Table 8-10

Continued

DI Factor Sample ID File ID Date Sampled Date Extracted Date Analyzed	1 PLNJ G-2587 1 RC232945 9/29/92 11/24/92 11/25/92	1 PLNJ G-2587 2 RC232946 9/29/92 11/24/92 11/25/92	Average	Absolute Percent Difference (%)	Standard Deviation	Relative Standard Deviation (%)
Concentrations (ppbv)						
Formaldehyde	4.04	3.95	3.99	2.4%	0.05	1.2%
Acetaldehyde	1.50	2.21	1.85	37.9%	0.35	18.9%
Acrolein	0.00	0.00	NA	NA	NA	NA
Acetone	0.00	0.00	NA	NA	NA	NA
Propionaldehyde	6.42	5.96	6.19	7.6%	0.23	3.8%
Crotonaldehyde	1.99	2.28	2.13	13.8%	0.15	6.9%
Butyr/Isobutyraldehyde	0.00	0.00	NA	NA	NA	NA
Benzaldehyde	0.00	0.00	NA	NA	NA	NA
Isovaleraldehyde	0.00	0.00	NA	NA	NA	NA
Valeraldehyde	0.00	0.00	NA	NA	NA	NA
Tolualdehydes	0.00	0.00	NA	NA	NA	NA
Hexanaldehyde	0.00	0.00	NA	NA	NA	NA
2,5-Dimethylbenzaldehyde	0.00	0.00	NA	NA	NA	NA
			Average	15.4%	0.20	7.7%

Table 8-10

Continued

DI Factor Sample ID File ID Date Sampled Date Extracted Date Analyzed	1 PLNJ B-2587 1 RC232941 9/29/92 11/24/92 11/25/92	1 PLNJ B-2587 2 RC232942 9/29/92 11/24/92 11/25/92	Average	Absolute Percent Difference (%)	Standard Deviation	Relative Standard Deviation (%)
Concentrations (ppbv)						
Formaldehyde	0.68	0.80	0.74	16.2%	0.06	8.1%
Acetaldehyde	2.26	3.24	2.75	35.6%	0.49	17.8%
Acrolein	0.00	0.00	NA	NA	NA	NA
Acetone	9.08	8.28	8.68	9.2%	0.40	4.6%
Propionaldehyde	0.00	0.00	NA	NA	NA	NA
Crotonaldehyde	0.00	0.00	NA	NA	NA	NA
Butyr/Isobutyraldehyde	0.00	0.00	NA	NA	NA	NA
Benzaldehyde	0.00	0.00	NA	NA	NA	NA
Isovaleraldehyde	0.00	0.00	NA	NA	NA	NA
Valeraldehyde	0.00	0.00	NA	NA	NA	NA
Tolualdehydes	0.00	0.00	NA	NA	NA	NA
Hexanaldehyde	0.00	0.00	NA	NA	NA	NA
2,5-Dimethylbenzaldehyde	0.00	0.00	NA	NA	NA	NA
			Average	20.4%	0.32	10.2%

Table 8-11

NMOC 1992 Newark, New Jersey Analytical Precision Statistics

DI Factor Sample ID File ID Date Sampled Date Extracted Date Analyzed	1 NWNJ R-2239 1 RC232926 9/3/92 11/24/92 11/24/92	1 NWNJ R-2239 2 RC232927 9/3/92 11/24/92 11/24/92	Average	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
Concentrations (ppbv)						
Formaldehyde	7.26	7.37	7.32	1.4%	0.05	0.7%
Acetaldehyde	11.70	14.93	13.31	24.3%	1.62	12.1%
Acrolein	0.00	0.00	NA	NA	NA	NA
Acetone	20.31	21.20	20.75	4.3%	0.45	2.1%
Propionaldehyde	3.21	3.66	3.44	13.0%	0.22	6.5%
Crotonaldehyde	0.00	0.00	NA	NA	NA	NA
Butyr/Isobutyraldehyde	0.00	0.00	NA	NA	NA	NA
Benzaldehyde	0.00	0.00	NA	NA	NA	NA
Isovaleraldehyde	1.27	0.97	1.12	26.4%	0.15	13.2%
Valeraldehyde	1.12	1.02	1.07	9.1%	0.05	4.5%
Tolualdehydes	0.00	0.00	NA	NA	NA	NA
Hexanaldehyde	3.31	3.55	3.43	7.0%	0.12	3.5%
2,5-Dimethylbenzaldehyde	0.00	0.00	NA	NA	NA	NA
			Average	12.2%	0.38	6.1%

Table 8-11

Continued

DI Factor Sample ID File ID Sampled Extracted Analyzed	1 NWNJ G-2239 1 RC232928 9/3/92 11/24/92 11/24/92	1 NWNJ G-2239 2 RC232929 9/3/92 11/24/92 11/25/92	Average	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
Concentrations (ppbv)						
Formaldehyde	6.39	6.55	6.47	2.4%	0.08	1.2%
Acetaldehyde	11.44	13.12	12.28	13.7%	0.84	6.8%
Acrolein	0.00	0.00	NA	NA	NA	NA
Acetone	22.25	22.17	22.21	0.4%	0.04	0.2%
Propionaldehyde	3.55	2.94	3.25	18.6%	0.30	9.3%
Crotonaldehyde	0.00	0.00	NA	NA	NA	NA
Butyr/Isobutyraldehyde	0.00	0.00	NA	NA	NA	NA
Benzaldehyde	0.00	0.00	NA	NA	NA	NA
Isovaleraldehyde	0.85	0.76	0.81	10.2%	0.04	5.1%
Valeraldehyde	0.72	0.89	0.81	20.7%	0.08	10.3%
Tolualdehydes	0.00	0.00	NA	NA	NA	NA
Hexanaldehyde	3.46	3.67	3.57	5.7%	0.10	2.9%
2,5-Dimethylbenzaldehyde	0.00	0.00	NA	NA	NA	NA
			Average	10.2%	0.21	5.1%

Table 8-11

Continued

DI Factor Sample ID File ID Sampled Extracted Analyzed	1 NWNJ B-2239 1 RC232924 9/3/92 11/24/92 11/24/92	1 NWNJ B-2239 2 RC232925 9/3/92 11/24/92 11/24/92	Average	Absolute Percent Difference (%)	Standard Deviation (ppbv)	Relative Standard Deviation (%)
Concentrations (ppbv)						
Formaldehyde	0.00	0.00	NA	NA	NA	NA
Acetaldehyde	4.34	3.21	3.78	29.9%	0.57	15.0%
Acrolein	0.00	0.00	NA	NA	NA	NA
Acetone	0.00	0.00	NA	NA	NA	NA
Propionaldehyde	5.31	6.02	5.67	12.5%	0.36	6.3%
Crotonaldehyde	0.00	0.00	NA	NA	NA	NA
Butyr/Isobutyraldehyde	0.00	0.00	NA	NA	NA	NA
Benzaldehyde	0.00	0.00	NA	NA	NA	NA
Isovaleraldehyde	0.00	0.00	NA	NA	NA	NA
Valeraldehyde	0.00	0.93	NA	NA	NA	NA
Tolualdehydes	0.00	0.00	NA	NA	NA	NA
Hexanaldehyde	2.89	2.61	2.75	10.2%	0.14	5.1%
2,5-Dimethylbenzaldehyde	0.00	0.00	NA	NA	NA	NA
			Average	17.5%	0.35	8.8%

analyses were performed on 10% of the samples from each site. The overall average standard deviation for all of the replicate analyses was 0.27 ppbv.

8.5.4 Quality Control Standards

As a quality control (QC) procedure on the analytical results for all of the quantitated analytes, a solution containing all targeted carbonyl compounds at a known concentration was prepared. QC samples were analyzed after every ten samples. Table 8-5 gives the percent recoveries for the quality control standards that were analyzed during this program. Shown in Table 8-12 are the average, maximum and minimum percent recovery and two standard deviations about the average percent recovery for each targeted carbonyl analyte. These results show that the analyses remained in control. The overall average percent recovery ranged from 83.63% for hexanaldehyde to 94.53% for tolualdehydes.

Table 8-12

NMOC 1992 Daily QC Standards Statistics

Analyte	Average	Standard Deviation	Maximum	Minimum	Avg + 2 * STD	Avg - 2 * STD
Formaldehyde	89.33%	22.36%	112.92%	55.11%	134.05%	44.60%
Acetaldehyde	89.04%	21.65%	111.44%	56.07%	132.33%	45.74%
Acrolein	88.59%	21.17%	107.47%	55.93%	130.93%	46.25%
Acetone	88.53%	20.55%	108.16%	57.26%	129.63%	47.43%
Propionaldehyde	89.81%	20.72%	110.03%	58.41%	131.24%	48.38%
Crotonaldehyde	89.16%	21.17%	108.45%	56.70%	131.50%	46.83%
Butyr/Isobutyraldehyde	90.84%	22.85%	115.85%	56.39%	136.53%	45.15%
Benzaldehyde	86.58%	24.14%	108.21%	49.04%	134.86%	38.30%
Isovaleraldehyde	87.74%	21.49%	107.51%	54.93%	130.72%	44.76%
Valeraldehyde	88.73%	21.94%	112.63%	55.93%	132.61%	44.85%
Tolualdehydes	94.53%	22.01%	118.33%	61.75%	138.55%	50.51%
Hexanaldehyde	83.63%	18.72%	105.16%	57.39%	121.06%	46.20%
2,5-Dimethylbenzaldehyde	85.99%	19.36%	105.15%	56.46%	124.71%	47.27%

9.0 SNMOC DATA SUMMARY

This section presents information on the number of samples collected, summary statistics, and individual sample results. For the 1992 SNMOC Monitoring Program 848 valid ambient air samples were received; 971 sample analyses were performed including 123 replicate analyses. The samples were analyzed by gas chromatography using dual flame ionization detectors to determine concentrations of 77 target hydrocarbons. Table 9-1 presents the target compounds. The samples were collected from nineteen sites that participated in the 1992 SNMOC program. Eleven of these sites conducted daily (Monday-Friday) sampling from 22 June to 30 September 1992. Eight sites participated in an optional analysis for which ten samples from each site collected for NMOC analysis were randomly selected to receive analysis by the speciation method. Appendix A presents the sites and the site codes used throughout this report.

9.1 Sample Collection Summary

Tables 9-2 and 9-3 summarize sample collection information for program and option sites, respectively. Program sites collected samples from 22 June to 30 September 1992. The B3AL and BRLA sites started later due to sampler problems, and the MIFL site missed several sampling days due to meteorological conditions (i.e., Hurricane Andrew). Tables 9-4 through 9-6 give information for the program sites on scheduled collection did not occur, the frequency of duplicate sample collection, and frequency of duplicate samples chosen for replicate analyses.

9.2 Site Specific Summary Statistics

Site specific statistics are given in Tables 9-7 through 9-25. Duplicate and duplicate/replicate results were averaged into single compound specific values for the

Table 9-1

1992 Ambient Air Hydrocarbon Program Target List

Compound	
Ethylene	2-Methylhexane (Isoheptane)
Acetylene	2,3-Dimethylpentane
Ethane	3-Methylhexane
Propylene	1-Heptene
Propane	2,2,4-Trimethylpentane
Propyne	n-Heptane
Isobutane	Methylcyclohexane
Isobutene	2,2,3-Trimethylpentane
1-Butene	2,3,4-Trimethylpentane
1,3-Butadiene	Toluene
n-Butane	2-Methylheptane
t-2-Butene	3-Methylheptane
c-2-Butene	1-Octene
3-Methyl-1-Butene	n-Octane
Isopentane	Ethylbenzene
1-Pentene	p,m-Xylene
2-Methyl-1-Butene	Styrene
n-Pentane	o-Xylene
Isoprene	1-Nonene
t-2-Pentene	n-Nonane
c-2-Pentene	Isopropylbenzene
2-Methyl-2-Butene	n-Propylbenzene
2,2-Dimethylbutane (Neohexane)	α-Pinene
Cyclopentene	m-Ethyltoluene
4-Methyl-1-Pentene	p-Ethyltoluene
2,3-Dimethylbutane	1,3,5-Trimethylbenzene
Cyclopentane	o-Ethyltoluene
2-Methylpentane (Isohexane)	1,2,4-Trimethylbenzene
3-Methylpentane	1-Decene
2-Methyl-1-Pentene	n-Decane
1-Hexene	1,2,3-Trimethylbenzene
2-Ethyl-1-Butene	p-Diethylbenzene
n-Hexane	1-Undecene
t-2-Hexene	n-Undecane
c-2-Hexene	Dodecene
Methylcyclopentane	n-Dodecane
2,4-Dimethylpentane	Tridecene
Benzene	n-Tridecane
Cyclohexane	

Table 9-2

Samples Collected and Analyzed for 1992 SNMOC Program Sites

Site	Total Duplicate Samples	Total Replicate Analyses	Total Single Samples	Total Valid Sampling Events	Total Valid Samples	Total Analyses Reported
B1AL	16	12	60	68	76	88
B2AL	20	12	61	71	81	93
B3AL	14	10	42	49	56	66
BMTX	20	10	58	68	78	88
BRLA	18	12	38	47	56	68
CHNC	18	10	44	53	62	72
DLTX	18	10	60	69	78	88
EPTX	18	10	61	70	79	89
FWTX	20	10	58	68	78	88
JUMX	14	8	55	62	69	77
MIFL	16	10	48	56	64	74

Table 9-3

Samples Collected and Analyzed for 1992 SNMOC Option Sites

Site	Total Duplicate Samples	Total Replicate analyses	Total Single Samples	Total Valid Samples	Total Analyses Reported
L1NY	2	1	7	9	10
MNY	2	1	6	8	9
NWNJ	4	2	5	9	11
PLNJ	2	1	7	9	10
R1NC	2	1	7	9	10
S2UT	2	1	7	9	10
S3UT	2	1	7	9	10
WSNC	2	1	7	9	10

Table 9-4. June-July Sampling Frequency

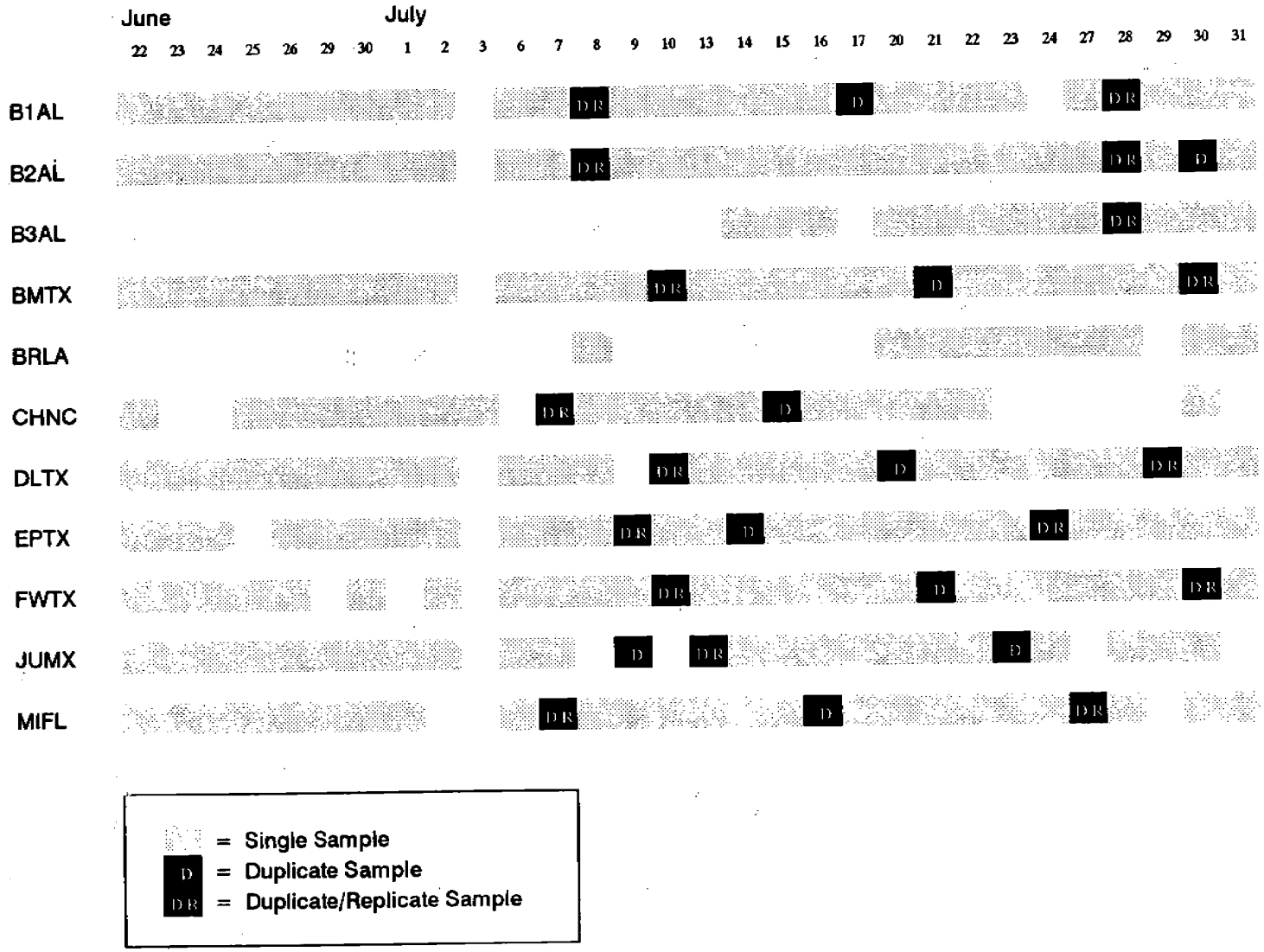

Table 9-5. August Sampling Frequency

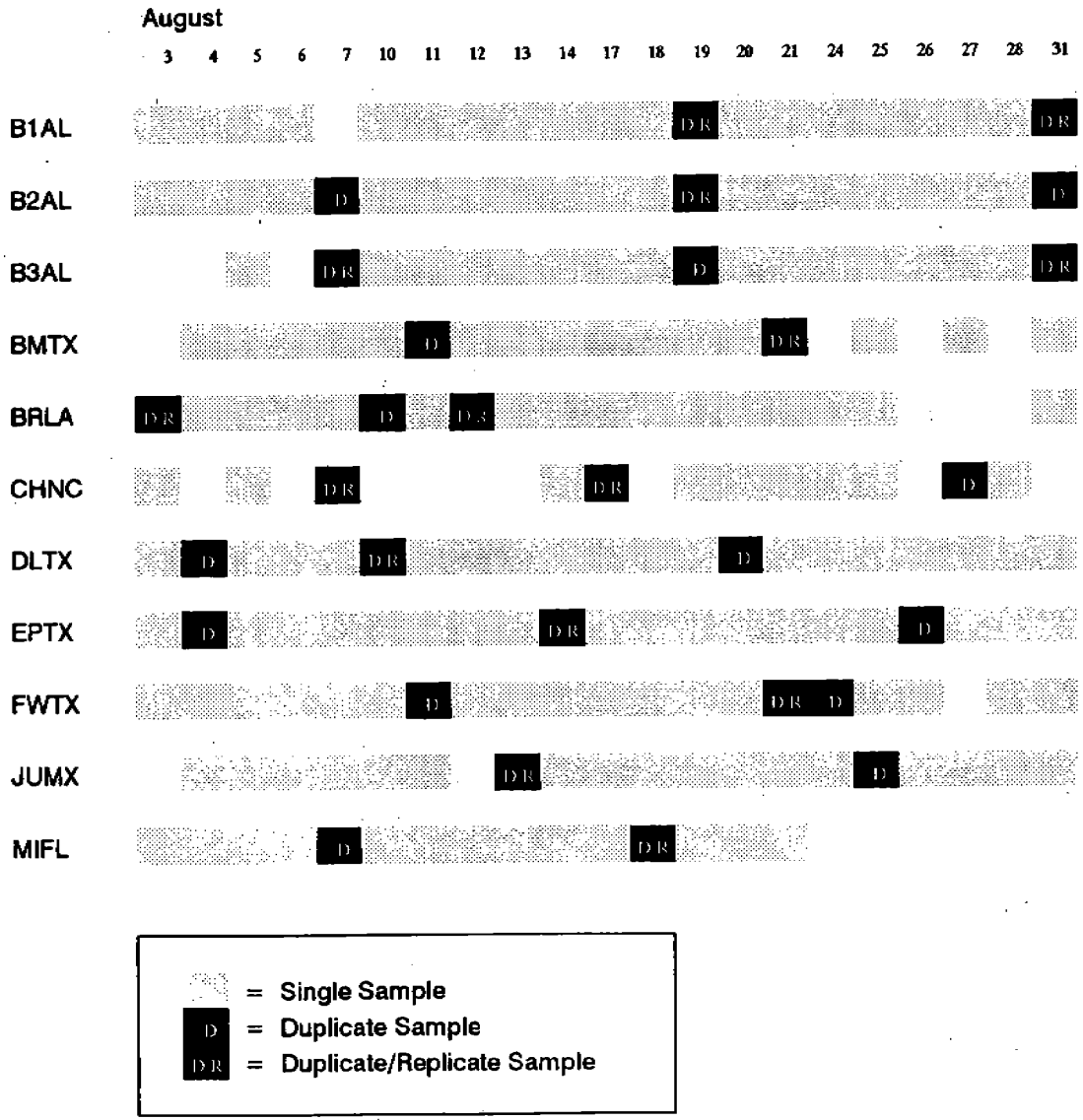

Table 9-6. September Sampling Frequency

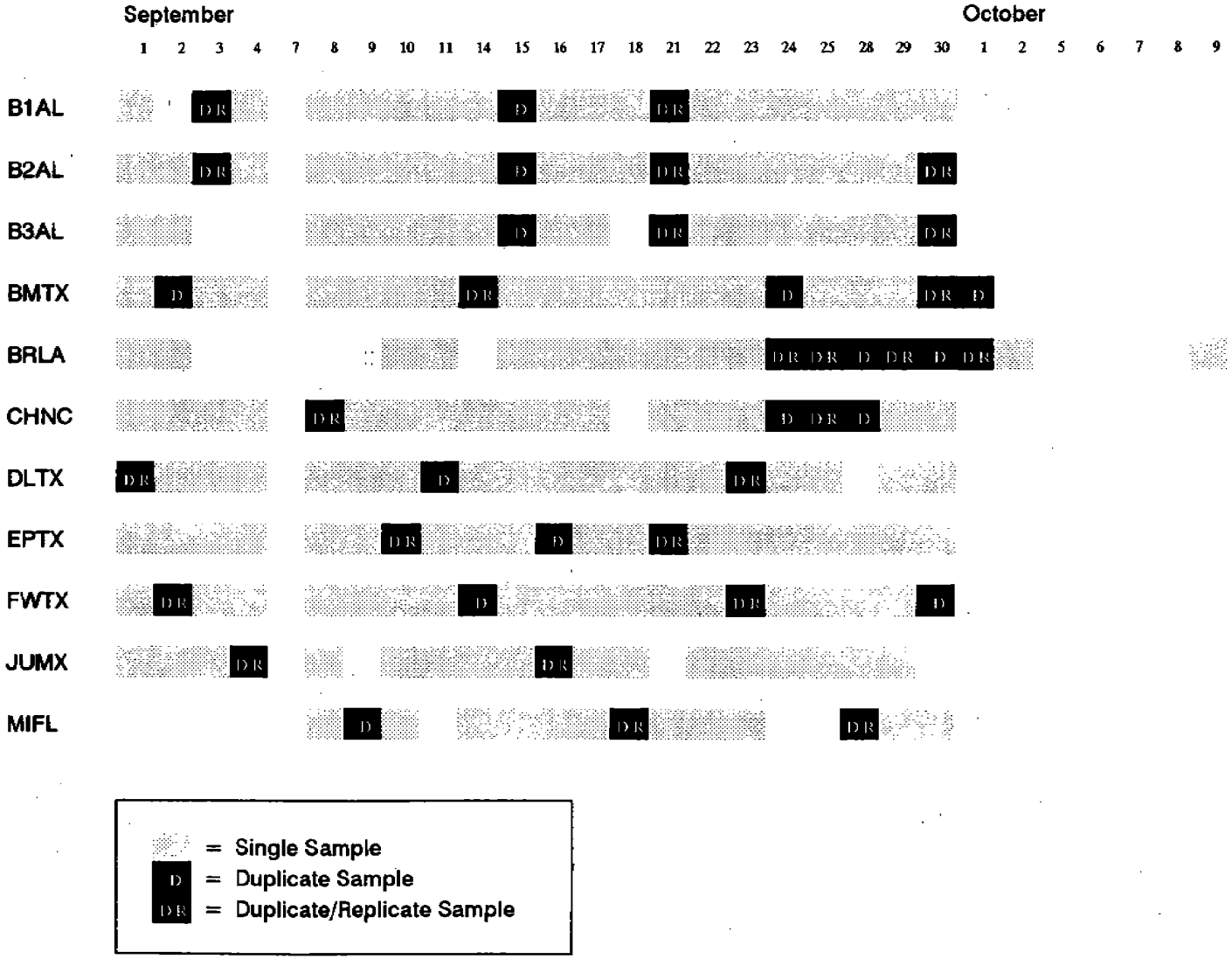

Table 9-7. 1992 Summary Statistics for Birmingham, AL (B1AL)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	68	100.00%	2.07	42.67	12.84	17.14	11.50	0.73	-0.76
Acetylene	66	97.06%	1.37	40.27	13.18	14.56	10.95	0.63	-0.89
Ethane	67	98.53%	1.48	35.15	11.89	12.95	8.15	0.85	0.04
Propylene	66	97.06%	0.82	14.99	4.97	6.13	4.40	0.51	-1.20
Propane	68	100.00%	1.12	47.48	14.21	15.66	11.38	0.94	0.37
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	66	97.06%	0.68	18.39	4.12	5.14	3.87	1.29	1.85
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	66	97.06%	0.53	8.21	2.81	3.38	2.19	0.55	-0.99
1,3-Butadiene	44	64.71%	0.55	4.25	1.76	1.75	0.90	0.46	-0.24
n-Butane	68	100.00%	1.26	67.49	10.67	12.49	9.94	2.62	12.73
t-2-Butene	42	61.76%	0.49	4.54	1.56	1.59	0.92	1.34	2.51
c-2-Butene	31	45.59%	0.51	8.55	1.13	1.40	1.49	4.07	18.72
3-Methyl-1-butene	26	38.24%	0.52	2.71	1.03	1.08	0.50	1.72	3.88
Isopentane	68	100.00%	2.35	163.33	21.25	29.10	26.09	2.23	8.96
1-Pentene	25	36.76%	0.54	7.41	1.63	2.26	1.74	2.09	4.56
2-Methyl-1-butene	56	82.35%	0.52	11.64	2.00	2.38	1.92	2.14	8.38
n-Pentane	68	100.00%	0.72	55.21	8.43	11.98	9.89	1.48	3.77
Isoprene	61	89.71%	0.48	19.14	2.86	3.93	3.60	1.92	4.61
t-2-Pentene	61	89.71%	0.47	13.77	1.98	2.58	2.27	2.21	8.38
c-2-Pentene	49	72.06%	0.55	16.71	1.58	2.13	2.45	4.80	27.31
2-Methyl-2-butene	63	92.65%	0.34	16.57	2.38	3.00	2.68	2.33	9.29
Neohexane	68	100.00%	2.40	27.40	12.45	12.72	5.17	0.63	0.58
Cyclopentene	30	44.12%	0.46	2.45	0.87	0.89	0.37	2.63	10.64
4-Methyl-1-pentene	50	73.53%	0.46	3.21	1.31	1.34	0.58	0.85	0.84
2,3-Dimethylbutane	41	60.29%	0.51	4.25	1.59	1.58	0.76	0.91	2.08
Cyclopentane	67	98.53%	0.54	11.94	2.54	3.45	2.48	0.86	0.40
Isohexane	68	100.00%	0.55	35.34	5.62	9.82	7.71	0.88	0.14
3-Methylpentane	67	98.53%	0.86	25.91	5.94	8.25	6.61	0.66	-0.60
1-Hexene	1	1.47%	2.48	2.48	2.48	2.48	.	.	.
2-Methyl-1-pentene	40	58.82%	0.48	4.34	1.71	1.65	0.80	0.83	1.64
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	67	98.53%	0.96	37.85	5.20	8.98	7.79	1.02	1.11
t-2-Hexene	32	47.06%	0.55	2.85	1.16	1.19	0.48	1.24	3.28

Table 9-7. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	28	41.18%	0.51	1.73	0.83	0.85	0.24	1.91	6.48
Methylcyclopentane	65	95.59%	0.60	12.47	2.44	4.63	3.51	0.53	-1.19
2,4-Dimethylpentane	61	89.71%	0.52	6.12	2.29	2.42	1.62	0.36	-1.30
Benzene	68	100.00%	1.92	43.04	9.58	12.11	9.45	1.25	1.25
Cyclohexane	60	88.24%	0.63	35.92	3.47	6.40	6.80	2.08	5.39
Isoheptane	62	91.18%	0.69	16.96	3.09	4.80	4.14	1.19	0.35
2,3-Dimethylpentane	18	26.47%	0.51	2.19	1.57	1.52	0.54	-0.32	-1.15
3-Methylhexane	68	100.00%	0.83	10.01	4.16	4.47	2.57	0.39	-1.14
2,2,4-Trimethylpentane	66	97.06%	0.53	19.15	5.28	7.48	5.55	0.54	-1.25
1-Heptene	33	48.53%	0.58	4.58	1.46	1.54	0.80	2.60	8.03
n-Heptane	64	94.12%	0.54	7.67	2.59	2.54	1.72	0.59	-0.52
Methylcyclohexane	53	77.94%	0.60	4.67	1.92	1.90	1.10	0.34	-1.04
2,2,3-Trimethylpentane	47	69.12%	0.52	2.83	1.51	1.58	0.79	0.08	-1.48
2,3,4-Trimethylpentane	65	95.59%	0.56	6.67	2.42	2.87	2.04	0.51	-1.34
Toluene	68	100.00%	1.84	68.58	20.99	26.71	18.56	0.51	-1.18
2-Methylheptane	61	89.71%	0.55	4.94	1.60	1.94	1.23	0.60	-0.85
3-Methylheptane	56	82.35%	0.52	4.11	1.49	1.79	1.06	0.49	-1.04
1-Octene	41	60.29%	0.53	2.72	1.83	1.69	0.72	-0.23	-1.44
n-Octane	47	69.12%	0.54	4.84	1.35	1.64	1.00	1.27	1.28
Ethylbenzene	67	98.53%	0.49	13.31	4.77	5.41	3.86	0.41	-1.28
p-Xylene + m-Xylene	68	100.00%	0.79	46.38	15.77	18.22	13.34	0.43	-1.21
Styrene	47	69.12%	0.52	2.81	1.48	1.52	0.69	0.11	-1.26
o-Xylene	67	98.53%	0.66	14.32	5.41	5.95	4.38	0.44	-1.28
1-Nonene	26	38.24%	0.55	1.24	0.91	0.88	0.18	-0.14	-0.73
n-Nonane	54	79.41%	0.50	5.15	1.82	2.02	1.30	0.77	-0.36
Isopropylbenzene	22	32.35%	0.48	2.86	0.72	0.81	0.47	4.21	18.93
n-Propylbenzene	58	85.29%	0.66	12.88	2.12	2.99	2.67	2.13	4.19
alpha-Pinene	59	86.76%	0.53	3.37	1.56	1.67	0.98	0.36	-1.36
m-Ethyltoluene	66	97.06%	0.58	15.33	4.20	4.72	3.34	0.73	-0.10
p-Ethyltoluene	44	64.71%	0.54	2.84	1.61	1.55	0.71	0.03	-1.15
1,3,5-Trimethylbenzene	63	92.65%	0.50	5.81	2.17	2.35	1.60	0.62	-0.82
o-Ethyltoluene	65	95.59%	0.53	6.77	2.32	2.95	1.89	0.49	-1.23
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	67	98.53%	1.02	17.50	5.25	7.22	5.16	0.48	-1.27

Table 9-7. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	41	60.29%	0.50	7.59	1.77	2.19	1.54	1.82	4.04
1,2,3-Trimethylbenzene	68	100.00%	0.76	7.16	3.28	3.49	1.78	0.35	-1.11
p-Diethylbenzene	49	72.06%	0.60	4.40	1.32	1.43	0.73	1.95	5.39
1-Undecene	63	92.65%	0.48	6.07	1.31	1.53	0.91	2.54	9.50
n-Undecane	66	97.06%	0.55	17.91	2.89	3.78	3.41	1.88	4.19
1-Dodecene	63	92.65%	0.51	4.45	1.00	1.13	0.62	2.91	12.83
n-Dodecane	61	89.71%	0.59	17.60	1.93	2.82	2.96	2.79	10.17
1-Tridecene	13	19.12%	0.55	1.69	0.85	0.90	0.35	1.04	0.44
n-Tridecane	48	70.59%	0.53	11.95	1.06	1.61	1.80	4.40	23.58

Table 9-8. 1992 Summary Statistics for Birmingham, AL (B2AL)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	70	98.59%	0.89	19.96	7.85	8.73	4.10	0.63	0.13
Acetylene	65	91.55%	0.96	11.16	3.78	4.16	2.23	0.84	0.37
Ethane	71	100.00%	0.76	12.72	4.43	4.73	2.42	0.93	1.12
Propylene	65	91.55%	0.60	6.65	2.36	2.57	1.37	0.84	0.46
Propane	71	100.00%	1.30	17.44	5.85	6.56	3.61	0.81	0.21
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	64	90.14%	0.59	21.45	1.46	2.63	3.78	3.85	15.60
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	64	90.14%	0.53	6.46	1.98	2.05	1.13	1.54	3.86
1,3-Butadiene	31	43.66%	0.52	1.70	0.75	0.84	0.27	1.47	2.35
n-Butane	70	98.59%	0.74	84.13	3.71	6.37	10.56	6.08	43.56
t-2-Butene	24	33.80%	0.51	3.59	0.80	0.97	0.65	3.20	11.81
c-2-Butene	9	12.68%	0.52	2.92	0.92	1.11	0.76	1.98	4.28
3-Methyl-1-butene	7	9.86%	0.44	2.11	0.75	0.98	0.60	1.43	1.28
Isopentane	69	97.18%	0.92	137.73	8.46	13.93	21.94	4.42	21.27
1-Pentene	7	9.86%	0.50	6.26	0.80	1.65	2.07	2.48	6.26
2-Methyl-1-butene	41	57.75%	0.50	9.28	0.88	1.34	1.51	4.14	19.85
n-Pentane	70	98.59%	0.56	66.22	3.42	5.30	8.67	5.66	37.04
Isoprene	56	78.87%	0.51	20.27	2.85	3.68	3.34	2.53	10.10
t-2-Pentene	37	52.11%	0.51	10.24	0.83	1.46	1.80	3.92	16.97
c-2-Pentene	20	28.17%	0.52	5.43	0.81	1.20	1.17	2.96	9.48
2-Methyl-2-butene	51	71.83%	0.51	14.03	1.09	1.59	2.06	5.01	28.24
Neohexane	71	100.00%	1.88	8.90	3.70	4.14	1.69	1.12	0.56
Cyclopentene	6	8.45%	0.46	1.71	0.80	0.89	0.48	1.14	0.94
4-Methyl-1-pentene	41	57.75%	0.48	2.32	0.78	0.96	0.47	1.22	0.68
2,3-Dimethylbutane	18	25.35%	0.43	4.77	0.80	1.18	1.16	2.62	6.20
Cyclopentane	51	71.83%	0.55	10.13	1.40	1.65	1.42	4.53	26.10
Isohexane	69	97.18%	0.51	29.10	2.67	3.43	3.74	5.02	32.98
3-Methylpentane	65	91.55%	0.52	17.56	1.86	2.61	2.68	3.50	15.79
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	17	23.94%	0.50	3.42	0.85	1.03	0.69	2.90	9.75
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	66	92.96%	0.50	15.24	1.93	2.64	2.64	3.02	10.20
t-2-Hexene	5	7.04%	0.62	4.33	0.96	1.70	1.54	1.76	3.00

Table 9-8. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	3	4.23%	0.49	1.14	0.60	0.74	0.35	1.54	.
Methylcyclopentane	56	78.87%	0.57	6.78	1.36	1.73	1.26	2.55	7.22
2,4-Dimethylpentane	42	59.15%	0.59	4.61	0.91	1.08	0.71	3.52	15.47
Benzene	71	100.00%	1.38	18.89	4.32	5.09	3.28	2.07	5.46
Cyclohexane	62	87.32%	0.54	14.97	1.49	2.22	2.55	3.66	14.57
Isoheptane	49	69.01%	0.52	4.76	1.52	1.81	1.02	0.89	0.35
2,3-Dimethylpentane	8	11.27%	0.49	9.42	0.63	2.10	3.06	2.51	6.54
3-Methylhexane	71	100.00%	0.72	8.35	1.75	2.02	1.25	2.69	9.98
2,2,4-Trimethylpentane	67	94.37%	0.52	12.28	2.16	2.48	1.79	2.63	12.40
1-Heptene	6	8.45%	0.52	2.19	0.63	0.95	0.66	1.81	2.99
n-Heptane	48	67.61%	0.53	3.83	0.80	1.03	0.70	3.01	9.12
Methylcyclohexane	27	38.03%	0.50	1.49	0.70	0.80	0.26	1.18	0.94
2,2,3-Trimethylpentane	22	30.99%	0.47	1.63	0.63	0.70	0.24	2.98	11.11
2,3,4-Trimethylpentane	48	67.61%	0.48	3.83	1.03	1.13	0.57	2.39	9.75
Toluene	71	100.00%	1.08	53.99	7.41	8.56	7.35	3.83	20.98
2-Methylheptane	35	49.30%	0.51	1.65	0.75	0.83	0.29	1.65	2.46
3-Methylheptane	26	36.62%	0.50	1.43	0.65	0.78	0.26	1.29	0.80
1-Octene	15	21.13%	0.51	1.25	0.65	0.73	0.22	1.27	0.93
n-Octane	13	18.31%	0.45	1.94	0.73	0.84	0.38	2.27	6.23
Ethylbenzene	60	84.51%	0.58	5.78	1.55	1.77	1.06	1.85	3.94
p-Xylene + m-Xylene	70	98.59%	0.57	22.20	4.70	5.20	3.91	2.03	5.76
Styrene	38	53.52%	0.52	4.46	0.69	0.87	0.63	5.18	29.53
o-Xylene	59	83.10%	0.53	7.84	1.80	1.99	1.30	2.20	6.64
1-Nonene	1	1.41%	1.52	1.52	1.52	1.52	.	.	.
n-Nonane	18	25.35%	0.50	3.82	0.65	0.92	0.79	3.24	11.48
Isopropylbenzene	1	1.41%	0.65	0.65	0.65	0.65	.	.	.
n-Propylbenzene	69	97.18%	0.71	7.45	2.64	2.89	1.63	0.86	0.20
alpha-Pinene	27	38.03%	0.49	2.22	0.62	0.78	0.41	2.41	5.97
m-Ethyltoluene	61	85.92%	0.59	6.35	1.87	2.09	1.15	1.32	2.21
p-Ethyltoluene	10	14.08%	0.42	1.78	0.66	0.84	0.44	1.39	1.20
1,3,5-Trimethylbenzene	45	63.38%	0.53	7.57	0.94	1.10	1.04	5.75	36.18
o-Ethyltoluene	61	85.92%	0.50	3.35	1.17	1.27	0.59	1.09	1.49
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	66	92.96%	0.54	7.32	2.13	2.29	1.32	1.25	2.37

Table 9-8. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	9	12.68%	0.50	20.63	1.54	3.85	6.46	2.73	7.65
1,2,3-Trimethylbenzene	71	100.00%	1.16	10.12	2.82	3.46	1.93	1.97	3.72
p-Diethylbenzene	36	50.70%	0.47	1.74	0.74	0.85	0.29	1.27	1.56
1-Undecene	69	97.18%	0.48	4.99	1.50	1.67	0.81	1.67	3.89
n-Undecane	62	87.32%	0.54	89.40	1.46	3.22	11.19	7.73	60.42
1-Dodecene	60	84.51%	0.54	3.07	0.93	1.06	0.46	2.12	6.05
n-Dodecane	61	85.92%	0.53	104.86	1.06	2.97	13.29	7.77	60.57
1-Tridecene	5	7.04%	0.51	2.77	0.54	0.99	1.00	2.23	4.98
n-Tridecane	28	39.44%	0.47	41.76	0.81	2.41	7.73	5.26	27.77

Table 9-9. 1992 Summary Statistics for Birmingham, AL (B3AL)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	47	95.92%	1.66	17.12	6.38	7.21	3.74	0.72	-0.17
Acetylene	45	91.84%	0.85	6.48	2.02	2.64	1.62	0.83	-0.49
Ethane	48	97.96%	0.75	11.86	4.67	4.84	2.40	0.41	0.28
Propylene	44	89.80%	0.65	6.00	1.52	2.03	1.26	1.21	0.96
Propane	49	100.00%	0.99	10.35	5.32	5.39	2.25	0.31	-0.35
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	46	93.88%	0.64	7.76	1.66	2.07	1.36	2.11	5.84
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	48	97.96%	0.55	3.88	1.28	1.46	0.83	1.34	1.28
1,3-Butadiene	13	26.53%	0.50	1.39	0.69	0.77	0.25	1.34	2.04
n-Butane	49	100.00%	0.66	34.02	4.39	6.12	5.71	3.06	12.00
t-2-Butene	15	30.61%	0.51	3.39	0.74	1.09	0.77	2.25	5.40
c-2-Butene	8	16.33%	0.56	1.63	0.76	0.90	0.42	1.16	-0.19
3-Methyl-1-butene	3	6.12%	0.74	0.86	0.75	0.78	0.07	1.69	.
Isopentane	49	100.00%	1.58	76.78	8.65	12.39	13.24	3.06	12.07
1-Pentene	11	22.45%	0.59	2.53	0.75	0.93	0.55	3.01	9.52
2-Methyl-1-butene	20	40.82%	0.56	3.77	1.26	1.48	1.01	1.46	1.10
n-Pentane	48	97.96%	0.62	41.78	3.71	5.79	7.08	3.40	14.40
Isoprene	41	83.67%	0.55	13.52	5.30	5.99	4.44	0.30	-1.34
t-2-Pentene	16	32.65%	0.56	3.80	0.98	1.33	0.96	1.95	3.13
c-2-Pentene	14	28.57%	0.55	2.06	0.77	0.89	0.44	2.17	3.94
2-Methyl-2-butene	22	44.90%	0.36	4.89	1.30	1.55	1.20	1.90	3.60
Neohexane	49	100.00%	2.65	76.61	21.85	23.42	16.16	1.40	2.37
Cyclopentene	2	4.08%	0.53	0.62	0.58	0.58	0.06	.	.
4-Methyl-1-pentene	35	71.43%	0.54	2.64	0.97	1.07	0.47	1.64	3.33
2,3-Dimethylbutane	11	22.45%	0.54	7.96	0.74	1.52	2.18	3.08	9.75
Cyclopentane	40	81.63%	0.58	4.71	1.14	1.47	0.86	1.79	4.22
Isohexane	46	93.88%	0.58	13.60	2.34	3.01	2.56	2.22	6.49
3-Methylpentane	42	85.71%	0.53	8.93	2.09	2.57	1.89	1.74	3.60
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	13	26.53%	0.59	1.49	0.74	0.87	0.28	0.94	0.11
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	44	89.80%	0.55	6.91	1.43	1.91	1.26	1.88	4.95
t-2-Hexene	3	6.12%	0.61	0.72	0.70	0.68	0.06	-1.51	.

