New York State Department of Health
Summary of Indoor and Outdoor Levels of Volatile Organic Compounds from Fuel Oil Heated Homes in NYS, 1997-2003
All Results are Micrograms Per Cubic Meter
Revised November 14, 2005

	Indoor							Outdoor						
Chemical	N	ND(%)	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Upper F	N	ND(%)	25th Pctl	50th Pctl	75th Pctl	90th Pctl	Upper F
1,1,1-TRICHLOROETHANE	400	41.5%	<0.25	0.33	1.1	3.1	2.5	200	62.5%	<0.25	<0.25	0.33	0.60	0.64
1,1,2,2-TETRACHLOROETHANE	400	96.5%	<0.25	<0.25	<0.25	<0.25	0.38	200	99.5%	<0.25	<0.25	<0.25	<0.25	0.36
1,1,2-TRICHLOROETHANE	400	96.0%	<0.25	<0.25	<0.25	<0.25	0.38	200	99.5%	<0.25	<0.25	<0.25	<0.25	0.34
1,1,2-TRICHLOROTRIFLUOROETHANE	400	44.5%	<0.25	0.54	1.1	1.8	2.5	200	48.5%	<0.25	0.46	1.1	1.9	2.5
1,1-DICHLOROETHANE	400	99.0%	<0.25	<0.25	<0.25	<0.25	0.38	200	100.0%	<0.25	<0.25	<0.25	<0.25	0.36
1,1-DICHLOROETHENE	400	93.3%	<0.25	<0.25	<0.25	<0.25	0.40	200	99.5%	<0.25	<0.25	<0.25	<0.25	0.40
1,2,3-TRIMETHYLBENZENE	400	41.0%	<0.25	0.39	1.1	2.7	2.5	200	82.5%	<0.25	<0.25	<0.25	0.39	0.46
1,2,4-TRICHLOROBENZENE	400	79.8%	<0.25	<0.25	<0.25	3.4	0.47	200	84.0%	<0.25	<0.25	<0.25	2.3	0.44
1,2,4-TRIMETHYLBENZENE	400	12.3%	0.69	1.9	4.3	9.5	9.8	200	54.5%	<0.25	<0.25	0.81	1.8	1.9
1,2-DIBROMOETHANE	400	99.3%	<0.25	<0.25	<0.25	<0.25	0.38	200	99.5%	<0.25	<0.25	<0.25	<0.25	0.37
1,2-DICHLOROBENZENE	400	78.8%	<0.25	<0.25	<0.25	0.72	0.48	200	83.0%	<0.25	<0.25	<0.25	0.60	0.42
1,2-DICHLOROETHANE	400	98.5%	<0.25	<0.25	<0.25	<0.25	0.37	200	99.5%	<0.25	<0.25	<0.25	<0.25	0.42
1,2-DICHLOROPROPANE	400	97.8%	<0.25	<0.25	<0.25	<0.25	0.39	200	97.0%	<0.25	<0.25	<0.25	<0.25	0.40
1,2-DICHLOROTETRAFLUOROETHANE	400	87.3%	<0.25	<0.25	<0.25	0.52	0.42	200	84.5%	<0.25	<0.25	<0.25	0.56	0.48
1,3,5-TRIMETHYLBENZENE	400	25.0%	0.27	0.64	1.7	3.6	3.9	200	71.5%	<0.25	<0.25	0.34	0.69	0.71
1,3-DICHLOROBENZENE	400	79.0%	<0.25	<0.25	<0.25	0.60	0.46	200	85.0%	<0.25	<0.25	<0.25	0.48	0.42
1,4-DICHLOROBENZENE	400	66.5%	<0.25	<0.25	0.54	1.3	1.2	200	82.0%	<0.25	<0.25	<0.25	0.54	0.46
2,3-DIMETHYLPENTANE	400	32.3%	<0.25	0.65	2.2	7.5	5.2	200	73.5%	<0.25	<0.25	0.31	0.96	0.66
