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1995 Nonmethane Organic Compounds And Speciated Nonmethane Organic Compounds Monitoring Program

1995 Non-Methane Organic Compounds and Speciated Non-Methane Organic Compounds Monitoring Programs

Final Report

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Abstract

From the Speciated NMOC analysis, the paraffins and aromatic compounds occurred more frequently than the olefins. Toluene, 1,2,3-trimethylbenzene, and isopentane were detected in all 254 Speciated NMOC samples. For the UATMP VOC analysis, the nonhalogenated compounds occurred more frequently than the halogenated compounds. 1,1,1-Trichloroethane and carbon tetrachloride were the only halogenated compounds detected in all 43 samples. For the carbonyl analysis, formaldehyde, acetaldehyde, acetone, and hexaldehyde were detected in all 41 analyzed samples.

Of the total NMOC measured by the Speciated NMOC method, an average of 78% is speciated by the GC/FID method. Of the Speciated NMOC, on average, 58% are paraffins, 23% are aromatic compounds, and 19% are olefins. Isopentane, propane, and ethane make up, on average, 30% of the paraffins. Toluene accounted for 30%, on average, of the aromatic fraction. Almost 30% of the olefin fraction is made up of ethylene and acetylene.

Temporal variations of the central tendencies of the data at a given site and between sites were examined. Based on visual inspection of the plotted data, no apparent upward or downward trends in the NMOC concentration was observed from 1988 through 1995. Downward trends were observed for 1,1,1-trichloroethane. Upward trends were observed for acetaldehyde.

Distributional analysis of the data confirmed that the data was lognormally distributed as is typical for environmental data. Completeness results for the 1995 program on a per site basis ranged from 94 to 100% with an overall completeness of 96 percent. Equipment malfunction was identified as the primary cause of missed samples.

Key Words

Non-Methane Organic Compound (NMOC)

Speciated Non-Methane Organic Compound (Speciated NMOC)

National Ambient Air Quality Standard (NAAQS)

Gas chromatography/multiple detector (GC/MD)

Urban Air Toxics Monitoring Program (UATMP)

Carbonyl

Gas chromatography with flame ionization detection (GC/FID)

Aerometric Information Retrieval System (AIRS)

Preconcentration direct flame ionization detection (PDFID)

Compendium Method TO-12

C_2 through C_{12} Hydrocarbons

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ABOUT THIS REPORT

This report documents the U. S. Environmental Protection Agency (EPA) 1995 Non-Methane Organic Compound (NMOC) and Speciated Non-Methane Organic Compound (Speciated NMOC) monitoring programs. Begun in 1984, the NMOC sampling program is designed to provide NMOC data for use in development of control strategies for ozone. The Speciated NMOC program was initiated in 1991 in response to requests by state agencies for more detailed speciated hydrocarbon data for use in their ozone control strategies.

Measurements of NMOC and Speciated NMOC are critical inputs to the development of ozone precursor emission control strategies. When started with 23 sites, the NMOC program was designed to provide NMOC data for use in photochemical modeling using the U.S. EPA Empirical Kinetic Modeling Approach (EKMA)/OZIPPM model.[1] As the need for more refined modeling tools developed, the Speciated NMOC sampling program was initiated to provide the speciated hydrocarbon data required for input to more advanced photochemical models such as the Urban Airshed Model (UAM).[2]

This report documents the 1995 NMOC and Speciated NMOC monitoring programs, including the base programs and optional monitoring performed for carbonyl and volatile organic compounds (VOCs). Details of the technical monitoring procedures used for the 1995 programs are identical to those used in the 1994 programs. The reader is directed to the 1994 final report for the technical details of the monitoring programs.[3]

This report is organized into six major sections. Background and introductory information are provided in Section 1.0 as well as a summary of the 10 sample site locations that participated in the 1995 programs. Section 2.0 contains the distribution analysis of the ambient air data. Program statistical results are summarized in Section 3.0. Geographical comparisons between the five participating metropolitan areas are given in Section 4.0. Section 5.0 examines trends of the data over time. Program completeness is covered in Section 6.0. References are provided in Section 7.0. Appendix A contains AIRS site descriptions. Appendices B through E contain

statistical summaries for the speciated NMOC base site data, speciated NMOC option site data, UATMP VOC option data, and carbonyl option data.

1.0 BACKGROUND, INTRODUCTION AND 1995 SITE INFORMATION

1.1 Background and Introduction

In areas of the country where the National Ambient Air Quality Standard (NAAQS) for ozone is exceeded, measurements of ambient total NMOCs and nitrogen oxides (NO_x) are used by the affected states in developing ozone precursor emission control strategies. To transfer hydrocarbon sampling and analysis technology to interested state and local agencies, EPA supports a centralized program that provides NMOC monitoring and analytical assistance to these state and local agencies. This program, consisting of the NMOC and Speciated NMOC sampling programs, was formerly operated through Radian Corporation but is now conducted through Eastern Research Group, Inc. (ERG).

The NMOC program yields a single total NMOC measurement for the 3-hour period 6 a.m. to 9 a.m., Monday through Friday, for each sampling location. Because of the importance of ambient VOC data for ozone control strategy development, some of the agencies participating in the NMOC program requested in 1991 that hydrocarbon speciation analysis be included as part of the NMOC program. Knowledge of the specific individual VOCs present in the ambient air is required for inputs for the UAM[2] and other photochemical models, such as Carbon Bond Four (CB4), necessary for forecasting the NMOC reductions needed to attain the NAAQS for ozone. Consequently, in response to the agency requests, analysis for 78 individual hydrocarbon compounds in the C_2 through C_{12} range was provided. This enhanced program was called the Speciated NMOC program. The 78 compounds were collected as 3-hour canister samples from 6:00 to 9:00 a.m., Monday through Friday and analyzed using gas chromatography with flame ionization detection (GC/FID). The list of hydrocarbon compounds that were speciated in 1995 is shown in Table 1-1.

Table 1-1

1995 Speciated NMOC Target Compounds

Ethylene	2,3-Dimethylpentane
Acetylene[1]	2-Methylhexane
Ethane	3-Methylhexane
Propyne	2,2,4-Trimethylpentane
Isobutane	*n*-Heptane
1-Butene	Methylcyclohexane
Isobutene	1-Heptene
Propylene[1]	2,2,3-Trimethylpentane
1,3-Butadiene[1]	2,3,4-Trimethylpentane
n-Butane	Toluene[1]
Propane	2-Methylheptane
trans-2-Butene	3-Methylheptane
cis-2-Butene	1-Octene
3-Methyl-1-butene	*n*-Octane[1]
Isopentane	Ethylbenzene[1]
1-Pentene	*m*- and *p*-Xylene[1]
2-Methyl-1-butene	Styrene[1]
n-Pentane	*o*-Xylene[1]
Isoprene	1-Nonene
trans-2-Pentene	*n*-Nonane
cis-2-Pentene	Isopropylbenzene
2-Methyl-2-butene	α-Pinene
2,2-Dimethylbutane	*n*-Propylbenzene
Cyclopentene	*m*-Ethyltoluene
4-Methyl-1-pentene	*p*-Ethyltoluene
Cyclopentane	1,3,5-Trimethylbenzene
2,3-Dimethylbutane	*o*-Ethyltoluene
2-Methylpentane	β-Pinene
3-Methylpentane	1-Decene
2-Methyl-1-pentene	1,2,4-Trimethylbenzene
1-Hexene	*n*-Decane
2-Ethyl-1-butene	1,2,3-Trimethylbenzene
n-Hexane	*p*-Diethylbenzene
trans-2-Hexene	1-Undecene
cis-2-Hexene	*n*-Undecane
Methylcyclopentane	1-Dodecene
2,4-Dimethylpentane	*n*-Dodecane
Benzene[1]	1-Tridecene
Cyclohexane	*n*-Tridecane

[1]Compounds included in the UATMP VOC sample analysis

In 1987, EPA , as part of the National Urban Air Toxics Monitoring Program (UATMP),[4] developed an analytical method to support the needs for information concerning the levels of specific chlorinated, brominated, aromatic, and olefinic VOC species in ambient air. The specific analytical method currently uses a gas chromatography/mass selective detector with a flame ionization detector (GC/MSD-FID) analysis to measure the concentration of the 38 selected VOC compounds listed in Table 1-2 . The compounds *m*- and *p*-xylene coelute. These compounds are referred to in this report as UATMP VOCs.

Table 1-2

Speciated UATMP VOCs Sampled in the 1995 UATMP VOC Option to the NMOC and Speciated NMOC Base Programs

Acetylene[1]	1,2-Dichloroethane	Tetrachloroethylene
Propylene[1]	1,1,1-Trichloroethane	Chlorobenzene
Chloromethane	Benzene[1]	Ethylbenzene[1]
Vinyl Chloride	Carbon Tetrachloride	*m*- and *p*-Xylene[1]
1,3-Butadiene[1]	1,2-Dichloropropane	Bromoform
Bromomethane	Bromodichloromethane	Styrene[1]
Chloroethane	Trichloroethylene	1,1,2,2-Tetrachloroethane
Methylene Chloride	*cis*-1,3-Dichloropropene	*o*-Xylene[1]
trans-1,2-Dichloroethylene	*trans*-1,3-Dichloropropene	*m*-Dichlorobenzene[1]
1,1-Dichloroethane	1,1,2-Trichloroethane	*p*-Dichlorobenzene[1]
Chloroprene	Toluene[1]	*o*-Dichlorobenzene[1]
Bromochloromethane	Dibromochloromethane	
Chloroform	*n*-Octane[1]	

[1]Compounds included in the Speciated NMOC sample analysis.

The UATMP was developed and implemented in 1987 following an EPA study entitled "The Air Toxic Problem in the United States: An Analysis of Cancer Risks for Selected

Pollutants,"[5] which was completed in May 1985. This study concluded that a high potential of elevated individual lifetime risks was associated with certain VOC frequently found in urban areas.

The UATMP sampling and analysis method was incorporated into the 1987 NMOC program as an option to the NMOC base sites. Additionally, monitoring for three carbonyl compounds (formaldehyde, acetaldehyde, and acetone) was added as an option to the NMOC base program in 1990. All carbonyl sampling was performed using 2,4-dinitrophenyl-hydrazine (DNPH) coated silica gel cartridges. In 1991, the carbonyl target analyte list was revised to encompass the 16 compounds shown in Table 1-3 (butyraldehyde coelutes with isobutyraldehyde, and the *m*-, *o*-, and *p*-tolualdehydes are reported together).

Table 1-3

Speciated Carbonyls Sampled in the 1995 Carbonyl Option to the NMOC and Speciated NMOC Base Programs

Formaldehyde	Propionaldehyde	Valeraldehyde
Acetaldehyde	Crotonaldehyde	Benzaldehyde
Acrolein	Butyraldehyde and Isobutyraldehyde	*m*-, *o*-, and *p*-Tolualdehydes
Acetone	Isovaleraldehyde	Hexaldehyde
		2,5-Dimethylbenzaldehyde

The NMOC and Speciated NMOC programs generally consist of several activities that include:

- Site coordination;
- Equipment certification, installation, and operator training;
- Sample analysis;
- Data reduction, validation, and reporting;

- Statistical analyses and data characterization;
- Formatting and submittal of the validated data to the AIRS-AQS; and
- Post-sample collection activities, such as equipment recovery and refurbishment, and canister cleanup and archive.

1.1.1 Summary of Technical Procedures and Methods

The NMOC and Speciated NMOC program sample collection systems and procedures are identical. Both UATMP VOC and Speciated NMOC option analyses are performed as subsequent analyses on a single sample canister. Carbonyl option samples are collected on the same schedule using a separate cartridge sample collection system.

Sample collection for the 1995 NMOC program occurred from 6 a.m. through 9 a.m. local time, Monday through Friday, from June 5 through September 29, 1995 for the NMOC and Speciated NMOC base sites. Samples were not collected on holidays or weekends. Historically, the NMOC and Speciated NMOC sampling season begins in June and ends in September, encompassing approximately 90 sampling days. In 1994, the previous program year, the sites started sampling in July and continued through October 31, for a total of about 81 sampling days.

Sample analyses for NMOC were performed in accordance with the cryogenic preconcentration direct flame ionization detection (PDFID) methodology described in Compendium Method TO-12.[6] This methodology incorporates PDFID gas chromatography and provides a total hydrocarbon measurement without speciation. In order to measure precision, approximately 10% of the samples were collected in duplicate. Duplicate sample canisters were analyzed in replicate, except where low pressure precluded a second analysis. Based on the 1984 through 1994 studies, the method was shown to be precise, accurate, and effective for indicating the concentration level of total hydrocarbons in ambient air.

Sample analyses for Speciated NMOC base and option programs were performed generally in accordance with the EPA's "Research Protocol Method for Analysis of C_2 through

C_{12} Hydrocarbons in Ambient Air by Gas Chromatography with Cryogenic Concentration."[7] This methodology incorporates the use of gas chromatography with dual capillary columns and FIDs. Seventy-eight hydrocarbons are quantified during this analysis. Chlorinated and oxygenated species are not identified using this procedure. Approximately 10% of the samples were collected in duplicate. One-half of all duplicate pairs were analyzed in replicate. The 1995 minimum detection limits are reported in Table 1-4.

The 3-hour UATMP VOC option program provides for subsequent UATMP VOC analysis on nine of the samples collected for each of the participating NMOC and Speciated NMOC base sites. Of the nine samples, one pair is a duplicate that is analyzed in replicate. Sample analyses for the UATMP VOC option were performed using the same procedures as used for the UATMP. The methodology employed is performed in accordance with Compendium Method TO-14.[8] The 1995 minimum detection limits are reported in Table 1-5.

Sample analyses for the 3-hour carbonyl option were performed using the methodology described in Compendium Method TO-11.[9] Approximately 10 carbonyl sample cartridges, including a duplicate pair, were sent to each site for sample collection and analysis. A trip blank was used to assess the potential for field contamination. The trip blank cartridge accompanied the sample cartridges, but at no time was exposed to ambient air. One set of field duplicates from each site was collected and analyzed in replicate to determine both the sampling and analytical precision. The 1995 minimum detection limits are reported in Table 1-6.

1.1.2 Report Objectives

The primary objective of this report is to summarize the data collected during the 1995 NMOC program. This objective is accomplished through a statistical and distributional description of the collected VOC samples. This information allows the ambient data collected during the NMOC and Speciated NMOC programs to be compared to and placed in context with monitoring data collected in prior years and in other sampling programs.

Table 1-4

1995 Method Detection Limits for the Speciated NMOC Target Compounds

Compound	Detection Limit (ppbC)	Compound	Detection Limit (ppbc)
Ethylene	0.330[2]	2,3-Dimethylpentane	0.078
Acetylene[1]	0.330	2-Methylhexane	0.078
Ethane	0.330	3-Methylhexane	0.078
Propyne	0.330	2,2,4-Trimethylpentane	0.078
Isobutane	0.078[3]	*n*-Heptane	0.078
1-Butene	0.078	Methylcyclohexane	0.078
Isobutene	0.078	1-Heptene	0.078
Propylene[1]	0.330	2,2,3-Trimethylpentane	0.078
1,3-Butadiene[1]	0.078	2,3,4-Trimethylpentane	0.078
n-Butane	0.078	Toluene[1]	0.078
Propane	0.330	2-Methylheptane	0.078
trans-2-Butene	0.078	3-Methylheptane	0.078
cis-2-Butene	0.078	1-Octene	0.078
3-Methyl-1-butene	0.078	*n*-Octane[1]	0.078
Isopentane	0.078	Ethylbenzene[1]	0.078
1-Pentene	0.078	*m*- and *p*-Xylene[1]	0.078
2-Methyl-1-butene	0.078	Styrene[1]	0.078
n-Pentane	0.078	*o*-Xylene[1]	0.078
Isoprene	0.078	1-Nonene	0.078
trans-2-Pentene	0.078	*n*-Nonane	0.078
cis-2-Pentene	0.078	Isopropylbenzene	0.078
2-Methyl-2-butene	0.078	α-Pinene	0.078
2,2-Dimethylbutane	0.078	*n*-Propylbenzene	0.078
Cyclopentene	0.078	*m*-Ethyltoluene	0.078
4-Methyl-1-pentene	0.078	*p*-Ethyltoluene	0.078
Cyclopentane	0.078	1,3,5-Trimethylbenzene	0.078
2,3-Dimethylbutane	0.078	*o*-Ethyltoluene	0.078
2-Methylpentane	0.078	β-Pinene	0.078
3-Methylpentane	0.078	1-Decene	0.078
2-Methyl-1-pentene	0.078	1,2,4-Trimethylbenzene	0.078
1-Hexene	0.078	*n*-Decane	0.078
2-Ethyl-1-butene	0.078	1,2,3-Trimethylbenzene	0.078
n-Hexane	0.078	*p*-Diethylbenzene	0.078
trans-2-Hexene	0.078	1-Undecene	0.078
cis-2-Hexene	0.078	*n*-Undecane	0.078
Methylcyclopentane	0.078	1-Dodecene	0.078
2,4-Dimethylpentane	0.078	*n*-Dodecane	0.078
Benzene[1]	0.078	1-Tridecene	0.078
Cyclohexane	0.078	*n*-Tridecane	0.078

[1]Compounds included in the UATMP VOC sample analysis.

[2]Detection limit calculated based on the area reject of the data system and the response factor for propane.

[3]Detection limit calculated based on the area reject of the data system and the response factor for benzene.

Table 1-5

1995 UATMP VOC Detection Limits

Compound	Detection Limit (ppbv)
Acetylene	0.12
Benzene	0.24
Bromochloromethane	0.07
Bromodichloromethane	0.09
Bromoform	0.08
Bromomethane	0.18
1,3-Butadiene	0.15
Carbon tetrachloride	0.07
Chlorobenzene	0.06
Chloroethane	0.18
Chloroform	0.06
Chloromethane	0.39
Chloroprene	0.05
Dibromochloromethane	0.05
m-Dichlorobenzene	0.07
o-Dichlorobenzene	0.08
p-Dichlorobenzene	0.06
1,1-Dichrloroethane	0.06
1,2-Dichloroethane	0.26
trans-1,2-Dichloroethylene	0.22
1,2-Dichlropropane	0.04
cis-1,3-Dichloropropylene	0.05
trans-1,3-Dichloropropylene	0.08
Ethylbenzene	0.08
Methylene chloride	0.16
n-Octane	0.05
Propylene	0.09
Styrene	0.08
1,1,2,2-Tetrachloroethane	0.16
Tetrachloroethylene	0.03
Toluene	0.04
1,1,1-Trichloroethane	0.33
1,1,2-Trichloroethane	0.05
Trichloroethylene	0.05
Vinyl chloride	0.11
m-, *p*-Xylene	0.11
o-Xylene	0.06

Table 1-6

Method Detection Limits, Underivatized
Detection Limit (ppbv)

	Sample Volume									
Compound	**100 L**	**200 L**	**300 L**	**400 L**	**500 L**	**600 L**	**700 L**	**800 L**	**900 L**	**1000 L**
Formaldehyde	0.06	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.005
Acetaldehyde	0.04	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.005	0.004
Acrolein	0.04	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.005	0.004
Acetone	0.04	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.005	0.004
Propionaldehyde	0.04	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.005	0.004
Crotonaldehyde	0.08	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
But/Isobutyraldehyde	0.04	0.02	0.01	0.01	0.01	0.01	0.01	0.005	0.004	0.004
Benzaldehyde	0.14	0.07	0.05	0.03	0.03	0.02	0.02	0.02	0.02	0.01
Isovaleraldehyde	0.07	0.04	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Valeraldehyde	0.07	0.04	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Tolualdehydes	0.49	0.24	0.16	0.12	0.10	0.08	0.07	0.06	0.05	0.05
Hexanaldehyde	0.03	0.02	0.01	0.01	0.01	0.01	0.005	0.004	0.004	0.003
2,6-Dimethylbenzaldehyde	0.12	0.06	0.04	0.03	0.02	0.02	0.02	0.02	0.01	0.01

Statistical parameters were calculated for all of the data. Skewness, kurtosis, and the Shapiro-Wilk statistic are all values that measure the normality of a data distribution. Most ambient air data are lognormally distributed.[10] Arithmetic and geometric means and medians provide information on the central tendency of the data. Standard deviations of the arithmetic and geometric means provide information on the variability of the data. The larger the standard deviation, the more variable the data; the smaller the standard deviation, the less variable the data. Temporal variations of the central tendencies of the data at a given site and between sites can indicate if the NMOC or speciated VOC concentrations are increasing or decreasing or if the average makeup of the VOC mix at a given site is changing with time.

A second objective of the monitoring program is to allow comparison of VOC concentrations in different air sheds or urban metropolitan areas. Comparisons include contrasting VOC data collected at urban versus suburban and urban versus rural sites within an air shed and between air sheds. Geographic comparisons of the data allow differences in air sheds to be identified and quantified.

A third objective is to compare the observed speciated compounds collected at each site with information on industrial chemical emissions reported in the EPA Toxics Release Inventory (TRI).[11] The relative concentrations and presence of each VOC and carbonyl species, typical wind flow patterns near each sampling site and within the air shed, and a comparison with reported emissions of the same compounds can indicate the potential types of sources that generated the measured compounds.

Finally, a fourth objective in the NMOC and Speciated NMOC programs is to determine the viability of conducting routine ambient sampling programs for VOCs. The completeness of the sampling record (i.e., percentage of planned samples actually collected) and the completeness of the analyses performed (i.e., ability of the analytical protocol to produce valid analyses for all designated analytes) reflect directly on the viability of the sampling program.

1.1.3 Executive Summary

From the Speciated NMOC analysis, the paraffins and aromatic compounds occurred more frequently than the olefins. Toluene, 1,2,3-trimethylbenzene, and isopentane were detected in all 254 Speciated NMOC samples. For the UATMP VOC analysis, the nonhalogenated compounds occurred more frequently than the halogenated compounds. 1,1,1-Trichloroethane and carbon tetrachloride were the only halogenated compounds detected in all 43 samples. For the carbonyl analysis, formaldehyde, acetaldehyde, acetone, and hexaldehyde were detected in all 41 analyzed samples.

Of the total NMOC measured by the Speciated NMOC method, an average of 78% is speciated by the GC/FID method. Of the Speciated NMOC, on average, 58% are paraffins, 23% are aromatic compounds, and 19% are olefins. Isopentane, propane, and ethane make up, on average, 30% of the paraffins. Toluene accounted for 30%, on average, of the aromatic fraction. Almost 30% of the olefin fraction is made up of ethylene and acetylene.

Temporal variations of the central tendencies of the data at a given site and between sites were examined. Based on visual inspection of the plotted data, no apparent upward or downward trends in the NMOC concentration was observed from 1988 through 1995. Downward trends were observed for 1,1,1-trichloroethane. Upward trends were observed for acetaldehyde.

Distributional analysis of the data confirmed that the data was lognormally distributed as is typical for environmental data.[10] Completeness results for the 1995 program on a per site basis ranged from 94 to 100% with an overall completeness of 96 percent. Equipment malfunction was identified as the primary cause of missed samples.

1.2 1995 Site Information

The sampling sites for the 1995 NMOC and Speciated NMOC monitoring programs are listed in Table 1-7, which includes the EPA region for each site, number of sites at each location, ERG site code, Aerometric Information Retrieval System (AIRS) code, site location, the typical

Table 1-7

1995 NMOC and Speciated NMOC Program Sites

Region	# of Sites	ERG Site Code	AIRS Code	Location	Land Use	Base Program	Options		
							SNMOC	UATMP VOCs	Carbonyl
2	1	LINY	36-059-005	Long Island, NY	Suburban commercial	NMOC			
	1	NWNJ	34-013-0011	Newark, NJ	Urban industrial	NMOC	Yes	Yes	Yes
	1	P2NJ	34-039-5001	Plainfield, NJ	Suburban residential	NMOC	Yes	Yes	Yes
4	1	B1AL	01-073-6002	Birmingham, AL (Tarrant)	Suburban residential	SNMOC		Yes	
	1	B2AL	01-073-5002	Birmingham, AL (Pinson)	Rural residential	SNMOC		Yes	
	1	B3AL	01-117-0004	Birmingham, AL (Helena)	Rural agricultural	SNMOC		Yes	
6	1	FWTX	48-439-1002	Fort Worth, TX	Urban commercial	SNMOC			Yes
	1	DLTX	48-113-0069	Dallas, TX	Urban commercial	SNMOC			Yes
	1	JUMX	80-006-0001	Juarez, MX	Urban commercial	SNMOC			
	1	NOLA	22-051-1001	New Orleans, LA	Suburban residential	SNMOC			Yes

land use surrounding each site, and the base and optional program participation for each site. The AIRS site description detailing the site characteristics are provided in Appendix A.

Three NMOC base sites were located in Long Island, New York (LINY); Newark, New Jersey (NWNJ); and Plainfield, New Jersey (P2NJ). Seven Speciated NMOC base sites were located in Birmingham, Alabama (B1AL, B2AL, B3AL); New Orleans, Louisiana (NOLA); Dallas, Texas (DLTX); Fort Worth, Texas (FWTX); and Ciudad Juarez, Mexico (JUMX). The JUMX monitor is located in the El Paso, Texas, air shed. Two NMOC base sites (NWNJ, P2NJ) participated in the Speciated NMOC analysis option. Five sites (NWNJ, P2NJ, B1AL, B2AL, B3AL) participated in the 3-hour UATMP VOC analysis option. Five sites (NWNJ, P2NJ, DLTX, FWTX, NOLA) participated in the 3-hour carbonyl analysis option.

Three sites (DLTX, FWTX, JUMX) are located in urban commercial areas and one site (NWNJ) is located in an urban industrial area. One site (LINY) is located in a suburban commercial area and three sites (P2NJ, B1AL, NOLA) are located in suburban residential areas. One site (B2AL) is located in a rural residential area and one site (B3AL) is located in a rural agricultural area.

1.2.1 The New York City and Northeastern New Jersey Metropolitan Area

In 1995, three of the participating sites (LINY, NWNJ, P2NJ) were located in an area that included the New York City and northeastern New Jersey metropolitan area.

1.2.1.1 Long Island, New York (LINY)

The LINY site has been participating in the NMOC program since 1990 and was established in 1971 by the New York State Department of Environmental Conservation. The site represents ambient air obtained from the New York City and northeastern New Jersey metropolitan area, with a population of approximately 16.5 million in 1990. The LINY site is located in a commercial suburban setting in Nassau County about 35 kilometers east of New York City. The sampling location is bounded by a road and a park, with a manufacturing facility

located directly across the street. No map was prepared for this site because the samples were only analyzed for NMOC, so no pollutant data or speciated data was available to relate to the TRI or local emissions information. The prevailing (or most frequent) wind direction across Long Island in the summer is from the south.[12]

1.2.1.2 Newark, New Jersey (NWNJ)

The NWNJ site has been participating in the NMOC program since 1987. This site was established by the New Jersey State Department of Environmental Protection in 1985 when sampling equipment was moved from another sampling site to this location. This site also represents ambient air from the New York City and northeastern New Jersey metropolitan area. The NWNJ site is located in an industrial urban center in Newark, which has a population of approximately 330,000 based on the 1990 census. The site is about 15 kilometers northwest of New York City. The sampling location is in a parking lot with a residential neighborhood on one side and a ballfield on another side. The local street running next to the parking lot has a traffic flow of approximately 2,000 cars per day. On the other side of the ballfield is an automobile junkyard. Also, manufacturing facilities are in the neighborhood and an expressway is nearby with a traffic flow of approximately 71,000 cars per day. Newark International Airport is located approximately 4 kilometers southwest of the sampling site.

According to the 1994 TRI data base,[11] the NWNJ site is surrounded, as shown in Figure 1-1, by facilities in Essex and Union Counties that reported releasing toxic chemicals to the air in 1994. A summary of the chemicals released and the facility location in relation to the NWNJ sampling site is provided in Table 1-8. The closest facility was located 0.5 kilometers south of the sampling site and reported releasing 1,2,4-trimethylbenzene, o-xylene, and mixed isomers of xylene. The prevailing wind at Newark International Airport during the summer is from the southwest.[13]

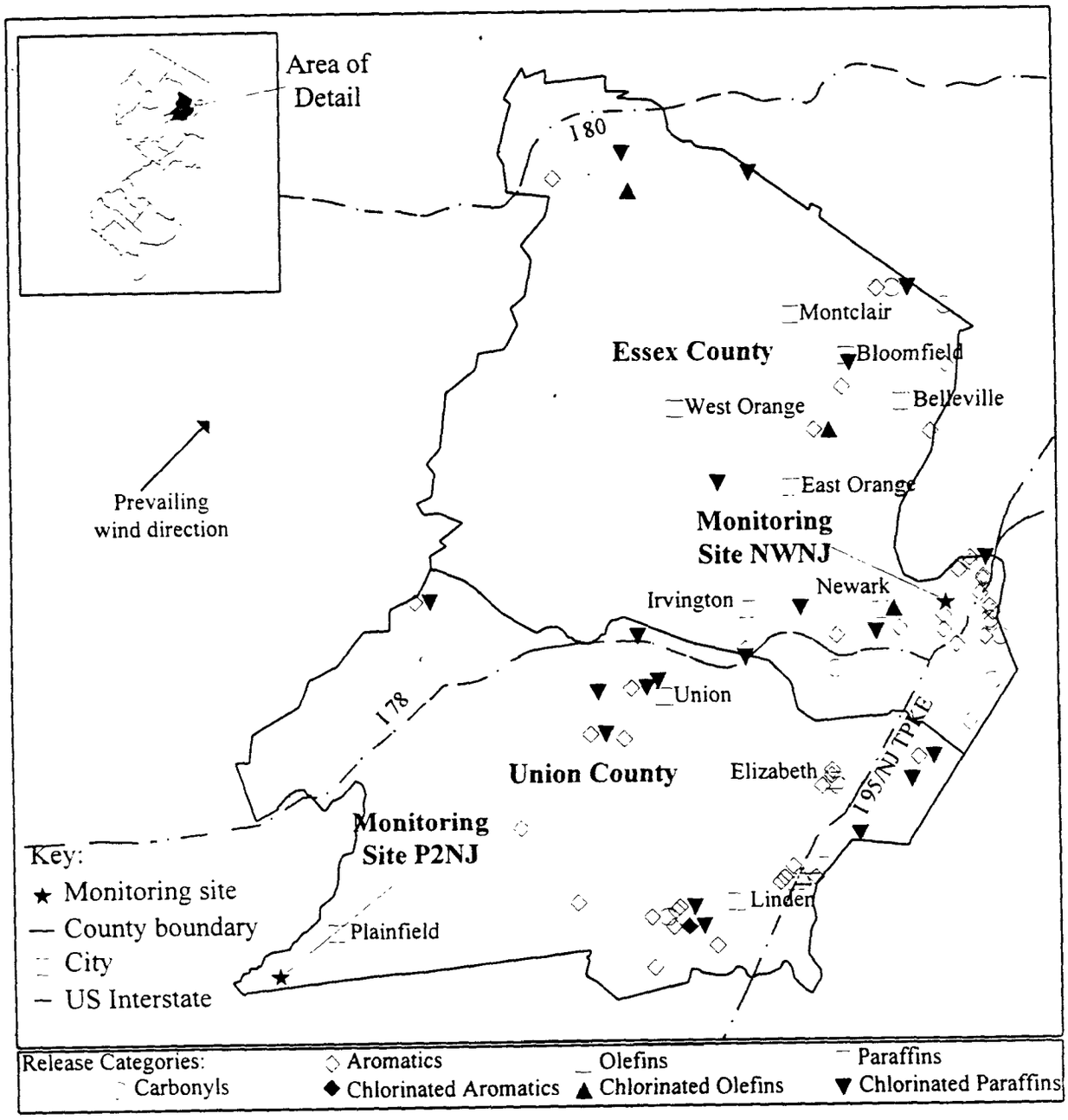


Figure 1-1. Location of Newark, New Jersey (NWNJ) and Plainfield, New Jersey (P2NJ) Monitoring Sites in Relationship to Potential Emission Sources

Table 1-8

Potential Source Locations (Based on 1994 TRI Data) in Relationship to NWNJ

Direction	Distance	Chemicals Emitted (Number of Reported Sources)
North	6 to 12 km	1,2,4-Trimethylbenzene, chloroform, cumene, dichloromethane, ethylbenzene, formaldehyde, isobutyraldehyde, toluene (3), xylenes
Northeast	1 to 4 km	1,1,1-Trichloroethane, 1,2,4-trimethylbenzene (2), cumene, dichloromethane, ethylbenzene (4), styrene, toluene (2), xylenes (4)
East	1 to 2 km	1,2,4-Trimethylbenzene, o-xylene, toluene
Southeast	1 to 4 km	Ethylbenzene, formaldehyde (3), propionaldehyde, toluene (2), xylenes (2)
South	0.5 km	1,2,4-Trimethylbenzene, o-xylene, xylenes
South	1 to 2 km	1,2,4-Trimethylbenzene (2), cumene, ethylbenzene, styrene, toluene, xylenes (2)
South	4 to 10 km	1,1,1-Trichloroethane, dichloromethane (2), toluene (2), trichloroethylene, xylenes (3)
South	17 to 22 km	1,1,1-Trichloroethane, tetrachloroethylene, toluene
South southwest	7 km	Dichloromethane, toluene
South southwest	7-13 km	1,1,1-Trichloroethane (2), 1,2,4-trimethylbenzene (2), 1,3-butadiene, benzene, cumene, cyclohexane (2), dichloromethane, ethylbenzene, ethylene, propylene (2), tetrachloroethylene, toluene (3), xylenes (2)
Southwest	2 to 8 km	Chloromethane, ethylbenzene, formaldehyde, toluene, xylenes (2)
Southwest	7 to 9 km	1,2,4-Trimethylbenzene, formaldehyde, toluene, xylenes
Southwest	15 to 19 km	1,1,1-Trichloroethane, 1,2,4-trimethylbenzene (2), 1,2-dichlorobenzene, benzene (2), chlorobenzene, chloroform, cumene, dichloromethane, ethylbenzene (3), formaldehyde, isobutyraldehyde, styrene, toluene (6), xylenes (4)
West southwest	7-19 km	1,1,1-Trichloroethane (5), 1,2,4-trimethylbenzene, dichloromethane (2), ethylbenzene, toluene, xylenes (3)
West	2 to 10 km	Tetrachloroethylene, toluene, xylenes (2)
West	5 to 6 km	Dichloromethane
West	11 to 21 km	1,1,1-Trichloroethane (2), 1,2-dichloroethane, dichloromethane, toluene
Northwest	20 to 21 km	1,1,1-Trichloroethane

1.2.1.3 Plainfield, New Jersey (P2NJ)

The P2NJ site has been participating in the NMOC program since 1988. This site was established in 1980 by the New Jersey State Department of Environmental Protection as part of the Northeast Oxidant Study. The site was relocated from latitude 40:36:04 N to 40:36:03 N at the beginning of the summer of 1992. The new site remains in the general location of the initial site. This site also represents ambient air in the New York City and northeastern New Jersey metropolitan area. The P2NJ site is located in a suburban residential neighborhood in Plainfield, which has a population of approximately 46,000 based on the 1990 census. The site is about 42 kilometers west of New York City. The sampling location is in a parking lot that is surrounded by commercial and industrial facilities. The parking lot houses a fleet of propane-fueled cars. The two local streets that pass by the parking lot have traffic flows of approximately 1,000 and 500 vehicles per day.

The P2NJ site is located south and west of the potential sources in Essex and Union Counties reported in the 1994 TRI data base.[11] Table 1-9 summarizes the chemicals released and facility location in relation to the P2NJ sampling site. The closest facility was located approximately 10 kilometers east northeast of the sampling site and reported releasing mixed isomers of xylene.

1.2.2 Birmingham (Alabama) Metropolitan Area

In 1995, three of the participating sites (B1AL, B2AL, B3AL) were located in the Birmingham, Alabama, metropolitan area. The B1AL and B2AL sites were established by the Jefferson County Department of Health. The B3AL site was established by the Alabama Department of Environmental Management in 1983. All three sites represent ambient air in the Birmingham metropolitan area, which has a population of approximately 1.2 million based on the 1990 census.

Table 1-9

Potential Source Locations (Based on 1994 TRI Data) in Relationship to P2NJ

Direction	Distance	Chemicals Emitted (Number of Reported Sources)
North northeast	15 to 16 km	1,2-Dichloroethane, dichloromethane, toluene
North northeast	31 to 36 km	1,1,1-Trichloroethane (2), tetrachloroethylene, toluene
Northeast	15 to 19 km	1,1,1-Trichloroethane (6), 1,2,4-trimethylbenzene, dichloromethane (2), ethylbenzene, toluene, xylene (mixed isomers) (2)
Northeast	19 to 36 km	1,1,1-Trichloroethane, 1,2,4-trimethylbenzene, chloroform, cumene, dichloromethane (2), ethylbenzene, formaldehyde, isobutyraldehyde, toluene (5), trichloroethylene, xylene (mixed isomers) (4)
Northeast	21 to 25 km	1,1,1-Trichloroethane, dichloromethane
East northeast	10 to 22 km	1,2,4-Trimethylbenzene (2), cumene, cyclohexane, formaldehyde, propylene, toluene, xylene (mixed isomers) (2)
East northeast	22 to 23 km	1,1,1-Trichloroethane (2), 1,2,4-trimethylbenzene, dichloromethane, tetrachloroethylene, toluene, xylene (mixed isomers) (2)
East northeast	22 to 33 km	1,1,1-Trichloroethane, 1,2,4-trimethylbenzene (6), chloromethane, cumene (2), dichloromethane (2), ethylbenzene (7), formaldehyde (4), o-xylene (2), propionaldehyde, styrene (2), tetrachloroethylene, toluene (7), xylene (mixed isomers) (13)
East northeast	24 to 25 km	Dichloromethane, toluene
East	14 to 21 km	1,1,1-Trichloroethane, 1,2,4-trimethylbenzene (2), 1,2-dichlorobenzene, 1,3-butadiene, benzene (3), chlorobenzene, chloroform, cumene, cyclohexane, dichloromethane, ethylbenzene (4), ethylene, formaldehyde, isobutyraldehyde, propylene, styrene, toluene (8), xylene (mixed isomers) (4)

The B1AL site is located in a suburban residential neighborhood in Tarrant City, which has a population of 8,148. The site is about 13 kilometers northeast of Birmingham and about 2 kilometers northwest of Birmingham Airport. The sampling location is next to tennis courts located behind an elementary school. Two local streets with traffic flows of 2,000 and 300 vehicles per day are near the sampling location. Two major streets with traffic flows of 1,500 and 80,000 vehicles per day are also in the vicinity. A major coke producing plant is located about 0.8 kilometers west of the sampling location.

The B2AL site is located in a rural residential area 32 kilometers northeast of Birmingham. The sampling location is next to tennis courts located in front of an elementary school. One through street with a traffic flow of approximately 13,000 vehicles per day passes by the sampling site.

The B3AL site is located in a rural agricultural area on a farm south of Birmingham. Two local highways with traffic flows of 1,000 and 20 vehicles per day pass nearby the site.

According to the 1994 TRI,[11] 30 facilities in Jefferson County and two facilities in Shelby County, Alabama, shown in Figure 1-2, reported emitting VOCs to the air. Nineteen of these facilities were located in Birmingham and reported releasing benzene, chlorobenzene, cyclohexane, dichloromethane, ethylbenzene, ethylene, propylene, styrene, toluene, 1,1,1-trichloroethane, trichloroethylene, 1,2,4-trimethylbenzene, xylenes, and o-xylene. Two facilities that reported releasing benzene, ethylene, styrene, 1,2,4-trimethylbenzene, toluene, and xylenes were located in the same city as B1AL, approximately 15 kilometers southwest of B2AL and 39 kilometers north of B3AL. Table 1-10 summarizes the chemicals released and facility location in relation to the three Birmingham sampling sites for the remaining 11 facilities.

Birmingham is located in a valley that produces significant terrain influence on the wind flow. Ridges extend southwest to northeast on each side of Birmingham and tend to produce channeled wind flow along the same axis. In the early summer, the prevailing winds tends to have a southwesterly component produced by flow from the Gulf of Mexico. By mid-summer, migratory high pressure systems tend to shift the wind flow so that the prevailing winds have a northeasterly component. On any given day in the summer, however, the location of the seasonal high pressure system over the southeast will determine the actual wind direction experienced on that day.[13]

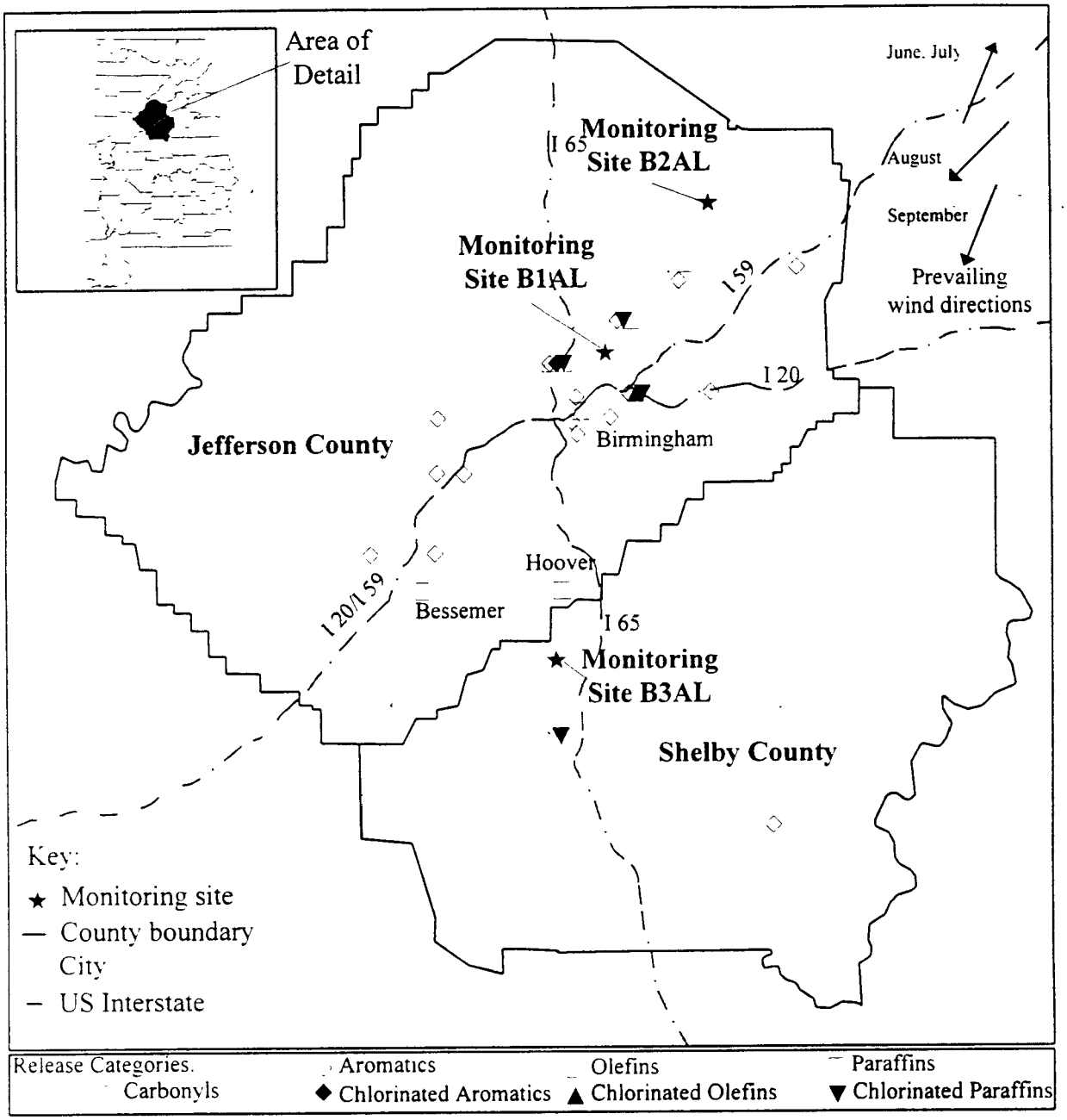


Figure 1-2. Location of Birmingham, Alabama (B1AL, B2AL, B3AL) Monitoring Sites in Relationship to Potential Emission Sources

Table 1-10

Potential Source Locations (Based on 1994 TRI Data) in Relation to Sampling Sites in the Birmingham (Alabama) Metropolitan Area

B1AL	B2AL	B3AL	Chemicals Emitted
27 km southwest	44 km southwest	16 km northwest	Styrene, toluene, and xylenes
22 km southwest	37 km southwest	25 km northwest	Benzene, toluene, and xylenes
17 km southwest	32 km southwest	21 km north	Xylenes
8 km southeast	25 km southeast	35 km northwest	Toluene
16 km northeast	11 km southeast	44 km northeast	Ethylbenzene, 1,2,4-trimethylbenzene, and xylenes
47 km south-southeast	59 km South	24 km east-southeast	Xylenes
36 km South	52 km South-southwest	7 km South	Chloroform

1.2.3 The Dallas and Fort Worth (Texas) Metropolitan Area

In 1995, two of the participating sites (DLTX, FWTX) were located in the Dallas and Fort Worth, Texas, metropolitan area. The prevailing wind in this region during June through September when the samples were collected is from the south.[13]

1.2.3.1 Dallas, Texas (DLTX)

The DLTX site did not participate in the Speciated NMOC program in 1994, although it participated in 1992 and 1993. The site was established by the city of Dallas Air Pollution Control Section, which relocated sampling equipment to this site. This site represents ambient air in the Dallas and Fort Worth metropolitan area. The DLTX site is located in a commercial urban center, north of the Trinity River and south of Dallas Love Field Municipal Airport, on the Northwest side of Dallas, which had a population of approximately 900,000 in 1990. The

sampling site is surrounded by parking lots and commercial buildings and is across the street from an arena. A major street with a railroad crossing and traffic flow of approximately 46,000 vehicles per hour runs by the site.

According to the 1994 TRI,[11] the DLTX site is surrounded, as shown in Figure 1-3, by facilities in Dallas and Tarrant Counties that reported releasing toxic chemicals to the air in 1994. A summary of some of the chemicals released and the facility location in relation to the DLTX sampling site is provided in Table 1-11. Chlorinated compounds were not included in the table because the DLTX site did not participate in the UATMP VOC option. The closest facility was located 1 to 2 kilometers northwest of the sampling site and reported releasing toluene.

1.2.3.2 Fort Worth, Texas (FWTX)

The FWTX site has been participating in the Speciated NMOC program since 1992. The site was established in 1975 by the Texas Natural Resources Conservation Commission and represents ambient air in the Dallas and Fort Worth metropolitan area. The FWTX site is located in a commercial urban center in Fort Worth, which had a population of 385,000 in 1990. The site is about 6 kilometers northwest of Fort Worth on the south side of Meacham field, a small airport with grass runways. The sampling location is surrounded by the airport and commercial buildings. The local street passing by the site had a traffic flow of 100 vehicles per day in 1992.

The FWTX site is located north, east, and south of the potential sources reported in the 1994 TRI data base[11] in Dallas and Tarrant Counties. Table 1-12 summarizes the chemicals released and facility location in relation to the FWTX sampling site. Chlorinated compounds were not included in the table because the FWTX site did not participate in the UATMP VOC option. The closest facility was located approximately 8 kilometers east-southeast of the sampling site and reported releasing toluene and mixed isomers of xylene.

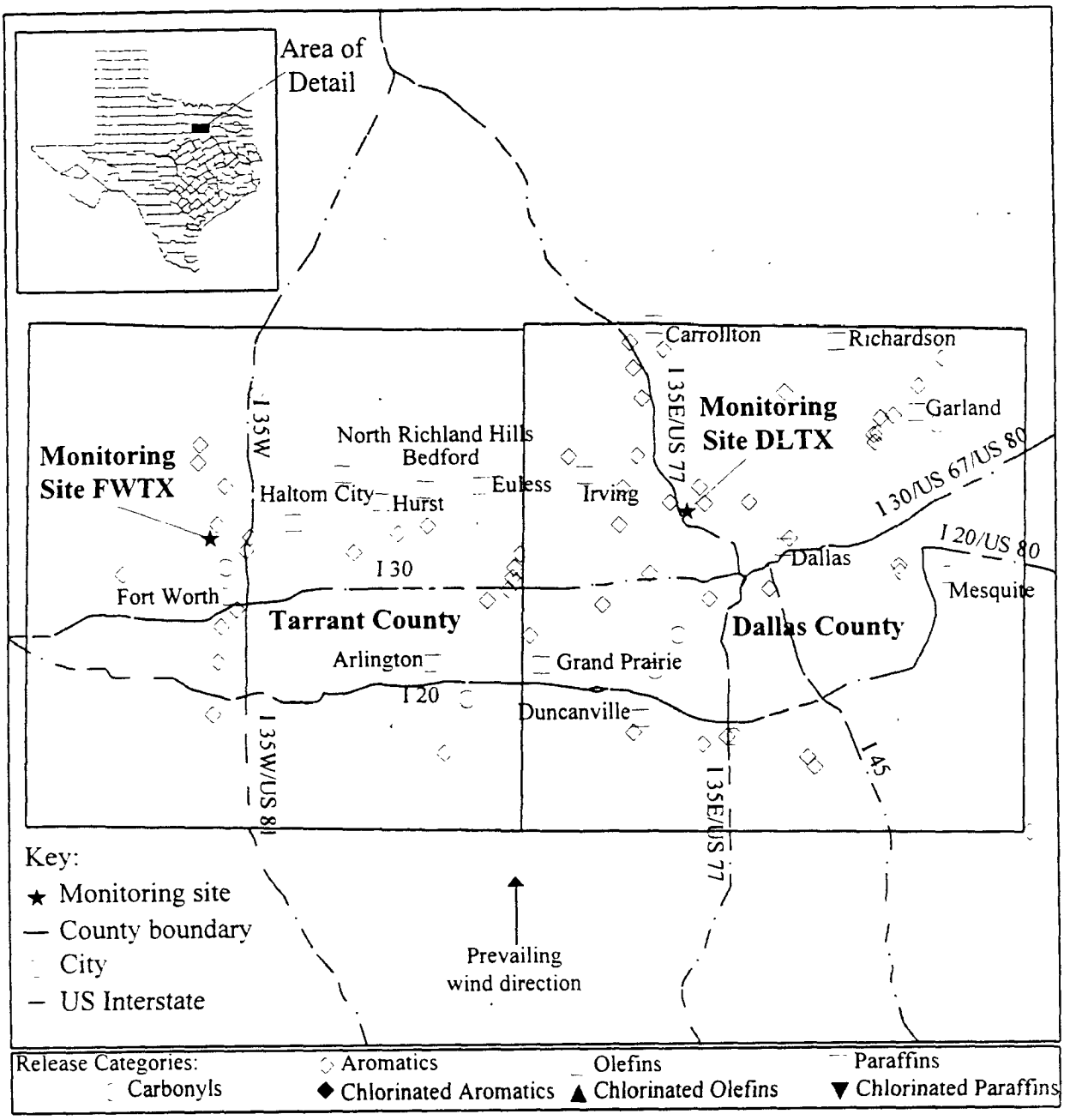


Figure 1-3. Location of Dallas, Texas (DLTX) and Fort Worth, Texas (FWTX) Monitoring Sites in Relationship to Potential Emission Sources

Table 1-11

Potential Source Locations (Based on 1994 TRI Data) in Relationship to DLTX

Direction	Distance	Chemicals Emitted (Number of Reported Sources)
North	11 to 18 km	1,2,4-Trimethylbenzene, ethylbenzene (2), styrene, toluene (2), xylene (mixed isomers) (4)
North	50 to 51 km	Toluene, xylene (mixed isomers)
Northeast	1 to 3 km	Styrene, toluene, xylene (mixed isomers) (2)
Northeast	14-20 km	1,2,4-Trimethylbenzene (2), cumene, ethylbenzene (2), styrene (2), toluene (2), xylene (mixed isomers) (2)
Northeast	20 to 27 km	Toluene (2), xylene (mixed isomers)
East	5 to 10 km	1,2,4-Trimethylbenzene, toluene, xylene (mixed isomers)
East	17 to 24 km	Formaldehyde, styrene (2), xylene (mixed isomers)
Southeast	10 to 11 km	Ethylbenzene, xylene (mixed isomers)
Southeast	26 to 28 km	Styrene, xylene (mixed isomers)
Southeast	43 to 44 km	Styrene
South	8 to 16 km	Toluene, formaldehyde (2)
South	22 to 23 km	1,2,4-Trimethylbenzene, ethylbenzene (2), formaldehyde, styrene, toluene (2), xylene (mixed isomers) (2)
Southwest	6 to 19 km	Toluene (2), xylene (mixed isomers)
Southwest	27 to 40 km	Formaldehyde, toluene (2), xylene (mixed isomers)
West southwest	15 to 17 km	1,2,4-Trimethylbenzene, ethylbenzene, styrene, toluene (2), xylene (mixed isomers)
West southwest	17 to 20 km	1,2,4-Trimethylbenzene, benzene, ethylbenzene, toluene, xylene (mixed isomers) (2)
West southwest	41 to 47 km	Toluene (2), xylene (mixed isomers) (2)
West	6 to 17 km	Toluene, xylene (mixed isomers) (2)
West	23 to 30 km	Toluene (2)
West	36 to 40 km	1,2,4-Trimethylbenzene, toluene, xylene (mixed isomers) (2)
West	41 to 44 km	Formaldehyde, styrene (2), toluene (2), xylene (mixed isomers)
West	50 to 51 km	Toluene, xylene (mixed isomers)
West northwest	39 to 50 km	Styrene (2), toluene, xylene (mixed isomers)
Northwest	1 to 2 km	Toluene
Northwest	6 to 12 km	Toluene, xylene (mixed isomers) (2)

Table 1-12

Potential Source Locations (Based on 1994 TRI Data) in Relationship to FWTX

Direction	Distance	Chemicals Emitted (Number of Reported Sources)
North northeast	17 to 18 km	Styrene
Northeast	16 to 24 km	Styrene, xylene (mixed isomers)
Northeast	79 to 80 km	Toluene, xylene (mixed isomers)
East northeast	15 to 18 km	Styrene (2), toluene (2), xylene (mixed isomers)
East northeast	54 to 58 km	1,2,4-Trimethylbenzene, ethylbenzene (2), styrene, toluene (2), xylene (mixed isomers) (4)
East northeast	66 to 81 km	Xylene (mixed isomers) (2)
East	14 to 18 km	1,2,4-Trimethylbenzene, formaldehyde, toluene (2), xylene (mixed isomers)
East	20 to 27 km	Xylene (mixed isomers) (2)
East	30 to 40 km	1,2,4-Trimethylbenzene, benzene, ethylbenzene, toluene (3), xylene (mixed isomers)
East	40 to 42 km	1,2,4-Trimethylbenzene, ethylbenzene, styrene, toluene (2), xylene (mixed isomers) (2)
East	41 to 50 km	Toluene, xylene (mixed isomers) (2)
East	50 to 59 km	Formaldehyde, styrene, toluene (5), xylene (mixed isomers) (5)
East	62 to 66 km	1,2,4-Trimethylbenzene, ethylbenzene, toluene, xylene (mixed isomers) (2)
East	73 to 79 km	1,2,4-Trimethylbenzene (2), cumene, ethylbenzene (2), formaldehyde, styrene (4), toluene (4), xylene (mixed isomers) (2)
East southeast	7 to 8 km	Toluene, xylene (mixed isomers)
East southeast	18 km	Toluene
East southeast	40 to 42 km	Formaldehyde, toluene, xylene (mixed isomers)
East southeast	43 to 44 km	Toluene
East southeast	55 to 63 km	1,2,4-Trimethylbenzene, ethylbenzene (2), formaldehyde (2), styrene, toluene (2), xylene (mixed isomers) (2)
East southeast	70 to 91 km	Styrene (2), xylene (mixed isomers)
Southeast	19 to 23 km	Toluene, xylene (mixed isomers) (2)
Southeast	41 to 42 km	Toluene

1.2.4 The El Paso (Texas) Metropolitan Area (Juraez, Mexico [JUMX]

In 1995, one of the participating sites (JUMX) was located in the El Paso, Texas, metropolitan area airshed. The JUMX site did not participate in the Speciated NMOC program in

1994, although the site did participate from 1991 through 1993. The site was established in 1990 as a special El Paso and Juarez monitoring site because of its location near the border. This site represents ambient air in the El Paso metropolitan area. The JUMX site is located in a commercial urban center in Juarez, which has a population of approximately 360,000. The prevailing wind in the El Paso region during June through September when the samples were collected is from the south.[13]

The JUMX site, as shown in Figure 1-4, is generally located west and south of the potential sources in El Paso County reported in the 1994 TRI data base.[11] Table 1-13 summarizes the chemicals released and facility location in relation to the JUMX sampling site. Chlorinated and brominated compounds and carbonyl compounds were not included in the table because the JUMX site did not participate in the UATMP VOC or Carbonyl option. The closest facilities in El Paso County were located approximately 5 kilometers north and north-northwest of the sampling site and reported releasing 1,2,4-trimethylbenzene, benzene, 1,3-butadiene, cumene, cyclohexane, ethylbenzene, ethylene, propylene, toluene, and mixed isomers of xylene. No information was available for potential sources in Juarez, Mexico.

1.2.5 The New Orleans (Louisiana) and Southern Louisiana Metropolitan Area

In 1995, one of the participating sites (NOLA) was located in the New Orleans, Louisiana, and Southern Louisiana metropolitan area. The NOLA site participated for the first time in the Speciated NMOC program in 1995. This site represents ambient air in the New Orleans and Southern Louisiana metropolitan area. The NOLA site is located in a residential suburban area on the west side of New Orleans about 7 kilometers north-northwest of New Orleans International Airport near Lake Pontchartrain. The prevailing wind in the New Orleans region during June through September when the samples were collected is from the Southeast.[14]

As shown in Figure 1-5, the NOLA site is generally located west and north of the potential sources in Jefferson Parrish reported in the 1994 TRI data base.[11] Table 1-14 summarizes the chemicals released and facility location in relation to the NOLA sampling site. Chlorinated and brominated compounds were not included in the table because the NOLA site did not participate

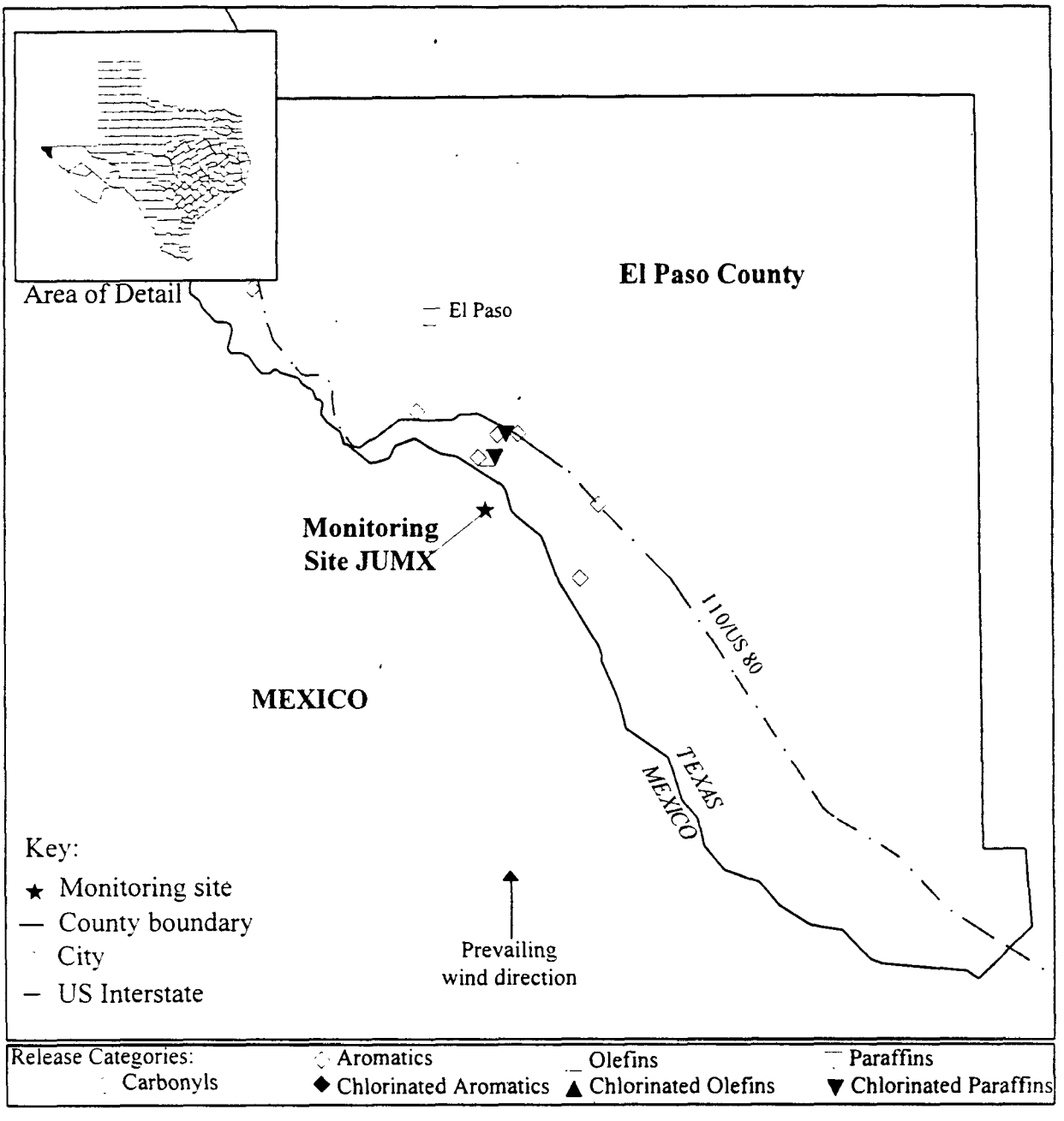


Figure 1-4. Location of Juarez, Mexico (JUMX) Monitoring Site in Relationship to Potential Emission Sources

in the UATMP VOC option. The closest facilities are located approximately 8 kilometers south-southeast of the sampling site and reported releasing mixed isomers of xylene.

Table 1-13

Potential Source Locations (Based on 1994 TRI Data) in Relationship to JUMX

Direction	Distance	Compounds Emitted (Number of Reported Sources)
North	5 to 6 km	1,2,4-Trimethylbenzene (2), benzene (2), cumene, cyclohexane (2), ethylbenzene (2), toluene (2), xylenes (2)
North-northeast	7 to 8 km	Toluene
East-northeast	6 to 7 km	Toluene
Southeast	7 to 8 km	1,2,4-Trimethylbenzene, cumene, xylenes
Northwest	24 to 25 km	Toluene, xylenes
North-northwest	5 to 6 km	1,2,4-Trimethylbenzene, 1,3-butadiene, benzene, cyclohexane, ethylbenzene, ethylene, propylene, toluene, xylenes
North-northwest	8 to 9 km	Toluene, xylenes

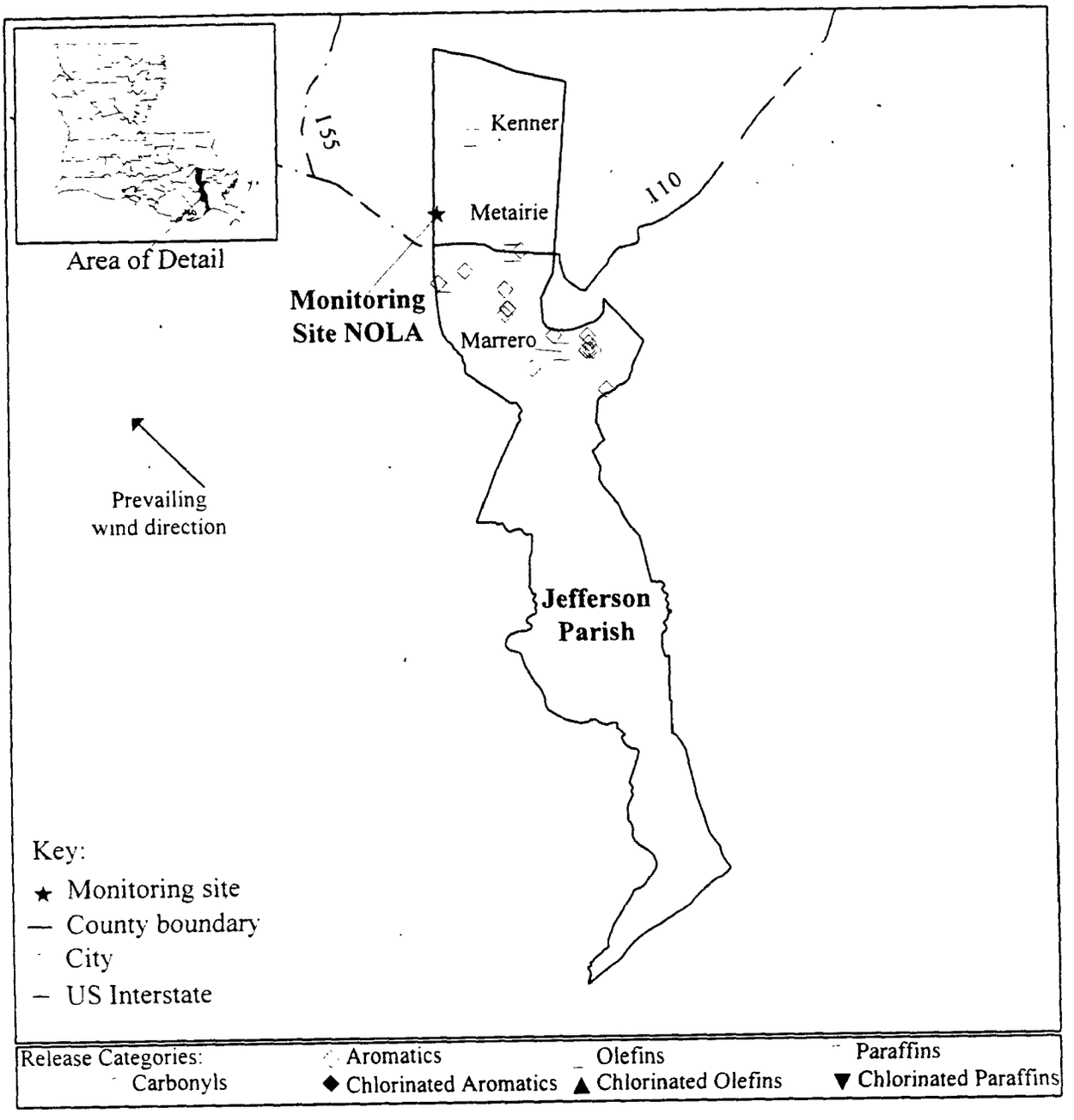


Figure 1-5. Location of New Orleans, Louisiana (NOLA) Monitoring Site in Relationship to Potential Emission Sources

Table 1-14

Potential Source Locations (Based on 1994 TRI Data) in Relationship to NOLA

Direction	Distance	Compounds Emitted (Number of Sources)
East-southeast	10 to 11 km	Ethylbenzene, toluene, xylene (mixed isomers)
Southeast	12 to 13 km	Xylenes
Southeast	20 to 21 km	Toluene
Southeast	22 to 23 km	Xylenes
Southeast	23 to 24 km	Toluene
Southeast	24 to 25 km	1,2,4-Trimethylbenzene (3), ethylbenzene (2), styrene, toluene, xylenes (2)
Southeast	29 to 30 km	Xylenes
South-southeast	7 to 8 km	Xylenes
South-southeast	14 to 15 km	1,2,4-Trimethylbenzene, toluene (2), xylenes
South-southeast	22 to 23 km	Toluene
South	8 to 9 km	Acrolein, propylene, toluene

2.0 THE DISTRIBUTIONS OF THE 1995 NMOC DATA

This section characterizes the distributions of the data collected from the 1995 NMOC program. Characterizing the statistical distributions of the data is important for accurate interpretation of the collected samples. Being able to categorize a pollutant according to a known statistical distribution (e.g., normal and lognormal distribution) provides a concise method of describing the data. This report uses the shape of the distributions, in terms of their symmetry and peakedness, as well the extent to which the distributions fit a normal or log-normal distribution, to characterize the distributions. This section begins with a discussion of the methods used to characterize the distributions and then discusses the results of applying these methods to the data.

2.1 Methodology

A number of parameters and statistical tests can be used to characterize a set of data, including the mean, median, standard deviation, skewness, kurtosis, and hypothesis for equality between mean values. Section 3.0 presents and discusses summary statistics for the data (i.e., means, median, standard deviations). This section analyzes the shape of the distributions, in terms of symmetry and peakedness, and their conformity to normal and log-normal distributions. The symmetry and peakedness of the dat are measured by *skewness* and the *kurtosis* parameters, respectively. Each distribution is also tested for its conformity to both the normal and log-normal distributions using the Shapiro-Wilk test and D'Agostino test for normality.

2.1.1 Skewness

The skewness of a distribution measures the symmetry of a distribution around its mean value. A distribution that is not skewed (i.e., symmetric) will have the same shape on either side of the median value.[15] Skewness (σ^3) is calculated as:

$$\sigma^3 = \frac{n}{(n-1)(n-2)} \sum_{n=1}^{n} \left(\frac{x_i - X}{s} \right)^3 \qquad \textbf{(2-1)}$$

where:

n	=	The number of observations;
s	=	Sample standard deviation; and
X	=	The sample mean.

Positively skewed distributions ($\sigma^3 > 0$) have long tails that extend toward higher values, while negatively skewed distributions ($\sigma^3 < 0$) have long tails extending toward lower values. A distribution with a zero skewness, such as the normal distribution, is symmetrical around the median and mean. A distribution with a skewness close to zero, in absolute value terms, can be said to be closer to a normal distribution than one that is further from zero, in absolute value terms.

The skewness of a distribution tells us in what direction (i.e., smaller or larger than the mean) we are likely to see extreme values. Pollutants with positively skewed distributions might generate concentrations well above the mean concentration, but might not result in concentrations far below the mean concentration.

The estimated values of skewness will be affected by the presence of non-detects. Non-detected values can be described as a truncation on the lower end of the distribution of daily concentrations.[16] Values lower than the detection limit have been assigned the arbitrary value of one-half of the detection limit, as opposed to their true value, which is unknown. This implies that the skewness of a distribution that contains non-detects will contain a positive bias. The assignment of one-half the detection limit to non-detected values creates an artificial clustering of data, at one-half the detection limit. The clustering will make the data appear asymmetrical because observations are not allowed to take on their true values. Because the clustering is below the mean, the bias to the skewness is positive.[17] Thus, interpretation of the skewness results should take into account the number of non-detects in the distribution.

2.1.2 Kurtosis

Kurtosis measures the peakedness (or flatness) of a distribution. A relatively peaked distribution will have thin tails while a relatively flat distribution will have broad tails.[15] Kurtosis (σ^4) is calculated as:

$$\sigma^4 = \left[\frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum_{i=1}^{n} \left(\frac{x_i - \bar{x}}{s}\right)\right] - \frac{3(n-1)^2}{(n-2)(n-3)} \qquad (2\text{-}2)$$

where:

n = The number of observations;

s = Sample standard deviation; and

x = The sample mean.

The calculation of kurtosis used in this report is scaled so that a normal distribution will have a zero kurtosis ($\sigma^4 = 0$). This is done by subtracting three from the normal measure of kurtosis.[18] Distributions with a positive kurtosis ($\sigma^4 > 0$) are relatively peaked with thin tails. A negative kurtosis ($\sigma^4 < 0$) indicates a flat distribution with relatively broad tails. Thus, a distribution with a kurtosis that is close to zero is closer to a normal distribution than one that is further from zero (in absolute value terms).

The kurtosis of a distribution tells us the likelihood of observing values far from the mean value. An urban air pollutant with a positive kurtosis can be expected to result in daily concentrations that are close (as defined by the standard deviation of the data) to the mean more often than daily concentrations that are far from the mean.

Non-detect values will bias the value of kurtosis in an indeterminate manner. Non-detected values can be described as a truncation on the lower end of the distribution. Values not detected are assigned the arbitrary value of one-half of the detection limit, as opposed to their

true value which creates an artificial clustering of data at one-half the detection limit. The direction of the bias caused by this cluster is indeterminate. If the true values are below one-half the detection limit, then the kurtosis will be positively biased (i.e., too peaked). In other words, observations that should broaden the tails are moved to a position where they contribute to the peakedness of the data. The opposite is true (i.e., a negative bias) if the true values are close to the mean and above one-half the detection limit. Therefore, interpretation of the kurtosis results should take into account the number of non-detects in the data.

2.1.3 Testing for Normality and Log-Normality

The normal distribution provides a succinct and well-known way of characterizing a data set. Data that is normally distributed has certain properties (e.g., symmetry, mean equal to median) that simplify interpretation. The symmetrical property of normal distributions is particularly useful for interpretation of urban air pollution data. Normal distributions are symmetrical about the mean. Given an estimate of the mean and standard derivation of the data, such as the sample mean and sample standard deviation, one can predict the frequency with which certain concentrations will be exceeded in a given time frame (e.g., a year).

This report compares the distributions of the collected data for this program to normal and log-normal distributions. If a set of data is log-normally distributed, then the logarithms of the data will exhibit the properties of a normal distribution. The hypotheses that each set of concentrations at each site is normally (or log-normally) distributed is tested against the hypothesis that they are not normally distributed. The Shapiro-Wilk[19] test for normality is used to perform these hypothesis tests.

If the data is normally distributed, W will equal one. Therefore, the null hypothesis in the Shapiro-Wilk test is that W = 1. If W is significantly different from one then the data rejects the hypothesis of a normal distribution.

Failing to reject the hypothesis is not equivalent to proving a set of data is normally distributed. A "fail to reject," or "insignificant difference," result says that no significant difference exists between the sampled data and a sample drawn from a normal distribution. It could be that not enough samples were collected to reject the hypothesis. For purposes of interpretation though, this report will refer to data that fails to reject the hypothesis as normally distributed if the test is performed on the data itself and as lognormally distributed if the test is performed on the logarithms of the data.

Each test conducted in this section is done at the 5% level of significance. If the data is normally distributed, then we can expect W to be within a 95% confidence interval of unity. The W-statistic can only take on values that are less than one. Therefore, the confidence interval for testing the hypothesis of W = 1 is only for values less than one. If the calculated value of W is not within that interval, the value of W is said to be significantly different than one, and the hypothesis of a normal distribution is rejected.

2.2 Distribution of Concentration Values

The D'Agostino Test was also used to examine the distribution of the data.[20] D'Agostino developed the D statistic to test the null hypothesis of normality or lognormality when $n \geq 50$. To conduct the D test, the data are ordered from smallest to largest and the D statistic is computed as shown in Equation 2-3:

$$D = \frac{\sum_{i=1}^{n} [i - 0.5\ (n + 1)]\ x_i}{n^2\ s} \qquad (2\text{-}3)$$

where:

$$s = [\frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^2]^{1/2} \qquad (2\text{-}4)$$

The D statistic is then transformed to the Y statistic using Equation 2-5:

$$Y = \frac{D - 0.28209479}{0.02998598/\sqrt{n}} \quad \textbf{(2-5)}$$

The expected value of Y is zero if n is large and the data are drawn from a normal distribution. If the distribution is not normal, then Y will tend to be either less than or greater than zero, depending on the particular distribution. Thus, a two-tailed test is used so the hypothesis that the distribution is normal is rejected if Y is less than the $\alpha/2$ quantile or greater than the $1-\alpha/2$ quantile of the distribution of Y.

2.2.1 NMOC Base Program

Three NMOC base sites participated in the 1995 NMOC program: Long Island, New York (LINY); Newark, New Jersey (NWNJ); and Plainfield, New Jersey (P2NJ). Data obtained for the 1995 NMOC program were analyzed for skewness, kurtosis, and W and Y using the untransformed data and the transformed data (natural logarithm). Results of the analyses for the overall program and the individual sites are reported in Table 2-1. As expected, the combined data from the three sites are lognormally distributed.

To provide a visual picture of the concentration distribution, a histogram was prepared using the NMOC values at all three NMOC base sites. NMOC values ranged from 0.062 to 1.248 ppmC. To prepare the histogram, the number of NMOC values at each 0.05 ppmC interval were summed between 0.05 and 1.00. Values greater than 1.00 were grouped together into a single category. Figure 2-1 shows the histogram obtained for all of the 1995 NMOC data from the three NMOC base sites. As is typical with ambient data, the distribution is skewed toward the lower values. Approximately 30% of the data falls within the range of 0.15 to 0.30 ppmC total NMOC.

Table 2-1

Shape Statistics for All Sites in the Total NMOC Option

Site	Normal			Lognormal		
	Shapiro-Wilk (W)	Skewness	Kurtosis	Shapiro-Wilk (W)	Skewness	Kurtosis
LINY	0.867[a]	1.514	2.598	0.981	0.067	-0.442
NWNJ	0.891[a]	1.198	1.670	0.969	0.143	-0.587
P2NJ	0.933[a]	0.822	0.365	0.952[a]	-0.420	-0.633
Overall	[b]	1.180	1.407	[c]	-0.153	-0.509

[a]Significant at the 5% level.

[b]D-Agostino's Test: $Y = -6.59$, $Y_{0.025} = -2.34$ and $Y_{0.975} = 1.54$; therefore the distribution is not normal.

[c]D-Agostino's Test: $Y = 1.52$, $Y_{0.025} = -2.34$ and $Y_{0.975} = 1.54$; therefore the distribution is lognormal.

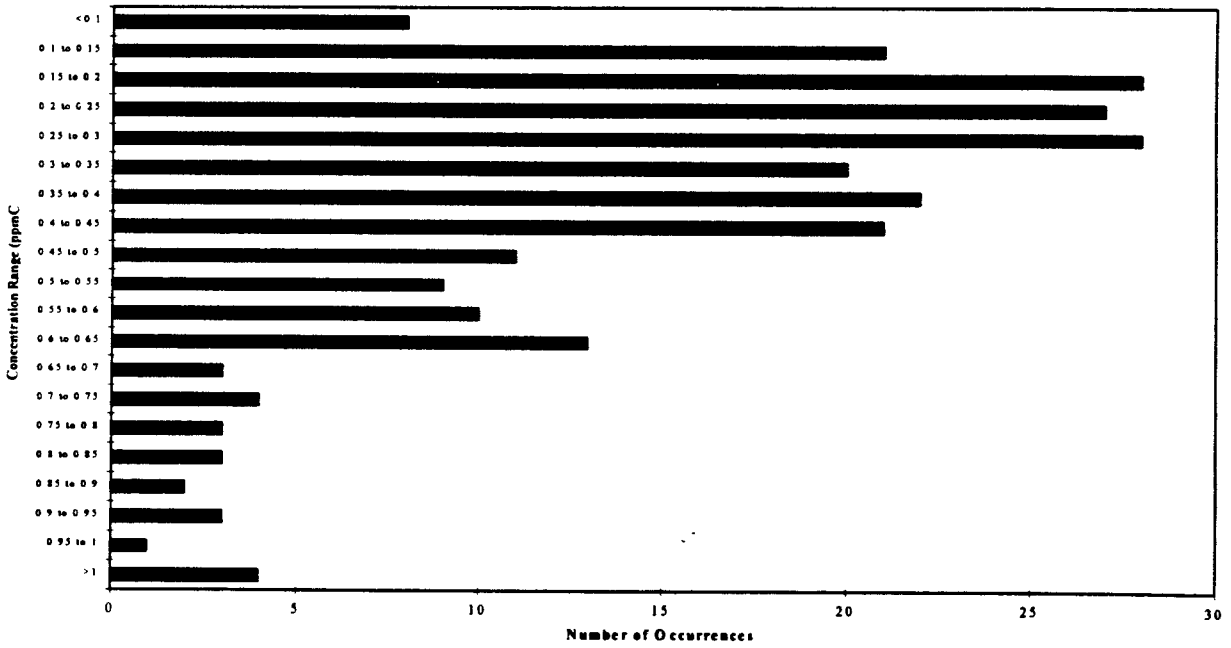


Figure 2-1. 1995 NMOC Histogram for All Sites

Interestingly, the W-statistic indicates that the data from P2NJ is neither normally distributed nor lognormally distributed. The NMOC data at this site were further analyzed by preparing a histogram of the data by summing the number of NMOC values at each 0.025 ppmC interval between 0.2 and 0.4 ppmC. The histogram is shown in Figure 2-2. A maximum frequency is found at the lower concentrations, yet the frequency remains fairly constant at the higher concentrations. As shown in Figure 2-1, the P2NJ sampling site is located in a residential suburban area upwind from most of the potential sources. The presence of a fleet of propane-fueled vehicles in the vicinity of the sampling location may result in a fairly constant NMOC background, however, the reason for the variability at P2NJ is unknown. It may be related to specific sources or to meteorological conditions.

2.2.2 Speciated NMOC Base Program

Seven sites participated in the Speciated NMOC base program: Birmingham, Alabama (B1AL, B2AL, B3AL); Dallas, Texas (DLTX); Fort Worth, Texas (FWTX); Juarez, Mexico (JUMX); and New Orleans , Louisiana (NOLA). Data obtained for the 1995 NMOC program were analyzed for skewness and kurtosis using the concentrations and the logarithms of the concentration. Analyses performed on the concentrations tested for normal distribution, and analyses on the logarithms tested for lognormal distributions. The results for all seven sites combined is presented in Appendix Table B-11. Results on a site-by-site basis are provided in Appendix Tables B-12 through B-18.

The skewness and kurtosis values generated for the concentrations were all positive, indicating that the concentration distribution for all of the compounds is more peaked than a normal distribution and tails toward the higher concentrations. The skewness and kurtosis values obtained for the distribution of the logarithms of the concentration are closer to zero, indicating that the concentrations tend to be lognormally distributed. Lognormal distributions are typical of environmental data, particularly ambient air samples; thus, these results are consistent with what has been seen in other data and in previous program years.

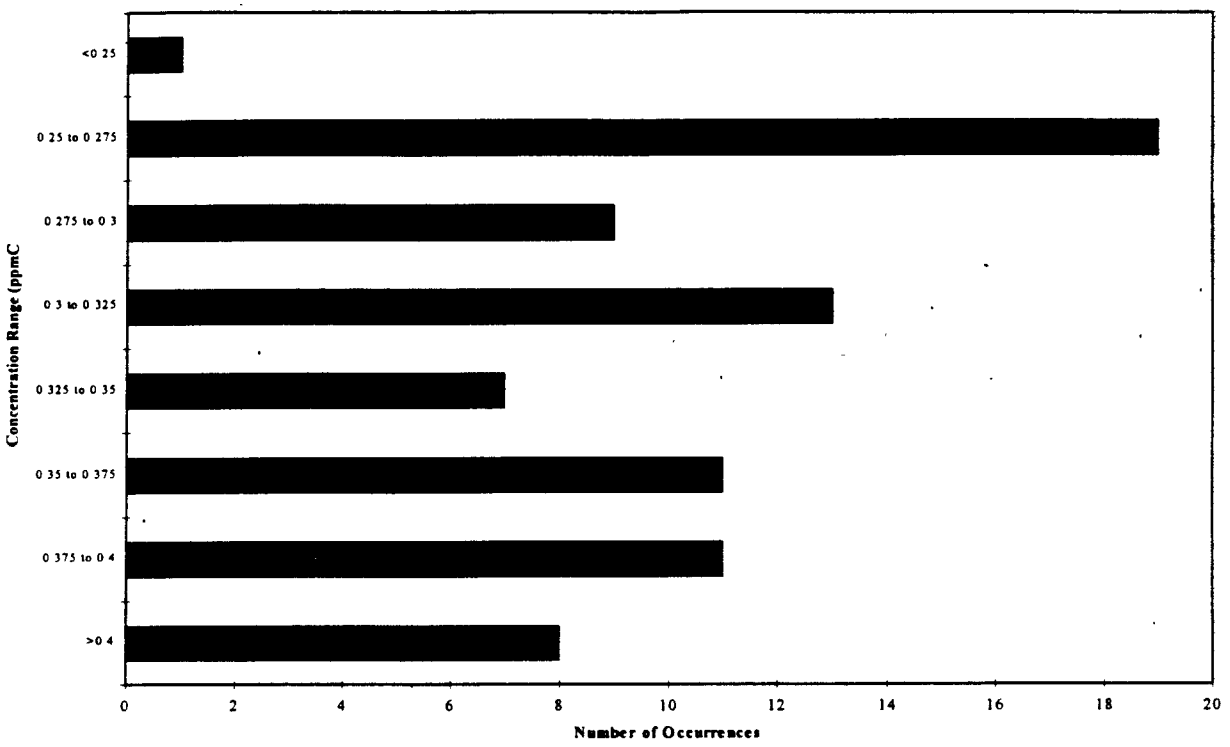


Figure 2-2. 1995 NMOC Histogram for P2NJ

To provide a visual picture of the concentration distribution, histograms were also prepared using the total NMOC at the seven Speciated NMOC base sites. Total NMOC values ranged from 0 to 3,000 ppbC. To prepare the histograms, the number of total NMOC values at each 50 ppbC interval were summed between 0 and 1,000. For values over 1,000 ppbC, intervals of 1,000 were used. Figure 2-3 shows the histogram obtained for all of the 1995 Speciated NMOC data at the seven Speciated NMOC base sites. As is typical with ambient data, the distribution is skewed toward the lower values. Approximately 20% of the data falls within the range of 100 to 150 ppbC total NMOC.

The distribution of the total NMOC data for the Speciated NMOC base sites was also analyzed using the D'Agostino Test.[20] The test was performed on the combined total NMOC data for all sites and on the data for each individual site except for JUMX. Because less than 50 valid samples were collected at JUMX, the W test was used for JUMX. The tests were

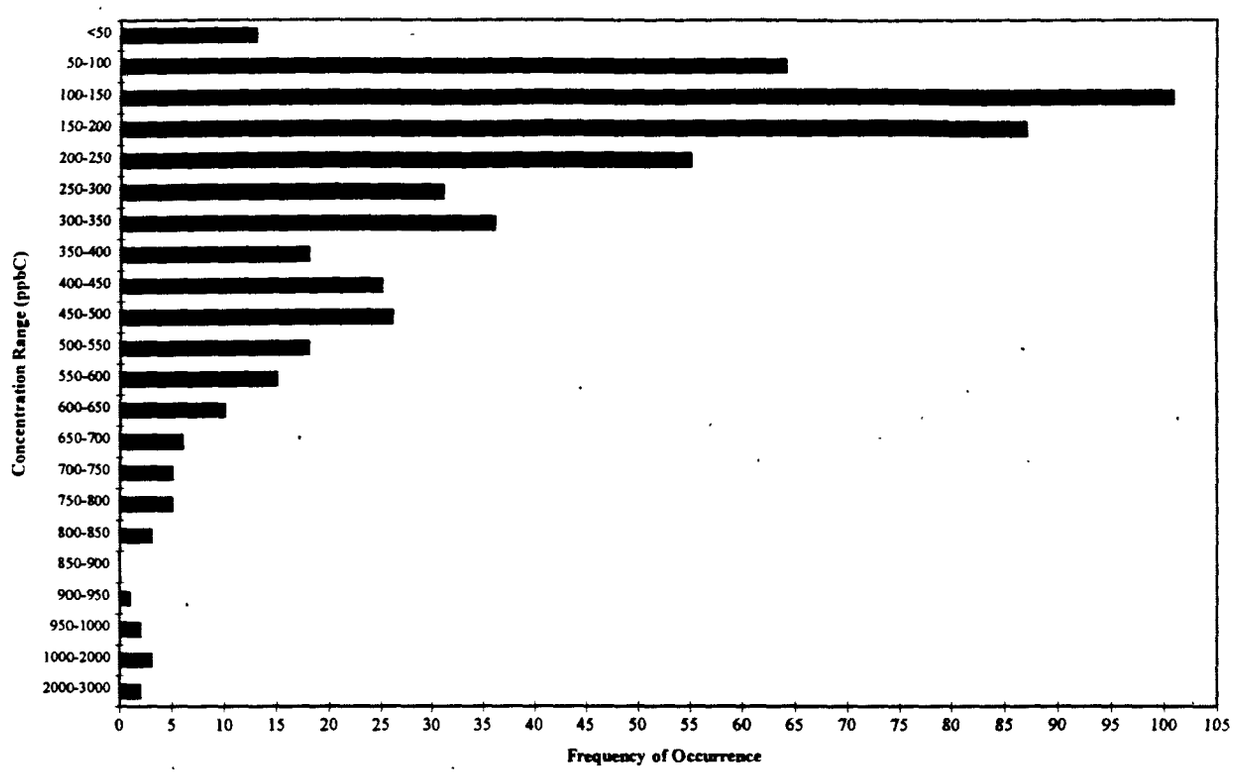


Figure 2-3. 1995 Histogram Showing Distribution of Total NMOC Concentrations For All Seven Speciated NMOC Base Sites.

performed on the data themselves and on the logarithms of the data. The hypothesis that the data was normally distributed was rejected in all cases. Results of the hypothesis tests on the logarithms of the concentrations is presented in Table 2-2. For the combined site data and for all of the sites except B1AL, the hypothesis that the distribution was lognormal was accepted.

The total NMOC data at B1AL were further analyzed by preparing a histogram (shown in Figure 2-4) of the data as described earlier. Instead of having one peak that tails toward higher concentration values, the histogram shows two peaks, one at 100 to 150 ppbC and one at 400 to 450 ppbC. This could possibly be produced by the nearness of the sampling site to the potential sources. Because Birmingham is located in a valley, the prevailing winds tend to alternate from blowing southwest to northeast. As shown in Figure 1-2, the B1AL site has potential sources both to the southwest and to the northeast. The sampling site may be closer to potential sources from one direction than the other. To determine the cause for the multimodal distribution and

Table 2-2

Goodness of Fit Test Results for Total NMOC at the Speciated NMOC Base Sites

Site	Number of Data	Test Used	Symbol	Value	Result
B1AL	77	D'Agostino Test	Y	-3.71	The distribution is not lognormal
B2AL	80	D'Agostino Test	Y	-1.50	The distribution is lognormal
B3AL	79	D'Agostino Test	Y	-0.09	The distribution is lognormal
DLTX	83	D'Agostino Test	Y	-3.25	The distribution is lognormal
FWTX	79	D'Agostino Test	Y	0.36	The distribution is lognormal
JUMX	49	W Test	W	1.41	The distribution is lognormal
NOLA	79	D'Agostino Test	Y	0.97	The distribution is lognormal
All Sites	526	D'Agostino Test	Y	0.50	The distribution is lognormal

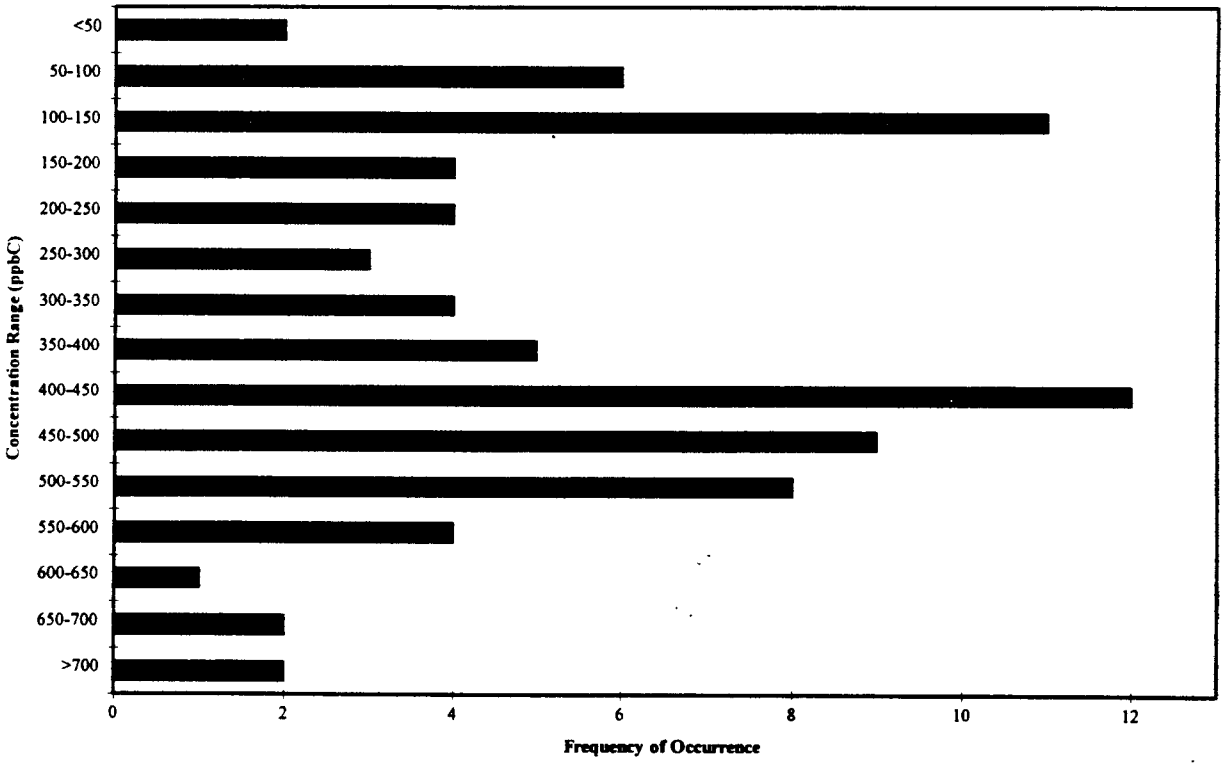


Figure 2-4. 1995 Histogram of Total NMOC at B1AL

whether it is related to wind flow, wind flow data would be needed for the days the samples were collected and a more detailed analysis of the data would be required.

2.2.3 Speciated NMOC Option Program

Two of the NMOC base sites participated in the Speciated NMOC option: Newark, New Jersey (NWNJ), and Plainfield, New Jersey (P2NJ). Data obtained for the 1995 Speciated NMOC option program were analyzed for skewness and kurtosis using the concentrations and the logarithms of the concentration. Analyses performed on the concentrations tested for normal distribution, and analyses on the logarithms tested for lognormal distributions. The results for both sites combined are presented in Appendix Table C-5. Results on a site-by-site basis are provided in Appendix Table C-6. As with the SNMOC base data, the SNMOC option data generally are better characterized by a lognormal distribution than by a normal distribution.

2.2.4 UATMP VOC Option

Five sites participated in the UATMP VOC option: Newark, New Jersey (NWNJ), Plainfield, New Jersey (P2NJ), and Birmingham, Alabama (B1AL, B2AL, B3AL). Data obtained for the 1995 UATMP VOC option program were analyzed for skewness, kurtosis, and the W-statistic using the concentrations and the logarithms of the concentration. Analyses performed on the concentrations tested for normal distribution, and analyses on the logarithms tested for lognormal distributions. The results for all five sites combined is presented in Appendix Table D-9. Results on a site-by-site basis are provided in Appendix Tables D-10 through D-14.

For the UATMP VOC option, the distributions were further analyzed by comparing the number of compounds at each site that had less than 25% non-detects that failed to reject the hypothesis of a normal or lognormal distribution. The results are reported in Table 2-3. More compounds failed to reject the hypothesis of a lognormal distribution than failed to reject the

Table 2-3

Number of Compounds with less than 25 Percent Non-detects That Fail to Reject the Hypothesis of a Normal Distribution For the UATMP VOC Option

		Straight		Logarithms	
Site	Less than 25% non-detects	Fail to reject null hypothesis	Percentage	Fail to reject null hypothesis	Percentage
B1AL	18	10	56%	12	67%
B2AL	14	6	43%	11	79%
B3AL	13	8	62%	12	92%
NWNJ	18	11	61%	16	89%
P2NJ	18	15	83%	16	89%
Totals	**81**	**50**	**62%**	**67**	**83%**

hypothesis of a normal distribution. This result indicates that the majority of the data are better characterized by a lognormal distribution, as would be expected for ambient air monitoring data.

2.2.5 Carbonyl Option

Five sites participated in the carbonyl option: Newark, New Jersey (NWNJ), Plainfield, New Jersey (P2NJ), Dallas, Texas (DLTX), Fort Worth, Texas (FWTX), and New Orleans, Louisiana (NOLA). Data obtained for the 1995 Carbonyl Option were analyzed for skewness and kurtosis using the concentrations and the logarithms of the concentration. Analyses performed on the concentrations tested for normal distributions while analyses on the logarithms tested for lognormal distributions. Generally, the data was better characterized by the lognormal distribution. Acetone was better characterized by the normal distribution. Results for the overall program are provided in Appendix Table E-9. Appendix Tables E-4 through E-8 provide the results on a site-by-site basis.

3.0 PROGRAM STATISTICAL SUMMARY

This section summarizes the statistical analysis of the data and includes discussions on the number and frequency of occurrences, the distribution of the data, and determination of the central tendency of the data using the arithmetic mean, the geometric mean and standard deviation, and the median.

3.1 Prevalence (Number and Frequency of Occurrence)

This discussion summarizes the frequencies at which speciated compounds were detected during the respective programs or options in 1995. Compounds that are detected frequently are more likely to derive from ubiquitous sources, such as automotive exhaust or biogenic emissions. Compounds that are detected infrequently may derive from occasional process upsets in local industrial processes or other unnatural or natural disruptions.

3.1.1 NMOC Base Program

Three NMOC base sites participated in the 1995 NMOC program: Long Island, New York (LINY); Newark, New Jersey (NWNJ); and Plainfield, New Jersey (P2NJ). Total NMOC was measured in 100% of the samples from all three sites.

3.1.2 Speciated NMOC Base Program

Seven sites participated in the Speciated NMOC base program: Birmingham, Alabama (B1AL, B2AL, B3AL); Dallas, Texas (DLTX); Fort Worth, Texas (FWTX); Juarez, Mexico (JUMX); and New Orleans , Louisiana (NOLA). For convenience, the Speciated NMOC compounds were divided into three classes: paraffins, olefins, and aromatics. Both the number and frequency of occurrence for the overall program for the three classes of compounds are provided in Appendix Table B-1 and frequency of occurrence is shown in Figures 3-1 through 3-3.

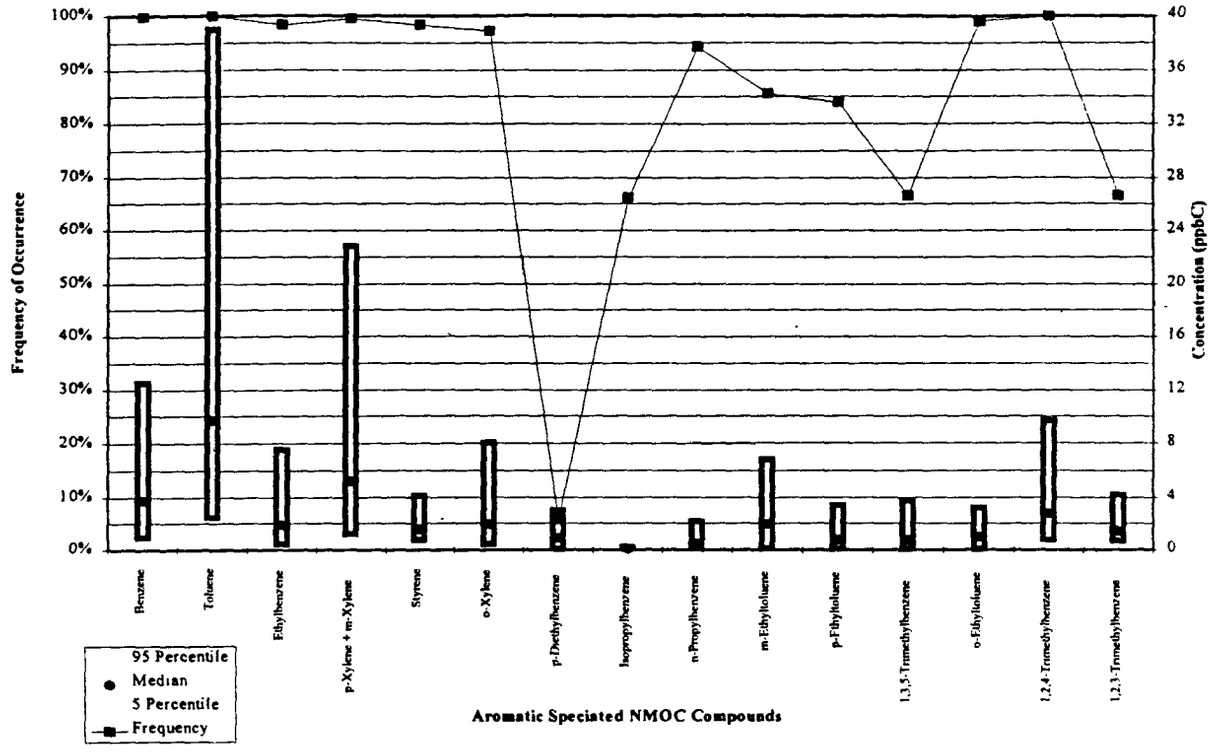


Figure 3-1. Frequency and Concentration Distribution of Speciated Aromatics in 1995

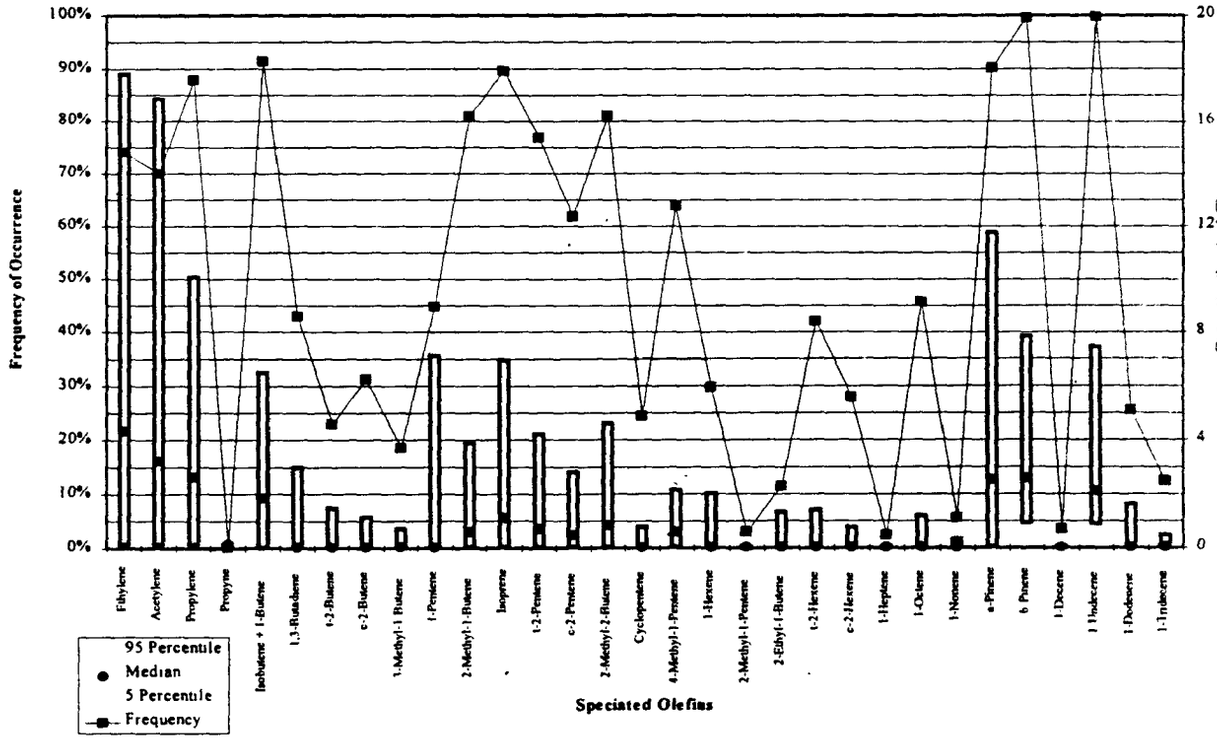


Figure 3-2. Frequency and Concentration Distribution of Speciated Olefins in 1995

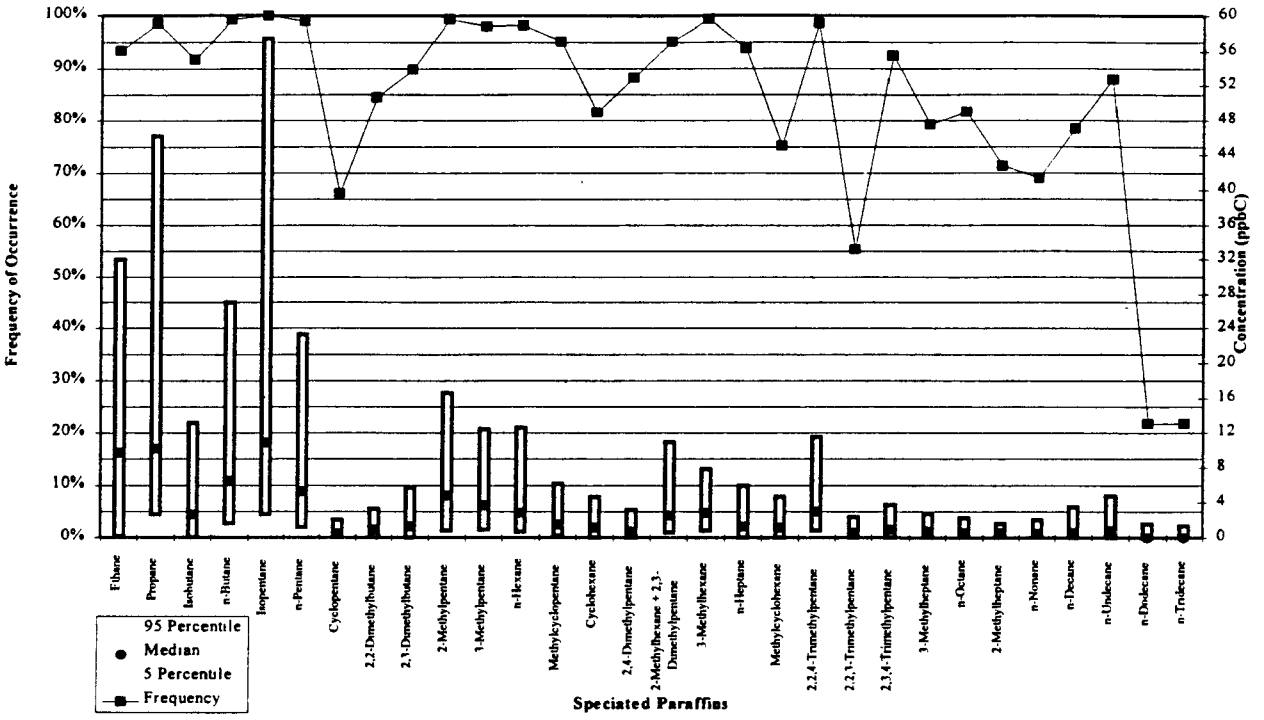


Figure 3-3. Frequency and Concentration Distribution of Speciated Paraffins in 1995

The paraffins and aromatic compounds occurred more frequently than the olefins. Three compounds—toluene, 1,2,3-trimethylbenzene, and isopentane—were detected in all 524 samples. Toluene has been shown to originate predominately from mobile source emissions, which are prevalent in all areas, so frequent occurrence is expected.[21] Table 3-1 lists the compounds detected most (>90%) and least (<10%) frequently during the 1995 Speciated NMOC base program.

Compound prevalence in this study was compared to compound prevalence in Columbus, Ohio, during June and July 1989. The Columbus, Ohio, study was designed to determine the variability of hazardous air pollutants in ambient air. The prevalence results were compared because the Columbus, Ohio, study analyzed for many of the same compounds and reported frequency of occurrence.

Table 3-1

Most and Least Frequently Detected Speciated NMOC Compounds for the 1995 Speciated NMOC Base Program

Compounds Detected in <10% of the Samples	Compounds Detected in >90% of the Samples		
Isopropylbenzene	Benzene	Propane	3-Methylhexane
Propyne	Toluene	Isobutane	*n*-Heptane
2-Methyl-1-pentene	Ethylbenzene	*n*-Butane	2,2,4-Trimethylpentane
1-Heptene	*p*- and *m*-Xylene	*n*-Pentane	2,3,4-Trimethylpentane
1-Nonene	Styrene	2,3-Dimethylbutane	Isobutene and 1-Butene
1-Decene	*o*-Xylene	2-Methylpentane	Isoprene
	m-Ethyltoluene	3-Methylpentane	α-Pinene
	1,2,3-Trimethylbenzene	*n*-Hexane	β-Pinene
	1,2,4-Trimethylbenzene	Methylcyclopentane	1-Dodecene
	Ethane	2-Methylhexane/2-Methylpentane	

Ten of the compounds detected with >90% frequency (benzene, toluene, ethylbenzene, *m*- and *p*-xylene, ethane, propane, isobutane, *n*-butane, and *n*-pentane) were detected with ≥99% frequency in Columbus, Ohio. Styrene was detected with 21% frequency in Columbus, Ohio, and 1,2,4-trimethylbenzene was detected with 82% frequency. None of the other compounds listed in Table 3-1 were included in the Columbus, Ohio, study.[22]

Number and frequency of occurrence for each of the seven sites is presented in Appendix Table B-2 and frequency of occurrence is shown in Appendix Figures B-1 through B-21. Besides toluene, 1,2,3-trimethylbenzene, and isopentane, several additional compounds listed in Tables 3-2 through 3-4 were detected in all of the samples at one or more of the seven sites. Tables 3-2 through 3-4 also list compounds that were detected in 90% or more of the samples at a given site.

Table 3-2

Speciated Aromatic Compounds Detected in 90 Percent or More of the Samples Collected at a Site in 1995

	Site						
Compound Name	**B1AL**	**B2AL**	**B3AL**	**DLTX**	**FWTX**	**JUMX**	**NOLA**
Benzene	✓	✓	x	✓	✓	✓	✓
Toluene	✓	✓	✓	✓	✓	✓	✓
Ethylbenzene	x	x	x	✓	x	✓	✓
p-Xylene + m-Xylene	x	x	✓	✓	✓	✓	✓
Styrene	✓	x	x	x	x	✓	✓
o-Xylene	x	x	x	x	x	✓	x
n-Propylbenzene						x	
m-Ethyltoluene	x	x	x	x	✓	x	
p-Ethyltoluene	x			x	x	x	
1,3,5-Trimethylbenzene	x			x	x	x	
1,2,4-Trimethylbenzene	x	x	✓	x	✓	✓	✓
1,2,3-Trimethylbenzene	✓	✓	✓	✓	✓	✓	✓
p-Diethylbenzene						x	

✓ Detected in all samples.
x Detected in > 90% of samples.

Table 3-3

Speciated Paraffin Compounds Detected in 90 Percent or More of the Samples Collected at a Site in 1995

	Site						
Compound Name	**B1AL**	**B2AL**	**B3AL**	**DLTX**	**FWTX**	**JUMX**	**NOLA**
Ethane	x		x	✓	✓	✓	x
Propane	x	x	✓	✓	✓	x	x
Isobutane			x	x	✓	✓	x
n-Butane	✓	x	x	✓	✓	✓	✓
Isopentane	✓	✓	✓	✓	✓	✓	✓
n-Pentane	x	✓	✓	✓	x	x	x
Cyclopentane					x	x	
2,2-Dimethylbutane				✓	✓		x
2,3-Dimethylbutane				x	x	x	
2-Methylpentane	✓	x	x	✓	✓	✓	✓
3-Methylpentane	x	x	x	✓	✓	✓	x
n-Hexane	x	x	x	✓	✓	✓	x
Methylcyclopentane	x			✓	✓	✓	x
Cyclohexane				x	✓	✓	
2,4-Dimethylpentane				x	x	x	
2-Methylhexane + 2,3-Dimethylpentane	x	x		✓	✓	✓	x
3-Methylhexane	✓	✓	x	✓	✓	✓	✓
n-Heptane	x			✓	✓	✓	x
Methylcyclohexane				✓	✓	✓	
2,2,4-Trimethylpentane	x	x	x	✓	✓	✓	x
2,3,4-Trimethylpentane	x	x		✓	✓	x	
3-Methylheptane				x	x	x	
n-Octane				x	x	x	
2-Methylheptane				x	x		
n-Nonane						x	
n-Decane				x	x	✓	
n-Undecane	x			✓	x	✓	

✓ Detected in all samples.
x Detected in > 90% of samples.