Table 9-9. Continued

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	1	2.04%	0.55	0.55	0.55	0.55	.	.	.
Methylcyclopentane	40	81.63%	0.51	4.58	1.55	1.74	0.94	1.04	1.02
2,4-Dimethylpentane	24	48.98%	0.52	4.75	1.00	1.22	0.90	3.05	10.67
Benzene	49	100.00%	1.01	9.09	3.35	3.76	1.99	0.86	-0.09
Cyclohexane	44	89.80%	0.56	29.01	1.88	3.02	4.38	5.11	29.96
Isoheptane	16	32.65%	0.63	2.47	1.03	1.14	0.50	1.37	1.93
2,3-Dimethylpentane	26	53.06%	0.60	13.34	1.42	2.10	2.44	4.17	19.40
3-Methylhexane	49	100.00%	0.62	14.98	2.06	2.72	2.30	3.50	16.52
2,2,4-Trimethylpentane	47	95.92%	0.56	8.95	1.90	2.40	1.73	1.62	3.33
1-Heptene	4	8.16%	0.50	0.84	0.59	0.63	0.15	1.46	2.37
n-Heptane	30	61.22%	0.47	7.20	0.77	1.07	1.20	4.91	25.52
Methylcyclohexane	14	28.57%	0.53	4.20	0.77	1.04	0.93	3.41	12.20
2,2,3-Trimethylpentane	13	26.53%	0.56	1.11	0.66	0.71	0.16	1.40	1.97
2,3,4-Trimethylpentane	29	59.18%	0.48	2.74	0.90	1.07	0.56	1.30	1.59
Toluene	49	100.00%	2.07	98.15	13.62	18.51	18.23	2.28	7.03
2-Methylheptane	12	24.49%	0.53	0.98	0.72	0.72	0.15	0.31	-1.19
3-Methylheptane	11	22.45%	0.43	1.02	0.60	0.64	0.15	1.40	3.21
1-Octene	9	18.37%	0.51	0.98	0.69	0.70	0.14	1.01	1.94
n-Octane	13	26.53%	0.53	5.89	0.73	1.14	1.44	3.53	12.59
Ethylbenzene	40	81.63%	0.63	7.44	1.58	1.77	1.18	2.95	13.21
p-Xylene + m-Xylene	49	100.00%	0.88	47.77	5.03	6.05	6.81	4.96	30.12
Styrene	23	46.94%	0.50	3.50	0.77	0.89	0.59	4.22	19.20
o-Xylene	42	85.71%	0.66	22.37	2.04	2.48	3.32	5.50	33.28
1-Nonene	1	2.04%	0.58	0.58	0.58	0.58	.	.	.
n-Nonane	20	40.82%	0.51	6.10	0.82	1.38	1.64	2.70	6.27
Isopropylbenzene	5	10.20%	0.50	2.95	0.66	1.08	1.04	2.20	4.88
n-Propylbenzene	42	85.71%	0.59	182.16	5.58	14.77	29.15	4.88	27.58
alpha-Pinene	22	44.90%	0.55	6.76	0.75	1.17	1.39	3.63	13.63
m-Ethyltoluene	42	85.71%	0.52	18.29	2.27	2.69	3.09	3.90	17.37
p-Ethyltoluene	5	10.20%	0.45	5.58	0.55	1.53	2.27	2.23	4.99
1,3,5-Trimethylbenzene	28	57.14%	0.50	8.05	0.84	1.11	1.38	5.08	26.46
o-Ethyltoluene	47	95.92%	0.50	6.11	1.27	1.52	1.08	2.89	10.21
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	48	97.96%	0.51	22.40	1.70	2.38	3.18	5.56	35.05

Table 9-9. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	15	30.61%	0.55	17.88	2.25	3.30	4.21	3.36	12.16
1,2,3-Trimethylbenzene	46	93.88%	0.86	17.49	1.66	2.33	2.55	4.97	28.57
p-Diethylbenzene	26	53.06%	0.56	2.86	0.83	0.97	0.46	2.90	11.13
1-Undecene	47	95.92%	0.75	22.50	1.63	3.01	3.64	3.76	17.71
n-Undecane	48	97.96%	0.50	37.94	1.67	4.46	6.62	3.22	13.40
1-Dodecene	47	95.92%	0.67	9.50	1.25	1.70	1.39	4.19	22.08
n-Dodecane	41	83.67%	0.51	26.96	1.66	4.25	5.32	2.42	7.36
1-Tridecene	7	14.29%	0.58	1.81	0.77	0.88	0.42	2.45	6.28
n-Tridecane	35	71.43%	0.51	22.52	1.25	2.66	3.90	4.16	20.53

Table 9-10. 1992 Summary Statistics for Beaumont, TX (BMTX)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	67	98.53%	1.62	484.61	15.99	41.46	78.16	4.10	18.77
Acetylene	53	77.94%	1.18	15.39	5.03	5.17	3.32	1.09	1.07
Ethane	68	100.00%	8.62	235.60	31.36	40.94	41.05	3.54	14.04
Propylene	67	98.53%	0.71	158.65	4.01	14.03	30.75	3.21	9.87
Propane	68	100.00%	6.09	97.74	30.68	33.50	19.21	1.07	1.39
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	68	100.00%	3.08	120.63	16.70	20.11	17.37	3.55	17.04
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	67	98.53%	0.87	19.98	2.59	3.45	3.43	3.19	11.32
1,3-Butadiene	41	60.29%	0.51	30.78	1.33	2.96	5.06	4.49	23.49
n-Butane	68	100.00%	6.01	66.12	23.17	26.21	13.86	0.99	0.73
t-2-Butene	43	63.24%	0.54	7.41	1.31	1.75	1.57	2.44	5.90
c-2-Butene	32	47.06%	0.55	8.64	1.12	1.71	1.80	2.83	8.11
3-Methyl-1-butene	36	52.94%	0.55	3.51	1.17	1.32	0.71	1.48	2.25
Isopentane	66	97.06%	6.58	135.35	30.22	37.14	26.47	1.21	1.60
1-Pentene	34	50.00%	0.62	9.62	1.83	2.54	2.05	2.06	4.58
2-Methyl-1-butene	59	86.76%	0.53	6.12	1.83	2.22	1.52	0.90	0.03
n-Pentane	68	100.00%	2.29	58.20	11.87	15.40	10.88	1.78	4.18
Isoprene	62	91.18%	0.52	21.38	1.65	2.55	2.93	4.60	27.87
t-2-Pentene	57	83.82%	0.54	8.18	2.14	2.72	1.96	1.03	0.38
c-2-Pentene	51	75.00%	0.69	4.19	1.53	1.68	0.87	0.92	0.12
2-Methyl-2-butene	66	97.06%	0.53	9.08	2.40	2.88	2.07	1.06	0.60
Neohexane	67	98.53%	5.38	38.69	15.05	16.61	6.60	0.91	1.21
Cyclopentene	25	36.76%	0.40	1.40	0.87	0.85	0.23	0.39	0.23
4-Methyl-1-pentene	53	77.94%	0.51	1.75	0.75	0.84	0.30	1.42	1.72
2,3-Dimethylbutane	64	94.12%	0.55	4.37	1.49	1.82	1.07	1.03	0.12
Cyclopentane	66	97.06%	0.82	9.79	2.59	2.84	1.65	1.60	3.97
Isohexane	68	100.00%	1.69	49.15	7.09	9.72	8.40	2.47	7.85
3-Methylpentane	68	100.00%	1.79	23.16	6.38	7.27	4.23	1.27	2.16
1-Hexene	1	1.47%	2.93	2.93	2.93	2.93	.	.	.
2-Methyl-1-pentene	40	58.82%	0.52	3.43	1.04	1.21	0.67	1.84	3.20
2-Ethyl-1-butene	1	1.47%	0.59	0.59	0.59	0.59	.	.	.
n-Hexane	68	100.00%	1.15	50.40	7.71	10.54	8.48	2.03	6.46
t-2-Hexene	22	32.35%	0.53	2.59	0.75	0.91	0.46	2.45	7.69

Table 9-10. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	15	22.06%	0.44	2.15	0.64	0.79	0.41	2.88	9.45
Methylcyclopentane	68	100.00%	0.73	14.09	4.58	5.14	3.08	1.05	0.74
2,4-Dimethylpentane	53	77.94%	0.56	3.81	1.11	1.29	0.66	1.79	4.04
Benzene	68	100.00%	2.45	55.97	6.60	9.53	9.87	3.12	10.62
Cyclohexane	67	98.53%	1.38	18.85	3.78	4.85	3.68	2.04	4.26
Isoheptane	64	94.12%	0.66	14.27	3.52	4.14	2.87	1.55	2.61
2,3-Dimethylpentane	6	8.82%	0.50	3.67	2.97	2.36	1.40	-0.77	-1.86
3-Methylhexane	68	100.00%	1.22	11.97	3.38	3.96	2.30	1.61	2.64
2,2,4-Trimethylpentane	67	98.53%	0.57	15.41	3.36	4.14	3.25	1.37	1.74
1-Heptene	39	57.35%	0.44	2.70	0.84	1.06	0.60	1.73	2.38
n-Heptane	67	98.53%	0.67	18.88	2.30	3.34	3.37	3.22	11.54
Methylcyclohexane	67	98.53%	0.78	16.23	2.75	3.59	2.84	2.81	9.05
2,2,3-Trimethylpentane	45	66.18%	0.37	2.44	0.91	1.02	0.47	1.21	1.19
2,3,4-Trimethylpentane	59	86.76%	0.49	5.73	1.49	1.77	1.12	1.62	2.71
Toluene	68	100.00%	3.14	71.93	13.38	17.22	13.33	1.79	3.79
2-Methylheptane	66	97.06%	0.55	8.83	1.38	1.78	1.52	3.02	10.51
3-Methylheptane	58	85.29%	0.50	4.85	1.10	1.40	0.92	1.96	4.07
1-Octene	28	41.18%	0.50	1.43	0.70	0.76	0.24	1.14	0.81
n-Octane	57	83.82%	0.54	10.88	0.94	1.68	2.06	3.24	10.81
Ethylbenzene	68	100.00%	0.81	9.51	2.59	2.94	1.76	1.44	2.61
p-Xylene + m-Xylene	68	100.00%	2.16	30.04	7.98	9.29	5.74	1.55	2.65
Styrene	51	75.00%	0.53	3.56	0.98	1.18	0.68	1.64	2.69
o-Xylene	67	98.53%	0.73	10.40	2.75	3.11	1.91	1.54	2.91
1-Nonene	8	11.76%	0.37	1.97	0.96	1.14	0.62	0.40	-1.56
n-Nonane	53	77.94%	0.49	9.30	0.96	1.94	2.25	2.23	4.13
Isopropylbenzene	3	4.41%	0.62	0.68	0.65	0.65	0.03	0.00	.
n-Propylbenzene	58	85.29%	0.55	10.66	1.82	2.38	1.87	2.08	5.93
alpha-Pinene	55	80.88%	0.51	4.76	0.96	1.18	0.76	2.48	8.36
m-Ethyltoluene	66	97.06%	0.64	6.86	2.25	2.64	1.47	1.21	1.11
p-Ethyltoluene	34	50.00%	0.52	2.61	0.92	1.05	0.50	1.50	1.98
1,3,5-Trimethylbenzene	59	86.76%	0.49	4.01	1.07	1.32	0.79	1.69	2.73
o-Ethyltoluene	68	100.00%	0.79	5.77	1.56	1.89	0.95	1.68	3.55
1-Decene	2	2.94%	1.95	4.04	2.99	2.99	1.47	.	.
1,2,4-Trimethylbenzene	68	100.00%	0.82	12.57	3.50	4.24	2.62	1.49	2.40

Table 9-10. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	41	60.29%	0.54	15.12	1.53	2.74	2.90	2.56	8.07
1,2,3-Trimethylbenzene	68	100.00%	1.17	18.55	2.44	3.04	2.29	4.97	31.88
p-Diethylbenzene	44	64.71%	0.54	3.33	0.96	1.11	0.57	1.90	4.54
1-Undecene	67	98.53%	0.80	5.05	1.36	1.67	0.87	2.05	4.30
n-Undecane	68	100.00%	0.75	21.62	2.41	3.37	3.21	3.41	15.93
1-Dodecene	67	98.53%	0.56	3.23	0.93	1.14	0.61	1.97	3.75
n-Dodecane	68	100.00%	0.51	8.77	1.65	2.07	1.56	2.32	6.95
1-Tridecene	21	30.88%	0.50	2.14	0.90	1.02	0.42	0.99	1.01
n-Tridecane	50	73.53%	0.43	6.51	0.88	1.17	1.02	3.90	17.36

Table 9-11. 1992 Summary Statistics for Baton Rouge, LA (BRLA)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	47	100.00%	3.78	40.47	10.33	12.82	7.44	1.95	4.50
Acetylene	42	89.36%	1.08	20.89	4.78	5.96	4.67	1.68	3.06
Ethane	47	100.00%	4.25	95.48	24.02	27.28	18.75	1.15	2.10
Propylene	47	100.00%	1.74	40.59	5.10	7.72	7.51	2.53	7.81
Propane	47	100.00%	7.90	1851.76	26.95	87.86	271.04	6.27	41.25
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	47	100.00%	2.90	73.78	12.01	13.60	11.78	3.22	14.56
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	47	100.00%	1.29	11.80	2.76	3.29	1.95	2.21	7.08
1,3-Butadiene	28	59.57%	0.39	5.25	1.19	1.35	0.99	2.56	8.45
n-Butane	47	100.00%	7.00	126.81	21.15	25.53	20.82	3.07	12.31
t-2-Butene	40	85.11%	0.51	12.10	1.05	1.59	1.89	4.68	25.38
c-2-Butene	28	59.57%	0.53	11.63	0.89	1.43	2.10	4.61	22.70
3-Methyl-1-butene	13	27.66%	0.45	3.78	0.80	1.09	0.86	2.86	9.10
Isopentane	46	97.87%	6.84	141.25	24.13	31.33	26.32	2.54	7.80
1-Pentene	15	31.91%	0.70	8.06	1.77	2.65	2.22	1.64	1.89
2-Methyl-1-butene	45	95.74%	0.52	13.31	1.19	2.05	2.33	3.18	12.35
n-Pentane	47	100.00%	2.59	52.13	10.73	13.18	10.46	2.30	6.32
Isoprene	40	85.11%	0.54	6.32	1.70	2.03	1.45	1.46	1.93
t-2-Pentene	45	95.74%	0.49	15.76	1.39	2.39	2.96	3.23	11.48
c-2-Pentene	35	74.47%	0.44	8.65	1.19	1.61	1.49	3.43	14.76
2-Methyl-2-butene	46	97.87%	0.64	21.14	1.73	2.73	3.37	4.03	20.06
Neohexane	47	100.00%	2.70	34.70	8.47	10.15	6.94	1.89	3.58
Cyclopentene	16	34.04%	0.59	2.50	0.78	0.97	0.53	2.13	4.33
4-Methyl-1-pentene	37	78.72%	0.51	2.46	0.90	0.97	0.39	1.70	4.43
2,3-Dimethylbutane	37	78.72%	0.50	3.54	0.92	1.15	0.72	2.18	4.88
Cyclopentane	47	100.00%	1.08	8.62	2.14	2.96	1.94	1.44	1.37
Isohexane	47	100.00%	2.12	30.22	6.25	8.29	6.42	2.04	4.23
3-Methylpentane	47	100.00%	1.08	24.46	4.98	6.74	5.22	1.72	3.09
1-Hexene	3	6.38%	0.71	1.04	0.76	0.84	0.18	1.58	
2-Methyl-1-pentene	26	55.32%	0.56	4.59	1.52	1.72	1.15	1.12	0.52
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	47	100.00%	1.65	45.44	4.98	8.02	7.87	2.88	10.84
t-2-Hexene	20	42.55%	0.49	2.66	1.10	1.17	0.68	1.16	0.66

Table 9-11. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	12	25.53%	0.58	1.64	0.69	0.80	0.31	2.19	4.71
Methylcyclopentane	47	100.00%	0.92	21.03	3.17	4.20	3.56	2.71	10.17
2,4-Dimethylpentane	45	95.74%	0.56	4.87	1.18	1.54	1.04	1.56	2.09
Benzene	47	100.00%	2.95	33.95	5.45	7.81	5.83	2.70	8.99
Cyclohexane	47	100.00%	0.56	7.56	2.68	3.15	1.59	1.02	0.98
Isoheptane	47	100.00%	1.08	15.33	3.30	4.14	3.05	1.67	3.06
2,3-Dimethylpentane	7	14.89%	0.56	2.44	0.71	0.99	0.67	2.16	4.77
3-Methylhexane	47	100.00%	1.85	13.23	3.80	4.49	2.26	1.65	3.74
2,2,4-Trimethylpentane	47	100.00%	1.41	23.45	4.58	6.23	4.49	1.62	3.36
1-Heptene	20	42.55%	0.53	2.21	0.77	0.97	0.52	1.44	1.33
n-Heptane	47	100.00%	0.65	6.84	1.77	2.30	1.42	1.46	2.23
Methylcyclohexane	46	97.87%	0.54	6.35	1.82	2.06	1.30	1.38	2.40
2,2,3-Trimethylpentane	38	80.85%	0.55	3.76	1.01	1.22	0.69	1.66	3.57
2,3,4-Trimethylpentane	47	100.00%	0.68	8.84	1.58	2.21	1.63	1.86	4.69
Toluene	47	100.00%	6.07	65.19	15.60	19.23	11.74	1.63	3.69
2-Methylheptane	47	100.00%	0.51	4.73	1.25	1.58	1.00	1.69	2.65
3-Methylheptane	42	89.36%	0.58	4.07	0.94	1.31	0.79	1.58	2.39
1-Octene	31	65.96%	0.52	3.99	1.09	1.33	0.81	1.44	2.27
n-Octane	43	91.49%	0.50	3.31	1.03	1.23	0.68	1.62	2.36
Ethylbenzene	47	100.00%	1.41	13.84	3.58	4.46	2.60	1.76	3.72
p-Xylene + m-Xylene	47	100.00%	3.36	37.04	8.98	10.79	6.69	1.73	3.97
Styrene	32	68.09%	0.45	3.42	0.94	1.21	0.69	1.22	1.65
o-Xylene	47	100.00%	0.93	12.26	2.75	3.38	2.36	1.70	3.39
1-Nonene	22	46.81%	0.54	1.23	0.59	0.70	0.18	1.58	2.41
n-Nonane	45	95.74%	0.64	3.68	1.59	1.66	0.70	0.97	1.41
Isopropylbenzene	14	29.79%	0.57	2.63	0.94	1.09	0.56	2.08	4.36
n-Propylbenzene	46	97.87%	0.51	10.68	2.20	2.96	2.43	1.74	2.75
alpha-Pinene	40	85.11%	0.52	3.34	0.80	1.06	0.57	2.05	5.47
m-Ethyltoluene	45	95.74%	0.66	8.89	2.08	2.58	1.62	1.79	4.12
p-Ethyltoluene	22	46.81%	0.40	2.32	1.01	1.04	0.53	1.16	1.25
1,3,5-Trimethylbenzene	39	82.98%	0.52	4.20	1.01	1.37	0.91	1.65	2.39
o-Ethyltoluene	47	100.00%	0.63	5.24	1.38	1.65	0.93	1.76	3.72
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	47	100.00%	1.09	15.25	3.07	3.89	2.82	1.90	4.65

Table 9-11. Continued

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	31	65.96%	0.43	3.72	0.91	1.20	0.78	1.73	3.29
1,2,3-Trimethylbenzene	47	100.00%	1.19	10.60	2.59	3.00	1.66	2.75	9.83
p-Diethylbenzene	40	85.11%	0.49	2.01	0.98	1.02	0.39	0.76	-0.08
1-Undecene	44	93.62%	1.52	15.65	7.42	7.93	3.66	0.28	-0.44
n-Undecane	47	100.00%	0.57	4.10	1.36	1.68	0.91	0.95	-0.05
1-Dodecene	44	93.62%	1.54	13.45	4.69	5.16	2.70	1.11	1.48
n-Dodecane	47	100.00%	0.55	9.84	1.22	1.55	1.56	4.19	19.53
1-Tridecene	13	27.66%	0.48	1.69	0.66	0.84	0.39	1.27	0.68
n-Tridecane	31	65.96%	0.51	1.66	0.78	0.85	0.29	1.40	1.75

Table 9-12. 1992 Summary Statistics for Charlotte, NC (CHNC)

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	52	98.11%	1.18	35.92	9.85	11.25	7.36	1.30	2.06
Acetylene	46	86.79%	0.59	23.52	6.39	7.23	4.85	1.43	2.31
Ethane	52	98.11%	1.26	15.81	5.01	5.90	3.21	0.94	0.73
Propylene	52	98.11%	0.69	13.63	3.49	4.02	3.12	1.67	2.65
Propane	52	98.11%	1.37	33.68	6.24	7.31	6.00	2.61	8.22
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	53	100.00%	0.69	12.23	2.18	3.65	3.11	1.40	1.27
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	53	100.00%	0.53	7.79	2.39	2.73	1.80	1.42	1.58
1,3-Butadiene	30	56.60%	0.53	3.79	1.20	1.47	0.91	1.19	0.41
n-Butane	53	100.00%	1.03	26.20	5.95	7.53	5.73	1.36	1.56
t-2-Butene	28	52.83%	0.54	2.54	1.09	1.23	0.61	0.85	-0.18
c-2-Butene	19	35.85%	0.48	39.63	0.83	3.02	8.88	4.33	18.85
3-Methyl-1-butene	16	30.19%	0.51	2.16	0.80	1.06	0.53	0.82	-0.59
Isopentane	53	100.00%	2.63	65.29	13.92	19.87	16.16	1.48	1.58
1-Pentene	16	30.19%	0.60	6.01	1.34	1.76	1.35	2.28	6.33
2-Methyl-1-butene	37	69.81%	0.54	5.46	1.39	1.82	1.35	1.57	1.93
n-Pentane	52	98.11%	0.89	65.49	4.93	7.55	9.81	4.36	24.04
Isoprene	48	90.57%	0.48	19.19	3.13	4.14	3.87	1.90	4.75
t-2-Pentene	39	73.58%	0.62	6.66	1.54	2.13	1.60	1.65	2.32
c-2-Pentene	34	64.15%	0.50	3.73	1.09	1.37	0.88	1.67	2.30
2-Methyl-2-butene	41	77.36%	0.62	8.61	1.44	2.30	1.97	1.97	3.74
Neohexane	41	77.36%	0.57	16.54	5.20	5.42	3.70	0.95	1.27
Cyclopentene	15	28.30%	0.51	1.33	0.66	0.78	0.30	1.14	-0.20
4-Methyl-1-pentene	42	79.25%	0.52	3.42	1.08	1.22	0.67	1.64	2.90
2,3-Dimethylbutane	31	58.49%	0.51	2.46	0.88	1.04	0.56	1.41	0.94
Cyclopentane	51	96.23%	0.56	6.98	1.74	2.39	1.67	1.45	1.58
Isohexane	53	100.00%	0.72	18.63	4.37	5.48	4.39	1.74	2.88
3-Methylpentane	52	98.11%	0.76	13.41	3.61	4.19	2.96	1.65	2.84
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	24	45.28%	0.65	5.65	1.21	1.63	1.15	2.07	5.47
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	53	100.00%	0.52	9.93	2.69	3.27	2.44	1.34	1.39
t-2-Hexene	17	32.08%	0.49	1.90	0.76	0.98	0.50	1.11	-0.46

Table 9-12. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	7	13.21%	0.46	1.13	0.99	0.83	0.30	-0.32	-2.56
Methylcyclopentane	50	94.34%	0.59	7.20	1.85	2.32	1.74	1.57	2.14
2,4-Dimethylpentane	43	81.13%	0.52	5.56	1.35	1.78	1.25	1.72	2.65
Benzene	53	100.00%	1.75	20.06	6.25	6.83	4.30	1.48	2.24
Cyclohexane	51	96.23%	0.64	4.64	1.83	1.97	0.93	0.73	0.30
Isoheptane	40	75.47%	0.55	11.59	1.37	1.91	1.84	3.98	19.86
2,3-Dimethylpentane	30	56.60%	0.55	14.24	1.36	2.31	2.75	3.29	12.51
3-Methylhexane	53	100.00%	0.54	7.58	2.55	3.12	1.76	1.09	0.43
2,2,4-Trimethylpentane	53	100.00%	0.95	20.38	4.77	5.76	4.70	1.74	3.00
1-Heptene	16	30.19%	0.50	1.79	0.74	0.90	0.44	1.37	0.51
n-Heptane	48	90.57%	0.48	4.63	1.43	1.66	1.00	1.35	1.46
Methylcyclohexane	42	79.25%	0.52	3.35	1.20	1.39	0.77	1.34	1.13
2,2,3-Trimethylpentane	39	73.58%	0.49	2.87	0.85	1.12	0.65	1.72	2.29
2,3,4-Trimethylpentane	45	84.91%	0.59	7.36	1.77	2.24	1.73	1.83	3.18
Toluene	53	100.00%	4.05	159.74	17.40	21.61	23.04	4.37	24.98
2-Methylheptane	44	83.02%	0.56	3.37	1.22	1.36	0.73	1.42	1.81
3-Methylheptane	34	64.15%	0.50	2.84	1.01	1.23	0.64	1.52	1.53
1-Octene	34	64.15%	0.53	3.00	0.98	1.15	0.65	1.56	1.74
n-Octane	36	67.92%	0.48	2.11	0.73	0.95	0.46	0.97	0.03
Ethylbenzene	52	98.11%	0.66	8.66	2.61	2.98	1.97	1.53	2.32
p-Xylene + m-Xylene	53	100.00%	1.73	29.77	7.70	9.29	6.79	1.65	2.55
Styrene	39	73.58%	0.50	4.66	1.34	1.52	0.95	1.26	1.60
o-Xylene	53	100.00%	0.59	11.07	2.73	3.24	2.54	1.67	2.75
1-Nonene	15	28.30%	0.50	1.12	0.62	0.70	0.21	1.15	0.07
n-Nonane	38	71.70%	0.48	5.99	0.89	1.09	0.89	4.72	25.86
Isopropylbenzene	7	13.21%	0.60	1.99	0.69	0.87	0.50	2.51	6.42
n-Propylbenzene	49	92.45%	0.58	18.90	2.45	4.62	5.06	1.64	1.77
alpha-Pinene	41	77.36%	0.53	4.08	0.98	1.27	0.74	1.87	4.10
m-Ethyltoluene	52	98.11%	0.65	9.99	2.52	3.23	2.29	1.42	1.64
p-Ethyltoluene	29	54.72%	0.50	2.18	0.89	1.07	0.51	1.08	0.16
1,3,5-Trimethylbenzene	43	81.13%	0.53	5.19	1.19	1.63	1.13	1.75	2.87
o-Ethyltoluene	53	100.00%	0.68	7.05	1.84	2.31	1.58	1.66	2.36
1-Decene	2	3.77%	0.81	1.04	0.93	0.93	0.16	.	.
1,2,4-Trimethylbenzene	53	100.00%	1.03	15.10	3.69	4.62	3.38	1.56	2.42

Table 9-12. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	19	35.85%	0.51	10.77	4.59	4.69	2.98	0.54	-0.43
1,2,3-Trimethylbenzene	53	100.00%	1.28	6.79	2.71	3.19	1.40	0.95	0.23
p-Diethylbenzene	31	58.49%	0.58	5.37	1.01	1.23	0.94	3.41	13.30
1-Undecene	52	98.11%	0.85	9.80	2.70	3.17	1.72	1.75	3.69
n-Undecane	53	100.00%	0.65	51.62	1.85	3.85	7.73	5.27	30.14
1-Dodecene	52	98.11%	0.52	7.47	1.64	1.96	1.30	2.28	6.45
n-Dodecane	53	100.00%	0.52	103.12	1.49	4.46	14.29	6.61	45.88
1-Tridecene	20	37.74%	0.47	1.73	0.71	0.78	0.29	2.14	5.53
n-Tridecane	41	77.36%	0.50	24.82	0.87	1.74	3.86	5.68	33.90

Table 9-13. 1992 Summary Statistics for Dallas, TX (DLTX)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	69	100.00%	3.38	85.80	11.35	13.16	11.08	4.69	28.16
Acetylene	66	95.65%	0.90	28.46	6.52	7.27	5.42	1.67	3.38
Ethane	69	100.00%	3.68	69.50	13.45	16.28	11.62	2.31	7.28
Propylene	68	98.55%	1.23	19.09	3.58	3.99	2.61	3.15	15.98
Propane	69	100.00%	4.94	66.11	14.50	16.06	10.85	2.46	8.25
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	67	97.10%	1.31	18.46	4.58	4.82	3.02	2.14	6.72
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	68	98.55%	0.71	10.42	2.24	2.54	1.45	2.88	12.82
1,3-Butadiene	48	69.57%	0.52	4.11	0.96	1.19	0.70	2.08	5.48
n-Butane	69	100.00%	0.99	40.56	9.46	10.62	6.92	2.27	7.46
t-2-Butene	42	60.87%	0.54	3.76	0.80	1.00	0.59	3.28	12.62
c-2-Butene	21	30.43%	0.45	5.63	0.67	1.04	1.17	3.47	12.72
3-Methyl-1-butene	23	33.33%	0.48	2.35	0.64	0.80	0.41	2.65	8.62
Isopentane	69	100.00%	6.01	127.33	16.76	21.62	17.74	3.87	19.75
1-Pentene	21	30.43%	0.61	5.83	1.25	1.79	1.42	2.09	3.93
2-Methyl-1-butene	64	92.75%	0.54	9.65	1.24	1.58	1.32	4.25	23.19
n-Pentane	68	98.55%	2.44	37.15	7.49	8.34	5.58	2.86	11.53
Isoprene	61	88.41%	0.50	6.29	0.89	1.25	1.03	3.39	13.42
t-2-Pentene	67	97.10%	0.52	8.45	1.48	1.82	1.37	2.75	9.34
c-2-Pentene	51	73.91%	0.56	5.93	1.03	1.26	0.86	3.79	17.83
2-Methyl-2-butene	68	98.55%	0.65	13.80	1.75	2.14	1.85	4.37	24.55
Neohexane	69	100.00%	5.67	85.75	19.64	24.55	16.58	1.82	3.63
Cyclopentene	15	21.74%	0.46	2.17	0.61	0.75	0.45	2.70	7.47
4-Methyl-1-pentene	53	76.81%	0.54	2.38	0.94	1.08	0.43	1.28	1.38
2,3-Dimethylbutane	46	66.67%	0.51	4.54	0.87	1.14	0.86	2.89	8.16
Cyclopentane	67	97.10%	0.58	13.60	1.89	2.62	2.41	2.78	8.86
Isohexane	69	100.00%	1.95	33.71	5.43	6.43	4.63	3.67	18.68
3-Methylpentane	69	100.00%	0.54	20.27	4.94	5.56	3.83	1.86	4.48
1-Hexene	1	1.45%	0.76	0.76	0.76	0.76	.	.	.
2-Methyl-1-pentene	40	57.97%	0.51	4.31	0.81	0.95	0.65	4.01	19.07
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	69	100.00%	1.21	20.02	3.83	4.49	3.00	2.90	11.37
t-2-Hexene	23	33.33%	0.46	5.91	0.68	1.16	1.28	2.84	8.65

Table 9-13. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	7	10.14%	0.52	1.67	0.72	0.87	0.42	1.50	1.55
Methylcyclopentane	69	100.00%	0.73	10.02	2.34	2.64	1.57	2.49	9.24
2,4-Dimethylpentane	57	82.61%	0.46	6.20	1.05	1.31	0.91	3.43	15.46
Benzene	69	100.00%	2.61	27.42	5.65	6.63	3.74	2.96	13.73
Cyclohexane	65	94.20%	0.65	6.09	1.71	1.82	0.85	2.54	10.05
Isoheptane	68	98.55%	0.82	19.43	3.37	4.07	3.09	2.82	10.76
2,3-Dimethylpentane	2	2.90%	0.70	2.13	1.42	1.42	1.01	.	.
3-Methylhexane	69	100.00%	1.34	12.75	2.99	3.64	2.04	2.41	7.48
2,2,4-Trimethylpentane	69	100.00%	1.53	30.39	4.71	5.46	3.99	3.89	22.13
1-Heptene	29	42.03%	0.51	1.68	0.75	0.78	0.23	2.33	7.86
n-Heptane	68	98.55%	0.84	10.35	1.77	2.33	1.81	2.57	8.02
Methylcyclohexane	66	95.65%	0.60	4.07	1.16	1.25	0.58	2.14	7.72
2,2,3-Trimethylpentane	53	76.81%	0.47	4.48	0.92	1.08	0.62	3.60	17.35
2,3,4-Trimethylpentane	68	98.55%	0.63	11.46	1.81	2.10	1.51	3.88	21.81
Toluene	69	100.00%	5.15	90.33	16.54	20.64	14.61	2.38	7.82
2-Methylheptane	67	97.10%	0.51	6.86	1.27	1.50	0.92	3.35	16.86
3-Methylheptane	64	92.75%	0.54	8.12	1.09	1.39	1.17	4.14	20.22
1-Octene	41	59.42%	0.49	3.51	0.78	0.89	0.51	3.82	18.34
n-Octane	59	85.51%	0.52	5.11	0.87	1.13	0.71	3.26	15.93
Ethylbenzene	69	100.00%	0.95	25.04	2.82	3.60	3.27	4.50	27.18
p-Xylene + m-Xylene	69	100.00%	3.00	91.09	9.72	12.64	11.97	4.54	27.21
Styrene	45	65.22%	0.52	2.59	0.80	0.89	0.40	2.37	7.21
o-Xylene	68	98.55%	1.11	28.10	3.33	4.27	3.70	4.35	25.64
1-Nonene	7	10.14%	0.53	0.90	0.64	0.66	0.13	1.22	1.49
n-Nonane	64	92.75%	0.52	6.80	1.11	1.63	1.22	2.01	4.54
Isopropylbenzene	9	13.04%	0.57	0.97	0.61	0.64	0.13	2.72	7.72
n-Propylbenzene	65	94.20%	0.50	5.55	1.82	1.96	0.84	1.70	4.71
alpha-Pinene	63	91.30%	0.52	6.05	1.05	1.34	0.88	3.14	13.10
m-Ethyltoluene	68	98.55%	1.02	16.62	2.89	3.48	2.38	3.13	13.88
p-Ethyltoluene	59	85.51%	0.51	5.54	0.93	1.14	0.75	3.88	20.63
1,3,5-Trimethylbenzene	68	98.55%	0.47	7.97	1.44	1.67	1.08	3.44	16.96
o-Ethyltoluene	68	98.55%	0.77	9.70	1.84	2.26	1.35	3.09	13.91
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	69	100.00%	1.84	28.81	5.08	5.92	3.87	3.49	17.90

Table 9-13. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	60	86.96%	0.54	9.90	1.23	2.07	1.90	2.18	5.16
1,2,3-Trimethylbenzene	69	100.00%	1.47	10.76	2.81	3.40	1.68	2.21	5.85
p-Diethylbenzene	52	75.36%	0.47	6.43	1.05	1.30	1.04	3.07	11.83
1-Undecene	66	95.65%	0.54	4.55	1.38	1.65	0.90	1.56	2.08
n-Undecane	68	98.55%	1.01	46.02	2.48	3.69	5.54	6.93	52.80
1-Dodecene	64	92.75%	0.51	7.22	0.96	1.31	1.13	3.75	16.24
n-Dodecane	69	100.00%	0.67	27.79	1.45	2.53	3.61	5.52	36.28
1-Tridecene	25	36.23%	0.54	4.32	0.85	1.29	0.95	1.95	3.59
n-Tridecane	57	82.61%	0.46	7.68	0.86	1.27	1.17	3.47	15.69

Table 9-14. 1992 Summary Statistics for El Paso, TX (EPTX)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	70	100.00%	8.48	52.92	21.76	23.00	8.84	1.23	2.10
Acetylene	70	100.00%	5.41	52.58	15.92	17.01	7.73	1.71	5.66
Ethane	70	100.00%	3.39	68.23	14.21	18.08	12.60	1.79	3.47
Propylene	70	100.00%	2.78	23.22	8.92	9.40	3.95	1.11	1.89
Propane	70	100.00%	3.58	235.92	20.51	33.83	40.66	3.07	11.57
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	70	100.00%	1.18	30.95	6.39	8.80	7.10	1.71	2.85
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	70	100.00%	1.60	22.51	5.51	6.16	2.88	2.91	14.33
1,3-Butadiene	66	94.29%	0.90	4.04	1.83	1.93	0.67	0.84	1.15
n-Butane	70	100.00%	4.31	88.13	17.30	21.25	16.92	1.98	4.31
t-2-Butene	67	95.71%	0.58	10.77	1.73	2.10	1.42	3.68	20.46
c-2-Butene	63	90.00%	0.51	11.66	1.27	1.75	1.87	3.89	16.42
3-Methyl-1-butene	42	60.00%	0.52	2.35	0.88	1.02	0.48	1.18	0.67
Isopentane	69	98.57%	6.80	126.92	28.96	35.80	21.95	1.71	3.83
1-Pentene	38	54.29%	0.60	10.22	1.69	2.20	1.77	2.89	10.92
2-Methyl-1-butene	69	98.57%	0.77	11.27	2.42	3.03	1.91	2.03	5.35
n-Pentane	70	100.00%	3.61	72.53	15.12	19.68	12.48	1.81	4.38
Isoprene	62	88.57%	0.52	1.94	0.96	1.05	0.35	0.85	0.11
t-2-Pentene	69	98.57%	0.58	12.62	2.54	3.27	2.38	2.34	6.04
c-2-Pentene	65	92.86%	0.55	6.00	1.65	1.85	0.92	2.04	6.23
2-Methyl-2-butene	70	100.00%	0.71	14.50	3.55	4.15	2.37	2.01	5.52
Neohexane	70	100.00%	11.36	97.97	28.84	33.01	17.84	1.39	2.02
Cyclopentene	40	57.14%	0.42	2.05	0.76	0.85	0.36	1.81	3.61
4-Methyl-1-pentene	62	88.57%	0.56	2.22	0.92	0.96	0.33	1.55	3.09
2,3-Dimethylbutane	69	98.57%	0.65	6.56	1.69	2.02	1.19	1.90	4.38
Cyclopentane	70	100.00%	1.29	11.49	4.43	4.66	2.11	0.91	1.05
Isohexane	70	100.00%	2.72	37.80	10.47	12.19	6.67	1.66	3.47
3-Methylpentane	70	100.00%	1.80	27.02	7.76	9.00	4.93	1.24	1.91
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	67	95.71%	0.56	4.03	1.11	1.33	0.66	1.74	3.83
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	70	100.00%	2.58	30.86	8.58	9.87	5.20	1.68	3.87
t-2-Hexene	57	81.43%	0.53	2.95	0.86	1.01	0.47	2.27	6.18

Table 9-14. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	32	45.71%	0.49	1.58	0.73	0.81	0.28	1.29	1.18
Methylcyclopentane	70	100.00%	1.55	21.52	6.15	7.07	3.59	1.57	3.58
2,4-Dimethylpentane	70	100.00%	1.23	12.40	4.54	5.06	2.35	1.10	1.55
Benzene	70	100.00%	4.78	37.75	15.81	16.88	6.49	0.97	1.42
Cyclohexane	69	98.57%	0.84	9.04	3.35	3.67	1.49	1.10	2.01
Isoheptane	63	90.00%	0.59	5.16	1.73	1.90	1.02	1.24	1.53
2,3-Dimethylpentane	69	98.57%	0.69	14.32	5.11	5.67	2.71	1.02	1.36
3-Methylhexane	70	100.00%	1.57	12.98	5.10	5.69	2.40	1.05	1.30
2,2,4-Trimethylpentane	70	100.00%	3.14	26.23	10.44	11.01	4.72	1.02	1.28
1-Heptene	61	87.14%	0.50	4.51	1.01	1.27	0.81	2.35	6.17
n-Heptane	70	100.00%	0.80	9.83	3.30	3.60	1.76	1.27	2.11
Methylcyclohexane	70	100.00%	0.63	6.97	2.05	2.25	1.11	1.70	4.61
2,2,3-Trimethylpentane	68	97.14%	0.70	4.33	1.62	1.82	0.79	1.28	1.74
2,3,4-Trimethylpentane	70	100.00%	1.16	10.89	3.86	4.24	1.96	1.19	1.90
Toluene	70	100.00%	9.94	115.43	37.50	40.81	18.56	1.50	3.58
2-Methylheptane	70	100.00%	0.74	6.99	2.35	2.65	1.19	1.30	2.44
3-Methylheptane	70	100.00%	0.65	5.96	2.13	2.36	1.05	1.26	2.10
1-Octene	70	100.00%	0.68	4.01	1.65	1.79	0.72	0.94	1.09
n-Octane	69	98.57%	0.61	4.83	1.44	1.66	0.89	1.69	3.25
Ethylbenzene	70	100.00%	1.47	16.47	6.54	7.05	3.06	1.00	1.39
p-Xylene + m-Xylene	70	100.00%	5.12	48.59	19.71	21.21	8.86	0.98	1.37
Styrene	69	98.57%	0.62	15.83	1.29	1.61	1.85	6.98	53.61
o-Xylene	70	100.00%	1.52	15.61	6.38	6.84	2.92	0.96	1.35
1-Nonene	59	84.29%	0.49	2.58	1.03	1.14	0.43	1.26	1.86
n-Nonane	70	100.00%	0.60	7.83	2.65	2.73	1.47	1.24	2.17
Isopropylbenzene	34	48.57%	0.38	1.23	0.69	0.74	0.20	0.95	0.43
n-Propylbenzene	68	97.14%	0.78	7.50	3.05	3.14	1.30	0.63	1.06
alpha-Pinene	69	98.57%	0.54	4.67	1.81	1.92	0.82	1.11	1.62
m-Ethyltoluene	70	100.00%	1.20	10.38	4.72	5.11	2.01	0.60	0.14
p-Ethyltoluene	61	87.14%	0.61	3.09	1.51	1.52	0.56	0.60	0.16
1,3,5-Trimethylbenzene	70	100.00%	0.78	6.34	2.22	2.38	1.01	1.52	3.81
o-Ethyltoluene	70	100.00%	0.52	6.43	3.15	3.18	1.21	0.41	0.24
1-Decene	1	1.43%	2.34	2.34	2.34	2.34	.	.	.
1,2,4-Trimethylbenzene	70	100.00%	1.37	21.90	8.23	8.67	3.76	1.08	2.08

Table 9-14. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	67	95.71%	0.52	16.47	2.04	3.31	3.30	2.01	4.14
1,2,3-Trimethylbenzene	70	100.00%	1.33	11.62	3.64	3.82	1.62	1.91	7.00
p-Diethylbenzene	65	92.86%	0.53	4.24	1.73	1.64	0.75	0.81	0.99
1-Undecene	66	94.29%	0.65	3.31	1.61	1.66	0.65	0.77	0.10
n-Undecane	70	100.00%	1.10	76.41	3.18	4.73	9.95	6.39	42.76
1-Dodecene	62	88.57%	0.49	3.40	0.85	0.99	0.46	2.75	11.23
n-Dodecane	70	100.00%	0.79	60.45	1.71	3.62	9.73	5.68	31.59
1-Tridecene	18	25.71%	0.51	3.45	1.10	1.33	0.80	1.29	1.47
n-Tridecane	65	92.86%	0.50	17.94	0.92	1.56	2.75	5.27	28.19

Table 9-15. 1992 Summary Statistics for Ft. Worth, TX (FWTX)

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	68	100.00%	3.24	32.37	8.42	9.93	5.54	1.69	3.69
Acetylene	63	92.65%	0.86	27.47	4.54	5.98	4.46	2.27	8.05
Ethane	68	100.00%	1.05	129.85	14.64	18.09	18.34	3.88	20.58
Propylene	68	100.00%	0.85	12.34	2.58	3.24	2.15	1.78	4.50
Propane	68	100.00%	2.43	123.20	12.45	16.07	16.60	4.49	26.30
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	68	100.00%	1.22	24.87	4.40	5.62	4.11	2.13	6.61
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	64	94.12%	0.67	6.82	1.83	2.35	1.44	1.45	1.53
1,3-Butadiene	31	45.59%	0.48	2.33	0.81	1.02	0.53	1.41	1.18
n-Butane	68	100.00%	2.34	57.38	12.02	14.87	11.12	2.12	5.52
t-2-Butene	33	48.53%	0.52	3.43	0.93	1.17	0.74	1.72	2.40
c-2-Butene	20	29.41%	0.53	13.81	0.84	1.65	2.92	4.22	18.31
3-Methyl-1-butene	18	26.47%	0.53	4.07	0.87	1.19	0.92	2.36	5.64
Isopentane	68	100.00%	6.09	157.30	16.30	23.23	22.89	3.66	18.10
1-Pentene	24	35.29%	0.50	9.71	1.53	2.54	2.68	1.53	1.22
2-Methyl-1-butene	55	80.88%	0.51	11.93	1.20	1.84	1.85	3.55	16.51
n-Pentane	68	100.00%	2.13	59.03	7.34	10.45	10.13	3.05	11.53
Isoprene	44	64.71%	0.54	4.05	0.85	1.14	0.76	2.63	7.47
t-2-Pentene	62	91.18%	0.53	13.35	1.30	1.99	1.95	3.81	19.06
c-2-Pentene	44	64.71%	0.50	7.14	1.14	1.45	1.18	2.99	11.99
2-Methyl-2-butene	61	89.71%	0.65	17.70	1.61	2.49	2.74	3.59	16.26
Neohexane	67	98.53%	3.70	51.41	8.37	10.28	7.51	3.18	13.50
Cyclopentene	14	20.59%	0.51	2.49	0.70	0.90	0.53	2.41	6.40
4-Methyl-1-pentene	52	76.47%	0.52	2.17	0.85	0.98	0.39	1.11	0.76
2,3-Dimethylbutane	46	67.65%	0.52	6.09	1.00	1.31	1.04	3.01	10.82
Cyclopentane	66	97.06%	0.59	9.83	1.74	2.35	1.81	2.17	5.69
Isohexane	68	100.00%	1.55	33.93	4.93	6.68	5.56	2.59	9.02
3-Methylpentane	67	98.53%	0.99	21.87	3.67	5.36	4.44	1.95	4.34
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	32	47.06%	0.48	3.77	1.00	1.19	0.82	1.86	3.28
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	68	100.00%	1.09	20.24	3.63	4.66	3.48	2.09	5.78
t-2-Hexene	21	30.88%	0.57	3.95	0.94	1.44	0.99	1.29	0.96

Table 9-15. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	10	14.71%	0.50	1.92	0.68	0.84	0.46	1.88	3.19
Methylcyclopentane	68	100.00%	0.83	11.51	2.23	2.98	2.33	2.16	5.00
2,4-Dimethylpentane	55	80.88%	0.52	5.07	1.06	1.38	0.91	2.16	5.62
Benzene	68	100.00%	1.89	18.35	5.03	6.02	3.59	1.58	2.65
Cyclohexane	62	91.18%	0.53	5.92	1.93	2.06	0.97	1.61	4.33
Isoheptane	65	95.59%	0.64	13.95	2.69	3.62	2.75	1.96	4.17
2,3-Dimethylpentane	3	4.41%	0.81	1.27	1.01	1.03	0.23	0.39	.
3-Methylhexane	68	100.00%	1.01	9.98	2.63	3.28	1.90	1.65	2.79
2,2,4-Trimethylpentane	68	100.00%	1.09	28.35	4.69	5.92	4.55	2.35	8.25
1-Heptene	28	41.18%	0.45	2.17	0.78	0.86	0.43	1.90	3.32
n-Heptane	68	100.00%	0.65	6.67	1.36	1.81	1.23	1.72	3.15
Methylcyclohexane	63	92.65%	0.54	6.53	1.14	1.42	1.01	2.83	10.56
2,2,3-Trimethylpentane	53	77.94%	0.49	4.54	0.83	1.14	0.72	2.59	9.31
2,3,4-Trimethylpentane	67	98.53%	0.61	10.01	1.63	2.16	1.61	2.39	8.10
Toluene	68	100.00%	2.78	218.21	13.31	26.32	39.43	3.18	10.47
2-Methylheptane	60	88.24%	0.53	5.56	1.18	1.42	0.92	2.12	6.26
3-Methylheptane	56	82.35%	0.49	4.78	1.08	1.30	0.82	2.01	5.18
1-Octene	32	47.06%	0.47	3.04	0.80	0.97	0.53	2.47	7.54
n-Octane	46	67.65%	0.51	26.34	0.94	2.06	4.26	4.86	25.32
Ethylbenzene	68	100.00%	0.60	10.29	2.25	2.85	1.96	1.60	2.88
p-Xylene + m-Xylene	68	100.00%	0.97	35.75	8.08	10.12	7.01	1.54	2.49
Styrene	41	60.29%	0.50	4.32	0.76	0.98	0.65	3.73	17.84
o-Xylene	67	98.53%	0.60	12.95	2.86	3.50	2.54	1.62	2.78
1-Nonene	3	4.41%	0.50	0.90	0.61	0.67	0.21	1.20	.
n-Nonane	41	60.29%	0.52	2.30	0.83	0.94	0.39	1.48	2.43
Isopropylbenzene	9	13.24%	0.47	0.99	0.71	0.72	0.18	0.24	-1.13
n-Propylbenzene	66	97.06%	0.57	8.39	1.97	2.00	1.18	2.90	13.73
alpha-Pinene	51	75.00%	0.52	3.26	0.94	1.17	0.61	1.51	2.19
m-Ethyltoluene	67	98.53%	0.64	10.43	2.35	2.91	1.90	1.76	3.89
p-Ethyltoluene	41	60.29%	0.44	2.97	0.94	1.10	0.55	1.68	3.18
1,3,5-Trimethylbenzene	61	89.71%	0.55	5.42	1.38	1.66	1.09	1.81	3.51
o-Ethyltoluene	66	97.06%	0.60	5.75	1.50	1.80	1.04	1.67	3.22
1-Decene	1	1.47%	1.83	1.83	1.83	1.83	.	.	.
1,2,4-Trimethylbenzene	68	100.00%	0.56	18.66	4.09	4.91	3.47	1.75	3.79

Table 9-15. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	33	48.53%	0.50	34.23	0.90	2.03	5.81	5.66	32.31
1,2,3-Trimethylbenzene	68	100.00%	1.33	8.23	2.97	3.37	1.41	1.23	1.56
p-Diethylbenzene	45	66.18%	0.52	2.39	0.94	1.08	0.48	1.05	0.31
1-Undecene	63	92.65%	0.52	6.53	1.34	1.68	1.03	2.28	7.19
n-Undecane	65	95.59%	0.65	9.65	1.91	2.28	1.67	2.19	6.28
1-Dodecene	63	92.65%	0.50	4.60	0.91	1.22	0.78	2.23	6.12
n-Dodecane	62	91.18%	0.59	7.70	1.08	1.69	1.60	2.77	7.63
1-Tridecene	11	16.18%	0.51	1.70	0.58	0.69	0.35	2.96	9.08
n-Tridecane	36	52.94%	0.51	5.96	0.76	1.14	1.09	3.32	11.91

Table 9-16. 1992 Summary Statistics for Juarez, Mexico (JUMX)

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	62	100.00%	1.15	213.71	13.97	17.58	26.55	6.81	50.72
Acetylene	62	100.00%	0.74	38.02	9.87	11.30	7.52	1.04	1.45
Ethane	62	100.00%	2.06	36.92	13.12	14.81	8.58	0.75	-0.14
Propylene	62	100.00%	0.75	13.71	5.15	5.45	3.11	0.58	-0.46
Propane	62	100.00%	10.08	188.55	40.68	53.14	43.20	1.26	0.93
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	62	100.00%	2.04	36.17	6.54	8.52	6.42	2.13	5.79
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	61	98.39%	0.53	9.54	3.02	3.43	1.92	0.94	0.90
1,3-Butadiene	42	67.74%	0.52	3.56	1.18	1.37	0.65	1.54	2.78
n-Butane	62	100.00%	1.21	62.54	19.28	21.90	13.94	1.01	0.68
t-2-Butene	44	70.97%	0.50	4.20	1.25	1.41	0.83	2.04	4.77
c-2-Butene	30	48.39%	0.53	14.24	0.87	1.54	2.54	4.67	23.32
3-Methyl-1-butene	22	35.48%	0.53	2.83	0.75	0.97	0.56	2.18	5.05
Isopentane	62	100.00%	3.45	81.55	18.32	23.18	16.74	1.78	3.71
1-Pentene	37	59.68%	0.56	2.85	1.06	1.19	0.58	1.51	2.10
2-Methyl-1-butene	54	87.10%	0.49	5.54	1.59	1.79	1.01	1.37	2.74
n-Pentane	62	100.00%	2.47	49.78	11.17	14.65	10.47	1.54	2.62
Isoprene	60	96.77%	1.18	23.91	5.65	7.26	5.05	1.53	2.18
t-2-Pentene	47	75.81%	0.56	9.16	1.54	1.99	1.74	2.58	7.48
c-2-Pentene	42	67.74%	0.51	2.85	1.04	1.12	0.50	1.49	3.03
2-Methyl-2-butene	53	85.48%	0.61	11.82	1.86	2.27	1.77	3.30	15.61
Neohexane	62	100.00%	11.40	131.26	32.28	40.16	24.69	1.36	2.12
Cyclopentene	10	16.13%	0.55	2.48	0.91	1.19	0.77	1.01	-0.63
4-Methyl-1-pentene	41	66.13%	0.52	1.77	0.81	0.87	0.33	1.29	1.28
2,3-Dimethylbutane	53	85.48%	0.44	4.50	1.33	1.48	0.84	1.54	2.87
Cyclopentane	61	98.39%	0.78	8.02	2.78	3.12	1.73	0.97	0.94
Isohexane	61	98.39%	1.02	24.76	7.58	8.82	5.68	1.09	0.95
3-Methylpentane	62	100.00%	1.14	16.47	6.23	7.04	3.65	0.44	-0.74
1-Hexene	1	1.61%	1.74	1.74	1.74	1.74	.	.	.
2-Methyl-1-pentene	36	58.06%	0.55	2.62	0.98	1.06	0.45	1.71	3.89
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	62	100.00%	0.95	19.14	6.57	7.21	4.10	0.85	0.66
t-2-Hexene	20	32.26%	0.49	1.76	0.66	0.72	0.27	3.10	11.48

