PNL-10388
UC-606

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June 1995

Prepared for Westinghouse Hanford Company
under a Related Services Agreement
with the U.S. Department of Energy
Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

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Summary

This report describes organic analyses results from ambient samples collected both upwind and through the vapor sampling system (VSS) near Hanford waste storage Tank 241-C-103 (referred to as Tank C-103). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Summary Table 1.

Quantitative results were obtained for organic compounds. Five organic tentatively identified compounds (TICs) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, we looked for the 40 standard TO-14 analytes. We observed 39. Of these, only one was observed above the 2-ppbv calibrated instrument detection limit. Dichloromethane was above the detection limits using both methods, but the result from the TO-14 method is traceable to a standard gas mixture and is considered more accurate. Organic analytes were found only in the sample collected through the VSS, suggesting that these compounds were residual contamination from a previous sampling job. Detailed descriptions of the results appear in the text.

Acknowledgments

The authors gratefully acknowledge the support of other project staff at Pacific Northwest Laboratory who contributed to the successful completion of this sampling and analysis activity. Jeff Edwards served as the PNL single-point-of-contact and coordinated sample handling and communications with Westinghouse Hanford Company. K. B. Olsen contributed in preparing this report. Georgia K. Ruebsamen provided word processing support.

Abbreviations

CAS	Chemical Abstracts Service
COC	chain of custody
EPA	U.S. Environmental Protection Agency
GC/MS	gas chromatography/mass spectrometry
HP	Hewlett Packard
IS	internal standard
PNL	Pacific Northwest Laboratory
ppbv	part per billion by volume
STP	standard temperature and pressure
TIC	tentatively identified compound
VSS	vapor sampling system
WHC	Westinghouse Hanford Company

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Tables

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1.0 Introduction

This report describes results of the analyses of ambient samples taken near the Hanford waste Tank 241-C-103 (referred to as Tank C-103). Pacific Northwest Laboratory (PNL)[a] contracted with Westinghouse Hanford Company (WHC) to provide sampling devices and to analyze inorganic and organic analytes collected from the tank headspace and ambient air. The sample job was designated S4025, and samples were collected by WHC on May 12, 1994.

Sampling devices, including 25 sorbent trains (16 samples and 9 trip blanks for inorganic analyses) and six SUMMA™ canisters (for organic analyses) were supplied to the WHC sampling staff on May 10. Samples were taken (by WHC) from the tank headspace on May 12 and were returned to PNL from the field on May 13. Inorganic (sorbent trap) samples were delivered to PNL on chain of custody (COC) 006871 and 006872 (see Figures 1.1a and 1.1b). The SUMMA™ canisters were delivered on COC No. 006873 (see Figure 1.1c). SUMMA™ canister sample No. S4025-B05-110 was taken as a surrogate sample. Westinghouse Hanford Company and PNL agreed that analysis of the surrogate sample was not required. SUMMA™ canisters S4025-B02-107, S4025-B03-108, and S4025-B04-109 were collected from the tank headspace through the vapor sampling system (VSS). PNL was not tasked to analyze these three samples. Ambient air was collected in SUMMA™ canister S4025-A01-111 upwind, approximately 30 ft from Tank C-103, and ambient air was collected in S4025-A02-112 through the VSS near Tank C-103. This report summarizes the results from the analyses of canisters S4025-A01-111 and S4025-A02-112.

The samples were inspected upon delivery to the 326/23B laboratory and logged into PNL record book 55408 before implementation of PNL Technical Procedure PNL-TVP-07[b]. Custody of the sorbent traps was transferred to PNL personnel performing the inorganic analysis and stored at refrigerated (≤ 10°C) temperature until the time of analysis. The canisters were stored in the 326/23B laboratory at ambient (25°C) temperature until the time of analysis. Access to the 326/23B laboratory is limited to PNL personnel working on the waste-tank safety program. Analyses described in this report were performed at PNL in the 300 area of the Hanford Reservation. Analytical methods that were used are described in the text. Organic analyses were performed using cryogenic preconcentration followed by gas chromatography/mass spectrometry (GC/MS).

(a) Pacific Northwest Laboratory is operated for the U. S. Department of Energy by Battelle Memorial Institute under Contract DE-AC06-76RLO 1830.

(b) PNL-TVP-07, Rev. 0, October 1994, *Sample Shipping and Receiving Procedure for PNL Waste Tank Samples*, PNL-Technical Procedure, Tank Vapor Project, Richland, Washington.