Table 3-4

Speciated Olefin Compounds Detected in 90 Percent or More of the Samples Collected at a Site in 1995

	Site						
Compound Name	**B1AL**	**B2AL**	**B3AL**	**DLTX**	**FWTX**	**JUMX**	**NOLA**
Propylene				✓	x	x	
Isobutene and 1-Butene				✓	✓	✓	x
2-Methyl-1-butene	x			x	x	x	
Isoprene	x	✓	✓				
t-2-Pentene				x			
2-Methyl-2-Butene	x			x	x		
α-Pinene	x	x	x			x	x
β-Pinene	✓	✓	✓	x	x	✓	✓
1-Undecene	✓	✓	x	✓	✓	✓	✓

✓ Detected in all samples.
x Detected in > 90% of samples.

Four compounds were not detected at one or more sites. 2-Methyl-1-pentene was not detected in any of the samples from B2AL; 2-ethyl-1-butene was not detected in any of the samples from JUMX; and 1-heptene was not detected in any of the samples from B3AL. Propyne was only detected at DLTX. Table 3-5 lists compounds that were detected in 10% or fewer of the samples at a given site.

3.1.3 Speciated NMOC Option

Two of the NMOC base sites participated in the Speciated NMOC option: Newark, New Jersey (NWNJ), and Plainfield, New Jersey (P2NJ). Both the number and frequency of occurrence for the overall option program are provided in Appendix Table C-1 and frequency of occurrence is shown in Figures 3-4 through 3-6 for the aromatics, paraffins, and olefins. Again the paraffins and aromatic compounds occurred more frequently than the olefins. Of

Table 3-5

Speciated Compounds Detected in Less Than 10 Percent of the Samples at a Site in 1995

	Site						
Compound Name	**B1AL**	**B2AL**	**B3AL**	**DLTX**	**FWTX**	**JUMX**	**NOLA**
Isopropylbenzene	x	x	x	x	x	x	x
Propyne	✘	✘	✘	x	✘	✘	✘
t-2-Butene		x					
c-2-Butene		x					
3-Methyl-1-Butene		x					
Cyclopentene		x					
1-Hexene		x					
2-Methyl-1-pentene	x	✘	x	x	x	x	x
2-Ethyl-1-butene		x		x	x	✘	x
c-2-Hexene		x					
1-Heptene	x	x	✘	x	x	x	x
1-Nonene	x	x	x	x	x		x
1-Decene	x	x	x	x		x	x
1-Tridecene			x				x

✘ Not detected in any samples
x Detected in < 10% of samples.

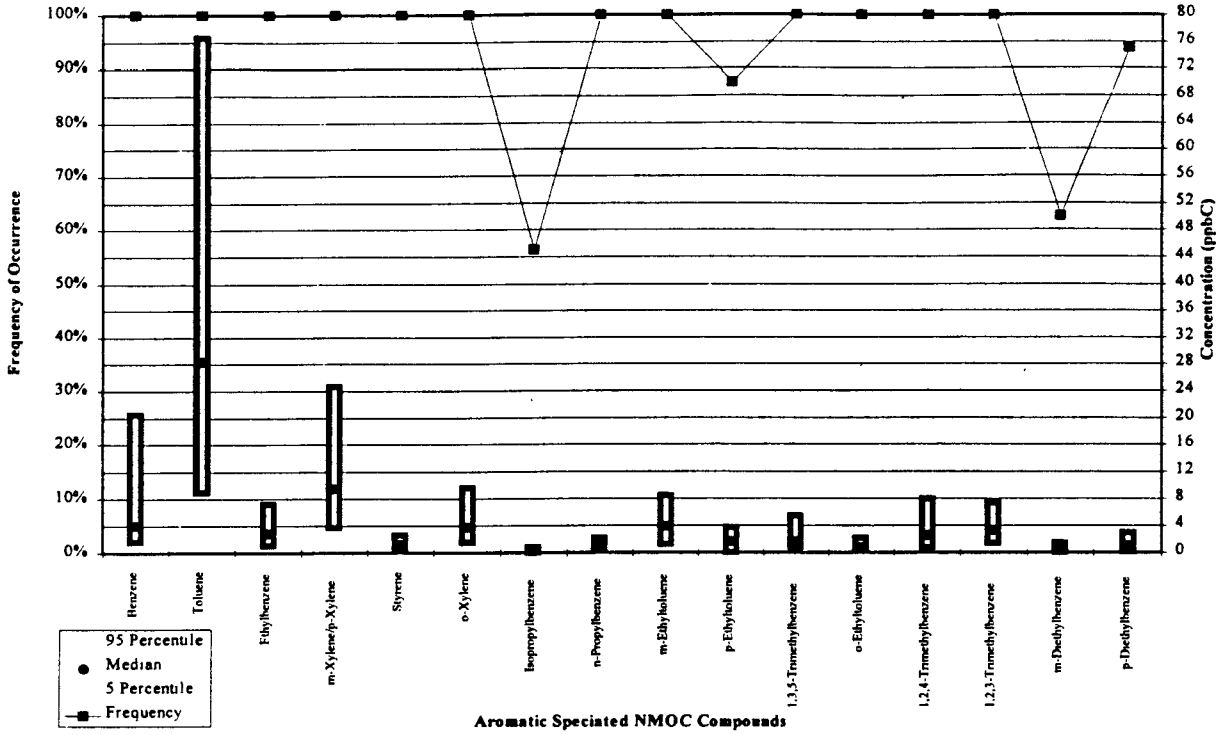


Figure 3-4. Frequency and Concentration Distribution of Aromatics for the 1995 Speciated NMOC Option

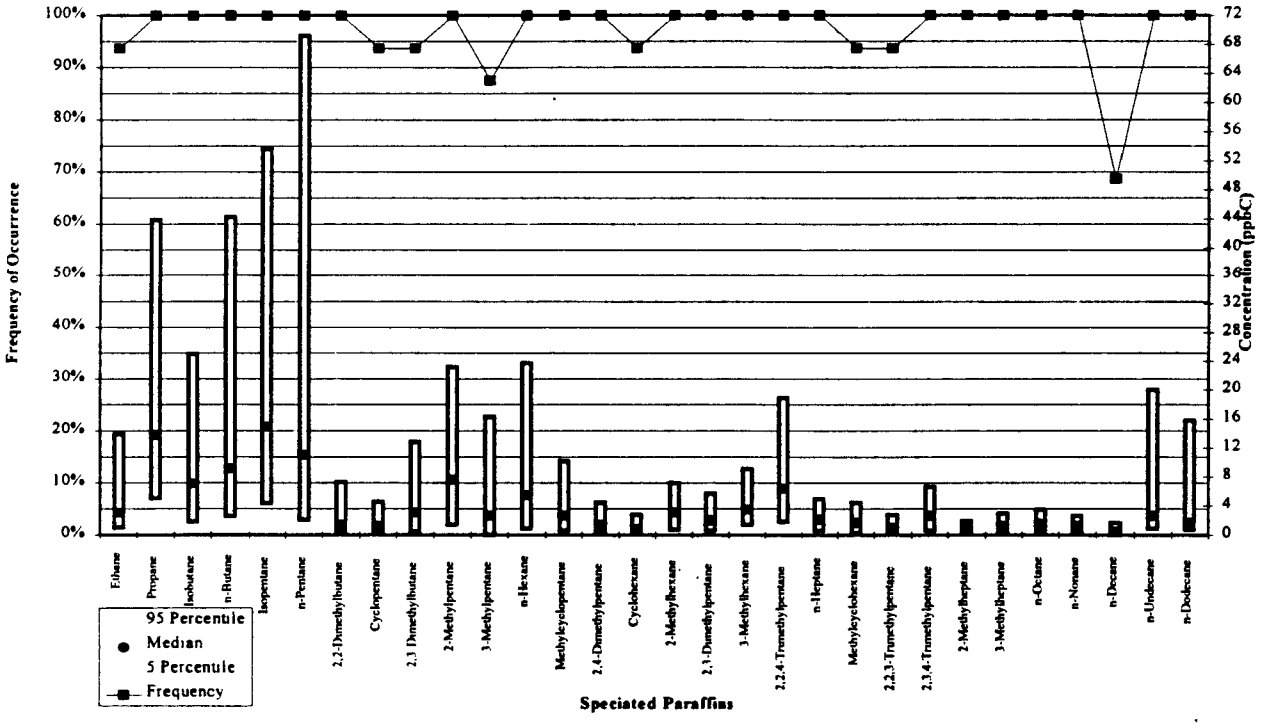


Figure 3-5. Frequency and Concentration Distribution for Paraffins for the 1995 Speciated NMOC Option

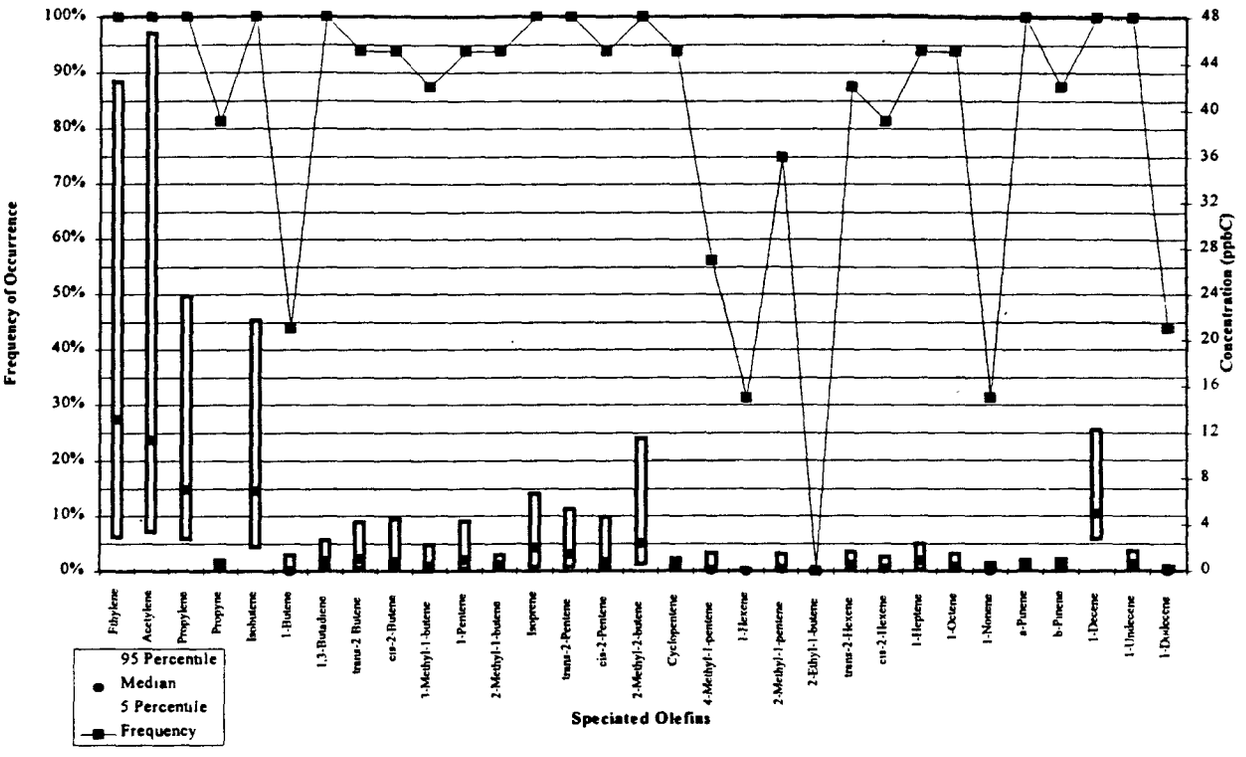


Figure 3-6. Frequency and Concentration Distribution of Olefins for the 1995 Speciated NMOC Option

the 78 compounds, 45 were detected in all 16 samples. Only one compound—2-ethyl-1-butene, was not detected in any of the samples.

Both the number and frequency of occurrence for both of the sites are presented in Appendix Table C-1 and Appendix Figures C-1 through C-6. Isopropylbenzene, m-diethylbenzene, ethane, 3-methylpentane, *n*-decane, propyne, 1-hexene, *cis*-2-hexene, 1-nonene, β-pinene, and 1-dodecene were detected more frequently at NWNJ. Cyclopentane, 2,3-dimethylbutane, cyclohexane, methylcyclohexane, 2,2,3-trimethylpentane, *trans*-2-butene, *cis*-2-butene, 1-pentene, 2-methyl-1-butene, *cis*-2-pentene, cyclopentene, 4-methyl-1-pentene, 1-heptene, and 1-octene were detected more frequently at P2NJ. Because the P2NJ site is located upwind and further from the potential emission sites than the NWNJ site, frequency of occurrence and concentration magnitude at this site are expected to be lower. However, as noted above and in Section 3.2.4, some compounds occur more frequently and at higher concentration levels at P2NJ. No explanation for these occurrences were identified.

3.1.4 UATMP VOC Option

Five sites participated in the UATMP VOC option: Newark, New Jersey (NWNJ), Plainfield, New Jersey (P2NJ), and Birmingham, Alabama (B1AL, B2AL, B3AL). For convenience, the UATMP VOC compounds were divided into two classes: the halogenated compounds and the nonhalogenated compounds. Both the number and frequency of occurrence for the overall program are provided in Appendix Table D-1 and frequency of occurrence is shown in Figures 3-7 and 3-8.

The nonhalogenated compounds occurred more frequently than the halogenated compounds. Nine of the 11 nonhalogenated compounds (*m*- and *p*-xylene coelute) were detected in all of the 43 samples. Only two—1,1,1-trichloroethane and carbon tetrachloride—of the 27 halogenated compounds were detected in all 43 samples. These two compounds were also detected with 100% frequency in Columbus, Ohio.[22] Of the 27 halogenated, 12 compounds were not detected in any of the samples. Six of these compounds (vinyl chloride, chloroethane, 1,1-dichloroethane, 1,2-dichloropropane, *cis*-1,3-dichloro-propene, and 1,1,2-trichloroethane) were also not detected in Columbus, Ohio.[22]

Both the number and frequency of occurrence for each of the five sites is presented in Appendix Table D-2 and Appendix Figures D-1 through D-10. Several additional compounds were detected in all of the samples at one or more of the five sites. Chloromethane was detected in all of the samples from Birmingham (B1AL, B2AL, B3AL) and in none of the samples from NWNJ or P2NJ. In Columbus, Ohio, chloromethane was detected with 97% frequency.[22] Methylene chloride, *n*-octane, tetrachloroethylene, and *p*-dichlorobenzene were detected in all of the samples from NWNJ, P2NJ, and B1AL. In Columbus, Ohio, methylene chloride was detected in 86% of the samples, tetrachloroethylene was detected in 76% of the samples and *p*-dichlorobenzene was detected in 1% of the samples.[22] Trichloroethylene was detected in all of the samples from P2NJ. In Columbus, Ohio, trichloroethylene was detected in only 17% of the samples.[22] 1,3-Butadiene was detected in all of the samples from B2AL. Several compounds were detected at some sites and not at others.

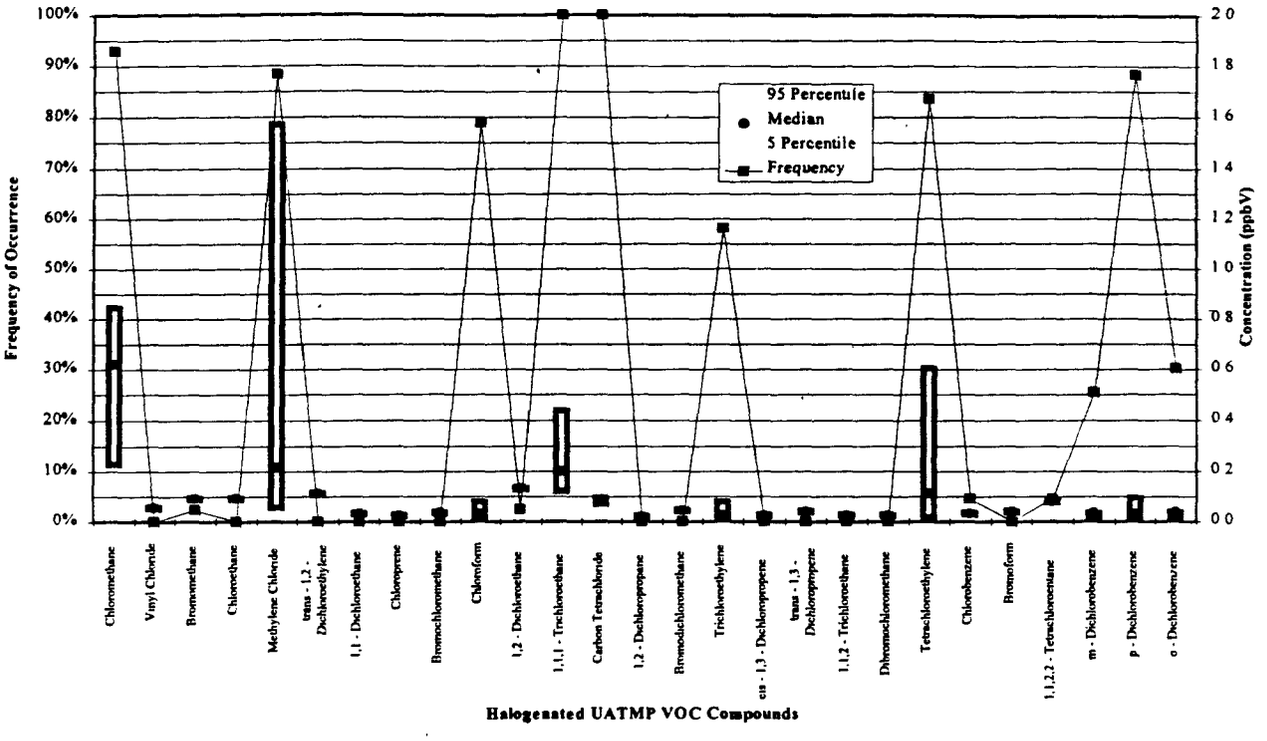


Figure 3-7. Frequency and Concentration Distribution for Halogenated UATMP VOCs in 1995

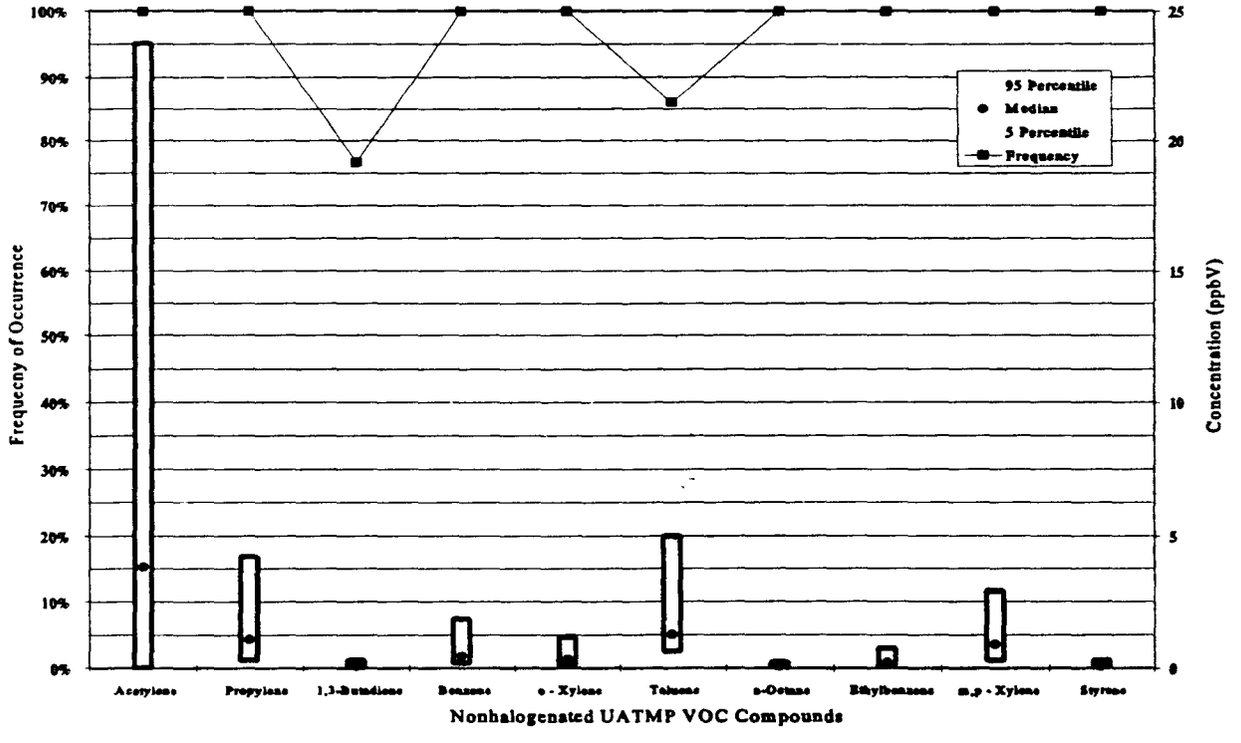


Figure 3-8. Frequency and Concentration Distribution for Nonhalogenated VOCs in 1995

Chlorobenzene was detected only at NWNJ and P2NJ. 1,2-Dichloroethane and 1,1,2,2-tetrachloroethane were only detected at NWNJ. Bromomethane was detected only at B2AL. In Columbus, Ohio, bromomethane was not detected at all.[22]

3.1.5 Carbonyl Option

Five sites participated in the carbonyl option: Newark, New Jersey (NWNJ), Plainfield, New Jersey (P2NJ), Dallas, Texas (DLTX), Fort Worth, Texas (FWTX), and New Orleans, Louisiana (NOLA). Both the number and frequency of occurrence for the overall program are provided in Appendix Table E-1 and frequency of occurrence is shown in Figure 3-9. Four compounds—formaldehyde, acetaldehyde, acetone, and hexaldehyde—were detected in all 41 analyzed samples. Four additional compounds—crotonaldehyde, butyraldehyde and isobutyraldehyde (which coelute), and benzaldehyde—were detected in over 50% of the analyzed samples. For comparison with other studies, formaldehyde, acetaldehyde, and acetone were detected in > 90%, butyraldehyde was detected in 17%, and crotonaldehyde and benzaldehyde were detected in <2% of samples collected in Columbus, Ohio during June and July, 1989.[22]

Both the number and frequency of occurrence for each of the five sites is presented in Appendix Table E-2 and frequency of occurrence is shown in Appendix Figures E-1 through E-5. Besides formaldehyde, acetaldehyde, acetone, and hexaldehyde, six additional compounds were detected in all of the samples at one or more of the five sites. Crotonaldehyde was detected in all of the samples at DLTX, NOLA, NWNJ, and P2NJ. Butryraldehyde and isobutyraldehyde were detected in all of the samples at NOLA, NWNJ, and P2NJ. Benzaldehyde was detected in all of the samples at NWNJ and P2NJ. Propionaldehyde was detected in all of the samples at DLTX; valeraldehyde was detected in all of the samples at P2NJ; and tolualdehyde was detected in all of the samples at FWTX.

Four compounds were not detected at all at one or more sites. 2,5-Dimethylbenz-aldehyde was not detected in any of the samples from DLTX, FWTX, and NOLA. Acrolein

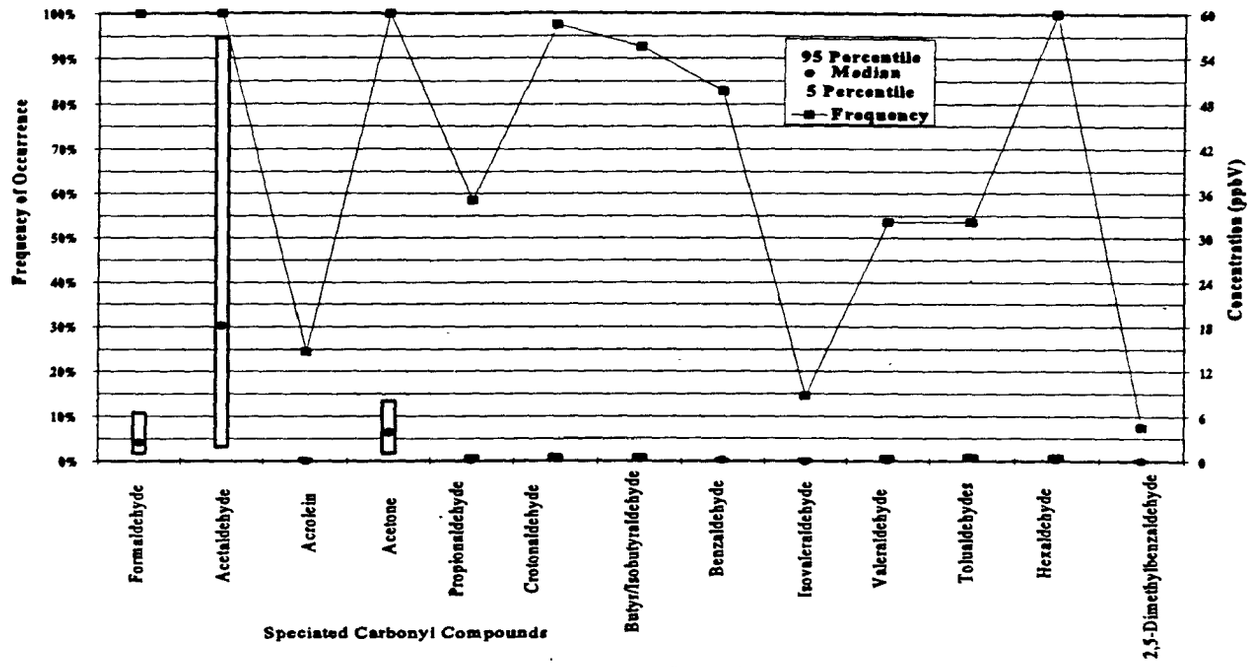


Figure 3-9. Frequency and Concentration Distribution for Carbonyls in 1995

was not detected in any of the samples from NOLA and P2NJ; isovaleraldehyde was not detected in any of the samples from DLTX or P2NJ. Tolualdehyde was not detected in any of the samples from NOLA.

3.2 Range, Central Tendency, and Variability

The following section discusses the concentration range, central tendency, and variability of the 1995 NMOC data.

Concentration range refers to the span of the concentration data, from lowest level to the highest. To indicate the range of chemical concentrations measured at the site, both the lowest and highest observed concentrations are reported. For most chemicals, at least one sample at each site resulted in a no*n*-detect, so the minimum concentration reported is one-half the detection limit as discussed in Section 3.2.1.

Median, arithmetic mean, and geometric mean concentrations are commonly calculated as a measure of the central tendency of a concentration distribution. The shape of the concentration distribution, however, determines the most appropriate value to use. Normally distributed data (having bell-shaped curves) have equal arithmetic mean and median values. If ambient air concentrations are normally distributed, the distribution central tendency would exactly equal the median and arithmetic mean of an adequate number of 3-hour average concentrations. As shown in many air monitoring studies,[23] including previous NMOC reports,[3] however, ambient air concentrations tend to more closely fit lognormal distributions. The lognormal distribution is asymmetrical with a higher probability of "outlier" observations than found in normal distributions. These outliers may exert an undue influence on the arithmetic mean. In particular, arithmetic mean concentrations calculated for lognormally distributed data generally overestimate the actual central tendency. The geometric mean more accurately represents the central tendency of lognormally distributed data. Although the geometric mean provides the best estimate of central tendency for NMOC monitoring results, the arithmetic mean and median concentrations have also been included in the data analysis to allow the reader to compare the results with other studies using these values instead of the geometric mean.

3.2.1 Treatment of Non-Detects

When analyzing ambient air monitoring data, something must be done with non-detect observations. These observations can be ignored, assigned a concentration of zero, or assigned some other proxy concentration. A non-detect result indicates that the actual chemical concentration in a sample is somewhere between zero and the detection limit. As a best estimate of the actual concentration, this study assigns all non-detect observations a concentration equal to half the detection limit. This approach has been followed by many previous monitoring studies and is the required approach for risk assessments involving environmental monitoring data.[24] Because the approach used to deal with non-detects significantly affects the data analysis, consistent approaches for treating non-detects should be used when comparing NMOC results to the results of other studies.

The accuracy of the central tendency estimates for any distribution ultimately depends on the number and accuracy of the individual measures. Concentrations above detection limits can be measured within acceptable accuracy bounds. Non-detect observations, however, cannot be assigned an accurate chemical concentration; the assumed concentration of half the detection limit represents only an estimate of the actual chemical concentration. Therefore, the accuracy of central tendency estimates decreases with increasing number of non-detect observations. For example, if a chemical has only "ND" readings for every sample, all the concentrations would be assigned a value of half the detection limit, and the median, arithmetic mean, and geometric mean would all equal this value; yet, the actual central tendency concentration could be anywhere between zero and the chemical detection limit.

Variability refers to the spread of data observations about the central tendency value. Variability in ambient air monitoring data may be useful to researchers examining the impact of meteorological and emissions fluctuations on ambient air concentrations. Common measures of the variability are the standard deviation and the coefficient of variation. Because standard deviations increase with higher data values, standard deviations of different data sets (e.g., for different chemicals) may not be comparable. The coefficient of variation, on the other hand, expresses the standard deviation of a data distribution as a percentage of the arithmetic mean. By scaling the standard deviation to the mean value, the coefficient of variation quantifies variability on a uniform scale, allowing comparison across distributions for different sites and chemicals.

3.2.2 NMOC Base Program

Three NMOC base sites participated in the 1995 NMOC program: Long Island, New York (LINY); Newark, New Jersey (NWNJ); and Plainfield, New Jersey (P2NJ). Data obtained for the 1995 NMOC program were analyzed for range, central tendency, and variability. Results of the analyses for the overall program and the individual sites are reported in Table 3-6 and depicted in Figure 3-10.

Table 3-6

Summary Statistics for All Sites in the NMOC Base Program in 1995

			Concentration Range (ppmC)		Central Tendency of Concentration (ppmC)				Concentration Variability		
Site	Cases	Non-Detects	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Arithmetic Coefficient of Variation	Geometric Standard Deviation
LINY	79	1	0.062	0.914	0.120	0.247	0.279	0.235	0.174	0.623	1.803
NWNJ	83	0	0.142	1.010	0.153	0.338	0.380	0.341	0.185	0.487	1.593
P2NJ	79	0	0.081	1.248	0.411	0.408	0.437	0.360	0.259	0.593	1.938
Overall	241	1	0.062	1.248	0.153	0.314	0.365	0.307	0.218	0.597	1.830

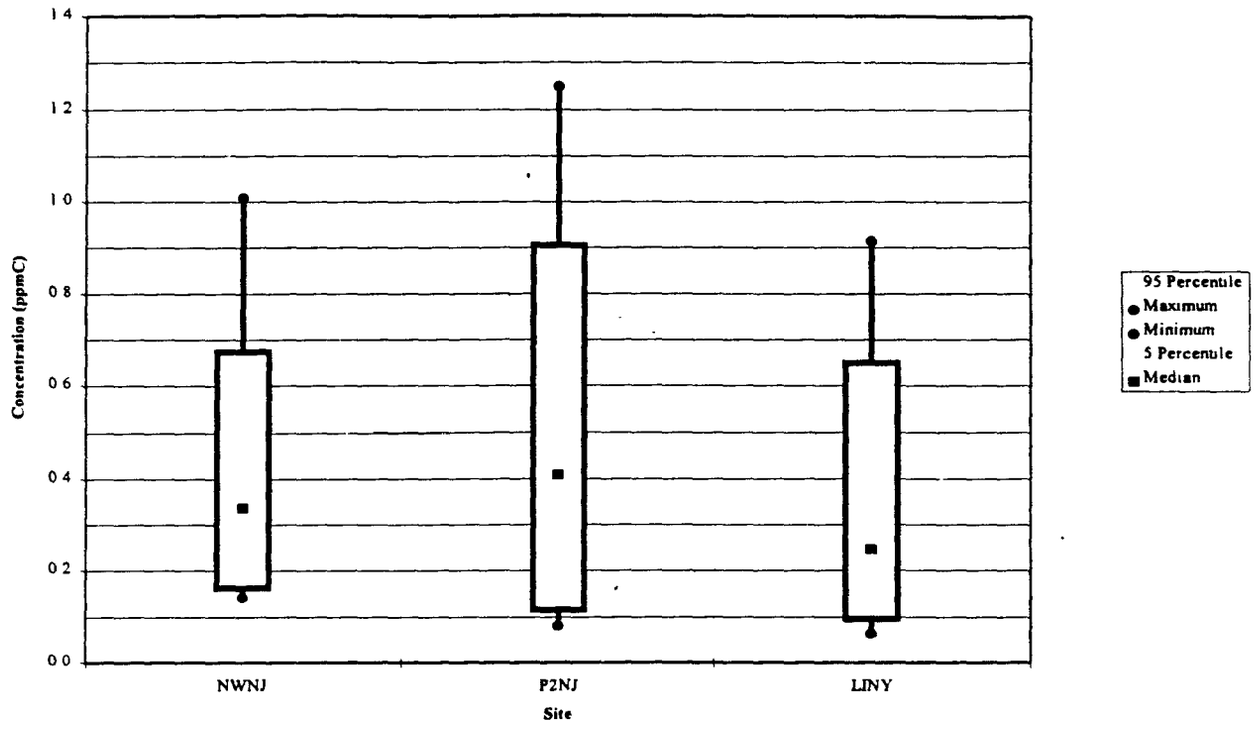
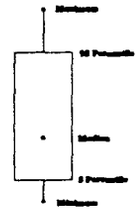


Figure 3-10. Comparison of NMOC Concentrations at the NMOC Base Sites in 1995

Figures 3-10 and 3-15 through 3-20 show statistical values in the form of a box plot. The maximum is depicted as a solid circle located above the box and attached to the box via a single, solid line. The top of the box represents the 95th percentile and the bottom of the box represents the 5th percentile; thus 90% of the sample values fall within the box. The median is depicted by a solid square within the box. Half of the samples are above the median and half of the samples are below the median. The minimum is depicted as a solid circle located below the box and attached to the box by a single, solid line.



Overall, P2NJ has the highest maximum, mode, median, and arithmetic and geometric means. These results are surprising because the P2NJ site is expected to be upwind from most of the sources during the summer sampling episode. However, the high NMOC levels could be related to the fleet of propane-fueled vehicles in the parking lot next to the sampling site. The

median propane levels are higher at P2NJ although the maximum observed propane concentration occurred at NWNJ as discussed in Section 3.2.4. The site is also located near roads with combined estimated traffic flows of 1500 vehicles per day. The median and maximum acetylene concentrations are higher at P2NJ. Acetylene is associated with vehicle emissions. The P2NJ is also located in a suburban residential area, so biogenic emissions could be greater due to the presence of more plants. P2NJ has the widest range of measured concentrations and the highest arithmetic and geometric standard deviations. No explanation is available for the higher and more variable NMOC concentrations observed at P2NJ.

3.2.3 Speciated NMOC Base Program

Seven sites participated in the Speciated NMOC base program: Birmingham, Alabama (B1AL, B2AL, B3AL); Dallas, Texas (DLTX); Fort Worth, Texas (FWTX); Juarez, Mexico (JUMX); and New Orleans , Louisiana (NOLA). Data obtained for the 1995 NMOC program were analyzed for range, central tendency, and variability. The results for all sites combined is reported in Appendix Table B-3. The medians and 5 and 95 percentiles are plotted in Figures 3-1 through 3-3. Results on a site-by-site basis are provided in Appendix Tables B-4 through B-10. The medians and 5 and 95 percentiles are plotted in Appendix Figures B-1 through B-21.

Of the NMOC measured, an average of 78% is speciated by the GC/FID method. The speciated NMOC data can be divided into three classes: aromatics, paraffins, and olefins. As shown in Figure 3-11, the speciated NMOC for the Speciated NMOC base program sites consists, on average, of 58% paraffins, 23% aromatics, and 19% olefins. Aromatic hydrocarbons have been found to be 20 to 40% (on a carbon basis) of the total nonmethane hydrocarbon concentration in the ambient air from a number of cities around the world.[25] The composition of each class is depicted in Figures 3-12 through 3-14. Isopentane, propane, and ethane constituted approximately 30% of the paraffins. Toluene accounted for 30% of the aromatic class with *m*- and *p*-xylene and benzene contributing almost another 30 percent. In ambient samples collected around the clock in 12 U.S. cities from 1979 to 1984, the average distribution of aromatic hydrocarbons was found to be 36% toluene, 15% *m*- and *p*-xylene, and 21% benzene.[25] Although

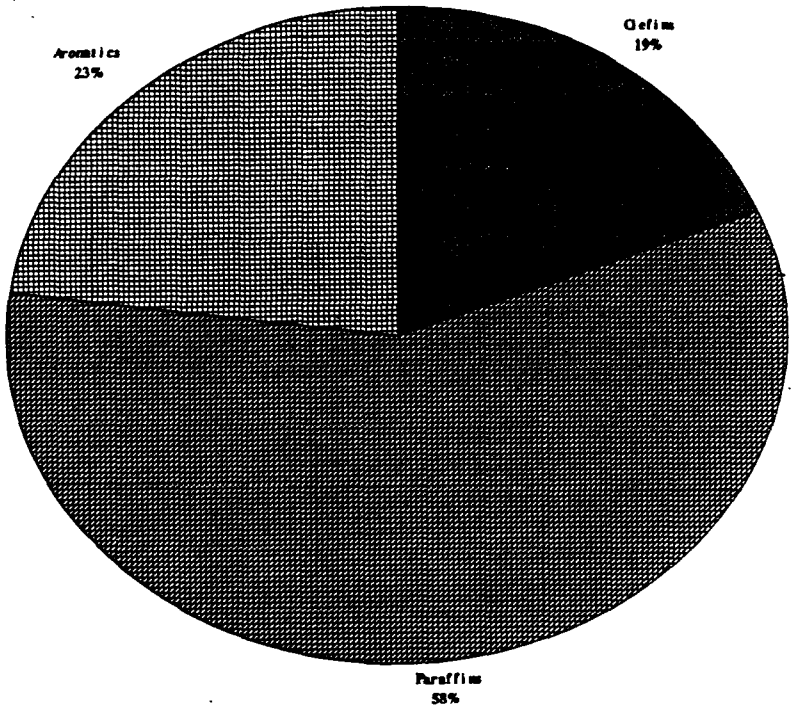


Figure 3-11. Distribution of the 78% of Identified NMOC between Compound Classes for the 1995 Speciated NMOC Base Program Sites

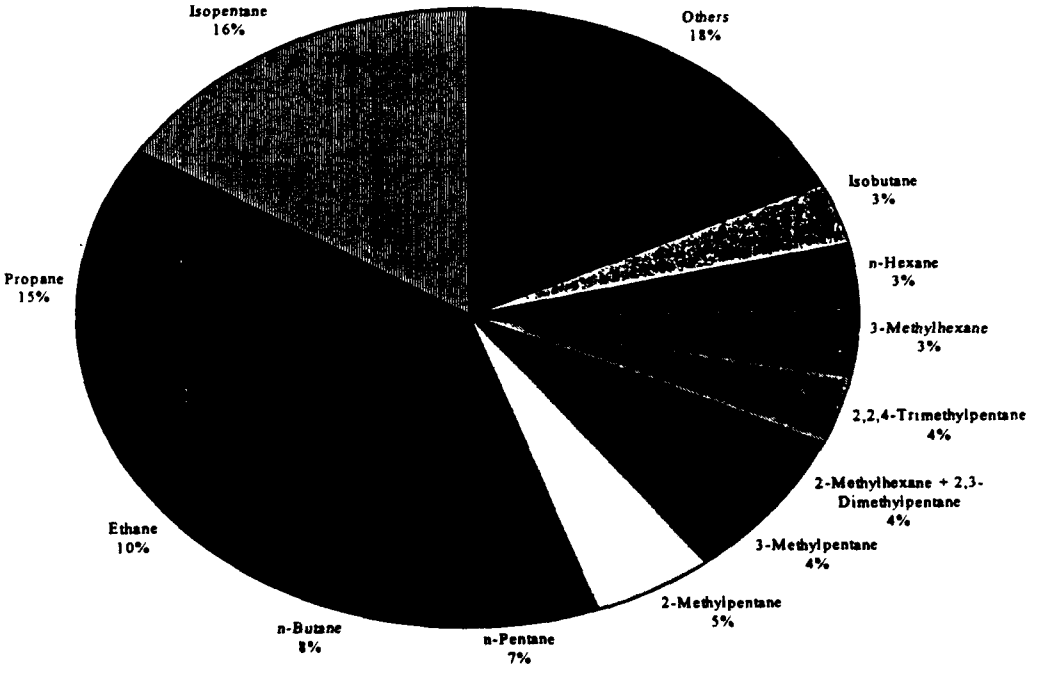


Figure 3-12. Average Composition of Paraffin Class for the 78% of Speciated NMOC in 1995

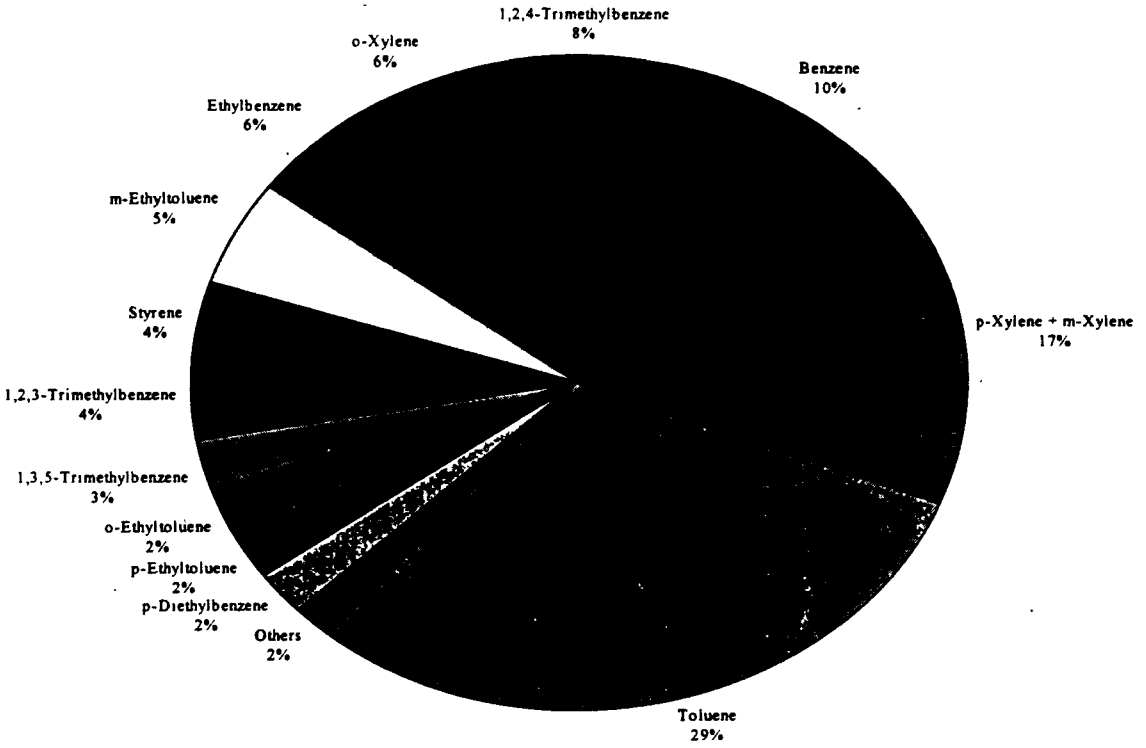


Figure 3-13. Average Composition of the Aromatic Class for the 78% of Speciated NMOC in 1995

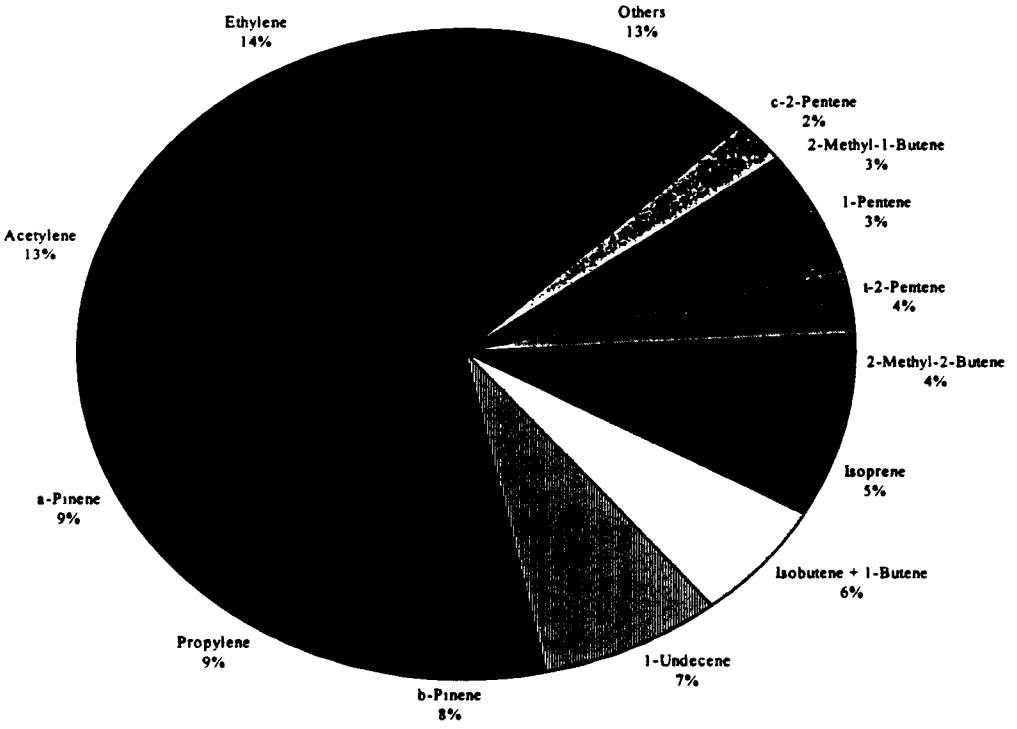


Figure 3-14. Average Composition of the Olefin Class for the 78% of Speciated NMOC in 1995

the ratio of toluene to *m*- and *p*-xylene and benzene combined is similar, the ratio of *m*- and *p*-xylene to benzene is higher than what was reported in 1979 to 1984. In the late 1970s, benzene was declared a carcinogen and as a result its use has been phased out for applications where other aromatic solvents can be substituted. Almost 30% of the olefin class is made up of ethylene and acetylene.

3.2.4 Speciated NMOC Option Program

Two of the NMOC base sites participated in the Speciated NMOC option: Newark, New Jersey (NWNJ), and Plainfield, New Jersey (P2NJ). Data obtained for the 1995 Speciated NMOC option program were analyzed for range, central tendency, and variability. The results for both sites combined are presented in Appendix Table C-2. The medians and 5 and 95 percentiles are plotted in Figures 3-4 through 3-6. Results on a site-by-site basis are provided in Appendix Tables C-3 and C-4. The medians and 5 and 95 percentiles are plotted in Appendix Figures C-1 through C-6.

Of the NMOC measured, an average of 85% is speciated by the GC/FID method–80% for NWNJ and 90% for P2NJ. The speciated NMOC data can be divided into three classes: aromatics, paraffins, and olefins. Figure 3-15 depicts the percentage of speciated NMOC that belonged to each class. The majority of the speciated NMOC were paraffins. Isopentane, propane, and pentane constitute, on average, 36% of the paraffin fraction. Approximately equal percentages of the speciated NMOC belonged to the aromatic and olefin fractions. Toluene represents about 40% of the aromatic fraction. The distribution of the total NMOC into the aromatic fraction and of the aromatic fraction into toluene agrees well with what has been reported previously.[25] Approximately 40% of the olefin fraction is made up of ethylene and acetylene.

Figure 3-16 depicts the percentage of speciated NMOC that belonged to each class on a site basis. Although the medians tend to be similar for all three classes at both sites, the ranges differ for the paraffins and olefins. At NWNJ the paraffins sometimes constitute a larger fraction

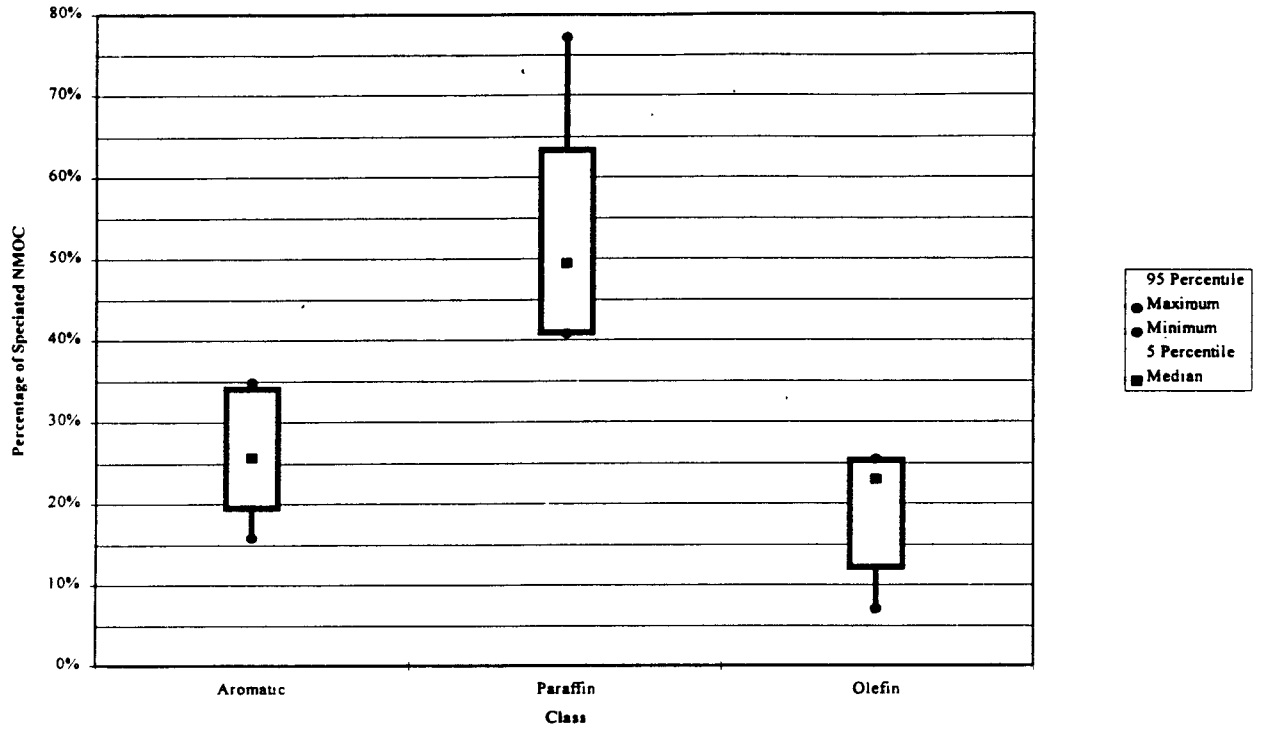


Figure 3-15. Class Breakdown of Speciated NMOC for the 1995 Speciated NMOC Option Sites

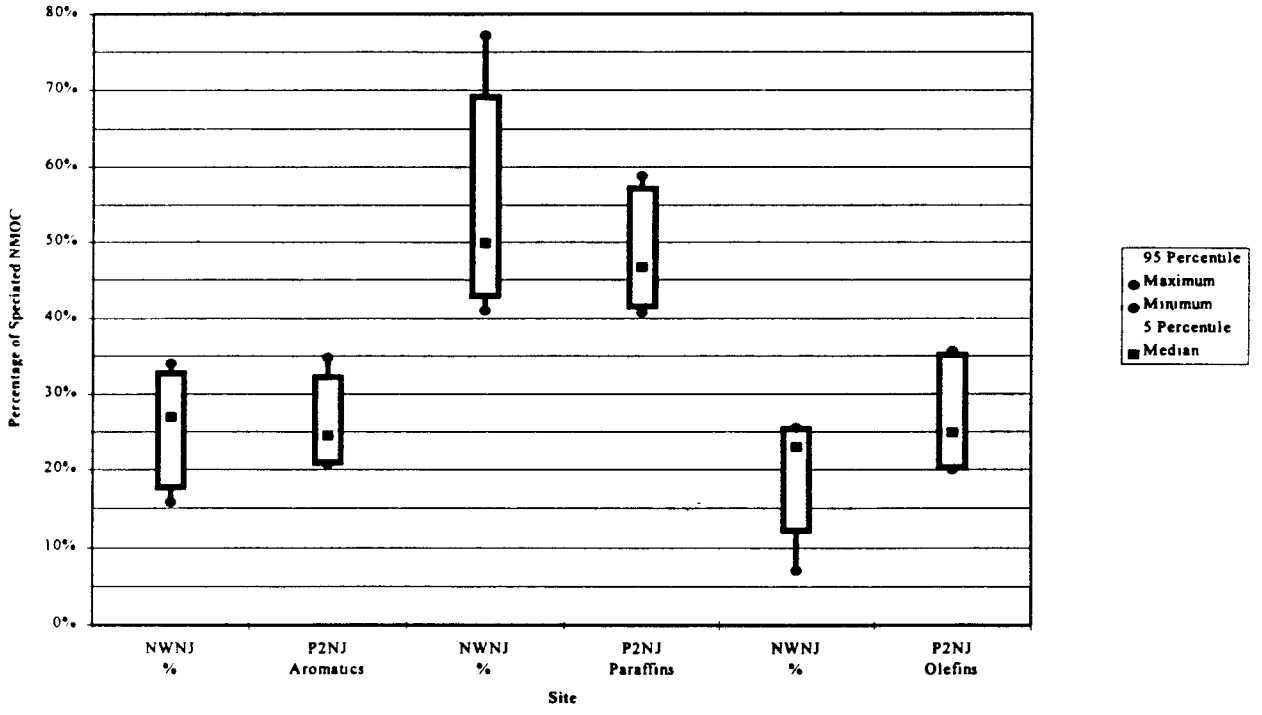


Figure 3-16. Comparison of Speciated NMOC on a Class and Site Basis for the 1995 Speciated NMOC Option Program

and the olefins a smaller fraction of the speciated NMOC than at P2NJ. Figure 3-17 shows the concentration ranges measured for each class at each site. The median at P2NJ is higher for all three classes. The concentration range for the olefins is similar at both sites. For the aromatics and paraffins, the range of concentrations observed is smaller at P2NJ. Figure 3-18 shows the concentration ranges at both sites for the six compounds that constitute approximately 40% of the speciated NMOC. In each case, the median concentration is higher at P2NJ than at NWNJ. The range of concentrations observed are smaller for propane and *n*-pentane and are larger for acetylene at P2NJ than at NWNJ.

3.2.5 UATMP VOC Option

Five sites participated in the UATMP VOC option: Newark, New Jersey (NWNJ), Plainfield, New Jersey (P2NJ), and Birmingham, Alabama (B1AL, B2AL, B3AL). Data obtained for the 1995 UATMP VOC option program were analyzed for range, central tendency, and variability. The results for all five sites combined is presented in Appendix Table D-3. Figures 3-7 and 3-8 graphically display the median and the 5 and 95 percentiles. Results on a site-by-site basis are provided in Appendix Tables D-4 through D-8. Appendix Figures D-1 through D-10 display the medium and 5 and 95 percentiles. The observed concentration ranges for benzene, *o*-xylene, toluene, ethylbenzene, *m*- and *p*-xylenes, and carbon tetrachloride were similar to the concentration ranges observed in Columbus, Ohio[22] for samples taken throughout the day in June and July of 1989. The observed concentration ranges for acetylene and propylene were larger than those observed in Columbus, Ohio.[22] The observed maximum concentrations for chloromethane, methylene chloride, 1,1,1-trichloro-ethane, and tetrachloroethane were smaller (sometimes by as much as a factor of 10) than those observed in Columbus, Ohio.[22]

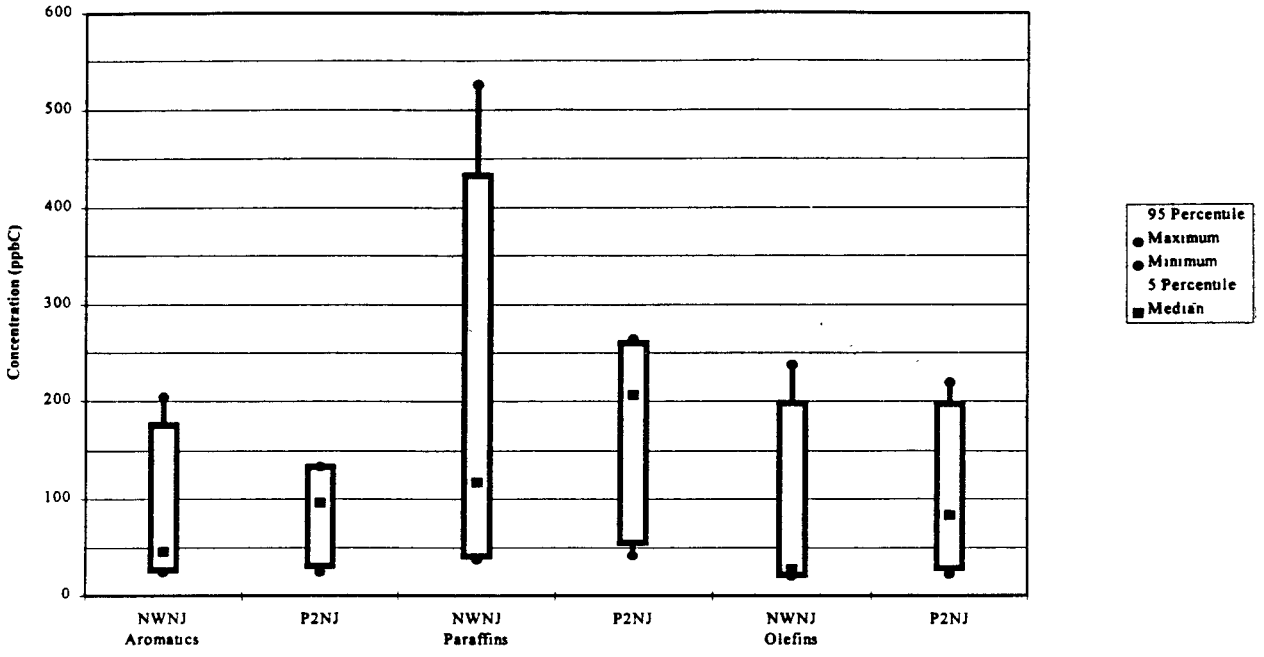


Figure 3-17. Site Comparison of Speciated Class Concentrations for the 1995 Speciated NMOC Option Program

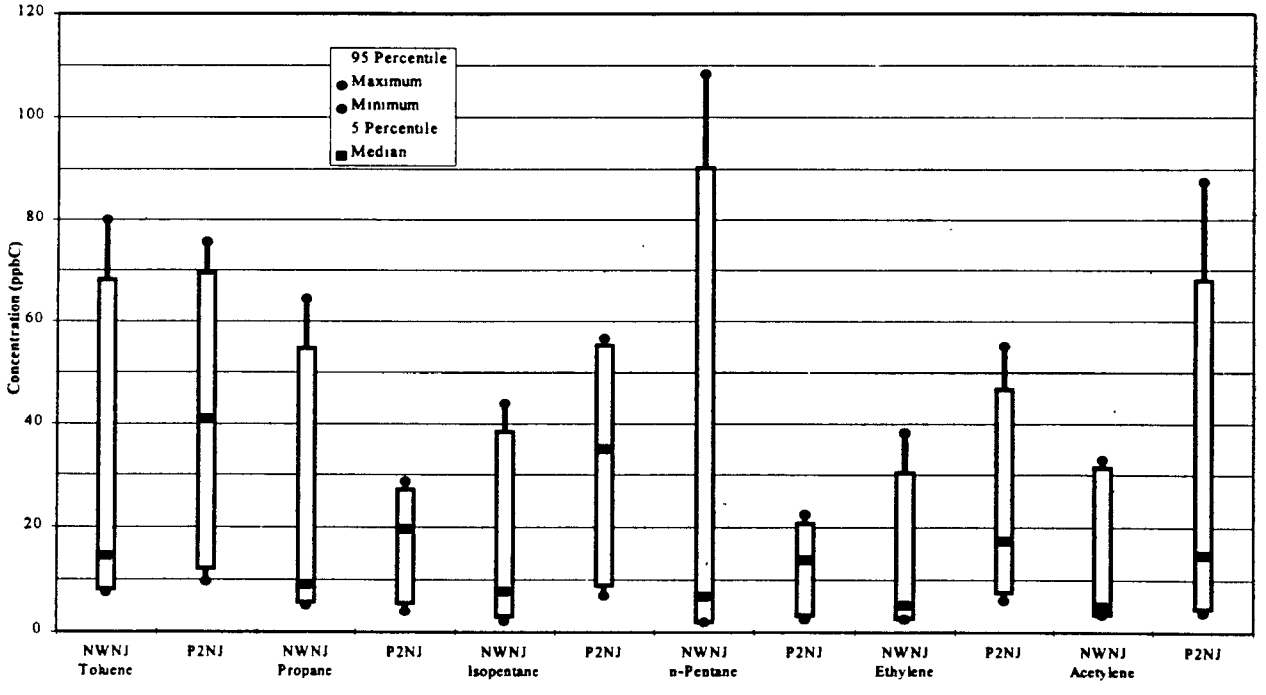


Figure 3-18. Site Comparison of Compounds Comprising 40 Percent of Speciated NMOC for the 1995 Speciated NMOC Option Program

The UATMP VOCs can be divided into two fractions: the halogenated compounds (those containing chlorine, bromine, or both) and the nonhalogenated compounds. Figure 3-19 shows the median and concentration ranges for the sum of these two fractions and Figure 3-20 shows the median percent of total UATMP VOC and the ranges in percent composition. The total concentration of halogenated compounds is much less than nonhalogenated compounds. Halogenated compounds only constitute from 6 to 50% of the measured UATMP VOC, whereas the nonhalogenated compounds make up 50 to 94 percent.

As shown in Figure 3-21, the measured UATMP VOCs consist, on average, of approximately 38% acetylene, 14% toluene, 9% propylene, 7% *m*- and *p*-xylenes, 6% chloromethane, and 4% benzene. As shown in Figure 3-22, chloromethane constitutes approximately 25% of the halogenated fraction. Methylene chloride, 1,1,1-trichloroethane, and tetrachloroethane make up an additional 30% of the halogenated portion.

3.2.6 Carbonyl Option

Five sites participated in the carbonyl option: Newark, New Jersey (NWNJ), Plainfield, New Jersey (P2NJ), Dallas, Texas (DLTX), Fort Worth, Texas (FWTX). and New Orleans, Louisiana (NOLA). Data obtained for the 1995 Carbonyl Option program were analyzed for range, central tendency, and variability. These values are summarized for the overall program in Appendix Table E-3. Figure 3-9 depicts the median and 5 and 95 percentiles. Concentration range, central tendency, and variability for each of the five sites is presented in Appendix Tables E-4 through E-8. Appendix Figures E-1 through E-5 show the median and 5 and 95 percentiles for each compound on a site by site basis. The combined data was compared to maximum values observed in Columbus, Ohio,[22] throughout the day in June and July, 1989. The observed maximum formaldehyde value was lower than at Columbus, Ohio.[22] The observed maximum acetaldehyde value was higher than at Columbus, Ohio;[22] and the observed maximum acetone value was similar.[22]

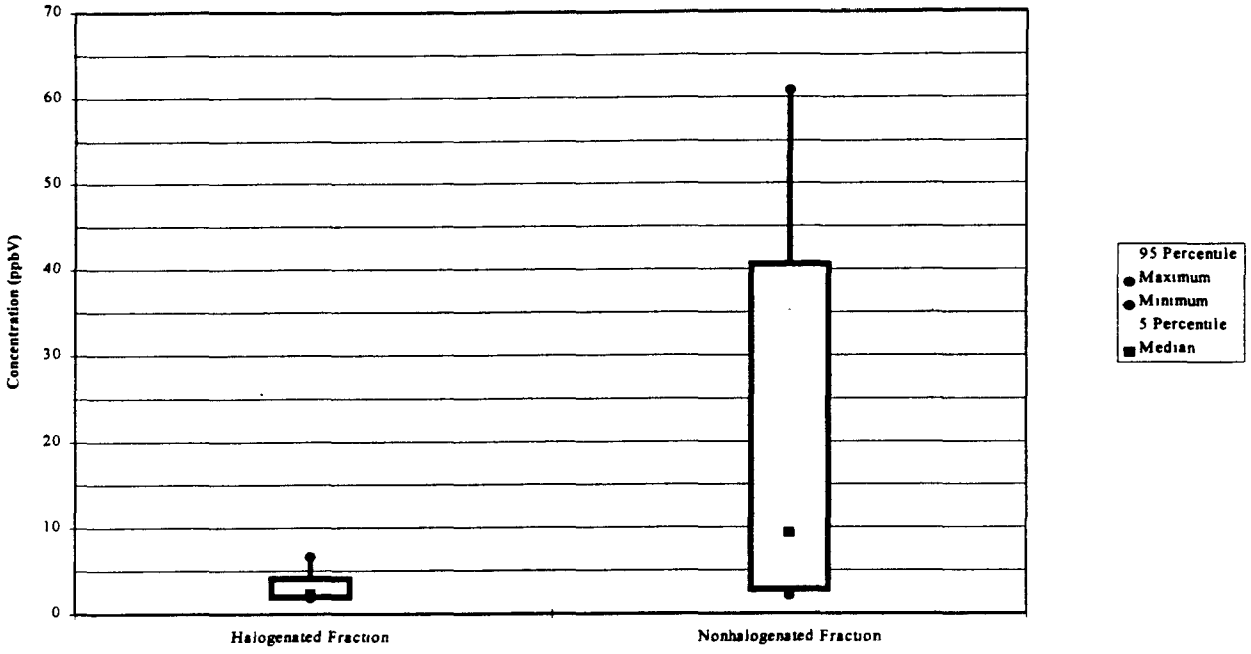


Figure 3-19. Comparison of Concentration Ranges of Different Fractions of VOC for the 1995 UATMP VOC Option

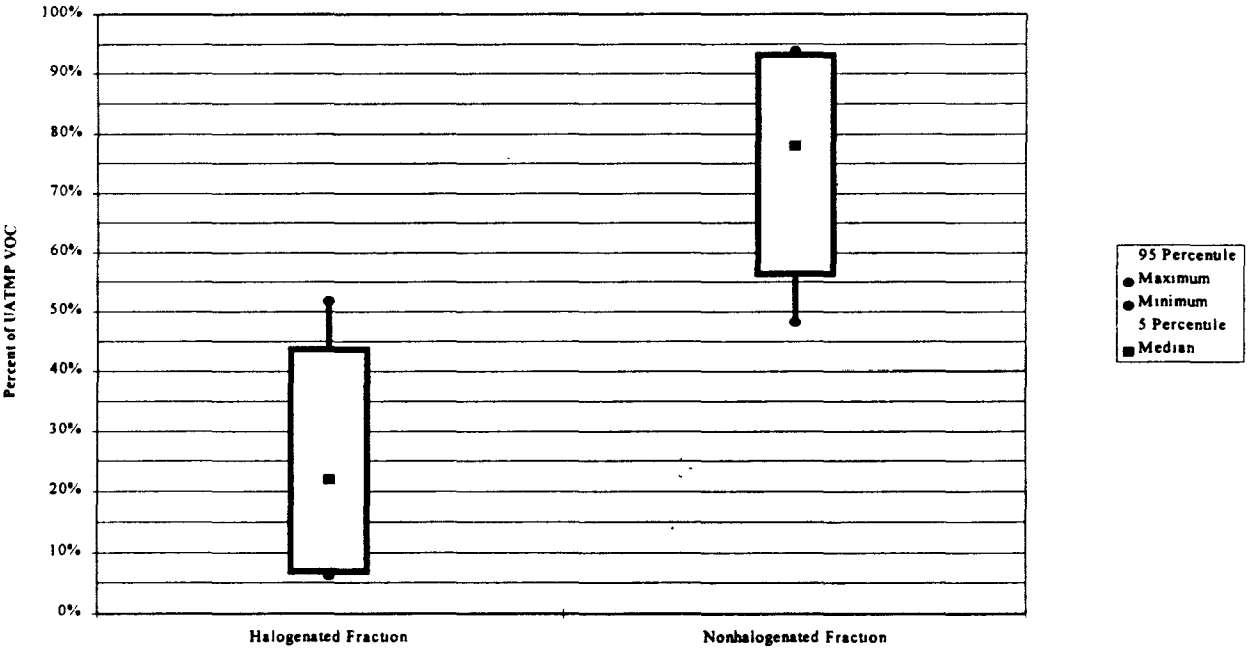


Figure 3-20. Percentage of UATMP VOC Per Compound Class in 1995

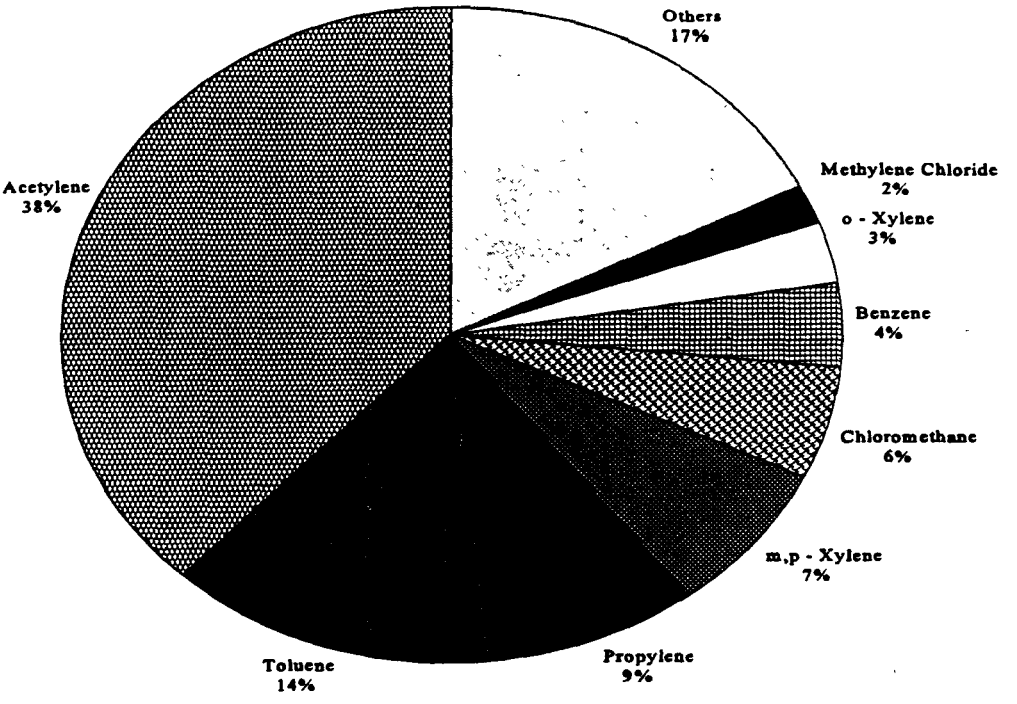


Figure 3-21. Composition of UATMP VOC Fraction in 1995

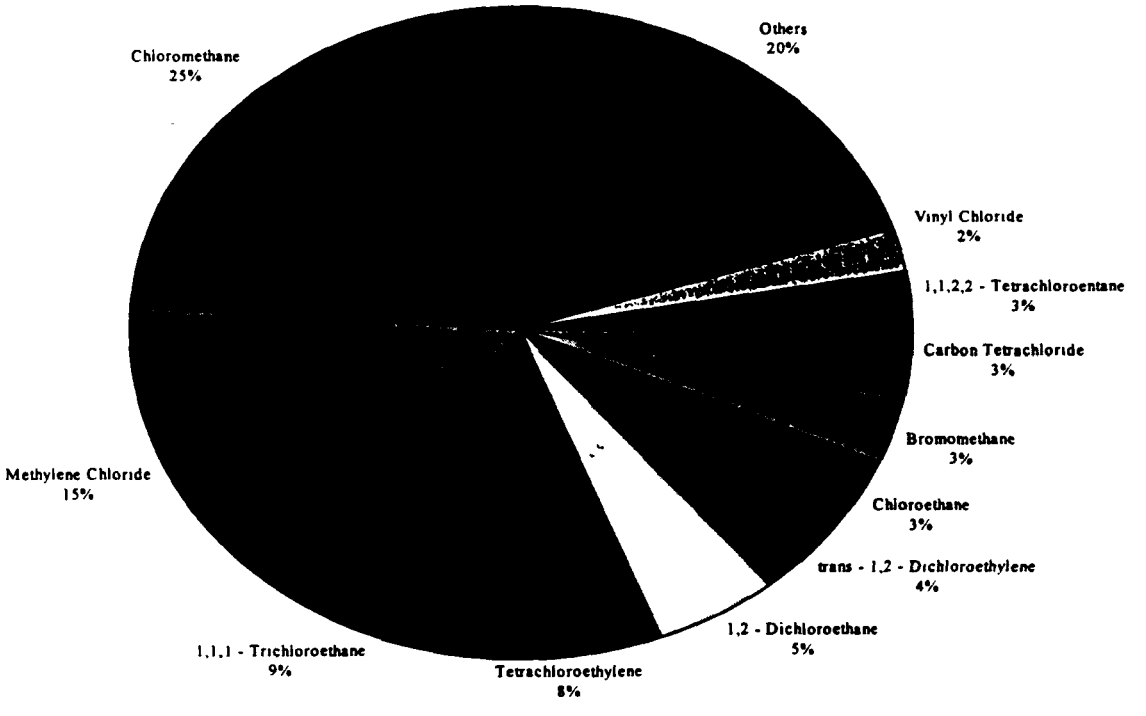


Figure 3-22. Composition of Halogenated Fraction of the UATMP VOC in 1995

As shown in Figure 3-23, the carbonyl fraction consists primarily of 14% formaldehyde, 62% acetaldehyde, and 16% acetone. Of the speciated carbonyl compounds, acetaldehyde has the highest median and maximum concentrations and its measured concentration varies the most. No explanation was identified for why acetaldehyde rather than formaldehyde was the most abundant carbonyl measured. The median, maximums, and amount of variability in measured concentrations are similar for formaldehyde and acetone. The other speciated carbonyl compounds are detected only at trace levels and individually constitute only 2% or less of the carbonyl fraction.

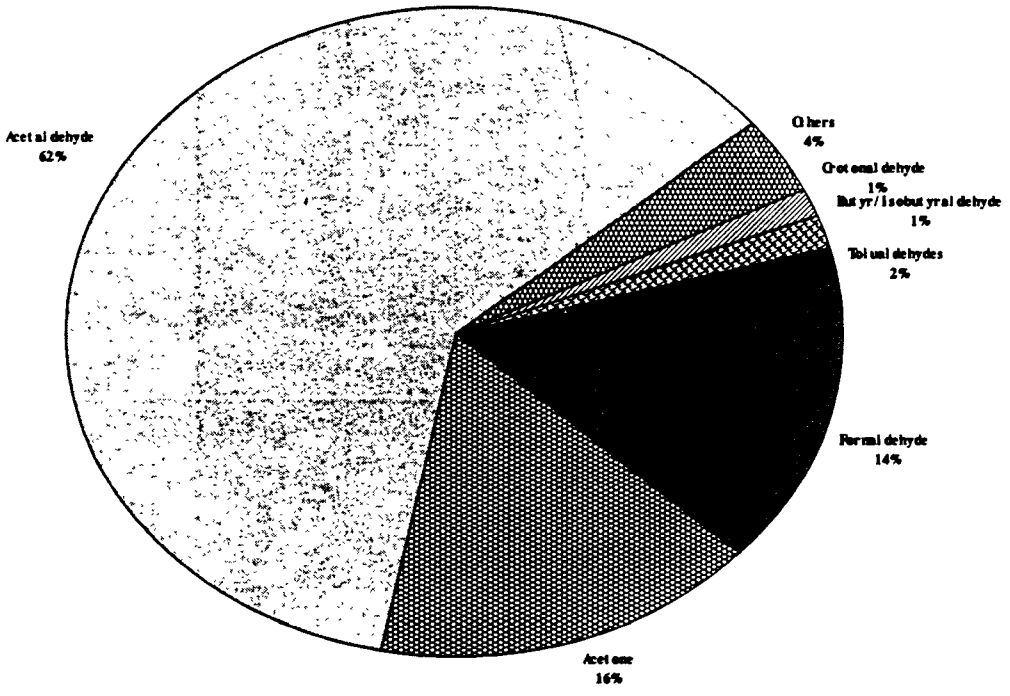


Figure 3-23. Composition of Carbonyl Fraction in 1995

4.0 GEOGRAPHICAL COMPARISONS

One objective of the NMOC monitoring program is to allow comparison of VOC concentrations in different airsheds or urban metropolitan areas. Comparisons include contrasting VOC data collected at urban versus suburban and urban versus rural sites within an airshed and between airsheds. Geographic comparisons of the data allow differences in airsheds to be identified and quantified.

4.1 Metropolitan Area Comparison

Five different metropolitan areas were represented by the 1995 NMOC base and Speciated NMOC base sites. These metropolitan areas are New York City, Birmingham, Dallas-Fort Worth, El Paso-Juarez, and New Orleans. All of the base NMOC data was collected in the New York City and Northeastern New Jersey airshed so no metropolitan area comparisons were possible for the NMOC base data. The NMOC measured using TO-12 is usually higher than the total NMOC measured using the GC/FID method. Higher values may be obtained using TO-12 because there is no column to retain compounds and NMOC greater than C_{13} can also be included. Total NMOC measured using the GC/FID method is based on summing all of the peak areas from C_1 to C_{13}. Thus, the base NMOC data was not compared with the Speciated NMOC base data.

4.1.1 Speciated NMOC Compounds

Four metropolitan areas are represented by the seven sites participating in the 1995 Speciated NMOC base program: Birmingham, Alabama (B1AL, B2AL, B3AL); Dallas and Fort Worth, Texas (DLTX, FWTX); Juarez, Mexico (JUMX); and New Orleans, Louisiana (NOLA). Comparisons were made between several parameters including prevalence of compounds and the magnitude and variability of the measured concentrations.

Frequency of occurrence of the aromatic compounds is depicted in Figure 4-1. The aromatic compounds occur most frequently in the El Paso-Juarez area and least frequently in the New Orleans area. Benzene, toluene, ethylbenzene and the xylenes are prevalent in all areas whereas isopropylbenzene occurs infrequently in all areas.

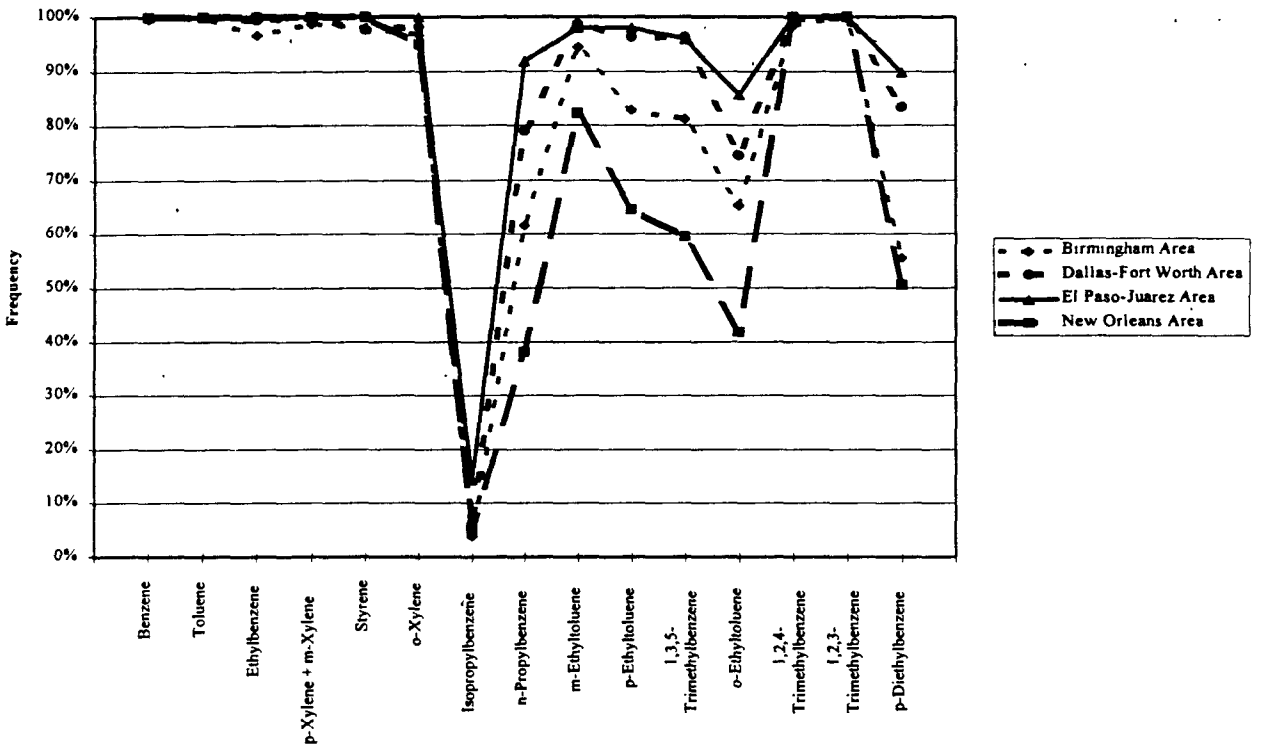


Figure 4-1. Frequency of Occurrence of Speciated Aromatics in 1995

Frequency of occurrence of the paraffin compounds is shown in Figure 4-2. The paraffin compounds occur most frequently in the Dallas-Fort Worth and El Paso-Juarez areas and least frequently in the Birmingham and New Orleans areas. Frequency of occurrence of the olefin compounds is graphed in Figure 4-3. The prevalence of the olefins is fairly consistent from metropolitan area to metropolitan area although there are differences in prevalence for some of the olefin compounds. For example, *c*-2-pentene occurs less frequently in the New Orleans area and *t*-2-hexene occurs more frequently in the El Paso area.

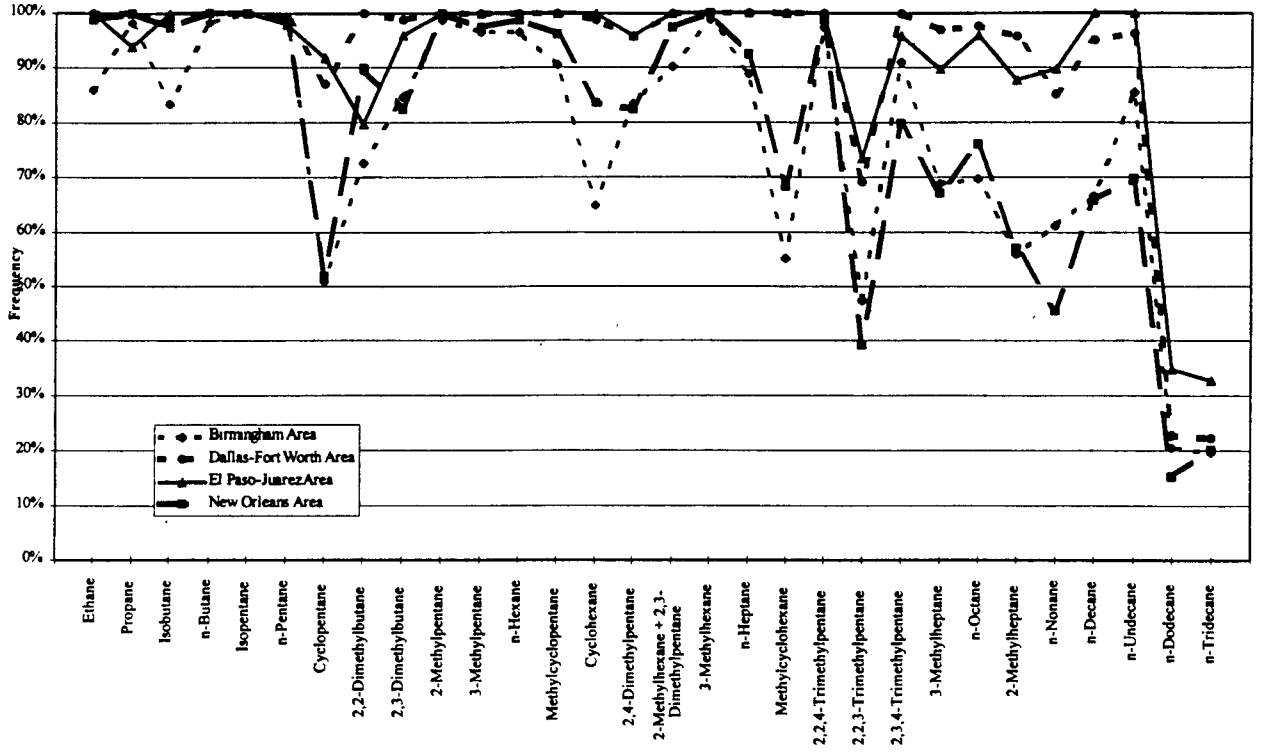


Figure 4-2. Frequency of Occurrence of Paraffins in 1995

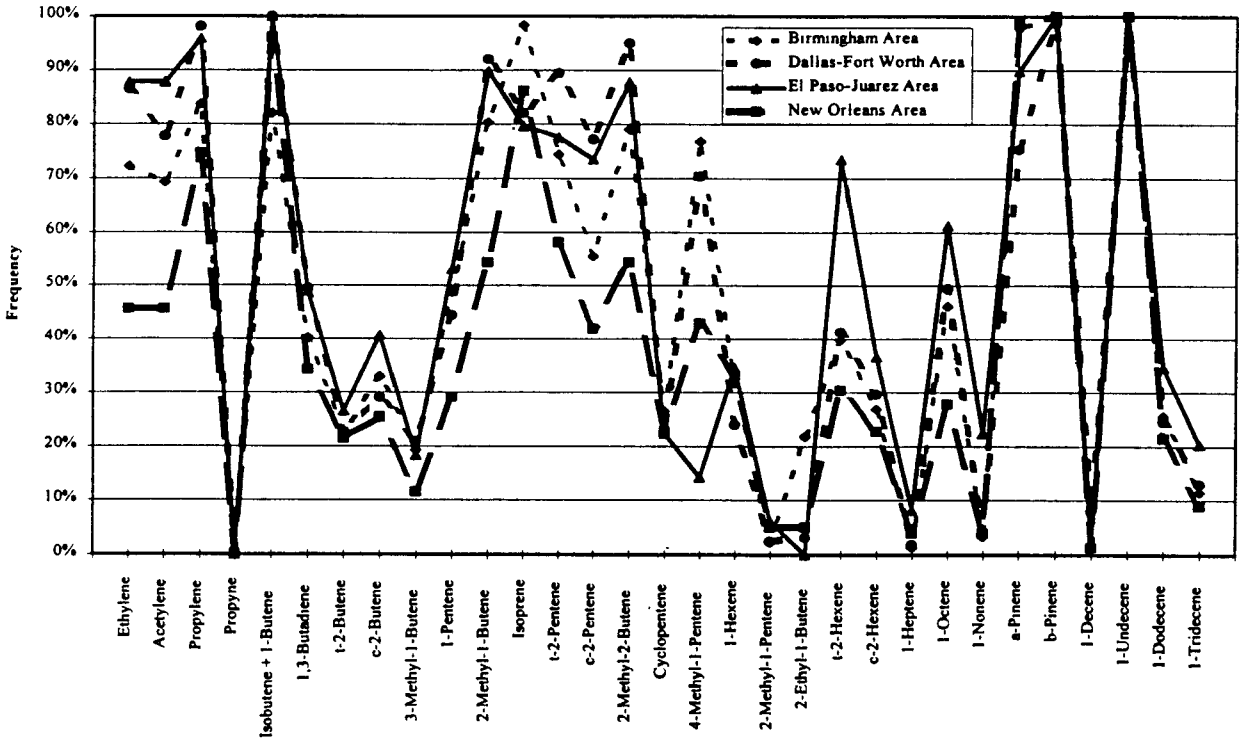


Figure 4-3. Frequency of Occurrence of Olefins in 1995

On average, 78% of the total NMOC was speciated in each metropolitan area. The average class composition of the speciated NMOC was calculated for each metropolitan area and remained fairly consistent from area to area. The aromatic fraction varied the least from metropolitan area to metropolitan area ranging from a low of 21% at New Orleans to a high of 24% at Birmingham. The paraffin fraction varied the most, ranging from 53% at Birmingham to 64% at El Paso-Juarez. The olefin fraction ranged from 14% at Juarez to 23% at Birmingham.

The average composition of each class was also examined. The composition of the aromatic class was consistent between the metropolitan areas. However, differences were observed in the composition of the paraffin and olefin classes. The compositions of the paraffin and olefin classes for each metropolitan area are shown in Figures 4-4 through 4-11. The composition of the paraffin class was very similar in Dallas-Fort Worth and in New Orleans. In Birmingham, the isopentane fraction was slightly larger (22% versus 15%) and the propane and ethane fractions were slightly smaller (7 to 10% versus 12 to 13%). The largest observed difference in the paraffin composition was observed for Juarez where propane comprised, on average, 36% of the speciated paraffins. The relatively high percentage of propane concentrations at the Juarez, Mexico (JUMX) site is consistent with a previous finding of high alkane hydrocarbons, including propane, in Mexico City. In this study, Blake and Rowland concluded that the observed high alkane concentrations were likely the result of leakage and incomplete combustion of liquid petroleum gas (LPG), a common cooking fuel in Mexico, and that these emissions contributed significantly to ozone formation in Mexico City.[26]

In Dallas-Fort Worth and Juarez, ethylene and acetylene combined, comprised greater than 30% and α- and β-pinene comprised less than 10% of the olefin fraction. In Birmingham and New Orleans, the olefin fraction consisted of less ethylene and acetylene and more α- and β-pinene. In Birmingham, ethylene and acetylene comprised 25% and α- and β-pinene comprised 19% of the olefin fraction while in New Orleans, ethylene and acetylene comprised only 17% and α- and β-pinene comprised 36%, on average. α- and β-Pinene have been associated with biogenic emissions. The observed levels of α- and β-pinene are consistent with estimates of biogenic emissions that are available from the U.S. EPA BEIS2.2 biogenic

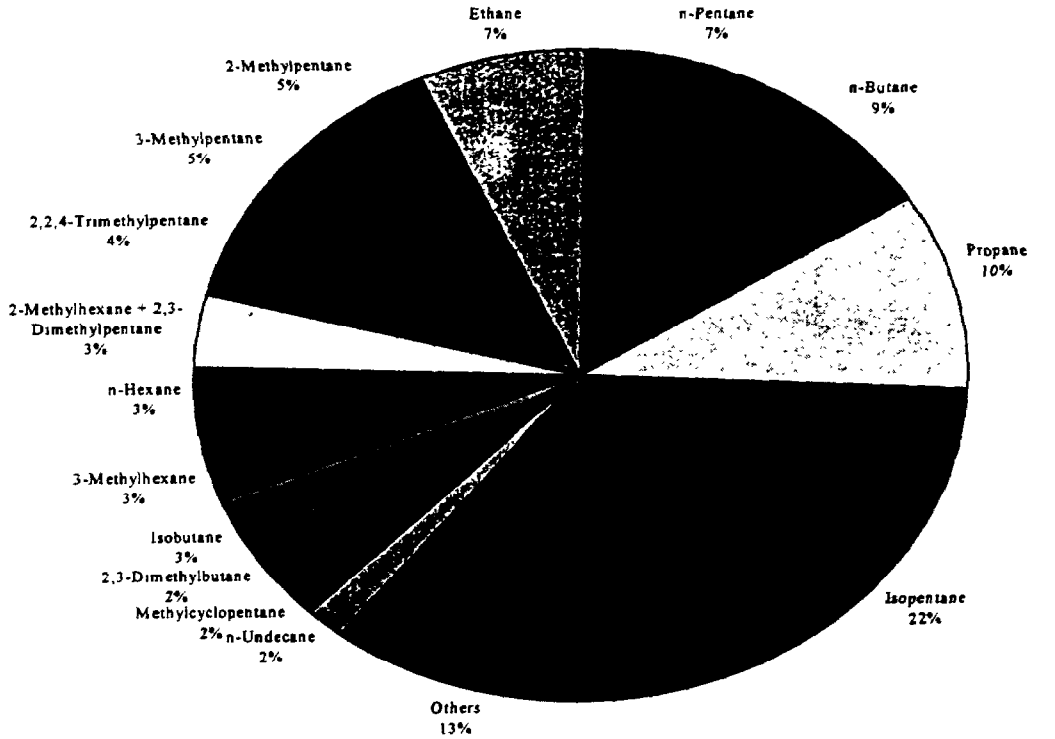


Figure 4-4. Composition of Paraffin Fraction at Birmingham in 1995

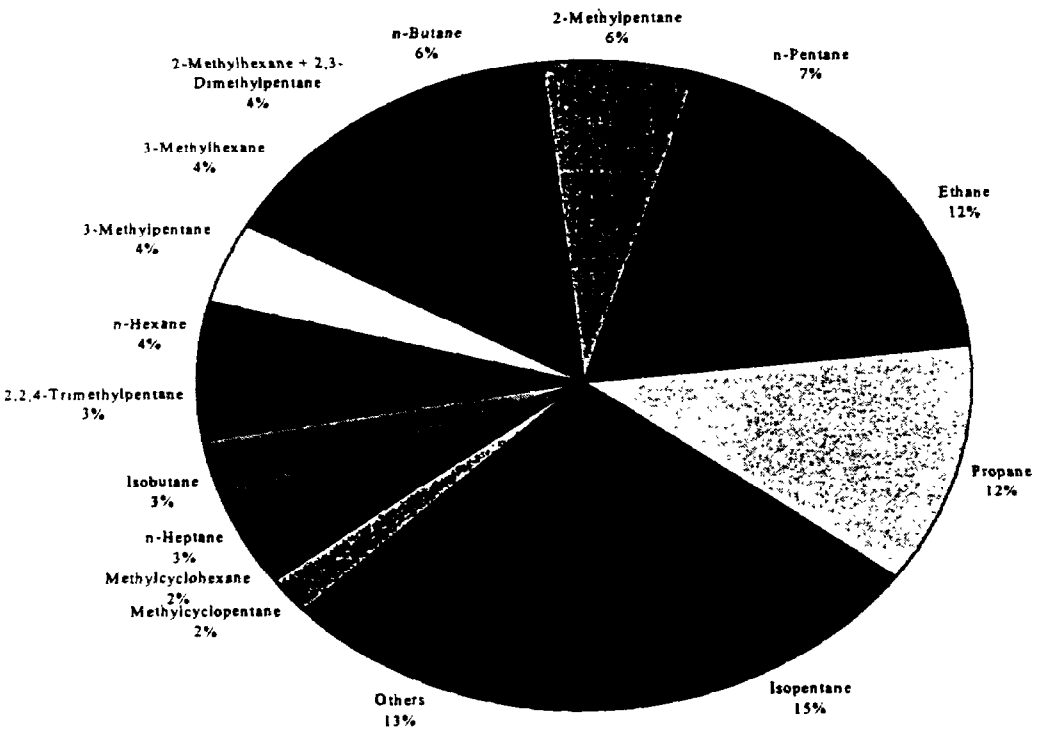


Figure 4-5. Composition of Paraffin Fraction at Dallas-Fort Worth in 1995

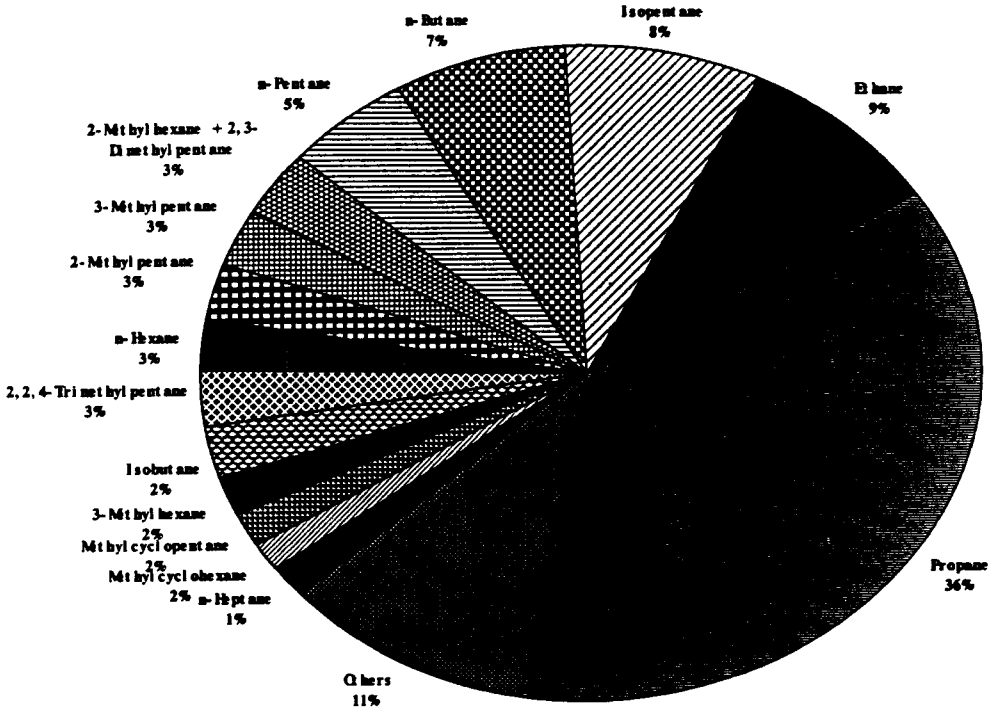


Figure 4-6. Composition of Paraffin Fraction at Juarez in 1995

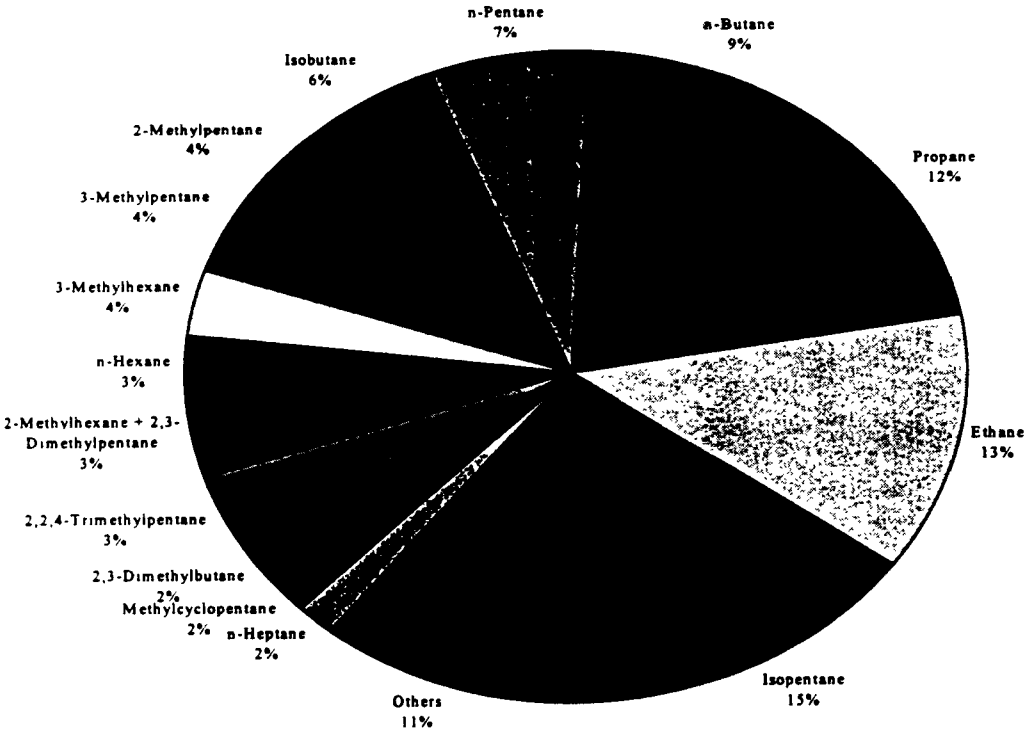


Figure 4-7. Composition of Paraffin Fraction at New Orleans in 1995

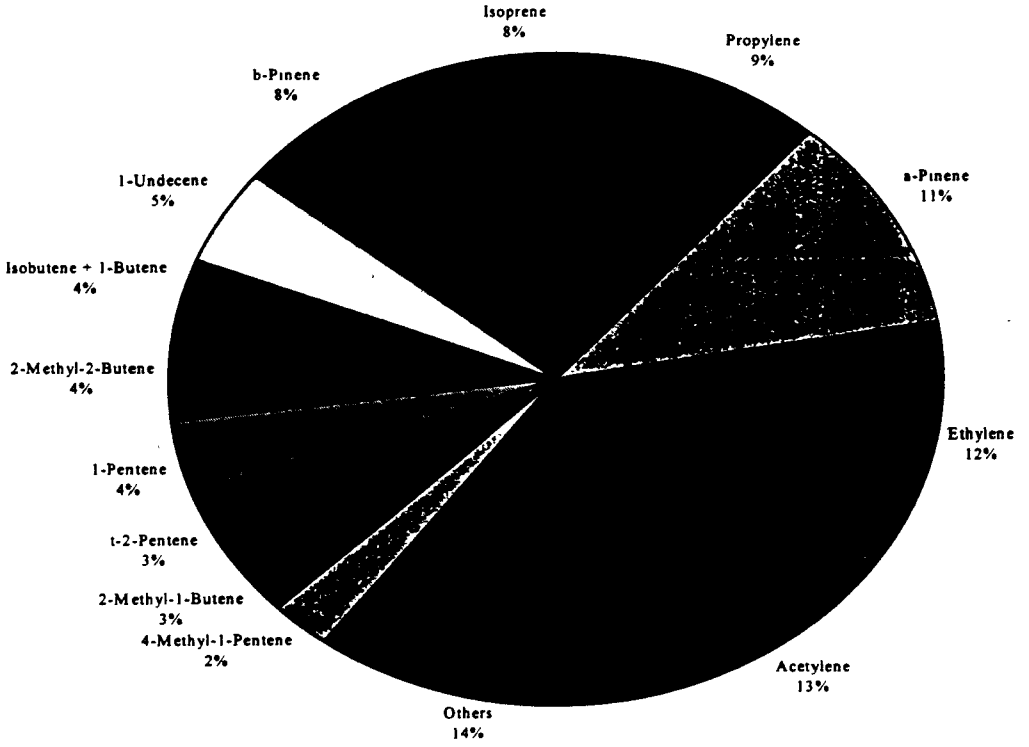


Figure 4-8. Composition of Olefin Fraction at Birmingham in 1995

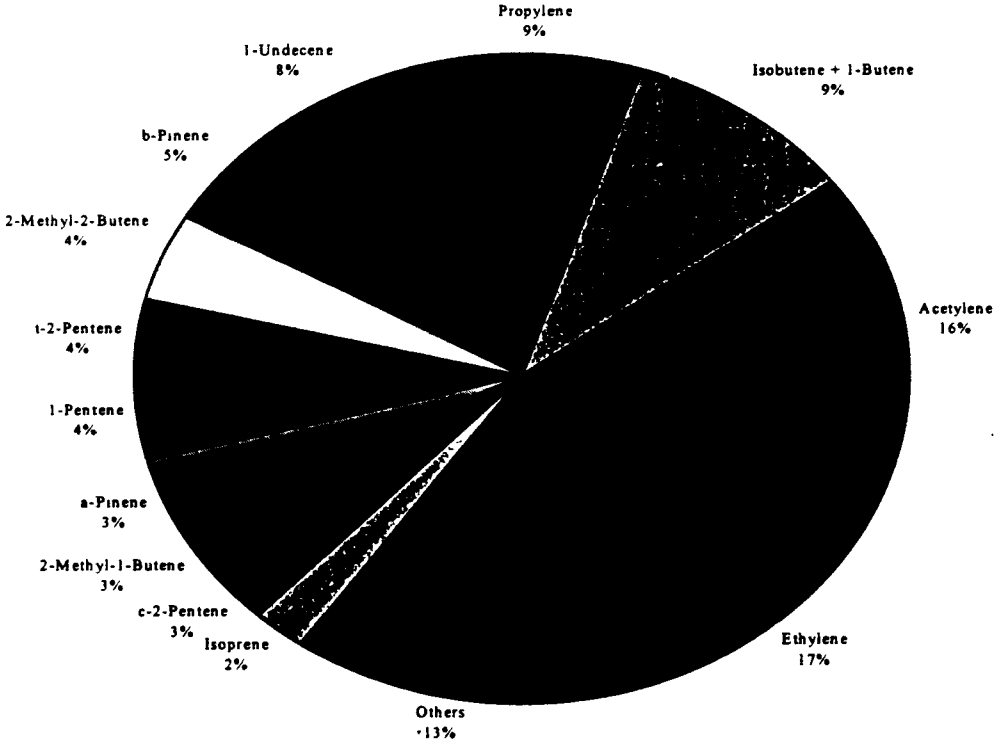


Figure 4-9. Composition of Olefin Fraction at Dallas-Fort Worth in 1995

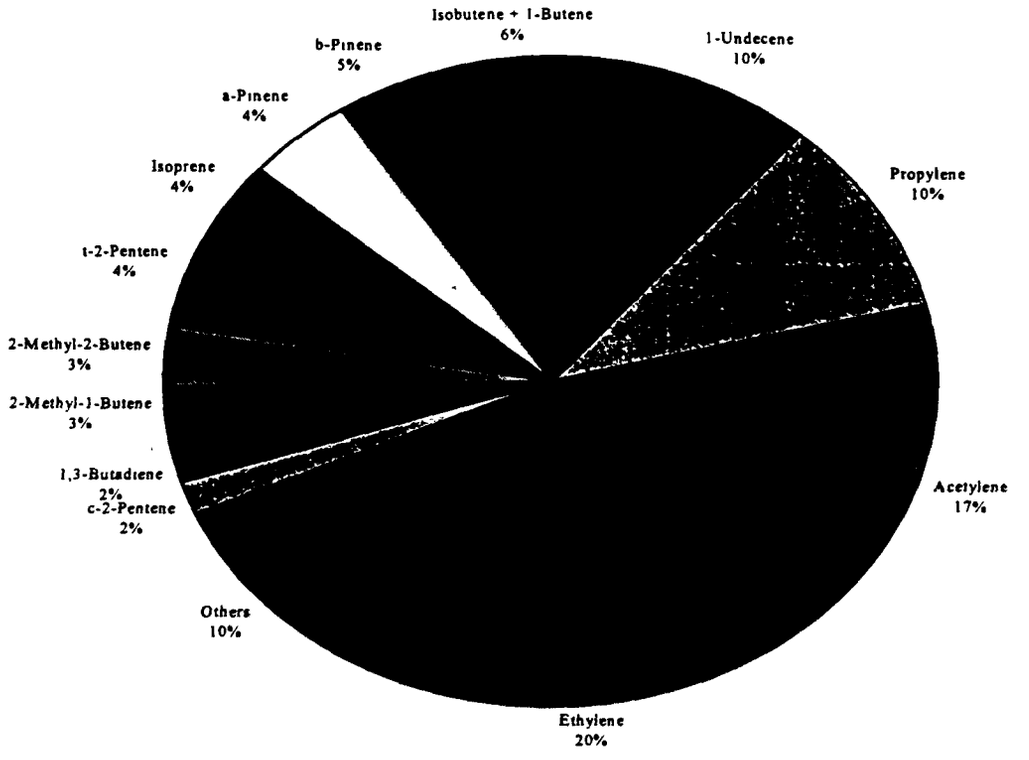


Figure 4-10. Composition of Olefin Fraction at Juarez in 1995

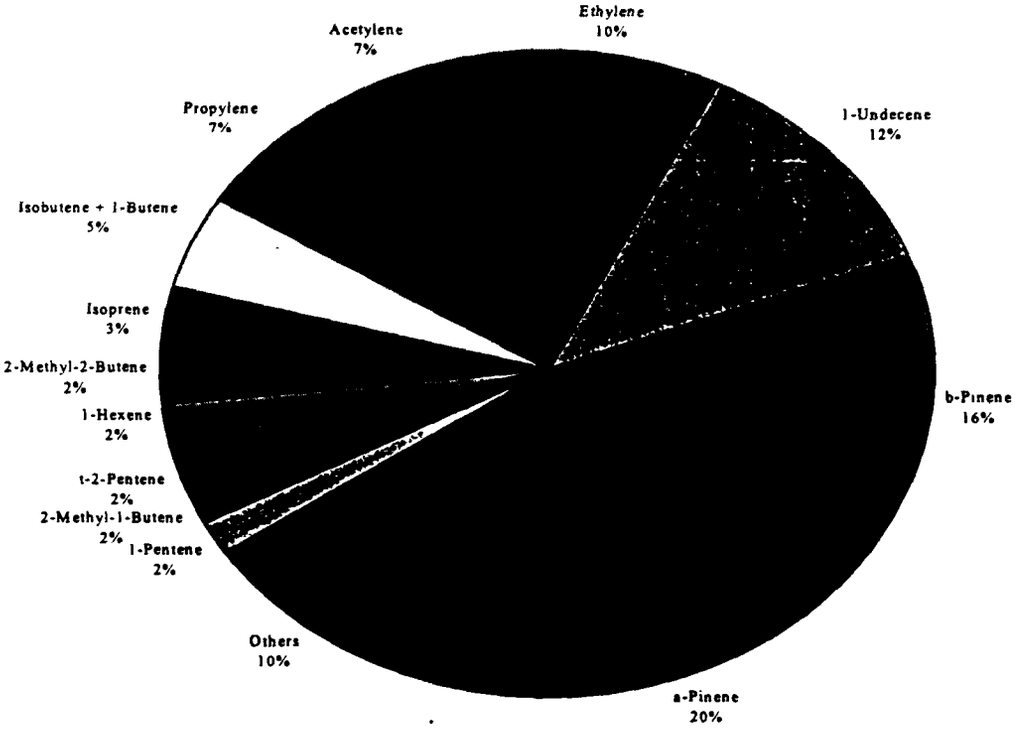
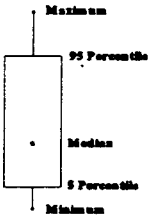


Figure 4-11. Composition of Olefin Fraction at New Orleans in 1995

emissions model and with average rainfall amounts for each city (more rainfall produces more biomass).[27] The southern cities of New Orleans and Birmingham have, on average, over 50 inches of precipitation per year, while Dallas has 32 inches and El Paso less than 8 inches per year on average.[13] The NOLA sampling site is located near to lake Pontchartrain which may also contribute to biogenic emissions. Acetylene is generally associated with emissions from motor vehicles.

The ranges and central tendencies of the measured concentrations were also compared for selected compounds using box plots. The maximum is depicted as a solid circle located above the box and attached to the box via a single, solid line. The top of the box represents the 95th percentile and the bottom of the box represents the 5th percentile; thus 90% of the sample values fall within the box. The median is depicted by a solid square within the box. Half of the samples are above the median and half of the samples are below the median. The minimum is depicted as a solid circle located below the box and attached to the box by a single, solid line. This type of box plot is used for Figures 4-12 through 4-16, 4-18 through 4-20, 4-22 through 4-26, 4-30 through 4-33, 4-35, 4-46 through 4-55, 4-57 through 4-59, and 4-61 through 4-67.



As examples, the results for toluene, ethane, and acetylene are shown in Figures 4-12 through 4-14. Generally the median concentrations were highest at Juarez and lowest either at Birmingham or New Orleans. In some cases, such as shown for α-pinene in Figure 4-15, the lowest median concentrations occurred at Dallas-Fort Worth and the highest concentrations occurred at either Birmingham or New Orleans.

Also, although the measured concentrations sometimes exhibited a high maxima, such as for toluene at Dallas-Fort Worth, the toluene fraction of the total NMOC remained relatively constant as shown in Figure 4-16.

