	4.3	U
Tributyl Phosphate	126-73-8	266	63.1	<0.0099	<0.83	Z	<0.0099	<0.83	Z	<0.0099	<0.83	Z	<0.0099	<0.83	Z

Data Quality Flags

B Compound found in associated laboratory blank.

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

U Target compound not detected at or above the IDL.

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

Z Retention time and mass spectral characteristics were determined and detectability possible at 0.8 ppbv; however, this compound is not currently part of the analytical method. See Section 3.4.2.1 for more information.

Distribution List

PNNL-11503

PNNL

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