Westinghouse Hanford Company	CHAIN OF CUSTODY	WHC 006871

Custody Form Initiator	J. A. Edwards	Telephone Pager	(509) 373-0141 85-3009
Company Contact	J. L. Huckaby	Telephone Pager	(509) 373-3443 85-3152
Project Designation/Sampling Locations	200 East Tank Farm C 103 Tank Vapor Sample SAF S4025 (VSS Truck)	Collection Date Preparation Date Field Logbook No.	05- 12 -94 05- 06 -94 WHC-N-___-
Ice Chest No.			
Bill of Lading/Airbill No.	N/A	Offsite Property No.	N/A
Method of Shipment	Government Truck	Sample Job	7-B
Shipped to	PNL		

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification

S4025 - A04 . 02X	SAP Ref ____	NH_3 / H_2O (Sample # 1)
S4025 - A05 . 03X	SAP Ref ____	NH_3 / H_2O (Sample # 2)
S4025 - A06 . 04X	SAP Ref ____	NH_3 / H_2O (Sample # 3)
S4025 - A07 . 05X	SAP Ref ____	NH_3 / H_2O (Sample # 4)
S4025 - A08 . 06X	SAP Ref ____	NH_3 / H_2O (Sample # 5)
S4025 - A09 . 07X	SAP Ref ____	NH_3 / H_2O (Sample # 6)
S4025 - A10 . 08X	SAP Ref ____	NH_3 / H_2O (Sample # 7)
S4025 - A11 . 09X	SAP Ref ____	NH_3 / H_2O (Sample # 8)
S4025 - A12 . 10X	SAP Ref ____	NH_3 / H_2O (Sample # 9)
S4025 - A13 . 11X	SAP Ref ____	NH_3 / H_2O (Sample #10)
S4025 - A14 . 12X	SAP Ref ____	NH_3 / H_2O (Trip Blank # 1)
S4025 - A15 . 13X	SAP Ref ____	NH_3 / H_2O (Trip Blank # 2)
S4025 - A16 . 14X	SAP Ref ____	NH_3 / H_2O (Trip Blank # 3)

[X] Field Transfer of Custody [ ] Chain of Possession (Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
J. A. Edwards-JA Edwards	05-12-94	0930	T.E. Darling T.E. Darling	5-12-94	0930
T.E. Darling	5-12-94	0650	C.H. Toms	5-12-94	0650
C.H. Toms	5-12-94	1705	T.E. Darling	5-12-94	1705
T.E. Darling	5-13-94	0955	JA Edwards-JA Edwards	5/13/94	0955

(Revised 02/28/94)

Final Sample Disposition

Disposal Method:

Disposed by:

Date/Time:

A-6000-407 (12/92) WEF061

Figure 1.1a Chain-of-Custody for Inorganic Samples from Tank C-103

Westinghouse Hanford Company	CHAIN OF CUSTODY	WHC 006872

Custody Form Initiator	J. A. Edwards	Telephone Pager	(509) 373-0141 85-3009
Company Contact	J. L. Huckaby	Telephone Pager	(509) 373-3443 85-3152
Project Designation/Sampling Locations	200 East Tank Farm C 103 Tank Vapor Sample SAF S4025 (VSS Truck)	Collection Date Preparation Date Field Logbook No.	05- 12 -94 05- 06 -94 WHC-N-___
Ice Chest No.			
Bill of Lading/Airbill No.	N/A	Offsite Property No.	N/A
Method of Shipment	Government Truck	Sample Job	Z-B
Shipped to	PNL		

Possible Sample Hazards/Remarks Unknown at time of sampling

Sample Identification		
S4025 - B06 - 15X	SAP Ref ___	NO_x / H_2O (Sample #1)
S4025 - B07 - 16X	SAP Ref ___	NO_x / H_2O (Sample #2)
S4025 - B08 - 17X	SAP Ref ___	NO_x / H_2O (Sample #3)
S4025 - B09 - 18X	SAP Ref ___	NO_x / H_2O (Trip Blank #1)
S4025 - B10 - 19X	SAP Ref ___	NO_x / H_2O (Trip Blank #2)
S4025 - B11 - 20X	SAP Ref ___	NO_x / H_2O (Trip Blank #3)
S4025 - B12 - 21X	SAP Ref ___	SO_x / H_2O (Sample #1)
S4025 - B13 - 22X	SAP Ref ___	SO_x / H_2O (Sample #2)
S4025 - B14 - 23X	SAP Ref ___	SO_x / H_2O (Sample #3)
S4025 - B15 - 24X	SAP Ref ___	SO_x / H_2O (Trip Blank #1)
S4025 - B16 - 25X	SAP Ref ___	SO_x / H_2O (Trip Blank #2)
S4025 - B17 - 26X	SAP Ref ___	SO_x / H_2O (Trip Blank #3)