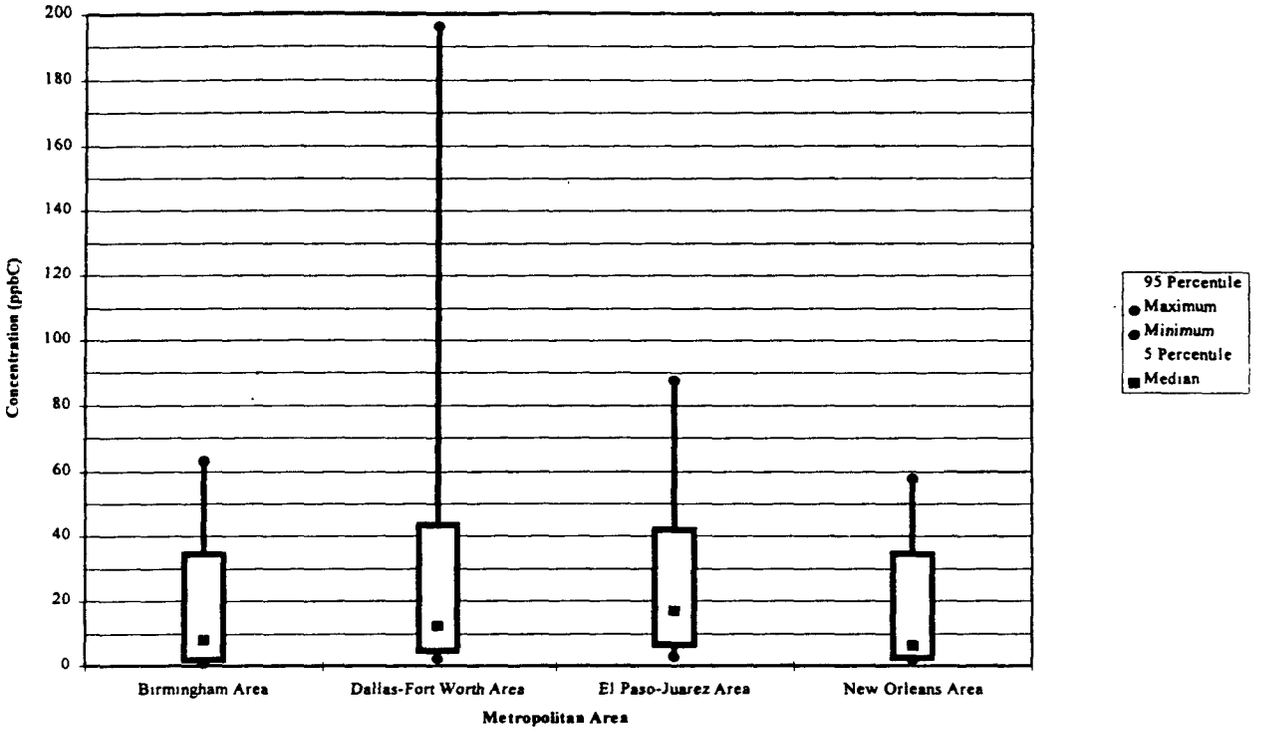


Figure 4-12. Toluene Concentrations at Different Metropolitan Areas in 1995

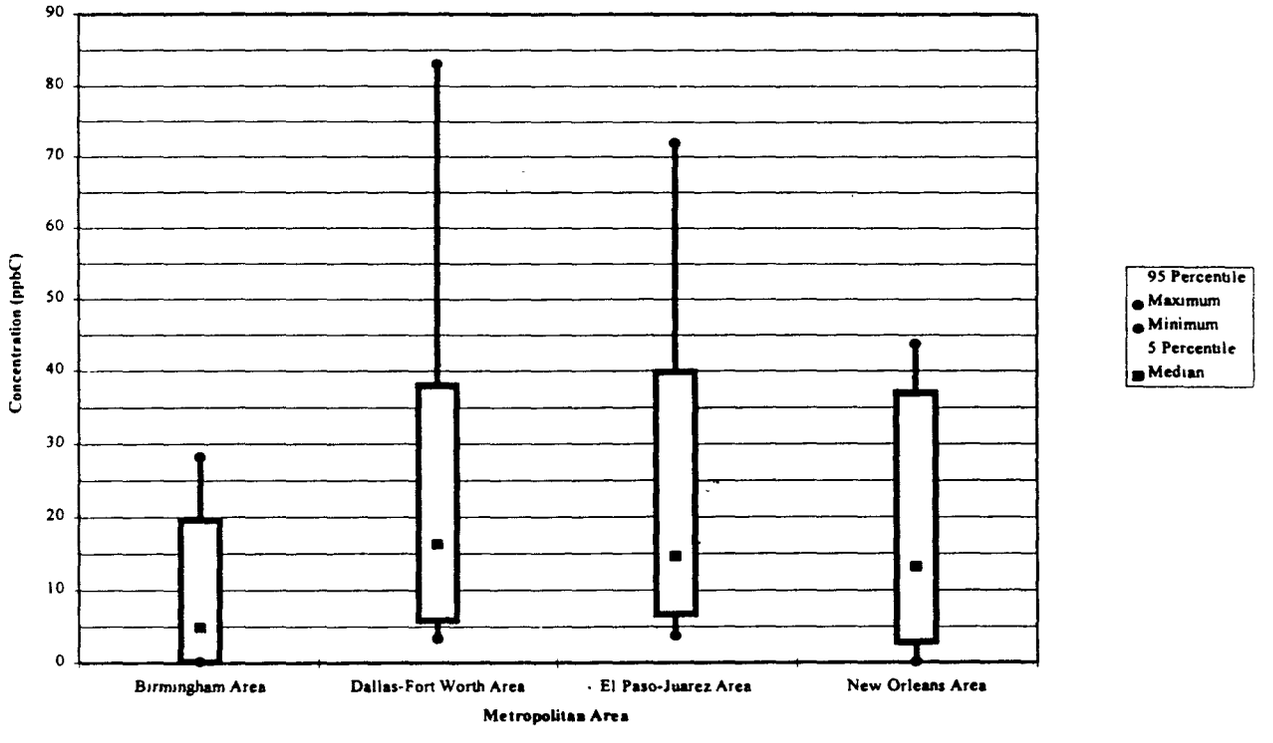


Figure 4-13. Ethane Concentrations Measured at Different Metropolitan Areas in 1995

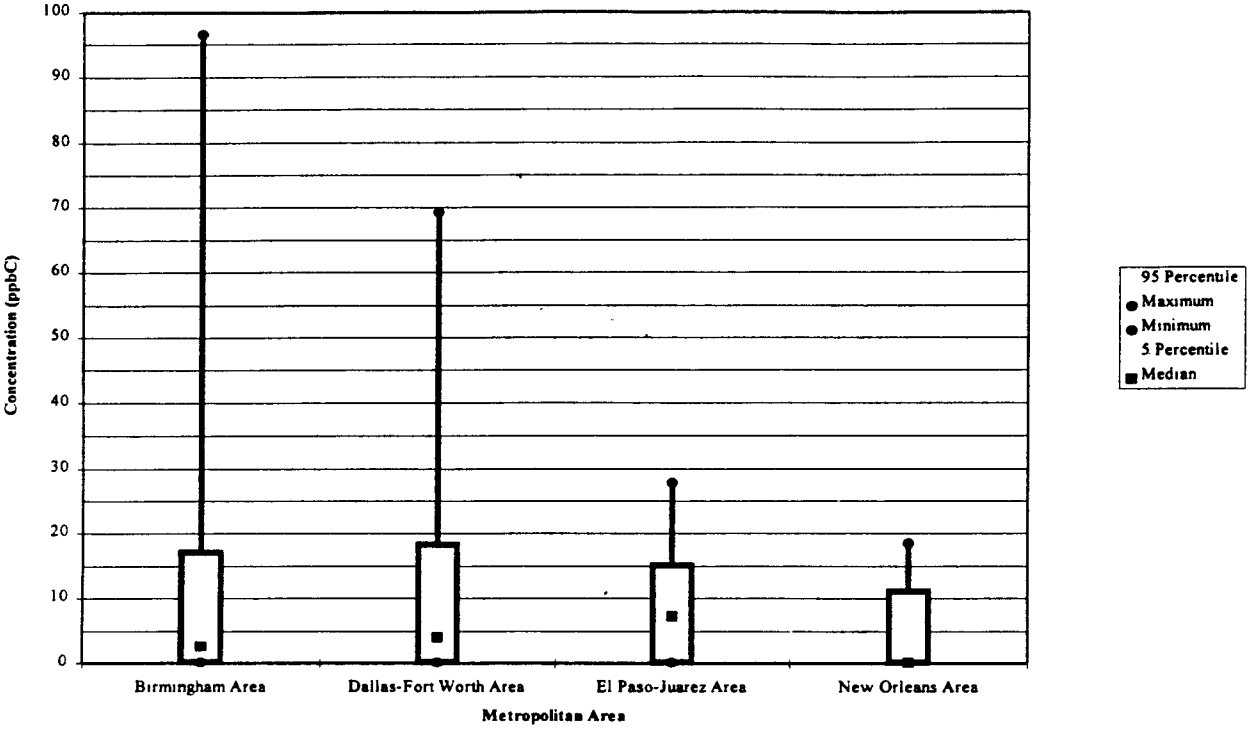


Figure 4-14. Acetylene Concentrations at Various Metropolitan Areas in 1995

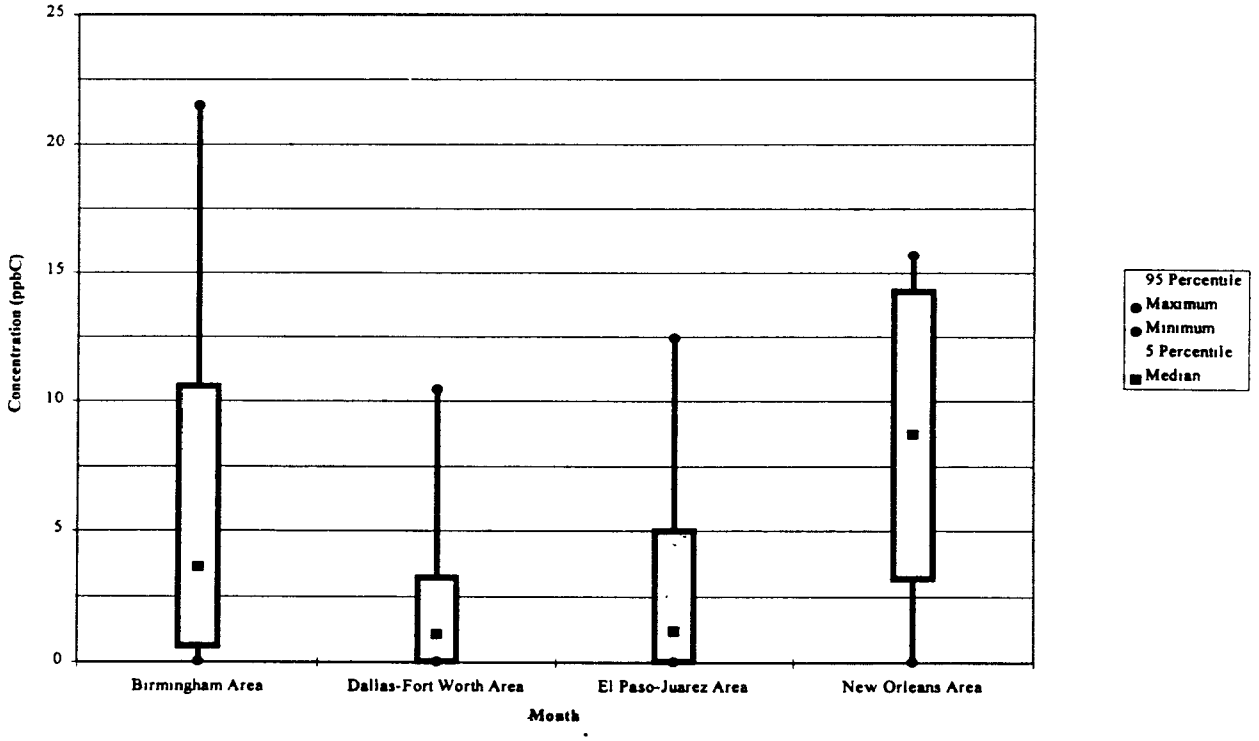


Figure 4-15. α-Pinene Concentrations at Various Metropolitan Areas in 1995

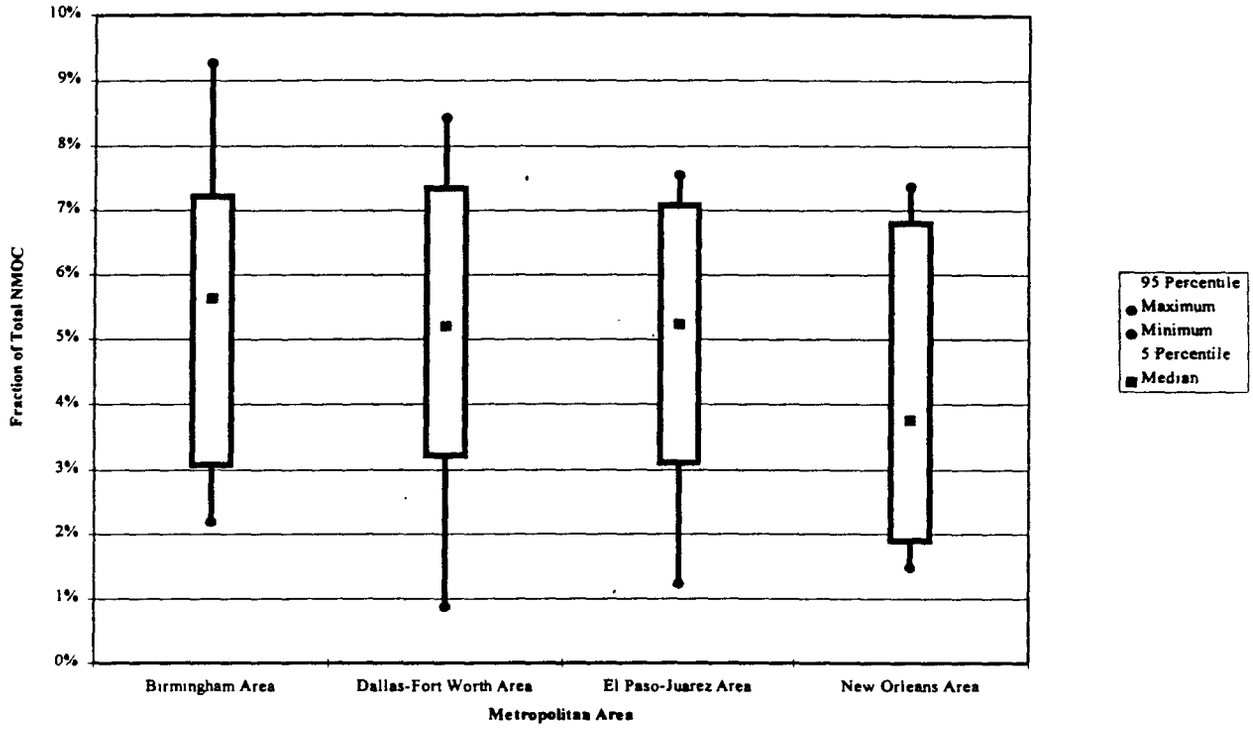


Figure 4-16. Comparison of Toluene Fraction at Various Metropolitan Areas in 1995

4.1.2 UATMP VOC Discussion

UATMP VOC data was collected in two of the five metropolitan areas: the New York City area (NWNJ, P2NJ) and the Birmingham area (B1AL, B2AL, B3AL). Frequencies of occurrence of the 28 UATMP VOC halogenated compounds for these two metropolitan areas is shown in Figure 4-17. The frequency of occurrence is very similar between the two metropolitan areas with several compounds (such as trichloroethylene and tetrachloroethylene) appearing more frequently in the New York City Area. The 1994 TRI data base reported several potential emission sources of trichloroethylene and tetrachloroethylene upwind of the NWNJ sampling site. Two compounds (chloromethane and bromomethane) occurred more frequently in Birmingham. The frequency of occurrence of the nonhalogenated compounds was also similar with the exception that 1,3-butadiene and *n*-octane occurred more frequently in the New York City area. The 1994 TRI data base also reported potential emission sources of 1,3-butadiene upwind of the NWNJ sampling site.

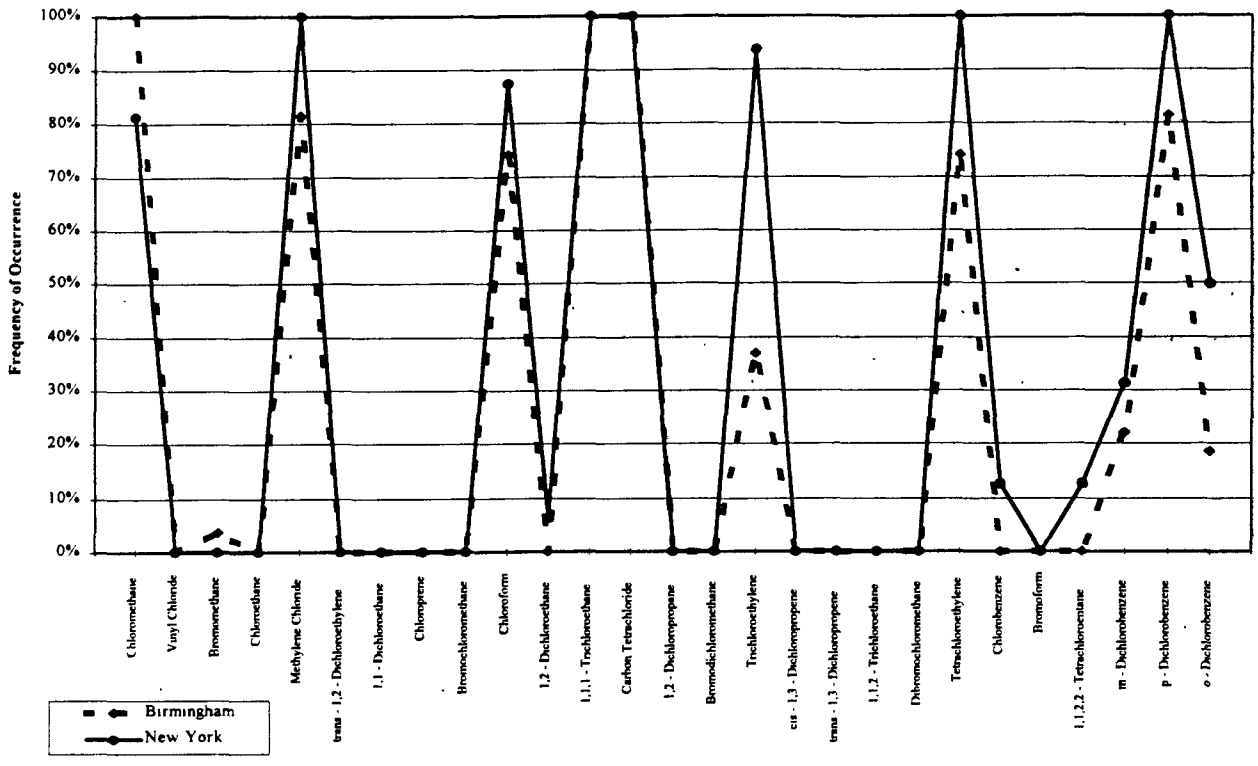


Figure 4-17. Frequency of Occurrence of Halogenated VOC in 1995 by Metropolitan Area

The UATMP VOC analyte list is composed of halogenated compounds and nonhalogenated compounds so the fraction of the total measured concentration that is halogenated or nonhalogenated can be compared between metropolitan areas. Figure 4-18 compares the median, maximum, minimum, and 5 and 95 percentiles of these two fractions on a percent of total VOC basis. The medians are similar for both metropolitan areas (approximately 20% halogenated). However, the composition is more consistent in New York City where the halogenated fraction ranges only from approximately 6 to 30% as compared to 6 to 50% in Birmingham. No explanation was identified for the larger variation in Birmingham.

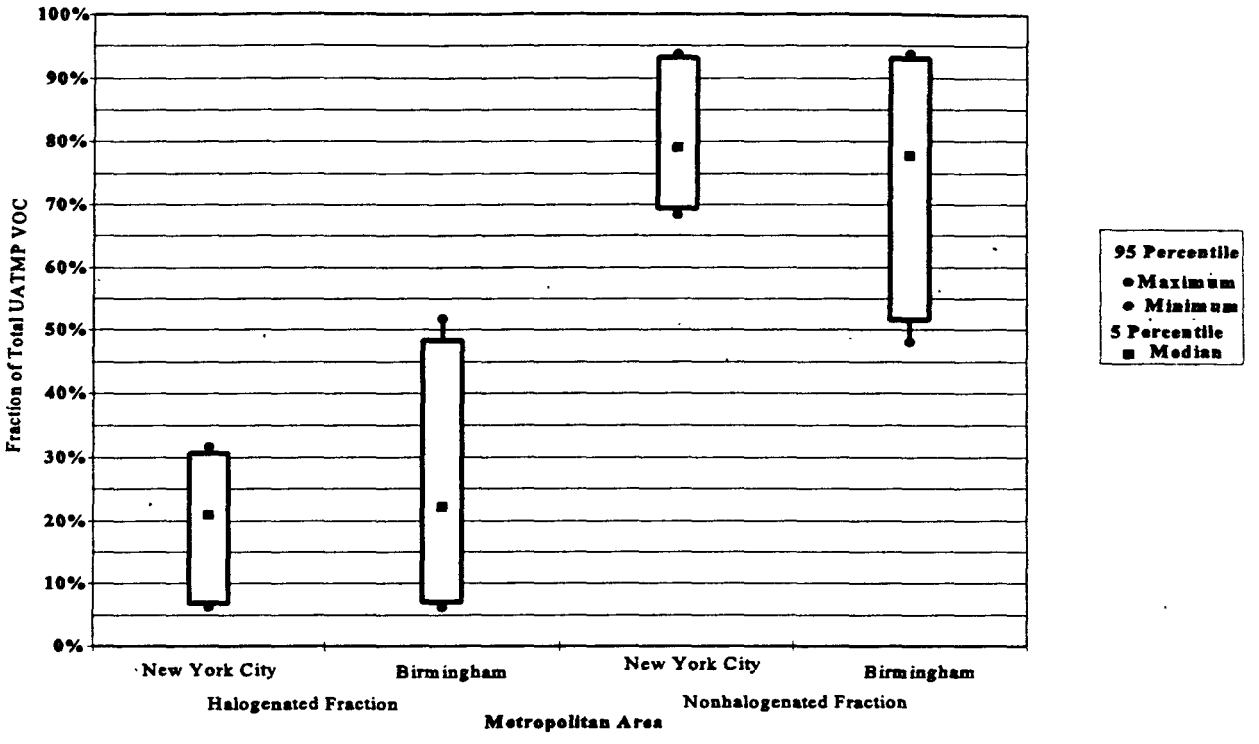


Figure 4-18. Comparison of Composition of UATMP VOC in 1995 by Metropolitan Area

The ranges and central tendencies of the measured concentrations were also compared for selected compounds. Figure 4-19 compares measured concentrations for chloromethane, methylene chloride, 1,1,1-trichloroethane, and tetrachloroethylene in the New York City and Birmingham areas. The median chloromethane concentration was similar for both metropolitan areas. However, the median concentrations were higher in the New York City area for methylene chloride, 1,1,1-trichloroethane, and tetrachloroethylene. All three of these compounds were reported in the 1994 TRI data base as having been released from a facility within 13 kilometers of the NWNJ sampling site. Figure 4-20 compares measured concentrations for acetylene, propylene, benzene, toluene, and *m*- and *p*-xylenes (which coelute). The median concentration for all five compounds was lower in Birmingham than in New York City; however, for benzene and toluene, the maximum concentration was significantly higher in Birmingham. According to the 1994 TRI data base, several facilities upwind of the B1AL site reported releasing benzene or toluene to the air so these high maximum concentration spikes

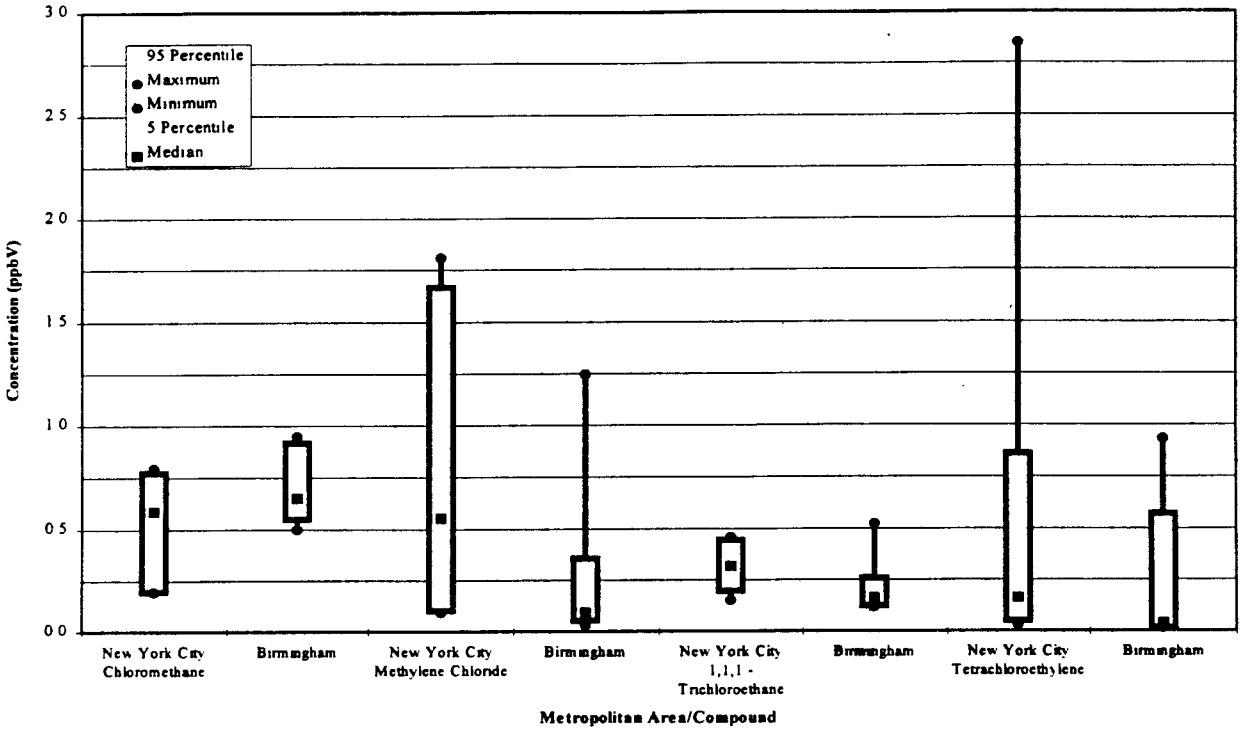


Figure 4-19. Comparison of Selected Halogenated Compound Concentrations in 1995 at New York City and Birmingham

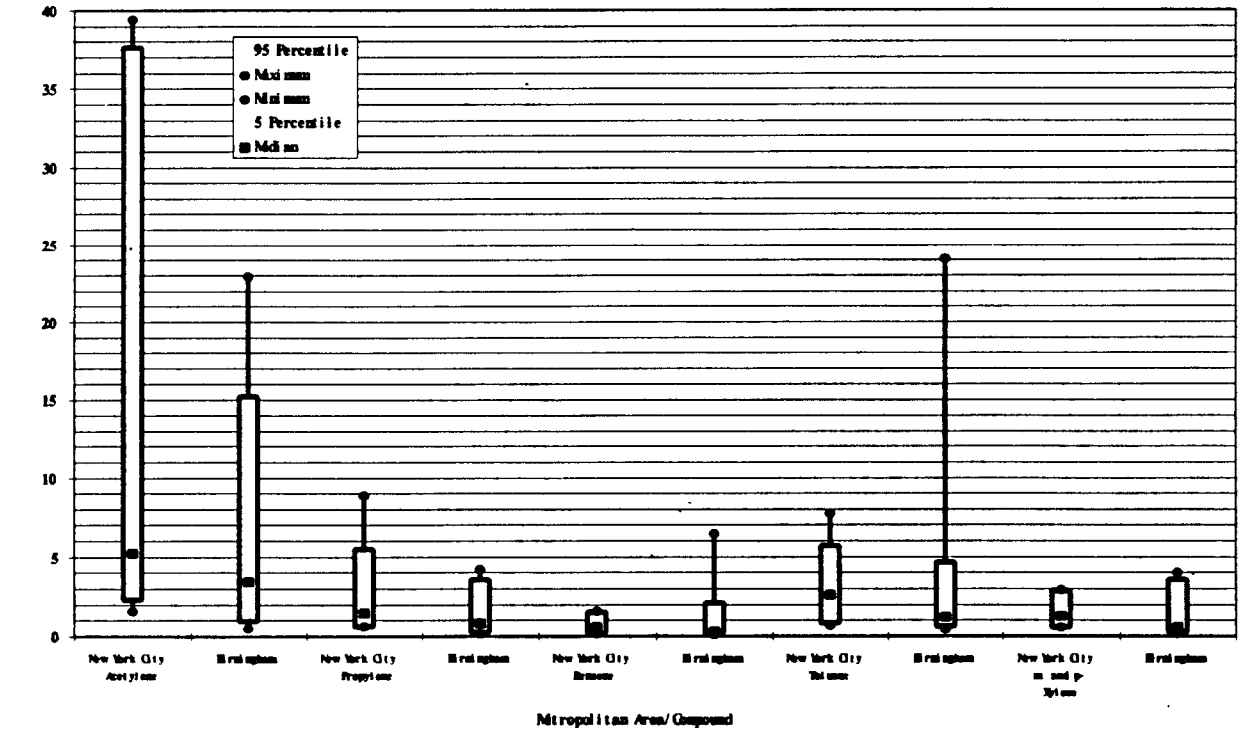


Figure 4-20. Comparison of Selected Nonhalogenated VOCs in 1995 at New York City and Birmingham

could be related to process releases. Benzene and toluene are also associated with motor vehicle emissions and the B1AL site is located near a freeway on which an estimated 80,000 vehicles per day travel.

4.1.3 Carbonyl Discussion

Carbonyl data was collected in three of the five metropolitan areas: the New York City area (NWNJ, P2NJ), the Dallas-Fort Worth area (DLTX, FWTX), and the New Orleans area (NOLA). Frequencies of occurrence of the 16 carbonyl compounds for these three metropolitan areas are shown in Figure 4-21 and provided in Table 4-1. Butyraldehyde and isobutyraldehyde coelute and are reported as one compound. The meta-, ortho-, and para-tolualdehydes are also reported as one compound because they are incompletely resolved by the analytical system.

The three metropolitan areas are similar in that formaldehyde, acetaldehyde, acetone, and hexaldehyde were measured in all of the samples from all three areas. Aldehydes are ubiquitous in urban air, where they are emitted by a variety of mobile and stationary sources. Acetaldehyde, formaldehyde, acetone, propionaldehyde, and acrolein have been measured in the emissions of gasoline-fueled vehicles.[28,29] Formaldehyde, acetaldehyde, propionaldehyde, crotonaldehyde, isobutyraldehyde, benzaldehyde, isovaleraldehyde, valeraldehyde, p-tolualdehyde, and hexaldehyde have been measured in the emissions of engines using No. 2 diesel fuel.[30] In addition, formaldehyde and acetaldehyde, the most abundant species, are formed in situ by the oxidation of virtually all hydrocarbons.

Figure 4-21 also highlights areas where differences exist between the metropolitan areas. Acrolein was not detected in any of the samples from New Orleans. New Orleans also had a low frequency of samples containing propionaldehyde and had a lower frequency of samples containing benzaldehyde than Dallas-Fort Worth and New York City. Isovaleraldehyde was detected more frequently in New Orleans than in the other two metropolitan areas. 2,5-Di-methy-benzaldehyde was only detected in the New York metropolitan area. Valeraldehyde was detected less frequently in the Dallas-Fort Worth area than in New Orleans or New York City.

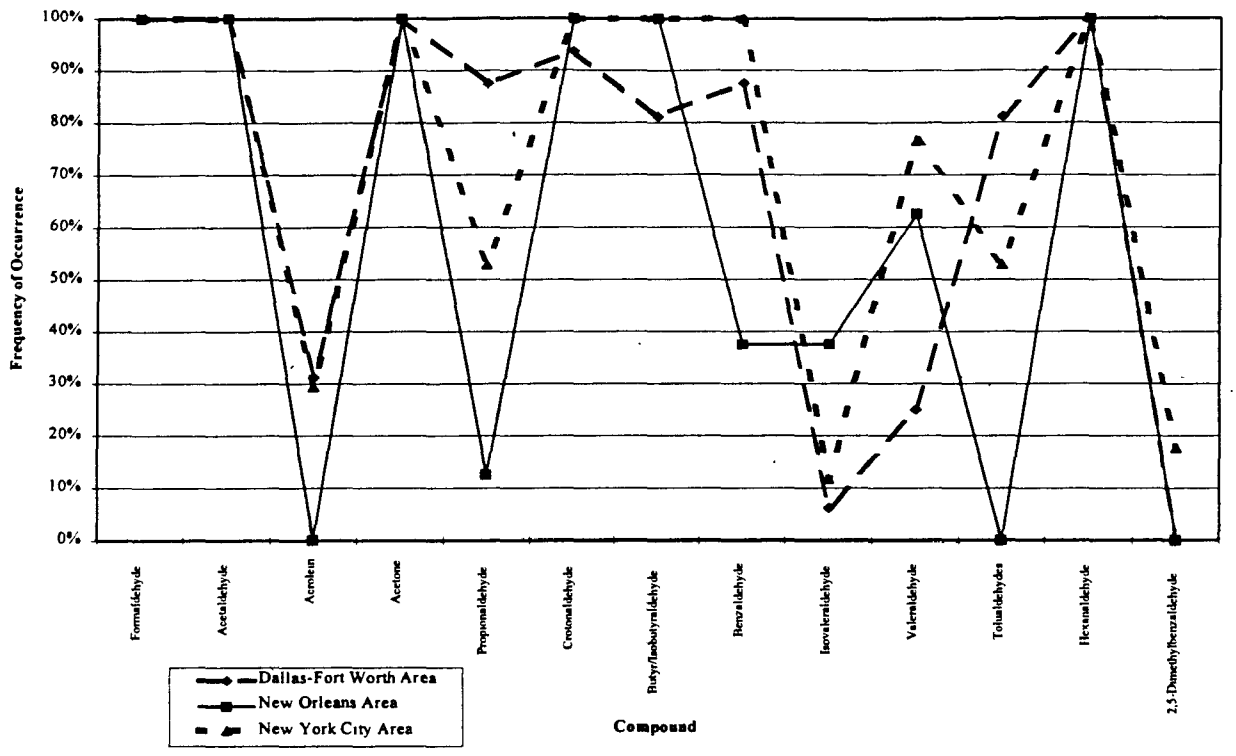


Figure 4-21. Between Metropolitan Area Comparison of Frequency of Occurrence in 1995 for the Carbonyl Compounds

Table 4-1. Comparison of Number and Frequency of Occurrence of Carbonyl Compounds by Metropolitan Area

Compound	Dallas-Fort Worth Metropolitan Area		New Orleans Metropolitan Area		New York City Metropolitan Area	
	Number of Occurrences	Frequency (%)	Number of Occurrences	Frequency (%)	Number of Occurrences	Frequency (%)
Formaldehyde	16	100%	8	100%	17	100%
Acetaldehyde	16	100%	8	100%	17	100%
Acrolein	5	31%	0	0%	5	29%
Acetone	16	100%	8	100%	17	100%
Propionaldehyde	14	88%	1	13%	9	53%
Crotonaldehyde	15	94%	8	100%	17	100%
Butyraldehyde and Isobutyraldehyde	13	81%	8	100%	17	100%
Benzaldehyde	14	88%	3	38%	17	100%
Isovaleraldehyde	1	6%	3	38%	2	12%
Valeraldehyde	4	25%	5	63%	13	76%
Tolualdehydes	13	81%	0	0%	9	53%
Hexaldehyde	16	100%	8	100%	17	100%
2,5-Dimethylbenzaldehyde	0	0%	0	0%	3	18%

The ranges and central tendencies of the measured concentrations were also compared for selected compounds. Figure 4-22 depicts the total carbonyl (sum of all 16 carbonyl compounds) measured in each metropolitan area. Based on visual inspection of the plot, the total carbonyl concentration appears to be similar in the New York City and Dallas-Fort Worth areas and to be much higher in New Orleans.

Figures 4-23 and 4-24 compare the amount of formaldehyde and acetaldehyde measured in the three metropolitan areas. Measured formaldehyde and acetaldehyde values were similar in the New York and Dallas-Fort Worth areas. The 1994 TRI data indicated there were several potential emissions sources for formaldehyde in these areas. Formaldehyde levels were lower in the New Orleans area where the 1994 TRI data did not indicate any potential emission sources. However, acetaldehyde concentrations were much higher in New Orleans. No explanation for the high acetaldehyde levels was found. Ambient levels of acetaldehyde will be higher in areas where ethanol fuel is used.[31] Acetaldehyde can also be emitted from coal-fired power stations at a concentration approximately four times that of formaldehyde.[32] No information on the type of fuel used in new Orleans or the proximity of the NOLA sampling site to a coal-fired power station was obtained.

Besides acetaldehyde, several other carbonyl compounds were present at higher concentrations in New Orleans. Figures 4-25 and 4-26 compare the amount of butyraldehyde and isobutyraldehyde (which coelute) and hexaldehyde measured in the three areas. Based on visual inspection of the plots, the butyraldehyde/isobutyraldehyde and hexaldehyde concentrations appear to be very similar in New York and Dallas-Fort Worth and to be much higher in New Orleans.

Another way to evaluate the metropolitan areas is by examining the ratio of formaldehyde to acetaldehyde and acetaldehyde to propionaldehyde. Examining these ratios allow the data to be compared to other data and also indicate how predominant anthropogenic sources are. In computing the acetaldehyde to propionaldehyde ratio, one-half the detection limit was used for

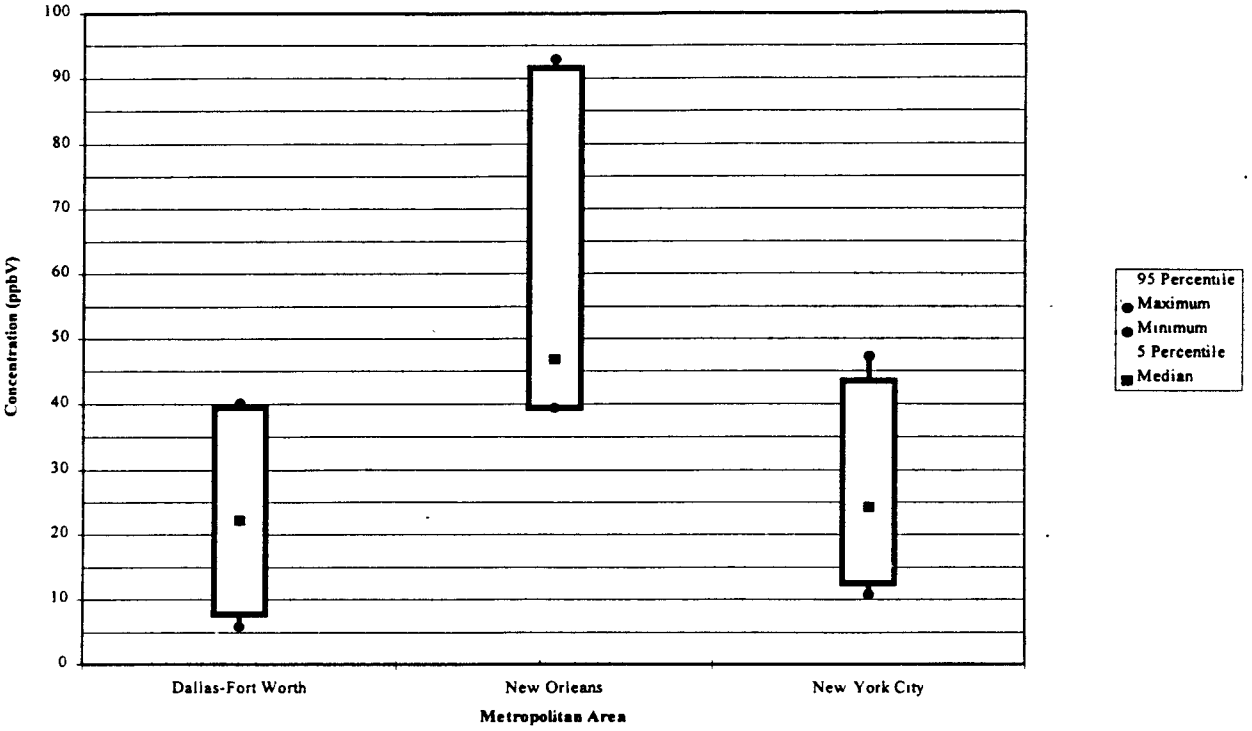


Figure 4-22. Total Carbonyls Measured at Each Metropolitan Area in 1995

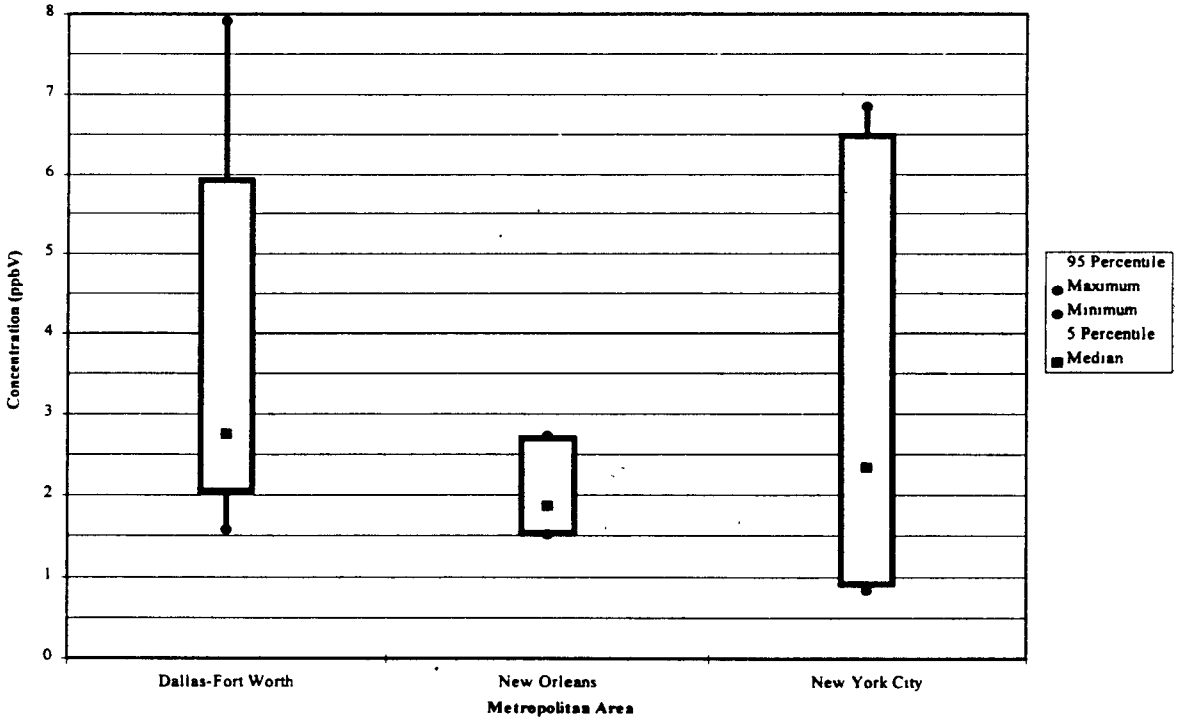


Figure 4-23. Comparison of Formaldehyde Levels by Metropolitan Area in 1995

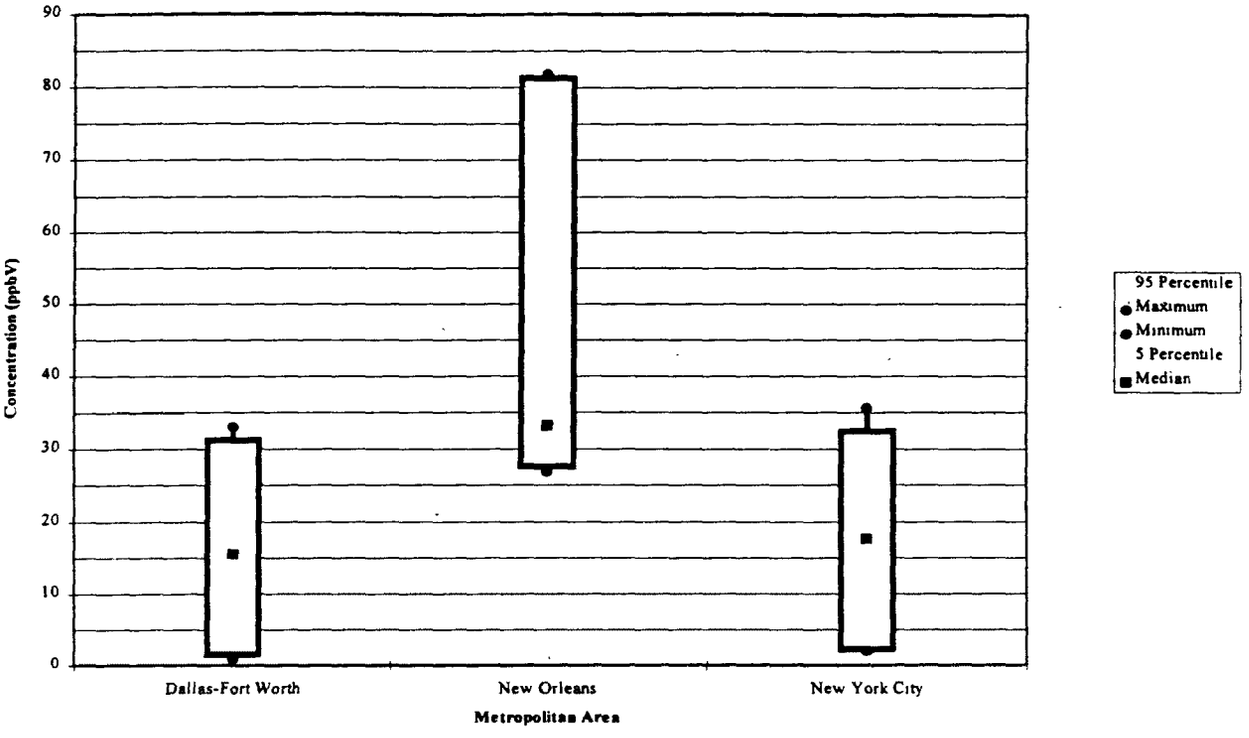


Figure 4-24. Comparison of Acetaldehyde Levels by Metropolitan Areas in 1995

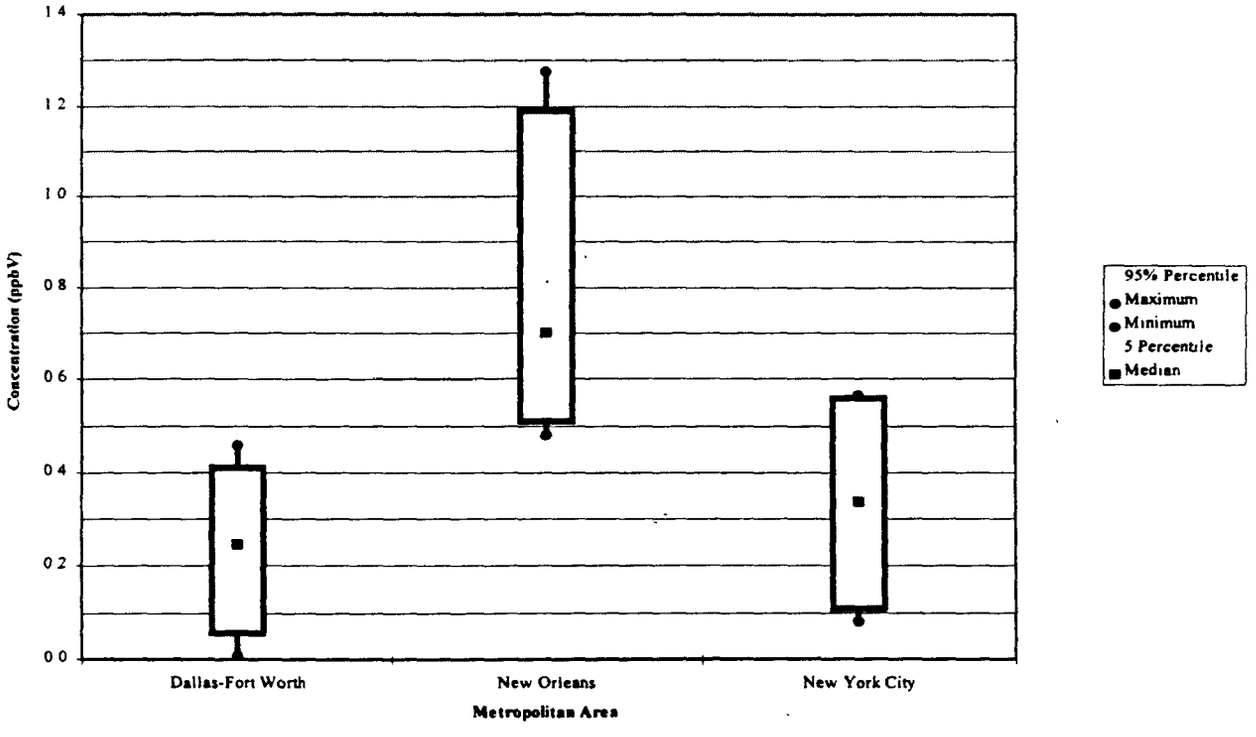


Figure 4-25. Butyraldehyde and Isobutyraldehyde Concentrations in 1995 by Metropolitan Area

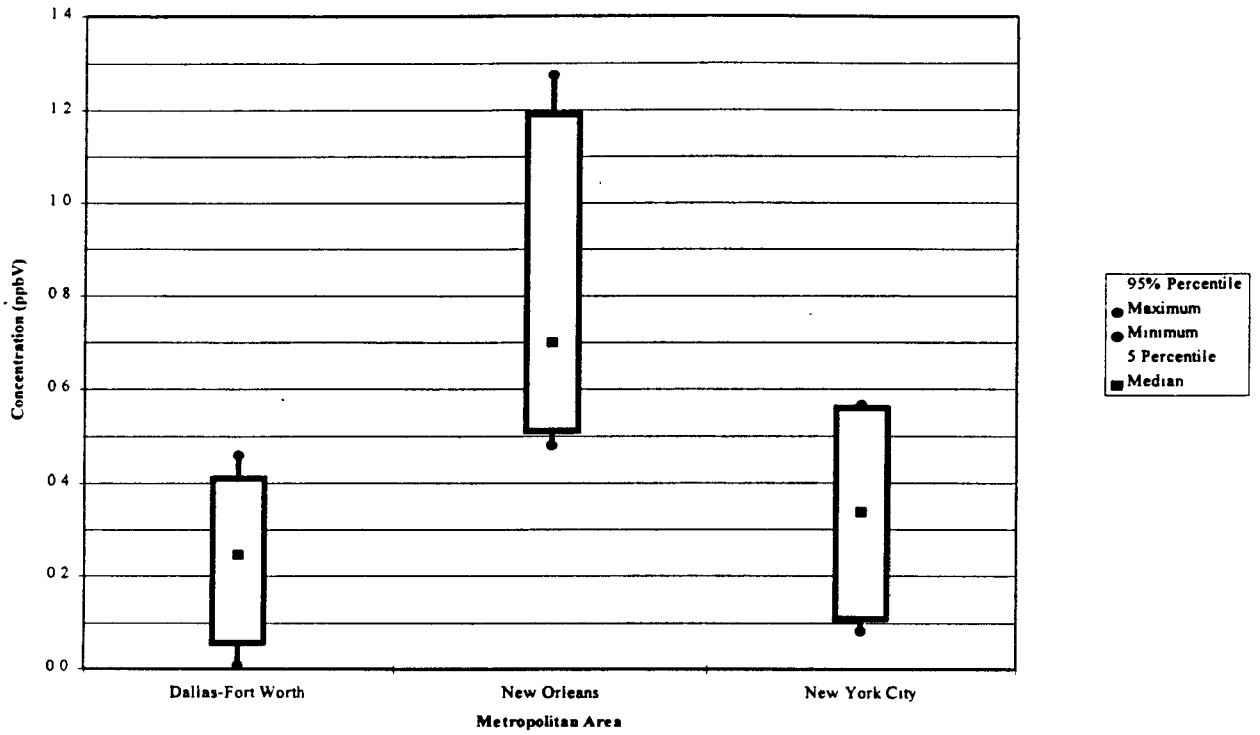


Figure 4-26. Comparison of Hexaldehyde Levels by Metropolitan Area in 1995

The composition, on average, of the carbonyl fractions for the three metropolitan areas was also determined by dividing the arithmetic mean concentration for each speciated carbonyl compound by the arithmetic mean for the sum of all of the speciated carbonyl compounds. Figures 4-27 through 4-29 present the results. The composition of the carbonyl fraction in New York City and in Dallas-Fort Worth was very similar for the major components (formaldehyde, acetaldehyde, and acetone). However, the composition of the carbonyl fraction in New Orleans contained a much larger percentage of acetaldehyde and a much lower percentage of acetone and formaldehyde which correlates with the concentration.

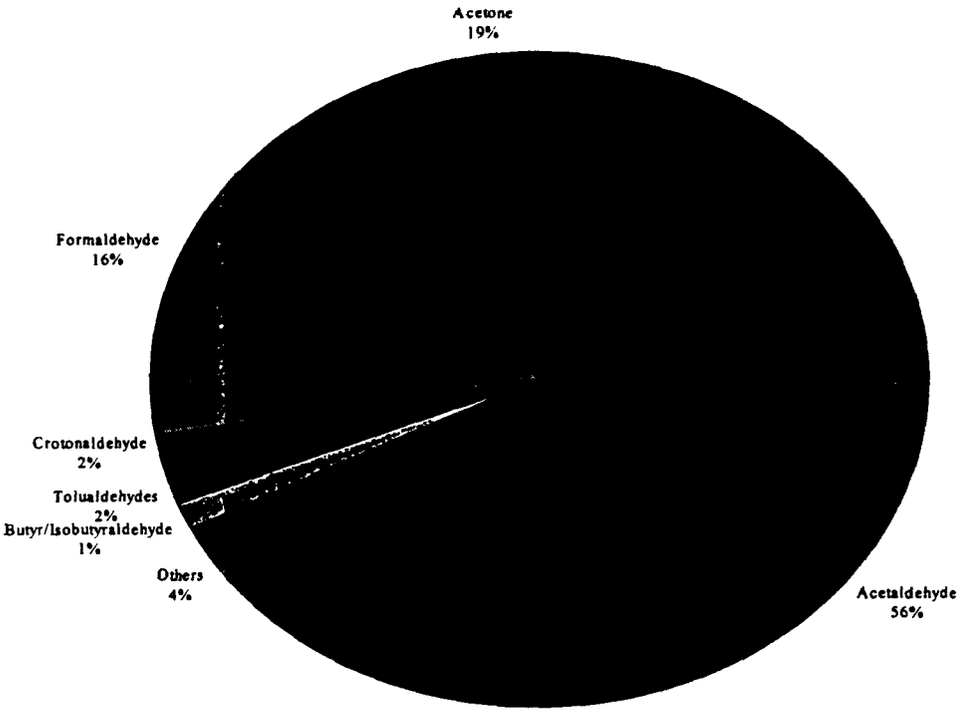


Figure 4-27. Composition, on Average, of Carbonyl Fraction in New York City in 1995

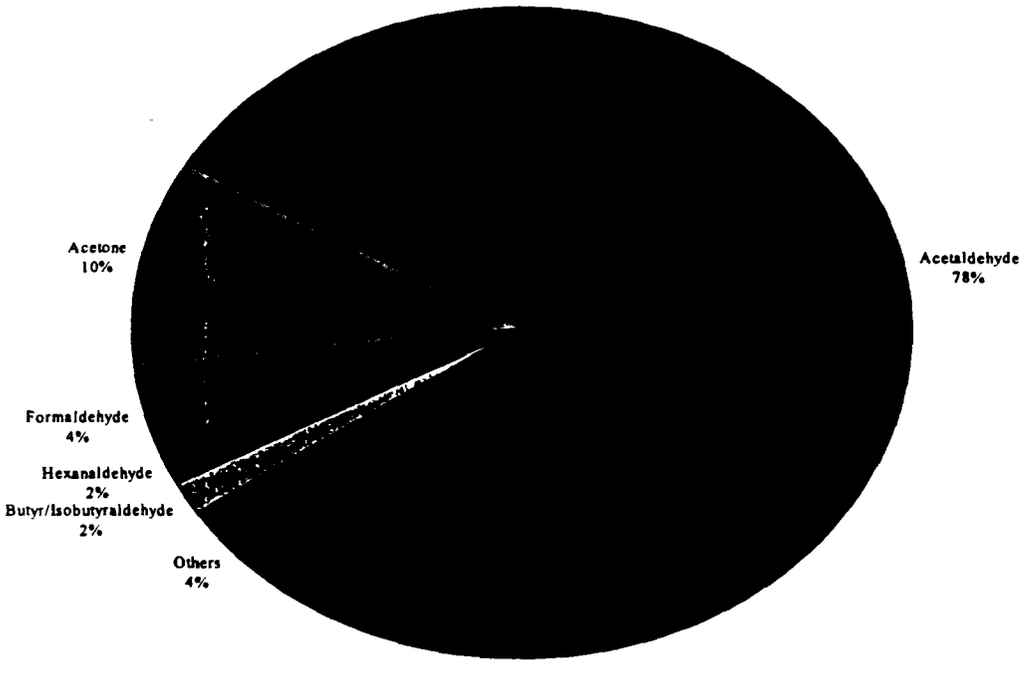


Figure 4-28. Composition, on Average, of Carbonyl Fraction in New Orleans in 1995

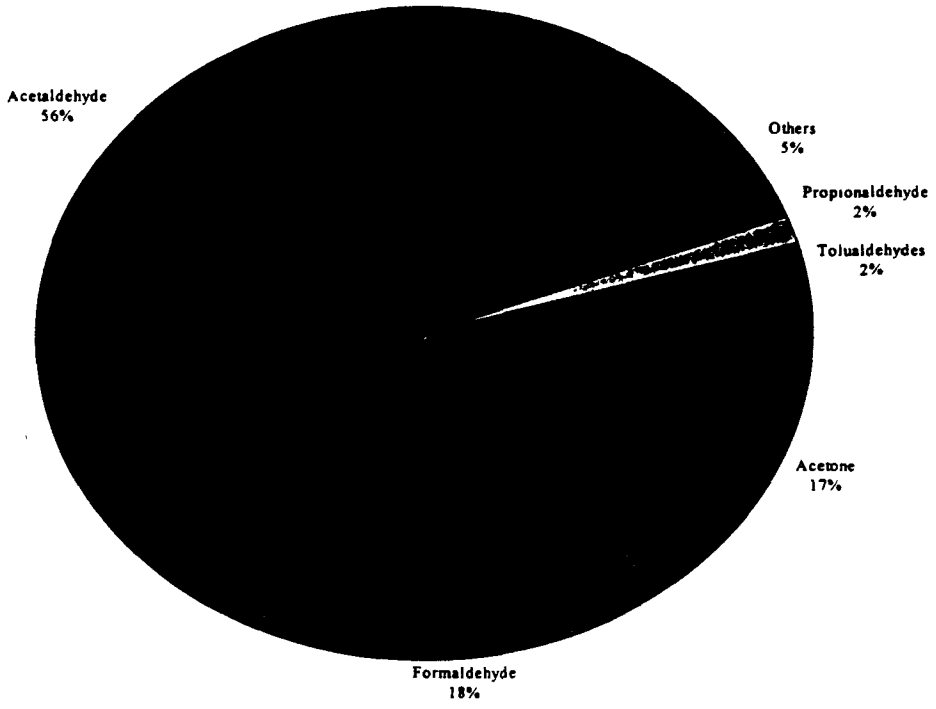


Figure 4-29. Composition, on Average, of Carbonyl Fraction in Dallas-Fort Worth in 1995

the cases where propionaldehyde was not detected. High formaldehyde to acetaldehyde concentration ratios may indicate a biogenic source of formaldehyde. For example, formaldehyde is a major reaction product from the oxidation of isoprene. Propionaldehyde is mostly of anthropogenic origin. Thus, acetaldehyde to propionaldehyde ratios may be an indicator of anthropogenic pollution. However, these ratios will vary significantly between urban areas (0.3 to 14.3 for formaldehyde to acetaldehyde and 1.7 to 49 for acetaldehyde to propionaldehyde) so the data should be carefully interpreted.[31] Figures 4-30 and 4-31 present the median, maximum, minimum, and 5 and 95 percentiles of these ratios for each metropolitan area.

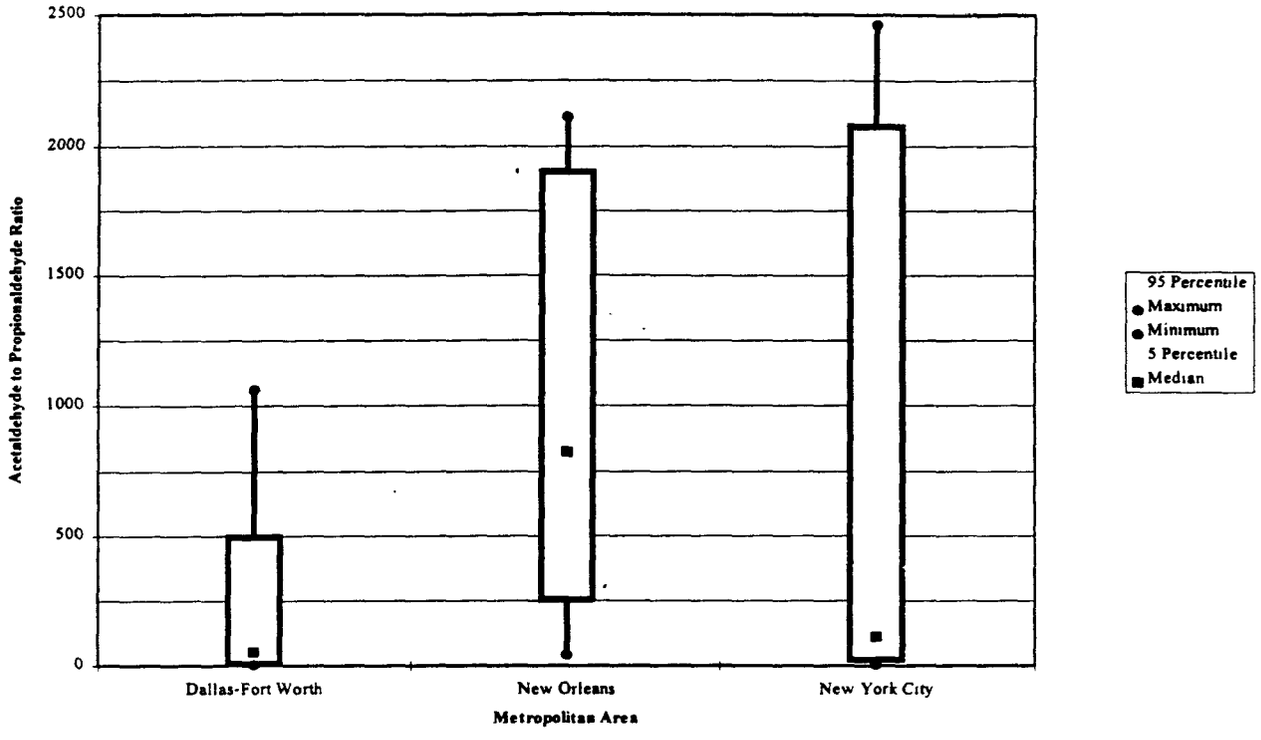


Figure 4-30. Comparison of Acetaldehyde to Propionaldehyde Ratio for Metropolitan Areas in 1995

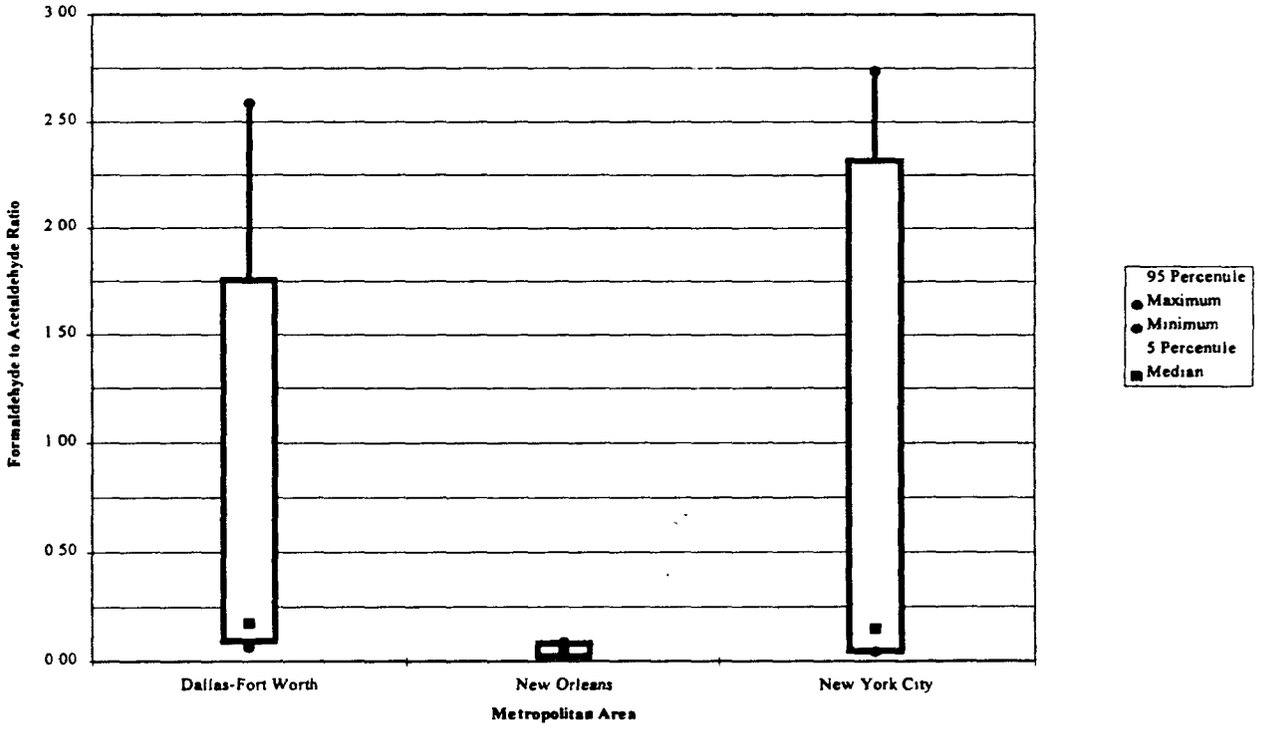


Figure 4-31. Formaldehyde to Acetaldehyde Ratio Comparison for Metropolitan Areas in 1995

The acetaldehyde to propionaldehyde ratio was most consistent in the Dallas-Fort Worth area and was generally highest in the New Orleans area where the highest concentration levels of acetaldehyde were measured. The measured ratios were quite high (as high as 1000 to 2500:1) compared to the ratios measured in diesel gas (approximately 12:1),[30] in ambient air samples in Italy (approximately 4:1 in urban air and 10:1 in nonurban air)[28] and in ambient air samples outside Los Angeles (approximately 2:1).[33] For the counties for which 1994 TRI data was collected, propionaldehyde was only reported at one source, located 1 to 4 kilometers southeast of the NWNJ sampling site. Figure 4-32 displays the measured propionaldehyde concentration ranges and central tendency for the three metropolitan areas. For New Orleans the median, minimum and 5 percentile are all equal to one-half the detection limit indicating that propionaldehyde was detected in less than 50% of the samples. Examination of Figure 4-21 indicates that propionaldehyde was detected in fewer than 20% of the samples from the New Orleans metropolitan area. This high incidence of nondetects may explain the high observed acetaldehyde to propionaldehyde ratios. Figure 4-33 depicts the acetaldehyde to propionaldehyde ratios when the nondetects are excluded. The median ratio for all three metropolitan areas is approximately 40:1 which is more reasonable, although still high compared to most other published data.

The formaldehyde to acetaldehyde ratios are generally less than 0.25, being smallest for the New Orleans area where the acetaldehyde concentrations were highest. The measured ratios were quite low compared to the ratios measured in diesel gas (approximately 5:1),[30] in ambient air samples in Italy (approximately 1:1 in urban air and 2:1 in nonurban air)[28] and in ambient air samples outside Los Angeles (approximately 2:1).[33] However, they are similar to ratios measured in areas where ethanol fuel is used (0.29-0.95 in Brazil)[31] and in the exhaust from coal-fired power plants (0.26).[32]

4.2 Comparison of Urban, Suburban, and Rural Areas

Six different land uses were represented by the 1995 NMOC base and Speciated NMOC base program sites. These land uses are urban industrial (NWNJ), urban commercial (FWTX,

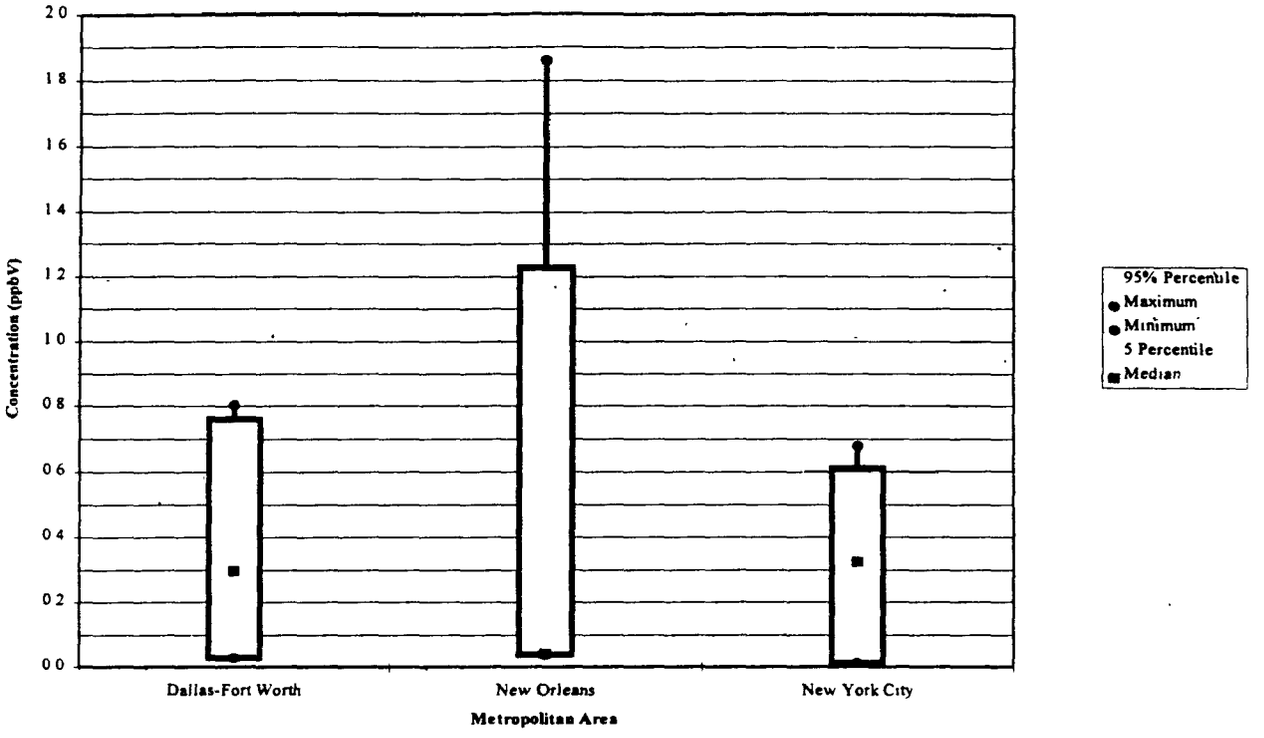


Figure 4-32. Propionaldehyde Concentration by Metropolitan Area in 1995

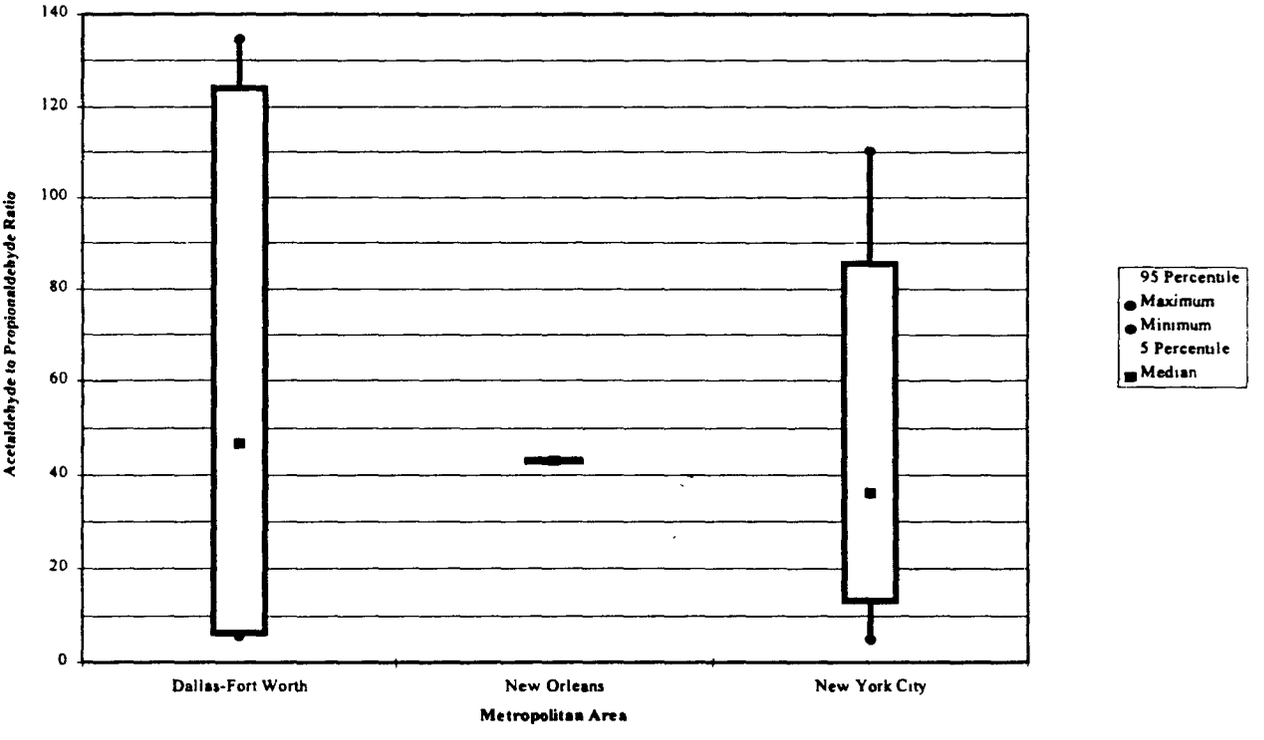


Figure 4-33. Acetaldehyde to Propionaldehyde Ratios without Nondetects in 1995

DLTX, JUMX), suburban commercial (LINY), suburban residential (P2NJ, B1AL, NOLA), rural residential (B2AL), and rural agricultural (B3AL).

4.2.1 NMOC Results

Each of the three NMOC base program sites was located in a different land use area. One site (NWNJ) was located in an urban industrial area, one site (LINY) was located in a suburban commercial area, and one site (P2NJ) was located in a suburban residential area. Comparison of the measured concentration ranges and central tendency of the data was discussed in Section 3.3.1, provided in Table 3-11, and displayed in Figure 3-14 on a site specific basis.

The suburban residential area exhibits the highest maximum, mode, median, arithmetic and geometric means, the widest range of concentrations, and the highest arithmetic and geometric means. The reason for the highest observed NMOC concentrations in a residential, suburban area when compared to the more urban or commercialized areas is unknown. The range of measured NMOC concentrations is similar for the urban industrial area and the suburban commercial area with the maximum, median, and minimum shifted to slightly lower values for the suburban commercial area.

Figure 4-34 exhibits the average monthly NMOC concentration plotted for each of the land use types. At all three sites the average NMOC concentration increases in July, decreases in August, and increases again in September. The monthly variation is smallest (less than 50 ppbC) for the suburban commercial area (LINY) and largest (approximately 100 ppbC) for the urban industrial area (NWNJ). No explanations for the variations other than random variability were identified.

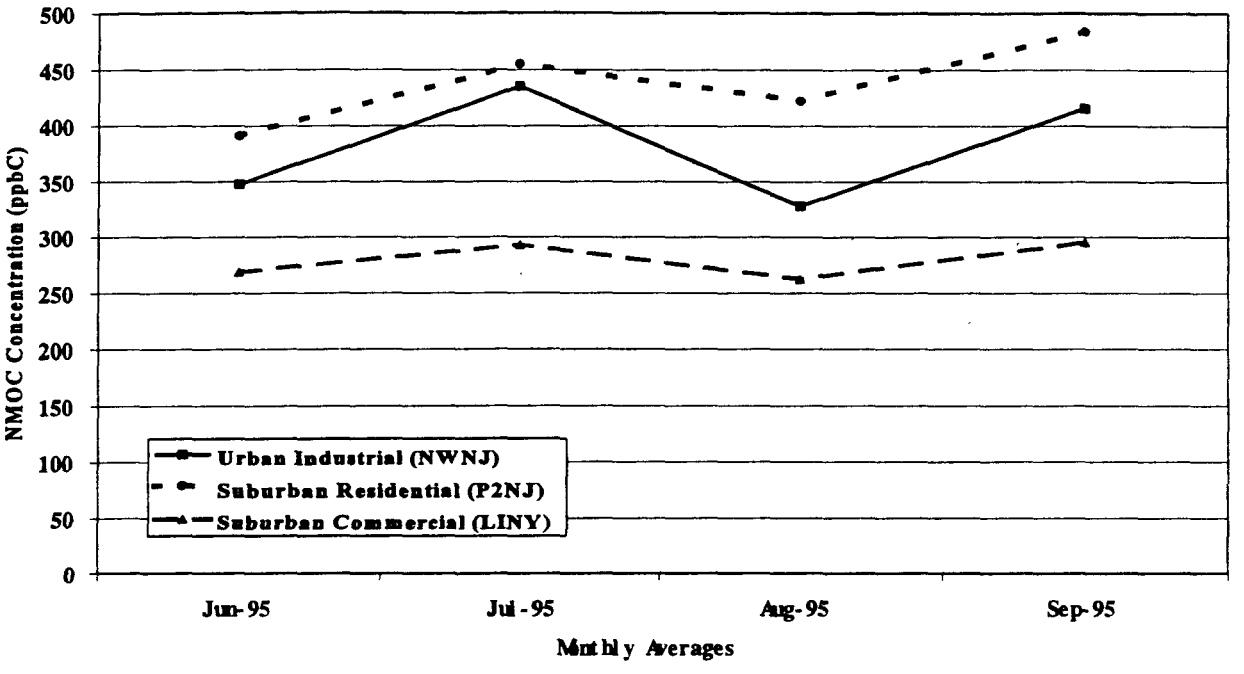


Figure 4-34. 1995 NMOC Monthly Variations for the Three Base NMOC Sites

4.2.2 Speciated NMOC Results

Four land use types are represented by the seven sites participating in the 1995 Speciated NMOC base program: urban commercial (DLTX, FWTX, JUMX), suburban residential (B1AL, NOLA), rural residential (B2AL), and rural agricultural (B3AL). Comparisons were made between several parameters including prevalence of compounds, composition of the air, and the magnitude and variability of the measured concentrations.

First, the total NMOC measured by the Speciated NMOC (GC/FID) method for each land use area was examined and compared to the results obtained using the NMOC base program data measured by TO-12. The medians, maximums, minimums, and 5 and 95 percentiles for the four represented land use types are presented in Figure 4-35. The maximum observed total NMOC concentration for the Speciated NMOC data occurred in the urban commercial area. The median total NMOC concentration for the Speciated NMOC data was similar between the urban

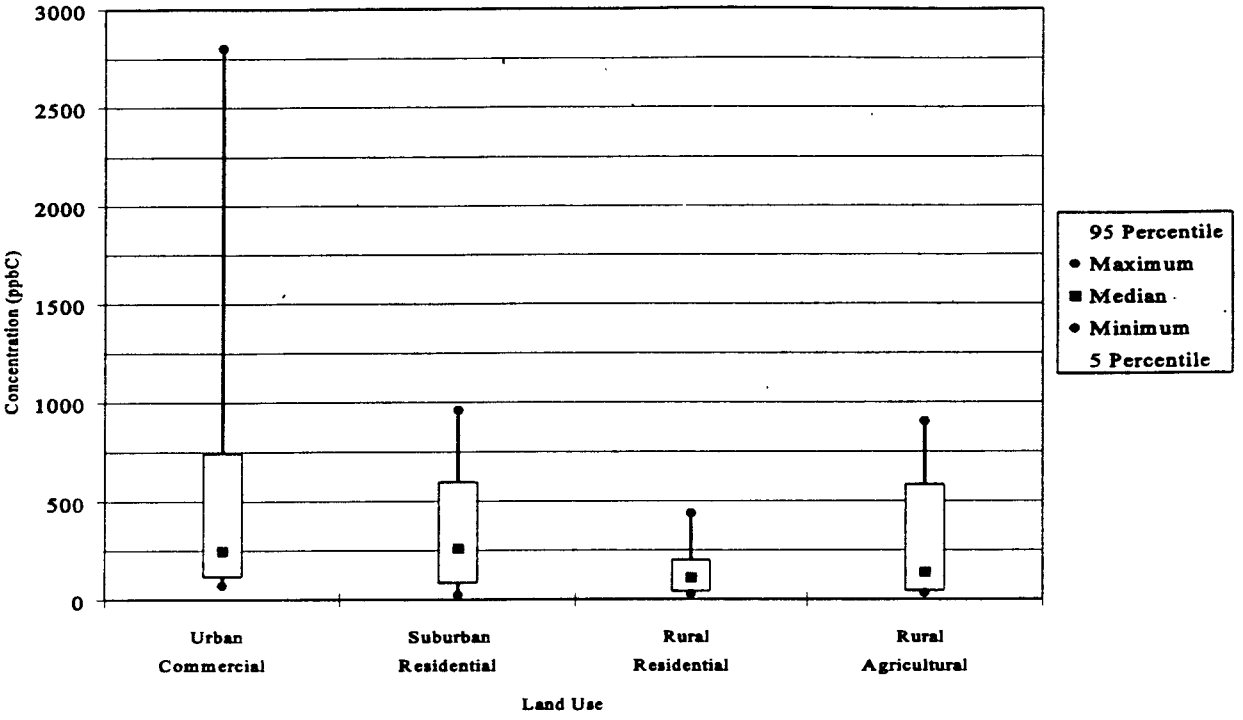


Figure 4-35. Central Tendencies and Ranges by Land Use Type for Total NMOC Measured by the Speciated NMOC (GC/FID) Method in 1995.

commercial and suburban residential areas. Both of these concentrations were higher than the median total NMOC concentrations for the speciated NMOC data observed in the rural areas. Interestingly, the range of observed total NMOC concentrations for the Speciated NMOC data for the rural agricultural area and the suburban residential area were similar. The rural residential area exhibited the smallest total NMOC concentration range for the Speciated NMOC data. The results from comparing total NMOC measured by the Speciated NMOC (GC/FID) method versus land use are different from the results comparing NMOC measured by TO-12 versus land use in that the residential areas do not exhibit higher and more variable total NMOC concentrations measured by the Speciated NMOC (FID) method than the urban areas. The reason for the observed difference between urban and residential areas is unknown.

On average, 77 to 81% of the total NMOC was speciated for each land use type. The average class composition of the speciated NMOC was calculated for each land use and was found to be dependent on land use as shown in Figure 4-36. The aromatic fraction showed the least dependence on land use, ranging from 18% in rural agricultural areas to 26% in rural residential areas. The paraffin fraction showed the most dependence on land use, ranging from 45% in the rural residential areas to 61% in the rural agricultural areas. The olefin fraction ranged from 16% in the urban commercial areas to 29% in the rural residential areas.

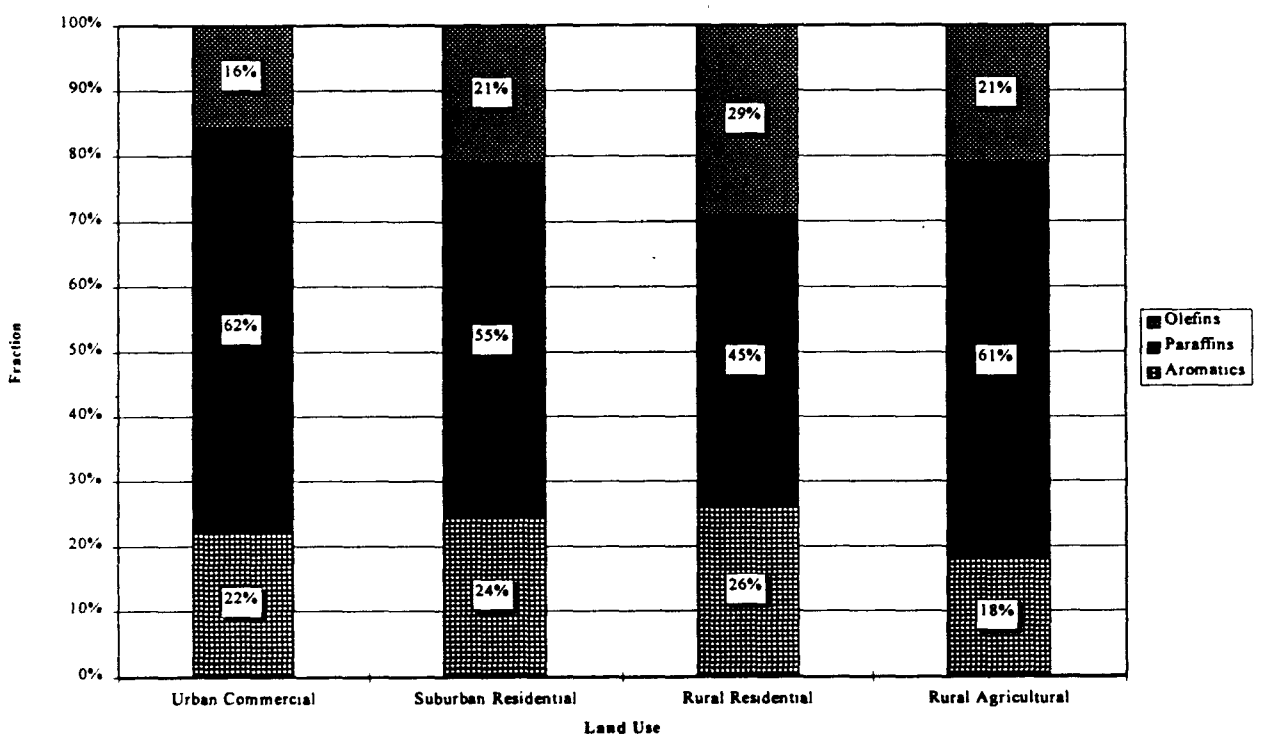


Figure 4-36. Comparison of Class Composition of the Speciated NMOC with Land Use in 1995

The average composition of each class was also examined. The composition of the aromatic class was independent of land use. However, differences were observed in the composition of the paraffin and olefin classes based on land use. The compositions of the paraffin and olefin classes for each land use are shown in Figures 4-37 through 4-44. Composition of the paraffin fraction was very similar in suburban residential and rural residential areas. In urban commercial areas, the isopentane was slightly lower (13% versus 16 to 20%) and the propane fraction was slightly larger (19% versus 12 to 13%). The largest observed difference in the paraffin composition was observed in rural agricultural areas where isopentane comprised, on average, 29% of the speciated paraffins.

In the urban commercial areas, the combined acetylene and ethylene concentration comprised 34%, α- and β-pinene comprised less than 10%, and isoprene comprised 3% of the olefin fraction. In the suburban residential area the olefin fraction consisted of slightly less acetylene and ethylene (28%), much more α- and β-pinene (22%), and about the same amount of isoprene (4%). In the rural residential and rural agricultural areas, the olefin fraction consisted of even less ethylene and acetylene and even more α- and β-pinene and isoprene. In the rural residential areas, the ethylene and acetylene comprised 19%, the α- and β-pinene comprised 28%, and isoprene comprised 12% of the olefin fraction while in rural agricultural areas, ethylene and acetylene comprised only 12%, α- and β-pinene comprised 25%, and isoprene comprised 11%, on average. Acetylene and ethylene are associated with anthropogenic emission sources especially motor vehichles, thus they would be expected to comprise a larger fraction of the speciated olefins in urban areas where there is more vehicular traffic. The pinenes and isoprene are associated with biogenic emissions which should be greater in rural areas where there are more plants and trees.

4.2.3 UATMP VOC Option Program

One UATMP VOC option site was located in an urban industrial area (NWNJ), two sites were located in suburban residential areas (P2NJ, B1AL), one site was located in a rural residential area (B2AL), and one site was located in a rural agricultural area (B3AL). Frequency

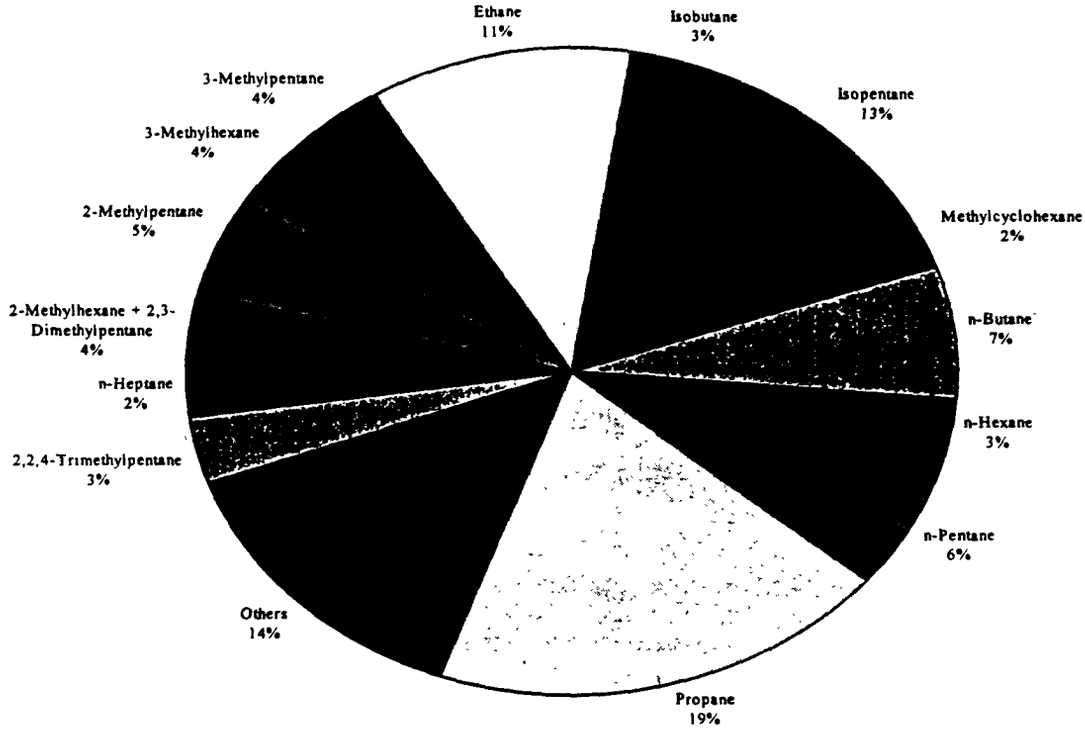


Figure 4-37. Composition of Speciated Paraffins from Urban Commercial Areas in 1995

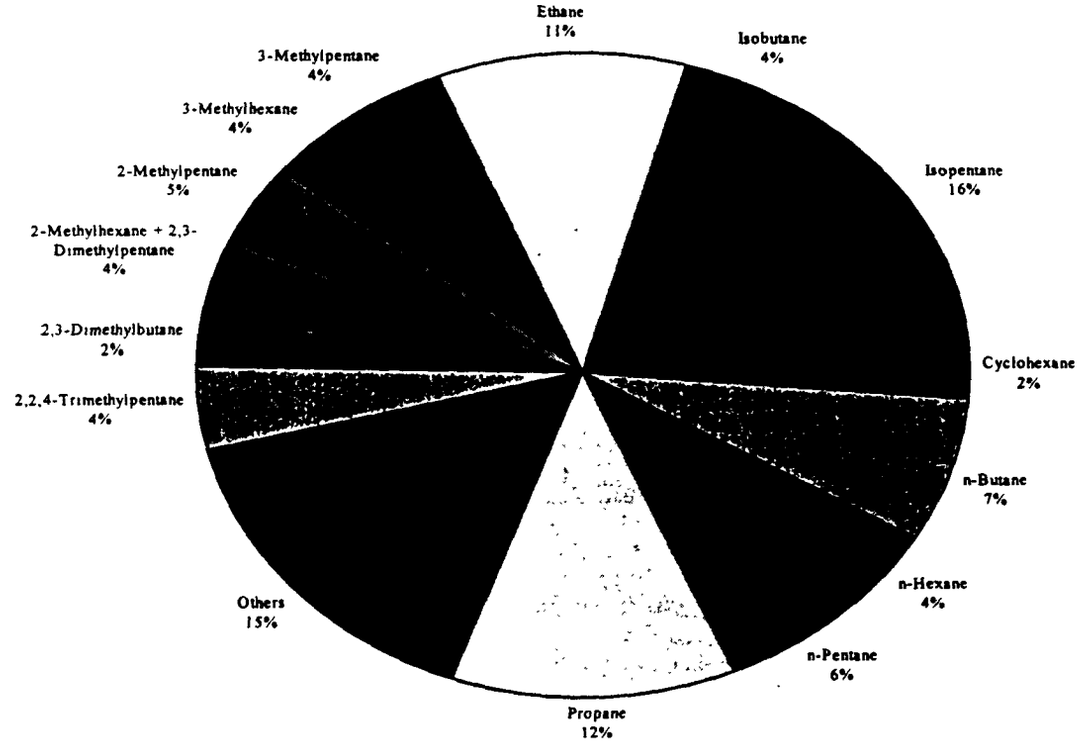


Figure 4-38. Composition of Speciated Paraffins from Suburban Residential Areas in 1995

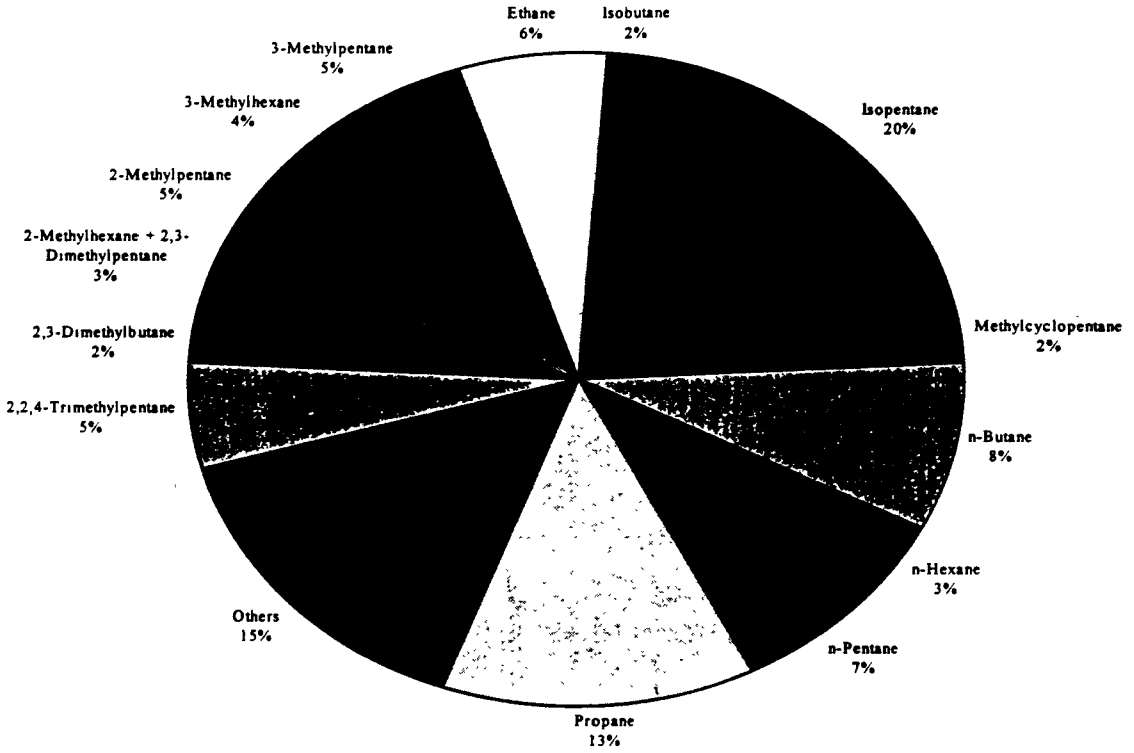


Figure 4-39. Composition of Speciated Paraffins from Rural Residential Areas in 1995

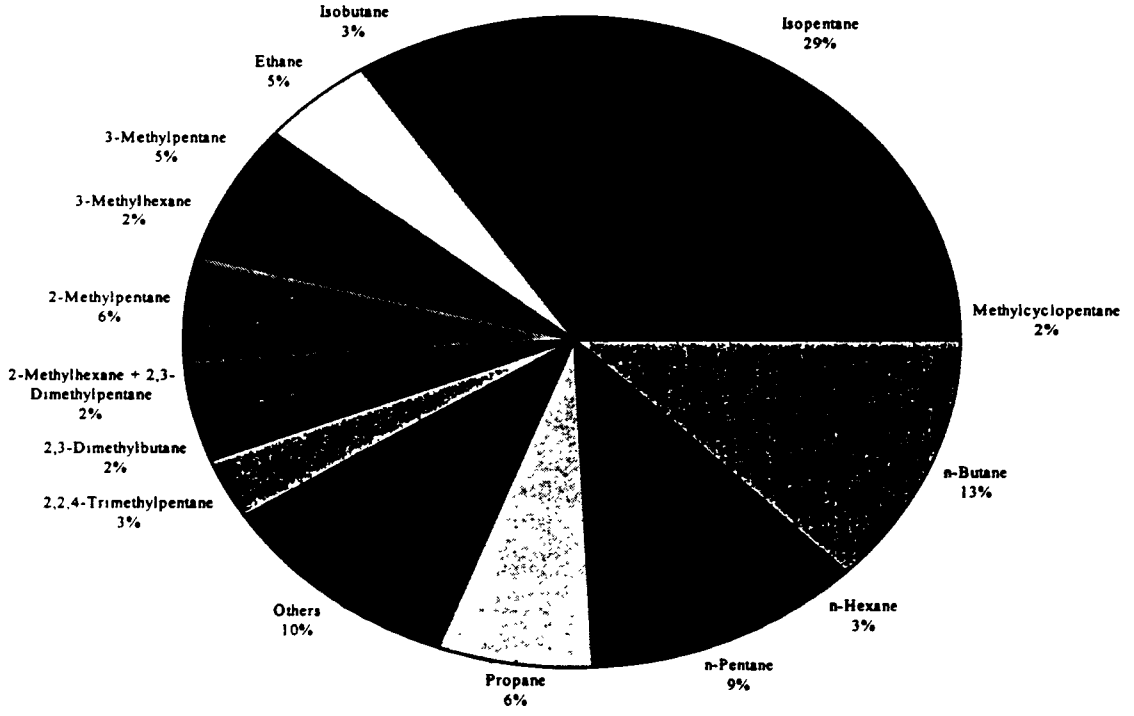


Figure 4-40. Composition of Speciated Paraffins from Rural Agricultural Areas in 1995

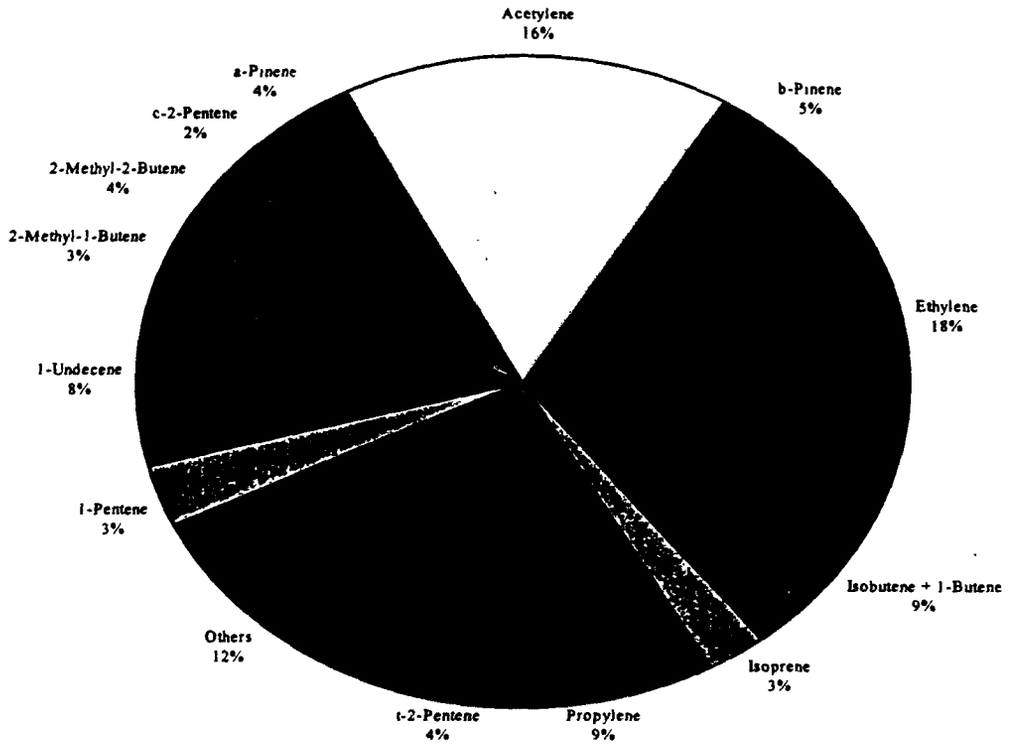


Figure 4-41. Composition of Speciated Olefins in Urban Commercial Areas in 1995

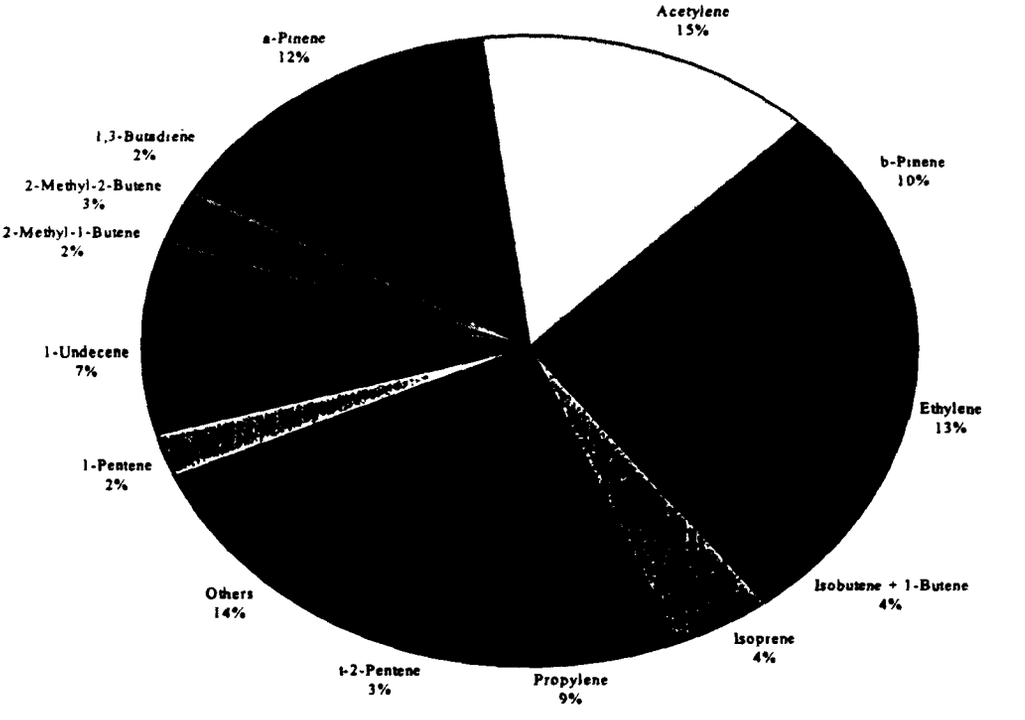


Figure 4-42. Composition of Speciated Olefins in Suburban Residential Areas in 1995

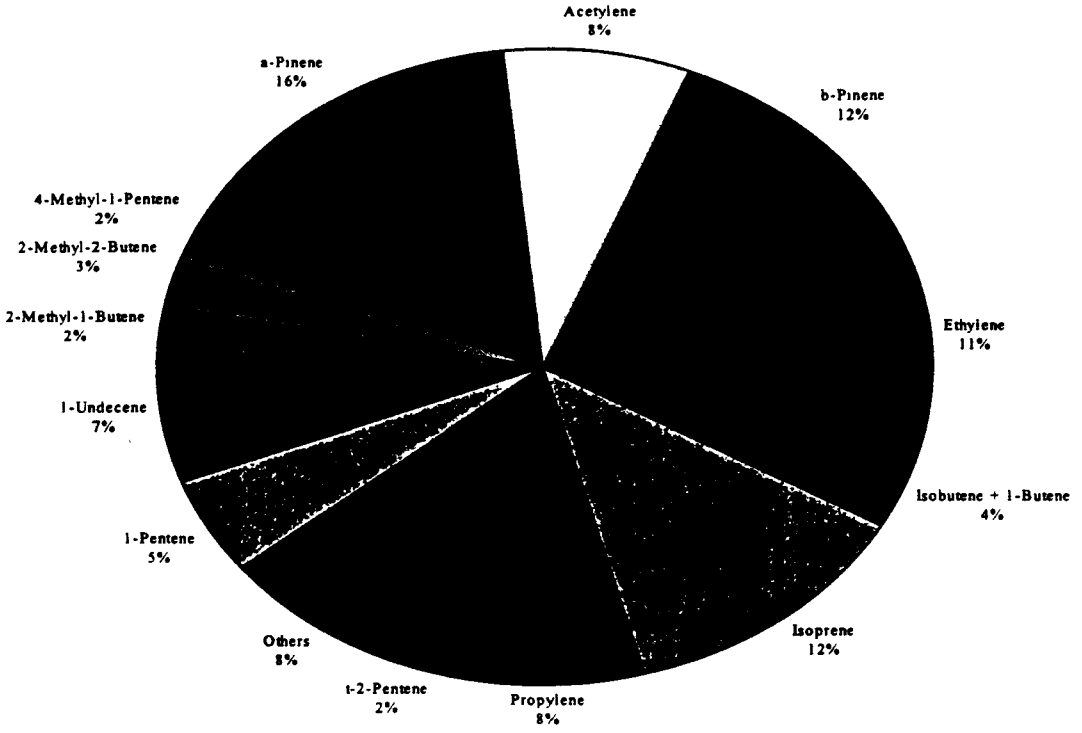


Figure 4-43. Composition of Speciated Olefins in Rural Residential Areas in 1995

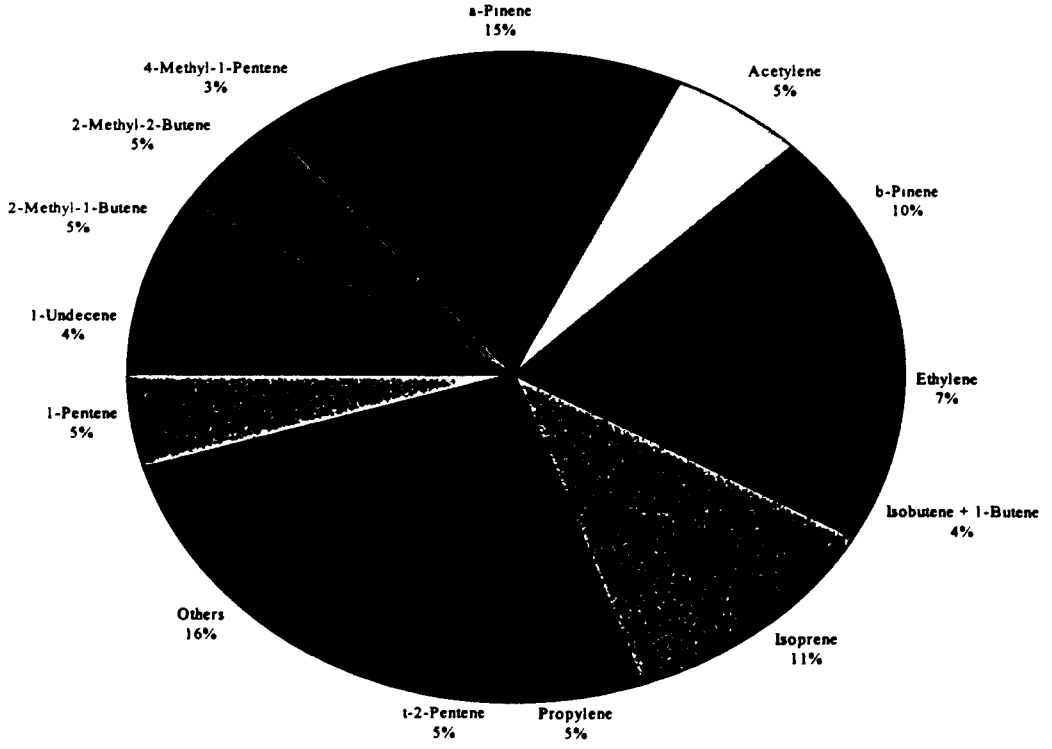


Figure 4-44. Composition of Speciated Olefins in Rural Agricultural Areas in 1995

of occurrence of the 27 halogenated compounds for these four land use types is displayed in Figure 4-45. Eight compounds (methylene chloride, chloroform, trichloroethylene, tetrachloroethylene, chlorobenzene, and the dichlorobenzenes) all occurred less frequently in rural areas than in urban or suburban areas. 1,2-Dichloroethane and 1,1,2,2,-tetrachloroethane occurred only in the urban industrial area. The 1994 TRI data base reported that 1,2-dichloroethane was released from one or more facilities located 11 to 21 kilometers west of the NWNJ sampling site. Chloromethane occurred more frequently in the rural areas than in the urban and suburban areas and bromomethane occurred only in the rural residential area. Bromomethane is used as an insect fumigant for mills, warehouses, vaults, ships, and freight cars and is also used as a soil fumigant. Of the 11 nonhalogenated compounds, all but two were detected with 100% frequency. 1,3-Butadiene was detected more frequently in the rural areas and *n*-octane was detected more frequently in the urban and suburban areas.

The composition of the UATMP VOC fraction from various land use areas is compared in Figure 4-46. In the urban industrial and rural residential areas the halogenated fraction comprises about 20% (median) of the UATMP VOC and ranges from 10 or 20 to 30 percent. In the rural residential area, the composition of the UATMP VOC fraction is most consistent ranging from 20 to 30% halogenated. The UATMP VOC fraction has the highest median (about 30%) and most variable (10 to 50%) halogenated content in the rural agricultural area. The median halogenated content is lowest (10%) in the suburban residential areas.