Table 9-16. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	9	14.52%	0.51	0.85	0.59	0.64	0.12	0.92	-0.59
Methylcyclopentane	62	100.00%	0.55	13.21	3.66	4.53	2.72	0.95	0.81
2,4-Dimethylpentane	60	96.77%	0.62	6.25	2.63	2.91	1.53	0.49	-0.85
Benzene	62	100.00%	1.81	23.82	8.47	9.92	5.19	0.50	-0.50
Cyclohexane	61	98.39%	0.83	10.92	3.42	3.59	1.94	1.46	3.08
Isoheptane	56	90.32%	0.52	4.39	1.40	1.54	0.83	1.34	2.05
2,3-Dimethylpentane	59	95.16%	0.55	7.19	2.84	3.12	1.67	0.48	-0.67
3-Methylhexane	62	100.00%	1.54	10.57	4.12	4.48	1.99	0.73	0.03
2,2,4-Trimethylpentane	61	98.39%	0.71	12.39	5.45	5.79	3.04	0.34	-0.98
1-Heptene	37	59.68%	0.49	13.20	1.02	1.85	2.47	3.41	12.91
n-Heptane	61	98.39%	0.63	10.12	2.39	2.84	1.69	1.51	4.24
Methylcyclohexane	57	91.94%	0.59	5.18	1.26	1.60	1.04	1.90	3.80
2,2,3-Trimethylpentane	52	83.87%	0.54	2.10	1.07	1.15	0.44	0.42	-0.84
2,3,4-Trimethylpentane	58	93.55%	0.47	5.27	2.23	2.34	1.21	0.47	-0.77
Toluene	62	100.00%	4.27	71.11	24.81	27.40	15.60	0.82	0.46
2-Methylheptane	58	93.55%	0.53	4.73	1.78	1.88	0.91	0.64	0.08
3-Methylheptane	57	91.94%	0.46	4.16	1.43	1.61	0.79	0.68	0.33
1-Octene	43	69.35%	0.49	2.42	1.10	1.13	0.44	0.62	0.14
n-Octane	53	85.48%	0.50	22.98	1.39	1.99	3.06	6.42	44.35
Ethylbenzene	62	100.00%	0.50	18.55	4.69	5.89	4.26	1.22	1.07
p-Xylene + m-Xylene	62	100.00%	1.40	70.38	14.94	19.25	15.35	1.57	2.23
Styrene	41	66.13%	0.50	6.39	1.06	1.65	1.43	2.15	4.25
o-Xylene	61	98.39%	0.58	22.49	4.71	6.06	4.74	1.61	2.51
1-Nonene	32	51.61%	0.52	1.72	0.84	0.92	0.30	0.82	0.19
n-Nonane	59	95.16%	0.56	4.87	1.64	1.69	0.89	1.03	1.36
Isopropylbenzene	15	24.19%	0.55	0.89	0.71	0.70	0.10	0.21	-0.33
n-Propylbenzene	58	93.55%	0.52	18.53	2.01	2.48	2.50	4.97	30.40
alpha-Pinene	55	88.71%	0.52	3.22	1.39	1.40	0.61	0.71	0.22
m-Ethyltoluene	59	95.16%	0.77	7.75	2.81	3.15	1.69	0.89	0.39
p-Ethyltoluene	44	70.97%	0.50	2.26	1.03	1.06	0.42	0.91	0.76
1,3,5-Trimethylbenzene	55	88.71%	0.53	3.51	1.34	1.43	0.67	1.26	1.70
o-Ethyltoluene	61	98.39%	0.45	5.02	1.86	2.06	0.97	0.60	0.14
1-Decene	1	1.61%	3.69	3.69	3.69	3.69	.	.	.
1,2,4-Trimethylbenzene	62	100.00%	0.65	13.06	4.71	4.96	2.72	0.65	0.18

Table 9-16. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	31	50.00%	0.52	33.14	1.10	3.31	6.66	3.61	14.10
1,2,3-Trimethylbenzene	62	100.00%	1.10	24.20	2.38	3.17	3.14	5.33	34.07
p-Diethylbenzene	48	77.42%	0.52	3.14	1.07	1.18	0.53	1.17	2.32
1-Undecene	62	100.00%	0.77	5.67	2.18	2.12	0.97	0.98	1.80
n-Undecane	62	100.00%	0.57	6.49	2.28	2.45	1.28	1.22	1.98
1-Dodecene	54	87.10%	0.57	5.18	1.33	1.56	0.98	2.11	5.11
n-Dodecane	60	96.77%	0.49	5.21	1.54	1.87	0.97	1.15	1.58
1-Tridecene	13	20.97%	0.52	11.15	0.86	1.89	2.92	3.12	10.13
n-Tridecane	49	79.03%	0.56	3.76	1.06	1.19	0.65	2.47	7.67

Table 9-17. 1992 Summary Statistics for Long Island, NY (LINY)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	8	100.00%	3.28	25.69	12.92	14.47	8.60	0.17	-1.84
Acetylene	7	87.50%	1.94	12.01	3.63	5.95	4.44	0.77	-1.55
Ethane	8	100.00%	2.44	26.93	7.05	10.75	9.60	0.73	-1.05
Propylene	8	100.00%	1.20	9.99	3.59	4.75	3.49	0.55	-1.64
Propane	8	100.00%	2.08	15.67	5.29	6.83	5.30	0.82	-0.85
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	8	100.00%	0.77	10.62	3.22	4.59	3.77	0.72	-1.14
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	8	100.00%	0.77	6.61	3.01	3.42	2.39	0.24	-2.05
1,3-Butadiene	5	62.50%	0.69	1.92	1.84	1.48	0.56	-0.88	-1.70
n-Butane	8	100.00%	2.05	20.57	7.03	9.61	7.57	0.46	-1.86
t-2-Butene	5	62.50%	0.70	2.57	2.03	1.72	0.82	-0.45	-2.50
c-2-Butene	5	62.50%	0.56	2.16	1.53	1.33	0.67	-0.08	-2.05
3-Methyl-1-butene	4	50.00%	0.47	0.81	0.67	0.65	0.15	-0.43	-0.98
Isopentane	8	100.00%	3.70	38.67	14.89	18.32	14.41	0.46	-1.70
1-Pentene	3	37.50%	1.18	1.70	1.28	1.39	0.28	1.50	.
2-Methyl-1-butene	5	62.50%	0.74	2.88	2.13	1.90	0.90	-0.39	-2.06
n-Pentane	8	100.00%	1.34	13.83	4.68	6.22	4.93	0.60	-1.41
Isoprene	5	62.50%	0.49	2.31	1.35	1.41	0.66	-0.04	0.94
t-2-Pentene	6	75.00%	0.55	3.10	1.68	1.70	1.11	0.11	-2.44
c-2-Pentene	5	62.50%	0.52	1.63	1.11	1.06	0.47	-0.02	-2.21
2-Methyl-2-butene	6	75.00%	0.41	3.72	2.52	2.28	1.27	-0.47	-1.24
Neohexane	5	62.50%	0.60	1.09	0.92	0.85	0.20	-0.23	-1.57
Cyclopentene	3	37.50%	0.56	0.69	0.58	0.61	0.07	1.63	.
4-Methyl-1-pentene	4	50.00%	0.68	1.01	0.87	0.86	0.18	-0.07	-5.57
2,3-Dimethylbutane	4	50.00%	0.67	1.28	1.06	1.02	0.27	-0.67	-1.38
Cyclopentane	6	75.00%	0.45	6.04	1.68	2.64	2.36	0.81	-1.56
Isohexane	8	100.00%	0.80	10.66	3.45	4.77	3.96	0.65	-1.42
3-Methylpentane	8	100.00%	0.62	7.58	2.24	3.28	2.84	0.78	-1.19
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	3	37.50%	0.98	1.23	1.22	1.14	0.14	-1.73	.
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	8	100.00%	0.63	5.99	2.10	2.70	2.15	0.61	-1.41
t-2-Hexene	3	37.50%	0.73	0.86	0.78	0.79	0.07	0.59	.

Table 9-17. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	3	37.50%	0.46	0.63	0.46	0.52	0.10	1.73	.
Methylcyclopentane	6	75.00%	0.63	4.39	2.33	2.44	1.50	0.16	-1.76
2,4-Dimethylpentane	5	62.50%	0.65	2.91	1.74	1.71	0.89	0.22	-1.04
Benzene	8	100.00%	2.83	13.53	6.90	7.63	4.49	0.23	-2.05
Cyclohexane	6	75.00%	0.49	2.28	1.20	1.28	0.65	0.50	-0.42
Isoheptane	5	62.50%	0.80	16.84	1.28	5.59	7.01	1.39	1.00
2,3-Dimethylpentane	2	25.00%	1.81	4.88	3.35	3.35	2.17	.	.
3-Methylhexane	8	100.00%	1.14	12.93	2.38	3.78	3.96	2.22	5.10
2,2,4-Trimethylpentane	8	100.00%	0.90	8.24	3.70	4.28	3.14	0.28	-2.03
1-Heptene	3	37.50%	0.69	1.01	0.71	0.80	0.18	1.71	.
n-Heptane	6	75.00%	0.66	10.01	1.30	3.78	4.20	1.03	-1.44
Methylcyclohexane	4	50.00%	0.78	2.95	1.38	1.62	0.96	1.23	1.25
2,2,3-Trimethylpentane	4	50.00%	0.72	1.45	1.27	1.18	0.34	-1.05	-0.22
2,3,4-Trimethylpentane	7	87.50%	0.45	3.04	1.61	1.75	1.13	0.04	-2.23
Toluene	8	100.00%	4.68	72.65	14.96	23.18	23.32	1.60	2.48
2-Methylheptane	5	62.50%	0.59	2.14	1.47	1.46	0.64	-0.35	-1.50
3-Methylheptane	4	50.00%	1.02	1.83	1.45	1.44	0.36	-0.15	-2.69
1-Octene	3	37.50%	0.81	1.05	1.01	0.96	0.13	-1.51	.
n-Octane	4	50.00%	0.69	1.47	0.81	0.95	0.36	1.82	3.44
Ethylbenzene	8	100.00%	0.77	6.47	2.41	3.06	2.28	0.53	-1.59
p-Xylene + m-Xylene	8	100.00%	2.37	22.34	8.84	10.74	8.00	0.46	-1.67
Styrene	4	50.00%	0.69	1.28	1.17	1.08	0.26	-1.72	3.26
o-Xylene	8	100.00%	0.68	7.53	3.02	3.59	2.79	0.40	-1.75
1-Nonene	3	37.50%	0.47	0.77	0.60	0.61	0.15	0.40	.
n-Nonane	4	50.00%	0.65	2.04	1.25	1.30	0.60	0.36	-1.07
Isopropylbenzene	2	25.00%	0.54	0.64	0.59	0.59	0.07	.	.
n-Propylbenzene	8	100.00%	0.75	4.70	1.11	1.54	1.31	2.58	6.93
alpha-Pinene	5	62.50%	0.56	1.91	1.26	1.29	0.54	-0.26	-1.15
m-Ethyltoluene	8	100.00%	0.61	5.48	2.37	2.80	1.85	0.37	-1.58
p-Ethyltoluene	5	62.50%	0.55	1.52	1.14	1.08	0.41	-0.33	-2.06
1,3,5-Trimethylbenzene	7	87.50%	0.55	2.73	1.41	1.66	0.95	0.03	-2.25
o-Ethyltoluene	8	100.00%	0.52	3.49	1.45	1.68	1.15	0.57	-1.25
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	8	100.00%	1.13	9.26	4.07	4.73	3.36	0.35	-1.83

Table 9-17. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	2	25.00%	1.48	5.94	3.71	3.71	3.16	.	.
1,2,3-Trimethylbenzene	8	100.00%	0.88	4.04	2.29	2.41	1.21	0.14	-1.79
p-Diethylbenzene	5	62.50%	0.76	1.96	1.05	1.26	0.57	0.48	-2.85
1-Undecene	8	100.00%	1.00	3.75	2.49	2.34	0.92	-0.03	-0.89
n-Undecane	8	100.00%	0.61	5.42	1.17	1.78	1.62	1.98	4.14
1-Dodecene	8	100.00%	0.69	2.05	0.94	1.07	0.44	1.91	4.12
n-Dodecane	6	75.00%	0.64	1.47	1.25	1.13	0.34	-0.76	-1.44
1-Tridecene	0	0.00%	.	.	.	.	.	.	.
n-Tridecane	5	62.50%	0.52	0.95	0.73	0.77	0.19	-0.18	-1.69

Table 9-18. 1992 Summary Statistics for Miami, FL (MIFL)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	56	100.00%	5.23	46.16	15.45	19.12	9.67	1.38	1.25
Acetylene	56	100.00%	3.97	33.50	10.27	12.18	6.43	1.03	0.67
Ethane	55	98.21%	0.78	23.32	4.56	5.76	4.23	2.21	5.95
Propylene	56	100.00%	1.06	19.77	5.66	7.52	4.56	1.08	0.32
Propane	56	100.00%	2.47	186.07	14.59	34.65	42.28	1.89	3.57
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	56	100.00%	1.53	26.48	4.04	5.96	5.29	2.05	4.77
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	56	100.00%	2.02	12.49	5.01	5.75	2.76	1.01	0.18
1,3-Butadiene	54	96.43%	0.58	4.40	1.34	1.72	0.92	1.36	1.08
n-Butane	56	100.00%	3.14	34.73	10.60	13.25	7.49	1.02	0.20
t-2-Butene	54	96.43%	0.62	7.94	1.45	1.85	1.26	2.47	9.29
c-2-Butene	49	87.50%	0.55	4.82	0.89	1.26	0.82	2.24	6.51
3-Methyl-1-butene	37	66.07%	0.45	1.88	0.86	0.98	0.42	0.77	-0.47
Isopentane	56	100.00%	9.30	165.71	33.80	44.57	31.31	1.66	3.25
1-Pentene	29	51.79%	0.59	10.73	2.32	2.44	1.98	2.67	10.45
2-Methyl-1-butene	55	98.21%	1.02	8.64	2.45	3.20	1.91	1.14	0.36
n-Pentane	56	100.00%	3.04	55.71	9.87	13.34	10.10	2.02	5.21
Isoprene	55	98.21%	0.71	3.64	1.22	1.53	0.71	1.30	1.01
t-2-Pentene	56	100.00%	0.93	15.78	2.75	4.02	3.27	2.01	4.27
c-2-Pentene	54	96.43%	0.71	5.24	1.59	1.97	1.08	1.13	0.56
2-Methyl-2-butene	56	100.00%	1.66	12.90	3.54	4.93	2.97	1.14	0.26
Neohexane	56	100.00%	3.86	105.35	21.26	25.39	17.64	2.44	8.00
Cyclopentene	39	69.64%	0.53	2.09	0.92	1.09	0.48	0.62	-0.91
4-Methyl-1-pentene	48	85.71%	0.43	2.29	0.87	0.97	0.39	1.12	1.23
2,3-Dimethylbutane	54	96.43%	0.55	4.39	1.13	1.45	0.90	1.47	2.15
Cyclopentane	56	100.00%	1.30	13.48	4.12	4.63	2.57	1.26	1.57
Isohexane	56	100.00%	2.76	35.94	9.51	11.83	7.60	1.27	1.10
3-Methylpentane	56	100.00%	1.72	23.73	6.30	7.40	4.51	1.22	1.70
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	54	96.43%	0.54	4.09	1.27	1.61	0.97	1.05	-0.04
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	56	100.00%	1.91	17.15	5.01	5.85	3.48	1.27	1.25
t-2-Hexene	48	85.71%	0.55	3.67	0.90	1.22	0.76	1.68	2.61

Table 9-18. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	37	66.07%	0.44	1.88	0.82	0.97	0.46	0.71	-0.73
Methylcyclopentane	56	100.00%	1.24	12.16	3.47	4.12	2.25	1.30	1.74
2,4-Dimethylpentane	56	100.00%	0.96	11.13	3.04	3.84	2.34	1.29	1.16
Benzene	56	100.00%	4.51	29.04	9.27	11.62	5.95	1.14	0.46
Cyclohexane	51	91.07%	0.57	10.94	1.75	2.25	1.61	3.57	16.95
Isoheptane	41	73.21%	0.66	4.69	1.34	1.75	1.08	1.13	0.49
2,3-Dimethylpentane	56	100.00%	0.80	10.17	2.59	3.31	2.34	1.20	0.98
3-Methylhexane	56	100.00%	1.56	15.21	4.11	4.67	2.54	1.69	4.28
2,2,4-Trimethylpentane	56	100.00%	4.43	46.03	13.92	16.59	9.98	1.20	0.63
1-Heptene	41	73.21%	0.49	2.58	0.96	1.16	0.56	0.70	-0.57
n-Heptane	55	98.21%	0.76	6.01	1.61	1.99	1.30	1.63	2.35
Methylcyclohexane	55	98.21%	0.70	5.26	1.32	1.75	1.08	1.60	2.40
2,2,3-Trimethylpentane	53	94.64%	0.73	5.99	1.96	2.33	1.34	1.05	0.09
2,3,4-Trimethylpentane	56	100.00%	1.42	15.12	4.67	5.54	3.34	1.16	0.50
Toluene	56	100.00%	12.49	115.96	33.07	40.66	24.11	1.34	1.50
2-Methylheptane	55	98.21%	0.80	5.89	1.76	2.16	1.21	1.26	1.02
3-Methylheptane	55	98.21%	0.69	5.21	1.54	1.87	1.04	1.23	1.01
1-Octene	54	96.43%	0.67	5.88	1.71	2.20	1.38	1.19	0.43
n-Octane	51	91.07%	0.55	5.11	1.14	1.44	0.93	2.13	5.53
Ethylbenzene	56	100.00%	1.62	16.09	4.91	6.00	3.37	1.21	0.93
p-Xylene + m-Xylene	56	100.00%	6.62	56.95	17.48	21.00	11.33	1.30	1.30
Styrene	55	98.21%	0.66	8.90	1.54	2.15	1.74	2.27	5.92
o-Xylene	55	98.21%	2.39	21.59	6.22	7.64	4.30	1.33	1.45
1-Nonene	31	55.36%	0.44	1.94	0.84	0.95	0.38	0.90	0.40
n-Nonane	55	98.21%	0.68	5.07	1.51	1.84	1.04	1.57	2.30
Isopropylbenzene	27	48.21%	0.51	1.70	0.72	0.82	0.30	1.29	1.32
n-Propylbenzene	56	100.00%	0.51	15.13	2.40	2.83	2.29	3.37	15.51
alpha-Pinene	56	100.00%	0.86	7.15	2.09	2.47	1.37	1.41	1.94
m-Ethyltoluene	56	100.00%	2.05	19.35	5.60	6.95	3.86	1.23	1.01
p-Ethyltoluene	53	94.64%	0.69	5.49	1.66	2.00	1.09	1.22	0.91
1,3,5-Trimethylbenzene	56	100.00%	1.11	9.44	3.16	3.78	2.04	1.04	0.29
o-Ethyltoluene	55	98.21%	1.68	11.25	3.94	4.42	2.19	1.34	1.59
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	56	100.00%	3.84	34.96	10.00	12.42	6.82	1.29	1.25

Table 9-18. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	56	100.00%	0.80	14.91	1.91	3.03	3.07	2.21	4.40
1,2,3-Trimethylbenzene	56	100.00%	2.12	10.47	4.69	5.13	2.08	0.93	0.21
p-Diethylbenzene	55	98.21%	0.59	3.80	1.27	1.49	0.72	1.08	0.72
1-Undecene	52	92.86%	0.92	10.63	1.80	2.27	1.72	3.02	11.26
n-Undecane	56	100.00%	1.79	43.14	4.35	5.71	5.57	5.73	38.14
1-Dodecene	54	96.43%	0.59	8.27	1.03	1.53	1.44	3.34	12.34
n-Dodecane	56	100.00%	0.93	27.51	1.78	2.57	3.57	6.46	45.32
1-Tridecene	28	50.00%	0.46	2.20	0.70	0.85	0.46	2.25	4.29
n-Tridecane	52	92.86%	0.57	5.52	1.03	1.22	0.78	3.74	17.88

Table 9-19. 1992 Summary Statistics for Manhattan, NY (MNY)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	7	100.00%	9.02	32.62	14.48	16.42	8.10	1.62	2.61
Acetylene	6	85.71%	4.21	9.45	7.43	6.96	2.46	-0.20	-2.75
Ethane	7	100.00%	5.25	80.52	13.41	23.85	26.66	2.06	4.38
Propylene	7	100.00%	2.93	14.57	6.02	6.64	3.87	1.69	3.47
Propane	7	100.00%	3.91	42.15	8.99	14.19	13.49	1.87	3.57
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	7	100.00%	3.47	32.79	9.17	12.71	10.23	1.41	2.19
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	7	100.00%	1.76	11.44	5.88	5.90	3.63	0.55	-1.01
1,3-Butadiene	6	85.71%	0.73	2.55	1.01	1.26	0.67	1.87	3.62
n-Butane	7	100.00%	4.07	60.42	15.04	23.45	19.90	1.12	0.94
t-2-Butene	7	100.00%	0.85	6.89	1.75	2.68	2.15	1.50	2.03
c-2-Butene	6	85.71%	0.57	11.33	1.94	3.85	4.14	1.53	1.73
3-Methyl-1-butene	3	42.86%	0.96	1.91	1.09	1.32	0.52	1.60	.
Isopentane	7	100.00%	7.18	194.43	18.90	51.93	66.68	2.08	4.58
1-Pentene	4	57.14%	0.81	4.45	1.95	2.29	1.58	1.09	1.01
2-Methyl-1-butene	6	85.71%	0.76	7.03	2.12	2.81	2.36	1.36	1.64
n-Pentane	7	100.00%	2.46	42.62	13.37	15.14	14.31	1.37	1.61
Isoprene	5	71.43%	0.61	9.03	0.99	2.52	3.65	2.21	4.89
t-2-Pentene	6	85.71%	0.57	6.50	2.51	2.93	2.34	0.62	-1.02
c-2-Pentene	5	71.43%	0.68	3.89	1.42	1.77	1.31	1.35	1.57
2-Methyl-2-butene	5	71.43%	0.56	4.38	1.98	2.07	1.49	0.99	0.95
Neohexane	4	57.14%	0.62	1.50	0.78	0.92	0.40	1.76	3.29
Cyclopentene	2	28.57%	0.79	1.36	1.08	1.08	0.40	.	.
4-Methyl-1-pentene	4	57.14%	0.54	1.17	0.73	0.79	0.28	0.91	-0.58
2,3-Dimethylbutane	4	57.14%	0.60	2.42	1.25	1.38	0.77	0.96	1.56
Cyclopentane	7	100.00%	0.75	8.27	3.33	3.74	2.71	0.65	-0.52
Isohexane	7	100.00%	1.97	25.15	4.32	8.69	8.30	1.59	2.26
3-Methylpentane	7	100.00%	1.09	11.72	5.58	5.26	3.83	0.60	-0.40
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	5	71.43%	0.71	2.73	1.17	1.38	0.83	1.36	1.65
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	7	100.00%	1.30	13.04	3.37	4.88	4.13	1.53	2.26
t-2-Hexene	4	57.14%	0.50	2.82	0.92	1.29	1.08	1.41	1.50

Table 9-19. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	2	28.57%	0.64	0.93	0.79	0.79	0.21	.	.
Methylcyclopentane	7	100.00%	1.00	6.29	1.92	2.57	1.90	1.43	2.00
2,4-Dimethylpentane	6	85.71%	0.82	4.70	1.80	2.28	1.50	0.93	-0.33
Benzene	7	100.00%	3.97	20.68	7.72	9.64	5.68	1.47	1.94
Cyclohexane	5	71.43%	1.20	9.92	3.46	4.69	3.57	0.84	-0.67
Isoheptane	6	85.71%	0.57	4.76	1.19	1.91	1.60	1.46	1.46
2,3-Dimethylpentane	6	85.71%	0.65	3.53	1.94	1.91	1.09	0.29	-0.78
3-Methylhexane	7	100.00%	1.35	21.14	6.26	7.58	7.31	1.24	0.89
2,2,4-Trimethylpentane	7	100.00%	2.27	16.29	5.12	6.91	4.80	1.49	2.05
1-Heptene	3	42.86%	0.53	1.45	0.59	0.86	0.52	1.71	.
n-Heptane	7	100.00%	0.61	8.91	2.28	3.12	3.01	1.43	1.59
Methylcyclohexane	7	100.00%	0.56	3.60	1.00	1.37	1.07	1.93	3.91
2,2,3-Trimethylpentane	6	85.71%	0.60	2.45	1.23	1.30	0.65	1.14	1.76
2,3,4-Trimethylpentane	7	100.00%	0.84	5.31	1.86	2.33	1.51	1.52	2.30
Toluene	7	100.00%	10.28	89.49	22.11	33.52	28.23	1.63	2.27
2-Methylheptane	7	100.00%	0.62	4.82	1.64	1.92	1.46	1.53	2.47
3-Methylheptane	6	85.71%	0.60	3.79	1.29	1.67	1.17	1.48	2.10
1-Octene	5	71.43%	0.65	2.16	0.99	1.13	0.62	1.53	2.42
n-Octane	6	85.71%	0.67	7.53	5.09	4.27	2.92	-0.50	-1.86
Ethylbenzene	7	100.00%	1.61	18.65	4.17	6.51	6.17	1.62	2.04
p-Xylene + m-Xylene	7	100.00%	5.60	71.60	13.99	26.04	24.24	1.32	1.05
Styrene	6	85.71%	0.54	8.42	1.48	2.48	2.99	2.16	4.88
o-Xylene	7	100.00%	1.85	27.27	4.58	9.71	9.37	1.28	0.96
1-Nonene	4	57.14%	0.86	13.04	2.61	4.78	5.66	1.70	2.84
n-Nonane	7	100.00%	1.02	40.77	4.58	11.18	14.47	1.74	3.11
Isopropylbenzene	4	57.14%	0.57	5.80	2.27	2.72	2.35	0.82	-0.87
n-Propylbenzene	7	100.00%	1.28	29.31	6.68	8.89	9.99	1.70	3.18
alpha-Pinene	7	100.00%	0.96	37.54	3.50	11.44	13.80	1.29	1.10
m-Ethyltoluene	7	100.00%	2.08	38.63	4.62	15.36	15.86	0.59	-1.97
p-Ethyltoluene	7	100.00%	0.74	19.25	2.13	6.48	7.28	0.98	-0.25
1,3,5-Trimethylbenzene	7	100.00%	1.15	19.55	2.25	8.08	8.31	0.51	-2.28
o-Ethyltoluene	7	100.00%	1.60	30.30	5.19	12.00	12.06	0.59	-1.79
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	7	100.00%	3.84	57.18	9.08	22.37	21.91	0.72	-1.38

Table 9-19. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	7	100.00%	1.24	59.05	3.23	12.58	20.82	2.48	6.30
1,2,3-Trimethylbenzene	7	100.00%	2.19	17.81	5.95	8.15	6.35	0.73	-1.29
p-Diethylbenzene	5	71.43%	2.04	4.64	2.70	2.88	1.06	1.53	2.48
1-Undecene	5	71.43%	0.91	49.40	6.21	18.56	20.88	0.99	-0.90
n-Undecane	7	100.00%	4.11	131.67	8.73	44.97	51.64	0.84	-0.88
1-Dodecene	6	85.71%	0.52	3.32	1.35	1.58	1.01	1.09	1.03
n-Dodecane	7	100.00%	1.79	25.03	2.99	9.48	10.04	0.93	-1.16
1-Tridecene	4	57.14%	1.25	1.62	1.33	1.38	0.17	1.29	0.93
n-Tridecane	7	100.00%	0.66	3.60	0.94	1.61	1.21	1.17	-0.57

Table 9-20. 1992 Summary Statistics for Newark, NJ (NWNJ)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	7	100.00%	6.06	20.17	14.93	14.73	4.70	-0.95	1.16
Acetylene	7	100.00%	4.85	8.27	7.14	6.86	1.41	-0.68	-1.20
Ethane	7	100.00%	9.33	24.00	18.47	17.11	5.09	-0.45	-0.55
Propylene	7	100.00%	3.24	11.68	8.29	7.94	2.71	-0.56	0.67
Propane	7	100.00%	13.41	32.24	17.73	20.43	7.40	1.01	-0.74
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	7	100.00%	4.93	22.92	9.06	9.88	6.10	2.05	4.72
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	7	100.00%	2.58	5.33	3.78	3.81	0.95	0.40	-0.51
1,3-Butadiene	4	57.14%	0.70	1.05	0.85	0.86	0.17	0.21	-4.32
n-Butane	7	100.00%	11.53	16.57	16.17	15.29	1.86	-1.78	2.63
t-2-Butene	7	100.00%	1.32	2.16	1.42	1.56	0.32	1.47	1.00
c-2-Butene	4	57.14%	1.05	6.28	1.54	2.60	2.48	1.86	3.47
3-Methyl-1-butene	4	57.14%	0.50	0.62	0.59	0.57	0.05	-1.17	1.09
Isopentane	7	100.00%	15.99	35.49	28.61	28.02	7.38	-0.55	-0.86
1-Pentene	7	100.00%	0.67	1.28	1.18	1.00	0.29	-0.33	-2.71
2-Methyl-1-butene	7	100.00%	1.29	2.45	1.74	1.77	0.39	0.50	0.51
n-Pentane	7	100.00%	6.07	22.26	8.83	10.80	5.42	1.99	4.31
Isoprene	7	100.00%	0.59	3.73	0.91	1.29	1.11	2.33	5.68
t-2-Pentene	5	71.43%	1.33	4.19	1.45	2.06	1.21	2.04	4.20
c-2-Pentene	7	100.00%	0.66	1.19	0.90	0.95	0.18	-0.22	-0.77
2-Methyl-2-butene	6	85.71%	0.89	2.53	1.50	1.57	0.57	0.87	1.12
Neohexane	6	85.71%	0.55	0.87	0.67	0.69	0.12	0.53	-0.78
Cyclopentene	1	14.29%	1.05	1.05	1.05	1.05	.	.	.
4-Methyl-1-pentene	4	57.14%	0.49	1.70	1.17	1.13	0.50	-0.42	1.50
2,3-Dimethylbutane	6	85.71%	0.68	1.67	0.84	0.96	0.38	1.77	3.22
Cyclopentane	7	100.00%	1.25	5.06	2.81	2.88	1.39	0.47	-0.97
Isohexane	7	100.00%	4.39	9.71	6.48	6.56	1.82	0.79	0.13
3-Methylpentane	7	100.00%	2.64	8.88	5.48	5.49	2.22	0.22	-0.94
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	6	85.71%	0.56	2.86	0.91	1.16	0.85	2.20	5.11
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	7	100.00%	2.43	6.55	3.45	4.02	1.58	0.95	-0.77
t-2-Hexene	4	57.14%	0.55	4.04	1.97	2.13	1.44	0.67	1.74

Table 9-20. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	1	14.29%	0.48	0.48	0.48	0.48	.	.	.
Methylcyclopentane	7	100.00%	2.18	4.13	3.38	3.31	0.62	-0.76	1.27
2,4-Dimethylpentane	7	100.00%	1.01	2.07	1.23	1.45	0.40	0.61	-1.35
Benzene	7	100.00%	5.05	10.55	7.27	7.30	1.86	0.80	0.30
Cyclohexane	7	100.00%	1.44	40.45	6.58	10.38	13.40	2.52	6.54
Isoheptane	7	100.00%	1.58	4.50	2.93	2.69	1.02	0.76	0.27
2,3-Dimethylpentane	5	71.43%	0.63	1.59	1.34	1.21	0.37	-1.19	1.52
3-Methylhexane	7	100.00%	3.71	10.01	6.64	6.60	2.46	0.20	-1.77
2,2,4-Trimethylpentane	7	100.00%	4.77	9.15	6.78	6.90	1.56	0.09	-1.19
1-Heptene	3	42.86%	0.58	0.63	0.62	0.61	0.03	-1.23	.
n-Heptane	7	100.00%	1.23	5.00	2.11	2.43	1.24	1.80	3.78
Methylcyclohexane	6	85.71%	0.94	1.51	1.14	1.16	0.20	1.15	1.80
2,2,3-Trimethylpentane	7	100.00%	0.64	1.26	1.04	0.99	0.23	-0.35	-1.51
2,3,4-Trimethylpentane	7	100.00%	1.33	2.57	1.90	1.97	0.44	-0.05	-1.12
Toluene	7	100.00%	17.09	61.88	29.75	33.39	15.60	1.16	0.76
2-Methylheptane	7	100.00%	1.05	2.25	1.36	1.44	0.38	1.94	4.70
3-Methylheptane	7	100.00%	0.78	1.88	1.12	1.18	0.35	1.52	3.37
1-Octene	6	85.71%	0.54	1.06	0.66	0.76	0.21	0.83	-1.52
n-Octane	7	100.00%	0.59	1.63	0.85	0.99	0.45	0.96	-1.01
Ethylbenzene	7	100.00%	2.91	7.87	4.24	4.99	1.64	0.76	0.41
p-Xylene + m-Xylene	7	100.00%	10.61	29.10	14.84	18.09	6.40	0.78	-0.17
Styrene	7	100.00%	1.38	2.58	1.68	1.76	0.40	1.65	3.25
o-Xylene	7	100.00%	3.85	8.92	4.84	5.69	1.73	1.15	1.05
1-Nonene	5	71.43%	0.53	1.91	0.60	0.94	0.59	1.54	1.84
n-Nonane	7	100.00%	1.23	3.09	1.67	1.82	0.61	1.78	3.77
Isopropylbenzene	4	57.14%	0.69	0.85	0.74	0.76	0.07	1.07	0.88
n-Propylbenzene	7	100.00%	1.05	7.38	3.76	3.87	2.50	0.24	-1.69
alpha-Pinene	7	100.00%	1.28	2.46	1.56	1.65	0.42	1.38	1.75
m-Ethyltoluene	7	100.00%	2.95	5.66	3.14	3.86	1.09	0.91	-0.91
p-Ethyltoluene	6	85.71%	0.65	1.78	0.97	1.04	0.40	1.52	2.74
1,3,5-Trimethylbenzene	7	100.00%	1.37	2.64	1.47	1.71	0.46	1.75	2.62
o-Ethyltoluene	7	100.00%	1.87	4.10	2.96	2.86	0.80	0.41	-0.87
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	7	100.00%	4.73	9.83	5.60	6.31	1.77	1.54	2.45

Table 9-20. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	7	100.00%	1.50	27.46	3.88	7.89	9.10	2.14	4.79
1,2,3-Trimethylbenzene	7	100.00%	1.38	7.17	2.57	3.05	2.04	1.68	2.91
p-Diethylbenzene	6	85.71%	0.50	4.90	1.06	1.67	1.63	2.13	4.74
1-Undecene	7	100.00%	1.41	5.92	2.30	3.18	1.87	0.58	-1.73
n-Undecane	7	100.00%	3.31	326.10	12.27	58.40	118.69	2.59	6.75
1-Dodecene	5	71.43%	0.59	2.75	0.86	1.27	0.87	1.73	2.97
n-Dodecane	7	100.00%	2.32	107.74	8.17	29.31	38.61	1.72	2.90
1-Tridecene	2	28.57%	0.56	1.53	1.05	1.05	0.69	.	.
n-Tridecane	7	100.00%	0.83	26.78	2.39	6.90	9.86	1.79	2.62

Table 9-21. 1992 Summary Statistics for Plainfield, NJ (PLNJ)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	8	100.00%	13.24	105.06	58.09	52.43	31.96	0.21	-0.81
Acetylene	8	100.00%	3.81	47.23	13.57	18.40	15.53	1.10	0.19
Ethane	8	100.00%	10.08	115.23	61.10	55.54	37.96	0.28	-1.06
Propylene	8	100.00%	3.39	23.59	17.16	15.67	7.50	-0.96	-0.39
Propane	8	100.00%	5.55	465.52	24.83	80.27	156.33	2.78	7.80
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	8	100.00%	3.27	28.40	20.19	19.31	7.88	-1.17	1.90
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	8	100.00%	1.99	12.48	9.44	8.65	3.59	-0.89	0.13
1,3-Butadiene	6	75.00%	0.56	2.85	2.45	2.18	0.86	-1.68	2.92
n-Butane	8	100.00%	4.57	54.69	30.90	30.47	14.19	-0.21	1.87
t-2-Butene	8	100.00%	0.78	8.22	4.72	4.95	2.11	-0.70	2.37
c-2-Butene	7	87.50%	3.29	7.54	3.61	4.23	1.51	2.35	5.75
3-Methyl-1-butene	7	87.50%	1.09	4.28	1.24	1.77	1.15	2.32	5.53
Isopentane	8	100.00%	9.32	247.17	67.12	93.40	75.03	1.41	1.94
1-Pentene	7	87.50%	2.05	14.42	3.23	4.71	4.39	2.40	5.95
2-Methyl-1-butene	8	100.00%	0.65	25.78	4.96	7.56	7.74	2.30	5.85
n-Pentane	8	100.00%	2.95	106.50	21.29	33.50	33.03	1.89	3.66
Isoprene	7	87.50%	1.68	4.37	2.70	2.72	0.96	0.80	-0.16
t-2-Pentene	8	100.00%	1.02	35.37	6.03	10.48	11.24	1.95	3.68
c-2-Pentene	7	87.50%	1.11	19.48	3.41	5.79	6.24	2.32	5.64
2-Methyl-2-butene	8	100.00%	1.10	51.48	7.77	13.37	15.95	2.46	6.43
Neohexane	7	87.50%	0.80	3.91	1.71	2.00	1.11	0.99	-0.03
Cyclopentene	7	87.50%	0.90	7.25	1.35	2.27	2.24	2.45	6.15
4-Methyl-1-pentene	7	87.50%	0.98	5.77	1.16	1.86	1.74	2.56	6.65
2,3-Dimethylbutane	7	87.50%	1.71	15.76	2.49	4.46	5.10	2.41	5.96
Cyclopentane	8	100.00%	1.30	29.09	6.05	8.70	8.58	2.38	6.25
Isohexane	8	100.00%	2.72	105.04	22.21	30.17	31.29	2.45	6.57
3-Methylpentane	8	100.00%	1.54	55.83	11.68	16.71	16.80	2.22	5.46
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	7	87.50%	1.84	17.01	2.42	4.74	5.47	2.54	6.53
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	8	100.00%	1.45	28.83	12.27	13.44	8.74	0.66	0.16
t-2-Hexene	7	87.50%	1.33	15.11	3.37	6.00	6.19	1.11	-0.94

Table 9-21. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	7	87.50%	0.75	9.48	1.04	2.46	3.16	2.45	6.14
Methylcyclopentane	8	100.00%	1.35	22.99	8.87	9.42	6.31	1.44	3.43
2,4-Dimethylpentane	8	100.00%	0.80	8.38	4.03	4.41	2.18	0.31	1.57
Benzene	8	100.00%	4.94	31.19	19.22	18.47	7.67	-0.16	1.18
Cyclohexane	8	100.00%	0.76	8.02	2.58	3.30	2.56	0.98	0.05
Isoheptane	7	87.50%	3.05	15.59	10.10	8.42	4.58	0.24	-0.97
2,3-Dimethylpentane	4	50.00%	2.22	18.46	2.81	6.58	7.93	1.99	3.98
3-Methylhexane	8	100.00%	1.69	18.10	7.33	8.56	5.15	0.91	0.70
2,2,4-Trimethylpentane	8	100.00%	4.01	21.47	13.96	13.77	4.92	-0.73	2.52
1-Heptene	7	87.50%	0.82	8.34	1.41	2.38	2.65	2.57	6.72
n-Heptane	8	100.00%	0.62	6.42	4.47	4.18	2.08	-0.57	-0.73
Methylcyclohexane	8	100.00%	0.65	12.42	2.77	3.71	3.63	2.47	6.65
2,2,3-Trimethylpentane	8	100.00%	0.66	8.54	2.42	3.04	2.34	2.24	5.93
2,3,4-Trimethylpentane	8	100.00%	2.18	16.81	5.91	7.05	4.31	1.91	4.68
Toluene	8	100.00%	11.57	187.39	72.49	75.96	50.95	1.56	3.87
2-Methylheptane	8	100.00%	0.78	20.71	3.40	5.27	6.34	2.66	7.32
3-Methylheptane	8	100.00%	0.78	16.59	2.96	4.43	4.99	2.64	7.28
1-Octene	8	100.00%	1.61	4.64	2.03	2.55	1.11	1.09	0.11
n-Octane	7	87.50%	0.58	6.65	1.75	2.29	1.99	2.29	5.75
Ethylbenzene	8	100.00%	2.01	30.84	9.89	11.47	8.38	2.06	5.47
p-Xylene + m-Xylene	8	100.00%	7.15	114.81	36.16	42.01	31.39	2.09	5.56
Styrene	7	87.50%	1.42	5.20	1.75	2.25	1.32	2.50	6.41
o-Xylene	8	100.00%	2.50	39.30	12.68	14.63	10.72	2.02	5.33
1-Nonene	7	87.50%	0.83	5.43	1.08	1.70	1.66	2.54	6.56
n-Nonane	8	100.00%	0.67	3.79	1.86	2.04	0.97	0.58	0.52
Isopropylbenzene	7	87.50%	0.61	35.26	1.07	6.51	12.78	2.56	6.63
n-Propylbenzene	8	100.00%	0.62	4.61	1.98	2.14	1.55	0.39	-1.61
alpha-Pinene	8	100.00%	0.59	7.19	2.90	3.25	1.91	1.19	2.74
m-Ethyltoluene	8	100.00%	1.84	21.75	8.53	9.46	5.67	1.46	3.82
p-Ethyltoluene	8	100.00%	0.63	6.65	2.48	2.74	1.72	1.86	5.03
1,3,5-Trimethylbenzene	8	100.00%	1.36	14.80	4.58	5.77	3.97	1.96	4.84
o-Ethyltoluene	8	100.00%	1.27	11.74	5.05	5.38	2.98	1.31	3.42
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	8	100.00%	3.24	39.37	15.35	16.96	10.29	1.50	3.93

Table 9-21. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	4	50.00%	0.93	35.38	5.46	11.81	16.10	1.74	2.97
1,2,3-Trimethylbenzene	8	100.00%	1.90	9.33	5.15	5.28	2.11	0.56	2.04
p-Diethylbenzene	7	87.50%	1.40	5.18	1.69	2.18	1.33	2.54	6.57
1-Undecene	7	87.50%	1.05	2.14	1.30	1.39	0.40	1.26	1.21
n-Undecane	7	87.50%	2.42	404.04	3.38	65.23	149.91	2.61	6.85
1-Dodecene	6	75.00%	0.53	2.22	0.84	1.07	0.62	1.68	2.87
n-Dodecane	7	87.50%	1.05	308.21	1.98	51.45	114.29	2.55	6.57
1-Tridecene	0	0.00%	.	.	.	.	.	.	.
n-Tridecane	7	87.50%	0.55	35.78	0.75	10.75	16.95	1.23	-0.84

Table 9-22. 1992 Summary Statistics for Raleigh, NC (R1NC)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	8	100.00%	5.23	14.35	9.54	9.17	3.32	0.25	-1.10
Acetylene	8	100.00%	1.07	8.48	4.60	4.21	2.40	0.37	0.27
Ethane	8	100.00%	2.29	13.64	5.26	5.79	3.38	2.12	5.49
Propylene	8	100.00%	0.77	3.61	2.97	2.41	1.12	-0.59	-1.85
Propane	8	100.00%	3.58	14.30	8.28	8.15	3.93	0.22	-1.25
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	8	100.00%	0.83	4.43	2.52	2.42	1.24	0.23	-0.93
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	8	100.00%	0.64	2.77	1.90	1.58	0.80	-0.10	-1.39
1,3-Butadiene	3	37.50%	0.57	0.89	0.62	0.69	0.17	1.57	.
n-Butane	8	100.00%	2.21	10.16	5.41	5.33	2.90	0.39	-1.03
t-2-Butene	4	50.00%	0.50	0.60	0.58	0.56	0.04	-1.50	2.65
c-2-Butene	0	0.00%	.	.	.	.	.	.	.
3-Methyl-1-butene	0	0.00%	.	.	.	.	.	.	.
Isopentane	8	100.00%	4.31	23.85	12.47	12.07	7.11	0.35	-0.89
1-Pentene	2	25.00%	0.88	1.04	0.96	0.96	0.11	.	.
2-Methyl-1-butene	6	75.00%	0.93	1.59	1.20	1.20	0.26	0.46	-0.71
n-Pentane	8	100.00%	1.51	9.07	4.25	4.15	2.61	0.77	0.43
Isoprene	5	62.50%	0.78	9.24	2.37	3.50	3.34	1.83	3.64
t-2-Pentene	5	62.50%	1.09	1.54	1.26	1.27	0.19	0.72	-0.29
c-2-Pentene	4	50.00%	0.69	0.79	0.75	0.75	0.05	-0.12	-5.29
2-Methyl-2-butene	6	75.00%	0.70	1.94	1.51	1.41	0.42	-0.84	1.22
Neohexane	2	25.00%	0.53	1.61	1.07	1.07	0.76	.	.
Cyclopentene	0	0.00%	.	.	.	.	.	.	.
4-Methyl-1-pentene	5	62.50%	0.56	1.78	0.68	0.86	0.52	2.16	4.74
2,3-Dimethylbutane	2	25.00%	0.55	0.79	0.67	0.67	0.17	.	.
Cyclopentane	7	87.50%	0.58	2.19	1.39	1.37	0.69	0.09	-2.19
Isohexane	8	100.00%	1.27	6.43	3.81	3.44	1.91	0.16	-1.22
3-Methylpentane	7	87.50%	0.74	5.16	2.64	2.52	1.57	0.53	-0.07
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	4	50.00%	0.61	0.74	0.65	0.66	0.06	0.73	-1.95
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	8	100.00%	0.72	4.23	2.56	2.38	1.47	0.02	-1.93
t-2-Hexene	0	0.00%	.	.	.	.	.	.	.

Table 9-22. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	0	0.00%	.	.	.	.	.	.	.
Methylcyclopentane	6	75.00%	0.56	2.51	1.87	1.70	0.66	-0.94	1.44
2,4-Dimethylpentane	5	62.50%	0.89	1.49	1.05	1.11	0.23	1.34	1.90
Benzene	8	100.00%	2.24	8.15	4.97	4.64	2.01	0.42	-0.41
Cyclohexane	7	87.50%	0.51	3.11	1.25	1.43	0.92	1.05	0.65
Isoheptane	7	87.50%	0.65	4.95	0.82	1.58	1.59	2.06	4.14
2,3-Dimethylpentane	4	50.00%	0.52	0.79	0.58	0.62	0.12	1.57	2.61
3-Methylhexane	8	100.00%	1.05	5.11	2.42	2.63	1.45	0.66	-0.59
2,2,4-Trimethylpentane	8	100.00%	1.07	6.34	3.76	3.24	1.89	0.17	-0.87
1-Heptene	0	0.00%	.	.	.	.	.	.	.
n-Heptane	6	75.00%	0.57	1.94	1.27	1.27	0.58	-0.03	-2.15
Methylcyclohexane	4	50.00%	0.59	0.97	0.65	0.71	0.18	1.74	3.00
2,2,3-Trimethylpentane	5	62.50%	0.59	0.94	0.63	0.68	0.15	2.10	4.53
2,3,4-Trimethylpentane	5	62.50%	1.29	2.13	1.46	1.57	0.33	1.69	3.12
Toluene	8	100.00%	4.31	19.81	11.82	10.72	5.56	0.20	-0.92
2-Methylheptane	5	62.50%	0.73	1.18	0.76	0.84	0.19	2.17	4.77
3-Methylheptane	5	62.50%	0.61	0.99	0.62	0.70	0.16	2.16	4.72
1-Octene	4	50.00%	0.55	0.85	0.56	0.63	0.15	1.99	3.98
n-Octane	2	25.00%	1.03	2.54	1.79	1.79	1.07	.	.
Ethylbenzene	7	87.50%	0.59	2.99	2.11	1.92	0.93	-0.68	-1.10
p-Xylene + m-Xylene	8	100.00%	1.79	10.53	6.68	5.77	3.18	-0.07	-1.38
Styrene	5	62.50%	0.58	0.77	0.61	0.66	0.09	0.58	-2.78
o-Xylene	8	100.00%	0.53	3.72	2.11	1.94	1.22	0.09	-1.49
1-Nonene	0	0.00%	.	.	.	.	.	.	.
n-Nonane	3	37.50%	0.59	0.98	0.67	0.75	0.21	1.44	.
Isopropylbenzene	0	0.00%	.	.	.	.	.	.	.
n-Propylbenzene	7	87.50%	0.76	11.92	5.54	5.29	3.74	0.69	0.71
alpha-Pinene	5	62.50%	0.56	1.29	0.64	0.77	0.30	2.01	4.19
m-Ethyltoluene	8	100.00%	0.61	7.56	2.08	2.74	2.29	1.48	2.47
p-Ethyltoluene	0	0.00%	.	.	.	.	.	.	.
1,3,5-Trimethylbenzene	5	62.50%	0.87	1.49	0.97	1.07	0.25	1.90	3.87
o-Ethyltoluene	8	100.00%	0.57	2.83	1.51	1.39	0.78	0.67	0.30
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	8	100.00%	0.96	5.41	3.00	2.66	1.53	0.50	-0.07

Table 9-22. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	0	0.00%	.	.	.	.	.	.	.
1,2,3-Trimethylbenzene	8	100.00%	0.76	2.58	1.95	1.78	0.64	-0.41	-0.95
p-Diethylbenzene	3	37.50%	0.49	1.23	0.71	0.81	0.38	1.10	.
1-Undecene	8	100.00%	1.74	5.36	2.89	3.21	1.40	0.79	-0.73
n-Undecane	8	100.00%	0.75	2.18	1.06	1.24	0.56	1.16	-0.28
1-Dodecene	8	100.00%	0.96	2.95	1.81	1.82	0.66	0.40	-0.13
n-Dodecane	8	100.00%	0.59	1.44	0.91	0.97	0.33	0.58	-1.25
1-Tridecene	2	25.00%	0.52	0.77	0.65	0.65	0.18	.	.
n-Tridecane	3	37.50%	0.55	0.96	0.66	0.72	0.21	1.22	.