[X] Field Transfer of Custody [ ] Chain of Possession (Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
J. A. Edwards JAEdwards	05-12-94	0930	J.E. Darling J.E. Darling	5-12-94	0930
J.E. Darling	05-12-94	0650	C.M. Jones CM Jones	5-12-94	0650
C.M. Jones	05-12-94	1705	J.E. Darling	5-12-94	1705
J.E. Darling	5-13-94	0955	JA Edwards JAEdwards	5/13/94	0955

(Revised 02/28/94)

Final Sample Disposition

Disposal Method:

Disposed by:

Date/Time:

A-6000-407 (12/92) WEF061

Figure 1.1b Chain-of-Custody for Organic Samples from Tank C-103

Westinghouse Hanford Company	CHAIN OF CUSTODY	WHC 006873

Custody Form Initiator: J. A. Edwards — Telephone (509)373 -0141, Pager 85-3009

Company Contact: J. L. Huckaby — Telephone (509) 373-3443, Pager 85-3152

Project Designation/Sampling Locations: 200 East Tank Farm
C 103 Tank Vapor Sample SAF S4025
Ice Chest No. (VSS Truck)

Collection Date 05- 12 -94
Preparation Date 05- 10 -94
Field Logbook No. WHC-N-___-

Bill of Lading/Airbill No.: N/A

Offsite Property No.: N/A

Method of Shipment: Government Truck

Sample Job 7-B

Shipped to: PNL

Possible Sample Hazards/Remarks: Unknown at time of sampling

Sample Identification		
S4025 - A01 - 111	SAP Ref ___	Ambient SUMMA air, NOT VSS
S4025 - A02 - 112	SAP Ref ___	Ambient SUMMA air, Thru VSS
S4025 - B02 - 107	SAP Ref ___	SUMMA #1
S4025 - B03 - 108	SAP Ref ___	SUMMA #2
S4025 - B04 - 109	SAP Ref ___	SUMMA #3
S4025 - B05 - 110	SAP Ref ___	SUMMA Surrogate Blank

[X] Field Transfer of Custody [ ] Chain of Possession (Sign and Print Names)

Relinquished By	Date	Time	Received By	Date	Time
J. A. Edwards J A Edwards	05-14-94	0915	J.E. Darling J.E. Darling	5-13-94	0915
J.E. Darling	05-13-94	0650	[illegible]	5-13-94	0650
[illegible]	05-13-94	1705	J.E. Darling	5-13-94	1705
J.E. Darling	5-13-94	0950	J A Edwards JA EDWARD	5/13/94	0950

(Revised 02/28/94)

Final Sample Disposition

Disposal Method:

Disposed by:

Date/Time:

A-6000-407 (12/92) WEF061

Figure 1.1c Chain-of-Custody for Inorganic Samples from Tank C-103

2.0 Inorganic Task

The inorganic samples were analyzed and subsequently summarized in a Technical Report, PNL-10172 (Ligotke et al. 1994).

3.0 Organic Task

3.1 SUMMA™ Canister Preparation

Before sending SUMMA™ canisters out to the field for sampling, the canisters are cleaned and verified contaminant free according to PNL Technical Procedure PNL-TVP-02[a]. The cleaning procedure uses an EnTech 3000 cleaning system that controls 1) filling the canisters with purified humid air and 2) evacuating, for several cycles with applied heat, before allowing the canister to evacuate overnight. The canister is filled a final time with purified humid air for analysis by PNL Technical Procedure PNL-TVP-01[b], which is a modification of U.S. Environmental Protection Agency (EPA) compendium Method TO-14. If the canister is verified as clean, free of TO-14 contaminants to a level of 5 parts per billion by volume (ppbv), the canister is evacuated to 30 in. Hg, tagged, and stored for use in the field. Before sending the canisters out to the field for sampling, the canisters are prehumidified with 100 µL of distilled water and labeled with a field-sampling identification. 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.