2,4-DIMETHYLPENTANE	400	35.8%	<0.25	0.57	2.0	7.7	4.7	200	69.5%	<0.25	<0.25	0.37	0.84	0.78
ACETONE	227	5.3%	10	21	52	110	115	114	6.1%	3.4	6.4	14	44	30
ALPHA-PINENE	400	19.8%	0.33	1.5	4.4	14	10	200	61.0%	<0.25	<0.25	0.53	2.0	1.2
BENZENE	400	7.0%	1.1	2.1	5.9	15	13	200	9.0%	0.57	1.3	2.3	4.3	4.8
BROMOMETHANE	400	77.0%	<0.25	<0.25	<0.25	0.60	0.48	200	81.0%	<0.25	<0.25	<0.25	0.47	0.45
CARBON TETRACHLORIDE	400	50.3%	<0.25	<0.25	0.59	0.81	1.3	200	54.0%	<0.25	<0.25	0.6	0.81	1.2
CHLOROBENZENE	400	99.5%	<0.25	<0.25	<0.25	<0.25	0.41	200	100.0%	<0.25	<0.25	<0.25	<0.25	0.38
CHLOROETHANE	400	90.3%	<0.25	<0.25	<0.25	<0.25	0.39	200	94.0%	<0.25	<0.25	<0.25	<0.25	0.40
CHLOROFORM	400	53.0%	<0.25	<0.25	0.54	1.4	1.2	200	84.0%	<0.25	<0.25	<0.25	0.39	0.48
CHLOROMETHANE	400	46.0%	<0.25	0.50	1.8	3.3	4.2	200	48.0%	<0.25	0.51	1.8	3.2	4.3
CIS-1,2-DICHLOROETHENE	400	91.0%	<0.25	<0.25	<0.25	<0.25	0.41	200	96.5%	<0.25	<0.25	<0.25	<0.25	0.38
CIS-1,3-DICHLOROPROPENE	400	97.0%	<0.25	<0.25	<0.25	<0.25	0.38	200	97.5%	<0.25	<0.25	<0.25	<0.25	0.40
CYCLOHEPTANE	400	39.8%	<0.25	0.52	1.3	3.1	2.9	200	74.0%	<0.25	<0.25	0.28	0.68	0.56
CYCLOHEXANE	400	31.3%	<0.25	0.81	2.6	8.1	6.3	200	68.5%	<0.25	<0.25	0.43	1.3	0.94
DICHLORODIFLUOROMETHANE	400	53.8%	<0.25	<0.25	4.1	15	10	200	54.0%	<0.25	<0.25	4.2	7.5	10
d-LIMONENE	400	19.3%	0.50	2.8	8.4	24	20	199	77.9%	<0.25	<0.25	<0.25	0.83	0.48
ETHYL ALCOHOL	227	1.3%	27	160	540	1400	1300	114	0.9%	3.3	6.9	16	31	34
ETHYLBENZENE	400	14.5%	0.41	1.0	2.8	7.4	6.4	200	53.5%	<0.25	<0.25	0.48	1.1	1.0
ETHYLCYCLOHEXANE	400	37.3%	<0.25	0.44	1.2	2.6	2.8	200	82.0%	<0.25	<0.25	<0.25	0.46	0.45
ETHYLMETHACRYLATE	227	94.7%	<0.25	<0.25	<0.25	<0.25	0.39	114	100.0%	<0.25	<0.25	<0.25	<0.25	0.38
HEXACHLORO-1,3-BUTADIENE	400	76.0%	<0.25	<0.25	<0.25	4.6	0.49	200	81.0%	<0.25	<0.25	<0.25	2.3	0.46
ISO-OCTANE	400	32.5%	<0.25	0.56	2.1	6.5	5.0	200	69.5%	<0.25	<0.25	0.33	0.87	0.67
ISOPRENE	400	11.0%	0.81	2.0	4.3	8.8	9.5	200	55.5%	<0.25	<0.25	0.86	2.8	2.0
ISOPROPYLBENZENE	400	64.8%	<0.25	<0.25	0.39	0.88	0.82	200	91.0%	<0.25	<0.25	<0.25	<0.25	0.38
M,P-XYLENE	400	13.5%	0.50	1.5	4.6	12	11	200	55.0%	<0.25	<0.25	0.48	1.4	1.0
METHYL ETHYL KETONE	227	8.8%	1.4	3.4	7.3	16	16	114	7.0%	0.76	1.3	2.6	6.3	5.3