Table 9-23. 1992 Summary Statistics for Salt Lake City, UT (S2UT)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	8	100.00%	11.63	51.54	39.82	35.49	12.56	-0.94	0.76
Acetylene	8	100.00%	6.84	34.22	23.75	22.95	9.08	-0.59	-0.14
Ethane	8	100.00%	7.21	61.51	38.52	39.74	17.85	-0.59	0.15
Propylene	8	100.00%	3.50	21.61	15.42	14.24	5.27	-1.10	2.41
Propane	8	100.00%	6.23	39.23	28.39	28.65	10.59	-1.41	2.67
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	8	100.00%	2.86	18.71	13.03	12.34	4.70	-1.05	2.05
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	8	100.00%	2.01	10.70	7.91	7.24	2.53	-1.17	2.59
1,3-Butadiene	8	100.00%	0.54	3.91	2.62	2.49	0.98	-0.88	1.98
n-Butane	8	100.00%	9.20	53.95	35.99	33.66	13.35	-0.51	0.94
t-2-Butene	7	87.50%	2.11	3.86	2.92	2.98	0.55	0.14	0.97
c-2-Butene	7	87.50%	0.81	3.38	1.87	1.99	0.93	0.52	-0.89
3-Methyl-1-butene	7	87.50%	0.93	1.52	1.25	1.21	0.20	0.11	-0.37
Isopentane	8	100.00%	15.67	163.79	73.21	82.13	45.04	0.54	0.65
1-Pentene	7	87.50%	1.85	3.16	2.20	2.39	0.48	0.80	-0.73
2-Methyl-1-butene	8	100.00%	0.97	6.01	4.45	4.25	1.57	-1.34	2.42
n-Pentane	8	100.00%	8.37	46.22	35.33	33.91	11.85	-1.53	3.18
Isoprene	8	100.00%	0.76	2.24	1.82	1.74	0.44	-1.83	4.53
t-2-Pentene	8	100.00%	1.13	8.20	5.14	5.30	2.23	-0.63	0.69
c-2-Pentene	8	100.00%	0.60	3.51	2.46	2.42	0.90	-1.13	1.78
2-Methyl-2-butene	8	100.00%	1.40	8.72	6.36	5.90	2.28	-1.06	1.44
Neohexane	7	87.50%	1.28	1.84	1.72	1.59	0.22	-0.43	-2.03
Cyclopentene	7	87.50%	0.64	1.28	0.90	0.93	0.22	0.55	-0.41
4-Methyl-1-pentene	6	75.00%	0.56	1.60	1.19	1.19	0.37	-0.87	1.15
2,3-Dimethylbutane	8	100.00%	0.59	3.15	2.42	2.31	0.79	-1.59	3.48
Cyclopentane	8	100.00%	2.10	10.18	7.93	7.65	2.49	-1.79	4.09
Isohexane	8	100.00%	6.06	32.79	24.58	23.80	8.27	-1.49	3.11
3-Methylpentane	8	100.00%	3.26	24.53	19.01	18.44	6.81	-1.80	4.01
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	7	87.50%	1.95	3.10	2.35	2.44	0.39	0.67	0.12
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	8	100.00%	5.58	29.11	22.80	21.54	7.29	-1.64	3.60
t-2-Hexene	7	87.50%	0.89	1.74	1.37	1.33	0.27	-0.22	0.55

Table 9-23. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	7	87.50%	0.62	1.31	0.94	0.97	0.23	-0.06	0.05
Methylcyclopentane	8	100.00%	1.91	14.63	11.46	9.87	4.74	-1.09	-0.24
2,4-Dimethylpentane	8	100.00%	1.67	9.10	7.12	6.62	2.32	-1.52	2.83
Benzene	8	100.00%	7.94	40.90	30.81	29.59	9.76	-1.69	4.14
Cyclohexane	8	100.00%	4.03	7.89	6.59	6.42	1.23	-1.04	1.09
Isoheptane	7	87.50%	4.58	7.35	5.59	6.05	1.11	0.09	-1.91
2,3-Dimethylpentane	7	87.50%	4.04	27.80	6.48	9.13	8.35	2.49	6.40
3-Methylhexane	8	100.00%	5.59	15.73	12.55	12.18	3.40	-1.03	0.85
2,2,4-Trimethylpentane	8	100.00%	4.86	25.02	21.26	18.85	6.54	-1.62	2.72
1-Heptene	8	100.00%	0.66	2.55	2.01	1.90	0.59	-1.37	2.47
n-Heptane	8	100.00%	3.87	13.28	10.05	9.96	3.13	-0.98	0.95
Methylcyclohexane	8	100.00%	1.65	7.86	5.96	5.64	2.04	-1.11	1.07
2,2,3-Trimethylpentane	8	100.00%	0.91	4.07	3.37	3.04	1.01	-1.51	2.42
2,3,4-Trimethylpentane	8	100.00%	1.69	9.40	7.45	6.68	2.43	-1.36	1.95
Toluene	8	100.00%	20.55	107.00	83.65	79.04	27.11	-1.56	3.19
2-Methylheptane	8	100.00%	1.51	8.01	5.73	5.66	2.11	-1.04	1.18
3-Methylheptane	8	100.00%	1.23	7.01	5.19	4.98	1.81	-1.34	2.16
1-Octene	8	100.00%	0.55	2.97	2.49	2.17	0.79	-1.43	1.86
n-Octane	8	100.00%	0.94	9.13	5.20	5.33	2.60	-0.19	0.11
Ethylbenzene	8	100.00%	2.95	15.06	11.10	10.64	3.64	-1.36	2.90
p-Xylene + m-Xylene	8	100.00%	12.42	65.81	47.86	46.04	16.01	-1.30	2.77
Styrene	7	87.50%	1.13	3.56	2.23	2.26	0.76	0.37	1.00
o-Xylene	8	100.00%	3.52	20.09	14.70	13.99	4.94	-1.36	3.04
1-Nonene	7	87.50%	1.09	1.63	1.24	1.34	0.20	0.38	-1.67
n-Nonane	8	100.00%	1.10	4.71	3.25	3.24	1.12	-0.72	1.11
Isopropylbenzene	7	87.50%	0.50	0.61	0.57	0.55	0.05	-0.17	-2.48
n-Propylbenzene	8	100.00%	2.03	3.60	3.12	2.97	0.55	-0.67	-0.70
alpha-Pinene	8	100.00%	0.79	3.32	2.51	2.43	0.78	-1.40	2.64
m-Ethyltoluene	8	100.00%	2.08	11.23	8.25	7.73	2.69	-1.28	2.93
p-Ethyltoluene	7	87.50%	1.85	3.07	2.32	2.40	0.38	0.57	1.42
1,3,5-Trimethylbenzene	8	100.00%	1.11	6.84	4.62	4.67	1.74	-1.09	2.15
o-Ethyltoluene	8	100.00%	1.53	5.73	4.20	4.06	1.21	-1.20	3.06
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	8	100.00%	4.10	20.82	15.02	14.27	4.91	-1.16	2.63

Table 9-23. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	6	75.00%	1.50	2.37	1.98	1.94	0.34	-0.18	-1.55
1,2,3-Trimethylbenzene	8	100.00%	3.86	6.36	4.29	4.61	0.86	1.50	1.71
p-Diethylbenzene	7	87.50%	1.16	2.67	1.61	1.72	0.60	0.77	-1.01
1-Undecene	7	87.50%	0.56	3.35	0.85	1.21	0.96	2.44	6.16
n-Undecane	8	100.00%	3.28	5.15	4.00	4.19	0.67	0.26	-1.47
1-Dodecene	3	37.50%	0.55	1.68	0.86	1.03	0.58	1.20	.
n-Dodecane	8	100.00%	1.88	3.64	2.50	2.53	0.66	0.49	-1.13
1-Tridecene	0	0.00%	.	.	.	.	.	.	.
n-Tridecane	8	100.00%	0.81	1.88	1.16	1.25	0.39	0.77	-0.74

Table 9-24. 1992 Summary Statistics for Salt Lake City, UT (S3UT)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	8	100.00%	5.10	35.83	28.83	23.45	11.62	-0.63	-1.50
Acetylene	8	100.00%	1.87	30.14	20.09	16.97	11.24	-0.27	-1.70
Ethane	8	100.00%	5.01	42.55	30.46	26.18	12.45	-0.64	-0.45
Propylene	8	100.00%	1.03	19.39	11.93	10.40	6.79	-0.23	-1.62
Propane	8	100.00%	2.89	109.29	42.57	40.07	34.51	1.06	1.55
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	8	100.00%	0.81	40.00	18.45	18.07	14.00	0.20	-1.19
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	8	100.00%	0.74	9.03	6.14	5.48	2.97	-0.53	-1.08
1,3-Butadiene	5	62.50%	0.63	2.15	1.89	1.53	0.72	-0.60	-2.82
n-Butane	8	100.00%	2.75	61.82	39.18	33.27	21.61	-0.21	-1.32
t-2-Butene	7	87.50%	0.81	3.78	2.38	2.35	0.97	-0.20	0.04
c-2-Butene	6	75.00%	1.16	2.30	1.79	1.73	0.45	-0.15	-1.73
3-Methyl-1-butene	5	62.50%	0.72	1.13	0.94	0.94	0.18	-0.13	-2.37
Isopentane	8	100.00%	4.90	81.44	66.03	53.49	28.76	-0.98	-0.61
1-Pentene	6	75.00%	1.94	4.75	2.33	2.69	1.04	2.10	4.61
2-Methyl-1-butene	7	87.50%	1.10	5.10	3.60	3.34	1.25	-0.70	1.42
n-Pentane	8	100.00%	2.18	48.01	35.39	28.82	16.46	-0.76	-0.85
Isoprene	7	87.50%	0.56	3.36	1.23	1.49	0.88	1.97	4.91
t-2-Pentene	7	87.50%	1.27	5.50	3.84	3.55	1.34	-0.52	0.79
c-2-Pentene	6	75.00%	0.69	2.98	2.14	2.03	0.83	-0.70	0.02
2-Methyl-2-butene	8	100.00%	0.86	8.25	3.91	4.03	2.55	0.39	-0.99
Neohexane	7	87.50%	0.57	2.59	1.22	1.36	0.64	1.24	2.34
Cyclopentene	5	62.50%	0.56	0.96	0.70	0.73	0.15	1.01	1.90
4-Methyl-1-pentene	6	75.00%	0.93	1.43	1.12	1.16	0.19	0.42	-1.32
2,3-Dimethylbutane	7	87.50%	0.55	2.81	2.50	2.12	0.80	-1.53	2.10
Cyclopentane	8	100.00%	0.73	8.54	6.19	5.55	2.61	-1.06	0.36
Isohexane	8	100.00%	1.76	27.14	19.78	17.75	8.98	-1.06	-0.01
3-Methylpentane	8	100.00%	0.99	17.91	12.55	11.32	5.91	-0.90	-0.12
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	6	75.00%	0.64	2.65	1.97	1.84	0.66	-1.20	2.81
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	8	100.00%	1.41	22.49	17.87	15.27	7.70	-1.16	0.01
t-2-Hexene	6	75.00%	0.62	1.67	1.19	1.15	0.35	-0.02	1.16

Table 9-24. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	5	62.50%	0.65	1.13	0.86	0.84	0.19	0.95	0.99
Methylcyclopentane	8	100.00%	0.55	11.76	8.57	7.60	3.85	-1.11	0.26
2,4-Dimethylpentane	7	87.50%	0.95	8.06	4.90	4.38	2.40	-0.01	-0.36
Benzene	8	100.00%	2.81	28.54	21.05	17.81	8.74	-0.71	-0.57
Cyclohexane	8	100.00%	0.66	8.63	5.15	5.11	2.59	-0.48	-0.04
Isoheptane	5	62.50%	1.34	13.64	4.94	5.78	4.68	1.57	3.07
2,3-Dimethylpentane	6	75.00%	1.96	20.03	8.82	10.24	7.53	0.30	-2.19
3-Methylhexane	8	100.00%	1.56	12.62	8.71	7.98	3.65	-0.81	0.03
2,2,4-Trimethylpentane	8	100.00%	1.51	23.47	15.64	13.90	7.15	-0.60	-0.22
1-Heptene	7	87.50%	0.59	2.10	1.43	1.47	0.49	-0.71	0.89
n-Heptane	8	100.00%	0.57	13.33	8.32	7.67	4.25	-0.58	-0.39
Methylcyclohexane	7	87.50%	1.86	13.42	7.76	7.44	3.63	0.16	0.81
2,2,3-Trimethylpentane	7	87.50%	1.12	3.67	2.55	2.48	0.90	-0.39	-0.80
2,3,4-Trimethylpentane	8	100.00%	0.53	7.54	5.74	4.68	2.36	-0.76	-0.47
Toluene	8	100.00%	5.09	85.69	53.99	46.62	25.77	-0.26	-0.37
2-Methylheptane	7	87.50%	1.69	15.33	4.73	6.04	4.38	1.96	4.59
3-Methylheptane	7	87.50%	1.53	9.36	4.10	4.40	2.53	1.34	2.38
1-Octene	7	87.50%	0.84	2.94	1.82	1.68	0.77	0.55	-0.68
n-Octane	7	87.50%	1.10	28.68	4.66	7.24	9.55	2.54	6.58
Ethylbenzene	8	100.00%	0.75	12.53	7.17	6.64	3.95	-0.04	-0.87
p-Xylene + m-Xylene	8	100.00%	3.19	52.99	32.18	29.45	17.06	-0.19	-1.00
Styrene	6	75.00%	0.70	3.11	1.32	1.55	0.83	1.64	3.41
o-Xylene	8	100.00%	0.77	14.93	9.48	8.78	4.91	-0.38	-0.78
1-Nonene	6	75.00%	1.00	2.40	1.38	1.49	0.52	1.24	1.42
n-Nonane	6	75.00%	2.47	9.34	4.22	4.72	2.40	1.82	3.91
Isopropylbenzene	2	25.00%	0.57	0.78	0.67	0.67	0.15	.	.
n-Propylbenzene	8	100.00%	0.91	3.47	2.36	2.26	0.85	-0.42	-0.44
alpha-Pinene	7	87.50%	0.69	2.52	1.75	1.72	0.59	-0.57	0.98
m-Ethyltoluene	7	87.50%	1.75	7.94	4.75	4.45	2.30	0.26	-1.32
p-Ethyltoluene	7	87.50%	0.67	6.33	1.40	2.05	1.95	2.29	5.56
1,3,5-Trimethylbenzene	7	87.50%	1.30	4.83	2.58	2.95	1.55	0.18	-2.43
o-Ethyltoluene	8	100.00%	0.63	4.37	2.80	2.63	1.18	-0.55	0.27
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	8	100.00%	1.09	14.74	9.84	8.47	4.57	-0.40	-0.87

Table 9-24. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	7	87.50%	0.68	3.35	2.96	2.45	0.95	-1.26	0.91
1,2,3-Trimethylbenzene	8	100.00%	1.22	4.71	3.45	3.24	1.13	-0.71	0.10
p-Diethylbenzene	5	62.50%	0.97	1.60	1.17	1.26	0.31	0.36	-3.06
1-Undecene	6	75.00%	0.55	4.19	0.90	1.47	1.37	2.16	4.80
n-Undecane	8	100.00%	1.45	5.07	3.05	3.17	1.25	0.00	-0.82
1-Dodecene	4	50.00%	0.61	3.44	0.99	1.50	1.32	1.79	3.23
n-Dodecane	8	100.00%	0.94	4.17	1.73	2.21	1.19	0.73	-0.91
1-Tridecene	1	12.50%	0.26	0.26	0.26	0.26	.	.	.
n-Tridecane	7	87.50%	0.55	1.71	1.19	1.16	0.35	-0.32	1.61

Table 9-25. 1992 Summary Statistics for Winston Salem, NC (WSNC)

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	8	100.00%	3.97	21.97	6.78	9.72	6.91	1.34	0.10
Acetylene	7	87.50%	1.79	16.03	3.17	6.15	5.71	1.27	-0.13
Ethane	8	100.00%	3.75	18.10	6.16	7.74	4.83	1.64	2.79
Propylene	7	87.50%	1.10	6.67	1.30	2.77	2.33	1.22	-0.45
Propane	8	100.00%	2.65	23.54	5.48	9.23	8.49	1.27	-0.19
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	8	100.00%	0.81	6.83	1.76	2.75	2.34	1.30	-0.05
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	8	100.00%	0.59	4.71	0.92	1.68	1.61	1.49	0.60
1,3-Butadiene	2	25.00%	1.13	1.84	1.49	1.49	0.50	.	.
n-Butane	8	100.00%	1.37	11.97	2.80	4.87	4.08	1.28	-0.08
t-2-Butene	2	25.00%	1.50	1.57	1.54	1.54	0.05	.	.
c-2-Butene	1	12.50%	0.75	0.75	0.75	0.75	.	.	.
3-Methyl-1-butene	2	25.00%	0.83	0.91	0.87	0.87	0.06	.	.
Isopentane	8	100.00%	3.61	42.16	6.31	13.41	15.28	1.51	0.60
1-Pentene	1	12.50%	1.23	1.23	1.23	1.23	.	.	.
2-Methyl-1-butene	2	25.00%	2.65	3.15	2.90	2.90	0.35	.	.
n-Pentane	8	100.00%	1.21	14.75	2.10	4.84	5.51	1.45	0.24
Isoprene	3	37.50%	0.60	5.61	2.55	2.92	2.53	0.65	.
t-2-Pentene	4	50.00%	0.49	3.12	1.71	1.76	1.39	0.04	-5.68
c-2-Pentene	2	25.00%	1.49	1.93	1.71	1.71	0.31	.	.
2-Methyl-2-butene	4	50.00%	0.48	5.01	1.95	2.35	2.21	0.48	-3.28
Neohexane	4	50.00%	0.60	1.17	0.90	0.89	0.32	-0.01	-5.92
Cyclopentene	2	25.00%	0.64	0.86	0.75	0.75	0.16	.	.
4-Methyl-1-pentene	1	12.50%	1.05	1.05	1.05	1.05	.	.	.
2,3-Dimethylbutane	2	25.00%	1.12	1.29	1.21	1.21	0.12	.	.
Cyclopentane	6	75.00%	0.68	4.29	1.05	1.92	1.59	1.01	-1.38
Isohexane	8	100.00%	1.19	11.87	1.87	4.08	4.51	1.42	0.06
3-Methylpentane	8	100.00%	0.73	10.91	1.13	3.26	4.26	1.47	0.26
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	2	25.00%	1.28	1.65	1.47	1.47	0.26	.	.
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	8	100.00%	0.69	6.34	1.01	2.20	2.37	1.43	0.10
t-2-Hexene	2	25.00%	1.48	2.82	2.15	2.15	0.95	.	.

Table 9-25. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	2	25.00%	0.69	0.79	0.74	0.74	0.07	.	.
Methylcyclopentane	6	75.00%	0.54	4.38	0.82	1.84	1.79	0.98	-1.68
2,4-Dimethylpentane	4	50.00%	0.77	3.31	1.98	2.01	1.39	0.02	-5.88
Benzene	8	100.00%	2.21	12.60	3.01	5.13	4.27	1.41	0.09
Cyclohexane	6	75.00%	0.58	3.01	0.79	1.23	0.94	1.83	3.16
Isoheptane	3	37.50%	1.27	2.32	1.95	1.85	0.53	-0.84	.
2,3-Dimethylpentane	4	50.00%	0.68	2.10	1.34	1.36	0.65	0.15	-3.23
3-Methylhexane	8	100.00%	1.07	5.12	1.52	2.34	1.68	1.31	-0.18
2,2,4-Trimethylpentane	8	100.00%	1.19	11.80	2.24	4.41	4.49	1.33	-0.15
1-Heptene	1	12.50%	1.15	1.15	1.15	1.15	.	.	.
n-Heptane	5	62.50%	0.60	9.95	0.96	4.11	4.54	0.70	-2.80
Methylcyclohexane	3	37.50%	0.48	2.36	1.67	1.50	0.95	-0.76	.
2,2,3-Trimethylpentane	3	37.50%	0.53	1.82	1.73	1.36	0.72	-1.70	.
2,3,4-Trimethylpentane	6	75.00%	0.58	4.63	1.06	2.04	1.86	0.94	-1.75
Toluene	8	100.00%	4.36	51.13	7.75	17.04	19.55	1.43	0.10
2-Methylheptane	3	37.50%	0.50	2.32	2.08	1.63	0.99	-1.62	.
3-Methylheptane	2	25.00%	1.77	2.05	1.91	1.91	0.20	.	.
1-Octene	3	37.50%	0.46	1.59	1.56	1.20	0.64	-1.73	.
n-Octane	3	37.50%	0.67	1.47	1.18	1.11	0.41	-0.79	.
Ethylbenzene	8	100.00%	0.57	5.73	1.05	2.09	2.25	1.40	-0.06
p-Xylene + m-Xylene	8	100.00%	1.70	19.05	3.37	6.77	7.56	1.40	-0.05
Styrene	2	25.00%	1.11	1.22	1.17	1.17	0.08	.	.
o-Xylene	8	100.00%	0.54	6.90	0.88	2.25	2.77	1.43	0.01
1-Nonene	2	25.00%	0.75	0.87	0.81	0.81	0.09	.	.
n-Nonane	3	37.50%	0.58	3.30	1.58	1.82	1.38	0.76	.
Isopropylbenzene	0	0.00%	.	.	.	.	.	.	.
n-Propylbenzene	8	100.00%	0.51	6.88	1.45	1.89	2.06	2.60	7.07
alpha-Pinene	2	25.00%	2.18	2.44	2.31	2.31	0.18	.	.
m-Ethyltoluene	7	87.50%	0.66	5.77	1.07	2.28	2.32	1.22	-0.83
p-Ethyltoluene	2	25.00%	1.38	1.60	1.49	1.49	0.16	.	.
1,3,5-Trimethylbenzene	4	50.00%	0.56	2.80	1.59	1.64	1.23	0.02	-5.87
o-Ethyltoluene	6	75.00%	0.59	4.41	0.80	1.77	1.70	1.08	-1.09
1-Decene	0	0.00%	.	.	.	.	.	.	.
1,2,4-Trimethylbenzene	8	100.00%	0.84	10.18	1.47	3.38	3.88	1.44	0.13

Table 9-25. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	3	37.50%	0.54	5.57	3.79	3.30	2.55	-0.83	.
1,2,3-Trimethylbenzene	8	100.00%	1.02	4.91	2.25	2.49	1.30	1.07	0.48
p-Diethylbenzene	5	62.50%	1.05	1.44	1.41	1.28	0.20	-0.60	-3.28
1-Undecene	8	100.00%	1.04	6.39	3.58	3.68	1.53	0.16	1.64
n-Undecane	8	100.00%	0.73	4.90	1.44	2.16	1.50	1.04	-0.17
1-Dodecene	7	87.50%	1.14	2.25	1.49	1.60	0.35	0.99	1.69
n-Dodecane	8	100.00%	0.82	3.79	1.56	1.96	1.16	1.02	-0.56
1-Tridecene	1	12.50%	0.52	0.52	0.52	0.52	.	.	.
n-Tridecane	8	100.00%	0.57	4.86	0.87	1.41	1.43	2.57	6.83

sample date and considered as one sample for the summary statistics. The target compounds for the 1992 monitoring season are given in the first column of the summary statistics tables. The cases columns denote the number of samples the compound was identified in for the 1992 monitoring season. The third column in the tables records the percent of the samples in which a particular compound was identified. The minimum, maximum, median, average, standard deviation, skewness, and kurtosis of the measured concentrations in ppbC are also listed in each table for each target compound.

9.3 Overall Data Summary

Table 9-26 presents the overall summary statistics for all daily monitoring sites in the 1992 monitoring program. The analysis results of 681 samples were considered for these statistics. Duplicate and duplicate/replicate data for a given sample date were averaged and considered as one sample. Average concentrations ranged from 0.59 ppbC for 2-ethyl-1-butene to 27.04 ppbC for propane. The largest standard deviation of concentration, 77.63 ppbC, was observed for propane.

Table 9-27 contains overall summary statistics for all optional analysis sties in the 1992 monitoring program. A total of 62 samples were considered, and statistics are reported in the same manner as the daily monitoring summary statistics. Average concentrations ranged from 0.97 ppbC for 1-tridecene to 44.23 ppbC for isopentane. The largest standard deviation was 67.90 ppbC for n-undecane.

Table 9-26. 1992 Summary Statistics for All Program Sites

			ppbC						
Compound	Cases	Frequency	Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	676	99.27%	0.89	484.61	11.78	16.92	28.34	10.71	146.61
Acetylene	634	93.10%	0.59	52.58	6.44	8.89	7.60	1.64	3.19
Ethane	677	99.41%	0.75	235.60	10.02	15.75	19.55	5.65	51.29
Propylene	665	97.65%	0.60	158.65	3.84	6.14	10.86	8.91	96.86
Propane	680	99.85%	0.99	1851.76	13.10	27.04	77.63	19.47	451.25
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	667	97.94%	0.59	120.63	4.66	7.47	9.17	4.99	43.94
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	664	97.50%	0.53	22.51	2.66	3.37	2.55	2.27	9.13
1,3-Butadiene	428	62.85%	0.39	30.78	1.21	1.60	1.79	10.90	167.01
n-Butane	680	99.85%	0.66	126.81	10.99	15.16	13.84	2.48	10.19
t-2-Butene	432	63.44%	0.49	12.10	1.22	1.53	1.22	3.78	23.03
c-2-Butene	310	45.52%	0.45	39.63	0.96	1.57	2.78	9.45	116.57
3-Methyl-1-butene	243	35.68%	0.44	4.07	0.86	1.05	0.59	2.10	5.81
Isopentane	675	99.12%	0.92	165.71	19.36	26.62	24.26	2.27	7.07
1-Pentene	257	37.74%	0.50	10.73	1.39	2.06	1.82	2.37	6.29
2-Methyl-1-butene	555	81.50%	0.49	13.31	1.64	2.15	1.77	2.37	8.14
n-Pentane	677	99.41%	0.56	72.53	8.26	11.57	10.63	2.22	6.52
Isoprene	590	86.64%	0.48	23.91	1.61	3.12	3.56	2.54	7.95
t-2-Pentene	556	81.64%	0.47	15.78	1.72	2.46	2.29	2.69	9.50
c-2-Pentene	459	67.40%	0.44	16.71	1.28	1.59	1.26	5.09	48.01
2-Methyl-2-butene	597	87.67%	0.34	21.14	2.04	2.84	2.56	2.58	9.77
Neohexane	667	97.94%	0.57	131.26	13.88	19.07	17.36	2.18	6.44
Cyclopentene	212	31.13%	0.40	2.50	0.79	0.92	0.44	1.74	2.98
4-Methyl-1-pentene	514	75.48%	0.43	3.42	0.90	1.02	0.46	1.61	3.52
2,3-Dimethylbutane	470	69.02%	0.43	7.96	1.16	1.50	1.03	2.15	6.46
Cyclopentane	642	94.27%	0.54	13.60	2.30	3.00	2.19	1.56	2.86
Isohexane	675	99.12%	0.51	49.15	5.69	7.90	6.70	1.93	4.90
3-Methylpentane	665	97.65%	0.52	27.02	4.77	6.14	4.76	1.40	2.03
1-Hexene	7	1.03%	0.71	2.93	1.04	1.49	0.91	0.81	-1.18
2-Methyl-1-pentene	389	57.12%	0.48	5.65	1.07	1.33	0.83	1.81	3.69
2-Ethyl-1-butene	1	0.15%	0.59	0.59	0.59	0.59	.	.	.
n-Hexane	670	98.38%	0.50	50.40	4.25	6.30	5.85	2.44	9.89
t-2-Hexene	268	39.35%	0.46	5.91	0.83	1.10	0.72	2.65	9.91

Table 9-26. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	161	23.64%	0.44	2.15	0.73	0.84	0.35	1.52	2.00
Methylcyclopentane	651	95.59%	0.51	21.52	2.83	3.87	3.05	1.70	4.05
2,4-Dimethylpentane	566	83.11%	0.46	12.40	1.58	2.35	1.98	1.79	3.92
Benzene	681	100.00%	1.01	55.97	6.64	8.90	7.02	2.12	6.67
Cyclohexane	639	93.83%	0.53	35.92	2.31	3.23	3.27	4.35	28.03
Isoheptane	571	83.85%	0.52	19.43	2.18	3.03	2.76	2.41	7.02
2,3-Dimethylpentane	284	41.70%	0.49	14.32	2.59	3.37	2.66	1.53	2.74
3-Methylhexane	681	100.00%	0.54	15.21	3.18	3.87	2.36	1.38	2.39
2,2,4-Trimethylpentane	671	98.53%	0.52	46.03	4.77	6.68	6.08	2.28	7.62
1-Heptene	314	46.11%	0.44	13.20	0.91	1.19	1.07	6.21	57.38
n-Heptane	626	91.92%	0.47	18.88	1.76	2.35	1.92	3.07	17.52
Methylcyclohexane	560	82.23%	0.50	16.23	1.44	1.87	1.53	3.93	26.75
2,2,3-Trimethylpentane	483	70.93%	0.37	5.99	1.11	1.36	0.87	1.95	4.84
2,3,4-Trimethylpentane	612	89.87%	0.47	15.12	1.94	2.63	2.16	2.07	5.73
Toluene	681	100.00%	1.08	218.21	17.94	24.37	22.31	2.88	14.38
2-Methylheptane	575	84.43%	0.51	8.83	1.39	1.75	1.16	1.88	5.32
3-Methylheptane	529	77.68%	0.43	8.12	1.21	1.56	1.01	1.81	5.09
1-Octene	398	58.44%	0.47	5.88	1.10	1.38	0.89	1.90	4.75
n-Octane	487	71.51%	0.45	26.34	1.08	1.52	1.94	8.32	90.22
Ethylbenzene	659	96.77%	0.49	25.04	3.08	4.16	3.29	1.72	4.08
p-Xylene + m-Xylene	680	99.85%	0.57	91.09	9.60	13.15	11.08	1.98	6.04
Styrene	481	70.63%	0.45	15.83	1.01	1.37	1.20	5.43	49.71
o-Xylene	656	96.33%	0.53	28.10	3.27	4.50	3.71	1.94	5.35
1-Nonene	205	30.10%	0.37	2.58	0.87	0.94	0.38	1.39	2.43
n-Nonane	517	75.92%	0.48	9.30	1.26	1.76	1.36	2.19	6.33
Isopropylbenzene	146	21.44%	0.38	2.95	0.69	0.80	0.38	3.61	15.70
n-Propylbenzene	635	93.25%	0.50	182.16	2.22	3.57	8.32	16.37	337.33
alpha-Pinene	538	79.00%	0.49	7.15	1.15	1.48	0.97	2.02	5.94
m-Ethyltoluene	652	95.74%	0.52	19.35	2.80	3.64	2.72	1.97	5.45
p-Ethyltoluene	402	59.03%	0.40	5.58	1.13	1.32	0.78	2.08	6.74
1,3,5-Trimethylbenzene	587	86.20%	0.47	9.44	1.42	1.88	1.42	2.07	5.26
o-Ethyltoluene	661	97.06%	0.45	11.25	1.79	2.32	1.57	1.80	4.49
1-Decene	7	1.03%	0.81	4.04	1.95	2.24	1.23	0.51	-1.10
1,2,4-Trimethylbenzene	674	98.97%	0.51	34.96	4.13	5.66	4.66	1.96	5.58

Table 9-26. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	403	59.18%	0.43	34.23	1.51	2.72	3.63	4.50	28.86
1,2,3-Trimethylbenzene	678	99.56%	0.76	24.20	2.86	3.42	2.09	3.34	21.83
p-Diethylbenzene	491	72.10%	0.47	6.43	1.04	1.25	0.71	2.35	9.25
1-Undecene	651	95.59%	0.48	22.50	1.65	2.38	2.31	3.52	16.73
n-Undecane	665	97.65%	0.50	89.40	2.35	3.58	6.25	8.68	94.45
1-Dodecene	630	92.51%	0.49	13.45	1.10	1.60	1.54	3.45	15.18
n-Dodecane	648	95.15%	0.49	104.86	1.48	2.73	7.03	11.19	145.44
1-Tridecene	174	25.55%	0.46	11.15	0.77	1.05	1.00	6.66	61.52
n-Tridecane	492	72.25%	0.43	41.76	0.92	1.49	2.74	9.58	115.34

Table 9-27. 1992 Summary Statistics for All Option Sites

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
Ethylene	62	100.00%	3.28	105.06	14.57	22.19	19.46	2.04	5.09
Acetylene	59	95.16%	1.07	47.23	7.48	11.43	10.45	1.44	1.56
Ethane	62	100.00%	2.29	115.23	16.12	23.43	24.01	1.82	3.52
Propylene	61	98.39%	0.77	23.59	6.32	8.21	6.50	0.73	-0.66
Propane	62	100.00%	2.08	465.52	13.73	26.26	59.58	6.82	50.36
Propyne	0	0.00%	.	.	.	.	.	.	.
Isobutane	62	100.00%	0.77	40.00	6.69	10.23	9.39	1.15	0.74
Isobutene	0	0.00%	.	.	.	.	.	.	.
1-Butene	62	100.00%	0.59	12.48	3.90	4.72	3.40	0.59	-0.71
1,3-Butadiene	39	62.90%	0.54	3.91	1.84	1.64	0.89	0.50	-0.68
n-Butane	62	100.00%	1.37	61.82	15.44	19.50	16.85	0.92	-0.09
t-2-Butene	47	75.81%	0.50	8.22	2.11	2.56	1.78	1.27	1.50
c-2-Butene	36	58.06%	0.56	11.33	1.93	2.63	2.22	2.25	6.15
3-Methyl-1-butene	32	51.61%	0.47	4.28	1.07	1.13	0.68	3.39	15.04
Isopentane	62	100.00%	3.61	247.17	27.73	44.23	48.73	2.13	5.40
1-Pentene	37	59.68%	0.67	14.42	2.05	2.41	2.30	4.17	21.24
2-Methyl-1-butene	49	79.03%	0.65	25.78	2.65	3.46	3.78	4.52	25.86
n-Pentane	62	100.00%	1.21	106.50	9.44	17.31	18.84	2.13	6.94
Isoprene	47	75.81%	0.49	9.24	1.66	2.09	1.85	2.61	7.79
t-2-Pentene	49	79.03%	0.49	35.37	3.10	4.13	5.48	4.35	22.92
c-2-Pentene	44	70.97%	0.52	19.48	1.51	2.25	2.93	4.99	28.98
2-Methyl-2-butene	51	82.26%	0.41	51.48	2.53	4.66	7.39	5.34	33.37
Neohexane	42	67.74%	0.53	3.91	1.17	1.25	0.70	1.86	4.60
Cyclopentene	27	43.55%	0.56	7.25	0.90	1.20	1.27	4.49	21.73
4-Methyl-1-pentene	37	59.68%	0.49	5.77	1.08	1.18	0.85	4.58	24.95
2,3-Dimethylbutane	40	64.52%	0.55	15.76	1.69	2.09	2.41	4.90	27.78
Cyclopentane	57	91.94%	0.45	29.09	3.59	4.53	4.41	3.19	16.38
Isohexane	62	100.00%	0.80	105.04	6.57	12.56	15.36	3.76	20.90
3-Methylpentane	61	98.39%	0.62	55.83	5.58	8.47	9.20	2.59	10.60
1-Hexene	0	0.00%	.	.	.	.	.	.	.
2-Methyl-1-pentene	40	64.52%	0.56	17.01	1.79	2.10	2.58	5.20	30.37
2-Ethyl-1-butene	0	0.00%	.	.	.	.	.	.	.
n-Hexane	62	100.00%	0.63	29.11	4.54	8.43	8.65	1.06	-0.24
t-2-Hexene	33	53.23%	0.50	15.11	1.37	2.38	3.37	3.40	11.29

Table 9-27. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
c-2-Hexene	27	43.55%	0.46	9.48	0.86	1.23	1.70	4.75	23.56
Methylcyclopentane	56	90.32%	0.54	22.99	3.31	5.22	4.70	1.40	2.26
2,4-Dimethylpentane	50	80.65%	0.65	9.10	2.20	3.30	2.50	0.86	-0.47
Benzene	62	100.00%	2.21	40.90	8.29	12.66	10.19	1.02	0.02
Cyclohexane	55	88.71%	0.49	40.45	3.01	4.36	5.65	4.98	31.47
Isoheptane	47	75.81%	0.57	16.84	3.06	4.36	3.99	1.53	2.08
2,3-Dimethylpentane	38	61.29%	0.52	27.80	2.16	4.84	6.28	2.26	4.89
3-Methylhexane	62	100.00%	1.05	21.14	5.32	6.44	4.95	0.90	0.12
2,2,4-Trimethylpentane	62	100.00%	0.90	25.02	6.86	9.10	7.06	0.72	-0.67
1-Heptene	32	51.61%	0.53	8.34	1.41	1.57	1.37	4.07	20.14
n-Heptane	55	88.71%	0.57	13.33	2.84	4.80	4.05	0.68	-0.90
Methylcyclohexane	47	75.81%	0.48	13.42	1.81	3.35	3.23	1.47	1.66
2,2,3-Trimethylpentane	48	77.42%	0.53	8.54	1.48	1.93	1.43	2.27	8.52
2,3,4-Trimethylpentane	56	90.32%	0.45	16.81	2.59	3.75	3.07	1.66	4.44
Toluene	62	100.00%	4.31	187.39	27.29	40.14	35.70	1.43	3.18
2-Methylheptane	50	80.65%	0.50	20.71	2.11	3.39	3.68	2.94	10.86
3-Methylheptane	47	75.81%	0.60	16.59	1.88	2.92	2.87	2.76	10.60
1-Octene	44	70.97%	0.46	4.64	1.38	1.56	0.96	1.07	1.01
n-Octane	44	70.97%	0.58	28.68	1.69	3.47	4.56	4.14	21.89
Ethylbenzene	61	98.39%	0.57	30.84	4.24	5.99	5.40	1.96	6.33
p-Xylene + m-Xylene	62	100.00%	1.70	114.81	15.48	23.15	21.73	1.63	3.94
Styrene	44	70.97%	0.54	8.42	1.51	1.77	1.35	3.24	13.70
o-Xylene	62	100.00%	0.53	39.30	5.17	7.57	7.25	1.82	5.11
1-Nonene	34	54.84%	0.47	13.04	1.14	1.69	2.22	4.44	21.82
n-Nonane	46	74.19%	0.58	40.77	2.04	3.79	6.35	4.82	26.54
Isopropylbenzene	26	41.94%	0.50	35.26	0.68	2.53	6.82	4.78	23.60
n-Propylbenzene	61	98.39%	0.51	29.31	2.31	3.49	4.27	4.10	22.25
alpha-Pinene	49	79.03%	0.56	37.54	1.89	3.35	6.02	4.56	23.02
m-Ethyltoluene	60	96.77%	0.61	38.63	4.11	6.06	7.09	2.96	9.87
p-Ethyltoluene	42	67.74%	0.55	19.25	1.69	2.69	3.49	3.39	12.90
1,3,5-Trimethylbenzene	53	85.48%	0.55	19.55	2.50	3.70	4.07	2.49	6.33
o-Ethyltoluene	60	96.77%	0.52	30.30	2.82	3.93	5.21	3.62	14.25
1-Decene	0	0.00%							
1,2,4-Trimethylbenzene	62	100.00%	0.84	57.18	6.30	9.75	10.62	2.48	7.46

Table 9-27. Continued

Compound	Cases	Frequency	ppbC Minimum	Maximum	Median	Average	Standard Deviation	Skewness	Kurtosis
n-Decane	36	58.06%	0.54	59.05	2.95	6.58	11.43	3.55	13.55
1,2,3-Trimethylbenzene	62	100.00%	0.76	17.81	3.45	3.82	3.03	2.74	9.64
p-Diethylbenzene	43	69.35%	0.49	5.18	1.44	1.70	1.05	2.03	4.36
1-Undecene	56	90.32%	0.55	49.40	2.22	3.86	7.45	5.20	28.79
n-Undecane	61	98.39%	0.61	404.04	3.31	20.99	67.90	4.74	23.16
1-Dodecene	47	75.81%	0.52	3.44	1.20	1.40	0.74	1.10	0.75
n-Dodecane	59	95.16%	0.59	308.21	1.88	11.86	42.54	6.25	42.39
1-Tridecene	10	16.13%	0.26	1.62	1.01	0.97	0.49	-0.04	-1.81
n-Tridecane	52	83.87%	0.52	35.78	0.97	3.27	7.64	3.69	12.93

9.4 Individual Sample Results

Appendix K contains the results from individual sample analyses. For each site sample, all target compounds are listed along with the concentration reported for each sample. There is also an unidentified compound sum concentration reported for each sample, labeled Unidentified VOC (Volatile Organic Compounds). The unidentified VOC total does not include the targeted compounds.

For daily monitoring program sites, the results are presented in a weekly report format (Monday to Friday). For days when duplicate samples were taken, the results for one of the duplicate samples was chosen to appear on the weekly report. The duplicate sample date can be used to reference a duplicate or duplicate/replicate report. The duplicate reports appear after the weekly reports for each site, and show a comparison of the results for a duplicate sample pair, or a duplicate pair with replicate analyses when done. For the optional analysis sites the five column report format is used, and the analytical results are presented in chronological order based on the sample collection date.

10.0 SNMOC TECHNICAL NOTES

This section describes the sampling and analytical equipment and procedures used for the 1992 SNMOC Monitoring Program. The sample collection method follows the general guidelines of EPA's Compendium of Methods TO-12. The analysis method follows the general guidelines of EPA's "Research Protocol Method for Analysis of C_2-C_{12} Hydrocarbons in Ambient Air by Gas Chromatography with Cryogenic Concentration" given in Appendix J.

10.1 Sampling Equipment and Procedure

The 1992 SNMOC monitoring program was scheduled to begin 22 June 1992, and end 30 September 1992. Integrated ambient air samples for program sites were collected from 6:00 a.m. to 9:00 a.m. (local civil time), Monday through Friday. The sampling equipment and sampling procedures used to collect these samples were the same as those used for the NMOC monitoring program described in Section 3.1.

10.2 Analytical System

Figure 10-2 presents the schematic of the analytical system used to perform the hydrocarbon analysis. The analytical system consists of a Radian Sample Interface System, a dual FID GC, and a data acquisition system.

Figures 10-2 and 10-3 show the flow paths of the valve located in the Radian Sample Interface System during the sample loading and sample injecting mode, respectively. When the six-port valve is in the sample load mode (see Figure 10-2), the sample interface cryogenically concentrates a predetermined repeated aliquot of sample. In the sample inject mode (see Figure 10-3), the cryogenically focused sample aliquot is thermally desorbed and the sample is swept by helium carrier gas to the head of the GC column. The GC oven temperature is programmed so the sample

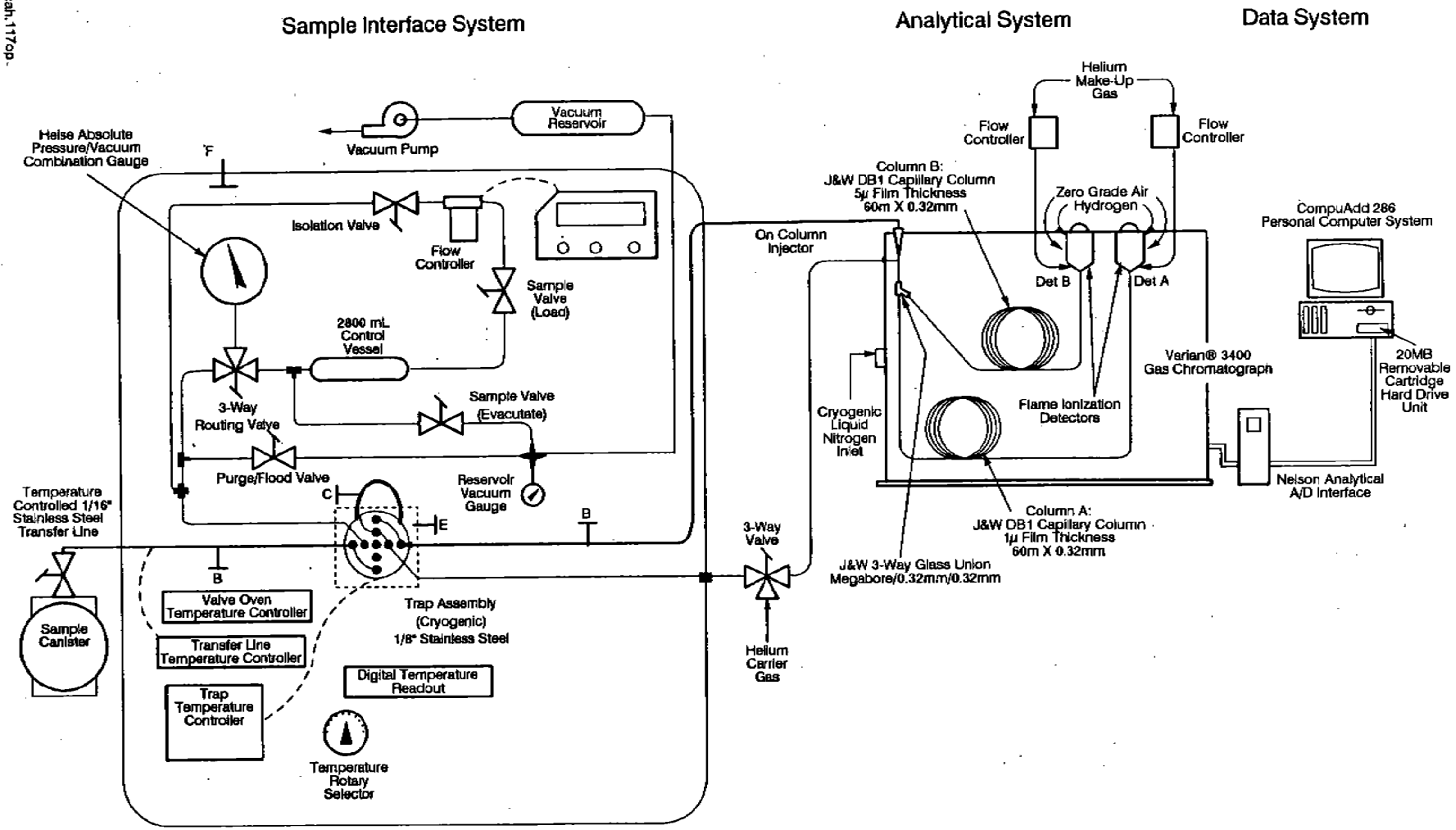

Figure 10-1. Hydrocarbon Analysis System

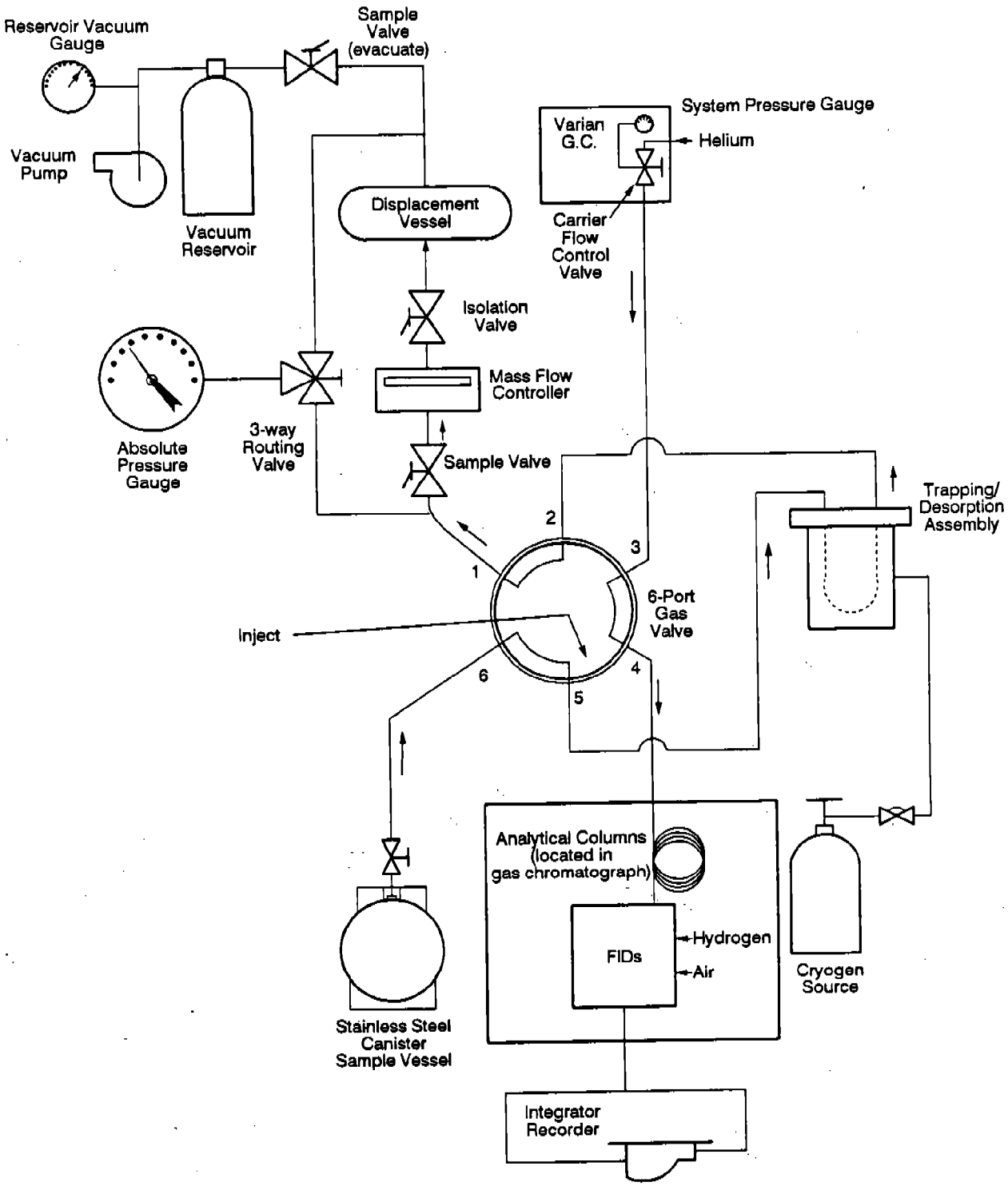

Figure 10-2. Radian Sample Interface in Sample Load Mode

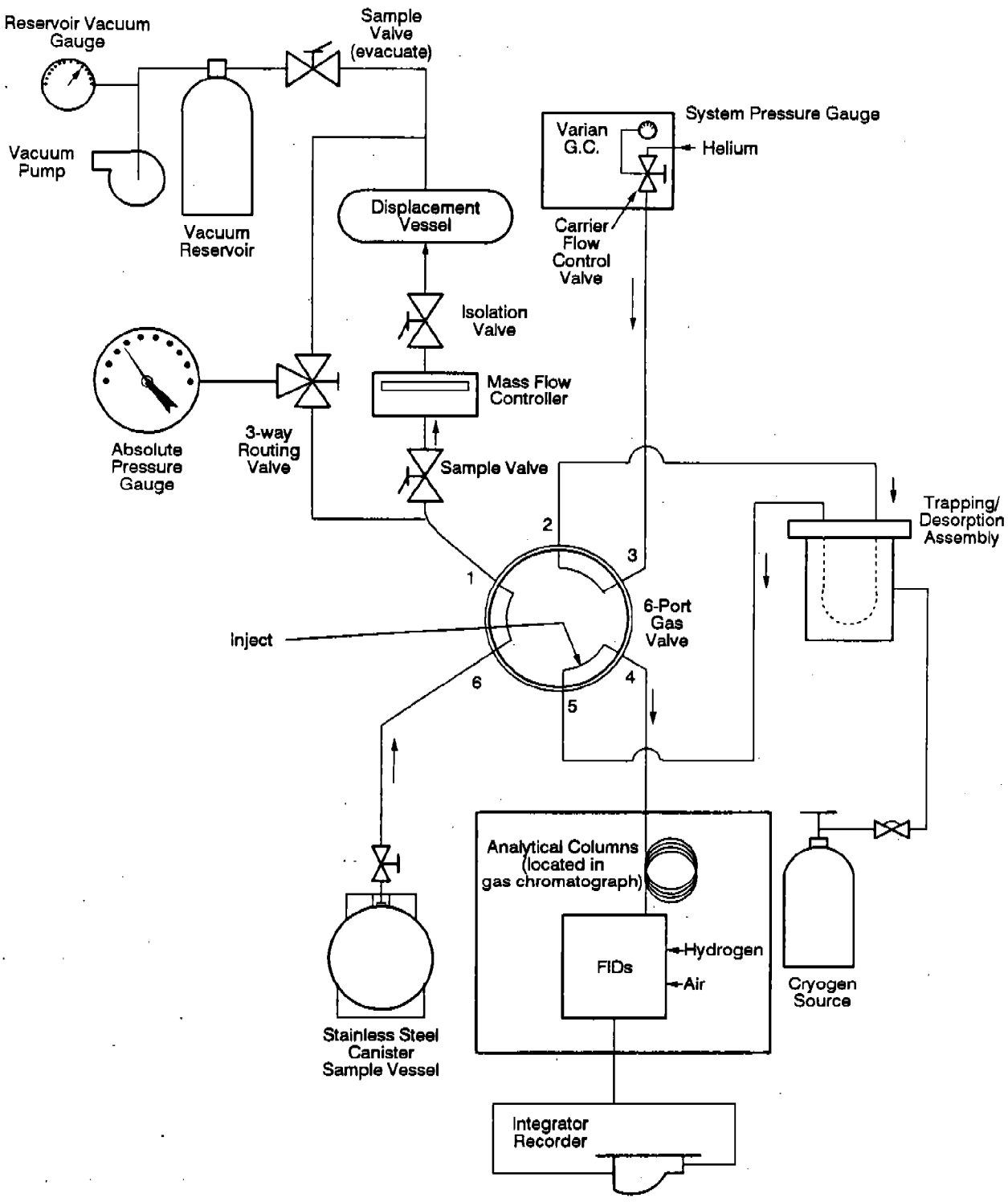

Figure 10-3. Radian Sample Interface in Sample Inject Mode

is refocused on the column at subambient conditions. The temperature is then increased to chromatographically separate the target compounds.