3.2 Sample Analysis Method

The SUMMA™ canister sample was analyzed according to PNL Technical Procedure PNL-TVP-03, *Determination of TO-14 Volatile Organic Compounds in Hanford Waste Tank Headspace Samples Using SUMMA™ Passivated Canister Sampling and Gas Chromatographic-Mass Spectrometry Analysis*, which is a modified version of EPA compendium Method TO-14. The method uses an EnTech cryoconcentration system interfaced with a Hewlett Packard (HP) 5971 GC/MS. The EnTech concentrator is used to pull a metered volume of sample air from the SUMMA™ canister, cryogenically concentrate the air volume, then transfer the volume 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 an analytical column, J&W Scientific DB-1 phase, 60-m by 0.32-mm internal diameter with 3-µm film thickness. The GC oven is programmed to run a temperature gradient beginning at 40°C, holding for 5 min, and ramping at 4°C per min to a final temperature of 260°C, with a 5-min hold.

3.3 Quality Assurance/Quality Control

Before the tank sample was analyzed, a diagnostic check was performed on the GC/MS instrument by running an instrument "quick 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 over 6 data points ranging from 2 ppbv to 100 ppbv, using a standard gas mixture containing 40 volatile organic compounds listed in EPA compendium Method TO-14. A gas mixture containing bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d_5 was used as an internal standard (IS) for all blank, calibration

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

(b) Pacific Northwest Laboratory. 8/94. *Determination of TO-14 Volatile Organic Compounds in Ambient Air Using SUMMA™ Passivated Canister Sampling and Gas Chromatographic-Mass Spectrometric Analysis*, PNL-TVP-01 (Rev. 0). PNL Technical Procedure, Richland, Washington.

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 curve 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. A least-squares linear-regression routine was applied to the data set to generate the best-fit line for each compound. The equation for that line was then used to quantify the TO-14 compounds found in the tank samples. Errors in sample collection are not factored into the sample analysis results.

3.3.1 Quantitation of TO-14 Results. The quantitative-analysis results for the TO-14 volatile organic compounds were calculated directly from the calibration curve generated using the IS method described above and in PNL-TVP-03. The conversion from ppmv to mg/m^3 assumes standard temperature and pressure (STP) conditions of 760 torr and 273K and was calculated directly from the following equation:

$$mg/m^3 = \frac{\text{ppmv x g mol wt of compound}}{22.4 \text{ L/mole}} \qquad (3.1)$$

3.3.2 Identification and Quantitation of Tentatively Identified Compounds. The tentatively identified compounds (TICs) are determined by mass-spectral interpretation and comparison of the spectra with the EPA/NIST/WILEY Library, which is a part of the HP 5971 instrument operating system. Chromatographic peaks with an area count greater than, or equal to, one half of the total area count of the chlorobenzene-d_5 IS peak at the 20-ppbv calibration level are tentatively identified and quantitatively estimated. This standard was chosen to determine the integration cutoff as it is in the middle of the chromatographic range and not in a region typically affected by coelution of other compounds. 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 a corrected total peak area for the IS chlorobenzene-d_5. Specifically, the total integrated area for the chlorobenzene-d_5 peak had to be corrected for possible coeluting compounds before calculating the response factor. The corrected total peak area for the IS was calculated by multiplying the IS quantitation ion by a correction factor based on the ratio of the total integrated peak area to the quantitation ion as measured in blank runs. The corrected peak area was then used to calculate a response factor using the IS concentration in mg/m^3:

$$\text{Response Factor} = \frac{\text{IS conc.} \left(mg/m^3\right)}{\text{IS peak area}} \qquad (3.2)$$

The calculated response factor was then multiplied by the TIC peak area to give an estimated concentration for that compound. For dichloromethane, the total peak area was multiplied by the response factor for chlorobenzene-d_5 to give an estimated concentration of 6.99 mg/m^3 (average of duplicate analyses for S4025-A02-112). Internal standards bromochloromethane and difluorobenzene were not used to quantitate the TICs because coeluting compounds appeared to have greatly altered the signal of the quantitation ions for those two ISs.