Concentrations of selected VOCs were compared to see how land use affected the magnitude or variability of the measured concentration. Figures 4-47 through 4-49 compare the measured methylene chloride, 1,1,1-trichloroethane, and trichloroethylene concentrations based on land use. The median methylene chloride, 1,1,1-trichloroethane, and trichloroethylene concentrations were much lower and much less variable in the rural areas. Methylene chloride is a commonly used solvent for degreasing and cleaning fluids and has also been used in food processing. 1,1,1-Trichloroethane is used in cold type metal cleaning and in cleaning plastic molds. Trichloroethylene is a commonly used solvent in paints and varnishes and is also used for degreasing and dry cleaning. Figure 4-50 shows the tetrachloroethylene concentrations

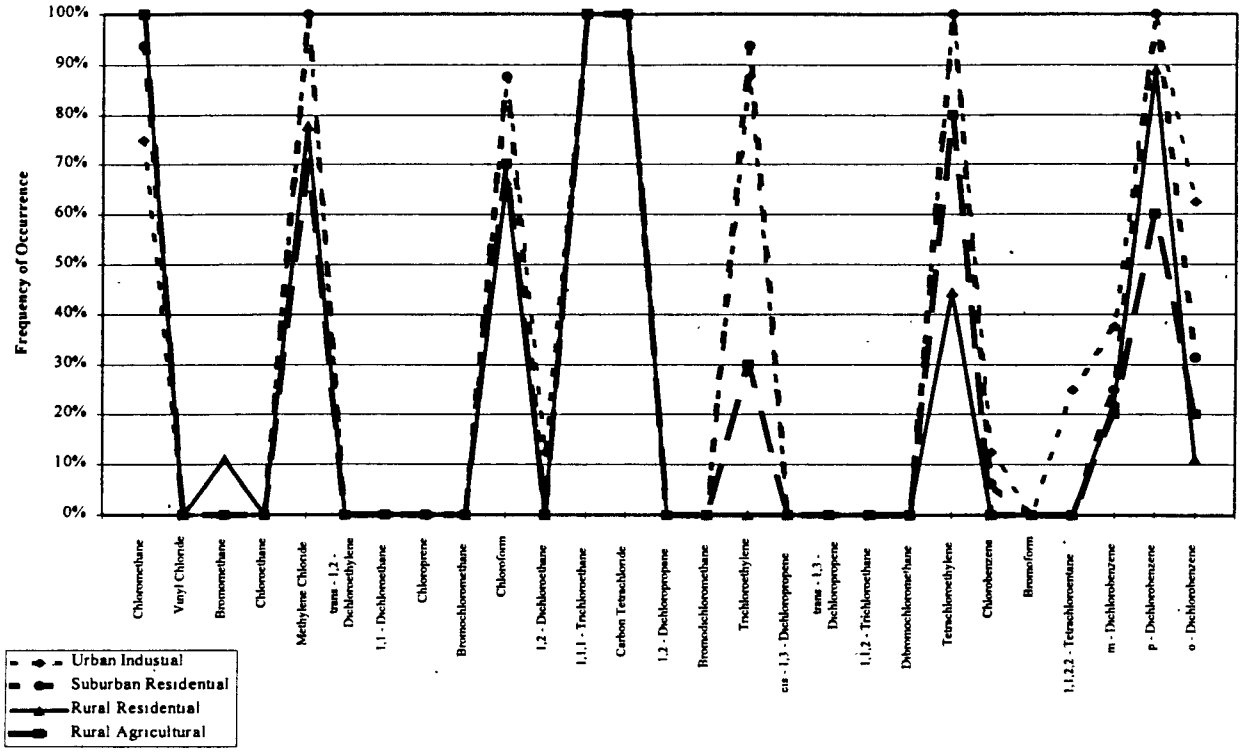


Figure 4-45. Frequency of Occurrence of Halogenated VOC Based on Land Use in 1995

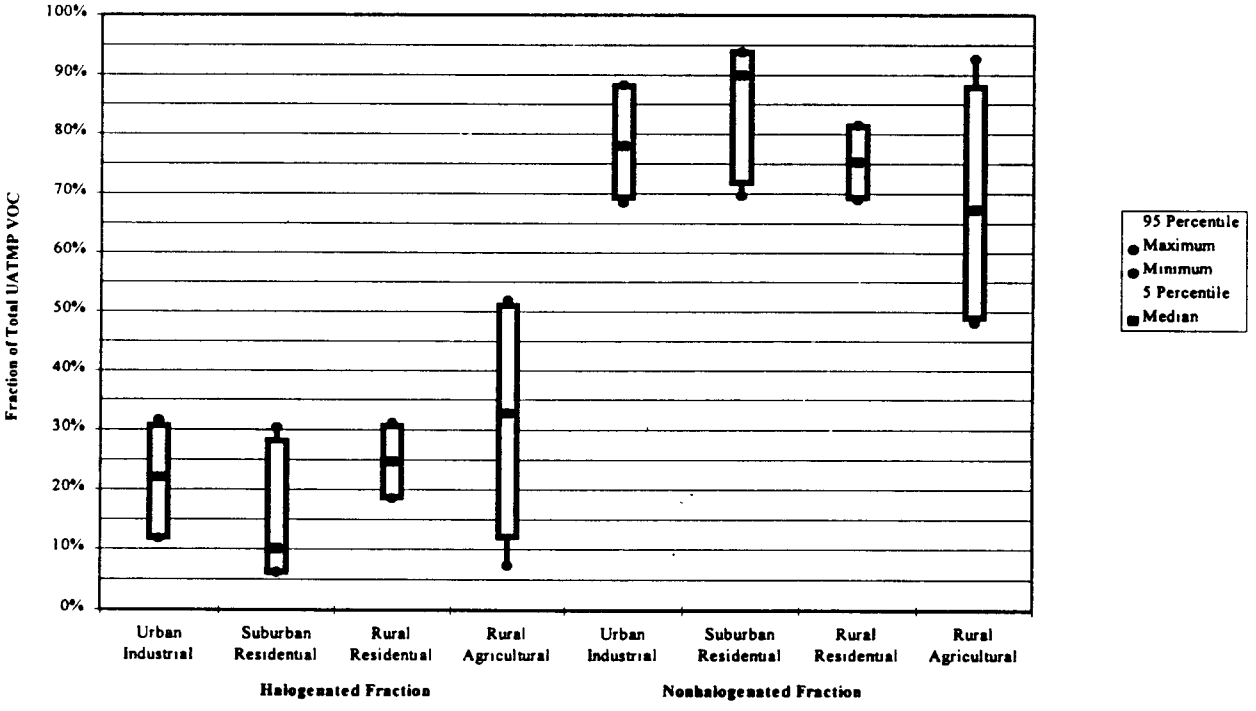


Figure 4-46. Comparison of UATMP VOC Composition for Different Land Uses in 1995

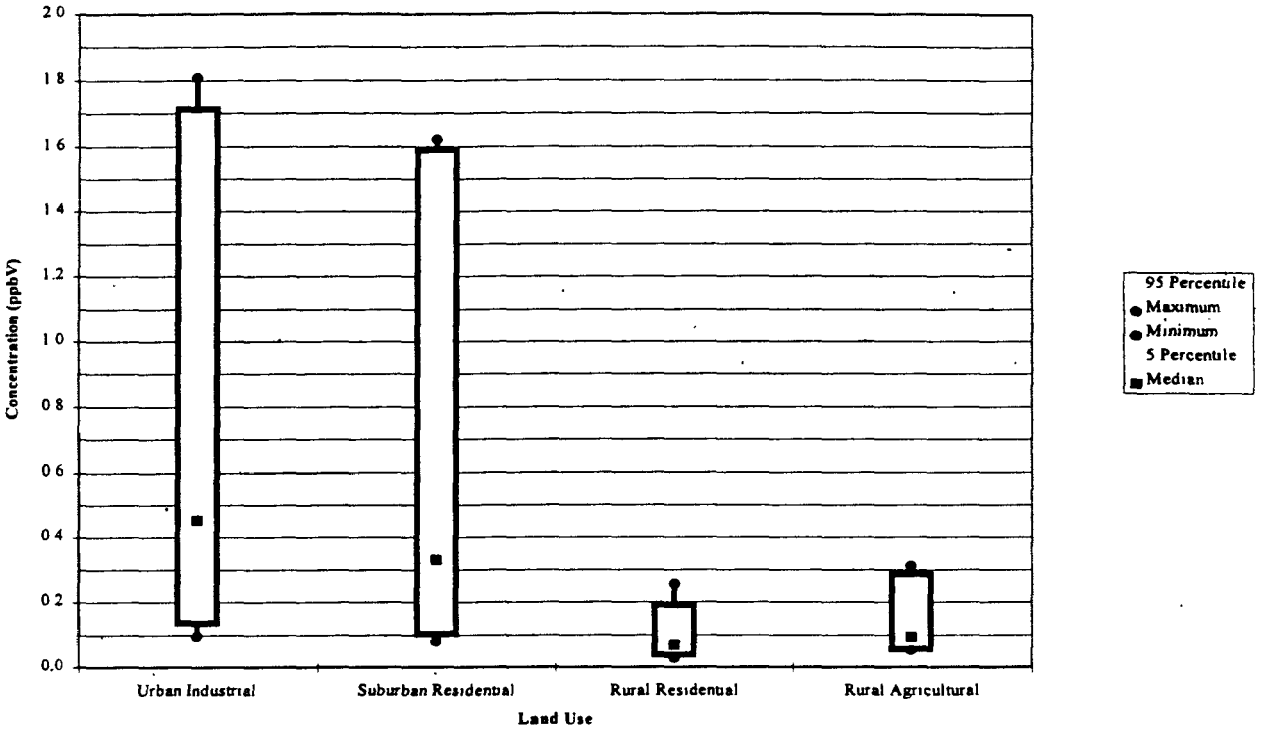


Figure 4-47. Comparison of Methylene Chloride Concentrations Versus Land Use in 1995

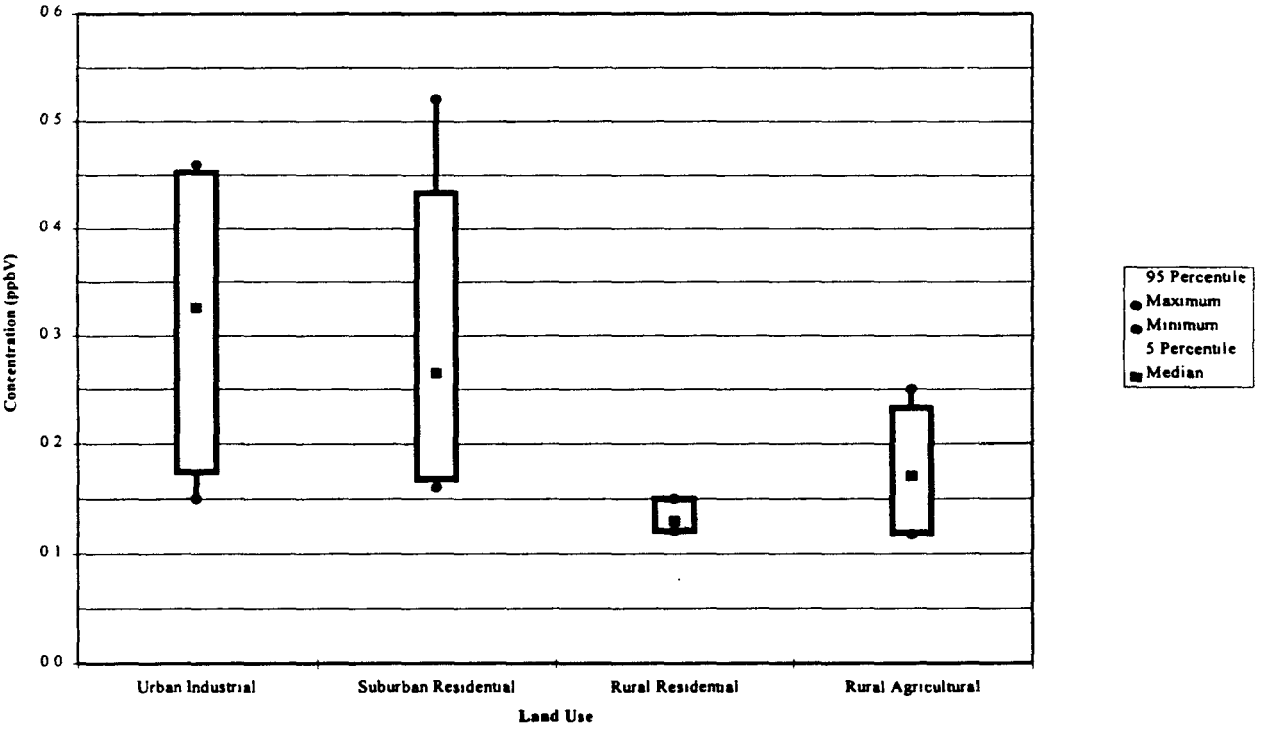


Figure 4-48. Comparison of 1,1,1-Trichloroethane Concentrations Versus Land Use in 1995

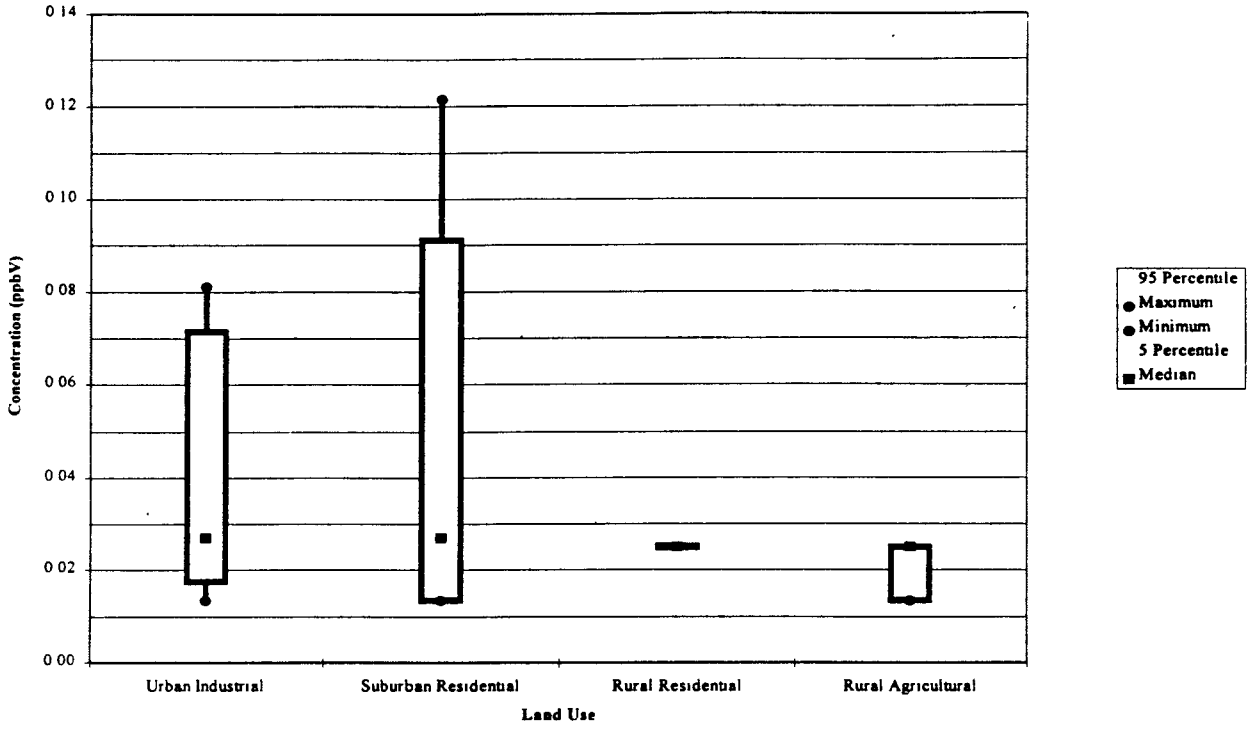


Figure 4-49. Comparison of Trichloroethylene Concentrations with Land Use in 1995

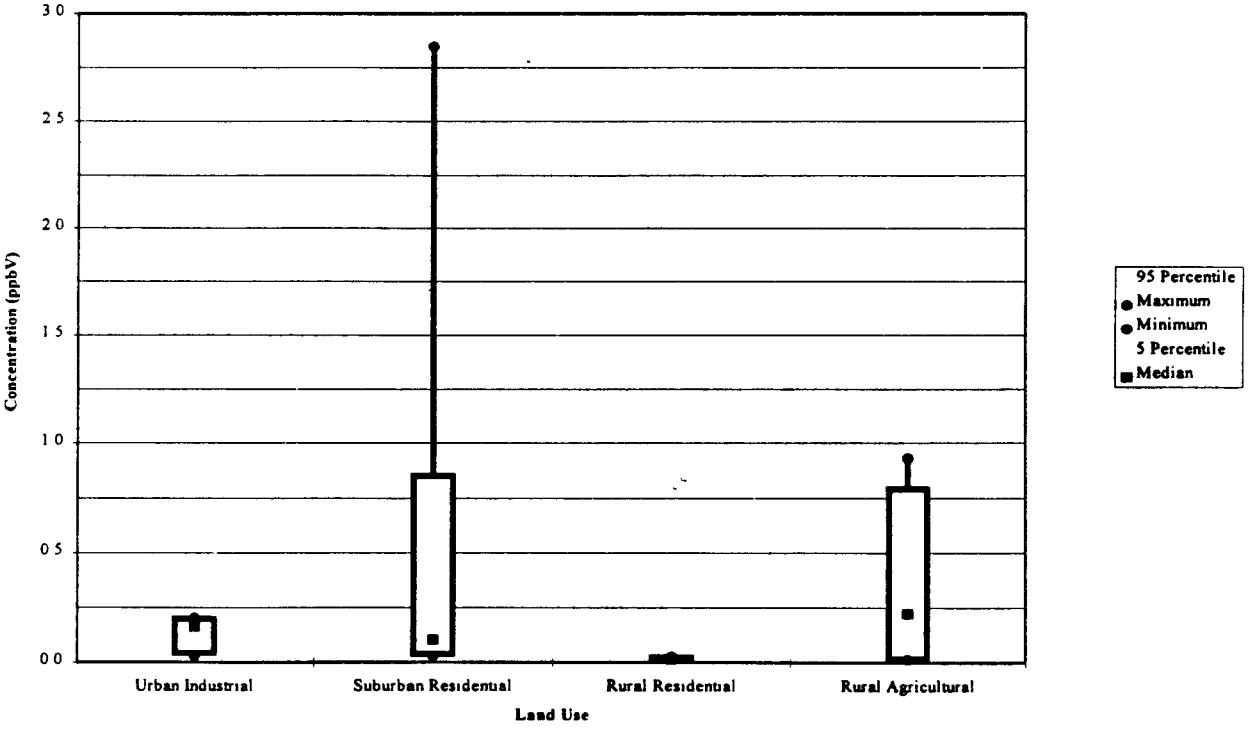


Figure 4-50. Comparison of Tetrachloroethylene versus Land Use in 1995

measured for the different land uses. The median concentration is similar in the various areas; however, the tetrachloroethylene concentration varies much more in magnitude in the suburban residential and rural agricultural areas. Tetrachloroethylene is also used for dry cleaning and degreasing and has been detected in the emissions from coal-fired power plants.[32]

Figure 4-51 depicts the acetylene concentration range and central tendency measured in different land use areas. Acetylene concentrations were lower and the range of measured concentrations were smaller in the rural areas. Acetylene is associated with emissions from motor vehicles. Both the NWNJ (urban industrial) and the B1AL (suburban residential) sites are located near major expressways.

Figures 4-52 through 4-55 show the concentration ranges and central tendencies for propylene, benzene, toluene, and *m*- and *p*-xylene (which coelute). The median concentrations are generally lower and the ranges are generally narrower in the rural areas. The highest median concentration and widest ranges are generally in the suburban residential areas. The one exception to these generalities is toluene. Although the median concentration is quite low in the rural agricultural area, the maximum toluene measurement is much higher than for the other areas and the concentration range is much wider. Toluene is used as a solvent for paints and lacquers and as a gasoline additive.

4.2.4 Presentation of the UATMP VOC and the Speciated NMOC Results

Eleven compounds (acetylene, propylene, 1,3-butadiene, benzene, *o*-xylene, toluene, n-octane, ethylbenzene, *m*- and *p*-xylene, and styrene) are analyzed by both the UATMP VOC multidetector and the Speciated NMOC flame ionization detector methods. Thus, the results obtained from the two programs can be looked at side-by-side to identify areas where the data agree and disagree.

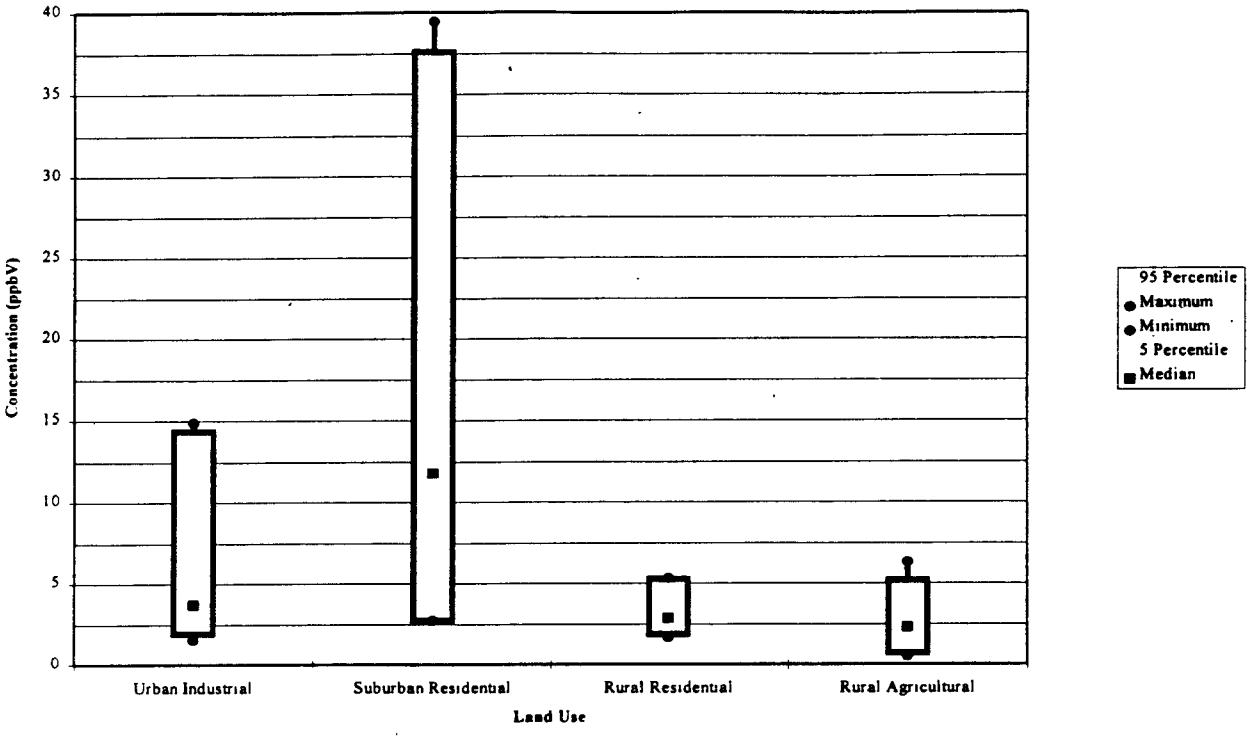


Figure 4-51. Comparison of Acetylene Concentration versus Land Use in 1995

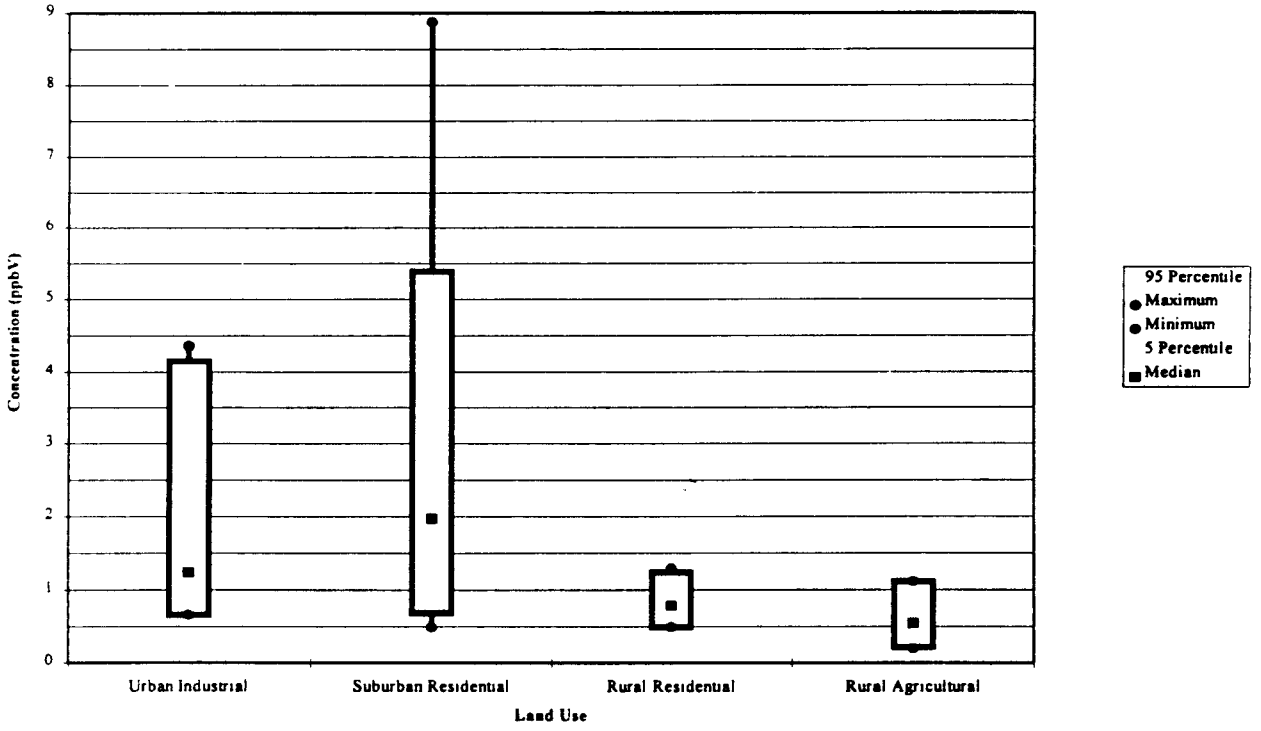


Figure 4-52. Comparison of Propylene Concentration Versus Land Use in 1995

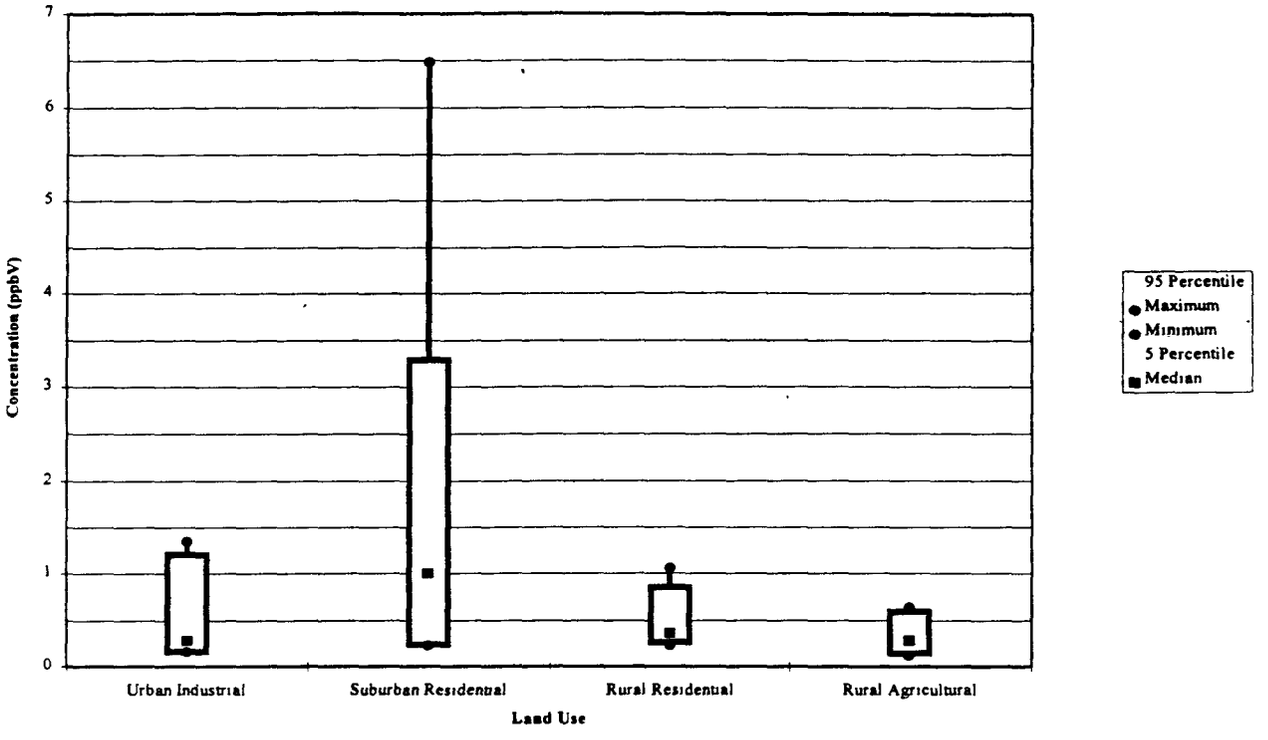


Figure 4-53. Comparison of Benzene Concentrations Versus Land Use in 1995

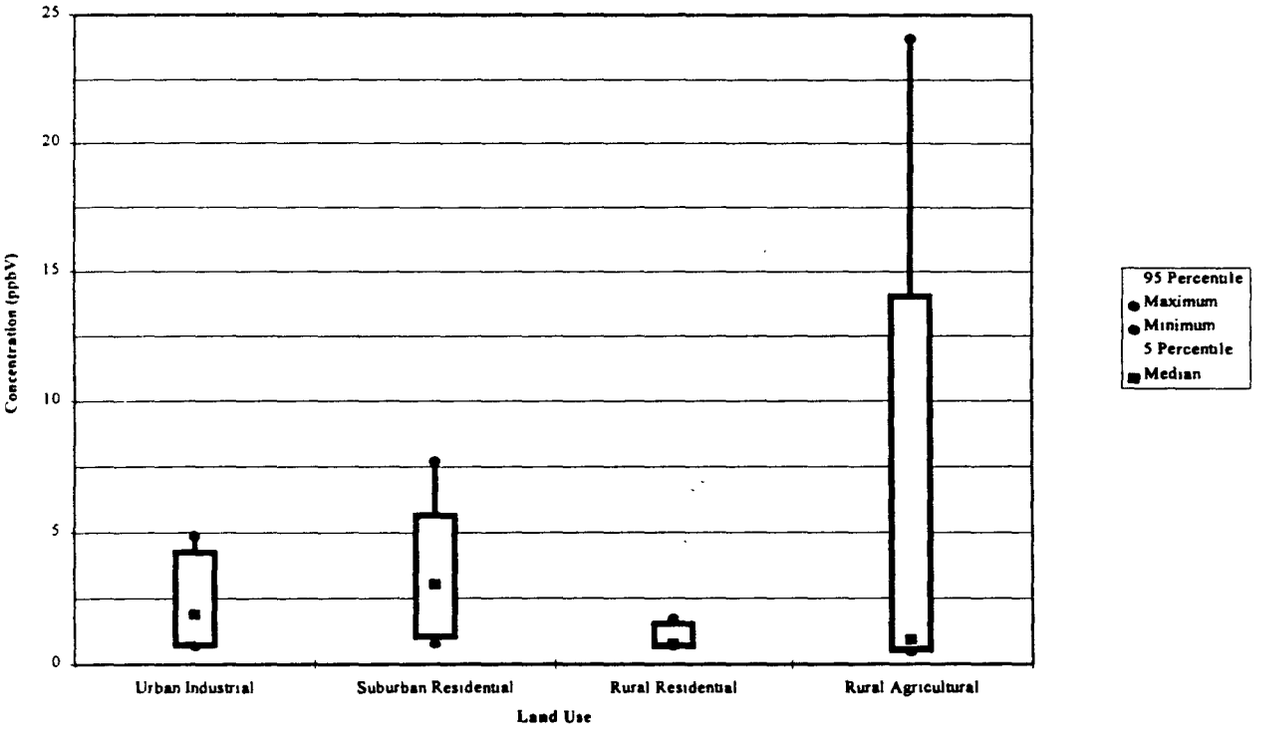


Figure 4-54. Comparison of Toluene Concentration Versus Land Use in 1995

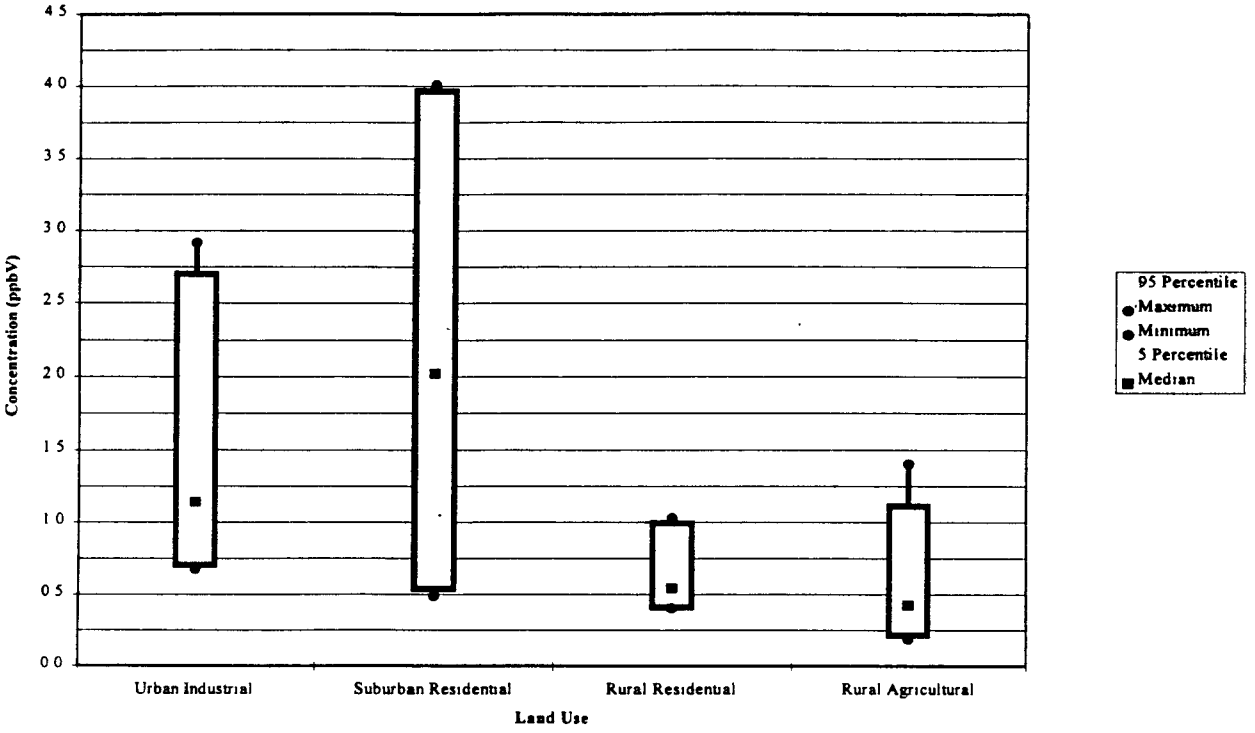


Figure 4-55. Comparison of *m*- and *p*-Xylene Concentration versus Land Use in 1995

First, frequency of occurrence was examined. Figure 4-56 shows the frequency of occurrence as determined by the Speciated NMOC method for the eleven compounds. As with the UATMP program, benzene, *o*-xylene, ethylbenzene, *m*-and *p*-xylene, and styrene were detected with high frequency in all areas. The results for *n*-octane are also similar in that n-octane occurs least frequently in rural agricultural areas and most frequently in urban commercial areas.

For acetylene, propylene, and 1,3-butadiene, the prevalence results from the Speciated NMOC analysis differ somewhat from the results from the UATMP VOC analysis. First, acetylene and propylene are detected less frequently by the speciated NMOC method, probably because the speciated NMOC method has an estimated detection limit for these compounds that is approximately ten times higher than that for the UATMP VOC method. For acetylene and propylene, the frequency of occurrence is greatest in the urban commercial areas and least in the

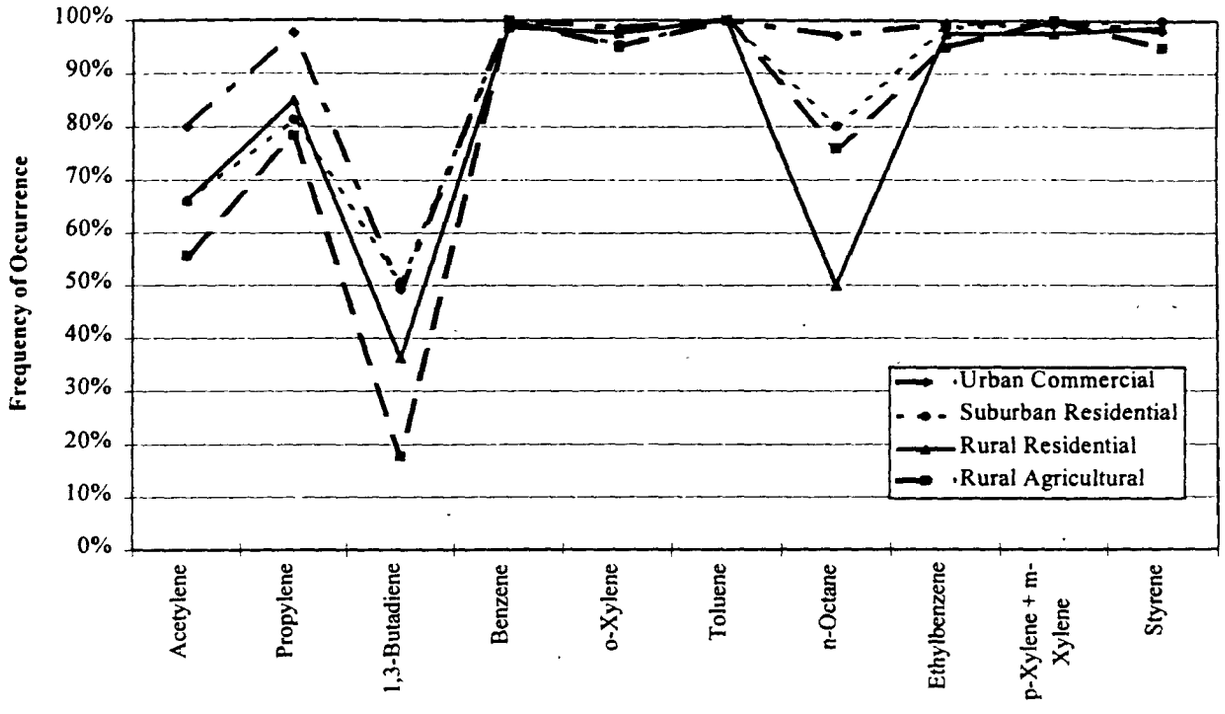


Figure 4-56. Frequency of Occurrence of Selected Compounds in 1995 as Determined by the Speciated NMOC Method

rural agricultural areas. Because, as mentioned earlier, acetylene and propylene are associated with motor vehicle emissions, the lower frequency of occurrence in the agricultural areas may be a result of the reduced number of motor vehicles in these areas. The incidence of 1,3-butadiene is less in the rural areas than in the suburban and urban areas which is the opposite of what was indicated by the UATMP VOC data.

The central tendency and variability of the data was also compared for propylene, acetylene, benzene, toluene, and *m*- and *p*-xylene. The central tendency and variability relationships for the two data sets were similar between the land use areas for propylene and benzene. As shown in Figures 4-57 through 4-59, slight differences were observed for acetylene, toluene, and *m*- and *p*-xylene. Although the suburban residential area still exhibits a wide range of concentrations for acetylene, the median value is very similar to that observed in the urban commercial areas. A difference in the median may result from the larger number of cases

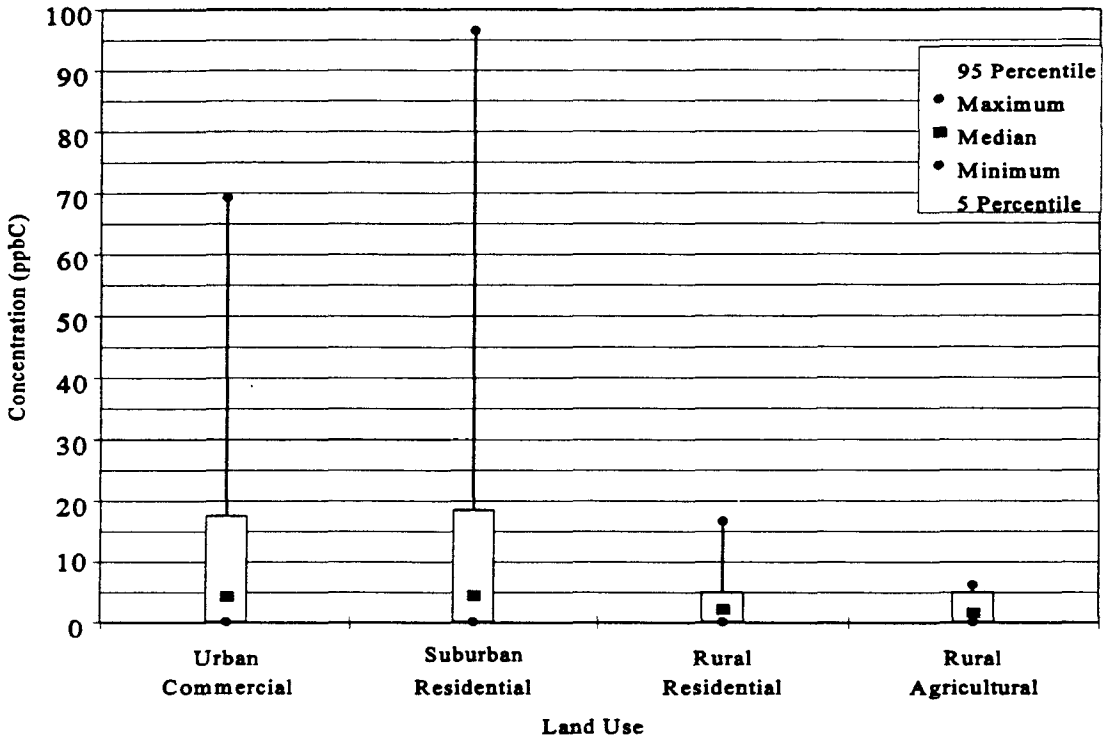


Figure 4-57. Acetylene Concentrations Measured by the Speciated NMOC Method for Different Land Uses in 1995

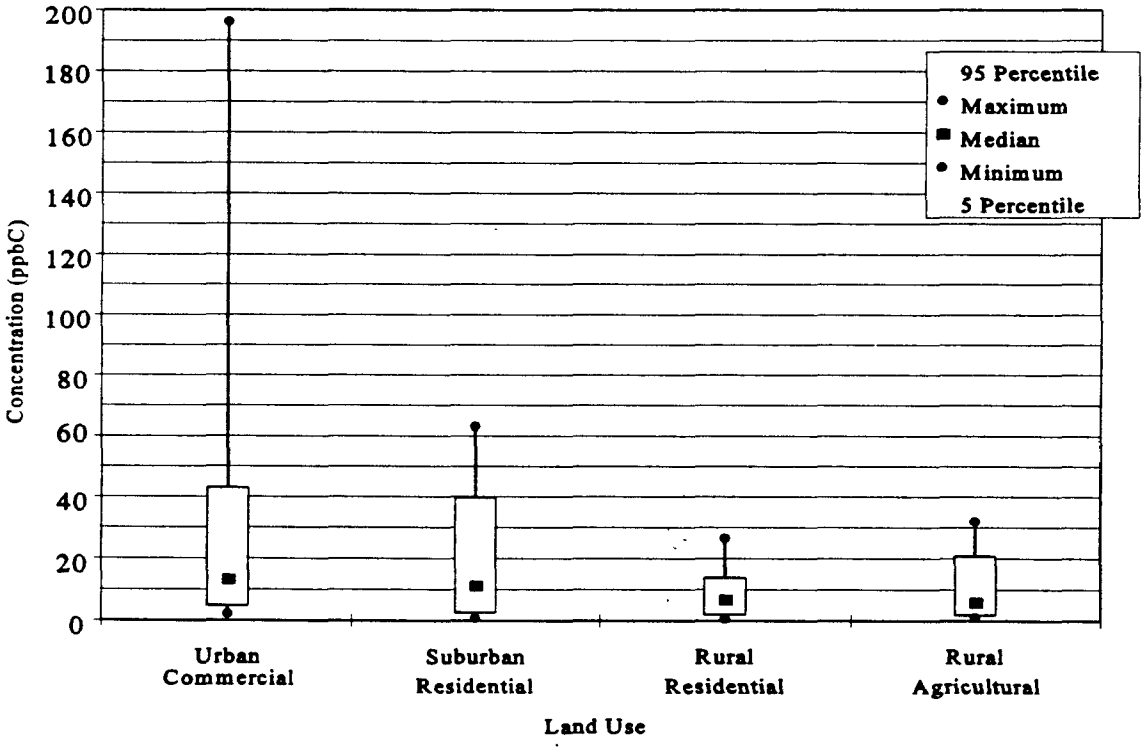


Figure 4-58. Toluene Concentrations Measured by the Speciated NMOC Method for Different Land Uses in 1995

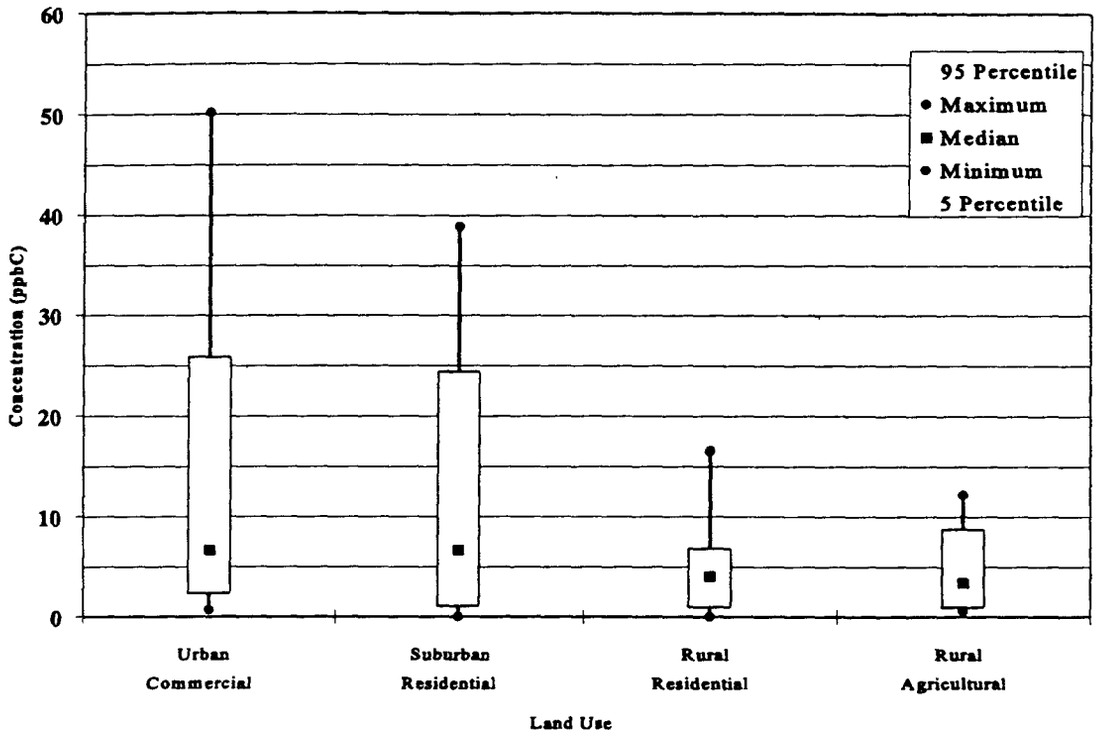


Figure 4-59. *m*- and *p*-Xylene Concentrations Measured by the Speciated NMOC Method for Different Land Uses in 1995

available for the speciated NMOC data. With more data available, a spurious high concentration observation will affect the median less. For toluene, the range of concentrations observed in the rural agricultural area is much smaller and for *m*- and *p*-xylene, the concentration ranges observed in the suburban residential areas is much smaller.

4.2.5 Carbonyl Discussion

Three carbonyl option sites (DLTX, FWTX, NWNJ) were located in urban areas and two sites (NOLA, P2NJ) were located in suburban residential areas. Frequency of occurrence of the 16 carbonyl compounds for these land uses are shown in Figure 4-60. Formaldehyde, acetaldehyde, acetone, and hexaldehyde showed up in all of the samples. Acrolein was detected most frequently in the urban industrial area and was not detected at all in the suburban residential samples. Acrolein emissions are associated with engines and fossil fuel combustion.[34] There is

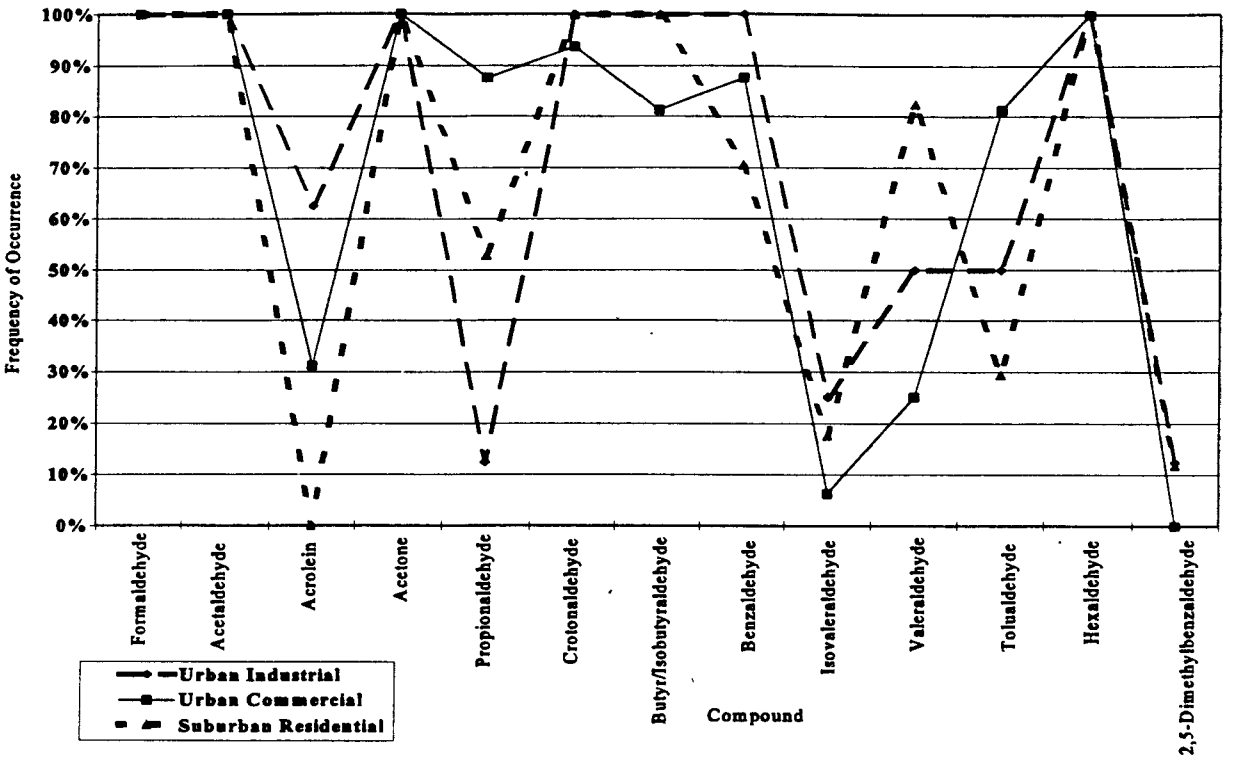


Figure 4-60. Comparison of Frequency of Occurrence of Carbonyls for Different Land Uses in 1995

less estimated vehicular traffic in the suburban residential levels and frequency of sampling areas than in the urban industrial area so lower occurrence would be expected for acrolein in the suburban areas. Propionaldehyde was detected most frequently in the urban commercial area and least frequently in the urban industrial area. Valeraldehyde was detected most frequently in the suburban residential area and least frequently in the urban commercial area. Tolualdehydes were detected most frequently in the urban industrial area and least frequently in the suburban residential area.

The ranges and central tendencies were also compared for selected compounds. Figure 4-61 depicts the formaldehyde concentrations measured in different areas. In the suburban residential areas the median formaldehyde measurement was less than 2 ppbv while it was greater than 2.5 ppbv in the urban commercial areas and almost 5 ppbv in the urban industrial areas. Figure 4-62 shows the acetaldehyde concentrations. The median acetaldehyde

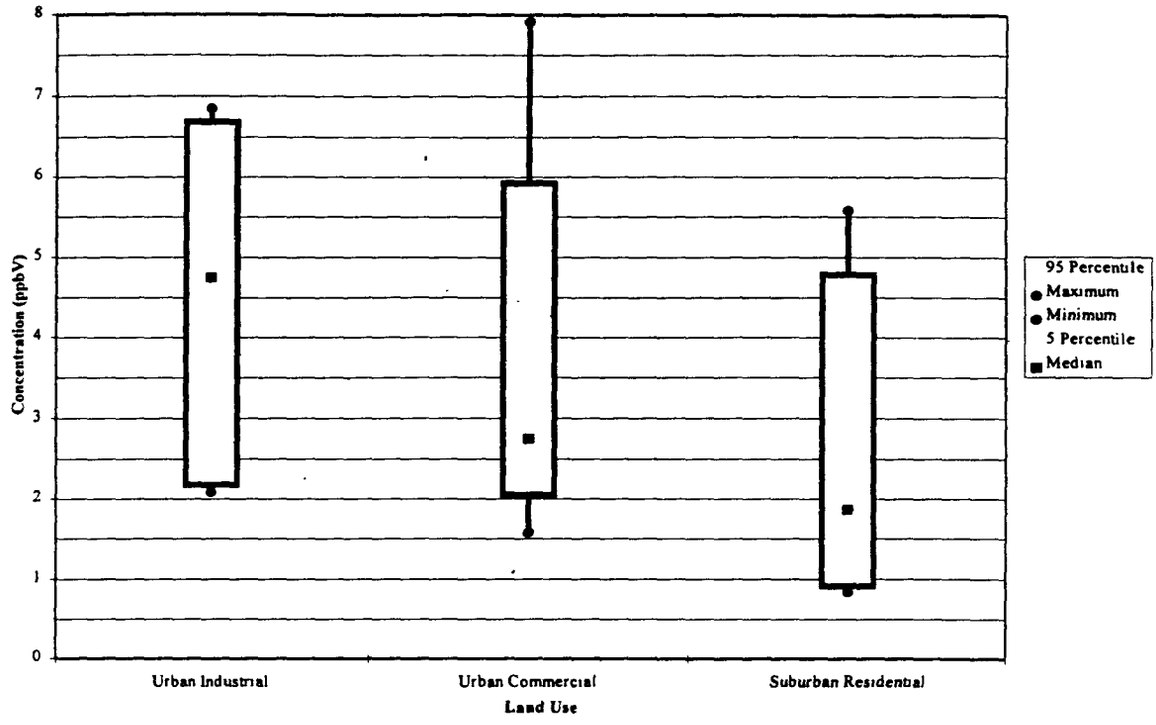


Figure 4-61. Comparison of Formaldehyde Concentration Versus Land Use in 1995

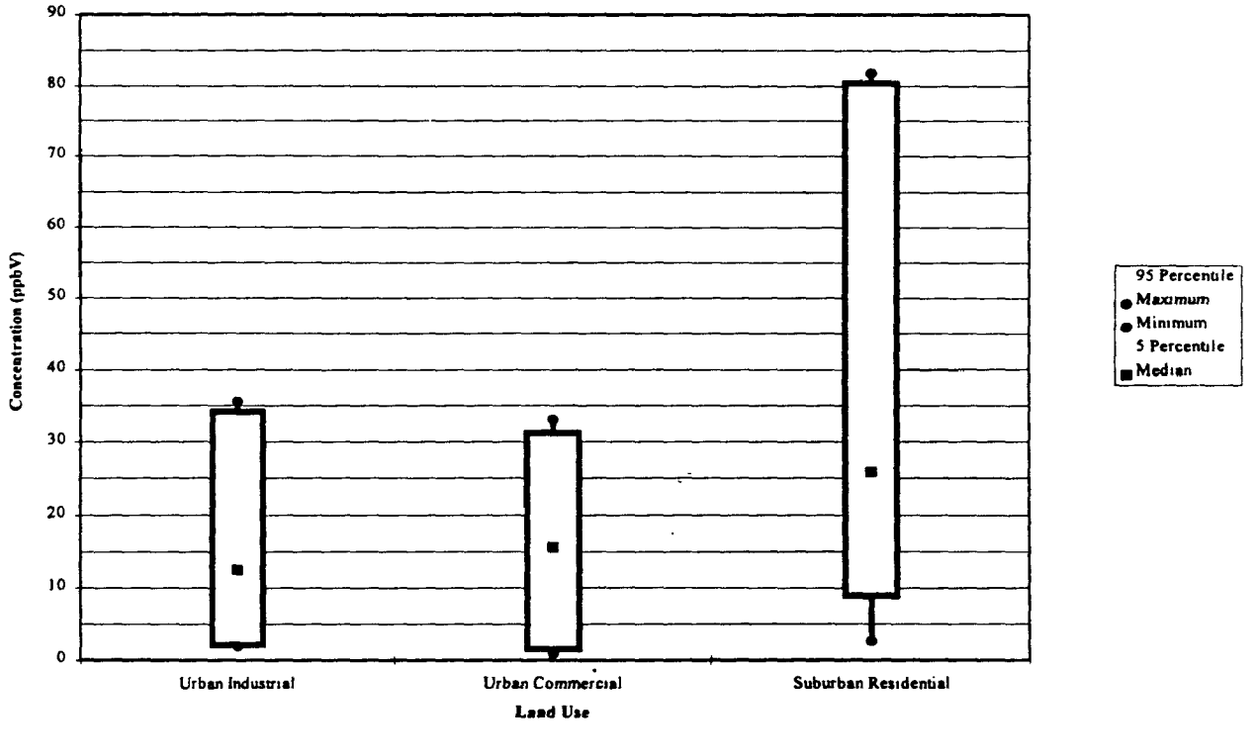


Figure 4-62. Comparison of Acetaldehyde Concentration versus Land Use in 1995

concentrations are highest (about 25 ppbV) in the suburban residential areas and lowest (about 12 ppbV) in the urban industrial areas. Figure 4-63 displays the formaldehyde to acetaldehyde ratios for the various areas. The ratios are largest for the urban industrial areas and lowest for the suburban residential areas. These results are opposite of what is expected based on the literature.[28]

Propionaldehyde concentrations are depicted in Figure 4-64. The median and maximum concentrations were highest and the measured range of concentrations was widest in the suburban residential areas and smallest and narrowest in the urban industrial areas. Figure 4-65 shows the acetaldehyde to propionaldehyde ratios (excluding the propionaldehyde nondetects). Again the ratios are higher in the urban areas and lower in the residential areas which is opposite of what is reported in the literature.[28]

Figures 4-66 and 4-67 depict the concentration ranges and central tendencies for acetone and hexaldehyde. Acetone concentrations were more consistent in the urban industrial area than in the other areas. Hexaldehyde concentrations varied widely and were generally larger in magnitude in the suburban residential areas.

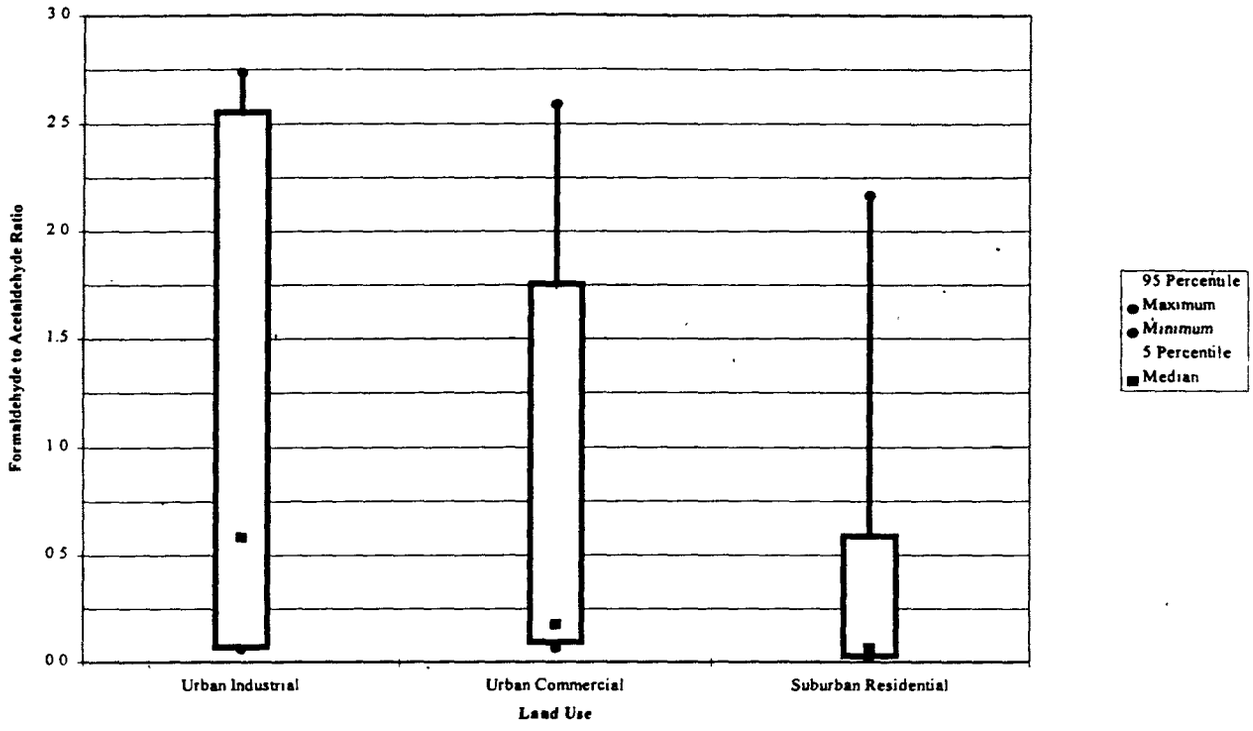


Figure 4-63. Comparison of Formaldehyde to Acetaldehyde Ratio with Land Use in 1995

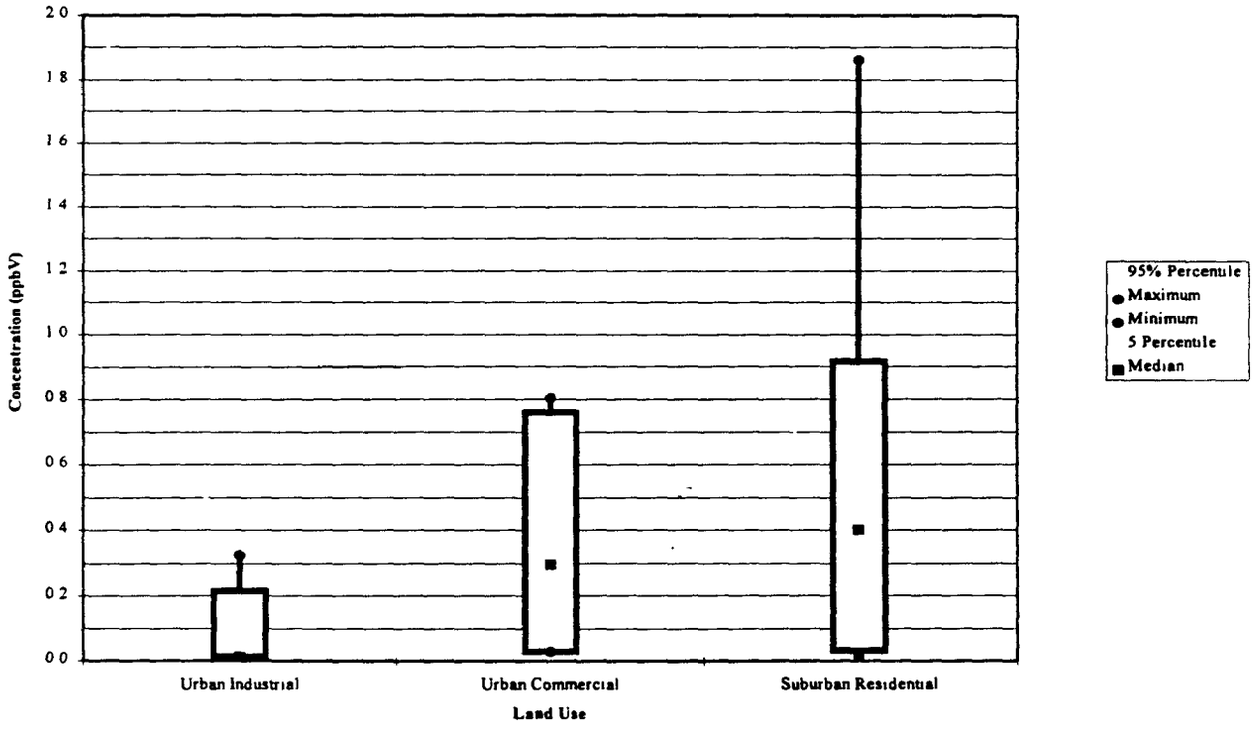


Figure 4-64. Comparison of Propionaldehyde Concentration versus Land Use in 1995

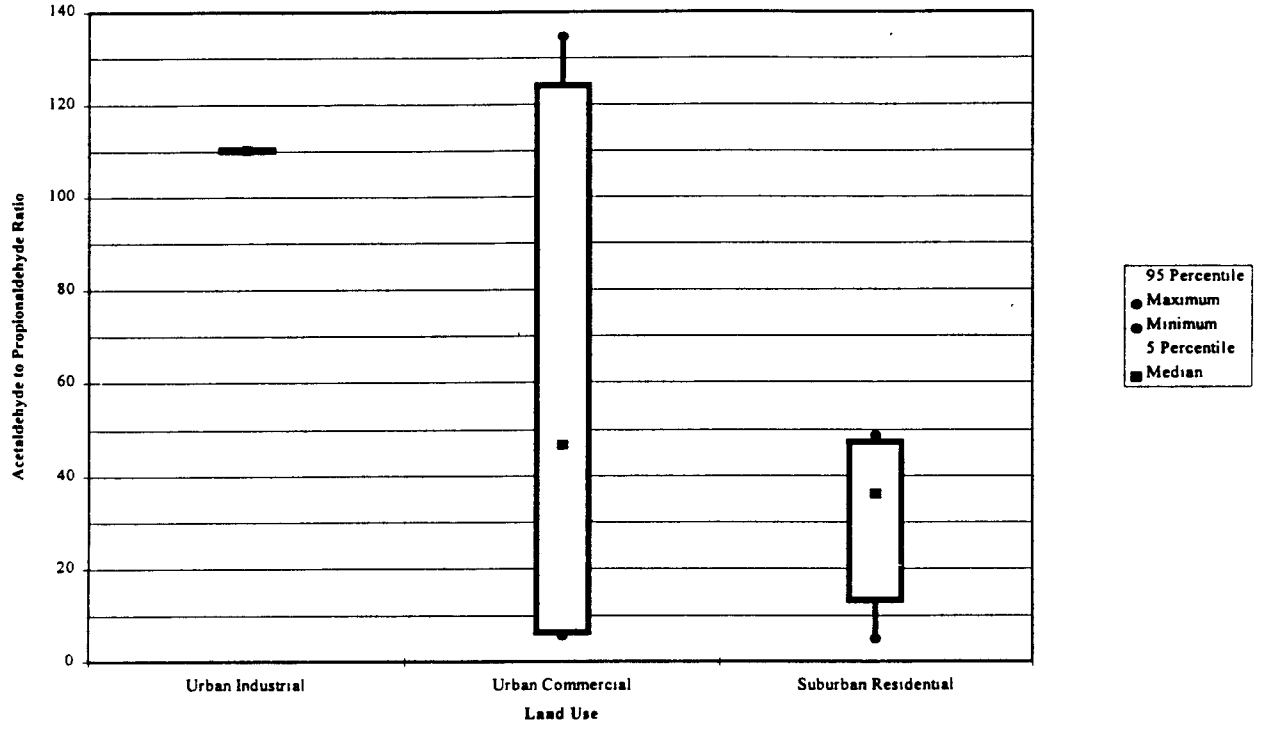


Figure 4-65. Comparison of Acetaldehyde to Propionaldehyde Ratios in 1995

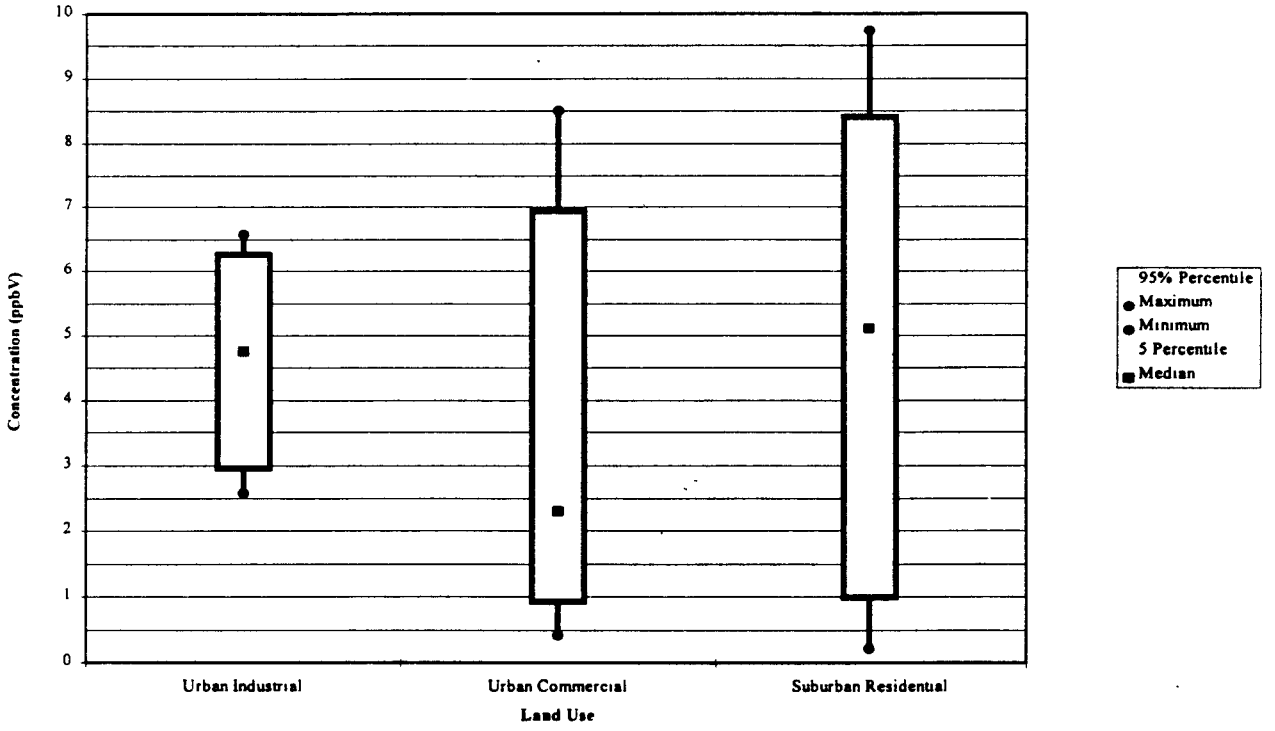


Figure 4-66. Comparison of Acetone Concentration versus Land Use in 1995

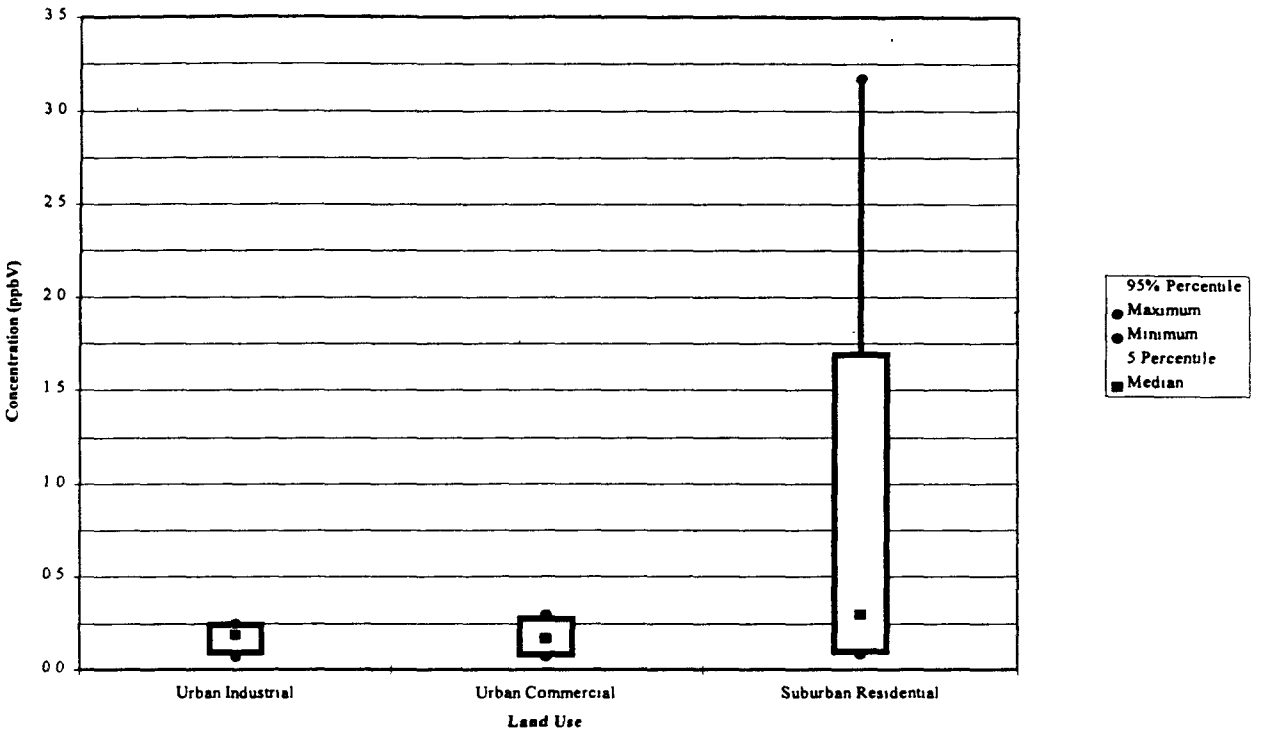


Figure 4-67. Comparison of Hexaldehyde Concentration versus Land Use in 1995

5.0 DATA TRENDS

Temporal variations of the central tendencies of the data at a given site and between sites can indicate if the NMOC or speciated VOC concentrations are increasing or decreasing or if the average makeup of the VOC mix at a given site is changing with time. The analysis of the temporal trends presented in this section are based upon visual observation of the plotted daily concentrations of the individual species examined. No statistical analysis of trends was performed and no adjustment of individual concentrations for day-to-day variations in meteorological reactivity were made. Also, no allowances for differences in photochemical reactivity were made when comparing the temporal trends of individual species. Differential reaction rates can cause large differences in the observed concentrations of similarly emitted species. These reactivity differences can be accentuated by the short-term (3-hour) nature of the samples whose concentrations are highly dependent upon the local ozone photochemistry (a function of both reactivity and meteorology) that occurred at the time a given sample was taken.

5.1 NMOC

Figures 5-1 through 5-3 plot the measured NMOC concentration in ppbC versus the date sampled for the three sites that participated in the 1995 NMOC base program. Breaks in the plot indicate scheduled sampling days on which valid samples were not collected with one exception. At Long Island, New York (LINY), a sample was collected on July 2 instead of July 3 due to a state recognized holiday. This sample is plotted as though it were collected on July 3. The plots display considerable day-to-day variability, which is typical for ambient monitoring data.

The median, maximum, minimum, and 5 and 95 percentile NMOC concentrations for each month were calculated for 1988, 1990, 1993, 1994, and 1995 for the Newark, New Jersey (NWNJ), and Plainfield, New Jersey (P2NJ), sites and for 1990, 1993, 1994, and 1995 for the Long Island, New York (LINY), site based on historical participation in the program. Plots of

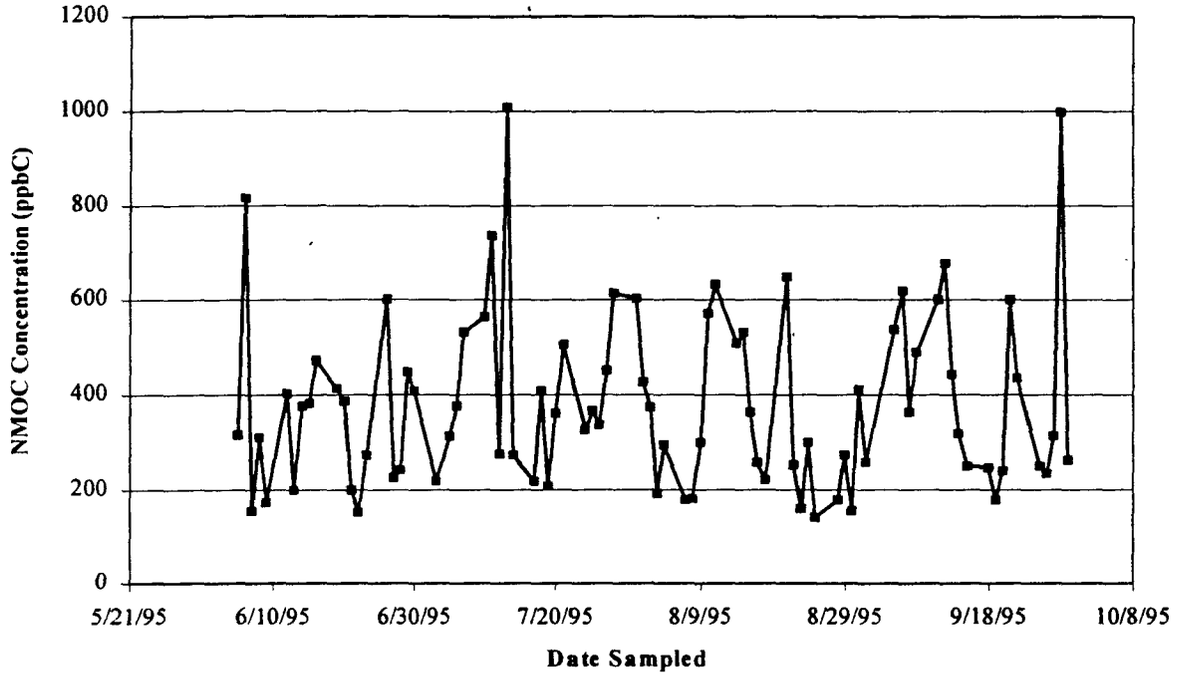


Figure 5-1. 1995 NMOC Concentrations, Newark, New Jersey (NWNJ)

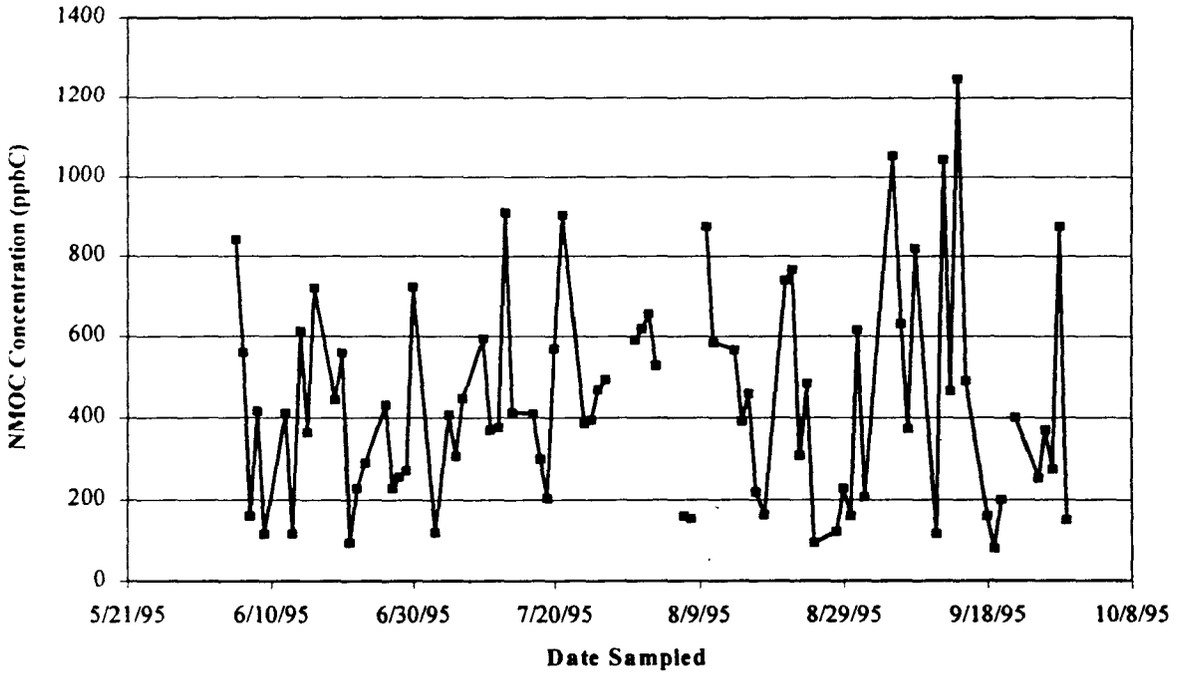


Figure 5-2. 1995 NMOC Concentrations, Plainfield, New Jersey (P2NJ)

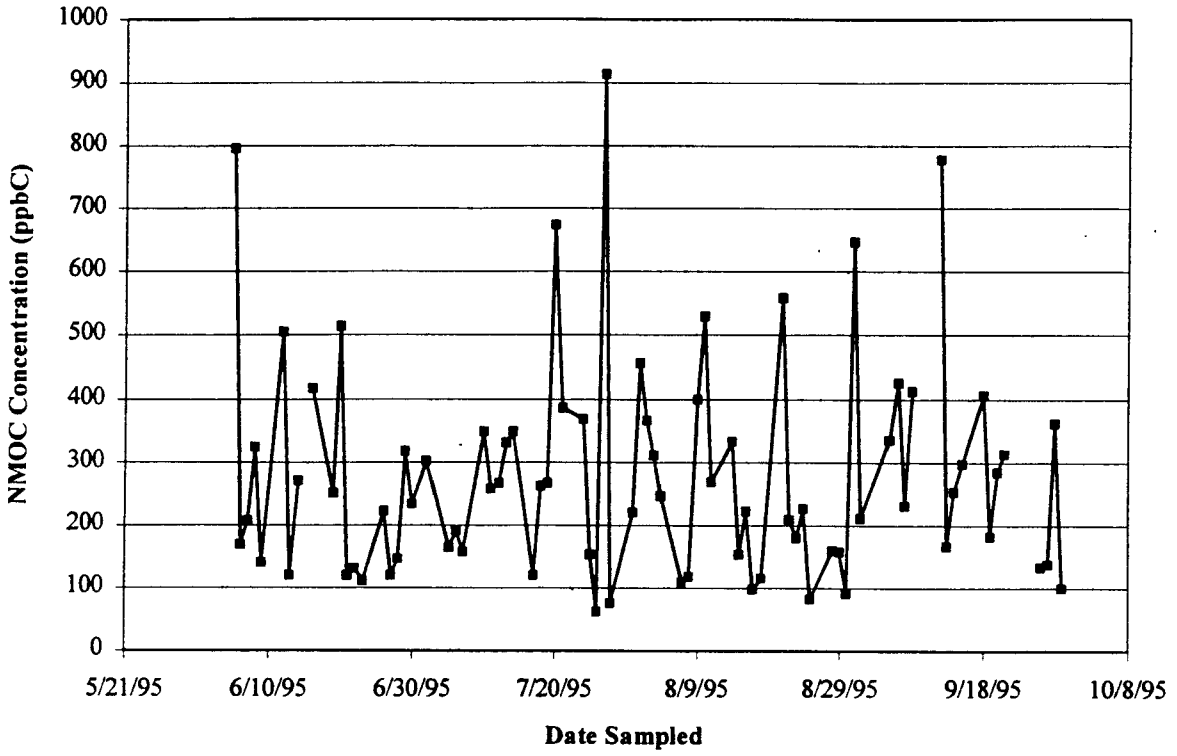
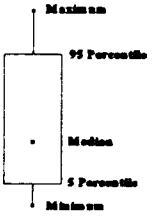


Figure 5-3. 1995 NMOC Concentrations, Long Island, New York (LINY)

these values for each site are shown in Figures 5-4 through 5-6. The maximum is depicted as a solid circle located above the box and attached to the box via a single, solid line. The top of the box represents the 95th percentile and the bottom of the box represents the 5th percentile; thus 90% of the sample values fall within the box. The median is depicted by a solid square within the box. Half of the samples are above the median and half of the samples are below the median. The minimum is depicted as a solid circle located below the box and attached to the box by a single, solid line. The numbers under the first letter of each month indicate the number of valid samples collected that month. No data was available for September of 1993 at Plainfield, New Jersey (P2NJ).



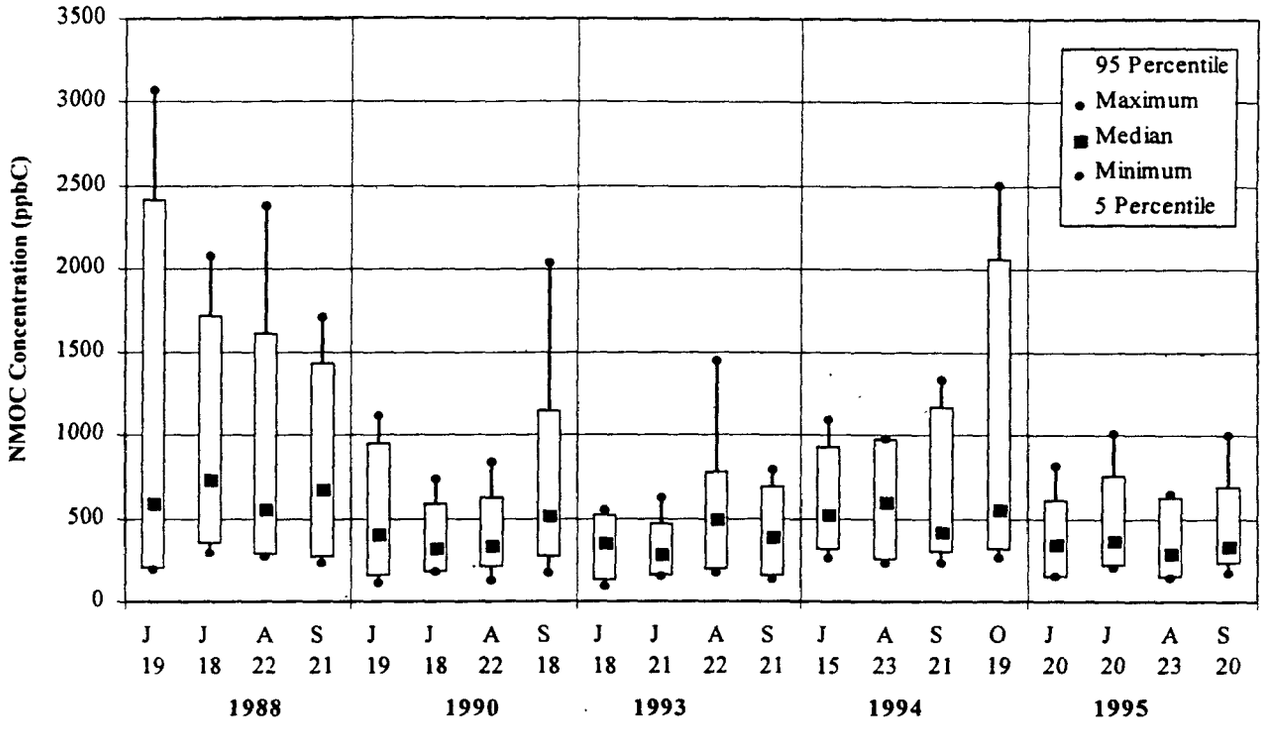


Figure 5-4. 1995 Temporal Comparisons of Monthly NMOC Concentrations Measured at Newark, New Jersey (NWNJ)

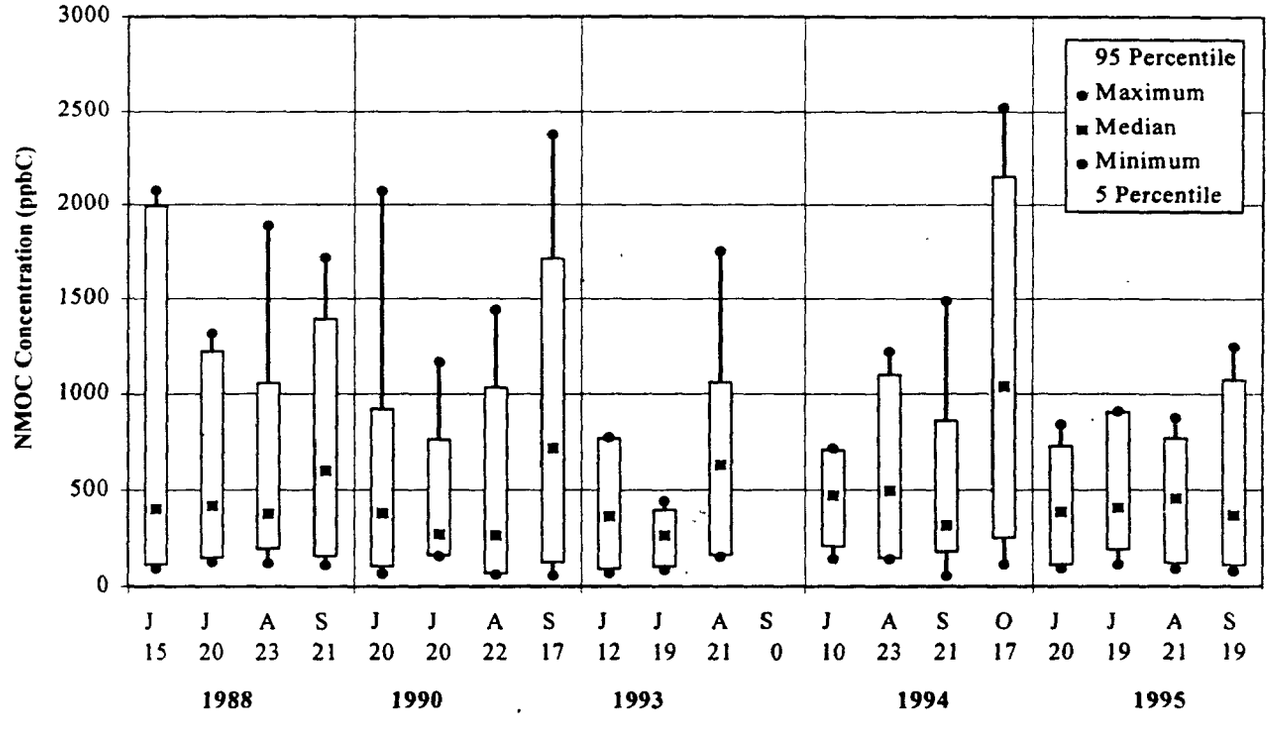


Figure 5-5. 1995 Temporal Comparisons of Monthly NMOC Concentrations Measured at Plainfield, New Jersey (P2NJ)

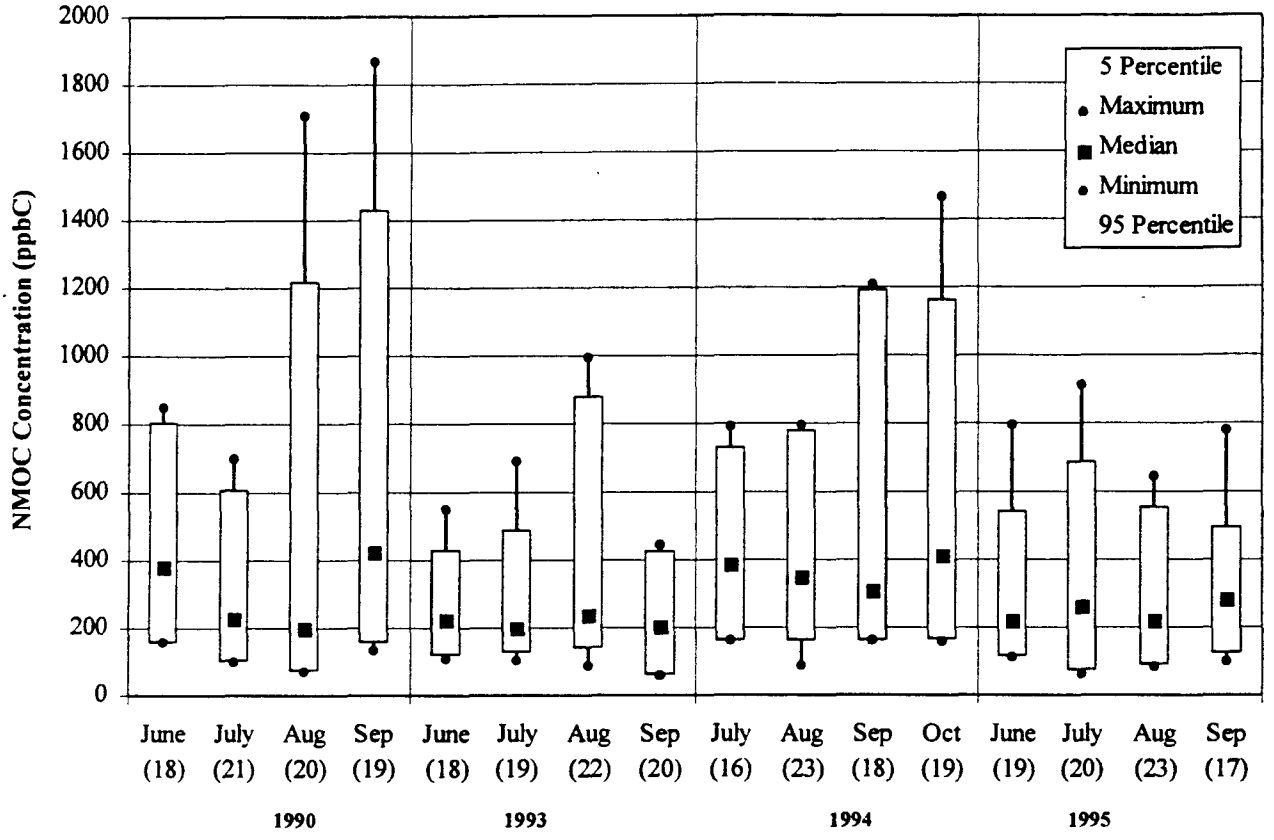


Figure 5-6. 1995 Temporal Comparisons of Monthly NMOC Concentrations Measured at Long Island, New York (LINY)

At Newark, New Jersey (NWNJ), the median 1995 NMOC concentrations seem to be comparable with values measured during the last few years. In 1995, however, the maximum concentration values are lower than in 1994 and the observed concentration ranges are also narrower. In general, the same observations are also true for the Plainfield, New Jersey (P2NJ), site. At Plainfield, the maximum observed NMOC concentration in June of 1994 is lower; however, only 10 valid samples were collected during this month, which may account for the lower maximum. At Long Island, New York (LINY), the median concentrations and the observed variability in the measurements appear to be comparable to what has been observed during the last 2 years. Thus, based on visual inspection of the plot, there does not appear to be any apparent trend in the NMOC concentration over the period studied at any of these three sites.

5.2 Speciated NMOC Compounds

The Speciated NMOC data were examined for the three Birmingham, Alabama, sites (B1AL, B2AL, B3AL) for seven selected compounds for the 4 years (1992 through 1995) that the sites participated. Compounds were selected for the temporal studies based on the frequency and magnitude of their occurrence. The maximum, minimum, and median measured concentration values for each year are reported by site in Tables 5-1 through 5-3. The median and minimum concentration values for 1995 were calculated by setting the non-detect values to one-half of the detection limit. The median and minimum concentration values for 1992, 1993, and 1994 were calculated by dropping the non-detects. Excluding the non-detects tends to increase the calculated median and minimum values, so these values may appear lower in 1995 based on how the calculations were performed. However, because the number of nondetects is usually less than 10% of the total values, the effect of the calculation procedure on the results will be minimal.

The maximum, minimum, and median values were plotted for toluene at the Helena, Alabama (B3AL), site and are shown in Figure 5-7. The median toluene concentration and the concentration range appear to be decreasing at this site. None of the other examined compounds at any of the sites exhibited any possible trends. The median values for acetylene, propane, and isopentane for each year were compared between the three sites as shown in Figures 5-8 through 5-10. The median acetylene and propane concentrations at the two rural sites (B2AL and B3AL) are lower than at the suburban site and appear to be correlated with each other. In fact, the median propane concentrations at B2AL and B3AL are almost identical. At B3AL, the median acetylene concentrations are lower than at B2AL as would be expected because acetylene is primarily associated with motor vehicle exhaust and B3AL is in a rural agricultural area where traffic is minimal.

Table 5-1

Historical Data for Selected Speciated NMOC Compounds at Tarrant City, Alabama (B1AL)

Compound	Value	1992	1993	1994	1995
Propylene	Maximum	4.82	17.60	25.94	17.25
	Minimum	0.56[a]	1.20	0.82[a]	0.17[b]
	Median	2.38[a]	5.30	4.55[a]	5.58[b]
	Cases	66	82	80	68
Ethylene	Maximum	42.67	81.00	47.84	23.64
	Minimum	2.07	2.20	0.53[a]	0.16[b]
	Median	12.84	15.00	11.03[a]	9.36[b]
	Cases	68	82	80	66
Benzene	Maximum	43.04	37.30	43.88	56.70
	Minimum	1.92	1.60	0.76	0.36
	Median	9.58	9.10	7.60	6.84
	Cases	68	82	81	77
Acetylene	Maximum	40.27	36.10	47.97	96.60
	Minimum	1.37[a]	1.90	1.21	0.17[b]
	Median	13.18[a]	10.20	7.93	10.74[b]
	Cases	66	82	81	67
Isopentane	Maximum	163.33	115.10	120.75	100.80
	Minimum	2.35	3.70	3.25	0.84
	Median	21.25	20.30	16.48	24.24
	Cases	68	82	81	77
Propane	Maximum	47.48	140.50	133.35	50.10
	Minimum	1.12	1.90	1.87	0.17[b]
	Median	14.21	15.00	16.95	15.00[b]
	Cases	68	82	81	75
Toluene	Maximum	68.58	58.30	107.40	63.00
	Minimum	1.84	4.70	2.98	0.90
	Median	20.99	22.10	17.73	23.88
	Cases	68	82	81	77

[a]Median and minimum values were calculated by dropping non-detect values.
[b]Median and minimum values were calculated by setting non-detect values to one-half the detection limit.

Table 5-2

Historical Data for Selected Speciated NMOC Compounds at Pinson, Alabama (B2AL)

Compound	Value	1992	1993	1994	1995
Propylene	Maximum	6.65	6.90	16.27	9.06
	Minimum	0.60[a]	0.80[a]	0.46[a]	0.17[b]
	Median	2.36[a]	2.60[a]	2.86[a]	2.44[b]
	Cases	65	81	75	68
Acetylene	Maximum	11.16	14.70	23.15	16.71
	Minimum	0.96[a]	0.70[a]	0.71[a]	0.17[b]
	Median	3.78[a]	4.40[a]	3.94[a]	2.28[b]
	Cases	65	81	72	53
Benzene	Maximum	18.89	11.10	13.38	9.06
	Minimum	1.38	0.70	0.68	0.04[b]
	Median	4.32	3.70	3.74	2.85[b]
	Cases	71	83	78	79
Isopentane	Maximum	137.73	668.20	44.50	93.6
	Minimum	0.92[a]	1.70	0.99	0.60
	Median	8.46[a]	7.90	8.05	6.57
	Cases	69	83	78	80
Propane	Maximum	17.44	13.60	45.34	22.29
	Minimum	1.30	1.40	1.08	0.16[b]
	Median	5.85	6.70	6.61	5.55[b]
	Cases	71	83	78	78
Toluene	Maximum	53.99	98.50	42.52	26.58
	Minimum	1.08	1.40	2.11	0.72
	Median	7.41	6.90	8.01	6.81
	Cases	71	83	78	80

[a]Median and minimum values were calculated by dropping non-detect values.
[b]Median and minimum values were calculated by setting non-detect values to one-half the detection limit.

Table 5-3

Historical Data for Selected Speciated NMOC Compounds at Helena, Alabama (B3AL)

Compound	Value	1992	1993	1994	1995
Propylene	Maximum	6.00	10.50	5.53	4.98
	Minimum	0.65[a]	0.60[a]	0.34[a]	0.17
	Median	1.52[a]	2.00[a]	2.01[a]	1.62
	Cases	44	64	73	79
Benzene	Maximum	9.09	11.30	9.52	12.24
	Minimum	1.01	0.90[a]	0.94	0.48
	Median	3.35	3.50[a]	3.18	2.52
	Cases	49	66	78	79
Acetylene	Maximum	6.48	9.60	9.10	6.24
	Minimum	0.85[a]	0.80[a]	0.40[a]	0.17
	Median	2.02[a]	2.50[a]	3.09[a]	1.71
	Cases	45	60	69	79
Isopentane	Maximum	76.78	89.50	413.00	216.60
	Minimum	1.58	1.80	1.14	1.80
	Median	8.65	12.20	11.37	10.08
	Cases	49	66	78	79
Propane	Maximum	10.35	380.10	16.59	26.70
	Minimum	0.99	1.80	1.27	1.56
	Median	5.32	6.90	6.45	5.61
	Cases	49	66	78	79
Toluene	Maximum	98.15	71.40	42.68	31.86
	Minimum	2.07	2.30	0.95	1.08
	Median	13.62	8.30	7.25	6.00
	Cases	49	66	78	79

[a]Median and minimum values were calculated by dropping non-detect values.

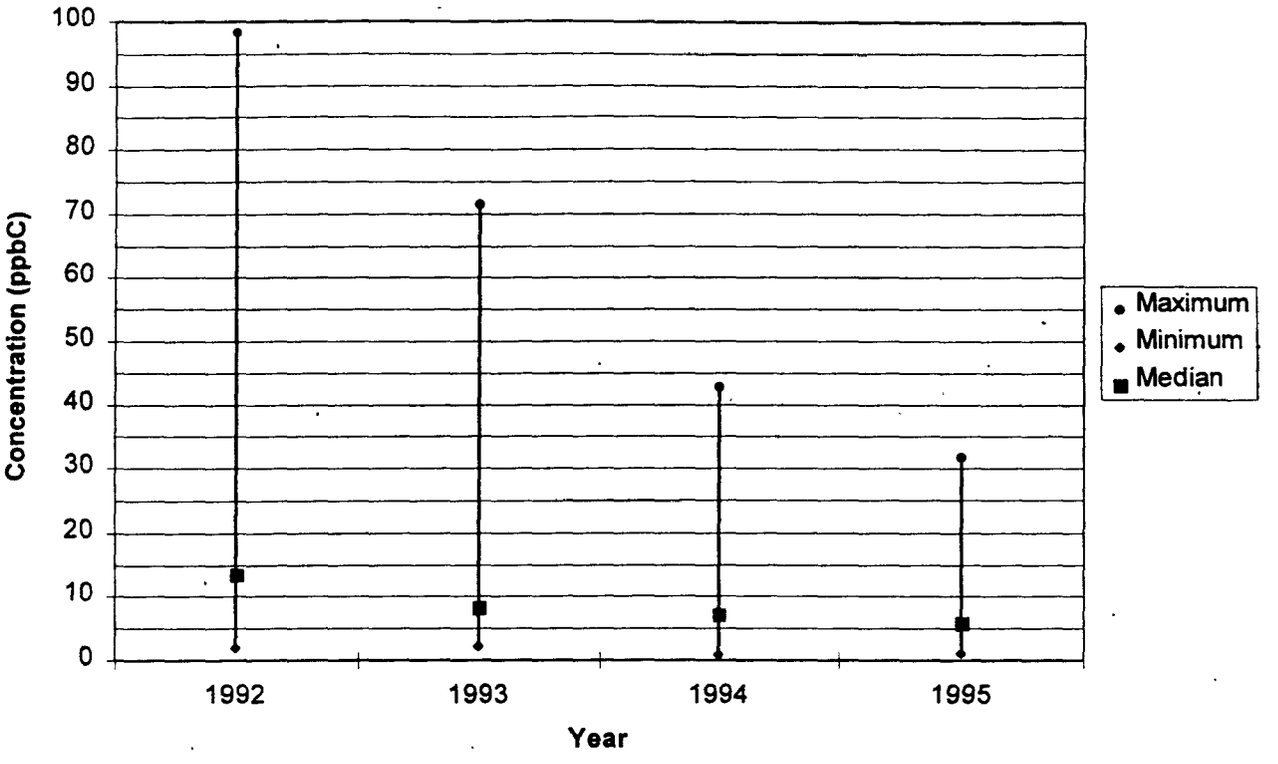


Figure 5-7. 1995 Temporal Comparisons of Yearly Toluene Concentrations at Helena, Alabama (B3AL)

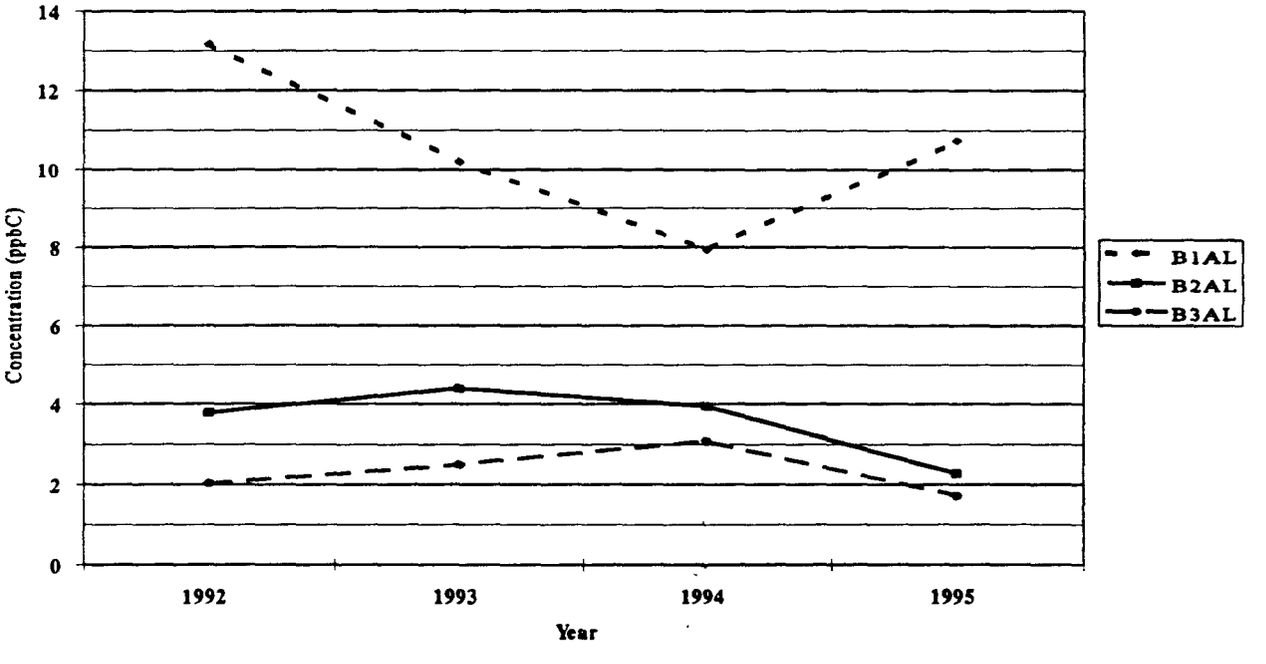


Figure 5-8. 1995 Temporal Comparisons of Yearly Median Acetylene Concentrations at the Three Birmingham, Alabama Sites

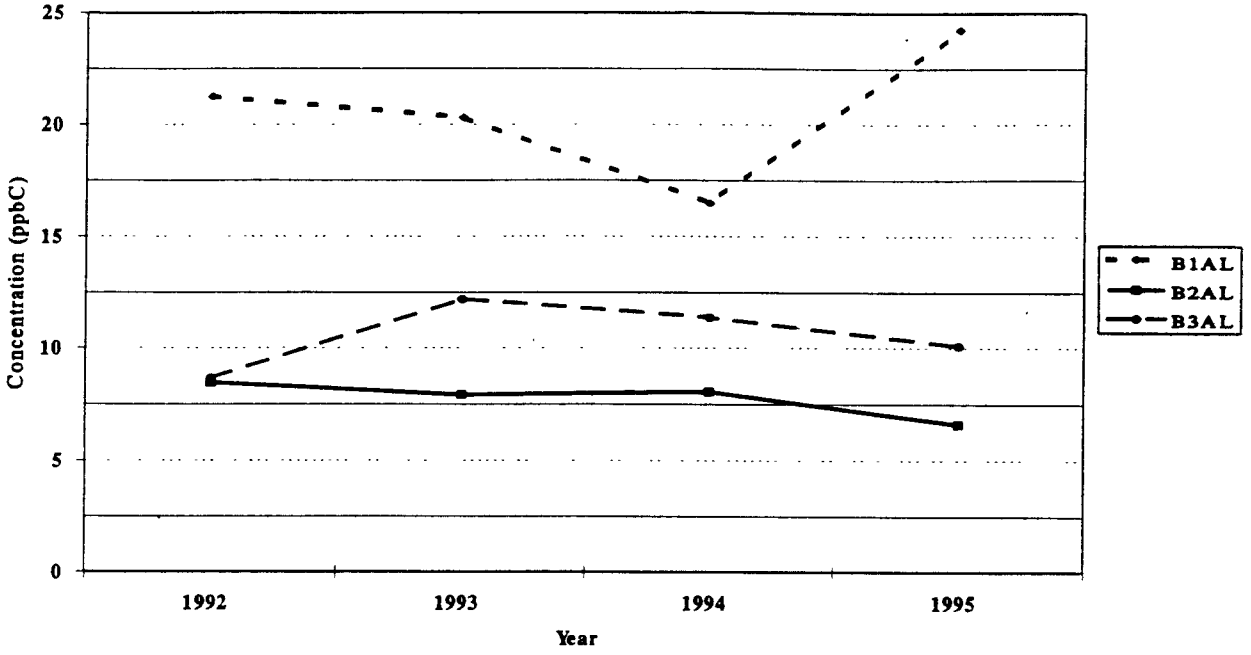


Figure 5-9. 1995 Temporal Comparisons of Yearly Median Isopentane Concentrations at the Three Birmingham, Alabama Sites

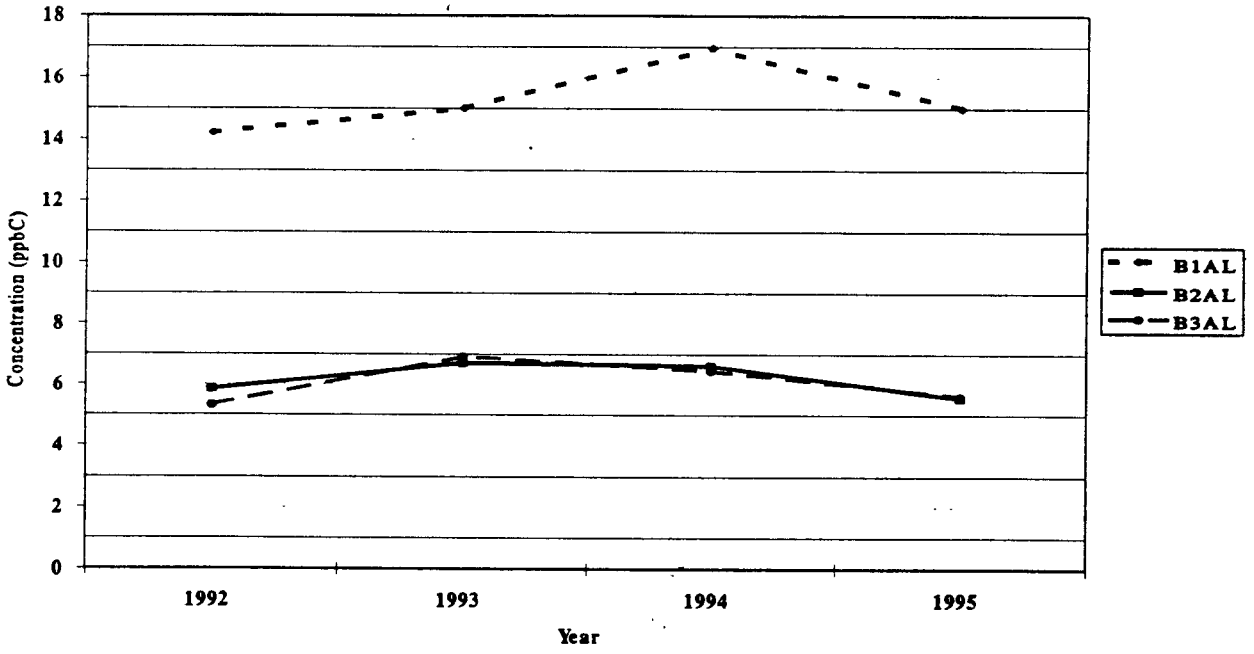


Figure 5-10. 1995 Temporal Comparisons of Yearly Median Propane Concentrations at the Three Birmingham, Alabama Sites

The median isopentane concentration is also lower at the two rural sites. Although the median isopentane concentration was similar at B2AL and B3AL in 1992, the median isopentane concentration has been higher at B3AL from 1993 through 1995. Isopentane is also associated with mobile emissions, so it is surprising that the median concentration is higher at B3AL than at B2AL; however, isopentane is also present in evaporative losses from motor vehicle fuels. The B3AL sampling site is located on a farm and farms often have onsite fuel storage tanks.