The GC contains two fused silica capillary columns each connected to a FID. The sample is split between the columns in a 1:1 ratio with a J&W precision splitter. Each column has a J&W DB-1® phase. One column has a phase thickness of 1 μm, to separate C_3 to C_{13} hydrocarbons effectively. The other has a phase thickness of 5 μm, to separate C_2 hydrocarbons consistently, and provide back-up capabilities for C_3 separation and quantitation. The chromatography for propylene and propane was better on the 5 μm column than the 1 μm column, so quantitation was performed from the secondary column data. Table 10-1 gives the operating conditions for the analytical system used for the 1992 SNMOC Monitoring Program.

Table 10-1

1992 Hydrocarbon Analysis GC/FID Operating Conditions

Parameter	Operating Value
Sample Volume	800 mL
J&W DB-1® Capillary Columns	
Column A:	
Film Thickness	1 μm
Length	60 m
Inside Diameter	0.32 mm
Column B:	
Film Thickness	5 μm
Length	60 m
Inside Diameter	0.32 mm
Oven Temperature Program	-60° for 5 min. Then: 6°C/min. to 150°C, then 20°C/min. to 180°C.
Analysis Time	45 min.
Detector Temperatures	
2 FIDs	300°C
Gas Flow Rates	
Helium Carrier Gas	3 mL/min.
Helium Make-Up	30 mL/min.
H_2 to FID	30 mL/min.
Air to FID	300 mL/min.

11.0 SNMOC QUALITY ASSURANCE AND CONTROL PROCEDURES

This section details the steps incorporated into the 1992 SNMOC Monitoring Program to ensure the data were of high and known quality. Procedures for standard preparation, database set-up, GC calibration, and daily analytical system checks are described. Duplicate samples and repeated analyses (replicates) provided information on sampling and analytical precision. Accuracy is assessed as the percent bias calculated from the analysis of external audit samples. An interlaboratory comparison with EPA provided information on the equivalency of the data reported for this program to data resulting from a comparable program.

11.1 Standards Preparation

Certified high pressure stock standards from Scott® Specialty Gases were used to prepare analytical calibration standards across the measurement range of the analytical system. Standards used to establish retention time information were prepared from stock standards prepared using neat liquid compounds injected into cleaned, evacuated canisters, and from certified gaseous stock standards.

All calibration and daily calibration check standards were made from certified standard gases. Gas-tight syringes were used to inject aliquots of the certified standard into cleaned, evacuated SUMMA® canisters. The canisters were then filled to ambient pressure with cleaned, humidified air using a standards preparation flow dilution system, then pressurized with nitrogen to approximately 35 psig using a precision canister dilution system.

11.2 Target Compounds Database

Standards used to gather retention time information and to set up a reference database using relative retention times referenced to toluene were prepared and analyzed. These relative retention times were used to identify the

target compounds in the ambient air samples. These standards were prepared, encompassing the list of target hydrocarbons found in Table 11-1, by using gas-tight syringes to inject aliquots of stock standards into clean, evacuated SUMMA® canisters.

11.3 GC/FID Monthly Calibration

The analytical system was calibrated monthly by analyzing three propane standards and a system blank of cleaned, humidified air. Three calibration standards were prepared from a Scott® Specialty Gases certified high pressure gaseous standard. The three levels prepared were 45, 150, 360 ppbC. The calibration range was based on the expected typical levels of target compound concentrations based on historical information.

The calibration standards were analyzed in order of increasing concentration. This was followed by the system blank to ensure no carryover after analysis of the high level standard. The area count recorded by each FID for each calibration standard was correlated to the nanoliters (nl) of propane, and the calibration was considered representative if the coefficient of correlation for the four points was greater than or equal to 0.995.

A least squares linear regression calculation was performed for the data from each detector, and the resulting slopes were used as the propane response factors. These response factors were divided by 3 (carbons/molecule of propane) to calculate a per carbon response factor for each detector. This value was used to calculate sample concentrations for the following month. Monthly propane calibration information is summarized in Table 11-2.

Table 11-1

1992 Ambient Air Hydrocarbon Program Target List

Compound	
Ethylene	2-Methylhexane (Isoheptane)
Acetylene	2,3-Dimethylpentane
Ethane	3-Methylhexane
Propylene	1-Heptene
Propane	2,2,4-Trimethylpentane
Propyne	n-Heptane
Isobutane	Methylcyclohexane
Isobutene	2,2,3-Trimethylpentane
1-Butene	2,3,4-Trimethylpentane
1,3-Butadiene	Toluene
n-Butane	2-Methylheptane
t-2-Butene	3-Methylheptane
c-2-Butene	1-Octene
3-Methyl-1-Butene	n-Octane
Isopentane	Ethylbenzene
1-Pentene	p,m-Xylene
2-Methyl-1-Butene	Styrene
n-Pentane	o-Xylene
Isoprene	1-Nonene
t-2-Pentene	n-Nonane
c-2-Pentene	Isopropylbenzene
2-Methyl-2-Butene	n-Propylbenzene
2,2-Dimethylbutane (Neohexane)	α-Pinene
Cyclopentene	m-Ethyltoluene
4-Methyl-1-Pentene	p-Ethyltoluene
2,3-Dimethylbutane	1,3,5-Trimethylbenzene
Cyclopentane	o-Ethyltoluene
2-Methylpentane (Isohexane)	1,2,4-Trimethylbenzene
3-Methylpentane	1-Decene
2-Methyl-1-Pentene	n-Decane
1-Hexene	1,2,3-Trimethylbenzene
2-Ethyl-1-Butene	p-Diethylbenzene
n-Hexane	1-Undecene
t-2-Hexene	n-Undecane
c-2-Hexene	Dodecene
Methylcyclopentane	n-Dodecane
2,4-Dimethylpentane	Tridecene
Benzene	n-Tridecane
Cyclohexane	

Table 11-2

Summary of Monthly Propane Calibration Curves

Calibration Date	Column A		Column B	
	Correlation Coefficient	Response Factor (AC/n1-C)	Correlation Coefficient	Response Factor (AC/n1-C)
6-23-92	0.9996	1776.6	0.9987	1421.2
7-23-92	1.0000	1803.7	1.0000	1435.9
8-23-92	1.0000	2017.5	1.0000	1628.1
9-25-92	1.0000	1937.6	1.0000	1566.5
10-23-92	1.0000	1813.5	1.0000	1415.7

11.4 Daily Quality Control Check

Daily, prior to sample analysis, a quality control standard, prepared from a Scott® Specialty Gases certified high pressure gaseous standard, was analyzed to ensure the validity of the current monthly response factors. This standard had an approximate propane concentration of 45 ppbC. This level was considered representative of the majority of concentrations expected in the monitoring ambient air samples.

The load volume (in liters) and the propane area count from each detector were entered into a computer spreadsheet and the current monthly response factors were used to calculate propane concentrations. These concentrations were compared to the calculated theoretical propane concentration of the quality control standard. A propane concentration percent bias of less than or equal to 30% was considered to be acceptable and that the analytical system was in control.

For the SNMOC Monitoring Program, if the daily QC standard did not meet the 30% criterion a second QC standard was prepared and analyzed. If the second QC standard met the criterion, the analytical system was considered in control. If the second QC check did not pass, a leak test and system maintenance were performed, and a third QC standard analysis was performed. If the criterion was met by the third analysis, the analytical system was considered in control. If the maintenance caused a change in system response a new calibration curve would be required. For the 1992 program the 30% criterion was met on the first standard analysis for every sample analysis day.

11.5 Daily Analytical System Blank

A dedicated cleaned, evacuated SUMMA® canister was reserved for system blank use during this analytical program. This canister was periodically pressurized with clean, humidified air from the canister cleaning system (described in

Section 3.3). A sample from this canister was analyzed after the daily QC standard analysis and prior to sample analysis. This allowed the presence of contamination to be assessed. The results from these analyses were filed with the daily QC checks and were used as a reference should questions arise concerning analytical interferences and results.

One interference was noted consistently from the system blank data. A peak occurring near the retention time of ethylene on the column used to quantitate ethylene was present in every blank analyzed. From data gathered this peak most commonly occurred at levels of 2-3.5 ppbC.

As a check for this possible interference, a nitrogen cylinder was connected to the analytical system and a normal sample volume analyzed, after a daily system canister blank had been analyzed. The interfering peak was present in the system canister blank at a concentration of 2.7 ppbC. The nitrogen analysis had no peak occurring at this time. This information indicated that the source of this peak was not the analytical system.

11.6 Precision of Sampling and Analysis

The precision of the sampling and analytical methods used for the 1992 SNMOC Monitoring Program was assessed using data from duplicate sample collections and replicate analyses.

11.6.1 Duplicate Samples

For each program site nine duplicate sample pairs were scheduled to be collected and analyzed. The actual number of sample pairs collected ranged from seven to ten. For the option sites one duplicate pair was randomly chosen for analysis. Pooled standard deviations for the duplicate samples were calculated as an indication of sampling precision. Table 11-3 presents the data for all program

Table 11-3. 1992 Duplicate Statistics for All Program Sites

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
Ethylene	96	12.27	22.43	14.05	1.96
Acetylene	84	5.86	8.35	18.77	1.38
Ethane	93	9.23	17.25	14.19	1.44
Propylene	95	3.82	7.33	8.63	1.06
Propane	96	12.48	20.97	5.72	1.41
Propyne	0				
Isobutane	95	4.30	7.72	10.20	0.90
Isobutene	0				
1-Butene	94	2.51	3.40	14.67	0.79
1,3-Butadiene	52	1.26	2.24	25.31	0.97
n-Butane	96	11.36	14.73	14.50	1.69
t-2-Butene	57	1.17	1.45	13.34	0.24
c-2-Butene	39	1.01	1.28	11.24	0.36
3-Methyl-1-butene	27	1.05	1.13	16.65	0.20
Isopentane	96	17.40	25.12	3.91	1.36
1-Pentene	25	1.53	2.15	24.36	0.88
2-Methyl-1-butene	77	1.43	2.09	7.18	0.21
n-Pentane	96	7.83	10.74	2.40	0.32
Isoprene	77	1.18	2.41	8.81	0.58
t-2-Pentene	72	1.52	2.43	11.93	0.51
c-2-Pentene	58	1.18	1.53	13.38	0.20
2-Methyl-2-butene	86	1.72	2.52	13.46	0.21
Neohexane	95	7.58	9.47	8.67	1.15
Cyclopentene	25	0.75	0.88	4.95	0.03
4-Methyl-1-pentene	68	0.87	0.95	13.34	0.16
2,3-Dimethylbutane	60	1.18	1.52	3.94	0.06
Cyclopentane	93	2.04	2.78	12.10	0.59
Isohexane	96	5.57	7.54	3.39	0.33
3-Methylpentane	94	4.52	6.12	16.63	0.87
1-Hexene	1	2.48	2.48	20.97	0.37
2-Methyl-1-pentene	41	1.01	1.33	11.31	0.52
2-Ethyl-1-butene	0				
n-Hexane	95	4.11	5.96	3.35	0.15
t-2-Hexene	30	0.78	1.09	6.37	0.07

Table 11-3. Continued

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
c-2-Hexene	14	0.81	0.98	6.21	0.05
Methylcyclopentane	94	2.53	3.66	7.46	0.26
2,4-Dimethylpentane	76	1.50	2.19	16.38	0.25
Benzene	96	5.84	8.76	5.84	0.74
Cyclohexane	90	2.44	3.26	27.74	0.87
Isoheptane	77	2.17	3.20	22.44	0.86
2,3-Dimethylpentane	31	2.57	3.26	34.46	1.08
3-Methylhexane	95	3.36	3.99	19.80	0.77
2,2,4-Trimethylpentane	96	4.31	6.24	4.85	0.24
1-Heptene	41	0.87	1.20	5.55	0.08
n-Heptane	89	1.66	2.38	11.50	0.24
Methylcyclohexane	73	1.40	2.14	9.35	0.58
2,2,3-Trimethylpentane	61	1.09	1.37	5.59	0.05
2,3,4-Trimethylpentane	88	1.68	2.42	3.77	0.08
Toluene	96	16.12	20.88	3.13	0.70
2-Methylheptane	80	1.33	1.76	8.39	0.25
3-Methylheptane	70	1.10	1.52	4.80	0.04
1-Octene	51	1.06	1.33	5.57	0.04
n-Octane	59	1.18	1.97	13.14	0.22
Ethylbenzene	95	2.70	3.77	9.39	0.46
p-Xylene + m-Xylene	96	8.34	12.29	5.02	1.68
Styrene	54	0.99	1.30	12.35	0.27
o-Xylene	94	2.75	4.06	6.95	0.58
1-Nonene	23	0.90	1.01	5.95	0.07
n-Nonane	70	1.06	1.72	9.85	0.11
Isopropylbenzene	15	0.79	0.95	6.28	0.05
n-Propylbenzene	84	2.04	2.85	31.70	1.66
alpha-Pinene	71	1.13	1.50	11.12	0.15
m-Ethyltoluene	95	2.39	3.42	14.65	0.68
p-Ethyltoluene	49	1.10	1.40	5.92	0.10
1,3,5-Trimethylbenzene	83	1.16	1.81	11.77	0.19
o-Ethyltoluene	95	1.56	2.18	10.07	0.28
1-Decene	2	3.86	3.86	3.83	0.11
1,2,4-Trimethylbenzene	96	3.31	5.27	9.49	0.35

Table 11-3. Continued

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
n-Decane	48	2.03	2.67	31.11	1.08
1,2,3-Trimethylbenzene	96	2.69	3.38	31.56	3.54
p-Diethylbenzene	58	1.09	1.27	36.70	0.46
1-Undecene	91	1.92	2.68	33.63	1.28
n-Undecane	91	2.12	2.73	28.79	0.81
1-Dodecene	87	1.23	1.79	36.67	1.09
n-Dodecane	86	1.36	1.97	34.59	1.17
1-Tridecene	13	0.66	0.71	25.16	0.16
n-Tridecane	60	0.90	1.16	36.90	0.65

sites. Table 11-4 presents the data for all optional analysis sites. The duplicate pooled standard deviations show similar results for each compound. This indicates that the sampling procedure for duplicates provided representative ambient air samples.

11.6.2 Replicate Analyses

For each program site half of a duplicate sample pair (a single canister of a duplicate collection) was scheduled to be analyzed in replicate to measure analytical precision. For the option sites, half of the duplicate sample pair was also selected to be analyzed in replicate. Tables 11-5 and 11-6 summarize the statistics for the replicate analyses of the program sites and option sites, respectively, in terms of average concentrations, average absolute percent differences, and pooled standard deviations. The results show excellent results for analytical precision.

11.7 Accuracy

Three external audits were supplied by the EPA's QA contractor. Table 11-7 summarizes the results of these audits. The results show good analytical accuracy. The percent bias for propane in the first audit (ID #2185) is higher than expected. It is unusual that propane showed the greatest percent bias. The system is calibrated with propane, and the response factor used to calculate all other concentrations for these reports is based on the propane calibration. The daily calibration checks for the days this audit was analyzed showed a propane bias of -13.9% and -6.0%, so the analytical system was operating within the expected limits, particularly for propane. If the true bias for propane was -38.5%, then this amount of bias would also be expected for all other compounds reported for Audit #2185. Unfortunately the contractor's analysis check did not include

Table 11-4. 1992 Duplicate Statistics for All Option Sites

		Duplicate Pair Statistics			
		Concentration		Average Absolute %	Pooled Standard
Compound	Cases	Median	Average	Difference	Deviation
Ethylene	9	17.04	20.04	6.45	0.89
Acetylene	9	8.62	11.51	13.15	2.96
Ethane	9	16.53	18.37	8.25	1.39
Propylene	9	6.44	8.21	6.54	0.33
Propane	9	15.69	18.70	5.18	0.76
Propyne	0	.	.	.	.
Isobutane	9	13.39	12.03	4.08	0.17
Isobutene	0	.	.	.	.
1-Butene	8	5.98	5.30	11.21	0.82
1,3-Butadiene	5	1.81	1.83	13.46	0.32
n-Butane	9	20.86	25.45	9.47	1.58
t-2-Butene	7	2.73	3.17	4.52	0.10
c-2-Butene	7	2.21	3.41	28.97	1.43
3-Methyl-1-butene	5	1.12	1.67	10.63	0.11
Isopentane	9	36.85	63.86	2.74	1.61
1-Pentene	7	1.44	3.58	16.35	0.83
2-Methyl-1-butene	8	2.71	5.74	3.51	0.16
n-Pentane	9	13.72	25.97	1.75	0.36
Isoprene	8	1.43	1.36	5.90	0.05
t-2-Pentene	8	4.15	7.37	12.58	0.79
c-2-Pentene	8	1.41	3.86	5.55	0.18
2-Methyl-2-butene	8	2.78	9.63	9.25	0.35
Neohexane	5	0.93	1.19	9.89	0.08
Cyclopentene	4	0.93	2.43	2.55	0.11
4-Methyl-1-pentene	6	1.15	1.87	10.22	0.09
2,3-Dimethylbutane	7	1.19	3.52	2.68	0.06
Cyclopentane	9	4.76	7.23	8.36	0.24
Isohexane	9	9.68	21.87	2.87	0.43
3-Methylpentane	9	6.69	13.21	18.86	1.67
1-Hexene	0	.	.	.	.
2-Methyl-1-pentene	8	1.17	3.35	11.43	0.17
2-Ethyl-1-butene	0	.	.	.	.
n-Hexane	9	5.38	10.78	3.39	0.20
t-2-Hexene	6	1.55	3.57	12.00	0.31

Table 11-4. Continued

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
c-2-Hexene	4	1.06	3.03	10.29	0.15
Methylcyclopentane	9	3.85	6.94	4.43	0.28
2,4-Dimethylpentane	9	2.19	3.70	5.36	0.09
Benzene	9	10.58	15.19	3.17	0.19
Cyclohexane	8	5.58	4.81	8.61	0.37
Isoheptane	8	3.17	3.90	23.38	0.70
2,3-Dimethylpentane	6	4.35	6.78	30.00	2.41
3-Methylhexane	9	6.66	8.18	18.49	1.27
2,2,4-Trimethylpentane	9	8.15	10.48	8.13	1.74
1-Heptene	5	1.86	2.87	11.39	0.25
n-Heptane	9	5.00	5.24	6.89	0.17
Methylcyclohexane	8	1.58	4.07	7.81	0.15
2,2,3-Trimethylpentane	8	1.34	2.62	5.92	0.15
2,3,4-Trimethylpentane	9	2.57	4.76	8.73	0.95
Toluene	9	38.76	58.20	1.95	2.12
2-Methylheptane	8	2.13	5.11	4.06	0.16
3-Methylheptane	8	1.77	4.23	6.19	0.16
1-Octene	8	1.00	1.76	6.75	0.36
n-Octane	7	1.62	3.02	8.15	0.19
Ethylbenzene	9	5.99	8.81	4.46	0.55
p-Xylene + m-Xylene	9	22.82	34.30	4.52	4.21
Styrene	8	1.70	1.56	6.96	0.07
o-Xylene	9	7.02	11.07	5.81	1.81
1-Nonene	5	1.22	1.87	3.38	0.03
n-Nonane	8	2.99	2.85	6.33	0.15
Isopropylbenzene	5	0.64	7.57	39.43	19.90
n-Propylbenzene	9	2.98	3.36	44.50	1.59
alpha-Pinene	7	2.37	3.08	9.63	1.10
m-Ethyltoluene	9	4.99	6.90	14.83	2.25
p-Ethyltoluene	7	2.15	2.53	11.97	0.72
1,3,5-Trimethylbenzene	9	2.63	4.00	11.41	1.89
o-Ethyltoluene	9	4.18	4.19	9.70	1.03
1-Decene	0				
1,2,4-Trimethylbenzene	9	9.15	12.35	7.02	4.59

Table 11-4. Continued

Compound	Cases	Duplicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
n-Decane	6	4.85	8.86	44.68	14.45
1,2,3-Trimethylbenzene	9	4.07	4.12	16.31	1.21
p-Diethylbenzene	8	1.79	2.14	51.10	0.88
1-Undecene	9	1.56	2.14	35.30	1.49
n-Undecane	9	4.43	39.15	54.88	140.68
1-Dodecene	7	0.83	1.32	38.06	0.94
n-Dodecane	9	3.00	32.77	68.87	109.89
1-Tridecene	0				
n-Tridecane	8	1.13	6.56	62.90	15.28

Table 11-5. 1992 Replicate Statistics for All Program Sites

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
Ethylene	114	12.47	24.05	21.65	3.01
Acetylene	95	5.54	8.73	23.97	1.84
Ethane	112	9.29	17.25	18.54	3.07
Propylene	109	3.82	7.29	10.58	0.66
Propane	114	10.94	21.46	7.69	1.60
Propyne	0				
Isobutane	110	4.05	7.24	12.11	1.22
Isobutene	0				
1-Butene	110	2.59	3.35	13.03	0.83
1,3-Butadiene	40	1.73	2.31	20.36	0.39
n-Butane	114	10.35	14.74	14.80	2.47
t-2-Butene	60	1.21	1.48	13.16	0.17
c-2-Butene	43	1.06	1.50	17.37	1.50
3-Methyl-1-butene	27	1.09	1.19	27.24	0.45
Isopentane	113	16.40	25.09	4.92	1.76
1-Pentene	28	1.96	2.53	14.34	0.22
2-Methyl-1-butene	86	1.45	2.21	4.35	0.10
n-Pentane	110	8.10	10.85	3.68	0.50
Isoprene	84	1.25	2.55	6.46	0.22
t-2-Pentene	83	1.53	2.51	10.78	0.59
c-2-Pentene	63	1.22	1.64	13.74	0.20
2-Methyl-2-butene	90	2.02	2.77	11.80	0.23
Neohexane	110	7.82	9.21	3.70	0.65
Cyclopentene	25	0.91	1.02	6.30	0.05
4-Methyl-1-pentene	78	0.92	1.01	7.55	0.19
2,3-Dimethylbutane	68	1.22	1.63	5.03	0.07
Cyclopentane	108	2.11	2.90	12.31	0.35
Isohexane	114	5.54	7.61	4.15	0.45
3-Methylpentane	111	4.10	5.91	15.37	1.14
1-Hexene	0				
2-Methyl-1-pentene	41	1.25	1.53	16.00	1.10
2-Ethyl-1-butene	0				
n-Hexane	114	4.08	5.96	5.16	0.33
t-2-Hexene	28	1.01	1.27	7.66	0.08

Table 11-5. Continued

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
c-2-Hexene	17	0.99	1.12	9.56	0.09
Methylcyclopentane	111	2.77	3.77	5.94	0.20
2,4-Dimethylpentane	94	1.66	2.30	5.68	0.19
Benzene	114	5.63	8.95	6.79	0.59
Cyclohexane	98	2.64	3.58	14.53	0.45
Isoheptane	82	2.09	3.46	23.38	1.47
2,3-Dimethylpentane	35	2.63	3.24	18.87	1.43
3-Methylhexane	114	3.58	4.20	4.53	0.18
2,2,4-Trimethylpentane	113	4.16	6.56	6.33	0.39
1-Heptene	41	1.00	1.50	15.47	0.34
n-Heptane	99	1.67	2.51	11.77	0.30
Methylcyclohexane	82	1.44	2.28	5.02	0.12
2,2,3-Trimethylpentane	68	1.17	1.48	5.64	0.08
2,3,4-Trimethylpentane	99	1.69	2.59	4.15	0.12
Toluene	114	16.30	21.19	3.08	0.99
2-Methylheptane	86	1.36	1.87	5.32	0.12
3-Methylheptane	72	1.30	1.69	5.30	0.08
1-Octene	56	1.14	1.45	5.16	0.07
n-Octane	69	1.16	1.58	13.47	0.43
Ethylbenzene	113	2.52	3.88	7.22	0.27
p-Xylene + m-Xylene	114	8.18	12.73	3.48	0.88
Styrene	55	1.14	1.49	5.61	0.08
o-Xylene	114	2.49	4.11	7.21	0.33
1-Nonene	26	0.90	1.02	9.72	0.15
n-Nonane	76	1.18	1.77	12.08	0.20
Isopropylbenzene	19	0.79	1.06	5.62	0.07
n-Propylbenzene	99	2.13	3.22	17.25	0.92
alpha-Pinene	71	1.32	1.78	8.02	0.14
m-Ethyltoluene	111	2.22	3.68	12.15	0.81
p-Ethyltoluene	46	1.33	1.71	7.69	0.18
1,3,5-Trimethylbenzene	94	1.22	2.00	11.05	0.29
o-Ethyltoluene	113	1.45	2.24	7.09	0.13
1-Decene	0				
1,2,4-Trimethylbenzene	113	3.19	5.49	8.69	0.48

Table 11-5. Continued

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
n-Decane	47	1.54	2.82	14.82	0.99
1,2,3-Trimethylbenzene	114	2.66	3.75	14.14	0.39
p-Diethylbenzene	62	1.08	1.35	34.97	0.66
1-Undecene	111	1.85	2.87	20.50	0.69
n-Undecane	105	2.00	2.85	27.88	1.12
1-Dodecene	100	1.37	1.93	29.40	0.51
n-Dodecane	97	1.32	2.18	23.59	0.59
1-Tridecene	10	0.70	0.75	18.74	0.22
n-Tridecane	62	0.90	1.37	19.42	0.30

Table 11-6. 1992 Replicate Statistics for All Option Sites

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
Ethylene	9	17.15	20.07	15.72	2.26
Acetylene	9	7.56	12.01	12.01	0.83
Ethane	9	16.53	18.99	7.24	0.79
Propylene	9	6.51	8.30	3.78	0.23
Propane	9	15.65	18.95	3.54	0.38
Propyne	0	.	.	.	.
Isobutane	8	11.95	11.52	3.79	0.20
Isobutene	0	.	.	.	.
1-Butene	8	6.81	5.48	4.22	0.19
1,3-Butadiene	6	1.41	1.53	19.74	0.35
n-Butane	9	20.00	25.58	9.49	1.36
t-2-Butene	7	2.59	3.16	6.67	0.16
c-2-Butene	6	2.00	2.76	12.12	0.19
3-Methyl-1-butene	5	1.06	1.61	7.58	0.09
Isopentane	9	36.76	63.76	4.58	2.93
1-Pentene	5	1.66	3.98	8.97	0.14
2-Methyl-1-butene	8	2.67	5.67	2.35	0.14
n-Pentane	9	13.65	25.95	2.17	0.69
Isoprene	7	1.47	1.35	2.57	0.03
t-2-Pentene	8	4.41	7.52	8.22	0.32
c-2-Pentene	8	1.39	3.83	18.66	0.30
2-Methyl-2-butene	8	2.71	9.49	15.80	0.41
Neohexane	6	0.91	1.10	15.39	0.15
Cyclopentene	4	0.94	2.40	4.22	0.05
4-Methyl-1-pentene	6	1.23	1.90	7.28	0.06
2,3-Dimethylbutane	7	1.19	3.51	2.75	0.09
Cyclopentane	9	4.95	7.20	11.30	0.27
Isohexane	9	9.77	21.78	2.88	0.61
3-Methylpentane	9	5.01	12.69	10.59	0.62
1-Hexene	0	.	.	.	.
2-Methyl-1-pentene	7	1.28	3.73	4.11	0.11
2-Ethyl-1-butene	0	.	.	.	.
n-Hexane	9	5.39	10.80	2.24	0.25
t-2-Hexene	6	1.55	3.60	11.91	0.37

Table 11-6. Continued

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
c-2-Hexene	3	1.09	3.77	7.55	0.10
Methylcyclopentane	9	3.77	6.86	10.76	0.56
2,4-Dimethylpentane	9	2.17	3.70	5.62	0.15
Benzene	9	10.51	15.22	3.29	0.25
Cyclohexane	8	5.52	4.85	9.32	0.36
Isoheptane	7	3.07	3.73	22.15	0.85
2,3-Dimethylpentane	6	4.92	7.56	27.20	5.33
3-Methylhexane	9	8.15	8.56	3.30	0.23
2,2,4-Trimethylpentane	9	8.15	10.10	17.08	3.35
1-Heptene	5	1.87	2.89	3.70	0.14
n-Heptane	9	5.01	5.27	5.58	0.12
Methylcyclohexane	8	1.58	4.03	18.47	0.28
2,2,3-Trimethylpentane	8	1.40	2.62	2.06	0.10
2,3,4-Trimethylpentane	9	2.56	4.50	21.12	1.80
Toluene	9	38.66	57.70	1.97	1.23
2-Methylheptane	8	2.11	5.09	1.93	0.10
3-Methylheptane	8	1.75	4.18	1.49	0.08
1-Octene	8	0.99	1.67	11.67	0.55
n-Octane	7	1.63	2.97	27.22	0.38
Ethylbenzene	9	5.79	8.66	3.49	0.27
p-Xylene + m-Xylene	9	21.92	33.09	1.57	0.65
Styrene	8	1.66	1.53	1.91	0.03
o-Xylene	9	7.04	10.59	2.18	0.21
1-Nonene	6	1.29	1.87	3.57	0.04
n-Nonane	8	2.96	2.84	3.23	0.08
Isopropylbenzene	2	0.60	0.60	2.45	0.00
n-Propylbenzene	9	2.98	2.98	23.96	1.43
alpha-Pinene	6	2.29	2.81	2.01	0.05
m-Ethyltoluene	9	4.94	6.48	2.01	0.23
p-Ethyltoluene	7	2.08	2.34	5.97	0.17
1,3,5-Trimethylbenzene	9	2.65	3.61	8.24	0.60
o-Ethyltoluene	9	3.96	3.97	2.59	0.05
1-Decene	0				
1,2,4-Trimethylbenzene	9	8.94	11.26	2.74	0.34

Table 11-6. Continued

Compound	Cases	Replicate Pair Statistics			
		Concentration		Average Absolute % Difference	Pooled Standard Deviation
		Median	Average		
n-Decane	7	3.25	11.65	37.88	26.37
1,2,3-Trimethylbenzene	9	3.98	3.98	13.11	0.39
p-Diethylbenzene	7	1.48	1.96	63.13	1.30
1-Undecene	9	1.47	2.51	8.27	0.20
n-Undecane	9	4.03	70.78	37.02	273.75
1-Dodecene	7	0.95	1.64	19.12	0.21
n-Dodecane	9	2.54	53.76	38.39	204.27
1-Tridecene	2	1.02	1.02	4.19	0.03
n-Tridecane	7	1.02	8.78	56.12	27.99

Table 11-7. Summary of External Audit Results

ID #	Compound	Theoretical Spike Level ppbv	Analysis Results ppbv		Percent Bias Results Relative to Theoretical		Percent Bias Results Relative to ManTech Radian
			ManTech	Radian	ManTech	Radian	
2185	Ethane	18.9	NA	15.1		-20.1	
	Propane	20.5	NA	12.6		-38.5	
	Isobutane	20.4	NA	18.4		-9.8	
	n-Butane	20.9	NA	19.4		-7.2	
	Isopentane	20.3	21.6	19.6	6.4	-3.4	-9.3
	n-Pentane	20.4	NA	19.8		-2.9	
	3-Methylpentane	20.0	19	19.4	-5.0	-3.0	2.1
	n-Hexane	20.0	NA	19.4		-3.0	
	Benzene	20.7	18.6	19.8	-10.1	-4.3	6.5
	n-Heptane	20.0	NA	19.7		-1.5	
	Toluene	19.9	NA	19.3		-3.0	
	n-Octane	19.8	17.4	19.3	-12.1	-2.5	10.9
	o-Xylene	19.3	18.7	17.8	-3.1	-7.8	-4.8
2403	Isopentane	5.0	5.0	5.2	0.0	4.0	4.0
	3-Methylpentane	4.8	4.9	5.0	2.1	4.2	2.0
	Benzene	5.0	5.8	5.5	16.0	10.0	-5.2
	Toluene	4.7	6.5	5.3	38.3	12.8	-18.5
	m-Xylene	5.0	4.6	9.3[a]	-8.0	-3.1	2.2
	p-Xylene	4.6	4.5	---	-2.2	---	
	o-Xylene	4.9	4.9	4.5	0.0	-8.2	-8.2
2580	Isobutane	5.0[b]	5.0	4.6	0.0	-8.0	-8.0
	n-Butane	5.0[b]	4.9	4.7	-2.0	-6.0	-4.1
	Isopentane	5.0[b]	5.8	4.9	16.0	-2.0	-15.5
	n-Pentane	5.0[b]	6.5	4.6	30.0	-8.0	-29.2
	n-Hexane	5.0[b]	4.6	4.7	-8.0	-6.0	2.2
	n-Heptane	5.0[b]	4.5	4.6	-10.0	-8.0	2.2
	n-Octane	5.0[b]	4.9	4.0	-2.0	-20.0	-18.4

NA = Not Analyzed
[a] = m-Xylene and p-Xylene reported as coeluting compounds
[b] = Theoretical concentrations nominally 5 ppb

propane, so there are not additional analytical data to support any conclusions. The daily calibration checks and the results for all other compounds indicate the true bias may have been a function of the theoretical spike level reported. This conclusion is supported further by the additional study described below.

During the 1992 analysis season the same analytical system also participated in the National Center for Atmospheric Research (NCAR) International Hydrocarbon Intercomparison Experiment. An audit canister containing 16 hydrocarbons was prepared by NCAR and analyzed in replicate using the same analysis procedures as applied to the previous audits. The percent bias reported by NCAR was less than 15% for all 16 compounds, the propane percent bias reported was 1.92% and 6.82% for the analyses.

The results from the EPA contractor audits and the NCAR experiment show good analytical accuracy. It was difficult to draw a conclusion about the large percent bias for propane in contractor Audit #2185. This percent bias is not considered a reasonable indication of the system accuracy for propane during this program since the results for all the other compounds reported are within reasonable percent bias expectations, the daily calibration check is within required limits, and all depend on the propane response factor in effect. In addition, results from a supporting experiment show good accuracy for propane and other compounds.

11.8 Comparative Analysis

Nine samples were supplied to the EPA's Atmospheric Research and Exposure Assessment Laboratory (AREAL) at Research Triangle Park, North Carolina, for comparative analyses. Fifty-one compounds chosen by the EPA AREAL were compared. Results of this comparison are given in Tables 11-8, 11-9, and 11-10. Table 11-8 displays the comparison data in ppbC units of concentration. Table 11-9 shows results expressed as a percent bias, using the

Table 11-8. Results of EPA Comparison Analysis

SITE ID	B1AL		B2AL		B3AL		BMTX		CHNC		DLTX		EPTX		FWTX		JUMX	
SAMPLE ID	2141		2190		2154		2435		2453		2314		2583		2581		2622	
	Radian	EPA	Radian	EPA	Radian	EPA	Radian	EPA	Radian	EPA	Radian	EPA	Radian	EPA	Radian	EPA	Radian	EPA
COMPOUND																		
Ethylene	13.5	9.8	10.1	10.1	12.6	10.2	7.2	2.6	18.9	21.9	12.5	9.6	52.9	55.0	15.2	14.7	24.6	25.5
Acetylene	4.2	5.0	6.2	8.5	6.5	7.3	1.9	1.8	12.0	10.9	7.0	8.1	52.6	64.4	9.6	12.5	20.5	27.2
Ethane	8.9	8.7	3.4	4.4	7.7	7.5	9.7	8.4	4.1	6.5	13.6	14.6	41.3	48.4	20.3	22.1	26.6	29.3
Propylene	2.8	3.2	3.7	4.6	4.3	4.7	1.1	1.4	6.0	5.4	3.9	4.2	23.2	24.4	5.6	6.6	9.3	11.6
Propane	12.4	13.6	8.9	11.2	10.3	6.4	10.9	11.9	11.6	11.6	16.2	17.7	87.6	91.6	17.6	19.6	40.1	48.7
Isobutane	1.7	1.8	1.1	1.3	5.3	5.8	9.3	10.3	6.0	5.8	4.8	5.4	30.9	32.9	6.5	7.1	11.2	12.5
1-Butene	1.7	1.9	2.2	2.8	3.6	4.1	1.9	2.2	3.8	3.7	2.3	2.6	22.5	21.8	3.5	3.9	5.7	6.5
1,3-Butadiene	ND	0.6	0.8	1.1	0.8	0.8	ND	0.2	1.3	1.2	ND	0.9	4.0	3.7	1.3	1.5	1.9	2.3
n-Butane	3.4	3.6	4.1	3.7	20.9	22.5	21.0	22.9	9.0	11.1	13.2	10.7	69.8	69.2	18.3	20.0	28.2	28.2
t-2-Butene	ND	0.4	0.5	0.7	1.9	1.6	1.4	1.2	1.3	1.2	ND	0.5	10.8	10.8	1.4	1.4	1.8	0.4
c-2-Butene	ND	0.3	ND	0.4	1.6	1.7	1.7	1.7	0.8	0.8	ND	0.4	8.7	7.6	0.8	0.9	0.8	1.2
3-Methyl-1-butene	ND	0.1	ND	0.3	0.7	0.9	1.2	1.2	0.6	0.5	ND	0.3	2.4	2.4	0.7	0.8	0.6	0.6
Isopentane	7.7	7.9	10.2	12.0	51.5	52.2	36.9	36.6	29.0	26.2	16.8	19.1	127.0	117.7	34.2	39.0	31.4	34.3
1-Pentane	ND	0.3	ND	0.5	ND	2.0	ND	1.7	ND	1.2	ND	0.7	5.2	5.7	ND	1.7	1.2	1.6
2-Methyl-1-butene	ND	0.4	0.9	1.0	3.4	3.6	2.7	2.8	2.4	2.3	1.2	1.3	11.3	4.5	2.4	2.6	2.7	3.0
n-Pentane	3.4	3.6	3.9	4.8	15.7	16.9	13.1	14.0	9.7	9.5	7.5	8.4	72.5	72.8	13.7	14.9	19.5	39.3
t-2-Pentene	0.6	0.6	1.0	1.2	3.8	4.6	2.9	3.2	3.2	3.2	1.4	2.0	12.5	8.9	2.5	2.8	2.1	3.0
c-2-Pentene	ND	0.4	0.5	0.7	1.7	2.3	1.3	1.6	1.9	1.5	0.9	0.9	6.0	4.9	1.8	1.5	1.4	1.7
2-Methyl-2-butene	0.7	0.8	1.3	1.6	4.9	5.2	3.9	4.1	4.2	3.7	1.9	2.2	14.5	1.1	2.8	3.2	3.6	4.2
Cyclopentene	ND	0.2	1.1	0.2	0.5	0.6	ND	0.4	0.7	0.7	ND	0.3	1.9	1.1	ND	0.5	0.6	0.7
Cyclopentane	1.2	0.4	ND	0.4	3.5	1.3	2.4	2.1	3.4	1.0	1.6	1.0	11.5	6.9	3.7	1.7	4.6	2.4
2,3-Dimethylbutane	ND	1.2	ND	1.3	1.3	3.6	2.0	2.3	1.1	3.0	0.8	2.1	6.6	11.5	1.3	4.0	2.0	5.2
Isohexane (a)	3.0	2.9	3.5	4.0	10.5	11.9	4.3	11.8	9.1	8.2	5.6	6.5	37.8	35.7	9.4	11.0	12.9	14.6
3-Methylpentane	1.8	3.3	2.2	3.4	8.4	8.4	5.3	6.8	5.8	6.2	5.6	5.0	27.0	24.5	5.6	8.1	7.2	9.3
2-Methyl-1-pentene	ND	0.3	ND	0.3	1.2	1.5	0.5	0.2	1.2	0.7	0.6	0.9	4.0	1.0	1.1	0.7	1.4	0.9
n-Hexane	1.9	2.1	1.3	2.3	5.0	5.4	5.7	6.1	4.8	4.9	3.8	4.4	30.9	31.0	6.0	6.4	12.3	13.1
t-2-Hexene	ND	0.3	ND	0.4	0.7	0.8	ND	0.4	0.9	0.7	ND	0.7	2.6	2.5	0.6	0.8	0.6	1.1
Methylcyclopentane	1.5	1.3	1.3	1.5	3.7	3.5	3.3	3.3	3.4	2.9	2.5	2.6	21.5	21.0	4.0	3.8	7.1	7.3
2,4-Dimethylpentane	0.7	1.1	0.7	1.3	1.8	2.0	0.8	1.5	2.4	2.6	1.0	1.8	12.0	12.3	1.8	2.5	5.3	6.3
Benzene	16.0	16.0	5.6	6.0	7.1	8.0	4.2	3.7	10.2	8.9	5.2	6.0	37.7	37.2	8.1	9.0	16.6	18.4
Cyclohexane	2.4	0.3	0.8	0.3	1.7	0.9	2.8	1.7	3.1	0.4	1.8	0.9	9.0	9.5	1.5	0.5	3.9	3.4
Isoheptane (b)	1.9	1.1	2.2	1.5	1.2	2.2	2.9	2.1	1.6	3.0	2.4	2.2	5.2	12.4	5.3	3.7	2.0	5.8
2,3-Dimethylpentane	ND	1.4	ND	1.7	1.0	2.8	ND	1.8	1.3	3.3	ND	1.8	14.3	25.2	ND	2.5	6.6	12.4
3-Methylhexane	2.0	2.4	1.8	2.5	3.1	3.5	3.0	3.3	3.9	4.2	3.5	4.4	13.0	13.7	4.0	4.8	6.5	7.7
2,2,4-Trimethylpentane	2.7	3.2	2.8	4.1	6.1	7.2	3.6	4.2	9.3	9.1	4.4	5.0	26.2	29.7	10.3	11.7	12.4	14.4
n-Heptane	1.3	0.8	0.7	0.8	1.3	1.6	2.2	2.0	2.1	2.3	1.6	1.9	9.8	11.2	2.1	2.5	4.6	5.4
Methylcyclohexane	0.7	1.1	0.5	1.1	1.1	1.7	2.1	2.5	1.8	2.0	1.4	2.4	7.0	8.5	1.4	2.6	2.1	3.6
2,3,4-Trimethylpentane	1.0	1.1	1.1	1.3	2.1	2.2	1.0	1.1	3.3	2.8	1.6	1.8	10.9	10.4	3.7	3.7	5.0	5.2
Toluene	11.1	11.3	8.9	10.7	18.3	19.1	6.4	6.7	27.5	24.2	15.2	16.3	85.0	82.8	26.2	26.7	64.7	65.2
2-Methylheptane	0.6	0.6	0.6	0.6	0.9	0.9	0.9	0.7	1.6	1.0	1.1	1.0	7.0	5.4	1.7	1.5	2.9	2.3
3-Methylheptane	ND	0.5	0.5	0.6	0.8	0.9	0.6	0.7	1.3	1.2	0.9	1.0	6.0	5.9	1.5	1.7	2.6	2.8
n-Octane	ND	0.6	ND	0.5	ND	0.6	0.5	0.9	0.7	1.0	0.7	1.0	4.8	6.4	1.4	1.3	2.3	2.8
Ethylbenzene	1.4	1.7	2.0	2.2	2.6	3.1	1.7	1.8	4.1	4.0	2.2	2.9	16.5	16.6	4.6	4.9	14.0	14.2
m/p-Xylene	6.1	6.2	5.6	6.8	9.7	10.0	4.4	4.4	14.4	12.8	8.3	8.8	47.2	45.6	15.5	16.2	48.9	49.2
Styrene	0.6	1.7	0.6	1.6	0.8	1.8	ND	1.3	1.8	3.2	0.5	3.1	2.8	4.1	1.0	2.0	4.6	6.4
o-Xylene	1.7	2.3	1.8	2.8	3.3	3.8	1.4	1.7	5.2	5.2	2.8	3.7	15.4	16.6	5.3	6.1	14.4	15.9
n-Nonane	0.6	0.5	ND	0.4	0.7	0.5	0.6	0.5	0.9	0.8	0.7	0.8	5.8	4.6	1.0	0.9	2.7	2.4
1,3,5-Trimethylbenzene	0.7	0.1	1.0	1.5	ND	1.4	0.6	0.1	2.2	0.5	1.5	1.8	6.3	6.2	2.4	2.5	2.1	0.6
1,2,4-Trimethylbenzene	2.4	7.1	2.8	7.2	4.1	7.0	2.0	9.4	7.4	46.1	4.3	8.2	18.0	19.4	6.7	8.9	8.8	21.7
n-Decane	ND	0.6	ND	0.9	ND	0.9	ND	0.9	ND	1.2	ND	1.0	8.5	5.6	0.6	1.3	1.2	3.3
1,2,3-Trimethylbenzene	1.3	0.8	2.5	1.3	3.3	1.8	1.7	0.9	4.4	3.1	3.0	1.5	7.0	5.1	2.7	2.1	3.4	3.1
TOTAL NMOC (c)	257	239	226	248	438	437	376	419	537	508	343	365	1720	1496	484	458	839	877

All concentrations given in ppbC.
ND not detected
(a) 2-Methylpentane = Isohexane
(b) 2-Methylhexane = Isoheptane
(c) NMOC = Nonmethane Organic Compounds

Table 11-9. Percent Bias Results of EPA Comparison Analysis

RESULTS OF EPA COMPARISON ANALYSIS

Percent difference between Radian analysis and EPA analysis.
All concentrations given in ppbC.