The ppmv concentrations are calculated from mg/m^3 and the molecular weight of the analyte.

$$\text{TIC in ppmv} = \frac{\text{TIC}\left(\text{mg/m}^3\right) \text{ x } 22.4 \text{ L/mole}}{\text{TIC g mol wt}} \qquad (3.3)$$

The IS level added to all blank, standard, and sample injections was 18.3 ppbv for bromochloromethane, 20.3 ppbv for 1,4-difluorobenzene, and 18.2 ppbv for chlorobenzene-d_5. The IS concentrations were converted from ppbv to mg/m^3 at STP using a molecular weight of 129.39 (g/mol) for bromochloromethane, 114.09 for 1,4-difluorobenzene, and 117.6 for chlorobenzene-d_5.

3.4 Analysis Results

The results of the GC/MS analysis of the ambient air sample collected upwind of Tank C-103 and of the ambient air sampled through the VSS near Tank C-103 are presented in Tables 3.1 and 3.2. A representative total ion chromatogram showing the identity of major constituents is given in Figure 3.1.

Table 3.1 lists the quantitative results for compounds listed as TO-14 analytes. No compounds were identified above the 2 ppbv MDL in the ambient air sample (PNL 111) collected upwind of Tank C-103. Methylene chloride at 6.99 mg/m^3 was the only compound identified in the ambient air through the VSS sample (PNL 112). The methylene chloride is believed to be remnants from the cleaning of the system.

Table 3.2 lists the semi-quantitative results for the TICs. A single compound, 2-butoxyethanol at 0.6 mg/m^3, was found in the ambient air sample collected ~10 m upwind of Tank C-103. This compound was attributed to an analytical system contaminant. Five compounds were identified in the ambient air through the VSS sample. Concentrations ranged from 0.05 mg/m^3 for nonanal to 0.33 mg/m^3 for acetone. Acetone is believed to be a remnant from the cleaning of the system and nonanal, dodecane, and tridecane are believed to be residual contamination of the VSS from a previous sampling job.

SUMMA™ canister PNL 112 was analyzed in replicate for TO-14 analytes and TICs to verify the initial analysis. The results of the replicate analysis are also reported in Tables 3.1 and 3.2.

4.0 Conclusions

The concentration of selected organic compounds was determined from the analysis of upwind ambient air sample and ambient air through the VSS sample. No TO-14 compounds were identified in the ambient air sample. Methylene chloride was found in the ambient air through the VSS sample. This compound is believed to be remnants from the cleaning of the system. Five TICs were identified in the ambient air through the VSS during this analysis. Acetone is believed to be remnant from the cleaning of the system, 2-butoxyethanol is an analytical system contaminant, and nonanal, dodecane, and tridecane are believed to be residual contamination of the VSS from a previous sampling job.

5.0 References

Clauss, T. W., M. W. Ligotke, B. D. McVeety, K. H. Pool, R. B. Lucke, J. S. Fruchter, and S. C. Goheen. 1994. *Vapor Space Characterization of Waste Tank 241-BY-104: Results from Samples Collected on 6/24/94.* PNL-10208. Pacific Northwest Laboratory, Richland, Washington.

Ligotke, M. W., K. H. Pool, and B. D. Lerner. 1994. *Vapor Space Characterization of Waste Tank 241-C-103: Inorganic Results from Sample Job 7B (5/12/94 - 5/25/94).* PNL-10172, Pacific Northwest Laboratory, Richland, Washington.

6.0 Further Reading

Pacific Northwest Laboratory. Analytical Laboratory Procedure Compendium. Procedures PNL-ALO-212, -226, -271. PNL-MA-599, Richland, Washington.

Pacific Northwest Laboratory. Quality Assurance Manual, Part 2: Good Practices Standard. PNL-MA-70, Part 2, Richland, Washington.

Pacific Northwest Laboratory. Quality Assurance Plan for Activities Conducted by the Analytical Chemistry Laboratory (ACL). MCS-033, Analytical Chemistry Laboratory, Richland, Washington.

Pacific Northwest Laboratory. 1994. *Determination of TO-14 Volatile Organic Compounds in Hanford Waste Tank Headspace Samples Using SUMMA™ Passivated Canister Sampling and Gas Chromatographic-Mass Spectrometry Analysis*, PNL-TVP-03 (Rev. 0), PNL Technical Procedure, Richland, Washington.

Pacific Northwest Laboratory. 1994. *Sample Shipping and Receiving Procedure - DRAFT for PNL Waste Tank Samples.* PNL-TVP-07 (Rev. 0), PNL Technical Procedure, Richland, Washington.