METHYL ISOBUTYL KETONE	227	44.9%	<0.25	0.33	0.86	2.2	1.9	114	75.4%	<0.25	<0.25	<0.25	0.94	0.50
METHYLCYCLOHEXANE	400	28.0%	<0.25	0.68	1.9	6.4	4.5	200	70.5%	<0.25	<0.25	0.34	0.78	0.70
METHYLENE CHLORIDE	400	22.3%	0.31	1.4	6.6	22	16	200	50.5%	<0.25	<0.25	0.73	1.6	1.6
METHYLMETHACRYLATE	227	86.8%	<0.25	<0.25	<0.25	0.45	0.43	114	96.5%	<0.25	<0.25	<0.25	<0.25	0.41
METHYL-tert-BUTYL ETHER	227	30.4%	<0.25	0.79	5.6	27	14	114	46.5%	<0.25	0.27	0.86	2.1	1.9
n-BUTYLBENZENE	400	55.5%	<0.25	<0.25	0.49	1.2	1.1	200	87.0%	<0.25	<0.25	<0.25	0.33	0.41
n-DECANE	400	10.0%	1.2	2.7	6.6	16	15	200	32.5%	<0.25	0.84	2.0	2.6	4.7
n-DODECANE	400	18.3%	0.42	1.5	3.9	11	9.2	200	47.0%	<0.25	0.45	1.9	4.5	4.5
n-HEPTANE	400	4.8%	1.0	2.8	7.6	19	18	200	28.5%	<0.25	0.49	1.0	2.6	2.2
n-HEXANE	400	12.5%	0.63	1.6	6.0	18	14	200	39.5%	<0.25	0.42	0.88	1.6	2.0
n-NONANE	400	16.3%	0.37	1.3	3.4	8.8	7.9	200	65.5%	<0.25	<0.25	0.37	0.78	0.74
n-OCTANE	400	21.0%	0.33	0.89	2.3	4.2	5.2	200	56.0%	<0.25	<0.25	0.65	1.2	1.5
n-PROPYLBENZENE	400	51.5%	<0.25	<0.25	0.69	1.7	1.5	200	92.0%	<0.25	<0.25	<0.25	<0.25	0.39
n-UNDECANE	400	14.8%	0.57	1.8	5.0	12	12	200	52.5%	<0.25	<0.25	0.67	1.7	1.5
O-XYLENE	400	17.8%	0.39	1.1	3.1	7.6	7.1	200	60.0%	<0.25	<0.25	0.56	1.7	1.2
sec-BUTYLBENZENE	400	56.3%	<0.25	<0.25	0.55	1.2	1.2	200	80.0%	<0.25	<0.25	<0.25	0.44	0.46
STYRENE	400	43.8%	<0.25	0.30	0.64	1.3	1.4	200	79.0%	<0.25	<0.25	<0.25	0.43	0.45
tert-BUTYLBENZENE	400	57.0%	<0.25	<0.25	0.60	1.6	1.3	200	88.5%	<0.25	<0.25	<0.25	0.27	0.44
TETRACHLOROETHENE	400	46.8%	<0.25	0.34	1.1	2.9	2.5	200	71.5%	<0.25	<0.25	0.34	0.81	0.68
TETRAHYDROFURAN	227	72.2%	<0.25	<0.25	0.35	3.3	0.78	114	94.7%	<0.25	<0.25	<0.25	<0.25	0.40
TOLUENE	400	6.3%	3.5	9.6	24.8	58	57	200	6.0%	0.60	1.3	2.4	5.9	5.1
TRANS-1,3-DICHLOROPROPENE	400	100.0%	<0.25	<0.25	<0.25	<0.25	0.40	200	100.0%	<0.25	<0.25	<0.25	<0.25	0.41
TRICHLOROETHENE	400	80.8%	<0.25	<0.25	<0.25	0.48	0.46	200	88.5%	<0.25	<0.25	<0.25	0.32	0.43
TRICHLOROFLUOROMETHANE	400	10.5%	1.1	2.9	5.4	17	12	200	35.0%	<0.25	0.78	2.2	3.6	5.1
VINYL CHLORIDE	400	96.8%	<0.25	<0.25	<0.25	<0.25	0.37	200	98.5%	<0.25	<0.25	<0.25	<0.25	0.39