SITE ID	B1AL	B2AL	B3AL	BMTX	CHNC	DLTX	EPTX	FWTX	JUMX	AVERAGE FOR
SAMPLE ID	2141	2190	2154	2435	2453	2314	2583	2581	2622	COMPOUND
COMPOUND										
Ethylene	37.8	0.0	23.5	176.9	-13.7	30.2	-3.8	3.4	-3.5	27.9
Acetylene	-16.0	-27.1	-11.0	5.6	10.1	-13.6	-18.3	-23.2	-24.6	-13.1
Ethane	2.3	-22.7	2.7	15.5	-36.9	-6.8	-14.7	-8.1	-9.2	-8.7
Propylene	-12.5	-19.6	-8.5	-21.4	11.1	-7.1	-4.9	-15.2	-19.8	-10.9
Propane	-8.8	-20.5	60.9	-8.4	0.0	-8.5	-4.4	-10.2	-17.7	-1.9
Isobutane	-5.6	-15.4	-8.6	-9.7	3.4	-11.1	-6.1	-8.5	-10.4	-8.0
1-Butene	-10.5	-21.4	-12.2	-13.6	2.7	-11.5	3.2	-10.3	-12.3	-9.6
1,3-Butadiene	(a)	-27.3	0.0	(a)	8.3	(a)	8.1	-13.3	-17.4	-6.9
n-Butane	-5.6	10.8	-7.1	-8.3	-18.9	23.4	0.9	-8.5	0.0	-1.5
t-2-Butene	(a)	-28.6	18.7	16.7	8.3	(a)	0.0	0.0	350.0	52.2
c-2-Butene	(a)	(a)	-5.9	0.0	0.0	(a)	14.5	-11.1	-33.3	-6.0
3-Methyl-1-butene	(a)	(a)	-22.2	0.0	20.0	(a)	0.0	-12.5	0.0	-2.5
Isopentane	-2.5	-15.0	-1.3	0.8	10.7	-12.0	7.9	-12.3	-8.5	-3.6
1-Pentene	(a)	(a)	(a)	(a)	(a)	(a)	-8.8	(a)	-25.0	-16.9
2-Methyl-1-butene	(a)	-10.0	-5.6	-3.6	4.3	-7.7	151.1	-7.7	-10.0	13.9
n-Pentane	-5.6	-18.8	-7.1	-6.4	2.1	-10.7	-0.4	-8.1	-50.4	-11.7
t-2-Pentene	0.0	-16.7	-17.4	-9.4	0.0	-30.0	40.4	-10.7	-30.0	-8.2
c-2-Pentene	(a)	-28.6	-26.1	-18.8	26.7	0.0	22.4	20.0	-17.6	-2.7
2-Methyl-2-butene	-12.5	-18.8	-5.8	-4.9	13.5	-13.6	1218.2	-12.5	-14.3	127.7
Cyclopentene	(a)	450.0	-16.7	(a)	0.0	(a)	72.7	(a)	-14.3	98.4
Cyclopentane	200.0	(a)	169.2	14.3	240.0	60.0	66.7	117.6	91.7	119.9
2,3-Dimethylbutane	(a)	(a)	-63.9	-13.0	-63.3	-61.9	-42.6	-67.5	-61.5	-53.4
Isohexane (b)	3.4	-12.5	-11.8	-63.6	11.0	-13.8	5.9	-14.5	-11.6	-12.0
3-Methylpentane	-45.5	-35.3	0.0	-22.1	-6.5	12.0	10.2	-30.9	-22.6	-15.6
2-Methyl-1-pentene	(a)	(a)	-20.0	150.0	71.4	-33.3	300.0	57.1	55.6	83.0
n-Hexane	-9.5	-43.5	-7.4	-6.6	-2.0	-13.6	-0.3	-6.3	-6.1	-10.6
t-2-Hexane	(a)	(a)	-12.5	(a)	28.6	(a)	4.0	-25.0	-45.5	-10.1
Methylcyclopentane	15.4	-13.3	5.7	0.0	17.2	-3.8	2.4	5.3	-2.7	2.9
2,4-Dimethylpentane	-36.4	-46.2	-10.0	-46.7	-7.7	-44.4	-2.4	-28.0	-15.9	-26.4
Benzene	0.0	-6.7	-11.3	13.5	14.6	-13.3	1.3	-10.0	-9.8	-2.4
Cyclohexane	700.0	166.7	88.9	64.7	675.0	100.0	-5.3	200.0	14.7	222.7
Isoheptane (c)	72.7	46.7	-45.5	38.1	-46.7	9.1	-58.1	43.2	-65.5	-0.7
2,3-Dimethylpentane	(a)	(a)	-64.3	(a)	-60.6	(a)	-43.3	(a)	-46.8	-53.7
3-Methylhexane	-16.7	-28.0	-11.4	-9.1	-7.1	-20.5	-5.1	-16.7	-15.6	-14.5
2,2,4-Trimethylpentane	-15.6	-31.7	-15.3	-14.3	2.2	-12.0	-11.8	-12.0	-13.9	-13.8
n-Heptane	62.5	-12.5	-18.8	10.0	-8.7	-15.8	-12.5	-16.0	-14.8	-2.9
Methylcyclohexane	-36.4	-54.5	-35.3	-16.0	-10.0	-41.7	-17.6	-46.2	-41.7	-33.3
2,3,4-Trimethylpentane	-9.1	-15.4	-4.5	-9.1	17.9	-11.1	4.8	0.0	-3.8	-3.4
Toluene	-1.8	-16.8	-4.2	-4.5	13.6	-6.7	2.7	-1.9	-0.8	-2.3
2-Methylheptane	0.0	0.0	0.0	28.6	60.0	10.0	29.6	13.3	26.1	18.6
3-Methylheptane	(a)	-16.7	-11.1	-14.3	8.3	-10.0	1.7	-11.8	-7.1	-7.6
n-Octane	(a)	(a)	(a)	-44.4	-30.0	-30.0	-25.0	7.7	-17.9	-23.3
Ethylbenzene	-17.6	-9.1	-16.1	-5.6	2.5	-24.1	-0.6	-6.1	-1.4	-8.7
m/p-Xylene	-1.6	-17.6	-3.0	0.0	12.5	-5.7	3.5	-4.3	-0.6	-1.9
Styrene	-64.7	-62.5	-55.6	(a)	-43.8	-83.9	-31.7	-50.0	-28.1	-52.5
o-Xylene	-26.1	-35.7	-13.2	-17.6	0.0	-24.3	-7.2	-13.1	-9.4	-16.3
n-Nonane	20.0	(a)	40.0	20.0	12.5	-12.5	26.1	11.1	12.5	16.2
1,3,5-Trimethylbenzene	600.0	-33.3	(a)	500.0	340.0	-16.7	1.6	-4.0	250.0	204.7
1,2,4-Trimethylbenzene	-66.2	-61.1	-41.4	-78.7	-83.9	-47.6	-7.2	-24.7	-59.4	-52.3
n-Decane	(a)	(a)	(a)	(a)	(a)	(a)	51.8	-53.8	-63.6	-21.9
1,2,3-Trimethylbenzene	62.5	92.3	83.3	88.9	41.9	100.0	37.3	28.6	9.7	60.5
Average for sample	37.5	-1.9	-3.0	15.3	25.5	-8.0	34.4	-2.2	-1.5	9.7 (d)

(a) No percent difference since compound response was below detection limit for Radian analysis.

(b) 2-Methylpentane = Isohexane

(c) 2-Methylhexane = Isoheptane

(d) Average of accumulated compound averages.

Table 11-10. Absolute Percent Bias Results of EPA Comparison Analysis

Absolute percent difference between Radian analysis and EPA analysis.
All concentrations given in ppbC.

SITE ID	B1AL	B2AL	B3AL	BMTX	CHNC	DLTX	EPTX	FWTX	JUMX	AVERAGE FOR
SAMPLE ID	2141	2190	2154	2435	2453	2314	2583	2581	2622	COMPOUND
COMPOUND										
Ethylene	31.8	0.0	21.1	93.9	14.7	26.2	3.9	3.3	3.6	22.1
Acetylene	17.4	31.3	11.6	5.4	9.6	14.6	20.2	26.2	28.1	18.3
Ethane	2.3	25.6	2.6	14.4	45.3	7.1	15.8	8.5	9.7	14.6
Propylene	13.3	21.7	8.9	24.0	10.5	7.4	5.0	16.4	22.0	14.4
Propane	9.2	22.9	46.7	8.8	0.0	8.8	4.5	10.8	19.4	14.6
Isobutane	5.7	16.7	9.0	10.2	3.4	11.8	6.3	8.8	11.0	9.2
1-Butene	11.1	24.0	13.0	14.6	2.7	12.2	3.2	10.8	13.1	11.6
1,3-Butadiene	(a)	31.6	0.0	(a)	8.0	(a)	7.8	14.3	19.0	13.5
n-Butane	5.7	10.3	7.4	8.7	20.9	20.9	0.9	8.9	0.0	9.3
t-2-Butene	(a)	33.3	17.1	15.4	8.0	(a)	0.0	0.0	127.3	28.7
c-2-Butene	(a)	(a)	6.1	0.0	0.0	(a)	13.5	11.8	40.0	11.9
3-Methyl-1-butene	(a)	(a)	25.0	0.0	18.2	(a)	0.0	13.3	0.0	9.4
Isopentane	2.6	16.2	1.4	0.8	10.1	12.8	7.6	13.1	8.8	8.2
1-Pentane	(a)	(a)	(a)	(a)	(a)	(a)	9.2	(a)	28.6	18.9
2-Methyl-1-butene	(a)	10.5	5.7	3.6	4.3	8.0	86.1	8.0	10.5	17.1
n-Pentane	5.7	20.7	7.4	6.6	2.1	11.3	0.4	8.4	67.3	14.4
t-2-Pentene	0.0	18.2	19.0	9.8	0.0	35.3	33.6	11.3	35.3	18.1
c-2-Pentene	(a)	33.3	30.0	20.7	23.5	0.0	20.2	18.2	19.4	20.7
2-Methyl-2-butene	13.3	20.7	5.9	5.0	12.7	14.6	171.8	13.3	15.4	30.3
Cyclopentene	(a)	138.5	18.2	(a)	0.0	(a)	53.3	(a)	15.4	45.1
Cyclopentane	100.0	(a)	91.7	13.3	109.1	46.2	50.0	74.1	62.9	68.4
2,3-Dimethylbutane	(a)	(a)	93.9	14.0	92.7	89.7	54.1	101.9	88.9	76.4
Isohexane (b)	3.4	13.3	12.5	93.2	10.4	14.9	5.7	15.7	12.4	20.2
3-Methylpentane	58.8	42.9	0.0	24.8	6.7	11.3	9.7	36.5	25.5	24.0
2-Methyl-1-pentene	(a)	(a)	22.2	85.7	52.6	40.0	120.0	44.4	43.5	58.4
n-Hexane	10.0	55.6	7.7	6.8	2.1	14.6	0.3	6.5	6.3	12.2
t-2-Hexene	(a)	(a)	13.3	(a)	25.0	(a)	3.9	28.6	58.8	25.9
Methylcyclopentane	14.3	14.3	5.6	0.0	15.9	3.9	2.4	5.1	2.8	7.1
2,4-Dimethylpentane	44.4	60.0	10.5	60.9	8.0	57.1	2.5	32.6	17.2	32.6
Benzene	0.0	6.9	11.9	12.7	13.6	14.3	1.3	10.5	10.3	9.1
Cyclohexane	155.6	90.9	61.5	48.9	154.3	66.7	5.4	100.0	13.7	77.4
Isoheptane (c)	53.3	37.8	58.8	32.0	60.9	8.7	81.8	35.6	97.4	51.8
2,3-Dimethylpentane	(a)	(a)	94.7	(a)	87.0	(a)	55.2	(a)	61.1	74.5
3-Methylhexane	18.2	32.6	12.1	9.5	7.4	22.8	5.2	18.2	16.9	15.9
2,2,4-Trimethylpentane	16.9	37.7	16.5	15.4	2.2	12.8	12.5	12.7	14.9	15.7
n-Heptane	47.6	13.3	20.7	9.5	9.1	17.1	13.3	17.4	16.0	18.2
Methylcyclohexane	44.4	75.0	42.9	17.4	10.5	52.6	19.4	60.0	52.6	41.6
2,3,4-Trimethylpentane	9.5	16.7	4.7	9.5	16.4	11.8	4.7	0.0	3.9	8.6
Toluene	1.8	18.4	4.3	4.6	12.8	7.0	2.6	1.9	0.8	6.0
2-Methylheptane	0.0	0.0	0.0	25.0	46.2	9.5	25.8	12.5	23.1	15.8
3-Methylheptane	(a)	18.2	11.8	15.4	8.0	10.5	1.7	12.5	7.4	10.7
n-Octane	(a)	(a)	(a)	57.1	35.3	35.3	28.6	7.4	19.6	30.6
Ethylbenzene	19.4	9.5	17.5	5.7	2.5	27.5	0.6	6.3	1.4	10.0
m/p-Xylene	1.6	19.4	3.0	0.0	11.8	5.8	3.4	4.4	0.6	5.6
Styrene	95.7	90.9	76.9	(a)	56.0	144.4	37.7	66.7	32.7	75.1
o-Xylene	30.0	43.5	14.1	19.4	0.0	27.7	7.5	14.0	9.9	18.4
n-Nonane	18.2	(a)	33.3	18.2	11.8	13.3	23.1	10.5	11.8	17.5
1,3,5-Trimethylbenzene	150.0	40.0	(a)	142.9	125.9	18.2	1.6	4.1	111.1	74.2
1,2,4-Trimethylbenzene	98.9	88.0	52.3	129.8	144.7	62.4	7.5	28.2	84.6	77.4
n-Decane	(a)	(a)	(a)	(a)	(a)	(a)	41.1	73.7	93.3	69.4
1,2,3-Trimethylbenzene	47.6	63.2	58.8	61.5	34.7	66.7	31.4	25.0	9.2	44.2
Average for sample	32.2	34.1	23.6	26.7	27.9	26.3	22.0	22.3	29.5	28.3 (d)

(a) No percent difference since compound response was below detection limit for Radian analysis.

(b) 2-Methylpentane = Isohexane

(c) 2-Methylhexane = Isoheptane

(d) Average of accumulated compound averages.

AREAL results as the reference. Table 11-10 gives the absolute percent differences.

The comparison results seen in Table 11-9 do not show an overall positive or negative bias tendency, and as a result the overall percent difference is low (< 10%). The majority of percent differences show good comparisons (< 50%). There are several very high positive percent differences (> 100%) caused by very low reported concentrations (< 1 ppbC), that are considered at or below detection limits for the SNMOC analysis method. The percent differences in Table 11-9 range from -83.9% to 1218.2%, with an overall average of 9.7 percent.

Table 11-10 compares the data on an absolute percent difference basis. The overall absolute percent difference is 28.3 percent. These are considered excellent results, showing comparable procedures and results between both laboratories. Because of a tendency for some compounds to have higher differences for all samples, it appears there may have been coelution problems for different compounds in each laboratory.

11.9 Data Acquisition and Reduction Procedures

A PE Nelson 2600 Chromatography Data System consisting of a 900 Series Intelligent Interface and a PC system containing the 2600 software was used to acquire, integrate and store the analytical data. A chromatogram and area count report from each detector are printed for each analysis. Electronic copies of the data were stored on 20 Mb flexible disk cartridges, and a compressed backup disk was also made.

The data was processed using Radian Peak Identification Program (RPIP) software. The RPIP used a database containing relative retention time information for all compounds of interest and applicable response factors to process the data files. A preliminary report was generated containing possible peak identifications

and quantitations based on the carbon response factor in effect at the time of analysis.

A data reviewer compared the RPIP report to the chromatogram to determine proper peak identifications. A second data review was performed to check for items which may have been overlooked on the first pass. After the data was reviewed twice, a final RPIP report was processed and reviewed for completeness. Final report versions containing information on all quantitated peaks were printed and filed with the analysis chromatogram printout and preliminary RPIP report. Electronic copies of all RPIP reports were also kept on file.

12.0 RECOMMENDATIONS

12.1 General

12.1.1 Vertical Stratification Study

In 1987, 1988, and 1989 ambient air samples were taken at ground level (3 to 10 meters) and at the 1197-foot (364.9-meter) level at one site. In 1988, an additional site was located on top of the World Trade Center in New York, a height of over 1000 feet. It is recommended that further study be performed at these sampling heights and that at least one more level (at 100 meters or some other appropirate height above ground level) be sampled at the same location. Upper atmospheric meteorological characterization measurements need to be made using a Wind Profiling system. Subsequent NMOC and meteorological data should be correlated. These samples should be analyzed for NMOC content as well as for the air toxics compound concentrations. It is also recommended that ozone concentrations and NO_x concentrations be monitored at the same locations and altitudes. The information gained from such a study would be useful in validating various atmospheric model predicitions.

12.1.2 Seasonal NMOC Studies

Data derived in a study qualifying NMOC and NO_x in seasons other than summer could be useful in understanding the relationship of NMOC to NO_x and meteorological conditions. Currently a year-round study for 24-hour air toxics ambient air samples is being conducted. No study is currently in progress to determine seasonal NMOC concentration changes.

12.1.3 Field Audit

It is recommended that a field audit be designed and conducted at several NMOC/SNMOC sites during the 1993 Monitoring Program. One field audit per month should be performed at an NMOC/SNMOC site during June, July, August, and September 1993. the field audit should use at least one standard of known NMOC/SNMOC concentration and should collect duplicate samples plus a zero-air blank for each site. The audit samples should use both dry and humid standards.

12.2 Equipment

12.2.1 Multiple Episode Sample Collection Equipment

A design for a multiple episode sampler has been completed. It is recommended that a prototype instrument be built according to the design. The prototype sampler should then be checked out and tested.

12.2.2 Current Sampling Equipment

The NMOC Program began in 1984. Some of the sampling equipment has been in used since 1984. Prior to the beginning of the 1992 sampling season, approximately 10 sampling systems were rebuilt using a new chassis-design (See Section 3.0). As the current sampling equipment fails, it is recommended to rebuild the samplers according to the more user-friendly chassis-design system (Style B) or the above mentioned multiple episode sampler.

12.2.3 Cleaning and Analytical Equipment

Much of the current cleanup system has been in operation since 1984. The original intended use of the equipment has been expanded to include year-round use. As components fail, provisions need to be made for replacements.

The GCs used for the PDFID method are also beginning to show signs of wear and tear. Maintenance of these systems must be maintained. And as with the cleanup system components, provisions need to be made for replacement parts as the need arises.

12.3 SNMOC

12.3.1 Expansion of Target Compound List

With the approval of the Clean Air Act Amendments (CAAA) compounds, it is recommended to expand the list of the current target compounds to include the appropriate ozone precursor CAAA compounds.

12.4 Air Toxics

12.4.1 Compound Stability Study

Depending on the intended use of the data collected under this option of the NMOC Program, further study may be needed to determine the compound stability in canisters. If health risk assessment is the intended use of this data, a compound stability study is recommended. Compound stability in this context refers to whether the apparent concentration of a compound in a sample taken from a canister is changing over time. The apparent change in concentration may result from a chemical reaction of the compound while it is in the canister, or result from a change in the gas phase concentration caused by adsorption of the compound on the interior canister surfaces.

A study needed to investigate this phenomenon would take several canisters--at least three from each initial concentration--ranging in target compound concentration from 0.0 to 20 ppbv. The canisters would be analyzed 24 hours after mixing, 72 hours after mixing, 30 days after mixing, and 60 days after mixing

to determine any concentration changes. It is also recommended that the same concentration be mixed in canisters, but that equilibration time of 7 days and 30 days be assigned before the first samples are drawn from the canisters to determine the effect of equilibration time on the concentration sample withdrawn from the canisters.

12.4.2 Expansion of Target Compound List

With the approval of the Clean Air Act Amendments compounds, it is recommended to expand the list of the current target 38 air toxic compounds to include the appropriate airborne toxic compounds.

12.5 Carbonyls

12.5.1 Use of Ozone Scrubber

Previous studies showed that the ozone scrubber was needed to accurately measure the carbonyl concentration in ambient air when sampling occurs with silica gel media. It is recommended to continue using the carbonyl ozone scrubber when sampling for carbonyl compounds.

12.5.2 Life of Ozone Scrubber

It is recommended to determine the life of the effectiveness of the ozone scrubbers. Some preliminary studies performed by the US EPA indicated that the effective life was approximately 6000 sample-hours. These results need to be checked and more definitively defined with field studies that extend over several years.

13.0 REFERENCES

1. Compendium Method TO-12, "Determination of Non-Methane Organic Compounds (NMOC) in Ambient Air Using Cryogenic Pre-Concentration and Direct Flame Ionization Detection (PDFID)," Quality Assurance Division, Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711, May 1988.

2. Radian Corporation. 1991 Nonmethane Organic Compound, Speciated Nonmethane Organic Compound, and Three-Hour Urban Air Toxics Monitoring Programs, Work Plan and Quality Assurance Project Plan. DCN No. 91-262-045-56. Prepared for the U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA Contract No. 68D80014.

3. Radian Corporation. 1990 Nonmethane Organic Compound and Three-Hour Air Toxics Monitoring Program. Final Report. Prepared for U. S. Environmental Protection Agency, Research Triangle Park, NC, 27711, DCN No. 91-262-045-04. January 1991.

4. Radian Corporation. 1989 Nonmethane Organic Compound and Three-Hour Air Toxics Monitoring Program. Final Report. Prepared for U. S. Environmental Protection Agency, Research Triangle Park, NC, 27711, EPA-450/4-90-011. May 1990.

5. Radian Corporation. 1988 Nonmethane Organic Compound and Urban Air Toxics Monitoring Program. Final Report. Volume I. U. S. Environmental Protection Agency, Research Triangle Park, NC, 27711, EPA-450/4-89-003. December 1988.

6. Radian Corporation, 1987 Nonmethane Organic Compound and Air Toxics Monitoring Programs. Final Report Volume 1 - Hydrocarbons, U. S. Environmental Protection Agency, Research Triangle Park, NC. EPA-450/4-88-011. August 19, 1988.

7. McAllister, R. A., R. F. Jongleux, D-P. Dayton, P. L. O'Hara, and D. E. Wagoner (Radian Corporation). Nonmethane Organic Compound Monitoring. Final Report. Prepared for U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA Contract No. 68-02-3889, July 1987.

8. McAllister, R. A., D-P. Dayton, and D. E. Wagoner (Radian Corporation). Nonmethane Organic Compound Monitoring. Final Project Report. Prepared for U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA Contract No. No. 68-02-3889, January 1986.

9. Radian Corporation. Nonmethane Organic Compounds Monitoring Assistance for Certain States in EPA Regions III, IV, V, VI, and VII, Phase II. Final Project Report. Prepared for the U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA Contract No. 38-02-3513, February 1985.

APPENDIX A

SAMPLING SITES FOR 1992 NMOC MONITORING PROGRAM

TABLE A-1
1992 NMOC Monitoring Program Sites

US EPA Region	Site Code	City	AIRS Number	Base Program	Speciated NMOC Option	3-Hour Air Tox Option	Carbonyl Option
II	MNY	New York, NY	36-061-0010	NMOC	Yes		
II	LINY	Long Island, NY	36-059-0005	NMOC	Yes		
II	NWNJ	Newark, NJ	34-013-0011	NMOC	Yes	Yes	Yes
II	PLNJ	Plainfield, NJ	34-039-5001	NMOC	Yes	Yes	Yes
IV	B1AL	Birmingham, AL	01-073-6002	Speciated NMOC		Yes	
IV	B2AL	Birmingham, AL	01-073-5002	Speciated NMOC		Yes	
IV	B3AL	Birmingham, AL	01-117-0004	Speciated NMOC		Yes	
IV	CHNC	Charlotte, NC	37-119-0034	Speciated NMOC			
IV	R1NC	Raleigh, NC	37-183-0015	NMOC	Yes		
IV	WSNC	Winston Salem, NC	37-067-0022	NMOC	Yes		
IV	MIFL	Dade County, FL	12-025-4002	Speciated NMOC			
VI	BRLA	Baton Rouge, LA	22-033-0006	Speciated NMOC			
VI	DLTX	Dallas, TX	48-113-0069	Speciated NMOC			
VI	BMTX	Beaumont TX	48-245-0009	Speciated NMOC			
VI	FWTX	Ft. Worth, TX	48-439-1002	Speciated NMOC			
VI	ELTX	El Paso, TX	48-141-0027	Speciated NMOC			
VI	JUMX	Juarez, Mexico	80-006-0001	Speciated NMOC			
XIII	S2UT	Salt Lake City, UT	49-035-3001	NMOC	Yes		
XIII	S3UT	Salt Lake City, UT	49-011-0001	NMOC	Yes		

The site at Ciudad Juarez, State of Chihuahua, Mexico, is sponsored by U.S. EPA Region VI

EPA-REGION: 04 STATE (01): ALABAMA

SITE ID : 01-073-5002 CITY (00000): NOT IN A CITY
CITY POPULATION : 1 COUNTY (073): JEFFERSON CO
AQCR POPULATION : 1,168,098 AQCR (004): METROPOLITAN BIRMINGHAM
DATE ESTABLISHED: / / LAND USE (1): RESIDENTIAL
DATE TERMINATED : / / LOCATION SETTING (3): RURAL
SITE ADDR: PINSON, HIGH SCH., BOX 360 HWY 75 NORTH
URBAN AREA (1000): BIRMINGHAM, AL
SUPPORTING AGENCY (012): JEFFERSON COUNTY DEPARTMENT OF HEALTH
COMMENTS: PINSON VALLEY HIGH SCHOOL BY TENNIS COURTS IN FRONT OF SCHOOL
SITE-USER-INFO: NAMS OZONE

LATITUDE : 33:42:16 N HQ EVAL DATE : 80/07/17
LONGITUDE: 86:40:08 W DIFF. GMT : 06
UTM ZONE : 16 ELEVATION ABOVE MSL: 201 M
UTM NORTHING: 3729242 RECORD LAST UPDATED: 92/06/22
UTM EASTING : 530684 LAST REG EVAL : / /
DISTANCE CITY: 032 COMPASS SECTOR : NE
HC IND: Y MET DATA : N
MSA (1000): BIRMINGHAM, AL

SITE ID : 01-073-6002 CITY (75000): TARRANT CITY
CITY POPULATION : 8,148 COUNTY (073): JEFFERSON CO
AQCR POPULATION : 1,168,098 AQCR (004): METROPOLITAN BIRMINGHAM
DATE ESTABLISHED: / / LAND USE (1): RESIDENTIAL
DATE TERMINATED : / / LOCATION SETTING (2): SUBURBAN
SITE ADDR: TARRANT, ELEM. SCH., 1269 PORTLAND STREE
URBAN AREA (1000): BIRMINGHAM, AL
SUPPORTING AGENCY (012): JEFFERSON COUNTY DEPARTMENT OF HEALTH
COMMENTS: TARRANT ELEM. SCH. NEAR TENNIS COURTS BEHIND SCHOOL
SITE-USER-INFO: NAMS TSP AND OZONE

LATITUDE : 33:34:42 N HQ EVAL DATE : 80/07/17
LONGITUDE: 86:46:26 W DIFF. GMT : 06
UTM ZONE : 16 ELEVATION ABOVE MSL: 171 M
UTM NORTHING: 3715234 RECORD LAST UPDATED: 92/05/18
UTM EASTING : 520984 LAST REG EVAL : / /
DISTANCE CITY: 013 COMPASS SECTOR : NE
HC IND: Y MET DATA : N
MSA (1000): BIRMINGHAM, AL

SITE ID : 01-117-0004 CITY (00000): NOT IN A CITY
CITY POPULATION : 1 COUNTY (117): SHELBY CO
AQCR POPULATION : 1,168,098 AQCR (004): METROPOLITAN BIRMINGHAM
DATE ESTABLISHED: 83/01/01 LAND USE (4): AGRICULTURAL
DATE TERMINATED : / / LOCATION SETTING (3): RURAL
SITE ADDR: BEARDEN FARM
URBAN AREA (1000): BIRMINGHAM, AL
SUPPORTING AGENCY (011): AL DEPT. OF ENV. MGT.
COMMENTS:

LATITUDE : 33:19:01 N HQ EVAL DATE : / /
LONGITUDE: 86:49:30 W DIFF. GMT :
UTM ZONE : 16 ELEVATION ABOVE MSL: 600 M
UTM NORTHING: 3686270 RECORD LAST UPDATED: 92/09/17
UTM EASTING : 516280 LAST REG EVAL : / /
DISTANCE CITY: COMPASS SECTOR :
HC IND: Y MET DATA : N
MSA (1000): BIRMINGHAM, AL

EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
SITE DESCRIPTION INVENTORY

EPA-REGION: 04

STATE (12): FLORIDA

SITE ID : 12-025-4002 CITY (45000): MIAMI
CITY POPULATION : 346,865 COUNTY (025): DADE CO
AQCR POPULATION : 3,515,388 AQCR (050): SOUTHEAST FLORIDA
DATE ESTABLISHED: / / LAND USE (2): COMMERCIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: METRO ANNEX 864 NW 3RD STREET
URBAN AREA (5000): MIAMI, FL
SUPPORTING AGENCY (018): DADE COUNTY DEPARTMENT ENVIRONMENTAL RESOURCES MANA NSA (5000): MIAMI-HIALEAH, FL
COMMENTS: DCPC #1

LATITUDE : 25:47:52 N
LONGITUDE: 80:12:37 W
UTM ZONE : 17
UTM NORTHING: 2853365
UTM EASTING : 579171
DISTANCE CITY: 029
HC IND: Y

HQ EVAL DATE : / /
DIFF. GMT : 05
ELEVATION ABOVE MSL: 5 M
RECORD LAST UPDATED: 92/08/03
LAST REG EVAL : / /
COMPASS SECTOR :
MET DATA : N

EPA-REGION: 06 STATE (22): LOUISIANA

SITE ID : 22-033-0006 CITY (05000): BATON ROUGE
CITY POPULATION : 219,419 COUNTY (033): EAST BATON ROUGE PAR
AQCR POPULATION : 3,921,588 AQCR (106): SOUTHERN LOUISIANA-SOUTHEAST T
DATE ESTABLISHED: 90/01/03 LAND USE (2): COMMERCIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: 1600 RIVERSIDE RD
URBAN AREA (0760): BATON ROUGE, LA
SUPPORTING AGENCY (001): STATE OF LOUISIANA
COMMENTS: CAPITOL SITE - RELOCATION FOR 220330004

LATITUDE : 30:27:52 N HQ EVAL DATE : / /
LONGITUDE: 91:11:17 W DIFF. GMT : 06
UTM ZONE : 15 ELEVATION ABOVE MSL: 62 M
UTM NORTHING: 3371464 RECORD LAST UPDATED: 92/03/11
UTM EASTING : 673956 LAST REG EVAL : / /
DISTANCE CITY: COMPASS SECTOR :
HC IND: N MET DATA : Y
MSA (0760): BATON ROUGE, LA

EPA-REGION: 02

STATE (34): NEW JERSEY

SITE ID : 34-013-0011 CITY (51000): NEWARK
CITY POPULATION : 329,248 COUNTY (013): ESSEX CO
AQCR POPULATION : 16,525,701 AQCR (043): NEW JERSEY-NEW YORK-CONNECTICU
DATE ESTABLISHED: 85/01/01 LAND USE (3): INDUSTRIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: ST. CHARLES BETWEEN KOSSUTH & KAMERON ST
URBAN AREA (5601): NEW YORK, NY-NORTHEASTERN NJ
SUPPORTING AGENCY (001): NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTEC
COMMENTS: NJ #07142,START 1/1/85,RELOC.FROM 340130008, SITTING CRITERIA?
SITE-USER-INFO: PM10,DICHOT,START 3/15/86,ELEV.16';03 DOWN 5/16/86-3/25/87

LATITUDE : 40:43:37 N
LONGITUDE: 74:08:39 W
UTM ZONE : 18
UTM NORTHING: 4508570
UTM EASTING : 572280
DISTANCE CITY: 015
HC IND: Y
MSA (5640): NEWARK, NJ

HQ EVAL DATE : / /
DIFF. GMT : 05
ELEVATION ABOVE MSL: 3 M
RECORD LAST UPDATED: 92/05/14
LAST REG EVAL : 86/05/06
COMPASS SECTOR : SW
MET DATA : N

SITE ID : 34-039-5001 CITY (59190): PLAINFIELD
CITY POPULATION : 45,555 COUNTY (039): UNION CO
AQCR POPULATION : 16,525,701 AQCR (043): NEW JERSEY-NEW YORK-CONNECTICU
DATE ESTABLISHED: 80/05/01 LAND USE (1): RESIDENTIAL
DATE TERMINATED : / / LOCATION SETTING (2): SUBURBAN
SITE ADDR: WEST THIRD AND BERGEN STREETS
URBAN AREA (5601): NEW YORK, NY-NORTHEASTERN NJ
SUPPORTING AGENCY (001): NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTEC
COMMENTS: NJ #20121, SLAMS-NO2,03 1980 NE OXIDANT STUDY;03,SO2,NOX
SITE-USER-INFO: FORMERLY CODED 340351001

LATITUDE : 40:36:03 N
LONGITUDE: 74:26:31 W
UTM ZONE : 18
UTM NORTHING: 4494399
UTM EASTING : 547218
DISTANCE CITY: 042
HC IND: Y
MSA (5640): NEWARK, NJ

HQ EVAL DATE : / /
DIFF. GMT : 05
ELEVATION ABOVE MSL: 18 M
RECORD LAST UPDATED: 91/04/10
LAST REG EVAL : 90/07/06
COMPASS SECTOR : SW
MET DATA : N

EPA-REGION: 02 STATE (36): NEW YORK

SITE ID : 36-059-0005 CITY (00000): NOT IN A CITY
CITY POPULATION : 1 COUNTY (059): NASSAU CO
AQCR POPULATION : 16,525,701 AQCR (043): NEW JERSEY-NEW YORK-CONNECTICU
DATE ESTABLISHED: 71/01/01 LAND USE (2): COMMERCIAL
DATE TERMINATED : / / LOCATION SETTING (2): SUBURBAN
SITE ADDR: EISENHOWER PARK,MERRICK AV&OLD COUNTRY R
URBAN AREA (5601): NEW YORK, NY-NORTHEASTERN NJ
SUPPORTING AGENCY (001): NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVA
COMMENTS: NYS #2950-10 START SO2,CO,O3,NO2,TSP'71,PB'72;NECRMP'80,NO,NO2,O3
SITE-USER-INFO: O3-#334105002F01 12/82,MIDDLE SCALE,MEETS SITING,NO2-2-025 - 12/86

LATITUDE : 40:44:43 N
LONGITUDE: 73:35:13 W
UTM ZONE : 18
UTM NORTHING: 4511200
UTM EASTING : 619300
DISTANCE CITY: 033
HC IND:
MSA (5380): NASSAU-SUFFOLK, NY

HQ EVAL DATE : / /
DIFF. GMT : 05
ELEVATION ABOVE MSL: 27 M
RECORD LAST UPDATED: 92/11/04
LAST REG EVAL : / /
COMPASS SECTOR : E
MET DATA : Y

SITE ID : 36-061-0010 CITY (51000): NEW YORK CITY
CITY POPULATION : 7,071,639 COUNTY (061): NEW YORK CO
AQCR POPULATION : 16,525,701 AQCR (043): NEW JERSEY-NEW YORK-CONNECTICU
DATE ESTABLISHED: / /
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: MABEL DEAN HIGH SCH.ANNEX, 240 2ND AVE.
URBAN AREA (5601): NEW YORK, NY-NORTHEASTERN NJ
SUPPORTING AGENCY (001): NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVA
COMMENTS: NYS#7093-05,START NO2,O3 11/18/76,TSP 10/10,CO 10/3/77,SO2 2/5/78
SITE-USER-INFO: 1980 NECRMP,DISC.CO,O3 5/25,RESTART O3 9/24/82;ELEV.TSP 102'

LATITUDE : 40:44:22 N
LONGITUDE: 73:59:10 W
UTM ZONE : 18
UTM NORTHING: 4510116
UTM EASTING : 585607
DISTANCE CITY: 003
HC IND: Y
MSA (5600): NEW YORK, NY

HQ EVAL DATE : 80/09/23
DIFF. GMT : 05
ELEVATION ABOVE MSL: 38 M
RECORD LAST UPDATED: 92/09/30
LAST REG EVAL : 80/09/22
COMPASS SECTOR : S
MET DATA : Y

EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
SITE DESCRIPTION INVENTORY

EPA-REGION: 04

STATE (37): NORTH CAROLINA

SITE ID : 37-067-0022 CITY (75000): WINSTON-SALEM
CITY POPULATION : 131,885 COUNTY (067): FORSYTH CO
AQCR POPULATION : 1,114,750 AQCR (136): NORTHERN PIEDMONT
DATE ESTABLISHED: / / LAND USE (1): RESIDENTIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: 1300 BLK. HATTIE AVENUE
URBAN AREA (9220): WINSTON-SALEM, NC
SUPPORTING AGENCY (002): FORSYTH COUNTY ENVIRONMENTAL AFFAIRS DEPARTMENT
COMMENTS: NEXT TO CHURCH SCHOOL. POP EXPOSURE.
SITE-USER-INFO: RJR BAILEY POWER PLANT PT MAX.

LATITUDE : 36:06:38 N
LONGITUDE: 80:13:36 W
UTM ZONE : 17
UTM NORTHING: 3996287
UTM EASTING : 569604
DISTANCE CITY:
HC IND:
MSA (3120): GREENSBORO-WINSTON-SALEM-HIGH POIN

HQ EVAL DATE : / /
DIFF. GMT : 05
ELEVATION ABOVE MSL: 287 M
RECORD LAST UPDATED: 90/03/29
LAST REG EVAL : / /
COMPASS SECTOR :
MET DATA :

SITE ID : 37-183-0015 CITY (55000): RALEIGH
CITY POPULATION : 150,255 COUNTY (183): WAKE CO
AQCR POPULATION : 1,082,284 AQCR (166): EASTERN PIEDMONT
DATE ESTABLISHED: 91/06/06 LAND USE (1): RESIDENTIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: 808 NORTH STATE STREET
URBAN AREA (6639): RALEIGH, NC
SUPPORTING AGENCY (001): NORTH CAROLINA DEPT NATURAL RESOURCES&COMMUNITY DEV
COMMENTS:

LATITUDE : 35:47:18 N
LONGITUDE: 78:37:20 W
UTM ZONE : 17
UTM NORTHING: 3962881
UTM EASTING : 714899
DISTANCE CITY: 002
HC IND: Y
MSA (6640): RALEIGH-DURHAM, NC

HQ EVAL DATE : / /
DIFF. GMT : 05
ELEVATION ABOVE MSL: 127 M
RECORD LAST UPDATED: 92/07/17
LAST REG EVAL : / /
COMPASS SECTOR :
MET DATA : N

EPA-REGION: 04 STATE (37): NORTH CAROLINA

SITE ID	: 37-119-0034	CITY (12000): CHARLOTTE	LATITUDE : 35:14:50 N	HQ EVAL DATE	: 83/07/22
CITY POPULATION	: 314,447	COUNTY (119): MECKLENBURG CO	LONGITUDE: 80:45:50 W	DIFF. GMT	: 05
AQCR POPULATION	: 1,216,719	AQCR (167): METROPOLITAN CHARLOTTE	UTM ZONE : 17	ELEVATION ABOVE MSL:	239 M
DATE ESTABLISHED:	/ /	LAND USE (1): RESIDENTIAL	UTM NORTHING: 3900287	RECORD LAST UPDATED:	92/07/17
DATE TERMINATED :	/ /	LOCATION SETTING (2): SUBURBAN	UTM EASTING : 521481	LAST REG EVAL	: / /
SITE ADDR: PLAZA ROAD AND LAKEDELL			DISTANCE CITY: 010	COMPASS SECTOR	: E
URBAN AREA (1519): CHARLOTTE, NC			HC IND: Y	MET DATA	:

SUPPORTING AGENCY (003): MECKLENBURG COUNTY DEPARTMENT OF ENVIRONMENTAL HEAL MSA (1520): CHARLOTTE-GASTONIA-ROCK HILL, NC-S
COMMENTS: NEW SITE-OZONE CARBON MONOXIDE AND NO 2 CONTINUOUS
SITE-USER-INFO: NEIGHBORHOOD SCALE POPULATION ORIENTED FOR CO & OZONE

EPA-REGION: 06

STATE (48): TEXAS

SITE ID : 48-113-0069 CITY (19000): DALLAS
CITY POPULATION : 904,078 COUNTY (113): DALLAS CO
AQCR POPULATION : 3,257,903 AQCR (215): METROPOLITAN DALLAS-FORT WORTH
DATE ESTABLISHED: 86/01/01 LAND USE (2): COMMERCIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: 1415 HINTON STREET
URBAN AREA (1920): DALLAS-FORT WORTH, TX
SUPPORTING AGENCY (002): CITY OF DALLAS AIR POLLUTION CONTROL SECTION
COMMENTS: FORMERLY MOCKINGBIRD SITE 451310044H01
SITE-USER-INFO: OFFICES MOVED, NEW SITE NEEDED

LATITUDE : 32:49:34 N HQ EVAL DATE : / /
LONGITUDE: 96:51:50 W DIFF. GMT : 06
UTM ZONE : 14 ELEVATION ABOVE MSL: 125 M
UTM NORTHING: 3633840 RECORD LAST UPDATED: 92/10/29
UTM EASTING : 699960 LAST REG EVAL : 86/12/11
DISTANCE CITY: COMPASS SECTOR :
HC IND: Y MET DATA :
MSA (1920): DALLAS, TX

SITE ID : 48-141-0027 CITY (24000): EL PASO
CITY POPULATION : 425,259 COUNTY (141): EL PASO CO
AQCR POPULATION : 660,806 AQCR (153): EL PASO-LAS CRUCES-ALAMOGORDO
DATE ESTABLISHED: 73/01/01 LAND USE (2): COMMERCIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: 500 NORTH CAMPBELL ST.
URBAN AREA (2320): EL PASO, TX
SUPPORTING AGENCY (001): TEXAS AIR CONTROL BOARD
COMMENTS: SIP MONITOR
SITE-USER-INFO: ACTIVE 11/73

LATITUDE : 31:45:45 N HQ EVAL DATE : / /
LONGITUDE: 106:29:13 W DIFF. GMT : 07
UTM ZONE : 13 ELEVATION ABOVE MSL: 1140 M
UTM NORTHING: 3514886 RECORD LAST UPDATED: 92/08/05
UTM EASTING : 359179 LAST REG EVAL : / /
DISTANCE CITY: COMPASS SECTOR :
HC IND: Y MET DATA :
MSA (2320): EL PASO, TX

SITE ID : 48-245-0009 CITY (07000): BEAUMONT
CITY POPULATION : 118,102 COUNTY (245): JEFFERSON CO
AQCR POPULATION : 3,921,588 AQCR (106): SOUTHERN LOUISIANA-SOUTHEAST T
DATE ESTABLISHED: 80/01/01 LAND USE (1): RESIDENTIAL
DATE TERMINATED : / / LOCATION SETTING (2): SUBURBAN
SITE ADDR: GEORGIA AT CUNNINGHAM, BEAUMONT, TX
URBAN AREA (0839): BEAUMONT, TX
SUPPORTING AGENCY (001): TEXAS AIR CONTROL BOARD
COMMENTS: MOVED FROM VIRGINIA ST
SITE-USER-INFO: LAMAR UNIVERSITY CAMPUS

LATITUDE : 30:02:22 N HQ EVAL DATE : / /
LONGITUDE: 94:04:29 W DIFF. GMT : 06
UTM ZONE : 15 ELEVATION ABOVE MSL: 13 M
UTM NORTHING: 3323462 RECORD LAST UPDATED: 92/08/05
UTM EASTING : 396381 LAST REG EVAL : / /
DISTANCE CITY: COMPASS SECTOR :
HC IND: MET DATA :
MSA (0840): BEAUMONT-PORT ARTHUR, TX

SITE ID : 48-439-1002 CITY (27000): FORT WORTH
CITY POPULATION : 385,164 COUNTY (439): TARRANT CO
AQCR POPULATION : 3,257,903 AQCR (215): METROPOLITAN DALLAS-FORT WORTH
DATE ESTABLISHED: 75/01/01 LAND USE (2): COMMERCIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: ROSS AVE BETWEEN LONG AND 34TH ST
URBAN AREA (1920): DALLAS-FORT WORTH, TX
SUPPORTING AGENCY (001): TEXAS AIR CONTROL BOARD
COMMENTS: CONTINUOUS MONITRING STATION

LATITUDE : 32:48:19 N HQ EVAL DATE : 80/10/28
LONGITUDE: 97:21:26 W DIFF. GMT : 06
UTM ZONE : 14 ELEVATION ABOVE MSL: 204 M
UTM NORTHING: 3630705 RECORD LAST UPDATED: 92/08/05
UTM EASTING : 653810 LAST REG EVAL : 80/08/01
DISTANCE CITY: 006 COMPASS SECTOR : N
HC IND: Y MET DATA : Y
MSA (2800): FORT WORTH-ARLINGTON, TX

EPA-REGION: 08 STATE (49): UTAH

SITE ID : 49-011-0001 CITY (07690): BOUNTIFUL
CITY POPULATION : 32,877 COUNTY (011): DAVIS CO
AQCR POPULATION : 1,154,361 AQCR (220): WASATCH FRONT
DATE ESTABLISHED: / / LAND USE (2): COMMERCIAL
DATE TERMINATED : / / LOCATION SETTING (2): SUBURBAN
SITE ADDR: 65W 300S BOUNTIFUL UTAH
URBAN AREA (7159): SALT LAKE CITY, UT
SUPPORTING AGENCY (001): UTAH DEPARTMENT OF HEALTH
COMMENTS: COMPLETE MONITORING STATION BEGAN 9-13-74

LATITUDE : 40:53:44 N HQ EVAL DATE : 81/10/28
LONGITUDE: 111:52:55 W DIFF. GMT : 07
UTM ZONE : 12 ELEVATION ABOVE MSL: 1335 M
UTM NORTHING: 4527325 RECORD LAST UPDATED: 92/04/30
UTM EASTING : 425708 LAST REG EVAL : 81/10/28
DISTANCE CITY: 015 COMPASS SECTOR : N
HC IND: Y MET DATA : Y
MSA (7160): SALT LAKE CITY-OGDEN, UT

SITE ID : 49-035-3001 CITY (67000): SALT LAKE CITY
CITY POPULATION : 163,697 COUNTY (035): SALT LAKE CO
AQCR POPULATION : 1,154,361 AQCR (220): WASATCH FRONT
DATE ESTABLISHED: 62/01/01 LAND USE (2): COMMERCIAL
DATE TERMINATED : / / LOCATION SETTING (1): URBAN AND CENTER CITY
SITE ADDR: HEALTH DEPT BLDG 610 SOUTH 2ND EAST
URBAN AREA (7159): SALT LAKE CITY, UT
SUPPORTING AGENCY (001): UTAH DEPARTMENT OF HEALTH
COMMENTS:

LATITUDE : 40:45:21 N HQ EVAL DATE : 81/10/27
LONGITUDE: 111:53:06 W DIFF. GMT : 07
UTM ZONE : 12 ELEVATION ABOVE MSL: 1305 M
UTM NORTHING: 4511818 RECORD LAST UPDATED: 92/04/30
UTM EASTING : 425294 LAST REG EVAL : 81/10/27
DISTANCE CITY: 002 COMPASS SECTOR : S
HC IND: Y MET DATA : Y
MSA (7160): SALT LAKE CITY-OGDEN, UT

EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
SITE DESCRIPTION INVENTORY

EPA-REGION: 06

STATE (80): COUNTRY OF MEXICO

SITE ID : 80-006-0001
CITY POPULATION : 355,555
AQCR POPULATION : 34,923,129
DATE ESTABLISHED: 90/06/04
DATE TERMINATED : / /
SITE ADDR: TECHNICAL INSTITUTE
URBAN AREA (2320): EL PASO, TX
SUPPORTING AGENCY (002): SEDUE
COMMENTS: SPECIAL EL PASO/JUAREZ MONITORING SITE.