Table 3.1 TO-14 Analysis Results from Sampling Ambient Air Near Tank C-103 Upwind and Through the VSS in SUMMA™ Canisters Collected on 5/12/94

TO-14 Analyte	Mol Wt	CAS No.	S4025-A01-111[a] PNL 111[b] Upwind Sample Concentration (ppbv)	S4025-A01-111[a] PNL 111[b] Upwind Sample Concentration (mg/m³)	S4025-A01-112[a] PNL 112[b] Through VSS Concentration (ppbv)	S4025-A01-112[a] PNL 112[b] Through VSS Concentration (mg/m³)	S4025-A01-112[a] Duplicate PNL 112[b] Through VSS Concentration (ppbv)	S4025-A01-112[a] Duplicate PNL 112[b] Through VSS Concentration (mg/m³)	Average Concentration for PNL 112 only (mg/m³)
Dichlorodifluoromethane (FREON-12)	120.92	75-71-8	<2	<0.011	<2	<0.011	<2	<0.011	(c)
Methyl chloride (chloromethane)	50.49	74-87-3	<2	<0.005	<2	<0.005	<2	<0.005	(c)
1,2-Dichloro-1,1,2,2,-Tetrafluoroethane (FREON-114)	170.93	76-14-2	< 2	< 0.02	< 2	< 0.02	< 2	< 0.02	(c)
Chloroethene (Vinyl Chloride)	62.50	75-01-4	< 2	< 0.006	< 2	< 0.006	< 2	< 0.006	(c)
Methyl bromide (Bromomethane)	94.95	74-83-9	< 2	< 0.009	< 2	< 0.009	< 2	< 0.009	(c)
Ethyl Chloride	64.52	75-00-3	< 2	< 0.006	< 2	< 0.006	< 2	< 0.006	(c)
Trichlorofluoromethane (FREON-11)	137.38	75-69-4	<2	<0.012	<2	<0.012	<2	<0.012	(c)
1,1-Dichloroethene (1,1-Dichloroethylene)	96.95	75-35-4	< 2	< 0.009	< 2	< 0.009	< 2	< 0.009	(c)
Dichloromethane (Methylene Chloride)	84.94	75-09-2	<2	<0.008	1917.00	7.265	1775.00	6.727	6.996
1,1,2-Trichloro-1,2,2-Trifluoroethane (FREON-113)	187.40	76-13-1	< 2	< 0.02	< 2	< 0.02	< 2	< 0.02	(c)
1,1-Dichloroethane	99.00	75-34-3	< 2	< 0.009	< 2	< 0.009	< 2	< 0.009	(c)
cis-1,2-Dichloroethene (cis-1,2-Dichloroethylene)	97.00	156-60-5	< 2	< 0.009	< 2	< 0.009	< 2	< 0.009	(c)
Trichloromethane (Chloroform)	119.00	67-66-3	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
cis 1,2-Dichloroethane	99.00	107-06-2	< 2	< 0.009	< 2	< 0.009	< 2	< 0.009	(c)
1,1,1-Trichloroethane	136.00	71-55-6	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
Benzene	84.16	71-43-2	< 2	< 0.009	< 2	< 0.009	< 2	< 0.009	(c)
Carbon Tetrachloride	154.00	56-23-5	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
1,2-Dichloropropane	113.00	78-87-5	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
Trichloroethylene	146.00	79-01-6	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
cis 1,3-Dichloropropene	113.00	61-02-6	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
trans 1,3-Dichloropropene	111.00	61-01-5	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
1,1,2-Trichloroethane	136.00	79-00-5	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
Methyl Benzene (Toluene)	92.14	108-88-3	0.50	0.002	<2	<0.008	<2	<0.008	(c)
1,2-Dibromoethane	174.00	106-93-4	< 2	< 0.02	< 2	< 0.02	< 2	< 0.02	(c)
Tetrachloroethene (Tetrachloroethylene)	165.83	127-18-4	< 2	< 0.02	< 2	< 0.02	< 2	< 0.02	(c)
Chlorobenzene	117.60	108-90-7	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
Ethylbenzene	116.25	100-41-4	1.10	0.006	1.20	0.006	1.10	0.006	0.006
m-Xylene (1,3-Dimethylbenzene)[d]	106.17	108-38-3	< 2	< 0.009	< 2	< 0.009	< 2	< 0.009	(c)
p-Xylene (1,4-Dimethylbenzene)[d]	104.00	106-42-3	< 2	< 0.009	< 2	< 0.009	< 2	< 0.009	(c)
Styrene	168.00	106-42-3	< 2	< 0.02	< 2	< 0.02	< 2	< 0.02	(c)
1,1,2,2-Tetrachloroethane									