Trends between compounds at each site were also evaluated. Figure 5-11 shows the median concentrations for benzene, toluene, ethylene, and propylene at the Tarrant City, Alabama (B1AL), site. The median concentrations of toluene, ethylene, and propylene appeared to increase from 1992 to 1993 and appeared to decrease from 1993 to 1994. From 1994 to 1995, the median concentration of ethylene continued to decrease, and the median concentrations of toluene and propylene increased. During the same 4-year period, the median concentration of benzene appeared to steadily decline. Figures 5-12 and 5-13 display similar information for the rural Birmingham sites (B2AL and B3AL). The median benzene, propylene, and toluene concentrations have all appeared to decrease from 1994 to 1995 at both of these sites.

5.3 UATMP VOC Compounds

The UATMP VOC data were examined for the five participating sites (NWNJ, P2NJ, B1AL, B2AL, B3AL) for eight selected compounds for the years that the various sites participated. Compounds were selected for the temporal studies based on their prevalence. Only those compounds that occurred most frequently were included. Any conclusions regarding trends that are based on the UATMP VOC data must be interpreted with caution because the data are based on only eight or nine samples selected at random throughout the summer. Two of the sites (NWNJ and P2NJ) are located in the New York City and Northeastern New Jersey airshed and participated in the UATMP VOC option from 1989 through 1995. The Birmingham, Alabama sites (B1AL, B2AL, and B3AL) participated from 1992 through 1995.

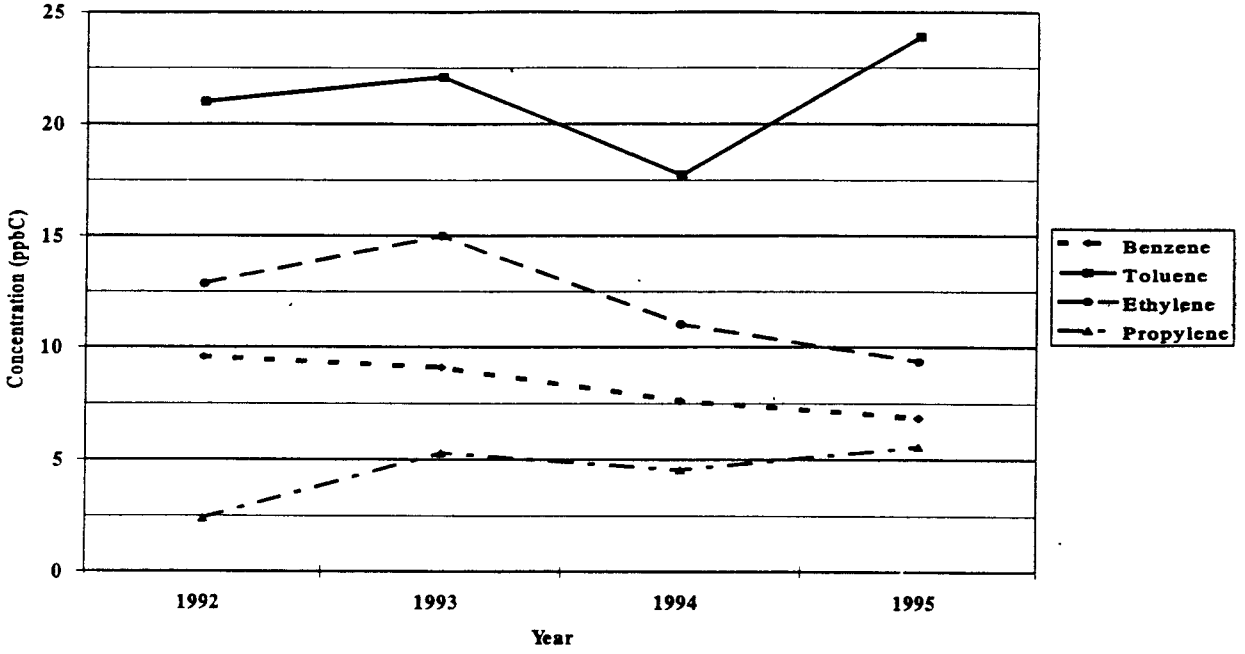


Figure 5-11. 1995 Temporal Comparisons of Yearly Median Concentrations of Selected Compounds at Tarrant City, Alabama (B1AL)

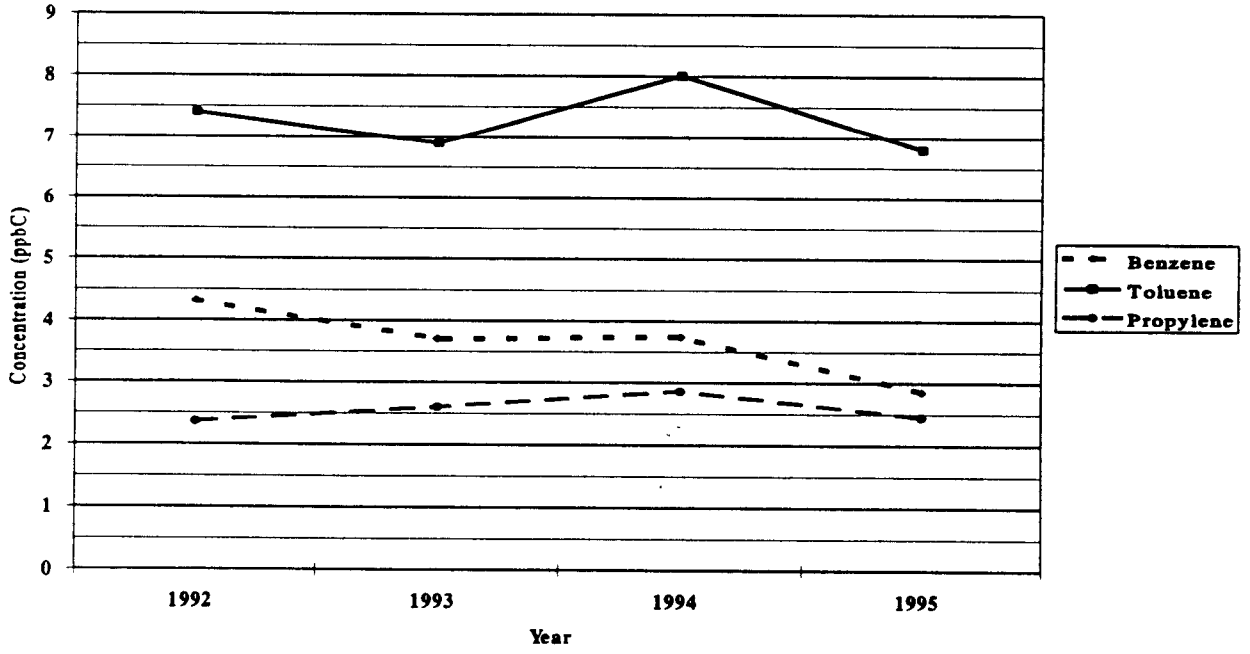


Figure 5-12. 1995 Temporal Comparisons of Yearly Median Concentrations of Selected Compounds at Pinson, Alabama (B2AL)

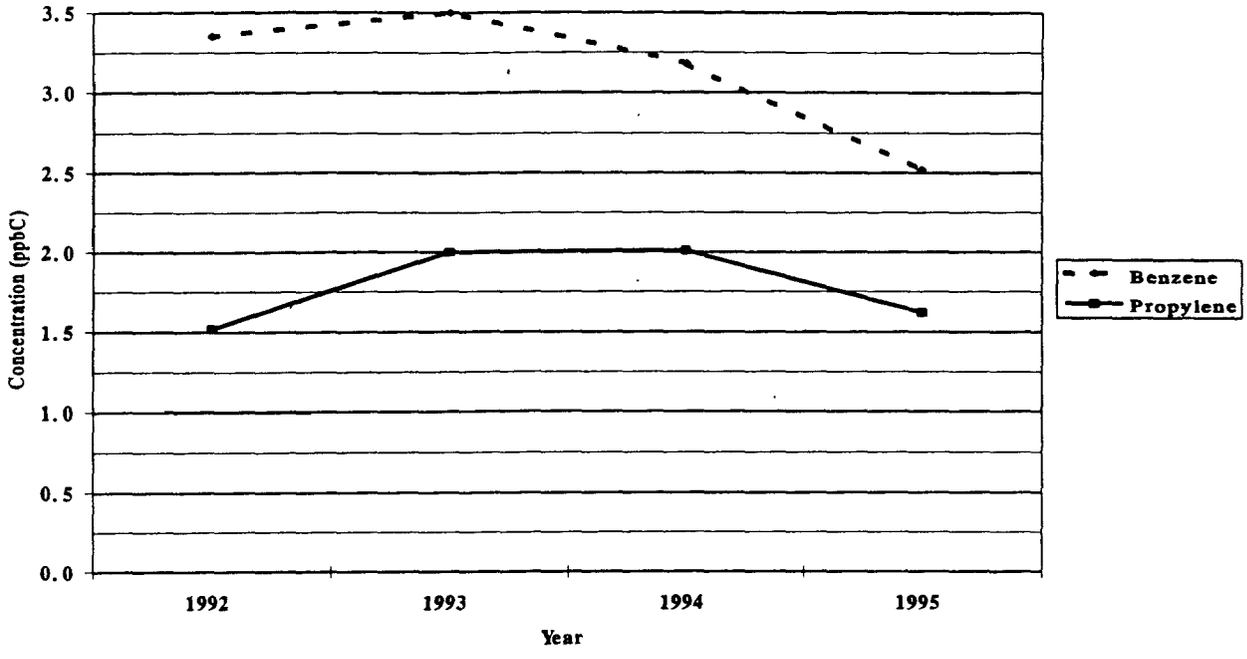


Figure 5-13. 1995 Temporal Comparisons of Yearly Concentrations of Benzene and Propylene at Helena, Alabama (B3AL)

The maximum, minimum, and average measured concentration values for each year are reported by site in Tables 5-4 through 5-8. The average measured concentration values for 1991, 1992, 1993, and 1995 were calculated by setting the non-detect values to one-half of the detection limit. The average concentration values for 1989, 1990, and 1994 were calculated by dropping the non-detects because the data reduction procedures used in those years dropped the non-detects. Excluding the non-detects tends to increase the calculated average concentration so these averages calculated may appear higher in 1989, 1990, and 1994 because of the procedures used. Because most of the compounds selected for study were detected at 100% prevalence, the data calculation procedure affects results only for 1,3-butadiene, tetrachloroethylene, and propylene.

5.3.1 New York City and Northeastern New Jersey Airshed (NWNJ, P2NJ)

Seven compounds (carbon tetrachloride, benzene, ethylbenzene, tetrachloroethylene, 1,1,1-trichloroethane, toluene, and 1,3-butadiene) were examined at the Newark, New Jersey

Table 5-4

Historical Data for Selected UATMP VOC Compounds at Newark, New Jersey (NWNJ) Concentration (ppbv)

Compound	Value	1989	1990	1991	1992	1993	1994	1995
1,3-Butadiene	Maximum	0.96	0.46	3.12	*	0.30	2.60	0.31
	Minimum	0.08	0.11	0.34		0.03	0.06	0.03
	Average	0.32[a]	0.21[a]	0.42[b]		0.09[b]	0.70	0.11[b]
	Cases	7	6	2		4	8	6
Carbon Tetrachloride	Maximum	0.21	0.18	0.30	0.16	0.39	0.09	0.09
	Minimum	0.13	0.13	0.26	0.14	0.24	0.05	0.07
	Average	0.15	0.14	0.28	0.14	0.78	0.06	0.08
	Cases	9	10	9	8	8	8	8
Benzene	Maximum	5.98	2.24	2.43	1.37	2.11	0.98	1.35
	Minimum	0.92	0.50	0.78	0.75	0.26	0.36	0.16
	Average	2.47	0.88	1.58	1.01	0.33	0.72	0.50
	Cases	9	10	9	8	8	8	8
Tetrachlorethylene	Maximum	1.78	3.73	1.30	0.92	1.33	2.20	0.20
	Minimum	0.15	0.14	0.28	0.07	0.12	0.02	0.03
	Average	1.00[a]	0.85	0.66	0.38	0.39	0.36	0.14
	Cases	7	10	9	8	8	8	8
Ethylbenzene	Maximum	2.44	1.07	1.33	0.97	1.67	0.87	0.67
	Minimum	0.33	0.19	0.37	0.36	0.12	0.14	0.12
	Average	1.03	0.41	0.89	0.63	0.50	0.44	0.32
	Cases	9	10	9	8	8	8	8
1,1,1-Trichloroethane	Maximum	2.57	2.16	3.59	253.06	4.24	0.78	0.46
	Minimum	0.49	0.70	1.18	4.42	1.23	0.16	0.15
	Average	1.33	1.28	2.33	37.87	2.17	0.48	0.31
	Cases	9	10	9	8	8	8	8
Toluene	Maximum	23.67	11.49	13.49	6.01	10.04	3.57	4.90
	Minimum	2.40	2.01	2.73	2.14	1.12	0.75	0.68
	Average	10.27	4.32	6.79	3.83	3.58	2.26	2.14
	Cases	9	10	9	8	8	8	8

*No results were reported.

[a]Average values were calculated by dropping non-detects.
[b]Average values were calculated by setting non-detect values to one-half the detection limit.

Table 5-5

Historical Data for Selected UATMP VOC Compounds at Plainfield, New Jersey (P2NJ) Concentration (ppbv)

Compound	Value	1989	1990	1991	1992	1993	1994	1995
Carbon Tetrachloride	Maximum	0.17	0.15	0.28	0.28	*	0.09	0.09
	Minimum	0.13	0.05	0.24	0.13		0.05	0.07
	Average	0.15	0.13	0.26	0.15		0.07	0.08
	Cases	9	10	8	8		8	8
Benzene	Maximum	3.48	3.00	2.83	4.09	3.09	4.22	1.62
	Minimum	0.49	0.27	0.34	0.60	0.18	0.18	0.23
	Average	1.91	1.09	1.35	2.28	1.04	1.48	0.83
	Cases	9	10	8	8	8	8	8
Ethylbenzene	Maximum	0.99	1.01	0.92	3.62	1.47	2.05	0.78
	Minimum	0.08	0.06	0.14	0.22	0.07	0.06	0.13
	Average	0.47	0.31	0.50	1.31	0.44	0.69	0.34
	Cases	9	10	8	8	8	8	8
1,1,1-Trichloroethane	Maximum	2.04	12.32	4.83	4.67	4.07	1.16	0.41
	Minimum	0.28	0.19	0.38	0.84	0.30	0.20	0.21
	Average	1.02	1.82	1.66	2.49	1.16	0.49	0.31
	Cases	9	10	8	8	8	8	8
Toluene	Maximum	8.95	13.34	9.85	17.40	15.18	12.45	7.72
	Minimum	1.04	0.78	0.87	1.50	0.45	0.36	1.13
	Average	4.85	3.49	4.62	7.46	4.22	4.82	3.36
	Cases	9	10	8	8	8	8	8

*No results were reported.

Table 5-6

Historical Data for Selected UATMP VOC Compounds at Tarrant City, Alabama (B1AL) Concentration (ppbv)

Compound	Value	1992	1993	1994	1995
Propylene	Maximum	4.82	3.54	3.14	4.23
	Minimum	0.56	0.46	0.18	0.48
	Average	2.38	1.38	1.24	2.29
	Cases	8	8	8	8
Carbon Tetrachloride	Maximum	0.14	0.37	0.11	0.09
	Minimum	0.12	0.22	0.06	0.07
	Average	0.13	0.29	0.07	0.08
	Cases	8	8	8	8
Benzene	Maximum	2.24	2.63	3.41	6.48
	Minimum	0.36	0.21	0.13	0.28
	Average	1.12	0.87	0.93	1.90
	Cases	8	8	8	8
Ethylbenzene	Maximum	1.03	1.08	0.84	0.90
	Minimum	0.12	0.08	0.05	0.12
	Average	0.56	0.39	0.32	0.58
	Cases	8	8	8	8
Tetrachlorethylene	Maximum	0.68	0.19	0.10	0.16
	Minimum	0.03	0.03	0.01	0.03
	Average	0.17	0.11	0.04	0.07
	Cases	8	8	8	8
1,1,1-Trichloroethane	Maximum	1.47	0.71	0.53	0.52
	Minimum	0.47	0.30	0.13	0.16
	Average	0.89	0.44	0.30	0.25
	Cases	8	8	8	8
Toluene	Maximum	5.58	4.78	3.86	4.95
	Minimum	0.77	0.55	0.27	0.76
	Average	2.80	2.01	1.58	3.05
	Cases	8	8	8	8

Table 5-7

Historical Data for Selected UATMP VOC Compounds at Pinson, Alabama (B2AL) Concentration (ppbv)

Compound	Value	1992	1993	1994	1995
Propylene	Maximum	2.62	1.39	1.27	1.29
	Minimum	0.27	0.08	0.33	0.48
	Average	0.93[a]	0.60	0.77	0.81
	Cases	7	8	8	9
Carbon Tetrachloride	Maximum	0.13	0.35	0.09	0.11
	Minimum	0.09	0.20	0.06	0.07
	Average	0.11	0.29	0.08	0.08
	Cases	8	8	8	9
Benzene	Maximum	0.56	0.59	0.99	1.05
	Minimum	0.15	0.09	0.17	0.23
	Average	0.30	0.29	0.53	0.43
	Cases	8	8	8	9
Ethylbenzene	Maximum	0.16	0.17	0.36	0.23
	Minimum	0.02	0.04	0.10	0.10
	Average	0.09	0.08	0.18	0.14
	Cases	8	6	8	9
1,1,1-Trichloroethane	Maximum	0.50	0.38	0.19	0.15
	Minimum	0.29	0.26	0.13	0.12
	Average	0.40	0.32	0.15	0.13
	Cases	8	8	8	9
Toluene	Maximum	0.91	1.23	1.62	1.71
	Minimum	0.14	0.16	0.59	0.68
	Average	0.56	0.62	0.98	0.96
	Cases	8	8	8	9

[a]Average values were calculated by setting non-detect values to one-half the detection limit.

Table 5-8

Historical Data for Selected UATMP VOC Compounds at Helena, Alabama (B3AL) Concentration (ppbv)

Compound	Value	1992	1993	1994	1995
Carbon Tetrachloride	Maximum	0.14	0.46	0.09	0.11
	Minimum	0.10	0.22	0.05	0.07
	Average	0.11	0.31	0.07	0.08
	Cases	8	8	8	10
Benzene	Maximum	0.73	0.72	0.66	0.63
	Minimum	0.12	0.09	0.32	0.12
	Average	0.42	0.29	0.45	0.33
	Cases	8	8	8	10
Ethylbenzene	Maximum	0.29	0.24	0.31	0.34
	Minimum	0.02	0.02	0.09	0.05
	Average	0.11	0.09	0.16	0.13
	Cases	8	8	8	10
Tetrachlorethylene	Maximum	0.30	1.82	0.47	0.93
	Minimum	0.01	0.02	0.04	0.02
	Average	0.11	0.38	0.22	0.30[a]
	Cases	8	8	8	8
1,1,1-Trichloroethane	Maximum	1.29	0.74	0.36	0.25
	Minimum	0.32	0.26	0.16	0.12
	Average	0.68	0.47	0.22	0.17
	Cases	8	8	8	10
Toluene	Maximum	1.68	2.00	1.36	24.08
	Minimum	0.17	0.22	0.55	0.47
	Average	0.84	0.77	0.93	3.27
	Cases	8	8	8	10

[a]Average values were calculated by setting non-detect values to one-half the detection limit.

(NWNJ), site and five compounds (carbon tetrachloride, benzene, ethylbenzene, 1,1,1-trichloroethane, and toluene) were examined at the Plainfield, New Jersey (P2NJ), site. Based on visual inspection of the plot, there does not appear to be any apparent upward or downward trends for 1,3-butadiene and carbon tetrachloride over the period from 1989 to 1995.

The average concentration and the measured range of concentrations appears to have decreased for 1,1,1-trichloroethane at both of these sampling locations in 1994 and 1995. Figure 5-14 presents the temporal comparison for 1,1,1-trichloroethane at P2NJ as an example. It should be noted that meteorological conditions can have a significant role in producing the observed changes in ambient concentrations as can emissions. However, there should be some correlation between the temporal changes in concentrations of individual species at a given site if meteorological conditions are contributing to the observed trends. Assessment of the role meteorology may have played in creating the observed temporal trends is beyond the scope of this analysis.

In 1991, 41% of the 1,1,1-trichloroethane sold was used in cold type metal cleaning and in cleaning plastic molds and 14% was used in aerosol products.[35] As a result of the Montreal Protocol, production of 1,1,1-trichloroethane will be phased out by January 1, 1996.[36] In addition, on December 2, 1994, the EPA published a regulation titled "National Emission Standards for Hazardous Air Pollutants (NESHAP): Halogenated Solvent Cleaning" that regulates the use of 1,1,1-trichloroethane.[37] The standard takes affect December 2, 1997. In 1993, several companies reported substituting other solvents for 1,1,1-trichloroethane in their degreasing and cleaning operations as part of their pollution prevention efforts.[38] Although the actual reason for the decrease in the observed concentration levels is unknown, the results agree with global monitoring reports which indicate that levels of 1,1,1-trichloroethane in the atmosphere have been declining since 1991.[39] The decline in atmospheric levels of 1,1,1-trichloroethane in the atmosphere are contributed to the Montreal Protocol.

The other four compounds exhibited a possible downward trend at the Newark, New Jersey, site (NWNJ), although they remained relatively constant at the Plainfield, New Jersey,

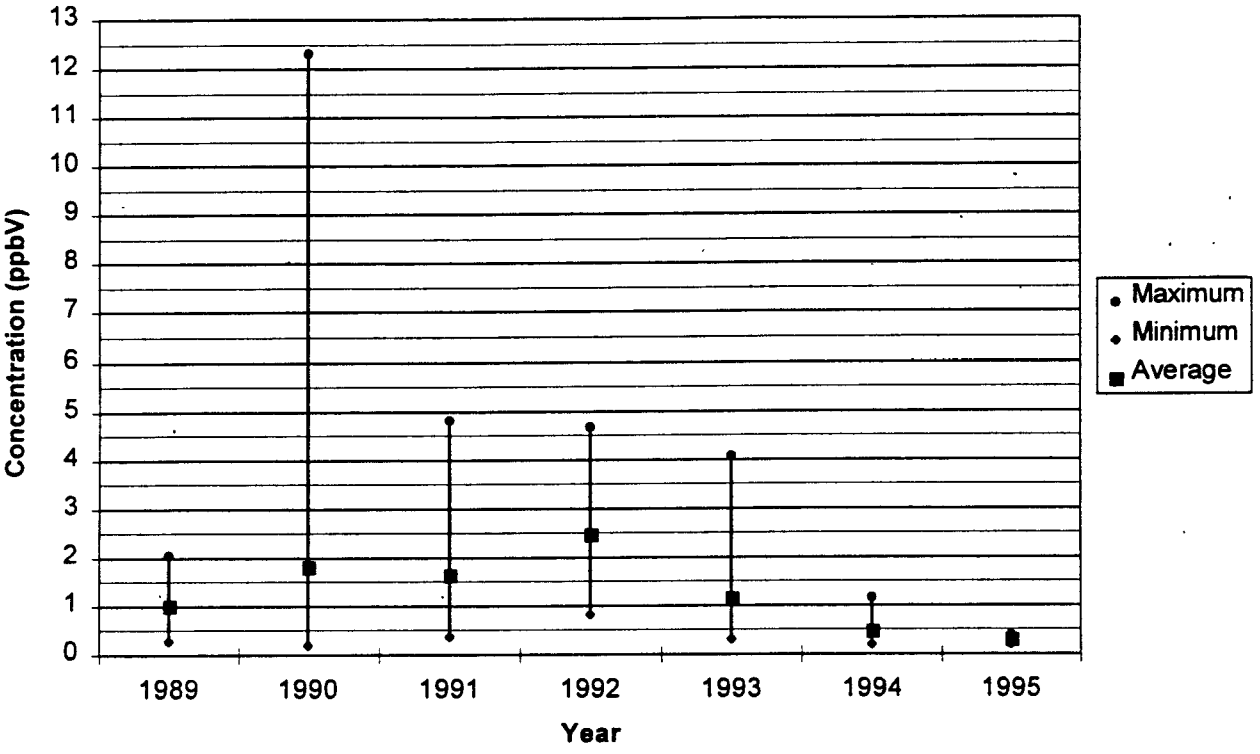


Figure 5-14. 1995 Temporal Comparisons of 1,1,1-Trichloroethane Concentrations Measured at Plainfield, New Jersey (P2NJ)

site (P2NJ). As shown in Figure 1-1, the NWNJ site is located much closer to potential emission sources than the P2NJ site. As an example, Figure 5-15 presents the temporal comparison for tetrachlorethylene at NWNJ, which exhibited a much narrower concentration range in 1995. Tetrachloroethylene is also used as a degreaser for metal cleaning and is regulated by the Halogenated Solvent Cleaner NESHAP.[37] In addition, tetrachloroethylene is used in dry-cleaning, which is also regulated by the EPA.[40]

5.3.2 Birmingham, Alabama Airshed

Seven compounds (carbon tetrachloride, benzene, ethylbenzene, tetrachloroethylene, 1,1,1-trichloroethane, toluene, and propylene) were examined at the Tarrant City, Alabama

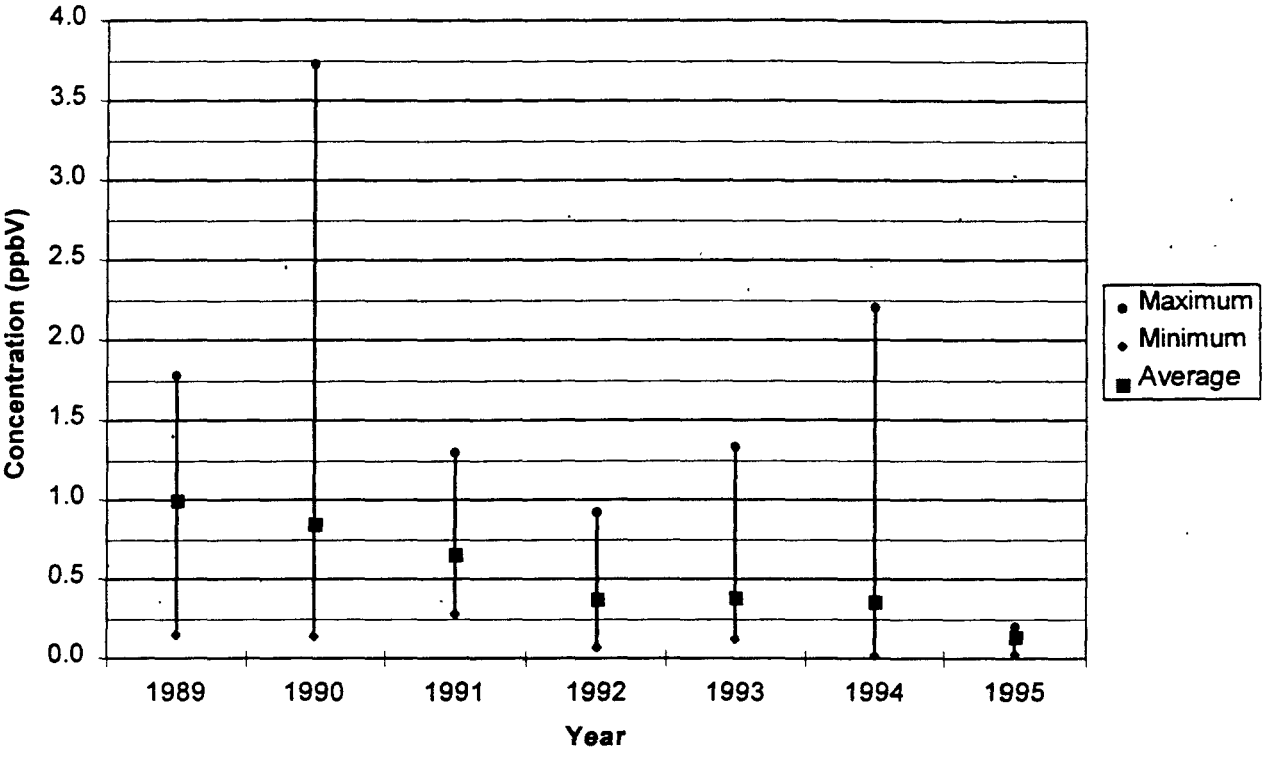


Figure 5-15. 1995 Temporal Comparisons of Tetrachloroethylene Concentrations Measured at Newark, New Jersey (NWNJ)

(B1AL), site and six compounds were examined at the other two Alabama sites (B2AL excluded tetrachloroethylene and B3AL excluded propylene). Based on visual inspection, there does not appear to be any apparent trends in concentration with time for propylene or carbon tetrachloride over the period from 1992 to 1995, although in 1993 the observed carbon tetrachloride concentrations were much higher at all three sites than in the other three years. Figure 5-16 shows the observed carbon tetrachloride concentrations for B1AL as an example. High values also were observed for carbon tetrachloride at NWNJ in 1993, which may indicate a bias in the analysis. No external audit results were reported for carbon tetrachloride in 1993. The production of carbon tetrachloride is scheduled to be phased out by January 1, 1996, as part of the Montreal Protocol.[36] As a result, ambient levels of carbon tetrachloride may decrease in future years.

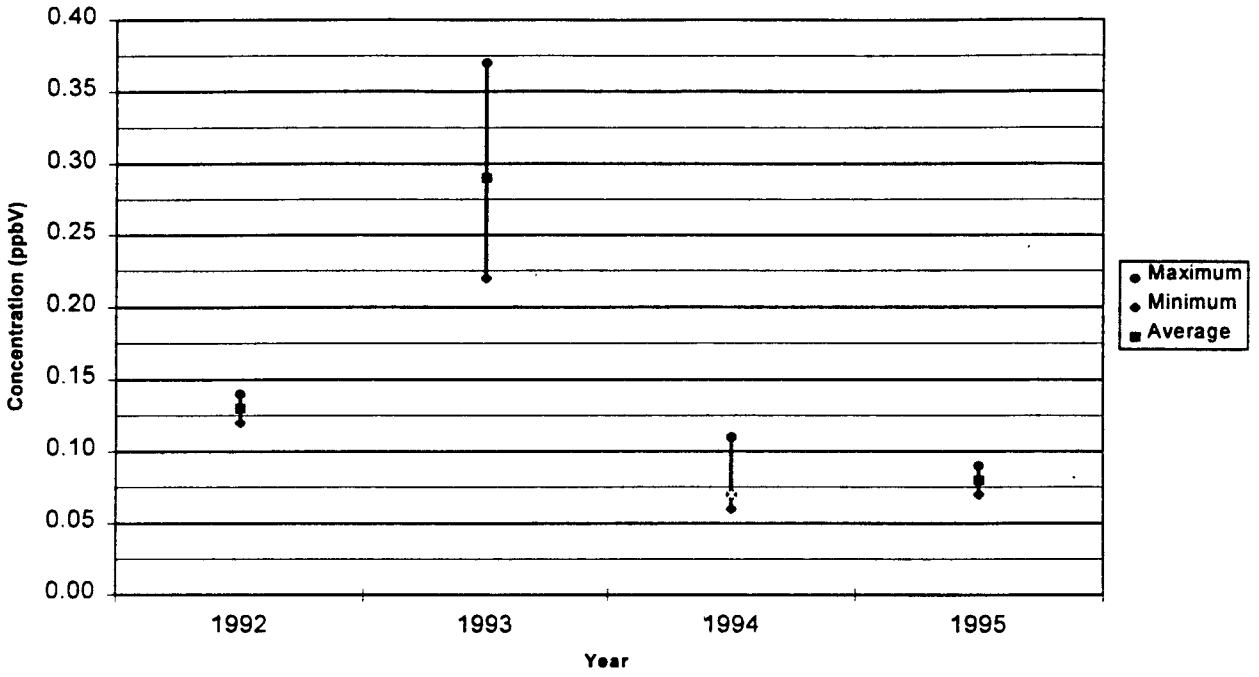


Figure 5-16. 1995 Temporal Comparisons of Carbon Tetrachloride Concentrations Measured at Tarrant City, Alabama (B1AL)

Just as in the New York City and Northern New Jersey airshed, the average concentration and the measured range of concentrations appear to have decreased for 1,1,1-trichloroethane at all three of the Birmingham, Alabama, sampling locations in 1994 and 1995. Figure 5-17 presents the temporal comparison for 1,1,1-trichloroethane at all three sites for 1992 through 1993. Besides a general decrease in observed concentration, the range of concentrations observed also appears to be narrowing. Based on visual inspection of the plot, the decrease in observed concentration is more apparent at B2AL and B3AL, where less variability is observed in the range of concentrations measured. As noted above, emissions of 1,1,1-trichloroethane from halogenated solvent cleaning processes will be regulated by the EPA starting in 1997.

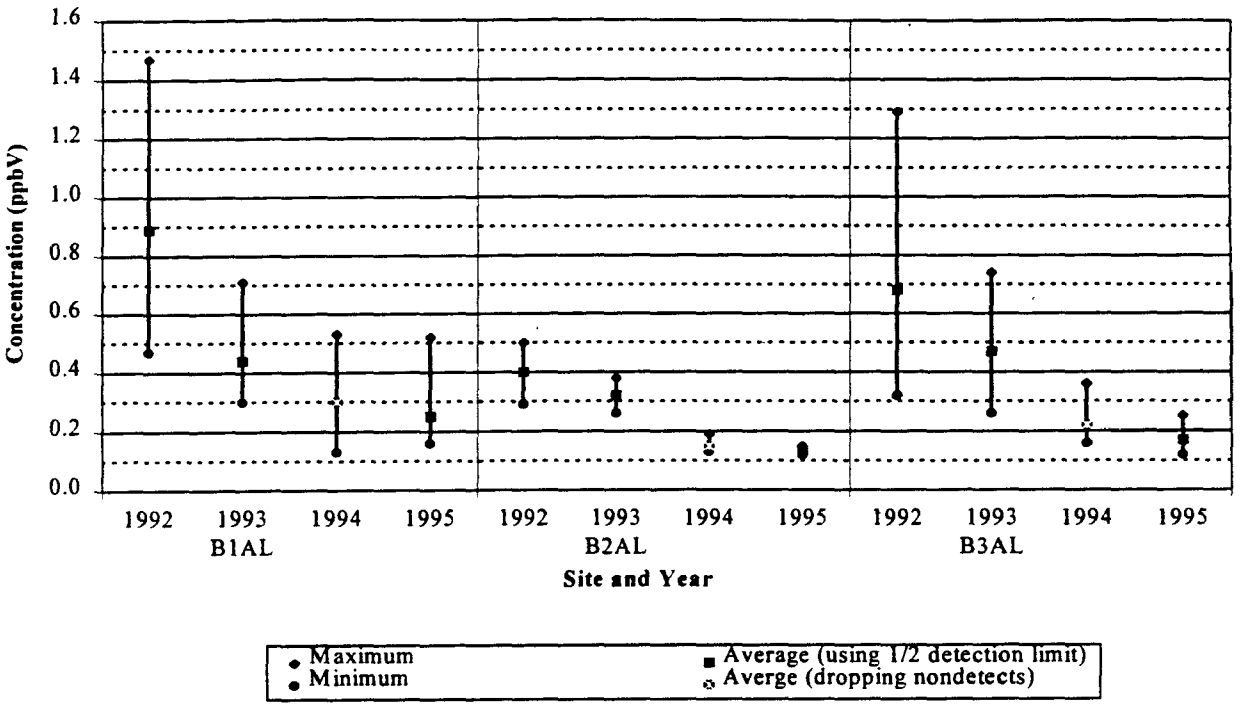


Figure 5-17. 1995 Temporal Comparisons of 1,1,1-Trichloroethane Concentrations Measured at Birmingham, Alabama

The other four compounds either exhibited no trend or a possible upward trend at one of the Birmingham sites. For example, Figure 5-18 presents the temporal comparison for benzene at B1AL, which exhibited a much wider concentration range and higher average in 1995 than in the preceding 3 years. As another example, Figure 5-19 shows the measured toluene concentrations at B2AL, which is located in a rural residential neighborhood in Pinson, Alabama.

The minimum, maximum, and average concentrations appear to be gradually increasing with time.

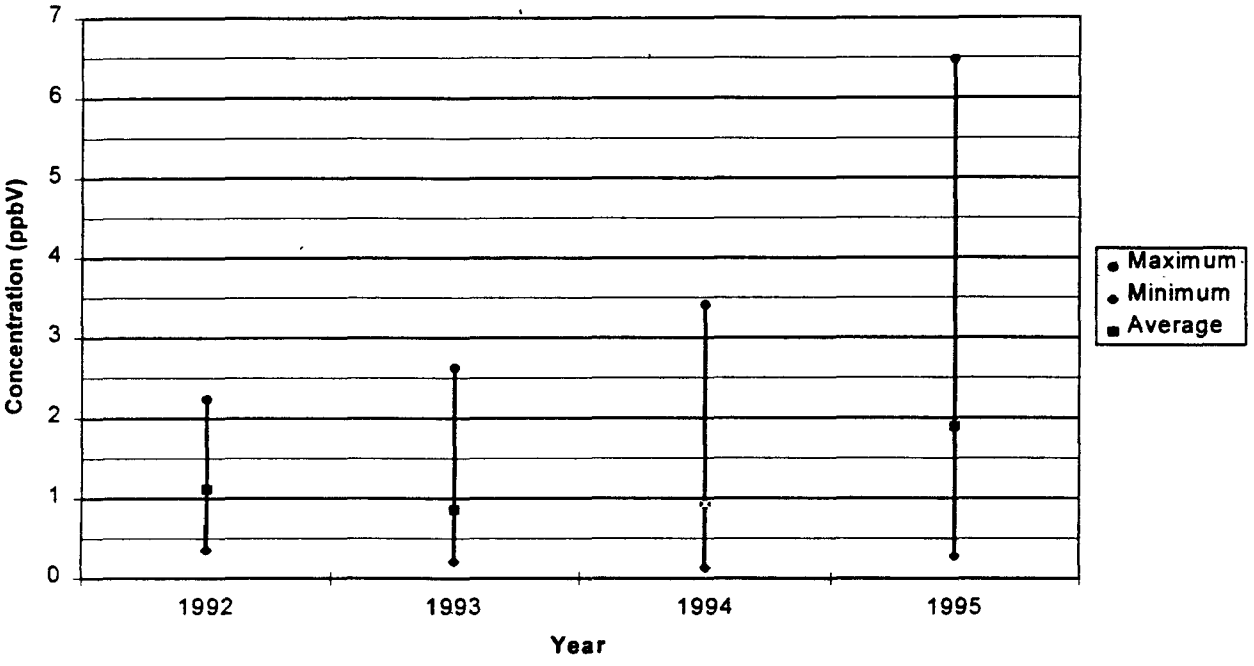


Figure 5-18. 1995 Temporal Comparisons of Benzene Concentrations Measured at Tarrant City, Alabama (B1AL)

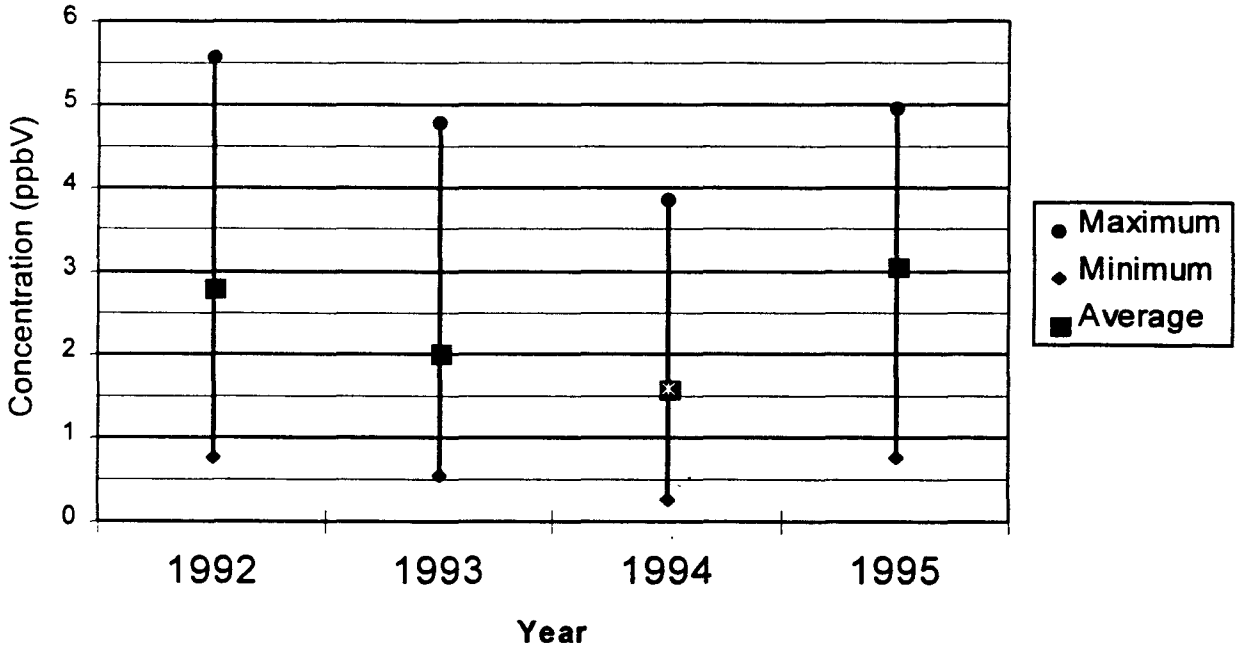


Figure 5-19. 1995 Temporal Comparisons of 1,1,1-Trichloroethane Concentrations Measured at Pinson, Alabama (B2AL)

5.4 Carbonyl Compounds

The carbonyl data were examined for the two sites in the New York City and Northern New Jersey airshed (NWNJ and P2NJ) for formaldehyde, acetaldehyde, and acetone over a 5 year period from 1991 through 1995. Although carbonyl analyses were included as an option to the NMOC program starting in 1989, the sampling procedures used before 1991 were slightly different (i.e., no ozone scrubber was used in 1989 and the samples were collected over a 24-hour period instead of from 6 to 9 a.m.). The maximum, minimum, and average measured concentration values for each year are plotted in Figures 5-20 through 5-22. The average measured concentration values for 1991 and 1992 were previously calculated by setting the non-detect values to zero. Using zero for the non-detects will bias the data low. No non-detects were recorded in 1993 through 1995, which indicates that the prevalence of these aldehydes may be increasing, or that the sensitivity of the analytical method used is increasing. For comparison purposes, the data for Newark, New Jersey (NWNJ), are presented on the left side of the plot and the data for Plainfield, New Jersey (P2NJ), are presented on the right side of the plot. The number in parentheses beside the year indicates the total number of samples collected and analyzed that year.

At Newark, New Jersey (NWNJ), the average formaldehyde values have ranged between a low of 2.5 ppbV in 1992 to a high of 7.5 ppbV in 1994. The average of 5 ppbV measured in 1995 seems to agree well with previous years. At Plainfield, New Jersey (P2NJ), the average formaldehyde values have decreased slightly over the last 3 years from a high of 9 ppbV in 1993 to 3 ppbV in 1994 and 2 ppbV in 1995. The range of values observed in 1995 (1 to 6 ppbV), however, was approximately twice as wide as the range of values observed in 1994 (3 to 5 ppbV).

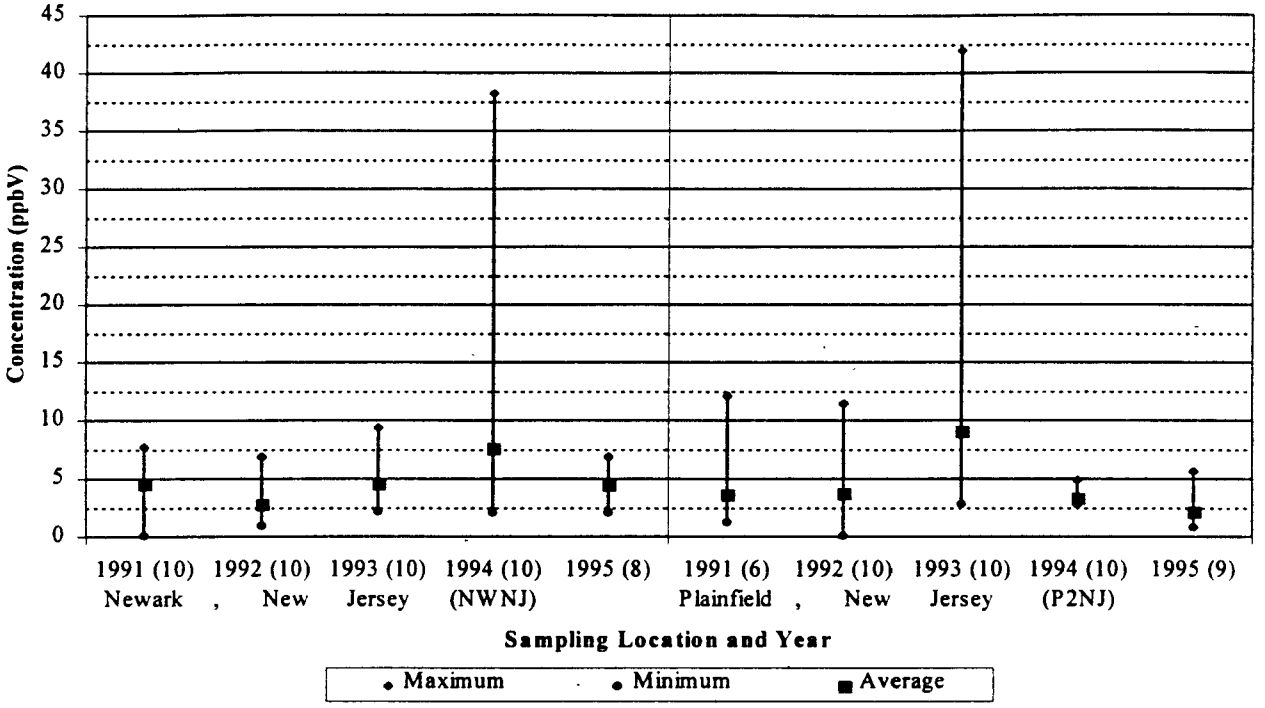


Figure 5-20. 1995 Temporal Comparisons of Formaldehyde Concentrations Measured in the New York City and Northern New Jersey Airshed

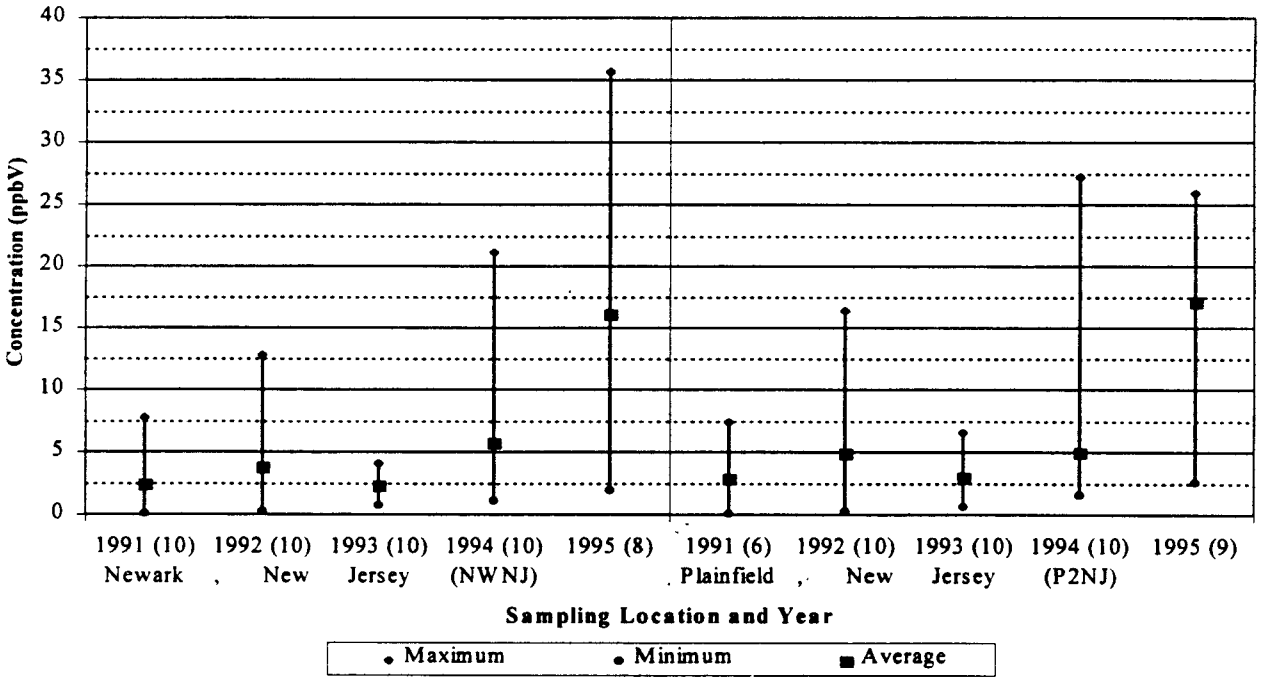


Figure 5-21. 1995 Temporal Comparisons of Acetaldehyde Concentrations Measured in the New York City and Northern New Jersey Airshed

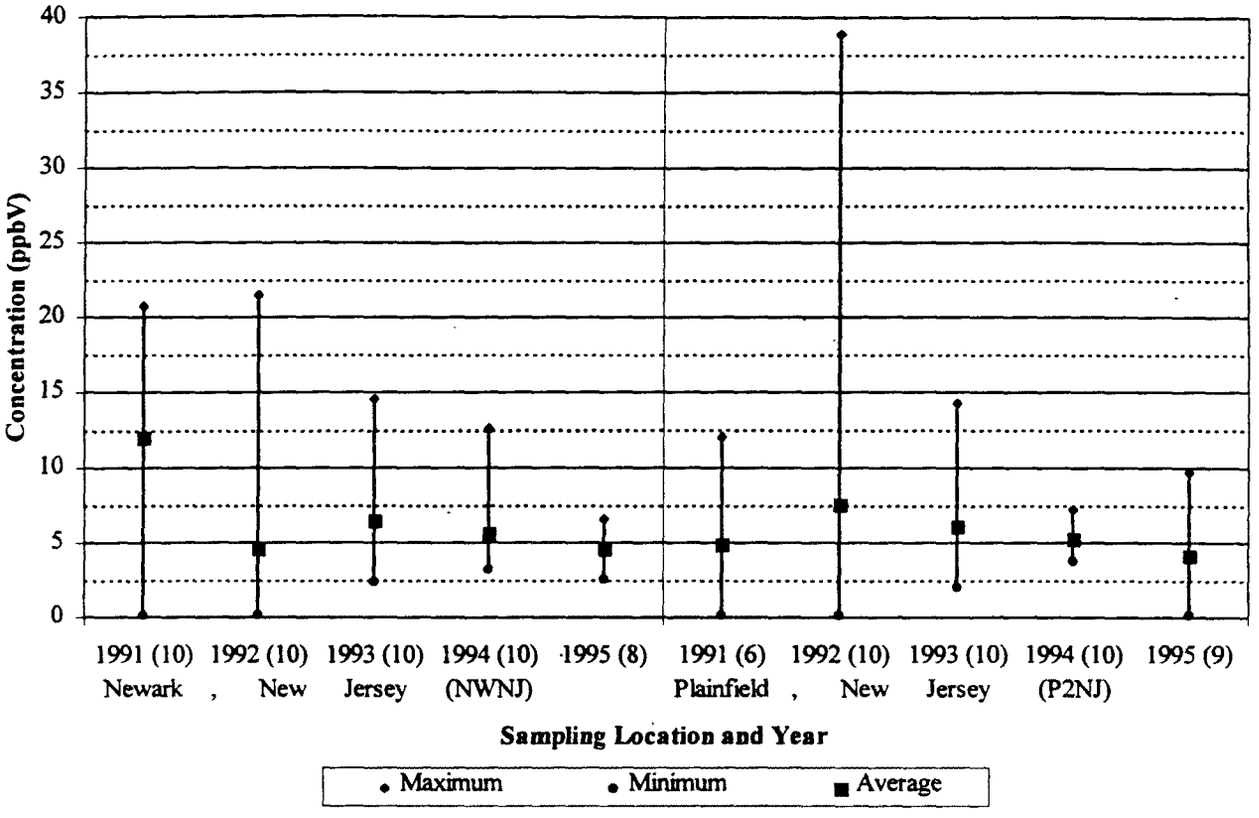


Figure 5-22. 1995 Temporal Comparisons of Acetone Concentrations Measured in the New York City and Northern New Jersey Airshed

The acetaldehyde concentration range and central tendency trends are almost identical for Newark, New Jersey (NWNJ), and Plainfield, New Jersey (P2NJ). At both sites the average concentration and the range of concentrations have increased from 1993 to 1995. In fact, the median concentrations have increased almost geometrically going from approximately 2.5 ppbV in 1993 to approximately 5 ppbV in 1994 and greater than 15 ppbV in 1995. Although the reason for the increase in acetaldehyde levels is not known, it may be related to EPA mandates that require the use of ethanol and other oxygenates in fuels year round starting January 1, 1995, in the New York City and Northern New Jersey airshed.[41]

At Newark, New Jersey (NWNJ), the average acetone concentration and the range of observed concentrations decreased from 1993 through 1995. At Plainfield, New Jersey (P2NJ),

the average acetone concentration decreased from 1992 through 1995; however, the observed range of acetone concentrations almost tripled in 1995 (0 to 10 ppbV) as compared to 1994 (4 to 7 ppbV). Acetone is considered an exempt compound by the EPA (i.e., it is not considered a VOC that contributes to ground level ozone production). As an exempt compounds, its use in consumer products may increase as VOC content limits are imposed on these products.

6.0 COMPLETENESS RESULTS BY PROGRAM

The completeness of ambient air monitoring efforts refers to the fraction of attempted sampling events resulting in either quantified chemical concentrations of not-detected results. Invalid sampling events may result from various sampling or analytical errors. Not all of the samples from the various base programs and their options were collected as scheduled. This section presents completeness results, indicating the percentages of samples that were collected as scheduled. The percentage complete does not include the collection and analysis of duplicate samples.

6.1 NMOC Base Program

For the 1995 NMOC base program, 242 of the scheduled 249 samples were collected on schedule for the three sites. The seven missing samples resulted in an overall result of 97% completeness. Percent completeness by site ranged from 95% at LINY to 100% at NWNJ Table 6-1 presents data from each of the base sites involved in the program. The overall completeness value for 1995 is comparable to completeness figures for previous years of the program. Figure 6-1 shows the sampling completeness for the history of the NMOC program. Table 6-2 lists the invalid samples by site. Equipment malfunction was identified as the primary cause of missed samples, accounting for 78 percent. Operator error accounted for the remaining 22% of the missed samples.

6.2 Speciated NMOC Base Program

For the 1995 Speciated NMOC base program, 524 of the 548 samples were taken on schedule. The 24 missed samples resulted in an overall completeness result of 96 percent. Percent completeness by site ranged from 94% at B1AL and B3AL to 100% at DLTX. Table 6-3 presents completeness data for each of the Speciated NMOC base sites in the 1995 program. The overall completeness value for 1995 is comparable to completeness figures for previous years of the program. Figure 6-2 shows the sampling completeness history of the Speciated NMOC program. Two of the 24 samples missed were because the shelter at the NOLA site was being

Table 6-1

1995 NMOC Completeness Results

Site Location	ERG Site Code	Scheduled Sampling Days	Total Scheduled Duplicate Samples	Total Scheduled Canister Analyses	Total Valid Duplicate Samples	Total Valid Samples	Percent Complete[a]
Long Island, NY	LINY	83	9	92	10	79	95
Newark, NJ	NWNJ	83	9	92	11	83	100
Plainfield, NJ	P2NJ	83	9	92	12	79	95
Overall		249	27	276	33	242	97

[a] Percent Complete = 100(Total Valid Samples/Scheduled Sampling Days)

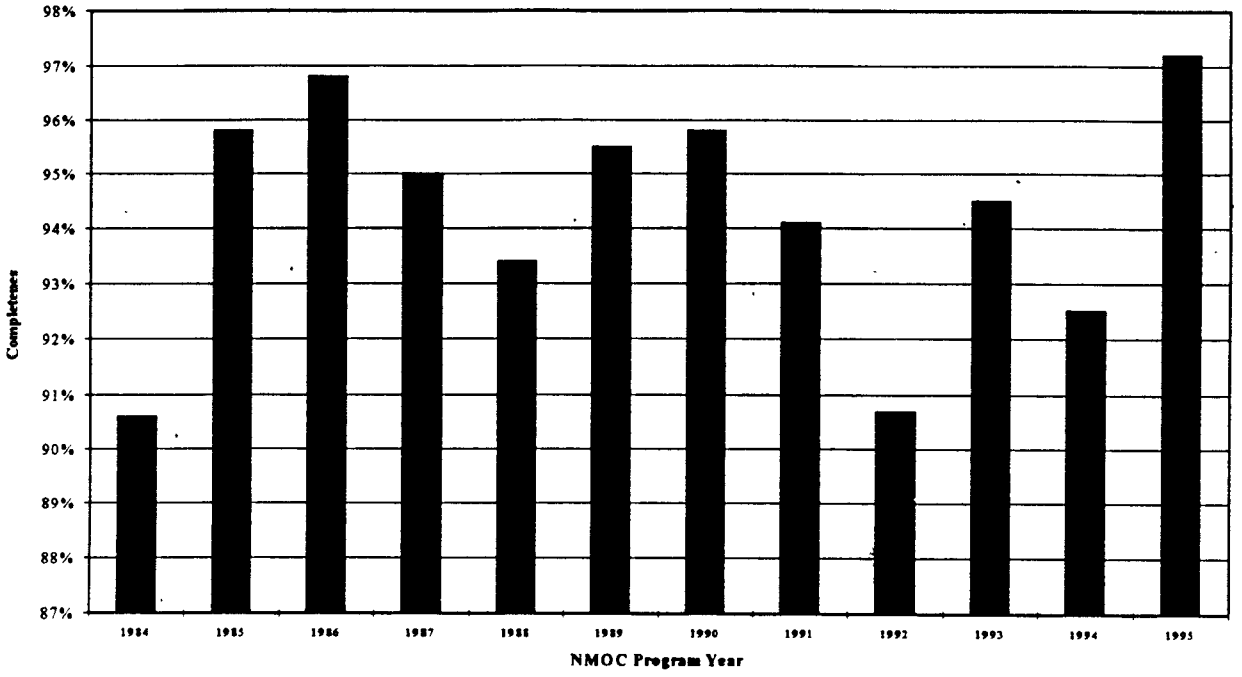


Figure 6-1. 1995 Sampling Completeness History for the NMOC Program

Table 6-2

1995 NMOC Invalid Samples by Site

Site	Date	Description	Assignment
LINY	6/15/95	Timer was in off position	Operator error
	9/11/95	Timer was not set for Monday	Operator error
	9/22/95	Pump failure	Equipment malfunction
	9/25/95	Pump failure	Equipment malfunction
NWNJ		(No invalid samples—100% Complete)	
P2NJ	7/28/95	Low pressure	Equipment malfunction
	8/04/95	Bad solenoid valve	Equipment malfunction
	8/09/95	Canister leaked	Equipment malfunction
	9/21/95	Canister leaked	Equipment malfunction

Table 6-3

1995 Speciated NMOC Completeness Results

Site Location	Site Code	Total Scheduled Sampling Days	Total Scheduled Duplicate Samples	Total Scheduled Canister Analyses	Total Valid Duplicate Samples	Total Valid Samples	Percent Complete[a]
Birmingham, AL (Tarrant)	B1AL	82	9	91	8	77 [b]	94
Birmingham, AL (Pinson)	B2AL	82	9	91	9	80 [b]	98
Birmingham, AL (Helena)	B3AL	82	9	91	9	77 [b]	94
Dallas, TX	DLTX	83	9	92	12	83	100
Fort Worth, TX	FWTX	80	9	89	10	[c] 79	99
Juarez, Mexico	JUMX	56	6	62	6	[d] 49	88
New Orleans, LA	NOLA	83	9	92	10	79	95
Overall		548	60	608	64	524	96

[a]Percent Complete = 100 (Total Valid Samples/Scheduled Sampling Days).
[b]The Birmingham, AL, sites started collecting samples on June 6.
[c]FWTX started collecting samples on June 8.
[d]JUMX started collecting samples on July 13.

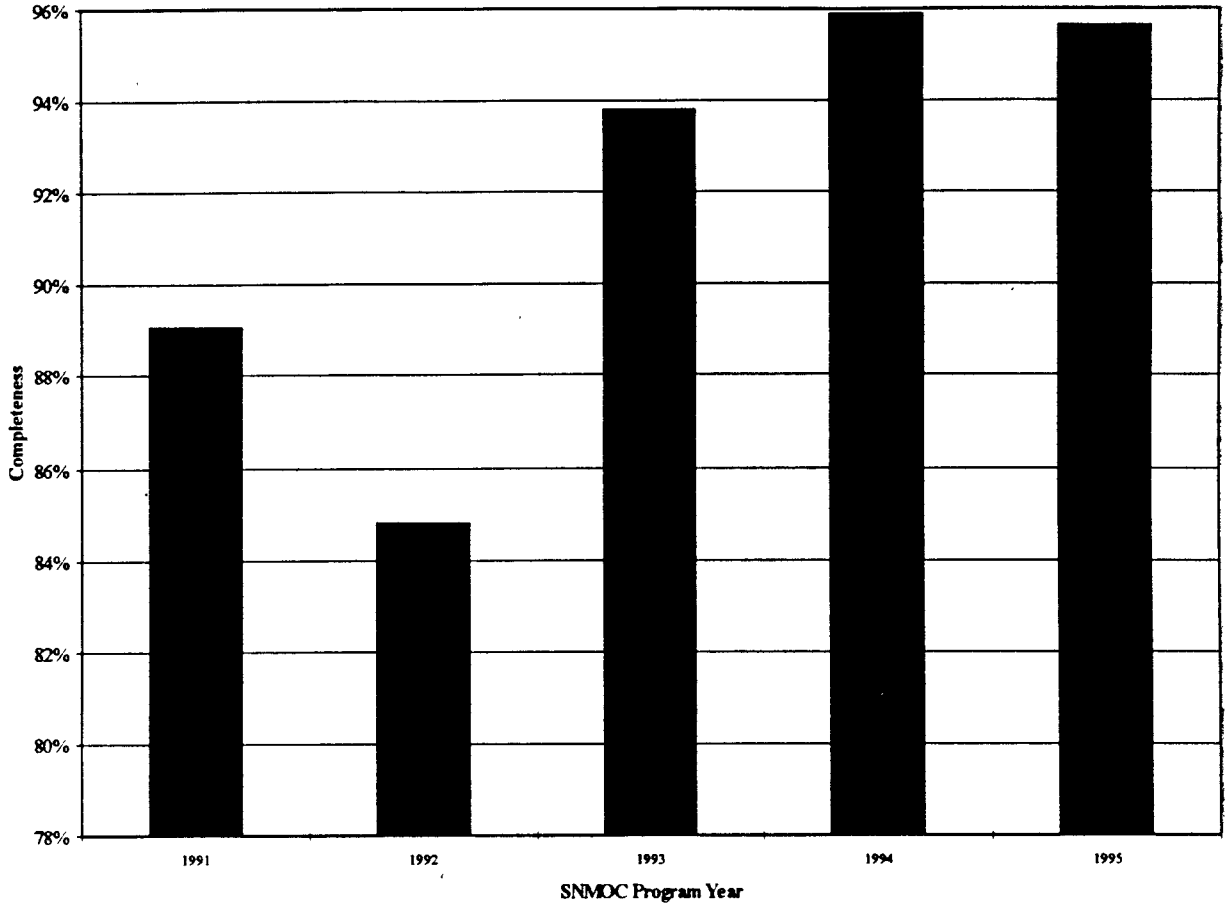


Figure 6-2. 1995 Sampling Completeness History for the Speciated NMOC Base Program

replaced. Three samples were missed because the sites at B1AL, B2AL, and B3AL did not sample on July 3. Other reasons for missed samples included leaking canisters, defective sampling pumps, and lack of power at the sampling site.

6.3 Speciated NMOC Option Program

Two (NWNJ, P2NJ) of the base NMOC sites participated in the 1995 Speciated NMOC option program. All of the 16 samples and 2 duplicate samples were taken on schedule resulting in an overall completeness result of 100 percent.

6.4 UATMP VOC Option Program

For the 1995 UATMP VOC option program, 40 samples and 5 duplicate samples were scheduled at the five participating sites (B1AL, B2AL, B3AL, NWNJ, P2NJ). All of the 40 samples plus 1 additional sample at B2AL and 2 additional samples at B3AL were successfully collected and analyzed. Although all 5 duplicate samples were apparently successfully collected, only three were analyzed. The duplicate samples for B1AL and B3AL were apparently collected according to the custody forms but no analytical results are reported.

6.5 Carbonyl Option Program

For the 1995 carbonyl option program, 40 samples and 5 duplicate samples were scheduled at the five participating sites (NWNJ, P2NJ, DLTX, FWTX, NOLA). All of the 40 samples plus 1 additional sample at P2NJ were successfully collected and analyzed. Only 4 of the 5 duplicate samples were successfully collected and analyzed. The duplicate sample for FWTX was either not collected or not analyzed. No analytical results were reported.

7.0 REFERENCES

1. Procedures for Applying City Specific EKMA (Empirical Kinetic Modeling Approach), Office of Air Quality and Planning Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 27711. EPA-450/4-89-012, 1989.

2. Morris, R.E. and Myers, T.C. "User's guide for the Urban Airshed Model, Volume I: User's Manual for UAM (CB-IV)." EPA-450/4-90-007A. Office of Air Quality and Planning Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. June 1990.

3. 1994 Non-Methane Organic Compounds and Speciated Non-Methane Organic Compounds Monitoring Programs. Final Report. Delivery Order 3. EPA Contract No.: 68-D3-0095. Prepared for Kathy Weant and Neil J. Berg, Jr., Office of Air Quality and Planning Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. January 25, 1996.

4. Development and Evaluation of a Prototype Analytical System for Measuring Air Toxics. Final Report. EPA Contract No.: 68-02-3889. Prepared for Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. November 13, 1987.

5. "The Air Toxic Problem in the United States: An Analysis of Cancer Risks for Selected Pollutants." U.S. Environmental Protection Agency, Internal Publication. May 1985.

6. 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.

7. Lonneman, W.A. and Seila, R.L. "Research Protocol Method for Analysis of C_2 through C_{12} Hydrocarbons in Ambient Air by Gas Chromatography with Cryogenic Concentration, in Determination of C_2 to C_{12} Ambient Air Hydrocarbons in 39 U.S. Cities from 1984 to 1986." EPA/600/3-89-058; March 1989.

8 Compendium Method TO-14. "The Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatographic Analysis." Quality Assurance Division, Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

9. Compendium Method TO-11. "Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography." Atmospheric Research and Exposure Assessment Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

10. Georgopoulos, P.G. and J.H. Seinfeld, 1982. "Statistical Distributions of Air Pollutant Concentrations." *Environmental Science and Technology*. 16:401-416.

11. TRI 1994, Toxic Release Inventory, 1994 Data Release. U.S. Environmental Protection Agency.

12. Personal communication with Howard Balentine, certified Meteorological Consultant, December 9, 1996.

13. "Climates of the States." Second Edition. Volume 2. Gale Research Company, Detroit, Michigan 48226. Page 509.

14. Personal communication from Howard Ballentine, certified Meteorological Consultant, December 8, 1996.

15. Donald L. Harnett. "Statistical Methods." Addison-Wesley Publishing Company, Third Edition. 1982.

16. Rhodes. "Much Ado About Nothing, Or What to do with Measurement Below the Detection Limit." Environmetrics 81: Selected Papers, SIAM SIMS Conference Series No. 8, Society for Industrial and Applied Mathematics, Philadelphia. Pp. 157-62, 1991.

17. Lawrence C. Hamilton. "Modern Data Analysis." Brooks/Cole Publishing Company. 1990.

18 Snedecor, George W. and William G. Cochran. "Statistical Methods." Ames, Iowa:The Iowa State University Press, Seventh Edition. 1980.

19. Shapiro, S.S. and M.B. Wilk. "An Analysis of Variance Test for Normality (complete samples)." Biometrika, 52:591-611, 1965.

20. D'Agostino, R.B. "An Omnibus Test of Normality for Moderate and Large Size Samples." Biometrika 58:341-348, 1971.

21. Scheff, P.A., R.A. Wadden, B.A. Bates and P.F. Aronian (1989). "Source Fingerprints for Receptor Modeling of Volatile Organics." *Journal of Air Pollut. Control Assoc.* 39:469-478.

22. Chester W. Spicer, Bruce E. Buxton, Michael W. Holdren, Deborah L. Smith, Thomas J. Keely, Steven W. Rust, Alan D. Pate, George M. Sverdrup, and Jane C. Chuang. "Variability of Hazardous Air Pollutants in an Urban Area." *Atmospheric Environment.* Volume 30, No. 20, pp 3443-3456, 1996.

23. Gilbert, Richard O. "Statistical Methods for Environmental Polution Monitoring." Van Nostrand Reinhold Publishers, 1987.

24. "Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part A)." Interim Final. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. December, 1989.

25. Singh, H.B., L.J. Salas, B.K. Cantrell, and R.M. Redmond. "Distribution of Aromatic Hydrocarbons in the Ambient Air." *Atmospheric Environment.* Volume 19, No. 11. Pp 1911-1919, 1985.

26. Blake, D.R. and F.S. Rowland (1995). "Urban Leakage of Liquified Petroleum Gas and its Impact on Mexico City Air Quality." *Science*, Volume 269, Pp. 953-956, 1995.

27. Birth, T.L. 1995. "User's Guide to the Personal Computer Version of the Biogenic Emissions Inventory System (PCBEIS2.2)." Prepared for the U.S. Environmental Protection Agency, Office of Research and Development. Washington, D.C.

28. Possanzini, M. and V. DiPalo. "Determination of Olefinic Aldehydes and Other Volatile Carbonyls in Air Samples by DNPH-Coated Cartridges and HPLC." *Chromatographia*, Volume 40. Pp. 134-138, 1995.

29. Hoshika, Yasuyuki and Yoshinori Takata. "Gas ChromatographicSeparation of Carbonyl Compounds as Their 2,4-Dinitrophenylhydrazones Using Glass Capillary Columns." *Journal of Chromatography*, Volume 120. Pp. 379-389, 1976.

30. Creech, G., R.T. Johnson, and J.O. Stoffer. "Part I. A Comparison of Three Different High Pressure Liquid Chromatography Systems for the Determination of Aldehydes and Ketones in Diesel Exhaust." *Journal of Chromatographic Science*, Volume 20, Pp. 67-72, 1982.

31. Grosjean, Daniel. "Discussion: Atmospheric Concentrations and Temporal Variations of C_1-C_3 Carbonyl Compounds at Two rural Sites in Central Ontario." *Atmospheric Environment.* Vol. 26A, No. 2. Pp. 349-351, 1992.

32. Garcia, J.P, S. Beyne-Masclet, G. Mouner, P. Masclet. "Emissions of Volatile Organic Compounds by Coal-fired Power Stations." *Atmospheric Environment.* Pp. 1589-1597. 1991.

33. Grosjean, Daniel. "Formaldehyde and other Carbonyls in Los Angeles Ambient Air." *Environmental Science Technology.* Vol. 16. Pp. 254-262. 1982.

34. Dost, F.N. "Acate Toxicology of Components of Vegetation Smoke." *Reviews of Environmental Contamination and Toxicology*. Vol. 119. Pp. 1-46. 1991.

35. Dew, R.J. "The Regulatory Outlook for Methyl Chrloroform." *Spray Technology and Marketing*, January 1993. Pp. 25-27.

36. Zurer, P. "Tighter CFC Substitute Controls Found Feasible." *Chemical and Engineering News*, March 13, 1995. Pg. 8.

37. "National Emissions Standards for Hazardous Air Pollutants (NESHAP); Halogenated Solvent Cleaning." Federal Register 59:61801-61820 (December 2, 1994).

38. Thayer, A.M. "Growing Exchange of Information Spurs Pollution Prevention Efforts." *Chemical and Engineering News*, July 26, 1993. Pp. 8-25.

39. Zurer, P. "Global Monitoring Shows Ozone Treaty is Working." *Chemical and Engineering News*, July 17, 1995. Pp. 7-8.

40. Federal Register, Volume 58, p. 49354. September 22, 1993. Office of the Federal Register, Washington, D.C.

41. Peaff, G. "Court Ruling Spurs Continued Debate Over Gasoline Oxygenates." *Chemical and Engineering News*, September 26, 1994. Pp. 8-13.

Appendix A

AIRS
Site Description

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ty: 073   JEFFERSON CO                   MSA : 1000  BIRMINGHAM, AL
   : 6002                                CMSA: 0000  DESCRIPTION UNKNOWN

ation (MSL)   :  171  METERS             Date Established :   /  /
 Use          : 1     RESIDENTIAL       Date Last Updated: 96/09/25
tion Setting  : 2     SUBURBAN          Date Terminated  :   /  /
              : 75000 TARRANT CITY

tude          : +33:34:42:0000          Longitude        : - 86:46:26:0000
od of Determ.:                          Est. of Accuracy :
m             :                         Scale            :

UTM =   Zone : 16       Easting :   520984    Northing : 3715234

ess           : TARRANT, ELEM. SCH., 1269 PORTLAND STREE
ort Agency    : 012 JEFFERSON COUNTY DEPARTMENT OF HEALTH
tion Descrip.:

end   PF4=main menu   PF5=terminate   PF7=prev   PF8=next   PF9=gen
```

State : 01 ALABAMA
County: 073 JEFFERSON CO
Site : 5002

AQCR: 004 METROPOLITAN BIRMINGHAM
MSA : 1000 BIRMINGHAM, AL
CMSA: 0000 DESCRIPTION UNKNOWN

Elevation (MSL) : 201 METERS
Land Use : 1 RESIDENTIAL
Location Setting : 3 RURAL
City : 00000 NOT IN A CITY

Date Established : / /
Date Last Updated: 96/09/25
Date Terminated : / /

Latitude : +33:42:16:0000
Method of Determ.:
Datum :

Longitude : - 86:40:08:0000
Est. of Accuracy :
Scale :

UTM = Zone : 16 Easting : 530684 Northing : 3729242

Address : PINSON, HIGH SCH., BOX 360 HWY 75 NORTH
Support Agency : 012 JEFFERSON COUNTY DEPARTMENT OF HEALTH
Location Descrip.:

PF3=end PF4=main menu PF5=terminate PF7=prev PF8=next PF9=gen

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e : 01  ALABAMA                          AQCR: 004   METROPOLITAN BIRMINGHAM
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:  : 0004                               CMSA: 0000  DESCRIPTION UNKNOWN

'ation (MSL)   :  600  METERS            Date Established : 83/01/01
l Use          : 4     AGRICULTURAL      Date Last Updated: 96/09/25
.tion Setting  : 3     RURAL             Date Terminated  :   /  /
'              : 00000 NOT IN A CITY

tude           : +33:19:01:0000          Longitude        : - 86:49:30:0000
ıod of Determ.:                          Est. of Accuracy :
.m             :                         Scale            :

UTM =   Zone : 16       Easting :   516280    Northing : 3686270

'ess           : BEARDEN FARM
›ort Agency    : 011 AL DEPT. OF ENV. MGT.
tion Descrip.:

end   PF4=main menu   PF5=terminate   PF7=prev   PF8=next   PF9=gen
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County: 113 DALLAS CO
Site : 0069

AQCR: 215 METROPOLITAN DALLAS-FOR
MSA : 1920 DALLAS, TX
CMSA: 0031 DALLAS-FORT WORTH, TX

Elevation (MSL) : 125 METERS
Land Use : 2 COMMERCIAL
Location Setting : 1 URBAN AND CE
City : 19000 DALLAS

Date Established : 86/01/01
Date Last Updated: 96/06/27
Date Terminated : / /

Latitude : +32:49:10:0000
Method of Determ.:
Datum :

Longitude : - 96:51:40:0000
Est. of Accuracy :
Scale :

UTM = Zone : 14 Easting : 700236 Northing : 3633107

Address : 1415 HINTON STREET
Support Agency : 002 CITY OF DALLAS AIR POLLUTION CONTROL SECTION
Location Descrip.:

PF3=end PF4=main menu PF5=terminate PF7=prev PF8=next PF9=gen

.e : 48 TEXAS AQCR: 215 METROPOLITAN DALLAS-FORT
ıty: 439 TARRANT CO MSA : 2800 FORT WORTH-ARLINGTON, TX
: 1002 CMSA: 0031 DALLAS-FORT WORTH, TX

ration (MSL) : 204 METERS Date Established : 75/01/01
l Use : 2 COMMERCIAL Date Last Updated: 96/06/27
ıtion Setting : 1 URBAN AND CE Date Terminated : / /
: 27000 FORT WORTH

.tude : +32:48:18:0000 Longitude : - 97:21:23:0000
ıod of Determ.: MAP Est. of Accuracy : 5.00000SEC
ım : 00 DATUM UNKNOW Scale : 24000A

UTM = Zone : 14 Easting : 653888 Northing : 3630675

ress : 3317 ROSS AVE.
ort Agency : 001 TEXAS NATURAL RESOURCES CONSERVATION COMMISSION
ıtion Descrip.:

end PF4=main menu PF5=terminate PF7=prev PF8=next PF9=gen

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County: 006 CHIHUAHUA STATE
Site : 0001

AQCR: 250 COUNTRY OF MEXICO
MSA : 2320 EL PASO, TX
CMSA: 0000 DESCRIPTION UNKNOWN

Elevation (MSL) : METERS
Land Use : 2 COMMERCIAL
Location Setting : 1 URBAN AND CE
City : 01150 CIUDAD-JUAREZ

Date Established : 90/06/04
Date Last Updated: 95/10/31
Date Terminated : / /

Latitude : +31:42:56:0000
Method of Determ.: SUR-GPS
Datum : 83 NAD 83

Longitude : -106:23:39:000(
Est. of Accuracy : 3.20000SEC
Scale : NA

UTM = Zone : 13 Easting : 367900 Northing : 3509566

Address : TECHNICAL INSTITUTE
Support Agency : 002 SEMARNAP
Location Descrip.:

PF3=end PF4=main menu PF5=terminate PF7=prev PF8=next PF9=gen

7/96 AIRS Air Quality Subsystem AMP510SB
Browse Site Data Page 1/3

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ty: 059 NASSAU CO MSA : 5380 NASSAU-SUFFOLK, NY
: 0005 CMSA: 0070 NY-N.NJ-L.IS,NY-NJ-CT-PA

ation (MSL) : 27 METERS Date Established : 71/01/01
Use : 2 COMMERCIAL Date Last Updated: 95/07/03
tion Setting : 2 SUBURBAN Date Terminated : / /
: 00000 NOT IN A CITY

tude : +40:44:41:0000 Longitude : - 73:35:13:0000
od of Determ.: Est. of Accuracy :
n : Scale :

JTM = Zone : 18 Easting : 619300 Northing : 4511200

ess : EISENHOWER PARK,MERRICK AV&OLD COUNTRY R
ort Agency : 001 NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATIO
tion Descrip.:

end PF4=main menu PF5=terminate PF7=prev PF8=next PF9=gen

State : 34 NEW JERSEY
County: 013 ESSEX CO
Site : 0011

AQCR: 043 NEW JERSEY-NEW YORK-CO
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CMSA: 0070 NY-N.NJ-L.IS,NY-NJ-CT-

Elevation (MSL) : 3 METERS
Land Use : 3 INDUSTRIAL
Location Setting : 1 URBAN AND CE
City : 51000 NEWARK

Date Established : 85/01/01
Date Last Updated: 96/09/25
Date Terminated : / /

Latitude : +40:43:36:0000
Method of Determ.:
Datum :

Longitude : - 74:08:39:000(
Est. of Accuracy :
Scale :

UTM = Zone : 18 Easting : 572280 Northing : 4508570

Address : ST. CHARLES BETWEEN KOSSUTH & KAMERON ST
Support Agency : 001 NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECT
Location Descrip.:

7/96 AIRS Air Quality Subsystem AMP510SB
Browse Site Data Page 1/3

```
e : 34  NEW JERSEY                          AQCR: 043   NEW JERSEY-NEW YORK-CONNE
ty: 039   UNION CO                          MSA : 5640  NEWARK, NJ
  : 5001                                    CMSA: 0070  NY-N.NJ-L.IS,NY-NJ-CT-PA

ation (MSL)  :   18  METERS                 Date Established : 80/05/01
 Use         : 1     RESIDENTIAL            Date Last Updated: 96/09/25
tion Setting : 2     SUBURBAN               Date Terminated  :   /  /
             : 59190 PLAINFIELD

tude         : +40:36:03:0000               Longitude        : - 74:26:31:0000
od of Determ.:                              Est. of Accuracy :
m            :                              Scale            :

UTM =   Zone : 18       Easting :   547218    Northing : 4494399

ess          : WEST THIRD AND BERGEN STREETS
ort Agency   : 001 NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTIO
tion Descrip.:

end   PF4=main menu   PF5=terminate   PF7=prev   PF8=next   PF9=gen
```

State : 22 LOUISIANA
County: 051 JEFFERSON PAR
Site : 1001

AQCR: 106 SOUTHERN LOUISIANA-SOU'
MSA : 5560 NEW ORLEANS, LA
CMSA: 0000 DESCRIPTION UNKNOWN

Elevation (MSL) : 3 METERS
Land Use : 1 RESIDENTIAL
Location Setting : 2 SUBURBAN
City : 39475 KENNER

Date Established : / /
Date Last Updated: 96/05/21
Date Terminated : / /

Latitude : +30:02:36:0000
Method of Determ.:
Datum :

Longitude : - 90:16:30:0000
Est. of Accuracy :
Scale :

UTM = Zone : 15 Easting : 762761 Northing : 3326537

Address : WEST TEMPLE PL
Support Agency : 001 STATE OF LOUISIANA
Location Descrip.:

Appendix B

Statistical Summary
for the
Speciated NMOC Base Sites

Table B-1. Number and Frequency of Occurrence for All 1995 Speciated NMOC Base Sites

Compound Name	Number of Occurrences	Frequency (%)
Benzene	523	100%
Toluene	524	100%
Ethylbenzene	515	98%
p-Xylene + m-Xylene	521	99%
Styrene	515	98%
o-Xylene	509	97%
Isopropylbenzene	30	6%
n-Propylbenzene	347	66%
m-Ethyltoluene	494	94%
p-Ethyltoluene	449	86%
1,3,5-Trimethylbenzene	440	84%
o-Ethyltoluene	349	67%
1,2,4-Trimethylbenzene	519	99%
1,2,3-Trimethylbenzene	524	100%
p-Diethylbenzene	349	67%
Aromatic Compound Average	**441**	**84%**
Ethane	490	94%
Propane	517	99%
Isobutane	481	92%
n-Butane	520	99%
Isopentane	524	100%
n-Pentane	519	99%
Cyclopentane	346	66%
2,2-Dimethylbutane	442	84%
2,3-Dimethylbutane	470	90%
2-Methylpentane	521	99%
3-Methylpentane	514	98%
n-Hexane	515	98%
Methylcyclopentane	499	95%
Cyclohexane	427	81%
2,4-Dimethylpentane	462	88%
2-Methylhexane + 2,3-Dimethylpentane	499	95%
3-Methylhexane	521	99%

Table B-1. Number and Frequency of Occurrence for All 1995 Speciated NMOC Base Sites

Compound Name	Number of Occurrences	Frequency (%)
n-Heptane	492	94%
Methylcyclohexane	394	75%
2,2,4-Trimethylpentane	517	99%
2,2,3-Trimethylpentane	290	55%
2,3,4-Trimethylpentane	485	93%
3-Methylheptane	415	79%
n-Octane	428	82%
2-Methylheptane	374	71%
n-Nonane	361	69%
n-Decane	411	78%
n-Undecane	460	88%
n-Dodecane	114	22%
n-Tridecane	114	22%
Parifin Compound Average	**437**	**83%**
Ethylene	388	74%
Acetylene	367	70%
Propylene	461	88%
Propyne	1	0%
Isobutene + 1-Butene	479	91%
1,3-Butadiene	225	43%
t-2-Butene	120	23%
c-2-Butene	164	31%
3-Methyl-1-Butene	97	19%
1-Pentene	235	45%
2-Methyl-1-Butene	424	81%
Isoprene	470	90%
t-2-Pentene	403	77%
c-2-Pentene	324	62%
2-Methyl-2-Butene	425	81%
Cyclopentene	128	24%
4-Methyl-1-Pentene	335	64%
1-Hexene	156	30%
2-Methyl-1-Pentene	16	3%
2-Ethyl-1-Butene	60	11%

Table B-1. Number and Frequency of Occurrence for All 1995 Speciated NMOC Base Sites

Compound Name	Number of Occurrences	Frequency (%)
t-2-Hexene	220	42%
c-2-Hexene	147	28%
1-Heptene	13	2%
1-Octene	240	46%
1-Nonene	29	6%
α-Pinene	473	90%
β-Pinene	522	100%
1-Decene	18	3%
1-Undecene	523	100%
1-Dodecene	134	26%
1-Tridecene	65	12%
Olefin Compound Average	247	47%

Table B-2. Number and Frequency of Occurrence for the 1995 Speciated NMOC Base Sites

Compound	Tarrant City, Alabama (B1AL)		Pinson, Alabama (B2AL)		Helena, Alabama (B3AL)		Dallas, Texas (DLTX)		Fort Worth, Texas (FWTX)		Juarez, Mexico (JUMX)		New Orleans, Louisiana (NOLA)	
	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency
Benzene	77	100%	79	99%	79	100%	83	100%	79	100%	49	100%	79	100%
Toluene	77	100%	80	100%	79	100%	83	100%	79	100%	49	100%	79	100%
Ethylbenzene	75	97%	78	98%	75	95%	83	100%	78	99%	49	100%	79	100%
p-Xylene and m-Xylene	76	99%	78	98%	79	100%	83	100%	79	100%	49	100%	79	100%
Styrene	77	100%	79	99%	75	95%	82	99%	76	96%	49	100%	79	100%
o-Xylene	74	96%	78	98%	75	95%	82	99%	77	97%	49	100%	75	95%
p-Diethylbenzene	63	82%	43	54%	25	32%	73	88%	62	78%	44	90%	40	51%
Isopropylbenzene	7	9%	1	1%	1	1%	6	7%	4	5%	7	14%	4	5%
n-Propylbenzene	64	83%	43	54%	38	48%	69	83%	59	75%	45	92%	30	38%
m-Ethyltoluene	73	95%	74	93%	76	96%	83	100%	77	97%	48	98%	65	82%
p-Ethyltoluene	71	92%	59	74%	65	82%	81	98%	75	95%	48	98%	51	65%
1,3,5-Trimethylbenzene	71	92%	63	79%	57	72%	82	99%	74	94%	47	96%	47	59%
o-Ethyltoluene	59	77%	50	63%	46	58%	61	73%	60	76%	42	86%	33	42%
1,2,4-Trimethylbenzene	76	99%	77	96%	79	100%	82	99%	79	100%	49	100%	79	100%
1,2,3-Trimethylbenzene	77	100%	80	100%	79	100%	83	100%	79	100%	49	100%	79	100%
Aromatic Average	**68**	**88%**	**64**	**80%**	**62**	**78%**	**74**	**90%**	**69**	**88%**	**45**	**92%**	**60**	**76%**
Ethane	70	91%	60	75%	73	92%	83	100%	79	100%	49	100%	78	99%
Propane	75	97%	78	98%	79	100%	83	100%	79	100%	46	94%	79	100%
Isobutane	68	88%	58	73%	71	90%	81	98%	79	100%	49	100%	77	97%
n-Butane	77	100%	77	96%	78	99%	83	100%	79	100%	49	100%	79	100%
Isopentane	77	100%	80	100%	79	100%	83	100%	79	100%	49	100%	79	100%
n-Pentane	75	97%	80	100%	79	100%	83	100%	78	99%	48	98%	78	99%
Cyclopentane	54	70%	31	39%	35	44%	69	83%	72	91%	45	92%	41	52%
2,2-Dimethylbutane	65	84%	48	60%	59	75%	83	100%	79	100%	39	80%	71	90%
2,3-Dimethylbutane	68	88%	68	85%	63	80%	82	99%	78	99%	47	96%	65	82%
2-Methylpentane	77	100%	79	99%	77	97%	83	100%	79	100%	49	100%	79	100%
3-Methylpentane	73	95%	77	96%	78	99%	83	100%	79	100%	49	100%	77	97%
n-Hexane	74	96%	76	95%	78	99%	83	100%	79	100%	49	100%	78	99%

Table B-2. Number and Frequency of Occurrence for the 1995 Speciated NMOC Base Sites

Compound	Tarrant City, Alabama (B1AL)		Pinson, Alabama (B2AL)		Helena, Alabama (B3AL)		Dallas, Texas (DLTX)		Fort Worth, Texas (FWTX)		Juarez, Mexico (JUMX)		New Orleans, Louisiana (NOLA)	
	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency
Methylcyclopentane	74	96%	71	89%	69	87%	83	100%	79	100%	49	100%	76	96%
Cyclohexane	62	81%	49	61%	43	54%	81	98%	79	100%	49	100%	66	84%
2,4-Dimethylpentane	68	88%	66	83%	63	80%	77	93%	78	99%	47	96%	65	82%
2-Methylhexane and 2,3-Dimethylpentane	72	94%	74	93%	67	85%	83	100%	79	100%	49	100%	77	97%
3-Methylhexane	77	100%	80	100%	76	96%	83	100%	79	100%	49	100%	79	100%
n-Heptane	73	95%	70	88%	67	85%	83	100%	79	100%	49	100%	73	92%
Methylcyclohexane	63	82%	32	40%	36	46%	83	100%	79	100%	49	100%	54	68%
2,2,4-Trimethylpentane	76	99%	78	98%	76	96%	83	100%	79	100%	49	100%	78	99%
2,2,3-Trimethylpentane	55	71%	29	36%	28	35%	52	63%	60	76%	36	73%	31	39%
2,3,4-Trimethylpentane	74	96%	74	93%	67	85%	83	100%	79	100%	47	96%	63	80%
3-Methylheptane	63	82%	52	65%	47	59%	81	98%	76	96%	44	90%	53	67%
n-Octane	65	84%	40	50%	60	76%	81	98%	77	97%	47	96%	60	76%
2-Methylheptane	62	81%	39	49%	31	39%	79	95%	76	96%	43	88%	45	57%
n-Nonane	62	81%	36	45%	47	59%	71	86%	67	85%	44	90%	36	46%
n-Decane	68	88%	32	40%	58	73%	82	99%	72	91%	49	100%	52	66%
n-Undecane	76	99%	60	75%	66	84%	83	100%	73	92%	49	100%	55	70%
n-Dodecane	18	23%	17	21%	13	16%	23	28%	14	18%	17	35%	12	15%
n-Tridecane	18	23%	16	20%	12	15%	22	27%	14	18%	16	33%	16	20%
Paraffin Average	**66**	**86%**	**58**	**72%**	**59**	**75%**	**76**	**92%**	**73**	**92%**	**45**	**92%**	**62**	**79%**
Ethylene	66	86%	58	73%	47	59%	71	86%	69	87%	43	88%	36	46%
Acetylene	67	87%	53	66%	44	56%	67	81%	59	75%	43	88%	36	46%
Propylene	68	88%	68	85%	62	78%	83	100%	76	96%	47	96%	59	75%
Propyne	0	0%	0	0%	0	0%	1	1%	0	0%	0	0%	0	0%
Isobutene and 1-Butene	68	88%	70	88%	56	71%	83	100%	79	100%	49	100%	76	96%
1,3-Butadiene	52	68%	29	36%	14	18%	44	53%	36	46%	24	49%	27	34%
t-2-Butene	31	40%	7	9%	16	20%	14	17%	23	29%	13	27%	17	22%
c-2-Butene	49	64%	5	6%	24	30%	19	23%	28	35%	20	41%	20	25%

Table B-2. Number and Frequency of Occurrence for the 1995 Speciated NMOC Base Sites

	Tarrant City, Alabama (B1AL)		Pinson, Alabama (B2AL)		Helena, Alabama (B3AL)		Dallas, Texas (DLTX)		Fort Worth, Texas (FWTX)		Juarez, Mexico (JUMX)		New Orleans, Louisiana (NOLA)	
Compound	**No.**	**Frequency**	**No.**	**Frequency**	**No.**	**Frequency**	**No.**	**Frequency**	**No.**	**Frequency**	**No.**	**Frequency**	**No.**	**Frequency**
3-Methyl-1-Butene	28	36%	2	3%	16	20%	15	18%	19	24%	9	18%	9	11%
1-Pentene	49	64%	29	36%	38	48%	34	41%	38	48%	26	53%	23	29%
2-Methyl-1-Butene	69	90%	63	79%	58	73%	78	94%	71	90%	44	90%	43	54%
Isoprene	73	95%	80	100%	79	100%	68	82%	65	82%	39	80%	68	86%
t-2-Pentene	67	87%	55	69%	54	68%	75	90%	70	89%	38	78%	46	58%
c-2-Pentene	62	81%	33	41%	37	47%	66	80%	59	75%	36	73%	33	42%
2-Methyl-2-Butene	69	90%	66	83%	52	66%	81	98%	73	92%	43	88%	43	54%
Cyclopentene	45	58%	5	6%	13	16%	18	22%	19	24%	11	22%	18	23%
4-Methyl-1-Pentene	63	82%	58	73%	60	76%	57	69%	57	72%	7	14%	34	43%
1-Hexene	51	66%	4	5%	20	25%	18	22%	21	27%	17	35%	26	33%
2-Methyl-1-Pentene	3	4%	0	0%	3	4%	2	2%	2	3%	3	6%	4	5%
2-Ethyl-1-Butene	28	36%	2	3%	22	28%	2	2%	3	4%	0	0%	4	5%
t-2-Hexene	53	69%	12	15%	29	37%	36	43%	31	39%	36	73%	24	30%
c-2-Hexene	47	61%	5	6%	12	15%	21	25%	27	34%	18	37%	18	23%
1-Heptene	2	3%	1	1%	0	0%	1	1%	2	3%	4	8%	3	4%
1-Octene	54	70%	27	34%	28	35%	37	45%	43	54%	30	61%	22	28%
1-Nonene	5	6%	2	3%	1	1%	4	5%	3	4%	11	22%	3	4%
a-Pinene	74	96%	79	99%	78	99%	66	80%	56	71%	44	90%	78	99%
b-Pinene	77	100%	80	100%	79	100%	82	99%	78	99%	49	100%	79	100%
1-Decene	0	0%	2	3%	1	1%	3	4%	10	13%	1	2%	1	1%
1-Undecene	77	100%	80	100%	78	99%	83	100%	79	100%	49	100%	79	100%
1-Dodecene	19	25%	22	28%	19	24%	23	28%	17	22%	17	35%	17	22%
1-Tridecene	11	14%	10	13%	6	8%	10	12%	11	14%	10	20%	7	9%
Olefin Average	**46**	**60%**	**32**	**41%**	**34**	**43%**	**41**	**49%**	**39**	**50%**	**25**	**51%**	**31**	**39%**

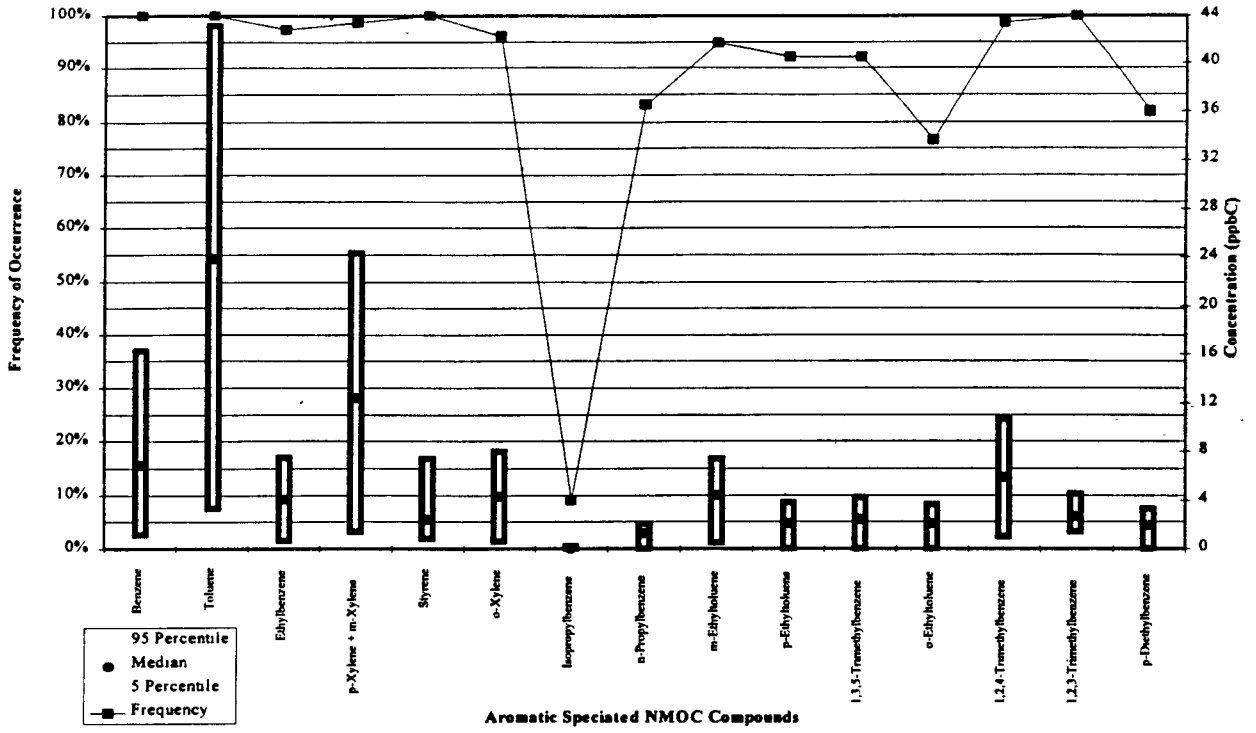

Figure B-1. Frequency and Concentration Distribution of Aromatics at B1AL in 1995.

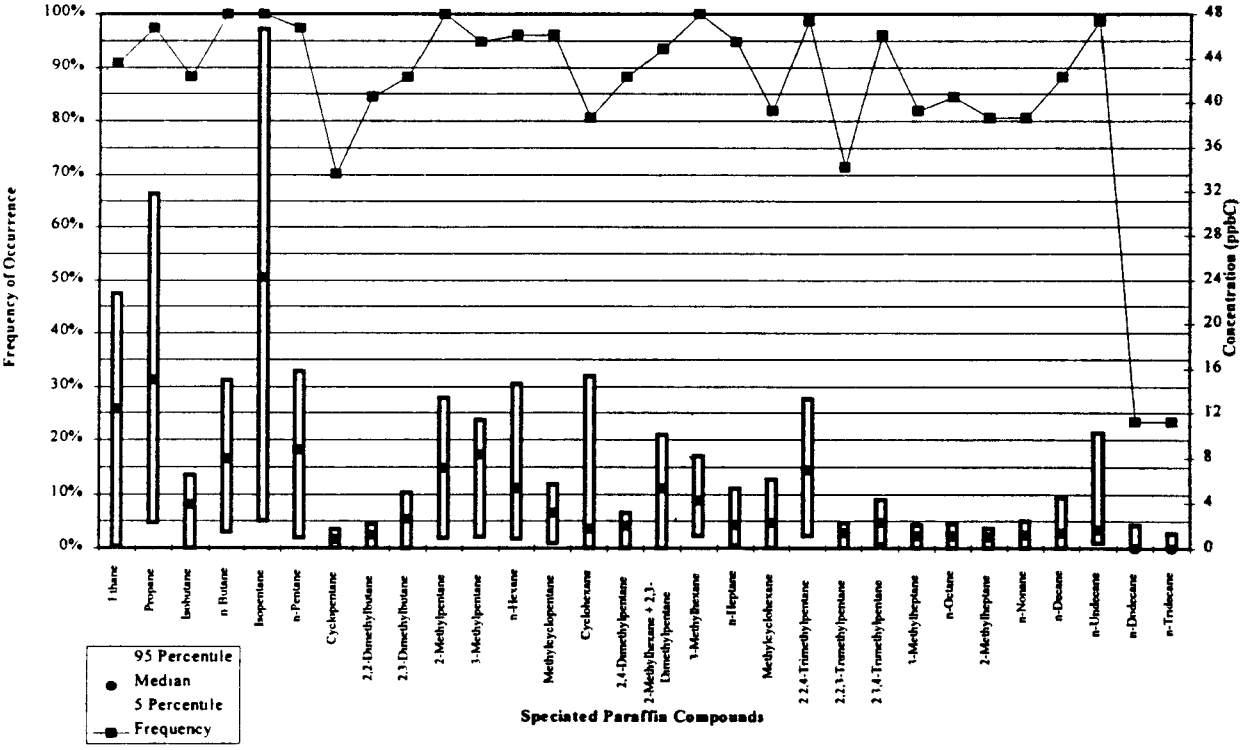

Figure B-2. Frequency and Concentration Distribution for Paraffins at B1AL in 1995.

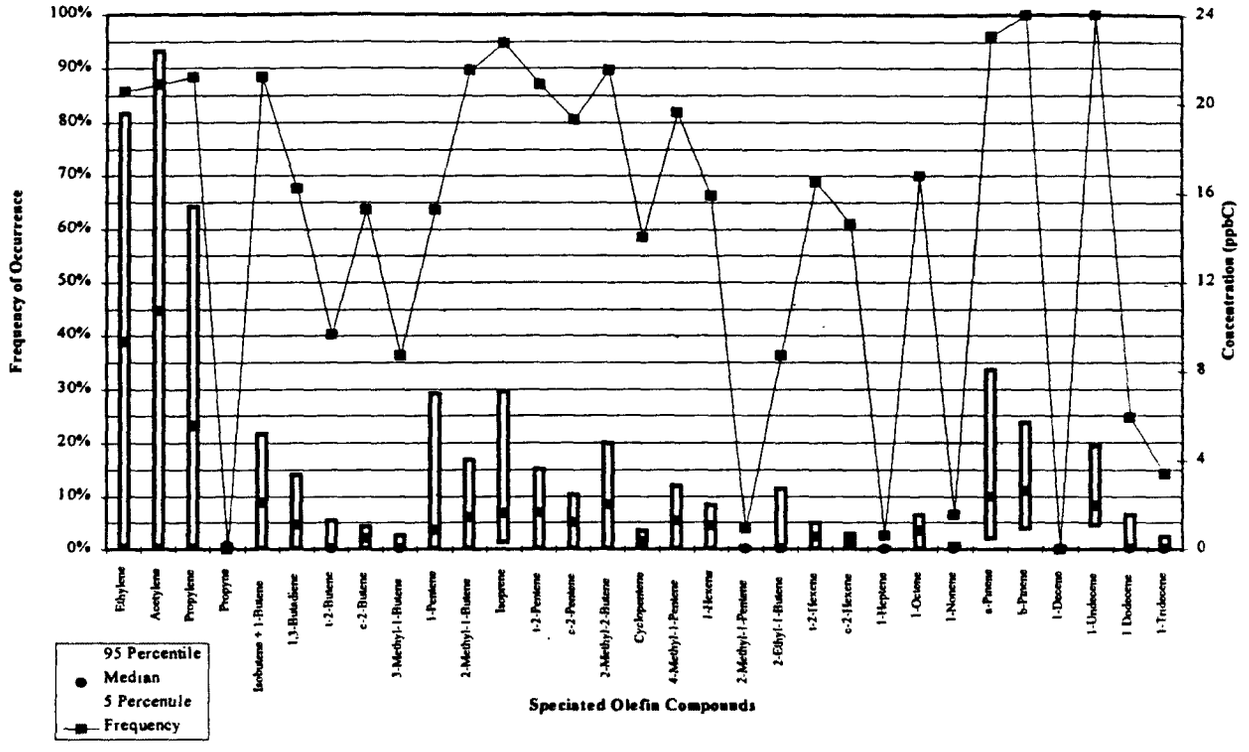

Figure B-3. Frequency and Concentration Distribution for Olefins at B1AL in 1995

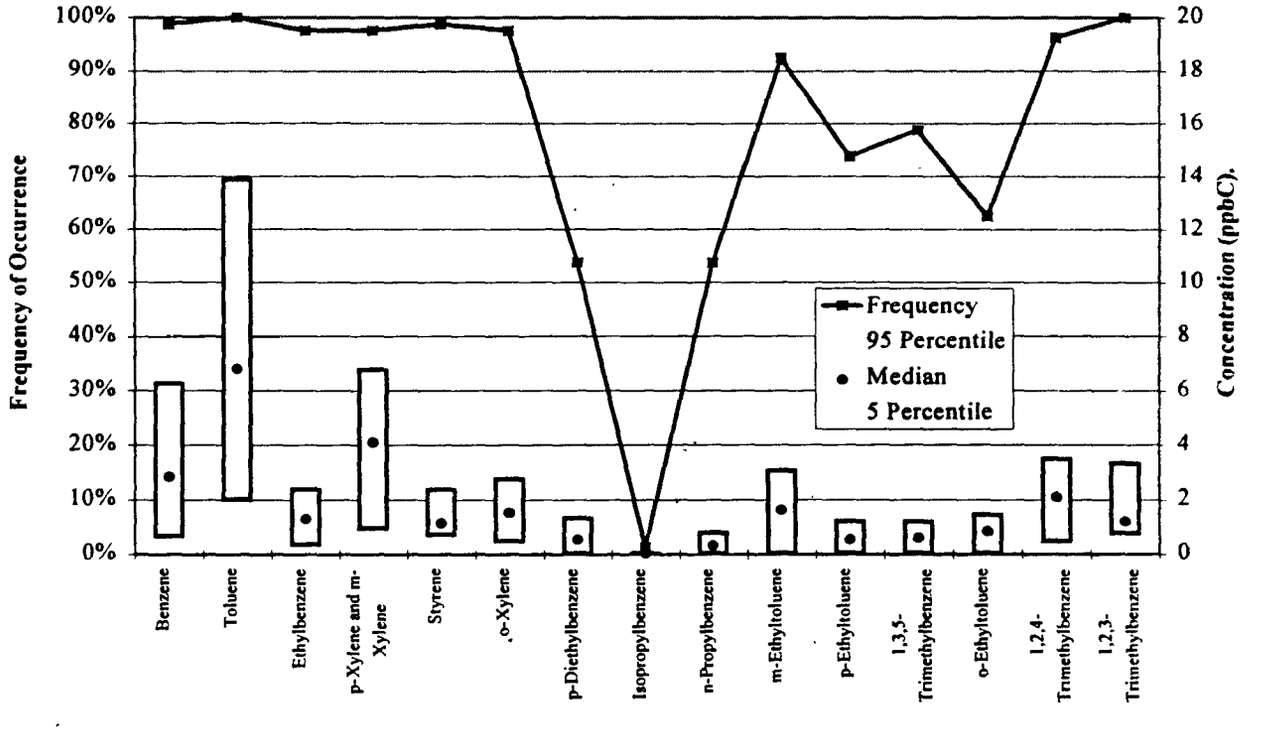

Figure B-4. Frequency and Concentration Distribution for Aromatics at B2AL in 1995

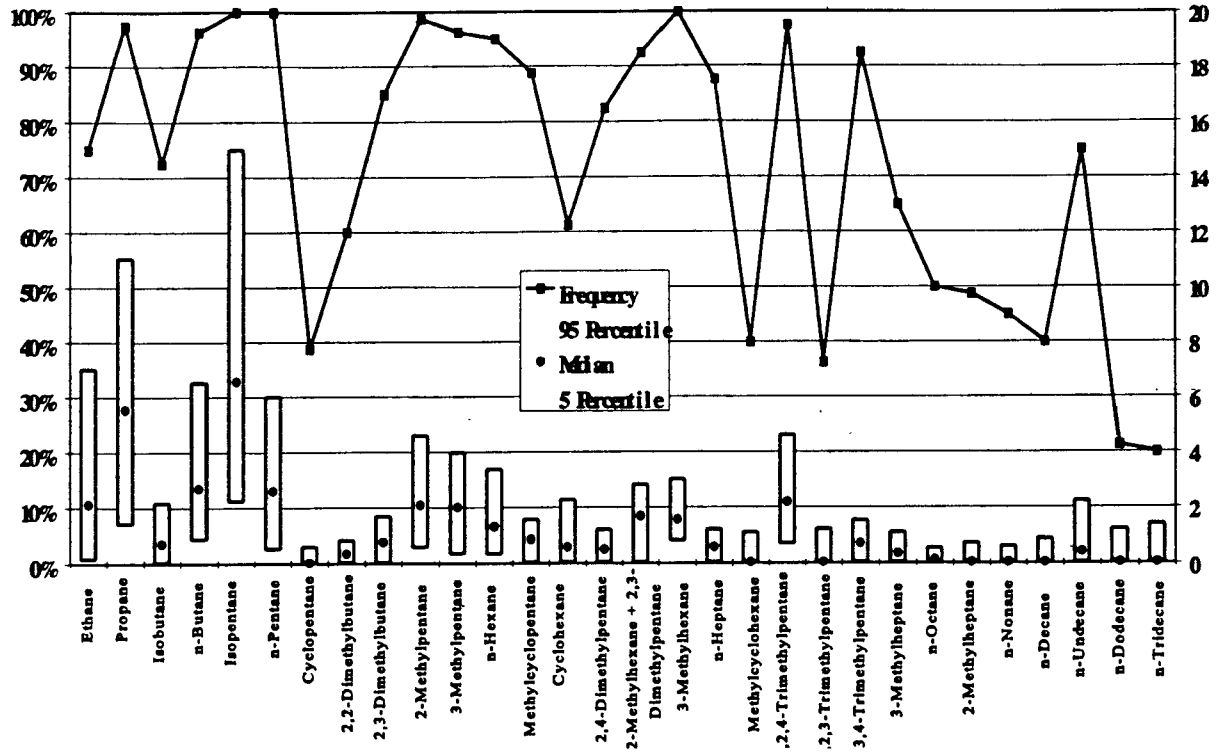

Figure B-5. Frequency and Concentration Distribution of Paraffins at B2AL in 1995

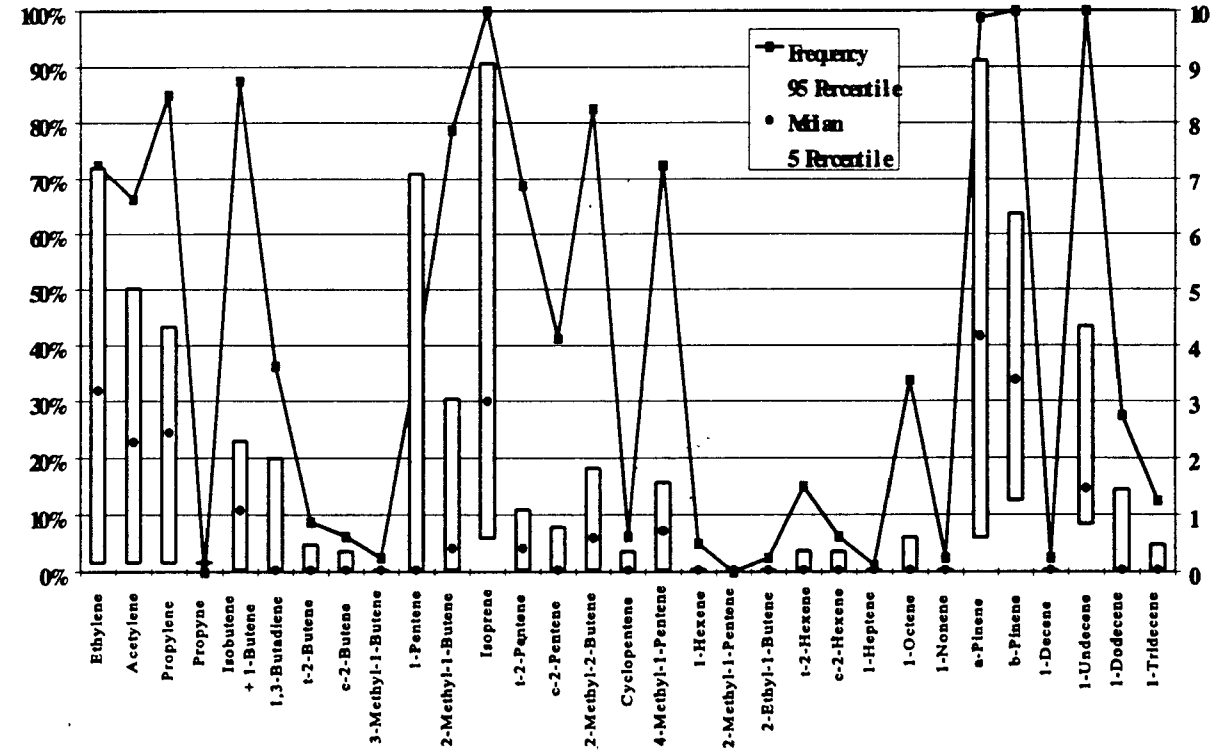

Figure B-6. Frequency and Concentration Distribution for Olefins at B2AL in 1995

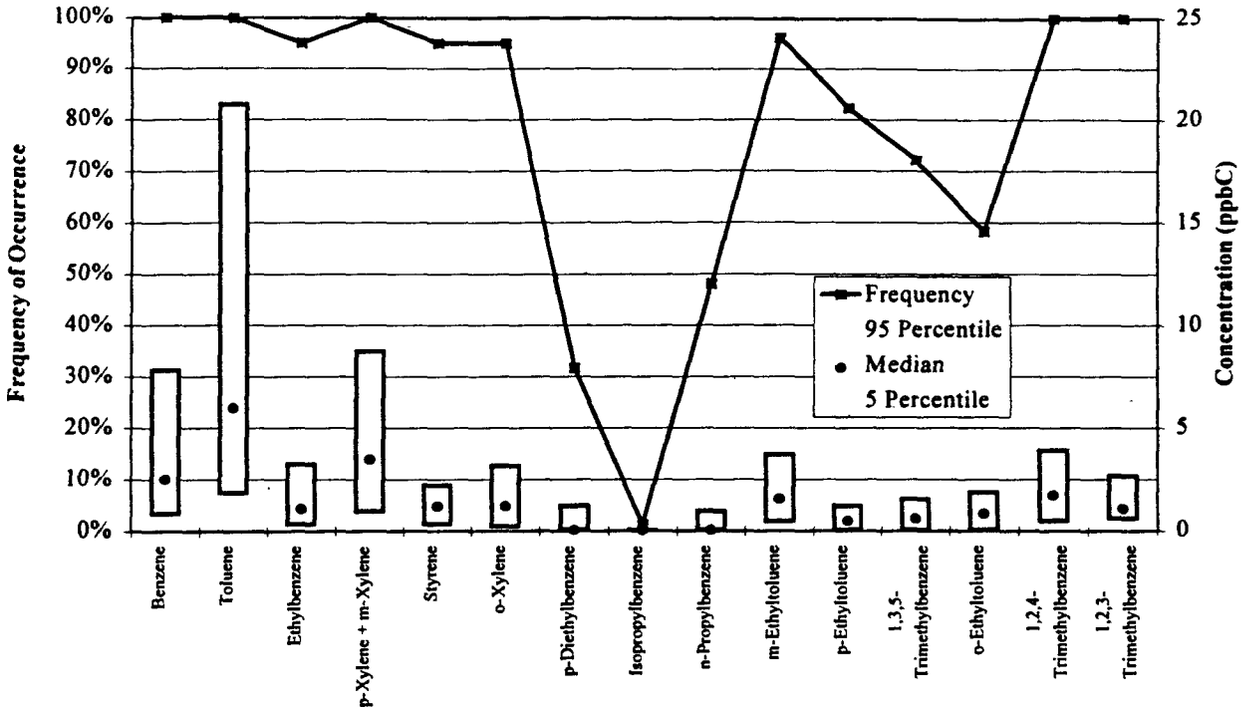

Figure B-7. Frequency and Concentration Distribution of Aromatics at B3AL in 1995

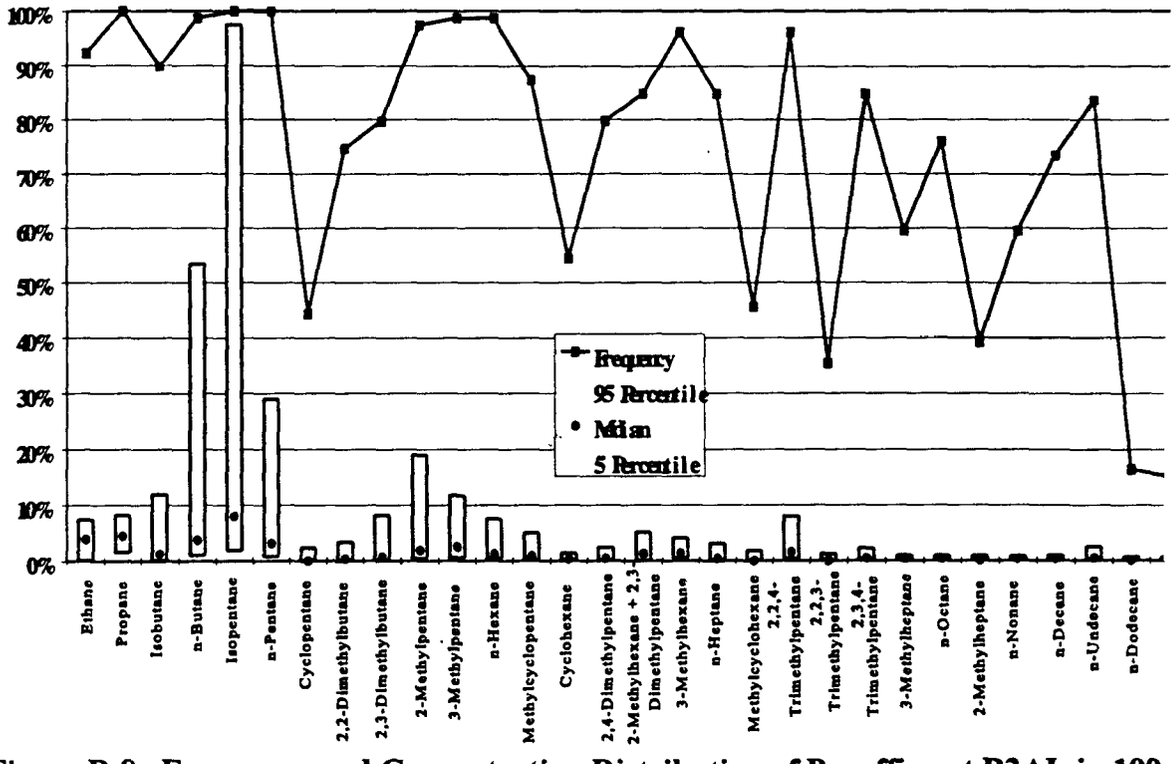

Figure B-8. Frequency and Concentration Distribution of Paraffins at B3AL in 199

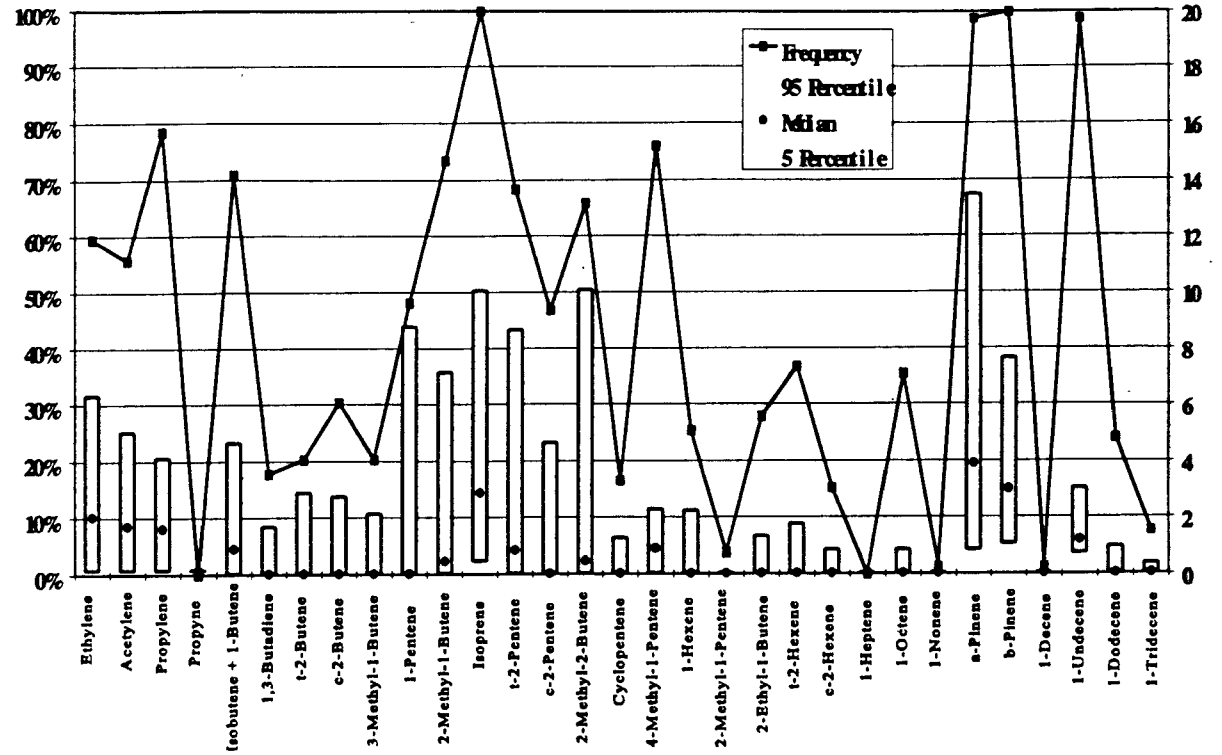

Figure B-9. Frequency and Concentration Distribution for Olefins at B3AL in 1995

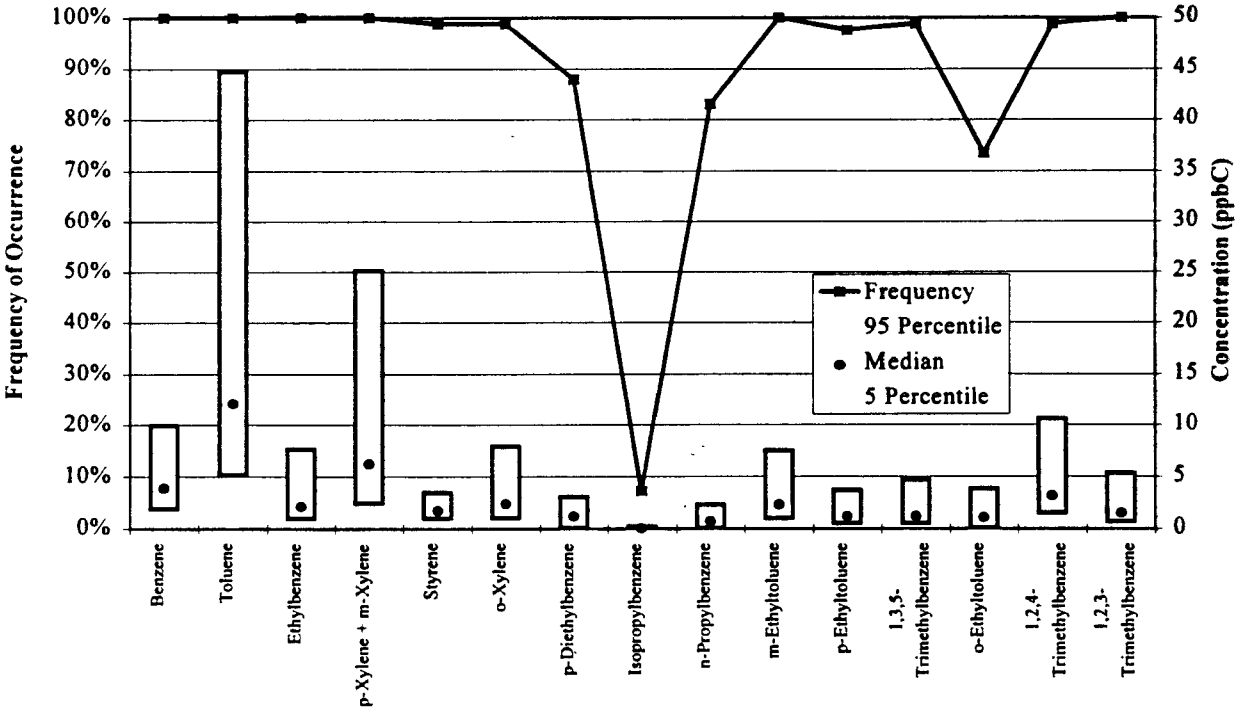

Figure B-10. Frequency and Concentration Distribution of Aromatics at DLTX in 1995

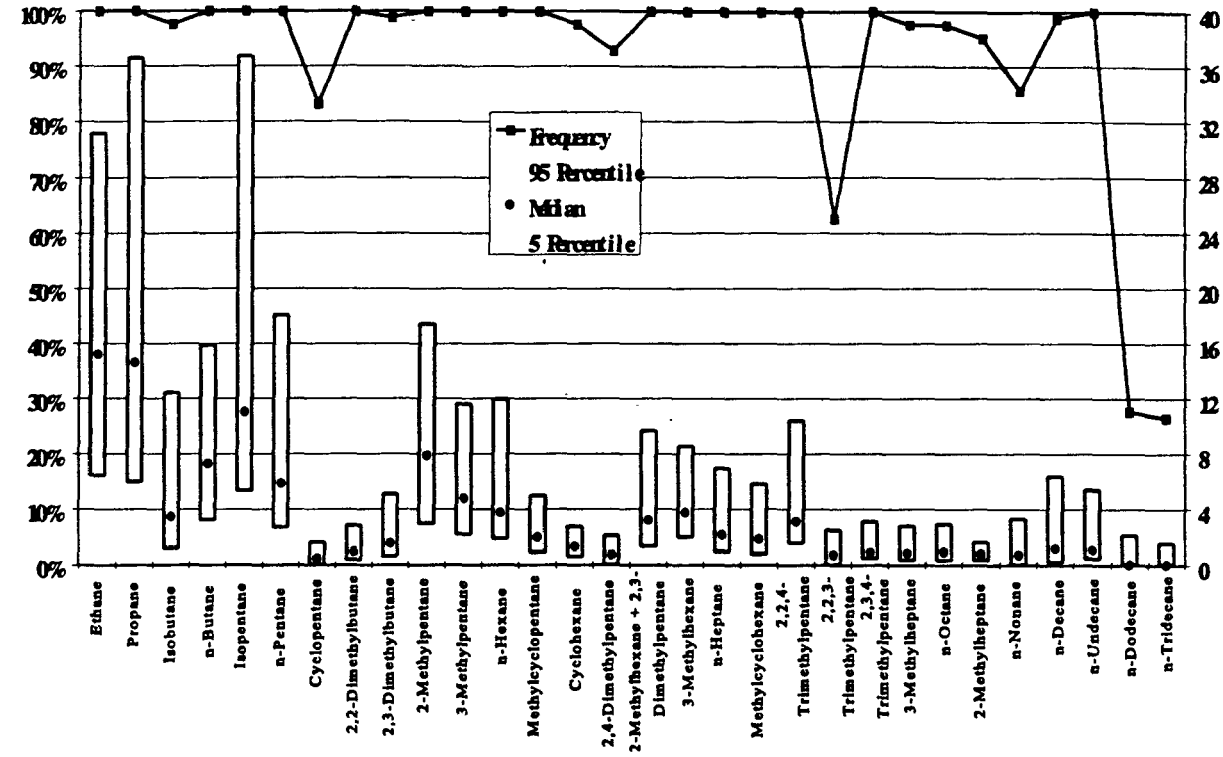

Figure B-11. Frequency and Concentration Distribution of Paraffins at DLTX in 1995

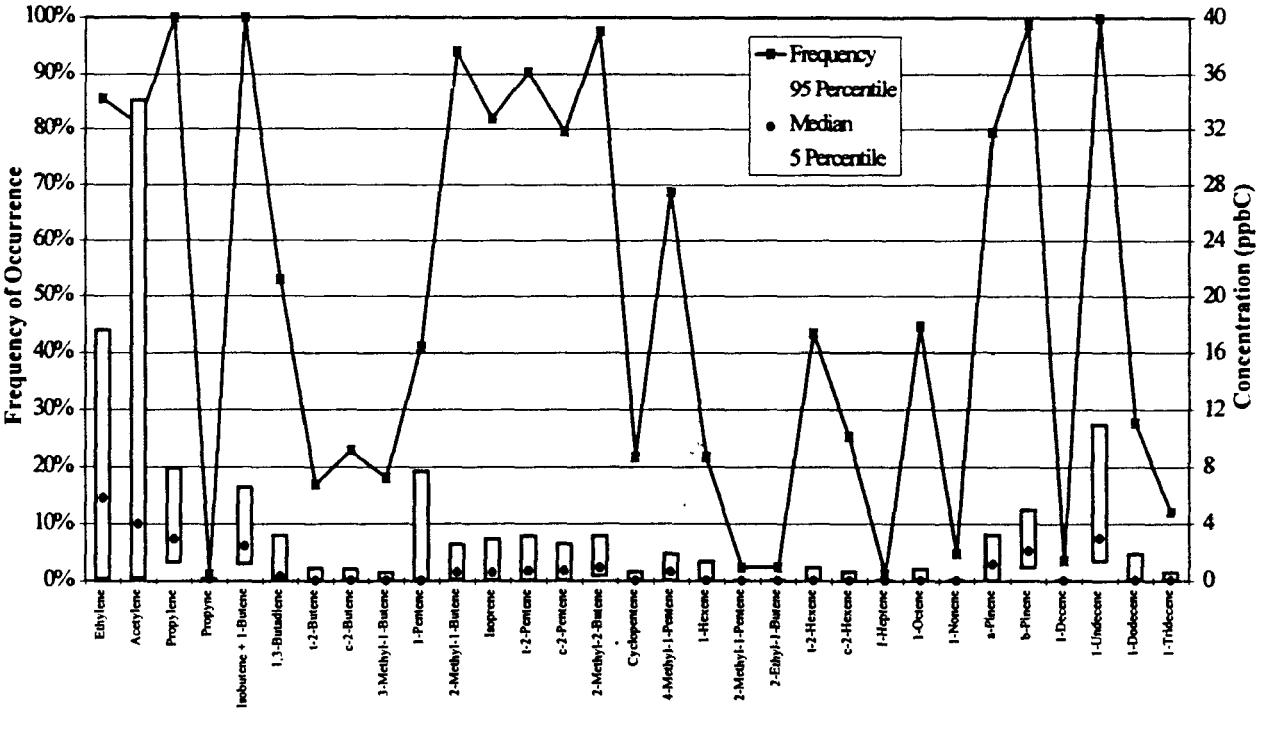

Figure B-12. Frequency and Concentration Distribution of Olefins at DLTX in 1995

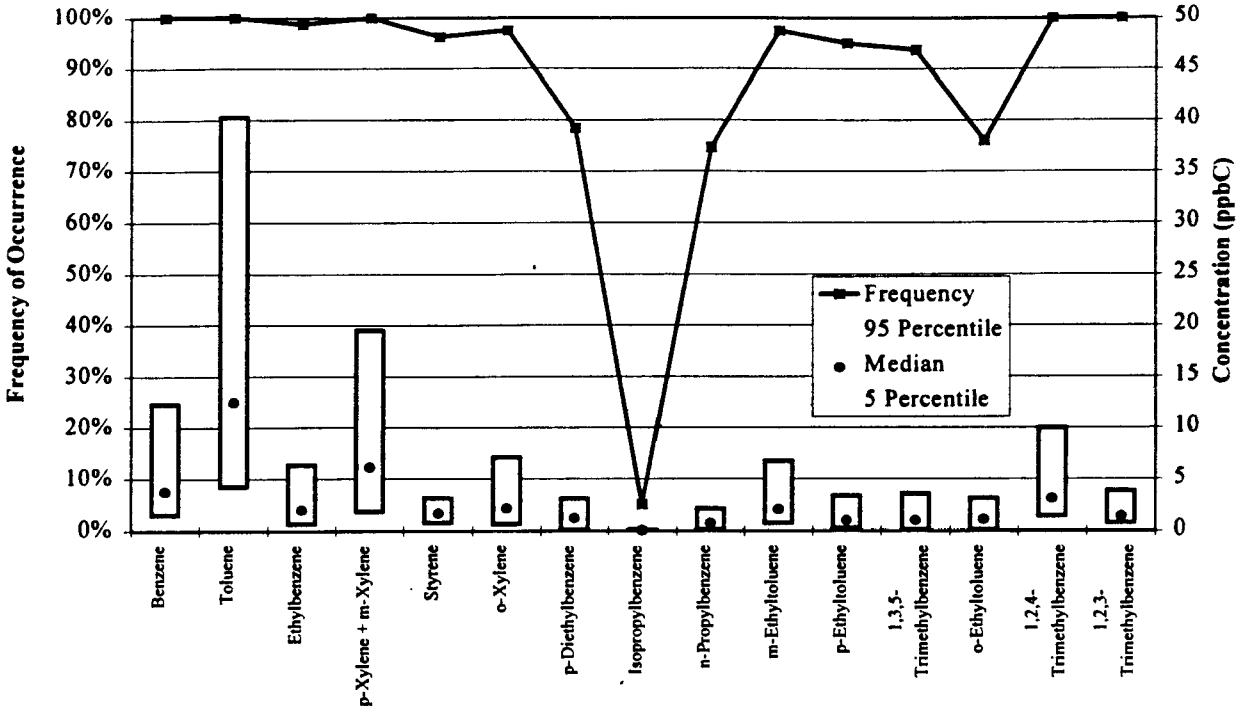

Figure B-13. Frequency and Concentration Distribution of Aromatics at FWTX in 1995

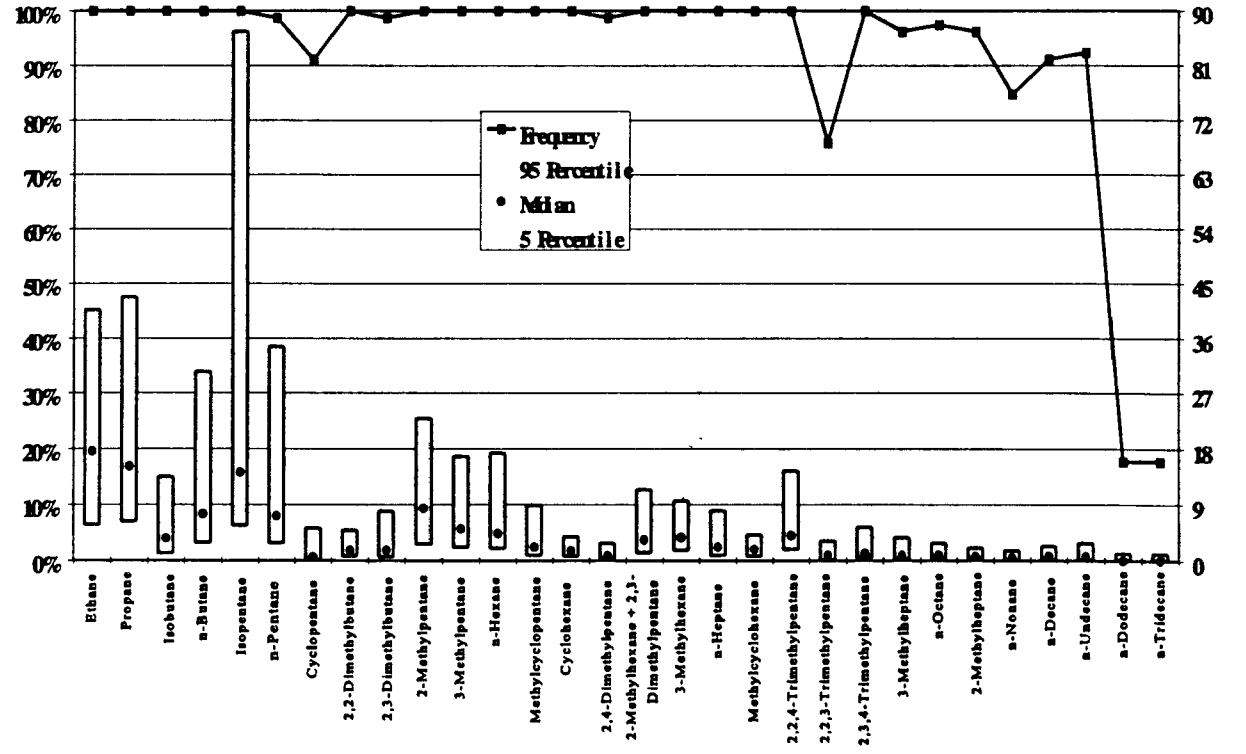

Figure B-14. Frequency and Concentration Distribution of Paraffins at FWTX in 1995

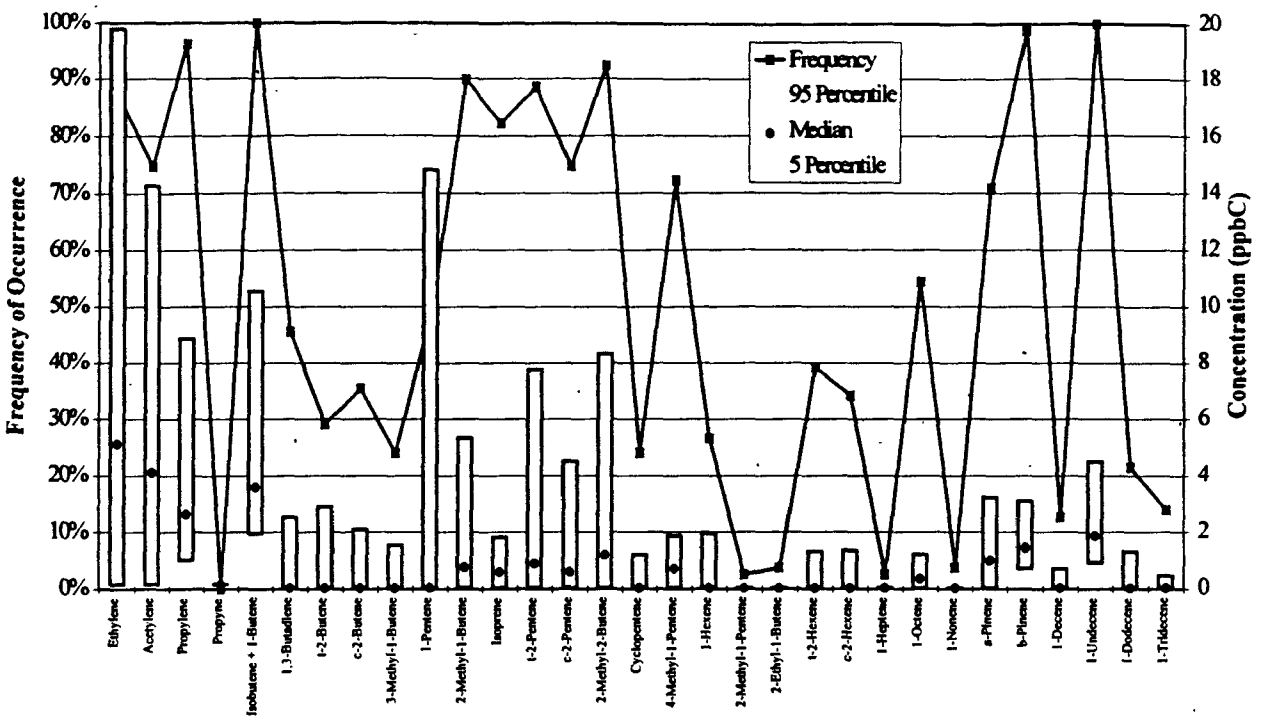

Figure B-15. Frequency and Concentration Distribution of Olefins at FWTX in 1995

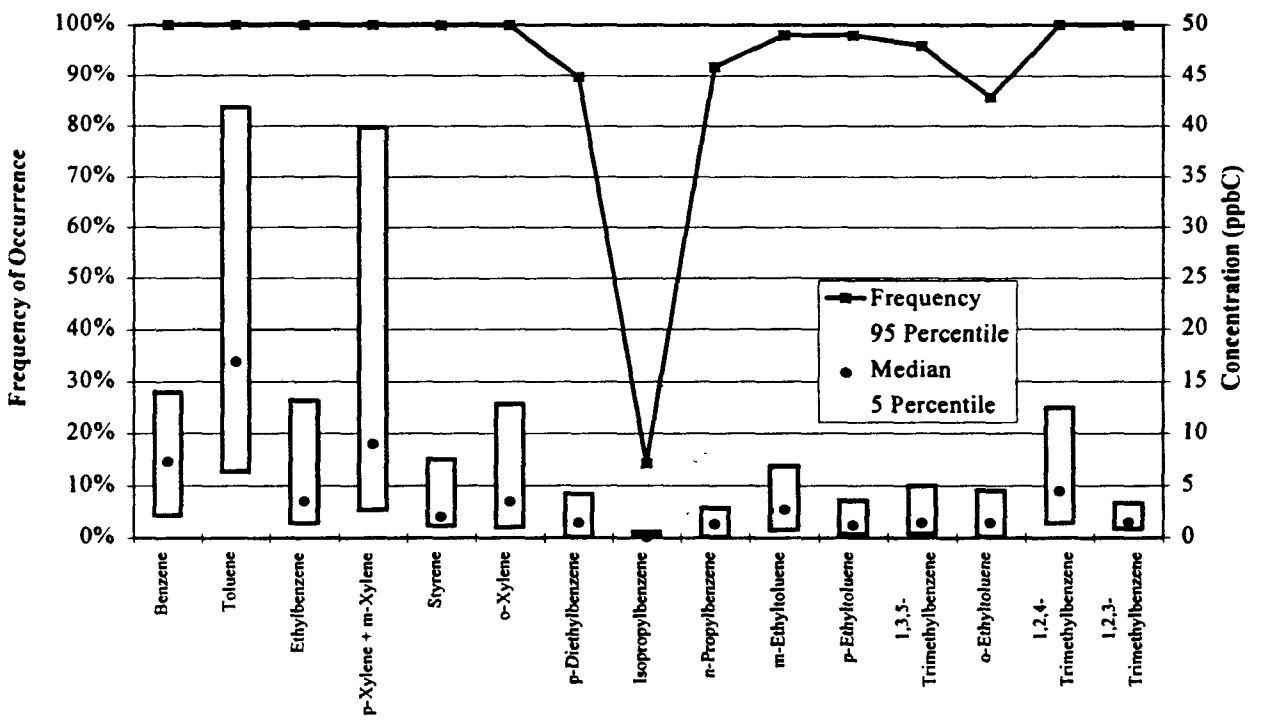

Figure B-16. Frequency and Concentration Distribution of Aromatics at JUMX in 1995

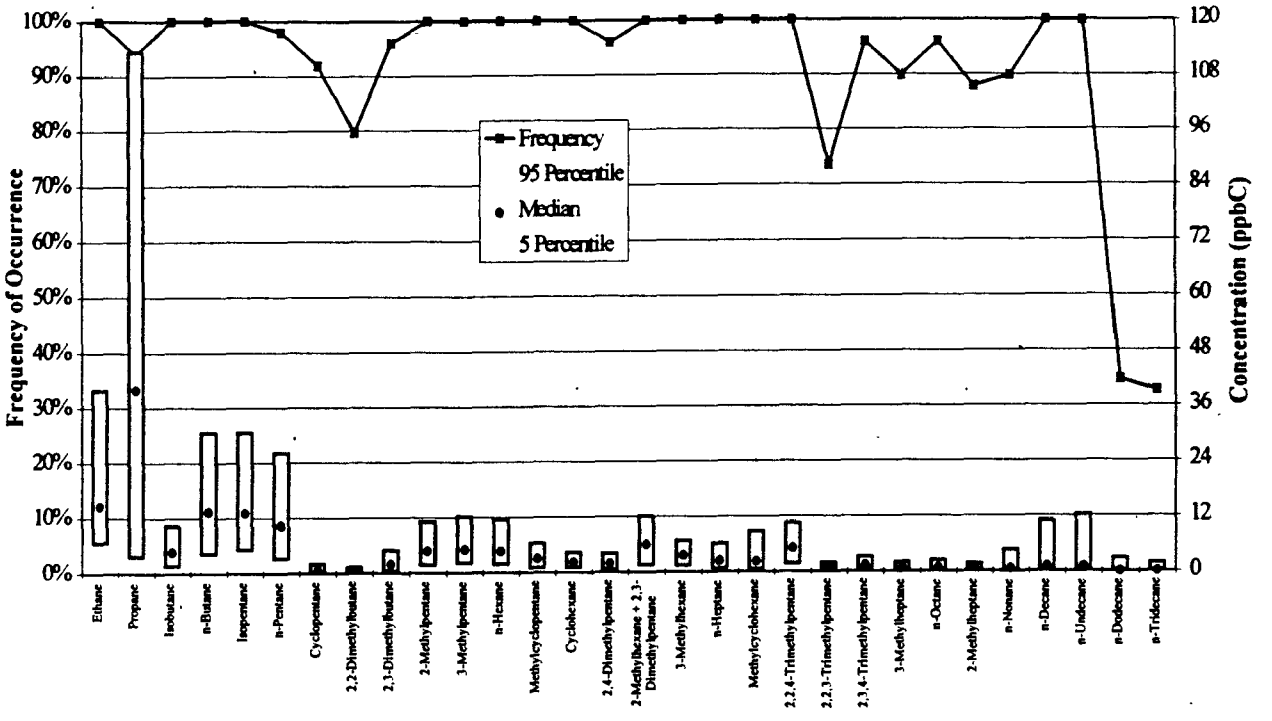

Figure B-17. Frequency and Concentration Distribution of Paraffins at JUMX in 1995

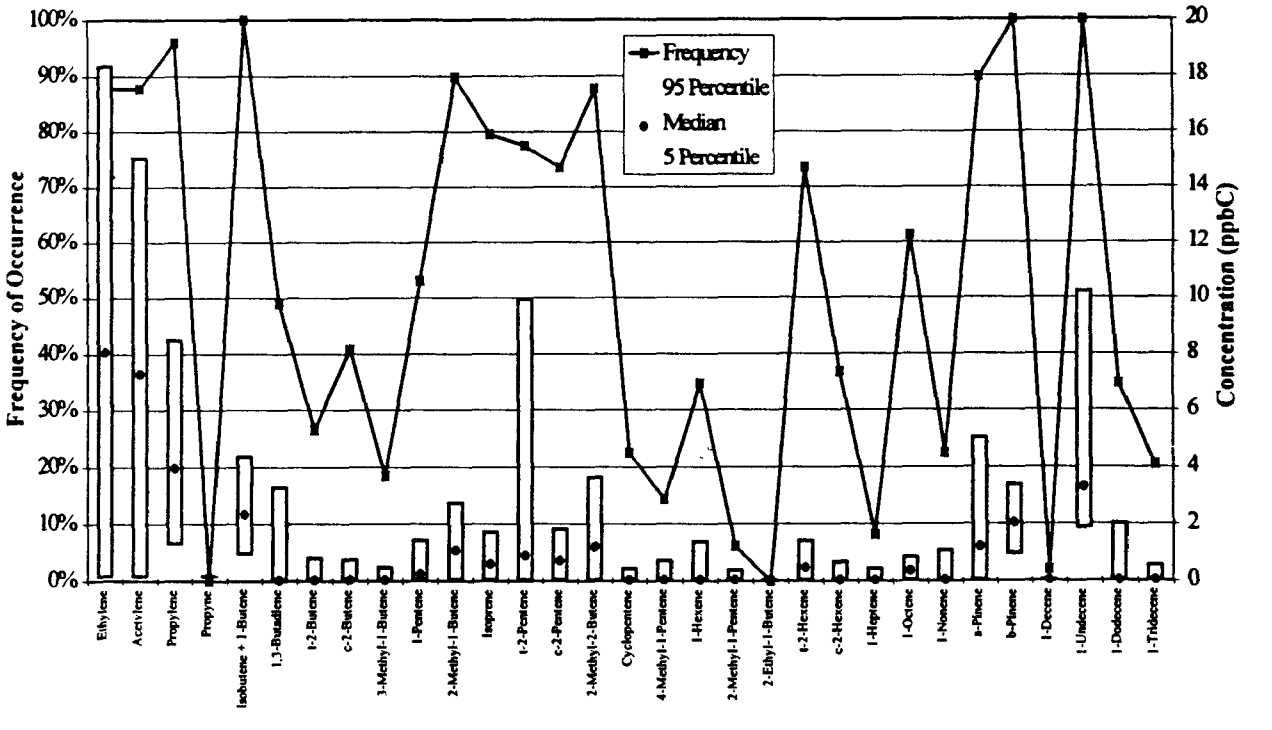

Figure B-18. Frequency and Concentration Distribution of Olefins at JUMX in 1995

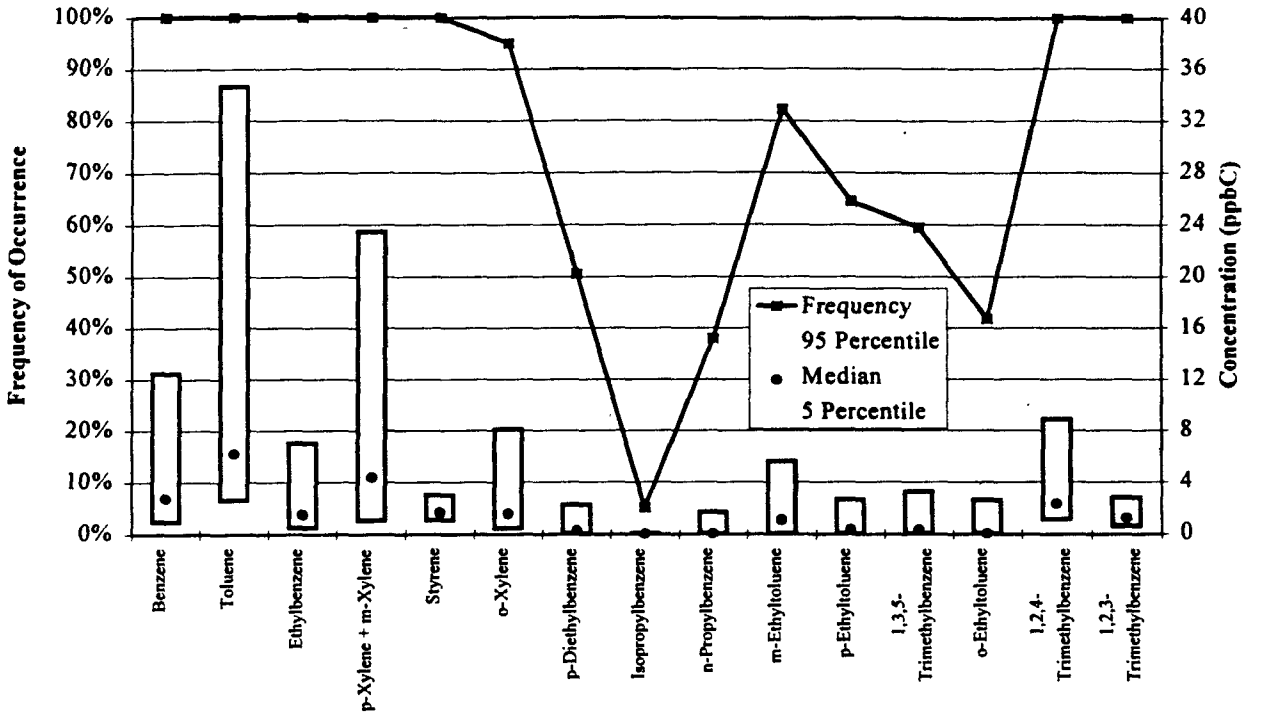

Figure B-19. Frequency and Concentration Distribution of Aromatics at NOLA in 1995

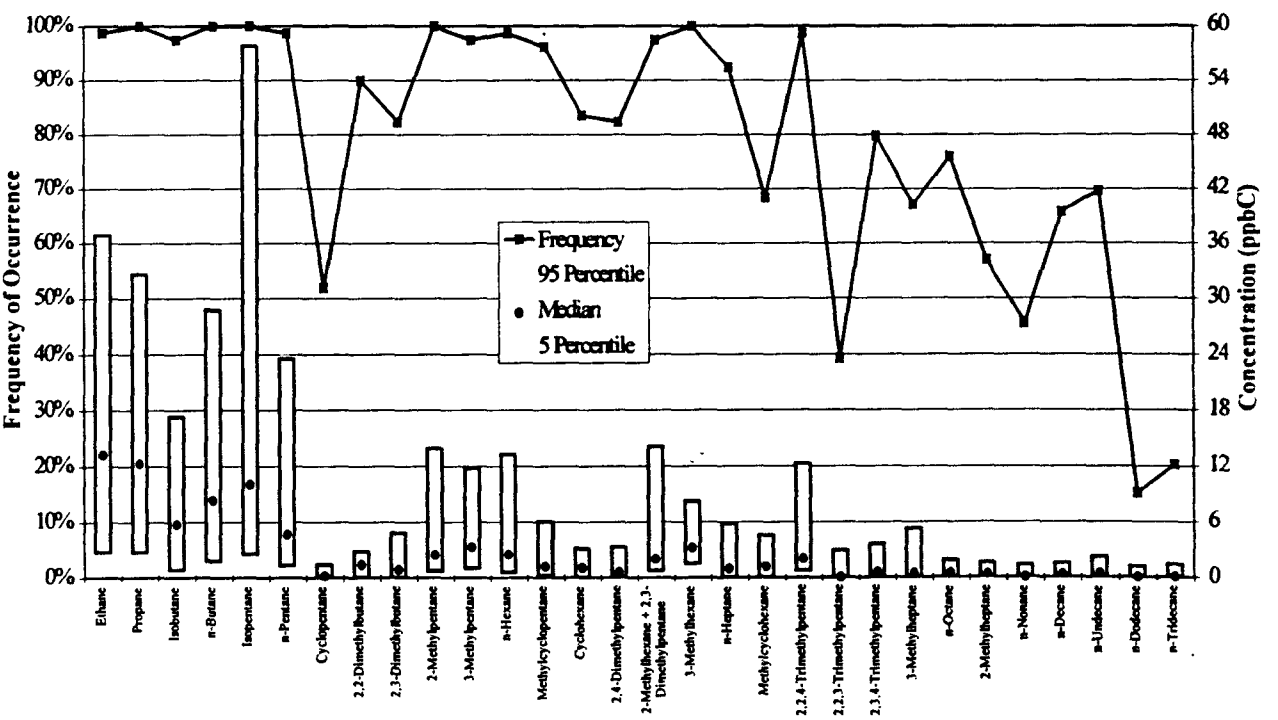

Figure B-20. Frequency and Concentration Distribution of Paraffins at NOLA in 1995

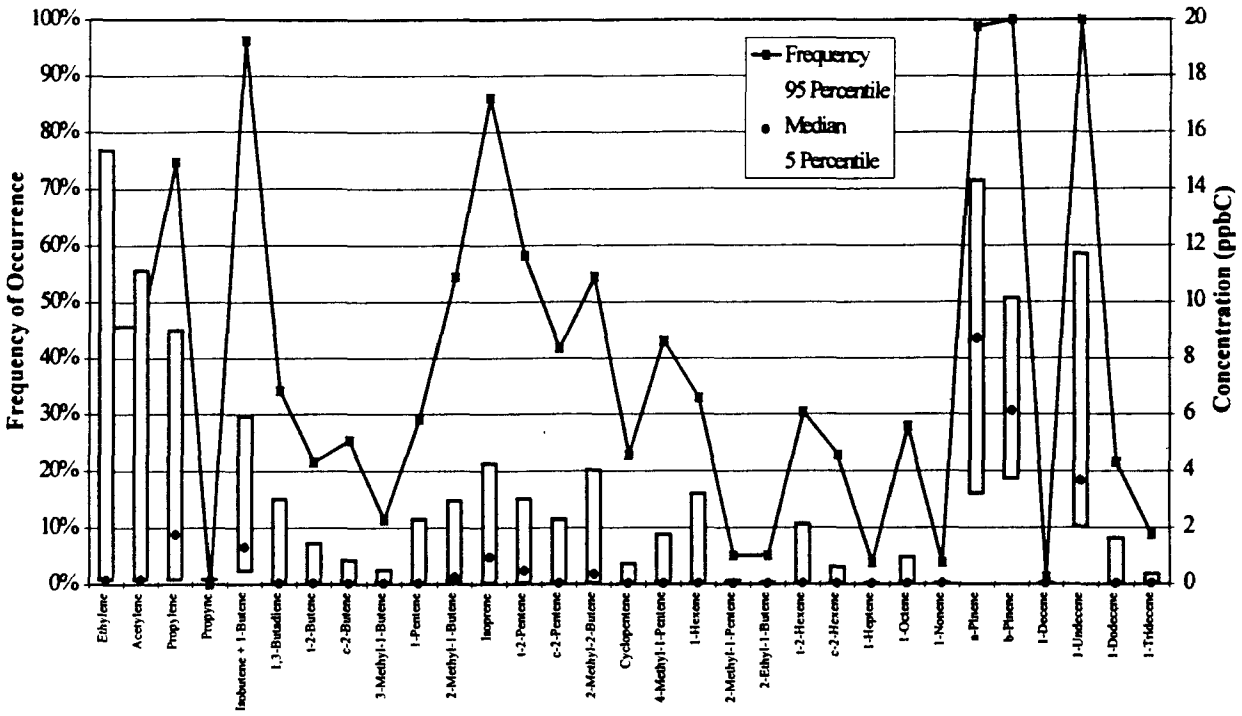

Figure B-21. Frequency and Concentration Distribution of Olefins at NOLA in 1995

Table B-3. Statistical Summary of the Speciated NMOC Base Program

	Concentration Range		Central Tendency of Measured Concentration				Variability	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Benzene	0.04	56.70	2.76	3.72	4.98	3.69	4.36	2.25
Toluene	0.72	196.20	5.88	9.69	14.73	10.28	14.66	2.37
Ethylbenzene	0.04	16.26	0.84	1.86	2.71	1.87	2.42	2.57
p-Xylene + m-Xylene	0.04	50.22	4.80	5.19	8.13	5.41	7.75	2.63
Styrene	0.04	17.88	1.32	1.56	1.93	1.55	1.64	2.06
o-Xylene	0.04	17.04	1.32	1.98	2.90	1.91	2.62	2.89
p-Diethylbenzene	0.04	8.40	0.04	0.90	1.06	0.41	1.06	5.67
Isopropylbenzene	0.04	9.48	0.04	0.04	0.08	0.05	0.43	1.85
n-Propylbenzene	0.04	10.68	0.04	0.48	0.75	0.31	0.87	4.82
m-Ethyltoluene	0.04	11.10	0.04	1.92	2.58	1.69	2.05	3.21
p-Ethyltoluene	0.04	6.96	0.04	0.78	1.15	0.63	1.08	3.85
1,3,5-Trimethylbenzene	0.04	7.92	0.04	0.78	1.25	0.64	1.26	4.12
o-Ethyltoluene	0.04	6.00	0.04	0.96	1.16	0.44	1.13	5.88
1,2,4-Trimethylbenzene	0.04	15.12	1.08	2.76	3.75	2.76	2.91	2.38
1,2,3-Trimethylbenzene	0.36	10.14	1.08	1.44	1.82	1.53	1.30	1.77
Ethane	0.17	83.10	0.17	9.77	12.38	7.28	10.77	3.71
Propane	0.17	1530.00	0.17	10.19	19.21	10.46	69.14	2.76
Isobutane	0.04	29.76	0.04	2.70	4.05	2.09	4.29	4.33
n-Butane	0.04	87.00	3.00	6.48	9.49	6.19	10.65	2.65
Isopentane	0.60	420.00	6.24	10.92	19.90	11.96	31.12	2.60
n-Pentane	0.04	76.20	3.60	5.31	8.26	5.18	9.24	2.85
Cyclopentane	0.04	56.40	0.04	0.48	0.83	0.28	2.81	4.68
2,2-Dimethylbutane	0.04	13.80	0.04	0.93	1.21	0.61	1.47	4.08
2,3-Dimethylbutane	0.04	106.80	0.04	1.32	2.24	1.09	5.17	4.01
2-Methylpentane	0.04	46.56	1.20	4.80	6.36	4.13	5.93	2.78
3-Methylpentane	0.04	31.56	2.40	3.75	5.16	3.60	4.19	2.73
n-Hexane	0.04	29.16	1.08	2.94	4.31	2.76	4.09	2.87
Methylcyclopentane	0.04	12.96	0.60	1.56	2.31	1.46	2.03	3.12

Table B-3. Statistical Summary of the Speciated NMOC Base Program

	Concentration Range		Central Tendency of Measured Concentration				Variability	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Cyclohexane	0.04	19.32	0.04	1.14	1.72	0.76	2.39	4.82
2,4-Dimethylpentane	0.04	7.56	0.04	0.72	1.14	0.67	1.08	3.49
2-Methylhexane + 2,3-Dimethylpentane	0.04	350.40	0.04	2.58	4.68	2.41	16.02	3.46
3-Methylhexane	0.04	344.40	1.68	2.85	4.35	2.81	15.57	2.21
n-Heptane	0.04	158.40	0.48	1.32	2.38	1.20	7.30	3.44
Methylcyclohexane	0.04	101.40	0.04	1.20	1.96	0.68	4.94	5.92
2,2,4-Trimethylpentane	0.04	21.24	2.04	3.06	4.43	3.08	3.69	2.61
2,2,3-Trimethylpentane	0.04	9.36	0.04	0.54	0.78	0.25	1.00	5.69
2,3,4-Trimethylpentane	0.04	6.96	0.48	0.90	1.37	0.86	1.22	3.14
3-Methylheptane	0.04	7.86	0.04	0.66	0.93	0.46	1.01	4.15
n-Octane	0.04	8.04	0.04	0.60	0.86	0.47	0.84	3.76
2-Methylheptane	0.04	4.68	0.04	0.60	0.65	0.33	0.58	4.14
n-Nonane	0.04	14.40	0.04	0.48	0.73	0.31	1.06	4.47
n-Decane	0.04	21.12	0.04	0.60	1.16	0.46	2.10	4.54
n-Undecane	0.04	101.40	0.04	0.78	1.85	0.70	6.35	3.93
n-Dodecane	0.04	19.44	0.04	0.04	0.38	0.08	1.29	4.12
n-Tridecane	0.04	16.14	0.04	0.04	0.30	0.08	0.92	3.87
Ethylene	0.17	32.40	0.17	4.34	5.73	2.35	5.77	5.46
Acetylene	0.17	96.60	0.17	3.24	5.41	1.91	8.02	5.64
Propylene	0.17	17.25	0.17	2.63	3.50	2.20	3.10	3.14
Propyne	0.17	0.48	0.17	0.17	0.17	0.17	0.01	1.05
Isobutene + 1-Butene	0.04	13.44	0.04	1.86	2.46	1.48	2.16	3.69
1,3-Butadiene	0.04	4.26	0.04	0.04	0.73	0.18	1.03	6.12
t-2-Butene	0.04	12.00	0.04	0.04	0.34	0.08	0.91	4.13
c-2-Butene	0.04	11.04	0.04	0.04	0.34	0.10	0.83	4.12
3-Methyl-1-Butene	0.04	6.36	0.04	0.04	0.19	0.07	0.51	3.10
1-Pentene	0.04	23.10	0.04	0.04	1.30	0.20	3.11	6.93
2-Methyl-1-Butene	0.04	20.88	0.04	0.60	1.18	0.50	1.87	4.39

Table B-3. Statistical Summary of the Speciated NMOC Base Program

	Concentration Range		Central Tendency of Measured Concentration				Variability	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isoprene	0.04	51.48	0.04	1.11	2.15	1.00	3.33	4.16
t-2-Pentene	0.04	24.12	0.04	0.72	1.45	0.53	2.61	5.04
c-2-Pentene	0.04	13.08	0.04	0.48	0.83	0.29	1.23	5.30
2-Methyl-2-Butene	0.04	26.88	0.04	0.84	1.52	0.64	2.43	4.72
Cyclopentene	0.04	3.36	0.04	0.04	0.20	0.08	0.42	3.31
4-Methyl-1-Pentene	0.04	3.90	0.04	0.60	0.74	0.31	0.74	5.02
1-Hexene	0.04	29.64	0.04	0.04	0.49	0.11	1.48	5.01
2-Methyl-1-Pentene	0.04	5.28	0.04	0.04	0.08	0.04	0.30	1.83
2-Ethyl-1-Butene	0.04	5.52	0.04	0.04	0.20	0.06	0.57	3.00
t-2-Hexene	0.04	3.36	0.04	0.04	0.37	0.13	0.54	4.37
c-2-Hexene	0.04	2.58	0.04	0.04	0.20	0.08	0.33	3.33
1-Heptene	0.04	7.02	0.04	0.04	0.07	0.04	0.36	1.62
1-Octene	0.04	3.24	0.04	0.04	0.36	0.14	0.45	4.25
1-Nonene	0.04	1.44	0.04	0.04	0.08	0.05	0.17	1.90
a-Pinene	0.04	21.48	0.04	2.52	3.83	1.88	3.69	4.75
b-Pinene	0.04	18.36	1.74	2.58	3.25	2.57	2.27	2.06
1-Decene	0.04	5.64	0.04	0.04	0.09	0.04	0.36	1.84
1-Undecene	0.04	36.72	1.32	2.10	3.02	2.29	3.07	2.02
1-Dodecene	0.04	5.40	0.04	0.04	0.36	0.09	0.67	4.44
1-Tridecene	0.04	4.08	0.04	0.04	0.11	0.05	0.26	2.40
TNMOC	26.40	2800.00	117.00	195.00	275.42	210.03	239.49	2.08

Table B-4. Statistical Summary for Tarrant City, Alabama (B1AL), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Aromatic Compounds:								
Benzene	0.36	56.70	6.84	6.84	7.74	5.51	7.27	2.47
Toluene	0.90	63.00	26.10	23.88	21.74	16.16	13.54	2.48
Ethylbenzene	0.04	8.88	1.08	4.02	3.79	2.78	2.23	2.77
p-Xylene and m-Xylene	0.04	31.56	19.08	12.36	12.01	8.35	7.73	3.00
Styrene	0.60	9.36	0.84	2.40	2.90	2.30	2.03	2.01
o-Xylene	0.04	10.50	1.20	4.26	4.17	2.92	2.52	3.14
p-Diethylbenzene	0.04	5.40	0.04	1.92	1.79	0.98	1.13	4.84
Isopropylbenzene	0.04	0.60	0.04	0.04	0.07	0.05	0.11	1.91
n-Propylbenzene	0.04	6.00	0.04	1.20	1.13	0.65	0.90	4.04
m-Ethyltoluene	0.04	9.30	6.24	4.38	4.03	2.71	2.47	3.41
p-Ethyltoluene	0.04	6.96	0.04	2.10	1.96	1.27	1.32	3.48
1,3,5-Trimethylbenzene	0.04	4.86	0.48	2.40	2.07	1.35	1.31	3.49
o-Ethyltoluene	0.04	4.86	0.04	2.10	1.86	0.87	1.28	5.84
1,2,4-Trimethylbenzene	0.04	13.74	1.20	5.88	5.47	4.05	3.31	2.62
1,2,3-Trimethylbenzene	0.48	5.64	2.76	2.64	2.67	2.50	0.94	1.47
Paraffins:								
Ethane	0.17	28.20	0.17	12.39	11.97	7.54	7.29	3.94
Propane	0.17	50.10	9.66	15.00	15.77	11.04	10.68	2.90
Isobutane	0.04	23.88	0.04	3.90	3.71	2.02	3.16	4.87
n-Butane	0.48	18.60	6.24	7.92	8.11	6.50	4.52	2.15

Table B-4. Statistical Summary for Tarrant City, Alabama (B1AL), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isopentane	0.84	100.80	7.44	24.24	22.86	16.06	16.61	2.70
n-Pentane	0.04	19.62	12.36	8.70	8.20	5.60	5.09	3.27
Cyclopentane	0.04	7.74	0.04	0.78	0.79	0.36	1.00	4.60
2,2-Dimethylbutane	0.04	2.46	0.04	1.20	1.05	0.62	0.69	3.90
2,3-Dimethylbutane	0.04	8.04	0.04	2.58	2.47	1.40	1.77	4.39
2-Methylpentane	0.36	17.52	1.80	7.08	7.01	5.02	4.49	2.62
3-Methylpentane	0.04	16.62	0.04	8.22	6.83	4.67	3.81	3.65
n-Hexane	0.04	17.40	0.96	5.28	5.52	3.41	4.31	3.56
Methylcyclopentane	0.04	6.36	0.84	3.12	2.85	1.97	1.78	3.06
Cyclohexane	0.04	19.32	0.04	1.68	3.82	1.18	4.87	7.15
2,4-Dimethylpentane	0.04	4.20	0.04	1.98	1.67	1.00	1.09	3.95
2-Methylhexane and 2,3-Dimethylpentane	0.04	91.20	0.04	5.28	5.93	3.20	10.42	4.02
3-Methylhexane	0.72	90.60	5.04	4.20	5.23	3.46	10.24	2.19
n-Heptane	0.04	39.48	0.48	2.04	2.68	1.51	4.55	3.35
Methylcyclohexane	0.04	29.52	0.04	2.28	2.50	1.08	3.53	5.57
2,2,4-Trimethylpentane	0.04	15.72	9.48	6.90	6.52	4.81	3.96	2.66
2,2,3-Trimethylpentane	0.04	2.88	0.04	1.32	1.08	0.50	0.81	5.29
2,3,4-Trimethylpentane	0.04	5.76	0.60	2.28	2.17	1.53	1.37	2.89
3-Methylheptane	0.04	4.62	0.04	1.08	1.05	0.60	0.77	4.05
n-Octane	0.04	5.70	0.04	1.08	1.08	0.64	0.88	3.81

Table B-4. Statistical Summary for Tarrant City, Alabama (B1AL), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methylheptane	0.04	2.76	0.04	0.96	0.87	0.52	0.58	3.83
n-Nonane	0.04	7.50	0.04	1.20	1.16	0.62	1.04	4.32
n-Decane	0.04	20.40	0.04	1.32	1.69	0.86	2.61	3.91
n-Undecane	0.04	101.40	0.48	1.62	3.65	1.60	11.73	2.82
n-Dodecane	0.04	3.48	0.04	0.04	0.39	0.09	0.74	4.58
n-Tridecane	0.04	2.04	0.04	0.04	0.28	0.08	0.49	4.02
Olefins:								
Ethylene	0.17	23.64	0.17	9.36	9.21	5.11	6.22	4.63
Acetylene	0.17	96.60	0.17	10.74	11.18	5.95	11.92	4.62
Propylene	0.17	17.25	0.17	5.58	6.11	3.53	4.70	3.86
Propyne	0.17	0.17	0.17	0.17	0.17	0.17	0.00	1.00
Isobutene and 1-Butene	0.04	8.88	0.04	2.10	2.38	1.40	1.74	4.21
1,3-Butadiene	0.04	4.08	0.04	1.14	1.32	0.49	1.21	6.27
t-2-Butene	0.04	1.56	0.04	0.04	0.41	0.14	0.50	4.82
c-2-Butene	0.04	1.32	0.04	0.48	0.44	0.23	0.36	3.95
3-Methyl-1-Butene	0.04	0.84	0.04	0.04	0.22	0.10	0.25	3.51
1-Pentene	0.04	16.14	0.04	0.84	1.38	0.37	2.55	6.31
2-Methyl-1-Butene	0.04	7.26	0.04	1.44	1.57	0.93	1.26	3.77
Isoprene	0.04	12.36	0.72	1.62	2.52	1.57	2.32	3.23
t-2-Pentene	0.04	11.40	0.04	1.68	1.74	0.97	1.56	4.19
c-2-Pentene	0.04	3.24	0.04	1.20	1.17	0.65	0.81	4.35

Table B-4. Statistical Summary for Tarrant City, Alabama (B1AL), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methyl-2-Butene	0.04	5.64	0.04	2.04	2.06	1.21	1.48	4.02
Cyclopentene	0.04	2.94	0.04	0.36	0.40	0.18	0.52	3.93
4-Methyl-1-Pentene	0.04	3.90	0.04	1.32	1.33	0.74	0.93	4.36
1-Hexene	0.04	2.64	0.04	1.08	0.90	0.39	0.72	5.36
2-Methyl-1-Pentene	0.04	1.56	0.04	0.04	0.09	0.04	0.25	1.98
2-Ethyl-1-Butene	0.04	5.52	0.04	0.04	0.72	0.15	1.14	6.25
t-2-Hexene	0.04	3.36	0.04	0.60	0.60	0.31	0.53	4.23
c-2-Hexene	0.04	1.26	0.04	0.36	0.31	0.18	0.26	3.47
1-Heptene	0.04	7.02	0.04	0.04	0.13	0.04	0.80	1.90
1-Octene	0.04	2.70	0.04	0.84	0.77	0.38	0.60	4.62
1-Nonene	0.04	1.02	0.04	0.04	0.07	0.05	0.15	1.92
a-Pinene	0.04	12.12	0.84	2.40	3.41	2.23	2.77	3.13
b-Pinene	0.36	9.30	2.64	2.64	2.93	2.48	1.68	1.85
1-Decene	0.04	0.04	0.04	0.04	0.04	0.04	0.00	1.00
1-Undecene	0.36	6.84	1.44	1.98	2.30	2.07	1.13	1.59
1-Dodecene	0.04	2.64	0.04	0.04	0.33	0.09	0.57	4.33
1-Tridecene	0.04	0.96	0.04	0.04	0.11	0.06	0.20	2.47
Total NMOC	**26.40**	**959.00**	**452.00**	**394.00**	**353.99**	**284.02**	**197.43**	**2.13**

Table B-5. Statistical Summary for Pinson, Alabama (B2AL) for the 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	**Minimum**	**Maximum**	**Mode**	**Median**	**Arithmetic Mean**	**Geometric Mean**	**Arithmetic Standard Deviation**	**Geometric Standard Deviation**
Aromatic Compounds:								
Benzene	0.04	9.06	1.98	2.85	3.18	2.57	1.79	2.22
Toluene	0.72	26.58	5.88	6.81	7.15	6.06	3.95	1.88
Ethylbenzene	0.04	4.92	1.92	1.29	1.37	1.13	0.75	2.14
p-Xylene and m-Xylene	0.04	16.56	6.12	4.11	3.98	3.13	2.33	2.50
Styrene	0.04	7.74	1.02	1.14	1.34	1.16	0.94	1.77
o-Xylene	0.04	5.64	1.32	1.53	1.56	1.26	0.88	2.22
p-Diethylbenzene	0.04	1.98	0.04	0.54	0.53	0.21	0.53	4.92
Isopropylbenzene	0.04	0.48	0.04	0.04	0.04	0.04	0.05	1.32
n-Propylbenzene	0.04	3.84	0.04	0.33	0.34	0.16	0.49	3.80
m-Ethyltoluene	0.04	5.64	0.04	1.62	1.64	1.17	0.98	3.04
p-Ethyltoluene	0.04	3.00	0.04	0.54	0.55	0.31	0.49	3.70
1,3,5-Trimethylbenzene	0.04	2.70	0.04	0.60	0.59	0.37	0.44	3.43
o-Ethyltoluene	0.04	2.46	0.04	0.84	0.70	0.31	0.57	5.04
1,2,4-Trimethylbenzene	0.04	6.72	1.38	2.10	2.05	1.60	1.16	2.53
1,2,3-Trimethylbenzene	0.60	7.20	1.20	1.20	1.58	1.38	1.07	1.62
Paraffins:								
Ethane	0.17	22.05	0.17	2.13	2.87	1.43	3.15	4.06
Propane	0.17	22.29	7.62	5.55	5.90	4.84	3.31	2.15
Isobutane	0.04	9.36	0.04	0.72	0.94	0.41	1.36	4.68
n-Butane	0.04	55.08	3.00	2.70	3.80	2.42	6.44	2.82

Table B-5. Statistical Summary for Pinson, Alabama (B2AL) for the 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isopentane	0.60	93.60	5.22	6.57	8.57	6.44	10.73	2.06
n-Pentane	0.24	23.04	1.68	2.61	3.10	2.42	2.89	2.06
Cyclopentane	0.04	1.98	0.04	0.04	0.21	0.10	0.32	3.29
2,2-Dimethylbutane	0.04	4.02	0.04	0.36	0.38	0.18	0.55	3.75
2,3-Dimethylbutane	0.04	4.92	0.04	0.78	0.86	0.54	0.72	3.35
2-Methylpentane	0.04	16.20	2.10	2.10	2.43	1.92	2.07	2.14
3-Methylpentane	0.04	9.78	2.76	2.01	2.19	1.65	1.56	2.60
n-Hexane	0.04	8.70	1.56	1.32	1.54	1.15	1.20	2.55
Methylcyclopentane	0.04	4.26	0.04	0.87	0.95	0.66	0.70	3.01
Cyclohexane	0.04	7.44	0.04	0.60	0.76	0.27	1.15	5.14
2,4-Dimethylpentane	0.04	2.28	0.04	0.51	0.56	0.37	0.42	3.09
2-Methylhexane and 2,3-Dimethylpentane	0.04	6.12	0.04	1.68	1.59	1.14	1.02	3.03
3-Methylhexane	0.30	4.32	1.20	1.56	1.66	1.50	0.75	1.58
n-Heptane	0.04	2.94	0.48	0.60	0.64	0.46	0.46	2.80
Methylcyclohexane	0.04	2.94	0.04	0.04	0.33	0.12	0.47	4.20
2,2,4-Trimethylpentane	0.04	9.42	2.34	2.19	2.41	1.88	1.56	2.36
2,2,3-Trimethylpentane	0.04	9.36	0.04	0.04	0.43	0.12	1.14	4.52
2,3,4-Trimethylpentane	0.04	3.30	0.48	0.72	0.77	0.58	0.53	2.52
3-Methylheptane	0.04	2.76	0.04	0.36	0.41	0.21	0.43	3.74
n-Octane	0.04	1.32	0.04	0.14	0.23	0.12	0.23	3.27

Table B-5. Statistical Summary for Pinson, Alabama (B2AL) for the 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methylheptane	0.04	1.20	0.04	0.04	0.28	0.14	0.29	3.73
n-Nonane	0.04	1.56	0.04	0.04	0.24	0.12	0.27	3.50
n-Decane	0.04	4.14	0.04	0.04	0.28	0.10	0.58	3.67
n-Undecane	0.04	7.92	0.04	0.42	0.65	0.31	1.03	3.81
n-Dodecane	0.04	9.00	0.04	0.04	0.36	0.08	1.19	3.91
n-Tridecane	0.04	5.16	0.04	0.04	0.28	0.07	0.71	3.75
Olefins:								
Ethylene	0.17	11.28	0.17	3.20	3.28	1.62	2.70	4.48
Acetylene	0.17	16.71	0.17	2.28	2.28	1.10	2.39	4.18
Propylene	0.17	9.06	0.17	2.45	2.36	1.67	1.45	2.87
Propyne	0.17	0.17	0.17	0.17	0.17	0.17	0.00	1.00
Isobutene and 1-Butene	0.04	4.44	0.04	1.08	1.17	0.78	0.77	3.39
1,3-Butadiene	0.04	4.14	0.04	0.04	0.41	0.12	0.72	4.62
t-2-Butene	0.04	3.24	0.04	0.04	0.12	0.05	0.39	2.35
c-2-Butene	0.04	2.88	0.04	0.04	0.10	0.05	0.33	2.03
3-Methyl-1-Butene	0.04	1.68	0.04	0.04	0.07	0.04	0.19	1.65
1-Pentene	0.04	19.14	0.04	0.04	1.53	0.17	3.17	8.27
2-Methyl-1-Butene	0.04	6.84	0.04	0.42	0.67	0.31	1.13	3.63
Isoprene	0.36	15.96	3.78	3.00	3.69	2.67	2.95	2.36
t-2-Pentene	0.04	8.04	0.04	0.42	0.55	0.26	0.94	3.91
c-2-Pentene	0.04	4.32	0.04	0.04	0.29	0.11	0.54	3.76

Table B-5. Statistical Summary for Pinson, Alabama (B2AL) for the 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methyl-2-Butene	0.04	10.68	0.04	0.60	0.82	0.45	1.25	3.54
Cyclopentene	0.04	1.44	0.04	0.04	0.08	0.05	0.18	1.94
4-Methyl-1-Pentene	0.04	3.00	0.04	0.72	0.68	0.36	0.55	4.17
1-Hexene	0.04	2.04	0.04	0.04	0.09	0.05	0.29	2.04
2-Methyl-1-Pentene	0.04	0.04	0.04	0.04	0.04	0.04	0.00	1.00
2-Ethyl-1-Butene	0.04	0.48	0.04	0.04	0.05	0.04	0.05	1.41
t-2-Hexene	0.04	1.20	0.04	0.04	0.10	0.05	0.18	2.30
c-2-Hexene	0.04	0.72	0.04	0.04	0.07	0.05	0.12	1.86
1-Heptene	0.04	0.66	0.04	0.04	0.05	0.04	0.07	1.37
1-Octene	0.04	2.40	0.04	0.04	0.22	0.09	0.35	3.44
1-Nonene	0.04	1.14	0.04	0.04	0.06	0.04	0.13	1.60
a-Pinene	0.04	12.00	0.60	4.17	4.45	3.39	2.74	2.47
b-Pinene	0.96	7.20	4.38	3.39	3.57	3.17	1.65	1.67
1-Decene	0.04	5.64	0.04	0.04	0.16	0.04	0.76	2.13
1-Undecene	0.60	13.02	1.20	1.47	1.95	1.61	1.76	1.73
1-Dodecene	0.04	3.72	0.04	0.04	0.36	0.10	0.63	4.51
1-Tridecene	0.04	1.32	0.04	0.04	0.11	0.05	0.21	2.41
Total NMOC	**27.30**	**439.00**	**113.00**	**114.00**	**125.94**	**110.23**	**70.58**	**1.69**

Table B-6. Statistical Summary for Helena, Alabama (B3AL), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Aromatic Compounds:								
Benzene	0.48	12.24	0.96	2.52	3.40	2.70	2.33	2.02
Toluene	1.08	31.86	5.04	6.00	8.90	6.85	6.46	2.14
Ethylbenzene	0.04	4.14	0.96	1.08	1.44	1.06	0.92	2.67
p-Xylene and m-Xylene	0.60	12.24	1.32	3.48	4.10	3.28	2.61	2.04
Styrene	0.04	3.36	0.96	1.20	1.30	1.04	0.66	2.39
o-Xylene	0.04	4.14	0.60	1.20	1.48	1.08	0.97	2.73
p-Diethylbenzene	0.04	3.42	0.04	0.04	0.38	0.11	0.63	4.67
Isopropylbenzene	0.04	9.48	0.04	0.04	0.16	0.04	1.06	1.86
n-Propylbenzene	0.04	1.56	0.04	0.04	0.34	0.15	0.36	4.15
m-Ethyltoluene	0.04	4.44	0.72	1.56	1.75	1.33	1.05	2.54
p-Ethyltoluene	0.04	3.18	0.04	0.48	0.57	0.36	0.48	3.18
1,3,5-Trimethylbenzene	0.04	1.80	0.04	0.60	0.58	0.32	0.48	3.94
o-Ethyltoluene	0.04	4.20	0.04	0.84	0.75	0.28	0.78	5.58
1,2,4-Trimethylbenzene	0.36	5.52	1.08	1.74	1.93	1.58	1.19	1.96
1,2,3-Trimethylbenzene	0.36	5.76	0.84	1.08	1.33	1.14	0.91	1.68
Paraffins:								
Ethane	0.17	11.70	0.17	4.92	4.77	3.55	2.58	2.77
Propane	1.56	26.70	6.99	5.61	6.19	5.47	3.44	1.66
Isobutane	0.04	24.12	0.04	1.56	3.12	1.38	4.59	4.42
n-Butane	0.04	87.00	2.70	4.74	12.03	5.69	18.96	3.35

Table B-6. Statistical Summary for Helena, Alabama (B3AL), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isopentane	1.80	216.60	6.24	10.08	28.06	12.75	46.83	3.21
n-Pentane	0.84	61.80	1.20	3.96	8.57	4.47	13.04	2.88
Cyclopentane	0.04	7.62	0.04	0.04	0.60	0.15	1.21	5.11
2,2-Dimethylbutane	0.04	13.44	0.04	0.48	1.18	0.37	2.26	4.96
2,3-Dimethylbutane	0.04	14.22	0.04	0.96	2.24	0.77	3.07	5.82
2-Methylpentane	0.04	38.82	0.96	2.40	5.36	2.67	7.75	3.40
3-Methylpentane	0.04	22.02	3.12	3.18	4.40	2.85	4.63	2.72
n-Hexane	0.04	13.86	1.08	1.50	2.49	1.63	2.78	2.53
Methylcyclopentane	0.04	9.78	0.60	1.08	1.66	0.84	1.99	4.01
Cyclohexane	0.04	2.46	0.04	0.36	0.56	0.21	0.59	5.00
2,4-Dimethylpentane	0.04	4.74	0.04	0.60	0.88	0.45	0.98	3.98
2-Methylhexane and 2,3-Dimethylpentane	0.04	10.26	0.04	1.62	2.27	1.15	2.16	4.80
3-Methylhexane	0.04	7.26	1.32	1.74	2.15	1.60	1.52	2.61
n-Heptane	0.04	5.88	0.60	0.60	1.09	0.58	1.23	3.79
Methylcyclohexane	0.04	3.00	0.04	0.04	0.61	0.18	0.81	5.59
2,2,4-Trimethylpentane	0.04	14.22	2.04	2.04	3.04	1.95	2.91	3.03
2,2,3-Trimethylpentane	0.04	2.40	0.04	0.04	0.38	0.12	0.55	4.60
2,3,4-Trimethylpentane	0.04	4.02	0.48	0.60	0.88	0.51	0.82	3.53
3-Methylheptane	0.04	2.28	0.04	0.42	0.46	0.21	0.46	4.26
n-Octane	0.04	2.40	0.04	0.48	0.51	0.30	0.48	3.46

Table B-6. Statistical Summary for Helena, Alabama (B3AL), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methylheptane	0.04	1.62	0.04	0.04	0.31	0.12	0.40	4.15
n-Nonane	0.04	1.08	0.04	0.36	0.37	0.19	0.32	3.86
n-Decane	0.04	4.74	0.04	0.48	0.53	0.28	0.65	3.70
n-Undecane	0.04	14.64	0.04	0.60	1.05	0.50	2.06	3.70
n-Dodecane	0.04	4.92	0.04	0.04	0.21	0.06	0.62	3.17
n-Tridecane	0.04	2.16	0.04	0.04	0.15	0.06	0.32	2.81
Olefins:								
Ethylene	0.17	9.42	0.17	2.04	2.31	0.98	2.30	4.64
Acetylene	0.17	6.24	0.17	1.71	1.81	0.81	1.76	4.31
Propylene	0.17	4.98	0.17	1.62	1.82	1.20	1.27	3.04
Propyne	0.17	0.17	0.17	0.17	0.17	0.17	0.00	1.00
Isobutene and 1-Butene	0.04	6.60	0.04	0.90	1.30	0.49	1.54	5.67
1,3-Butadiene	0.04	2.76	0.04	0.04	0.27	0.07	0.57	3.74
t-2-Butene	0.04	6.12	0.04	0.04	0.46	0.08	1.15	4.56
c-2-Butene	0.04	5.52	0.04	0.04	0.48	0.10	1.06	4.83
3-Methyl-1-Butene	0.04	5.04	0.04	0.04	0.35	0.08	0.84	4.14
1-Pentene	0.04	10.92	0.04	0.04	1.57	0.23	2.78	7.98
2-Methyl-1-Butene	0.04	13.98	0.04	0.48	1.54	0.42	2.81	5.75
Isoprene	0.24	21.96	0.72	2.88	3.80	2.49	3.61	2.66
t-2-Pentene	0.04	16.14	0.04	0.84	1.76	0.48	3.09	6.54
c-2-Pentene	0.04	8.76	0.04	0.04	0.85	0.19	1.70	5.99

Table B-6. Statistical Summary for Helena, Alabama (B3AL), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methyl-2-Butene	0.04	21.36	0.04	0.48	1.76	0.39	3.83	6.56
Cyclopentene	0.04	2.88	0.04	0.04	0.21	0.06	0.52	3.23
4-Methyl-1-Pentene	0.04	3.06	0.04	0.90	0.96	0.49	0.77	4.52
1-Hexene	0.04	4.26	0.04	0.04	0.38	0.09	0.80	4.47
2-Methyl-1-Pentene	0.04	1.62	0.04	0.04	0.08	0.04	0.24	1.94
2-Ethyl-1-Butene	0.04	2.52	0.04	0.04	0.31	0.09	0.52	4.20
t-2-Hexene	0.04	2.94	0.04	0.04	0.39	0.11	0.67	4.45
c-2-Hexene	0.04	1.50	0.04	0.04	0.16	0.06	0.31	2.97
1-Heptene	0.04	0.04	0.04	0.04	0.04	0.04	0.00	1.00
1-Octene	0.04	1.14	0.04	0.04	0.25	0.10	0.31	3.81
1-Nonene	0.04	1.32	0.04	0.04	0.06	0.04	0.14	1.49
a-Pinene	0.04	21.48	0.84	3.90	4.91	3.32	4.10	2.78
b-Pinene	0.36	10.74	1.74	3.00	3.34	2.75	2.09	1.92
1-Decene	0.04	0.84	0.04	0.04	0.05	0.04	0.09	1.41
1-Undecene	0.04	6.78	0.96	1.20	1.45	1.24	0.97	1.84
1-Dodecene	0.04	4.20	0.04	0.04	0.29	0.08	0.66	3.93
1-Tridecene	0.04	1.44	0.04	0.04	0.09	0.05	0.20	2.10
Total NMOC	33.20	902.00	113.00	142.00	195.23	146.26	172.44	2.11

Table B-7. Statistical Summary for Dallas, Texas (DLTX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	**Minimum**	**Maximum**	**Mode**	**Median**	**Arithmetic Mean**	**Geometric Mean**	**Arithmetic Standard Deviation**	**Geometric Standard Deviation**
Aromatic Compounds:								
Benzene	1.44	17.10	2.28	3.90	4.85	4.16	2.97	1.72
Toluene	3.42	196.20	13.08	12.12	18.74	13.42	23.41	2.10
Ethylbenzene	0.72	12.48	1.68	2.16	3.07	2.46	2.36	1.92
p-Xylene and m-Xylene	1.12	50.22	5.76	6.24	9.48	7.11	8.31	2.11
Styrene	0.04	17.88	1.32	1.74	2.04	1.71	1.93	1.84
o-Xylene	0.04	12.90	1.68	2.40	3.28	2.53	2.47	2.23
p-Diethylbenzene	0.04	4.74	0.04	1.20	1.38	0.89	0.94	3.53
Isopropylbenzene	0.04	0.75	0.04	0.04	0.07	0.05	0.11	1.84
n-Propylbenzene	0.04	3.06	0.04	0.72	0.89	0.53	0.72	3.65
m-Ethyltoluene	0.72	11.10	1.62	2.28	3.16	2.57	2.18	1.90
p-Ethyltoluene	0.04	5.64	0.84	1.20	1.62	1.25	1.14	2.28
1,3,5-Trimethylbenzene	0.04	6.48	0.60	1.20	1.79	1.28	1.48	2.38
o-Ethyltoluene	0.04	5.10	0.04	1.08	1.43	0.61	1.27	5.65
1,2,4-Trimethylbenzene	0.04	15.12	1.92	3.18	4.44	3.48	3.12	2.22
1,2,3-Trimethylbenzene	0.54	8.64	0.96	1.50	2.09	1.70	1.58	1.85
Paraffins:								
Ethane	3.84	49.50	11.82	15.24	17.16	15.19	8.72	1.65
Propane	3.72	56.70	31.80	14.64	16.99	14.73	9.65	1.71
Isobutane	0.04	18.60	2.22	3.48	4.28	3.12	3.53	2.59
n-Butane	1.92	21.60	5.76	7.32	8.23	7.26	4.19	1.68

Table B-7. Statistical Summary for Dallas, Texas (DLTX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isopentane	3.84	420.00	7.80	11.04	20.42	13.38	45.60	2.05
n-Pentane	1.80	42.60	5.28	5.88	7.86	6.41	6.12	1.84
Cyclopentane	0.04	13.44	0.04	0.48	0.77	0.42	1.48	3.36
2,2-Dimethylbutane	0.36	4.86	0.72	0.96	1.28	1.05	0.87	1.85
2,3-Dimethylbutane	0.04	15.24	1.32	1.56	2.22	1.69	2.05	2.16
2-Methylpentane	2.40	24.60	7.08	7.86	8.69	7.72	4.36	1.65
3-Methylpentane	1.56	21.24	4.80	4.80	5.70	4.84	3.55	1.77
n-Hexane	1.38	19.74	2.16	3.78	5.00	4.19	3.38	1.78
Methylcyclopentane	0.54	8.88	1.20	1.98	2.39	2.02	1.51	1.79
Cyclohexane	0.04	9.00	1.62	1.32	1.50	1.23	1.06	2.07
2,4-Dimethylpentane	0.04	7.56	0.48	0.72	0.98	0.68	0.97	2.70
2-Methylhexane and 2,3-Dimethylpentane	1.08	350.40	1.86	3.24	8.33	3.64	38.11	2.20
3-Methylhexane	0.96	344.40	3.12	3.78	8.49	4.13	37.39	1.98
n-Heptane	0.54	158.40	1.02	2.16	4.59	2.35	17.19	2.17
Methylcyclohexane	0.54	101.40	1.20	1.86	3.67	2.10	11.04	2.15
2,2,4-Trimethylpentane	1.20	20.40	5.16	3.12	4.38	3.53	3.37	1.88
2,2,3-Trimethylpentane	0.04	7.32	0.04	0.72	0.86	0.31	1.09	5.50
2,3,4-Trimethylpentane	0.36	4.86	0.48	0.90	1.34	1.06	1.00	1.94
3-Methylheptane	0.04	4.50	0.84	0.84	1.15	0.88	0.83	2.23
n-Octane	0.04	4.68	0.84	0.96	1.22	0.97	0.85	2.15

Table B-7. Statistical Summary for Dallas, Texas (DLTX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methylheptane	0.04	2.40	0.60	0.78	0.86	0.71	0.44	2.17
n-Nonane	0.04	5.40	0.04	0.72	1.11	0.59	1.16	3.80
n-Decane	0.04	21.12	0.60	1.20	1.96	1.20	2.70	2.70
n-Undecane	0.36	85.20	0.48	1.08	2.99	1.35	9.69	2.58
n-Dodecane	0.04	4.68	0.04	0.04	0.38	0.10	0.77	4.52
n-Tridecane	0.04	2.64	0.04	0.04	0.32	0.09	0.57	4.21
Olefins:								
Ethylene	0.17	26.88	0.17	5.82	7.01	3.86	5.78	4.27
Acetylene	0.17	69.30	0.17	3.99	8.31	3.19	12.21	5.26
Propylene	1.20	12.75	2.40	2.94	3.70	3.14	2.35	1.75
Propyne	0.17	0.48	0.17	0.17	0.17	0.17	0.03	1.12
Isobutene and 1-Butene	0.96	12.12	1.86	2.46	3.15	2.62	2.22	1.78
1,3-Butadiene	0.04	3.78	0.04	0.36	0.86	0.24	1.09	6.17
t-2-Butene	0.04	1.86	0.04	0.04	0.19	0.07	0.36	3.24
c-2-Butene	0.04	1.14	0.04	0.04	0.18	0.07	0.28	3.25
3-Methyl-1-Butene	0.04	1.02	0.04	0.04	0.13	0.06	0.22	2.77
1-Pentene	0.04	20.46	0.04	0.04	1.40	0.18	3.29	7.37
2-Methyl-1-Butene	0.04	4.44	0.36	0.60	0.93	0.62	0.89	2.70
Isoprene	0.04	3.48	0.04	0.60	0.89	0.47	0.88	3.88
t-2-Pentene	0.04	19.80	0.96	0.72	1.44	0.72	2.57	3.45
c-2-Pentene	0.04	4.56	0.04	0.72	0.92	0.46	0.94	4.16

Table B-7. Statistical Summary for Dallas, Texas (DLTX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methyl-2-Butene	0.04	6.72	0.36	0.96	1.35	0.99	1.09	2.38
Cyclopentene	0.04	2.40	0.04	0.04	0.18	0.07	0.39	3.12
4-Methyl-1-Pentene	0.04	2.70	0.04	0.66	0.72	0.34	0.62	4.58
1-Hexene	0.04	2.64	0.04	0.04	0.29	0.08	0.55	4.03
2-Methyl-1-Pentene	0.04	1.02	0.04	0.04	0.06	0.04	0.12	1.57
2-Ethyl-1-Butene	0.04	1.02	0.04	0.04	0.05	0.04	0.11	1.54
t-2-Hexene	0.04	1.50	0.04	0.04	0.29	0.12	0.36	3.88
c-2-Hexene	0.04	2.22	0.04	0.04	0.19	0.08	0.35	3.27
1-Heptene	0.04	0.36	0.04	0.04	0.04	0.04	0.04	1.28
1-Octene	0.04	1.50	0.04	0.04	0.28	0.12	0.32	3.77
1-Nonene	0.04	0.36	0.04	0.04	0.05	0.04	0.06	1.58
a-Pinene	0.04	10.44	0.04	1.20	1.42	0.66	1.49	4.90
b-Pinene	0.04	8.52	1.74	2.10	2.36	1.98	1.46	1.97
1-Decene	0.04	2.58	0.04	0.04	0.09	0.04	0.31	1.93
1-Undecene	0.84	36.72	1.62	3.00	4.17	3.16	4.53	1.97
1-Dodecene	0.04	5.40	0.04	0.04	0.44	0.10	0.85	4.93
1-Tridecene	0.04	4.08	0.04	0.04	0.15	0.06	0.47	2.63
Total NMOC	**76.00**	**2800.00**	**234.00**	**222.00**	**308.03**	**247.03**	**321.73**	**1.81**

Table B-8. Statistical Summary for Fort Worth, Texas (FWTX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Aromatic Compounds:								
Benzene	0.60	16.20	2.58	3.78	4.86	3.85	3.47	2.01
Toluene	2.16	66.60	9.30	12.48	16.58	12.65	12.78	2.12
Ethylbenzene	0.04	10.56	1.32	1.98	2.66	2.02	1.98	2.29
p-Xylene and m-Xylene	0.72	32.64	3.54	6.12	8.00	6.12	6.20	2.12
Styrene	0.04	3.54	1.74	1.62	1.61	1.34	0.73	2.24
o-Xylene	0.04	11.76	1.74	2.16	2.91	2.13	2.20	2.58
p-Diethylbenzene	0.04	4.20	0.04	1.20	1.26	0.65	0.99	4.70
Isopropylbenzene	0.04	0.84	0.04	0.04	0.07	0.04	0.14	1.84
n-Propylbenzene	0.04	2.76	0.04	0.72	0.82	0.42	0.69	4.35
m-Ethyltoluene	0.04	9.84	1.08	2.04	2.72	2.03	1.95	2.52
p-Ethyltoluene	0.04	4.68	0.72	0.96	1.30	0.93	0.98	2.67
1,3,5-Trimethylbenzene	0.04	5.40	0.60	0.96	1.32	0.88	1.11	2.91
o-Ethyltoluene	0.04	4.32	0.04	1.08	1.22	0.59	1.02	4.98
1,2,4-Trimethylbenzene	0.84	14.88	3.12	3.12	4.28	3.54	2.80	1.86
1,2,3-Trimethylbenzene	0.36	10.14	1.08	1.38	1.74	1.44	1.48	1.76
Paraffins:								
Ethane	3.30	83.10	8.88	17.61	18.97	15.68	12.64	1.88
Propane	3.63	215.40	7.53	15.18	19.53	14.77	25.25	1.93
Isobutane	0.90	21.00	1.62	3.60	4.65	3.64	3.74	1.99
n-Butane	2.22	64.20	5.88	7.50	10.67	7.89	10.49	2.08

Table B-8. Statistical Summary for Fort Worth, Texas (FWTX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isopentane	3.54	214.20	5.64	14.22	24.08	15.71	31.74	2.32
n-Pentane	0.04	76.20	6.12	7.20	12.15	7.97	13.33	2.73
Cyclopentane	0.04	56.40	0.48	0.60	1.85	0.66	6.40	3.61
2,2-Dimethylbutane	0.12	13.80	1.20	1.68	2.25	1.72	2.11	2.11
2,3-Dimethylbutane	0.04	17.76	1.20	1.68	2.63	1.80	2.81	2.45
2-Methylpentane	1.20	46.56	6.36	8.46	10.35	8.35	7.62	1.95
3-Methylpentane	0.72	31.56	2.46	5.16	6.90	5.38	5.51	2.02
n-Hexane	1.08	29.16	3.30	4.38	6.49	4.96	5.42	2.05
Methylcyclopentane	0.36	12.96	1.50	2.22	3.29	2.49	2.67	2.12
Cyclohexane	0.36	4.68	0.96	1.62	1.92	1.67	1.01	1.72
2,4-Dimethylpentane	0.04	4.32	0.60	0.84	1.18	0.92	0.86	2.10
2-Methylhexane and 2,3-Dimethylpentane	0.60	14.76	1.62	3.36	4.66	3.66	3.31	2.03
3-Methylhexane	1.08	11.88	2.82	3.72	4.44	3.78	2.56	1.78
n-Heptane	0.48	8.52	0.96	2.22	2.97	2.31	2.17	2.05
Methylcyclohexane	0.36	5.52	0.84	1.80	2.10	1.74	1.20	1.92
2,2,4-Trimethylpentane	1.20	17.16	4.26	4.08	5.74	4.60	4.05	1.94
2,2,3-Trimethylpentane	0.04	4.44	0.04	0.90	1.10	0.51	1.02	4.85
2,3,4-Trimethylpentane	0.24	6.24	0.72	1.20	1.88	1.42	1.49	2.14
3-Methylheptane	0.04	5.16	0.60	0.90	1.29	0.89	1.09	2.63
n-Octane	0.04	4.08	0.48	0.96	1.21	0.96	0.78	2.18

Table B-8. Statistical Summary for Fort Worth, Texas (FWTX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methylheptane	0.04	4.68	0.72	0.72	0.94	0.76	0.64	2.13
n-Nonane	0.04	3.12	0.48	0.54	0.72	0.45	0.60	3.25
n-Decane	0.04	7.68	0.48	0.78	1.02	0.67	1.01	2.96
n-Undecane	0.04	14.10	0.60	0.72	1.13	0.69	1.71	2.89
n-Dodecane	0.04	19.44	0.04	0.04	0.44	0.07	2.20	3.84
n-Tridecane	0.04	16.14	0.04	0.04	0.38	0.07	1.83	3.67
Olefins:								
Ethylene	0.17	25.02	0.17	5.13	6.57	3.56	5.94	4.06
Acetylene	0.17	17.40	0.17	4.11	4.64	2.15	4.31	4.91
Propylene	0.17	11.04	2.64	2.64	3.60	2.77	2.53	2.28
Propyne	0.17	0.17	0.17	0.17	0.17	0.17	0.00	1.00
Isobutene and 1-Butene	0.60	13.44	3.30	3.60	4.60	3.97	2.74	1.72
1,3-Butadiene	0.04	4.26	0.04	0.04	0.76	0.20	1.01	6.26
t-2-Butene	0.04	12.00	0.04	0.04	0.69	0.11	1.78	5.64
c-2-Butene	0.04	11.04	0.04	0.04	0.64	0.13	1.60	5.40
3-Methyl-1-Butene	0.04	6.36	0.04	0.04	0.33	0.08	0.87	4.02
1-Pentene	0.04	23.10	0.04	0.04	1.72	0.21	4.75	7.13
2-Methyl-1-Butene	0.04	20.88	0.60	0.78	1.61	0.74	3.07	3.67
Isoprene	0.04	2.76	0.04	0.60	0.75	0.46	0.58	3.50
t-2-Pentene	0.04	24.12	0.04	0.90	2.05	0.87	3.62	4.16
c-2-Pentene	0.04	13.08	0.04	0.60	1.22	0.46	1.94	5.04

Table B-8. Statistical Summary for Fort Worth, Texas (FWTX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methyl-2-Butene	0.04	26.88	0.60	1.20	2.33	1.11	3.95	3.71
Cyclopentene	0.04	3.36	0.04	0.04	0.25	0.08	0.53	3.64
4-Methyl-1-Pentene	0.04	3.78	0.04	0.72	0.77	0.38	0.70	4.44
1-Hexene	0.04	4.44	0.04	0.04	0.45	0.10	0.84	4.97
2-Methyl-1-Pentene	0.04	1.50	0.04	0.04	0.07	0.04	0.18	1.69
2-Ethyl-1-Butene	0.04	4.08	0.04	0.04	0.10	0.04	0.46	1.89
t-2-Hexene	0.04	2.28	0.04	0.04	0.35	0.12	0.50	4.36
c-2-Hexene	0.04	2.58	0.04	0.04	0.32	0.10	0.52	4.16
1-Heptene	0.04	0.36	0.04	0.04	0.05	0.04	0.04	1.38
1-Octene	0.04	3.24	0.04	0.36	0.44	0.18	0.55	4.36
1-Nonene	0.04	0.60	0.04	0.04	0.06	0.04	0.09	1.62
a-Pinene	0.04	7.56	0.04	1.02	1.30	0.52	1.37	5.73
b-Pinene	0.04	5.04	1.14	1.44	1.53	1.34	0.78	1.81
1-Decene	0.04	0.90	0.04	0.04	0.12	0.06	0.21	2.55
1-Undecene	0.48	12.72	1.44	1.86	2.30	1.98	1.58	1.70
1-Dodecene	0.04	2.04	0.04	0.04	0.27	0.08	0.49	3.91
1-Tridecene	0.04	0.72	0.04	0.04	0.10	0.06	0.16	2.39
Total NMOC	**74.30**	**1170.00**	**191.00**	**262.00**	**322.38**	**268.04**	**216.67**	**1.82**

Table B-9. Statistical Summary for Juarez, Mexico (JUMX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Aromatic Compounds:								
Benzene	1.08	23.64	3.54	7.32	7.67	6.29	4.58	1.97
Toluene	2.64	87.60	9.96	16.92	21.03	16.78	15.20	2.00
Ethylbenzene	0.60	16.26	1.98	3.54	5.02	3.78	3.86	2.18
p-Xylene and m-Xylene	1.44	47.40	4.92	9.00	13.69	9.85	11.48	2.32
Styrene	0.60	17.76	1.32	2.04	2.94	2.27	2.94	1.91
o-Xylene	0.60	17.04	1.56	3.48	5.06	3.66	4.11	2.32
p-Diethylbenzene	0.04	8.40	0.84	1.44	1.66	1.05	1.43	3.51
Isopropylbenzene	0.04	1.08	0.04	0.04	0.12	0.06	0.22	2.55
n-Propylbenzene	0.04	3.30	1.08	1.32	1.44	1.05	0.81	2.98
m-Ethyltoluene	0.04	9.42	1.50	2.70	3.24	2.44	2.10	2.52
p-Ethyltoluene	0.04	4.14	0.72	1.20	1.50	1.13	1.04	2.40
1,3,5-Trimethylbenzene	0.04	6.12	0.60	1.44	1.70	1.15	1.43	2.81
o-Ethyltoluene	0.04	6.00	0.04	1.44	1.64	0.95	1.31	4.13
1,2,4-Trimethylbenzene	0.72	13.20	4.80	4.50	5.32	4.41	3.12	1.94
1,2,3-Trimethylbenzene	0.36	6.96	0.84	1.50	1.82	1.57	1.13	1.71
Paraffins:								
Ethane	3.75	72.00	11.34	14.64	18.22	15.20	12.56	1.82
Propane	0.17	1530.00	0.17	39.90	78.25	29.95	215.56	5.06
Isobutane	1.44	14.28	7.86	4.68	5.29	4.48	3.05	1.82
n-Butane	4.20	55.20	4.26	13.32	15.55	12.88	10.06	1.88

Table B-9. Statistical Summary for Juarez, Mexico (JUMX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isopentane	3.48	87.60	20.94	13.08	16.74	13.18	14.18	1.97
n-Pentane	0.04	43.86	4.20	10.38	11.43	8.46	8.15	2.78
Cyclopentane	0.04	19.80	0.36	0.84	1.40	0.74	2.84	3.16
2,2-Dimethylbutane	0.04	1.62	0.04	0.72	0.62	0.35	0.48	3.78
2,3-Dimethylbutane	0.04	27.48	0.72	1.98	2.60	1.61	3.89	2.94
2-Methylpentane	1.08	18.96	7.20	4.80	5.75	4.66	3.68	1.97
3-Methylpentane	1.20	15.30	3.36	5.16	5.96	5.12	3.25	1.78
n-Hexane	1.32	17.52	1.86	4.68	5.66	4.68	3.50	1.89
Methylcyclopentane	0.72	9.54	1.56	3.12	3.39	2.81	1.99	1.92
Cyclohexane	0.72	6.96	1.20	2.22	2.39	2.12	1.20	1.65
2,4-Dimethylpentane	0.04	6.96	1.20	1.92	2.11	1.57	1.37	2.66
2-Methylhexane and 2,3-Dimethylpentane	0.72	38.46	3.36	6.00	6.63	5.09	5.73	2.12
3-Methylhexane	1.08	29.88	4.44	3.66	4.21	3.41	4.11	1.82
n-Heptane	0.24	19.74	0.96	2.46	3.03	2.21	2.98	2.25
Methylcyclohexane	0.60	23.64	0.60	2.28	3.30	2.17	3.90	2.42
2,2,4-Trimethylpentane	0.60	17.76	5.16	5.16	5.62	4.61	3.35	1.99
2,2,3-Trimethylpentane	0.04	4.14	0.04	0.96	0.95	0.46	0.81	4.79
2,3,4-Trimethylpentane	0.04	5.04	0.60	1.44	1.58	1.19	1.02	2.57
3-Methylheptane	0.04	3.06	0.84	0.84	0.96	0.65	0.66	3.06
n-Octane	0.04	8.04	0.48	0.84	1.06	0.75	1.17	2.45

Table B-9. Statistical Summary for Juarez, Mexico (JUMX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	**Minimum**	**Maximum**	**Mode**	**Median**	**Arithmetic Mean**	**Geometric Mean**	**Arithmetic Standard Deviation**	**Geometric Standard Deviation**
2-Methylheptane	0.04	2.04	0.60	0.72	0.76	0.54	0.46	2.93
n-Nonane	0.04	14.40	0.48	0.60	1.29	0.63	2.28	3.45
n-Decane	0.36	16.32	0.72	1.20	2.65	1.51	3.80	2.59
n-Undecane	0.36	24.96	0.84	1.08	2.93	1.55	4.84	2.61
n-Dodecane	0.04	14.40	0.04	0.04	0.80	0.14	2.18	6.01
n-Tridecane	0.04	6.72	0.04	0.04	0.55	0.12	1.19	5.28
Olefins:								
Ethylene	0.17	32.40	0.17	8.07	8.97	5.37	6.44	4.13
Acetylene	0.17	27.81	0.17	7.29	7.60	4.65	5.38	3.94
Propylene	0.17	15.24	2.40	3.96	4.51	3.51	2.81	2.35
Propyne	0.17	0.17	0.17	0.17	0.17	0.17	0.00	1.00
Isobutene and 1-Butene	0.60	8.82	1.92	2.34	2.60	2.28	1.39	1.69
1,3-Butadiene	0.04	4.14	0.04	0.04	0.91	0.23	1.16	6.69
t-2-Butene	0.04	1.62	0.04	0.04	0.22	0.08	0.34	3.66
c-2-Butene	0.04	3.78	0.04	0.04	0.35	0.12	0.68	4.12
3-Methyl-1-Butene	0.04	0.72	0.04	0.04	0.12	0.06	0.18	2.66
1-Pentene	0.04	2.40	0.04	0.24	0.45	0.18	0.53	4.51
2-Methyl-1-Butene	0.04	3.78	0.04	1.08	1.23	0.81	0.87	3.33
Isoprene	0.04	51.48	0.04	0.60	1.94	0.46	7.49	4.51
t-2-Pentene	0.04	21.24	0.04	0.90	1.93	0.59	3.98	5.50
c-2-Pentene	0.04	3.06	0.04	0.72	0.77	0.39	0.67	4.34

Table B-9. Statistical Summary for Juarez, Mexico (JUMX), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methyl-2-Butene	0.04	6.12	0.36	1.20	1.33	0.76	1.23	3.79
Cyclopentene	0.04	0.72	0.04	0.04	0.12	0.06	0.16	2.62
4-Methyl-1-Pentene	0.04	0.84	0.04	0.04	0.12	0.06	0.21	2.59
1-Hexene	0.04	2.10	0.04	0.04	0.40	0.12	0.55	4.88
2-Methyl-1-Pentene	0.04	1.08	0.04	0.04	0.09	0.05	0.21	2.12
2-Ethyl-1-Butene	0.04	0.04	0.04	0.04	0.04	0.04	0.00	1.00
t-2-Hexene	0.04	2.40	0.04	0.48	0.58	0.31	0.52	3.89
c-2-Hexene	0.04	0.96	0.04	0.04	0.19	0.09	0.23	3.21
1-Heptene	0.04	3.30	0.04	0.04	0.18	0.05	0.60	2.64
1-Octene	0.04	0.96	0.04	0.36	0.38	0.20	0.31	3.83
1-Nonene	0.04	1.44	0.04	0.04	0.24	0.08	0.39	3.75
a-Pinene	0.04	12.48	0.04	1.20	2.01	1.07	2.20	4.02
b-Pinene	0.84	4.08	2.16	2.04	2.05	1.90	0.80	1.50
1-Decene	0.04	1.86	0.04	0.04	0.08	0.04	0.26	1.74
1-Undecene	1.50	18.96	1.98	3.30	4.40	3.63	3.35	1.79
1-Dodecene	0.04	2.52	0.04	0.04	0.55	0.14	0.77	5.73
1-Tridecene	0.04	0.96	0.04	0.04	0.14	0.07	0.21	2.86
Total NMOC	**110.00**	**2190.00**	**314.00**	**314.00**	**425.37**	**342.59**	**348.91**	**1.88**

Table B-10. Statistical Summary for New Orleans, Louisiana (NOLA), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Aromatic Compounds:								
Benzene	0.48	19.32	1.44	2.76	4.29	2.96	3.91	2.37
Toluene	1.74	57.72	3.96	6.24	11.43	7.68	11.39	2.38
Ethylbenzene	0.36	11.46	0.72	1.50	2.54	1.71	2.47	2.42
p-Xylene and m-Xylene	0.84	38.94	1.32	4.38	7.88	4.67	8.47	2.82
Styrene	0.72	4.92	1.32	1.68	1.83	1.73	0.67	1.38
o-Xylene	0.04	12.48	0.84	1.56	2.71	1.53	2.83	3.44
p-Diethylbenzene	0.04	3.48	0.04	0.30	0.67	0.21	0.82	5.65
Isopropylbenzene	0.04	0.60	0.04	0.04	0.06	0.04	0.11	1.78
n-Propylbenzene	0.04	10.68	0.04	0.04	0.53	0.13	1.29	5.03
m-Ethyltoluene	0.04	9.12	0.04	1.08	1.81	0.83	1.96	4.88
p-Ethyltoluene	0.04	3.84	0.04	0.36	0.71	0.26	0.91	4.92
1,3,5-Trimethylbenzene	0.04	7.92	0.04	0.36	0.85	0.26	1.30	5.55
o-Ethyltoluene	0.04	4.32	0.04	0.04	0.68	0.17	0.97	6.02
1,2,4-Trimethylbenzene	0.84	14.28	1.32	2.34	3.41	2.64	2.79	1.98
1,2,3-Trimethylbenzene	0.48	9.84	1.08	1.20	1.55	1.31	1.30	1.69
Paraffins:								
Ethane	0.17	43.80	4.62	13.26	14.81	10.25	11.33	2.66
Propane	2.07	65.10	5.25	12.30	14.47	10.64	11.34	2.27
Isobutane	0.04	29.76	1.08	5.76	6.87	3.97	6.15	3.55
n-Butane	1.32	42.12	1.32	8.40	10.41	7.00	9.10	2.54

Table B-10. Statistical Summary for New Orleans, Louisiana (NOLA), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isopentane	1.08	97.20	2.64	10.02	17.52	10.01	19.60	2.96
n-Pentane	0.04	40.92	1.32	4.68	7.78	4.62	7.93	3.11
Cyclopentane	0.04	2.22	0.04	0.24	0.45	0.17	0.55	4.56
2,2-Dimethylbutane	0.04	7.32	0.04	1.44	1.50	0.99	1.05	3.45
2,3-Dimethylbutane	0.04	106.80	0.04	0.90	2.85	0.74	11.95	5.22
2-Methylpentane	0.36	23.76	0.84	2.46	4.62	2.73	4.85	2.86
3-Methylpentane	0.04	16.92	2.40	3.30	4.47	3.06	3.68	2.82
n-Hexane	0.04	16.92	0.72	2.52	4.03	2.40	4.14	3.01
Methylcyclopentane	0.04	7.56	0.60	1.20	2.04	1.19	1.95	3.27
Cyclohexane	0.04	14.82	0.04	1.08	1.40	0.71	1.83	4.26
2,4-Dimethylpentane	0.04	6.00	0.04	0.60	1.02	0.51	1.15	4.05
2-Methylhexane and 2,3-Dimethylpentane	0.04	24.72	0.84	1.98	3.96	2.20	4.91	3.17
3-Methylhexane	0.48	19.32	3.30	3.24	4.08	3.36	3.09	1.83
n-Heptane	0.04	14.04	0.36	0.96	1.80	0.93	2.24	3.65
Methylcyclohexane	0.04	8.34	0.04	1.20	1.63	0.53	1.82	6.74
2,2,4-Trimethylpentane	0.04	21.24	0.96	2.04	3.85	2.33	4.12	2.86
2,2,3-Trimethylpentane	0.04	5.64	0.04	0.04	0.70	0.16	1.12	6.07
2,3,4-Trimethylpentane	0.04	6.96	0.04	0.60	1.09	0.49	1.30	4.45
3-Methylheptane	0.04	7.86	0.04	0.48	1.19	0.36	1.72	5.90
n-Octane	0.04	4.92	0.04	0.48	0.76	0.38	0.80	4.12

Table B-10. Statistical Summary for New Orleans, Louisiana (NOLA), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methylheptane	0.04	3.60	0.04	0.36	0.54	0.21	0.70	4.66
n-Nonane	0.04	2.58	0.04	0.04	0.40	0.15	0.51	4.50
n-Decane	0.04	6.24	0.04	0.36	0.54	0.24	0.81	4.15
n-Undecane	0.04	23.04	0.04	0.48	0.97	0.32	2.68	4.70
n-Dodecane	0.04	4.56	0.04	0.04	0.23	0.06	0.62	3.38
n-Tridecane	0.04	1.92	0.04	0.04	0.26	0.08	0.49	3.83
Olefins:								
Ethylene	0.17	27.81	0.17	0.17	4.07	0.89	6.00	6.88
Acetylene	0.17	18.54	0.17	0.17	2.93	0.78	4.14	5.87
Propylene	0.17	15.57	0.17	1.77	2.86	1.36	3.19	4.09
Propyne	0.17	0.17	0.17	0.17	0.17	0.17	0.00	1.00
Isobutene and 1-Butene	0.04	9.36	0.96	1.32	2.02	1.39	1.80	2.71
1,3-Butadiene	0.04	3.78	0.04	0.04	0.68	0.14	1.02	6.21
t-2-Butene	0.04	1.92	0.04	0.04	0.28	0.08	0.50	4.02
c-2-Butene	0.04	1.44	0.04	0.04	0.22	0.08	0.33	3.59
3-Methyl-1-Butene	0.04	0.96	0.04	0.04	0.10	0.05	0.17	2.31
1-Pentene	0.04	17.28	0.04	0.04	0.72	0.11	2.34	5.38
2-Methyl-1-Butene	0.04	4.08	0.04	0.24	0.74	0.22	1.01	5.61
Isoprene	0.04	7.86	0.04	0.96	1.46	0.76	1.52	4.12
t-2-Pentene	0.04	4.68	0.04	0.48	0.86	0.27	1.08	5.77
c-2-Pentene	0.04	3.24	0.04	0.04	0.58	0.16	0.83	5.51

Table B-10. Statistical Summary for New Orleans, Louisiana (NOLA), 1995 Speciated NMOC Base Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability in Concentration (ppbC)	
Compound Name	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methyl-2-Butene	0.04	5.04	0.04	0.36	0.98	0.26	1.38	6.33
Cyclopentene	0.04	1.62	0.04	0.04	0.17	0.07	0.28	3.15
4-Methyl-1-Pentene	0.04	2.46	0.04	0.04	0.41	0.14	0.56	4.65
1-Hexene	0.04	29.64	0.04	0.04	0.92	0.13	3.42	6.02
2-Methyl-1-Pentene	0.04	5.28	0.04	0.04	0.15	0.05	0.64	2.34
2-Ethyl-1-Butene	0.04	2.10	0.04	0.04	0.09	0.05	0.28	2.04
t-2-Hexene	0.04	3.00	0.04	0.04	0.40	0.11	0.70	4.72
c-2-Hexene	0.04	1.08	0.04	0.04	0.15	0.07	0.23	3.01
1-Heptene	0.04	0.60	0.04	0.04	0.06	0.04	0.10	1.67
1-Octene	0.04	1.20	0.04	0.04	0.23	0.09	0.33	3.65
1-Nonene	0.04	0.72	0.04	0.04	0.06	0.04	0.09	1.61
a-Pinene	0.04	15.72	6.96	8.70	8.74	7.56	3.41	2.15
b-Pinene	1.92	18.36	6.12	6.12	6.56	6.19	2.32	1.42
1-Decene	0.04	2.58	0.04	0.04	0.07	0.04	0.29	1.60
1-Undecene	0.96	23.64	3.12	3.66	5.01	4.14	3.99	1.77
1-Dodecene	0.04	3.54	0.04	0.04	0.34	0.08	0.70	4.32
1-Tridecene	0.04	1.86	0.04	0.04	0.09	0.05	0.23	2.14
Total NMOC	**83.60**	**784.00**	**117.00**	**189.00**	**256.16**	**210.60**	**170.98**	**1.85**