CITY (01150): CIUDAD-JUAREZ
COUNTY (006): CHIHUAHUA STATE
AQCR (250): COUNTRY OF MEXICO
LAND USE (2): COMMERCIAL
LOCATION SETTING (1): URBAN AND CENTER CITY

LATITUDE :
LONGITUDE:
UTM ZONE :
UTM NORTHING:
UTM EASTING :
DISTANCE CITY:
HC IND: N
MSA (2320): EL PASO, TX

HQ EVAL DATE : / /
DIFF. GMT :
ELEVATION ABOVE MSL:
RECORD LAST UPDATED: 92/04/02
LAST REG EVAL : / /
COMPASS SECTOR :
MET DATA :

APPENDIX B

CRYOGENIC PRECONCENTRATION AND DIRECT FLAME IONIZATION DETECTION (PDFID) METHOD

COMPENDIUM METHOD TO-12

DETERMINATION OF NON-METHANE ORGANIC COMPOUNDS (NMOC) IN AMBIENT AIR USING CRYOGENIC PRE-CONCENTRATION AND DIRECT FLAME IONIZATION DETECTION (PDFID)

QUALITY ASSURANCE DIVISION
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

MAY, 1988

METHOD TO12

METHOD FOR THE DETERMINATION OF NON-METHANE ORGANIC COMPOUNDS (NMOC) IN AMBIENT AIR USING CRYOGENIC PRECONCENTRATION AND DIRECT FLAME IONIZATION DETECTION (PDFID)

1. Scope

1.1 In recent years, the relationship between ambient concentrations of precursor organic compounds and subsequent downwind concentrations of ozone has been described by a variety of photochemical dispersion models. The most important application of such models is to determine the degree of control of precursor organic compounds that is necessary in an urban area to achieve compliance with applicable ambient air quality standards for ozone (1,2).

1.2 The more elaborate theoretical models generally require detailed organic species data obtained by multicomponent gas chromatography (3 The Empirical Kinetic Modeling Approach (EKMA), however, requires only the total non-methane organic compound (NMOC) concentration data; specifically, the average total NMOC concentration from 6 a.m. to 9 a.m. daily at the sampling location. The use of total NMOC concentration data in the EKMA substantially reduces the cost and complexity of the sampling and analysis system by not requiring qualitative and quantitative species identification.

1.3 Method TO1, "Method for The Determination of Volatile Organic Compounds in Ambient Air Using Tenax® Adsorption and Gas Chromatography/Mass Spectrometry (GC/MS)", employs collection of certain volatile organic compounds on Tenax® GC with subsequent analysis by thermal desorption/cryogenic preconcentration and GC/MS identification. This method (TO12) combines the same type of cryogenic concentration technique used in Method TO1 for high sensitivity with the simple flame ionization detector (FID) of the GC for total NMOC measurements, without the GC columns and complex procedures necessary for species separation.

1.4 In a flame ionization detector, the sample is injected into a hydrogen-rich flame where the organic vapors burn producing ionized molecular fragments. The resulting ion fragments are then collected and detected. The FID is nearly a univer detector. However, the detector response varies with t species of [functional group in] the organic compound in an oxy n atmosphere. Because this method employs a helium or argon carrier gas, the detector response is nearly one for all compounds. Thus, the historical short-coming of the FID involving varying detector response to different organic functional groups is minimized.

1.5 The method can be used either for direct, in situ ambient measurements or (more commonly) for analysis of integrated samples collected in specially treated stainless steel canisters. EKMA models generally require 3-hour integrated NMOC measurements over the 6 a.m. to 9 a.m. period and are used by State or local agencies to prepare State Implementation Plans (SIPs) for ozone control to achieve compliance with the National Ambient Air Quality Standards (NAAQS) for ozone. For direct, in situ ambient measurements, the analyst must be presen ring the 6 a.m. to 9 a.m. period, and repeat measurements (a oximately six per hour) must be taken to obtain the 6 a.m. to 9 a.m. average NMOC oncentration. The use of sample canisters allows the col tion of integrated air samples over the 6 a.m. to 9 a.m. period by unattended, automated samplers. This method has incorporated both sampling approaches.

2. Applicable Documents

2.1 ASTM Standards

D1356 - Definition of Terms Related to Atmospheric Sampling and Analysis

E260 - Recommended Practice for General Gas Chromatography Procedures

E355 - Practice for Gas Chromatography Terms and Relationships

2.2 Other Documents

U. S. Environmental Protection Agency Technical Assistance Documents (4,5)

Laboratory and Ambient Air Studies (6-10)

3. Summary of Method

3.1 A whole air sample is either extracted directly from the ambient air and analyzed on site by the GC system or collected into a precleaned sample canister and analyzed off site.

3.2 The analysis requires drawing a fixed-volume portion of the sample air at a low flow rate through a glass-bead filled trap that is cooled to approximately -186°C with liquid argon. The cryogenic trap simultaneously collects and concentrates the NMOC (either via condensation or adsorption) while allowing the methane, nitrogen, oxygen, etc. to pass through the trap without retention. The system is dynamically calibrated so that the volume of sample passing through the trap does not have to be quantitatively measured, but must be precisely repeatable between the calibration and the analytical phases.

3.3 After the fixed-volume air sample has been drawn through the trap, a helium carrier gas flow is diverted to pass through the trap, in the opposite direction to the sample flow, and into an FID. When the residual air and methane have been flushed from the trap and the FID baseline restabilizes, the cryogen is removed and the temperature of the trap is raised to approximately 90°C.

3.4 The organic compounds previously collected in the trap revolatilize due to the increase in temperature and are carried into the FID, resulting in a response peak or peaks from the FID. The area of the peak or peaks is integrated, and the integrated value is translated to concentration units via a previously-obtained calibration curve relating integrated peak areas with known concentrations of propane.

3.5 By convention, concentrations of NMOC are reported in units of parts per million carbon (ppmC), which, for a specific compound, is the concentration by volume (ppmV) multiplied by the number of carbon atoms in the compound.

3.6 The cryogenic trap simultaneously concentrates the NMOC while separating and removing the methane from air samples. The technique is thus direct reading for NMOC and, because of the concentration step, is more sensitive than conventional continuous NMOC analyzers.

4. Significance

4.1 Accurate measurements of ambient concentrations of NMOC are important for the control of photochemical smog because these organic compounds are primary precursors of atmospheric ozone and other oxidants. Achieving and maintaining compliance with the NAAQS for ozone thus depends largely on control of ambient levels of NMOC.

4.2 The NMOC concentrations typically found at urban sites may range up to 5-7 ppmC or higher. In order to determine transport of precursors into an area, measurement of NMOC upwind of the area may be necessary. Upwind NMOC concentrations are likely to be less than a few tenths of 1 ppm.

4.3 Conventional methods that depend on gas chromatography and qualitative and quantitative species evaluation are excessively difficult and expensive to operate and maintain when speciated measurements are not needed. The method described here involves a simple, cryogenic preconcentration procedure with subsequent, direct, flame ionization detection. The method is sensitive and provides accurate measurements of ambient NMOC concentrations where speciated data are not required as applicable to the EKMA.

5. Definitions

[Note: Definitions used in this document and in any user-prepared Standard Operating Procedures (SOPs) should be consistent with ASTM Methods D1356 and E355. All abbreviations and symbols are defined within this document at point of use.]

5.1 Absolute pressure - Pressure measured with reference to absolute zero pressure (as opposed to atmospheric pressure), usually expressed as pounds-force per square inch absolute (psia).

5.2 Cryogen - A substance used to obtain very low trap temperatures in the NMOC analysis system. Typical cryogens are liquid argon (bp -185.7) and liquid oxygen (bp-183.0).

5.3 Dynamic calibration - Calibration of an analytical system with pollutant concentrations that are generated in a dynamic, flowing system, such as by quantitative, flow-rate dilution of a high concentration gas standard with zero gas.

5.4 EKMA - Empirical Kinetics Modeling Approach; an empirical model that attempts to relate morning ambient concentrations of nonmethane organic compounds (NMOC) and NO_x with subsequent peak, downwind ambient ozone concentrations; used by pollution control agencies to estimate the degree of hydrocarbon emission reduction needed to achieve compliance with national ambient air quality standards for ozone.

5.5 Gauge pressure - Pressure measured with reference to atmospheric pressure (as opposed to absolute pressure). Zero gauge pressure (0 psig) is equal to atmospheric pressure, or 14.7 psia (101 kPa).

5.6 *In situ* - In place; *In situ* measurements are obtained by direct, on-the-spot analysis, as opposed to subsequent, remote analysis of a collected sample.

5.7 Integrated sample - A sample obtained uniformly over a specified time period and representative of the average levels of pollutants during the time period.

5.8 NMOC - Nonmethane organic compounds; total organic compounds as measured by a flame ionization detector, excluding methane.

5.9 ppmC - Concentration unit of parts per million carbon; for a specific compound, ppmC is equivalent to parts per million by volume (ppmv) multiplied by the number of carbon atoms in the compound.

5.10 Sampling - The process of withdrawing or isolating a representative portion of an ambient atmosphere, with or without the simultaneous isolation of selected components for subsequent analysis.

6. Interferences

6.1 In field and laboratory evaluation, water was found to cause a positive shift in the FID baseline. The effect of this shift is minimized by carefully selecting the integration termination point and adjusted baseline used for calculating the area of the NMOC peak(s)

6.2 When using helium as a carrier gas, FID response is quite uniform for most hydrocarbon compounds, but the response can vary considerably for other types of organic compounds.

7. Apparatus

7.1 Direct Air Sampling (Figure 1)

7.1.1 Sample manifold or sample inlet line - to bring sample air into the analytical system.

7.1.2 Vacuum pump or blower - to draw sample air through a sample manifold or long inlet line to reduce inlet residence time. Maximum residence time should be no greater than 1 minute.

7.2 Remote Sample Collection in Pressurized Canisters (Figure 2)

7.2.1 Sample canister(s) - stainless steel, Summa®-polished vessel(s) of 4-6 L capacity (Scientific Instrumentation Specialists, Inc., P.O. Box 8941, Moscow, ID 83843), used for automatic collection of 3-hour integrated field air samples. Each canister should have a unique identification number stamped on its frame.

7.2.2 Sample pump - stainless steel, metal bellows type (Model MB-151, Metal Bellows Corp., 1075 Providence Highway, Sharon, MA 02067) capable of 2 atmospheres minimum output pressure. Pump must be free of leaks, clean, and uncontaminated by oil or organic compounds.

7.2.3 Pressure gauge - 0-30 psig (0-240 kPa).

7.2.4 Solenoid valve - special electrically-operated, bistable solenoid valve (Skinner Magnelatch Valve, New Britain,

CT), to control sample flow to the canister with negligible temperature rise (Figure 3). The use of the Skinner Magnelatch valve avoids any substantial temperature rise that would occur with a conventional, normally closed solenoid valve, which would have to be energized during the entire sample period. This temperature rise in the valve could cause outgasing of organics from the Viton valve seat material. The Skinner Magnelatch valve requires only a brief electrical pulse to open or close at the appropriate start and stop times and therefore experiences no temperature increase. The pulses may be obtained with an electronic timer that can be programmed for short (5 to 60 seconds) ON periods or with a conventional mechanical timer and a special pulse circuit. Figure 3 [a] illustrates a simple electrical pulse circuit for operating the Skinner Magnelatch solenoid valve with a conventional mechanical timer. However, with this simple circuit, the valve may operate unpredictably during brief power interruptions or if the timer is manually switched on and off too fast. A better circuit incorporating a time-delay relay to provide more reliable valve operation is shown in Figure 3[b].

7.2.5 Stainless steel orifice (or short capillary) - capable of maintaining a substantially constant flow over the sampling period (see Figure 4).

7.2.6 Particulate matter filter - 2 micron stainless steel sintered in-line type (see Figure 4).

7.2.7 Timer - used for unattended sample collection. Capable of controlling pump(s) and solenoid valve.

7.3 Sample Canister Cleaning (Figure 5)

7.3.1 Vacuum pump - capable of evacuating sample canister(s) to an absolute pressure of <5 mm Hg.

7.3.2 Manifold - stainless steel manifold with connections for simultaneously cleaning several canisters.

7.3.3 Shut off valve(s) - seven required.

7.3.4 Vacuum gauge - capable of measuring vacuum in the manifold to an absolute pressure of 5 mm Hg or less.

7.3.5 Cryogenic trap (2 required) - U-snaped open tubular trap cooled with liquid nitrogen or argon used to prevent contamination from back diffusion of oil from vacuum pump, and to provide clean, zero air to sample canister(s).

7.3.6 Pressure gauge - 0-50 psig (0-345 kPa), to monitor zero air pressure.

7.3.7 Flow control valve - to regulate flow of zero air into canister(s).

7.3.8 Humidifier - water bubbler or other system capable of providing moisture to the zero air supply.

7.4 Analytical System (Figure 1)

7.4.1 FID detector system - including flow controls for the FID fuel and air, temperature control for the FID, and signal processing electronics. The FID burner air, hydrogen, and helium carrier flow rates should be set according to the manufacturer's instructions to obtain an adequate FID response while maintaining as stable a flame as possible throughout all phases of the analytical cycle.

7.4.2 Chart recorder - compatible the output signal, to record FID response.

7.4.3 Electronic integrator - capable of integrating the area of one or more FID response peaks and calculating peak area corrected for baseline drift. If a separate integrator and chart recorder are used, care must be exercised to be sure that these components do not interfere with each other electrically. Range selector controls on both the integrator and the FID analyzer may not provide accurate range ratios, so individual calibration curves should be prepared for each range to be used. The integrator should be capable of marking the beginning and ending of peaks, constructing the appropriate baseline between the start and end of the integration period, and calculating the peak area.

Note: The FID (7.4.1), chart recorder (7.4.2), integrator (7.4.3), valve heater (7.4.5), and a trap heating system are conveniently provided by a standard laboratory chromatograph and associated integrator. EPA has adapted two such systems for the PDFID method: a Hewlett-Packard model 5880 (Hewlett-Packard Corp., Avondale, PA) and a Shimadzu model GC8APF (Shimadzu Scientific Instruments Inc., Columbia, MD; see Reference 5). Other similar systems may also be applicable.

7.4.4 Trap - the trap should be carefully constructed from a single piece of chromatographic-grade stainless steel tubing (0.32 cm O.D, 0.21 cm I.D.) as shown in Figure 6. The central portion of the trap (7-10 cm) is packed with 60/80 mesh glass beads, with small glass wool (dimethyldichlorosilane-treated) plugs to retain the beads. The trap must fit conveniently into the Dewar flask (7.4.9), and the arms must be of an appropriate length to allow the beaded portion of the trap to be submerged below the level of liquid cryogen in the Dewar. The trap should connect directly to the six-port valve, if possible, to minimize line length between the trap and the FID. The trap must be mounted to allow the Dewar to be slipped conveniently on and off the trap and also to facilitate heating of the trap (see 7.4.13).

7.4.5 Six-port chromatographic valve - Seiscor Model VIII (Seismograph Service Corp., Tulsa, OK), Valco Model 9110 (Valco Instruments Co., Houston, TX), or equivalent. The six-port valve and as much of the interconnecting tubing as practical should be located inside an oven or otherwise heated to 80 - 90°C to minimize wall losses or adsorption/desorption in the connecting tubing. All lines should be as short as practical.

7.4.6 Multistage pressure regulators - standard two-stage, stainless steel diaphram regulators with pressure gauges, for helium, air, and hydrogen cylinders.

7.4.7 Pressure regulators - optional single stage, stainless steel, with pressure gauge, if needed, to maintain constant helium carrier and hydrogen flow rates.

7.4.8 Fine needle valve - to adjust sample flow rate through trap.

7.4.9 ewar flask - to hr liquid cryogen to cool the trap, sized to contain submerged portion of trap.

7.4.10 Absolute pressure gauge - 0-4[illegible]0 mm Hg,(2 mm Hg [scale divisions indicating units]). o monitor repeatable volumes of sample air through cryogenic trap (Wallace and Tiernan, Model 61C-ID-0410, 25 Main Street, Belleville, NJ).

7.4.11 Vacuum reservoir - 1-2 L capacity, typically 1 L.

7.4.12 Gas purifiers - gas scrubbers containing Drierite® or silica gel and 5A molecular sieve to remove moisture and organic impurities in the helium, air, and hydrogen gas flows (Alltech Associates, Deerfield, IL). Note: Check [illegible]ity of gas purifiers prior to use by passing zero-a.. through the unit and analyzing according to Section 11.4. Gas purifiers are clean if produce [contain] less than 0.02 ppmC hydrocarbons.

7.4.13 Trap heating system - chromatoc phic oven, hot water, or other means to heat the trap to 80° to 90°C. A simple heating source for the trap is a beaker or Dewar filled with water maintained at 80-90°C. More repeata..e types of heat sources are recommended, including a temperature-programmed chromatograph oven, electrical heating of the trap itself, or any type of heater that brings the temperature of the trap up to 80-90°C in 1-2 minutes.

7.4.14 Toggle shut-off valves (2) - leak free, for vacuum valve and sample valve.

7.4.15 Vacuum pump - general purpose laboratory pump capable of evacuating the vacuum reservoir to an appropriate vacuum that allows the desired sample volume to be drawn through the trap.

7.4.16 Vent - to keep the trap at atmospheric pressure during trapping when using pressurized canisters.

7.4.17 Rotameter - to verify vent flow.

7.4.18 Fine needle valve (optional) - to adjust flow rate of sample from canister during analysis.

7.4.19 Chromatographic-grade stainless steel tubing (Alltech Applied Science, 2051 Waukegan Road, Deerfield, IL, 60015, (312) 948-8600) and stainless steel plumbing fittings - for interconnections. All such materials in contact with the sample, analyte, or support gases prior to analysis should be stainless steel or other inert metal. Do not use plastic or Teflon® tubing or fittings.

7.5 Commercially Available PDFID System (5)

7.5.1 A convenient and cost-effective modular PDFID system suitable for use with a conventional laboratory chromatograph is commercially available (NuTech Corporation, Model 8548, 2806 Cheek Road, Durham, NC, 27704, (919) 682-0402).

7.5.2 This modular system contains almost all of the apparatus items needed to convert the chromatograph into a PDFID analytical system and has been designed to be readily available and easy to assemble.

8. Reagents and Materials

8.1 Gas cylinders of helium and hydrogen - ultrahigh purity grade.

8.2 Combustion air - cylinder containing less than 0.02 ppm hydrocarbons, or equivalent air source.

8.3 Propane calibration standard - cylinder containing 1-100 ppm (3-300 ppmC) propane in air. The cylinder assay should be traceable to a National Bureau of Standards (NBS) Standard Reference Material (SRM) or to a NBS/EPA-approved Certified Reference Material (CRM).

8.4 Zero air - cylinder containing less than 0.02 ppmC hydrocarbons. Zero air may be obtained from a cylinder of zero-grade compressed air scrubbed with Drierite® or silica gel and 5A molecular sieve or activated charcoal, or by catalytic cleanup

of ambient air. All zero air should be passed through a liquid argon cold trap for final cleanup, then passed through a hyrdocarbon-free water bubbler (or other device) for humidification.

8.5 Liquid cryogen - liquid argon (bp -185.7°C) or liquid oxygen, (bp -183°C) may be used as the cryogen. Experiments have shown no differences in trapping efficiency between liquid argon and liquid oxygen. However, appropriate safety precautions must be taken if liquid oxygen is used. Liquid nitrogen (bp -195°C) should not be used because it causes condensation of oxygen and methane in the trap.

9. Direct Sampling

9.1 For direct ambient air sampling, the cryogenic trapping system draws the air sample directly from a pump-ventilated distribution manifold or sample line (see Figure 1). The connecting line should be of small diameter (1/8" O.D.) stainless steel tubing and as short as possible to minimize its dead volume.

9.2 Multiple analyses over the sampling period must be made to establish hourly or 3-hour NMOC concentration averages.

10. Sample Collection in Pressurized Canister(s)

For integrated pressurized canister sampling, ambient air is sampled by a metal bellows pump through a critical orifice (to maintain constant flow), and pressurized into a clean, evacuated, Summa®-polished sample canister. The critical orifice size is chosen so that the canister is pressurized to approximately one atmosphere above ambient pressure, at a constant flow rate over the desired sample period. Two canisters are connected in parallel for duplicate samples. The canister(s) are then returned to the laboratory for analysis, using the PDFID analytical system. Collection of ambient air samples in pressurized canisters provides the following advantages:

- o Convenient integration of ambient samples over a specific time period
- o Capability of remote sampling with subsequent central laboratory analysis
- o Ability to ship and store samples, if necessary

- o Unattended sample collection
- o Analysis of samples from multiple sites with one analytical system
- o Collection of replicate samples for assessment of measurement precision

With canister sampling, however, great care must be exercised in selecting, cleaning, and handling the sample canister(s) and sampling apparatus to avoid losses or contamination of the samples.

10.1 Canister Cleanup and Preparation

10.1.1 All canisters must be clean and free of any contaminants before sample collection.

10.1.2 Leak test all canisters by pressurizing them to approximately 30 psig [200 kPa (gauge)] with zero air. The use of the canister cleaning system (see Figure 5) may be adequate for this task. Measure the final pressure - close the canister valve, then check the pressure after 24 hours. If leak tight, the pressure should not vary more than $\pm$ 2 psig over the 24-hour period. Note leak check result on sampling data sheet, Figure 7.

10.1.3 Assemble a canister cleaning system, as illustrated in Figure 5. Add cryogen to both the vacuum pump and zero air supply traps. Connect the canister(s) to the manifold. Open the vent shut off valve and the canister valve(s) to release any remaining pressure in the canister. Now close the vent shut off valve and open the vacuum shut off valve. Start the vacuum pump and evacuate the canister(s) to $\leq$ 5.0 mm Hg (for at least one hour). [Note: On a daily basis or more often if necessary, blow-out the cryogenic traps with zero air to remove any trapped water from previous canister cleaning cycles.]

10.1.4 Close the vacuum and vacuum gauge shut off valves and open the zero air shut off valve to pressurize the canister(s) with moist zero air to approximately 30 psig [200 kPa (gauge)]. If a zero gas generator system is used,

the flow rate may need to be limited to maintain the zero air quality.

10.1.5 Close the zero shut off valve and allow canister(s) to vent down to atmospheric pressure through the vent shut off valve. Close the vent shut off valve. Repeat steps 10.1.3 through 10.1.5 two additional times for a total of three (3) evacuation/pressurization cycles for each set of canisters.

10.1.6 As a "blank" check of the canister(s) and cleanup procedure, analyze the final zero-air fill of 100% of the canisters until the cleanup system and canisters are proven reliable. The check can then be reduced to a lower percentage of canisters. Any canister that does not test clean (compared to direct analysis of humidified zero air of less than 0.02 ppmC) should not be utilized.

10.1.7 The canister is then re-evacuated to $\leq$ 5.0 mm Hg, using the canister cleaning system, and remains in this condition until use. Close the canister valve, remove the canister from the canister cleaning system and cap canister connection with a stainless steel fitting. The canister is now ready for collection of an air sample. Attach an identification tag to the neck of each canister for field notes and chain-of-custody purposes.

10.2 Collection of Integrated Whole-Air Samples

10.2.1 Assemble the sampling apparatus as shown in Figure 2. The connecting lines between the sample pump and the canister(s) should be as short as possible to minimize their volume. A second canister is used when a duplicate sample is desired for quality assurance (QA) purposes (see Section 12.2.4). The small auxiliary vacuum pump purges the inlet manifold or lines with a flow of several L/min to minimize the sample residence time. The larger metal bellows pump takes a small portion of this sample to fill and pressurize the sample canister(s) Both pumps should be shock-mounted to minimize vibration. Prior to field use, each sampling system should be leak

tested. The outlet side of the metal bellows pump can be checked for leaks by attaching the 0-30 psig pressure gauge to the canister(s) inlet via connecting tubing and pressurizing to 2 atmospheres or approximately 29.4 psig. If pump and connecting lines are leak free pressure should remain at ± 2 psig for 15 minutes. To check the inlet side, plug the sample inlet and insure that there is no flow at the outlet of the pump.

10.2.2 Calculate the flow rate needed so that the canister(s) are pressurized to approximately one atmosphere above ambient pressure (2 atmospheres absolute pressure) over the desired sample period, utilizing the following equation:

$$F = \frac{(P)(V)(N)}{(T)(60)}$$

where:

F = flow rate (cm^3/min)
P = final canister pressure (atmospheres absolute)
= $(P_g/P_a) + 1$
V = volume of the canister (cm^3)
N = number of canisters connected together for simultaneous sample collection
T = sample period (hours)
P_g = gauge pressure in canister, psig (kPa)
Pa = standard atmospheric pressure, 14.7 psig (101 kPa)

For example, if one 6-L canister is to be filled to 2 atmospheres absolute pressure (14.7 psig) in 3 hours, the flow rate would be calculated as follows:

$$F = \frac{2 \times 6000 \times 1}{3 \times 60} = 67 \text{ cm}^3/\text{min}$$

10.2.3 Select a critical orifice or hypodermic needle suitable to maintain a substantially constant flow at the calculated flow rate into the canister(s) over the desired sample period. A 30-gauge hypodermic needle, 2.5 cm

long, provides a flow of approximately 65 cm^3/min with the Metal Bellows Model MBV-151 pump (see Figure 4). Such a needle will maintain approximately constant flow up to a canister pressure of about 10 psig (71 kPa), after which the flow drops with increasing pressure. At 14.7 psig (2 atmospheres absolute pressure), the flow is about 10% below the original flow.

10.2.4 Assemble the 2.0 micron stainless steel in-line particulate filter and position it in front of the critical orifice. A suggested filter-hypodermic needle assembly can be fabricated as illustrated in Figure 4.

10.2.5 Check the sampling system for contamination by filling two evacuated, cleaned canister(s) (See Section 10.1) with humidified zero air through the sampling system. Analyze the canisters according to Section 11.4. The sampling system is free of contamination if the canisters contain less than 0.02 ppmC hydrocarbons, similar to that of humidified zero air.

10.2.6 During the system contamination check procedure, check the critical orifice flow rate on the sampling system to insure that sample flow rate remains relatively constant (±10%) up to about 2 atmospheres absolute pressure (101 kPa). Note: A drop in the flow rate may occur near the end of the sampling period as the canister pressure approaches two atmospheres.

10.2.7 Reassemble the sampling system. If the inlet sample line is longer than 3 meters, install an auxiliary pump to ventilate the sample line, as illustrated in Figure 2.

10.2.8 Verify that the timer, pump(s) and solenoid valve are connected and operating properly.

10.2.9 Verify that the timer is correctly set for the desired sample period, and that the solenoid valve is closed.

10.2.10 Connect a cleaned, evacuated canister(s) (Section 10.1) to the non-contaminated sampling system, by way of the solenoid valve, for sample collection.

10.2.11 Make sure the solenoid valve is closed. Open the canister valve(s). Temporarily connect a small rotameter to the sample inlet to verify that there is no flow. Note: Flow detection would indicate a leaking (or open) solenoid valve. Remove the rotameter after leak detection procedure.

10.2.12 Fill out the necessary information on the Field Data Sheet (Figure 7).

10.2.13 Set the automatic timer to start and stop the pump or pumps to open and close the solenoid valve at the appropriate time for the intended sample period. Sampling will begin at the pre-determined time.

10.2.14 After the sample period, close the canister valve(s) and disconnect the canister(s) from the sampling system. Connect a pressure gauge to the canister(s) and briefly open and close the canister valve. Note the canister pressure on the Field Data Sheet (see Figure 7). The canister pressure should be approximately 2 atmospheres absolute [1 atmosphere or 101 kPa (gauge)]. Note: If the canister pressure is not approximately 2 atmospheres absolute (14.7 psig), determine and correct the cause before next sample. Re-cap canister valve.

10.2.15 Fill out the identification tag on the sample canister(s) and complete the Field Data Sheet as necessary. Note any activities or special conditions in the area (rain, smoke, etc.) that may affect the sample contents on the sampling data sheet.

10.2.16 Return the canister(s) to the analytical system for analysis.

11. Sample Analysis

11.1 Analytical System Leak Check

11.1.1 Before sample analysis, the analytical system is assembled (see Figure 1) and leak checked.

11.1.2 To leak check the analytical system, place the six-port gas valve in the trapping position. Disconnect and cap the absolute pressure gauge. Insert a pressure gauge capable of recording up to 60 psig at the vacuum valve outlet.

11.1.3 Attach a valve and a zero air supply to the sample inlet port. Pressurize the system to about 50 psig (350 kPa) and close the valve.

11.1.4 Wait approximately 3 hrs. and re-check pressure. If the pressure did not vary more than ± 2 psig, the system is considered leak tight.

11.1.5 If the system is leak free, de-pressurize and reconnect absolute pressure gauge.

11.1.6 The analytical system leak check procedure needs to be performed during the system checkout, during a series of analysis or if leaks are suspected. This should b part of the user-prepared SOP manual (see Section 12..

11.2 Sample Volume Determination

11.2.1 The vacuum reservoir and absolute pressure gauge are used to meter a precisely repeatable volume of sample air through the cryogenically-cooled trap, as follows: With the sample valve closed and the vacuum valve open, the reservoir is first evacuated with the vacuum pump to a predetermined pressure (e.g., 100 mm Hg). Then the vacuum valve is closed and the sample valve is opened to allow sample air to be drawn through the cryogenic trap and into the evacuated reservoir until a second predetermined reservoir pressure is reached (e.g., 300 mm Hg). The (fixed) volume of air thus sampled is determined by the pressure rise in the vacuum reservoir (difference between the predetermined pressures) as measured by the absolute pressure gauge (see Section 12.2.1).

11.2.2 The sample volume can be calculated by:

$$V_s = \frac{(\Delta P)(V_r)}{(P_s)}$$

where:

V_s = volume of air sampled (standard cm^3)
ΔP = pressure difference measured by gauge (mm Hg)
V_r = volume of vacuum reservoir (cm^3) usually 1 L
P_s = standard pressure (760 mm Hg)

For example, with a vacuum reservoir of 1000 cm^3 and a pressure change of 200 mm Hg (100 to 300 mm Hg), the volume sampled would be 263 cm^3. [Note: Typical sample volume using this procedure is between 200-300 cm^3.]

11.2.3 The sample volume determination need only be performed once during the system check-out and shall be part of the user-prepared SOP Manual (see Section 12.1).

11.3 Analytical System Dynamic Calibration

11.3.1 Before sample analysis, a complete dynamic calibration of the analytical system should be carried out at five or more concentrations on each range to define the calibration curve. This should be carried out initially and periodically thereafter [may be done only once during a series of analyses]. This should be part of the user-prepared SOP Manual (See Section 12.1). The calibration should be verified with two or three-point calibration checks (including zero) each day the analytical system is used to analyze samples.

11.3.2 Concentration standards of propane are used to calibrate the analytical system. Propane calibration standards may be obtained directly from low concentration cylinder standards or by dilution of high concentration cylinder

standards with zero air (see Section 8.3). Dilution flow rates must be measured accurately, and the combined gas stream must be mixed thoroughly for successful calibration of the analyzer. Calibration standards should be sampled directly from a vented manifold or tee. Note: Remember that a propane NMOC concentration in ppmC is three times the volumetric concentration in ppm.

11.3.3 Select one or more combinations of the following parameters to provide the desired range or ranges (e.g., 0-1.0 ppmC or 0-5.0 ppmC): FID attenuator setting, output voltage setting, integrator resolution (if applicable), and sample volume. Each individual range should be calibrated separately and should have a separate calibration curve. Note: Modern GC integrators may provide automatic ranging such that several decades of concentration may be covered in a single range. The user-prepared SOP manual should address variations applicable to a specific system design (see Section 12.1).

11.3.4 Analyze each calibration standard three times according to the procedure in Section 11.4. Insure that flow rates, pressure gauge start - stop readings, initial cryogen liquid level in the dewar, timing, heating, integrator settings, and other variables are the same as those that will be used during analysis of ambient samples. Typical flow rates for the gases are: hydrogen, 30 cm^3/minute; helium carrier, 30 cm^3/minute; burner air, 400 cm^3/minute.

11.3.5 Average the three analyses for each concentration standard and plot the calibration curve(s) as average integrated peak area reading versus concentration in ppmC. The relative standard deviation for the three analyses should be less

than 3% (except for zero concentration). Linearity should be expected; points that appear to deviate abnormally should be repeated. Response has been shown to be linear over a wide range (0-10,000 ppbC). If nonlinearity is observed, an effort should be made to identify and correct the problem. If the problem cannot be corrected, additional points in the nonlinear region may be needed to define the calibration curve adequately.

11.4 Analysis Procedure

11.4.1 Insure the analytical system has been assembled properly, leaked checked, and properly calibrated through a dynamic standard calibration. Light the FID detector and allow to stabilize.

11.4.2 Check and adjust the helium carrier pressure to provide the correct carrier flow rate for the system. Helium is used to purge residual air and methane from the trap at the end of the sampling phase and to carry the re-volatilized NMOC from the trap into the FID. A single-stage auxiliary regulator between the cylinder and the analyzer may not be necessary, but is recommended to regulate the helium pressure better than the multistage cylinder regulator. When an auxiliary regulator is used, the secondary stage of the two-stage regulator must be set at a pressure higher than the pressure setting of the single-stage regulator. Also check the FID hydrogen and burner air flow rates (see 11.3.4).

11.4.3 Close the sample valve and open the vacuum valve to evacuate the vacuum reservoir to a specific predetermined value (e.g., 100 mm Hg).

11.4.4 With the trap at room temperature, place the six-port valve in the inject position.

11.4.5 Open the sample valve and adjust the sample flow rate needle valve for an appropriate trap flow of 50-100 cm^3/min. Note: The flow will be lower later, when the trap is cold.

11.4.6 Check the sample canister pressure before attaching it to the analytical system and record on Field Data Sheet (see Figure 7). Connect the sample canister or direct sample inlet to the six-port valve, as shown in Figure 1. For a canister, either the canister valve or an optional fine needle valve installed between the canister and the vent is used to adjust the canister flow rate to a value slightly higher than the trap flow rate set by the sample flow rate needle valve. The excess flow exhausts through the vent, which assures that the sample air flowing through the trap is at atmospheric pressure. The vent is connected to a flow indicator such as a rotameter as an indication of vent flow to assist in adjusting the flow control valve. Open the canister valve and adjust the canister valve or the sample flow needle valve to obtain a moderate vent flow as indicated by the rotameter. The sample flow rate will be lower (and hence the vent flow rate will be higher) when the the trap is cold.

11.4.7 Close the sample valve and open the vacuum valve (if t a[illegible]y op[illegible] to evacuate the vacuum reservoir. [illegible]h t[illegible]ix-p[illegible] valve in the inject position and the [illegible]acuum valve open, open the sample valve for 2-3 minutes [with both valves open, the pressure reading won't change] to flush and condition the inlet lines.

11.4.8 Close the sample valve and evacuate the reservoir to the predetermined sample starting pressure (typically 100 mm Hg) as indicated by the absolute pressure gauge.

11.4.9 Switch the six-port valve to the sample position.

11.4.10 Submerge the trap in the cryogen. Allow a few minutes for the trap to cool completely (indicated when the cryogen stops boiling). Add cryogen to the initial level used during system dynamic calibration. The level of the cryogenic liquid should remain constant with respect to the trap and should completely cover the beaded portion of the trap.

11.4.11 Open the sample valve and observe the increasing pressure on the pressure gauge. When it reaches the specific predetermined pressure (typically 300 mm Hg) representative of the desired sample volume (Section 11.2), close the sample valve.

11.4.12 Add a little cryogen or elevate the Dewar to raise the liquid level to a point slightly higher (3-15 mm) than the initial level at the beginning of the trapping.
Note: This insures that organics do not bleed from the trap and are counted as part of the NMOC peak(s).

11.4.13 Switch the 6-port valve to the inject position, keeping the cryogenic liquid on the trap until the methane and upset peaks have deminished (10-20 seconds). Now close the canister valve to conserve the remaining sample in the canister.

11.4.14 Start the integrator and remove the Dewar flask containing the cryogenic liquid from the trap.

11.4.15 Close the GC oven door and allow the GC oven (or alternate trap heating system) to heat the trap at a predetermined rate (typically, 30°C/min) to 90°. Heating the trap volatilizes the concentrated NMOC such that the FID produces integrated peaks. A uniform trap temperature rise rate (above 0°C) helps to reduce variability and facilitates more accurate correction for the moisture-shifted baseline. With a chromatograph oven to heat the trap, the following parameters have been found to be acceptable: initial temperature, 30°C; initial time, 0.20 minutes (following start of the integrator); heat rate, 30°/minute; final temperature, 90°C.

11.4.16 Use the same heating process and temperatures for both calibration and sample analysis. Heating the trap too quickly may cause an initial negative response that could hamper accurate integration. Some initial experimentation may be necessary to determine the optimal heating procedure for each system. Once established, the procedure should be consistent for each analysis as outlined in the user-prepared SOP Manual.

11.4.17 Continue the integration (generally, in the range of 1-2 minutes is adequate) only long enough to include all of the organic compound peaks and to establish the end point FID baseline, as illustrated in Figure 8. The integrator should be capable of marking the beginning and ending of peaks, constructing the appropriate operational baseline between the start and end of the integration period, and calculating the resulting corrected peak area. This ability is necessary because the moisture in the sample, which is also concentrated in the trap, will cause a slight positive baseline shift. This baseline shift starts as the trap warms and continues until all of the moisture is swept from the trap, at which time the baseline returns to its normal level. The shift always continues longer than the ambient organic peak(s). The integrator should be programmed to correct for this shifted baseline by ending the integration at a point after the last NMOC peak and prior to the return of the shifted baseline to normal (see Figure 8) so that the calculated operational baseline effectively compensates for the water-shifted baseline. Electronic integrators either do this automatically or they should be programmed to make this correction. Alternatively, analyses of humidified zero air prior to sample analyses should be performed to determine the water envelope and the proper blank value for correcting the ambient air concentration measurements accordingly. Heating and flushing of the trap should continue after the integration period has ended to insure all water has been removed to prevent buildup of water in the trap. Therefore, be sure that the 6-port valve remains in the inject position until all moisture has purged from the trap (3 minutes or longer).

11.4.18 Use the dynamic calibration curve (see Section 11.3) to convert the integrated peak area reading into concentration units (ppmC). Note that the NMOC peak shape may not be precisely reproducible due to variations in heating the trap, but the total NMOC peak area should be reproducible.

11.4.19 Analyze each canister sample at least twice and report the average NMOC concentration. Problems during an analysis occasionally will cause erratic or inconsistent results. If the first two analyses do not agree within ± 5% relative standard deviation (RSD), additional analyses should be made to identify inaccurate measurements and produce a more accurate average (see also Section 12.2.).

12. Performance Criteria and Quality Assurance

This section summarizes required quality assurance measures and provides guidance concerning performance criteria that should be achieved within each laboratory.

12.1 Standard Operating Procedures (SOPs)

12.1.1 Users should generate SOPs describing and documenting the following activities in their laboratory: (1) assembly, calibration, leak check, and operation of the specific sampling system and equipment used; (2) preparation, storage, shipment, and handling of samples; (3) assembly, leak-check, calibration, and operation of the analytical system, addressing the specific equipment used; (4) canister storage and cleaning; and (5) all aspects of of data recording and processing, including lists of computer hardware and software used.

12.1.2 SOPs should provide specific stepwise instructions and should be readily available to, and understood by, the laboratory personnel conducting the work.

12.2 Method Sensitivity, Accuracy, Precision and Linearity

12.2.1 The sensitivity and precision of the method is proportional to the sample volume. However, ice formation in the trap may reduce or stop the sample flow during trapping if the sample volume exceeds 1.0 cm³. Sample volumes below about 100-150 cm³ may cause increased measurement variability due to dead volume in lines and valves. For most typical ambient NMOC concentrations, sample volumes in the range of 200-400 cm³ appear to be appropriate. If a response peak obtained with a 400 cm³ sample is off scale or exceeds the calibration range, a second analysis can be carried out with a smaller volume. The actual sample volume used need not be accurately known if it is precisely repeatable during both calibration and analysis. Similarly, the actual volume of the vacuum reservoir need not be accurately known. But the reservoir volume should be matched to the pressure range and resolution of the absolute pressure gauge so that the measurement of the pressure change in the reservoir, hence the sample volume, is repeatable within 1%. A 1000 cm³ vacuum reservoir and a pressure change of 200 mm Hg, measured with the specified pressure gauge, have provided a sampling precision of $\pm$ 1.31 cm³. A smaller volume reservoir may be used with a greater pressure change to accommodate absolute pressure gauges with lower resolution, and vice versa.

12.2.2 Some FID detector systems associated with laboratory chromatographs may have autoranging. Others may provide attenuator control and internal full-scale output voltage selectors. An appropriate combination should be chosen so that an adequate output level for accurate integration is obtained down to the detection limit; however, the electrometer or integrator must not be driven into saturation at the upper end of the calibration. Saturation of the electrometer may be indicated by flattening of the calibration curve at

high concentrations. Additional adjustments of range and sensitivity can be provided by adjusting the sample volume used, as discussed in Section 12.2.1.

12.2.3 System linearity has been documented (6) from 0 to 10,000 ppbC.

12.2.4 Some organic compounds contained in ambient air are "sticky" and may require repeated analyses before they fully appear in the FID output. Also, some adjustment may have to be made in the integrator off time setting to accommodate compounds that reach the FID late in the analysis cycle. Similarly, "sticky" compounds from ambient samples or from contaminated propane standards may temporarily contaminate the analytical system and can affect subsequent analyses. Such temporary contamination can usually be removed by repeated analyses of humidified zero air.

12.2.5 Simultaneous collection of duplicate samples decreases the possibility of lost measurement data from samples lost due to leakage or contamination in either of the canisters. Two (or more) canisters can be filled simultaneously by connecting them in parallel (see Figure 2(a)) and selecting an appropriate flow rate to accommodate the number of canisters (Section 10.2.2). Duplicate (or replicate) samples also allow assessment of measurement precision based on the differences between duplicate samples (or the standard deviations among replicate samples).

13. Method Modification

13.1 Sample Metering System

13.1.1 Although the vacuum reservoir and absolute pressure gauge technique for metering the sample volume during analysis is efficient and convenient, other techniques should work also.

13.1.2 A constant sample flow could be established with a vacuum pump and a critical orifice, with the six-port valve being switched to the sample position for a measured time period.

A gas volume meter, such as a wet test meter, could also be used to measure the total volume of sample air drawn through the trap. These alternative techniques should be tested and evaluated as part of a user-prepared SOP manual.

13.2 FID Detector System

13.2.1 A variety of FID detector systems should be adaptable to the method.

13.2.2 The specific flow rates and necessary modifications for the helium carrier for any alternative FID instrument should be evaluated prior to use as part of the user-prepared SOP manual.

13.3 Range

13.3.1 It may be possible to increase the sensitivity of the method by increasing the sample volume. However, limitations may arise such as plugging of the trap by ice.

13.3.2 Any attempt to increase sensitivity should be evaluated as part of the user-prepared SOP manual.

13.4 Sub-Atmospheric Pressure Canister Sampling

13.4.1 Collection and analysis of canister air samples at sub-atmospheric pressure is also possible with minor modifications to the sampling and analytical procedures.

13.4.2 Method TO-14, "Integrated Canister Sampling for Selective Organics: Pressurized and Sub-atmospheric Collection Mechanism," addresses sub-atmospheric pressure canister sampling. Additional information can be found in the literature (11-17).

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17. Oliver, K. D. Pleil, J. D., 1985, "Automated Cryogenic Sampling and Gas Chromatographic Analysis of Ambient Vapor-Phase Organic Compounds: Procedures and Comparison Tests," EPA Contract No. 68-02-4035, Research Triangle Park, NC, Northrop Services, Inc. - Environmental Sciences.