N: Total Number of Samples

ND(%): % of nondetects

Upper F: Upper Fence, see accompanying text for this calculation

New York State Department of Health
Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes

Between 1997 and 2003, the New York State Department of Health (NYSDOH) conducted a study of the occurrence of volatile organic chemicals (VOCs) in the indoor air of homes that heat with fuel oil. The purpose of the study was to characterize the indoor environment of fuel oil heated homes as a means of evaluating post clean-up conditions in residences affected by petroleum spills. The study included basement, living space and outdoor samples from 104 homes, tested during both heating and non-heating seasons. Most of the more than 600 samples collected in the study were analyzed for 69 individual VOCs. This summary report presents the results to help characterize commonly found concentrations of these 69 compounds in the indoor and outdoor air of residential settings heated with fuel oil.

The study is comprised of single family homes heated with fuel oil. With the exception of New York City, homes from across the state were included in the study, with the majority of the homes being near the Albany area. Prospective residences were required to have no past oil spills, no hobbies or home business that regularly use products containing VOCs, and no recent activities utilizing products that contain VOCs (e.g. painting, staining). A pre-sampling inspection was conducted in each home and included completing a building questionnaire to gather building information such as age, basement characteristics, heating and ventilation parameters, location of fuel oil tank, garage placement, etc. and an inventory of products that might be sources of indoor VOCs. When present, the products and their ingredients were listed on the inventory form. In addition, the product containers were screened with a photoionization detector (PID) to identify potential chemical interference during each sampling event and elevated readings were noted on the inventory forms. In most homes, gross sources of VOCs were not identified and containers were generally found to be tightly sealed. In some homes the PID detected elevated VOC levels associated with a product; however, the products were not removed and samples were still collected.

Sampling was performed in a manner consistent with the NYSDOH's February 1, 2005 Indoor Air Sampling and Analysis Guidance. This Guidance is an updated version of the 1997 Draft Indoor Air Sampling and Analysis Protocol and the 2001 Indoor Air Sampling and Analysis Guidance documents, and reflects the procedures followed during the study. Two-hour samples were collected in 6-liter pre-cleaned, passivated, evacuated whole air canisters prepared and analyzed at the NYSDOH's Wadsworth Center laboratory. The samples were analyzed in accordance with EPA Method TO-15 utilizing a Tekmar® AutoCan® concentrator / Agilent® 6890/5973 GC/MSD analytical system. The method detection limits for all compounds except hexachlorobutadiene were 0.25 micrograms per cubic meter ($\mu g/m^3$). The method detection limit for hexachlorobutadiene was $0.43 \mu g/m^3$.

The dataset exhibits a lognormal distribution typical of environmental data. The summary table contains the 25^{th}, 50^{th}, 75^{th}, 90^{th} percentile values and the upper fence value for each compound. The upper fence is calculated as 1.5 times the interquartile range (difference between the 25^{th} and 75^{th} percentile values) above the 75^{th} percentile value. The upper fence is a boundary used for identifying the presence of outliers in the data. In cases where the 25^{th} or 75^{th} percentiles were below the laboratory detection limit of 0.25 $\mu g/m^3$, randomly generated values between 0.000 and 0.250 were used in calculating the upper fence. All of the values calculated for the lower fence were negative and are not included in the table. For hexachlorobutadiene, the randomly generated values used to calculate the upper fence ranged from 0.000 to 0.430. All of the values are adjusted to two significant figures.