Table B-11. Distribution Shape Characteristics for the Speciated NMOC Base Program

Compound Name	Cases	Nondetects	Test for Normal Distribution		Test for Lognormal Distribution		
			Skew	Kurtosis	Skew	Kurtosis	Results
Benzene	526	1	4.07	37.87	-0.48	1.64	Peaked, tails toward zero
Toluene	526	0	4.58	45.52	-0.06	-0.18	Flat, tails toward zero
Ethylbenzene	526	9	1.99	5.21	-0.97	3.19	Peaked, tails toward zero
p-Xylene + m-Xylene	526	3	2.02	5.23	-0.70	2.81	Peaked, tails toward zero
Styrene	526	9	4.97	37.76	-1.79	10.41	Peaked, tails toward zero
o-Xylene	526	16	1.89	4.57	-1.30	3.52	Peaked, tails toward zero
p-Diethylbenzene	526	176	1.49	4.59	-0.50	-1.49	Flat, tails toward zero
Isopropylbenzene	526	496	20.54	451.10	4.46	21.24	Peaked, tails toward infinity
n-Propylbenzene	526	178	3.83	33.98	-0.36	-1.46	Flat, tails toward zero
m-Ethyltoluene	526	30	1.24	1.15	-1.71	3.72	Peaked, tails toward zero
p-Ethyltoluene	526	76	1.45	2.34	-0.94	0.07	Peaked, tails toward zero
1,3,5-Trimethylbenzene	526	85	1.66	3.09	-0.88	-0.07	Flat, tails toward zero
o-Ethyltoluene	526	175	1.11	1.11	-0.51	-1.49	Flat, tails toward zero
1,2,4-Trimethylbenzene	526	5	1.38	1.62	-1.11	4.20	Peaked, tails toward zero
1,2,3-Trimethylbenzene	526	0	2.68	10.31	0.46	0.29	Peaked, tails toward infinity
Ethane	526	34	1.73	5.52	-1.44	2.07	Peaked, tails toward zero
Propane	526	7	20.07	436.53	-0.43	3.56	Peaked, tails toward zero
Isobutane	526	43	2.18	6.07	-1.37	1.95	Peaked, tails toward zero
n-Butane	526	4	3.54	17.10	-0.85	4.46	Peaked, tails toward zero
Isopentane	526	0	6.58	63.51	0.24	0.54	Peaked, tails toward infinity
n-Pentane	526	5	3.27	14.95	-0.90	3.53	Peaked, tails toward zero
Cyclopentane	526	179	15.79	298.83	-0.08	-0.99	Flat, tails toward zero
2,2-Dimethylbutane	526	82	4.38	29.13	-0.85	-0.14	Flat, tails toward zero
2,3-Dimethylbutane	526	55	16.20	320.13	-1.05	1.23	Peaked, tails toward zero

Table B-11. Distribution Shape Characteristics for the Speciated NMOC Base Program

Compound Name	Cases	Nondetects	Test for Normal Distribution		Test for Lognormal Distribution		Results
			Skew	Kurtosis	Skew	Kurtosis	
2-Methylpentane	526	3	2.20	8.00	-0.67	1.31	Peaked, tails toward zero
3-Methylpentane	526	10	1.78	4.94	-1.69	6.02	Peaked, tails toward zero
n-Hexane	526	9	1.90	4.79	-0.97	2.80	Peaked, tails toward zero
Methylcyclopentane	526	25	1.58	3.09	-1.30	2.59	Peaked, tails toward zero
Cyclohexane	526	97	4.18	22.39	-0.88	-0.13	Flat, tails toward zero
2,4-Dimethylpentane	526	62	1.81	4.67	-1.02	0.66	Peaked, tails toward zero
2-Methylhexane + 2,3-Dimethylpentane	526	25	19.55	416.54	-1.37	4.04	Peaked, tails toward zero
3-Methylhexane	526	3	20.24	436.65	-0.33	6.86	Peaked, tails toward zero
n-Heptane	526	32	18.97	400.44	-0.87	1.84	Peaked, tails toward zero
Methylcyclohexane	526	130	16.14	315.24	-0.65	-0.84	Flat, tails toward zero
2,2,4-Trimethylpentane	526	7	1.43	1.95	-1.15	4.03	Peaked, tails toward zero
2,2,3-Trimethylpentane	526	235	2.74	14.62	0.01	-1.75	Flat, tails toward infinity
2,3,4-Trimethylpentane	526	39	1.49	2.22	-1.13	1.56	Peaked, tails toward zero
3-Methylheptane	526	110	2.58	9.99	-0.72	-0.60	Flat, tails toward zero
n-Octane	526	96	2.68	13.83	-0.88	-0.25	Flat, tails toward zero
2-Methylheptane	526	151	1.64	6.12	-0.66	-1.18	Flat, tails toward zero
n-Nonane	526	163	5.86	59.35	-0.34	-1.20	Flat, tails toward zero
n-Decane	526	113	5.66	41.26	-0.42	-0.58	Flat, tails toward zero
n-Undecane	526	64	12.17	172.24	-0.43	1.11	Peaked, tails toward zero
n-Dodecane	526	412	9.62	119.45	1.64	1.21	Peaked, tails toward infinity
n-Tridecane	526	412	11.03	171.23	1.57	0.86	Peaked, tails toward infinity
Ethylene	526	136	1.31	1.69	-0.65	-1.08	Flat, tails toward zero
Acetylene	526	157	5.17	44.27	-0.41	-1.23	Flat, tails toward zero

Table B-11. Distribution Shape Characteristics for the Speciated NMOC Base Program

Compound Name	Cases	Nondetects	Test for Normal Distribution		Test for Lognormal Distribution		
			Skew	Kurtosis	Skew	Kurtosis	Results
Propylene	526	63	1.70	3.27	-1.03	0.69	Peaked, tails toward zero
Propyne	526	525	22.93	526.00	22.93	526.00	Peaked, tails toward infinity
Isobutene + 1-Butene	526	45	1.93	5.00	-1.61	2.55	Peaked, tails toward zero
1,3-Butadiene	526	300	1.42	0.98	0.45	-1.62	Flat, tails toward infinity
t-2-Butene	526	405	6.83	66.51	1.48	0.55	Peaked, tails toward infinity
c-2-Butene	526	361	6.95	68.06	1.06	-0.40	Flat, tails toward infinity
3-Methyl-1-Butene	526	428	6.90	63.60	1.87	2.09	Peaked, tails toward infinity
1-Pentene	526	289	4.07	19.33	0.68	-0.95	Flat, tails toward infinity
2-Methyl-1-Butene	526	100	5.19	38.96	-0.48	-0.50	Flat, tails toward zero
Isoprene	526	54	7.42	94.80	-0.78	0.55	Peaked, tails toward zero
t-2-Pentene	526	121	4.89	29.46	-0.45	-0.64	Flat, tails toward zero
c-2-Pentene	526	200	4.16	27.90	-0.12	-1.50	Flat, tails toward zero
2-Methyl-2-Butene	526	99	5.61	43.63	-0.65	-0.36	Flat, tails toward zero
Cyclopentene	526	397	4.23	21.86	1.42	0.44	Peaked, tails toward infinity
4-Methyl-1-Pentene	526	190	1.19	1.52	-0.37	-1.60	Flat, tails toward zero
1-Hexene	526	369	14.95	289.42	1.03	-0.70	Flat, tails toward infinity
2-Methyl-1-Pentene	526	509	11.67	176.60	5.53	29.78	Peaked, tails toward infinity
2-Ethyl-1-Butene	526	465	4.83	28.30	2.63	5.39	Peaked, tails toward infinity
t-2-Hexene	526	305	2.19	5.90	0.55	-1.43	Flat, tails toward infinity
c-2-Hexene	526	378	3.06	12.80	1.14	-0.43	Flat, tails toward infinity
1-Heptene	526	513	15.94	282.59	7.35	58.31	Peaked, tails toward infinity
1-Octene	526	285	1.94	5.86	0.33	-1.69	Flat, tails toward infinity
1-Nonene	526	497	5.35	30.01	4.13	15.75	Peaked, tails toward infinity
a-Pinene	526	51	1.30	1.37	-1.26	1.12	Peaked, tails toward zero

Table B-11. Distribution Shape Characteristics for the Speciated NMOC Base Program

Compound Name	Cases	Nondetects	Test for Normal Distribution		Test for Lognormal Distribution		
			Skew	Kurtosis	Skew	Kurtosis	Results
b-Pinene	526	2	1.54	3.90	-0.72	3.27	Peaked, tails toward zero
1-Decene	526	508	11.12	143.48	5.59	31.35	Peaked, tails toward infinity
1-Undecene	526	1	4.81	36.59	0.20	2.52	Peaked, tails toward infinity
1-Dodecene	526	392	2.93	11.58	1.23	-0.33	Flat, tails toward infinity
1-Tridecene	526	461	8.26	104.61	2.48	4.69	Peaked, tails toward infinity
TNMOC	526	0	3.97	31.14	0.04	-0.10	Flat, tails toward infinity
Average			5.97	81.65	0.37	9.89	

Table B-12. Shape Statistics for Tarrant City, Alabama (B1AL) 1995 Speciated NMOC Base Program

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
Benzene	77	0	4.19	26.60	-0.80	1.13
Toluene	77	0	0.41	-0.06	-1.13	0.83
Ethylbenzene	77	2	0.11	-0.91	-2.12	6.29
p-Xylene + m-Xylene	77	1	0.26	-0.76	-1.99	6.40
Styrene	77	0	1.23	1.16	0.03	-0.95
o-Xylene	77	3	0.20	-0.69	-2.24	6.05
p-Diethylbenzene	77	14	0.11	0.13	-1.46	0.47
Isopropylbenzene	77	70	3.88	15.29	3.08	8.08
n-Propylbenzene	77	13	1.95	9.84	-1.21	0.14
m-Ethyltoluene	77	4	0.01	-1.16	-2.17	5.23
p-Ethyltoluene	77	6	0.61	1.13	-1.67	2.37
1,3,5-Trimethylbenzene	77	6	0.01	-1.10	-1.75	2.64
o-Ethyltoluene	77	18	-0.09	-0.95	-1.13	-0.53
1,2,4-Trimethylbenzene	77	1	0.19	-0.80	-1.87	5.82
1,2,3-Trimethylbenzene	77	0	0.70	0.94	-1.01	3.53
Ethane	77	7	-0.04	-0.96	-1.94	3.03
Propane	77	2	0.72	0.57	-1.79	4.68
Isobutane	77	9	3.37	21.05	-1.73	2.01
n-Butane	77	0	0.20	-0.78	-1.10	0.92
Isopentane	77	0	1.47	5.10	-1.06	0.76
n-Pentane	77	2	0.09	-0.93	-2.22	6.52
Cyclopentane	77	23	4.69	30.55	-0.59	-1.17
2,2-Dimethylbutane	77	12	-0.09	-0.98	-1.24	0.06
2,3-Dimethylbutane	77	9	0.68	0.78	-1.57	1.47
2-Methylpentane	77	0	0.10	-1.06	-0.91	-0.19
3-Methylpentane	77	4	-0.15	-0.87	-2.67	7.63
n-Hexane	77	3	0.82	0.11	-1.69	3.92
Methylcyclopentane	77	3	0.01	-1.18	-1.79	3.80
Cyclohexane	77	15	1.73	2.40	-0.66	-0.69
2,4-Dimethylpentane	77	9	-0.06	-1.11	-1.46	1.06
2-Methylhexane + 2,3-Dimethylpentane	77	5	7.42	60.89	-1.87	4.70
3-Methylhexane	77	0	7.85	65.76	0.54	2.95
n-Heptane	77	4	7.15	57.83	-1.19	2.80
Methylcyclohexane	77	14	6.03	45.68	-1.09	0.01
2,2,4-Trimethylpentane	77	1	0.19	-0.82	-1.94	6.42
2,2,3-Trimethylpentane	77	22	-0.06	-1.24	-0.81	-1.21
2,3,4-Trimethylpentane	77	3	0.25	-0.71	-1.70	3.48
3-Methylheptane	77	14	1.31	4.90	-1.24	0.05
n-Octane	77	12	2.22	9.89	-1.26	0.42
2-Methylheptane	77	15	0.38	0.27	-1.24	-0.02
n-Nonane	77	15	3.04	17.18	-1.14	-0.11
n-Decane	77	9	5.42	35.91	-1.02	1.07

Table B-12. Shape Statistics for Tarrant City, Alabama (B1AL) 1995 Speciated NMOC Base Program (Continued)

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
n-Undecane	77	1	7.88	65.70	0.54	4.55
n-Dodecane	77	59	2.30	4.98	1.40	0.11
n-Tridecane	77	59	1.97	2.89	1.37	-0.01
Ethylene	77	11	0.18	-0.74	-1.51	0.98
Acetylene	77	10	4.93	34.67	-1.53	1.44
Propylene	77	9	0.52	-0.65	-1.20	0.57
Propyne	77	77	1.02	-2.05	1.02	-2.05
Isobutene + 1-Butene	77	9	0.95	1.39	-1.69	1.99
1,3-Butadiene	77	25	0.47	-1.10	-0.55	-1.50
t-2-Butene	77	46	0.88	-0.78	0.47	-1.74
c-2-Butene	77	28	0.37	-0.95	-0.42	-1.67
3-Methyl-1-Butene	77	49	0.85	-0.89	0.61	-1.62
1-Pentene	77	28	3.63	15.70	-0.10	-1.29
2-Methyl-1-Butene	77	8	1.52	4.47	-1.33	1.01
Isoprene	77	4	1.73	3.52	-1.39	3.15
t-2-Pentene	77	10	3.13	18.19	-1.32	0.77
c-2-Pentene	77	15	0.23	-0.55	-1.22	-0.08
2-Methyl-2-Butene	77	8	0.43	-0.67	-1.49	1.39
Cyclopentene	77	32	3.12	11.77	-0.04	-1.50
4-Methyl-1-Pentene	77	14	0.47	0.02	-1.33	0.26
1-Hexene	77	26	0.21	-0.71	-0.63	-1.54
2-Methyl-1-Pentene	77	74	5.04	24.75	4.87	22.38
2-Ethyl-1-Butene	77	49	1.95	4.03	0.71	-1.37
t-2-Hexene	77	24	1.79	7.96	-0.63	-1.36
c-2-Hexene	77	30	0.68	0.58	-0.31	-1.76
1-Heptene	77	75	8.75	76.66	7.29	55.64
1-Octene	77	23	0.54	0.47	-0.76	-1.26
1-Nonene	77	72	4.82	25.01	3.80	13.22
a-Pinene	77	3	1.24	1.40	-1.64	4.26
b-Pinene	77	0	1.24	2.39	-0.56	0.56
1-Decene	77	77	-1.02	-2.05	1.02	-2.05
1-Undecene	77	0	1.60	3.23	-0.22	2.02
1-Dodecene	77	58	2.05	3.68	1.27	-0.27
1-Tridecene	77	66	3.07	9.28	2.23	3.36
TNMOC	77	0	0.27	-0.13	-0.98	0.32

Table B-13. Shape Statistics for Pinson, Alabama (B2AL)
1995 Speciated NMOC Base Program

Compound Name	Cases	Non-detects	Normal Skew	Normal Kurtosis	Lognormal Skew	Lognormal Kurtosis
Benzene	80	2	0.93	1.36	-2.29	9.26
Toluene	80	0	1.59	6.17	-1.02	1.84
Ethylbenzene	80	6	1.32	5.16	-2.23	8.01
p-Xylene + m-Xylene	80	2	1.88	9.34	-2.88	11.80
Styrene	80	1	4.60	28.15	-1.96	16.29
o-Xylene	80	4	1.23	4.31	-2.17	7.50
p-Diethylbenzene	80	37	0.67	-0.40	-0.08	-1.94
Isopropylbenzene	80	79	8.94	80.00	8.94	80.00
n-Propylbenzene	80	48	4.90	33.15	0.08	-1.58
m-Ethyltoluene	80	7	0.79	2.22	-2.11	4.29
p-Ethyltoluene	80	32	2.07	7.90	-0.73	-0.96
1,3,5-Trimethylbenzene	80	24	1.53	5.86	-1.09	-0.28
o-Ethyltoluene	80	30	0.25	-0.52	-0.47	-1.74
1,2,4-Trimethylbenzene	80	4	1.04	3.07	-2.46	7.83
1,2,3-Trimethylbenzene	80	0	3.11	11.86	1.11	1.77
Ethane	80	20	3.10	16.49	-0.53	-1.05
Propane	80	2	1.59	6.27	-2.24	8.16
Isobutane	80	22	4.49	24.01	-0.63	-0.88
n-Butane	80	3	6.83	52.57	-1.90	8.84
Isopentane	80	0	6.61	51.23	-0.19	3.59
n-Pentane	80	2	4.75	29.70	-0.59	2.79
Cyclopentane	80	71	3.39	14.46	0.75	-0.98
2,2-Dimethylbutane	80	47	4.46	25.54	-0.08	-1.37
2,3-Dimethylbutane	80	15	2.90	14.00	-1.35	0.93
2-Methylpentane	80	2	4.34	25.68	-1.61	8.51
3-Methylpentane	80	5	2.71	11.56	-2.28	7.34
n-Hexane	80	5	3.45	17.18	-2.17	6.84
Methylcyclopentane	80	10	2.49	10.25	-1.74	2.50
Cyclohexane	80	35	3.61	16.50	-0.13	-1.49
2,4-Dimethylpentane	80	30	1.63	5.01	-1.14	0.21
2-Methylhexane + 2,3-Dimethylpentane	80	7	1.55	5.08	-2.12	4.33
3-Methylhexane	80	1	1.28	2.31	-0.37	1.25
n-Heptane	80	19	2.14	8.38	-1.52	1.72
Methylcyclohexane	80	50	2.73	11.43	0.55	-1.52
2,2,4-Trimethylpentane	80	2	1.84	5.75	-2.29	8.92
2,2,3-Trimethylpentane	80	53	6.55	49.69	0.87	-0.68
2,3,4-Trimethylpentane	80	16	1.91	6.31	-1.64	3.27
3-Methylheptane	80	46	2.44	10.35	-0.31	-1.48
n-Octane	80	66	1.59	4.79	0.13	-1.82
2-Methylheptane	80	52	0.84	-0.16	0.16	-1.88
n-Nonane	80	57	1.82	5.59	0.32	-1.75
n-Decane	80	62	4.72	27.12	0.92	-0.46

Table B-13. Shape Statistics for Pinson, Alabama (B2AL)
1995 Speciated NMOC Base Program
(Continued)

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
n-Undecane	80	39	5.02	31.83	-0.38	-0.55
n-Dodecane	80	66	5.92	38.92	1.83	2.20
n-Tridecane	80	64	4.87	29.26	1.74	1.49
Ethylene	80	22	0.46	-0.54	-0.69	-1.20
Acetylene	80	27	2.89	15.66	-0.41	-1.49
Propylene	80	12	0.99	4.41	-1.45	0.93
Propyne	80	80	1.02	-2.05	1.02	-2.05
Isobutene + 1-Butene	80	10	1.11	3.22	-1.73	1.99
1,3-Butadiene	80	55	2.87	9.99	0.82	-1.01
t-2-Butene	80	73	7.10	56.11	3.31	10.21
c-2-Butene	80	77	7.97	67.38	4.25	18.39
3-Methyl-1-Butene	80	78	8.19	69.43	6.58	43.75
1-Pentene	80	56	3.13	12.36	0.89	-0.93
2-Methyl-1-Butene	80	39	3.79	15.35	-0.21	-0.09
Isoprene	80	2	1.62	3.59	-0.34	-0.47
t-2-Pentene	80	36	6.64	52.11	-0.38	-0.98
c-2-Pentene	80	56	5.65	40.20	0.61	-1.13
2-Methyl-2-Butene	80	18	6.50	50.51	-0.89	0.37
Cyclopentene	80	77	6.18	43.17	3.95	14.81
4-Methyl-1-Pentene	80	25	1.12	2.88	-0.80	-1.06
1-Hexene	80	77	5.71	33.82	4.53	19.72
2-Methyl-1-Pentene	80	80	-1.02	-2.05	1.02	-2.05
2-Ethyl-1-Butene	80	79	7.31	55.88	6.45	41.60
t-2-Hexene	80	76	4.15	19.50	2.33	4.23
c-2-Hexene	80	77	4.27	18.04	3.77	12.79
1-Heptene	80	79	8.94	80.00	8.94	80.00
1-Octene	80	63	3.75	20.08	0.88	-0.91
1-Nonene	80	78	7.56	59.86	6.41	40.97
a-Pinene	80	1	0.58	-0.18	-1.89	6.44
b-Pinene	80	0	0.35	-0.86	-0.44	-0.66
1-Decene	80	78	6.50	42.44	6.22	37.63
1-Undecene	80	0	4.18	21.66	1.30	2.55
1-Dodecene	80	58	2.75	10.00	1.11	-0.63
1-Tridecene	80	73	3.77	16.53	2.44	4.35
TNMOC	80	0	2.16	7.69	-0.18	0.53

Table B-14. Shape Statistics for Helena, Alabama (B3AL)
1995 Speciated NMOC Base Program

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
Benzene	79	0	1.27	1.67	-0.19	-0.46
Toluene	79	0	1.37	2.06	-0.30	-0.38
Ethylbenzene	79	4	0.71	0.00	-1.85	4.36
p-Xylene + m-Xylene	79	0	0.89	0.33	-0.45	-0.31
Styrene	79	4	0.84	1.76	-2.68	8.32
o-Xylene	79	4	0.66	-0.24	-1.76	3.90
p-Diethylbenzene	79	54	2.60	8.60	0.90	-1.07
Isopropylbenzene	79	78	8.89	79.00	8.89	79.00
n-Propylbenzene	79	41	0.87	0.00	0.17	-1.90
m-Ethyltoluene	79	3	0.56	-0.36	-2.06	5.89
p-Ethyltoluene	79	14	2.26	10.11	-1.00	-0.03
1,3,5-Trimethylbenzene	79	22	0.70	-0.10	-0.70	-1.14
o-Ethyltoluene	79	33	1.31	3.37	-0.19	-1.86
1,2,4-Trimethylbenzene	79	0	0.90	0.41	-0.34	-0.58
1,2,3-Trimethylbenzene	79	0	2.79	9.87	0.78	0.94
Ethane	79	6	0.15	-0.16	-2.06	3.94
Propane	79	0	2.89	15.28	-0.25	1.02
Isobutane	79	8	2.86	8.27	-0.96	1.41
n-Butane	79	1	2.71	6.81	-0.20	3.07
Isopentane	79	0	2.93	8.42	0.68	0.06
n-Pentane	79	0	2.94	8.65	0.68	0.13
Cyclopentane	79	44	3.65	15.80	0.67	-0.97
2,2-Dimethylbutane	79	20	3.69	15.13	0.01	-0.68
2,3-Dimethylbutane	79	16	2.05	3.86	-0.53	-0.63
2-Methylpentane	79	2	2.63	6.76	-0.47	2.51
3-Methylpentane	79	1	2.31	5.27	-0.83	3.49
n-Hexane	79	1	2.44	5.84	-0.28	2.63
Methylcyclopentane	79	10	2.38	5.68	-0.98	0.86
Cyclohexane	79	36	0.96	0.34	-0.02	-1.87
2,4-Dimethylpentane	79	16	2.20	5.11	-0.73	-0.37
2-Methylhexane + 2,3-Dimethylpentane	79	12	1.74	3.29	-1.31	0.76
3-Methylhexane	79	3	1.46	2.25	-2.06	6.70
n-Heptane	79	12	2.28	5.33	-0.86	0.32
Methylcyclohexane	79	43	1.37	0.93	0.34	-1.74
2,2,4-Trimethylpentane	79	3	1.92	3.64	-1.41	4.17
2,2,3-Trimethylpentane	79	51	1.59	1.81	0.78	-1.26
2,3,4-Trimethylpentane	79	12	1.65	2.94	-0.96	0.26
3-Methylheptane	79	32	1.25	2.06	-0.20	-1.75
n-Octane	79	19	2.07	5.73	-0.71	-0.73
2-Methylheptane	79	48	1.50	1.78	0.56	-1.57
n-Nonane	79	32	0.30	-1.22	-0.28	-1.83
n-Decane	79	21	4.06	23.05	-0.50	-0.94

Table B-14. Shape Statistics for Helena, Alabama (B3AL)
1995 Speciated NMOC Base Program
(Continued)

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
n-Undecane	79	13	5.37	31.21	-0.64	0.79
n-Dodecane	79	66	6.20	44.93	2.15	3.35
n-Tridecane	79	67	4.15	21.17	2.14	3.03
Ethylene	79	32	0.92	0.20	-0.20	-1.77
Acetylene	79	35	0.65	-0.77	-0.09	-1.87
Propylene	79	17	0.56	-0.25	-0.98	-0.43
Propyne	79	79	1.02	-2.05	1.02	-2.05
Isobutene + 1-Butene	79	23	1.85	3.01	-0.54	-1.17
1,3-Butadiene	79	65	2.56	5.94	1.88	1.77
t-2-Butene	79	63	3.32	11.30	1.77	1.56
c-2-Butene	79	55	3.19	10.60	1.20	-0.09
3-Methyl-1-Butene	79	63	3.48	13.71	1.76	1.48
1-Pentene	79	41	1.91	2.57	0.61	-1.24
2-Methyl-1-Butene	79	21	2.84	8.13	0.04	-0.90
Isoprene	79	0	2.19	7.40	-0.22	-0.64
t-2-Pentene	79	25	3.25	11.52	-0.22	-1.18
c-2-Pentene	79	42	3.23	11.02	0.51	-1.22
2-Methyl-2-Butene	79	27	3.87	16.18	0.07	-1.04
Cyclopentene	79	66	3.94	16.71	2.11	3.02
4-Methyl-1-Pentene	79	19	0.63	-0.12	-0.93	-0.75
1-Hexene	79	59	2.94	9.32	1.38	0.19
2-Methyl-1-Pentene	79	76	5.40	29.36	4.97	23.43
2-Ethyl-1-Butene	79	57	2.13	4.38	1.14	-0.54
t-2-Hexene	79	50	2.26	4.59	0.91	-0.79
c-2-Hexene	79	67	2.70	6.86	2.05	2.40
1-Heptene	79	79	-1.02	-2.05	1.02	-2.05
1-Octene	79	51	1.07	-0.32	0.69	-1.48
1-Nonene	79	78	8.89	79.00	8.89	79.00
a-Pinene	79	1	1.54	2.95	-1.17	3.25
b-Pinene	79	0	1.22	1.36	-0.45	0.58
1-Decene	79	78	8.89	79.00	8.89	79.00
1-Undecene	79	1	3.21	13.42	-1.85	13.17
1-Dodecene	79	60	4.25	21.08	1.42	0.39
1-Tridecene	79	73	5.11	29.24	3.47	10.88
TNMOC	79	0	2.17	5.04	0.30	-0.16

Table B-15. Shape Statistics for Dallas, Texas (DLTX)
1995 Speciated NMOC Base Program

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
Benzene	83	0	1.61	3.00	0.40	-0.47
Toluene	83	0	5.60	40.57	0.77	0.77
Ethylbenzene	83	0	1.97	4.36	0.46	-0.42
p-Xylene + m-Xylene	83	0	2.33	7.21	0.29	-0.23
Styrene	83	1	6.96	56.14	-2.16	20.09
o-Xylene	83	1	1.77	3.51	-1.49	7.86
p-Diethylbenzene	83	10	0.87	1.04	-1.72	2.08
Isopropylbenzene	83	77	4.61	22.47	3.58	11.66
n-Propylbenzene	83	14	1.10	1.06	-1.14	0.21
m-Ethyltoluene	83	0	1.43	1.82	0.24	-0.64
p-Ethyltoluene	83	2	1.37	1.78	-1.54	5.85
1,3,5-Trimethylbenzene	83	1	1.33	1.14	-0.54	1.82
o-Ethyltoluene	83	22	0.91	0.39	-0.82	-0.99
1,2,4-Trimethylbenzene	83	1	1.41	1.72	-1.95	11.16
1,2,3-Trimethylbenzene	83	0	2.04	4.42	0.60	-0.08
Ethane	83	0	1.22	1.84	-0.18	0.06
Propane	83	0	1.47	2.69	0.01	-0.03
Isobutane	83	2	2.16	4.99	-2.16	9.59
n-Butane	83	0	1.05	1.04	-0.21	-0.19
Isopentane	83	0	8.41	74.29	1.45	5.08
n-Pentane	83	0	2.95	12.76	0.49	0.28
Cyclopentane	83	14	7.79	66.71	-0.79	0.69
2,2-Dimethylbutane	83	0	1.69	3.53	0.29	-0.57
2,3-Dimethylbutane	83	1	3.73	19.72	-0.96	6.28
2-Methylpentane	83	0	1.19	1.73	-0.17	-0.10
3-Methylpentane	83	0	1.62	3.57	0.24	-0.46
n-Hexane	83	0	1.84	4.03	0.50	-0.28
Methylcyclopentane	83	0	1.62	3.46	0.17	-0.35
Cyclohexane	83	2	4.53	30.60	-2.39	11.37
2,4-Dimethylpentane	83	6	4.22	25.62	-1.36	3.13
2-Methylhexane + 2,3-Dimethylpentane	83	0	9.04	82.09	2.40	12.45
3-Methylhexane	83	0	9.06	82.36	3.33	20.93
n-Heptane	83	0	8.95	81.04	1.98	9.38
Methylcyclohexane	83	0	8.68	77.53	1.73	7.14
2,2,4-Trimethylpentane	83	0	2.23	6.46	0.59	-0.30
2,2,3-Trimethylpentane	83	31	2.95	14.22	-0.21	-1.64
2,3,4-Trimethylpentane	83	0	1.61	2.45	0.41	-0.70
3-Methylheptane	83	2	1.49	2.42	-1.13	3.93
n-Octane	83	2	1.71	3.43	-1.47	5.98
2-Methylheptane	83	4	0.86	1.27	-2.45	7.73
n-Nonane	83	12	1.91	3.87	-0.85	0.19
n-Decane	83	1	4.86	31.32	-0.18	1.37

Table B-15. Shape Statistics for Dallas, Texas (DLTX)
1995 Speciated NMOC Base Program
(Continued)

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
n-Undecane	83	0	7.85	65.49	1.46	4.04
n-Dodecane	83	60	3.27	12.86	1.20	-0.29
n-Tridecane	83	61	2.42	5.78	1.21	-0.35
Ethylene	83	12	1.17	1.47	-1.31	0.66
Acetylene	83	16	3.13	11.50	-0.67	-0.31
Propylene	83	0	1.63	2.76	0.40	-0.43
Propyne	83	82	9.11	83.00	9.11	83.00
Isobutene + 1-Butene	83	0	2.07	4.97	0.61	-0.14
1,3-Butadiene	83	39	1.21	0.28	0.13	-1.76
t-2-Butene	83	69	2.56	6.57	1.85	1.58
c-2-Butene	83	64	1.85	2.31	1.38	0.01
3-Methyl-1-Butene	83	68	2.28	4.42	1.76	1.27
1-Pentene	83	49	3.59	15.14	0.85	-0.77
2-Methyl-1-Butene	83	5	2.19	5.30	-0.87	1.86
Isoprene	83	15	1.35	1.10	-0.75	-0.37
t-2-Pentene	83	8	5.30	33.45	-0.65	1.55
c-2-Pentene	83	17	1.81	4.02	-0.74	-0.59
2-Methyl-2-Butene	83	2	2.17	7.15	-1.03	3.13
Cyclopentene	83	65	4.29	20.93	1.65	1.29
4-Methyl-1-Pentene	83	26	0.91	0.89	-0.64	-1.36
1-Hexene	83	65	2.39	5.69	1.49	0.37
2-Methyl-1-Pentene	83	81	7.48	58.48	6.49	41.84
2-Ethyl-1-Butene	83	81	8.06	67.74	6.67	44.89
t-2-Hexene	83	47	1.42	1.32	0.47	-1.58
c-2-Hexene	83	62	3.50	15.19	1.35	0.19
1-Heptene	83	82	9.11	83.00	9.11	83.00
1-Octene	83	46	1.33	1.64	0.36	-1.73
1-Nonene	83	79	4.49	19.03	4.34	17.42
a-Pinene	83	17	2.95	15.34	-0.89	-0.52
b-Pinene	83	1	2.23	6.67	-2.24	13.17
1-Decene	83	80	7.21	56.22	5.26	27.06
1-Undecene	83	0	4.94	32.67	0.83	1.02
1-Dodecene	83	60	3.27	14.24	1.13	-0.55
1-Tridecene	83	73	7.33	60.09	2.69	6.34
TNMOC	83	0	5.94	44.45	1.01	2.24

Table B-16. Shape Statistics for Fort Worth, Texas (FWTX) 1995 Speciated NMOC Base Program

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
Benzene	79	0	1.40	1.55	-0.10	-0.13
Toluene	79	0	1.51	2.43	0.02	-0.59
Ethylbenzene	79	1	1.53	2.76	-1.26	5.36
p-Xylene + m-Xylene	79	0	1.62	2.87	-0.10	-0.04
Styrene	79	3	0.54	0.84	-3.21	12.50
o-Xylene	79	2	1.60	3.06	-1.84	6.66
p-Diethylbenzene	79	17	0.88	0.85	-1.12	-0.32
Isopropylbenzene	79	75	4.69	21.64	4.27	16.92
n-Propylbenzene	79	20	0.77	-0.07	-0.80	-0.92
m-Ethyltoluene	79	2	1.35	1.72	-1.92	7.04
p-Ethyltoluene	79	4	1.37	1.74	-1.51	3.55
1,3,5-Trimethylbenzene	79	5	1.45	1.94	-1.29	2.53
o-Ethyltoluene	79	19	0.90	0.61	-0.95	-0.72
1,2,4-Trimethylbenzene	79	0	1.47	2.14	0.05	-0.20
1,2,3-Trimethylbenzene	79	0	3.97	19.03	0.73	2.38
Ethane	79	0	2.14	7.70	-0.16	-0.04
Propane	79	0	6.37	47.71	0.93	2.84
Isobutane	79	0	2.22	5.93	0.26	-0.24
n-Butane	79	0	2.88	10.19	0.60	0.14
Isopentane	79	0	3.86	18.31	0.82	0.59
n-Pentane	79	1	2.78	9.04	-1.49	9.23
Cyclopentane	79	7	8.16	69.86	-0.02	1.96
2,2-Dimethylbutane	79	0	3.67	16.77	-0.48	2.83
2,3-Dimethylbutane	79	1	3.09	11.98	-0.58	3.56
2-Methylpentane	79	0	2.34	7.36	-0.27	1.04
3-Methylpentane	79	0	2.12	5.63	0.12	0.13
n-Hexane	79	0	2.01	4.50	0.35	-0.35
Methylcyclopentane	79	0	1.65	2.51	0.12	-0.31
Cyclohexane	79	0	0.84	0.00	-0.21	-0.37
2,4-Dimethylpentane	79	1	1.51	2.19	-0.67	2.96
2-Methylhexane + 2,3-Dimethylpentane	79	0	1.22	0.98	-0.02	-0.66
3-Methylhexane	79	0	1.02	0.50	-0.03	-0.70
n-Heptane	79	0	1.18	0.50	0.09	-0.79
Methylcyclohexane	79	0	0.53	-0.59	-0.40	-0.73
2,2,4-Trimethylpentane	79	0	1.26	0.80	0.24	-0.82
2,2,3-Trimethylpentane	79	19	1.16	1.19	-0.77	-0.92
2,3,4-Trimethylpentane	79	0	1.36	1.21	0.14	-0.73
3-Methylheptane	79	3	1.49	1.82	-0.99	2.39
n-Octane	79	2	1.26	1.71	-1.58	5.62
2-Methylheptane	79	3	2.96	14.35	-1.99	7.57
n-Nonane	79	12	1.57	3.45	-1.09	0.39
n-Decane	79	7	4.05	24.32	-1.31	2.13

Table B-16. Shape Statistics for Fort Worth, Texas (FWTX)
1995 Speciated NMOC Base Program
(Continued)

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
n-Undecane	79	6	6.09	43.95	-0.97	2.72
n-Dodecane	79	65	8.49	74.08	2.13	3.79
n-Tridecane	79	65	8.37	72.53	2.17	3.98
Ethylene	79	10	1.27	1.16	-1.11	0.49
Acetylene	79	20	1.19	1.00	-0.80	-0.90
Propylene	79	3	1.30	1.24	-1.25	3.48
Propyne	79	79	1.02	-2.05	1.02	-2.05
Isobutene + 1-Butene	79	0	1.51	1.77	0.02	1.11
1,3-Butadiene	79	43	1.39	1.42	0.32	-1.78
t-2-Butene	79	56	4.56	24.01	1.19	-0.18
c-2-Butene	79	51	4.77	26.23	0.94	-0.60
3-Methyl-1-Butene	79	60	5.14	31.26	1.53	0.88
1-Pentene	79	41	3.66	12.58	0.77	-0.49
2-Methyl-1-Butene	79	8	4.78	25.61	-0.50	1.30
Isoprene	79	14	0.99	1.13	-1.12	0.09
t-2-Pentene	79	9	4.12	20.05	-0.58	0.88
c-2-Pentene	79	20	3.92	19.38	-0.42	-0.82
2-Methyl-2-Butene	79	6	4.41	22.69	-0.71	1.71
Cyclopentene	79	60	3.89	17.83	1.46	0.57
4-Methyl-1-Pentene	79	22	1.42	3.60	-0.72	-1.11
1-Hexene	79	58	2.57	7.36	1.18	-0.45
2-Methyl-1-Pentene	79	77	7.22	54.45	6.28	38.97
2-Ethyl-1-Butene	79	76	8.66	76.12	5.87	36.48
t-2-Hexene	79	48	1.71	2.54	0.66	-1.37
c-2-Hexene	79	52	2.37	5.83	0.89	-0.92
1-Heptene	79	77	6.64	45.01	6.26	38.58
1-Octene	79	36	2.46	8.89	0.06	-1.69
1-Nonene	79	76	5.30	28.02	4.99	23.66
a-Pinene	79	23	1.99	5.85	-0.64	-1.22
b-Pinene	79	1	1.77	5.08	-2.52	15.17
1-Decene	79	69	2.56	5.21	2.32	3.56
1-Undecene	79	0	4.10	24.07	0.04	2.55
1-Dodecene	79	62	2.11	3.52	1.50	0.38
1-Tridecene	79	68	2.46	4.88	2.17	2.87
TNMOC	79	0	1.71	3.28	0.31	-0.39

Table B-17. Shape Statistics for Juarez, Mexico (JUMX)
1995 Speciated NMOC Base Program

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
Benzene	49	0	0.95	1.56	-0.53	-0.24
Toluene	49	0	2.03	6.55	-0.14	-0.05
Ethylbenzene	49	0	1.30	1.19	-0.11	-0.48
p-Xylene + m-Xylene	49	0	1.47	1.85	-0.07	-0.56
Styrene	49	0	3.53	14.57	1.00	1.68
o-Xylene	49	0	1.32	1.33	-0.13	-0.61
p-Diethylbenzene	49	5	2.54	9.75	-1.71	2.75
Isopropylbenzene	49	42	3.11	9.71	2.26	3.54
n-Propylbenzene	49	4	0.34	-0.22	-2.24	4.81
m-Ethyltoluene	49	1	0.75	0.12	-1.96	7.12
p-Ethyltoluene	49	1	0.91	0.14	-1.24	3.20
1,3,5-Trimethylbenzene	49	2	1.54	2.23	-1.26	3.07
o-Ethyltoluene	49	7	1.37	2.23	-1.51	1.30
1,2,4-Trimethylbenzene	49	0	0.95	0.64	-0.69	0.59
1,2,3-Trimethylbenzene	49	0	2.26	7.87	0.19	0.60
Ethane	49	0	2.25	6.83	0.22	0.16
Propane	49	3	6.63	45.38	-1.75	5.27
Isobutane	49	0	1.00	0.99	-0.15	-0.84
n-Butane	49	0	1.64	4.03	-0.07	-0.51
Isopentane	49	0	3.15	13.37	0.26	0.07
n-Pentane	49	1	1.74	4.48	-3.04	15.45
Cyclopentane	49	4	6.01	38.87	-0.73	2.75
2,2-Dimethylbutane	49	10	0.29	-1.04	-0.71	-1.08
2,3-Dimethylbutane	49	2	5.68	36.37	-1.34	4.99
2-Methylpentane	49	0	1.14	1.93	-0.23	-0.78
3-Methylpentane	49	0	0.83	0.24	-0.31	-0.36
n-Hexane	49	0	1.09	1.31	-0.12	-0.87
Methylcyclopentane	49	0	0.71	0.27	-0.29	-1.03
Cyclohexane	49	0	1.30	3.03	-0.15	-0.31
2,4-Dimethylpentane	49	2	1.06	1.80	-2.16	6.74
2-Methylhexane + 2,3-Dimethylpentane	49	0	3.68	19.57	-0.30	0.56
3-Methylhexane	49	0	5.26	32.91	0.61	2.28
n-Heptane	49	0	3.83	20.41	-0.12	0.34
Methylcyclohexane	49	0	3.49	15.56	0.42	-0.25
2,2,4-Trimethylpentane	49	0	1.04	2.07	-0.71	0.46
2,2,3-Trimethylpentane	49	13	1.22	3.40	-0.82	-1.03
2,3,4-Trimethylpentane	49	2	0.93	1.18	-1.90	5.39
3-Methylheptane	49	5	0.90	1.02	-1.51	1.86
n-Octane	49	2	4.66	26.87	-1.06	4.07
2-Methylheptane	49	6	0.74	0.92	-1.70	2.07
n-Nonane	49	5	4.45	23.30	-0.44	1.53
n-Decane	49	0	2.61	6.16	1.02	0.65

Table B-17. Shape Statistics for Juarez, Mexico (JUMX) 1995 Speciated NMOC Base Program (Continued)

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
n-Undecane	49	0	3.13	10.20	1.40	1.53
n-Dodecane	49	32	5.39	32.80	0.94	-0.66
n-Tridecane	49	33	3.86	16.87	0.98	-0.70
Ethylene	49	6	1.07	2.24	-1.74	2.12
Acetylene	49	6	1.08	2.64	-1.70	1.98
Propylene	49	2	1.23	2.94	-1.82	5.12
Propyne	49	49	1.03	-2.09	1.03	-2.09
Isobutene + 1-Butene	49	0	1.90	6.97	-0.36	0.67
1,3-Butadiene	49	25	1.14	0.16	0.22	-1.84
t-2-Butene	49	36	1.99	4.36	1.15	-0.60
c-2-Butene	49	29	4.00	17.48	0.69	-0.97
3-Methyl-1-Butene	49	40	1.95	2.46	1.72	1.04
1-Pentene	49	23	1.66	3.16	0.10	-1.78
2-Methyl-1-Butene	49	5	0.78	0.57	-1.54	1.85
Isoprene	49	10	6.37	42.12	0.06	1.46
t-2-Pentene	49	11	3.79	14.49	-0.34	-0.37
c-2-Pentene	49	13	1.32	2.72	-0.80	-0.99
2-Methyl-2-Butene	49	6	1.79	4.24	-1.14	0.73
Cyclopentene	49	38	2.11	3.91	1.47	0.38
4-Methyl-1-Pentene	49	42	2.54	5.07	2.22	3.21
1-Hexene	49	32	1.24	0.56	0.71	-1.49
2-Methyl-1-Pentene	49	46	4.11	16.20	3.82	13.26
2-Ethyl-1-Butene	49	49	1.03	-2.09	1.03	-2.09
t-2-Hexene	49	13	1.23	2.06	-0.64	-1.10
c-2-Hexene	49	31	1.56	2.06	0.70	-1.37
1-Heptene	49	45	4.74	21.89	3.62	12.44
1-Octene	49	19	0.13	-1.48	-0.36	-1.81
1-Nonene	49	38	1.74	1.58	1.42	0.08
a-Pinene	49	5	2.74	10.26	-1.19	1.27
b-Pinene	49	0	0.48	-0.45	-0.24	-0.74
1-Decene	49	48	7.00	49.00	7.00	49.00
1-Undecene	49	0	2.47	7.35	0.85	0.38
1-Dodecene	49	32	1.17	0.11	0.70	-1.52
1-Tridecene	49	39	2.11	4.00	1.57	0.59
TNMOC	49	0	3.13	13.47	0.52	0.25

Table B-18. Shape Statistics for New Orleans, Louisiana (NOLA) 1995 Speciated NMOC Base Program

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
Benzene	79	0	1.54	2.09	0.21	-0.78
Toluene	79	0	1.76	2.98	0.50	-0.77
Ethylbenzene	79	0	1.67	2.49	0.37	-0.87
p-Xylene + m-Xylene	79	0	1.66	2.40	0.26	-1.02
Styrene	79	0	2.00	6.14	0.48	1.27
o-Xylene	79	4	1.65	2.30	-0.98	2.01
p-Diethylbenzene	79	39	1.34	1.31	0.14	-1.84
Isopropylbenzene	79	75	4.28	17.07	4.19	16.02
n-Propylbenzene	79	49	6.55	50.90	0.76	-1.02
m-Ethyltoluene	79	14	1.69	2.53	-0.96	0.02
p-Ethyltoluene	79	28	1.65	2.22	-0.03	-1.48
1,3,5-Trimethylbenzene	79	32	2.82	10.86	0.09	-1.47
o-Ethyltoluene	79	46	1.57	2.01	0.49	-1.63
1,2,4-Trimethylbenzene	79	0	1.72	2.66	0.68	-0.54
1,2,3-Trimethylbenzene	79	0	4.42	24.07	1.10	2.90
Ethane	79	1	0.78	-0.33	-0.98	2.37
Propane	79	0	1.56	4.02	-0.11	-1.03
Isobutane	79	2	1.15	1.42	-1.18	2.55
n-Butane	79	0	1.31	1.52	-0.02	-1.19
Isopentane	79	0	1.99	4.35	0.17	-1.03
n-Pentane	79	1	1.76	3.60	-0.77	2.49
Cyclopentane	79	38	1.41	1.50	0.17	-1.73
2,2-Dimethylbutane	79	8	2.11	10.77	-1.78	2.38
2,3-Dimethylbutane	79	14	8.66	76.20	-0.41	0.28
2-Methylpentane	79	0	1.57	2.32	0.21	-1.15
3-Methylpentane	79	2	1.38	1.50	-1.72	6.28
n-Hexane	79	1	1.59	1.94	-0.47	1.03
Methylcyclopentane	79	3	1.17	0.35	-0.71	0.74
Cyclohexane	79	13	5.34	37.73	-1.04	0.27
2,4-Dimethylpentane	79	14	2.02	4.52	-0.68	-0.30
2-Methylhexane + 2,3-Dimethylpentane	79	2	2.42	6.18	-0.59	2.40
3-Methylhexane	79	0	2.83	10.27	0.19	1.40
n-Heptane	79	6	2.87	11.30	-0.69	0.79
Methylcyclohexane	79	25	1.54	2.91	-0.45	-1.45
2,2,4-Trimethylpentane	79	1	1.80	3.37	-0.33	1.58
2,2,3-Trimethylpentane	79	48	2.14	5.05	0.62	-1.43
2,3,4-Trimethylpentane	79	16	2.01	4.78	-0.55	-0.63
3-Methylheptane	79	26	2.12	4.37	-0.07	-1.38
n-Octane	79	19	2.33	8.84	-0.65	-0.84
2-Methylheptane	79	34	2.36	7.13	0.02	-1.63
n-Nonane	79	43	1.75	3.63	0.35	-1.69
n-Decane	79	27	4.80	31.64	-0.17	-1.27

Table B-18. Shape Statistics for New Orleans, Louisiana (NOLA) 1995 Speciated NMOC Base Program (Continued)

Compound Name	Cases	Non-detects	Normal		Lognormal	
			Skew	Kurtosis	Skew	Kurtosis
n-Undecane	79	24	7.44	60.56	-0.10	-0.64
n-Dodecane	79	67	4.96	30.50	2.16	3.12
n-Tridecane	79	63	2.16	3.51	1.59	0.67
Ethylene	79	43	1.83	3.36	0.39	-1.67
Acetylene	79	43	1.69	2.46	0.38	-1.66
Propylene	79	20	1.90	4.08	-0.40	-1.06
Propyne	79	79	1.02	-2.05	1.02	-2.05
Isobutene + 1-Butene	79	3	2.10	4.87	-1.47	4.69
1,3-Butadiene	79	52	1.46	1.05	0.75	-1.38
t-2-Butene	79	62	1.85	2.05	1.46	0.22
c-2-Butene	79	59	1.74	2.15	1.21	-0.45
3-Methyl-1-Butene	79	70	3.13	9.78	2.54	4.74
1-Pentene	79	56	5.85	37.16	1.28	0.28
2-Methyl-1-Butene	79	36	1.45	1.04	0.24	-1.61
Isoprene	79	11	2.00	4.80	-0.98	0.31
t-2-Pentene	79	33	1.53	1.74	-0.03	-1.68
c-2-Pentene	79	46	1.56	1.57	0.51	-1.57
2-Methyl-2-Butene	79	36	1.57	1.34	0.18	-1.62
Cyclopentene	79	61	2.62	8.40	1.43	0.25
4-Methyl-1-Pentene	79	45	1.74	2.80	0.45	-1.62
1-Hexene	79	53	7.82	65.87	1.07	-0.29
2-Methyl-1-Pentene	79	75	7.10	54.28	4.48	19.47
2-Ethyl-1-Butene	79	75	5.94	37.45	4.47	19.20
t-2-Hexene	79	55	2.20	4.44	1.03	-0.74
c-2-Hexene	79	61	1.98	3.22	1.41	0.13
1-Heptene	79	76	5.02	24.09	4.94	23.04
1-Octene	79	57	1.52	1.04	1.08	-0.77
1-Nonene	79	76	6.07	39.42	5.08	25.02
a-Pinene	79	1	-0.13	-0.18	-4.59	28.99
b-Pinene	79	0	1.68	7.54	-0.51	2.17
1-Decene	79	78	8.89	79.00	8.89	79.00
1-Undecene	79	0	2.99	10.32	0.78	1.25
1-Dodecene	79	62	2.84	9.03	1.50	0.41
1-Tridecene	79	72	6.29	45.35	3.27	9.88
TNMOC	79	0	1.20	0.60	0.39	-1.00

Appendix C

Statistical Analysis Results for the Speciated NMOC Option

Table C-1. Number and Frequency of Occurrence for the 1995 Speciated NMOC Option Program

	Overall		NWNJ		P2NJ	
Compound	Occurrence	Frequency	Occurrence	Frequency	Number	Frequency
Benzene	16	100%	8	100%	8	100%
Toluene	16	100%	8	100%	8	100%
Ethylbenzene	16	100%	8	100%	8	100%
m-Xylene/p-Xylene	16	100%	8	100%	8	100%
Styrene	16	100%	8	100%	8	100%
o-Xylene	16	100%	8	100%	8	100%
Isopropylbenzene	9	56%	5	63%	4	50%
n-Propylbenzene	16	100%	8	100%	8	100%
m-Ethyltoluene	16	100%	8	100%	8	100%
p-Ethyltoluene	14	88%	7	88%	7	88%
1,3,5-Trimethylbenzene	16	100%	8	100%	8	100%
o-Ethyltoluene	16	100%	8	100%	8	100%
1,2,4-Trimethylbenzene	16	100%	8	100%	8	100%
1,2,3-Trimethylbenzene	16	100%	8	100%	8	100%
m-Diethylbenzene	10	63%	6	75%	4	50%
p-Diethylbenzene	15	94%	8	100%	7	88%
AromaticAverage	**15**	**94%**	**8**	**95%**	**7**	**92%**
Ethane	15	94%	8	100%	7	88%
Propane	16	100%	8	100%	8	100%
Isobutane	16	100%	8	100%	8	100%
n-Butane	16	100%	8	100%	8	100%
Isopentane	16	100%	8	100%	8	100%
n-Pentane	16	100%	8	100%	8	100%
2,2-Dimethylbutane	16	100%	8	100%	8	100%
Cyclopentane	15	94%	7	88%	8	100%
2,3-Dimethylbutane	15	94%	7	88%	8	100%
2-Methylpentane	16	100%	8	100%	8	100%
3-Methylpentane	14	88%	8	100%	6	75%
n-Hexane	16	100%	8	100%	8	100%
Methylcyclopentane	16	100%	8	100%	8	100%
2,4-Dimethylpentane	16	100%	8	100%	8	100%
Cyclohexane	15	94%	7	88%	8	100%
2-Methylhexane	16	100%	8	100%	8	100%
2,3-Dimethylpentane	16	100%	8	100%	8	100%
3-Methylhexane	16	100%	8	100%	8	100%
2,2,4-Trimethylpentane	16	100%	8	100%	8	100%
n-Heptane	16	100%	8	100%	8	100%
Methylcyclohexane	15	94%	7	88%	8	100%
2,2,3-Trimethylpentane	15	94%	7	88%	8	100%
2,3,4-Trimethylpentane	16	100%	8	100%	8	100%

Table C-1. Number and Frequency of Occurrence for the 1995 Speciated NMOC Option Program

	Overall		NWNJ		P2NJ	
Compound	**Occurrence**	**Frequency**	**Occurrence**	**Frequency**	**Number**	**Frequency**
2-Methylheptane	16	100%	8	100%	8	100%
3-Methylheptane	16	100%	8	100%	8	100%
n-Octane	16	100%	8	100%	8	100%
n-Nonane	16	100%	8	100%	8	100%
n-Decane	11	69%	7	88%	4	50%
n-Undecane	16	100%	8	100%	8	100%
n-Dodecane	16	100%	8	100%	8	100%
Paraffin Average	**16**	**97%**	**8**	**98%**	**8**	**97%**
Ethylene	16	100%	8	100%	8	100%
Acetylene	16	100%	8	100%	8	100%
Propylene	16	100%	8	100%	8	100%
Propyne	13	81%	7	88%	6	75%
Isobutene	16	100%	8	100%	8	100%
1-Butene	7	44%	4	50%	3	38%
1,3-Butadiene	16	100%	8	100%	8	100%
trans-2-Butene	15	94%	7	88%	8	100%
cis-2-Butene	15	94%	7	88%	8	100%
3-Methyl-1-butene	14	88%	7	88%	7	88%
1-Pentene	15	94%	7	88%	8	100%
2-Methyl-1-butene	15	94%	7	88%	8	100%
Isoprene	16	100%	8	100%	8	100%
trans-2-Pentene	16	100%	8	100%	8	100%
cis-2-Pentene	15	94%	7	88%	8	100%
2-Methyl-2-butene	16	100%	8	100%	8	100%
Cyclopentene	15	94%	7	88%	8	100%
4-Methyl-1-pentene	9	56%	4	50%	5	63%
1-Hexene	5	31%	3	38%	2	25%
2-Methyl-1-pentene	12	75%	6	75%	6	75%
2-Ethyl-1-butene	0	0%	0	0%	0	0%
trans-2-Hexene	14	88%	7	88%	7	88%
cis-2-Hexene	13	81%	7	88%	6	75%
1-Heptene	15	94%	7	88%	8	100%
1-Octene	15	94%	7	88%	8	100%
1-Nonene	5	31%	3	38%	2	25%
a-Pinene	16	100%	8	100%	8	100%
b-Pinene	14	88%	8	100%	6	75%
1-Decene	16	100%	8	100%	8	100%
1-Undecene	16	100%	8	100%	8	100%
1-Dodecene	7	44%	6	75%	1	13%
Olefin Average	**13**	**82%**	**7**	**83%**	**7**	**82%**

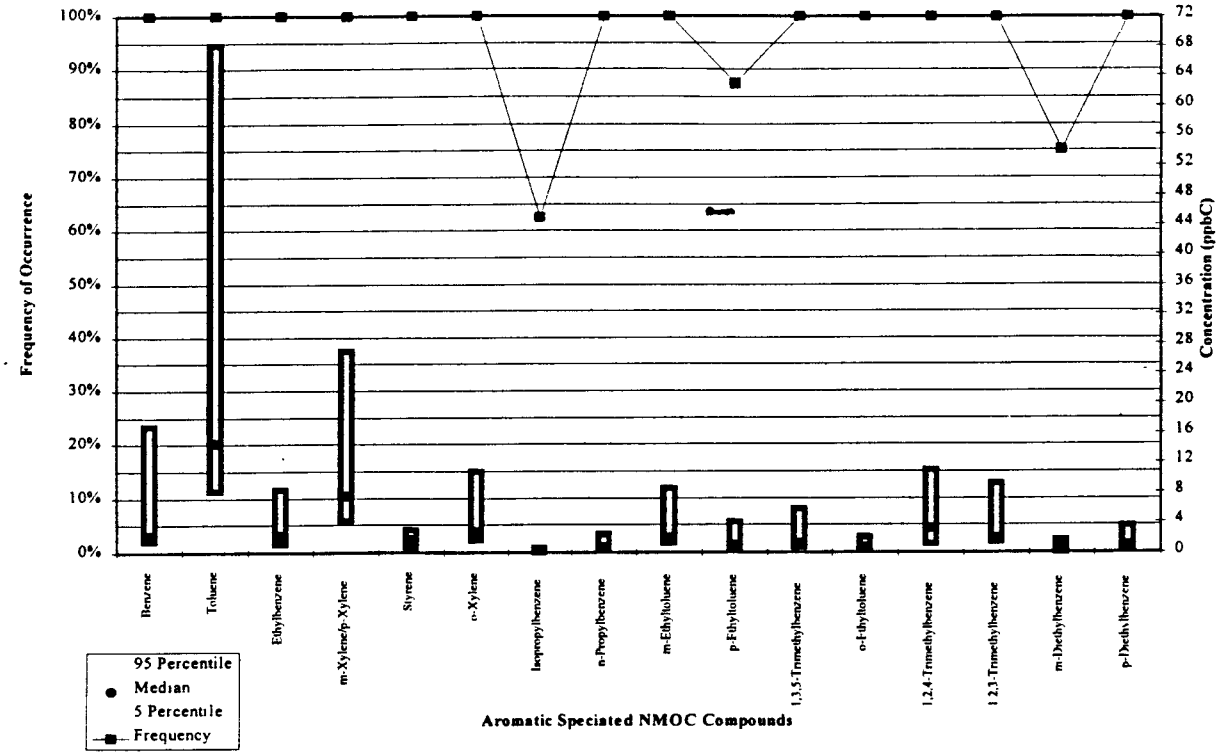

Figure C-1. Frequency and Concentration Distribution of Aromatics at NWNJ in 1995

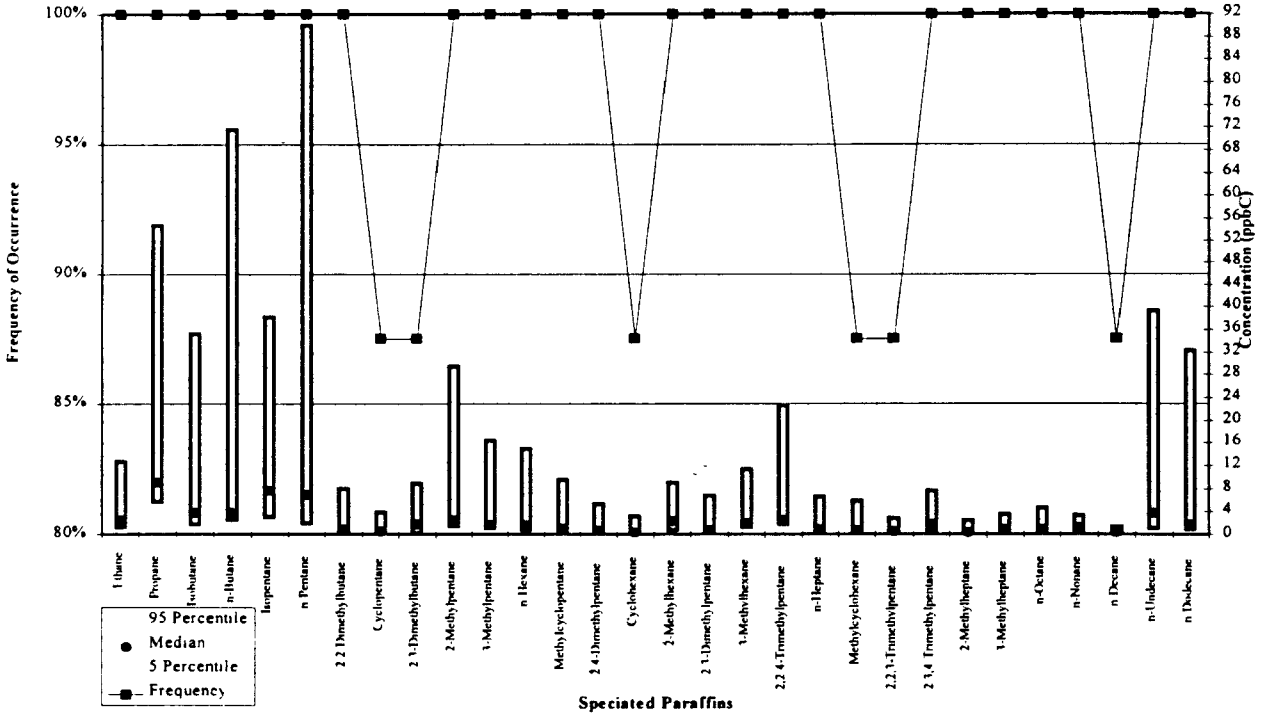

Figure C-2. Frequency and Concentration Distribution of Paraffins at NWNJ in 1995

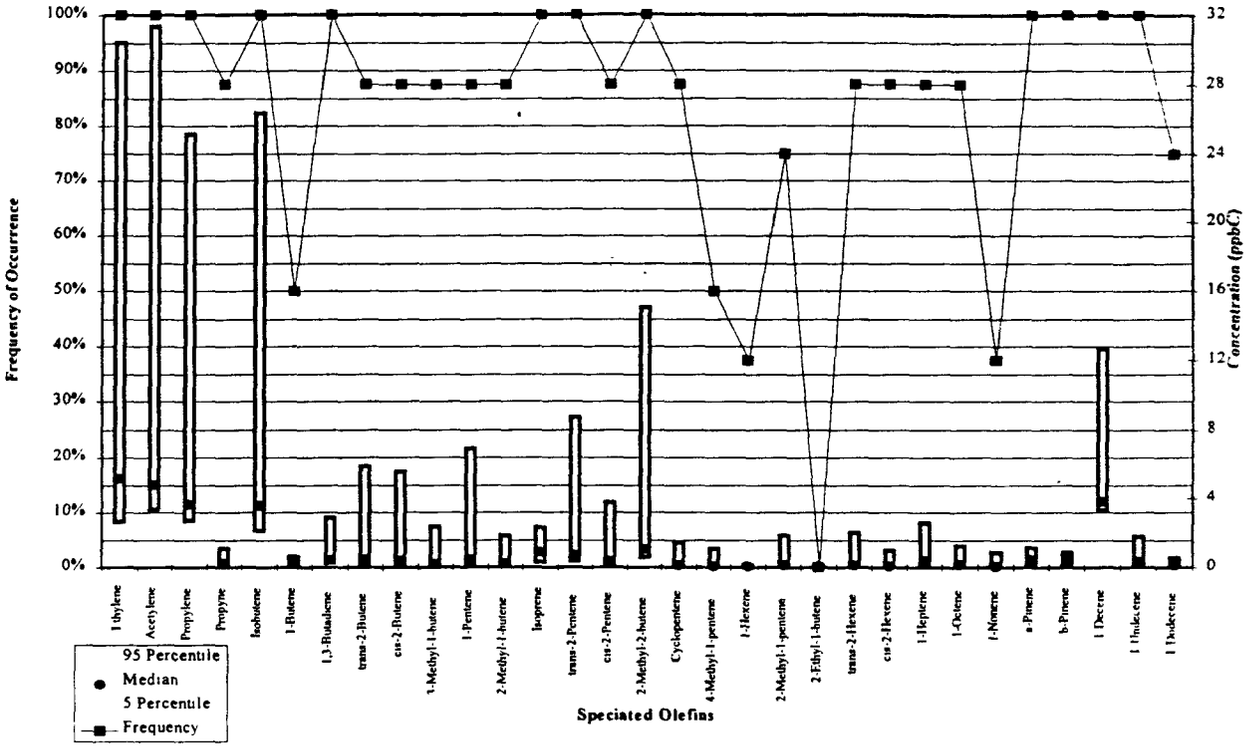

Figure C-3. Frequency and Concentration Distribution of Olefins at NWNJ in 1995

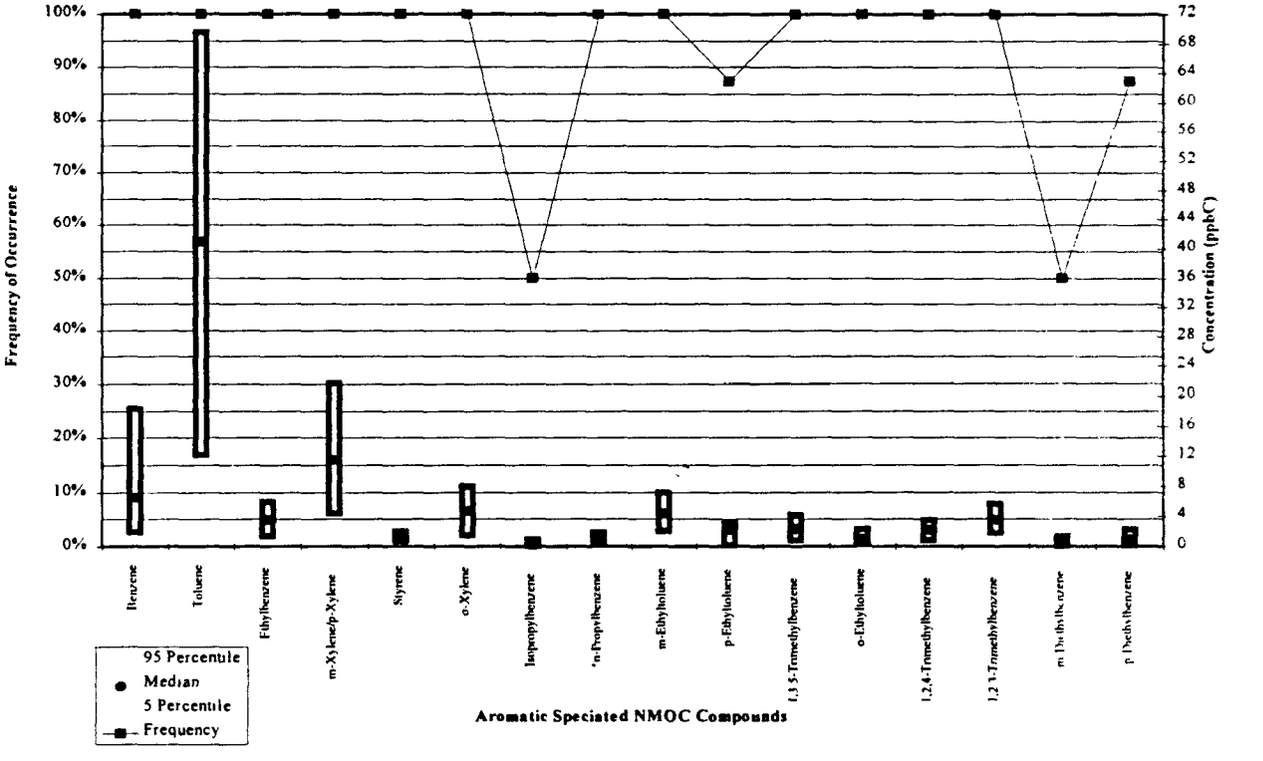

Figure C-4. Frequency and Concentration Distribution of Aromatics at P2NJ in 1995

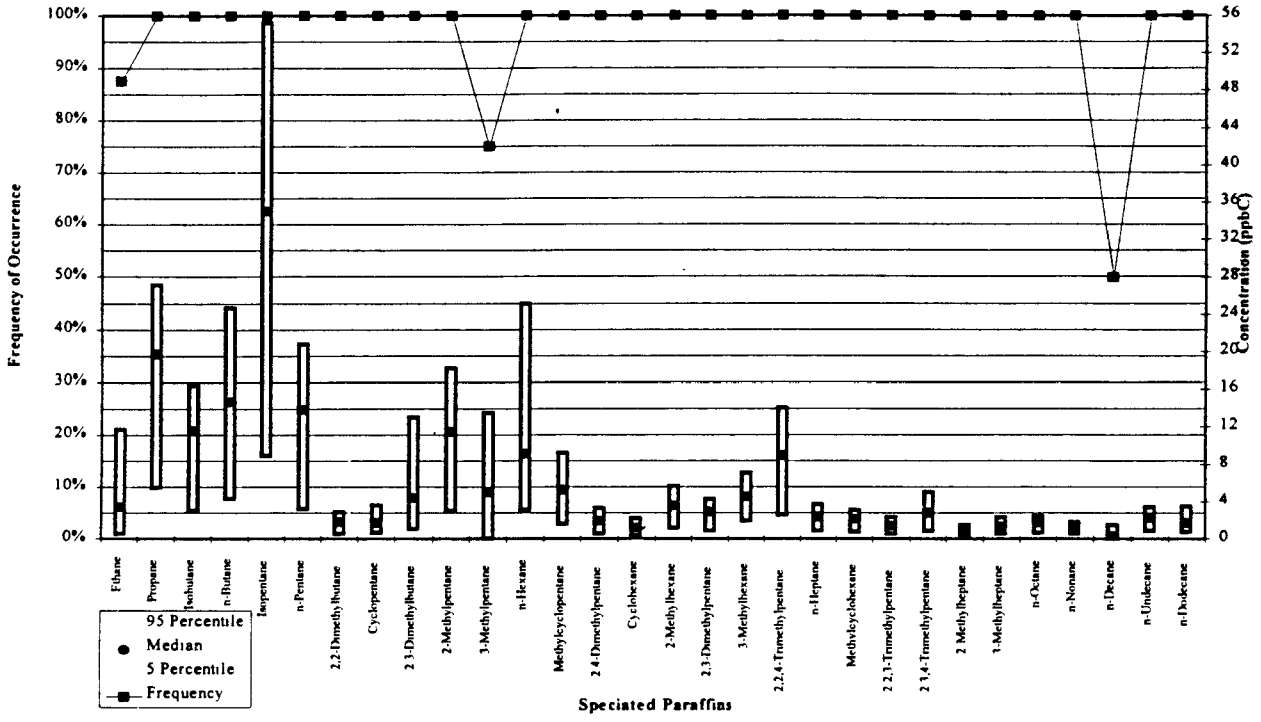

Figure C-5. Frequency and Concentration Distribution for Paraffins at P2NJ in 1995

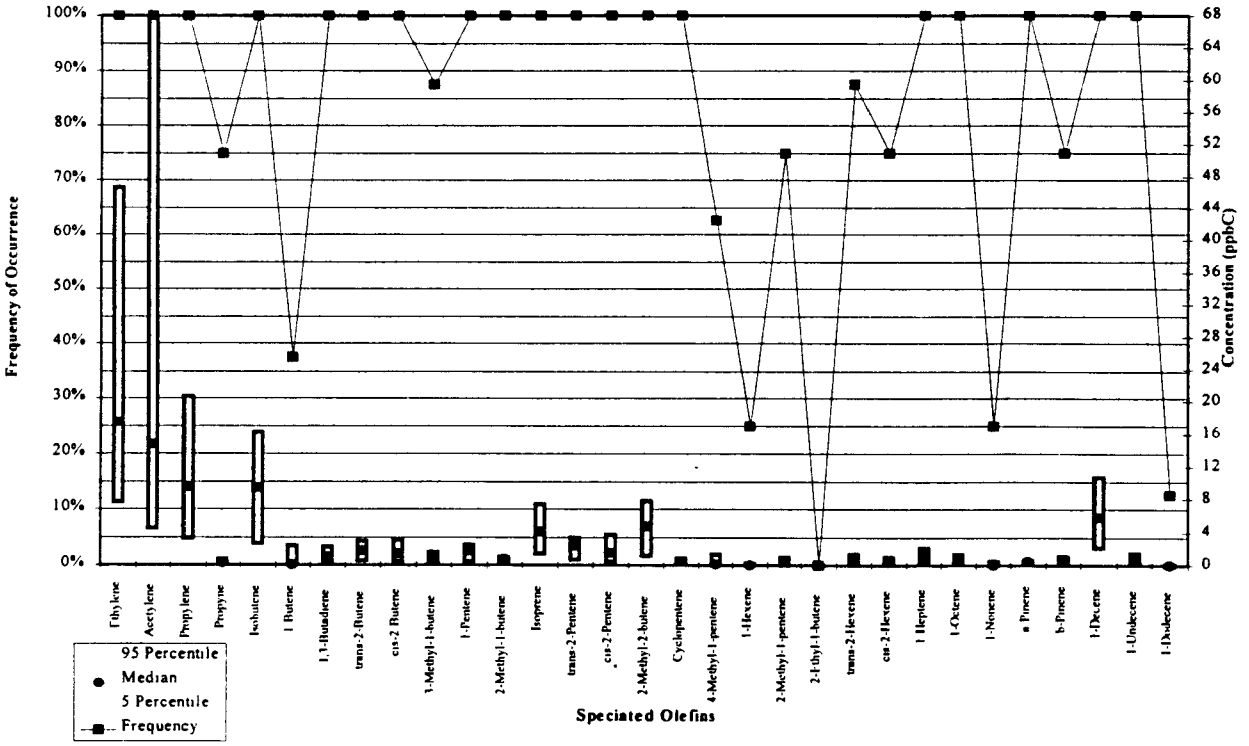

Figure C-6. Frequency and Concentration Distribution for Olefins at P2NJ in 1995

Table C-2. Summary Statistics for the 1995 Speciated NMOC Option Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Benzene	1.35	22.40	1.81	4.10	6.88	4.53	6.60	2.58
Toluene	7.54	80.15	None	28.33	33.77	25.44	24.46	2.24
Ethylbenzene	0.94	9.40	None	2.83	3.65	2.96	2.41	1.98
m-Xylene/p-Xylene	3.76	30.10	None	9.44	12.46	10.18	8.00	1.95
Styrene	0.57	3.33	None	1.27	1.48	1.29	0.79	1.71
o-Xylene	1.12	12.39	None	3.81	4.66	3.76	3.13	2.00
Isopropylbenzene	0.04	1.08	0.04	0.20	0.30	0.15	0.33	3.73
n-Propylbenzene	0.23	2.73	None	0.89	1.09	0.85	0.73	2.16
m-Ethyltoluene	1.14	9.41	None	3.98	3.99	3.26	2.54	1.97
p-Ethyltoluene	0.04	4.64	0.04	1.60	1.74	1.01	1.31	4.18
1,3,5-Trimethylbenzene	0.64	7.03	1.17	1.63	2.29	1.79	1.75	2.05
o-Ethyltoluene	0.17	2.62	None	0.77	1.05	0.84	0.70	2.05
1,2,4-Trimethylbenzene	0.66	13.67	3.64	2.48	3.19	2.38	3.11	2.12
1,2,3-Trimethylbenzene	1.30	10.96	1.68	3.24	3.65	3.02	2.51	1.86
m-Diethylbenzene	0.04	1.89	0.04	0.52	0.59	0.25	0.59	4.86
p-Diethylbenzene	0.04	4.05	None	0.98	1.22	0.81	1.05	2.98
Total Aromatics	**23.91**	**204.77**	**None**	**71.40**	**81.95**	**66.03**	**53.01**	**2.02**
Ethane	0.17	15.07	None	3.06	4.96	3.09	4.53	3.14
Propane	4.05	64.40	None	13.88	19.17	14.15	16.05	2.24
Isobutane	1.76	46.42	None	7.06	10.16	6.51	11.10	2.64
n-Butane	2.43	99.05	None	9.12	16.45	9.15	23.50	2.91

Table C-2. Summary Statistics for the 1995 Speciated NMOC Option Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Isopentane	2.04	56.57	None	14.91	23.32	15.68	18.66	2.73
n-Pentane	1.88	108.31	None	11.11	18.67	9.42	27.36	3.24
2,2-Dimethylbutane	0.29	8.45	None	1.42	2.12	1.31	2.35	2.75
Cyclopentane	0.04	5.04	None	1.29	1.55	0.93	1.44	3.42
2,3-Dimethylbutane	0.04	17.38	None	2.97	4.00	2.06	4.50	4.28
2-Methylpentane	1.40	37.23	None	7.64	9.90	6.16	9.60	2.88
3-Methylpentane	0.04	20.94	0.04	2.62	5.62	2.24	6.10	6.44
n-Hexane	0.73	26.40	None	5.41	8.23	4.73	8.24	3.20
Methylcyclopentane	0.55	11.94	None	2.59	4.09	2.61	3.64	2.83
2,4-Dimethylpentane	0.36	6.52	None	1.34	1.82	1.24	1.66	2.52
Cyclohexane	0.04	4.31	0.21	0.78	1.09	0.65	1.10	3.23
2-Methylhexane	0.58	11.43	None	3.09	3.38	2.49	2.75	2.33
2,3-Dimethylpentane	0.52	8.35	None	1.99	2.44	1.70	2.11	2.47
3-Methylhexane	1.18	13.56	None	3.48	4.35	3.41	3.27	2.05
2,2,4-Trimethylpentane	1.68	27.07	1.92	6.34	7.78	5.45	6.91	2.42
n-Heptane	0.50	8.24	None	2.09	2.30	1.65	1.98	2.39
Methylcyclohexane	0.04	7.56	None	1.62	1.92	1.17	1.82	3.42
2,2,3-Trimethylpentane	0.04	2.91	None	0.94	1.28	0.85	0.95	3.08
2,3,4-Trimethylpentane	0.51	8.92	None	2.57	2.73	1.95	2.29	2.41
2-Methylheptane	0.12	2.93	None	0.78	0.85	0.55	0.76	2.80
3-Methylheptane	0.29	3.99	0.49	1.30	1.40	1.07	1.02	2.23

Table C-2. Summary Statistics for the 1995 Speciated NMOC Option Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
n-Octane	0.39	5.78	None	1.48	1.69	1.31	1.33	2.10
n-Nonane	0.41	4.17	None	1.29	1.40	1.19	0.90	1.84
n-Decane	0.04	1.78	0.04	0.43	0.61	0.28	0.60	4.56
n-Undecane	0.77	56.39	None	2.61	6.26	2.85	13.52	2.82
n-Dodecane	0.72	46.61	None	1.72	5.00	2.21	11.19	2.83
Total Paraffins	**37.17**	**524.81**	**None**	**175.62**	**174.55**	**129.90**	**130.83**	**2.30**
Ethylene	2.42	55.05	None	13.18	16.12	11.16	14.49	2.49
Acetylene	3.32	87.43	None	11.36	18.06	10.95	21.37	2.74
Propylene	2.41	26.23	None	7.06	10.37	7.49	8.26	2.33
Propyne	0.08	1.30	0.17	0.30	0.40	0.30	0.33	2.16
Isobutene	2.01	32.21	None	7.03	9.00	6.38	8.04	2.38
1-Butene	0.04	3.14	0.04	0.04	0.41	0.13	0.77	4.51
1,3-Butadiene	0.24	3.42	None	0.90	1.11	0.80	0.94	2.38
trans-2-Butene	0.04	7.85	0.47	1.02	1.66	0.93	1.91	3.49
cis-2-Butene	0.04	7.61	0.38	0.82	1.49	0.78	1.89	3.59
3-Methyl-1-butene	0.04	3.15	0.04	0.41	0.69	0.34	0.83	3.73
1-Pentene	0.04	9.14	None	0.94	1.66	0.84	2.19	3.74
2-Methyl-1-butene	0.04	2.49	None	0.50	0.62	0.39	0.60	2.96
Isoprene	0.24	8.08	None	2.00	2.61	1.67	2.33	2.87
trans-2-Pentene	0.35	11.68	1.49	1.49	2.27	1.40	2.76	2.71
cis-2-Pentene	0.04	4.88	None	0.79	1.33	0.72	1.48	3.52

Table C-2. Summary Statistics for the 1995 Speciated NMOC Option Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
2-Methyl-2-butene	0.55	20.06	2.40	2.40	4.16	2.42	4.92	2.96
Cyclopentene	0.04	1.83	0.10	0.47	0.49	0.30	0.46	3.03
4-Methyl-1-pentene	0.04	1.61	0.04	0.09	0.34	0.13	0.53	3.97
1-Hexene	0.04	0.23	0.04	0.04	0.06	0.05	0.06	1.74
2-Methyl-1-pentene	0.04	2.27	0.04	0.17	0.45	0.20	0.61	3.82
2-Ethyl-1-butene	0.04	0.04	0.04	0.04	0.04	0.04	0.00	1.00
trans-2-Hexene	0.04	2.59	0.04	0.54	0.68	0.34	0.70	3.91
cis-2-Hexene	0.04	1.29	0.04	0.15	0.33	0.17	0.40	3.41
1-Heptene	0.04	3.12	None	0.88	1.05	0.67	0.87	3.17
1-Octene	0.04	1.63	0.04	0.37	0.54	0.28	0.52	3.82
1-Nonene	0.04	1.18	0.04	0.04	0.20	0.08	0.31	3.40
a-Pinene	0.11	1.41	None	0.47	0.51	0.43	0.31	1.92
b-Pinene	0.04	1.26	0.04	0.46	0.51	0.34	0.36	2.94
1-Decene	1.53	14.24	None	4.96	6.12	5.24	3.54	1.80
1-Undecene	0.07	2.10	0.36	0.63	0.75	0.55	0.57	2.44
1-Dodecene	0.04	0.74	0.04	0.04	0.12	0.07	0.18	2.49
Total Olefins	**20.30**	**237.41**	**None**	**75.34**	**84.07**	**60.21**	**69.95**	**2.36**
TNMOC (w/ unknowns)	109.94	1264.27	None	394.48	398.43	310.02	299.86	2.10
TNMOC (speciated)	89.26	966.98	None	348.10	340.57	261.78	243.03	2.19

Percentages:

Table C-2. Summary Statistics for the 1995 Speciated NMOC Option Program

	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Aromatics	16%	35%	27%	26%	26%	25%	5%	122%
Paraffins	41%	77%	50%	49%	50%	50%	9%	117%
Olefins	7%	36%	25%	24%	24%	23%	6%	143%

Table C-3. Summary Statistics for Newark, New Jersey (NWNJ), 1995 Speciated NMOC Option

			Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Cases	Non-detects	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation
Benzene	8	0	1.35	19.93	#N/A	2.14	5.91	3.65	6.65	1.13
Toluene	8	0	7.54	80.15	#N/A	14.56	27.46	19.62	25.44	0.93
Ethylbenzene	8	0	0.94	9.40	#N/A	2.13	3.73	2.79	3.05	0.82
m-Xylene and p-Xylene	8	0	3.76	30.10	#N/A	7.49	12.60	9.82	9.59	0.76
Styrene	8	0	0.63	3.33	#N/A	1.63	1.67	1.40	1.00	0.60
o-Xylene	8	0	1.62	12.39	#N/A	2.74	4.72	3.62	3.86	0.82
Isopropylbenzene	8	3	0.04	0.77	0.04	0.21	0.27	0.15	0.26	0.97
n-Propylbenzene	8	0	0.23	2.73	#N/A	0.69	1.05	0.75	0.89	0.85
m-Ethyltoluene	8	0	1.14	9.41	#N/A	1.87	3.55	2.62	3.09	0.87
p-Ethyltoluene	8	1	0.04	4.64	#N/A	1.01	1.65	0.93	1.53	0.92
1,3,5-Trimethylbenzene	8	0	0.64	7.03	#N/A	1.20	2.34	1.70	2.18	0.93
o-Ethyltoluene	8	0	0.40	2.07	#N/A	0.71	1.00	0.83	0.67	0.67
1,2,4-Trimethylbenzene	8	0	0.84	13.67	#N/A	3.05	4.22	3.02	4.14	0.98
1,2,3-Trimethylbenzene	8	0	1.30	10.96	#N/A	1.75	3.67	2.73	3.37	0.92
m-Diethylbenzene	8	2	0.04	1.89	0.04	0.51	0.61	0.31	0.62	1.03
p-Diethylbenzene	8	0	0.32	4.05	#N/A	0.98	1.43	1.04	1.26	0.88
n-Undecane	8	0	0.93	56.39	#N/A	3.67	10.35	4.23	18.77	1.81
n-Dodecane	8	0	0.76	46.61	#N/A	1.72	7.99	2.89	15.71	1.97
Ethane	8	0	1.15	15.07	#N/A	2.40	4.74	3.17	4.85	1.02
Propane	8	0	5.20	64.40	#N/A	8.99	21.41	14.08	21.45	1.00
Isobutane	8	0	1.76	46.42	#N/A	3.67	10.48	5.29	15.22	1.45

Table C-3. Summary Statistics for Newark, New Jersey (NWNJ), 1995 Speciated NMOC Option

			Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Cases	Non-detects	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation
n-Butane	8	0	2.43	99.05	#N/A	3.79	18.69	7.27	33.16	1.77
Isopentane	8	0	2.04	43.86	#N/A	7.67	14.30	9.37	14.48	1.01
n-Pentane	8	0	1.88	108.31	#N/A	6.83	25.04	8.92	38.24	1.53
2,2-Dimethylbutane	8	0	0.29	8.45	#N/A	0.95	2.51	1.18	3.27	1.30
Cyclopentane	8	1	0.04	5.04	#N/A	0.47	1.15	0.53	1.64	1.43
2,3-Dimethylbutane	8	1	0.04	11.30	#N/A	1.69	2.86	1.18	3.69	1.29
2-Methylpentane	8	0	1.40	37.23	#N/A	2.45	9.00	4.32	12.48	1.39
3-Methylpentane	8	0	0.90	20.94	#N/A	1.65	5.13	2.75	6.89	1.34
n-Hexane	8	0	0.73	19.05	#N/A	1.58	4.86	2.59	6.28	1.29
Methylcyclopentane	8	0	0.55	11.94	#N/A	1.05	3.04	1.65	3.95	1.30
2,4-Dimethylpentane	8	0	0.36	6.52	#N/A	0.74	1.76	1.01	2.14	1.22
Cyclohexane	8	1	0.04	4.31	#N/A	0.38	0.94	0.42	1.41	1.50
2-Methylhexane	8	0	0.58	11.43	#N/A	2.21	3.26	2.06	3.60	1.11
2,3-Dimethylpentane	8	0	0.52	8.35	#N/A	0.79	2.32	1.34	2.76	1.19
3-Methylhexane	8	0	1.18	13.56	#N/A	1.93	4.31	2.95	4.34	1.01
2,2,4-Trimethylpentane	8	0	1.68	27.07	#N/A	2.53	7.48	4.36	9.04	1.21
n-Heptane	8	0	0.50	8.24	#N/A	0.87	2.22	1.31	2.68	1.20
Methylcyclohexane	8	1	0.04	7.56	#N/A	0.70	1.81	0.78	2.49	1.37
2,2,3-Trimethylpentane	8	1	0.04	2.91	#N/A	0.52	1.13	0.59	1.15	1.02
2,3,4-Trimethylpentane	8	0	0.51	8.92	#N/A	1.71	2.75	1.71	2.92	1.06
2-Methylheptane	8	0	0.12	2.93	#N/A	0.29	0.82	0.44	0.99	1.20

Table C-3. Summary Statistics for Newark, New Jersey (NWNJ), 1995 Speciated NMOC Option

			Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Cases	Non-detects	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation
3-Methylheptane	8	0	0.29	3.99	#N/A	0.96	1.46	0.98	1.32	0.91
n-Octane	8	0	0.39	5.78	#N/A	0.85	1.72	1.17	1.81	1.05
n-Nonane	8	0	0.42	4.17	#N/A	1.22	1.52	1.20	1.20	0.79
n-Decane	8	1	0.04	1.59	#N/A	0.43	0.67	0.40	0.59	0.88
Ethylene	8	0	2.42	38.23	#N/A	5.15	11.27	7.34	12.16	1.08
Acetylene	8	0	3.32	33.03	#N/A	4.84	11.78	7.68	12.10	1.03
Propylene	8	0	2.41	26.23	#N/A	3.67	10.19	6.61	9.92	0.97
Propyne	8	3	0.08	1.30	#N/A	0.22	0.41	0.28	0.42	1.04
Isobutene	8	0	2.01	32.21	#N/A	3.62	8.86	5.40	10.50	1.18
1-Butene	8	4	0.04	0.62	0.04	0.20	0.26	0.14	0.26	0.98
1,3-Butadiene	8	0	0.24	3.42	#N/A	0.43	1.00	0.63	1.13	1.13
trans-2-Butene	8	1	0.04	7.85	0.47	0.47	1.61	0.62	2.61	1.62
cis-2-Butene	8	1	0.04	7.61	#N/A	0.38	1.46	0.51	2.55	1.75
3-Methyl-1-butene	8	1	0.04	3.15	#N/A	0.17	0.65	0.26	1.05	1.63
1-Pentene	8	1	0.04	9.14	#N/A	0.47	1.80	0.61	3.09	1.71
2-Methyl-1-butene	8	1	0.04	2.49	#N/A	0.25	0.57	0.28	0.81	1.42
Isoprene	8	0	0.24	2.79	#N/A	0.89	1.06	0.81	0.83	0.79
trans-2-Pentene	8	0	0.35	11.68	#N/A	0.73	2.38	1.08	3.88	1.63
cis-2-Pentene	8	1	0.04	4.88	#N/A	0.37	1.08	0.45	1.62	1.51
2-Methyl-2-butene	8	0	0.55	20.06	#N/A	1.05	4.03	1.71	6.71	1.67
Cyclopentene	8	1	0.04	1.83	#N/A	0.13	0.39	0.18	0.61	1.55

Table C-3. Summary Statistics for Newark, New Jersey (NWNJ), 1995 Speciated NMOC Option

			Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)				Variability	
Compound	Cases	Non-detects	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation
4-Methyl-1-pentene	8	4	0.04	1.57	0.04	0.07	0.26	0.09	0.53	2.05
1-Hexene	8	5	0.04	0.06	0.04	0.04	0.04	0.04	0.01	0.19
2-Methyl-1-pentene	8	2	0.04	2.27	0.04	0.13	0.49	0.17	0.79	1.63
2-Ethyl-1-butene	8	8	0.04	0.04	0.04	0.04	0.04	0.04	0.00	0.00
trans-2-Hexene	8	1	0.04	2.59	#N/A	0.14	0.60	0.25	0.88	1.45
cis-2-Hexene	8	1	0.04	1.21	#N/A	0.08	0.28	0.14	0.40	1.45
1-Heptene	8	1	0.04	3.12	#N/A	0.41	0.92	0.45	1.06	1.15
1-Octene	8	2	0.04	1.46	#N/A	0.16	0.44	0.20	0.53	1.20
1-Nonene	8	5	0.04	1.18	0.04	0.04	0.26	0.10	0.40	1.55
a-Pinene	8	0	0.15	1.41	#N/A	0.45	0.56	0.44	0.41	0.73
b-Pinene	8	0	0.10	0.96	#N/A	0.46	0.52	0.42	0.30	0.58
1-Decene	8	0	3.27	14.24	#N/A	3.83	6.09	5.21	4.01	0.66
1-Undecene	8	0	0.07	2.10	#N/A	0.38	0.71	0.44	0.70	1.00
1-Dodecene	8	2	0.04	0.35	0.04	0.09	0.14	0.10	0.11	0.80
TNMOC (w/ unknowns)	8	0	113.86	1264.27	#N/A	271.24	396.38	280.97	387.54	0.98
TNMOC (speciated)	8	0	90.79	966.98	#N/A	231.77	321.72	225.33	301.52	0.94

Table C-4. Summary Statistics for Plainfield, New Jersey (P2NJ), 1995 Speciated NMOC Option

			Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)			Variability	
Compound	Cases	Non-detects	Minimum	Maximum	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation
Benzene	8	0	1.81	22.40	6.44	7.85	5.62	6.84	0.87
Toluene	8	0	9.66	75.48	40.95	40.08	33.00	23.31	0.58
Ethylbenzene	8	0	1.16	6.39	3.55	3.56	3.13	1.76	0.50
m-Xylene/p-Xylene	8	0	3.80	23.08	11.46	12.32	10.55	6.72	0.55
Styrene	8	0	0.57	2.23	1.27	1.29	1.19	0.52	0.40
o-Xylene	8	0	1.12	8.62	4.76	4.60	3.90	2.46	0.53
Isopropylbenzene	8	4	0.04	1.08	0.14	0.25	0.12	0.35	1.40
n-Propylbenzene	8	0	0.26	2.09	1.23	1.13	0.95	0.61	0.54
m-Ethyltoluene	8	0	1.76	8.06	4.33	4.44	4.04	1.95	0.44
p-Ethyltoluene	8	1	0.04	3.47	2.11	1.82	1.11	1.15	0.63
1,3,5-Trimethylbenzene	8	0	0.73	4.84	2.32	2.24	1.89	1.35	0.60
o-Ethyltoluene	8	0	0.17	2.62	0.90	1.10	0.85	0.78	0.71
1,2,4-Trimethylbenzene	8	0	0.66	3.64	2.20	2.16	1.88	1.06	0.49
1,2,3-Trimethylbenzene	8	0	1.46	6.11	3.46	3.64	3.35	1.47	0.40
m-Diethylbenzene	8	4	0.04	1.32	0.33	0.50	0.19	0.55	1.11
p-Diethylbenzene	8	1	0.04	2.63	0.90	1.01	0.63	0.82	0.81
Ethane	8	1	0.17	13.60	3.43	5.18	3.01	4.51	0.87
Propane	8	0	4.05	28.84	19.76	16.94	14.22	8.96	0.53
Isobutane	8	0	2.49	17.92	11.62	9.83	8.01	5.68	0.58
n-Butane	8	0	3.33	26.01	14.68	14.21	11.51	8.52	0.60
Isopentane	8	0	6.95	56.57	35.01	32.33	26.22	18.72	0.58
n-Pentane	8	0	2.41	22.46	13.82	12.29	9.95	7.04	0.57
2,2-Dimethylbutane	8	0	0.40	3.14	1.82	1.73	1.45	0.93	0.54
Cyclopentane	8	0	0.36	4.34	1.70	1.95	1.61	1.18	0.61

Table C-4. Summary Statistics for Plainfield, New Jersey (P2NJ), 1995 Speciated NMOC Option

			Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)			Variability	
Compound	Cases	Non-detects	Minimum	Maximum	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation
2,3-Dimethylbutane	8	0	0.76	17.38	4.35	5.15	3.60	5.18	1.01
2-Methylpentane	8	0	2.64	18.47	11.47	10.81	8.79	6.31	0.58
3-Methylpentane	8	2	0.04	14.81	5.07	6.11	1.82	5.63	0.92
n-Hexane	8	0	3.01	26.40	9.17	11.60	8.67	8.96	0.77
Methylcyclopentane	8	0	1.36	9.58	5.23	5.14	4.13	3.20	0.62
2,4-Dimethylpentane	8	0	0.47	3.71	1.89	1.88	1.52	1.14	0.61
Cyclohexane	8	0	0.24	2.33	1.17	1.23	1.01	0.73	0.60
2-Methylhexane	8	0	0.86	5.79	3.57	3.50	3.01	1.77	0.51
2,3-Dimethylpentane	8	0	0.62	4.74	2.89	2.57	2.17	1.38	0.54
3-Methylhexane	8	0	1.84	7.59	4.52	4.39	3.95	2.03	0.46
2,2,4-Trimethylpentane	8	0	1.92	16.28	8.88	8.08	6.80	4.51	0.56
n-Heptane	8	0	0.57	3.82	2.40	2.38	2.07	1.12	0.47
Methylcyclohexane	8	0	0.47	3.30	2.20	2.03	1.76	0.94	0.46
2,2,3-Trimethylpentane	8	0	0.37	2.48	1.42	1.43	1.21	0.76	0.53
2,3,4-Trimethylpentane	8	0	0.58	5.86	2.83	2.71	2.23	1.64	0.61
2-Methylheptane	8	0	0.13	1.51	0.85	0.88	0.70	0.49	0.56
3-Methylheptane	8	0	0.35	2.37	1.30	1.35	1.16	0.69	0.51
n-Octane	8	0	0.46	2.64	1.76	1.66	1.48	0.71	0.43
n-Nonane	8	0	0.41	1.81	1.42	1.28	1.17	0.50	0.39
n-Decane	8	4	0.04	1.78	0.36	0.55	0.20	0.64	1.15
n-Undecane	8	0	0.77	3.71	2.25	2.17	1.93	1.01	0.46
n-Dodecane	8	0	0.72	3.64	1.75	2.02	1.69	1.19	0.59
Ethylene	8	0	6.14	55.05	17.45	20.98	16.97	15.74	0.75
Acetylene	8	0	3.80	87.43	14.70	24.34	15.60	27.24	1.12

Table C-4. Summary Statistics for Plainfield, New Jersey (P2NJ), 1995 Speciated NMOC Option

Compound	Cases	Non-detects	Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)			Variability	
			Minimum	Maximum	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation
Propylene	8	0	2.89	22.26	9.54	10.54	8.49	6.90	0.65
Propyne	8	3	0.16	0.82	0.24	0.36	0.29	0.25	0.69
Isobutene	8	0	2.08	18.23	9.44	9.15	7.53	5.33	0.58
1-Butene	8	5	0.04	3.14	0.04	0.55	0.13	1.08	1.94
1,3-Butadiene	8	0	0.30	2.45	1.00	1.23	1.01	0.75	0.61
trans-2-Butene	8	0	0.38	3.05	1.76	1.71	1.40	1.00	0.59
cis-2-Butene	8	0	0.31	3.55	1.37	1.53	1.18	1.08	0.71
3-Methyl-1-Butene	8	1	0.04	1.94	0.74	0.74	0.45	0.61	0.83
1-Pentene	8	0	0.19	2.54	1.76	1.52	1.17	0.87	0.57
2-Methyl-1-Butene	8	0	0.10	1.01	0.77	0.66	0.55	0.32	0.49
Isoprene	8	0	0.78	8.08	4.03	4.16	3.45	2.34	0.56
trans-2-Pentene	8	0	0.49	3.36	2.35	2.17	1.83	1.10	0.51
cis-2-Pentene	8	0	0.27	4.68	1.44	1.59	1.16	1.38	0.87
2-Methyl-2-Butene	8	0	0.88	8.66	4.67	4.30	3.43	2.62	0.61
Cyclopentene	8	0	0.10	0.93	0.55	0.51	0.43	0.25	0.49
4-Methyl-1-Pentene	8	3	0.04	1.61	0.17	0.42	0.18	0.55	1.30
1-Hexene	8	6	0.04	0.23	0.04	0.08	0.06	0.08	0.97
2-Methyl-1-Pentene	8	2	0.04	1.27	0.35	0.41	0.24	0.40	0.98
2-Ethyl-1-Butene	8	8	0.04	0.04	0.04	0.04	0.04	0.00	0.00
trans-2-Hexene	8	1	0.04	1.33	0.86	0.76	0.47	0.53	0.70
cis-2-Hexene	8	2	0.04	1.29	0.31	0.37	0.19	0.41	1.12
1-Heptene	8	0	0.27	2.14	1.27	1.19	0.98	0.67	0.56
1-Octene	8	0	0.05	1.63	0.61	0.64	0.40	0.53	0.83
1-Nonene	8	6	0.04	0.53	0.04	0.14	0.07	0.19	1.38

Table C-4. Summary Statistics for Plainfield, New Jersey (P2NJ), 1995 Speciated NMOC Option

			Concentration Range (ppbC)		Central Tendency of Measured Concentration (ppbC)			Variability	
Compound	Cases	Non-detects	Minimum	Maximum	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation
a-Pinene	8	0	0.11	0.68	0.51	0.47	0.41	0.19	0.41