Table 3.1 Contd

TO-14 Analyte	Mol Wt	CAS No.	S4025-A01-111[a] PNL 111[b] Upwind Sample Concentration (ppbv)	S4025-A01-111[a] PNL 111[b] Upwind Sample Concentration (mg/m^3)	S4025-A01-112[a] PNL 112[b] Through VSS Concentration (ppbv)	S4025-A01-112[a] PNL 112[b] Through VSS Concentration (mg/m^3)	S4025-A01-112[a] Duplicate PNL 112[b] Through VSS Concentration (ppbv)	S4025-A01-112[a] Duplicate PNL 112[b] Through VSS Concentration (mg/m^3)	Average Concentration for PNL 112 only (mg/m^3)
o-Xylene (1,2-Dimethylbenzene)	106.17	100-42-5	0.71	0.003	0.60	0.003	0.60	0.003	0.003
1,3,5-Trimethylbenzene	120.20	79-34-5	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
1,2,4-Trimethylbenzene	120.20	95-47-6	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
Chloromethylbenzene, alpha (Benzyl Chloride)	126.60	108-67-8	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
m-Dichlorobenzene (1,3-Dichlorobenzene)	147.00	95-63-6	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
p-Dichlorobenzene (1,4-Dichlorobenzene)	147.00	100-44-7	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
o-Dichlorobenzene (1,2-Dichlorobenzene)	147.00	541-73-1	< 2	< 0.01	< 2	< 0.01	< 2	< 0.01	(c)
1,2,4-Trichlorobenzene	181.45	106-46-7	< 2	< 0.02	< 2	< 0.02	< 2	< 0.02	(c)
Hexachloro-1,3-Butadiene	261.00	95-50-1	1.20	0.000	1.00	0.012	1.00	0.012	0.012

(a) WHC sample identification number
(b) PNL canister number
(c) Average and standard deviation data are not meaningful for this analyte.
(d) m-Xylene and p-Xylene coelute, and therefore reported concentrations are for the sum of these two compounds.

Table 3.2 Tentatively Identified Compounds and Estimated Concentration[a] from Sampling Ambient Air Near Tank C-103 Upwind and Through the VSS in SUMMA™ Canisters Collected on 5/12/94

Tentatively Identified Compounds[d]	Cas No.[d]	Mol Wt	Retention Time (min)	S4025-A01-111[b] PNL111[c] Upwind Sample (mg/m³)	(ppmv)	S4025-A02-112[b] PNL112[c] Through VSS (mg/m³)	(ppmv)	S4025-A02-112[b] PNL112[c] Duplicate Through VSS (mg/m³)	(ppmv)	Average for PNL112 Only (mg/m³)	(ppmv)
Carbon dioxide	124-38-9	44.0	5.946	(e)	(e)	(e)	(e)	(e)	(e)	(e)	(e)
Acetone	67-64-1	58	10.282	<0.026	<0.01	0.312	0.121	0.338	0.130	0.325	0.126
Dichloromethane	75-09-2	85	11.948	<0.038	<0.01	2.767	0.729	2.915	0.768	2.841	0.749
Bromochlormethane (IS)	74-97-5	128	15.78	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)
1,4-Difluorobenzene (IS)	540-36-3	114	19.187	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)
d5-Chlorobenzene (IS)	3114-55-4	117	28.435	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)
2-Butoxyethanol [g]	111-76-2	118	30.95	0.060	0.011	0.052	0.100	<0.053	<0.010	0.052	0.010
Nonanal	124-19-6	142	39.86	<0.063	<0.01	0.051	0.008	0.053	0.008	0.052	0.008
Dodecane	112-40-3	170	44.37	<0.076	<0.01	0.168	0.022	0.175	0.023	0.171	0.023
Tridecane	629-50-5	184	48.11	<0.082	<0.01	0.294	0.036	0.305	0.037	0.299	0.036