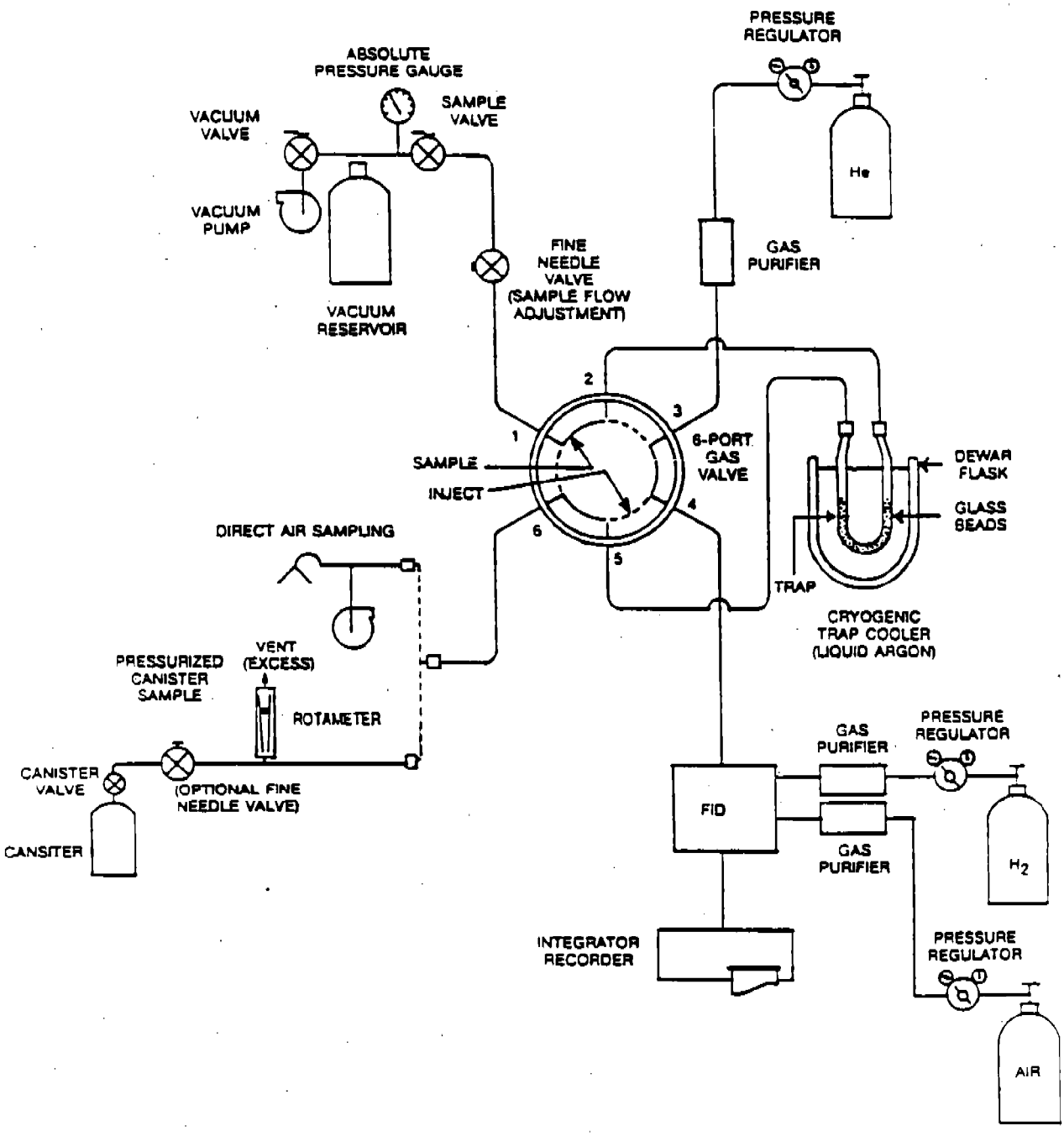


FIGURE 1. SCHEMATIC OF ANALYTICAL SYSTEM FOR NMOC—TWO SAMPLING MODES

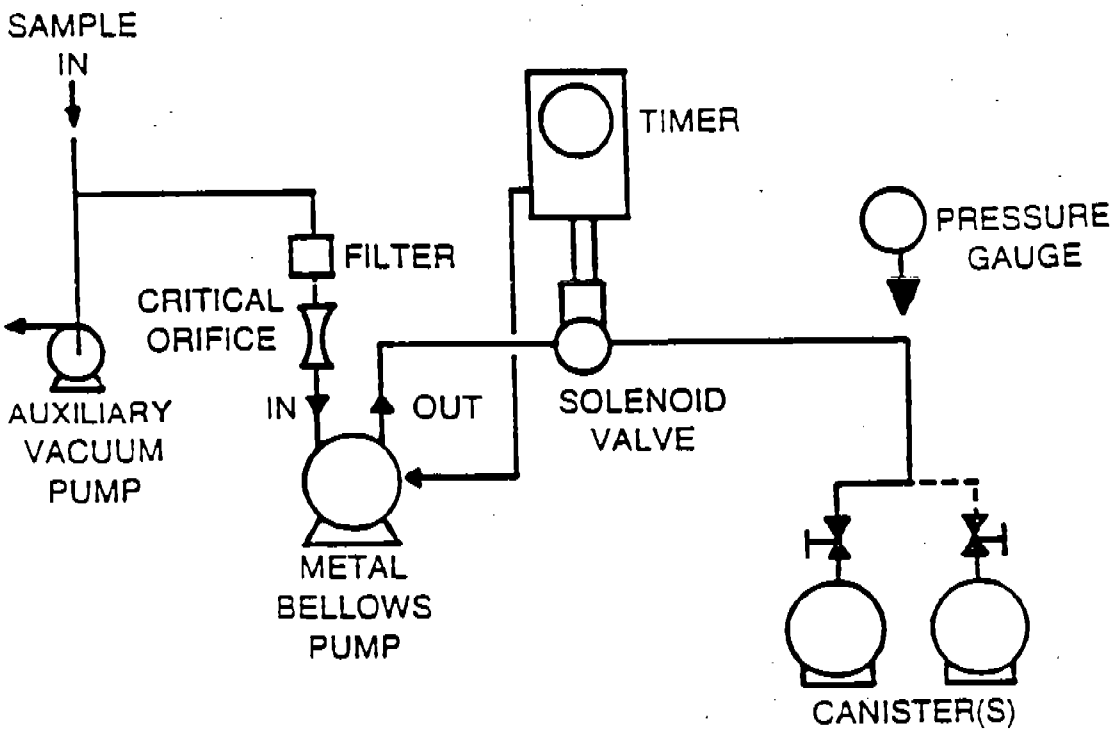
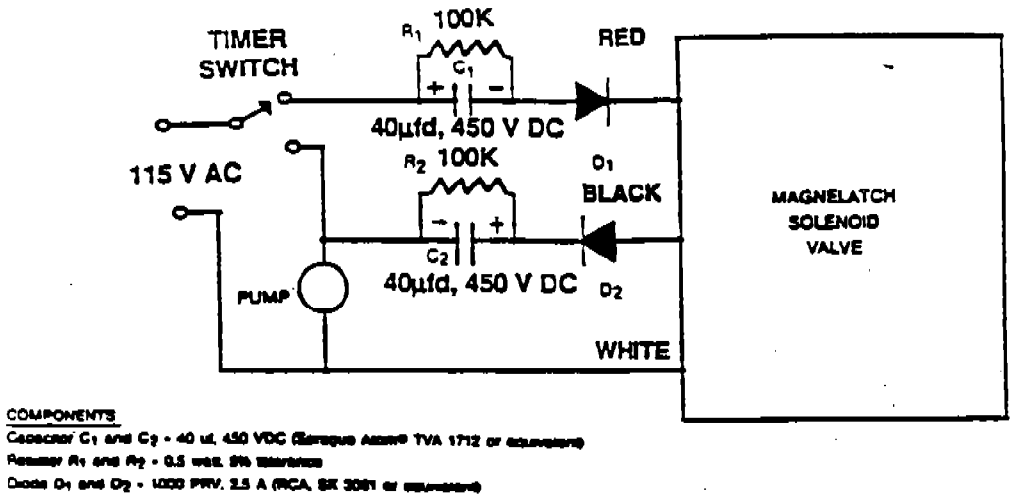


FIGURE 2. SAMPLE SYSTEM FOR AUTOMATIC COLLECTION OF 3-HOUR INTEGRATED AIR SAMPLES



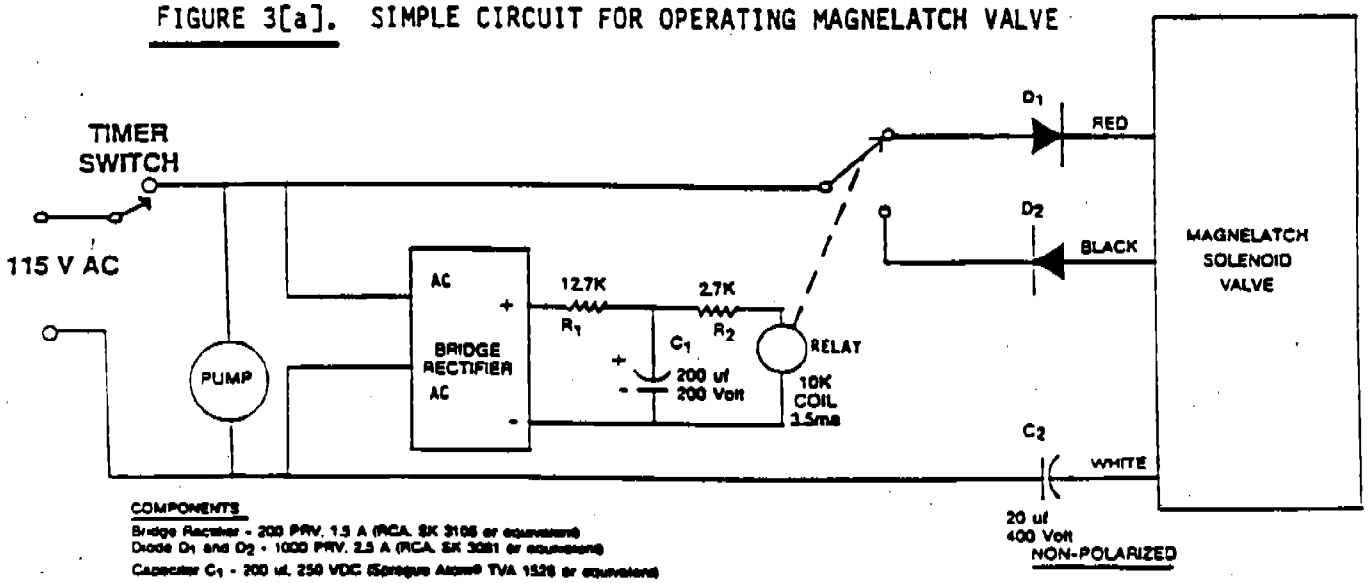
COMPONENTS

Capacitor C_1 and C_2 - 40 ul, 450 VDC (Sprague Atom® TVA 1712 or equivalent)

Resistor R_1 and R_2 - 0.5 watt, 5% tolerance

Diode D_1 and D_2 - 1000 PRV, 2.5 A (RCA, SK 3081 or equivalent)

FIGURE 3[a]. SIMPLE CIRCUIT FOR OPERATING MAGNELATCH VALVE



COMPONENTS

Bridge Rectifier - 200 PRV, 1.5 A (RCA, SK 3106 or equivalent)

Diode D_1 and D_2 - 1000 PRV, 2.5 A (RCA, SK 3081 or equivalent)

Capacitor C_1 - 200 ul, 250 VDC (Sprague Atom® TVA 1526 or equivalent)

Capacitor C_2 - 20 ul, 400 VDC Non-Polarized (Sprague Atom® TVAN 1652 or equivalent)

Relay - 10,000 ohm coil, 3.5 ma (AMF Potter and Brumfield, KCP 5, or equivalent)

Resistor R_1 and R_2 - 0.5 watt, 5% tolerance

FIGURE 3[b]. IMPROVED CIRCUIT DESIGNED TO HANDLE POWER INTERRUPTIONS

FIGURE 3. ELECTRICAL PULSE CIRCUITS FOR DRIVING SKINNER MAGNELATCH SOLENOID VALVE WITH A MECHANICAL TIMER

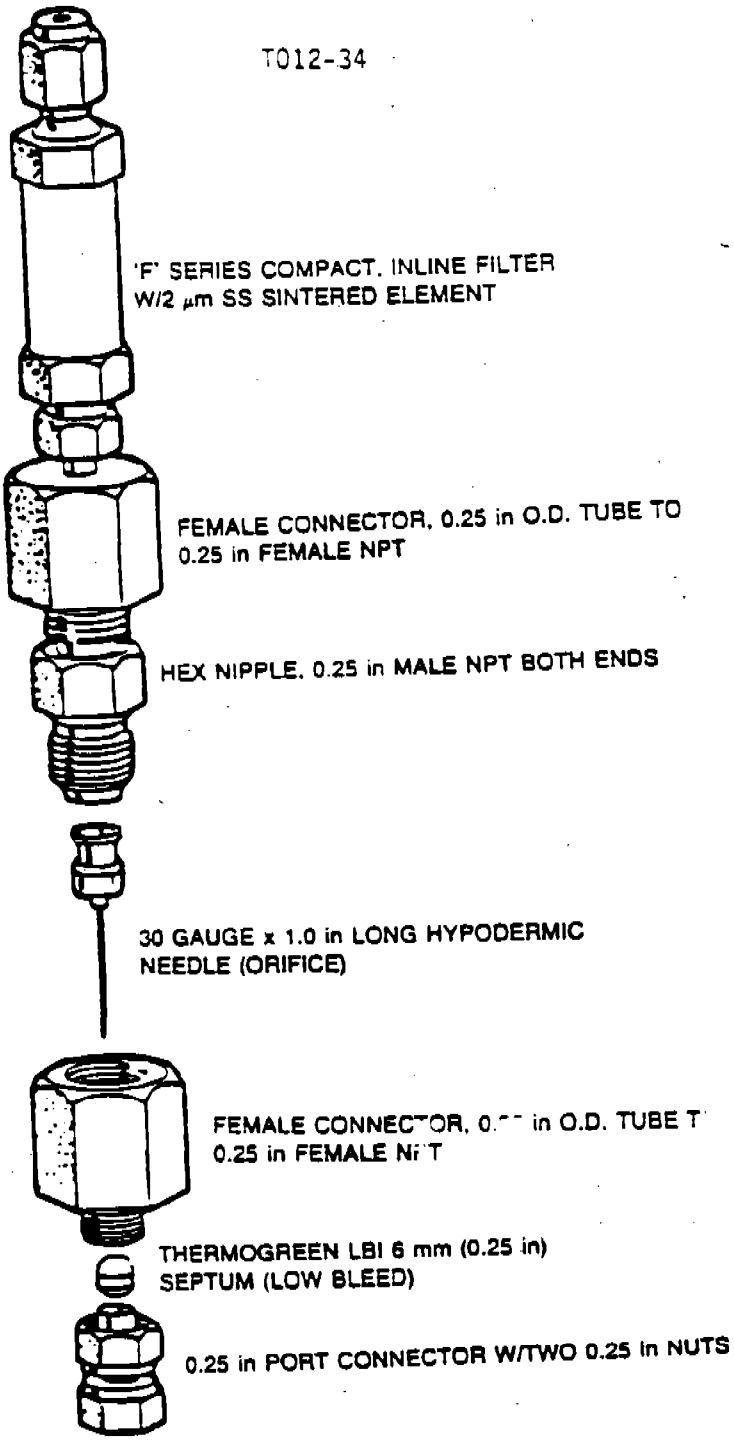


FIGURE 4. FILTER AND HYPODERMIC NEEDLE ASSEMBLY FOR SAMPLE INLET FLOW CONTROL

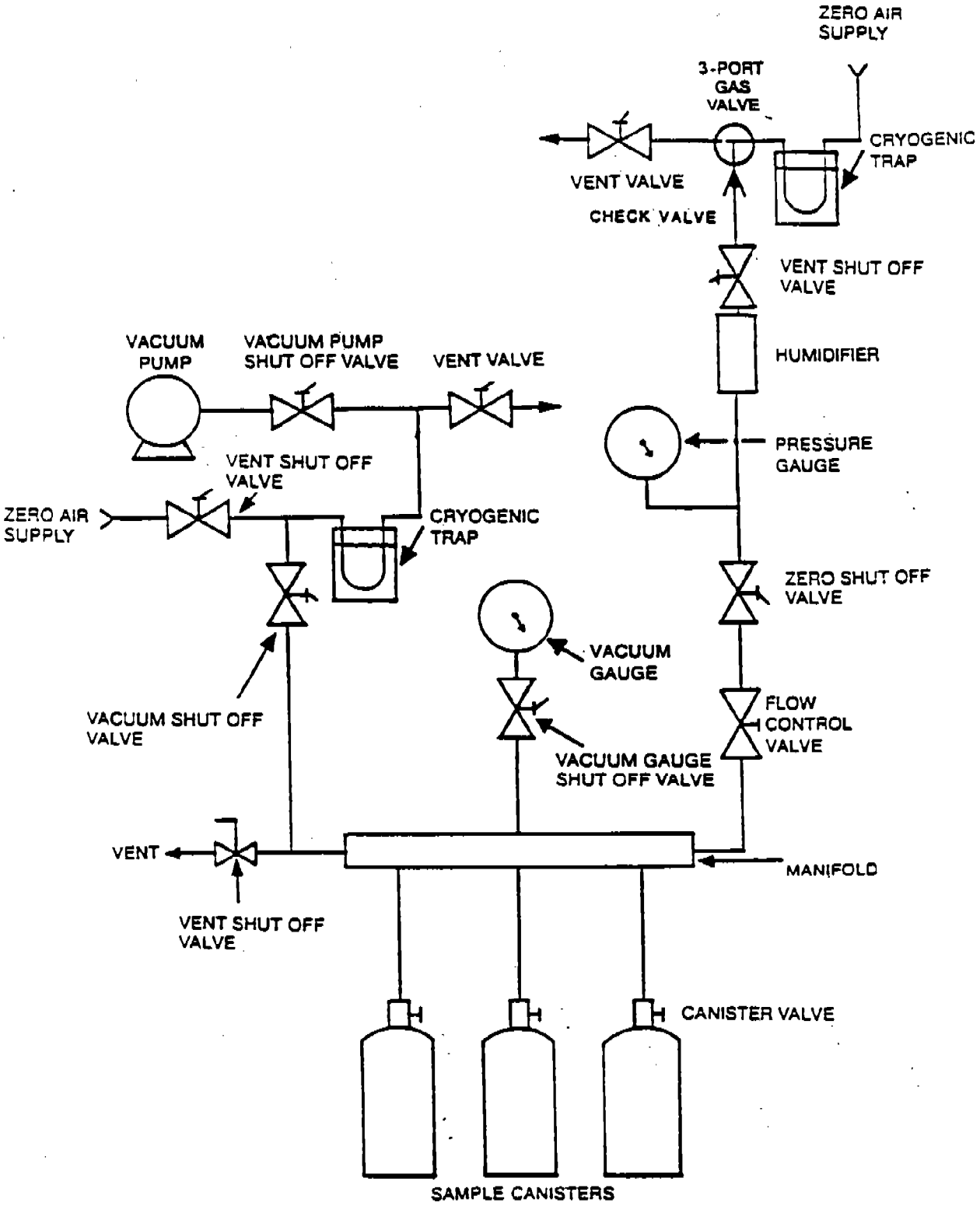


FIGURE 5. CANISTER CLEANING SYSTEM

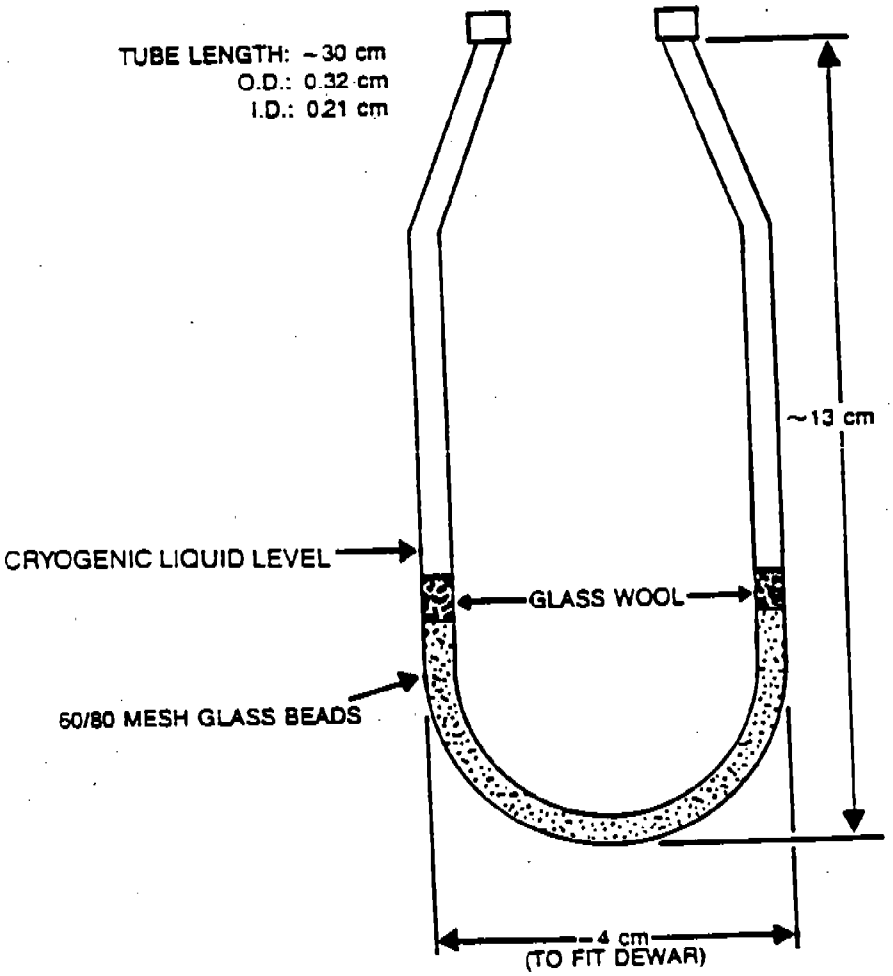


FIGURE 6. CRYOGENIC SAMPLE TRAP DIMENSIONS

PRESSURIZED CANISTER SAMPLING DATA SHEET

GENERAL INFORMATION:

PROJECT: _____
SITE: _____
LOCATION: _____
MONITOR STATION NUMBER: _____
PUMP SERIAL NUMBER: _____

OPERATOR: _____
ORIFICE IDENTIFICATION: _____
FLOW RATE: _____
CALIBRATED BY: _____
LEAK CHECK _____ Pass _____ Fail

FIELD DATA:

Date	Canister Serial Number	Sample Number	Sample Time		Average Atmospheric Conditions			Canister pressure Final, Laboratory		Comments
			Start	Stop	Temperature	Pressure	Relative Humidity			

Date _____ Title _____ Signature _____

TO12-37

FIGURE 7. EXAMPLE SAMPLING DATA SHEET

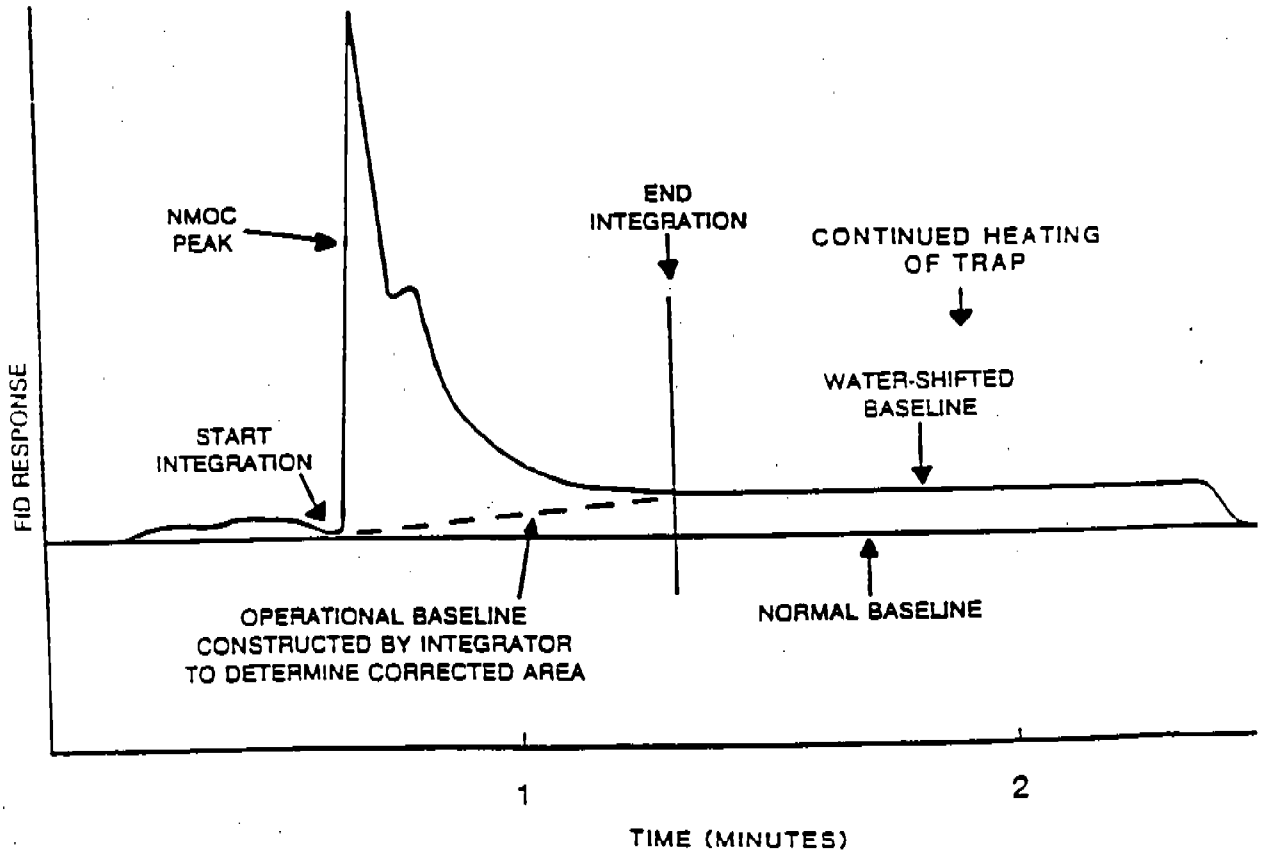


FIGURE 8. CONSTRUCTION OF OPERATIONAL BASELINE AND CORRESPONDING CORRECTION OF PEAK AREA

APPENDIX C

1992 NMOC MONITORING PROGRAM SITE DATA

APPENDIX C

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Summary Results for Winston Salem, NC (WSNC) C-30

Long Island, NY (LINY)

1992 NMOC Program (AIRS# 36-059-0005)

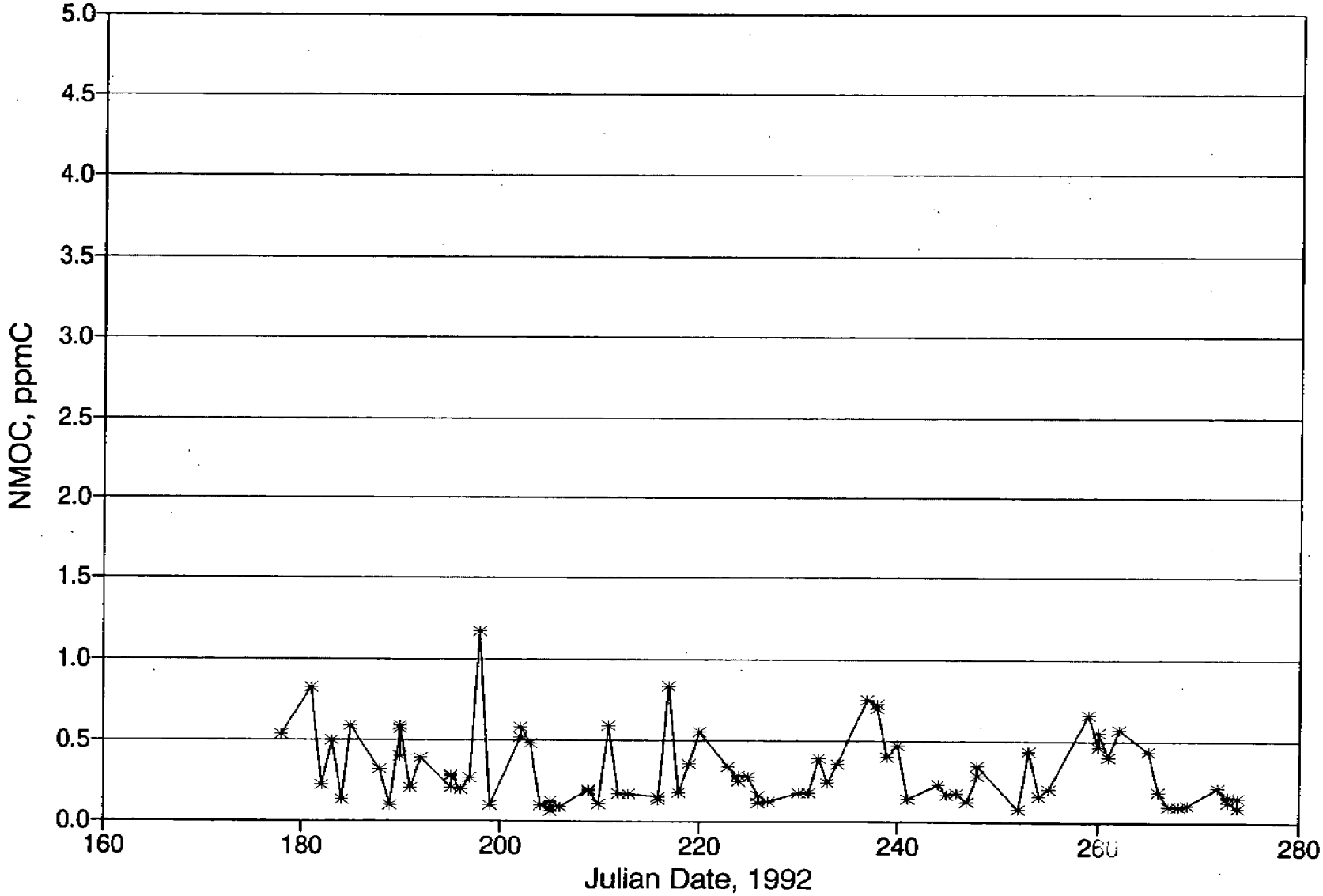

TABLE C-1. SUMMARY OF THE 1992 NMOC DATA FOR LONG ISLAND, NY (LINY)

Sample Period: 6:00 a.m. to 9:00 a.m.

Date Sampled	Julian Date Sampled	Sample ID Number	Sample Canister Number	Sample Pressure (psig)	Analysis Pressure (psig)	Radian Channel	Mean NMOC ppmC
26-Jun-92	178	1119	48	12.0	14.0	A	0.536
29-Jun-92	181	1114	188	11.5	13.0	D	0.829
30-Jun-92	182	1098	140	12.0	14.0	A	0.223
01-Jul-92	183	1096	711	12.0	14.0	C	0.502
02-Jul-92	184	1099	789	12.0	14.0	B	0.129
03-Jul-92	185	1163	401	12.0	12.0	C	0.590
06-Jul-92	188	1169	153	12.0	10.0	C	0.318
07-Jul-92	189	1153	788	12.5	13.0	D	0.092
08-Jul-92	190	1165	193	14.0	14.0	C	0.573
08-Jul-92	190	1166	680	14.0	14.0	C	0.403
08-Jul-92	190	1166	680	14.0	14.0	C	0.589
09-Jul-92	191	1218	929	12.0	12.0	B	0.204
10-Jul-92	192	1216	914	12.0	13.0	A	0.395
13-Jul-92	195	1207	717	13.5	14.0	D	0.205
13-Jul-92	195	1207	717	13.5	14.0	D	0.284
13-Jul-92	195	1208	927	13.5	14.0	D	0.276
14-Jul-92	196	1284	638	12.5	13.0	C	0.193
15-Jul-92	197	1285	166	12.0	13.0	D	0.264
16-Jul-92	198	1286	109	15.0	12.0	D	1.168
17-Jul-92	199	1355	143	13.0	12.0	C	0.098
20-Jul-92	202	1341	153	14.0	14.0	C	0.518
20-Jul-92	202	1341	153	14.0	14.0	C	0.584
21-Jul-92	203	1356	172	12.0	12.0	D	0.487
22-Jul-92	204	1389	186	12.5	13.0	D	0.098
23-Jul-92	205	1400	178	13.5	14.0	C	0.122
23-Jul-92	205	1401	105	13.5	14.0	C	0.059
23-Jul-92	205	1401	105	13.5	14.0	C	0.083
24-Jul-92	206	1469	770	13.0	14.0	D	0.088
27-Jul-92	209	1483	823	12.0	12.0	D	0.192
27-Jul-92	209	1483	823	12.0	12.0	D	0.183
28-Jul-92	210	1468	789	13.0	14.0	C	0.102
29-Jul-92	211	1548	674	13.0	14.0	A	0.592

TABLE C-1. SUMMARY OF THE 1992 NMOC DATA FOR LONG ISLAND, NY (LINY)

Sample Period: 6:00 a.m. to 9:00 a.m.

Date Sampled	Julian Date Sampled	Sample ID Number	Sample Canister Number	Sample Pressure (psig)	Analysis Pressure (psig)	Radian Channel	Mean NMOC ppmC
30-Jul-92	212	1550	840	12.0	13.0	D	0.164
31-Jul-92	213	1549	178	12.0	13.0	C	0.168
03-Aug-92	216	1605	705	13.5	14.0	D	0.146
03-Aug-92	216	1607	36	13.5	14.0	D	0.129
04-Aug-92	217	1629	164	5.0	5.0	B	0.837
05-Aug-92	218	1665	49	12.0	14.0	B	0.178
06-Aug-92	219	1675	910	12.0	14.0	C	0.356
07-Aug-92	220	1734	837	12.0	14.0	B	0.556
10-Aug-92	223	1737	48	14.0	14.0	A	0.340
11-Aug-92	224	1760	113	12.0	14.0	C	0.250
11-Aug-92	224	1760	113	12.0	14.0	C	0.284
12-Aug-92	225	1807	799	12.5	14.0	A	0.273
13-Aug-92	226	1801	104	13.0	14.0	D	0.155
13-Aug-92	226	1801	104	13.0	14.0	D	0.161
13-Aug-92	226	1802	146	13.0	14.0	C	0.110
14-Aug-92	227	1865	783	13.0	14.0	D	0.119
17-Aug-92	230	1856	179	12.0	14.0	D	0.172
18-Aug-92	231	1911	130	12.0	14.0	B	0.174
19-Aug-92	232	1929	137	12.0	13.0	A	0.396
20-Aug-92	233	1998	113	12.0	14.0	C	0.240
21-Aug-92	234	2004	883	13.0	14.0	D	0.359
24-Aug-92	237	2008	151	12.0	13.0	D	0.752
25-Aug-92	238	2106	662	14.0	15.0	D	0.727
25-Aug-92	238	2107	707	14.0	15.0	B	0.699
26-Aug-92	239	2116	885	12.0	13.0	D	0.399
27-Aug-92	240	2114	842	12.0	13.0	C	0.471
28-Aug-92	241	2104	685	13.0	14.0	C	0.138
31-Aug-92	244	2197	175	12.0	14.0	C	0.227
01-Sep-92	245	2198	8	12.0	14.0	D	0.167
02-Sep-92	246	2199	304	12.5	15.0	D	0.176
03-Sep-92	247	2232	583	12.0	15.0	D	0.119
04-Sep-92	248	2237	51	13.5	16.0	C	0.285

TABLE C-1. SUMMARY OF THE 1992 NMOC DATA FOR LONG ISLAND, NY (LINY)

Sample Period: 6:00 a.m. to 9:00 a.m.

Date Sampled	Julian Date Sampled	Sample ID Number	Sample Canister Number	Sample Pressure (psig)	Analysis Pressure (psig)	Radian Channel	Mean NMOC ppmC
04-Sep-92	248	2237	51	13.5	16.0	C	0.351
04-Sep-92	248	2238	707	13.5	16.0	B	0.344
08-Sep-92	252	2297	872	12.0	14.0	C	0.081
09-Sep-92	253	2300	627	13.0	15.0	B	0.435
10-Sep-92	254	2299	788	13.0	15.0	D	0.158
11-Sep-92	255	2325	762	13.0	15.0	D	0.199
15-Sep-92	259	2356	680	13.0	15.0	A	0.665
16-Sep-92	260	2392	706	14.0	16.0	D	0.468
16-Sep-92	260	2396	853	14.0	16.0	C	0.557
17-Sep-92	261	2405	11	12.0	14.0	D	0.405
18-Sep-92	262	2437	983	13.0	14.0	B	0.569
21-Sep-92	265	2439	100	12.0	15.0	B	0.441
22-Sep-92	266	2456	807	12.0	15.0	A	0.181
23-Sep-92	267	2498	815	12.0	12.0	A	0.094
24-Sep-92	268	2503	84	12.0	12.0	A	0.092
25-Sep-92	269	2570	889	13.0	12.0	A	0.100
28-Sep-92	272	2578	569	12.0	13.0	B	0.209
29-Sep-92	273	2567	822	13.0	15.0	C	0.118
29-Sep-92	273	2567	822	13.0	15.0	C	0.158
29-Sep-92	273	2575	137	13.0	14.0	D	0.122
30-Sep-92	274	2613	102	13.5	14.0	B	0.090
30-Sep-92	274	2614	761	13.5	14.0	C	0.148

New York, NY (MNY)

1992 NMOC Program (AIRS # 36-061-0010)

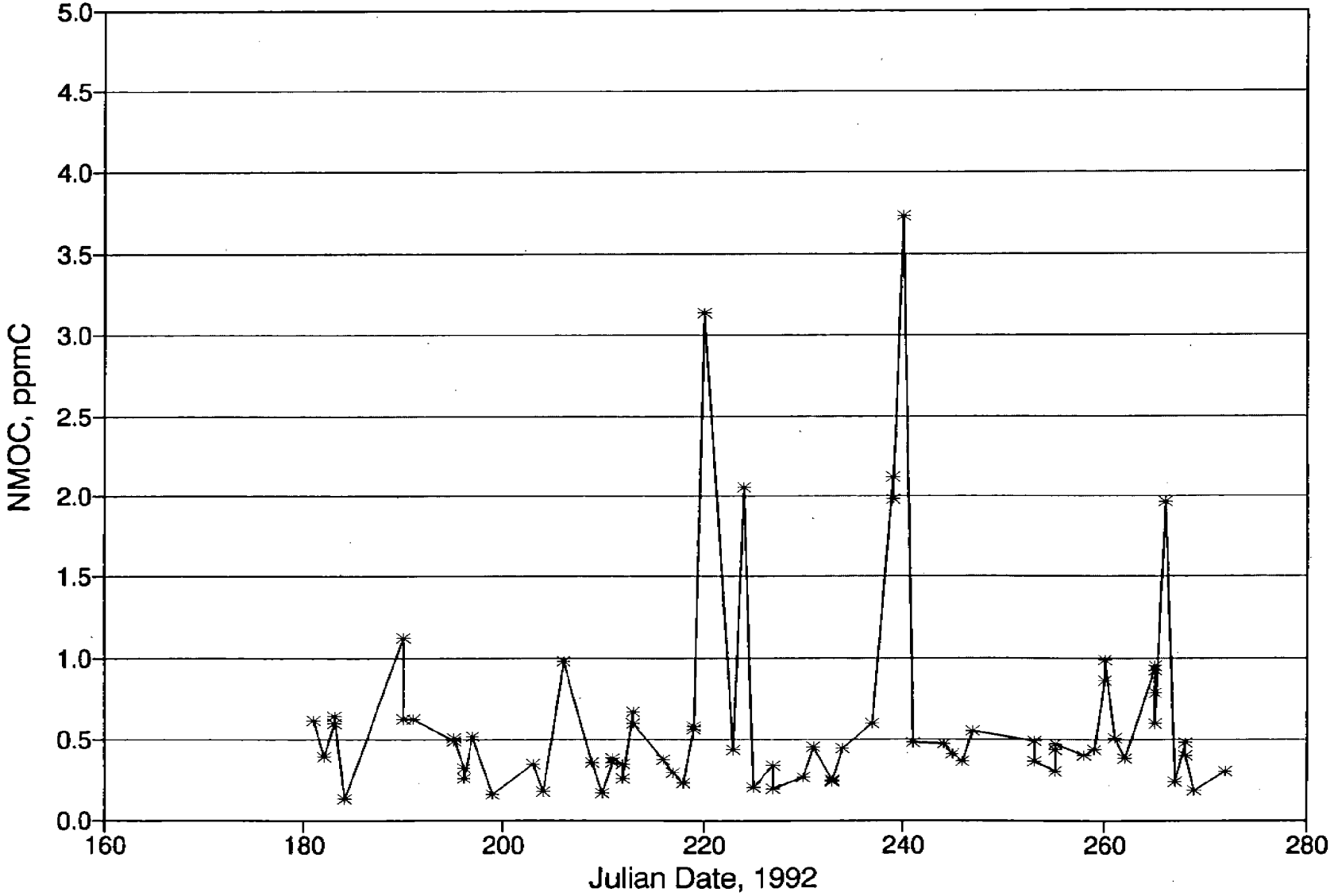

TABLE C-2. SUMMARY OF THE 1992 NMOC DATA FOR MANHATTEN, NY (MNY)

Sample Period: 6:00 a.m. to 9:00 a.m.

Date Sampled	Julian Date Sampled	Sample ID Number	Sample Canister Number	Sample Pressure (psig)	Analysis Pressure (psig)	Radian Channel	Mean NMOC ppmC
29-Jun-92	181	1122	704	16.0	14.0	D	0.619
30-Jun-92	182	1101	921	15.0	15.0	A	0.396
01-Jul-92	183	1110	107	15.0	16.0	D	0.602
01-Jul-92	183	1110	107	15.0	16.0	D	0.647
02-Jul-92	184	1109	649	15.0	16.0	C	0.128
08-Jul-92	190	1178	772	12.0	12.0	A	1.120
08-Jul-92	190	1182	165	17.5	17.0	B	0.628
09-Jul-92	191	1203	656	15.0	16.0	D	0.626
13-Jul-92	195	1226	188	19.0	19.0	B	0.495
13-Jul-92	195	1227	140	19.0	19.0	B	0.509
14-Jul-92	196	1304	197	22.0	22.0	D	0.316
14-Jul-92	196	1304	197	22.0	22.0	D	0.257
15-Jul-92	197	1303	764	15.0	15.0	A	0.517
17-Jul-92	199	1322	407	15.0	15.0	C	0.162
17-Jul-92	199	1322	407	15.0	15.0	C	0.154
21-Jul-92	203	1372	821	14.5	15.0	D	0.346
22-Jul-92	204	1408	766	15.0	15.0	C	0.175
24-Jul-92	206	1434	82	15.0	15.0	B	0.983
27-Jul-92	209	1459	855	14.5	14.0	D	0.359
28-Jul-92	210	1470	771	15.5	16.0	C	0.167
29-Jul-92	211	1502	679	15.0	16.0	D	0.358
29-Jul-92	211	1502	679	15.0	16.0	D	0.382
30-Jul-92	212	1522	875	14.0	15.0	C	0.349
30-Jul-92	212	1522	875	14.0	15.0	C	0.255
31-Jul-92	213	1557	624	17.0	17.0	B	0.676
31-Jul-92	213	1558	711	17.0	17.0	A	0.596
03-Aug-92	216	1595	50	14.0	15.0	C	0.376
04-Aug-92	217	1623	137	14.0	14.0	D	0.290
05-Aug-92	218	1631	15	14.5	16.0	D	0.227
06-Aug-92	219	1712	816	14.5	16.0	D	0.562
06-Aug-92	219	1712	816	14.5	16.0	D	0.581

TABLE C-2. SUMMARY OF THE 1992 NMOC DATA FOR MANHATTEN, NY (MNY)

Sample Period: 6:00 a.m. to 9:00 a.m.

Date Sampled	Julian Date Sampled	Sample ID Number	Sample Canister Number	Sample Pressure (psig)	Analysis Pressure (psig)	Radian Channel	Mean NMOC ppmC
07-Aug-92	220	1703	902	15.0	17.0	A	3.140
10-Aug-92	223	1736	889	14.0	16.0	B	0.437
11-Aug-92	224	1754	872	14.5	16.0	B	2.057
12-Aug-92	225	1779	50	14.5	16.0	D	0.205
14-Aug-92	227	1837	626	15.0	15.0	C	0.338
14-Aug-92	227	1837	626	15.0	15.0	C	0.198
17-Aug-92	230	1861	697	15.0	16.0	C	0.267
18-Aug-92	231	1879	50	14.5	16.0	B	0.452
20-Aug-92	233	1946	843	14.5	16.0	C	0.244
20-Aug-92	233	1946	843	14.5	16.0	C	0.235
21-Aug-92	234	1983	921	15.0	16.0	D	0.444
24-Aug-92	237	2001	121	15.0	15.0	C	0.602
26-Aug-92	239	2064	782	21.0	21.0	A	2.120
26-Aug-92	239	2064	782	21.0	21.0	A	1.980
27-Aug-92	240	2097	670	20.0	20.0	D	3.730
28-Aug-92	241	2121	4	11.0	11.0	D	0.480
31-Aug-92	244	2143	301	11.0	12.0	C	0.471
01-Sep-92	245	2161	154	12.0	13.0	A	0.407
02-Sep-92	246	2200	171	11.5	13.0	A	0.362
03-Sep-92	247	2257	974	11.0	14.0	A	0.552
09-Sep-92	253	2270	662	16.0	18.0	A	0.494
09-Sep-92	253	2271	853	16.0	18.0	D	0.369
11-Sep-92	255	2318	105	19.0	20.0	D	0.300
11-Sep-92	255	2318	105	19.0	19.0	D	0.440
11-Sep-92	255	2322	708	18.5	20.0	A	0.476
14-Sep-92	258	2334	815	12.0	13.0	A	0.399
15-Sep-92	259	2350	130	12.0	14.0	C	0.434
16-Sep-92	260	2373	183	17.0	20.0	B	0.864
16-Sep-92	260	2390	720	9.0	10.0	D	0.984
17-Sep-92	261	2416	623	12.0	14.0	C	0.509
18-Sep-92	262	2422	800	12.0	13.0	A	0.381

TABLE C-2. SUMMARY OF THE 1992 NMOC DATA FOR MANHATTEN, NY (MNY)

Sample Period: 6:00 a.m. to 9:00 a.m.

Date Sampled	Julian Date Sampled	Sample ID Number	Sample Canister Number	Sample Pressure (psig)	Analysis Pressure (psig)	Radian Channel	Mean NMOC ppmC
21-Sep-92	265	2440	2	16.0	18.0	C	0.955
21-Sep-92	265	2440	2	16.0	18.0	C	0.924
21-Sep-92	265	2441	79	16.0	18.0	C	0.788
21-Sep-92	265	2441	79	16.0	18.0	C	0.599
22-Sep-92	266	2454	723	12.0	12.0	A	1.964
23-Sep-92	267	2490	130	11.5	12.0	C	0.236
24-Sep-92	268	2506	36	16.5	15.0	C	0.484
24-Sep-92	268	2507	659	16.5	15.0	C	0.398
25-Sep-92	269	2524	51	11.0	11.0	C	0.189
28-Sep-92	272	2617	983	12.0	12.0	D	0.301

Newark, NJ (NWNJ)

1992 NMOC Program (AIRS #34-013-0011)

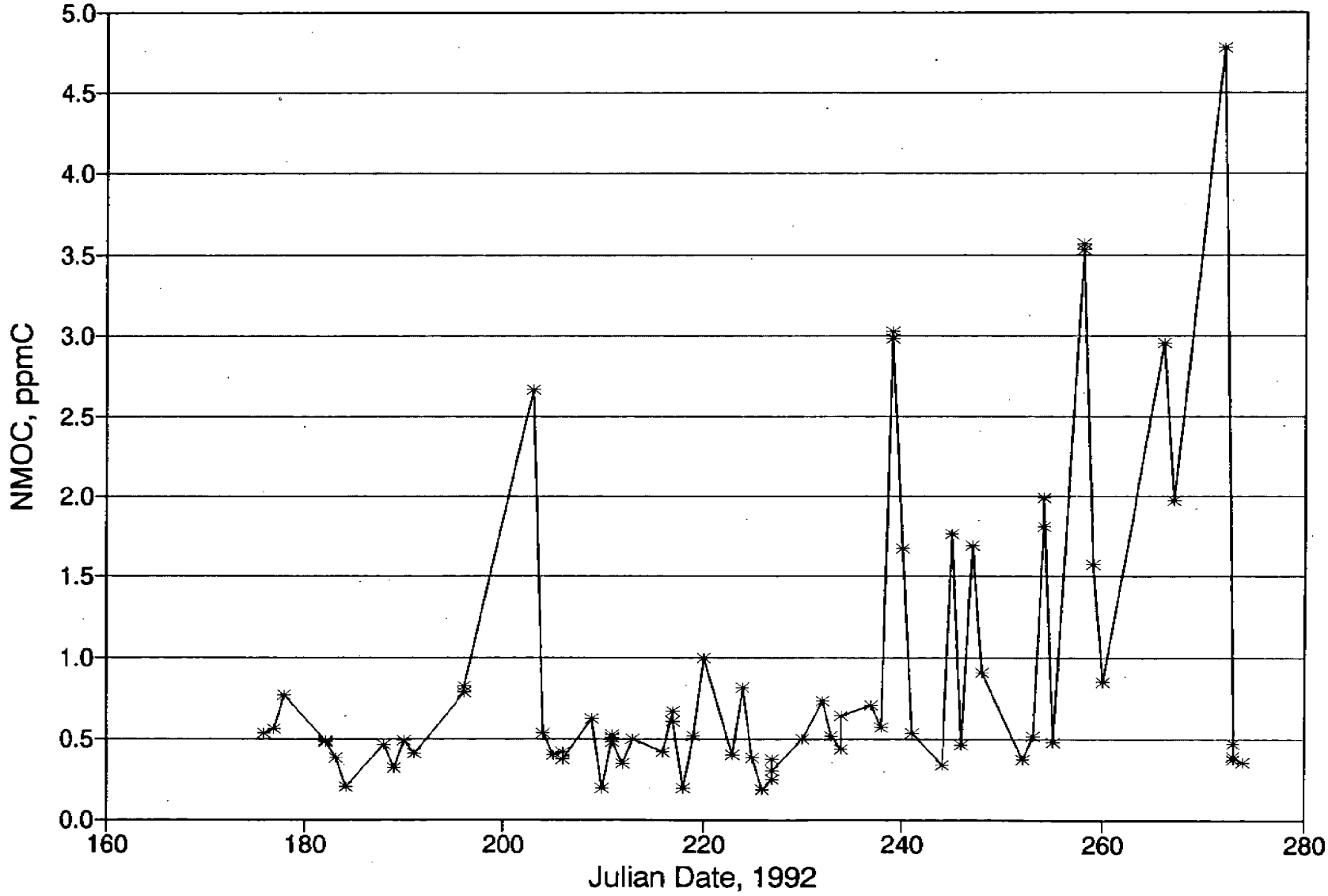

TABLE C-3. SUMMARY OF THE NMOC DATA FOR NEWARK, NJ (NWNJ)

Sample Period: 6:00 a.m. to 9:00 a.m.

Date Sampled	Julian Date Sampled	Sample ID Number	Sample Canister Number	Sample Pressure (psig)	Analysis Pressure (psig)	Radian Channel	Mean NMOC ppmC
24-Jun-92	176	1051	680	15.0	15.0	D	0.536
25-Jun-92	177	1053	815	14.0	14.0	C	0.563
26-Jun-92	178	1064	780	12.4	12.0	D	0.768
30-Jun-92	182	1121	764	12.0	13.0	B	0.492
30-Jun-92	182	1121	764	12.0	13.0	B	0.486
01-Jul-92	183	1117	607	14.1	13.0	B	0.388
02-Jul-92	184	1130	20	13.9	13.0	C	0.205
06-Jul-92	188	1139	84	11.2	12.0	D	0.465
07-Jul-92	189	1177	186	10.0	9.5	A	0.319
08-Jul-92	190	1181	663	10.1	10.0	A	0.493
09-Jul-92	191	1217	43	10.0	9.0	B	0.409
14-Jul-92	196	1255	878	15.5	15.5	C	0.787
14-Jul-92	196	1255	878	15.5	15.5	C	0.823
21-Jul-92	203	1404	157	18.5	18.0	D	2.670
22-Jul-92	204	1395	767	18.5	18.0	D	0.533
23-Jul-92	205	1444	52	14.0	14.0	A	0.406
24-Jul-92	206	1445	1	16.4	16.0	C	0.421
24-Jul-92	206	1446	35	16.4	16.0	C	0.374
27-Jul-92	209	1494	796	15.0	14.0	B	0.625
28-Jul-92	210	1495	308	14.1	14.0	C	0.197
29-Jul-92	211	1553	14	15.4	1.0	D	0.506
29-Jul-92	211	1553	14	15.4	14.0	D	0.528
29-Jul-92	211	1554	631	15.4	14.0	A	0.481
30-Jul-92	212	1564	849	14.4	14.0	D	0.347
31-Jul-92	213	1569	914	14.5	14.0	B	0.498
03-Aug-92	216	1609	406	16.3	16.0	A	0.422
04-Aug-92	217	1637	632	15.1	11.0	D	0.668
04-Aug-92	217	1642	794	15.1	16.0	C	0.609
05-Aug-92	218	1647	852	16.0	16.0	D	0.194
06-Aug-92	219	1711	74	14.3	16.0	A	0.515
07-Aug-92	220	1709	713	16.2	17.0	C	0.998