b-Pinene	8	2	0.04	1.26	0.41	0.50	0.28	0.44	0.88
1-Decene	8	0	1.53	11.57	5.75	6.16	5.27	3.29	0.53
1-Undecene	8	0	0.23	1.59	0.76	0.80	0.68	0.44	0.55
1-Dodecene	8	7	0.04	0.06	0.04	0.04	0.04	0.01	0.19
TNMOC(w/unknowns)	8	0	109.94	687.87	442.29	400.48	342.08	206.11	0.51
TNMOC (speciated)	8	0	88.26	616.17	407.14	359.54	304.19	186.79	0.52

Table C-5. 1995 Speciated NMOC Option Shape Statistics

Compound	Cases	Nondetects	Normal Distribution		Lognormal Distribution	
			Skew	Kurtosis	Skew	Kurtosis
Benzene	16	0	1.38	1.16	0.35	-1.40
Toluene	16	0	0.65	-0.86	-0.05	-1.57
Ethylbenzene	16	0	0.96	0.39	-0.01	-1.08
m-Xylene/p-Xylene	16	0	0.80	-0.32	0.01	-1.27
Styrene	16	0	0.88	0.19	0.09	-1.13
o-Xylene	16	0	1.06	0.85	-0.03	-1.00
Isopropylbenzene	16	7	1.20	0.49	0.13	-1.78
n-Propylbenzene	16	0	0.73	-0.16	-0.28	-1.12
m-Ethyltoluene	16	0	0.76	-0.25	-0.07	-1.35
p-Ethyltoluene	16	2	0.60	-0.11	-1.58	1.95
1,3,5-Trimethylbenzene	16	0	1.52	2.43	0.31	-1.00
o-Ethyltoluene	16	0	0.99	0.05	-0.36	0.25
1,2,4-Trimethylbenzene	16	0	2.84	9.36	0.42	0.84
1,2,3-Trimethylbenzene	16	0	1.73	3.85	0.37	-0.71
m-Diethylbenzene	16	6	0.79	-0.34	-0.25	-1.88
p-Diethylbenzene	16	1	1.56	2.49	-1.31	3.10
Paraffins						
Ethane	16	1	1.18	0.50	-0.88	1.53
Propane	16	0	1.61	3.08	0.20	-1.06
Isobutane	16	0	2.51	7.82	0.26	-0.85
n-Butane	16	0	3.22	11.57	0.52	-0.27
Isopentane	16	0	0.55	-1.25	-0.38	-0.86
n-Pentane	16	0	2.78	8.19	0.42	-0.32
2,2-Dimethylbutane	16	0	1.97	3.41	0.27	-0.70
Cyclopentane	16	1	1.39	1.53	-1.02	1.57
2,3-Dimethylbutane	16	1	2.14	4.95	-1.28	2.68
2-Methylpentane	16	0	1.60	3.26	-0.01	-1.42
3-Methylpentane	16	2	1.30	1.17	-1.22	1.22
n-Hexane	16	0	1.17	0.27	-0.10	-1.20
Methylcyclopentane	16	0	0.89	-0.35	-0.06	-1.47
2,4-Dimethylpentane	16	0	1.63	3.20	0.11	-1.27
Cyclohexane	16	1	1.89	4.22	-0.71	0.83
2-Methylhexane	16	0	1.71	4.08	-0.21	-0.74

Table C-5. 1995 Speciated NMOC Option Shape Statistics

Compound	Cases	Nondetects	Normal Distribution		Lognormal Distribution	
			Skew	Kurtosis	Skew	Kurtosis
2,3-Dimethylpentane	16	0	1.50	2.87	0.05	-1.42
3-Methylhexane	16	0	1.55	3.01	0.23	-1.05
2,2,4-Trimethylpentane	16	0	1.60	2.95	0.15	-1.27
n-Heptane	16	0	1.84	4.67	-0.02	-1.10
Methylcyclohexane	16	1	2.07	5.80	-1.33	2.91
2,2,3-Trimethylpentane	16	1	0.46	-1.25	-1.33	2.50
2,3,4-Trimethylpentane	16	0	1.48	2.43	-0.08	-1.07
2-Methylheptane	16	0	1.40	2.55	-0.21	-1.32
3-Methylheptane	16	0	1.08	1.16	-0.20	-1.13
n-Octane	16	0	2.01	5.56	0.04	-0.53
n-Nonane	16	0	1.96	5.73	-0.15	0.23
n-Decane	16	5	0.69	-0.87	-0.36	-1.61
n-Undecane	16	0	3.85	15.13	1.56	3.77
n-Dodecane	16	0	3.88	15.33	1.70	4.12
Olefins						
Ethylene	16	0	1.58	2.42	-0.01	-0.86
Acetylene	16	0	2.51	7.53	0.46	-0.81
Propylene	16	0	0.77	-0.89	0.20	-1.71
Propyne	16	6	1.61	2.42	0.32	-0.59
Isobutene	16	0	1.74	3.67	0.19	-1.13
1-Butene	16	9	3.33	12.07	0.70	-0.92
1,3-Butadiene	16	0	1.20	0.85	0.13	-1.31
trans-2-Butene	16	1	2.47	7.44	-0.80	1.62
cis-2-Butene	16	1	2.54	7.44	-0.47	0.80
3-Methyl-1-butene	16	2	2.04	4.55	-0.15	-0.86
1-Pentene	16	1	2.90	9.83	-0.54	0.75
2-Methyl-1-butene	16	1	2.16	6.28	-0.57	-0.01
Isoprene	16	0	1.10	0.48	-0.27	-0.95
trans-2-Pentene	16	0	2.90	9.90	0.31	-0.48
cis-2-Pentene	16	1	1.73	2.38	-0.51	0.48
2-Methyl-2-butene	16	0	2.46	7.32	0.24	-0.99
Cyclopentene	16	1	1.71	4.02	-0.38	-0.93
4-Methyl-1-pentene	16	7	1.93	2.63	0.84	-0.70

Table C-5. 1995 Speciated NMOC Option Shape Statistics

Compound	Cases	Nondetects	Normal Distribution		Lognormal Distribution	
			Skew	Kurtosis	Skew	Kurtosis
1-Hexene	16	11	2.64	6.23	2.31	4.37
2-Methyl-1-pentene	16	4	2.13	4.71	0.25	-1.06
2-Ethyl-1-butene	16	16	1.11	-2.31	1.11	-2.31
trans-2-Hexene	16	2	1.37	2.24	-0.27	-1.36
cis-2-Hexene	16	3	1.69	2.21	0.28	-1.39
1-Heptene	16	1	0.88	0.37	-0.95	0.83
1-Octene	16	2	0.82	-0.36	-0.27	-1.53
1-Nonene	16	11	2.55	7.22	1.11	-0.44
a-Pinene	16	0	1.44	3.60	-0.54	0.27
b-Pinene	16	2	0.47	-0.60	-1.03	0.22
1-Decene	16	0	0.98	0.25	-0.10	-0.18
1-Undecene	16	0	0.99	0.53	-0.56	0.02
1-Dodecene	16	9	2.95	9.17	1.65	1.98

Table C-6. Shape Summary Statistics for Newark, New Jersey (NWNJ) and Plainfield, New Jersey (P2NJ), 1995 Speciated NMOC Option

	Newark, New Jersey (NWNJ)			Plainfield, New Jersey (P2NJ)		
Compound	Non-detects	Skew	Kurtosis	Non-detects	Skew	Kurtosis
Benzene	0	1.67	2.27	0	1.52	2.63
Toluene	0	1.51	1.83	0	0.12	-1.32
Ethylbenzene	0	1.06	-0.10	0	0.24	-0.77
m-Xylene/p-Xylene	0	1.01	-0.31	0	0.35	-0.90
Styrene	0	0.47	-1.19	0	0.50	0.60
o-Xylene	0	1.33	1.00	0	0.17	-0.49
Isopropylbenzene	3	1.03	0.44	4	2.32	5.80
n-Propylbenzene	0	1.10	0.28	0	0.08	-0.78
m-Ethyltoluene	0	1.26	0.34	0	0.57	0.88
p-Ethyltoluene	1	1.19	0.87	1	-0.38	-0.65
1,3,5-Trimethylbenzene	0	1.71	2.84	0	0.86	0.84
o-Ethyltoluene	0	1.03	-0.67	0	1.10	1.05
1,2,4-Trimethylbenzene	0	2.08	4.66	0	-0.06	-1.39
1,2,3-Trimethylbenzene	0	1.76	2.90	0	0.24	-0.09
m-Diethylbenzene	2	1.38	1.82	4	0.69	-1.31
p-Diethylbenzene	0	1.58	2.18	1	1.07	1.34
Ethane	0	1.68	2.54	1	0.94	0.22
Propane	0	1.36	1.09	0	-0.30	-1.54
Isobutane	0	2.38	5.90	0	-0.17	-1.57
n-Butane	0	2.61	7.01	0	0.03	-1.78
Isopentane	0	1.54	1.66	0	-0.12	-1.63
n-Pentane	0	1.90	3.13	0	-0.13	-1.29
2,2-Dimethylbutane	0	1.41	0.27	0	-0.05	-1.00
Cyclopentane	0	2.40	6.08	0	1.09	2.15
2,3-Dimethylbutane	0	2.09	4.77	0	2.32	6.05
2-Methylpentane	1	2.05	4.29	0	-0.11	-1.88
3-Methylpentane	1	2.16	4.78	2	0.37	-1.52
n-Hexane	0	2.03	4.26	0	0.82	-0.79
Methylcyclopentane	0	2.03	4.14	0	0.13	-1.84
2,4-Dimethylpentane	0	1.93	3.69	0	0.26	-1.09
Cyclohexane	0	2.46	6.35	0	0.37	-0.97
2-Methylhexane	0	2.01	4.40	0	-0.14	-1.33
2,3-Dimethylpentane	1	1.81	3.17	0	0.02	-0.89

Table C-6. Shape Summary Statistics for Newark, New Jersey (NWNJ) and Plainfield, New Jersey (P2NJ), 1995 Speciated NMOC Option

	Newark, New Jersey (NWNJ)			Plainfield, New Jersey (P2NJ)		
Compound	Non-detects	Skew	Kurtosis	Non-detects	Skew	Kurtosis
3-Methylhexane	0	1.67	2.49	0	0.23	-1.02
2,2,4-Trimethylpentane	0	1.83	2.99	0	0.47	0.43
n-Heptane	0	1.99	4.08	0	-0.24	-0.57
Methylcyclohexane	0	2.19	5.03	0	-0.39	-0.71
2,2,3-Trimethylpentane	0	0.94	-0.98	0	0.04	-1.68
2,3,4-Trimethylpentane	1	1.63	2.43	0	0.76	0.98
2-Methylheptane	1	1.65	2.47	0	-0.11	-0.73
3-Methylheptane	0	1.07	0.38	0	0.27	-0.66
n-Octane	0	1.95	3.97	0	-0.45	-0.38
n-Nonane	0	1.77	3.63	0	-0.76	-0.63
n-Decane	0	0.56	-1.64	4	1.02	0.37
n-Undecane	0	2.73	7.56	0	-0.03	-0.82
n-Dodecane	1	2.76	7.69	0	0.27	-2.02
Ethylene	0	1.88	3.64	0	1.70	3.09
Acetylene	0	1.26	-0.16	0	2.18	5.20
Propylene	0	0.93	-1.15	0	0.63	-0.69
Propyne	3	1.69	2.16	3	1.15	0.27
Isobutene	0	1.96	3.75	0	0.32	-0.39
1-Butene	4	0.49	-1.74	5	2.54	6.62
1,3-Butadiene	0	1.77	2.63	0	0.48	-0.98
trans-2-Butene	1	2.49	6.41	0	0.08	-1.66
cis-2-Butene	1	2.58	6.87	0	0.83	0.21
3-Methyl-1-Butene	1	2.45	6.24	1	0.95	1.18
1-Pentene	1	2.45	6.14	0	-0.42	-1.27
2-Methyl-1-Butene	1	2.39	6.00	0	-0.78	-0.51
Isoprene	0	1.41	2.18	0	0.34	-0.26
trans-2-Pentene	0	2.51	6.50	0	-0.45	-1.41
cis-2-Pentene	1	2.31	5.49	0	1.85	4.20
2-Methyl-2-Butene	0	2.48	6.34	0	0.22	-0.56
Cyclopentene	1	2.39	5.87	0	0.01	0.69
4-Methyl-1-Pentene	4	2.79	7.84	3	1.74	2.93
1-Hexene	5	1.67	2.34	6	1.63	1.19
2-Methyl-1-Pentene	2	2.07	3.98	2	1.51	2.68

Table C-6. Shape Summary Statistics for Newark, New Jersey (NWNJ) and Plainfield, New Jersey (P2NJ), 1995 Speciated NMOC Option

	Newark, New Jersey (NWNJ)			Plainfield, New Jersey (P2NJ)		
Compound	Non-detects	Skew	Kurtosis	Non-detects	Skew	Kurtosis
2-Ethyl-1-Butene	8	NA	NA	8	NA	NA
trans-2-Hexene	1	2.08	4.45	1	-0.32	-1.81
cis-2-Hexene	1	2.21	4.87	2	1.81	3.81
1-Heptene	1	1.51	1.91	0	0.01	-1.36
1-Octene	2	1.23	0.52	0	0.73	0.16
1-Nonene	5	2.26	5.37	6	1.78	2.13
a-Pinene	0	1.38	2.08	0	-0.97	0.17
b-Pinene	0	0.13	-1.23	2	0.67	-0.62
1-Decene	0	1.51	1.51	0	0.35	-0.51
1-Undecene	0	1.32	1.00	0	0.59	0.24
1-Dodecene	2	1.19	0.75	7	2.83	8.00
TNMOC (w/ unknowns)	0	1.93	4.02	0	-0.18	-1.30
TNMOC (speciated)	0	1.61	2.70	0	-0.25	-1.31

NA = Not Applicable (No values were detected).
Note = There were 8 cases for both sites.

Appendix D

Statistical Summary for the UATMP VOC Option

Table D-1. 1995 UATMP VOC Option Summary of Number and Frequency of Occurrences for All Sites

Compounds	Number of Occurences	Frequency (%)
Halogenated Compounds:		
Chloromethane	40	93%
Vinyl Chloride	0	0%
Bromomethane	1	2%
Chloroethane	0	0%
Methylene Chloride	38	88%
trans-1,2-Dichloroethylene	0	0%
1,1-Dichloroethane	0	0%
Chloroprene	0	0%
Bromochloromethane	0	0%
Chloroform	34	79%
1,2 - Dichloroethane	1	2%
1,1,1 - Trichloroethane	43	100%
Carbon Tetrachloride	43	100%
1,2 - Dichloropropane	0	0%
Bromodichloromethane	0	0%
Trichloroethylene	25	58%
cis-1,3-Dichloropropene	0	0%
trans-1,3-Dichloropropene	0	0%
1,1,2 - Trichloroethane	0	0%
Dibromochloromethane	0	0%
Tetrachloroethylene	36	84%
Chlorobenzene	2	5%
Bromoform	0	0%
1,1,2,2-Tetrachloroentane	2	5%
m-Dichlorobenzene	11	26%
p-Dichlorobenzene	38	88%
o-Dichlorobenzene	13	30%
Nonhalogenated Compunds:		
Acetylene	43	100%
Propyne	43	100%
1,3-Butadiene	33	77%
Benzene	43	100%
o-Xylene	43	100%

Table D-1. 1995 UATMP VOC Option Summary of Number and Frequency of Occurrences for All Sites

Compounds	Number of Occurences	Frequency (%)
Toluene	37	86%
n-Octane	43	100%
Ethylbenzene	43	100%
m- and p-Xylene	43	100%
Styrene	43	100%

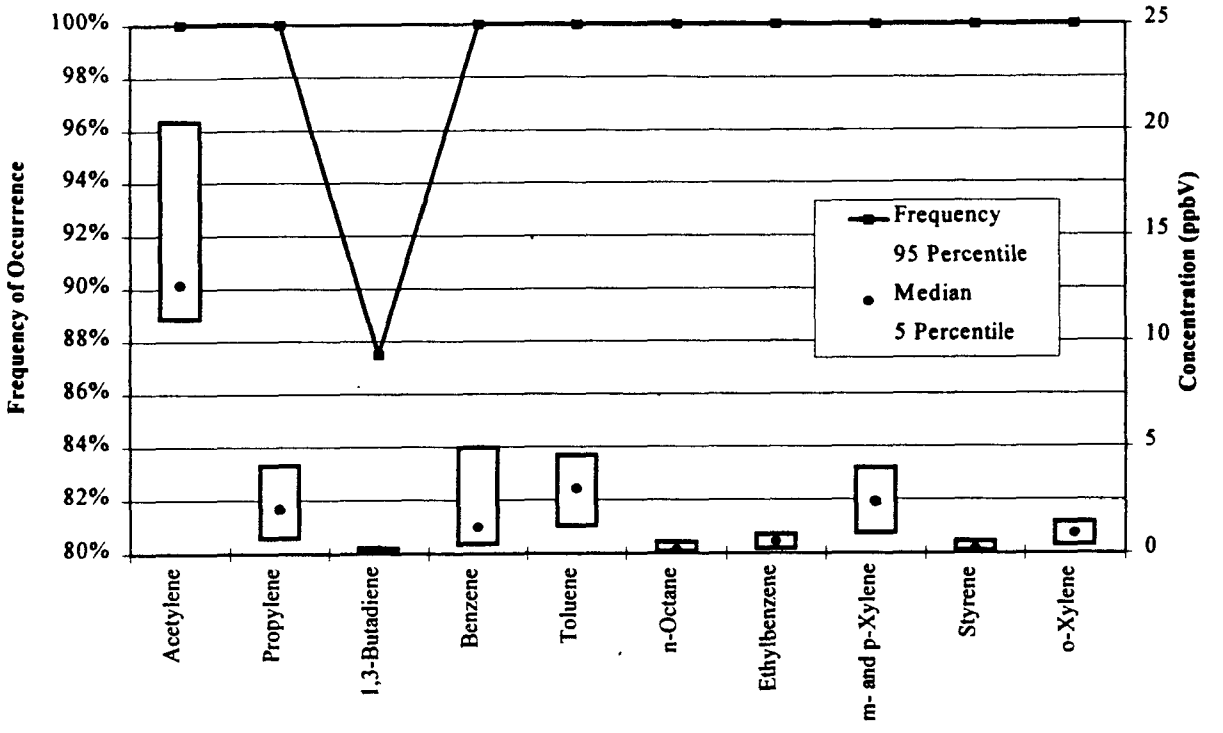

Figure D-1. Frequency and Concentration Distribution of the Nonhalogenated UATMP VOCs at B1AL in 1995

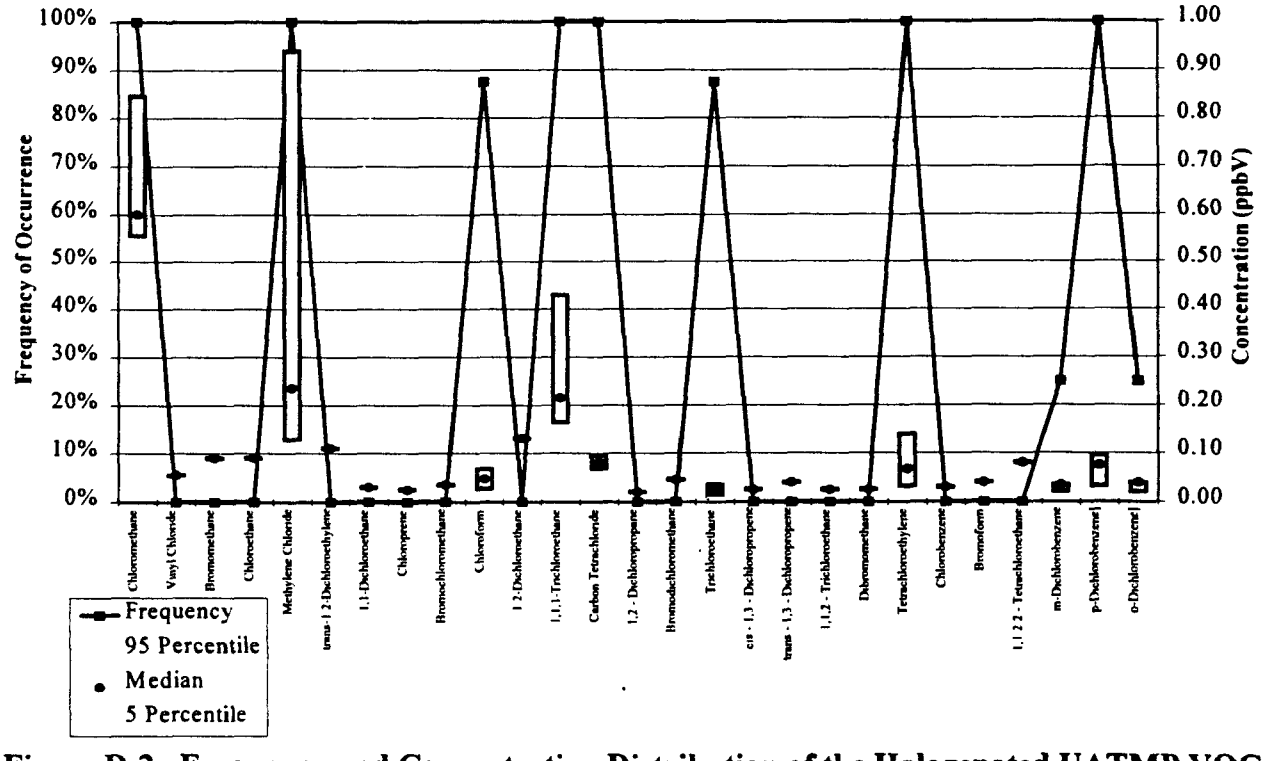

Figure D-2. Frequency and Concentration Distribution of the Halogenated UATMP VOCs at B1AL in 1995

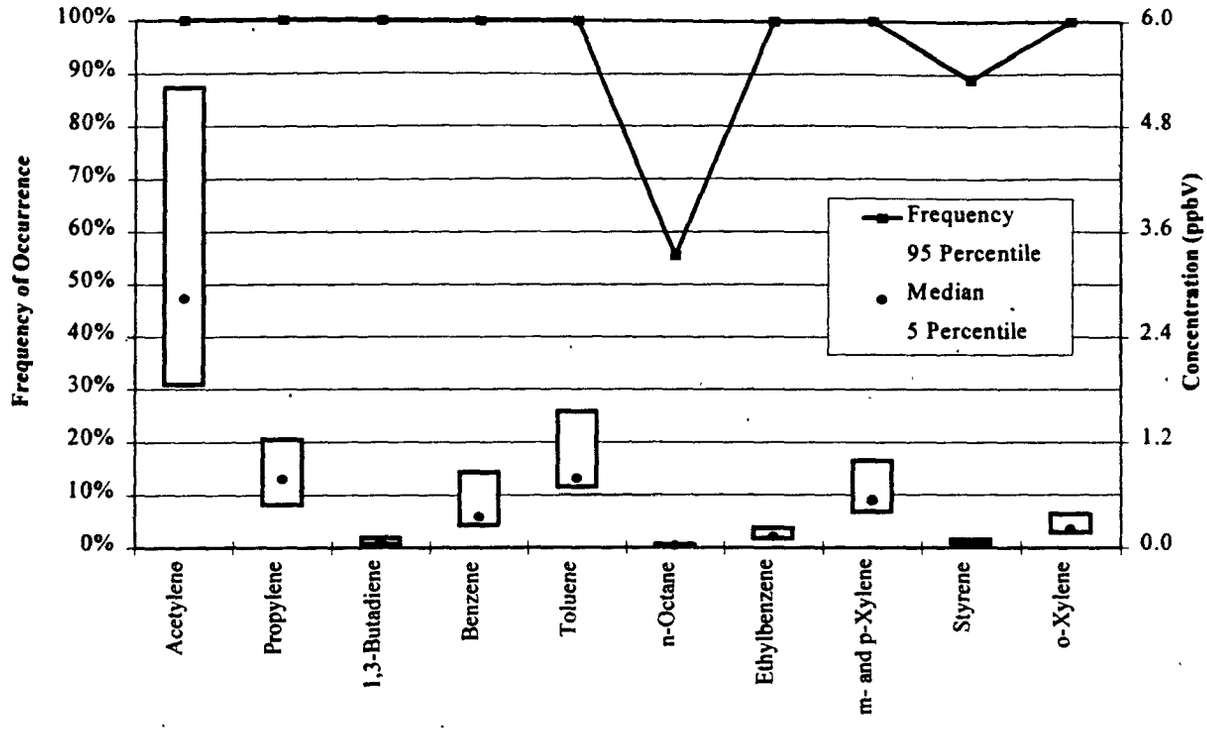

Figure D-3. Frequency and Concentration Distribution of Nonhalogenated UATMP VOCs at Pinson, Alabama (B2AL) in 1995.

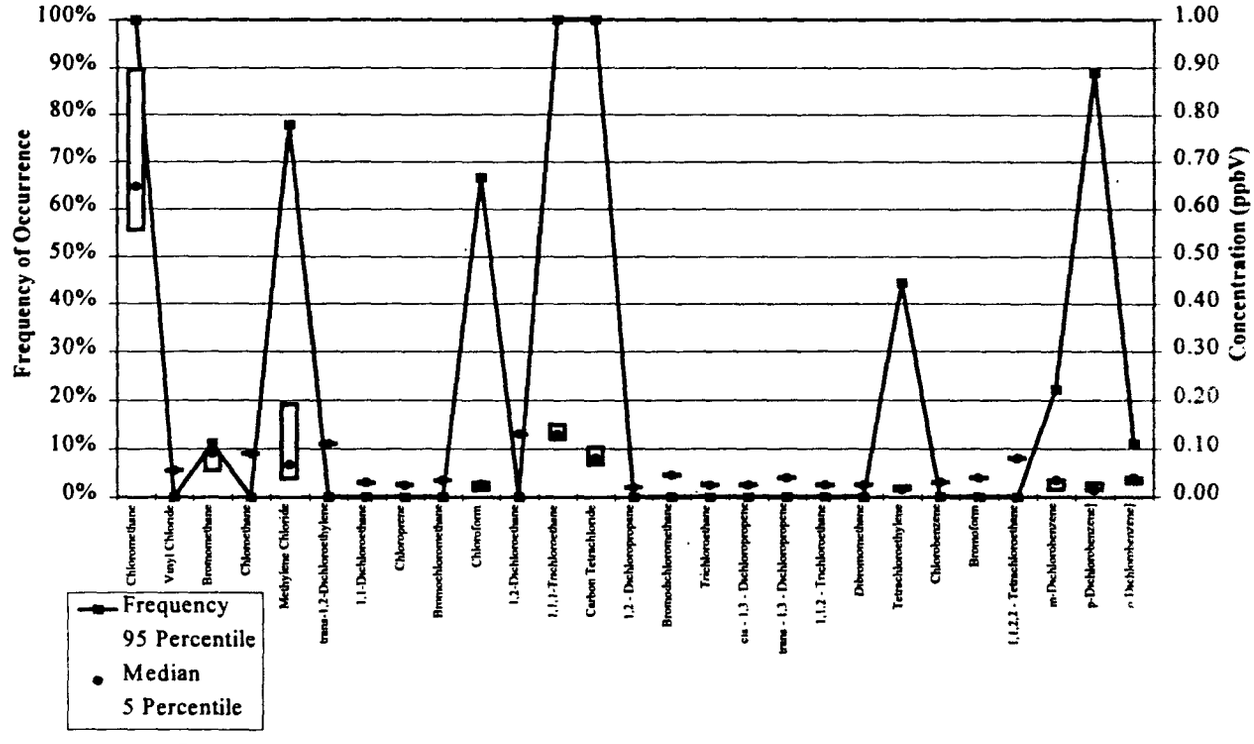

Figure D-4. Frequency and Concentration Distribution of Halogenated UATMP VOC at Pinson, Alabama (B2AL) in 1995

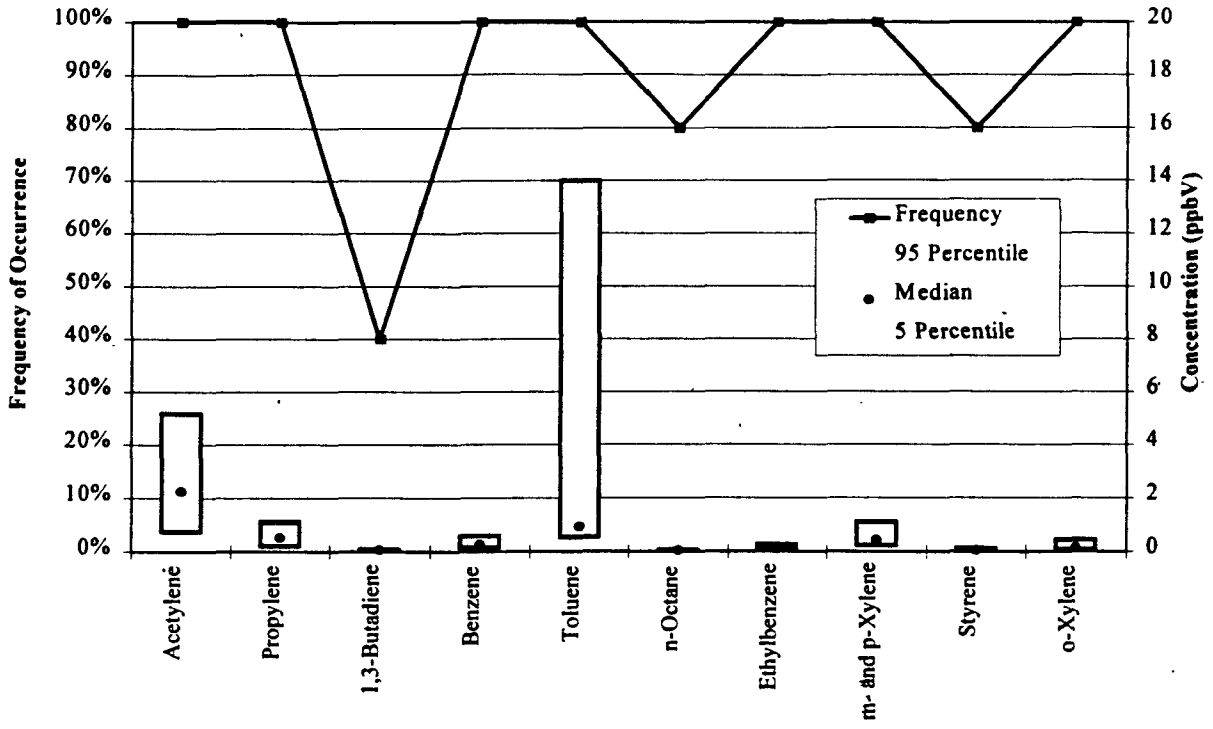

Figure D-5. Frequency and Concentration Distribution for Nonhalogenated UATMP VOCs at Helena, Alabama (B3AL) in 1995

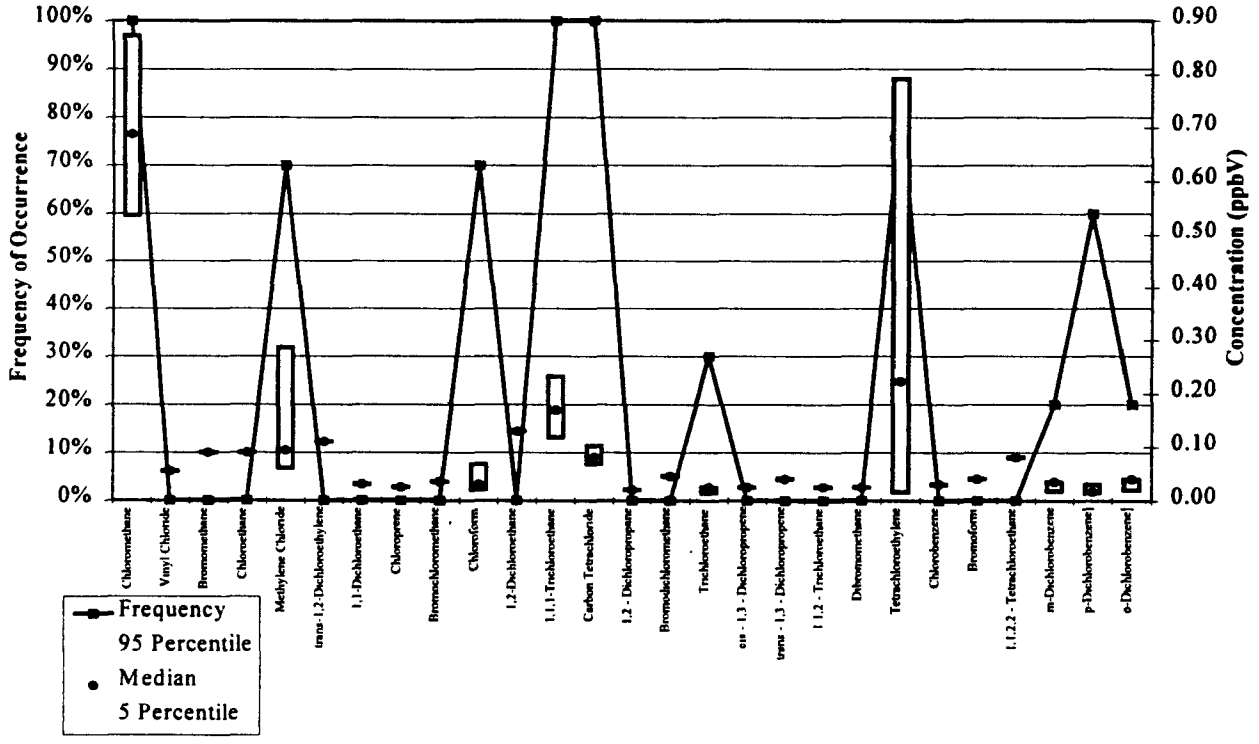

Figure D-6. Frequency and Concentration Distribution of Halogenated UATMP VOCs at Helena, Alabama (B3AL) in 1995

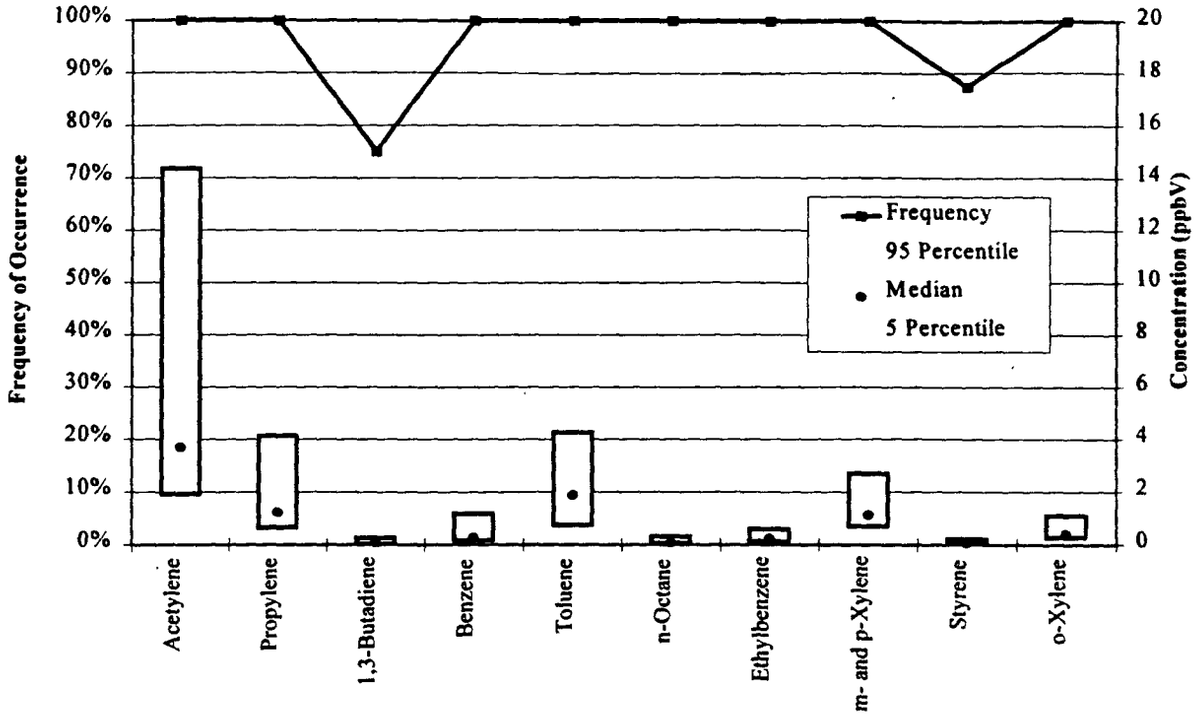

Figure D-7. Frequency and Concentration Distribution for Nonhalogenated UATMP VOCs at Newark, New Jersey (NWNJ) in 1995

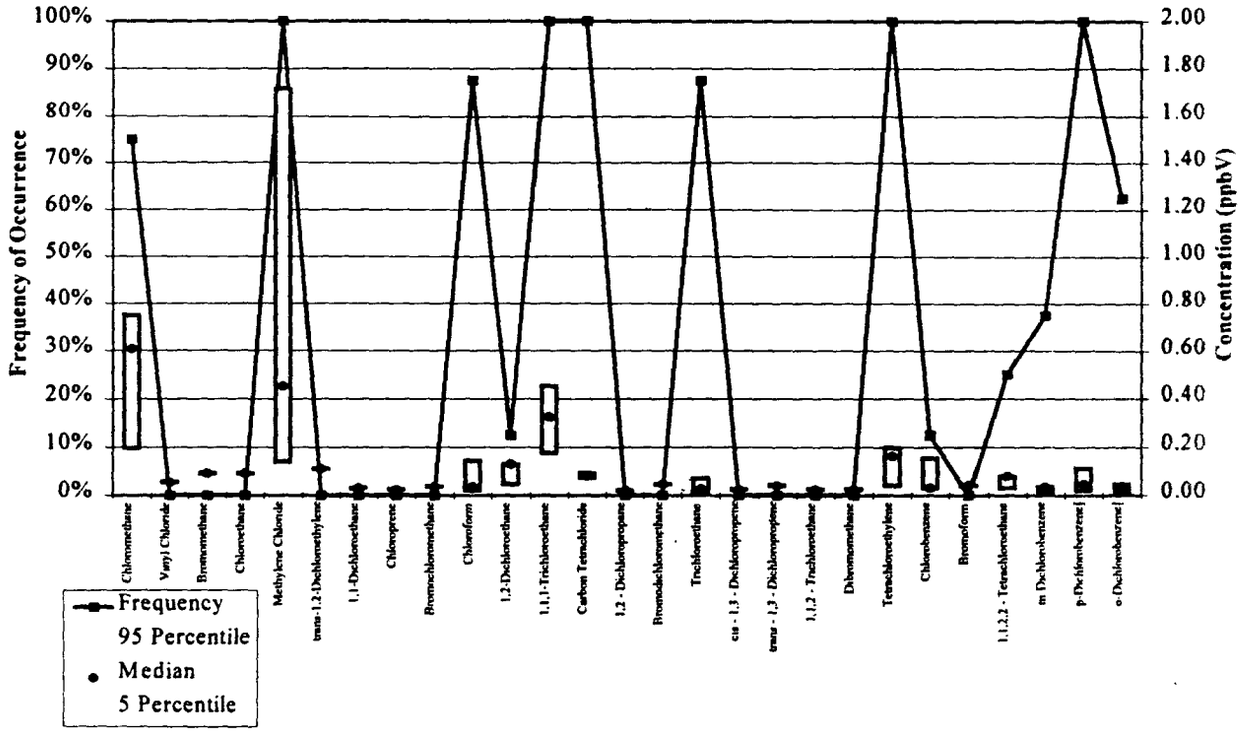

Figure D-8. Frequency and Concentration Distribution of Halogenated UATMP VOCs at Newark, New Jersey (NWNJ) in 1995

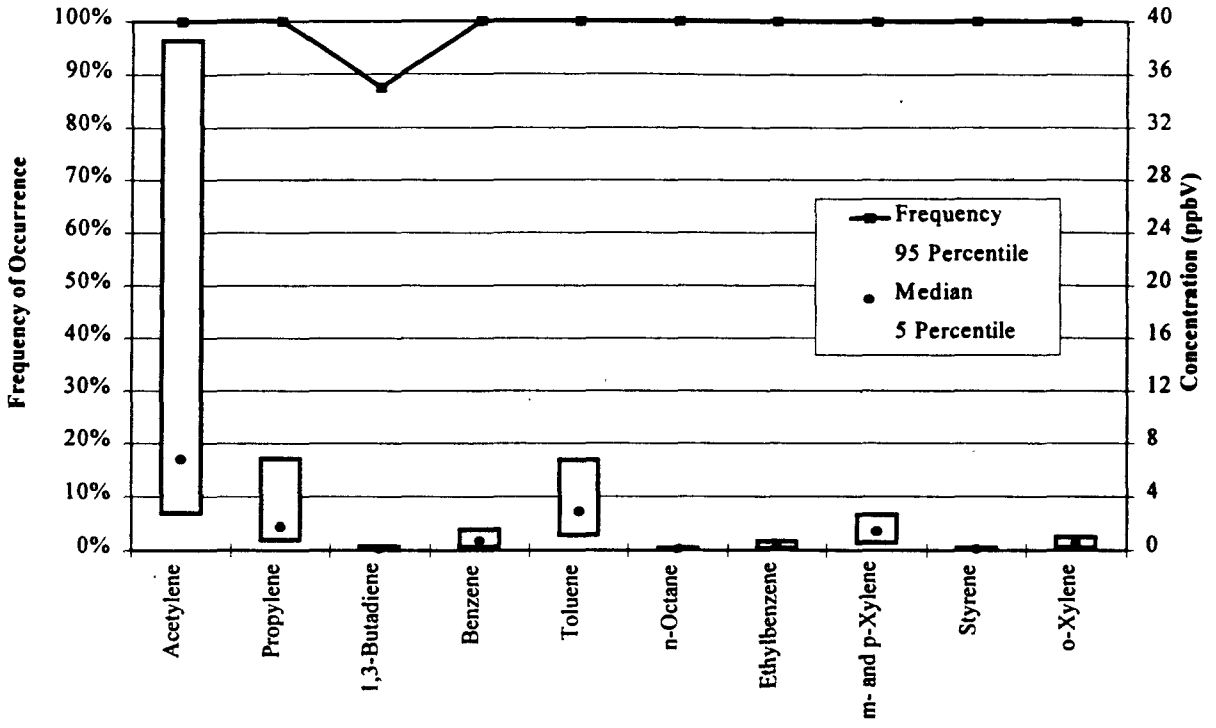

Figure D-9. Frequency and Concentration Distribution of Nonhalogenated UATMP VOCs at Plainfield, New Jersey (P2NJ) in 1995

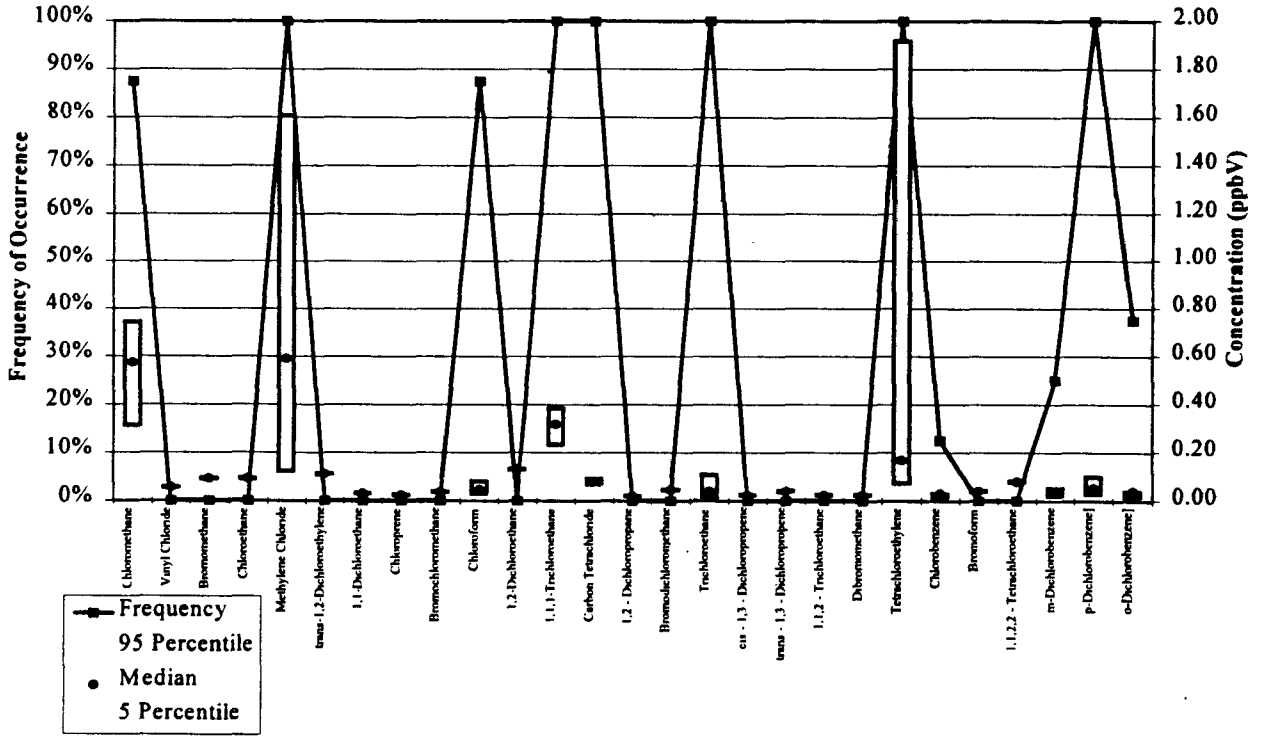

Figure D-10. Frequency and Concentration Distribution for Halogenated UATMP VOCs at Plainfield, New Jersey (P2NJ) in 1995

Table D-2. Number and Frequency of Occurrence of the UATMP VOCs in 1995 by Site

Compound	Tarrant City, Alabama (B1AL)		Pinson, Alabama (B2AL)		Helena, Alabama (B3AL)		Newark, New Jersey (NWNJ)		Plainfield, New Jersey (P2NJ)	
	Occurrences		Occurrences		Occurrences		Occurence		Occurrence	
	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency
Acetylene	8	100%	9	100%	10	100%	8	100%	8	100%
Propylene	8	100%	9	100%	10	100%	8	100%	8	100%
1,3-Butadiene	7	88%	9	100%	4	40%	6	75%	7	88%
Benzene	8	100%	9	100%	10	100%	8	100%	8	100%
Toluene	8	100%	9	100%	10	100%	8	100%	8	100%
n-Octane	8	100%	5	56%	8	80%	8	100%	8	100%
Ethylbenzene	8	100%	9	100%	10	100%	8	100%	8	100%
m- and p-Xylene	8	100%	9	100%	10	100%	8	100%	8	100%
Styrene	8	100%	8	89%	8	80%	7	88%	8	100%
o-Xylene	8	100%	9	100%	10	100%	8	100%	8	100%
Chloromethane	8	100%	9	100%	10	100%	6	75%	7	88%
Vinyl Chloride	0	0%	0	0%	0	0%	0	0%	0	0%
Bromomethane	0	0%	1	11%	0	0%	0	0%	0	0%
Chloroethane	0	0%	0	0%	0	0%	0	0%	0	0%
Methylene Chloride	8	100%	7	78%	7	70%	8	100%	8	100%
trans-1,2-Dichloroethylene	0	0%	0	0%	0	0%	0	0%	0	0%
1,1-Dichloroethane	0	0%	0	0%	0	0%	0	0%	0	0%
Chloroprene	0	0%	0	0%	0	0%	0	0%	0	0%
Bromochloromethane	0	0%	0	0%	0	0%	0	0%	0	0%
Chloroform	7	88%	6	67%	7	70%	7	88%	7	88%
1,2-Dichloroethane	0	0%	0	0%	0	0%	1	13%	0	0%
1,1,1-Trichloroethane	8	100%	9	100%	10	100%	8	100%	8	100%

Table D-2. Number and Frequency of Occurrence of the UATMP VOCs in 1995 by Site

Compound	Tarrant City, Alabama (B1AL)		Pinson, Alabama (B2AL)		Helena, Alabama (B3AL)		Newark, New Jersey (NWNJ)		Plainfield, New Jersey (P2NJ)	
	Occurrences		Occurrences		Occurrences		Occurence		Occurrence	
	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency	No.	Frequency
Carbon Tetrachloride	8	100%	9	100%	10	100%	8	100%	8	100%
1,2-Dichloropropane	0	0%	0	0%	0	0%	0	0%	0	0%
Bromodichloromethane	0	0%	0	0%	0	0%	0	0%	0	0%
Trichloroethane	7	88%	0	0%	3	30%	7	88%	8	100%
cis-1,3-Dichloropropene	0	0%	0	0%	0	0%	0	0%	0	0%
trans-1,3-Dichloropropene	0	0%	0	0%	0	0%	0	0%	0	0%
1,1,2-Trichloroethane	0	0%	0	0%	0	0%	0	0%	0	0%
Dibromomethane	0	0%	0	0%	0	0%	0	0%	0	0%
Tetrachloroethylene	8	100%	4	44%	8	80%	8	100%	8	100%
Chlorobenzene	0	0%	0	0%	0	0%	1	13%	1	13%
Bromoform	0	0%	0	0%	0	0%	0	0%	0	0%
1,1,2,2-Tetrachloroethane	0	0%	0	0%	0	0%	2	25%	0	0%
m-Dichlorobenzene	2	25%	2	22%	2	20%	3	38%	2	25%
p-Dichlorobenzene	8	100%	8	89%	6	60%	8	100%	8	100%
o-Dichlorobenzene	2	25%	1	11%	2	20%	5	63%	3	38%

Table D-3. Summary Statistics for the UATMP VOC Option Program

		Concentration Range		Central Tendency of Measured Concentration				Variability	
Compound	Nondetects	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Acetylene	0	0.50	39.45	None	3.83	7.91	4.86	8.86	2.70
Propyne	0	0.20	8.87	1.23	1.10	1.59	1.11	1.60	2.33
Chloromethane	3	0.20	0.95	0.58	0.62	0.63	0.60	0.16	1.41
Vinyl Chloride	43	0.06	0.06	0.06	0.06	0.06	0.06	0.00	1.00
1,3-Butadiene	10	0.03	0.41	0.08	0.08	0.12	0.09	0.08	1.91
Bromomethane	42	0.03	0.09	0.09	0.09	0.09	0.09	0.01	1.18
Chloroethane	43	0.09	0.09	0.09	0.09	0.09	0.09	0.00	1.00
Methylene Chloride	5	0.03	1.81	0.08	0.22	0.40	0.21	0.51	3.08
trans-1,2-Dichloroethylene	43	0.11	0.11	0.11	0.11	0.11	0.11	0.00	1.00
1,1-Dichloroethane	43	0.03	0.03	0.03	0.03	0.03	0.03	0.00	1.00
Chloroprene	43	0.03	0.03	0.03	0.03	0.03	0.03	0.00	1.00
Bromochloromethane	43	0.04	0.04	0.04	0.04	0.04	0.04	0.00	1.00
Chloroform	9	0.01	0.15	0.03	0.03	0.04	0.04	0.03	1.78
1,2-Dichloroethane	42	0.13	0.13	0.13	0.13	0.13	0.13	0.00	1.00
1,1,1-Trichloroethane	0	0.12	0.52	0.12	0.20	0.23	0.21	0.10	1.53
Benzene	0	0.12	6.48	0.30	0.46	0.77	0.50	1.03	2.35
Carbon Tetrachloride	0	0.07	0.11	0.08	0.08	0.08	0.08	0.01	1.15
1,2-Dichloropropane	43	0.02	0.02	0.02	0.02	0.02	0.02	0.00	1.00
Bromodichloromethane	43	0.05	0.05	0.05	0.05	0.05	0.05	0.00	1.00
Trichloroethylene	18	0.01	0.12	0.03	0.03	0.03	0.03	0.02	1.66
cis-1,3-Dichloropropene	43	0.03	0.03	0.03	0.03	0.03	0.03	0.00	1.00
trans-1,3-Dichloropropene	43	0.04	0.04	0.04	0.04	0.04	0.04	0.00	1.00
1,1,2-Trichloroethane	43	0.03	0.03	0.03	0.03	0.03	0.03	0.00	1.00
Toluene	0	0.47	24.08	1.22	1.31	2.55	1.67	3.71	2.30
Dibromochloromethane	43	0.03	0.03	0.03	0.03	0.03	0.03	0.00	1.00
n-Octane	6	0.01	0.70	0.03	0.07	0.11	0.07	0.12	2.52

Table D-3. Summary Statistics for the UATMP VOC Option Program

		Concentration Range		Central Tendency of Measured Concentration				Variability	
Compound	Nondetects	Minimum	Maximum	Mode	Median	Arithmetic Mean	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Tetrachloroethylene	7	0.01	2.85	0.02	0.08	0.20	0.08	0.45	3.75
Chlorobenzene	41	0.01	0.22	0.03	0.03	0.03	0.03	0.03	1.42
Ethylbenzene	0	0.05	0.90	0.13	0.21	0.29	0.22	0.23	2.18
m- and p-Xylene	0	0.19	4.01	0.57	0.90	1.26	0.93	1.00	2.22
Bromoform	43	0.04	0.04	0.04	0.04	0.04	0.04	0.00	1.00
Styrene	0	0.02	0.65	0.03	0.08	0.12	0.08	0.12	2.28
1,1,2,2-Tetrachloroentane	41	0.01	0.08	0.08	0.08	0.08	0.08	0.01	1.37
o-Xylene	0	0.08	1.51	0.23	0.34	0.49	0.37	0.38	2.18
m-Dichlorobenzene	32	0.01	0.06	0.04	0.04	0.03	0.03	0.01	1.49
p-Dichlorobenzene	5	0.01	0.12	0.01	0.03	0.04	0.03	0.03	2.12
o-Dichlorobenzene	30	0.01	0.05	0.04	0.04	0.03	0.03	0.01	1.55

There were a total of 43 valid samples from the five participating sites.

Table D-4. Summary Statistics for Tarrant City, Alabama (B1AL), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Arithmetic Mean	Geometric Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
ACETYLENE	8	0	13.98	13.58	12.69	10.91	22.95	3.97	0.28
PROPYLENE	8	0	2.29	1.92	2.11	0.48	4.23	1.31	0.57
CHLOROMETHANE	8	0	0.65	0.64	0.60	0.55	0.85	0.12	0.19
VINYL CHLORIDE	8	8	0.06	0.06	0.06	0.06	0.06	0.00	0.00
1,3-BUTADIENE	8	1	0.18	0.17	0.19	0.08	0.31	0.08	0.41
BROMOMETHANE	8	8	0.09	0.09	0.09	0.09	0.09	0.00	0.00
CHLOROETHANE	8	8	0.09	0.09	0.09	0.09	0.09	0.00	0.00
METHYLENE CHLORIDE	8	0	0.36	0.27	0.24	0.08	1.24	0.36	1.00
trans-1,2-DICHLOROETHYLENE	8	8	0.11	0.11	0.11	0.11	0.11	0.00	0.00
1,1-DICHLOROETHANE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
CHLOROPRENE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
BROMOCHLOROMETHANE	8	8	0.04	0.04	0.04	0.04	0.04	0.00	0.00
CHLOROFORM	8	1	0.05	0.04	0.05	0.03	0.07	0.02	0.37
1,2-DICHLOROETHANE	8	8	0.13	0.13	0.13	0.13	0.13	0.00	0.00
1,1,1-TRICHLOROETHANE	8	0	0.25	0.23	0.22	0.16	0.52	0.12	0.47
BENZENE	8	0	1.90	1.32	1.25	0.28	6.48	1.95	1.03
CARBON TETRACHLORIDE	8	0	0.08	0.08	0.08	0.07	0.09	0.01	0.13
1,2-DICHLOROPROPANE	8	8	0.02	0.02	0.02	0.02	0.02	0.00	0.00
BROMODICHLOROMETHANE	8	8	0.05	0.05	0.05	0.05	0.05	0.00	0.00
TRICHLOROETHYLENE	8	1	0.03	0.02	0.03	0.01	0.04	0.01	0.34
cis-1,3-DICHLOROPROPENE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
trans-1,3-DICHLOROPROPENE	8	8	0.04	0.04	0.04	0.04	0.04	0.00	0.00
1,1,2-TRICHLOROETHANE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
TOLUENE	8	0	3.05	2.73	3.04	0.76	4.95	1.25	0.41
DIBROMOCHLOROMETHANE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
n-OCTANE	8	0	0.24	0.20	0.20	0.08	0.70	0.19	0.81
TETRACHLOROETHYLENE	8	0	0.07	0.07	0.07	0.03	0.16	0.04	0.56
CHLOROBENZENE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
ETHYLBENZENE	8	0	0.58	0.50	0.56	0.12	0.90	0.25	0.43

Table D-4. Summary Statistics for Tarrant City, Alabama (B1AL), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Arithmetic Mean	Geometric Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
m,p-XYLENE	8	0	2.52	2.18	2.42	0.49	4.01	1.14	0.45
BROMOFORM	8	8	0.04	0.04	0.04	0.04	0.04	0.00	0.00
STYRENE	8	0	0.28	0.23	0.23	0.08	0.65	0.18	0.65
1,1,2,2-TETRACHLOROETHANE	8	8	0.08	0.08	0.08	0.08	0.08	0.00	0.00
o-XYLENE	8	0	0.96	0.85	0.94	0.20	1.51	0.41	0.42
m-DICHLOROBENZENE	8	6	0.03	0.03	0.04	0.02	0.04	0.01	0.22
p-DICHLOROBENZENE	8	0	0.07	0.07	0.07	0.03	0.09	0.03	0.36
o-DICHLOROBENZENE	8	6	0.04	0.03	0.04	0.02	0.04	0.01	0.26

Table D-5. Summary Statistics for Pinson, Alabama (B2AL), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Arithmetic Mean	Geometric Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
ACETYLENE	9	0	3.30	3.07	2.85	1.68	5.29	1.33	0.40
PROPYLENE	9	0	0.81	0.76	0.78	0.48	1.29	0.30	0.37
CHLOROMETHANE	9	0	0.68	0.67	0.65	0.54	0.95	0.13	0.19
VINYL CHLORIDE	9	9	0.06	0.06	0.06	0.06	0.06	0.00	0.00
1,3-BUTADIENE	9	0	0.07	0.07	0.07	0.04	0.12	0.03	0.38
BROMOMETHANE	9	8	0.08	0.08	0.09	0.03	0.09	0.02	0.24
CHLOROETHANE	9	9	0.09	0.09	0.09	0.09	0.09	0.00	0.00
METHYLENE CHLORIDE	9	2	0.09	0.07	0.07	0.03	0.26	0.07	0.78
trans-1,2-DICHLOROETHYLENE	9	9	0.11	0.11	0.11	0.11	0.11	0.00	0.00
1,1-DICHLOROETHANE	9	9	0.03	0.03	0.03	0.03	0.03	0.00	0.00
CHLOROPRENE	9	9	0.03	0.03	0.03	0.03	0.03	0.00	0.00
BROMOCHLOROMETHANE	9	9	0.04	0.04	0.04	0.04	0.04	0.00	0.00
CHLOROFORM	9	3	0.02	0.02	0.03	0.01	0.03	0.01	0.32
1,2-DICHLOROETHANE	9	9	0.13	0.13	0.13	0.13	0.13	0.00	0.00
1,1,1-TRICHLOROETHANE	9	0	0.13	0.13	0.13	0.12	0.15	0.01	0.10
BENZENE	9	0	0.43	0.39	0.35	0.23	1.05	0.25	0.59
CARBON TETRACHLORIDE	9	0	0.08	0.08	0.08	0.07	0.11	0.01	0.18
1,2-DICHLOROPROPANE	9	9	0.02	0.02	0.02	0.02	0.02	0.00	0.00
BROMODICHLOROMETHANE	9	9	0.05	0.05	0.05	0.05	0.05	0.00	0.00
TRICHLOROETHYLENE	9	9	0.03	0.03	0.03	0.03	0.03	0.00	0.00
cis-1,3-DICHLOROPROPENE	9	9	0.03	0.03	0.03	0.03	0.03	0.00	0.00
trans-1,3-DICHLOROPROPENE	9	9	0.04	0.04	0.04	0.04	0.04	0.00	0.00
1,1,2-TRICHLOROETHANE	9	9	0.03	0.03	0.03	0.03	0.03	0.00	0.00
TOLUENE	9	0	0.96	0.91	0.78	0.68	1.71	0.37	0.38
DIBROMOCHLOROMETHANE	9	9	0.03	0.03	0.03	0.03	0.03	0.00	0.00
n-OCTANE	9	4	0.03	0.03	0.03	0.03	0.04	0.00	0.18
TETRACHLOROETHYLENE	9	5	0.02	0.02	0.02	0.01	0.03	0.00	0.27
CHLOROBENZENE	9	9	0.03	0.03	0.03	0.03	0.03	0.00	0.00
ETHYLBENZENE	9	0	0.14	0.14	0.13	0.10	0.23	0.05	0.34

Table D-5. Summary Statistics for Pinson, Alabama (B2AL), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Arithmetic Mean	Geometric Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
m,p-XYLENE	9	0	0.61	0.57	0.54	0.41	1.03	0.22	0.37
BROMOFORM	9	9	0.04	0.04	0.04	0.04	0.04	0.00	0.00
STYRENE	9	1	0.07	0 06	0.06	0.04	0.10	0.02	0.35
1,1,2,2-TETRACHLOROETHANE	9	9	0.08	0.08	0.08	0.08	0.08	0.00	0.00
o-XYLENE	9	0	0.24	0.23	0.22	0.16	0.39	0.08	0.34
m-DICHLOROBENZENE	9	7	0.03	0.03	0.04	0.01	0.04	0.01	0.29
p-DICHLOROBENZENE	9	1	0.02	0.02	0.01	0.01	0.03	0.01	0.40
o-DICHLOROBENZENE	9	8	0.04	0.04	0.04	0.02	0.04	0.01	0.18

Table D-6. Summary Statistics for Helena, Alabama (B3AL), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Arithmetic Mean	Geometric Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
ACETYLENE	10	0	2.49	2.01	2.25	0.60	6.29	1.69	0.68
PROPYLENE	10	0	0.59	0.50	0.54	0.20	1.11	0.34	0.58
CHLOROMETHANE	10	0	0.69	0.68	0.69	0.50	0.95	0.12	0.18
VINYL CHLORIDE	10	10	0.06	0.06	0.06	0.06	0.06	0.00	0.00
1,3-BUTADIENE	10	6	0.07	0.07	0.08	0.04	0.12	0.02	0.28
BROMOMETHANE	10	10	0.09	0.09	0.09	0.09	0.09	0.00	0.00
CHLOROETHANE	10	10	0.09	0.09	0.09	0.09	0.09	0.00	0.00
METHYLENE CHLORIDE	10	3	0.13	0.11	0.09	0.05	0.31	0.09	0.66
trans-1,2-DICHLOROETHYLENE	10	10	0.11	0.11	0.11	0.11	0.11	0.00	0.00
1,1-DICHLOROETHANE	10	10	0.03	0.03	0.03	0.03	0.03	0.00	0.00
CHLOROPRENE	10	10	0.03	0.03	0.03	0.03	0.03	0.00	0.00
BROMOCHLOROMETHANE	10	10	0.04	0.04	0.04	0.04	0.04	0.00	0.00
CHLOROFORM	10	3	0.04	0.03	0.03	0.01	0.07	0.02	0.50
1,2-DICHLOROETHANE	10	10	0.13	0.13	0.13	0.13	0.13	0.00	0.00
1,1,1-TRICHLOROETHANE	10	0	0.17	0.17	0.17	0.12	0.25	0.04	0.24
BENZENE	10	0	0.33	0.29	0.28	0.12	0.63	0.18	0.54
CARBON TETRACHLORIDE	10	0	0.08	0.08	0.08	0.07	0.11	0.01	0.18
1,2-DICHLOROPROPANE	10	10	0.02	0.02	0.02	0.02	0.02	0.00	0.00
BROMODICHLOROMETHANE	10	10	0.05	0.05	0.05	0.05	0.05	0.00	0.00
TRICHLOROETHYLENE	10	7	0.02	0.02	0.03	0.01	0.03	0.01	0.26
cis-1,3-DICHLOROPROPENE	10	10	0.03	0.03	0.03	0.03	0.03	0.00	0.00
trans-1,3-DICHLOROPROPENE	10	10	0.04	0.04	0.04	0.04	0.04	0.00	0.00
1,1,2-TRICHLOROETHANE	10	10	0.03	0.03	0.03	0.03	0.03	0.00	0.00
TOLUENE	10	0	3.27	1.23	0.93	0.47	24.08	7.32	2.24
DIBROMOCHLOROMETHANE	10	10	0.03	0.03	0.03	0.03	0.03	0.00	0.00
N-OCTANE	10	2	0.04	0.03	0.04	0.01	0.09	0.02	0.56
TETRACHLOROETHYLENE	10	2	0.30	0.13	0.22	0.02	0.93	0.31	1.04
CHLOROBENZENE	10	10	0.03	0.03	0.03	0.03	0.03	0.00	0.00
ETHYLBENZENE	10	0	0.13	0.11	0.11	0.05	0.34	0.09	0.68

Table D-6. Summary Statistics for Helena, Alabama (B3AL), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Arithmetic Mean	Geometric Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
m,p-XYLENE	10	0	0.52	0.44	0.43	0.19	1.40	0.35	0.68
BROMOFORM	10	10	0.04	0.04	0.04	0.04	0.04	0.00	0.00
STYRENE	10	2	0.06	0.05	0.04	0.02	0.13	0.04	0.68
1,1,2,2-TETRACHLOROETHANE	10	10	0.08	0.08	0.08	0.08	0.08	0.00	0.00
o-XYLENE	10	0	0.21	0.18	0.18	0.08	0.58	0.15	0.69
m-DICHLOROBENZENE	10	8	0.03	0.03	0.04	0.01	0.04	0.01	0.25
p-DICHLOROBENZENE	10	4	0.02	0.02	0.02	0.01	0.03	0.01	0.40
o-DICHLOROBENZENE	10	8	0.04	0.03	0.04	0.01	0.04	0.01	0.27

Table D-7. Summary Statistics for Newark, New Jersey (NWNJ), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Arithmetic Mean	Geometric Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
ACETYLENE	8	0	6.16	4.68	3.71	1.57	14.90	5.09	0.83
PROPYLENE	8	0	2.00	1.56	1.24	0.65	4.36	1.48	0.74
CHLOROMETHANE	8	2	0.55	0.49	0.61	0.20	0.77	0.23	0.41
VINYL CHLORIDE	8	8	0.06	0.06	0.06	0.06	0.06	0.00	0.00
1,3-BUTADIENE	8	2	0.11	0.08	0.08	0.03	0.31	0.10	0.90
BROMOMETHANE	8	8	0.09	0.09	0.09	0.09	0.09	0.00	0.00
CHLOROETHANE	8	8	0.09	0.09	0.09	0.09	0.09	0.00	0.00
METHYLENE CHLORIDE	8	0	0.72	0.48	0.45	0.09	1.81	0.65	0.90
trans-1,2-DICHLOROETHYLENE	8	8	0.11	0.11	0.11	0.11	0.11	0.00	0.00
1,1-DICHLOROETHANE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
CHLOROPRENE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
BROMOCHLOROMETHANE	8	8	0.04	0.04	0.04	0.04	0.04	0.00	0.00
CHLOROFORM	8	1	0.06	0.04	0.04	0.01	0.15	0.05	0.86
1,2-DICHLOROETHANE	8	7	0.11		0.13	0.00	0.13	0.05	0.40
1,1,1-TRICHLOROETHANE	8	0	0.31	0.30	0.33	0.15	0.46	0.11	0.35
BENZENE	8	0	0.50	0.38	0.28	0.16	1.35	0.43	0.86
CARBON TETRACHLORIDE	8	0	0.08	0.08	0.08	0.07	0.09	0.01	0.09
1,2-DICHLOROPROPANE	8	8	0.02	0.02	0.02	0.02	0.02	0.00	0.00
BROMODICHLOROMETHANE	8	8	0.05	0.05	0.05	0.05	0.05	0.00	0.00
TRICHLOROETHYLENE	8	1	0.03		0.03	0.00	0.08	0.03	0.75
cis-1,3-DICHLOROPROPENE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
trans-1,3-DICHLOROPROPENE	8	8	0.04	0.04	0.04	0.04	0.04	0.00	0.00
1,1,2-TRICHLOROETHANE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
TOLUENE	8	0	2.14	1.78	1.87	0.68	4.90	1.39	0.65
DIBROMOCHLOROMETHANE	8	8	0.03	0.03	0.03	0.03	0.03	0.00	0.00
N-OCTANE	8	0	0.13	0.10	0.07	0.04	0.39	0.12	0.87
TETRACHLOROETHYLENE	8	0	0.14	0.12	0.16	0.03	0.20	0.06	0.44
CHLOROBENZENE	8	7	0.05	0.04	0.03	0.03	0.22	0.07	1.25

Table D-7. Summary Statistics for Newark, New Jersey (NWNJ), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Arithmetic Mean	Geometric Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
ETHYLBENZENE	8	0	0.32	0.27	0.25	0.12	0.67	0.20	0.61
m,p-XYLENE	8	0	1.48	1.30	1.13	0.68	2.92	0.83	0.56
BROMOFORM	8	8	0.04	0.04	0.04	0.04	0.04	0.00	0.00
STYRENE	8	1	0.11	0.08	0.08	0.03	0.28	0.08	0.77
1,1,2,2-TETRACHLOROETHANE	8	6	0.07	0.06	0.08	0.01	0.08	0.02	0.35
o-XYLENE	8	0	0.57	0.50	0.43	0.23	1.19	0.34	0.59
m-DICHLOROBENZENE	8	5	0.03	0.03	0.04	0.01	0.04	0.01	0.32
p-DICHLOROBENZENE	8	0	0.06	0.05	0.05	0.01	0.12	0.04	0.63
o-DICHLOROBENZENE	8	3	0.03	0.03	0.04	0.01	0.05	0.02	0.50

Table D-8. Summary Statistics for Plainfield, New Jersey (P2NJ), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
ACETYLENE	8	0	15.54	6.81	2.71	39.45	15.57	1.00
PROPYLENE	8	0	2.61	1.75	0.74	8.87	2.66	1.02
CHLOROMETHANE	8	1	0.56	0.57	0.20	0.80	0.17	0.30
VINYL CHLORIDE	8	8	0.06	0.06	0.06	0.06	0.00	0.00
1,3-BUTADIENE	8	1	0.16	0.12	0.04	0.41	0.12	0.76
BROMOMETHANE	8	8	0.09	0.09	0.09	0.09	0.00	0.00
CHLOROETHANE	8	8	0.09	0.09	0.09	0.09	0.00	0.00
METHYLENE CHLORIDE	8	0	0.82	0.59	0 11	1.62	0.64	0.78
trans-1,2-DICHLOROETHYLENE	8	8	0.11	0.11	0.11	0.11	0.00	0.00
1,1-DICHLOROETHANE	8	8	0.03	0.03	0.03	0.03	0.00	0.00
CHLOROPRENE	8	8	0.03	0.03	0.03	0.03	0.00	0.00
BROMOCHLOROMETHANE	8	8	0.04	0.04	0.04	0.04	0.00	0.00
CHLOROFORM	8	1	0.05	0.05	0.03	0.08	0.02	0.46
1,2-DICHLOROETHANE	8	8	0.13	0.13	0.13	0.13	0.00	0.00
1,1,1-TRICHLOROETHANE	8	0	0.31	0.32	0.21	0.41	0.06	0.18
BENZENE	8	0	0.83	0.76	0.23	1.62	0.52	0.62
CARBON TETRACHLORIDE	8	0	0.08	0.08	0.07	0.09	0.01	0.13
1,2-DICHLOROPROPANE	8	8	0.02	0.02	0.02	0.02	0.00	0.00
BROMODICHLOROMETHANE	8	8	0.05	0.05	0.05	0.05	0.00	0.00
TRICHLOROETHYLENE	8	0	0.05	0.04	0.01	0.12	0.04	0.81
cis-1,3-DICHLOROPROPENE	8	8	0.03	0.03	0.03	0.03	0.00	0.00
trans-1,3-DICHLOROPROPENE	8	8	0.04	0.04	0.04	0.04	0.00	0.00
1,1,2-TRICHLOROETHANE	8	8	0.03	0.03	0.03	0.03	0.00	0.00
TOLUENE	8	0	3.36	2.88	1.13	7.72	2.16	0.64
DIBROMOCHLOROMETHANE	8	8	0.03	0.03	0.03	0.03	0.00	0.00
N-OCTANE	8	0	0.14	0.13	0.05	0.22	0.05	0.38
TETRACHLOROETHYLENE	8	0	0.49	0.17	0.05	2.85	0.96	1.97
CHLOROBENZENE	8	7	0.03	0.03	0.01	0.03	0.01	0.26
ETHYLBENZENE	8	0	0.34	0.31	0.13	0.78	0.21	0.61

Table D-8. Summary Statistics for Plainfield, New Jersey (P2NJ), 1995 UATMP VOC Option

Compound	Cases	Non-Detects	Mean	Median	Minimum	Maximum	Standard Deviation	Coeficient of Variation
m,p-XYLENE	8	0	1.46	1.44	0.55	2.88	0.79	0.54
BROMOFORM	8	8	0.04	0.04	0.04	0.04	0.00	0.00
STYRENE	8	0	0.10	0.09	0.03	0.27	0.08	0.80
1,1,2,2-TETRACHLOROETHANE	8	8	0.08	0.08	0.08	0.08	0.00	0.00
o-XYLENE	8	0	0.58	0.59	0.22	1.09	0.30	0.52
m-DICHLOROBENZENE	8	6	0.04	0.04	0.01	0.06	0.01	0.38
p-DICHLOROBENZENE	8	0	0.06	0.05	0.03	0.11	0.03	0.49
o-DICHLOROBENZENE	8	5	0.03	0.04	0.01	0.04	0.01	0.31

Table D-9. Shape Summary Statistics for the UATMP VOC Option

Compound	Cases	Nondetects	Normal Distribution		Lognormal Distribution	
			Skew	Kurtosis	Skew	Kurtosis
Chloromethane	43	3	-0.89	2.36	-2.33	6.18
Vinyl Chloride	43	43	-1.04	-2.10	1.04	-2.10
Bromomethane	43	42	-6.56	43.00	-6.56	43.00
Chloroethane	43	43	1.04	-2.10	1.04	-2.10
Methylene Chloride	43	5	1.75	1.78	0.44	-0.74
trans-1,2-Dichloroethylene	43	43	-1.04	-2.10	-1.04	-2.10
1,1-Dichloroethane	43	43	-1.04	-2.10	1.04	-2.10
Chloroprene	43	43	-1.04	-2.10	-1.04	-2.10
Bromochloromethane	43	43	1.04	-2.10	1.04	-2.10
Chloroform	43	9	2.03	4.86	0.39	0.13
1,2-Dichloroethane	43	42	1.04	-2.10	1.04	-2.10
1,1,1-Trichloroethane	43	0	1.02	0.35	0.37	-0.92
Carbon Tetrachloride	43	0	0.54	-0.28	0.27	-0.71
1,2-Dichloropropane	43	43	-1.04	-2.10	-1.04	-2.10
Bromodichloromethane	43	43	1.04	-2.10	1.04	-2.10
Trichloroethylene	43	18	2.76	8.99	0.92	1.46
cis-1,3-Dichloropropene	43	43	-1.04	-2.10	-1.04	-2.10
trans-1,3-Dichloropropene	43	43	-1.04	-2.10	1.04	-2.10
1,1,2-Trichloroethane	43	43	-1.04	-2.10	-1.04	-2.10
Dibromochloromethane	43	43	-1.04	-2.10	-1.04	-2.10
Tetrachloroethylene	43	7	5.16	29.70	0.39	-0.19
Chlorobenzene	43	41	6.44	42.01	3.63	27.15
Bromoform	43	43	-1.04	-2.10	1.04	-2.10
1,1,2,2-Tetrachloroentane	43	41	-6.17	39.05	-6.46	42.09
m-Dichlorobenzene	43	32	-0.72	2.93	-1.96	3.38
p-Dichlorobenzene	43	5	0.87	-0.55	0.15	-1.36
o-Dichlorobenzene	43	30	-1.58	1.29	-2.01	2.88
Acetylene	43	0	2.19	5.02	0.18	-0.30
Propyne	43	0	2.65	9.35	0.21	-0.15
1,3-Butadiene	43	10	1.66	2.64	0.33	-0.26
Benzene	43	0	4.35	23.18	0.71	0.36
Toluene	43	0	4.92	28.12	0.84	0.90
n-Octane	43	6	3.05	12.49	0.35	-0.71

Table D-9. Shape Summary Statistics for the UATMP VOC Option

Compound	Cases	Nondetects	Normal Distribution		Lognormal Distribution	
			Skew	Kurtosis	Skew	Kurtosis
Ethylbenzene	43	0	1.22	0.64	0.18	-0.94
m- and p-Xylene	43	0	1.19	0.68	0.10	-0.95
Styrene	43	0	2.64	8.77	0.41	-0.28
o-Xylene	43	0	1.07	0.23	0.08	-1.00

Table D-10. Shape Statisitcs for Tarrant City, Alabama (B1AL) 1995 UATMP VOC Option

		Straight			Logarithm		
Compound	Non-Detects	Shapiro-Wilk (W)	Skewness	Kurtosis	Shapiro-Wilk (W)	Skewness	Kurtosis
ACETYLENE	0	0.766*	2.01	4.34	0.839	1.62	2.76
PROPYLENE	0	0.941	0.42	-0.70	0.942	-0.99	1.32
CHLOROMETHANE	0	0.718*	1.32	-0.13	0.743*	1.26	-0.20
VINYL CHLORIDE	8						
1,3-BUTADIENE	1	0.967*	0.21	-0.39	0.952	-0.65	0.11
BROMOMETHANE	8		1.25	-2.80		-1.25	-2.80
CHLOROETHANE	8		1.25	-2.80		-1.25	-2.80
METHYLENE CHLORIDE	0	0.626	2.54	6.85	0.870	0.77	2.94
trans-1,2-DICHLOROETHYLENE	8					-1.25	-2.80
1,1-DICHLOROETHANE	8						
CHLOROPRENE	8		1.25	-2.80			
BROMOCHLOROMETHANE	8						
CHLOROFORM	1	0.869*	0.12	-1.88	0.864	-0.14	-2.02
1,2-DICHLOROETHANE	8						
1,1,1-TRICHLOROETHANE	0	0.710*	2.30	5.81	0.844	1.67	3.46
BENZENE	0	0.720	2.29	5.76	0.970	0.09	1.36
CARBON TETRACHLORIDE	0	0.849*	0.00	-0.70	0.847	-0.22	-0.69
1,2-DICHLOROPROPANE	8						
BROMODICHLOROMETHANE	8		1.25	-2.80			
TRICHLOROETHYLENE	1	0.843	0.18	0.84	0.812*	-0.67	-0.07
cis-1,3-DICHLOROPROPENE	8		1.25	-2.80			
trans-1,3-DICHLOROPROPENE	8						
1,1,2-TRICHLOROETHANE	8		1.25	-2.80			
TOLUENE	0	0.975	-0.43	0.98	0.822	-1.84	4.23
DIBROMOCHLOROMETHANE	8		1.25	-2.80			
N-OCTANE	0	0.665	2.45	6.52	0.890	1.02	2.80
TETRACHLOROETHYLENE	0	0.890*	1.42	2.75	0.985	0.00	0.53
CHLOROBENZENE	8						
ETHYLBENZENE	0	0.932*	-0.42	0.70	0.784*	-1.93	4.60
m,p-XYLENE	0	0.929	-0.31	0.51	0.786*	-1.90	4.49
BROMOFORM	8						
STYRENE	0	0.892	1.37	2.05	0.991	-0.04	0.25
1,1,2,2-TETRACHLOROETHANE	8						
o-XYLENE	0	0.951	-0.54	0.88	0.785*	-1.99	4.75
m-DICHLOROBENZENE	6	0.566*	-1.44	0.00	0.566*	-1.44	0.00
p-DICHLOROBENZENE	0	0.866	-0.80	-0.62	0.818*	-1.30	0.79
o-DICHLOROBENZENE	6	0.566*	-1.44	0.00	0.566*	-1.44	0.00

** Significant at the 5% level.*

Table D-11. Shape Statisitcs for Pinson, Alabama (B2AL)
1995 UATMP VOC Option

		Normal			Lognormal		
Compound	Non-Detects	Shapiro-Wilk (W)	Skewness	Kurtosis	Shapiro-Wilk (W)	Skewness	Kurtosis
ACETYLENE	0	0.914	0.54	-1.25	0.953	0.09	-1.25
PROPYLENE	0	0.918	0.44	-1.34	0.928	0.10	-1.65
CHLOROMETHANE	0	0.870	1.34	1.32	0.913	1.05	0.64
VINYL CHLORIDE	9	0.386*			0.386*	-1.21	-2.67
1,3-BUTADIENE	0	0.937	0.54	-0.49	0.943	-0.08	-0.90
BROMOMETHANE	8	0.386*	-3.00	9.00	0.386*	-3.00	9.00
CHLOROETHANE	9		1.21	-2.67			
METHYLENE CHLORIDE	2	0.670*	2.51	6.97	0.900	0.84	2.85
trans-1,2-DICHLOROETHYLENE	9						
1,1-DICHLOROETHANE	9		-1.21	-2.67		1.21	-2.67
CHLOROPRENE	9	0.386*	1.21	-2.67	0.386*	1.21	-2.67
BROMOCHLOROMETHANE	9	0.386*			0.386*	-1.21	-2.67
CHLOROFORM	3	0.730*	-0.75	-1.71	0.701*	-0.80	-1.71
1,2-DICHLOROETHANE	9					-1.21	-2.67
1,1,1-TRICHLOROETHANE	0	0.814*	0.68	-1.25	0.818*	0.61	-1.37
BENZENE	0	0.718*	2.24	5.41	0.871	1.43	2.25
CARBON TETRACHLORIDE	0	0.866	0.69	-0.60	0.872	0.48	-1.05
1,2-DICHLOROPROPANE	9					-1.21	-2.67
BROMODICHLOROMETHANE	9	0.386*	1.21	-2.67	0.386*		
TRICHLOROETHYLENE	9	0.386*	1.21	-2.67	0.386*	1.21	-2.67
cis-1,3-DICHLOROPROPENE	9	0.386*	1.21	-2.67	0.386*	1.21	-2.67
trans-1,3-DICHLOROPROPENE	9					-1.21	-2.67
1,1,2-TRICHLOROETHANE	9	0.386*	1.21	-2.67	0.386*	1.21	-2.67
TOLUENE	0	0.769*	1.36	0.89	0.801*	1.08	-0.34
DIBROMOCHLOROMETHANE	9	0.386*	1.21	-2.67	0.386*	1.21	-2.67
n-OCTANE	4	0.647*	2.77	7.97	0.693*	2.64	7.43
TETRACHLOROETHYLENE	5	0.975*	2.83	8.27	0.724*	2.67	7.62
CHLOROBENZENE	9		-1.21	-2.67		1.21	-2.67
ETHYLBENZENE	0	0.772*	1.33	0.32	0.836	1.09	-0.06
m,p-XYLENE	0	0.806*	1.33	0.49	0.874	1.00	-0.08
BROMOFORM	9					-1.21	-2.67
STYRENE	1	0.868	0.55	-1.62	0.899	0.31	-1.63
1,1,2,2-TETRACHLOROETHANE	9						
o-XYLENE	0	0.797*	1.28	0.23	0.867	0.98	-0.11
m-DICHLOROBENZENE	7	0.569*	-2.12	4.00	0.554*	-2.46	6.07
p-DICHLOROBENZENE	1	0.670*	1.67	1.10	0.721*	1.65	0.92
o-DICHLOROBENZENE	8	0.386*	-3.00	9.00	0.386*	-3.00	9.00

* *Significant at the 5% level.*

Table D-12. Shape Statisitcs for Helena, Alabama (B3AL)
1995 UATMP VOC Option

		Normal			Lognormal		
Compound	Non-Detects	Shapiro-Wilk (W)	Skewness	Kurtosis	Shapiro-Wilk (W)	Skewness	Kurtosis
ACETYLENE	0	0.902	1.25	2.02	0.974	-0.26	-0.48
PROPYLENE	0	0.910	0.48	-1.21	0.936	-0.16	-1.44
CHLOROMETHANE	0	0.951	0.73	1.52	0.974	0.16	0.91
VINYL CHLORIDE	10	0.360*	-1.19	-2.57	0.360*	-1.19	-2.57
1,3-BUTADIENE	6	0.824*	1.09	3.74	0.855	-0.24	2.46
BROMOMETHANE	10		1.36	-1.72			
CHLOROETHANE	10		1.36	-1.72			
METHYLENE CHLORIDE	3	0.803	1.21	0.08	0.891	0.71	-0.89
trans-1,2-DICHLOROETHYLENE	10		-1.185854	-2.57			
1,1-DICHLOROETHANE	10		-1.19	-2.57			
CHLOROPRENE	10	0.360*	1.36	-1.72	0.360*	1.19	-2.57
BROMOCHLOROMETHANE	10	0.360*	-1.19	-2.57	0.360*	-1.19	-2.57
CHLOROFORM	3	0.790*	1.18	0.52	0.871	0.12	0.79
1,2-DICHLOROETHANE	10		1.19	-2.57		-1.19	-2.57
1,1,1-TRICHLOROETHANE	0	0.951	0.52	0.33	0.960	-0.02	-0.31
BENZENE	0	0.895	0.72	-0.96	0.953	0.09	-1.07
CARBON TETRACHLORIDE	0	0.869	0.71	-0.45	0.875	0.49	-0.97
1,2-DICHLOROPROPANE	10		1.19	-2.57		-1.19	-2.57
BROMODICHLOROMETHANE	10	0.360*	1.36	-1.72	0.360*	1.19	-2.57
TRICHLOROETHYLENE	7	0.740*	-1.04	-1.22	0.705*	-1.04	-1.22
cis-1,3-DICHLOROPROPENE	10	0.360*	1.36	-1.72	0.360*	1.19	-2.57
trans-1,3-DICHLOROPROPENE	10		1.19	-2.57		-1.19	-2.57
1,1,2-TRICHLOROETHANE	10	0.360*	1.36	-1.72	0.360*	1.19	-2.57
TOLUENE	0	0.407*	3.15	9.93	0.701*	2.48	6.91
DIBROMOCHLOROMETHANE	10	0.360*	1.36	-1.72	0.360*	1.19	-2.57
N-OCTANE	2	0.741*	2.02	5.48	0.882	0.16	1.84
TETRACHLOROETHYLENE	2	0.876	0.95	0.19	0.898	-0.34	-1.69
CHLOROBENZENE	10		-1.19	-2.57			
ETHYLBENZENE	0	0.794*	1.89	4.23	0.946	0.64	0.09
m,p-XYLENE	0	0.794*	1.94	4.39	0.959	0.63	0.33
BROMOFORM	10		1.19	-2.57		-1.19	-2.57
STYRENE	2	0.865	0.85	-0.74	0.921	0.25	-1.46
1,1,2,2-TETRACHLOROETHANE	10		1.19	-2.57			
o-XYLENE	0	0.798*	1.91	4.11	0.959	0.66	0.24
m-DICHLOROBENZENE	8	0.452*	-2.66	7.19	0.419*	-2.92	8.72
p-DICHLOROBENZENE	4	0.716*	0.36	-2.25	0.720*	0.29	-2.27
o-DICHLOROBENZENE	8	0.496*	-2.66	7.19	0.454*	-2.94	8.82

** Significant at the 5% level.*

Table D-13. Shape Statistics for Newark, New Jersey (NWNJ) 1995 UATMP VOC Option

		Normal			Lognormal		
Compound	Non-Detects	Shapiro-Wilk (W)	Skewness	Kurtosis	Shapiro-Wilk (W)	Skewness	Kurtosis
ACETYLENE	0	0.785*	1.23	-0.17	0.923	0.46	-0.63
PROPYLENE	0	0.836	0.76	-1.36	0.891	0.30	-1.75
CHLOROMETHANE	2	0.798*	-1.09	-0.41	0.711*	-1.32	-0.16
VINYL CHLORIDE	8	0.417*			0.417*	-1.25	-2.80
1,3-BUTADIENE	2	0.775*	1.66	2.44	0.908	0.30	-0.29
BROMOMETHANE	8		1.25	-2.80			
CHLOROETHANE	8		1.25	-2.80			
METHYLENE CHLORIDE	0	0.861	0.91	-0.78	0.960	-0.12	-1.03
trans-1,2-DICHLOROETHYLENE	8						
1,1-DICHLOROETHANE	8					1.25	-2.80
CHLOROPRENE	8	0.417*	1.25	-2.80	0.417*	1.25	-2.80
BROMOCHLOROMETHANE	8	0.417*			0.417*	-1.25	-2.80
CHLOROFORM	1	0.788*	1.13	-0.44	0.920	0.35	-0.91
1,2-DICHLOROETHANE	7	0.417*	-2.83	8.00		-1.30	-3.00
1,1,1-TRICHLOROETHANE	0	0.950	-0.10	-1.32	0.932	-0.61	-0.61
BENZENE	0	0.793*	1.43	1.07	0.904	0.70	-0.84
CARBON TETRACHLORIDE	0	0.844*	-0.31	2.21	0.832	-0.69	2.60
1,2-DICHLOROPROPANE	8						
BROMODICHLOROMETHANE	8	0.417*	1.25	-2.80	0.417*		
TRICHLOROETHYLENE	1	0.948	0.84	0.90	0.967	0.09	0.04
cis-1,3-DICHLOROPROPENE	8	0.417*	1.25	-2.80	0.417*	1.25	-2.80
trans-1,3-DICHLOROPROPENE	8					-1.25	-2.80
1,1,2-TRICHLOROETHANE	8	0.417*	1.25	-2.80	0.417*	1.25	-2.80
TOLUENE	0	0.915	1.11	1.15	0.980	-0.04	-0.82
DIBROMOCHLOROMETHANE	8	0.417*	1.25	-2.80	0.417*	1.25	-2.80
N-OCTANE	0	0.761*	1.86	3.58	0.905	0.79	-0.06
TETRACHLOROETHYLENE	0	0.859	-1.14	0.19	0.745*	-1.81	2.81
CHLOROBENZENE	7	0.417*	2.83	8.00	0.417*	2.83	8.00
ETHYLBENZENE	0	0.898	0.87	-0.29	0.944	0.11	-1.22
m,p-XYLENE	0	0.878	0.84	-0.78	0.926	0.37	-1.54
BROMOFORM	8					-1.25	-2.80
STYRENE	1	0.855	1.43	1.93	0.975	0.24	-0.70
1,1,2,2-TETRACHLOROETHANE	6	0.492	-2.60	6.89	0.452*	-2.78	7.76
o-XYLENE	0	0.876	1.02	-0.12	0.945	0.38	-1.03
m-DICHLOROBENZENE	5	0.692	-1.64	1.77	0.650*	-2.03	3.86
p-DICHLOROBENZENE	0	0.919	0.46	-1.33	0.943	-0.53	-0.29
o-DICHLOROBENZENE	3	0.821	-0.54	-1.49	0.770*	-0.91	-1.07

* *Significant at the 5% level*

Table D-14. Shape Statistics for Plainfield, New Jersey (P2NJ) 1995 UATMP VOC Option

Compound	Non-Detects	Normal			Lognormal		
		Shapiro-Wilk (W)	Skewness	Kurtosis	Shapiro-Wilk (W)	Skewness	Kurtosis
ACETYLENE	0	0.787*	0.87	-1.27	0.876	0.32	-1.82
PROPYLENE	0	0.702*	2.32	5.78	0.941	0.86	0.89
CHLOROMETHANE	1	0.842	-1.41	3.81	0.698*	-2.30	6.10
VINYL CHLORIDE	8	0.417*			0.417*	-1.25	-2.80
1,3-BUTADIENE	1	0.851	1.47	2.35	0.959	0.14	-0.54
BROMOMETHANE	8		1.25	-2.80			
CHLOROETHANE	8		1.25	-2.80			
METHYLENE CHLORIDE	0	0.838	0.36	-2.02	0.883	-0.56	-1.03
trans-1,2-DICHLOROETHYLENE	8						
1,1-DICHLOROETHANE	8					1.25	-2.80
CHLOROPRENE	8	0.417*	1.25	-2.80	0.417*	1.25	-2.80
BROMOCHLOROMETHANE	8	0.417*			0.417*	-1.25	-2.80
CHLOROFORM	1	0.869	0.31	-1.90	0.871	0.01	-2.06
1,2-DICHLOROETHANE	8					-1.25	-2.80
1,1,1-TRICHLOROETHANE	0	0.965	-0.31	1.21	0.933	-0.90	1.81
BENZENE	0	0.911	0.49	-0.80	0.897	-0.56	-0.77
CARBON TETRACHLORIDE	0	0.839	0.26	-0.71	0.838	0.07	-1.12
1,2-DICHLOROPROPANE	8						
BROMODICHLOROMETHANE	8	0.417*	1.25	-2.80	0.417*		
TRICHLOROETHYLENE	0	0.853	1.14	0.84	0.890	0.03	-1.55
cis-1,3-DICHLOROPROPENE	8	0.417*	1.25	-2.80	0.417*	1.25	-2.80
trans-1,3-DICHLOROPROPENE	8					-1.25	-2.80
1,1,2-TRICHLOROETHANE	8	0.417*	1.25	-2.80	0.417*	1.25	-2.80
TOLUENE	0	0.892	1.21	1.64	0.939	-0.13	-0.46
DIBROMOCHLOROMETHANE	8	0.417*	1.25	-2.80	0.417*	1.25	-2.80
n-OCTANE	0	0.979	0.06	-0.01	0.935	-0.98	1.46
TETRACHLOROETHYLENE	0	0.462*	2.82	7.94	0.733*	2.00	5.35
CHLOROBENZENE	7	0.417*	-2.83	8.00	0.417*	-2.83	8.00
ETHYLBENZENE	0	0.873	1.47	2.64	0.969	0.17	-0.12
m,p-XYLENE	0	0.934	0.71	0.08	0.946	-0.26	-0.85
BROMOFORM	8					-1.25	-2.80
STYRENE	0	0.815	1.63	3.16	0.929	0.20	-0.71
1,1,2,2-TETRACHLOROETHANE	8						
o-XYLENE	0	0.936	0.42	-0.32	0.902	-0.54	-0.73
m-DICHLOROBENZENE	6	0.794*	0.00	3.50	0.689*	-1.94	5.46
p-DICHLOROBENZENE	0	0.925	0.52	-0.70	0.928	-0.15	-1.27
o-DICHLOROBENZENE	5	0.675*	-2.12	4.68	0.597*	-2.53	6.65

**Significant at the 5% level.*

Appendix E

Statistical Summary for the Carbonyl Option

Table E-1. 1995 NMOC Carbonyl Option Summary of Number and Frequency of Occurrence for All Sites

Analyte	Number of Occurences	Frequency (%)
Formaldehyde	41	100%
Acetaldehyde	41	100%
Acrolein	10	24%
Acetone	41	100%
Propionaldehyde	24	59%
Crotonaldehyde	40	98%
Butyraldehyde and Isobutyraldehyde	38	93%
Benzaldehyde	34	83%
Isovaleraldehyde	6	15%
Valeraldehyde	22	54%
Tolualdehydes	22	54%
Hexaldehyde	41	100%
2,5-Dimethylbenzaldehyde	3	7%

Table E-2. Number and Frequency of Occurrences for the Carbonyl Compounds in 1995 by Site

	Dallas, TX (DLTX)		Fort Worth, TX (FWTX)		New Orleans, LA (NOLA)		Newark, NJ (NWNJ)		Plainfield, NJ (P2NJ)	
	Occurrences		Occurrences		Occurrences		Occurrences		Occurrences	
Compound	Number	Frequency	Number	Frequency	Number	Frequency	Number	Frequency	Number	Frequency
Formaldehyde	8	100%	8	100%	8	100%	8	100%	9	100%
Acetaldehyde	8	100%	8	100%	8	100%	8	100%	9	100%
Acrolein	1	13%	4	50%	0	0%	5	63%	0	0%
Acetone	8	100%	8	100%	8	100%	8	100%	9	100%
Propionaldehyde	8	100%	6	75%	1	13%	1	13%	8	89%
Crotonaldehyde	8	100%	7	88%	8	100%	8	100%	9	100%
Butyraldehyde and Isobutyraldehyde	7	88%	6	75%	8	100%	8	100%	9	100%
Benzaldehyde	7	88%	7	88%	3	38%	8	100%	9	100%
Isovaleraldehyde	0	0%	1	13%	3	38%	2	25%	0	0%
Valeraldehyde	1	13%	3	38%	5	63%	4	50%	9	100%
Tolualdehydes	5	63%	8	100%	0	0%	4	50%	5	56%
Hexaldehyde	8	100%	8	100%	8	100%	8	100%	9	100%
2,5-Dimethylbenzaldehyde	0	0%	0	0%	0	0%	1	13%	2	22%

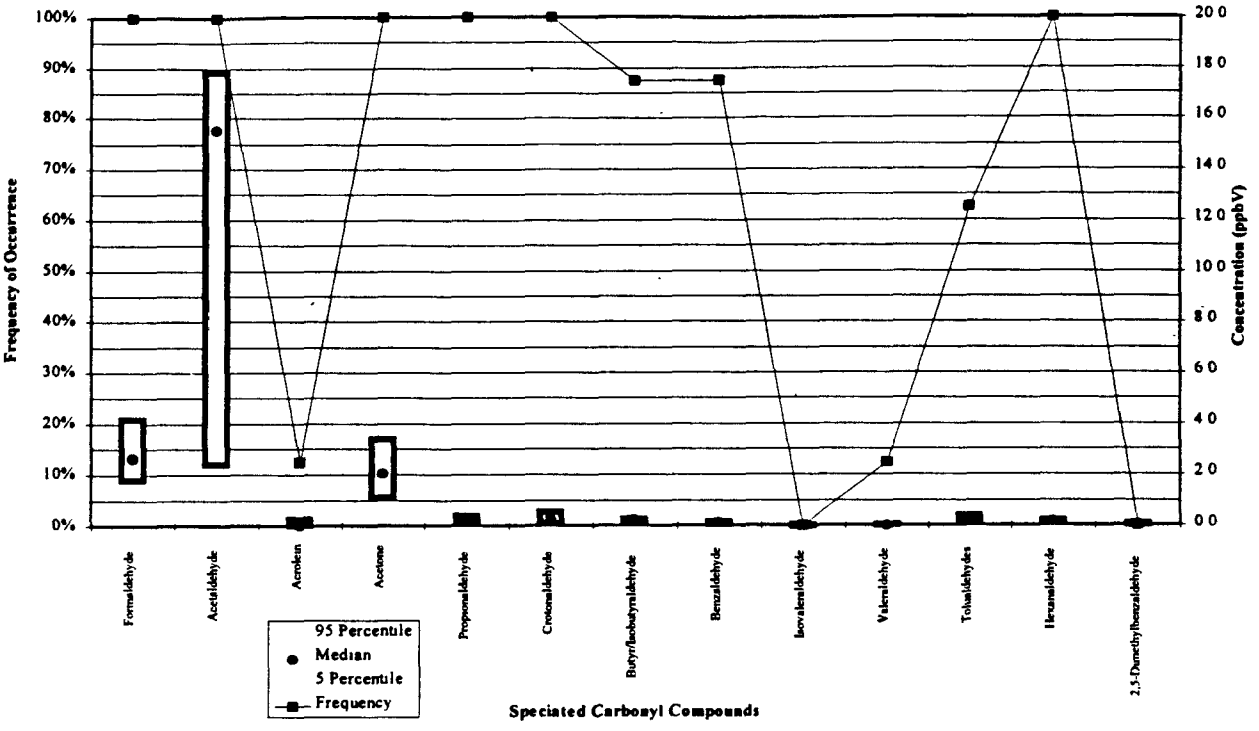

Figure E-1. Frequency and Concentration Distribution of Carbonyls at DLTX in 1995

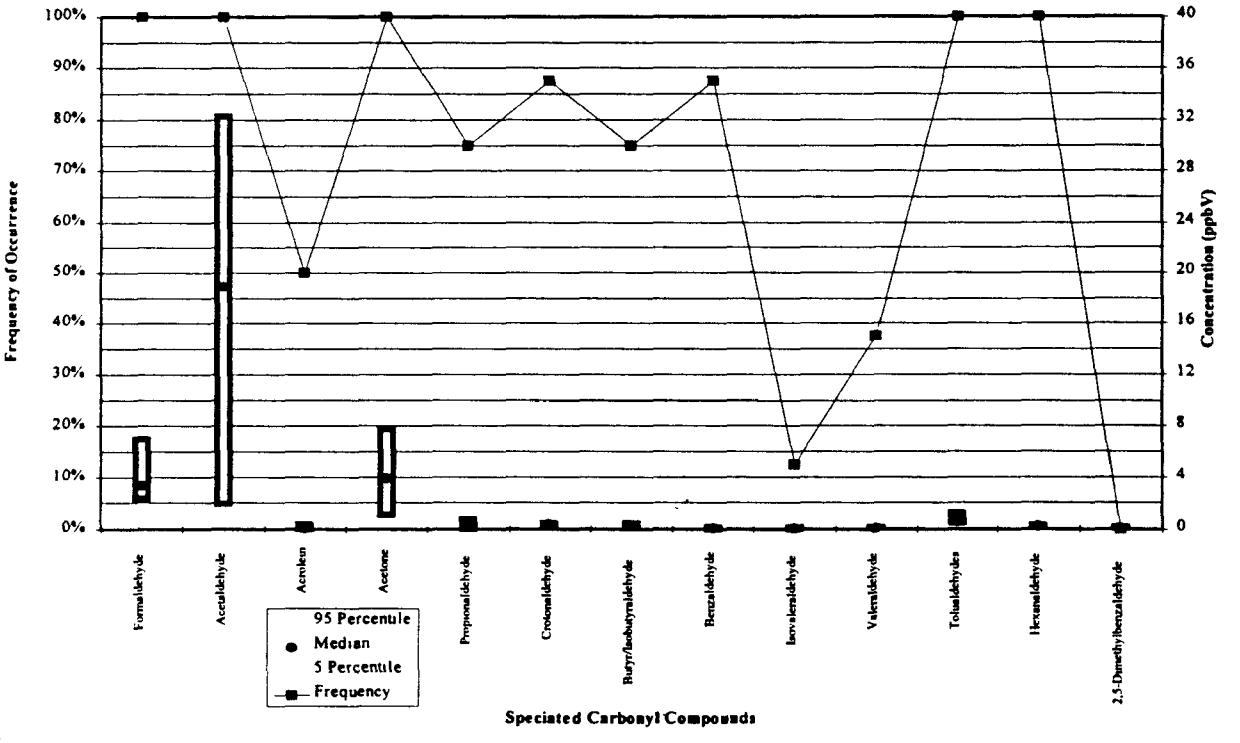

Figure E-2. Frequency and Concentration Distribution of Carbonyls at FWTX in 1995

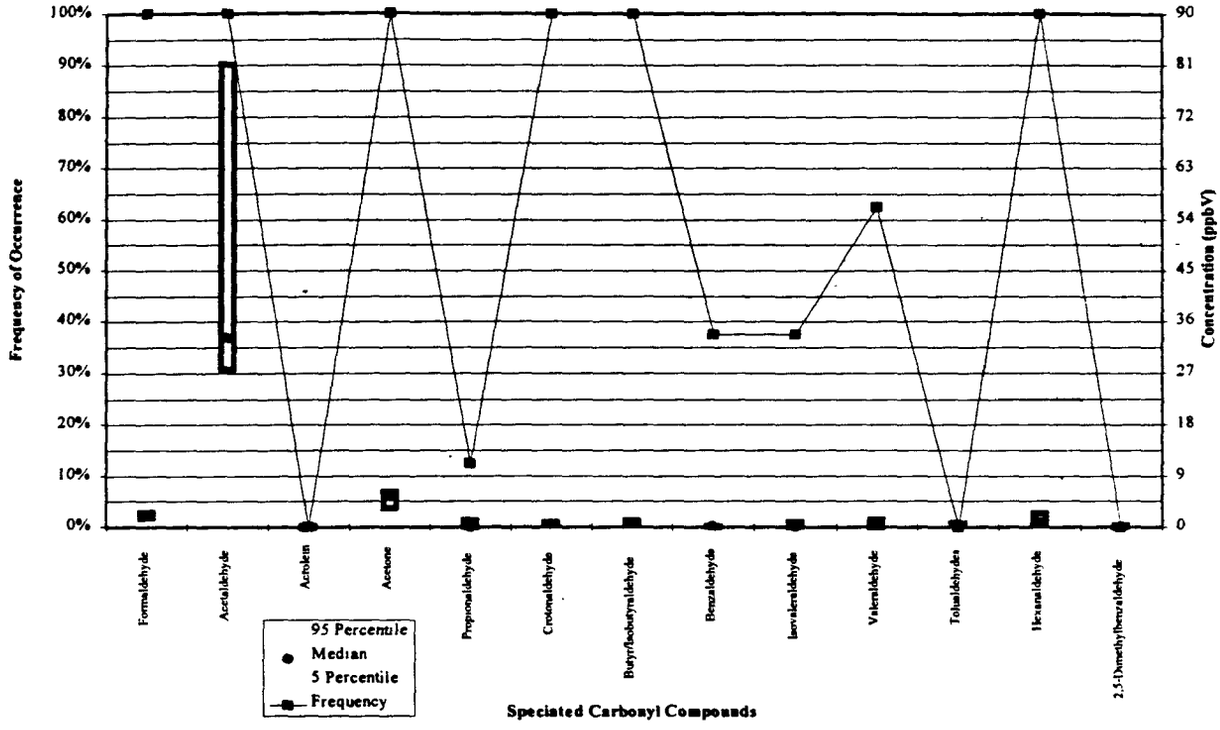

Figure E-3. Frequency and Concentration Distribution of Carbonyls at NOLA in 1995

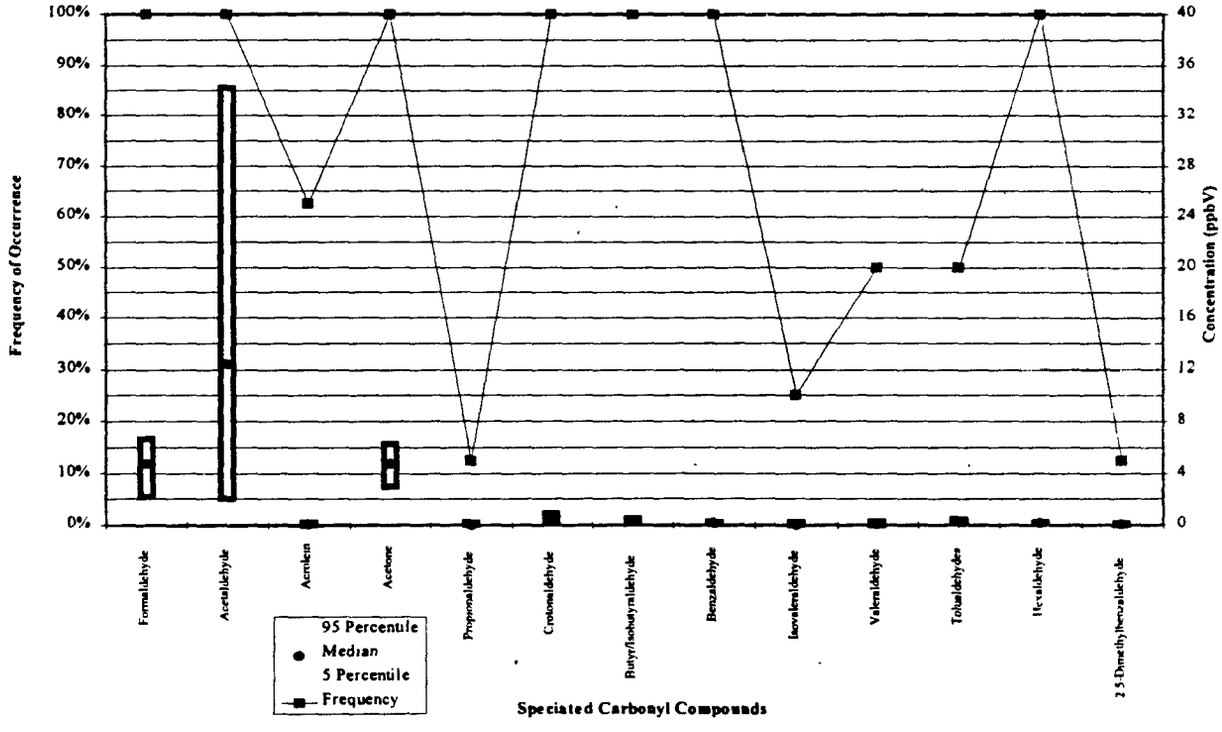

Figure E-4. Frequency and Concentration Distribution of Carbonyls at NWNJ in 1995

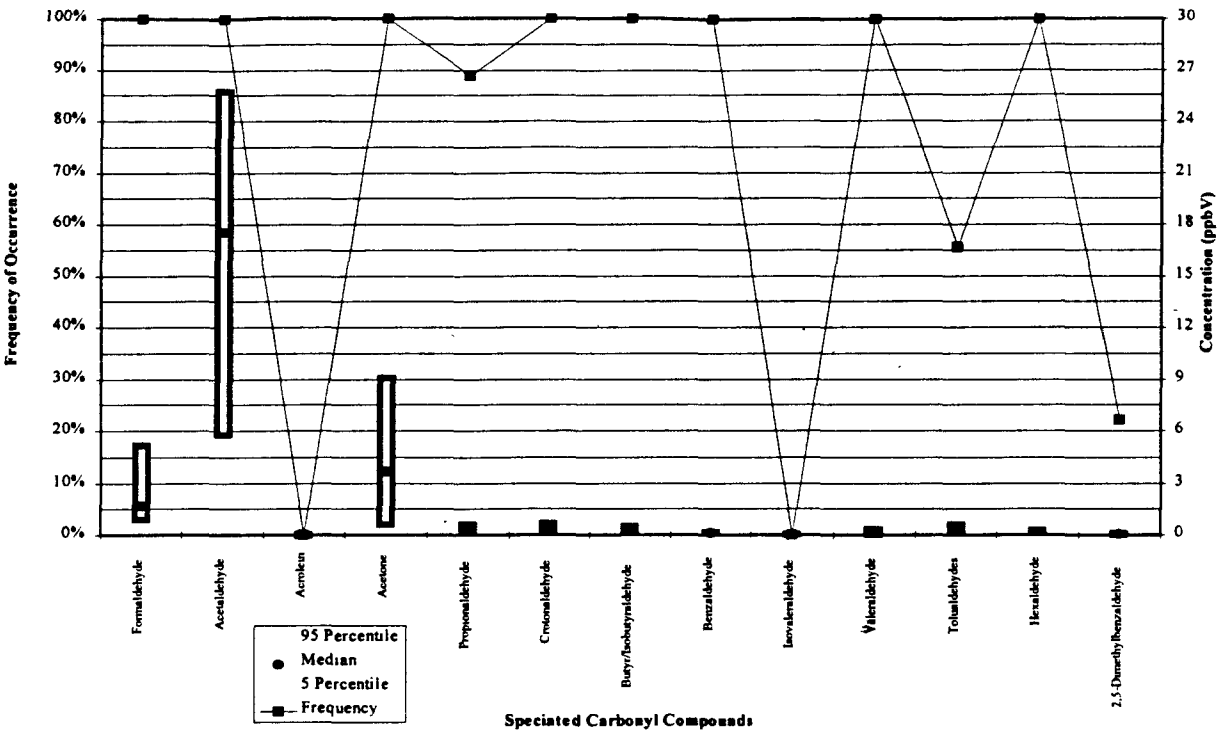

Figure E-5. Frequency and Concentration Distribution of Carbonyls at P2NJ in 1995

Table E-3. Statistical Summary for Total Carbonyl Option Program

	Concentration Range (ppbV)		Central Tendency of Measured Concentration (ppbV)				Variability of Concentration	
Compound	Minimum	Maximum	Mode	Median	Arithmetic Average	Geometric Mean	Arithmetic Standard Deviation	Geometric Standard Deviation
Formaldehyde	0.83	7.92	2.21	2.55	3.04	2.63	1.73	1.72
Acetaldehyde	0.85	81.90	30.75	18.09	21.84	14.26	18.41	2.94
Acrolein	0.01	0.41	0.01	0.03	0.07	0.03	0.11	3.45
Acetone	0.22	9.74	None	3.82	4.00	3.19	2.30	2.21
Propionaldehyde	0.01	1.86	0.01	0.15	0.28	0.12	0.34	4.62
Crotonaldehyde	0.05	0.92	0.37	0.37	0.40	0.32	0.23	2.11
Butyr/Isobutyraldehyde	0.01	1.27	0.46	0.34	0.39	0.30	0.26	2.33
Benzaldehyde	0.03	0.28	0.14	0.12	0.12	0.10	0.06	1.72
Isovaleraldehyde	0.02	1.16	0.02	0.02	0.08	0.04	0.18	2.59
Valeraldehyde	0.02	1.62	0.02	0.07	0.18	0.08	0.30	3.45
Tolualdehydes	0.10	1.23	0.17	0.43	0.41	0.33	0.26	1.94
Hexanaldehyde	0.07	3.17	0.19	0.19	0.34	0.22	0.51	2.22
2,5-Dimethylbenzaldehyde	0.02	0.22	0.03	0.04	0.07	0.06	0.04	1.84

Table E-4. Statistical Summary for Dallas, Texas (DLTX) for the 1995 Carbonyl Option

		Concentration Range (ppbV)		Central Tendency of Measured Concentration (ppbV)			Variability of Concentration (ppbV)		Shape Statistics	
Compound	Non-detects	Minimum	Maximum	Median	Arithmetic Average	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation	Skew	Kurtosis
Formaldehyde	0	1.58	4.96	2.63	2.73	2.60	0.98	0.36	1.87	4.85
Acetaldehyde	0	0.85	18.09	15.54	12.37	9.30	6.33	0.51	-1.10	-0.14
Acrolein	7	0.01	0.40	0.01	0.06	0.02	0.14	2.35	2.83	8.00
Acetone	0	1.09	4.04	2.05	1.99	1.83	0.95	0.47	1.55	3.20
Propionaldehyde	0	0.12	0.42	0.22	0.23	0.21	0.11	0.49	0.50	-1.24
Crotonaldehyde	0	0.06	0.60	0.26	0.29	0.23	0.18	0.62	0.53	-0.42
Butyraldehyde and Isobutyraldehyde	1	0.01	0.30	0.23	0.20	0.15	0.09	0.43	-1.74	3.68
Benzaldehyde	1	0.03	0.15	0.11	0.10	0.09	0.04	0.42	-0.72	-0.67
Isovaleraldehyde	8	0.02	0.02	0.02	0.02	0.02	0.00	0.00	Not Applicable	
Valeraldehyde	7	0.02	0.06	0.02	0.03	0.02	0.01	0.57	2.83	8.00
Tolualdehydes	3	0.10	0.42	0.18	0.20	0.18	0.11	0.57	1.13	0.85
Hexaldehyde	0	0.07	0.20	0.14	0.14	0.13	0.05	0.35	-0.10	-1.08
2,5-Dimethylbenzaldehyde	8	0.02	0.02	0.02	0.02	0.02	0.00	0.00	Not Applicable	

Note: There were a total of 8 cases.

Table E-5. Statistical Summary for Fort Worth, Texas (FWTX) for the 1995 Carbonyl Option

		Concentration Range (ppbV)		Central Tendency of Measured Concentration (ppbV)			Variability of Concentration (ppbV)		Shape Statistics	
Compound	Non-detects	Minimum	Maximum	Median	Arithmetic Average	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation	Skew	Kurtosis
Formaldehyde	0	2.21	7.92	3.34	3.87	3.56	1.88	0.49	1.73	2.92
Acetaldehyde	0	1.69	33.12	18.92	17.74	10.91	14.08	0.79	-0.06	-2.56
Acrolein	4	0.02	0.41	0.09	0.16	0.08	0.17	1.04	0.68	-1.50
Acetone	0	0.41	8.50	3.86	4.05	3.13	2.49	0.61	0.57	0.52
Propionaldehyde	2	0.01	0.80	0.38	0.38	0.18	0.29	0.77	0.20	-0.72
Crotonaldehyde	0	0.05	0.45	0.40	0.31	0.24	0.17	0.55	-0.98	-0.93
Butyraldehyde and Isobutyraldehyde	1	0.04	0.46	0.32	0.29	0.24	0.14	0.49	-0.70	-0.44
Benzaldehyde	1	0.03	0.19	0.08	0.10	0.08	0.06	0.63	0.54	-1.42
Isovaleraldehyde	7	0.03	0.09	0.03	0.04	0.04	0.02	0.45	2.20	4.66
Valeraldehyde	5	0.03	0.22	0.06	0.08	0.07	0.07	0.79	1.40	1.66
Tolualdehydes	0	0.43	1.23	0.53	0.71	0.65	0.33	0.47	1.03	-0.80
Hexaldehyde	0	0.13	0.29	0.20	0.21	0.20	0.06	0.28	0.11	-1.06
2,5-Dimethylbenzaldehyde	8	0.03	0.09	0.03	0.04	0.04	0.02	0.46	2.83	8.00

Note: There were a total of 8 cases.

Table E-6. Statistical Summary for New Orleans, Lousiana (NOLA) for the 1995 Carbonyl Option

		Concentration Range (ppbV)		Central Tendency of Measured Concentration (ppbV)			Variability of Concentration (ppbV)		Shape Statistics	
Compound	Non-detects	Minimum	Maximum	Median	Arithmetic Average	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation	Skew	Kurtosis
Formaldehyde	0	1.52	2.72	1.87	1.98	1.93	0.48	0.24	0.71	-1.09
Acetaldehyde	0	26.82	81.90	33.26	46.47	42.09	23.22	0.50	0.94	-1.10
Acrolein	8	0.04	0.06	0.04	0.05	0.05	0.01	0.13	2.83	8.00
Acetone	0	2.81	6.51	5.44	5.14	5.00	1.17	0.23	-1.24	1.61
Propionaldehyde	7	0.03	1.86	0.03	0.26	0.05	0.65	2.53	2.83	8.00
Crotonaldehyde	0	0.25	0.88	0.51	0.54	0.51	0.21	0.38	0.32	-0.53
Butyraldehyde and Isobutyraldehyde	0	0.48	1.27	0.70	0.77	0.74	0.27	0.34	1.04	0.43
Benzaldehyde	5	0.03	0.28	0.13	0.14	0.13	0.07	0.48	0.49	2.42
Isovaleraldehyde	5	0.09	1.16	0.09	0.25	0.15	0.37	1.52	2.74	7.58
Valeraldehyde	3	0.09	1.62	0.30	0.51	0.29	0.54	1.06	1.39	1.67
Tolualdehydes	8	0.44	0.61	0.44	0.46	0.46	0.06	0.13	2.83	8.00
Hexaldehyde	0	0.45	3.17	0.83	1.03	0.85	0.88	0.86	2.59	7.06
2,5-Dimethylbenzaldehyde	8	0.09	0.12	0.09	0.09	0.09	0.01	0.13	2.83	8.00

Note: There were a total of 8 cases.

Table E-7. Statistical Summary for Newark, New Jersey (NWNJ) for the 1995 Carbonyl Option

		Concentration Range (ppbV)		Central Tendency of Measured Concentration (ppbV)			Variability of Concentration (ppbV)		Shape Statistics	
Compound	Non-detects	Minimum	Maximum	Median	Arithmetic Average	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation	Skew	Kurtosis
Formaldehyde	0	2.09	6.85	4.75	4.50	4.12	1.89	0.42	-0.15	-1.91
Acetaldehyde	0	1.91	35.63	12.44	16.07	9.62	14.06	0.88	0.34	-2.04
Acrolein	3	0.01	0.24	0.09	0.10	0.05	0.09	0.90	0.42	-1.44
Acetone	0	2.58	6.58	4.75	4.67	4.48	1.35	0.29	-0.15	-1.08
Propionaldehyde	7	0.01	0.32	0.01	0.05	0.02	0.11	2.25	2.83	8.00
Crotonaldehyde	0	0.06	0.92	0.29	0.42	0.30	0.34	0.80	0.65	-1.41
Butyraldehyde and Isobutyraldehyde	0	0.20	0.56	0.33	0.35	0.33	0.12	0.35	0.38	-0.63
Benzaldehyde	0	0.09	0.25	0.14	0.15	0.14	0.05	0.37	0.87	0.35
Isovaleraldehyde	6	0.02	0.29	0.02	0.08	0.04	0.11	1.40	0.87	0.35
Valeraldehyde	4	0.02	0.34	0.04	0.14	0.07	0.15	1.09	0.64	-2.09
Tolualdehydes	4	0.10	0.47	0.22	0.26	0.20	0.17	0.67	0.17	-2.46
Hexaldehyde	0	0.07	0.25	0.19	0.18	0.17	0.06	0.34	-0.71	-0.14
2,5-Dimethylbenzaldehyde	7	0.02	0.09	0.02	0.03	0.02	0.03	0.87	0.87	0.35

Note: There were a total of 8 cases.

Table E-8. Statistical Summary for Plainfield, New Jersey (P2NJ) for the 1995 Carbonyl Option

		Concentration Range (ppbV)		Central Tendency of Measured Concentration (ppbV)			Variability of Concentration (ppbV)		Shape Statistics	
Compound	Non-detects	Minimum	Maximum	Median	Arithmetic Average	Geometric Mean	Arithmetic Standard Deviation	Coefficient of Variation	Skew	Kurtosis
Formaldehyde	0	0.83	5.58	1.67	2.23	1.80	1.69	0.76	1.46	0.92
Acetaldehyde	0	2.57	25.94	17.53	17.12	14.36	8.31	0.49	-0.48	-0.99
Acrolein	9	0.01	0.01	0.01	0.01	0.01	0.00	0.00	Not Applicable	
Acetone	0	0.22	9.74	3.69	4.14	2.61	3.42	0.82	0.60	-1.22
Propionaldehyde	1	0.01	0.68	0.51	0.46	0.33	0.19	0.41	-1.86	4.58
Crotonaldehyde	0	0.22	0.72	0.34	0.43	0.40	0.17	0.40	0.54	-1.20
Butyraldehyde and Isobutyraldehyde	0	0.08	0.57	0.34	0.32	0.26	0.19	0.59	-0.04	-2.01
Benzaldehyde	0	0.05	0.17	0.09	0.10	0.09	0.04	0.42	0.54	-0.95
Isovaleraldehyde	9	0.02	0.02	0.02	0.02	0.02	0.00	0.00	Not Applicable	
Valeraldehyde	0	0.03	0.46	0.13	0.15	0.10	0.14	0.94	1.61	2.79
Tolualdehydes	4	0.10	0.65	0.38	0.35	0.25	0.25	0.71	0.02	-2.27
Hexaldehyde	0	0.08	0.30	0.18	0.16	0.15	0.07	0.42	0.79	0.41
2,5-Dimethylbenzaldehyde	7	0.02	0.06	0.02	0.03	0.02	0.01	0.54	1.67	1.10

Note: There were a total of 9 cases.

Table E-9. Shape Statistics for the 1995 Carbonyl Option

	Normal Distribution		Lognormal Distribution	
Compound	Skew	Kurtosis	Skew	Kurtosis
Formaldehyde	1.16	0.63	0.10	-0.33
Acetaldehyde	1.66	3.70	-0.85	0.17
Acrolein	2.09	3.49	0.76	-0.77
Acetone	0.44	-0.33	-1.37	2.45
Propionaldehyde	2.52	9.72	-0.23	-1.59
Crotonaldehyde	0.52	-0.23	-1.05	0.73
Butyraldehyde and Isobutyraldehyde	1.44	2.87	-1.68	5.20
Benzaldehyde	0.58	0.55	-0.72	-0.02
Isovaleraldehyde	5.40	31.72	1.67	2.72
Valeraldehyde	3.40	13.76	0.58	-0.61
Tolualdehydes	1.23	2.48	-0.39	-1.07
Hexaldehyde	4.63	24.89	1.25	2.03
2,5-Dimethylbenzaldehyde	1.14	-0.19	0.78	-1.07

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PPLEMENTARY NOTES

STRACT

ERTAIN AREAS OF THE COUNTRY WHERE THE NATIONAL AMBIENT AIR QUALITY STANDARD (NAAQS) R OZONE IS BEING EXCEEDED, ADDITIONAL MEASUREMENTS OF AMBIENT NONMETHANE ORGANIC MPOUNDS (NMOC) ARE NEEDED TO ASSIST THE AFFECTED STATES IN DEVELOPING REVISED OZONE NTROL STRATEGIES. BECAUSE OF PREVIOUS DIFFICULTY IN OBTAINING ACCURATE NMOC ASUREMENTS, THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) HAS PROVIDED MONITORING) ANALYTICAL ASSISTANCE TO THESE STATES, BEGINNING IN 1984 AND CONTINUING THROUGH THE 5 NMOC MONITORING PROGRAM.

KEY WORDS AND DOCUMENT ANALYSIS

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one Control Stategies ional Ambient Air Quality Standards methane Organic Compound nitoring Analysis 5 NMOC Monitoring Program		

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