(a) Semi-qantitative estimate calculated using concentration of closest eluting IS
(b) WHC sample number
(c) PNL SUMMA™ canister number
(d) Obtained by mass spectral interpretation and comparison with the EPA/NIST/WILEY Library
(e) Carbon dioxide cannot be determined by the analytical method used.
(f) Concentration information for ISs is determined by directed calibration.
(g) Analytical system contaminant

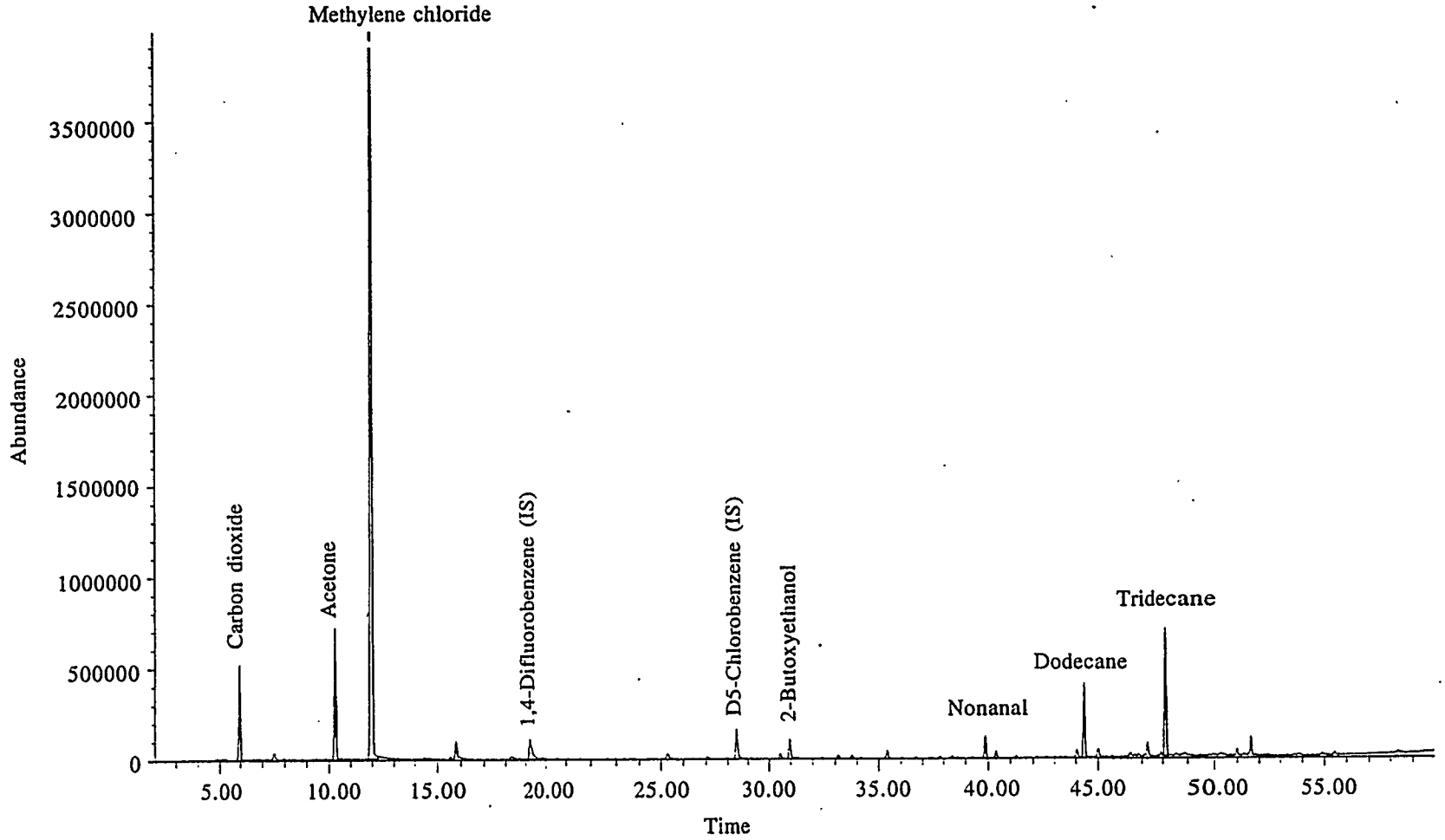

Figure 3.1 Total Ion Chromatogram of SUMMA™ Canister Sample S4025-A02-112 Collected Near Hanford Waste Tank C-103 on 5/12/94

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